Boost.Asio

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Boost.Asio is a cross-platform C++ library for network and low-level I/O programming that provides developers with a consistent asynchronous model using a modern C++ approach.

Overview

Rationale

Most programs interact with the outside world in some way, whether it be via a file, a network, a serial cable, or the console. Sometimes, as is the case with networking, individual I/O operations can take a long time to complete. This poses particular challenges to application development.

Boost.Asio provides the tools to manage these long running operations, without requiring programs to use concurrency models based on threads and explicit locking.

The Boost.Asio library is intended for programmers using C++ for systems programming, where access to operating system functionality such as networking is often required. In particular, Boost.Asio addresses the following goals:

- **Portability.** The library should support a range of commonly used operating systems, and provide consistent behaviour across these operating systems.
- **Scalability.** The library should facilitate the development of network applications that scale to thousands of concurrent connections. The library implementation for each operating system should use the mechanism that best enables this scalability.
- **Efficiency.** The library should support techniques such as scatter-gather I/O, and allow programs to minimise data copying.
- **Model concepts from established APIs, such as BSD sockets.** The BSD socket API is widely implemented and understood, and is covered in much literature. Other programming languages often use a similar interface for networking APIs. As far as is reasonable, Boost.Asio should leverage existing practice.
- **Ease of use.** The library should provide a lower entry barrier for new users by taking a toolkit, rather than framework, approach. That is, it should try to minimise the up-front investment in time to just learning a few basic rules and guidelines. After that, a library user should only need to understand the specific functions that are being used.
- **Basis for further abstraction.** The library should permit the development of other libraries that provide higher levels of abstraction. For example, implementations of commonly used protocols such as HTTP.

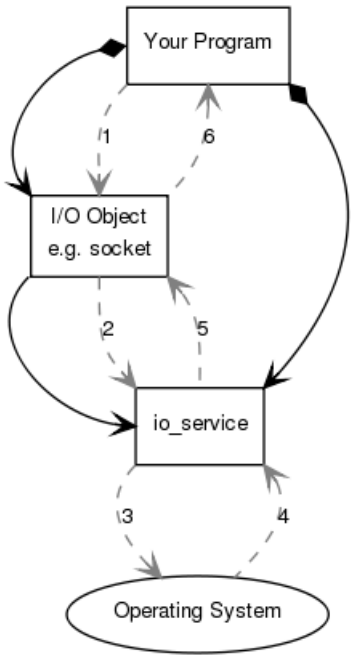
Although Boost.Asio started life focused primarily on networking, its concepts of asynchronous I/O have been extended to include other operating system resources such as serial ports, file descriptors, and so on.

Core Concepts and Functionality

Basic Boost.Asio Anatomy

Boost.Asio may be used to perform both synchronous and asynchronous operations on I/O objects such as sockets. Before using Boost.Asio it may be useful to get a conceptual picture of the various parts of Boost.Asio, your program, and how they work together.

As an introductory example, let's consider what happens when you perform a connect operation on a socket. We shall start by examining synchronous operations.



Your program will have at least one **io_service** object. The **io_service** represents **your program**'s link to the **operating system**'s I/O services.

```
boost::asio::io_service io_service;
```

To perform I/O operations **your program** will need an **I/O object** such as a TCP socket:

```
boost::asio::ip::tcp::socket socket(io_service);
```

When a synchronous connect operation is performed, the following sequence of events occurs:

1. **Your program** initiates the connect operation by calling the **I/O object**:

```
socket.connect(server_endpoint);
```

2. The **I/O object** forwards the request to the **io_service**.

3. The **io_service** calls on the **operating system** to perform the connect operation.

4. The **operating system** returns the result of the operation to the **io_service**.

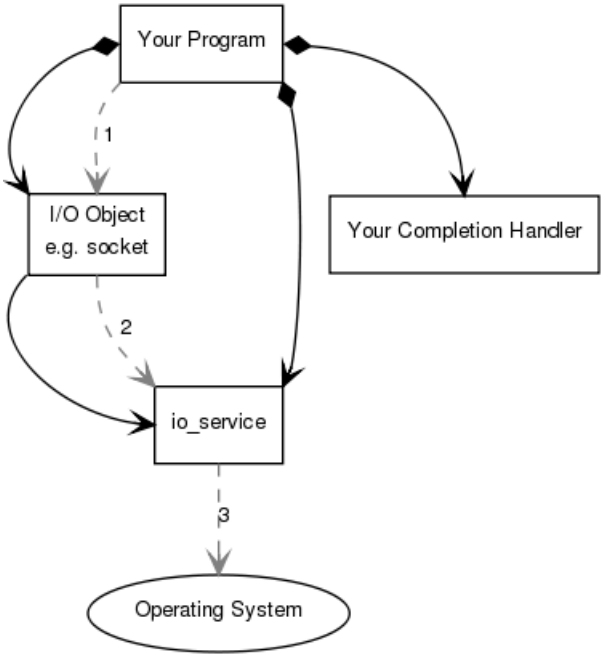
5. The **io_service** translates any error resulting from the operation into a `boost::system::error_code`. An `error_code` may be compared with specific values, or tested as a boolean (where a `false` result means that no error occurred). The result is then forwarded back up to the **I/O object**.

6. The **I/O object** throws an exception of type `boost::system::system_error` if the operation failed. If the code to initiate the operation had instead been written as:

```
boost::system::error_code ec;
socket.connect(server_endpoint, ec);
```

then the `error_code` variable `ec` would be set to the result of the operation, and no exception would be thrown.

When an asynchronous operation is used, a different sequence of events occurs.



1. **Your program** initiates the connect operation by calling the **I/O object**:

```
socket.async_connect(server_endpoint, your_completion_handler);
```

where `your_completion_handler` is a function or function object with the signature:

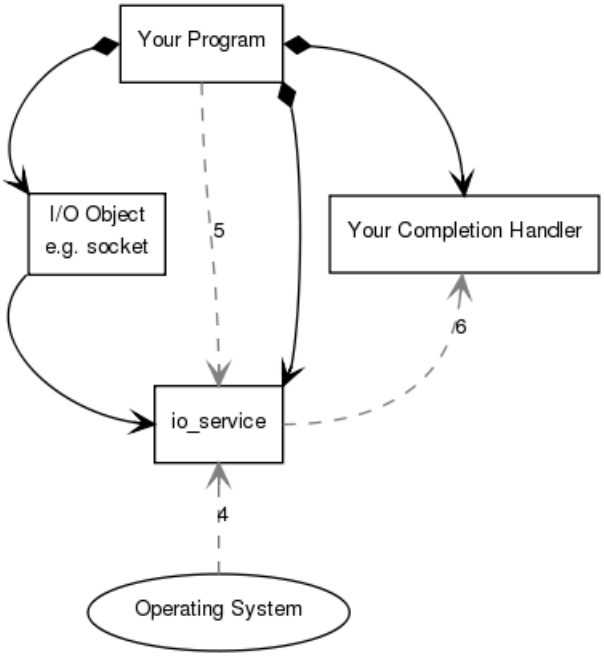
```
void your_completion_handler(const boost::system::error_code& ec);
```

The exact signature required depends on the asynchronous operation being performed. The reference documentation indicates the appropriate form for each operation.

2. The **I/O object** forwards the request to the **io_service**.

3. The **io_service** signals to the **operating system** that it should start an asynchronous connect.

Time passes. (In the synchronous case this wait would have been contained entirely within the duration of the connect operation.)



4. The **operating system** indicates that the connect operation has completed by placing the result on a queue, ready to be picked up by the **io_service**.

5. **Your program** must make a call to `io_service::run()` (or to one of the similar **io_service** member functions) in order for the result to be retrieved. A call to `io_service::run()` blocks while there are unfinished asynchronous operations, so you would typically call it as soon as you have started your first asynchronous operation.

6. While inside the call to `io_service::run()`, the **io_service** dequeues the result of the operation, translates it into an `error_code`, and then passes it to **your completion handler**.

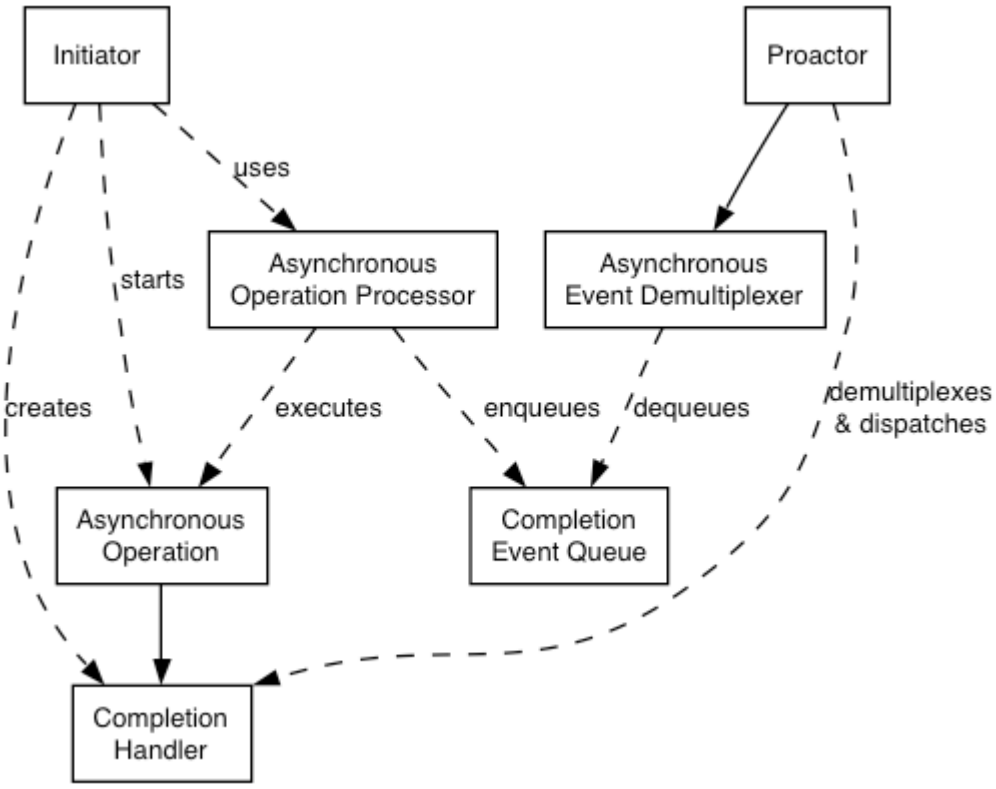
This is a simplified picture of how Boost.Asio operates. You will want to delve further into the documentation if your needs are more advanced, such as extending Boost.Asio to perform other types of asynchronous operations.

The Proactor Design Pattern: Concurrency Without Threads

The Boost.Asio library offers side-by-side support for synchronous and asynchronous operations. The asynchronous support is based on the Proactor design pattern [POSA2]. The advantages and disadvantages of this approach, when compared to a synchronous-only or Reactor approach, are outlined below.

Proactor and Boost.Asio

Let us examine how the Proactor design pattern is implemented in Boost.Asio, without reference to platform-specific details.



Proactor design pattern (adapted from [POSA2])

— Asynchronous Operation

Defines an operation that is executed asynchronously, such as an asynchronous read or write on a socket.

— Asynchronous Operation Processor

Executes asynchronous operations and queues events on a completion event queue when operations complete. From a high-level point of view, services like `stream_socket_service` are asynchronous operation processors.

— Completion Event Queue

Buffers completion events until they are dequeued by an asynchronous event demultiplexer.

— Completion Handler

Processes the result of an asynchronous operation. These are function objects, often created using `boost::bind`.

— Asynchronous Event Demultiplexer

Blocks waiting for events to occur on the completion event queue, and returns a completed event to its caller.

— Proactor

Calls the asynchronous event demultiplexer to dequeue events, and dispatches the completion handler (i.e. invokes the function object) associated with the event. This abstraction is represented by the `io_service` class.

— Initiator

Application-specific code that starts asynchronous operations. The initiator interacts with an asynchronous operation processor via a high-level interface such as `basic_stream_socket`, which in turn delegates to a service like `stream_socket_service`.

Implementation Using Reactor

On many platforms, Boost.Asio implements the Proactor design pattern in terms of a Reactor, such as `select`, `epoll` or `kqueue`. This implementation approach corresponds to the Proactor design pattern as follows:

— Asynchronous Operation Processor

> A reactor implemented using `select`, `epoll` or `kqueue`. When the reactor indicates that the resource is ready to perform the operation, the processor executes the asynchronous operation and enqueues the associated completion handler on the completion event queue.

— Completion Event Queue

> A linked list of completion handlers (i.e. function objects).

— Asynchronous Event Demultiplexer

> This is implemented by waiting on an event or condition variable until a completion handler is available in the completion event queue.

Implementation Using Windows Overlapped I/O

On Windows NT, 2000 and XP, Boost.Asio takes advantage of overlapped I/O to provide an efficient implementation of the Proactor design pattern. This implementation approach corresponds to the Proactor design pattern as follows:

— Asynchronous Operation Processor

> This is implemented by the operating system. Operations are initiated by calling an overlapped function such as `AcceptEx`.

— Completion Event Queue

> This is implemented by the operating system, and is associated with an I/O completion port. There is one I/O completion port for each `io_service` instance.

— Asynchronous Event Demultiplexer

> Called by Boost.Asio to dequeue events and their associated completion handlers.

Advantages

— Portability.

> Many operating systems offer a native asynchronous I/O API (such as overlapped I/O on *Windows*) as the preferred option for developing high performance network applications. The library may be implemented in terms of native asynchronous I/O. However, if native support is not available, the library may also be implemented using synchronous event demultiplexors that typify the Reactor pattern, such as *POSIX* `select()`.

— Decoupling threading from concurrency.

> Long-duration operations are performed asynchronously by the implementation on behalf of the application. Consequently applications do not need to spawn many threads in order to increase concurrency.

— Performance and scalability.

> Implementation strategies such as thread-per-connection (which a synchronous-only approach would require) can degrade system performance, due to increased context switching, synchronisation and data movement among CPUs. With asynchronous operations it is possible to avoid the cost of context switching by minimising the number of operating system threads — typically a limited resource — and only activating the logical threads of control that have events to process.

— Simplified application synchronisation.

Asynchronous operation completion handlers can be written as though they exist in a single-threaded environment, and so application logic can be developed with little or no concern for synchronisation issues.

— Function composition.

Function composition refers to the implementation of functions to provide a higher-level operation, such as sending a message in a particular format. Each function is implemented in terms of multiple calls to lower-level read or write operations.

For example, consider a protocol where each message consists of a fixed-length header followed by a variable length body, where the length of the body is specified in the header. A hypothetical read_message operation could be implemented using two lower-level reads, the first to receive the header and, once the length is known, the second to receive the body.

To compose functions in an asynchronous model, asynchronous operations can be chained together. That is, a completion handler for one operation can initiate the next. Starting the first call in the chain can be encapsulated so that the caller need not be aware that the higher-level operation is implemented as a chain of asynchronous operations.

The ability to compose new operations in this way simplifies the development of higher levels of abstraction above a networking library, such as functions to support a specific protocol.

Disadvantages

— Program complexity.

It is more difficult to develop applications using asynchronous mechanisms due to the separation in time and space between operation initiation and completion. Applications may also be harder to debug due to the inverted flow of control.

— Memory usage.

Buffer space must be committed for the duration of a read or write operation, which may continue indefinitely, and a separate buffer is required for each concurrent operation. The Reactor pattern, on the other hand, does not require buffer space until a socket is ready for reading or writing.

References

[POSA2] D. Schmidt et al, *Pattern Oriented Software Architecture, Volume 2*. Wiley, 2000.

Threads and Boost.Asio

Thread Safety

In general, it is safe to make concurrent use of distinct objects, but unsafe to make concurrent use of a single object. However, types such as `io_service` provide a stronger guarantee that it is safe to use a single object concurrently.

Thread Pools

Multiple threads may call `io_service::run()` to set up a pool of threads from which completion handlers may be invoked. This approach may also be used with `io_service::post()` to use a means to perform any computational tasks across a thread pool.

Note that all threads that have joined an `io_service`'s pool are considered equivalent, and the `io_service` may distribute work across them in an arbitrary fashion.

Internal Threads

The implementation of this library for a particular platform may make use of one or more internal threads to emulate asynchronicity. As far as possible, these threads must be invisible to the library user. In particular, the threads:

- must not call the user's code directly; and
- must block all signals.

Note

The implementation currently violates the first of these rules for the following functions:

— `ip::basic_resolver::async_resolve()` on all platforms.

— `basic_socket::async_connect()` on Windows.

— Any operation involving `null_buffers()` on Windows, other than an asynchronous read performed on a stream-oriented socket.

This approach is complemented by the following guarantee:

- Asynchronous completion handlers will only be called from threads that are currently calling `io_service::run()`.

Consequently, it is the library user's responsibility to create and manage all threads to which the notifications will be delivered.

The reasons for this approach include:

- By only calling `io_service::run()` from a single thread, the user's code can avoid the development complexity associated with synchronisation. For example, a library user can implement scalable servers that are single-threaded (from the user's point of view).
- A library user may need to perform initialisation in a thread shortly after the thread starts and before any other application code is executed. For example, users of Microsoft's COM must call `CoInitializeEx` before any other COM operations can be called from that thread.
- The library interface is decoupled from interfaces for thread creation and management, and permits implementations on platforms where threads are not available.

See Also

io_service.

Strands: Use Threads Without Explicit Locking

A strand is defined as a strictly sequential invocation of event handlers (i.e. no concurrent invocation). Use of strands allows execution of code in a multithreaded program without the need for explicit locking (e.g. using mutexes).

Strands may be either implicit or explicit, as illustrated by the following alternative approaches:

- Calling io_service::run() from only one thread means all event handlers execute in an implicit strand, due to the io_service's guarantee that handlers are only invoked from inside run().
- Where there is a single chain of asynchronous operations associated with a connection (e.g. in a half duplex protocol implementation like HTTP) there is no possibility of concurrent execution of the handlers. This is an implicit strand.
- An explicit strand is an instance of `io_service::strand`. All event handler function objects need to be wrapped using `io_service::strand::wrap()` or otherwise posted/dispatched through the `io_service::strand` object.

In the case of composed asynchronous operations, such as `async_read()` or `async_read_until()`, if a completion handler goes through a strand, then all intermediate handlers should also go through the same strand. This is needed to ensure thread safe access for any objects that are shared between the caller and the composed operation (in the case of `async_read()` it's the socket, which the caller can close() to cancel the operation). This is done by having hook functions for all intermediate handlers which forward the calls to the customisable hook associated with the final handler:

```
struct my_handler
{
  void operator()() { ... }
};

template<class F>
void asio_handler_invoke(F f, my_handler*)
{
  // Do custom invocation here.
  // Default implementation calls f();
}
```

The `io_service::strand::wrap()` function creates a new completion handler that defines `asio_handler_invoke` so that the function object is executed through the strand.

See Also

io_service::strand, tutorial Timer.5, HTTP server 3 example.

Buffers

Fundamentally, I/O involves the transfer of data to and from contiguous regions of memory, called buffers. These buffers can be simply expressed as a tuple consisting of a pointer and a size in bytes. However, to allow the development of efficient network applications, Boost.Asio includes support for scatter-gather operations. These operations involve one or more buffers:

- A scatter-read receives data into multiple buffers.
- A gather-write transmits multiple buffers.

Therefore we require an abstraction to represent a collection of buffers. The approach used in Boost.Asio is to define a type (actually two types) to represent a single buffer. These can be stored in a container, which may be passed to the scatter-gather operations.

In addition to specifying buffers as a pointer and size in bytes, Boost.Asio makes a distinction between modifiable memory (called mutable) and non-modifiable memory (where the latter is created from the storage for a const-qualified variable). These two types could therefore be defined as follows:

```
typedef std::pair<void*, std::size_t> mutable_buffer;
typedef std::pair<const void*, std::size_t> const_buffer;
```

Here, a mutable_buffer would be convertible to a const_buffer, but conversion in the opposite direction is not valid.

However, Boost.Asio does not use the above definitions as-is, but instead defines two classes: `mutable_buffer` and `const_buffer`. The goal of these is to provide an opaque representation of contiguous memory, where:

- Types behave as std::pair would in conversions. That is, a `mutable_buffer` is convertible to a `const_buffer`, but the opposite conversion is disallowed.
- There is protection against buffer overruns. Given a buffer instance, a user can only create another buffer representing the same range of memory or a sub-range of it. To provide further safety, the library also includes mechanisms for automatically determining the size of a buffer from an array, `boost::array` or `std::vector` of POD elements, or from a `std::string`.
- Type safety violations must be explicitly requested using the `buffer_cast` function. In general an application should never need to do this, but it is required by the library implementation to pass the raw memory to the underlying operating system functions.

Finally, multiple buffers can be passed to scatter-gather operations (such as read() or write()) by putting the buffer objects into a container. The `MutableBufferSequence` and `ConstBufferSequence` concepts have been defined so that containers such as `std::vector`, `std::list`, `std::vector` or `boost::array` can be used.

Streambuf for Integration with Iostreams

The class `boost::asio::basic_streambuf` is derived from `std::basic_streambuf` to associate the input sequence and output sequence with one or more objects of some character array type, whose elements store arbitrary values. These character array objects are internal to the streambuf object, but direct access to the array elements is provided to permit them to be used with I/O operations, such as the send or receive operations of a socket:

- The input sequence of the streambuf is accessible via the data() member function. The return type of this function meets the `ConstBufferSequence` requirements.
- The output sequence of the streambuf is accessible via the prepare() member function. The return type of this function meets the `MutableBufferSequence` requirements.
- Data is transferred from the front of the output sequence to the back of the input sequence by calling the commit() member function.
- Data is removed from the front of the input sequence by calling the consume() member function.

The streambuf constructor accepts a `size_t` argument specifying the maximum of the sum of the sizes of the input sequence and output sequence. Any operation that would, if successful, grow the internal data beyond this limit will throw a `std::length_error` exception.

Bytewise Traversal of Buffer Sequences

The `buffers_iterator<>` class template allows buffer sequences (i.e. types meeting `MutableBufferSequence` or `ConstBufferSequence` requirements) to be traversed as though they were a contiguous sequence of bytes. Helper functions called buffers_begin() and buffers_end() are also provided, where the buffers_iterator<> template parameter is automatically deduced.

As an example, to read a single line from a socket and into a `std::string`, you may write:

```
boost::asio::streambuf sb;
...
std::size_t n = boost::asio::read_until(sock, sb, '\n');
boost::asio::streambuf::const_buffers_type bufs = sb.data();
std::string line(
    boost::asio::buffers_begin(bufs),
    boost::asio::buffers_begin(bufs) + n);
```

Buffer Debugging

Some standard library implementations, such as the one that ships with Microsoft Visual C++ 8.0 and later, provide a feature called iterator debugging. What this means is that the validity of iterators is checked at runtime. If a program tries to use an iterator that has been invalidated, an assertion will be triggered. For example:

```
std::vector<int> v(1)
std::vector<int>::iterator i = v.begin();
v.clear(); // invalidates iterators
*i = 0; // assertion!
```

Boost.Asio takes advantage of this feature to add buffer debugging. Consider the following code:

```
void dont_do_this()
{
 std::string msg = "Hello, world!";
 boost::asio::async_write(sock, boost::asio::buffer(msg), my_handler);
}
```

When you call an asynchronous read or write you need to ensure that the buffers for the operation are valid until the completion handler is called. In the above example, the buffer is the `std::string` variable `msg`. This variable is on the stack, and so it goes

out of scope before the asynchronous operation completes. If you're lucky then the application will crash, but random failures are more likely.

When buffer debugging is enabled, Boost.Asio stores an iterator into the string until the asynchronous operation completes, and then dereferences it to check its validity. In the above example you would observe an assertion failure just before Boost.Asio tries to call the completion handler.

This feature is automatically made available for Microsoft Visual Studio 8.0 or later and for GCC when `_GLIBCXX_DEBUG` is defined. There is a performance cost to this checking, so buffer debugging is only enabled in debug builds. For other compilers it may be enabled by defining `BOOST_ASIO_ENABLE_BUFFER_DEBUGGING`. It can also be explicitly disabled by defining `BOOST_ASIO_DISABLE_BUFFER_DEBUGGING`.

See Also

buffer, buffers_begin, buffers_end, buffers_iterator, const_buffer, const_buffers_1, mutable_buffer, mutable_buffers_1, streambuf, ConstBufferSequence, MutableBufferSequence, buffers example.

Streams, Short Reads and Short Writes

Many I/O objects in Boost.Asio are stream-oriented. This means that:

- There are no message boundaries. The data being transferred is a continuous sequence of bytes.
- Read or write operations may transfer fewer bytes than requested. This is referred to as a short read or short write.

Objects that provide stream-oriented I/O model one or more of the following type requirements:

- `SyncReadStream`, where synchronous read operations are performed using a member function called `read_some()`.
- `AsyncReadStream`, where asynchronous read operations are performed using a member function called `async_read_some()`.
- `SyncWriteStream`, where synchronous write operations are performed using a member function called `write_some()`.
- `AsyncWriteStream`, where synchronous write operations are performed using a member function called `async_write_some()`.

Examples of stream-oriented I/O objects include `ip::tcp::socket`, `ssl::stream<>`, `posix::stream_descriptor`, `windows::stream_handle`, etc.

Programs typically want to transfer an exact number of bytes. When a short read or short write occurs the program must restart the operation, and continue to do so until the required number of bytes has been transferred. Boost.Asio provides generic functions that do this automatically: `read()`, `async_read()`, `write()` and `async_write()`.

Why EOF is an Error

- The end of a stream can cause `read`, `async_read`, `read_until` or `async_read_until` functions to violate their contract. E.g. a read of N bytes may finish early due to EOF.
- An EOF error may be used to distinguish the end of a stream from a successful read of size 0.

See Also

async_read(), async_write(), read(), write(), AsyncReadStream, AsyncWriteStream, SyncReadStream, SyncWriteStream.

Reactor-Style Operations

Sometimes a program must be integrated with a third-party library that wants to perform the I/O operations itself. To facilitate this, Boost.Asio includes a `null_buffers` type that can be used with both read and write operations. A `null_buffers` operation doesn't return until the I/O object is "ready" to perform the operation.

As an example, to perform a non-blocking read something like the following may be used:

```
ip::tcp::socket socket(my_io_service);
...
ip::tcp::socket::non_blocking nb(true);
socket.io_control(nb);
...
socket.async_read_some(null_buffers(), read_handler);
...
void read_handler(boost::system::error_code ec)
{
  if (!ec)
  {
    std::vector<char> buf(socket.available());
    socket.read_some(buffer(buf));
  }
}
```

These operations are supported for sockets on all platforms, and for the POSIX stream-oriented descriptor classes.

See Also

null_buffers, nonblocking example.

Line-Based Operations

Many commonly-used internet protocols are line-based, which means that they have protocol elements that are delimited by the character sequence `"\r\n"`. Examples include HTTP, SMTP and FTP. To more easily permit the implementation of line-based protocols, as well as other protocols that use delimiters, Boost.Asio includes the functions `read_until()` and `async_read_until()`.

The following example illustrates the use of `async_read_until()` in an HTTP server, to receive the first line of an HTTP request from a client:

```
class http_connection
{
  ...

  void start()
  {
    boost::asio::async_read_until(socket_, data_, "\r\n",
        boost::bind(&http_connection::handle_request_line, this, _1));
  }

  void handle_request_line(boost::system::error_code ec)
  {
    if (!ec)
    {
      std::string method, uri, version;
      char sp1, sp2, cr, lf;
      std::istream is(&data_);
      is.unsetf(std::ios_base::skipws);
      is >> method >> sp1 >> uri >> sp2 >> version >> cr >> lf;
      ...
    }
  }

  ...

  boost::asio::ip::tcp::socket socket_;
  boost::asio::streambuf data_;
};
```

The `streambuf` data member serves as a place to store the data that has been read from the socket before it is searched for the delimiter. It is important to remember that there may be additional data *after* the delimiter. This surplus data should be left in the `streambuf` so that it may be inspected by a subsequent call to `read_until()` or `async_read_until()`.

The delimiters may be specified as a single `char`, a `std::string` or a `boost::regex`. The `read_until()` and `async_read_until()` functions also include overloads that accept a user-defined function object called a match condition. For example, to read data into a streambuf until whitespace is encountered:

```
typedef boost::asio::buffers_iterator<
    boost::asio::streambuf::const_buffers_type> iterator;

std::pair<iterator, bool>
match_whitespace(iterator begin, iterator end)
{
  iterator i = begin;
  while (i != end)
    if (std::isspace(*i++))
      return std::make_pair(i, true);
  return std::make_pair(i, false);
}
...
boost::asio::streambuf b;
boost::asio::read_until(s, b, match_whitespace);
```

To read data into a streambuf until a matching character is found:

```
class match_char
{
public:
  explicit match_char(char c) : c_(c) {}

  template <typename Iterator>
  std::pair<Iterator, bool> operator()(
      Iterator begin, Iterator end) const
  {
    Iterator i = begin;
    while (i != end)
      if (c_ == *i++)
        return std::make_pair(i, true);
    return std::make_pair(i, false);
  }

private:
  char c_;
};

namespace boost { namespace asio {
  template <> struct is_match_condition<match_char>
    : public boost::true_type {};
} } // namespace boost::asio
...
boost::asio::streambuf b;
boost::asio::read_until(s, b, match_char('a'));
```

The `is_match_condition<>` type trait automatically evaluates to true for functions, and for function objects with a nested `result_type` typedef. For other types the trait must be explicitly specialised, as shown above.

See Also

async_read_until(), is_match_condition, read_until(), streambuf, HTTP client example.

Custom Memory Allocation

Many asynchronous operations need to allocate an object to store state associated with the operation. For example, a Win32 implementation needs `OVERLAPPED`-derived objects to pass to Win32 API functions.

Furthermore, programs typically contain easily identifiable chains of asynchronous operations. A half duplex protocol implementation (e.g. an HTTP server) would have a single chain of operations per client (receives followed by sends). A full duplex protocol implementation would have two chains executing in parallel. Programs should be able to leverage this knowledge to reuse memory for all asynchronous operations in a chain.

Given a copy of a user-defined `Handler` object `h`, if the implementation needs to allocate memory associated with that handler it will execute the code:

```
void* pointer = asio_handler_allocate(size, &h);
```

Similarly, to deallocate the memory it will execute:

```
asio_handler_deallocate(pointer, size, &h);
```

These functions are located using argument-dependent lookup. The implementation provides default implementations of the above functions in the `asio` namespace:

```
void* asio_handler_allocate(size_t, ...);
void asio_handler_deallocate(void*, size_t, ...);
```

which are implemented in terms of `::operator new()` and `::operator delete()` respectively.

The implementation guarantees that the deallocation will occur before the associated handler is invoked, which means the memory is ready to be reused for any new asynchronous operations started by the handler.

The custom memory allocation functions may be called from any user-created thread that is calling a library function. The implementation guarantees that, for the asynchronous operations included the library, the implementation will not make concurrent calls to the memory allocation functions for that handler. The implementation will insert appropriate memory barriers to ensure correct memory visibility should allocation functions need to be called from different threads.

Custom memory allocation support is currently implemented for all asynchronous operations with the following exceptions:

- `ip::basic_resolver::async_resolve()` on all platforms.
- `basic_socket::async_connect()` on Windows.
- Any operation involving `null_buffers()` on Windows, other than an asynchronous read performed on a stream-oriented socket.

See Also

asio_handler_allocate, asio_handler_deallocate, custom memory allocation example.

Networking

- TCP, UDP and ICMP
- Socket Iostreams
- The BSD Socket API and Boost.Asio

TCP, UDP and ICMP

Boost.Asio provides off-the-shelf support for the internet protocols TCP, UDP and ICMP.

TCP Clients

Hostname resolution is performed using a resolver, where host and service names are looked up and converted into one or more endpoints:

```
ip::tcp::resolver resolver(my_io_service);
ip::tcp::resolver::query query("www.boost.org", "http");
ip::tcp::resolver::iterator iter = resolver.resolve(query);
ip::tcp::resolver::iterator end; // End marker.
while (iter != end)
{
  ip::tcp::endpoint endpoint = *iter++;
  std::cout << endpoint << std::endl;
}
```

The list of endpoints obtained above could contain both IPv4 and IPv6 endpoints, so a program may try each of them until it finds one that works. This keeps the client program independent of a specific IP version.

When an endpoint is available, a socket can be created and connected:

```
ip::tcp::socket socket(my_io_service);
socket.connect(endpoint);
```

Data may be read from or written to a connected TCP socket using the receive(), async_receive(), send() or async_send() member functions. However, as these could result in short writes or reads, an application will typically use the following operations instead: read(), async_read(), write() and async_write().

TCP Servers

A program uses an acceptor to accept incoming TCP connections:

```
ip::tcp::acceptor acceptor(my_io_service, my_endpoint);
...
ip::tcp::socket socket(my_io_service);
acceptor.accept(socket);
```

After a socket has been successfully accepted, it may be read from or written to as illustrated for TCP clients above.

UDP

UDP hostname resolution is also performed using a resolver:

```
ip::udp::resolver resolver(my_io_service);
ip::udp::resolver::query query("localhost", "daytime");
ip::udp::resolver::iterator iter = resolver.resolve(query);
...
```

A UDP socket is typically bound to a local endpoint. The following code will create an IP version 4 UDP socket and bind it to the "any" address on port `12345`:

```
ip::udp::endpoint endpoint(ip::udp::v4(), 12345);
ip::udp::socket socket(my_io_service, endpoint);
```

Data may be read from or written to an unconnected UDP socket using the receive_from(), async_receive_from(), send_to() or async_send_to() member functions. For a connected UDP socket, use the receive(), async_receive(), send() or async_send() member functions.

ICMP

As with TCP and UDP, ICMP hostname resolution is performed using a resolver:

```
ip::icmp::resolver resolver(my_io_service);
ip::icmp::resolver::query query("localhost", "");
ip::icmp::resolver::iterator iter = resolver.resolve(query);
...
```

An ICMP socket may be bound to a local endpoint. The following code will create an IP version 6 ICMP socket and bind it to the "any" address:

```
ip::icmp::endpoint endpoint(ip::icmp::v6(), 0);
ip::icmp::socket socket(my_io_service, endpoint);
```

The port number is not used for ICMP.

Data may be read from or written to an unconnected ICMP socket using the receive_from(), async_receive_from(), send_to() or async_send_to() member functions.

Other Protocols

Support for other socket protocols (such as Bluetooth or IRCOMM sockets) can be added by implementing the Protocol type requirements.

See Also

ip::tcp, ip::udp, ip::icmp, daytime protocol tutorials, ICMP ping example.

Socket Iostreams

Boost.Asio includes classes that implement iostreams on top of sockets. These hide away the complexities associated with endpoint resolution, protocol independence, etc. To create a connection one might simply write:

```
ip::tcp::iostream stream("www.boost.org", "http");
if (!stream)
{
  // Can't connect.
}
```

The iostream class can also be used in conjunction with an acceptor to create simple servers. For example:

```
io_service ios;

ip::tcp::endpoint endpoint(tcp::v4(), 80);
ip::tcp::acceptor acceptor(ios, endpoint);

for (;;)
{
  ip::tcp::iostream stream;
  acceptor.accept(*stream.rdbuf());
  ...
}
```

See Also

ip::tcp::iostream, basic_socket_iostream, iostreams examples.

Notes

These iostream templates only support `char`, not `wchar_t`, and do not perform any code conversion.

The BSD Socket API and Boost.Asio

The Boost.Asio library includes a low-level socket interface based on the BSD socket API, which is widely implemented and supported by extensive literature. It is also used as the basis for networking APIs in other languages, like Java. This low-level interface is designed to support the development of efficient and scalable applications. For example, it permits programmers to exert finer control over the number of system calls, avoid redundant data copying, minimise the use of resources like threads, and so on.

Unsafe and error prone aspects of the BSD socket API not included. For example, the use of `int` to represent all sockets lacks type safety. The socket representation in Boost.Asio uses a distinct type for each protocol, e.g. for TCP one would use `ip::tcp::socket`, and for UDP one uses `ip::udp::socket`.

The following table shows the mapping between the BSD socket API and Boost.Asio:

BSD Socket API Elements	Equivalents in Boost.Asio
socket descriptor - `int` (POSIX) or `SOCKET` (Windows)	For TCP: ip::tcp::socket, ip::tcp::acceptor For UDP: ip::udp::socket basic_socket, basic_stream_socket, basic_datagram_socket, basic_raw_socket
`in_addr`, `in6_addr`	ip::address, ip::address_v4, ip::address_v6
`sockaddr_in`, `sockaddr_in6`	For TCP: ip::tcp::endpoint For UDP: ip::udp::endpoint ip::basic_endpoint
`accept()`	For TCP: ip::tcp::acceptor::accept() basic_socket_acceptor::accept()
`bind()`	For TCP: ip::tcp::acceptor::bind(), ip::tcp::socket::bind() For UDP: ip::udp::socket::bind() basic_socket::bind()
`close()`	For TCP: ip::tcp::acceptor::close(), ip::tcp::socket::close() For UDP: ip::udp::socket::close() basic_socket::close()
`connect()`	For TCP: ip::tcp::socket::connect() For UDP: ip::udp::socket::connect() basic_socket::connect()
`getaddrinfo()`, `gethostbyaddr()`, `gethostbyname()`, `getnameinfo()`, `getservbyname()`, `getservbyport()`	For TCP: ip::tcp::resolver::resolve(), ip::tcp::resolver::async_resolve() For UDP: ip::udp::resolver::resolve(), ip::udp::resolver::async_resolve() ip::basic_resolver::resolve(), ip::basic_resolver::async_resolve()
`gethostname()`	ip::host_name()
`getpeername()`	For TCP: ip::tcp::socket::remote_endpoint() For UDP: ip::udp::socket::remote_endpoint() basic_socket::remote_endpoint()
`getsockname()`	For TCP: ip::tcp::acceptor::local_endpoint(), ip::tcp::socket::local_endpoint() For UDP: ip::udp::socket::local_endpoint() basic_socket::local_endpoint()

BSD Socket API Elements	Equivalents in Boost.Asio
`getsockopt()`	For TCP: ip::tcp::acceptor::get_option(), ip::tcp::socket::get_option() For UDP: ip::udp::socket::get_option() basic_socket::get_option()
`inet_addr()`, `inet_aton()`, `inet_pton()`	ip::address::from_string(), ip::address_v4::from_string(), ip_address_v6::from_string()
`inet_ntoa()`, `inet_ntop()`	ip::address::to_string(), ip::address_v4::to_string(), ip_address_v6::to_string()
`ioctl()`	For TCP: ip::tcp::socket::io_control() For UDP: ip::udp::socket::io_control() basic_socket::io_control()
`listen()`	For TCP: ip::tcp::acceptor::listen() basic_socket_acceptor::listen()
`poll()`, `select()`, `pselect()`	io_service::run(), io_service::run_one(), io_service::poll(), io_service::poll_one() Note: in conjunction with asynchronous operations.
`readv()`, `recv()`, `read()`	For TCP: ip::tcp::socket::read_some(), ip::tcp::socket::async_read_some(), ip::tcp::socket::receive(), ip::tcp::socket::async_receive() For UDP: ip::udp::socket::receive(), ip::udp::socket::async_receive() basic_stream_socket::read_some(), basic_stream_socket::async_read_some(), basic_stream_socket::receive(), basic_stream_socket::async_receive(), basic_datagram_socket::receive(), basic_datagram_socket::async_receive()
`recvfrom()`	For UDP: ip::udp::socket::receive_from(), ip::udp::socket::async_receive_from() basic_datagram_socket::receive_from(), basic_datagram_socket::async_receive_from()
`send()`, `write()`, `writev()`	For TCP: ip::tcp::socket::write_some(), ip::tcp::socket::async_write_some(), ip::tcp::socket::send(), ip::tcp::socket::async_send() For UDP: ip::udp::socket::send(), ip::udp::socket::async_send() basic_stream_socket::write_some(), basic_stream_socket::async_write_some(), basic_stream_socket::send(), basic_stream_socket::async_send(), basic_datagram_socket::send(), basic_datagram_socket::async_send()
`sendto()`	For UDP: ip::udp::socket::send_to(), ip::udp::socket::async_send_to() basic_datagram_socket::send_to(), basic_datagram_socket::async_send_to()
`setsockopt()`	For TCP: ip::tcp::acceptor::set_option(), ip::tcp::socket::set_option() For UDP: ip::udp::socket::set_option() basic_socket::set_option()

BSD Socket API Elements	Equivalents in Boost.Asio
`shutdown()`	For TCP: ip::tcp::socket::shutdown() For UDP: ip::udp::socket::shutdown() basic_socket::shutdown()
`sockatmark()`	For TCP: ip::tcp::socket::at_mark() basic_socket::at_mark()
`socket()`	For TCP: ip::tcp::acceptor::open(), ip::tcp::socket::open() For UDP: ip::udp::socket::open() basic_socket::open()
`socketpair()`	local::connect_pair() Note: POSIX operating systems only.

Timers

Long running I/O operations will often have a deadline by which they must have completed. These deadlines may be expressed as absolute times, but are often calculated relative to the current time.

As a simple example, to perform a synchronous wait operation on a timer using a relative time one may write:

```
io_service i;
...
deadline_timer t(i);
t.expires_from_now(boost::posix_time::seconds(5));
t.wait();
```

More commonly, a program will perform an asynchronous wait operation on a timer:

```
void handler(boost::system::error_code ec) { ... }
...
io_service i;
...
deadline_timer t(i);
t.expires_from_now(boost::posix_time::milliseconds(400));
t.async_wait(handler);
...
i.run();
```

The deadline associated with a timer may be also be obtained as a relative time:

```
boost::posix_time::time_duration time_until_expiry
  = t.expires_from_now();
```

or as an absolute time to allow composition of timers:

```
deadline_timer t2(i);
t2.expires_at(t.expires_at() + boost::posix_time::seconds(30));
```

See Also

basic_deadline_timer, deadline_timer, deadline_timer_service, timer tutorials.

Serial Ports

Boost.Asio includes classes for creating and manipulating serial ports in a portable manner. For example, a serial port may be opened using:

```
serial_port port(my_io_service, name);
```

where name is something like `"COM1"` on Windows, and `"/dev/ttyS0"` on POSIX platforms.

Once opened the serial port may be used as a stream. This means the objects can be used with any of the read(), async_read(), write(), async_write(), read_until() or async_read_until() free functions.

The serial port implementation also includes option classes for configuring the port's baud rate, flow control type, parity, stop bits and character size.

See Also

serial_port, serial_port_base, basic_serial_port, serial_port_service, serial_port_base::baud_rate, serial_port_base::flow_control, serial_port_base::parity, serial_port_base::stop_bits, serial_port_base::character_size.

Notes

Serial ports are available on all POSIX platforms. For Windows, serial ports are only available at compile time when the I/O completion port backend is used (which is the default). A program may test for the macro `BOOST_ASIO_HAS_SERIAL_PORTS` to determine whether they are supported.

POSIX-Specific Functionality

UNIX Domain Sockets

Stream-Oriented File Descriptors

UNIX Domain Sockets

Boost.Asio provides basic support UNIX domain sockets (also known as local sockets). The simplest use involves creating a pair of connected sockets. The following code:

```
local::stream_protocol::socket socket1(my_io_service);
local::stream_protocol::socket socket2(my_io_service);
local::connect_pair(socket1, socket2);
```

will create a pair of stream-oriented sockets. To do the same for datagram-oriented sockets, use:

```
local::datagram_protocol::socket socket1(my_io_service);
local::datagram_protocol::socket socket2(my_io_service);
local::connect_pair(socket1, socket2);
```

A UNIX domain socket server may be created by binding an acceptor to an endpoint, in much the same way as one does for a TCP server:

```
::unlink("/tmp/foobar"); // Remove previous binding.
local::stream_protocol::endpoint ep("/tmp/foobar");
local::stream_protocol::acceptor acceptor(my_io_service, ep);
local::stream_protocol::socket socket(my_io_service);
acceptor.accept(socket);
```

A client that connects to this server might look like:

```
local::stream_protocol::endpoint ep("/tmp/foobar");
local::stream_protocol::socket socket(my_io_service);
socket.connect(ep);
```

Transmission of file descriptors or credentials across UNIX domain sockets is not directly supported within Boost.Asio, but may be achieved by accessing the socket's underlying descriptor using the native() member function.

See Also

local::connect_pair, local::datagram_protocol, local::datagram_protocol::endpoint, local::datagram_protocol::socket, local::stream_protocol, local::stream_protocol::acceptor, local::stream_protocol::endpoint, local::stream_protocol::iostream, local::stream_protocol::socket, UNIX domain sockets examples.

Notes

UNIX domain sockets are only available at compile time if supported by the target operating system. A program may test for the macro `BOOST_ASIO_HAS_LOCAL_SOCKETS` to determine whether they are supported.

Stream-Oriented File Descriptors

Boost.Asio includes classes added to permit synchronous and asynchronous read and write operations to be performed on POSIX file descriptors, such as pipes, standard input and output, and various devices (but *not* regular files).

For example, to perform read and write operations on standard input and output, the following objects may be created:

```
posix::stream_descriptor in(my_io_service, ::dup(STDIN_FILENO));
posix::stream_descriptor out(my_io_service, ::dup(STDOUT_FILENO));
```

These are then used as synchronous or asynchronous read and write streams. This means the objects can be used with any of the read(), async_read(), write(), async_write(), read_until() or async_read_until() free functions.

See Also

posix::stream_descriptor, posix::basic_stream_descriptor, posix::stream_descriptor_service, Chat example.

Notes

POSIX stream descriptors are only available at compile time if supported by the target operating system. A program may test for the macro `BOOST_ASIO_HAS_POSIX_STREAM_DESCRIPTOR` to determine whether they are supported.

Windows-Specific Functionality

Stream-Oriented HANDLEs

Random-Access HANDLEs

Stream-Oriented HANDLEs

Boost.Asio contains classes to allow asynchronous read and write operations to be performed on Windows `HANDLE`s, such as named pipes.

For example, to perform asynchronous operations on a named pipe, the following object may be created:

```
HANDLE handle = ::CreateFile(...);
windows::stream_handle pipe(my_io_service, handle);
```

These are then used as synchronous or asynchronous read and write streams. This means the objects can be used with any of the read(), async_read(), write(), async_write(), read_until() or async_read_until() free functions.

The kernel object referred to by the `HANDLE` must support use with I/O completion ports (which means that named pipes are supported, but anonymous pipes and console streams are not).

See Also

windows::stream_handle, windows::basic_stream_handle, windows::stream_handle_service.

Notes

Windows stream `HANDLE`s are only available at compile time when targeting Windows and only when the I/O completion port backend is used (which is the default). A program may test for the macro `BOOST_ASIO_HAS_WINDOWS_STREAM_HANDLE` to determine whether they are supported.

Random-Access HANDLEs

Boost.Asio provides Windows-specific classes that permit asynchronous read and write operations to be performed on HANDLEs that refer to regular files.

For example, to perform asynchronous operations on a file the following object may be created:

```
HANDLE handle = ::CreateFile(...);
windows::random_access_handle file(my_io_service, handle);
```

Data may be read from or written to the handle using one of the `read_some_at()`, `async_read_some_at()`, `write_some_at()` or `async_write_some_at()` member functions. However, like the equivalent functions (`read_some()`, etc.) on streams, these functions are only required to transfer one or more bytes in a single operation. Therefore free functions called read_at(), async_read_at(), write_at() and async_write_at() have been created to repeatedly call the corresponding `*_some_at()` function until all data has been transferred.

See Also

windows::random_access_handle, windows::basic_random_access_handle, windows::random_access_handle_service.

Notes

Windows random-access `HANDLE`s are only available at compile time when targeting Windows and only when the I/O completion port backend is used (which is the default). A program may test for the macro `BOOST_ASIO_HAS_WINDOWS_RANDOM_ACCESS_HANDLE` to determine whether they are supported.

SSL

Boost.Asio contains classes and class templates for basic SSL support. These classes allow encrypted communication to be layered on top of an existing stream, such as a TCP socket.

Before creating an encrypted stream, an application must construct an SSL context object. This object is used to set SSL options such as verification mode, certificate files, and so on. As an illustration, client-side initialisation may look something like:

```
ssl::context ctx(my_io_service, ssl::context::sslv23);
ctx.set_verify_mode(ssl::context::verify_peer);
ctx.load_verify_file("ca.pem");
```

To use SSL with a TCP socket, one may write:

```
ssl::stream<ip::tcp::socket> ssl_sock(my_io_service, ctx);
```

To perform socket-specific operations, such as establishing an outbound connection or accepting an incoming one, the underlying socket must first be obtained using the `ssl::stream` template's `lowest_layer()` member function:

```
ip::tcp::socket::lowest_layer_type& sock = ssl_sock.lowest_layer();
sock.connect(my_endpoint);
```

In some use cases the underlying stream object will need to have a longer lifetime than the SSL stream, in which case the template parameter should be a reference to the stream type:

```
ip::tcp::socket sock(my_io_service);
ssl::stream<ip::tcp::socket&> ssl_sock(sock, ctx);
```

SSL handshaking must be performed prior to transmitting or receiving data over an encrypted connection. This is accomplished using the `ssl::stream` template's handshake() or async_handshake() member functions.

Once connected, SSL stream objects are used as synchronous or asynchronous read and write streams. This means the objects can be used with any of the read(), async_read(), write(), async_write(), read_until() or async_read_until() free functions.

See Also

ssl::basic_context, ssl::context, ssl::context_base, ssl::context_service, ssl::stream, ssl::stream_base, ssl::stream_service, SSL example.

Notes

OpenSSL is required to make use of Boost.Asio's SSL support. When an application needs to use OpenSSL functionality that is not wrapped by Boost.Asio, the underlying OpenSSL types may be obtained by calling `ssl::context::impl()` or `ssl::stream::impl()`.

Platform-Specific Implementation Notes

This section lists platform-specific implementation details, such as the default demultiplexing mechanism, the number of threads created internally, and when threads are created.

Linux Kernel 2.4

Demultiplexing mechanism:

- Uses `select` for demultiplexing. This means that the number of file descriptors in the process cannot be permitted to exceed `FD_SETSIZE`.

Threads:

- Demultiplexing using `select` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

Linux Kernel 2.6

Demultiplexing mechanism:

- Uses `epoll` for demultiplexing.

Threads:

- Demultiplexing using `epoll` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

Solaris

Demultiplexing mechanism:

- Uses `/dev/poll` for demultiplexing.

Threads:

- Demultiplexing using `/dev/poll` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

QNX Neutrino

Demultiplexing mechanism:

- Uses `select` for demultiplexing. This means that the number of file descriptors in the process cannot be permitted to exceed `FD_SETSIZE`.

Threads:

- Demultiplexing using `select` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

Mac OS X

Demultiplexing mechanism:

- Uses `kqueue` for demultiplexing.

Threads:

- Demultiplexing using `kqueue` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

FreeBSD

Demultiplexing mechanism:

- Uses `kqueue` for demultiplexing.

Threads:

- Demultiplexing using `kqueue` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

AIX

Demultiplexing mechanism:

- Uses `select` for demultiplexing. This means that the number of file descriptors in the process cannot be permitted to exceed `FD_SETSIZE`.

Threads:

- Demultiplexing using `select` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

HP-UX

Demultiplexing mechanism:

- Uses `select` for demultiplexing. This means that the number of file descriptors in the process cannot be permitted to exceed `FD_SETSIZE`.

Threads:

- Demultiplexing using `select` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

Tru64

Demultiplexing mechanism:

- Uses `select` for demultiplexing. This means that the number of file descriptors in the process cannot be permitted to exceed `FD_SETSIZE`.

Threads:

- Demultiplexing using `select` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- At most `min(64,IOV_MAX)` buffers may be transferred in a single operation.

Windows 95, 98 and Me

Demultiplexing mechanism:

- Uses `select` for demultiplexing.

Threads:

- Demultiplexing using `select` is performed in one of the threads that calls `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- For sockets, at most 16 buffers may be transferred in a single operation.

Windows NT, 2000, XP, 2003 and Vista

Demultiplexing mechanism:

- Uses overlapped I/O and I/O completion ports for all asynchronous socket operations except for asynchronous connect.
- Uses `select` for emulating asynchronous connect.

Threads:

- Demultiplexing using I/O completion ports is performed in all threads that call `io_service::run()`, `io_service::run_one()`, `io_service::poll()` or `io_service::poll_one()`.

- An additional thread per `io_service` is used for the `select` demultiplexing. This thread is created on the first call to `async_connect()`.
- An additional thread per `io_service` is used to emulate asynchronous host resolution. This thread is created on the first call to either `ip::tcp::resolver::async_resolve()` or `ip::udp::resolver::async_resolve()`.

Scatter-Gather:

- For sockets, at most 64 buffers may be transferred in a single operation.
- For stream-oriented handles, only one buffer may be transferred in a single operation.

Using Boost.Asio

Supported Platforms

The following platforms and compilers have been tested:

- Win32 and Win64 using Visual C++ 7.1 and Visual C++ 8.0.
- Win32 using MinGW.
- Win32 using Cygwin. (`__USE_W32_SOCKETS` must be defined.)
- Linux (2.4 or 2.6 kernels) using g++ 3.3 or later.
- Solaris using g++ 3.3 or later.
- Mac OS X 10.4 using g++ 3.3 or later.

The following platforms may also work:

- AIX 5.3 using XL C/C++ v9.
- HP-UX 11i v3 using patched aC++ A.06.14.
- QNX Neutrino 6.3 using g++ 3.3 or later.
- Solaris using Sun Studio 11 or later.
- Tru64 v5.1 using Compaq C++ v7.1.
- Win32 using Borland C++ 5.9.2

Dependencies

The following libraries must be available in order to link programs that use Boost.Asio:

- Boost.System for the `boost::system::error_code` and `boost::system::system_error` classes.
- Boost.Regex (optional) if you use any of the `read_until()` or `async_read_until()` overloads that take a `boost::regex` parameter.
- OpenSSL (optional) if you use Boost.Asio's SSL support.

Furthermore, some of the examples also require the Boost.Thread, Boost.Date_Time or Boost.Serialization libraries.

Note

With MSVC or Borland C++ you may want to add `-DBOOST_DATE_TIME_NO_LIB` and `-DBOOST_REGEX_NO_LIB` to your project settings to disable autolinking of the Boost.Date_Time and Boost.Regex libraries respectively. Alternatively, you may choose to build these libraries and link to them.

Building Boost Libraries

You may build the subset of Boost libraries required to use Boost.Asio and its examples by running the following command from the root of the Boost download package:

```
bjam --with-system --with-thread --with-date_time --with-regex --with-serialization stage
```

This assumes that you have already built `bjam`. Consult the Boost.Build documentation for more details.

Macros

The macros listed in the table below may be used to control the behaviour of Boost.Asio.

Macro	Description
BOOST_ASIO_ENABLE_BUFFER_DEBUGGING	Enables Boost.Asio's buffer debugging support, which can help identify when invalid buffers are used in read or write operations (e.g. if a std::string object being written is destroyed before the write operation completes). When using Microsoft Visual C++, this macro is defined automatically if the compiler's iterator debugging support is enabled, unless BOOST_ASIO_DISABLE_BUFFER_DEBUGGING has been defined. When using g++, this macro is defined automatically if standard library debugging is enabled (_GLIBCXX_DEBUG is defined), unless BOOST_ASIO_DISABLE_BUFFER_DEBUGGING has been defined.
BOOST_ASIO_DISABLE_BUFFER_DEBUGGING	Explictly disables Boost.Asio's buffer debugging support.
BOOST_ASIO_DISABLE_DEV_POLL	Explicitly disables /dev/poll support on Solaris, forcing the use of a select-based implementation.
BOOST_ASIO_DISABLE_EPOLL	Explicitly disables epoll support on Linux, forcing the use of a select-based implementation.
BOOST_ASIO_DISABLE_EVENTFD	Explicitly disables eventfd support on Linux, forcing the use of a pipe to interrupt blocked epoll/select system calls.
BOOST_ASIO_DISABLE_KQUEUE	Explicitly disables kqueue support on Mac OS X and BSD variants, forcing the use of a select-based implementation.
BOOST_ASIO_DISABLE_IOCP	Explicitly disables I/O completion ports support on Windows, forcing the use of a select-based implementation.
BOOST_ASIO_NO_WIN32_LEAN_AND_MEAN	By default, Boost.Asio will automatically define WIN32_LEAN_AND_MEAN when compiling for Windows, to minimise the number of Windows SDK header files and features that are included. The presence of BOOST_ASIO_NO_WIN32_LEAN_AND_MEAN prevents WIN32_LEAN_AND_MEAN from being defined.
BOOST_ASIO_NO_DEFAULT_LINKED_LIBS	When compiling for Windows using Microsoft Visual C++ or Borland C++, Boost.Asio will automatically link in the necessary Windows SDK libraries for sockets support (i.e. ws2_32.lib and mswsock.lib, or ws2.lib when building for Windows CE). The BOOST_ASIO_NO_DEFAULT_LINKED_LIBS macro prevents these libraries from being linked.
BOOST_ASIO_SOCKET_STREAMBUF_MAX_ARITY	Determines the maximum number of arguments that may be passed to the basic_socket_streambuf class template's connect member function. Defaults to 5.
BOOST_ASIO_SOCKET_IOSTREAM_MAX_ARITY	Determines the maximum number of arguments that may be passed to the basic_socket_iostream class template's constructor and connect member function. Defaults to 5.

Macro	Description
`BOOST_ASIO_ENABLE_CANCELIO`	Enables use of the `CancelIo` function on older versions of Windows. If not enabled, calls to `cancel()` on a socket object will always fail with `asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows. When running on Windows Vista, Windows Server 2008, and later, the `CancelIoEx` function is always used. The `CancelIo` function has two issues that should be considered before enabling its use: * It will only cancel asynchronous operations that were initiated in the current thread. * It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed. For portable cancellation, consider using one of the following alternatives: * Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP. * Use the socket object's close() function to simultaneously cancel the outstanding operations and close the socket.
`BOOST_ASIO_NO_TYPEID`	Disables uses of the `typeid` operator in Boost.Asio. Defined automatically if `BOOST_NO_TYPEID` is defined.
`BOOST_ASIO_HASH_MAP_BUCKETS`	Determines the number of buckets in Boost.Asio's internal `hash_map` objects. The value should be a comma separated list of prime numbers, in ascending order. The `hash_map` implementation will automatically increase the number of buckets as the number of elements in the map increases. Some examples: * Defining `BOOST_ASIO_HASH_MAP_BUCKETS` to `1021` means that the `hash_map` objects will always contain 1021 buckets, irrespective of the number of elements in the map. * Defining `BOOST_ASIO_HASH_MAP_BUCKETS` to `53,389,1543` means that the `hash_map` objects will initially contain 53 buckets. The number of buckets will be increased to 389 and then 1543 as elements are added to the map.

Mailing List

A mailing list specifically for Boost.Asio may be found on SourceForge.net. Newsgroup access is provided via Gmane.

Wiki

Users are encouraged to share examples, tips and FAQs on the Boost.Asio wiki, which is located at http://asio.sourceforge.net.

Tutorial

Basic Skills

The tutorial programs in this first section introduce the fundamental concepts required to use the asio toolkit. Before plunging into the complex world of network programming, these tutorial programs illustrate the basic skills using simple asynchronous timers.

- Timer.1 - Using a timer synchronously
- Timer.2 - Using a timer asynchronously
- Timer.3 - Binding arguments to a handler
- Timer.4 - Using a member function as a handler
- Timer.5 - Synchronising handlers in multithreaded programs

Introduction to Sockets

The tutorial programs in this section show how to use asio to develop simple client and server programs. These tutorial programs are based around the daytime protocol, which supports both TCP and UDP.

The first three tutorial programs implement the daytime protocol using TCP.

- Daytime.1 - A synchronous TCP daytime client
- Daytime.2 - A synchronous TCP daytime server
- Daytime.3 - An asynchronous TCP daytime server

The next three tutorial programs implement the daytime protocol using UDP.

- Daytime.4 - A synchronous UDP daytime client
- Daytime.5 - A synchronous UDP daytime server
- Daytime.6 - An asynchronous UDP daytime server

The last tutorial program in this section demonstrates how asio allows the TCP and UDP servers to be easily combined into a single program.

- Daytime.7 - A combined TCP/UDP asynchronous server

Timer.1 - Using a timer synchronously

This tutorial program introduces asio by showing how to perform a blocking wait on a timer.

We start by including the necessary header files.

All of the asio classes can be used by simply including the `"asio.hpp"` header file.

```
#include <iostream>
#include <boost/asio.hpp>
```

Since this example users timers, we need to include the appropriate Boost.Date_Time header file for manipulating times.

```
#include <boost/date_time/posix_time/posix_time.hpp>
```

All programs that use asio need to have at least one io_service object. This class provides access to I/O functionality. We declare an object of this type first thing in the main function.

```
int main()
{
  boost::asio::io_service io;
```

Next we declare an object of type boost::asio::deadline_timer. The core asio classes that provide I/O functionality (or as in this case timer functionality) always take a reference to an io_service as their first constructor argument. The second argument to the constructor sets the timer to expire 5 seconds from now.

```
  boost::asio::deadline_timer t(io, boost::posix_time::seconds(5));
```

In this simple example we perform a blocking wait on the timer. That is, the call to deadline_timer::wait() will not return until the timer has expired, 5 seconds after it was created (i.e. not from when the wait starts).

A deadline timer is always in one of two states: "expired" or "not expired". If the deadline_timer::wait() function is called on an expired timer, it will return immediately.

```
  t.wait();
```

Finally we print the obligatory `"Hello, world!"` message to show when the timer has expired.

```
  std::cout << "Hello, world!\n";

  return 0;
}
```

See the full source listing

Return to the tutorial index

Next: Timer.2 - Using a timer asynchronously

Source listing for Timer.1

```
//
// timer.cpp
// ~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/asio.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>

int main()
{
  boost::asio::io_service io;

  boost::asio::deadline_timer t(io, boost::posix_time::seconds(5));
  t.wait();

  std::cout << "Hello, world!\n";

  return 0;
}
```

Return to Timer.1 - Using a timer synchronously

Timer.2 - Using a timer asynchronously

This tutorial program demonstrates how to use asio's asynchronous callback functionality by modifying the program from tutorial Timer.1 to perform an asynchronous wait on the timer.

```
#include <iostream>
#include <boost/asio.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>
```

Using asio's asynchronous functionality means having a callback function that will be called when an asynchronous operation completes. In this program we define a function called `print` to be called when the asynchronous wait finishes.

```
void print(const boost::system::error_code& /*e*/)
{
  std::cout << "Hello, world!\n";
}

int main()
{
  boost::asio::io_service io;

  boost::asio::deadline_timer t(io, boost::posix_time::seconds(5));
```

Next, instead of doing a blocking wait as in tutorial Timer.1, we call the deadline_timer::async_wait() function to perform an asynchronous wait. When calling this function we pass the `print` callback handler that was defined above.

```
  t.async_wait(print);
```

Finally, we must call the io_service::run() member function on the io_service object.

The asio library provides a guarantee that callback handlers will only be called from threads that are currently calling io_service::run(). Therefore unless the io_service::run() function is called the callback for the asynchronous wait completion will never be invoked.

The io_service::run() function will also continue to run while there is still "work" to do. In this example, the work is the asynchronous wait on the timer, so the call will not return until the timer has expired and the callback has completed.

It is important to remember to give the io_service some work to do before calling io_service::run(). For example, if we had omitted the above call to deadline_timer::async_wait(), the io_service would not have had any work to do, and consequently io_service::run() would have returned immediately.

```
  io.run();

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Timer.1 - Using a timer synchronously

Next: Timer.3 - Binding arguments to a handler

Source listing for Timer.2

```
//
// timer.cpp
// ~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/asio.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>

void print(const boost::system::error_code& /*e*/)
{
  std::cout << "Hello, world!\n";
}

int main()
{
  boost::asio::io_service io;

  boost::asio::deadline_timer t(io, boost::posix_time::seconds(5));
  t.async_wait(print);

  io.run();

  return 0;
}
```

Return to Timer.2 - Using a timer asynchronously

Timer.3 - Binding arguments to a handler

In this tutorial we will modify the program from tutorial Timer.2 so that the timer fires once a second. This will show how to pass additional parameters to your handler function.

```
#include <iostream>
#include <boost/asio.hpp>
#include <boost/bind.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>
```

To implement a repeating timer using asio you need to change the timer's expiry time in your callback function, and to then start a new asynchronous wait. Obviously this means that the callback function will need to be able to access the timer object. To this end we add two new parameters to the `print` function:

- A pointer to a timer object.
- A counter so that we can stop the program when the timer fires for the sixth time.

```
void print(const boost::system::error_code& /*e*/,
    boost::asio::deadline_timer* t, int* count)
{
```

As mentioned above, this tutorial program uses a counter to stop running when the timer fires for the sixth time. However you will observe that there is no explicit call to ask the io_service to stop. Recall that in tutorial Timer.2 we learnt that the io_service::run()

function completes when there is no more "work" to do. By not starting a new asynchronous wait on the timer when `count` reaches 5, the io_service will run out of work and stop running.

```
  if (*count < 5)
  {
    std::cout << *count << "\n";
    ++(*count);
```

Next we move the expiry time for the timer along by one second from the previous expiry time. By calculating the new expiry time relative to the old, we can ensure that the timer does not drift away from the whole-second mark due to any delays in processing the handler.

```
    t->expires_at(t->expires_at() + boost::posix_time::seconds(1));
```

Then we start a new asynchronous wait on the timer. As you can see, the boost::bind() function is used to associate the extra parameters with your callback handler. The deadline_timer::async_wait() function expects a handler function (or function object) with the signature `void(const boost::system::error_code&)`. Binding the additional parameters converts your `print` function into a function object that matches the signature correctly.

See the Boost.Bind documentation for more information on how to use boost::bind().

In this example, the boost::asio::placeholders::error argument to boost::bind() is a named placeholder for the error object passed to the handler. When initiating the asynchronous operation, and if using boost::bind(), you must specify only the arguments that match the handler's parameter list. In tutorial Timer.4 you will see that this placeholder may be elided if the parameter is not needed by the callback handler.

```
    t->async_wait(boost::bind(print,
          boost::asio::placeholders::error, t, count));
  }
}

int main()
{
  boost::asio::io_service io;
```

A new `count` variable is added so that we can stop the program when the timer fires for the sixth time.

```
  int count = 0;
  boost::asio::deadline_timer t(io, boost::posix_time::seconds(1));
```

As in Step 4, when making the call to deadline_timer::async_wait() from `main` we bind the additional parameters needed for the `print` function.

```
  t.async_wait(boost::bind(print,
        boost::asio::placeholders::error, &t, &count));

  io.run();
```

Finally, just to prove that the `count` variable was being used in the `print` handler function, we will print out its new value.

```
  std::cout << "Final count is " << count << "\n";

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Timer.2 - Using a timer asynchronously

Next: Timer.4 - Using a member function as a handler

Source listing for Timer.3

```
//
// timer.cpp
// ~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/asio.hpp>
#include <boost/bind.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>

void print(const boost::system::error_code& /*e*/,
    boost::asio::deadline_timer* t, int* count)
{
  if (*count < 5)
  {
    std::cout << *count << "\n";
    ++(*count);

    t->expires_at(t->expires_at() + boost::posix_time::seconds(1));
    t->async_wait(boost::bind(print,
          boost::asio::placeholders::error, t, count));
  }
}

int main()
{
  boost::asio::io_service io;

  int count = 0;
  boost::asio::deadline_timer t(io, boost::posix_time::seconds(1));
  t.async_wait(boost::bind(print,
        boost::asio::placeholders::error, &t, &count));

  io.run();

  std::cout << "Final count is " << count << "\n";

  return 0;
}
```

Return to Timer.3 - Binding arguments to a handler

Timer.4 - Using a member function as a handler

In this tutorial we will see how to use a class member function as a callback handler. The program should execute identically to the tutorial program from tutorial Timer.3.

```
#include <iostream>
#include <boost/asio.hpp>
#include <boost/bind.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>
```

Instead of defining a free function `print` as the callback handler, as we did in the earlier tutorial programs, we now define a class called `printer`.

```
class printer
{
public:
```

The constructor of this class will take a reference to the io_service object and use it when initialising the `timer_` member. The counter used to shut down the program is now also a member of the class.

```
  printer(boost::asio::io_service& io)
    : timer_(io, boost::posix_time::seconds(1)),
      count_(0)
  {
```

The boost::bind() function works just as well with class member functions as with free functions. Since all non-static class member functions have an implicit `this` parameter, we need to bind `this` to the function. As in tutorial Timer.3, boost::bind() converts our callback handler (now a member function) into a function object that can be invoked as though it has the signature `void(const boost::system::error_code&)`.

You will note that the boost::asio::placeholders::error placeholder is not specified here, as the `print` member function does not accept an error object as a parameter.

```
    timer_.async_wait(boost::bind(&printer::print, this));
  }
```

In the class destructor we will print out the final value of the counter.

```
  ~printer()
  {
    std::cout << "Final count is " << count_ << "\n";
  }
```

The `print` member function is very similar to the `print` function from tutorial Timer.3, except that it now operates on the class data members instead of having the timer and counter passed in as parameters.

```
  void print()
  {
    if (count_ < 5)
    {
      std::cout << count_ << "\n";
      ++count_;

      timer_.expires_at(timer_.expires_at() + boost::posix_time::seconds(1));
      timer_.async_wait(boost::bind(&printer::print, this));
    }
  }

private:
  boost::asio::deadline_timer timer_;
  int count_;
};
```

The `main` function is much simpler than before, as it now declares a local `printer` object before running the io_service as normal.

```
int main()
{
  boost::asio::io_service io;
  printer p(io);
  io.run();

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Timer.3 - Binding arguments to a handler

Next: Timer.5 - Synchronising handlers in multithreaded programs

Source listing for Timer.4

```
//
// timer.cpp
// ~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/asio.hpp>
#include <boost/bind.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>

class printer
{
public:
  printer(boost::asio::io_service& io)
    : timer_(io, boost::posix_time::seconds(1)),
      count_(0)
  {
    timer_.async_wait(boost::bind(&printer::print, this));
  }

  ~printer()
  {
    std::cout << "Final count is " << count_ << "\n";
  }

  void print()
  {
    if (count_ < 5)
    {
      std::cout << count_ << "\n";
      ++count_;

      timer_.expires_at(timer_.expires_at() + boost::posix_time::seconds(1));
      timer_.async_wait(boost::bind(&printer::print, this));
    }
  }

private:
  boost::asio::deadline_timer timer_;
  int count_;
};

int main()
{
  boost::asio::io_service io;
  printer p(io);
  io.run();

  return 0;
}
```

Return to Timer.4 - Using a member function as a handler

Timer.5 - Synchronising handlers in multithreaded programs

This tutorial demonstrates the use of the boost::asio::strand class to synchronise callback handlers in a multithreaded program.

The previous four tutorials avoided the issue of handler synchronisation by calling the io_service::run() function from one thread only. As you already know, the asio library provides a guarantee that callback handlers will only be called from threads that are currently calling io_service::run(). Consequently, calling io_service::run() from only one thread ensures that callback handlers cannot run concurrently.

The single threaded approach is usually the best place to start when developing applications using asio. The downside is the limitations it places on programs, particularly servers, including:

- Poor responsiveness when handlers can take a long time to complete.
- An inability to scale on multiprocessor systems.

If you find yourself running into these limitations, an alternative approach is to have a pool of threads calling io_service::run(). However, as this allows handlers to execute concurrently, we need a method of synchronisation when handlers might be accessing a shared, thread-unsafe resource.

```
#include <iostream>
#include <boost/asio.hpp>
#include <boost/thread.hpp>
#include <boost/bind.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>
```

We start by defining a class called `printer`, similar to the class in the previous tutorial. This class will extend the previous tutorial by running two timers in parallel.

```
class printer
{
public:
```

In addition to initialising a pair of boost::asio::deadline_timer members, the constructor initialises the `strand_` member, an object of type boost::asio::strand.

An boost::asio::strand guarantees that, for those handlers that are dispatched through it, an executing handler will be allowed to complete before the next one is started. This is guaranteed irrespective of the number of threads that are calling io_service::run(). Of course, the handlers may still execute concurrently with other handlers that were not dispatched through an boost::asio::strand, or were dispatched through a different boost::asio::strand object.

```
  printer(boost::asio::io_service& io)
    : strand_(io),
      timer1_(io, boost::posix_time::seconds(1)),
      timer2_(io, boost::posix_time::seconds(1)),
      count_(0)
  {
```

When initiating the asynchronous operations, each callback handler is "wrapped" using the boost::asio::strand object. The strand::wrap() function returns a new handler that automatically dispatches its contained handler through the boost::asio::strand object. By wrapping the handlers using the same boost::asio::strand, we are ensuring that they cannot execute concurrently.

```
    timer1_.async_wait(strand_.wrap(boost::bind(&printer::print1, this)));
    timer2_.async_wait(strand_.wrap(boost::bind(&printer::print2, this)));
  }

  ~printer()
  {
    std::cout << "Final count is " << count_ << "\n";
  }
```

In a multithreaded program, the handlers for asynchronous operations should be synchronised if they access shared resources. In this tutorial, the shared resources used by the handlers (`print1` and `print2`) are `std::cout` and the `count_` data member.

```
  void print1()
  {
    if (count_ < 10)
    {
      std::cout << "Timer 1: " << count_ << "\n";
      ++count_;

      timer1_.expires_at(timer1_.expires_at() + boost::posix_time::seconds(1));
      timer1_.async_wait(strand_.wrap(boost::bind(&printer::print1, this)));
    }
  }

  void print2()
  {
    if (count_ < 10)
    {
      std::cout << "Timer 2: " << count_ << "\n";
      ++count_;

      timer2_.expires_at(timer2_.expires_at() + boost::posix_time::seconds(1));
      timer2_.async_wait(strand_.wrap(boost::bind(&printer::print2, this)));
    }
  }

private:
  boost::asio::strand strand_;
  boost::asio::deadline_timer timer1_;
  boost::asio::deadline_timer timer2_;
  int count_;
};
```

The `main` function now causes io_service::run() to be called from two threads: the main thread and one additional thread. This is accomplished using an boost::thread object.

Just as it would with a call from a single thread, concurrent calls to io_service::run() will continue to execute while there is "work" left to do. The background thread will not exit until all asynchronous operations have completed.

```
int main()
{
  boost::asio::io_service io;
  printer p(io);
  boost::thread t(boost::bind(&boost::asio::io_service::run, &io));
  io.run();
  t.join();

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Timer.4 - Using a member function as a handler

Source listing for Timer.5

```
//
// timer.cpp
// ~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/asio.hpp>
#include <boost/thread.hpp>
#include <boost/bind.hpp>
#include <boost/date_time/posix_time/posix_time.hpp>

class printer
{
public:
  printer(boost::asio::io_service& io)
    : strand_(io),
      timer1_(io, boost::posix_time::seconds(1)),
      timer2_(io, boost::posix_time::seconds(1)),
      count_(0)
  {
    timer1_.async_wait(strand_.wrap(boost::bind(&printer::print1, this)));
    timer2_.async_wait(strand_.wrap(boost::bind(&printer::print2, this)));
  }

  ~printer()
  {
    std::cout << "Final count is " << count_ << "\n";
  }

  void print1()
  {
    if (count_ < 10)
    {
      std::cout << "Timer 1: " << count_ << "\n";
      ++count_;

      timer1_.expires_at(timer1_.expires_at() + boost::posix_time::seconds(1));
```

```
      timer1_.async_wait(strand_.wrap(boost::bind(&printer::print1, this)));
    }
  }

  void print2()
  {
    if (count_ < 10)
    {
      std::cout << "Timer 2: " << count_ << "\n";
      ++count_;

      timer2_.expires_at(timer2_.expires_at() + boost::posix_time::seconds(1));
      timer2_.async_wait(strand_.wrap(boost::bind(&printer::print2, this)));
    }
  }

private:
  boost::asio::strand strand_;
  boost::asio::deadline_timer timer1_;
  boost::asio::deadline_timer timer2_;
  int count_;
};

int main()
{
  boost::asio::io_service io;
  printer p(io);
  boost::thread t(boost::bind(&boost::asio::io_service::run, &io));
  io.run();
  t.join();

  return 0;
}
```

Return to Timer.5 - Synchronising handlers in multithreaded programs

Daytime.1 - A synchronous TCP daytime client

This tutorial program shows how to use asio to implement a client application with TCP.

We start by including the necessary header files.

```
#include <iostream>
#include <boost/array.hpp>
#include <boost/asio.hpp>
```

The purpose of this application is to access a daytime service, so we need the user to specify the server.

```
using boost::asio::ip::tcp;

int main(int argc, char* argv[])
{
  try
  {
    if (argc != 2)
    {
      std::cerr << "Usage: client <host>" << std::endl;
      return 1;
    }
```

All programs that use asio need to have at least one io_service object.

```
    boost::asio::io_service io_service;
```

We need to turn the server name that was specified as a parameter to the application, into a TCP endpoint. To do this we use an ip::tcp::resolver object.

```
    tcp::resolver resolver(io_service);
```

A resolver takes a query object and turns it into a list of endpoints. We construct a query using the name of the server, specified in `argv[1]`, and the name of the service, in this case `"daytime"`.

```
    tcp::resolver::query query(argv[1], "daytime");
```

The list of endpoints is returned using an iterator of type ip::tcp::resolver::iterator. A default constructed ip::tcp::resolver::iterator object is used as the end iterator.

```
    tcp::resolver::iterator endpoint_iterator = resolver.resolve(query);
    tcp::resolver::iterator end;
```

Now we create and connect the socket. The list of endpoints obtained above may contain both IPv4 and IPv6 endpoints, so we need to try each of them until we find one that works. This keeps the client program independent of a specific IP version.

```
    tcp::socket socket(io_service);
    boost::system::error_code error = boost::asio::error::host_not_found;
    while (error && endpoint_iterator != end)
    {
      socket.close();
      socket.connect(*endpoint_iterator++, error);
    }
    if (error)
      throw boost::system::system_error(error);
```

The connection is open. All we need to do now is read the response from the daytime service.

We use a `boost::array` to hold the received data. The boost::asio::buffer() function automatically determines the size of the array to help prevent buffer overruns. Instead of a `boost::array`, we could have used a `char []` or `std::vector`.

```
    for (;;)
    {
      boost::array<char, 128> buf;
      boost::system::error_code error;

      size_t len = socket.read_some(boost::asio::buffer(buf), error);
```

When the server closes the connection, the ip::tcp::socket::read_some() function will exit with the boost::asio::error::eof error, which is how we know to exit the loop.

```
      if (error == boost::asio::error::eof)
        break; // Connection closed cleanly by peer.
      else if (error)
        throw boost::system::system_error(error); // Some other error.

      std::cout.write(buf.data(), len);
    }
```

Finally, handle any exceptions that may have been thrown.

```
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }
```

See the full source listing

Return to the tutorial index

Next: Daytime.2 - A synchronous TCP daytime server

Source listing for Daytime.1

```
//
// client.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/array.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::tcp;

int main(int argc, char* argv[])
{
  try
  {
    if (argc != 2)
    {
      std::cerr << "Usage: client <host>" << std::endl;
      return 1;
    }

    boost::asio::io_service io_service;

    tcp::resolver resolver(io_service);
    tcp::resolver::query query(argv[1], "daytime");
    tcp::resolver::iterator endpoint_iterator = resolver.resolve(query);
    tcp::resolver::iterator end;

    tcp::socket socket(io_service);
    boost::system::error_code error = boost::asio::error::host_not_found;
    while (error && endpoint_iterator != end)
    {
      socket.close();
      socket.connect(*endpoint_iterator++, error);
    }
    if (error)
      throw boost::system::system_error(error);

    for (;;)
    {
      boost::array<char, 128> buf;
      boost::system::error_code error;

      size_t len = socket.read_some(boost::asio::buffer(buf), error);

      if (error == boost::asio::error::eof)
        break; // Connection closed cleanly by peer.
      else if (error)
        throw boost::system::system_error(error); // Some other error.

      std::cout.write(buf.data(), len);
    }
  }
  catch (std::exception& e)
```

```
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.1 - A synchronous TCP daytime client

Daytime.2 - A synchronous TCP daytime server

This tutorial program shows how to use asio to implement a server application with TCP.

```
#include <ctime>
#include <iostream>
#include <string>
#include <boost/asio.hpp>

using boost::asio::ip::tcp;
```

We define the function `make_daytime_string()` to create the string to be sent back to the client. This function will be reused in all of our daytime server applications.

```
std::string make_daytime_string()
{
  using namespace std; // For time_t, time and ctime;
  time_t now = time(0);
  return ctime(&now);
}

int main()
{
  try
  {
    boost::asio::io_service io_service;
```

A ip::tcp::acceptor object needs to be created to listen for new connections. It is initialised to listen on TCP port 13, for IP version 4.

```
    tcp::acceptor acceptor(io_service, tcp::endpoint(tcp::v4(), 13));
```

This is an iterative server, which means that it will handle one connection at a time. Create a socket that will represent the connection to the client, and then wait for a connection.

```
    for (;;)
    {
      tcp::socket socket(io_service);
      acceptor.accept(socket);
```

A client is accessing our service. Determine the current time and transfer this information to the client.

```
      std::string message = make_daytime_string();

      boost::system::error_code ignored_error;
      boost::asio::write(socket, boost::asio::buffer(message),
          boost::asio::transfer_all(), ignored_error);
    }
  }
```

Finally, handle any exceptions.

```
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Daytime.1 - A synchronous TCP daytime client

Next: Daytime.3 - An asynchronous TCP daytime server

Source listing for Daytime.2

```
//
// server.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <ctime>
#include <iostream>
#include <string>
#include <boost/asio.hpp>

using boost::asio::ip::tcp;

std::string make_daytime_string()
{
  using namespace std; // For time_t, time and ctime;
  time_t now = time(0);
  return ctime(&now);
}

int main()
{
  try
  {
    boost::asio::io_service io_service;

    tcp::acceptor acceptor(io_service, tcp::endpoint(tcp::v4(), 13));

    for (;;)
    {
      tcp::socket socket(io_service);
      acceptor.accept(socket);

      std::string message = make_daytime_string();

      boost::system::error_code ignored_error;
      boost::asio::write(socket, boost::asio::buffer(message),
          boost::asio::transfer_all(), ignored_error);
    }
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.2 - A synchronous TCP daytime server

Daytime.3 - An asynchronous TCP daytime server

The main() function

```
int main()
{
  try
  {
```

We need to create a server object to accept incoming client connections. The io_service object provides I/O services, such as sockets, that the server object will use.

```
    boost::asio::io_service io_service;
    tcp_server server(io_service);
```

Run the io_service object so that it will perform asynchronous operations on your behalf.

```
    io_service.run();
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

The tcp_server class

```
class tcp_server
{
public:
```

The constructor initialises an acceptor to listen on TCP port 13.

```
  tcp_server(boost::asio::io_service& io_service)
    : acceptor_(io_service, tcp::endpoint(tcp::v4(), 13))
  {
    start_accept();
  }

private:
```

The function `start_accept()` creates a socket and initiates an asynchronous accept operation to wait for a new connection.

```
  void start_accept()
  {
    tcp_connection::pointer new_connection =
      tcp_connection::create(acceptor_.io_service());

    acceptor_.async_accept(new_connection->socket(),
        boost::bind(&tcp_server::handle_accept, this, new_connection,
          boost::asio::placeholders::error));
  }
```

The function `handle_accept()` is called when the asynchronous accept operation initiated by `start_accept()` finishes. It services the client request, and then calls `start_accept()` to initiate the next accept operation.

```
  void handle_accept(tcp_connection::pointer new_connection,
      const boost::system::error_code& error)
  {
    if (!error)
    {
      new_connection->start();
      start_accept();
    }
  }
```

The tcp_connection class

We will use `shared_ptr` and `enable_shared_from_this` because we want to keep the `tcp_connection` object alive as long as there is an operation that refers to it.

```
class tcp_connection
  : public boost::enable_shared_from_this<tcp_connection>
{
public:
  typedef boost::shared_ptr<tcp_connection> pointer;

  static pointer create(boost::asio::io_service& io_service)
  {
    return pointer(new tcp_connection(io_service));
  }

  tcp::socket& socket()
  {
    return socket_;
  }
```

In the function `start()`, we call boost::asio::async_write() to serve the data to the client. Note that we are using boost::asio::async_write(), rather than ip::tcp::socket::async_write_some(), to ensure that the entire block of data is sent.

```
  void start()
  {
```

The data to be sent is stored in the class member `message_` as we need to keep the data valid until the asynchronous operation is complete.

```
    message_ = make_daytime_string();
```

When initiating the asynchronous operation, and if using boost::bind(), you must specify only the arguments that match the handler's parameter list. In this program, both of the argument placeholders (boost::asio::placeholders::error and boost::asio::placeholders::bytes_transferred) could potentially have been removed, since they are not being used in `handle_write()`.

```
    boost::asio::async_write(socket_, boost::asio::buffer(message_),
        boost::bind(&tcp_connection::handle_write, shared_from_this(),
          boost::asio::placeholders::error,
          boost::asio::placeholders::bytes_transferred));
```

Any further actions for this client connection are now the responsibility of `handle_write()`.

```
  }

private:
  tcp_connection(boost::asio::io_service& io_service)
    : socket_(io_service)
  {
  }

  void handle_write(const boost::system::error_code& /*error*/,
      size_t /*bytes_transferred*/)
  {
  }

  tcp::socket socket_;
  std::string message_;
};
```

Removing unused handler parameters

You may have noticed that the `error`, and `bytes_transferred` parameters are not used in the body of the `handle_write()` function. If parameters are not needed, it is possible to remove them from the function so that it looks like:

```
  void handle_write()
  {
  }
```

The boost::asio::async_write() call used to initiate the call can then be changed to just:

```
  boost::asio::async_write(socket_, boost::asio::buffer(message_),
      boost::bind(&tcp_connection::handle_write, shared_from_this()));
```

See the full source listing

Return to the tutorial index

Previous: Daytime.2 - A synchronous TCP daytime server

Next: Daytime.4 - A synchronous UDP daytime client

Source listing for Daytime.3

```
//
// server.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <ctime>
#include <iostream>
#include <string>
#include <boost/bind.hpp>
#include <boost/shared_ptr.hpp>
#include <boost/enable_shared_from_this.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::tcp;

std::string make_daytime_string()
{
  using namespace std; // For time_t, time and ctime;
  time_t now = time(0);
  return ctime(&now);
}

class tcp_connection
  : public boost::enable_shared_from_this<tcp_connection>
{
public:
  typedef boost::shared_ptr<tcp_connection> pointer;

  static pointer create(boost::asio::io_service& io_service)
  {
    return pointer(new tcp_connection(io_service));
  }

  tcp::socket& socket()
  {
    return socket_;
  }

  void start()
  {
    message_ = make_daytime_string();

    boost::asio::async_write(socket_, boost::asio::buffer(message_),
        boost::bind(&tcp_connection::handle_write, shared_from_this(),
          boost::asio::placeholders::error,
          boost::asio::placeholders::bytes_transferred));
  }

private:
  tcp_connection(boost::asio::io_service& io_service)
    : socket_(io_service)
  {
  }

  void handle_write(const boost::system::error_code& /*error*/,
      size_t /*bytes_transferred*/)
```

```
  {
  }

  tcp::socket socket_;
  std::string message_;
};

class tcp_server
{
public:
  tcp_server(boost::asio::io_service& io_service)
    : acceptor_(io_service, tcp::endpoint(tcp::v4(), 13))
  {
    start_accept();
  }

private:
  void start_accept()
  {
    tcp_connection::pointer new_connection =
      tcp_connection::create(acceptor_.io_service());

    acceptor_.async_accept(new_connection->socket(),
        boost::bind(&tcp_server::handle_accept, this, new_connection,
          boost::asio::placeholders::error));
  }

  void handle_accept(tcp_connection::pointer new_connection,
      const boost::system::error_code& error)
  {
    if (!error)
    {
      new_connection->start();
      start_accept();
    }
  }

  tcp::acceptor acceptor_;
};

int main()
{
  try
  {
    boost::asio::io_service io_service;
    tcp_server server(io_service);
    io_service.run();
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.3 - An asynchronous TCP daytime server

Daytime.4 - A synchronous UDP daytime client

This tutorial program shows how to use asio to implement a client application with UDP.

```
#include <iostream>
#include <boost/array.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::udp;
```

The start of the application is essentially the same as for the TCP daytime client.

```
int main(int argc, char* argv[])
{
  try
  {
    if (argc != 2)
    {
      std::cerr << "Usage: client <host>" << std::endl;
      return 1;
    }

    boost::asio::io_service io_service;
```

We use an ip::udp::resolver object to find the correct remote endpoint to use based on the host and service names. The query is restricted to return only IPv4 endpoints by the ip::udp::v4() argument.

```
    udp::resolver resolver(io_service);
    udp::resolver::query query(udp::v4(), argv[1], "daytime");
```

The ip::udp::resolver::resolve() function is guaranteed to return at least one endpoint in the list if it does not fail. This means it is safe to dereference the return value directly.

```
    udp::endpoint receiver_endpoint = *resolver.resolve(query);
```

Since UDP is datagram-oriented, we will not be using a stream socket. Create an ip::udp::socket and initiate contact with the remote endpoint.

```
    udp::socket socket(io_service);
    socket.open(udp::v4());

    boost::array<char, 1> send_buf  = { 0 };
    socket.send_to(boost::asio::buffer(send_buf), receiver_endpoint);
```

Now we need to be ready to accept whatever the server sends back to us. The endpoint on our side that receives the server's response will be initialised by ip::udp::socket::receive_from().

```
    boost::array<char, 128> recv_buf;
    udp::endpoint sender_endpoint;
    size_t len = socket.receive_from(
        boost::asio::buffer(recv_buf), sender_endpoint);

    std::cout.write(recv_buf.data(), len);
  }
```

Finally, handle any exceptions that may have been thrown.

```
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Daytime.3 - An asynchronous TCP daytime server

Next: Daytime.5 - A synchronous UDP daytime server

Source listing for Daytime.4

```
//
// client.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <iostream>
#include <boost/array.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::udp;

int main(int argc, char* argv[])
{
  try
  {
    if (argc != 2)
    {
      std::cerr << "Usage: client <host>" << std::endl;
      return 1;
    }

    boost::asio::io_service io_service;

    udp::resolver resolver(io_service);
    udp::resolver::query query(udp::v4(), argv[1], "daytime");
    udp::endpoint receiver_endpoint = *resolver.resolve(query);

    udp::socket socket(io_service);
    socket.open(udp::v4());

    boost::array<char, 1> send_buf  = { 0 };
    socket.send_to(boost::asio::buffer(send_buf), receiver_endpoint);

    boost::array<char, 128> recv_buf;
    udp::endpoint sender_endpoint;
    size_t len = socket.receive_from(
        boost::asio::buffer(recv_buf), sender_endpoint);
```

```
    std::cout.write(recv_buf.data(), len);
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.4 - A synchronous UDP daytime client

Daytime.5 - A synchronous UDP daytime server

This tutorial program shows how to use asio to implement a server application with UDP.

```
int main()
{
  try
  {
    boost::asio::io_service io_service;
```

Create an ip::udp::socket object to receive requests on UDP port 13.

```
    udp::socket socket(io_service, udp::endpoint(udp::v4(), 13));
```

Wait for a client to initiate contact with us. The remote_endpoint object will be populated by ip::udp::socket::receive_from().

```
    for (;;)
    {
      boost::array<char, 1> recv_buf;
      udp::endpoint remote_endpoint;
      boost::system::error_code error;
      socket.receive_from(boost::asio::buffer(recv_buf),
          remote_endpoint, 0, error);

      if (error && error != boost::asio::error::message_size)
        throw boost::system::system_error(error);
```

Determine what we are going to send back to the client.

```
      std::string message = make_daytime_string();
```

Send the response to the remote_endpoint.

```
      boost::system::error_code ignored_error;
      socket.send_to(boost::asio::buffer(message),
          remote_endpoint, 0, ignored_error);
    }
  }
```

Finally, handle any exceptions.

```
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

See the full source listing

Return to the tutorial index

Previous: Daytime.4 - A synchronous UDP daytime client

Next: Daytime.6 - An asynchronous UDP daytime server

Source listing for Daytime.5

```
//
// server.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <ctime>
#include <iostream>
#include <string>
#include <boost/array.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::udp;

std::string make_daytime_string()
{
  using namespace std; // For time_t, time and ctime;
  time_t now = time(0);
  return ctime(&now);
}

int main()
{
  try
  {
    boost::asio::io_service io_service;

    udp::socket socket(io_service, udp::endpoint(udp::v4(), 13));

    for (;;)
    {
      boost::array<char, 1> recv_buf;
      udp::endpoint remote_endpoint;
      boost::system::error_code error;
      socket.receive_from(boost::asio::buffer(recv_buf),
          remote_endpoint, 0, error);

      if (error && error != boost::asio::error::message_size)
        throw boost::system::system_error(error);
```

```
      std::string message = make_daytime_string();

      boost::system::error_code ignored_error;
      socket.send_to(boost::asio::buffer(message),
          remote_endpoint, 0, ignored_error);
    }
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.5 - A synchronous UDP daytime server

Daytime.6 - An asynchronous UDP daytime server

The main() function

```
int main()
{
  try
  {
```

Create a server object to accept incoming client requests, and run the io_service object.

```
    boost::asio::io_service io_service;
    udp_server server(io_service);
    io_service.run();
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

The udp_server class

```
class udp_server
{
public:
```

The constructor initialises a socket to listen on UDP port 13.

```
  udp_server(boost::asio::io_service& io_service)
    : socket_(io_service, udp::endpoint(udp::v4(), 13))
  {
    start_receive();
  }

private:
  void start_receive()
  {
```

The function ip::udp::socket::async_receive_from() will cause the application to listen in the background for a new request. When such a request is received, the io_service object will invoke the `handle_receive()` function with two arguments: a value of type boost::system::error_code indicating whether the operation succeeded or failed, and a `size_t` value `bytes_transferred` specifying the number of bytes received.

```
    socket_.async_receive_from(
        boost::asio::buffer(recv_buffer_), remote_endpoint_,
        boost::bind(&udp_server::handle_receive, this,
          boost::asio::placeholders::error,
          boost::asio::placeholders::bytes_transferred));
  }
```

The function `handle_receive()` will service the client request.

```
  void handle_receive(const boost::system::error_code& error,
      std::size_t /*bytes_transferred*/)
  {
```

The `error` parameter contains the result of the asynchronous operation. Since we only provide the 1-byte `recv_buffer_` to contain the client's request, the io_service object would return an error if the client sent anything larger. We can ignore such an error if it comes up.

```
    if (!error || error == boost::asio::error::message_size)
    {
```

Determine what we are going to send.

```
      boost::shared_ptr<std::string> message(
          new std::string(make_daytime_string()));
```

We now call ip::udp::socket::async_send_to() to serve the data to the client.

```
      socket_.async_send_to(boost::asio::buffer(*message), remote_endpoint_,
          boost::bind(&udp_server::handle_send, this, message,
            boost::asio::placeholders::error,
            boost::asio::placeholders::bytes_transferred));
```

When initiating the asynchronous operation, and if using boost::bind(), you must specify only the arguments that match the handler's parameter list. In this program, both of the argument placeholders (boost::asio::placeholders::error and boost::asio::placeholders::bytes_transferred) could potentially have been removed.

Start listening for the next client request.

```
      start_receive();
```

Any further actions for this client request are now the responsibility of `handle_send()`.

```
    }
  }
```

The function `handle_send()` is invoked after the service request has been completed.

```
  void handle_send(boost::shared_ptr<std::string> /*message*/,
      const boost::system::error_code& /*error*/,
      std::size_t /*bytes_transferred*/)
  {
  }

  udp::socket socket_;
  udp::endpoint remote_endpoint_;
  boost::array<char, 1> recv_buffer_;
};
```

See the full source listing

Return to the tutorial index

Previous: Daytime.5 - A synchronous UDP daytime server

Next: Daytime.7 - A combined TCP/UDP asynchronous server

Source listing for Daytime.6

```
//
// server.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <ctime>
#include <iostream>
#include <string>
#include <boost/array.hpp>
#include <boost/bind.hpp>
#include <boost/shared_ptr.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::udp;

std::string make_daytime_string()
{
  using namespace std; // For time_t, time and ctime;
  time_t now = time(0);
  return ctime(&now);
}

class udp_server
{
public:
  udp_server(boost::asio::io_service& io_service)
    : socket_(io_service, udp::endpoint(udp::v4(), 13))
  {
    start_receive();
  }

private:
  void start_receive()
  {
    socket_.async_receive_from(
        boost::asio::buffer(recv_buffer_), remote_endpoint_,
        boost::bind(&udp_server::handle_receive, this,
          boost::asio::placeholders::error,
          boost::asio::placeholders::bytes_transferred));
  }

  void handle_receive(const boost::system::error_code& error,
      std::size_t /*bytes_transferred*/)
  {
    if (!error || error == boost::asio::error::message_size)
    {
      boost::shared_ptr<std::string> message(
          new std::string(make_daytime_string()));

      socket_.async_send_to(boost::asio::buffer(*message), remote_endpoint_,
          boost::bind(&udp_server::handle_send, this, message,
            boost::asio::placeholders::error,
            boost::asio::placeholders::bytes_transferred));

      start_receive();
    }
```

```
  }

  void handle_send(boost::shared_ptr<std::string> /*message*/,
      const boost::system::error_code& /*error*/,
      std::size_t /*bytes_transferred*/)
  {
  }

  udp::socket socket_;
  udp::endpoint remote_endpoint_;
  boost::array<char, 1> recv_buffer_;
};

int main()
{
  try
  {
    boost::asio::io_service io_service;
    udp_server server(io_service);
    io_service.run();
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.6 - An asynchronous UDP daytime server

Daytime.7 - A combined TCP/UDP asynchronous server

This tutorial program shows how to combine the two asynchronous servers that we have just written, into a single server application.

The main() function

```
int main()
{
  try
  {
    boost::asio::io_service io_service;
```

We will begin by creating a server object to accept a TCP client connection.

```
    tcp_server server1(io_service);
```

We also need a server object to accept a UDP client request.

```
    udp_server server2(io_service);
```

We have created two lots of work for the io_service object to do.

```
    io_service.run();
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

The tcp_connection and tcp_server classes

The following two classes are taken from Daytime.3 .

```
class tcp_connection
  : public boost::enable_shared_from_this<tcp_connection>
{
public:
  typedef boost::shared_ptr<tcp_connection> pointer;

  static pointer create(boost::asio::io_service& io_service)
  {
    return pointer(new tcp_connection(io_service));
  }

  tcp::socket& socket()
  {
    return socket_;
  }

  void start()
  {
    message_ = make_daytime_string();

    boost::asio::async_write(socket_, boost::asio::buffer(message_),
        boost::bind(&tcp_connection::handle_write, shared_from_this()));
  }

private:
  tcp_connection(boost::asio::io_service& io_service)
    : socket_(io_service)
  {
  }

  void handle_write()
  {
  }

  tcp::socket socket_;
  std::string message_;
};

class tcp_server
{
public:
  tcp_server(boost::asio::io_service& io_service)
    : acceptor_(io_service, tcp::endpoint(tcp::v4(), 13))
  {
    start_accept();
  }

private:
```

```
  void start_accept()
  {
    tcp_connection::pointer new_connection =
      tcp_connection::create(acceptor_.io_service());

    acceptor_.async_accept(new_connection->socket(),
        boost::bind(&tcp_server::handle_accept, this, new_connection,
          boost::asio::placeholders::error));
  }

  void handle_accept(tcp_connection::pointer new_connection,
      const boost::system::error_code& error)
  {
    if (!error)
    {
      new_connection->start();
      start_accept();
    }
  }

  tcp::acceptor acceptor_;
};
```

The udp_server class

Similarly, this next class is taken from the previous tutorial step .

```
class udp_server
{
public:
  udp_server(boost::asio::io_service& io_service)
    : socket_(io_service, udp::endpoint(udp::v4(), 13))
  {
    start_receive();
  }

private:
  void start_receive()
  {
    socket_.async_receive_from(
        boost::asio::buffer(recv_buffer_), remote_endpoint_,
        boost::bind(&udp_server::handle_receive, this,
          boost::asio::placeholders::error));
  }

  void handle_receive(const boost::system::error_code& error)
  {
    if (!error || error == boost::asio::error::message_size)
    {
      boost::shared_ptr<std::string> message(
          new std::string(make_daytime_string()));

      socket_.async_send_to(boost::asio::buffer(*message), remote_endpoint_,
          boost::bind(&udp_server::handle_send, this, message));

      start_receive();
    }
  }

  void handle_send(boost::shared_ptr<std::string> /*message*/)
  {
  }

  udp::socket socket_;
  udp::endpoint remote_endpoint_;
  boost::array<char, 1> recv_buffer_;
};
```

See the full source listing

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Previous: Daytime.6 - An asynchronous UDP daytime server

Source listing for Daytime.7

```
//
// server.cpp
// ~~~~~~~~~~
//
// Copyright (c) 2003-2010 Christopher M. Kohlhoff (chris at kohlhoff dot com)
//
// Distributed under the Boost Software License, Version 1.0. (See accompanying
// file LICENSE_1_0.txt or copy at http://www.boost.org/LICENSE_1_0.txt)
//

#include <ctime>
#include <iostream>
#include <string>
#include <boost/array.hpp>
#include <boost/bind.hpp>
#include <boost/shared_ptr.hpp>
#include <boost/enable_shared_from_this.hpp>
#include <boost/asio.hpp>

using boost::asio::ip::tcp;
using boost::asio::ip::udp;

std::string make_daytime_string()
{
  using namespace std; // For time_t, time and ctime;
  time_t now = time(0);
  return ctime(&now);
}

class tcp_connection
  : public boost::enable_shared_from_this<tcp_connection>
{
public:
  typedef boost::shared_ptr<tcp_connection> pointer;

  static pointer create(boost::asio::io_service& io_service)
  {
    return pointer(new tcp_connection(io_service));
  }

  tcp::socket& socket()
  {
    return socket_;
  }

  void start()
  {
    message_ = make_daytime_string();

    boost::asio::async_write(socket_, boost::asio::buffer(message_),
        boost::bind(&tcp_connection::handle_write, shared_from_this()));
  }

private:
  tcp_connection(boost::asio::io_service& io_service)
    : socket_(io_service)
  {
  }

  void handle_write()
  {
```

```
  }

  tcp::socket socket_;
  std::string message_;
};

class tcp_server
{
public:
  tcp_server(boost::asio::io_service& io_service)
    : acceptor_(io_service, tcp::endpoint(tcp::v4(), 13))
  {
    start_accept();
  }

private:
  void start_accept()
  {
    tcp_connection::pointer new_connection =
      tcp_connection::create(acceptor_.io_service());

    acceptor_.async_accept(new_connection->socket(),
        boost::bind(&tcp_server::handle_accept, this, new_connection,
          boost::asio::placeholders::error));
  }

  void handle_accept(tcp_connection::pointer new_connection,
      const boost::system::error_code& error)
  {
    if (!error)
    {
      new_connection->start();
      start_accept();
    }
  }

  tcp::acceptor acceptor_;
};

class udp_server
{
public:
  udp_server(boost::asio::io_service& io_service)
    : socket_(io_service, udp::endpoint(udp::v4(), 13))
  {
    start_receive();
  }

private:
  void start_receive()
  {
    socket_.async_receive_from(
        boost::asio::buffer(recv_buffer_), remote_endpoint_,
        boost::bind(&udp_server::handle_receive, this,
          boost::asio::placeholders::error));
  }

  void handle_receive(const boost::system::error_code& error)
  {
    if (!error || error == boost::asio::error::message_size)
    {
      boost::shared_ptr<std::string> message(
          new std::string(make_daytime_string()));
```

```
      socket_.async_send_to(boost::asio::buffer(*message), remote_endpoint_,
          boost::bind(&udp_server::handle_send, this, message));

      start_receive();
    }
  }

  void handle_send(boost::shared_ptr<std::string> /*message*/)
  {
  }

  udp::socket socket_;
  udp::endpoint remote_endpoint_;
  boost::array<char, 1> recv_buffer_;
};

int main()
{
  try
  {
    boost::asio::io_service io_service;
    tcp_server server1(io_service);
    udp_server server2(io_service);
    io_service.run();
  }
  catch (std::exception& e)
  {
    std::cerr << e.what() << std::endl;
  }

  return 0;
}
```

Return to Daytime.7 - A combined TCP/UDP asynchronous server

Examples

Allocation

This example shows how to customise the allocation of memory associated with asynchronous operations.

- boost_asio/example/allocation/server.cpp

Buffers

This example demonstrates how to create reference counted buffers that can be used with socket read and write operations.

- boost_asio/example/buffers/reference_counted.cpp

Chat

This example implements a chat server and client. The programs use a custom protocol with a fixed length message header and variable length message body.

- boost_asio/example/chat/chat_message.hpp
- boost_asio/example/chat/chat_client.cpp
- boost_asio/example/chat/chat_server.cpp

The following POSIX-specific chat client demonstrates how to use the posix::stream_descriptor class to perform console input and output.

- boost_asio/example/chat/posix_chat_client.cpp

Echo

A collection of simple clients and servers, showing the use of both synchronous and asynchronous operations.

- boost_asio/example/echo/async_tcp_echo_server.cpp
- boost_asio/example/echo/async_udp_echo_server.cpp
- boost_asio/example/echo/blocking_tcp_echo_client.cpp
- boost_asio/example/echo/blocking_tcp_echo_server.cpp
- boost_asio/example/echo/blocking_udp_echo_client.cpp
- boost_asio/example/echo/blocking_udp_echo_server.cpp

HTTP Client

Example programs implementing simple HTTP 1.0 clients. These examples show how to use the read_until and async_read_until functions.

- boost_asio/example/http/client/sync_client.cpp
- boost_asio/example/http/client/async_client.cpp

HTTP Server

This example illustrates the use of asio in a simple single-threaded server implementation of HTTP 1.0. It demonstrates how to perform a clean shutdown by cancelling all outstanding asynchronous operations.

- boost_asio/example/http/server/connection.cpp
- boost_asio/example/http/server/connection.hpp
- boost_asio/example/http/server/connection_manager.cpp
- boost_asio/example/http/server/connection_manager.hpp
- boost_asio/example/http/server/header.hpp
- boost_asio/example/http/server/mime_types.cpp
- boost_asio/example/http/server/mime_types.hpp
- boost_asio/example/http/server/posix_main.cpp
- boost_asio/example/http/server/reply.cpp
- boost_asio/example/http/server/reply.hpp
- boost_asio/example/http/server/request.hpp
- boost_asio/example/http/server/request_handler.cpp
- boost_asio/example/http/server/request_handler.hpp

- boost_asio/example/http/server/request_parser.cpp
- boost_asio/example/http/server/request_parser.hpp
- boost_asio/example/http/server/server.cpp
- boost_asio/example/http/server/server.hpp
- boost_asio/example/http/server/win_main.cpp

HTTP Server 2

An HTTP server using an io_service-per-CPU design.

- boost_asio/example/http/server2/connection.cpp
- boost_asio/example/http/server2/connection.hpp
- boost_asio/example/http/server2/header.hpp
- boost_asio/example/http/server2/io_service_pool.cpp
- boost_asio/example/http/server2/io_service_pool.hpp
- boost_asio/example/http/server2/mime_types.cpp
- boost_asio/example/http/server2/mime_types.hpp
- boost_asio/example/http/server2/posix_main.cpp
- boost_asio/example/http/server2/reply.cpp
- boost_asio/example/http/server2/reply.hpp
- boost_asio/example/http/server2/request.hpp
- boost_asio/example/http/server2/request_handler.cpp
- boost_asio/example/http/server2/request_handler.hpp
- boost_asio/example/http/server2/request_parser.cpp
- boost_asio/example/http/server2/request_parser.hpp
- boost_asio/example/http/server2/server.cpp
- boost_asio/example/http/server2/server.hpp
- boost_asio/example/http/server2/win_main.cpp

HTTP Server 3

An HTTP server using a single io_service and a thread pool calling `io_service::run()`.

- boost_asio/example/http/server3/connection.cpp
- boost_asio/example/http/server3/connection.hpp
- boost_asio/example/http/server3/header.hpp
- boost_asio/example/http/server3/mime_types.cpp

- boost_asio/example/http/server3/mime_types.hpp
- boost_asio/example/http/server3/posix_main.cpp
- boost_asio/example/http/server3/reply.cpp
- boost_asio/example/http/server3/reply.hpp
- boost_asio/example/http/server3/request.hpp
- boost_asio/example/http/server3/request_handler.cpp
- boost_asio/example/http/server3/request_handler.hpp
- boost_asio/example/http/server3/request_parser.cpp
- boost_asio/example/http/server3/request_parser.hpp
- boost_asio/example/http/server3/server.cpp
- boost_asio/example/http/server3/server.hpp
- boost_asio/example/http/server3/win_main.cpp

HTTP Server 4

A single-threaded HTTP server implemented using stackless coroutines.

- boost_asio/example/http/server4/coroutine.hpp
- boost_asio/example/http/server4/file_handler.cpp
- boost_asio/example/http/server4/file_handler.hpp
- boost_asio/example/http/server4/header.hpp
- boost_asio/example/http/server4/mime_types.cpp
- boost_asio/example/http/server4/mime_types.hpp
- boost_asio/example/http/server4/posix_main.cpp
- boost_asio/example/http/server4/reply.cpp
- boost_asio/example/http/server4/reply.hpp
- boost_asio/example/http/server4/request.hpp
- boost_asio/example/http/server4/request_parser.cpp
- boost_asio/example/http/server4/request_parser.hpp
- boost_asio/example/http/server4/server.cpp
- boost_asio/example/http/server4/server.hpp
- boost_asio/example/http/server4/unyield.hpp
- boost_asio/example/http/server4/win_main.cpp
- boost_asio/example/http/server4/yield.hpp

ICMP

This example shows how to use raw sockets with ICMP to ping a remote host.

- boost_asio/example/icmp/ping.cpp
- boost_asio/example/icmp/ipv4_header.hpp
- boost_asio/example/icmp/icmp_header.hpp

Invocation

This example shows how to customise handler invocation. Completion handlers are added to a priority queue rather than executed immediately.

- boost_asio/example/invocation/prioritised_handlers.cpp

Iostreams

Two examples showing how to use ip::tcp::iostream.

- boost_asio/example/iostreams/daytime_client.cpp
- boost_asio/example/iostreams/daytime_server.cpp

Multicast

An example showing the use of multicast to transmit packets to a group of subscribers.

- boost_asio/example/multicast/receiver.cpp
- boost_asio/example/multicast/sender.cpp

Serialization

This example shows how Boost.Serialization can be used with asio to encode and decode structures for transmission over a socket.

- boost_asio/example/serialization/client.cpp
- boost_asio/example/serialization/connection.hpp
- boost_asio/example/serialization/server.cpp
- boost_asio/example/serialization/stock.hpp

Services

This example demonstrates how to integrate custom functionality (in this case, for logging) into asio's io_service, and how to use a custom service with basic_stream_socket<>.

- boost_asio/example/services/basic_logger.hpp
- boost_asio/example/services/daytime_client.cpp
- boost_asio/example/services/logger.hpp
- boost_asio/example/services/logger_service.cpp
- boost_asio/example/services/logger_service.hpp

- boost_asio/example/services/stream_socket_service.hpp

SOCKS 4

Example client program implementing the SOCKS 4 protocol for communication via a proxy.

- boost_asio/example/socks4/sync_client.cpp
- boost_asio/example/socks4/socks4.hpp

SSL

Example client and server programs showing the use of the ssl::stream<> template with asynchronous operations.

- boost_asio/example/ssl/client.cpp
- boost_asio/example/ssl/server.cpp

Timeouts

A collection of examples showing how to cancel long running asynchronous operations after a period of time.

- boost_asio/example/timeouts/accept_timeout.cpp
- boost_asio/example/timeouts/connect_timeout.cpp
- boost_asio/example/timeouts/datagram_receive_timeout.cpp
- boost_asio/example/timeouts/stream_receive_timeout.cpp

Timers

Examples showing how to customise deadline_timer using different time types.

- boost_asio/example/timers/tick_count_timer.cpp
- boost_asio/example/timers/time_t_timer.cpp

Porthopper

Example illustrating mixed synchronous and asynchronous operations, and how to use Boost.Lambda with Boost.Asio.

- boost_asio/example/porthopper/protocol.hpp
- boost_asio/example/porthopper/client.cpp
- boost_asio/example/porthopper/server.cpp

Nonblocking

Example demonstrating reactor-style operations for integrating a third-party library that wants to perform the I/O operations itself.

- boost_asio/example/nonblocking/third_party_lib.cpp

UNIX Domain Sockets

Examples showing how to use UNIX domain (local) sockets.

- boost_asio/example/local/connect_pair.cpp

- boost_asio/example/local/stream_server.cpp
- boost_asio/example/local/stream_client.cpp

Windows

An example showing how to use the Windows-specific function `TransmitFile` with Boost.Asio.

- boost_asio/example/windows/transmit_file.cpp

Reference

Core

Classes

const_buffer
const_buffers_1
invalid_service_owner
io_service
io_service::id
io_service::service
io_service::strand
io_service::work
mutable_buffer
mutable_buffers_1
null_buffers
service_already_exists
streambuf

Class Templates

basic_io_object
basic_streambuf
buffered_read_stream
buffered_stream
buffered_write_stream
buffers_iterator

Free Functions

add_service
asio_handler_allocate
asio_handler_deallocate
asio_handler_invoke
async_read
async_read_at
async_read_until
async_write
async_write_at
buffer
buffers_begin
buffers_end
has_service
read
read_at
read_until
transfer_all
transfer_at_least
use_service
write
write_at

Placeholders

placeholders::bytes_transferred
placeholders::error
placeholders::iterator

Error Codes

error::basic_errors
error::netdb_errors
error::addrinfo_errors
error::misc_errors

Type Traits

is_match_condition
is_read_buffered
is_write_buffered

Type Requirements

Asynchronous operations
AsyncRandomAccessReadDevice
AsyncRandomAccessWriteDevice
AsyncReadStream
AsyncWriteStream
CompletionHandler
ConstBufferSequence
ConvertibleToConstBuffer
ConvertibleToMutableBuffer
Handler
IoObjectService
MutableBufferSequence
ReadHandler
Service
SyncRandomAccessReadDevice
SyncRandomAccessWriteDevice
SyncReadStream
SyncWriteStream
WriteHandler

Networking

Classes

ip::address
ip::address_v4
ip::address_v6
ip::icmp
ip::icmp::endpoint
ip::icmp::resolver
ip::icmp::socket
ip::resolver_query_base
ip::tcp
ip::tcp::acceptor
ip::tcp::endpoint
ip::tcp::iostream
ip::tcp::resolver
ip::tcp::socket
ip::udp
ip::udp::endpoint
ip::udp::resolver
ip::udp::socket
socket_base

Free Functions

ip::host_name

Class Templates

basic_datagram_socket
basic_deadline_timer
basic_socket
basic_raw_socket
basic_socket_acceptor
basic_socket_iostream
basic_socket_streambuf
basic_stream_socket
ip::basic_endpoint
ip::basic_resolver
ip::basic_resolver_entry
ip::basic_resolver_iterator
ip::basic_resolver_query

Services

datagram_socket_service
ip::resolver_service
raw_socket_service
socket_acceptor_service
stream_socket_service

Socket Options

ip::multicast::enable_loopback
ip::multicast::hops
ip::multicast::join_group
ip::multicast::leave_group
ip::multicast::outbound_interface
ip::tcp::no_delay
ip::unicast::hops
ip::v6_only
socket_base::broadcast
socket_base::debug
socket_base::do_not_route
socket_base::enable_connection_aborted
socket_base::keep_alive
socket_base::linger
socket_base::receive_buffer_size
socket_base::receive_low_watermark
socket_base::reuse_address
socket_base::send_buffer_size
socket_base::send_low_watermark

I/O Control Commands

socket_base::bytes_readable
socket_base::non_blocking_io

Type Requirements

AcceptHandler
ConnectHandler
DatagramSocketService
Endpoint
GettableSocketOption
InternetProtocol
IoControlCommand
Protocol
RawSocketService
ResolveHandler
ResolverService
SettableSocketOption
SocketAcceptorService
SocketService
StreamSocketService

Timers

Classes

deadline_timer

Class Templates

basic_deadline_timer
time_traits

Services

deadline_timer_service

Type Requirements

TimerService
TimeTraits
WaitHandler

SSL

Classes

ssl::context
ssl::context_base
ssl::stream_base

Class Templates

ssl::basic_context
ssl::stream

Services

ssl::context_service
ssl::stream_service

Serial Ports

Classes

serial_port
serial_port_base

Class Templates

basic_serial_port

Services

serial_port_service

Serial Port Options

serial_port_base::baud_rate
serial_port_base::flow_control
serial_port_base::parity
serial_port_base::stop_bits
serial_port_base::character_size

Type Requirements

GettableSerialPortOption
SerialPortService
SettableSerialPortOption

POSIX-specific

Classes

local::stream_protocol
local::stream_protocol::acceptor
local::stream_protocol::endpoint
local::stream_protocol::iostream
local::stream_protocol::socket
local::datagram_protocol
local::datagram_protocol::endpoint
local::datagram_protocol::socket
posix::descriptor_base
posix::stream_descriptor

Free Functions

local::connect_pair

Class Templates

local::basic_endpoint
posix::basic_descriptor
posix::basic_stream_descriptor

Services

posix::stream_descriptor_service

Type Requirements

DescriptorService
StreamDescriptorService

Windows-specific

Classes

windows::overlapped_ptr
windows::random_access_handle
windows::stream_handle

Class Templates

windows::basic_handle
windows::basic_random_access_handle
windows::basic_stream_handle

Services

windows::random_access_handle_service
windows::stream_handle_service

Type Requirements

HandleService
RandomAccessHandleService
StreamHandleService

Requirements on asynchronous operations

In Boost.Asio, an asynchronous operation is initiated by a function that is named with the prefix `async_`. These functions will be referred to as *initiating functions*.

All initiating functions in Boost.Asio take a function object meeting handler requirements as the final parameter. These handlers accept as their first parameter an lvalue of type `const error_code`.

Implementations of asynchronous operations in Boost.Asio may call the application programming interface (API) provided by the operating system. If such an operating system API call results in an error, the handler will be invoked with a `const error_code` lvalue that evaluates to true. Otherwise the handler will be invoked with a `const error_code` lvalue that evaluates to false.

Unless otherwise noted, when the behaviour of an asynchronous operation is defined "as if" implemented by a *POSIX* function, the handler will be invoked with a value of type `error_code` that corresponds to the failure condition described by *POSIX* for that function, if any. Otherwise the handler will be invoked with an implementation-defined `error_code` value that reflects the operating system error.

Asynchronous operations will not fail with an error condition that indicates interruption by a signal (*POSIX* `EINTR`). Asynchronous operations will not fail with any error condition associated with non-blocking operations (*POSIX* `EWOULDBLOCK`, `EAGAIN` or `EINPROGRESS`; *Windows* `WSAEWOULDBLOCK` or `WSAEINPROGRESS`).

All asynchronous operations have an associated `io_service` object. Where the initiating function is a member function, the associated `io_service` is that returned by the `io_service()` member function on the same object. Where the initiating function is not a member function, the associated `io_service` is that returned by the `io_service()` member function of the first argument to the initiating function.

Arguments to initiating functions will be treated as follows:

— If the parameter is declared as a const reference or by-value, the program is not required to guarantee the validity of the argument after the initiating function completes. The implementation may make copies of the argument, and all copies will be destroyed no later than immediately after invocation of the handler.

— If the parameter is declared as a non-const reference, const pointer or non-const pointer, the program must guarantee the validity of the argument until the handler is invoked.

The library implementation is only permitted to make calls to an initiating function's arguments' copy constructors or destructors from a thread that satisfies one of the following conditions:

— The thread is executing any member function of the associated `io_service` object.

— The thread is executing the destructor of the associated `io_service` object.

— The thread is executing one of the `io_service` service access functions `use_service`, `add_service` or `has_service`, where the first argument is the associated `io_service` object.

— The thread is executing any member function, constructor or destructor of an object of a class defined in this clause, where the object's `io_service()` member function returns the associated `io_service` object.

— The thread is executing any function defined in this clause, where any argument to the function has an `io_service()` member function that returns the associated `io_service` object.

> Boost.Asio may use one or more hidden threads to emulate asynchronous functionality. The above requirements are intended to prevent these hidden threads from making calls to program code. This means that a program can, for example, use thread-unsafe reference counting in handler objects, provided the program ensures that all calls to an `io_service` and related objects occur from the one thread.

The `io_service` object associated with an asynchronous operation will have unfinished work, as if by maintaining the existence of one or more objects of class `io_service::work` constructed using the `io_service`, until immediately after the handler for the asynchronous operation has been invoked.

When an asynchronous operation is complete, the handler for the operation will be invoked as if by:

1. Constructing a bound completion handler `bch` for the handler, as described below.

2. Calling `ios.post(bch)` to schedule the handler for deferred invocation, where `ios` is the associated `io_service`.

This implies that the handler must not be called directly from within the initiating function, even if the asynchronous operation completes immediately.

A bound completion handler is a handler object that contains a copy of a user-supplied handler, where the user-supplied handler accepts one or more arguments. The bound completion handler does not accept any arguments, and contains values to be passed as arguments to the user-supplied handler. The bound completion handler forwards the `asio_handler_allocate()`, `asio_handler_deallocate()`, and `asio_handler_invoke()` calls to the corresponding functions for the user-supplied handler. A bound completion handler meets the requirements for a completion handler.

For example, a bound completion handler for a `ReadHandler` may be implemented as follows:

```
template<class ReadHandler>
struct bound_read_handler
{
  bound_read_handler(ReadHandler handler, const error_code& ec, size_t s)
    : handler_(handler), ec_(ec), s_(s)
  {
  }

  void operator()()
  {
    handler_(ec_, s_);
  }

  ReadHandler handler_;
  const error_code ec_;
  const size_t s_;
};

template<class ReadHandler>
void* asio_handler_allocate(size_t size,
                            bound_read_handler<ReadHandler>* this_handler)
{
  using namespace boost::asio;
  return asio_handler_allocate(size, &this_handler->handler_);
}

template<class ReadHandler>
void asio_handler_deallocate(void* pointer, std::size_t size,
                             bound_read_handler<ReadHandler>* this_handler)
{
  using namespace boost::asio;
  asio_handler_deallocate(pointer, size, &this_handler->handler_);
}

template<class F, class ReadHandler>
void asio_handler_invoke(const F& f,
                         bound_read_handler<ReadHandler>* this_handler)
{
  using namespace boost::asio;
  asio_handler_invoke(f, &this_handler->handler_);
}
```

If the thread that initiates an asynchronous operation terminates before the associated handler is invoked, the behaviour is implementation-defined. Specifically, on *Windows* versions prior to Vista, unfinished operations are cancelled when the initiating thread exits.

The handler argument to an initiating function defines a handler identity. That is, the original handler argument and any copies of the handler argument will be considered equivalent. If the implementation needs to allocate storage for an asynchronous operation, the implementation will perform `asio_handler_allocate(size, &h)`, where `size` is the required size in bytes, and `h` is the handler. The implementation will perform `asio_handler_deallocate(p, size, &h)`, where `p` is a pointer to the storage, to deallocate the storage prior to the invocation of the handler via `asio_handler_invoke`. Multiple storage blocks may be allocated for a single asynchronous operation.

Accept handler requirements

An accept handler must meet the requirements for a handler. A value `h` of an accept handler class should work correctly in the expression `h(ec)`, where `ec` is an lvalue of type `const error_code`.

Examples

A free function as an accept handler:

```
void accept_handler(
    const boost::system::error_code& ec)
{
  ...
}
```

An accept handler function object:

```
struct accept_handler
{
  ...
  void operator()(
      const boost::system::error_code& ec)
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to an accept handler using `bind()`:

```
void my_class::accept_handler(
    const boost::system::error_code& ec)
{
  ...
}
...
acceptor.async_accept(...,
    boost::bind(&my_class::accept_handler,
      this, boost::asio::placeholders::error));
```

Buffer-oriented asynchronous random-access read device requirements

In the table below, `a` denotes an asynchronous random access read device object, `o` denotes an offset of type `boost::uint64_t`, `mb` denotes an object satisfying mutable buffer sequence requirements, and `h` denotes an object satisfying read handler requirements.

Table 1. Buffer-oriented asynchronous random-access read device requirements

operation	type	semantics, pre/post-conditions
`a.get_io_service();`	`io_service&`	Returns the `io_service` object through which the `async_read_some_at` handler `h` will be invoked.
`a.async_read_some_at(o, mb, h);`	`void`	Initiates an asynchronous operation to read one or more bytes of data from the device `a` at the offset `o`. The operation is performed via the `io_service` object `a.get_io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The `async_read_some_at` operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous read operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read.

Buffer-oriented asynchronous random-access write device requirements

In the table below, `a` denotes an asynchronous write stream object, `o` denotes an offset of type `boost::uint64_t`, `cb` denotes an object satisfying constant buffer sequence requirements, and `h` denotes an object satisfying write handler requirements.

Table 2. Buffer-oriented asynchronous random-access write device requirements

operation	type	semantics, pre/post-conditions
`a.get_io_service();`	`io_service&`	Returns the `io_service` object through which the `async_write_some_at` handler `h` will be invoked.
`a.async_write_some_at(o, cb, h);`	`void`	Initiates an asynchronous operation to write one or more bytes of data to the device `a` at offset `o`. The operation is performed via the `io_service` object `a.get_io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The `async_write_some_at` operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous write operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous write operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes written.

Buffer-oriented asynchronous read stream requirements

In the table below, `a` denotes an asynchronous read stream object, `mb` denotes an object satisfying mutable buffer sequence requirements, and `h` denotes an object satisfying read handler requirements.

Table 3. Buffer-oriented asynchronous read stream requirements

operation	type	semantics, pre/post-conditions
`a.io_service();`	`io_service&`	Returns the `io_service` object through which the `async_read_some` handler `h` will be invoked.
`a.async_read_some(mb, h);`	`void`	Initiates an asynchronous operation to read one or more bytes of data from the stream `a`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The `async_read_some` operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous read operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read.

Buffer-oriented asynchronous write stream requirements

In the table below, `a` denotes an asynchronous write stream object, `cb` denotes an object satisfying constant buffer sequence requirements, and `h` denotes an object satisfying write handler requirements.

Table 4. Buffer-oriented asynchronous write stream requirements

operation	type	semantics, pre/post-conditions
`a.io_service();`	`io_service&`	Returns the `io_service` object through which the `async_write_some` handler `h` will be invoked.
`a.async_write_some(cb, h);`	`void`	Initiates an asynchronous operation to write one or more bytes of data to the stream `a`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The `async_write_some` operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous write operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous write operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes written.

Completion handler requirements

A completion handler must meet the requirements for a handler. A value `h` of a completion handler class should work correctly in the expression `h()`.

Examples

A free function as a completion handler:

```
void completion_handler()
{
  ...
}
```

A completion handler function object:

```
struct completion_handler
{
  ...
  void operator()()
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to a completion handler using `bind()`:

```
void my_class::completion_handler()
{
  ...
}
...
my_io_service.post(boost::bind(&my_class::completion_handler, this));
```

Connect handler requirements

A connect handler must meet the requirements for a handler. A value `h` of a connect handler class should work correctly in the expression `h(ec)`, where `ec` is an lvalue of type `const error_code`.

Examples

A free function as a connect handler:

```
void connect_handler(
    const boost::system::error_code& ec)
{
  ...
}
```

A connect handler function object:

```
struct connect_handler
{
  ...
  void operator()(
      const boost::system::error_code& ec)
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to a connect handler using `bind()`:

```
void my_class::connect_handler(
    const boost::system::error_code& ec)
{
  ...
}
...
socket.async_connect(...,
    boost::bind(&my_class::connect_handler,
      this, boost::asio::placeholders::error));
```

Constant buffer sequence requirements

In the table below, `X` denotes a class containing objects of type `T`, `a` denotes a value of type `X` and `u` denotes an identifier.

Table 5. ConstBufferSequence requirements

expression	return type	assertion/note pre/post-condition
`X::value_type`	`T`	`T` meets the requirements for ConvertibleToConstBuffer.
`X::const_iterator`	iterator type pointing to `T`	`const_iterator` meets the requirements for bidirectional iterators (C++ Std, 24.1.4).

`X(a);`		post: `equal_const_buffer_seq(a, X(a))` where the binary predicate `equal_const_buffer_seq` is defined as
		`bool equal_const_buffer_seq(`
		`  const X& x1, const X& x2)`
		`{`
		`  return`
		`  distance(x1.begin(), x1.end())`
		`  == distance(x2.begin(), x2.end())`
		`  && equal(x1.begin(), x1.end(),`
		`  x2.begin(), equal_buffer);`
		`}`
		and the binary predicate `equal_buffer` is defined as
		`bool equal_buffer(`
		`  const X::value_type& v1,`
		`  const X::value_type& v2)`
		`{`
		`  const_buffer b1(v1);`
		`  const_buffer b2(v2);`
		`  return`
		`  buffer_cast<const void*>(b1)`
		`  == buffer_cast<const void*>(b2)`
		`  && buffer_size(b1) == buffer_size(b2);`
		`}`

`X u(a);`		post:
		`distance(a.begin(), a.end())`
		`  == distance(u.begin(), u.end())`
		`  && equal(a.begin(), a.end(),`
		`  u.begin(), equal_buffer)`
		where the binary predicate `equal_buffer` is defined as
		`bool equal_buffer(`
		`  const X::value_type& v1,`
		`  const X::value_type& v2)`
		`{`
		`  const_buffer b1(v1);`
		`  const_buffer b2(v2);`
		`  return`
		`  buffer_cast<const void*>(b1)`
		`  == buffer_cast<const void*>(b2)`
		`  && buffer_size(b1) == buffer_size(b2);`
		`}`

expression	return type	assertion/note pre/post-condition
`(&a)->~X();`	`void`	note: the destructor is applied to every element of `a`; all the memory is deallocated.
`a.begin();`	`const_iterator` or `convertible to const_iterator`	
`a.end();`	`const_iterator` or `convertible to const_iterator`	

Convertible to const buffer requirements

A type that meets the requirements for convertibility to a const buffer must meet the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).

In the table below, `X` denotes a class meeting the requirements for convertibility to a const buffer, `a` and `b` denote values of type `X`, and `u`, `v` and `w` denote identifiers.

Table 6. ConvertibleToConstBuffer requirements

expression	postcondition
`const_buffer u(a);` `const_buffer v(a);`	`buffer_cast<const void*>(u) == buffer_cast<const void*>(v)` `&& buffer_size(u) == buffer_size(v)`
`const_buffer u(a);` `const_buffer v = a;`	`buffer_cast<const void*>(u) == buffer_cast<const void*>(v)` `&& buffer_size(u) == buffer_size(v)`

`const_buffer u(a);`
`const_buffer ↵`
`v; v = a;`
	`buffer_cast<const void*>(u) == buffer_cast<const void*>(v)`
	`&& buffer_size(u) == buffer_size(v)`

`const_buffer u(a);`
`const X& v = a;`
`const_buffer w(v);`
	`buffer_cast<const void*>(u) == buffer_cast<const void*>(w)`
	`&& buffer_size(u) == buffer_size(w)`

`const_buffer u(a);`
`X v(a);`
`const_buffer w(v);`
	`buffer_cast<const void*>(u) == buffer_cast<const void*>(w)`
	`&& buffer_size(u) == buffer_size(w)`

`const_buffer u(a);`
`X v = a;`
`const_buffer w(v);`
	`buffer_cast<const void*>(u) == buffer_cast<const void*>(w)`
	`&& buffer_size(u) == buffer_size(w)`

`const_buffer u(a);`
`X v(b); v = a;`
`const_buffer w(v);`
	`buffer_cast<const void*>(u) == buffer_cast<const void*>(w)`
	`&& buffer_size(u) == buffer_size(w)`

Convertible to mutable buffer requirements

A type that meets the requirements for convertibility to a mutable buffer must meet the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).

In the table below, `X` denotes a class meeting the requirements for convertibility to a mutable buffer, `a` and `b` denote values of type `X`, and `u`, `v` and `w` denote identifiers.

Table 7. ConvertibleToMutableBuffer requirements

expression	postcondition

`mutable_buffer u(a);`
`mutable_buffer v(a);`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(v)`
	`  && buffer_size(u) == buffer_size(v)`

`mutable_buffer u(a);`
`mutable_buffer v = a;`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(v)`
	`  && buffer_size(u) == buffer_size(v)`

`mutable_buffer u(a);`
`mutable_buffer ↵`
`v; v = a;`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(v)`
	`  && buffer_size(u) == buffer_size(v)`

`mutable_buffer u(a);`
`const X& v = a;`
`mutable_buffer w(v);`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(w)`
	`  && buffer_size(u) == buffer_size(w)`

`mutable_buffer u(a);`
`X v(a);`
`mutable_buffer w(v);`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(w)`
	`  && buffer_size(u) == buffer_size(w)`

`mutable_buffer u(a);`
`X v = a;`
`mutable_buffer w(v);`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(w)`
	`  && buffer_size(u) == buffer_size(w)`

`mutable_buffer u(a);`
`X v(b); v = a;`
`mutable_buffer w(v);`
	`buffer_cast<void*>(u) == buf.↵`
	`fer_cast<void*>(w)`
	`  && buffer_size(u) == buffer_size(w)`

Datagram socket service requirements

A datagram socket service must meet the requirements for a socket service, as well as the additional requirements listed below.

In the table below, `X` denotes a datagram socket service class for protocol `Protocol`, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `e` denotes a value of type `Protocol::endpoint`, `ec` denotes a value of type `error_code`, `f` denotes a value of type `socket_base::message_flags`, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements.

Table 8. DatagramSocketService requirements

expression	return type	assertion/note pre/post-condition
`a.receive(b, mb, f, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a connected socket `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`.
`a.async_receive(b, mb, f, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a connected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.receive_from(b, mb, e, f, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from an unconnected socket `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`.

expression	return type	assertion/note pre/post-condition
`a.async_receive_from(b, mb, e, f, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from an unconnected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. The program must ensure the object `e` is valid until the handler for the asynchronous operation is invoked. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.send(b, cb, f, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a connected socket `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`.
`a.async_send(b, cb, f, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a connected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`const typename Protocol::endpoint& u = e;` `a.send_to(b, cb, u, f, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to an unconnected socket `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`.

expression	return type	assertion/note pre/post-condition
`const typename Protocol::endpoint& u = e;` `a.async_send(b, cb, u, f, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to an unconnected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Descriptor service requirements

A descriptor service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a descriptor service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `n` denotes a value of type `X::native_type`, `ec` denotes a value of type `error_code`, `i` denotes a value meeting `IoControlCommand` requirements, and `u` and `v` denote identifiers.

Table 9. DescriptorService requirements

expression	return type	assertion/note pre/post-condition
`X::native_type`		The implementation-defined native representation of a descriptor. Must satisfy the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).
`a.construct(b);`		From IoObjectService requirements. post: `!a.is_open(b)`.
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous operations, as if by calling `a.close(b, ec)`.
`a.assign(b, n, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.is_open(b);`	`bool`	

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.is_open(v);`
	`bool`	

`a.close(b, ec);`	`error_code`	If `a.is_open()` is true, causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`. post: `!a.is_open(b)`.
`a.native(b);`	`X::native_type`	
`a.cancel(b, ec);`	`error_code`	pre: `a.is_open(b)`. Causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`.
`a.io_control(b, i, ec);`	`error_code`	pre: `a.is_open(b)`.

Endpoint requirements

An endpoint must meet the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).

In the table below, `X` denotes an endpoint class, `a` denotes a value of type `X`, `s` denotes a size in bytes, and `u` denotes an identifier.

Table 10. Endpoint requirements

expression	type	assertion/note pre/post-conditions
`X::protocol_type`	type meeting protocol requirements	
`X u;`		
`X();`		
`a.protocol();`	`protocol_type`	
`a.data();`	a pointer	Returns a pointer suitable for passing as the *address* argument to *POSIX* functions such as `accept()`, `getpeername()`, `getsockname()` and `recvfrom()`. The implementation shall perform a `reinterpret_cast` on the pointer to convert it to `sockaddr*`.
`const X& u = a;` `u.data();`	a pointer	Returns a pointer suitable for passing as the *address* argument to *POSIX* functions such as `connect()`, or as the *dest_addr* argument to *POSIX* functions such as `sendto()`. The implementation shall perform a `reinterpret_cast` on the pointer to convert it to `const sockaddr*`.
`a.size();`	`size_t`	Returns a value suitable for passing as the *address_len* argument to *POSIX* functions such as `connect()`, or as the *dest_len* argument to *POSIX* functions such as `sendto()`, after appropriate integer conversion has been performed.
`a.resize(s);`		post: `a.size() == s` Passed the value contained in the *address_len* argument to *POSIX* functions such as `accept()`, `getpeername()`, `getsockname()` and `recvfrom()`, after successful completion of the function. Permitted to throw an exception if the protocol associated with the endpoint object `a` does not support the specified size.
`a.capacity();`	`size_t`	Returns a value suitable for passing as the *address_len* argument to *POSIX* functions such as `accept()`, `getpeername()`, `getsockname()` and `recvfrom()`, after appropriate integer conversion has been performed.

Gettable serial port option requirements

In the table below, `X` denotes a serial port option class, `a` denotes a value of `X`, `ec` denotes a value of type `error_code`, and `s` denotes a value of implementation-defined type *`storage`* (where *`storage`* is the type `DCB` on Windows and `termios` on *POSIX* platforms), and `u` denotes an identifier.

Table 11. GettableSerialPortOption requirements

expression	type	assertion/note pre/post-conditions
`const storage& u = s;` `a.load(u, ec);`	`error_code`	Retrieves the value of the serial port option from the storage. If successful, sets `ec` such that `!ec` is true. If an error occurred, sets `ec` such that `!!ec` is true. Returns `ec`.

Gettable socket option requirements

In the table below, `X` denotes a socket option class, `a` denotes a value of `X`, `p` denotes a value that meets the protocol requirements, and `u` denotes an identifier.

Table 12. GettableSocketOption requirements

expression	type	assertion/note pre/post-conditions
`a.level(p);`	`int`	Returns a value suitable for passing as the *level* argument to *POSIX* `getsockopt()` (or equivalent).
`a.name(p);`	`int`	Returns a value suitable for passing as the *option_name* argument to *POSIX* `getsockopt()` (or equivalent).
`a.data(p);`	a pointer, convertible to `void*`	Returns a pointer suitable for passing as the *option_value* argument to *POSIX* `getsockopt()` (or equivalent).
`a.size(p);`	`size_t`	Returns a value suitable for passing as the *option_len* argument to *POSIX* `getsockopt()` (or equivalent), after appropriate integer conversion has been performed.
`a.resize(p, s);`		post: `a.size(p) == s`. Passed the value contained in the *option_len* argument to *POSIX* `getsockopt()` (or equivalent) after successful completion of the function. Permitted to throw an exception if the socket option object `a` does not support the specified size.

Handlers

A handler must meet the requirements of `CopyConstructible` types (C++ Std, 20.1.3).

In the table below, `X` denotes a handler class, `h` denotes a value of `X`, `p` denotes a pointer to a block of allocated memory of type `void*`, `s` denotes the size for a block of allocated memory, and `f` denotes a function object taking no arguments.

Table 13. Handler requirements

expression	return type	assertion/note pre/post-conditions
`us↵ ing namespace boost::asio; asio_handler_alloc↵ ate(s, &h);`	`void*`	Returns a pointer to a block of memory of size `s`. The pointer must satisfy the same alignment requirements as a pointer returned by `::operator new()`. Throws `bad_alloc` on failure. The `asio_handler_allocate()` function is located using argument-dependent lookup. The function `boost::asio::asio_handler_allocate()` serves as a default if no user-supplied function is available.
`us↵ ing namespace boost::asio; asio_handler_dealloc↵ ate(p, s, &h);`		Frees a block of memory associated with a pointer `p`, of at least size `s`, that was previously allocated using `asio_handler_allocate()`. The `asio_handler_deallocate()` function is located using argument-dependent lookup. The function `boost::asio::asio_handler_deallocate()` serves as a default if no user-supplied function is available.
`us↵ ing namespace boost::asio; asio_handler_in↵ voke(f, &h);`		Causes the function object `f` to be executed as if by calling `f()`. The `asio_handler_invoke()` function is located using argument-dependent lookup. The function `boost::asio::asio_handler_invoke()` serves as a default if no user-supplied function is available.

Handle service requirements

A handle service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a handle service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `n` denotes a value of type `X::native_type`, `ec` denotes a value of type `error_code`, and `u` and `v` denote identifiers.

Table 14. HandleService requirements

expression	return type	assertion/note pre/post-condition
`X::native_type`		The implementation-defined native representation of a handle. Must satisfy the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).
`a.construct(b);`		From IoObjectService requirements. post: `!a.is_open(b)`.
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous operations, as if by calling `a.close(b, ec)`.
`a.assign(b, n, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.is_open(b);`	`bool`	

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.is_open(v);`
	`bool`	

`a.close(b, ec);`	`error_code`	If `a.is_open()` is true, causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`. post: `!a.is_open(b)`.
`a.native(b);`	`X::native_type`	
`a.cancel(b, ec);`	`error_code`	pre: `a.is_open(b)`. Causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`.

Internet protocol requirements

An internet protocol must meet the requirements for a protocol as well as the additional requirements listed below.

In the table below, `X` denotes an internet protocol class, `a` denotes a value of type `X`, and `b` denotes a value of type `X`.

Table 15. InternetProtocol requirements

expression	return type	assertion/note pre/post-conditions
`X::resolver`	`ip::basic_resolver<X>`	The type of a resolver for the protocol.
`X::v4()`	`X`	Returns an object representing the IP version 4 protocol.
`X::v6()`	`X`	Returns an object representing the IP version 6 protocol.
`a == b`	convertible to `bool`	Returns whether two protocol objects are equal.
`a != b`	convertible to `bool`	Returns `!(a == b)`.

I/O control command requirements

In the table below, `X` denotes an I/O control command class, `a` denotes a value of `X`, and `u` denotes an identifier.

Table 16. IoControlCommand requirements

expression	type	assertion/note pre/post-conditions
`a.name();`	`int`	Returns a value suitable for passing as the *request* argument to *POSIX* `ioctl()` (or equivalent).
`a.data();`	a pointer, convertible to `void*`	

I/O object service requirements

An I/O object service must meet the requirements for a service, as well as the requirements listed below.

In the table below, `X` denotes an I/O object service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, and `u` denotes an identifier.

Table 17. IoObjectService requirements

expression	return type	assertion/note pre/post-condition
`X::implementation_type`		
`X::implementation_type u;`		note: `X::implementation_type` has a public default constructor and destructor.
`a.construct(b);`		
`a.destroy(b);`		note: `destroy()` will only be called on a value that has previously been initialised with `construct()`.

Mutable buffer sequence requirements

In the table below, `X` denotes a class containing objects of type `T`, `a` denotes a value of type `X` and `u` denotes an identifier.

Table 18. MutableBufferSequence requirements

expression	return type	assertion/note pre/post-condition
`X::value_type`	`T`	`T` meets the requirements for ConvertibleToMutableBuffer.
`X::const_iterator`	iterator type pointing to `T`	`const_iterator` meets the requirements for bidirectional iterators (C++ Std, 24.1.4).

`X(a);`		post: `equal_mutable_buffer_seq(a, X(a))` where the binary predicate `equal_mutable_buffer_seq` is defined as
		`bool equal_mutable_buffer_seq(`
		`  const X& x1, const X& x2)`
		`{`
		`  return`
		`  distance(x1.begin(), x1.end())`
		`  == distance(x2.begin(), x2.end())`
		`  && equal(x1.begin(), x1.end(),`
		`  x2.begin(), equal_buffer);`
		`}`
		and the binary predicate `equal_buffer` is defined as
		`bool equal_buffer(`
		`  const X::value_type& v1,`
		`  const X::value_type& v2)`
		`{`
		`  mutable_buffer b1(v1);`
		`  mutable_buffer b2(v2);`
		`  return`
		`  buffer_cast<const void*>(b1)`
		`  == buffer_cast<const void*>(b2)`
		`  && buffer_size(b1) == buffer_size(b2);`
		`}`

`X u(a);`		post:
		`distance(a.begin(), a.end())`
		`  == distance(u.begin(), u.end())`
		`  && equal(a.begin(), a.end(),`
		`  u.begin(), equal_buffer)`
		where the binary predicate `equal_buffer` is defined as
		`bool equal_buffer(`
		`  const X::value_type& v1,`
		`  const X::value_type& v2)`
		`{`
		`  mutable_buffer b1(v1);`
		`  mutable_buffer b2(v2);`
		`  return`
		`  buffer_cast<const void*>(b1)`
		`  == buffer_cast<const void*>(b2)`
		`  && buffer_size(b1) == buffer_size(b2);`
		`}`

expression	return type	assertion/note pre/post-condition
`(&a)->~X();`	`void`	note: the destructor is applied to every element of `a`; all the memory is deallocated.
`a.begin();`	`const_iterator` or `convertible to const_iterator`	
`a.end();`	`const_iterator` or `convertible to const_iterator`	

Protocol requirements

A protocol must meet the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).

In the table below, `X` denotes a protocol class, and `a` denotes a value of `X`.

Table 19. Protocol requirements

expression	return type	assertion/note pre/post-conditions
`X::endpoint`	type meeting endpoint requirements	
`a.family()`	`int`	Returns a value suitable for passing as the *domain* argument to *POSIX* `socket()` (or equivalent).
`a.type()`	`int`	Returns a value suitable for passing as the *type* argument to *POSIX* `socket()` (or equivalent).
`a.protocol()`	`int`	Returns a value suitable for passing as the *protocol* argument to *POSIX* `socket()` (or equivalent).

Random access handle service requirements

A random access handle service must meet the requirements for a handle service, as well as the additional requirements listed below.

In the table below, `X` denotes a random access handle service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `ec` denotes a value of type `error_code`, `o` denotes an offset of type boost::uint64_t, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements.

Table 20. RandomAccessHandleService requirements

expression	return type	assertion/note pre/post-condition
`a.read_some_at(b, o, mb, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a handle `b` at offset `o`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately.
`a.async_read_some_at(b, o, mb, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a handle `b` at offset `o`. The operation is performed via the `io_service` object `a.get_io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.write_some_at(b, o, cb, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a handle `b` at offset `o`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.

expression	return type	assertion/note pre/post-condition
`a.async_write_some_at(b, o, cb, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a handle `b` at offset `o`. The operation is performed via the `io_service` object `a.get_io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Raw socket service requirements

A raw socket service must meet the requirements for a socket service, as well as the additional requirements listed below.

In the table below, `X` denotes a raw socket service class for protocol `Protocol`, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `e` denotes a value of type `Protocol::endpoint`, `ec` denotes a value of type `error_code`, `f` denotes a value of type `socket_base::message_flags`, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements.

Table 21. RawSocketService requirements

expression	return type	assertion/note pre/post-condition
`a.receive(b, mb, f, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a connected socket `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`.
`a.async_receive(b, mb, f, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a connected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.receive_from(b, mb, e, f, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from an unconnected socket `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`.

expression	return type	assertion/note pre/post-condition
`a.async_receive_from(b, mb, e, f, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from an unconnected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. The program must ensure the object `e` is valid until the handler for the asynchronous operation is invoked. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.send(b, cb, f, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a connected socket `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`.
`a.async_send(b, cb, f, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a connected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`const typename Protocol::endpoint& u = e;` `a.send_to(b, cb, u, f, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to an unconnected socket `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`.

expression	return type	assertion/note pre/post-condition
`const typename Protocol::endpoint& u = e;` `a.async_send(b, cb, u, f, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to an unconnected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Read handler requirements

A read handler must meet the requirements for a handler. A value `h` of a read handler class should work correctly in the expression `h(ec, s)`, where `ec` is an lvalue of type `const error_code` and `s` is an lvalue of type `const size_t`.

Examples

A free function as a read handler:

```
void read_handler(
    const boost::system::error_code& ec,
    std::size_t bytes_transferred)
{
  ...
}
```

A read handler function object:

```
struct read_handler
{
  ...
  void operator()(
      const boost::system::error_code& ec,
      std::size_t bytes_transferred)
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to a read handler using `bind()`:

```
void my_class::read_handler(
    const boost::system::error_code& ec,
    std::size_t bytes_transferred)
{
  ...
}
...
socket.async_read(...,
    boost::bind(&my_class::read_handler,
      this, boost::asio::placeholders::error,
      boost::asio::placeholders::bytes_transferred));
```

Resolve handler requirements

A resolve handler must meet the requirements for a handler. A value `h` of a resolve handler class should work correctly in the expression `h(ec, i)`, where `ec` is an lvalue of type `const error_code` and `i` is an lvalue of type `const ip::basic_resolver_iterator<InternetProtocol>`. `InternetProtocol` is the template parameter of the `resolver_service` which is used to initiate the asynchronous operation.

Examples

A free function as a resolve handler:

```
void resolve_handler(
    const boost::system::error_code& ec,
    boost::asio::ip::tcp::resolver::iterator iterator)
{
  ...
}
```

A resolve handler function object:

```
struct resolve_handler
{
  ...
  void operator()(
      const boost::system::error_code& ec,
      boost::asio::ip::tcp::resolver::iterator iterator)
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to a resolve handler using `bind()`:

```
void my_class::resolve_handler(
    const boost::system::error_code& ec,
    boost::asio::ip::tcp::resolver::iterator iterator)
{
  ...
}
...
resolver.async_resolve(...,
    boost::bind(&my_class::resolve_handler,
      this, boost::asio::placeholders::error,
      boost::asio::placeholders::iterator));
```

Resolver service requirements

A resolver service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a resolver service class for protocol `InternetProtocol`, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `q` denotes a value of type `ip::basic_resolver_query<InternetProtocol>`, `e` denotes a value of type `ip::basic_endpoint<InternetProtocol>`, `ec` denotes a value of type `error_code`, and `h` denotes a value meeting `ResolveHandler` requirements.

Table 22. ResolverService requirements

expression	return type	assertion/note pre/post-condition
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous resolve operations, as if by calling `a.cancel(b, ec)`.
`a.cancel(b, ec);`	`error_code`	Causes any outstanding asynchronous resolve operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`.
`a.resolve(b, q, ec);`	`ip::basic_resolver_iterator< InternetProtocol>`	On success, returns an iterator `i` such that `i != ip::basic_resolver_iterator<InternetProtocol>()`. Otherwise returns `ip::basic_resolver_iterator<InternetProtocol>()`.
`a.async_resolve(b, q, h);`		Initiates an asynchronous resolve operation that is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. If the operation completes successfully, the `ResolveHandler` object `h` shall be invoked with an iterator object `i` such that the condition `i != ip::basic_resolver_iterator<InternetProtocol>()` holds. Otherwise it is invoked with `ip::basic_resolver_iterator<InternetProtocol>()`.
`a.resolve(b, e, ec);`	`ip::basic_resolver_iterator< InternetProtocol>`	On success, returns an iterator `i` such that `i != ip::basic_resolver_iterator<InternetProtocol>()`. Otherwise returns `ip::basic_resolver_iterator<InternetProtocol>()`.
`a.async_resolve(b, e, h);`		Initiates an asynchronous resolve operation that is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. If the operation completes successfully, the `ResolveHandler` object `h` shall be invoked with an iterator object `i` such that the condition `i != ip::basic_resolver_iterator<InternetProtocol>()` holds. Otherwise it is invoked with `ip::basic_resolver_iterator<InternetProtocol>()`.

Serial port service requirements

A serial port service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a serial port service class, `a` denotes a value of type `X`, `d` denotes a serial port device name of type `std::string`, `b` denotes a value of type `X::implementation_type`, `n` denotes a value of type `X::native_type`, `ec` denotes a value of type `error_code`, `s` denotes a value meeting `SettableSerialPortOption` requirements, `g` denotes a value meeting `GettableSerialPortOption` requirements, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements. and `u` and `v` denote identifiers.

Table 23. SerialPortService requirements

expression	return type	assertion/note pre/post-condition
`X::native_type`		The implementation-defined native representation of a serial port. Must satisfy the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).
`a.construct(b);`		From IoObjectService requirements. post: `!a.is_open(b)`.
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous operations, as if by calling `a.close(b, ec)`.
`const std::string& u = d;` `a.open(b, u, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.assign(b, n, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.is_open(b);`	`bool`	

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.is_open(v);`
	`bool`	

`a.close(b, ec);`	`error_code`	If `a.is_open()` is true, causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`. post: `!a.is_open(b)`.
`a.native(b);`	`X::native_type`	
`a.cancel(b, ec);`	`error_code`	pre: `a.is_open(b)`. Causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`.
`a.set_option(b, s, ec);`	`error_code`	pre: `a.is_open(b)`.
`a.get_option(b, g, ec);`	`error_code`	pre: `a.is_open(b)`.

expression	return type	assertion/note pre/post-condition

`const X& u = a;`
`const X::implementation_type& v = b;`
`u.get_option(v, g, ec);`
	`error_code`	pre: `a.is_open(b)`.

`a.send_break(b, ec);`	`error_code`	pre: `a.is_open(b)`.
`a.read_some(b, mb, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a serial port `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`.
`a.async_read_some(b, mb, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a serial port `b`. The operation is performed via the `io_service` object `a.get_io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.write_some(b, cb, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a serial port `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.

expression	return type	assertion/note pre/post-condition
`a.async_write_some(b, cb, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a serial port `b`. The operation is performed via the `io_service` object `a.get_io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Service requirements

A class is a service if it is publicly derived from another service, or if it is a class derived from `io_service::service` and contains a publicly-accessible declaration as follows:

```
static io_service::id id;
```

All services define a one-argument constructor that takes a reference to the `io_service` object that owns the service. This constructor is *explicit*, preventing its participation in automatic conversions. For example:

```
class my_service : public io_service::service
{
public:
  static io_service::id id;
  explicit my_service(io_service& ios);
private:
  virtual void shutdown_service();
  ...
};
```

A service's `shutdown_service` member function must cause all copies of user-defined handler objects that are held by the service to be destroyed.

Settable serial port option requirements

In the table below, `X` denotes a serial port option class, `a` denotes a value of `X`, `ec` denotes a value of type `error_code`, and `s` denotes a value of implementation-defined type *`storage`* (where *`storage`* is the type `DCB` on Windows and `termios` on *POSIX* platforms), and `u` denotes an identifier.

Table 24. SettableSerialPortOption requirements

expression	type	assertion/note pre/post-conditions
`const X& u = a;` `u.store(s, ec);`	`error_code`	Saves the value of the serial port option to the storage. If successful, sets `ec` such that `!ec` is true. If an error occurred, sets `ec` such that `!!ec` is true. Returns `ec`.

Settable socket option requirements

In the table below, `X` denotes a socket option class, `a` denotes a value of `X`, `p` denotes a value that meets the protocol requirements, and `u` denotes an identifier.

Table 25. SettableSocketOption requirements

expression	type	assertion/note pre/post-conditions
`a.level(p);`	`int`	Returns a value suitable for passing as the *level* argument to *POSIX* `setsockopt()` (or equivalent).
`a.name(p);`	`int`	Returns a value suitable for passing as the *option_name* argument to *POSIX* `setsockopt()` (or equivalent).
`const X& u = a;` `u.data(p);`	a pointer, convertible to `const void*`	Returns a pointer suitable for passing as the *option_value* argument to *POSIX* `setsockopt()` (or equivalent).
`a.size(p);`	`size_t`	Returns a value suitable for passing as the *option_len* argument to *POSIX* `setsockopt()` (or equivalent), after appropriate integer conversion has been performed.

Socket acceptor service requirements

A socket acceptor service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a socket acceptor service class for protocol `Protocol`, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `p` denotes a value of type `Protocol`, `n` denotes a value of type `X::native_type`, `e` denotes a value of type `Protocol::endpoint`, `ec` denotes a value of type `error_code`, `s` denotes a value meeting `SettableSocketOption` requirements, `g` denotes a value meeting `GettableSocketOption` requirements, `i` denotes a value meeting `IoControlCommand` requirements, `k` denotes a value of type `basic_socket<Protocol, SocketService>` where `SocketService` is a type meeting socket service requirements, `ah` denotes a value meeting `AcceptHandler` requirements, and `u` and `v` denote identifiers.

Table 26. SocketAcceptorService requirements

expression	return type	assertion/note pre/post-condition
`X::native_type`		The implementation-defined native representation of a socket acceptor. Must satisfy the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).
`a.construct(b);`		From IoObjectService requirements. post: `!a.is_open(b)`.
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous operations, as if by calling `a.close(b, ec)`.
`a.open(b, p, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.assign(b, p, n, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.is_open(b);`	`bool`	

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.is_open(v);`
	`bool`	

`a.close(b, ec);`	`error_code`	If `a.is_open()` is true, causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`. post: `!a.is_open(b)`.
`a.native(b);`	`X::native_type`	
`a.cancel(b, ec);`	`error_code`	pre: `a.is_open(b)`. Causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`.
`a.set_option(b, s, ec);`	`error_code`	pre: `a.is_open(b)`.
`a.get_option(b, g, ec);`	`error_code`	pre: `a.is_open(b)`.

expression	return type	assertion/note pre/post-condition

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.get_option(v, g, ec);`
	`error_code`	pre: `a.is_open(b)`.

`a.io_control(b, i, ec);`	`error_code`	pre: `a.is_open(b)`.

`const typename Protocol::en↵`
`dpoint& u = e;`
`a.bind(b, u, ec);`
	`error_code`	pre: `a.is_open(b)`.

`a.local_endpoint(b, ec);`	`Protocol::end-point`	pre: `a.is_open(b)`.

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.local_endpoint(v, ec);`
	`Protocol::end-point`	pre: `a.is_open(b)`.

`a.accept(b, k, &e, ec);`	`error_code`	pre: `a.is_open(b) && !k.is_open()`. post: `k.is_open()`
`a.accept(b, k, 0, ec);`	`error_code`	pre: `a.is_open(b) && !k.is_open()`. post: `k.is_open()`
`a.async_ac↵` `cept(b, k, &e, ah);`		pre: `a.is_open(b) && !k.is_open()`. Initiates an asynchronous accept operation that is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The program must ensure the objects `k` and `e` are valid until the handler for the asynchronous operation is invoked.
`a.async_ac↵` `cept(b, k, 0, ah);`		pre: `a.is_open(b) && !k.is_open()`. Initiates an asynchronous accept operation that is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The program must ensure the object `k` is valid until the handler for the asynchronous operation is invoked.

Socket service requirements

A socket service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a socket service class for protocol `Protocol`, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `p` denotes a value of type `Protocol`, `n` denotes a value of type `X::native_type`, `e` denotes a value of type `Protocol::endpoint`, `ec` denotes a value of type `error_code`, `s` denotes a value meeting `SettableSocketOption`

requirements, `g` denotes a value meeting `GettableSocketOption` requirements, `i` denotes a value meeting `IoControlCommand` requirements, `h` denotes a value of type `socket_base::shutdown_type`, `ch` denotes a value meeting `ConnectHandler` requirements, and `u` and `v` denote identifiers.

Table 27. SocketService requirements

expression	return type	assertion/note pre/post-condition
`X::native_type`		The implementation-defined native representation of a socket. Must satisfy the requirements of `CopyConstructible` types (C++ Std, 20.1.3), and the requirements of `Assignable` types (C++ Std, 23.1).
`a.construct(b);`		From IoObjectService requirements. post: `!a.is_open(b)`.
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous operations, as if by calling `a.close(b, ec)`.
`a.open(b, p, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.assign(b, p, n, ec);`	`error_code`	pre: `!a.is_open(b)`. post: `!!ec || a.is_open(b)`.
`a.is_open(b);`	`bool`	

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.is_open(v);`
	`bool`	

`a.close(b, ec);`	`error_code`	If `a.is_open()` is true, causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`. post: `!a.is_open(b)`.
`a.native(b);`	`X::native_type`	
`a.cancel(b, ec);`	`error_code`	pre: `a.is_open(b)`. Causes any outstanding asynchronous operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`.
`a.set_option(b, s, ec);`	`error_code`	pre: `a.is_open(b)`.
`a.get_option(b, g, ec);`	`error_code`	pre: `a.is_open(b)`.

expression	return type	assertion/note pre/post-condition

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.get_option(v, g, ec);`
	`error_code`	pre: `a.is_open(b)`.

`a.io_control(b, i, ec);`	`error_code`	pre: `a.is_open(b)`.
`a.at_mark(b, ec);`	`bool`	pre: `a.is_open(b)`.

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.at_mark(v, ec);`
	`bool`	pre: `a.is_open(b)`.

`a.available(b, ec);`	`size_t`	pre: `a.is_open(b)`.

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.available(v, ec);`
	`size_t`	pre: `a.is_open(b)`.

`const typename Protocol::end↵`
`point& u = e;`
`a.bind(b, u, ec);`
	`error_code`	pre: `a.is_open(b)`.

`a.shutdown(b, h, ec);`	`error_code`	pre: `a.is_open(b)`.
`a.local_endpoint(b, ec);`	`Protocol::endpoint`	pre: `a.is_open(b)`.

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.local_endpoint(v, ec);`
	`Protocol::endpoint`	pre: `a.is_open(b)`.

`a.remote_endpoint(b, ec);`	`Protocol::endpoint`	pre: `a.is_open(b)`.

expression	return type	assertion/note pre/post-condition

`const X& u = a;`
`const X::implementa↵`
`tion_type& v = b;`
`u.remote_endpoint(v, ec);`
	`Protocol::endpoint`	pre: `a.is_open(b)`.

`const typename Protocol::end↵`
`point& u = e;`
`a.connect(b, u, ec);`
	`error_code`	pre: `a.is_open(b)`.

`const typename Protocol::end↵`
`point& u = e;`
`a.async_connect(b, u, ch);`
		pre: `a.is_open(b)`.
		Initiates an asynchronous connect operation that is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements.

Stream descriptor service requirements

A stream descriptor service must meet the requirements for a descriptor service, as well as the additional requirements listed below.

In the table below, `X` denotes a stream descriptor service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `ec` denotes a value of type `error_code`, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements.

Table 28. StreamDescriptorService requirements

expression	return type	assertion/note pre/post-condition
`a.read_some(b, mb, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a descriptor `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`.
`a.async_read_some(b, mb, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a descriptor `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.write_some(b, cb, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a descriptor `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.

expression	return type	assertion/note pre/post-condition
`a.async_write_some(b, cb, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a descriptor `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Stream handle service requirements

A stream handle service must meet the requirements for a handle service, as well as the additional requirements listed below.

In the table below, `X` denotes a stream handle service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `ec` denotes a value of type `error_code`, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements.

Table 29. StreamHandleService requirements

expression	return type	assertion/note pre/post-condition
`a.read_some(b, mb, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a handle `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`.
`a.async_read_some(b, mb, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a handle `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.write_some(b, cb, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a handle `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.

expression	return type	assertion/note pre/post-condition
`a.async_write_some(b, cb, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a handle `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Stream socket service requirements

A stream socket service must meet the requirements for a socket service, as well as the additional requirements listed below.

In the table below, `X` denotes a stream socket service class, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `ec` denotes a value of type `error_code`, `f` denotes a value of type `socket_base::message_flags`, `mb` denotes a value satisfying mutable buffer sequence requirements, `rh` denotes a value meeting `ReadHandler` requirements, `cb` denotes a value satisfying constant buffer sequence requirements, and `wh` denotes a value meeting `WriteHandler` requirements.

Table 30. StreamSocketService requirements

expression	return type	assertion/note pre/post-condition
`a.receive(b, mb, f, ec);`	`size_t`	pre: `a.is_open(b)`. Reads one or more bytes of data from a connected socket `b`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read. Otherwise returns `0`. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`.
`a.async_receive(b, mb, f, rh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to read one or more bytes of data from a connected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The mutable buffer sequence `mb` specifies memory where the data should be placed. The operation shall always fill a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `mb` until such time as the read operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `mb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `mb` is `0`, the asynchronous read operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes due to graceful connection closure by the peer, the operation shall fail with `error::eof`. If the operation completes successfully, the `ReadHandler` object `rh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.
`a.send(b, cb, f, ec);`	`size_t`	pre: `a.is_open(b)`. Writes one or more bytes of data to a connected socket `b`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written. Otherwise returns `0`. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.
`a.async_send(b, cb, f, wh);`	`void`	pre: `a.is_open(b)`. Initiates an asynchronous operation to write one or more bytes of data to a connected socket `b`. The operation is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The constant buffer sequence `cb` specifies memory where the data to be written is located. The operation shall always write a buffer in the sequence completely before proceeding to the next. The implementation shall maintain one or more copies of `cb` until such time as the write operation no longer requires access to the memory specified by the buffers in the sequence. The program must ensure the memory is valid until: — the last copy of `cb` is destroyed, or — the handler for the asynchronous operation is invoked, whichever comes first. If the total size of all buffers in the sequence `cb` is `0`, the asynchronous operation shall complete immediately and pass `0` as the argument to the handler that specifies the number of bytes read. If the operation completes successfully, the `WriteHandler` object `wh` is invoked with the number of bytes transferred. Otherwise it is invoked with `0`.

Buffer-oriented synchronous random-access read device requirements

In the table below, `a` denotes a synchronous random-access read device object, `o` denotes an offset of type `boost::uint64_t`, `mb` denotes an object satisfying mutable buffer sequence requirements, and `ec` denotes an object of type `error_code`.

Table 31. Buffer-oriented synchronous random-access read device requirements

operation	type	semantics, pre/post-conditions

`a.read_some_at(o, mb);`	`size_t`	Equivalent to:
		`error_code ec;`
		`size_t s = a.read_some_at(o, mb, ec);`
		`if (ec) throw system_error(ec);`
		`return s;`

`a.read_some_at(o, mb, ec);`	`size_t`	Reads one or more bytes of data from the device `a` at offset `o`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The `read_some_at` operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read and sets `ec` such that `!ec` is true. If an error occurred, returns `0` and sets `ec` such that `!!ec` is true. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately.

Buffer-oriented synchronous random-access write device requirements

In the table below, `a` denotes a synchronous random-access write device object, `o` denotes an offset of type `boost::uint64_t`, `cb` denotes an object satisfying constant buffer sequence requirements, and `ec` denotes an object of type `error_code`.

Table 32. Buffer-oriented synchronous random-access write device requirements

operation	type	semantics, pre/post-conditions

`a.write_some_at(o, cb);`	`size_t`	Equivalent to:
		`error_code ec;`
		`size_t s = a.write_some(o, cb, ec);`
		`if (ec) throw system_error(ec);`
		`return s;`

`a.write_some_at(o, cb, ec);`	`size_t`	Writes one or more bytes of data to the device `a` at offset `o`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The `write_some_at` operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written and sets `ec` such that `!ec` is true. If an error occurred, returns `0` and sets `ec` such that `!!ec` is true. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.

Buffer-oriented synchronous read stream requirements

In the table below, `a` denotes a synchronous read stream object, `mb` denotes an object satisfying mutable buffer sequence requirements, and `ec` denotes an object of type `error_code`.

Table 33. Buffer-oriented synchronous read stream requirements

operation	type	semantics, pre/post-conditions

`a.read_some(mb);`	`size_t`	Equivalent to:
		`error_code ec;`
		`size_t s = a.read_some(mb, ec);`
		`if (ec) throw system_error(ec);`
		`return s;`

`a.read_some(mb, ec);`	`size_t`	Reads one or more bytes of data from the stream `a`. The mutable buffer sequence `mb` specifies memory where the data should be placed. The `read_some` operation shall always fill a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes read and sets `ec` such that `!ec` is true. If an error occurred, returns `0` and sets `ec` such that `!!ec` is true. If the total size of all buffers in the sequence `mb` is `0`, the function shall return `0` immediately.

Buffer-oriented synchronous write stream requirements

In the table below, `a` denotes a synchronous write stream object, `cb` denotes an object satisfying constant buffer sequence requirements, and `ec` denotes an object of type `error_code`.

Table 34. Buffer-oriented synchronous write stream requirements

operation	type	semantics, pre/post-conditions

`a.write_some(cb);`	`size_t`	Equivalent to:
		`error_code ec;`
		`size_t s = a.write_some(cb, ec);`
		`if (ec) throw system_error(ec);`
		`return s;`

`a.write_some(cb, ec);`	`size_t`	Writes one or more bytes of data to the stream `a`. The constant buffer sequence `cb` specifies memory where the data to be written is located. The `write_some` operation shall always write a buffer in the sequence completely before proceeding to the next. If successful, returns the number of bytes written and sets `ec` such that `!ec` is true. If an error occurred, returns `0` and sets `ec` such that `!!ec` is true. If the total size of all buffers in the sequence `cb` is `0`, the function shall return `0` immediately.

Time traits requirements

In the table below, `X` denotes a time traits class for time type `Time`, `t`, `t1`, and `t2` denote values of type `Time`, and `d` denotes a value of type `X::duration_type`.

Table 35. TimeTraits requirements

expression	return type	assertion/note pre/post-condition
`X::time_type`	`Time`	Represents an absolute time. Must support default construction, and meet the requirements for `CopyConstructible` and `Assignable`.
`X::duration_type`		Represents the difference between two absolute times. Must support default construction, and meet the requirements for `CopyConstructible` and `Assignable`. A duration can be positive, negative, or zero.
`X::now();`	`time_type`	Returns the current time.
`X::add(t, d);`	`time_type`	Returns a new absolute time resulting from adding the duration `d` to the absolute time `t`.
`X::subtract(t1, t2);`	`duration_type`	Returns the duration resulting from subtracting `t2` from `t1`.
`X::less_than(t1, t2);`	`bool`	Returns whether `t1` is to be treated as less than `t2`.
`X::to_posix_duration(d);`	`date_time::time_duration_type`	Returns the `date_time::time_duration_type` value that most closely represents the duration `d`.

Timer service requirements

A timer service must meet the requirements for an I/O object service, as well as the additional requirements listed below.

In the table below, `X` denotes a timer service class for time type `Time` and traits type `TimeTraits`, `a` denotes a value of type `X`, `b` denotes a value of type `X::implementation_type`, `t` denotes a value of type `Time`, `d` denotes a value of type `TimeTraits::duration_type`, `e` denotes a value of type `error_code`, and `h` denotes a value meeting `WaitHandler` requirements.

Table 36. TimerService requirements

expression	return type	assertion/note pre/post-condition
`a.destroy(b);`		From IoObjectService requirements. Implicitly cancels asynchronous wait operations, as if by calling `a.cancel(b, e)`.
`a.cancel(b, e);`	`size_t`	Causes any outstanding asynchronous wait operations to complete as soon as possible. Handlers for cancelled operations shall be passed the error code `error::operation_aborted`. Sets `e` to indicate success or failure. Returns the number of operations that were cancelled.
`a.expires_at(b);`	`Time`	
`a.expires_at(b, t, e);`	`size_t`	Implicitly cancels asynchronous wait operations, as if by calling `a.cancel(b, e)`. Returns the number of operations that were cancelled. post: `a.expires_at(b) == t`.
`a.expires_from_now(b);`	`TimeTraits::duration_type`	Returns a value equivalent to `TimeTraits::subtract(a.expires_at(b), TimeTraits::now())`.
`a.expires_from_now(b, d, e);`	`size_t`	Equivalent to `a.expires_at(b, TimeTraits::add(TimeTraits::now(), d), e)`.
`a.wait(b, e);`	`error_code`	Sets `e` to indicate success or failure. Returns `e`. post: `!!e || !TimeTraits::lt(TimeTraits::now(), a.expires_at(b))`.
`a.async_wait(b, h);`		Initiates an asynchronous wait operation that is performed via the `io_service` object `a.io_service()` and behaves according to asynchronous operation requirements. The handler shall be posted for execution only if the condition `!!ec || !TimeTraits::lt(TimeTraits::now(), a.expires_at(b))` holds, where `ec` is the error code to be passed to the handler.

Wait handler requirements

A wait handler must meet the requirements for a handler. A value `h` of a wait handler class should work correctly in the expression `h(ec)`, where `ec` is an lvalue of type `const error_code`.

Examples

A free function as a wait handler:

```
void wait_handler(
    const boost::system::error_code& ec)
{
  ...
}
```

A wait handler function object:

```
struct wait_handler
{
  ...
  void operator()(
      const boost::system::error_code& ec)
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to a wait handler using `bind()`:

```
void my_class::wait_handler(
    const boost::system::error_code& ec)
{
  ...
}
...
socket.async_wait(...,
    boost::bind(&my_class::wait_handler,
      this, boost::asio::placeholders::error));
```

Write handler requirements

A write handler must meet the requirements for a handler. A value `h` of a write handler class should work correctly in the expression `h(ec, s)`, where `ec` is an lvalue of type `const error_code` and `s` is an lvalue of type `const size_t`.

Examples

A free function as a write handler:

```
void write_handler(
    const boost::system::error_code& ec,
    std::size_t bytes_transferred)
{
  ...
}
```

A write handler function object:

```
struct write_handler
{
  ...
  void operator()(
      const boost::system::error_code& ec,
      std::size_t bytes_transferred)
  {
    ...
  }
  ...
};
```

A non-static class member function adapted to a write handler using `bind()`:

```
void my_class::write_handler(
    const boost::system::error_code& ec,
    std::size_t bytes_transferred)
{
  ...
}
...
socket.async_write(...,
    boost::bind(&my_class::write_handler,
      this, boost::asio::placeholders::error,
      boost::asio::placeholders::bytes_transferred));
```

add_service

```
template<
    typename Service>
void add_service(
    io_service & ios,
    Service * svc);
```

This function is used to add a service to the `io_service`.

Parameters

ios — The `io_service` object that owns the service.

svc — The service object. On success, ownership of the service object is transferred to the `io_service`. When the `io_service` object is destroyed, it will destroy the service object by performing:

```
delete static_cast<io_service::service*>(svc)
```

Exceptions

boost::asio::service_already_exists	Thrown if a service of the given type is already present in the `io_service`.
boost::asio::invalid_service_owner	Thrown if the service's owning `io_service` is not the `io_service` object specified by the ios parameter.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

asio_handler_allocate

Default allocation function for handlers.

```
void * asio_handler_allocate(
    std::size_t size,
    ... );
```

Asynchronous operations may need to allocate temporary objects. Since asynchronous operations have a handler function object, these temporary objects can be said to be associated with the handler.

Implement asio_handler_allocate and asio_handler_deallocate for your own handlers to provide custom allocation for these temporary objects.

This default implementation is simply:

```
return ::operator new(size);
```

Remarks

All temporary objects associated with a handler will be deallocated before the upcall to the handler is performed. This allows the same memory to be reused for a subsequent asynchronous operation initiated by the handler.

Example

```
class my_handler;

void* asio_handler_allocate(std::size_t size, my_handler* context)
{
  return ::operator new(size);
}

void asio_handler_deallocate(void* pointer, std::size_t size,
    my_handler* context)
{
  ::operator delete(pointer);
}
```

Requirements

Header: `boost/asio/handler_alloc_hook.hpp`

Convenience header: `boost/asio.hpp`

asio_handler_deallocate

Default deallocation function for handlers.

```
void asio_handler_deallocate(
    void * pointer,
    std::size_t size,
    ... );
```

Implement asio_handler_allocate and asio_handler_deallocate for your own handlers to provide custom allocation for the associated temporary objects.

This default implementation is simply:

```
::operator delete(pointer);
```

Requirements

Header: `boost/asio/handler_alloc_hook.hpp`

Convenience header: `boost/asio.hpp`

asio_handler_invoke

Default invoke function for handlers.

```
template<
    typename Function>
void asio_handler_invoke(
    Function function,
    ... );
```

Completion handlers for asynchronous operations are invoked by the `io_service` associated with the corresponding object (e.g. a socket or deadline_timer). Certain guarantees are made on when the handler may be invoked, in particular that a handler can only be invoked from a thread that is currently calling `run()` on the corresponding `io_service` object. Handlers may subsequently be invoked through other objects (such as `io_service::strand` objects) that provide additional guarantees.

When asynchronous operations are composed from other asynchronous operations, all intermediate handlers should be invoked using the same method as the final handler. This is required to ensure that user-defined objects are not accessed in a way that may violate the guarantees. This hooking function ensures that the invoked method used for the final handler is accessible at each intermediate step.

Implement asio_handler_invoke for your own handlers to specify a custom invocation strategy.

This default implementation is simply:

```
function();
```

Example

```
class my_handler;

template <typename Function>
void asio_handler_invoke(Function function, my_handler* context)
{
  context->strand_.dispatch(function);
}
```

Requirements

Header: `boost/asio/handler_invoke_hook.hpp`

Convenience header: `boost/asio.hpp`

async_read

Start an asynchronous operation to read a certain amount of data from a stream.

```
template<
    typename AsyncReadStream,
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
  » more...

template<
    typename AsyncReadStream,
    typename MutableBufferSequence,
    typename CompletionCondition,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    ReadHandler handler);
  » more...

template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    basic_streambuf< Allocator > & b,
    ReadHandler handler);
  » more...

template<
    typename AsyncReadStream,
    typename Allocator,
    typename CompletionCondition,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    ReadHandler handler);
  » more...
```

Requirements

Header: `boost/asio/read.hpp`

Convenience header: `boost/asio.hpp`

async_read (1 of 4 overloads)

Start an asynchronous operation to read a certain amount of data from a stream.

```
template<
    typename AsyncReadStream,
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function.

Parameters

s — The stream from which the data is to be read. The type must support the AsyncReadStream concept.

buffers — One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the stream. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes copied into the
                                          // buffers. If an error occurred,
                                          // this will be the  number of
                                          // bytes successfully transferred
                                          // prior to the error.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::async_read(s, boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

Remarks

This overload is equivalent to calling:

```
boost::asio::async_read(
    s, buffers,
    boost::asio::transfer_all(),
    handler);
```

async_read (2 of 4 overloads)

Start an asynchronous operation to read a certain amount of data from a stream.

```
template<
    typename AsyncReadStream,
    typename MutableBufferSequence,
    typename CompletionCondition,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

Parameters

s — The stream from which the data is to be read. The type must support the AsyncReadStream concept.

buffers — One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the stream. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

completion_condition — The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_read_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the stream's async_read_some function.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes copied in↵
to the
                                          // buffers. If an error oc↵
curred,
                                         // this will be the  number of
                                          // bytes successfully trans↵
ferred
                                          // prior to the error.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::async_read(s,
    boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32),
    handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

async_read (3 of 4 overloads)

Start an asynchronous operation to read a certain amount of data from a stream.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    basic_streambuf< Allocator > & b,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function.

Parameters

s	The stream from which the data is to be read. The type must support the AsyncReadStream concept.
b	A `basic_streambuf` object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
handler	The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes copied into the
                                          // buffers. If an error occurred,
                                          // this will be the  number of
                                          // bytes successfully transferred
                                          // prior to the error.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

This overload is equivalent to calling:

```
boost::asio::async_read(
    s, b,
    boost::asio::transfer_all(),
    handler);
```

async_read (4 of 4 overloads)

Start an asynchronous operation to read a certain amount of data from a stream.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename CompletionCondition,
    typename ReadHandler>
void async_read(
    AsyncReadStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function.

Parameters

s	The stream from which the data is to be read. The type must support the AsyncReadStream concept.
b	A `basic_streambuf` object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_read_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the stream's async_read_some function.

handler

The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes copied in↵
to the
                                          // buffers. If an error oc↵
curred,
                                         // this will be the  number of
                                          // bytes successfully trans↵
ferred
                                          // prior to the error.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

async_read_at

Start an asynchronous operation to read a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
  » more...

template<
    typename AsyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename CompletionCondition,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    ReadHandler handler);
  » more...

template<
    typename AsyncRandomAccessReadDevice,
    typename Allocator,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    ReadHandler handler);
  » more...

template<
    typename AsyncRandomAccessReadDevice,
    typename Allocator,
    typename CompletionCondition,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    ReadHandler handler);
  » more...
```

Requirements

Header: `boost/asio/read_at.hpp`

Convenience header: `boost/asio.hpp`

async_read_at (1 of 4 overloads)

Start an asynchronous operation to read a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a random access device at the specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the device's async_read_some_at function.

Parameters

d — The device from which the data is to be read. The type must support the AsyncRandomAccessReadDevice concept.

offset — The offset at which the data will be read.

buffers — One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the device. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes copied into the buffers. If an error
  // occurred, this will be the number of bytes successfully
  // transferred prior to the error.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::async_read_at(d, 42, boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

Remarks

This overload is equivalent to calling:

```
boost::asio::async_read_at(
    d, 42, buffers,
    boost::asio::transfer_all(),
    handler);
```

async_read_at (2 of 4 overloads)

Start an asynchronous operation to read a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename CompletionCondition,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a random access device at the specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

Parameters

d — The device from which the data is to be read. The type must support the AsyncRandomAccessReadDevice concept.

offset — The offset at which the data will be read.

buffers — One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the device. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

completion_condition — The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_read_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the device's async_read_some_at function.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes copied into the buffers. If an error
  // occurred, this will be the number of bytes successfully
  // transferred prior to the error.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::async_read_at(d, 42,
    boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32),
    handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

async_read_at (3 of 4 overloads)

Start an asynchronous operation to read a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessReadDevice,
    typename Allocator,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a random access device at the specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- An error occurred.

This operation is implemented in terms of zero or more calls to the device's async_read_some_at function.

Parameters

d	The device from which the data is to be read. The type must support the AsyncRandomAccessReadDevice concept.
offset	The offset at which the data will be read.
b	A `basic_streambuf` object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
handler	The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes copied into the buffers. If an error
  // occurred, this will be the number of bytes successfully
  // transferred prior to the error.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

This overload is equivalent to calling:

```
boost::asio::async_read_at(
    d, 42, b,
    boost::asio::transfer_all(),
    handler);
```

async_read_at (4 of 4 overloads)

Start an asynchronous operation to read a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessReadDevice,
    typename Allocator,
    typename CompletionCondition,
    typename ReadHandler>
void async_read_at(
    AsyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    ReadHandler handler);
```

This function is used to asynchronously read a certain number of bytes of data from a random access device at the specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's async_read_some_at function.

Parameters

d	The device from which the data is to be read. The type must support the AsyncRandomAccessReadDevice concept.
offset	The offset at which the data will be read.
b	A `basic_streambuf` object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_read_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the device's async_read_some_at function.

handler

The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes copied into the buffers. If an error
  // occurred, this will be the number of bytes successfully
  // transferred prior to the error.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

async_read_until

Start an asynchronous operation to read data into a streambuf until it contains a delimiter, matches a regular expression, or a function object indicates a match.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    char delim,
    ReadHandler handler);
  » more...

template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const std::string & delim,
    ReadHandler handler);
  » more...

template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const boost::regex & expr,
    ReadHandler handler);
  » more...

template<
    typename AsyncReadStream,
    typename Allocator,
    typename MatchCondition,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    MatchCondition match_condition,
    ReadHandler handler,
    typename boost::enable_if< is_match_condition< MatchCondition > >::type *  = 0);
  » more...
```

Requirements

Header: `boost/asio/read_until.hpp`

Convenience header: `boost/asio.hpp`

async_read_until (1 of 4 overloads)

Start an asynchronous operation to read data into a streambuf until it contains a specified delimiter.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    char delim,
    ReadHandler handler);
```

This function is used to asynchronously read data into the specified streambuf until the streambuf's get area contains the specified delimiter. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The get area of the streambuf contains the specified delimiter.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function. If the streambuf's get area already contains the delimiter, the asynchronous operation completes immediately.

Parameters

s — The stream from which the data is to be read. The type must support the AsyncReadStream concept.

b — A streambuf object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.

delim — The delimiter character.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // The number of bytes in the streambuf's get
  // area up to and including the delimiter.
  // 0 if an error occurred.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

After a successful async_read_until operation, the streambuf may contain additional data beyond the delimiter. An application will typically leave that data in the streambuf for a subsequent async_read_until operation to examine.

Example

To asynchronously read data into a streambuf until a newline is encountered:

```
boost::asio::streambuf b;
...
void handler(const boost::system::error_code& e, std::size_t size)
{
  if (!e)
  {
    std::istream is(&b);
    std::string line;
    std::getline(is, line);
    ...
  }
}
...
boost::asio::async_read_until(s, b, '\n', handler);
```

async_read_until (2 of 4 overloads)

Start an asynchronous operation to read data into a streambuf until it contains a specified delimiter.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const std::string & delim,
    ReadHandler handler);
```

This function is used to asynchronously read data into the specified streambuf until the streambuf's get area contains the specified delimiter. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The get area of the streambuf contains the specified delimiter.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function. If the streambuf's get area already contains the delimiter, the asynchronous operation completes immediately.

Parameters

s	The stream from which the data is to be read. The type must support the AsyncReadStream concept.
b	A streambuf object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
delim	The delimiter string.
handler	The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // The number of bytes in the streambuf's get
  // area up to and including the delimiter.
  // 0 if an error occurred.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

After a successful async_read_until operation, the streambuf may contain additional data beyond the delimiter. An application will typically leave that data in the streambuf for a subsequent async_read_until operation to examine.

Example

To asynchronously read data into a streambuf until a newline is encountered:

```
boost::asio::streambuf b;
...
void handler(const boost::system::error_code& e, std::size_t size)
{
  if (!e)
  {
    std::istream is(&b);
    std::string line;
    std::getline(is, line);
    ...
  }
}
...
boost::asio::async_read_until(s, b, "\r\n", handler);
```

async_read_until (3 of 4 overloads)

Start an asynchronous operation to read data into a streambuf until some part of its data matches a regular expression.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const boost::regex & expr,
    ReadHandler handler);
```

This function is used to asynchronously read data into the specified streambuf until the streambuf's get area contains some data that matches a regular expression. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- A substring of the streambuf's get area matches the regular expression.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function. If the streambuf's get area already contains data that matches the regular expression, the function returns immediately.

Parameters

s — The stream from which the data is to be read. The type must support the AsyncReadStream concept.

b — A streambuf object into which the data will be read. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.

expr — The regular expression.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // The number of bytes in the streambuf's get
  // area up to and including the substring
  // that matches the regular. expression.
  // 0 if an error occurred.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

After a successful async_read_until operation, the streambuf may contain additional data beyond that which matched the regular expression. An application will typically leave that data in the streambuf for a subsequent async_read_until operation to examine.

Example

To asynchronously read data into a streambuf until a CR-LF sequence is encountered:

```
boost::asio::streambuf b;
...
void handler(const boost::system::error_code& e, std::size_t size)
{
  if (!e)
  {
    std::istream is(&b);
    std::string line;
    std::getline(is, line);
    ...
  }
}
...
boost::asio::async_read_until(s, b, boost::regex("\r\n"), handler);
```

async_read_until (4 of 4 overloads)

Start an asynchronous operation to read data into a streambuf until a function object indicates a match.

```
template<
    typename AsyncReadStream,
    typename Allocator,
    typename MatchCondition,
    typename ReadHandler>
void async_read_until(
    AsyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    MatchCondition match_condition,
    ReadHandler handler,
    typename boost::enable_if< is_match_condition< MatchCondition > >::type *  = 0);
```

This function is used to asynchronously read data into the specified streambuf until a user-defined match condition function object, when applied to the data contained in the streambuf, indicates a successful match. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- The match condition function object returns a std::pair where the second element evaluates to true.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_read_some function. If the match condition function object already indicates a match, the operation completes immediately.

Parameters

s — The stream from which the data is to be read. The type must support the AsyncReadStream concept.

b — A streambuf object into which the data will be read.

match_condition — The function object to be called to determine whether a match exists. The signature of the function object must be:

```
pair<iterator, bool> match_condition(iterator begin, iterator end);
```

where `iterator` represents the type:

```
buffers_iterator<basic_streambuf<Allocator>::const_buffers_type>
```

The iterator parameters `begin` and `end` define the range of bytes to be scanned to determine whether there is a match. The `first` member of the return value is an iterator marking one-past-the-end of the bytes that have been consumed by the match function. This iterator is used to calculate the `begin` parameter for any subsequent invocation of the match condition. The `second` member of the return value is true if a match has been found, false otherwise.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // The number of bytes in the streambuf's get
  // area that have been fully consumed by the
  // match function. O if an error occurred.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

After a successful async_read_until operation, the streambuf may contain additional data beyond that which matched the function object. An application will typically leave that data in the streambuf for a subsequent async_read_until operation to examine.

The default implementation of the `is_match_condition` type trait evaluates to true for function pointers and function objects with a `result_type` typedef. It must be specialised for other user-defined function objects.

Examples

To asynchronously read data into a streambuf until whitespace is encountered:

```
typedef boost::asio::buffers_iterator<
    boost::asio::streambuf::const_buffers_type> iterator;

std::pair<iterator, bool>
match_whitespace(iterator begin, iterator end)
{
  iterator i = begin;
  while (i != end)
    if (std::isspace(*i++))
      return std::make_pair(i, true);
  return std::make_pair(i, false);
}
...
void handler(const boost::system::error_code& e, std::size_t size);
...
boost::asio::streambuf b;
boost::asio::async_read_until(s, b, match_whitespace, handler);
```

To asynchronously read data into a streambuf until a matching character is found:

```
class match_char
{
public:
  explicit match_char(char c) : c_(c) {}

  template <typename Iterator>
  std::pair<Iterator, bool> operator()(
      Iterator begin, Iterator end) const
  {
    Iterator i = begin;
    while (i != end)
      if (c_ == *i++)
        return std::make_pair(i, true);
    return std::make_pair(i, false);
  }

private:
  char c_;
};

namespace asio {
  template <> struct is_match_condition<match_char>
    : public boost::true_type {};
} // namespace asio
...
void handler(const boost::system::error_code& e, std::size_t size);
...
boost::asio::streambuf b;
boost::asio::async_read_until(s, b, match_char('a'), handler);
```

async_write

Start an asynchronous operation to write a certain amount of data to a stream.

```
template<
    typename AsyncWriteStream,
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
  » more...

template<
    typename AsyncWriteStream,
    typename ConstBufferSequence,
    typename CompletionCondition,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    WriteHandler handler);
  » more...

template<
    typename AsyncWriteStream,
    typename Allocator,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    WriteHandler handler);
  » more...

template<
    typename AsyncWriteStream,
    typename Allocator,
    typename CompletionCondition,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    WriteHandler handler);
  » more...
```

Requirements

Header: `boost/asio/write.hpp`

Convenience header: `boost/asio.hpp`

async_write (1 of 4 overloads)

Start an asynchronous operation to write all of the supplied data to a stream.

```
template<
    typename AsyncWriteStream,
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_write_some function.

Parameters

s — The stream to which the data is to be written. The type must support the AsyncWriteStream concept.

buffers — One or more buffers containing the data to be written. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes written from the
                                          // buffers. If an error occurred,
                                          // this will be less than the sum
                                          // of the buffer sizes.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::async_write(s, boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

async_write (2 of 4 overloads)

Start an asynchronous operation to write a certain amount of data to a stream.

```
template<
    typename AsyncWriteStream,
    typename ConstBufferSequence,
    typename CompletionCondition,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's async_write_some function.

Parameters

s — The stream to which the data is to be written. The type must support the AsyncWriteStream concept.

buffers — One or more buffers containing the data to be written. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

completion_condition — The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_write_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the stream's async_write_some function.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes written ↵
from the
                                          // buffers. If an error oc↵
curred,
                                        // this will be less than the ↵
sum
                                          // of the buffer sizes.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::async_write(s,
    boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32),
    handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

async_write (3 of 4 overloads)

Start an asynchronous operation to write all of the supplied data to a stream.

```
template<
    typename AsyncWriteStream,
    typename Allocator,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's async_write_some function.

Parameters

s	The stream to which the data is to be written. The type must support the AsyncWriteStream concept.
b	A `basic_streambuf` object from which data will be written. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
handler	The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes written from the
                                          // buffers. If an error occurred,
                                          // this will be less than the sum
                                          // of the buffer sizes.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

async_write (4 of 4 overloads)

Start an asynchronous operation to write a certain amount of data to a stream.

```
template<
    typename AsyncWriteStream,
    typename Allocator,
    typename CompletionCondition,
    typename WriteHandler>
void async_write(
    AsyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a stream. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's async_write_some function.

Parameters

s — The stream to which the data is to be written. The type must support the AsyncWriteStream concept.

b — A `basic_streambuf` object from which data will be written. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.

completion_condition — The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_write_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the stream's async_write_some function.

handler

The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.

  std::size_t bytes_transferred           // Number of bytes written ↵
from the
                                          // buffers. If an error oc↵
curred,
                                        // this will be less than the ↵
sum
                                          // of the buffer sizes.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

async_write_at

Start an asynchronous operation to write a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
  » more...

template<
    typename AsyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename CompletionCondition,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    WriteHandler handler);
  » more...

template<
    typename AsyncRandomAccessWriteDevice,
    typename Allocator,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    WriteHandler handler);
  » more...

template<
    typename AsyncRandomAccessWriteDevice,
    typename Allocator,
    typename CompletionCondition,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    WriteHandler handler);
  » more...
```

Requirements

Header: `boost/asio/write_at.hpp`

Convenience header: `boost/asio.hpp`

async_write_at (1 of 4 overloads)

Start an asynchronous operation to write all of the supplied data at the specified offset.

```
template<
    typename AsyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a random access device at a specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the device's async_write_some_at function.

Parameters

d — The device to which the data is to be written. The type must support the AsyncRandomAccessWriteDevice concept.

offset — The offset at which the data will be written.

buffers — One or more buffers containing the data to be written. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes written from the buffers. If an error
  // occurred, this will be less than the sum of the buffer sizes.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::async_write_at(d, 42, boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

async_write_at (2 of 4 overloads)

Start an asynchronous operation to write a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename CompletionCondition,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a random access device at a specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's async_write_some_at function.

Parameters

d — The device to which the data is to be written. The type must support the AsyncRandomAccessWriteDevice concept.

offset — The offset at which the data will be written.

buffers — One or more buffers containing the data to be written. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

completion_condition — The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_write_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the device's async_write_some_at function.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes written from the buffers. If an error
  // occurred, this will be less than the sum of the buffer sizes.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::async_write_at(d, 42,
    boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32),
    handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

async_write_at (3 of 4 overloads)

Start an asynchronous operation to write all of the supplied data at the specified offset.

```
template<
    typename AsyncRandomAccessWriteDevice,
    typename Allocator,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a random access device at a specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- An error occurred.

This operation is implemented in terms of zero or more calls to the device's async_write_some_at function.

Parameters

d	The device to which the data is to be written. The type must support the AsyncRandomAccessWriteDevice concept.
offset	The offset at which the data will be written.
b	A `basic_streambuf` object from which data will be written. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
handler	The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes written from the buffers. If an error
  // occurred, this will be less than the sum of the buffer sizes.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

async_write_at (4 of 4 overloads)

Start an asynchronous operation to write a certain amount of data at the specified offset.

```
template<
    typename AsyncRandomAccessWriteDevice,
    typename Allocator,
    typename CompletionCondition,
    typename WriteHandler>
void async_write_at(
    AsyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    WriteHandler handler);
```

This function is used to asynchronously write a certain number of bytes of data to a random access device at a specified offset. The function call always returns immediately. The asynchronous operation will continue until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's async_write_some_at function.

Parameters

d	The device to which the data is to be written. The type must support the AsyncRandomAccessWriteDevice concept.
offset	The offset at which the data will be written.
b	A `basic_streambuf` object from which data will be written. Ownership of the streambuf is retained by the caller, which must guarantee that it remains valid until the handler is called.
completion_condition	The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest async_write_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the device's async_write_some_at function.

handler

The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  // Result of operation.
  const boost::system::error_code& error,

  // Number of bytes written from the buffers. If an error
  // occurred, this will be less than the sum of the buffer sizes.
  std::size_t bytes_transferred
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_datagram_socket

Provides datagram-oriented socket functionality.

```
template<
    typename Protocol,
    typename DatagramSocketService = datagram_socket_service<Protocol>>
class basic_datagram_socket :
  public basic_socket< Protocol, DatagramSocketService >
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive on a connected socket.
async_receive_from	Start an asynchronous receive.
async_send	Start an asynchronous send on a connected socket.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_datagram_socket	Construct a basic_datagram_socket without opening it. Construct and open a basic_datagram_socket. Construct a basic_datagram_socket, opening it and binding it to the given local endpoint. Construct a basic_datagram_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
receive	Receive some data on a connected socket.
receive_from	Receive a datagram with the endpoint of the sender.

Name	Description
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on a connected socket.
send_to	Send a datagram to the specified endpoint.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_datagram_socket` class template provides asynchronous and blocking datagram-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::assign

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...

boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::assign (1 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
```

basic_datagram_socket::assign (2 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

basic_datagram_socket::async_connect

Inherited from basic_socket.

Start an asynchronous connect.

```
void async_connect(
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

This function is used to asynchronously connect a socket to the specified remote endpoint. The function call always returns immediately.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected. Copies will be made of the endpoint object as required.
handler	The handler to be called when the connection operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

```
void connect_handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Connect succeeded.
  }
}

...

boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_connect(endpoint, connect_handler);
```

basic_datagram_socket::async_receive

Start an asynchronous receive on a connected socket.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
  » more...

template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
  » more...
```

basic_datagram_socket::async_receive (1 of 2 overloads)

Start an asynchronous receive on a connected socket.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously receive data from the datagram socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_receive operation can only be used with a connected socket. Use the async_receive_from function to receive data on an unconnected datagram socket.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.async_receive(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::async_receive (2 of 2 overloads)

Start an asynchronous receive on a connected socket.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
```

This function is used to asynchronously receive data from the datagram socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the receive call is to be made.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_receive operation can only be used with a connected socket. Use the async_receive_from function to receive data on an unconnected datagram socket.

basic_datagram_socket::async_receive_from

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    ReadHandler handler);
  » more...

template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    ReadHandler handler);
  » more...
```

basic_datagram_socket::async_receive_from (1 of 2 overloads)

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    ReadHandler handler);
```

This function is used to asynchronously receive a datagram. The function call always returns immediately.

Parameters

buffers	One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

sender_endpoint — An endpoint object that receives the endpoint of the remote sender of the datagram. Ownership of the sender_endpoint object is retained by the caller, which must guarantee that it is valid until the handler is called.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.async_receive_from(
    boost::asio::buffer(data, size), 0, sender_endpoint, handler);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::async_receive_from (2 of 2 overloads)

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    ReadHandler handler);
```

This function is used to asynchronously receive a datagram. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

sender_endpoint — An endpoint object that receives the endpoint of the remote sender of the datagram. Ownership of the sender_endpoint object is retained by the caller, which must guarantee that it is valid until the handler is called.

flags — Flags specifying how the receive call is to be made.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_datagram_socket::async_send

Start an asynchronous send on a connected socket.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
  » more...

template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
  » more...
```

basic_datagram_socket::async_send (1 of 2 overloads)

Start an asynchronous send on a connected socket.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to send data on the datagram socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers — One or more data buffers to be sent on the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_send operation can only be used with a connected socket. Use the async_send_to function to send data on an unconnected datagram socket.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.async_send(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::async_send (2 of 2 overloads)

Start an asynchronous send on a connected socket.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
```

This function is used to send data on the datagram socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers — One or more data buffers to be sent on the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the send call is to be made.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_send operation can only be used with a connected socket. Use the async_send_to function to send data on an unconnected datagram socket.

basic_datagram_socket::async_send_to

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    WriteHandler handler);
  » more...

template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    WriteHandler handler);
  » more...
```

basic_datagram_socket::async_send_to (1 of 2 overloads)

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    WriteHandler handler);
```

This function is used to asynchronously send a datagram to the specified remote endpoint. The function call always returns immediately.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.
destination	The remote endpoint to which the data will be sent. Copies will be made of the endpoint as required.
handler	The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To send a single data buffer use the `buffer` function as follows:

```
boost::asio::ip::udp::endpoint destination(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_send_to(
    boost::asio::buffer(data, size), destination, handler);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::async_send_to (2 of 2 overloads)

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    WriteHandler handler);
```

This function is used to asynchronously send a datagram to the specified remote endpoint. The function call always returns immediately.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.
flags	Flags specifying how the send call is to be made.
destination	The remote endpoint to which the data will be sent. Copies will be made of the endpoint as required.
handler	The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_datagram_socket::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
  » more...

bool at_mark(
    boost::system::error_code & ec) const;
  » more...
```

basic_datagram_socket::at_mark (1 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

Exceptions

boost::system::system_error Thrown on failure.

basic_datagram_socket::at_mark (2 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    boost::system::error_code & ec) const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

basic_datagram_socket::available

Determine the number of bytes available for reading.

```
std::size_t available() const;
  » more...

std::size_t available(
    boost::system::error_code & ec) const;
  » more...
```

basic_datagram_socket::available (1 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available() const;
```

This function is used to determine the number of bytes that may be read without blocking.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

Exceptions

boost::system::system_error Thrown on failure.

basic_datagram_socket::available (2 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available(
    boost::system::error_code & ec) const;
```

This function is used to determine the number of bytes that may be read without blocking.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

basic_datagram_socket::basic_datagram_socket

Construct a `basic_datagram_socket` without opening it.

```
explicit basic_datagram_socket(
    boost::asio::io_service & io_service);
  » more...
```

Construct and open a `basic_datagram_socket`.

```
basic_datagram_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
  » more...
```

Construct a basic_datagram_socket, opening it and binding it to the given local endpoint.

```
basic_datagram_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
  » more...
```

Construct a basic_datagram_socket on an existing native socket.

```
basic_datagram_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...
```

basic_datagram_socket::basic_datagram_socket (1 of 4 overloads)

Construct a basic_datagram_socket without opening it.

```
basic_datagram_socket(
    boost::asio::io_service & io_service);
```

This constructor creates a datagram socket without opening it. The open() function must be called before data can be sent or received on the socket.

Parameters

io_service	The io_service object that the datagram socket will use to dispatch handlers for any asynchronous operations performed on the socket.

basic_datagram_socket::basic_datagram_socket (2 of 4 overloads)

Construct and open a basic_datagram_socket.

```
basic_datagram_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
```

This constructor creates and opens a datagram socket.

Parameters

io_service	The io_service object that the datagram socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error	Thrown on failure.

basic_datagram_socket::basic_datagram_socket (3 of 4 overloads)

Construct a `basic_datagram_socket`, opening it and binding it to the given local endpoint.

```
basic_datagram_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
```

This constructor creates a datagram socket and automatically opens it bound to the specified endpoint on the local machine. The protocol used is the protocol associated with the given endpoint.

Parameters

io_service	The `io_service` object that the datagram socket will use to dispatch handlers for any asynchronous operations performed on the socket.
endpoint	An endpoint on the local machine to which the datagram socket will be bound.

Exceptions

boost::system::system_error	Thrown on failure.

basic_datagram_socket::basic_datagram_socket (4 of 4 overloads)

Construct a `basic_datagram_socket` on an existing native socket.

```
basic_datagram_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
```

This constructor creates a datagram socket object to hold an existing native socket.

Parameters

io_service	The `io_service` object that the datagram socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.
native_socket	The new underlying socket implementation.

Exceptions

boost::system::system_error	Thrown on failure.

basic_datagram_socket::bind

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
  » more...

boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::bind (1 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345));
```

basic_datagram_socket::bind (2 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
boost::system::error_code ec;
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345), ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::broadcast

Inherited from socket_base.

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::bytes_readable

Inherited from socket_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::cancel

Cancel all asynchronous operations associated with the socket.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::cancel (1 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
void cancel();
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_datagram_socket::cancel (2 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_datagram_socket::close

Close the socket.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::close (1 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
void close();
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_datagram_socket::close (2 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.close(ec);
if (ec)
{
  // An error occurred.
}
```

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_datagram_socket::connect

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
  » more...

boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::connect (1 of 2 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.connect(endpoint);
```

basic_datagram_socket::connect (2 of 2 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
boost::system::error_code ec;
socket.connect(endpoint, ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::debug

Inherited from socket_base.

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::do_not_route

Inherited from socket_base.

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::enable_connection_aborted

Inherited from socket_base.

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_datagram_socket::get_option

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
  » more...

boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
  » more...
```

basic_datagram_socket::get_option (1 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
socket.get_option(option);
bool is_set = option.get();
```

basic_datagram_socket::get_option (2 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
boost::system::error_code ec;
socket.get_option(option, ec);
if (ec)
{
  // An error occurred.
}
bool is_set = option.get();
```

basic_datagram_socket::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_datagram_socket::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::io_control

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
  » more...

boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::io_control (1 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

basic_datagram_socket::io_control (2 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
boost::system::error_code ec;
socket.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

basic_datagram_socket::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_datagram_socket::is_open

Inherited from basic_socket.

Determine whether the socket is open.

```
bool is_open() const;
```

basic_datagram_socket::keep_alive

Inherited from socket_base.

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::linger

Inherited from socket_base.

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::local_endpoint

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
  » more...

endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_datagram_socket::local_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
```

This function is used to obtain the locally bound endpoint of the socket.

Return Value

An object that represents the local endpoint of the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint();
```

basic_datagram_socket::local_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the locally bound endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the local endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

basic_datagram_socket::lowest_layer (1 of 2 overloads)

Inherited from basic_socket.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_datagram_socket::lowest_layer (2 of 2 overloads)

Inherited from basic_socket.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_datagram_socket::lowest_layer_type

Inherited from basic_socket.

A `basic_socket` is always the lowest layer.

```
typedef basic_socket< Protocol, DatagramSocketService > lowest_layer_type;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket	Construct a basic_socket without opening it. Construct and open a basic_socket. Construct a basic_socket, opening it and binding it to the given local endpoint. Construct a basic_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Protected Member Functions

Name	Description
~basic_socket	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket` class template provides functionality that is common to both stream-oriented and datagram-oriented sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::max_connections

Inherited from socket_base.

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

basic_datagram_socket::message_do_not_route

Inherited from socket_base.

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

basic_datagram_socket::message_flags

Inherited from socket_base.

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::message_out_of_band

Inherited from socket_base.

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

basic_datagram_socket::message_peek

Inherited from socket_base.

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

basic_datagram_socket::native

Inherited from basic_socket.

Get the native socket representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the socket. This is intended to allow access to native socket functionality that is not otherwise provided.

basic_datagram_socket::native_type

The native representation of a socket.

```
typedef DatagramSocketService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::non_blocking_io

Inherited from socket_base.

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::open

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
  » more...

boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::open (1 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
```

basic_datagram_socket::open (2 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol	An object specifying which protocol is to be used.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::system::error_code ec;
socket.open(boost::asio::ip::tcp::v4(), ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::receive

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::receive (1 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers);
```

This function is used to receive data on the datagram socket. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers One or more buffers into which the data will be received.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The receive operation can only be used with a connected socket. Use the receive_from function to receive data on an unconnected datagram socket.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.receive(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::receive (2 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags);
```

This function is used to receive data on the datagram socket. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers One or more buffers into which the data will be received.

flags Flags specifying how the receive call is to be made.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The receive operation can only be used with a connected socket. Use the receive_from function to receive data on an unconnected datagram socket.

basic_datagram_socket::receive (3 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to receive data on the datagram socket. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers One or more buffers into which the data will be received.

flags Flags specifying how the receive call is to be made.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes received.

Remarks

The receive operation can only be used with a connected socket. Use the receive_from function to receive data on an unconnected datagram socket.

basic_datagram_socket::receive_buffer_size

Inherited from socket_base.

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::receive_from

Receive a datagram with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::receive_from (1 of 3 overloads)

Receive a datagram with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint);
```

This function is used to receive a datagram. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
sender_endpoint	An endpoint object that receives the endpoint of the remote sender of the datagram.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
boost::asio::ip::udp::endpoint sender_endpoint;
socket.receive_from(
    boost::asio::buffer(data, size), sender_endpoint);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::receive_from (2 of 3 overloads)

Receive a datagram with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags);
```

This function is used to receive a datagram. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
sender_endpoint	An endpoint object that receives the endpoint of the remote sender of the datagram.
flags	Flags specifying how the receive call is to be made.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error	Thrown on failure.

basic_datagram_socket::receive_from (3 of 3 overloads)

Receive a datagram with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to receive a datagram. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
sender_endpoint	An endpoint object that receives the endpoint of the remote sender of the datagram.
flags	Flags specifying how the receive call is to be made.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes received.

basic_datagram_socket::receive_low_watermark

Inherited from socket_base.

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::remote_endpoint

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
  » more...

endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_datagram_socket::remote_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
```

This function is used to obtain the remote endpoint of the socket.

Return Value

An object that represents the remote endpoint of the socket.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint();
```

basic_datagram_socket::remote_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the remote endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the remote endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::reuse_address

Inherited from socket_base.

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::send

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::send (1 of 3 overloads)

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers);
```

This function is used to send data on the datagram socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers One ore more data buffers to be sent on the socket.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

The send operation can only be used with a connected socket. Use the send_to function to send data on an unconnected datagram socket.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.send(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::send (2 of 3 overloads)

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags);
```

This function is used to send data on the datagram socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One ore more data buffers to be sent on the socket.
flags	Flags specifying how the send call is to be made.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

The send operation can only be used with a connected socket. Use the send_to function to send data on an unconnected datagram socket.

basic_datagram_socket::send (3 of 3 overloads)

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to send data on the datagram socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent on the socket.
flags	Flags specifying how the send call is to be made.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes sent.

Remarks

The send operation can only be used with a connected socket. Use the send_to function to send data on an unconnected datagram socket.

basic_datagram_socket::send_buffer_size

Inherited from socket_base.

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::send_low_watermark

Inherited from socket_base.

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::send_to

Send a datagram to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::send_to (1 of 3 overloads)

Send a datagram to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination);
```

This function is used to send a datagram to the specified remote endpoint. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint.
destination	The remote endpoint to which the data will be sent.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To send a single data buffer use the `buffer` function as follows:

```
boost::asio::ip::udp::endpoint destination(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.send_to(boost::asio::buffer(data, size), destination);
```

See the buffer documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_datagram_socket::send_to (2 of 3 overloads)

Send a datagram to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags);
```

This function is used to send a datagram to the specified remote endpoint. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint.
destination	The remote endpoint to which the data will be sent.
flags	Flags specifying how the send call is to be made.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

basic_datagram_socket::send_to (3 of 3 overloads)

Send a datagram to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to send a datagram to the specified remote endpoint. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint.
destination	The remote endpoint to which the data will be sent.
flags	Flags specifying how the send call is to be made.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes sent.

basic_datagram_socket::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_datagram_socket::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef DatagramSocketService service_type;
```

Requirements

Header: `boost/asio/basic_datagram_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_datagram_socket::set_option

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
  » more...

boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::set_option (1 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

Exceptions

boost::system::system_error	Thrown on failure.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
socket.set_option(option);
```

basic_datagram_socket::set_option (2 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the socket.

Parameters

option	The new option value to be set on the socket.
ec	Set to indicate what error occurred, if any.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
boost::system::error_code ec;
socket.set_option(option, ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::shutdown

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
  » more...

boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
  » more...
```

basic_datagram_socket::shutdown (1 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

Exceptions

boost::system::system_error Thrown on failure.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send);
```

basic_datagram_socket::shutdown (2 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

ec Set to indicate what error occurred, if any.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send, ec);
if (ec)
{
  // An error occurred.
}
```

basic_datagram_socket::shutdown_type

Inherited from socket_base.

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive	Shutdown the receive side of the socket.
shutdown_send	Shutdown the send side of the socket.
shutdown_both	Shutdown both send and receive on the socket.

basic_deadline_timer

Provides waitable timer functionality.

```
template<
    typename Time,
    typename TimeTraits = boost::asio::time_traits<Time>,
    typename TimerService = deadline_timer_service<Time, TimeTraits>>
class basic_deadline_timer :
  public basic_io_object< TimerService >
```

Types

Name	Description
duration_type	The duration type.
implementation_type	The underlying implementation type of I/O object.
service_type	The type of the service that will be used to provide I/O operations.
time_type	The time type.
traits_type	The time traits type.

Member Functions

Name	Description
async_wait	Start an asynchronous wait on the timer.
basic_deadline_timer	Constructor. Constructor to set a particular expiry time as an absolute time. Constructor to set a particular expiry time relative to now.
cancel	Cancel any asynchronous operations that are waiting on the timer.
expires_at	Get the timer's expiry time as an absolute time. Set the timer's expiry time as an absolute time.
expires_from_now	Get the timer's expiry time relative to now. Set the timer's expiry time relative to now.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
wait	Perform a blocking wait on the timer.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_deadline_timer` class template provides the ability to perform a blocking or asynchronous wait for a timer to expire.

A deadline timer is always in one of two states: "expired" or "not expired". If the `wait()` or `async_wait()` function is called on an expired timer, the wait operation will complete immediately.

Most applications will use the `boost::asio::deadline_timer` typedef.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Examples

Performing a blocking wait:

```
// Construct a timer without setting an expiry time.
boost::asio::deadline_timer timer(io_service);

// Set an expiry time relative to now.
timer.expires_from_now(boost::posix_time::seconds(5));

// Wait for the timer to expire.
timer.wait();
```

Performing an asynchronous wait:

```
void handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Timer expired.
  }
}

...

// Construct a timer with an absolute expiry time.
boost::asio::deadline_timer timer(io_service,
    boost::posix_time::time_from_string("2005-12-07 23:59:59.000"));

// Start an asynchronous wait.
timer.async_wait(handler);
```

Changing an active deadline_timer's expiry time

Changing the expiry time of a timer while there are pending asynchronous waits causes those wait operations to be cancelled. To ensure that the action associated with the timer is performed only once, use something like this: used:

```
void on_some_event()
{
  if (my_timer.expires_from_now(seconds(5)) > 0)
  {
    // We managed to cancel the timer. Start new asynchronous wait.
    my_timer.async_wait(on_timeout);
  }
  else
  {
    // Too late, timer has already expired!
  }
}

void on_timeout(const boost::system::error_code& e)
{
  if (e != boost::asio::error::operation_aborted)
  {
    // Timer was not cancelled, take necessary action.
  }
}
```

- The boost::asio::basic_deadline_timer::expires_from_now() function cancels any pending asynchronous waits, and returns the number of asynchronous waits that were cancelled. If it returns 0 then you were too late and the wait handler has already been executed, or will soon be executed. If it returns 1 then the wait handler was successfully cancelled.
- If a wait handler is cancelled, the boost::system::error_code passed to it contains the value boost::asio::error::operation_aborted.

Requirements

Header: `boost/asio/basic_deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

basic_deadline_timer::async_wait

Start an asynchronous wait on the timer.

```
template<
    typename WaitHandler>
void async_wait(
    WaitHandler handler);
```

This function may be used to initiate an asynchronous wait against the timer. It always returns immediately.

For each call to `async_wait()`, the supplied handler will be called exactly once. The handler will be called when:

- The timer has expired.
- The timer was cancelled, in which case the handler is passed the error code boost::asio::error::operation_aborted.

Parameters

handler — The handler to be called when the timer expires. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_deadline_timer::basic_deadline_timer

Constructor.

```
explicit basic_deadline_timer(
    boost::asio::io_service & io_service);
  » more...
```

Constructor to set a particular expiry time as an absolute time.

```
basic_deadline_timer(
    boost::asio::io_service & io_service,
    const time_type & expiry_time);
  » more...
```

Constructor to set a particular expiry time relative to now.

```
basic_deadline_timer(
    boost::asio::io_service & io_service,
    const duration_type & expiry_time);
  » more...
```

basic_deadline_timer::basic_deadline_timer (1 of 3 overloads)

Constructor.

```
basic_deadline_timer(
    boost::asio::io_service & io_service);
```

This constructor creates a timer without setting an expiry time. The `expires_at()` or `expires_from_now()` functions must be called to set an expiry time before the timer can be waited on.

Parameters

io_service — The `io_service` object that the timer will use to dispatch handlers for any asynchronous operations performed on the timer.

basic_deadline_timer::basic_deadline_timer (2 of 3 overloads)

Constructor to set a particular expiry time as an absolute time.

```
basic_deadline_timer(
    boost::asio::io_service & io_service,
    const time_type & expiry_time);
```

This constructor creates a timer and sets the expiry time.

Parameters

io_service — The `io_service` object that the timer will use to dispatch handlers for any asynchronous operations performed on the timer.

expiry_time — The expiry time to be used for the timer, expressed as an absolute time.

basic_deadline_timer::basic_deadline_timer (3 of 3 overloads)

Constructor to set a particular expiry time relative to now.

```
basic_deadline_timer(
    boost::asio::io_service & io_service,
    const duration_type & expiry_time);
```

This constructor creates a timer and sets the expiry time.

Parameters

io_service — The `io_service` object that the timer will use to dispatch handlers for any asynchronous operations performed on the timer.

expiry_time — The expiry time to be used for the timer, relative to now.

basic_deadline_timer::cancel

Cancel any asynchronous operations that are waiting on the timer.

```
std::size_t cancel();
  » more...

std::size_t cancel(
    boost::system::error_code & ec);
  » more...
```

basic_deadline_timer::cancel (1 of 2 overloads)

Cancel any asynchronous operations that are waiting on the timer.

```
std::size_t cancel();
```

This function forces the completion of any pending asynchronous wait operations against the timer. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

Cancelling the timer does not change the expiry time.

Return Value

The number of asynchronous operations that were cancelled.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

If the timer has already expired when `cancel()` is called, then the handlers for asynchronous wait operations will:

- have already been invoked; or
- have been queued for invocation in the near future.

These handlers can no longer be cancelled, and therefore are passed an error code that indicates the successful completion of the wait operation.

basic_deadline_timer::cancel (2 of 2 overloads)

Cancel any asynchronous operations that are waiting on the timer.

```
std::size_t cancel(
    boost::system::error_code & ec);
```

This function forces the completion of any pending asynchronous wait operations against the timer. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

Cancelling the timer does not change the expiry time.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of asynchronous operations that were cancelled.

Remarks

If the timer has already expired when `cancel()` is called, then the handlers for asynchronous wait operations will:

- have already been invoked; or
- have been queued for invocation in the near future.

These handlers can no longer be cancelled, and therefore are passed an error code that indicates the successful completion of the wait operation.

basic_deadline_timer::duration_type

The duration type.

```
typedef traits_type::duration_type duration_type;
```

Requirements

Header: `boost/asio/basic_deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

basic_deadline_timer::expires_at

Get the timer's expiry time as an absolute time.

```
time_type expires_at() const;
  » more...
```

Set the timer's expiry time as an absolute time.

```
std::size_t expires_at(
    const time_type & expiry_time);
  » more...

std::size_t expires_at(
    const time_type & expiry_time,
    boost::system::error_code & ec);
  » more...
```

basic_deadline_timer::expires_at (1 of 3 overloads)

Get the timer's expiry time as an absolute time.

```
time_type expires_at() const;
```

This function may be used to obtain the timer's current expiry time. Whether the timer has expired or not does not affect this value.

basic_deadline_timer::expires_at (2 of 3 overloads)

Set the timer's expiry time as an absolute time.

```
std::size_t expires_at(
    const time_type & expiry_time);
```

This function sets the expiry time. Any pending asynchronous wait operations will be cancelled. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

Parameters

expiry_time The expiry time to be used for the timer.

Return Value

The number of asynchronous operations that were cancelled.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

If the timer has already expired when `expires_at()` is called, then the handlers for asynchronous wait operations will:

- have already been invoked; or
- have been queued for invocation in the near future.

These handlers can no longer be cancelled, and therefore are passed an error code that indicates the successful completion of the wait operation.

basic_deadline_timer::expires_at (3 of 3 overloads)

Set the timer's expiry time as an absolute time.

```
std::size_t expires_at(
    const time_type & expiry_time,
    boost::system::error_code & ec);
```

This function sets the expiry time. Any pending asynchronous wait operations will be cancelled. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

Parameters

expiry_time The expiry time to be used for the timer.

ec Set to indicate what error occurred, if any.

Return Value

The number of asynchronous operations that were cancelled.

Remarks

If the timer has already expired when `expires_at()` is called, then the handlers for asynchronous wait operations will:

- have already been invoked; or
- have been queued for invocation in the near future.

These handlers can no longer be cancelled, and therefore are passed an error code that indicates the successful completion of the wait operation.

basic_deadline_timer::expires_from_now

Get the timer's expiry time relative to now.

```
duration_type expires_from_now() const;
  » more...
```

Set the timer's expiry time relative to now.

```
std::size_t expires_from_now(
    const duration_type & expiry_time);
  » more...

std::size_t expires_from_now(
    const duration_type & expiry_time,
    boost::system::error_code & ec);
  » more...
```

basic_deadline_timer::expires_from_now (1 of 3 overloads)

Get the timer's expiry time relative to now.

```
duration_type expires_from_now() const;
```

This function may be used to obtain the timer's current expiry time. Whether the timer has expired or not does not affect this value.

basic_deadline_timer::expires_from_now (2 of 3 overloads)

Set the timer's expiry time relative to now.

```
std::size_t expires_from_now(
    const duration_type & expiry_time);
```

This function sets the expiry time. Any pending asynchronous wait operations will be cancelled. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

Parameters

expiry_time The expiry time to be used for the timer.

Return Value

The number of asynchronous operations that were cancelled.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

If the timer has already expired when `expires_from_now()` is called, then the handlers for asynchronous wait operations will:

- have already been invoked; or
- have been queued for invocation in the near future.

These handlers can no longer be cancelled, and therefore are passed an error code that indicates the successful completion of the wait operation.

basic_deadline_timer::expires_from_now (3 of 3 overloads)

Set the timer's expiry time relative to now.

```
std::size_t expires_from_now(
    const duration_type & expiry_time,
    boost::system::error_code & ec);
```

This function sets the expiry time. Any pending asynchronous wait operations will be cancelled. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

Parameters

expiry_time	The expiry time to be used for the timer.
ec	Set to indicate what error occurred, if any.

Return Value

The number of asynchronous operations that were cancelled.

Remarks

If the timer has already expired when `expires_from_now()` is called, then the handlers for asynchronous wait operations will:

- have already been invoked; or
- have been queued for invocation in the near future.

These handlers can no longer be cancelled, and therefore are passed an error code that indicates the successful completion of the wait operation.

basic_deadline_timer::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_deadline_timer::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_deadline_timer::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

basic_deadline_timer::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_deadline_timer::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_deadline_timer::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef TimerService service_type;
```

Requirements

Header: `boost/asio/basic_deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

basic_deadline_timer::time_type

The time type.

```
typedef traits_type::time_type time_type;
```

Requirements

Header: `boost/asio/basic_deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

basic_deadline_timer::traits_type

The time traits type.

```
typedef TimeTraits traits_type;
```

Requirements

Header: `boost/asio/basic_deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

basic_deadline_timer::wait

Perform a blocking wait on the timer.

```
void wait();
  » more...

void wait(
    boost::system::error_code & ec);
  » more...
```

basic_deadline_timer::wait (1 of 2 overloads)

Perform a blocking wait on the timer.

```
void wait();
```

This function is used to wait for the timer to expire. This function blocks and does not return until the timer has expired.

Exceptions

boost::system::system_error	Thrown on failure.

basic_deadline_timer::wait (2 of 2 overloads)

Perform a blocking wait on the timer.

```
void wait(
    boost::system::error_code & ec);
```

This function is used to wait for the timer to expire. This function blocks and does not return until the timer has expired.

Parameters

ec	Set to indicate what error occurred, if any.

basic_io_object

Base class for all I/O objects.

```
template<
    typename IoObjectService>
class basic_io_object :
  noncopyable
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.

Protected Member Functions

Name	Description
basic_io_object	Construct a basic_io_object.
~basic_io_object	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

Requirements

Header: `boost/asio/basic_io_object.hpp`

Convenience header: `boost/asio.hpp`

basic_io_object::basic_io_object

Construct a `basic_io_object`.

```
basic_io_object(
    boost::asio::io_service & io_service);
```

Performs:

```
service.construct(implementation);
```

basic_io_object::get_io_service

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_io_object::implementation

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_io_object::implementation_type

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_io_object.hpp`

Convenience header: `boost/asio.hpp`

basic_io_object::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_io_object::service

The service associated with the I/O object.

```
service_type & service;
```

basic_io_object::service_type

The type of the service that will be used to provide I/O operations.

```
typedef IoObjectService service_type;
```

Requirements

Header: `boost/asio/basic_io_object.hpp`

Convenience header: `boost/asio.hpp`

basic_io_object::~basic_io_object

Protected destructor to prevent deletion through this type.

```
~basic_io_object();
```

Performs:

```
service.destroy(implementation);
```

basic_raw_socket

Provides raw-oriented socket functionality.

```
template<
    typename Protocol,
    typename RawSocketService = raw_socket_service<Protocol>>
class basic_raw_socket :
  public basic_socket< Protocol, RawSocketService >
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive on a connected socket.
async_receive_from	Start an asynchronous receive.
async_send	Start an asynchronous send on a connected socket.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_raw_socket	Construct a basic_raw_socket without opening it. Construct and open a basic_raw_socket. Construct a basic_raw_socket, opening it and binding it to the given local endpoint. Construct a basic_raw_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
receive	Receive some data on a connected socket.
receive_from	Receive raw data with the endpoint of the sender.

Name	Description
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on a connected socket.
send_to	Send raw data to the specified endpoint.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_raw_socket` class template provides asynchronous and blocking raw-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::assign

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...

boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::assign (1 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
```

basic_raw_socket::assign (2 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

basic_raw_socket::async_connect

Inherited from basic_socket.

Start an asynchronous connect.

```
void async_connect(
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

This function is used to asynchronously connect a socket to the specified remote endpoint. The function call always returns immediately.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected. Copies will be made of the endpoint object as required.
handler	The handler to be called when the connection operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

```
void connect_handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Connect succeeded.
  }
}

...

boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_connect(endpoint, connect_handler);
```

basic_raw_socket::async_receive

Start an asynchronous receive on a connected socket.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
  » more...

template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
  » more...
```

basic_raw_socket::async_receive (1 of 2 overloads)

Start an asynchronous receive on a connected socket.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously receive data from the raw socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_receive operation can only be used with a connected socket. Use the async_receive_from function to receive data on an unconnected raw socket.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.async_receive(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::async_receive (2 of 2 overloads)

Start an asynchronous receive on a connected socket.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
```

This function is used to asynchronously receive data from the raw socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the receive call is to be made.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_receive operation can only be used with a connected socket. Use the async_receive_from function to receive data on an unconnected raw socket.

basic_raw_socket::async_receive_from

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    ReadHandler handler);
  » more...

template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    ReadHandler handler);
  » more...
```

basic_raw_socket::async_receive_from (1 of 2 overloads)

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    ReadHandler handler);
```

This function is used to asynchronously receive raw data. The function call always returns immediately.

Parameters

buffers	One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

sender_endpoint — An endpoint object that receives the endpoint of the remote sender of the data. Ownership of the sender_endpoint object is retained by the caller, which must guarantee that it is valid until the handler is called.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.async_receive_from(
    boost::asio::buffer(data, size), 0, sender_endpoint, handler);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::async_receive_from (2 of 2 overloads)

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    ReadHandler handler);
```

This function is used to asynchronously receive raw data. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

sender_endpoint — An endpoint object that receives the endpoint of the remote sender of the data. Ownership of the sender_endpoint object is retained by the caller, which must guarantee that it is valid until the handler is called.

flags — Flags specifying how the receive call is to be made.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_raw_socket::async_send

Start an asynchronous send on a connected socket.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
  » more...

template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
  » more...
```

basic_raw_socket::async_send (1 of 2 overloads)

Start an asynchronous send on a connected socket.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to send data on the raw socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers — One or more data buffers to be sent on the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_send operation can only be used with a connected socket. Use the async_send_to function to send data on an unconnected raw socket.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.async_send(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::async_send (2 of 2 overloads)

Start an asynchronous send on a connected socket.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
```

This function is used to send data on the raw socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers — One or more data buffers to be sent on the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the send call is to be made.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The async_send operation can only be used with a connected socket. Use the async_send_to function to send data on an unconnected raw socket.

basic_raw_socket::async_send_to

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    WriteHandler handler);
  » more...

template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    WriteHandler handler);
  » more...
```

basic_raw_socket::async_send_to (1 of 2 overloads)

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    WriteHandler handler);
```

This function is used to asynchronously send raw data to the specified remote endpoint. The function call always returns immediately.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.
destination	The remote endpoint to which the data will be sent. Copies will be made of the endpoint as required.
handler	The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

To send a single data buffer use the `buffer` function as follows:

```
boost::asio::ip::udp::endpoint destination(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_send_to(
    boost::asio::buffer(data, size), destination, handler);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::async_send_to (2 of 2 overloads)

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    WriteHandler handler);
```

This function is used to asynchronously send raw data to the specified remote endpoint. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be sent to the remote endpoint. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the send call is to be made.

destination — The remote endpoint to which the data will be sent. Copies will be made of the endpoint as required.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_raw_socket::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
  » more...

bool at_mark(
    boost::system::error_code & ec) const;
  » more...
```

basic_raw_socket::at_mark (1 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

Exceptions

boost::system::system_error Thrown on failure.

basic_raw_socket::at_mark (2 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    boost::system::error_code & ec) const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

basic_raw_socket::available

Determine the number of bytes available for reading.

```
std::size_t available() const;
  » more...

std::size_t available(
    boost::system::error_code & ec) const;
  » more...
```

basic_raw_socket::available (1 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available() const;
```

This function is used to determine the number of bytes that may be read without blocking.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

Exceptions

boost::system::system_error Thrown on failure.

basic_raw_socket::available (2 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available(
    boost::system::error_code & ec) const;
```

This function is used to determine the number of bytes that may be read without blocking.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

basic_raw_socket::basic_raw_socket

Construct a `basic_raw_socket` without opening it.

```
explicit basic_raw_socket(
    boost::asio::io_service & io_service);
  » more...
```

Construct and open a `basic_raw_socket`.

```
basic_raw_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
  » more...
```

Construct a basic_raw_socket, opening it and binding it to the given local endpoint.

```
basic_raw_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
  » more...
```

Construct a basic_raw_socket on an existing native socket.

```
basic_raw_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...
```

basic_raw_socket::basic_raw_socket (1 of 4 overloads)

Construct a basic_raw_socket without opening it.

```
basic_raw_socket(
    boost::asio::io_service & io_service);
```

This constructor creates a raw socket without opening it. The open() function must be called before data can be sent or received on the socket.

Parameters

io_service	The io_service object that the raw socket will use to dispatch handlers for any asynchronous operations performed on the socket.

basic_raw_socket::basic_raw_socket (2 of 4 overloads)

Construct and open a basic_raw_socket.

```
basic_raw_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
```

This constructor creates and opens a raw socket.

Parameters

io_service	The io_service object that the raw socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error	Thrown on failure.

basic_raw_socket::basic_raw_socket (3 of 4 overloads)

Construct a `basic_raw_socket`, opening it and binding it to the given local endpoint.

```
basic_raw_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
```

This constructor creates a raw socket and automatically opens it bound to the specified endpoint on the local machine. The protocol used is the protocol associated with the given endpoint.

Parameters

io_service	The `io_service` object that the raw socket will use to dispatch handlers for any asynchronous operations performed on the socket.
endpoint	An endpoint on the local machine to which the raw socket will be bound.

Exceptions

boost::system::system_error	Thrown on failure.

basic_raw_socket::basic_raw_socket (4 of 4 overloads)

Construct a `basic_raw_socket` on an existing native socket.

```
basic_raw_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
```

This constructor creates a raw socket object to hold an existing native socket.

Parameters

io_service	The `io_service` object that the raw socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.
native_socket	The new underlying socket implementation.

Exceptions

boost::system::system_error	Thrown on failure.

basic_raw_socket::bind

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
  » more...

boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::bind (1 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345));
```

basic_raw_socket::bind (2 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
boost::system::error_code ec;
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345), ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::broadcast

Inherited from socket_base.

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::bytes_readable

Inherited from socket_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::cancel

Cancel all asynchronous operations associated with the socket.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::cancel (1 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
void cancel();
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_raw_socket::cancel (2 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_raw_socket::close

Close the socket.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::close (1 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
void close();
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_raw_socket::close (2 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.close(ec);
if (ec)
{
  // An error occurred.
}
```

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_raw_socket::connect

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
  » more...

boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::connect (1 of 2 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.connect(endpoint);
```

basic_raw_socket::connect (2 of 2 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
boost::system::error_code ec;
socket.connect(endpoint, ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::debug

Inherited from socket_base.

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::do_not_route

Inherited from socket_base.

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::enable_connection_aborted

Inherited from socket_base.

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_raw_socket::get_option

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
  » more...

boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
  » more...
```

basic_raw_socket::get_option (1 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
socket.get_option(option);
bool is_set = option.get();
```

basic_raw_socket::get_option (2 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
boost::system::error_code ec;
socket.get_option(option, ec);
if (ec)
{
  // An error occurred.
}
bool is_set = option.get();
```

basic_raw_socket::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_raw_socket::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::io_control

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
  » more...

boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::io_control (1 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

basic_raw_socket::io_control (2 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
boost::system::error_code ec;
socket.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

basic_raw_socket::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_raw_socket::is_open

Inherited from basic_socket.

Determine whether the socket is open.

```
bool is_open() const;
```

basic_raw_socket::keep_alive

Inherited from socket_base.

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::linger

Inherited from socket_base.

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::local_endpoint

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
  » more...

endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_raw_socket::local_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
```

This function is used to obtain the locally bound endpoint of the socket.

Return Value

An object that represents the local endpoint of the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint();
```

basic_raw_socket::local_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the locally bound endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the local endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

basic_raw_socket::lowest_layer (1 of 2 overloads)

Inherited from basic_socket.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_raw_socket::lowest_layer (2 of 2 overloads)

Inherited from basic_socket.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_raw_socket::lowest_layer_type

Inherited from basic_socket.

A `basic_socket` is always the lowest layer.

```
typedef basic_socket< Protocol, RawSocketService > lowest_layer_type;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket	Construct a basic_socket without opening it. Construct and open a basic_socket. Construct a basic_socket, opening it and binding it to the given local endpoint. Construct a basic_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Protected Member Functions

Name	Description
~basic_socket	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket` class template provides functionality that is common to both stream-oriented and datagram-oriented sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::max_connections

Inherited from socket_base.

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

basic_raw_socket::message_do_not_route

Inherited from socket_base.

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

basic_raw_socket::message_flags

Inherited from socket_base.

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::message_out_of_band

Inherited from socket_base.

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

basic_raw_socket::message_peek

Inherited from socket_base.

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

basic_raw_socket::native

Inherited from basic_socket.

Get the native socket representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the socket. This is intended to allow access to native socket functionality that is not otherwise provided.

basic_raw_socket::native_type

The native representation of a socket.

```
typedef RawSocketService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::non_blocking_io

Inherited from socket_base.

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::open

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
  » more...

boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::open (1 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
```

basic_raw_socket::open (2 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol	An object specifying which protocol is to be used.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::system::error_code ec;
socket.open(boost::asio::ip::tcp::v4(), ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::receive

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::receive (1 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers);
```

This function is used to receive data on the raw socket. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers One or more buffers into which the data will be received.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The receive operation can only be used with a connected socket. Use the receive_from function to receive data on an unconnected raw socket.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.receive(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::receive (2 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags);
```

This function is used to receive data on the raw socket. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers One or more buffers into which the data will be received.

flags Flags specifying how the receive call is to be made.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The receive operation can only be used with a connected socket. Use the receive_from function to receive data on an unconnected raw socket.

basic_raw_socket::receive (3 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to receive data on the raw socket. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers One or more buffers into which the data will be received.

flags Flags specifying how the receive call is to be made.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes received.

Remarks

The receive operation can only be used with a connected socket. Use the receive_from function to receive data on an unconnected raw socket.

basic_raw_socket::receive_buffer_size

Inherited from socket_base.

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::receive_from

Receive raw data with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::receive_from (1 of 3 overloads)

Receive raw data with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint);
```

This function is used to receive raw data. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
sender_endpoint	An endpoint object that receives the endpoint of the remote sender of the data.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
boost::asio::ip::udp::endpoint sender_endpoint;
socket.receive_from(
    boost::asio::buffer(data, size), sender_endpoint);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::receive_from (2 of 3 overloads)

Receive raw data with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags);
```

This function is used to receive raw data. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
sender_endpoint	An endpoint object that receives the endpoint of the remote sender of the data.
flags	Flags specifying how the receive call is to be made.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error	Thrown on failure.

basic_raw_socket::receive_from (3 of 3 overloads)

Receive raw data with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to receive raw data. The function call will block until data has been received successfully or an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
sender_endpoint	An endpoint object that receives the endpoint of the remote sender of the data.
flags	Flags specifying how the receive call is to be made.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes received.

basic_raw_socket::receive_low_watermark

Inherited from socket_base.

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::remote_endpoint

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
  » more...

endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_raw_socket::remote_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
```

This function is used to obtain the remote endpoint of the socket.

Return Value

An object that represents the remote endpoint of the socket.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint();
```

basic_raw_socket::remote_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the remote endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the remote endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::reuse_address

Inherited from socket_base.

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::send

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::send (1 of 3 overloads)

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers);
```

This function is used to send data on the raw socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers One ore more data buffers to be sent on the socket.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

The send operation can only be used with a connected socket. Use the send_to function to send data on an unconnected raw socket.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.send(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::send (2 of 3 overloads)

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags);
```

This function is used to send data on the raw socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One ore more data buffers to be sent on the socket.
flags	Flags specifying how the send call is to be made.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

The send operation can only be used with a connected socket. Use the send_to function to send data on an unconnected raw socket.

basic_raw_socket::send (3 of 3 overloads)

Send some data on a connected socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to send data on the raw socket. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent on the socket.
flags	Flags specifying how the send call is to be made.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes sent.

Remarks

The send operation can only be used with a connected socket. Use the send_to function to send data on an unconnected raw socket.

basic_raw_socket::send_buffer_size

Inherited from socket_base.

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::send_low_watermark

Inherited from socket_base.

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::send_to

Send raw data to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::send_to (1 of 3 overloads)

Send raw data to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination);
```

This function is used to send raw data to the specified remote endpoint. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint.
destination	The remote endpoint to which the data will be sent.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To send a single data buffer use the `buffer` function as follows:

```
boost::asio::ip::udp::endpoint destination(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.send_to(boost::asio::buffer(data, size), destination);
```

See the buffer documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_raw_socket::send_to (2 of 3 overloads)

Send raw data to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags);
```

This function is used to send raw data to the specified remote endpoint. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint.
destination	The remote endpoint to which the data will be sent.
flags	Flags specifying how the send call is to be made.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error	Thrown on failure.

basic_raw_socket::send_to (3 of 3 overloads)

Send raw data to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to send raw data to the specified remote endpoint. The function call will block until the data has been sent successfully or an error occurs.

Parameters

buffers	One or more data buffers to be sent to the remote endpoint.
destination	The remote endpoint to which the data will be sent.
flags	Flags specifying how the send call is to be made.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes sent.

basic_raw_socket::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_raw_socket::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef RawSocketService service_type;
```

Requirements

Header: `boost/asio/basic_raw_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_raw_socket::set_option

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
  » more...

boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::set_option (1 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

Exceptions

boost::system::system_error	Thrown on failure.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
socket.set_option(option);
```

basic_raw_socket::set_option (2 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the socket.

Parameters

option	The new option value to be set on the socket.
ec	Set to indicate what error occurred, if any.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
boost::system::error_code ec;
socket.set_option(option, ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::shutdown

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
  » more...

boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
  » more...
```

basic_raw_socket::shutdown (1 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

Exceptions

boost::system::system_error Thrown on failure.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send);
```

basic_raw_socket::shutdown (2 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

ec Set to indicate what error occurred, if any.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send, ec);
if (ec)
{
  // An error occurred.
}
```

basic_raw_socket::shutdown_type

Inherited from socket_base.

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive	Shutdown the receive side of the socket.
shutdown_send	Shutdown the send side of the socket.
shutdown_both	Shutdown both send and receive on the socket.

basic_serial_port

Provides serial port functionality.

```
template<
    typename SerialPortService = serial_port_service>
class basic_serial_port :
  public basic_io_object< SerialPortService >,
  public serial_port_base
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_serial_port is always the lowest layer.
native_type	The native representation of a serial port.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native serial port to the serial port.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_serial_port	Construct a basic_serial_port without opening it. Construct and open a basic_serial_port. Construct a basic_serial_port on an existing native serial port.
cancel	Cancel all asynchronous operations associated with the serial port.
close	Close the serial port.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the serial port.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the serial port is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native serial port representation.
open	Open the serial port using the specified device name.
read_some	Read some data from the serial port.
send_break	Send a break sequence to the serial port.
set_option	Set an option on the serial port.
write_some	Write some data to the serial port.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_serial_port` class template provides functionality that is common to all serial ports.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_serial_port.hpp`

Convenience header: `boost/asio.hpp`

basic_serial_port::assign

Assign an existing native serial port to the serial port.

```
void assign(
    const native_type & native_serial_port);
  » more...

boost::system::error_code assign(
    const native_type & native_serial_port,
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::assign (1 of 2 overloads)

Assign an existing native serial port to the serial port.

```
void assign(
    const native_type & native_serial_port);
```

basic_serial_port::assign (2 of 2 overloads)

Assign an existing native serial port to the serial port.

```
boost::system::error_code assign(
    const native_type & native_serial_port,
    boost::system::error_code & ec);
```

basic_serial_port::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read data from the serial port. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be read. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes read.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The read operation may not read all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is read before the asynchronous operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
serial_port.async_read_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_serial_port::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write data to the serial port. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be written to the serial port. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes written.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The write operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
serial_port.async_write_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_serial_port::basic_serial_port

Construct a `basic_serial_port` without opening it.

```
explicit basic_serial_port(
    boost::asio::io_service & io_service);
  » more...
```

Construct and open a `basic_serial_port`.

```
explicit basic_serial_port(
    boost::asio::io_service & io_service,
    const char * device);
  » more...

explicit basic_serial_port(
    boost::asio::io_service & io_service,
    const std::string & device);
  » more...
```

Construct a `basic_serial_port` on an existing native serial port.

```
basic_serial_port(
    boost::asio::io_service & io_service,
    const native_type & native_serial_port);
  » more...
```

basic_serial_port::basic_serial_port (1 of 4 overloads)

Construct a `basic_serial_port` without opening it.

```
basic_serial_port(
    boost::asio::io_service & io_service);
```

This constructor creates a serial port without opening it.

Parameters

io_service	The `io_service` object that the serial port will use to dispatch handlers for any asynchronous operations performed on the port.

basic_serial_port::basic_serial_port (2 of 4 overloads)

Construct and open a `basic_serial_port`.

```
basic_serial_port(
    boost::asio::io_service & io_service,
    const char * device);
```

This constructor creates and opens a serial port for the specified device name.

Parameters

io_service	The `io_service` object that the serial port will use to dispatch handlers for any asynchronous operations performed on the port.
device	The platform-specific device name for this serial port.

basic_serial_port::basic_serial_port (3 of 4 overloads)

Construct and open a `basic_serial_port`.

```
basic_serial_port(
    boost::asio::io_service & io_service,
    const std::string & device);
```

This constructor creates and opens a serial port for the specified device name.

Parameters

io_service	The `io_service` object that the serial port will use to dispatch handlers for any asynchronous operations performed on the port.
device	The platform-specific device name for this serial port.

basic_serial_port::basic_serial_port (4 of 4 overloads)

Construct a `basic_serial_port` on an existing native serial port.

```
basic_serial_port(
    boost::asio::io_service & io_service,
    const native_type & native_serial_port);
```

This constructor creates a serial port object to hold an existing native serial port.

Parameters

io_service	The `io_service` object that the serial port will use to dispatch handlers for any asynchronous operations performed on the port.
native_serial_port	A native serial port.

Exceptions

boost::system::system_error	Thrown on failure.

basic_serial_port::cancel

Cancel all asynchronous operations associated with the serial port.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::cancel (1 of 2 overloads)

Cancel all asynchronous operations associated with the serial port.

```
void cancel();
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

basic_serial_port::cancel (2 of 2 overloads)

Cancel all asynchronous operations associated with the serial port.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

basic_serial_port::close

Close the serial port.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::close (1 of 2 overloads)

Close the serial port.

```
void close();
```

This function is used to close the serial port. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

basic_serial_port::close (2 of 2 overloads)

Close the serial port.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the serial port. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

basic_serial_port::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_serial_port::get_option

Get an option from the serial port.

```
template<
    typename GettableSerialPortOption>
void get_option(
    GettableSerialPortOption & option);
  » more...

template<
    typename GettableSerialPortOption>
boost::system::error_code get_option(
    GettableSerialPortOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::get_option (1 of 2 overloads)

Get an option from the serial port.

```
template<
    typename GettableSerialPortOption>
void get_option(
    GettableSerialPortOption & option);
```

This function is used to get the current value of an option on the serial port.

Parameters

option The option value to be obtained from the serial port.

Exceptions

boost::system::system_error Thrown on failure.

basic_serial_port::get_option (2 of 2 overloads)

Get an option from the serial port.

```
template<
    typename GettableSerialPortOption>
boost::system::error_code get_option(
    GettableSerialPortOption & option,
    boost::system::error_code & ec);
```

This function is used to get the current value of an option on the serial port.

Parameters

option The option value to be obtained from the serial port.

ec Set to indicate what error occured, if any.

basic_serial_port::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_serial_port::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_serial_port.hpp`

Convenience header: `boost/asio.hpp`

basic_serial_port::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_serial_port::is_open

Determine whether the serial port is open.

```
bool is_open() const;
```

basic_serial_port::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

basic_serial_port::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `basic_serial_port` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_serial_port::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `basic_serial_port` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_serial_port::lowest_layer_type

A `basic_serial_port` is always the lowest layer.

```
typedef basic_serial_port< SerialPortService > lowest_layer_type;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_serial_port is always the lowest layer.
native_type	The native representation of a serial port.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native serial port to the serial port.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_serial_port	Construct a basic_serial_port without opening it. Construct and open a basic_serial_port. Construct a basic_serial_port on an existing native serial port.
cancel	Cancel all asynchronous operations associated with the serial port.
close	Close the serial port.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the serial port.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the serial port is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native serial port representation.
open	Open the serial port using the specified device name.
read_some	Read some data from the serial port.
send_break	Send a break sequence to the serial port.
set_option	Set an option on the serial port.
write_some	Write some data to the serial port.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_serial_port` class template provides functionality that is common to all serial ports.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_serial_port.hpp`

Convenience header: `boost/asio.hpp`

basic_serial_port::native

Get the native serial port representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the serial port. This is intended to allow access to native serial port functionality that is not otherwise provided.

basic_serial_port::native_type

The native representation of a serial port.

```
typedef SerialPortService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_serial_port.hpp`

Convenience header: `boost/asio.hpp`

basic_serial_port::open

Open the serial port using the specified device name.

```
void open(
    const std::string & device);
  » more...

boost::system::error_code open(
    const std::string & device,
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::open (1 of 2 overloads)

Open the serial port using the specified device name.

```
void open(
    const std::string & device);
```

This function opens the serial port for the specified device name.

Parameters

device The platform-specific device name.

Exceptions

boost::system::system_error	Thrown on failure.

basic_serial_port::open (2 of 2 overloads)

Open the serial port using the specified device name.

```
boost::system::error_code open(
    const std::string & device,
    boost::system::error_code & ec);
```

This function opens the serial port using the given platform-specific device name.

Parameters

device	The platform-specific device name.
ec	Set the indicate what error occurred, if any.

basic_serial_port::read_some

Read some data from the serial port.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::read_some (1 of 2 overloads)

Read some data from the serial port.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

This function is used to read data from the serial port. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers	One or more buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error	Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
serial_port.read_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_serial_port::read_some (2 of 2 overloads)

Read some data from the serial port.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to read data from the serial port. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers	One or more buffers into which the data will be read.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

basic_serial_port::send_break

Send a break sequence to the serial port.

```
void send_break();
  » more...

boost::system::error_code send_break(
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::send_break (1 of 2 overloads)

Send a break sequence to the serial port.

```
void send_break();
```

This function causes a break sequence of platform-specific duration to be sent out the serial port.

Exceptions

boost::system::system_error	Thrown on failure.

basic_serial_port::send_break (2 of 2 overloads)

Send a break sequence to the serial port.

```
boost::system::error_code send_break(
    boost::system::error_code & ec);
```

This function causes a break sequence of platform-specific duration to be sent out the serial port.

Parameters

ec	Set to indicate what error occurred, if any.

basic_serial_port::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_serial_port::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef SerialPortService service_type;
```

Requirements

Header: `boost/asio/basic_serial_port.hpp`

Convenience header: `boost/asio.hpp`

basic_serial_port::set_option

Set an option on the serial port.

```
template<
    typename SettableSerialPortOption>
void set_option(
    const SettableSerialPortOption & option);
  » more...

template<
    typename SettableSerialPortOption>
boost::system::error_code set_option(
    const SettableSerialPortOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::set_option (1 of 2 overloads)

Set an option on the serial port.

```
template<
    typename SettableSerialPortOption>
void set_option(
    const SettableSerialPortOption & option);
```

This function is used to set an option on the serial port.

Parameters

option The option value to be set on the serial port.

Exceptions

boost::system::system_error Thrown on failure.

basic_serial_port::set_option (2 of 2 overloads)

Set an option on the serial port.

```
template<
    typename SettableSerialPortOption>
boost::system::error_code set_option(
    const SettableSerialPortOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the serial port.

Parameters

option The option value to be set on the serial port.

ec Set to indicate what error occurred, if any.

basic_serial_port::write_some

Write some data to the serial port.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

basic_serial_port::write_some (1 of 2 overloads)

Write some data to the serial port.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

This function is used to write data to the serial port. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers — One or more data buffers to be written to the serial port.

Return Value

The number of bytes written.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
serial_port.write_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_serial_port::write_some (2 of 2 overloads)

Write some data to the serial port.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to write data to the serial port. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers One or more data buffers to be written to the serial port.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes written. Returns 0 if an error occurred.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

basic_socket

Provides socket functionality.

```
template<
    typename Protocol,
    typename SocketService>
class basic_socket :
  public basic_io_object< SocketService >,
  public socket_base
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket	Construct a basic_socket without opening it. Construct and open a basic_socket. Construct a basic_socket, opening it and binding it to the given local endpoint. Construct a basic_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Protected Member Functions

Name	Description
~basic_socket	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket` class template provides functionality that is common to both stream-oriented and datagram-oriented sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::assign

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...

boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
  » more...
```

basic_socket::assign (1 of 2 overloads)

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
```

basic_socket::assign (2 of 2 overloads)

Assign an existing native socket to the socket.

```
boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

basic_socket::async_connect

Start an asynchronous connect.

```
template<
    typename ConnectHandler>
void async_connect(
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

This function is used to asynchronously connect a socket to the specified remote endpoint. The function call always returns immediately.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected. Copies will be made of the endpoint object as required.
handler	The handler to be called when the connection operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

```
void connect_handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Connect succeeded.
  }
}

...

boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_connect(endpoint, connect_handler);
```

basic_socket::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
  » more...

bool at_mark(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket::at_mark (1 of 2 overloads)

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

Exceptions

boost::system::system_error	Thrown on failure.

basic_socket::at_mark (2 of 2 overloads)

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    boost::system::error_code & ec) const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

basic_socket::available

Determine the number of bytes available for reading.

```
std::size_t available() const;
  » more...

std::size_t available(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket::available (1 of 2 overloads)

Determine the number of bytes available for reading.

```
std::size_t available() const;
```

This function is used to determine the number of bytes that may be read without blocking.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket::available (2 of 2 overloads)

Determine the number of bytes available for reading.

```
std::size_t available(
    boost::system::error_code & ec) const;
```

This function is used to determine the number of bytes that may be read without blocking.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

basic_socket::basic_socket

Construct a basic_socket without opening it.

```
explicit basic_socket(
    boost::asio::io_service & io_service);
  » more...
```

Construct and open a basic_socket.

```
basic_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
  » more...
```

Construct a basic_socket, opening it and binding it to the given local endpoint.

```
basic_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
  » more...
```

Construct a basic_socket on an existing native socket.

```
basic_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...
```

basic_socket::basic_socket (1 of 4 overloads)

Construct a basic_socket without opening it.

```
basic_socket(
    boost::asio::io_service & io_service);
```

This constructor creates a socket without opening it.

Parameters

io_service — The io_service object that the socket will use to dispatch handlers for any asynchronous operations performed on the socket.

basic_socket::basic_socket (2 of 4 overloads)

Construct and open a basic_socket.

```
basic_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
```

This constructor creates and opens a socket.

Parameters

io_service	The `io_service` object that the socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error	Thrown on failure.

basic_socket::basic_socket (3 of 4 overloads)

Construct a `basic_socket`, opening it and binding it to the given local endpoint.

```
basic_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
```

This constructor creates a socket and automatically opens it bound to the specified endpoint on the local machine. The protocol used is the protocol associated with the given endpoint.

Parameters

io_service	The `io_service` object that the socket will use to dispatch handlers for any asynchronous operations performed on the socket.
endpoint	An endpoint on the local machine to which the socket will be bound.

Exceptions

boost::system::system_error	Thrown on failure.

basic_socket::basic_socket (4 of 4 overloads)

Construct a `basic_socket` on an existing native socket.

```
basic_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
```

This constructor creates a socket object to hold an existing native socket.

Parameters

io_service	The `io_service` object that the socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.
native_socket	A native socket.

Exceptions

boost::system::system_error	Thrown on failure.

basic_socket::bind

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
  » more...

boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_socket::bind (1 of 2 overloads)

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345));
```

basic_socket::bind (2 of 2 overloads)

Bind the socket to the given local endpoint.

```
boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
boost::system::error_code ec;
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345), ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::broadcast

Inherited from socket_base.

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::bytes_readable

Inherited from socket_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::cancel

Cancel all asynchronous operations associated with the socket.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_socket::cancel (1 of 2 overloads)

Cancel all asynchronous operations associated with the socket.

```
void cancel();
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_socket::cancel (2 of 2 overloads)

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_socket::close

Close the socket.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_socket::close (1 of 2 overloads)

Close the socket.

```
void close();
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_socket::close (2 of 2 overloads)

Close the socket.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.close(ec);
if (ec)
{
  // An error occurred.
}
```

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_socket::connect

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
  » more...

boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_socket::connect (1 of 2 overloads)

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.connect(endpoint);
```

basic_socket::connect (2 of 2 overloads)

Connect the socket to the specified endpoint.

```
boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
boost::system::error_code ec;
socket.connect(endpoint, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::debug

Inherited from socket_base.

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::do_not_route

Inherited from socket_base.

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::enable_connection_aborted

Inherited from socket_base.

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_socket::get_option

Get an option from the socket.

```
template<
    typename GettableSocketOption>
void get_option(
    GettableSocketOption & option) const;
  » more...

template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
  » more...
```

basic_socket::get_option (1 of 2 overloads)

Get an option from the socket.

```
template<
    typename GettableSocketOption>
void get_option(
    GettableSocketOption & option) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
socket.get_option(option);
bool is_set = option.get();
```

basic_socket::get_option (2 of 2 overloads)

Get an option from the socket.

```
template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
boost::system::error_code ec;
socket.get_option(option, ec);
if (ec)
{
  // An error occurred.
}
bool is_set = option.get();
```

basic_socket::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_socket::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::io_control

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
void io_control(
    IoControlCommand & command);
  » more...

template<
    typename IoControlCommand>
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

basic_socket::io_control (1 of 2 overloads)

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

basic_socket::io_control (2 of 2 overloads)

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
boost::system::error_code ec;
socket.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

basic_socket::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_socket::is_open

Determine whether the socket is open.

```
bool is_open() const;
```

basic_socket::keep_alive

Inherited from socket_base.

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::linger

Inherited from socket_base.

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::local_endpoint

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
  » more...

endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket::local_endpoint (1 of 2 overloads)

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
```

This function is used to obtain the locally bound endpoint of the socket.

Return Value

An object that represents the local endpoint of the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint();
```

basic_socket::local_endpoint (2 of 2 overloads)

Get the local endpoint of the socket.

```
endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the locally bound endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the local endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

basic_socket::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_socket::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_socket::lowest_layer_type

A `basic_socket` is always the lowest layer.

```
typedef basic_socket< Protocol, SocketService > lowest_layer_type;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket	Construct a basic_socket without opening it. Construct and open a basic_socket. Construct a basic_socket, opening it and binding it to the given local endpoint. Construct a basic_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Protected Member Functions

Name	Description
~basic_socket	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket` class template provides functionality that is common to both stream-oriented and datagram-oriented sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::max_connections

Inherited from socket_base.

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

basic_socket::message_do_not_route

Inherited from socket_base.

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

basic_socket::message_flags

Inherited from socket_base.

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::message_out_of_band

Inherited from socket_base.

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

basic_socket::message_peek

Inherited from socket_base.

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

basic_socket::native

Get the native socket representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the socket. This is intended to allow access to native socket functionality that is not otherwise provided.

basic_socket::native_type

The native representation of a socket.

```
typedef SocketService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::non_blocking_io

Inherited from socket_base.

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::open

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
  » more...

boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
  » more...
```

basic_socket::open (1 of 2 overloads)

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
```

basic_socket::open (2 of 2 overloads)

Open the socket using the specified protocol.

```
boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol	An object specifying which protocol is to be used.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::system::error_code ec;
socket.open(boost::asio::ip::tcp::v4(), ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::receive_buffer_size

Inherited from socket_base.

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::receive_low_watermark

Inherited from socket_base.

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::remote_endpoint

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
  » more...

endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket::remote_endpoint (1 of 2 overloads)

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
```

This function is used to obtain the remote endpoint of the socket.

Return Value

An object that represents the remote endpoint of the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint();
```

basic_socket::remote_endpoint (2 of 2 overloads)

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the remote endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the remote endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::reuse_address

Inherited from socket_base.

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::send_buffer_size

Inherited from socket_base.

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::send_low_watermark

Inherited from socket_base.

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_socket::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef SocketService service_type;
```

Requirements

Header: `boost/asio/basic_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_socket::set_option

Set an option on the socket.

```
template<
    typename SettableSocketOption>
void set_option(
    const SettableSocketOption & option);
  » more...

template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_socket::set_option (1 of 2 overloads)

Set an option on the socket.

```
template<
    typename SettableSocketOption>
void set_option(
    const SettableSocketOption & option);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
socket.set_option(option);
```

basic_socket::set_option (2 of 2 overloads)

Set an option on the socket.

```
template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

ec Set to indicate what error occurred, if any.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
boost::system::error_code ec;
socket.set_option(option, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::shutdown

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
  » more...

boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
  » more...
```

basic_socket::shutdown (1 of 2 overloads)

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

Exceptions

boost::system::system_error Thrown on failure.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send);
```

basic_socket::shutdown (2 of 2 overloads)

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

ec Set to indicate what error occurred, if any.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket::shutdown_type

Inherited from socket_base.

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive	Shutdown the receive side of the socket.
shutdown_send	Shutdown the send side of the socket.
shutdown_both	Shutdown both send and receive on the socket.

basic_socket::~basic_socket

Protected destructor to prevent deletion through this type.

```
~basic_socket();
```

basic_socket_acceptor

Provides the ability to accept new connections.

```
template<
    typename Protocol,
    typename SocketAcceptorService = socket_acceptor_service<Protocol>>
class basic_socket_acceptor :
  public basic_io_object< SocketAcceptorService >,
  public socket_base
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of an acceptor.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
accept	Accept a new connection. Accept a new connection and obtain the endpoint of the peer.
assign	Assigns an existing native acceptor to the acceptor.
async_accept	Start an asynchronous accept.
basic_socket_acceptor	Construct an acceptor without opening it. Construct an open acceptor. Construct an acceptor opened on the given endpoint. Construct a basic_socket_acceptor on an existing native acceptor.
bind	Bind the acceptor to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the acceptor.
close	Close the acceptor.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the acceptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the acceptor is open.
listen	Place the acceptor into the state where it will listen for new connections.
local_endpoint	Get the local endpoint of the acceptor.
native	Get the native acceptor representation.
open	Open the acceptor using the specified protocol.
set_option	Set an option on the acceptor.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket_acceptor` class template is used for accepting new socket connections.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Example

Opening a socket acceptor with the SO_REUSEADDR option enabled:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
boost::asio::ip::tcp::endpoint endpoint(boost::asio::ip::tcp::v4(), port);
acceptor.open(endpoint.protocol());
acceptor.set_option(boost::asio::ip::tcp::acceptor::reuse_address(true));
acceptor.bind(endpoint);
acceptor.listen();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::accept

Accept a new connection.

```
template<
    typename SocketService>
void accept(
    basic_socket< protocol_type, SocketService > & peer);
  » more...

template<
    typename SocketService>
boost::system::error_code accept(
    basic_socket< protocol_type, SocketService > & peer,
    boost::system::error_code & ec);
  » more...
```

Accept a new connection and obtain the endpoint of the peer.

```
template<
    typename SocketService>
void accept(
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type & peer_endpoint);
  » more...

template<
    typename SocketService>
boost::system::error_code accept(
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::accept (1 of 4 overloads)

Accept a new connection.

```
template<
    typename SocketService>
void accept(
    basic_socket< protocol_type, SocketService > & peer);
```

This function is used to accept a new connection from a peer into the given socket. The function call will block until a new connection has been accepted successfully or an error occurs.

Parameters

peer The socket into which the new connection will be accepted.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::socket socket(io_service);
acceptor.accept(socket);
```

basic_socket_acceptor::accept (2 of 4 overloads)

Accept a new connection.

```
template<
    typename SocketService>
boost::system::error_code accept(
    basic_socket< protocol_type, SocketService > & peer,
    boost::system::error_code & ec);
```

This function is used to accept a new connection from a peer into the given socket. The function call will block until a new connection has been accepted successfully or an error occurs.

Parameters

peer The socket into which the new connection will be accepted.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::soocket socket(io_service);
boost::system::error_code ec;
acceptor.accept(socket, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::accept (3 of 4 overloads)

Accept a new connection and obtain the endpoint of the peer.

```
template<
    typename SocketService>
void accept(
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type & peer_endpoint);
```

This function is used to accept a new connection from a peer into the given socket, and additionally provide the endpoint of the remote peer. The function call will block until a new connection has been accepted successfully or an error occurs.

Parameters

peer The socket into which the new connection will be accepted.

peer_endpoint An endpoint object which will receive the endpoint of the remote peer.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint;
acceptor.accept(socket, endpoint);
```

basic_socket_acceptor::accept (4 of 4 overloads)

Accept a new connection and obtain the endpoint of the peer.

```
template<
    typename SocketService>
boost::system::error_code accept(
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

This function is used to accept a new connection from a peer into the given socket, and additionally provide the endpoint of the remote peer. The function call will block until a new connection has been accepted successfully or an error occurs.

Parameters

peer	The socket into which the new connection will be accepted.
peer_endpoint	An endpoint object which will receive the endpoint of the remote peer.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint;
boost::system::error_code ec;
acceptor.accept(socket, endpoint, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::assign

Assigns an existing native acceptor to the acceptor.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_acceptor);
  » more...

boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_acceptor,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::assign (1 of 2 overloads)

Assigns an existing native acceptor to the acceptor.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_acceptor);
```

basic_socket_acceptor::assign (2 of 2 overloads)

Assigns an existing native acceptor to the acceptor.

```
boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_acceptor,
    boost::system::error_code & ec);
```

basic_socket_acceptor::async_accept

Start an asynchronous accept.

```
template<
    typename SocketService,
    typename AcceptHandler>
void async_accept(
    basic_socket< protocol_type, SocketService > & peer,
    AcceptHandler handler);
  » more...

template<
    typename SocketService,
    typename AcceptHandler>
void async_accept(
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type & peer_endpoint,
    AcceptHandler handler);
  » more...
```

basic_socket_acceptor::async_accept (1 of 2 overloads)

Start an asynchronous accept.

```
template<
    typename SocketService,
    typename AcceptHandler>
void async_accept(
    basic_socket< protocol_type, SocketService > & peer,
    AcceptHandler handler);
```

This function is used to asynchronously accept a new connection into a socket. The function call always returns immediately.

Parameters

peer — The socket into which the new connection will be accepted. Ownership of the peer object is retained by the caller, which must guarantee that it is valid until the handler is called.

handler — The handler to be called when the accept operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

```
void accept_handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Accept succeeded.
  }
}

...

boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::socket socket(io_service);
acceptor.async_accept(socket, accept_handler);
```

basic_socket_acceptor::async_accept (2 of 2 overloads)

Start an asynchronous accept.

```
template<
    typename SocketService,
    typename AcceptHandler>
void async_accept(
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type & peer_endpoint,
    AcceptHandler handler);
```

This function is used to asynchronously accept a new connection into a socket, and additionally obtain the endpoint of the remote peer. The function call always returns immediately.

Parameters

peer — The socket into which the new connection will be accepted. Ownership of the peer object is retained by the caller, which must guarantee that it is valid until the handler is called.

peer_endpoint — An endpoint object into which the endpoint of the remote peer will be written. Ownership of the peer_endpoint object is retained by the caller, which must guarantee that it is valid until the handler is called.

handler — The handler to be called when the accept operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

basic_socket_acceptor::basic_socket_acceptor

Construct an acceptor without opening it.

```
explicit basic_socket_acceptor(
    boost::asio::io_service & io_service);
  » more...
```

Construct an open acceptor.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
  » more...
```

Construct an acceptor opened on the given endpoint.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint,
    bool reuse_addr = true);
  » more...
```

Construct a `basic_socket_acceptor` on an existing native acceptor.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_acceptor);
  » more...
```

basic_socket_acceptor::basic_socket_acceptor (1 of 4 overloads)

Construct an acceptor without opening it.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service);
```

This constructor creates an acceptor without opening it to listen for new connections. The `open()` function must be called before the acceptor can accept new socket connections.

Parameters

io_service — The `io_service` object that the acceptor will use to dispatch handlers for any asynchronous operations performed on the acceptor.

basic_socket_acceptor::basic_socket_acceptor (2 of 4 overloads)

Construct an open acceptor.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
```

This constructor creates an acceptor and automatically opens it.

Parameters

io_service — The `io_service` object that the acceptor will use to dispatch handlers for any asynchronous operations performed on the acceptor.

protocol An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket_acceptor::basic_socket_acceptor (3 of 4 overloads)

Construct an acceptor opened on the given endpoint.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint,
    bool reuse_addr = true);
```

This constructor creates an acceptor and automatically opens it to listen for new connections on the specified endpoint.

Parameters

io_service The `io_service` object that the acceptor will use to dispatch handlers for any asynchronous operations performed on the acceptor.

endpoint An endpoint on the local machine on which the acceptor will listen for new connections.

reuse_addr Whether the constructor should set the socket option `socket_base::reuse_address`.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

This constructor is equivalent to the following code:

```
basic_socket_acceptor<Protocol> acceptor(io_service);
acceptor.open(endpoint.protocol());
if (reuse_addr)
  acceptor.set_option(socket_base::reuse_address(true));
acceptor.bind(endpoint);
acceptor.listen(listen_backlog);
```

basic_socket_acceptor::basic_socket_acceptor (4 of 4 overloads)

Construct a `basic_socket_acceptor` on an existing native acceptor.

```
basic_socket_acceptor(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_acceptor);
```

This constructor creates an acceptor object to hold an existing native acceptor.

Parameters

io_service The `io_service` object that the acceptor will use to dispatch handlers for any asynchronous operations performed on the acceptor.

protocol An object specifying protocol parameters to be used.

native_acceptor A native acceptor.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket_acceptor::bind

Bind the acceptor to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
  » more...

boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::bind (1 of 2 overloads)

Bind the acceptor to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
```

This function binds the socket acceptor to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket acceptor will be bound.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
acceptor.open(boost::asio::ip::tcp::v4());
acceptor.bind(boost::asio::ip::tcp::endpoint(12345));
```

basic_socket_acceptor::bind (2 of 2 overloads)

Bind the acceptor to the given local endpoint.

```
boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

This function binds the socket acceptor to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket acceptor will be bound.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
acceptor.open(boost::asio::ip::tcp::v4());
boost::system::error_code ec;
acceptor.bind(boost::asio::ip::tcp::endpoint(12345), ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::broadcast

Inherited from socket_base.

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::bytes_readable

Inherited from socket_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::cancel

Cancel all asynchronous operations associated with the acceptor.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::cancel (1 of 2 overloads)

Cancel all asynchronous operations associated with the acceptor.

```
void cancel();
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

basic_socket_acceptor::cancel (2 of 2 overloads)

Cancel all asynchronous operations associated with the acceptor.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

basic_socket_acceptor::close

Close the acceptor.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::close (1 of 2 overloads)

Close the acceptor.

```
void close();
```

This function is used to close the acceptor. Any asynchronous accept operations will be cancelled immediately.

A subsequent call to `open()` is required before the acceptor can again be used to again perform socket accept operations.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket_acceptor::close (2 of 2 overloads)

Close the acceptor.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the acceptor. Any asynchronous accept operations will be cancelled immediately.

A subsequent call to `open()` is required before the acceptor can again be used to again perform socket accept operations.

Parameters

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::system::error_code ec;
acceptor.close(ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::debug

Inherited from socket_base.

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::do_not_route

Inherited from socket_base.

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::enable_connection_aborted

Inherited from socket_base.

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_socket_acceptor::get_option

Get an option from the acceptor.

```
template<
    typename GettableSocketOption>
void get_option(
    GettableSocketOption & option);
  » more...

template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::get_option (1 of 2 overloads)

Get an option from the acceptor.

```
template<
    typename GettableSocketOption>
void get_option(
    GettableSocketOption & option);
```

This function is used to get the current value of an option on the acceptor.

Parameters

option The option value to be obtained from the acceptor.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the value of the SOL_SOCKET/SO_REUSEADDR option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::acceptor::reuse_address option;
acceptor.get_option(option);
bool is_set = option.get();
```

basic_socket_acceptor::get_option (2 of 2 overloads)

Get an option from the acceptor.

```
template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to get the current value of an option on the acceptor.

Parameters

option The option value to be obtained from the acceptor.

ec Set to indicate what error occurred, if any.

Example

Getting the value of the SOL_SOCKET/SO_REUSEADDR option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::acceptor::reuse_address option;
boost::system::error_code ec;
acceptor.get_option(option, ec);
if (ec)
{
  // An error occurred.
}
bool is_set = option.get();
```

basic_socket_acceptor::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_socket_acceptor::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_socket_acceptor::is_open

Determine whether the acceptor is open.

```
bool is_open() const;
```

basic_socket_acceptor::keep_alive

Inherited from socket_base.

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::linger

Inherited from socket_base.

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::listen

Place the acceptor into the state where it will listen for new connections.

```
void listen(
    int backlog = socket_base::max_connections);
  » more...

boost::system::error_code listen(
    int backlog,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::listen (1 of 2 overloads)

Place the acceptor into the state where it will listen for new connections.

```
void listen(
    int backlog = socket_base::max_connections);
```

This function puts the socket acceptor into the state where it may accept new connections.

Parameters

backlog The maximum length of the queue of pending connections.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket_acceptor::listen (2 of 2 overloads)

Place the acceptor into the state where it will listen for new connections.

```
boost::system::error_code listen(
    int backlog,
    boost::system::error_code & ec);
```

This function puts the socket acceptor into the state where it may accept new connections.

Parameters

backlog The maximum length of the queue of pending connections.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::system::error_code ec;
acceptor.listen(boost::asio::socket_base::max_connections, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::local_endpoint

Get the local endpoint of the acceptor.

```
endpoint_type local_endpoint() const;
  » more...

endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket_acceptor::local_endpoint (1 of 2 overloads)

Get the local endpoint of the acceptor.

```
endpoint_type local_endpoint() const;
```

This function is used to obtain the locally bound endpoint of the acceptor.

Return Value

An object that represents the local endpoint of the acceptor.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = acceptor.local_endpoint();
```

basic_socket_acceptor::local_endpoint (2 of 2 overloads)

Get the local endpoint of the acceptor.

```
endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the locally bound endpoint of the acceptor.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the local endpoint of the acceptor. Returns a default-constructed endpoint object if an error occurred and the error handler did not throw an exception.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = acceptor.local_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::max_connections

Inherited from socket_base.

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

basic_socket_acceptor::message_do_not_route

Inherited from socket_base.

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

basic_socket_acceptor::message_flags

Inherited from socket_base.

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::message_out_of_band

Inherited from socket_base.

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

basic_socket_acceptor::message_peek

Inherited from socket_base.

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

basic_socket_acceptor::native

Get the native acceptor representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the acceptor. This is intended to allow access to native acceptor functionality that is not otherwise provided.

basic_socket_acceptor::native_type

The native representation of an acceptor.

```
typedef SocketAcceptorService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::non_blocking_io

Inherited from socket_base.

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::open

Open the acceptor using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
  » more...

boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::open (1 of 2 overloads)

Open the acceptor using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
```

This function opens the socket acceptor so that it will use the specified protocol.

Parameters

protocol An object specifying which protocol is to be used.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
acceptor.open(boost::asio::ip::tcp::v4());
```

basic_socket_acceptor::open (2 of 2 overloads)

Open the acceptor using the specified protocol.

```
boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

This function opens the socket acceptor so that it will use the specified protocol.

Parameters

protocol	An object specifying which protocol is to be used.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
boost::system::error_code ec;
acceptor.open(boost::asio::ip::tcp::v4(), ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::receive_buffer_size

Inherited from socket_base.

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::receive_low_watermark

Inherited from socket_base.

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::reuse_address

Inherited from socket_base.

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::send_buffer_size

Inherited from socket_base.

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::send_low_watermark

Inherited from socket_base.

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_socket_acceptor::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef SocketAcceptorService service_type;
```

Requirements

Header: `boost/asio/basic_socket_acceptor.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_acceptor::set_option

Set an option on the acceptor.

```
template<
    typename SettableSocketOption>
void set_option(
    const SettableSocketOption & option);
  » more...

template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_socket_acceptor::set_option (1 of 2 overloads)

Set an option on the acceptor.

```
template<
    typename SettableSocketOption>
void set_option(
    const SettableSocketOption & option);
```

This function is used to set an option on the acceptor.

Parameters

option The new option value to be set on the acceptor.

Exceptions

boost::system::system_error Thrown on failure.

Example

Setting the SOL_SOCKET/SO_REUSEADDR option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::acceptor::reuse_address option(true);
acceptor.set_option(option);
```

basic_socket_acceptor::set_option (2 of 2 overloads)

Set an option on the acceptor.

```
template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the acceptor.

Parameters

option The new option value to be set on the acceptor.

ec Set to indicate what error occurred, if any.

Example

Setting the SOL_SOCKET/SO_REUSEADDR option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::ip::tcp::acceptor::reuse_address option(true);
boost::system::error_code ec;
acceptor.set_option(option, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_acceptor::shutdown_type

Inherited from socket_base.

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive Shutdown the receive side of the socket.

shutdown_send Shutdown the send side of the socket.

shutdown_both Shutdown both send and receive on the socket.

basic_socket_iostream

Iostream interface for a socket.

```
template<
    typename Protocol,
    typename StreamSocketService = stream_socket_service<Protocol>>
class basic_socket_iostream
```

Member Functions

Name	Description
basic_socket_iostream	Construct a basic_socket_iostream without establishing a connection. Establish a connection to an endpoint corresponding to a resolver query.
close	Close the connection.
connect	Establish a connection to an endpoint corresponding to a resolver query.
rdbuf	Return a pointer to the underlying streambuf.

Requirements

Header: `boost/asio/basic_socket_iostream.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_iostream::basic_socket_iostream

Construct a `basic_socket_iostream` without establishing a connection.

```
basic_socket_iostream();
  » more...
```

Establish a connection to an endpoint corresponding to a resolver query.

```
template<
    typename T1,
    ... ,
    typename TN>
explicit basic_socket_iostream(
    T1 t1,
    ... ,
    TN tn);
  » more...
```

basic_socket_iostream::basic_socket_iostream (1 of 2 overloads)

Construct a `basic_socket_iostream` without establishing a connection.

```
basic_socket_iostream();
```

basic_socket_iostream::basic_socket_iostream (2 of 2 overloads)

Establish a connection to an endpoint corresponding to a resolver query.

```
template<
    typename T1,
    ... ,
    typename TN>
basic_socket_iostream(
    T1 t1,
    ... ,
    TN tn);
```

This constructor automatically establishes a connection based on the supplied resolver query parameters. The arguments are used to construct a resolver query object.

basic_socket_iostream::close

Close the connection.

```
void close();
```

basic_socket_iostream::connect

Establish a connection to an endpoint corresponding to a resolver query.

```
template<
    typename T1,
    ... ,
    typename TN>
void connect(
    T1 t1,
    ... ,
    TN tn);
```

This function automatically establishes a connection based on the supplied resolver query parameters. The arguments are used to construct a resolver query object.

basic_socket_iostream::rdbuf

Return a pointer to the underlying streambuf.

```
basic_socket_streambuf< Protocol, StreamSocketService > * rdbuf() const;
```

basic_socket_streambuf

Iostream streambuf for a socket.

```
template<
    typename Protocol,
    typename StreamSocketService = stream_socket_service<Protocol>>
class basic_socket_streambuf :
  public basic_socket< Protocol, StreamSocketService >
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket_streambuf	Construct a basic_socket_streambuf without establishing a connection.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the connection. Close the socket.
connect	Establish a connection. Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.
~basic_socket_streambuf	Destructor flushes buffered data.

Protected Member Functions

Name	Description
overflow	
setbuf	
sync	
underflow	

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::assign

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...

boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::assign (1 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
```

basic_socket_streambuf::assign (2 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

basic_socket_streambuf::async_connect

Inherited from basic_socket.

Start an asynchronous connect.

```
void async_connect(
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

This function is used to asynchronously connect a socket to the specified remote endpoint. The function call always returns immediately.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint — The remote endpoint to which the socket will be connected. Copies will be made of the endpoint object as required.

handler — The handler to be called when the connection operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

```
void connect_handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Connect succeeded.
  }
}

...

boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_connect(endpoint, connect_handler);
```

basic_socket_streambuf::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
  » more...

bool at_mark(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket_streambuf::at_mark (1 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket_streambuf::at_mark (2 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    boost::system::error_code & ec) const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

basic_socket_streambuf::available

Determine the number of bytes available for reading.

```
std::size_t available() const;
  » more...

std::size_t available(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket_streambuf::available (1 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available() const;
```

This function is used to determine the number of bytes that may be read without blocking.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

Exceptions

boost::system::system_error Thrown on failure.

basic_socket_streambuf::available (2 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available(
    boost::system::error_code & ec) const;
```

This function is used to determine the number of bytes that may be read without blocking.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

basic_socket_streambuf::basic_socket_streambuf

Construct a `basic_socket_streambuf` without establishing a connection.

```
basic_socket_streambuf();
```

basic_socket_streambuf::bind

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
  » more...

boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::bind (1 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345));
```

basic_socket_streambuf::bind (2 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
boost::system::error_code ec;
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345), ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::broadcast

Inherited from socket_base.

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::bytes_readable

Inherited from socket_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::cancel

Cancel all asynchronous operations associated with the socket.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::cancel (1 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
void cancel();
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.

- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_socket_streambuf::cancel (2 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_socket_streambuf::close

Close the connection.

```
basic_socket_streambuf< Protocol, StreamSocketService > * close();
  » more...
```

Close the socket.

```
boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::close (1 of 2 overloads)

Close the connection.

```
basic_socket_streambuf< Protocol, StreamSocketService > * close();
```

Return Value

`this` if a connection was successfully established, a null pointer otherwise.

basic_socket_streambuf::close (2 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.close(ec);
if (ec)
{
  // An error occurred.
}
```

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_socket_streambuf::connect

Establish a connection.

```
basic_socket_streambuf< Protocol, StreamSocketService > * connect(
    const endpoint_type & endpoint);
  » more...

template<
    typename T1,
    ... ,
    typename TN>
basic_socket_streambuf< Protocol, StreamSocketService > * connect(
    T1 t1,
    ... ,
    TN tn);
  » more...
```

Connect the socket to the specified endpoint.

```
boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::connect (1 of 3 overloads)

Establish a connection.

```
basic_socket_streambuf< Protocol, StreamSocketService > * connect(
    const endpoint_type & endpoint);
```

This function establishes a connection to the specified endpoint.

Return Value

`this` if a connection was successfully established, a null pointer otherwise.

basic_socket_streambuf::connect (2 of 3 overloads)

Establish a connection.

```
template<
    typename T1,
    ... ,
    typename TN>
basic_socket_streambuf< Protocol, StreamSocketService > * connect(
    T1 t1,
    ... ,
    TN tn);
```

This function automatically establishes a connection based on the supplied resolver query parameters. The arguments are used to construct a resolver query object.

Return Value

`this` if a connection was successfully established, a null pointer otherwise.

basic_socket_streambuf::connect (3 of 3 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
boost::system::error_code ec;
socket.connect(endpoint, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::debug

Inherited from socket_base.

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::do_not_route

Inherited from socket_base.

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::enable_connection_aborted

Inherited from socket_base.

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_socket_streambuf::get_option

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
  » more...

boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
  » more...
```

basic_socket_streambuf::get_option (1 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
socket.get_option(option);
bool is_set = option.get();
```

basic_socket_streambuf::get_option (2 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
boost::system::error_code ec;
socket.get_option(option, ec);
if (ec)
{
  // An error occurred.
}
bool is_set = option.get();
```

basic_socket_streambuf::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_socket_streambuf::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::io_control

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
  » more...

boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::io_control (1 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

basic_socket_streambuf::io_control (2 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
boost::system::error_code ec;
socket.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

basic_socket_streambuf::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_socket_streambuf::is_open

Inherited from basic_socket.

Determine whether the socket is open.

```
bool is_open() const;
```

basic_socket_streambuf::keep_alive

Inherited from socket_base.

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::linger

Inherited from socket_base.

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::local_endpoint

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
  » more...

endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket_streambuf::local_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
```

This function is used to obtain the locally bound endpoint of the socket.

Return Value

An object that represents the local endpoint of the socket.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint();
```

basic_socket_streambuf::local_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the locally bound endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the local endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

basic_socket_streambuf::lowest_layer (1 of 2 overloads)

Inherited from basic_socket.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_socket_streambuf::lowest_layer (2 of 2 overloads)

Inherited from basic_socket.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_socket_streambuf::lowest_layer_type

Inherited from basic_socket.

A `basic_socket` is always the lowest layer.

```
typedef basic_socket< Protocol, StreamSocketService > lowest_layer_type;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket	Construct a basic_socket without opening it. Construct and open a basic_socket. Construct a basic_socket, opening it and binding it to the given local endpoint. Construct a basic_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Protected Member Functions

Name	Description
~basic_socket	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket` class template provides functionality that is common to both stream-oriented and datagram-oriented sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::max_connections

Inherited from socket_base.

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

basic_socket_streambuf::message_do_not_route

Inherited from socket_base.

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

basic_socket_streambuf::message_flags

Inherited from socket_base.

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::message_out_of_band

Inherited from socket_base.

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

basic_socket_streambuf::message_peek

Inherited from socket_base.

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

basic_socket_streambuf::native

Inherited from basic_socket.

Get the native socket representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the socket. This is intended to allow access to native socket functionality that is not otherwise provided.

basic_socket_streambuf::native_type

Inherited from basic_socket.

The native representation of a socket.

```
typedef StreamSocketService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::non_blocking_io

Inherited from socket_base.

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::open

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
  » more...

boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::open (1 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol	An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
```

basic_socket_streambuf::open (2 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol	An object specifying which protocol is to be used.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::system::error_code ec;
socket.open(boost::asio::ip::tcp::v4(), ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::overflow

```
int_type overflow(
    int_type c);
```

basic_socket_streambuf::protocol_type

Inherited from basic_socket.

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::receive_buffer_size

Inherited from socket_base.

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::receive_low_watermark

Inherited from socket_base.

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::remote_endpoint

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
  » more...

endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_socket_streambuf::remote_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
```

This function is used to obtain the remote endpoint of the socket.

Return Value

An object that represents the remote endpoint of the socket.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint();
```

basic_socket_streambuf::remote_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the remote endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the remote endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::reuse_address

Inherited from socket_base.

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::send_buffer_size

Inherited from socket_base.

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::send_low_watermark

Inherited from socket_base.

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_socket_streambuf::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef StreamSocketService service_type;
```

Requirements

Header: `boost/asio/basic_socket_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_socket_streambuf::set_option

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
  » more...

boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::set_option (1 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
socket.set_option(option);
```

basic_socket_streambuf::set_option (2 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

ec Set to indicate what error occurred, if any.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
boost::system::error_code ec;
socket.set_option(option, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::setbuf

```
std::streambuf * setbuf(
    char_type * s,
    std::streamsize n);
```

basic_socket_streambuf::shutdown

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
  » more...

boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
  » more...
```

basic_socket_streambuf::shutdown (1 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

Exceptions

boost::system::system_error Thrown on failure.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send);
```

basic_socket_streambuf::shutdown (2 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

ec Set to indicate what error occurred, if any.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send, ec);
if (ec)
{
  // An error occurred.
}
```

basic_socket_streambuf::shutdown_type

Inherited from socket_base.

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive	Shutdown the receive side of the socket.
shutdown_send	Shutdown the send side of the socket.
shutdown_both	Shutdown both send and receive on the socket.

basic_socket_streambuf::sync

```
int sync();
```

basic_socket_streambuf::underflow

```
int_type underflow();
```

basic_socket_streambuf::~basic_socket_streambuf

Destructor flushes buffered data.

```
virtual ~basic_socket_streambuf();
```

basic_stream_socket

Provides stream-oriented socket functionality.

```
template<
    typename Protocol,
    typename StreamSocketService = stream_socket_service<Protocol>>
class basic_stream_socket :
  public basic_socket< Protocol, StreamSocketService >
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_read_some	Start an asynchronous read.
async_receive	Start an asynchronous receive.
async_send	Start an asynchronous send.
async_write_some	Start an asynchronous write.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_stream_socket	Construct a basic_stream_socket without opening it. Construct and open a basic_stream_socket. Construct a basic_stream_socket, opening it and binding it to the given local endpoint. Construct a basic_stream_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
read_some	Read some data from the socket.

Name	Description
receive	Receive some data on the socket. Receive some data on a connected socket.
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.
write_some	Write some data to the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_stream_socket` class template provides asynchronous and blocking stream-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::assign

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...

boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::assign (1 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
void assign(
    const protocol_type & protocol,
    const native_type & native_socket);
```

basic_stream_socket::assign (2 of 2 overloads)

Inherited from basic_socket.

Assign an existing native socket to the socket.

```
boost::system::error_code assign(
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

basic_stream_socket::async_connect

Inherited from basic_socket.

Start an asynchronous connect.

```
void async_connect(
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

This function is used to asynchronously connect a socket to the specified remote endpoint. The function call always returns immediately.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected. Copies will be made of the endpoint object as required.
handler	The handler to be called when the connection operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Example

```
void connect_handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Connect succeeded.
  }
}

...

boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.async_connect(endpoint, connect_handler);
```

basic_stream_socket::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read data from the stream socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be read. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes read.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The read operation may not read all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is read before the asynchronous operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
socket.async_read_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::async_receive

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
  » more...

template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
  » more...
```

basic_stream_socket::async_receive (1 of 2 overloads)

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously receive data from the stream socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The receive operation may not receive all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is received before the asynchronous operation completes.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.async_receive(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::async_receive (2 of 2 overloads)

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
```

This function is used to asynchronously receive data from the stream socket. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be received. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the receive call is to be made.

handler — The handler to be called when the receive operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes received.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The receive operation may not receive all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is received before the asynchronous operation completes.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.async_receive(boost::asio::buffer(data, size), 0, handler);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::async_send

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
  » more...

template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
  » more...
```

basic_stream_socket::async_send (1 of 2 overloads)

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously send data on the stream socket. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be sent on the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The send operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.async_send(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::async_send (2 of 2 overloads)

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
```

This function is used to asynchronously send data on the stream socket. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be sent on the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

flags — Flags specifying how the send call is to be made.

handler — The handler to be called when the send operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes sent.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The send operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.async_send(boost::asio::buffer(data, size), 0, handler);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write data to the stream socket. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be written to the socket. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes written.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The write operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
socket.async_write_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
  » more...

bool at_mark(
    boost::system::error_code & ec) const;
  » more...
```

basic_stream_socket::at_mark (1 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark() const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

Exceptions

boost::system::system_error Thrown on failure.

basic_stream_socket::at_mark (2 of 2 overloads)

Inherited from basic_socket.

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    boost::system::error_code & ec) const;
```

This function is used to check whether the socket input is currently positioned at the out-of-band data mark.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

A bool indicating whether the socket is at the out-of-band data mark.

basic_stream_socket::available

Determine the number of bytes available for reading.

```
std::size_t available() const;
  » more...

std::size_t available(
    boost::system::error_code & ec) const;
  » more...
```

basic_stream_socket::available (1 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available() const;
```

This function is used to determine the number of bytes that may be read without blocking.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

Exceptions

boost::system::system_error	Thrown on failure.

basic_stream_socket::available (2 of 2 overloads)

Inherited from basic_socket.

Determine the number of bytes available for reading.

```
std::size_t available(
    boost::system::error_code & ec) const;
```

This function is used to determine the number of bytes that may be read without blocking.

Parameters

ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes that may be read without blocking, or 0 if an error occurs.

basic_stream_socket::basic_stream_socket

Construct a `basic_stream_socket` without opening it.

```
explicit basic_stream_socket(
    boost::asio::io_service & io_service);
  » more...
```

Construct and open a `basic_stream_socket`.

```
basic_stream_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
  » more...
```

Construct a basic_stream_socket, opening it and binding it to the given local endpoint.

```
basic_stream_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
  » more...
```

Construct a basic_stream_socket on an existing native socket.

```
basic_stream_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
  » more...
```

basic_stream_socket::basic_stream_socket (1 of 4 overloads)

Construct a basic_stream_socket without opening it.

```
basic_stream_socket(
    boost::asio::io_service & io_service);
```

This constructor creates a stream socket without opening it. The socket needs to be opened and then connected or accepted before data can be sent or received on it.

Parameters

io_service	The io_service object that the stream socket will use to dispatch handlers for any asynchronous operations performed on the socket.

basic_stream_socket::basic_stream_socket (2 of 4 overloads)

Construct and open a basic_stream_socket.

```
basic_stream_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol);
```

This constructor creates and opens a stream socket. The socket needs to be connected or accepted before data can be sent or received on it.

Parameters

io_service	The io_service object that the stream socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error	Thrown on failure.

basic_stream_socket::basic_stream_socket (3 of 4 overloads)

Construct a `basic_stream_socket`, opening it and binding it to the given local endpoint.

```
basic_stream_socket(
    boost::asio::io_service & io_service,
    const endpoint_type & endpoint);
```

This constructor creates a stream socket and automatically opens it bound to the specified endpoint on the local machine. The protocol used is the protocol associated with the given endpoint.

Parameters

io_service	The `io_service` object that the stream socket will use to dispatch handlers for any asynchronous operations performed on the socket.
endpoint	An endpoint on the local machine to which the stream socket will be bound.

Exceptions

boost::system::system_error	Thrown on failure.

basic_stream_socket::basic_stream_socket (4 of 4 overloads)

Construct a `basic_stream_socket` on an existing native socket.

```
basic_stream_socket(
    boost::asio::io_service & io_service,
    const protocol_type & protocol,
    const native_type & native_socket);
```

This constructor creates a stream socket object to hold an existing native socket.

Parameters

io_service	The `io_service` object that the stream socket will use to dispatch handlers for any asynchronous operations performed on the socket.
protocol	An object specifying protocol parameters to be used.
native_socket	The new underlying socket implementation.

Exceptions

boost::system::system_error	Thrown on failure.

basic_stream_socket::bind

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
  » more...

boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::bind (1 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
void bind(
    const endpoint_type & endpoint);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345));
```

basic_stream_socket::bind (2 of 2 overloads)

Inherited from basic_socket.

Bind the socket to the given local endpoint.

```
boost::system::error_code bind(
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

This function binds the socket to the specified endpoint on the local machine.

Parameters

endpoint An endpoint on the local machine to which the socket will be bound.

ec Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
boost::system::error_code ec;
socket.bind(boost::asio::ip::tcp::endpoint(
      boost::asio::ip::tcp::v4(), 12345), ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::broadcast

Inherited from socket_base.

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::bytes_readable

Inherited from socket_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::cancel

Cancel all asynchronous operations associated with the socket.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::cancel (1 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
void cancel();
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_stream_socket::cancel (2 of 2 overloads)

Inherited from basic_socket.

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous connect, send and receive operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

Remarks

Calls to `cancel()` will always fail with `boost::asio::error::operation_not_supported` when run on Windows XP, Windows Server 2003, and earlier versions of Windows, unless BOOST_ASIO_ENABLE_CANCELIO is defined. However, the CancelIo function has two issues that should be considered before enabling its use:

- It will only cancel asynchronous operations that were initiated in the current thread.
- It can appear to complete without error, but the request to cancel the unfinished operations may be silently ignored by the operating system. Whether it works or not seems to depend on the drivers that are installed.

For portable cancellation, consider using one of the following alternatives:

- Disable asio's I/O completion port backend by defining BOOST_ASIO_DISABLE_IOCP.
- Use the close() function to simultaneously cancel the outstanding operations and close the socket.

When running on Windows Vista, Windows Server 2008, and later, the CancelIoEx function is always used. This function does not have the problems described above.

basic_stream_socket::close

Close the socket.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::close (1 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
void close();
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_stream_socket::close (2 of 2 overloads)

Inherited from basic_socket.

Close the socket.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the socket. Any asynchronous send, receive or connect operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.close(ec);
if (ec)
{
  // An error occurred.
}
```

Remarks

For portable behaviour with respect to graceful closure of a connected socket, call `shutdown()` before closing the socket.

basic_stream_socket::connect

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
  » more...

boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::connect (1 of 2 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
void connect(
    const endpoint_type & peer_endpoint);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.

Exceptions

boost::system::system_error	Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
socket.connect(endpoint);
```

basic_stream_socket::connect (2 of 2 overloads)

Inherited from basic_socket.

Connect the socket to the specified endpoint.

```
boost::system::error_code connect(
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

This function is used to connect a socket to the specified remote endpoint. The function call will block until the connection is successfully made or an error occurs.

The socket is automatically opened if it is not already open. If the connect fails, and the socket was automatically opened, the socket is not returned to the closed state.

Parameters

peer_endpoint	The remote endpoint to which the socket will be connected.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::asio::ip::tcp::endpoint endpoint(
    boost::asio::ip::address::from_string("1.2.3.4"), 12345);
boost::system::error_code ec;
socket.connect(endpoint, ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::debug

Inherited from socket_base.

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::do_not_route

Inherited from socket_base.

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::enable_connection_aborted

Inherited from socket_base.

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_stream_socket::get_option

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
  » more...

boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
  » more...
```

basic_stream_socket::get_option (1 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
void get_option(
    GettableSocketOption & option) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
socket.get_option(option);
bool is_set = option.get();
```

basic_stream_socket::get_option (2 of 2 overloads)

Inherited from basic_socket.

Get an option from the socket.

```
boost::system::error_code get_option(
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

This function is used to get the current value of an option on the socket.

Parameters

option The option value to be obtained from the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the value of the SOL_SOCKET/SO_KEEPALIVE option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::keep_alive option;
boost::system::error_code ec;
socket.get_option(option, ec);
if (ec)
{
  // An error occurred.
}
bool is_set = option.get();
```

basic_stream_socket::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

basic_stream_socket::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::io_control

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
  » more...

boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::io_control (1 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

basic_stream_socket::io_control (2 of 2 overloads)

Inherited from basic_socket.

Perform an IO control command on the socket.

```
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the socket.

Parameters

command The IO control command to be performed on the socket.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::socket::bytes_readable command;
boost::system::error_code ec;
socket.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

basic_stream_socket::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

basic_stream_socket::is_open

Inherited from basic_socket.

Determine whether the socket is open.

```
bool is_open() const;
```

basic_stream_socket::keep_alive

Inherited from socket_base.

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::linger

Inherited from socket_base.

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::local_endpoint

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
  » more...

endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_stream_socket::local_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint() const;
```

This function is used to obtain the locally bound endpoint of the socket.

Return Value

An object that represents the local endpoint of the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint();
```

basic_stream_socket::local_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the local endpoint of the socket.

```
endpoint_type local_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the locally bound endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the local endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.local_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

basic_stream_socket::lowest_layer (1 of 2 overloads)

Inherited from basic_socket.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_stream_socket::lowest_layer (2 of 2 overloads)

Inherited from basic_socket.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `basic_socket` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

basic_stream_socket::lowest_layer_type

Inherited from basic_socket.

A `basic_socket` is always the lowest layer.

```
typedef basic_socket< Protocol, StreamSocketService > lowest_layer_type;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_socket	Construct a basic_socket without opening it. Construct and open a basic_socket. Construct a basic_socket, opening it and binding it to the given local endpoint. Construct a basic_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
remote_endpoint	Get the remote endpoint of the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Protected Member Functions

Name	Description
~basic_socket	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket` class template provides functionality that is common to both stream-oriented and datagram-oriented sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::max_connections

Inherited from socket_base.

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

basic_stream_socket::message_do_not_route

Inherited from socket_base.

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

basic_stream_socket::message_flags

Inherited from socket_base.

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::message_out_of_band

Inherited from socket_base.

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

basic_stream_socket::message_peek

Inherited from socket_base.

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

basic_stream_socket::native

Inherited from basic_socket.

Get the native socket representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the socket. This is intended to allow access to native socket functionality that is not otherwise provided.

basic_stream_socket::native_type

The native representation of a socket.

```
typedef StreamSocketService::native_type native_type;
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::non_blocking_io

Inherited from socket_base.

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::open

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
  » more...

boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::open (1 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
void open(
    const protocol_type & protocol = protocol_type());
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol An object specifying protocol parameters to be used.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
socket.open(boost::asio::ip::tcp::v4());
```

basic_stream_socket::open (2 of 2 overloads)

Inherited from basic_socket.

Open the socket using the specified protocol.

```
boost::system::error_code open(
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

This function opens the socket so that it will use the specified protocol.

Parameters

protocol	An object specifying which protocol is to be used.
ec	Set to indicate what error occurred, if any.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
boost::system::error_code ec;
socket.open(boost::asio::ip::tcp::v4(), ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::read_some

Read some data from the socket.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::read_some (1 of 2 overloads)

Read some data from the socket.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

This function is used to read data from the stream socket. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers — One or more buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
socket.read_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::read_some (2 of 2 overloads)

Read some data from the socket.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to read data from the stream socket. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers One or more buffers into which the data will be read.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

basic_stream_socket::receive

Receive some data on the socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags);
  » more...
```

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::receive (1 of 3 overloads)

Receive some data on the socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers);
```

This function is used to receive data on the stream socket. The function call will block until one or more bytes of data has been received successfully, or until an error occurs.

Parameters

buffers — One or more buffers into which the data will be received.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The receive operation may not receive all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.receive(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::receive (2 of 3 overloads)

Receive some data on the socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags);
```

This function is used to receive data on the stream socket. The function call will block until one or more bytes of data has been received successfully, or until an error occurs.

Parameters

buffers — One or more buffers into which the data will be received.

flags — Flags specifying how the receive call is to be made.

Return Value

The number of bytes received.

Exceptions

boost::system::system_error	Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The receive operation may not receive all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To receive into a single data buffer use the `buffer` function as follows:

```
socket.receive(boost::asio::buffer(data, size), 0);
```

See the `buffer` documentation for information on receiving into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::receive (3 of 3 overloads)

Receive some data on a connected socket.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to receive data on the stream socket. The function call will block until one or more bytes of data has been received successfully, or until an error occurs.

Parameters

buffers	One or more buffers into which the data will be received.
flags	Flags specifying how the receive call is to be made.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes received. Returns 0 if an error occurred.

Remarks

The receive operation may not receive all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

basic_stream_socket::receive_buffer_size

Inherited from socket_base.

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::receive_low_watermark

Inherited from socket_base.

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::remote_endpoint

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
  » more...

endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
  » more...
```

basic_stream_socket::remote_endpoint (1 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint() const;
```

This function is used to obtain the remote endpoint of the socket.

Return Value

An object that represents the remote endpoint of the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint();
```

basic_stream_socket::remote_endpoint (2 of 2 overloads)

Inherited from basic_socket.

Get the remote endpoint of the socket.

```
endpoint_type remote_endpoint(
    boost::system::error_code & ec) const;
```

This function is used to obtain the remote endpoint of the socket.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

An object that represents the remote endpoint of the socket. Returns a default-constructed endpoint object if an error occurred.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
boost::asio::ip::tcp::endpoint endpoint = socket.remote_endpoint(ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::reuse_address

Inherited from socket_base.

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::send

Send some data on the socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags);
  » more...

template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::send (1 of 3 overloads)

Send some data on the socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers);
```

This function is used to send data on the stream socket. The function call will block until one or more bytes of the data has been sent successfully, or an until error occurs.

Parameters

buffers One or more data buffers to be sent on the socket.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The send operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.send(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::send (2 of 3 overloads)

Send some data on the socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags);
```

This function is used to send data on the stream socket. The function call will block until one or more bytes of the data has been sent successfully, or an until error occurs.

Parameters

buffers One or more data buffers to be sent on the socket.

flags Flags specifying how the send call is to be made.

Return Value

The number of bytes sent.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The send operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

Example

To send a single data buffer use the `buffer` function as follows:

```
socket.send(boost::asio::buffer(data, size), 0);
```

See the `buffer` documentation for information on sending multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::send (3 of 3 overloads)

Send some data on the socket.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

This function is used to send data on the stream socket. The function call will block until one or more bytes of the data has been sent successfully, or an until error occurs.

Parameters

buffers One or more data buffers to be sent on the socket.

flags Flags specifying how the send call is to be made.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes sent. Returns 0 if an error occurred.

Remarks

The send operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

basic_stream_socket::send_buffer_size

Inherited from socket_base.

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::send_low_watermark

Inherited from socket_base.

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

basic_stream_socket::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef StreamSocketService service_type;
```

Requirements

Header: `boost/asio/basic_stream_socket.hpp`

Convenience header: `boost/asio.hpp`

basic_stream_socket::set_option

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
  » more...

boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::set_option (1 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
void set_option(
    const SettableSocketOption & option);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

Exceptions

boost::system::system_error Thrown on failure.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
socket.set_option(option);
```

basic_stream_socket::set_option (2 of 2 overloads)

Inherited from basic_socket.

Set an option on the socket.

```
boost::system::error_code set_option(
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

This function is used to set an option on the socket.

Parameters

option The new option value to be set on the socket.

ec Set to indicate what error occurred, if any.

Example

Setting the IPPROTO_TCP/TCP_NODELAY option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
boost::system::error_code ec;
socket.set_option(option, ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::shutdown

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
  » more...

boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::shutdown (1 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
void shutdown(
    shutdown_type what);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

Exceptions

boost::system::system_error Thrown on failure.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send);
```

basic_stream_socket::shutdown (2 of 2 overloads)

Inherited from basic_socket.

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    shutdown_type what,
    boost::system::error_code & ec);
```

This function is used to disable send operations, receive operations, or both.

Parameters

what Determines what types of operation will no longer be allowed.

ec Set to indicate what error occurred, if any.

Example

Shutting down the send side of the socket:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::system::error_code ec;
socket.shutdown(boost::asio::ip::tcp::socket::shutdown_send, ec);
if (ec)
{
  // An error occurred.
}
```

basic_stream_socket::shutdown_type

Inherited from socket_base.

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive Shutdown the receive side of the socket.

shutdown_send Shutdown the send side of the socket.

shutdown_both Shutdown both send and receive on the socket.

basic_stream_socket::write_some

Write some data to the socket.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

basic_stream_socket::write_some (1 of 2 overloads)

Write some data to the socket.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

This function is used to write data to the stream socket. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers — One or more data buffers to be written to the socket.

Return Value

The number of bytes written.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
socket.write_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

basic_stream_socket::write_some (2 of 2 overloads)

Write some data to the socket.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to write data to the stream socket. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers One or more data buffers to be written to the socket.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes written. Returns 0 if an error occurred.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

basic_streambuf

Automatically resizable buffer class based on std::streambuf.

```
template<
    typename Allocator = std::allocator<char>>
class basic_streambuf :
  noncopyable
```

Types

Name	Description
const_buffers_type	The type used to represent the input sequence as a list of buffers.
mutable_buffers_type	The type used to represent the output sequence as a list of buffers.

Member Functions

Name	Description
basic_streambuf	Construct a basic_streambuf object.
commit	Move characters from the output sequence to the input sequence.
consume	Remove characters from the input sequence.
data	Get a list of buffers that represents the input sequence.
max_size	Get the maximum size of the basic_streambuf.
prepare	Get a list of buffers that represents the output sequence, with the given size.
size	Get the size of the input sequence.

Protected Member Functions

Name	Description
overflow	Override std::streambuf behaviour.
reserve	
underflow	Override std::streambuf behaviour.

The `basic_streambuf` class is derived from `std::streambuf` to associate the streambuf's input and output sequences with one or more character arrays. These character arrays are internal to the `basic_streambuf` object, but direct access to the array elements is provided to permit them to be used efficiently with I/O operations. Characters written to the output sequence of a `basic_streambuf` object are appended to the input sequence of the same object.

The `basic_streambuf` class's public interface is intended to permit the following implementation strategies:

- A single contiguous character array, which is reallocated as necessary to accommodate changes in the size of the character sequence. This is the implementation approach currently used in Asio.
- A sequence of one or more character arrays, where each array is of the same size. Additional character array objects are appended to the sequence to accommodate changes in the size of the character sequence.
- A sequence of one or more character arrays of varying sizes. Additional character array objects are appended to the sequence to accommodate changes in the size of the character sequence.

The constructor for `basic_streambuf` accepts a `size_t` argument specifying the maximum of the sum of the sizes of the input sequence and output sequence. During the lifetime of the `basic_streambuf` object, the following invariant holds:

```
size() <= max_size()
```

Any member function that would, if successful, cause the invariant to be violated shall throw an exception of class `std::length_error`.

The constructor for `basic_streambuf` takes an Allocator argument. A copy of this argument is used for any memory allocation performed, by the constructor and by all member functions, during the lifetime of each `basic_streambuf` object.

Examples

Writing directly from an streambuf to a socket:

```
boost::asio::streambuf b;
std::ostream os(&b);
os << "Hello, World!\n";

// try sending some data in input sequence
size_t n = sock.send(b.data());

b.consume(n); // sent data is removed from input sequence
```

Reading from a socket directly into a streambuf:

```
boost::asio::streambuf b;

// reserve 512 bytes in output sequence
boost::asio::streambuf::mutable_buffers_type bufs = b.prepare(512);

size_t n = sock.receive(bufs);

// received data is "committed" from output sequence to input sequence
b.commit(n);

std::istream is(&b);
std::string s;
is >> s;
```

Requirements

Header: `boost/asio/basic_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_streambuf::basic_streambuf

Construct a `basic_streambuf` object.

```
basic_streambuf(
    std::size_t max_size = (std::numeric_limits< std::size_t >::max)(),
    const Allocator & allocator = Allocator());
```

Constructs a streambuf with the specified maximum size. The initial size of the streambuf's input sequence is 0.

basic_streambuf::commit

Move characters from the output sequence to the input sequence.

```
void commit(
    std::size_t n);
```

Appends `n` characters from the start of the output sequence to the input sequence. The beginning of the output sequence is advanced by `n` characters.

Requires a preceding call `prepare(x)` where `x >= n`, and no intervening operations that modify the input or output sequence.

Exceptions

std::length_error	If `n` is greater than the size of the output sequence.

basic_streambuf::const_buffers_type

The type used to represent the input sequence as a list of buffers.

```
typedef implementation_defined const_buffers_type;
```

Requirements

Header: `boost/asio/basic_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_streambuf::consume

Remove characters from the input sequence.

```
void consume(
    std::size_t n);
```

Removes `n` characters from the beginning of the input sequence.

Exceptions

std::length_error	If `n > size()`.

basic_streambuf::data

Get a list of buffers that represents the input sequence.

```
const_buffers_type data() const;
```

Return Value

An object of type `const_buffers_type` that satisfies ConstBufferSequence requirements, representing all character arrays in the input sequence.

Remarks

The returned object is invalidated by any `basic_streambuf` member function that modifies the input sequence or output sequence.

basic_streambuf::max_size

Get the maximum size of the `basic_streambuf`.

```
std::size_t max_size() const;
```

Return Value

The allowed maximum of the sum of the sizes of the input sequence and output sequence.

basic_streambuf::mutable_buffers_type

The type used to represent the output sequence as a list of buffers.

```
typedef implementation_defined mutable_buffers_type;
```

Requirements

Header: `boost/asio/basic_streambuf.hpp`

Convenience header: `boost/asio.hpp`

basic_streambuf::overflow

Override std::streambuf behaviour.

```
int_type overflow(
    int_type c);
```

Behaves according to the specification of `std::streambuf::overflow()`, with the specialisation that `std::length_error` is thrown if appending the character to the input sequence would require the condition `size() > max_size()` to be true.

basic_streambuf::prepare

Get a list of buffers that represents the output sequence, with the given size.

```
mutable_buffers_type prepare(
    std::size_t n);
```

Ensures that the output sequence can accommodate `n` characters, reallocating character array objects as necessary.

Return Value

An object of type `mutable_buffers_type` that satisfies MutableBufferSequence requirements, representing character array objects at the start of the output sequence such that the sum of the buffer sizes is `n`.

Exceptions

std::length_error	If `size() + n > max_size()`.

Remarks

The returned object is invalidated by any `basic_streambuf` member function that modifies the input sequence or output sequence.

basic_streambuf::reserve

```
void reserve(
    std::size_t n);
```

basic_streambuf::size

Get the size of the input sequence.

```
std::size_t size() const;
```

Return Value

The size of the input sequence. The value is equal to that calculated for `s` in the following code:

```
size_t s = 0;
const_buffers_type bufs = data();
const_buffers_type::const_iterator i = bufs.begin();
while (i != bufs.end())
{
  const_buffer buf(*i++);
  s += buffer_size(buf);
}
```

basic_streambuf::underflow

Override std::streambuf behaviour.

```
int_type underflow();
```

Behaves according to the specification of `std::streambuf::underflow()`.

buffer

The `boost::asio::buffer` function is used to create a buffer object to represent raw memory, an array of POD elements, a vector of POD elements, or a std::string.

```
mutable_buffers_1 buffer(
    const mutable_buffer & b);
  » more...

mutable_buffers_1 buffer(
    const mutable_buffer & b,
    std::size_t max_size_in_bytes);
  » more...

const_buffers_1 buffer(
    const const_buffer & b);
  » more...

const_buffers_1 buffer(
    const const_buffer & b,
    std::size_t max_size_in_bytes);
  » more...

mutable_buffers_1 buffer(
    void * data,
    std::size_t size_in_bytes);
  » more...

const_buffers_1 buffer(
    const void * data,
    std::size_t size_in_bytes);
  » more...

template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    PodType (&data)[N]);
  » more...

template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    PodType (&data)[N],
    std::size_t max_size_in_bytes);
  » more...

template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const PodType (&data)[N]);
  » more...

template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const PodType (&data)[N],
    std::size_t max_size_in_bytes);
  » more...

template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    boost::array< PodType, N > & data);
```

```
  » more...

template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    boost::array< PodType, N > & data,
    std::size_t max_size_in_bytes);
  » more...

template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    boost::array< const PodType, N > & data);
  » more...

template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    boost::array< const PodType, N > & data,
    std::size_t max_size_in_bytes);
  » more...

template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const boost::array< PodType, N > & data);
  » more...

template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const boost::array< PodType, N > & data,
    std::size_t max_size_in_bytes);
  » more...

template<
    typename PodType,
    typename Allocator>
mutable_buffers_1 buffer(
    std::vector< PodType, Allocator > & data);
  » more...

template<
    typename PodType,
    typename Allocator>
mutable_buffers_1 buffer(
    std::vector< PodType, Allocator > & data,
    std::size_t max_size_in_bytes);
  » more...

template<
    typename PodType,
    typename Allocator>
const_buffers_1 buffer(
    const std::vector< PodType, Allocator > & data);
  » more...

template<
```

```
    typename PodType,
    typename Allocator>
const_buffers_1 buffer(
    const std::vector< PodType, Allocator > & data,
    std::size_t max_size_in_bytes);
  » more...

const_buffers_1 buffer(
    const std::string & data);
  » more...

const_buffers_1 buffer(
    const std::string & data,
    std::size_t max_size_in_bytes);
  » more...
```

A buffer object represents a contiguous region of memory as a 2-tuple consisting of a pointer and size in bytes. A tuple of the form `{void*, size_t}` specifies a mutable (modifiable) region of memory. Similarly, a tuple of the form `{const void*, size_t}` specifies a const (non-modifiable) region of memory. These two forms correspond to the classes `mutable_buffer` and `const_buffer`, respectively. To mirror C++'s conversion rules, a `mutable_buffer` is implicitly convertible to a `const_buffer`, and the opposite conversion is not permitted.

The simplest use case involves reading or writing a single buffer of a specified size:

```
sock.send(boost::asio::buffer(data, size));
```

In the above example, the return value of `boost::asio::buffer` meets the requirements of the ConstBufferSequence concept so that it may be directly passed to the socket's write function. A buffer created for modifiable memory also meets the requirements of the MutableBufferSequence concept.

An individual buffer may be created from a builtin array, std::vector or boost::array of POD elements. This helps prevent buffer overruns by automatically determining the size of the buffer:

```
char d1[128];
size_t bytes_transferred = sock.receive(boost::asio::buffer(d1));

std::vector<char> d2(128);
bytes_transferred = sock.receive(boost::asio::buffer(d2));

boost::array<char, 128> d3;
bytes_transferred = sock.receive(boost::asio::buffer(d3));
```

In all three cases above, the buffers created are exactly 128 bytes long. Note that a vector is **never** automatically resized when creating or using a buffer. The buffer size is determined using the vector's `size()` member function, and not its capacity.

Accessing Buffer Contents

The contents of a buffer may be accessed using the boost::asio::buffer_size and boost::asio::buffer_cast functions:

```
boost::asio::mutable_buffer b1 = ...;
std::size_t s1 = boost::asio::buffer_size(b1);
unsigned char* p1 = boost::asio::buffer_cast<unsigned char*>(b1);

boost::asio::const_buffer b2 = ...;
std::size_t s2 = boost::asio::buffer_size(b2);
const void* p2 = boost::asio::buffer_cast<const void*>(b2);
```

The boost::asio::buffer_cast function permits violations of type safety, so uses of it in application code should be carefully considered.

Buffer Invalidation

A buffer object does not have any ownership of the memory it refers to. It is the responsibility of the application to ensure the memory region remains valid until it is no longer required for an I/O operation. When the memory is no longer available, the buffer is said to have been invalidated.

For the `boost::asio::buffer` overloads that accept an argument of type std::vector, the buffer objects returned are invalidated by any vector operation that also invalidates all references, pointers and iterators referring to the elements in the sequence (C++ Std, 23.2.4)

For the `boost::asio::buffer` overloads that accept an argument of type std::string, the buffer objects returned are invalidated according to the rules defined for invalidation of references, pointers and iterators referring to elements of the sequence (C++ Std, 21.3).

Buffer Arithmetic

Buffer objects may be manipulated using simple arithmetic in a safe way which helps prevent buffer overruns. Consider an array initialised as follows:

```
boost::array<char, 6> a = { 'a', 'b', 'c', 'd', 'e' };
```

A buffer object `b1` created using:

```
b1 = boost::asio::buffer(a);
```

represents the entire array, `{ 'a', 'b', 'c', 'd', 'e' }`. An optional second argument to the `boost::asio::buffer` function may be used to limit the size, in bytes, of the buffer:

```
b2 = boost::asio::buffer(a, 3);
```

such that `b2` represents the data `{ 'a', 'b', 'c' }`. Even if the size argument exceeds the actual size of the array, the size of the buffer object created will be limited to the array size.

An offset may be applied to an existing buffer to create a new one:

```
b3 = b1 + 2;
```

where `b3` will set to represent `{ 'c', 'd', 'e' }`. If the offset exceeds the size of the existing buffer, the newly created buffer will be empty.

Both an offset and size may be specified to create a buffer that corresponds to a specific range of bytes within an existing buffer:

```
b4 = boost::asio::buffer(b1 + 1, 3);
```

so that `b4` will refer to the bytes `{ 'b', 'c', 'd' }`.

Buffers and Scatter-Gather I/O

To read or write using multiple buffers (i.e. scatter-gather I/O), multiple buffer objects may be assigned into a container that supports the MutableBufferSequence (for read) or ConstBufferSequence (for write) concepts:

```
char d1[128];
std::vector<char> d2(128);
boost::array<char, 128> d3;

boost::array<mutable_buffer, 3> bufs1 = {
  boost::asio::buffer(d1),
  boost::asio::buffer(d2),
  boost::asio::buffer(d3) };
bytes_transferred = sock.receive(bufs1);

std::vector<const_buffer> bufs2;
bufs2.push_back(boost::asio::buffer(d1));
bufs2.push_back(boost::asio::buffer(d2));
bufs2.push_back(boost::asio::buffer(d3));
bytes_transferred = sock.send(bufs2);
```

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

buffer (1 of 22 overloads)

Create a new modifiable buffer from an existing buffer.

```
mutable_buffers_1 buffer(
    const mutable_buffer & b);
```

Return Value

`mutable_buffers_1(b)`.

buffer (2 of 22 overloads)

Create a new modifiable buffer from an existing buffer.

```
mutable_buffers_1 buffer(
    const mutable_buffer & b,
    std::size_t max_size_in_bytes);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    buffer_cast<void*>(b),
    min(buffer_size(b), max_size_in_bytes));
```

buffer (3 of 22 overloads)

Create a new non-modifiable buffer from an existing buffer.

```
const_buffers_1 buffer(
    const const_buffer & b);
```

Return Value

`const_buffers_1(b)`.

buffer (4 of 22 overloads)

Create a new non-modifiable buffer from an existing buffer.

```
const_buffers_1 buffer(
    const const_buffer & b,
    std::size_t max_size_in_bytes);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    buffer_cast<const void*>(b),
    min(buffer_size(b), max_size_in_bytes));
```

buffer (5 of 22 overloads)

Create a new modifiable buffer that represents the given memory range.

```
mutable_buffers_1 buffer(
    void * data,
    std::size_t size_in_bytes);
```

Return Value

`mutable_buffers_1(data, size_in_bytes)`.

buffer (6 of 22 overloads)

Create a new non-modifiable buffer that represents the given memory range.

```
const_buffers_1 buffer(
    const void * data,
    std::size_t size_in_bytes);
```

Return Value

`const_buffers_1(data, size_in_bytes)`.

buffer (7 of 22 overloads)

Create a new modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    PodType (&data)[N]);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    static_cast<void*>(data),
    N * sizeof(PodType));
```

buffer (8 of 22 overloads)

Create a new modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    PodType (&data)[N],
    std::size_t max_size_in_bytes);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    static_cast<void*>(data),
    min(N * sizeof(PodType), max_size_in_bytes));
```

buffer (9 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const PodType (&data)[N]);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    static_cast<const void*>(data),
    N * sizeof(PodType));
```

buffer (10 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const PodType (&data)[N],
    std::size_t max_size_in_bytes);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    static_cast<const void*>(data),
    min(N * sizeof(PodType), max_size_in_bytes));
```

buffer (11 of 22 overloads)

Create a new modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    boost::array< PodType, N > & data);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    data.data(),
    data.size() * sizeof(PodType));
```

buffer (12 of 22 overloads)

Create a new modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
mutable_buffers_1 buffer(
    boost::array< PodType, N > & data,
    std::size_t max_size_in_bytes);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    data.data(),
    min(data.size() * sizeof(PodType), max_size_in_bytes));
```

buffer (13 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    boost::array< const PodType, N > & data);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.data(),
    data.size() * sizeof(PodType));
```

buffer (14 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    boost::array< const PodType, N > & data,
    std::size_t max_size_in_bytes);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.data(),
    min(data.size() * sizeof(PodType), max_size_in_bytes));
```

buffer (15 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const boost::array< PodType, N > & data);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.data(),
    data.size() * sizeof(PodType));
```

buffer (16 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD array.

```
template<
    typename PodType,
    std::size_t N>
const_buffers_1 buffer(
    const boost::array< PodType, N > & data,
    std::size_t max_size_in_bytes);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.data(),
    min(data.size() * sizeof(PodType), max_size_in_bytes));
```

buffer (17 of 22 overloads)

Create a new modifiable buffer that represents the given POD vector.

```
template<
    typename PodType,
    typename Allocator>
mutable_buffers_1 buffer(
    std::vector< PodType, Allocator > & data);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    data.size() ? &data[0] : 0,
    data.size() * sizeof(PodType));
```

Remarks

The buffer is invalidated by any vector operation that would also invalidate iterators.

buffer (18 of 22 overloads)

Create a new modifiable buffer that represents the given POD vector.

```
template<
    typename PodType,
    typename Allocator>
mutable_buffers_1 buffer(
    std::vector< PodType, Allocator > & data,
    std::size_t max_size_in_bytes);
```

Return Value

A `mutable_buffers_1` value equivalent to:

```
mutable_buffers_1(
    data.size() ? &data[0] : 0,
    min(data.size() * sizeof(PodType), max_size_in_bytes));
```

Remarks

The buffer is invalidated by any vector operation that would also invalidate iterators.

buffer (19 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD vector.

```
template<
    typename PodType,
    typename Allocator>
const_buffers_1 buffer(
    const std::vector< PodType, Allocator > & data);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.size() ? &data[0] : 0,
    data.size() * sizeof(PodType));
```

Remarks

The buffer is invalidated by any vector operation that would also invalidate iterators.

buffer (20 of 22 overloads)

Create a new non-modifiable buffer that represents the given POD vector.

```
template<
    typename PodType,
    typename Allocator>
const_buffers_1 buffer(
    const std::vector< PodType, Allocator > & data,
    std::size_t max_size_in_bytes);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.size() ? &data[0] : 0,
    min(data.size() * sizeof(PodType), max_size_in_bytes));
```

Remarks

The buffer is invalidated by any vector operation that would also invalidate iterators.

buffer (21 of 22 overloads)

Create a new non-modifiable buffer that represents the given string.

```
const_buffers_1 buffer(
    const std::string & data);
```

Return Value

`const_buffers_1(data.data(), data.size())`.

Remarks

The buffer is invalidated by any non-const operation called on the given string object.

buffer (22 of 22 overloads)

Create a new non-modifiable buffer that represents the given string.

```
const_buffers_1 buffer(
    const std::string & data,
    std::size_t max_size_in_bytes);
```

Return Value

A `const_buffers_1` value equivalent to:

```
const_buffers_1(
    data.data(),
    min(data.size(), max_size_in_bytes));
```

Remarks

The buffer is invalidated by any non-const operation called on the given string object.

buffered_read_stream

Adds buffering to the read-related operations of a stream.

```
template<
    typename Stream>
class buffered_read_stream :
  noncopyable
```

Types

Name	Description
lowest_layer_type	The type of the lowest layer.
next_layer_type	The type of the next layer.

Member Functions

Name	Description
async_fill	Start an asynchronous fill.
async_read_some	Start an asynchronous read. The buffer into which the data will be read must be valid for the lifetime of the asynchronous operation.
async_write_some	Start an asynchronous write. The data being written must be valid for the lifetime of the asynchronous operation.
buffered_read_stream	Construct, passing the specified argument to initialise the next layer.
close	Close the stream.
fill	Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation. Throws an exception on failure. Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation, or 0 if an error occurred.
get_io_service	Get the io_service associated with the object.
in_avail	Determine the amount of data that may be read without blocking.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
next_layer	Get a reference to the next layer.
peek	Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure. Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.
read_some	Read some data from the stream. Returns the number of bytes read. Throws an exception on failure. Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.
write_some	Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure. Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred.

Data Members

Name	Description
default_buffer_size	The default buffer size.

The `buffered_read_stream` class template can be used to add buffering to the synchronous and asynchronous read operations of a stream.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/buffered_read_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_read_stream::async_fill

Start an asynchronous fill.

```
template<
    typename ReadHandler>
void async_fill(
    ReadHandler handler);
```

buffered_read_stream::async_read_some

Start an asynchronous read. The buffer into which the data will be read must be valid for the lifetime of the asynchronous operation.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

buffered_read_stream::async_write_some

Start an asynchronous write. The data being written must be valid for the lifetime of the asynchronous operation.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

buffered_read_stream::buffered_read_stream

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
explicit buffered_read_stream(
    Arg & a);
  » more...

template<
    typename Arg>
buffered_read_stream(
    Arg & a,
    std::size_t buffer_size);
  » more...
```

buffered_read_stream::buffered_read_stream (1 of 2 overloads)

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
buffered_read_stream(
    Arg & a);
```

buffered_read_stream::buffered_read_stream (2 of 2 overloads)

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
buffered_read_stream(
    Arg & a,
    std::size_t buffer_size);
```

buffered_read_stream::close

Close the stream.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

buffered_read_stream::close (1 of 2 overloads)

Close the stream.

```
void close();
```

buffered_read_stream::close (2 of 2 overloads)

Close the stream.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

buffered_read_stream::default_buffer_size

The default buffer size.

```
static const std::size_t default_buffer_size = implementation_defined;
```

buffered_read_stream::fill

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation. Throws an exception on failure.

```
std::size_t fill();
  » more...
```

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation, or 0 if an error occurred.

```
std::size_t fill(
    boost::system::error_code & ec);
  » more...
```

buffered_read_stream::fill (1 of 2 overloads)

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation. Throws an exception on failure.

```
std::size_t fill();
```

buffered_read_stream::fill (2 of 2 overloads)

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation, or 0 if an error occurred.

```
std::size_t fill(
    boost::system::error_code & ec);
```

buffered_read_stream::get_io_service

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

buffered_read_stream::in_avail

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
  » more...

std::size_t in_avail(
    boost::system::error_code & ec);
  » more...
```

buffered_read_stream::in_avail (1 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
```

buffered_read_stream::in_avail (2 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail(
    boost::system::error_code & ec);
```

buffered_read_stream::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

buffered_read_stream::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

buffered_read_stream::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

buffered_read_stream::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

buffered_read_stream::lowest_layer_type

The type of the lowest layer.

```
typedef next_layer_type::lowest_layer_type lowest_layer_type;
```

Requirements

Header: `boost/asio/buffered_read_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_read_stream::next_layer

Get a reference to the next layer.

```
next_layer_type & next_layer();
```

buffered_read_stream::next_layer_type

The type of the next layer.

```
typedef boost::remove_reference< Stream >::type next_layer_type;
```

Requirements

Header: `boost/asio/buffered_read_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_read_stream::peek

Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
  » more...
```

Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_read_stream::peek (1 of 2 overloads)

Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
```

buffered_read_stream::peek (2 of 2 overloads)

Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_read_stream::read_some

Read some data from the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...
```

Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_read_stream::read_some (1 of 2 overloads)

Read some data from the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

buffered_read_stream::read_some (2 of 2 overloads)

Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_read_stream::write_some

Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...
```

Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_read_stream::write_some (1 of 2 overloads)

Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

buffered_read_stream::write_some (2 of 2 overloads)

Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_stream

Adds buffering to the read- and write-related operations of a stream.

```
template<
    typename Stream>
class buffered_stream :
  noncopyable
```

Types

Name	Description
lowest_layer_type	The type of the lowest layer.
next_layer_type	The type of the next layer.

Member Functions

Name	Description
async_fill	Start an asynchronous fill.
async_flush	Start an asynchronous flush.
async_read_some	Start an asynchronous read. The buffer into which the data will be read must be valid for the lifetime of the asynchronous operation.
async_write_some	Start an asynchronous write. The data being written must be valid for the lifetime of the asynchronous operation.
buffered_stream	Construct, passing the specified argument to initialise the next layer.
close	Close the stream.
fill	Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation. Throws an exception on failure. Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation, or 0 if an error occurred.
flush	Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation. Throws an exception on failure. Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation, or 0 if an error occurred.
get_io_service	Get the io_service associated with the object.
in_avail	Determine the amount of data that may be read without blocking.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
next_layer	Get a reference to the next layer.
peek	Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure. Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.
read_some	Read some data from the stream. Returns the number of bytes read. Throws an exception on failure. Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.
write_some	Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure. Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred.

The `buffered_stream` class template can be used to add buffering to the synchronous and asynchronous read and write operations of a stream.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/buffered_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_stream::async_fill

Start an asynchronous fill.

```
template<
    typename ReadHandler>
void async_fill(
    ReadHandler handler);
```

buffered_stream::async_flush

Start an asynchronous flush.

```
template<
    typename WriteHandler>
void async_flush(
    WriteHandler handler);
```

buffered_stream::async_read_some

Start an asynchronous read. The buffer into which the data will be read must be valid for the lifetime of the asynchronous operation.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

buffered_stream::async_write_some

Start an asynchronous write. The data being written must be valid for the lifetime of the asynchronous operation.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

buffered_stream::buffered_stream

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
explicit buffered_stream(
    Arg & a);
  » more...

template<
    typename Arg>
explicit buffered_stream(
    Arg & a,
    std::size_t read_buffer_size,
    std::size_t write_buffer_size);
  » more...
```

buffered_stream::buffered_stream (1 of 2 overloads)

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
buffered_stream(
    Arg & a);
```

buffered_stream::buffered_stream (2 of 2 overloads)

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
buffered_stream(
    Arg & a,
    std::size_t read_buffer_size,
    std::size_t write_buffer_size);
```

buffered_stream::close

Close the stream.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

buffered_stream::close (1 of 2 overloads)

Close the stream.

```
void close();
```

buffered_stream::close (2 of 2 overloads)

Close the stream.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

buffered_stream::fill

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation. Throws an exception on failure.

```
std::size_t fill();
  » more...
```

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation, or 0 if an error occurred.

```
std::size_t fill(
    boost::system::error_code & ec);
  » more...
```

buffered_stream::fill (1 of 2 overloads)

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation. Throws an exception on failure.

```
std::size_t fill();
```

buffered_stream::fill (2 of 2 overloads)

Fill the buffer with some data. Returns the number of bytes placed in the buffer as a result of the operation, or 0 if an error occurred.

```
std::size_t fill(
    boost::system::error_code & ec);
```

buffered_stream::flush

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation. Throws an exception on failure.

```
std::size_t flush();
  » more...
```

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation, or 0 if an error occurred.

```
std::size_t flush(
    boost::system::error_code & ec);
  » more...
```

buffered_stream::flush (1 of 2 overloads)

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation. Throws an exception on failure.

```
std::size_t flush();
```

buffered_stream::flush (2 of 2 overloads)

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation, or 0 if an error occurred.

```
std::size_t flush(
    boost::system::error_code & ec);
```

buffered_stream::get_io_service

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

buffered_stream::in_avail

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
  » more...

std::size_t in_avail(
    boost::system::error_code & ec);
  » more...
```

buffered_stream::in_avail (1 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
```

buffered_stream::in_avail (2 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail(
    boost::system::error_code & ec);
```

buffered_stream::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

buffered_stream::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

buffered_stream::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

buffered_stream::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

buffered_stream::lowest_layer_type

The type of the lowest layer.

```
typedef next_layer_type::lowest_layer_type lowest_layer_type;
```

Requirements

Header: `boost/asio/buffered_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_stream::next_layer

Get a reference to the next layer.

```
next_layer_type & next_layer();
```

buffered_stream::next_layer_type

The type of the next layer.

```
typedef boost::remove_reference< Stream >::type next_layer_type;
```

Requirements

Header: `boost/asio/buffered_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_stream::peek

Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
  » more...
```

Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_stream::peek (1 of 2 overloads)

Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
```

buffered_stream::peek (2 of 2 overloads)

Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_stream::read_some

Read some data from the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...
```

Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_stream::read_some (1 of 2 overloads)

Read some data from the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

buffered_stream::read_some (2 of 2 overloads)

Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_stream::write_some

Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...
```

Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_stream::write_some (1 of 2 overloads)

Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

buffered_stream::write_some (2 of 2 overloads)

Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_write_stream

Adds buffering to the write-related operations of a stream.

```
template<
    typename Stream>
class buffered_write_stream :
  noncopyable
```

Types

Name	Description
lowest_layer_type	The type of the lowest layer.
next_layer_type	The type of the next layer.

Member Functions

Name	Description
async_flush	Start an asynchronous flush.
async_read_some	Start an asynchronous read. The buffer into which the data will be read must be valid for the lifetime of the asynchronous operation.
async_write_some	Start an asynchronous write. The data being written must be valid for the lifetime of the asynchronous operation.
buffered_write_stream	Construct, passing the specified argument to initialise the next layer.
close	Close the stream.
flush	Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation. Throws an exception on failure. Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation, or 0 if an error occurred.
get_io_service	Get the io_service associated with the object.
in_avail	Determine the amount of data that may be read without blocking.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
next_layer	Get a reference to the next layer.
peek	Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure. Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.
read_some	Read some data from the stream. Returns the number of bytes read. Throws an exception on failure. Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.
write_some	Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure. Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred and the error handler did not throw.

Data Members

Name	Description
default_buffer_size	The default buffer size.

The `buffered_write_stream` class template can be used to add buffering to the synchronous and asynchronous write operations of a stream.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/buffered_write_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_write_stream::async_flush

Start an asynchronous flush.

```
template<
    typename WriteHandler>
void async_flush(
    WriteHandler handler);
```

buffered_write_stream::async_read_some

Start an asynchronous read. The buffer into which the data will be read must be valid for the lifetime of the asynchronous operation.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

buffered_write_stream::async_write_some

Start an asynchronous write. The data being written must be valid for the lifetime of the asynchronous operation.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

buffered_write_stream::buffered_write_stream

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
explicit buffered_write_stream(
    Arg & a);
  » more...

template<
    typename Arg>
buffered_write_stream(
    Arg & a,
    std::size_t buffer_size);
  » more...
```

buffered_write_stream::buffered_write_stream (1 of 2 overloads)

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
buffered_write_stream(
    Arg & a);
```

buffered_write_stream::buffered_write_stream (2 of 2 overloads)

Construct, passing the specified argument to initialise the next layer.

```
template<
    typename Arg>
buffered_write_stream(
    Arg & a,
    std::size_t buffer_size);
```

buffered_write_stream::close

Close the stream.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

buffered_write_stream::close (1 of 2 overloads)

Close the stream.

```
void close();
```

buffered_write_stream::close (2 of 2 overloads)

Close the stream.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

buffered_write_stream::default_buffer_size

The default buffer size.

```
static const std::size_t default_buffer_size = implementation_defined;
```

buffered_write_stream::flush

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation. Throws an exception on failure.

```
std::size_t flush();
  » more...
```

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation, or 0 if an error occurred.

```
std::size_t flush(
    boost::system::error_code & ec);
  » more...
```

buffered_write_stream::flush (1 of 2 overloads)

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation. Throws an exception on failure.

```
std::size_t flush();
```

buffered_write_stream::flush (2 of 2 overloads)

Flush all data from the buffer to the next layer. Returns the number of bytes written to the next layer on the last write operation, or 0 if an error occurred.

```
std::size_t flush(
    boost::system::error_code & ec);
```

buffered_write_stream::get_io_service

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

buffered_write_stream::in_avail

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
  » more...

std::size_t in_avail(
    boost::system::error_code & ec);
  » more...
```

buffered_write_stream::in_avail (1 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
```

buffered_write_stream::in_avail (2 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail(
    boost::system::error_code & ec);
```

buffered_write_stream::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

buffered_write_stream::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

buffered_write_stream::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

buffered_write_stream::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

buffered_write_stream::lowest_layer_type

The type of the lowest layer.

```
typedef next_layer_type::lowest_layer_type lowest_layer_type;
```

Requirements

Header: `boost/asio/buffered_write_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_write_stream::next_layer

Get a reference to the next layer.

```
next_layer_type & next_layer();
```

buffered_write_stream::next_layer_type

The type of the next layer.

```
typedef boost::remove_reference< Stream >::type next_layer_type;
```

Requirements

Header: `boost/asio/buffered_write_stream.hpp`

Convenience header: `boost/asio.hpp`

buffered_write_stream::peek

Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
  » more...
```

Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_write_stream::peek (1 of 2 overloads)

Peek at the incoming data on the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
```

buffered_write_stream::peek (2 of 2 overloads)

Peek at the incoming data on the stream. Returns the number of bytes read, or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_write_stream::read_some

Read some data from the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...
```

Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_write_stream::read_some (1 of 2 overloads)

Read some data from the stream. Returns the number of bytes read. Throws an exception on failure.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

buffered_write_stream::read_some (2 of 2 overloads)

Read some data from the stream. Returns the number of bytes read or 0 if an error occurred.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffered_write_stream::write_some

Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...
```

Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred and the error handler did not throw.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

buffered_write_stream::write_some (1 of 2 overloads)

Write the given data to the stream. Returns the number of bytes written. Throws an exception on failure.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

buffered_write_stream::write_some (2 of 2 overloads)

Write the given data to the stream. Returns the number of bytes written, or 0 if an error occurred and the error handler did not throw.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

buffers_begin

Construct an iterator representing the beginning of the buffers' data.

```
template<
    typename BufferSequence>
buffers_iterator< BufferSequence > buffers_begin(
    const BufferSequence & buffers);
```

Requirements

Header: `boost/asio/buffers_iterator.hpp`

Convenience header: `boost/asio.hpp`

buffers_end

Construct an iterator representing the end of the buffers' data.

```
template<
    typename BufferSequence>
buffers_iterator< BufferSequence > buffers_end(
    const BufferSequence & buffers);
```

Requirements

Header: `boost/asio/buffers_iterator.hpp`

Convenience header: `boost/asio.hpp`

buffers_iterator

A random access iterator over the bytes in a buffer sequence.

```
template<
    typename BufferSequence,
    typename ByteType = char>
class buffers_iterator
```

Member Functions

Name	Description
begin	Construct an iterator representing the beginning of the buffers' data.
buffers_iterator	Default constructor. Creates an iterator in an undefined state.
end	Construct an iterator representing the end of the buffers' data.

Requirements

Header: `boost/asio/buffers_iterator.hpp`

Convenience header: `boost/asio.hpp`

buffers_iterator::begin

Construct an iterator representing the beginning of the buffers' data.

```
static buffers_iterator begin(
    const BufferSequence & buffers);
```

buffers_iterator::buffers_iterator

Default constructor. Creates an iterator in an undefined state.

```
buffers_iterator();
```

buffers_iterator::end

Construct an iterator representing the end of the buffers' data.

```
static buffers_iterator end(
    const BufferSequence & buffers);
```

const_buffer

Holds a buffer that cannot be modified.

```
class const_buffer
```

Member Functions

Name	Description
const_buffer	Construct an empty buffer. Construct a buffer to represent a given memory range. Construct a non-modifiable buffer from a modifiable one.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new non-modifiable buffer that is offset from the start of another.

The `const_buffer` class provides a safe representation of a buffer that cannot be modified. It does not own the underlying data, and so is cheap to copy or assign.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

const_buffer::buffer_cast

Cast a non-modifiable buffer to a specified pointer to POD type.

```
template<
    typename PointerToPodType>
PointerToPodType buffer_cast(
    const const_buffer & b);
```

const_buffer::buffer_size

Get the number of bytes in a non-modifiable buffer.

```
std::size_t buffer_size(
    const const_buffer & b);
```

const_buffer::const_buffer

Construct an empty buffer.

```
const_buffer();
  » more...
```

Construct a buffer to represent a given memory range.

```
const_buffer(
    const void * data,
    std::size_t size);
  » more...
```

Construct a non-modifiable buffer from a modifiable one.

```
const_buffer(
    const mutable_buffer & b);
  » more...
```

const_buffer::const_buffer (1 of 3 overloads)

Construct an empty buffer.

```
const_buffer();
```

const_buffer::const_buffer (2 of 3 overloads)

Construct a buffer to represent a given memory range.

```
const_buffer(
    const void * data,
    std::size_t size);
```

const_buffer::const_buffer (3 of 3 overloads)

Construct a non-modifiable buffer from a modifiable one.

```
const_buffer(
    const mutable_buffer & b);
```

const_buffer::operator+

Create a new non-modifiable buffer that is offset from the start of another.

```
const_buffer operator+(
    const const_buffer & b,
    std::size_t start);
  » more...

const_buffer operator+(
    std::size_t start,
    const const_buffer & b);
  » more...
```

const_buffer::operator+ (1 of 2 overloads)

Create a new non-modifiable buffer that is offset from the start of another.

```
const_buffer operator+(
    const const_buffer & b,
    std::size_t start);
```

const_buffer::operator+ (2 of 2 overloads)

Create a new non-modifiable buffer that is offset from the start of another.

```
const_buffer operator+(
    std::size_t start,
    const const_buffer & b);
```

const_buffers_1

Adapts a single non-modifiable buffer so that it meets the requirements of the ConstBufferSequence concept.

```
class const_buffers_1 :
  public const_buffer
```

Types

Name	Description
const_iterator	A random-access iterator type that may be used to read elements.
value_type	The type for each element in the list of buffers.

Member Functions

Name	Description
begin	Get a random-access iterator to the first element.
const_buffers_1	Construct to represent a given memory range. Construct to represent a single non-modifiable buffer.
end	Get a random-access iterator for one past the last element.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new non-modifiable buffer that is offset from the start of another.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

const_buffers_1::begin

Get a random-access iterator to the first element.

```
const_iterator begin() const;
```

const_buffers_1::buffer_cast

Inherited from const_buffer.

Cast a non-modifiable buffer to a specified pointer to POD type.

```
template<
    typename PointerToPodType>
PointerToPodType buffer_cast(
    const const_buffer & b);
```

const_buffers_1::buffer_size

Inherited from const_buffer.

Get the number of bytes in a non-modifiable buffer.

```
std::size_t buffer_size(
    const const_buffer & b);
```

const_buffers_1::const_buffers_1

Construct to represent a given memory range.

```
const_buffers_1(
    const void * data,
    std::size_t size);
  » more...
```

Construct to represent a single non-modifiable buffer.

```
explicit const_buffers_1(
    const const_buffer & b);
  » more...
```

const_buffers_1::const_buffers_1 (1 of 2 overloads)

Construct to represent a given memory range.

```
const_buffers_1(
    const void * data,
    std::size_t size);
```

const_buffers_1::const_buffers_1 (2 of 2 overloads)

Construct to represent a single non-modifiable buffer.

```
const_buffers_1(
    const const_buffer & b);
```

const_buffers_1::const_iterator

A random-access iterator type that may be used to read elements.

```
typedef const const_buffer * const_iterator;
```

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

const_buffers_1::end

Get a random-access iterator for one past the last element.

```
const_iterator end() const;
```

const_buffers_1::operator+

Create a new non-modifiable buffer that is offset from the start of another.

```
const_buffer operator+(
    const const_buffer & b,
    std::size_t start);
  » more...

const_buffer operator+(
    std::size_t start,
    const const_buffer & b);
  » more...
```

const_buffers_1::operator+ (1 of 2 overloads)

Inherited from const_buffer.

Create a new non-modifiable buffer that is offset from the start of another.

```
const_buffer operator+(
    const const_buffer & b,
    std::size_t start);
```

const_buffers_1::operator+ (2 of 2 overloads)

Inherited from const_buffer.

Create a new non-modifiable buffer that is offset from the start of another.

```
const_buffer operator+(
    std::size_t start,
    const const_buffer & b);
```

const_buffers_1::value_type

The type for each element in the list of buffers.

```
typedef const_buffer value_type;
```

Member Functions

Name	Description
const_buffer	Construct an empty buffer. Construct a buffer to represent a given memory range. Construct a non-modifiable buffer from a modifiable one.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new non-modifiable buffer that is offset from the start of another.

The `const_buffer` class provides a safe representation of a buffer that cannot be modified. It does not own the underlying data, and so is cheap to copy or assign.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

datagram_socket_service

Default service implementation for a datagram socket.

```
template<
    typename Protocol>
class datagram_socket_service :
  public io_service::service
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The type of a datagram socket.
native_type	The native socket type.
protocol_type	The protocol type.

Member Functions

Name	Description
assign	Assign an existing native socket to a datagram socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive.
async_receive_from	Start an asynchronous receive that will get the endpoint of the sender.
async_send	Start an asynchronous send.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
bind	
cancel	Cancel all asynchronous operations associated with the socket.
close	Close a datagram socket implementation.
connect	Connect the datagram socket to the specified endpoint.
construct	Construct a new datagram socket implementation.
datagram_socket_service	Construct a new datagram socket service for the specified io_service.
destroy	Destroy a datagram socket implementation.
get_io_service	Get the io_service object that owns the service.
get_option	Get a socket option.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint.
native	Get the native socket implementation.
open	
receive	Receive some data from the peer.
receive_from	Receive a datagram with the endpoint of the sender.
remote_endpoint	Get the remote endpoint.
send	Send the given data to the peer.
send_to	Send a datagram to the specified endpoint.

Name	Description
set_option	Set a socket option.
shutdown	Disable sends or receives on the socket.
shutdown_service	Destroy all user-defined handler objects owned by the service.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/datagram_socket_service.hpp`

Convenience header: `boost/asio.hpp`

datagram_socket_service::assign

Assign an existing native socket to a datagram socket.

```
boost::system::error_code assign(
    implementation_type & impl,
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

datagram_socket_service::async_connect

Start an asynchronous connect.

```
template<
    typename ConnectHandler>
void async_connect(
    implementation_type & impl,
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

datagram_socket_service::async_receive

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
```

datagram_socket_service::async_receive_from

Start an asynchronous receive that will get the endpoint of the sender.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    ReadHandler handler);
```

datagram_socket_service::async_send

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
```

datagram_socket_service::async_send_to

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    WriteHandler handler);
```

datagram_socket_service::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

datagram_socket_service::available

Determine the number of bytes available for reading.

```
std::size_t available(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

datagram_socket_service::bind

```
boost::system::error_code bind(
    implementation_type & impl,
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

datagram_socket_service::cancel

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

datagram_socket_service::close

Close a datagram socket implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

datagram_socket_service::connect

Connect the datagram socket to the specified endpoint.

```
boost::system::error_code connect(
    implementation_type & impl,
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

datagram_socket_service::construct

Construct a new datagram socket implementation.

```
void construct(
    implementation_type & impl);
```

datagram_socket_service::datagram_socket_service

Construct a new datagram socket service for the specified `io_service`.

```
datagram_socket_service(
    boost::asio::io_service & io_service);
```

datagram_socket_service::destroy

Destroy a datagram socket implementation.

```
void destroy(
    implementation_type & impl);
```

datagram_socket_service::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/datagram_socket_service.hpp`

Convenience header: `boost/asio.hpp`

datagram_socket_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

datagram_socket_service::get_option

Get a socket option.

```
template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    const implementation_type & impl,
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

datagram_socket_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

datagram_socket_service::implementation_type

The type of a datagram socket.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/datagram_socket_service.hpp`

Convenience header: `boost/asio.hpp`

datagram_socket_service::io_control

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    implementation_type & impl,
    IoControlCommand & command,
    boost::system::error_code & ec);
```

datagram_socket_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

datagram_socket_service::is_open

Determine whether the socket is open.

```
bool is_open(
    const implementation_type & impl) const;
```

datagram_socket_service::local_endpoint

Get the local endpoint.

```
endpoint_type local_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

datagram_socket_service::native

Get the native socket implementation.

```
native_type native(
    implementation_type & impl);
```

datagram_socket_service::native_type

The native socket type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/datagram_socket_service.hpp`

Convenience header: `boost/asio.hpp`

datagram_socket_service::open

```
boost::system::error_code open(
    implementation_type & impl,
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

datagram_socket_service::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/datagram_socket_service.hpp`

Convenience header: `boost/asio.hpp`

datagram_socket_service::receive

Receive some data from the peer.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

datagram_socket_service::receive_from

Receive a datagram with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

datagram_socket_service::remote_endpoint

Get the remote endpoint.

```
endpoint_type remote_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

datagram_socket_service::send

Send the given data to the peer.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

datagram_socket_service::send_to

Send a datagram to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

datagram_socket_service::set_option

Set a socket option.

```
template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    implementation_type & impl,
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

datagram_socket_service::shutdown

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    implementation_type & impl,
    socket_base::shutdown_type what,
    boost::system::error_code & ec);
```

datagram_socket_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

deadline_timer

Typedef for the typical usage of timer. Uses a UTC clock.

```
typedef basic_deadline_timer< boost::posix_time::ptime > deadline_timer;
```

Types

Name	Description
duration_type	The duration type.
implementation_type	The underlying implementation type of I/O object.
service_type	The type of the service that will be used to provide I/O operations.
time_type	The time type.
traits_type	The time traits type.

Member Functions

Name	Description
async_wait	Start an asynchronous wait on the timer.
basic_deadline_timer	Constructor. Constructor to set a particular expiry time as an absolute time. Constructor to set a particular expiry time relative to now.
cancel	Cancel any asynchronous operations that are waiting on the timer.
expires_at	Get the timer's expiry time as an absolute time. Set the timer's expiry time as an absolute time.
expires_from_now	Get the timer's expiry time relative to now. Set the timer's expiry time relative to now.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
wait	Perform a blocking wait on the timer.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_deadline_timer` class template provides the ability to perform a blocking or asynchronous wait for a timer to expire.

A deadline timer is always in one of two states: "expired" or "not expired". If the `wait()` or `async_wait()` function is called on an expired timer, the wait operation will complete immediately.

Most applications will use the `boost::asio::deadline_timer` typedef.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Examples

Performing a blocking wait:

```
// Construct a timer without setting an expiry time.
boost::asio::deadline_timer timer(io_service);

// Set an expiry time relative to now.
timer.expires_from_now(boost::posix_time::seconds(5));

// Wait for the timer to expire.
timer.wait();
```

Performing an asynchronous wait:

```
void handler(const boost::system::error_code& error)
{
  if (!error)
  {
    // Timer expired.
  }
}

...

// Construct a timer with an absolute expiry time.
boost::asio::deadline_timer timer(io_service,
    boost::posix_time::time_from_string("2005-12-07 23:59:59.000"));

// Start an asynchronous wait.
timer.async_wait(handler);
```

Changing an active deadline_timer's expiry time

Changing the expiry time of a timer while there are pending asynchronous waits causes those wait operations to be cancelled. To ensure that the action associated with the timer is performed only once, use something like this: used:

```
void on_some_event()
{
  if (my_timer.expires_from_now(seconds(5)) > 0)
  {
    // We managed to cancel the timer. Start new asynchronous wait.
    my_timer.async_wait(on_timeout);
  }
  else
  {
    // Too late, timer has already expired!
  }
}

void on_timeout(const boost::system::error_code& e)
{
  if (e != boost::asio::error::operation_aborted)
  {
    // Timer was not cancelled, take necessary action.
  }
}
```

- The boost::asio::basic_deadline_timer::expires_from_now() function cancels any pending asynchronous waits, and returns the number of asynchronous waits that were cancelled. If it returns 0 then you were too late and the wait handler has already been executed, or will soon be executed. If it returns 1 then the wait handler was successfully cancelled.
- If a wait handler is cancelled, the boost::system::error_code passed to it contains the value boost::asio::error::operation_aborted.

Requirements

Header: `boost/asio/deadline_timer.hpp`

Convenience header: `boost/asio.hpp`

deadline_timer_service

Default service implementation for a timer.

```
template<
    typename TimeType,
    typename TimeTraits = boost::asio::time_traits<TimeType>>
class deadline_timer_service :
  public io_service::service
```

Types

Name	Description
duration_type	The duration type.
implementation_type	The implementation type of the deadline timer.
time_type	The time type.
traits_type	The time traits type.

Member Functions

Name	Description
async_wait	
cancel	Cancel any asynchronous wait operations associated with the timer.
construct	Construct a new timer implementation.
deadline_timer_service	Construct a new timer service for the specified io_service.
destroy	Destroy a timer implementation.
expires_at	Get the expiry time for the timer as an absolute time. Set the expiry time for the timer as an absolute time.
expires_from_now	Get the expiry time for the timer relative to now. Set the expiry time for the timer relative to now.
get_io_service	Get the io_service object that owns the service.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
shutdown_service	Destroy all user-defined handler objects owned by the service.
wait	

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/deadline_timer_service.hpp`

Convenience header: `boost/asio.hpp`

deadline_timer_service::async_wait

```
template<
    typename WaitHandler>
void async_wait(
    implementation_type & impl,
    WaitHandler handler);
```

deadline_timer_service::cancel

Cancel any asynchronous wait operations associated with the timer.

```
std::size_t cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

deadline_timer_service::construct

Construct a new timer implementation.

```
void construct(
    implementation_type & impl);
```

deadline_timer_service::deadline_timer_service

Construct a new timer service for the specified `io_service`.

```
deadline_timer_service(
    boost::asio::io_service & io_service);
```

deadline_timer_service::destroy

Destroy a timer implementation.

```
void destroy(
    implementation_type & impl);
```

deadline_timer_service::duration_type

The duration type.

```
typedef traits_type::duration_type duration_type;
```

Requirements

Header: `boost/asio/deadline_timer_service.hpp`

Convenience header: `boost/asio.hpp`

deadline_timer_service::expires_at

Get the expiry time for the timer as an absolute time.

```
time_type expires_at(
    const implementation_type & impl) const;
  » more...
```

Set the expiry time for the timer as an absolute time.

```
std::size_t expires_at(
    implementation_type & impl,
    const time_type & expiry_time,
    boost::system::error_code & ec);
  » more...
```

deadline_timer_service::expires_at (1 of 2 overloads)

Get the expiry time for the timer as an absolute time.

```
time_type expires_at(
    const implementation_type & impl) const;
```

deadline_timer_service::expires_at (2 of 2 overloads)

Set the expiry time for the timer as an absolute time.

```
std::size_t expires_at(
    implementation_type & impl,
    const time_type & expiry_time,
    boost::system::error_code & ec);
```

deadline_timer_service::expires_from_now

Get the expiry time for the timer relative to now.

```
duration_type expires_from_now(
    const implementation_type & impl) const;
  » more...
```

Set the expiry time for the timer relative to now.

```
std::size_t expires_from_now(
    implementation_type & impl,
    const duration_type & expiry_time,
    boost::system::error_code & ec);
  » more...
```

deadline_timer_service::expires_from_now (1 of 2 overloads)

Get the expiry time for the timer relative to now.

```
duration_type expires_from_now(
    const implementation_type & impl) const;
```

deadline_timer_service::expires_from_now (2 of 2 overloads)

Set the expiry time for the timer relative to now.

```
std::size_t expires_from_now(
    implementation_type & impl,
    const duration_type & expiry_time,
    boost::system::error_code & ec);
```

deadline_timer_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

deadline_timer_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

deadline_timer_service::implementation_type

The implementation type of the deadline timer.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/deadline_timer_service.hpp`

Convenience header: `boost/asio.hpp`

deadline_timer_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

deadline_timer_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

deadline_timer_service::time_type

The time type.

```
typedef traits_type::time_type time_type;
```

Requirements

Header: `boost/asio/deadline_timer_service.hpp`

Convenience header: `boost/asio.hpp`

deadline_timer_service::traits_type

The time traits type.

```
typedef TimeTraits traits_type;
```

Requirements

Header: `boost/asio/deadline_timer_service.hpp`

Convenience header: `boost/asio.hpp`

deadline_timer_service::wait

```
void wait(
    implementation_type & impl,
    boost::system::error_code & ec);
```

error::addrinfo_category

```
static const boost::system::error_category & addrinfo_category = boost::asio::error::get_ad↵
drinfo_category();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::addrinfo_errors

```
enum addrinfo_errors
```

Values

service_not_found	The service is not supported for the given socket type.
socket_type_not_supported	The socket type is not supported.

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::basic_errors

```
enum basic_errors
```

Values

access_denied	Permission denied.
address_family_not_supported	Address family not supported by protocol.
address_in_use	Address already in use.
already_connected	Transport endpoint is already connected.
already_started	Operation already in progress.
broken_pipe	Broken pipe.
connection_aborted	A connection has been aborted.
connection_refused	Connection refused.
connection_reset	Connection reset by peer.
bad_descriptor	Bad file descriptor.
fault	Bad address.
host_unreachable	No route to host.
in_progress	Operation now in progress.
interrupted	Interrupted system call.
invalid_argument	Invalid argument.
message_size	Message too long.
name_too_long	The name was too long.
network_down	Network is down.
network_reset	Network dropped connection on reset.
network_unreachable	Network is unreachable.
no_descriptors	Too many open files.
no_buffer_space	No buffer space available.
no_memory	Cannot allocate memory.
no_permission	Operation not permitted.
no_protocol_option	Protocol not available.
not_connected	Transport endpoint is not connected.
not_socket	Socket operation on non-socket.
operation_aborted	Operation cancelled.

operation_not_supported	Operation not supported.
shut_down	Cannot send after transport endpoint shutdown.
timed_out	Connection timed out.
try_again	Resource temporarily unavailable.
would_block	The socket is marked non-blocking and the requested operation would block.

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::get_addrinfo_category

```
const boost::system::error_category & get_addrinfo_category();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::get_misc_category

```
const boost::system::error_category & get_misc_category();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::get_netdb_category

```
const boost::system::error_category & get_netdb_category();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::get_ssl_category

```
const boost::system::error_category & get_ssl_category();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: boost/asio.hpp

error::get_system_category

```
const boost::system::error_category & get_system_category();
```

Requirements

Header: boost/asio/error.hpp

Convenience header: boost/asio.hpp

error::make_error_code

```
boost::system::error_code make_error_code(
    basic_errors e);
  » more...

boost::system::error_code make_error_code(
    netdb_errors e);
  » more...

boost::system::error_code make_error_code(
    addrinfo_errors e);
  » more...

boost::system::error_code make_error_code(
    misc_errors e);
  » more...

boost::system::error_code make_error_code(
    ssl_errors e);
  » more...
```

Requirements

Header: boost/asio/error.hpp

Convenience header: boost/asio.hpp

error::make_error_code (1 of 5 overloads)

```
boost::system::error_code make_error_code(
    basic_errors e);
```

error::make_error_code (2 of 5 overloads)

```
boost::system::error_code make_error_code(
    netdb_errors e);
```

error::make_error_code (3 of 5 overloads)

```
boost::system::error_code make_error_code(
    addrinfo_errors e);
```

error::make_error_code (4 of 5 overloads)

```
boost::system::error_code make_error_code(
    misc_errors e);
```

error::make_error_code (5 of 5 overloads)

```
boost::system::error_code make_error_code(
    ssl_errors e);
```

error::misc_category

```
static const boost::system::error_category & misc_category = boost::asio::error::get_misc_cat↵
egory();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::misc_errors

```
enum misc_errors
```

Values

already_open	Already open.
eof	End of file or stream.
not_found	Element not found.
fd_set_failure	The descriptor cannot fit into the select system call's fd_set.

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::netdb_category

```
static const boost::system::error_category & netdb_category = boost::asio::error::get_netdb_cat↵
egory();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::netdb_errors

```
enum netdb_errors
```

Values

host_not_found	Host not found (authoritative).
host_not_found_try_again	Host not found (non-authoritative).
no_data	The query is valid but does not have associated address data.
no_recovery	A non-recoverable error occurred.

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::ssl_category

```
static const boost::system::error_category & ssl_category = boost::asio::error::get_ssl_category();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::ssl_errors

```
enum ssl_errors
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

error::system_category

```
static const boost::system::error_category & system_category = boost::asio::error::get_system_cat↵
egory();
```

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

has_service

```
template<
    typename Service>
bool has_service(
    io_service & ios);
```

This function is used to determine whether the `io_service` contains a service object corresponding to the given service type.

Parameters

ios The `io_service` object that owns the service.

Return Value

A boolean indicating whether the `io_service` contains the service.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

invalid_service_owner

Exception thrown when trying to add a service object to an `io_service` where the service has a different owner.

```
class invalid_service_owner
```

Member Functions

Name	Description
invalid_service_owner	

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

invalid_service_owner::invalid_service_owner

```
invalid_service_owner();
```

io_service

Provides core I/O functionality.

```
class io_service :
  noncopyable
```

Types

Name	Description
id	Class used to uniquely identify a service.
service	Base class for all io_service services.
strand	Provides serialised handler execution.
work	Class to inform the io_service when it has work to do.

Member Functions

Name	Description
dispatch	Request the io_service to invoke the given handler.
io_service	Constructor.
poll	Run the io_service object's event processing loop to execute ready handlers.
poll_one	Run the io_service object's event processing loop to execute one ready handler.
post	Request the io_service to invoke the given handler and return immediately.
reset	Reset the io_service in preparation for a subsequent run() invocation.
run	Run the io_service object's event processing loop.
run_one	Run the io_service object's event processing loop to execute at most one handler.
stop	Stop the io_service object's event processing loop.
wrap	Create a new handler that automatically dispatches the wrapped handler on the io_service.
~io_service	Destructor.

Friends

Name	Description
add_service	Add a service object to the io_service.
has_service	Determine if an io_service contains a specified service type.
use_service	Obtain the service object corresponding to the given type.

The `io_service` class provides the core I/O functionality for users of the asynchronous I/O objects, including:

- boost::asio::ip::tcp::socket
- boost::asio::ip::tcp::acceptor
- boost::asio::ip::udp::socket
- boost::asio::deadline_timer.

The `io_service` class also includes facilities intended for developers of custom asynchronous services.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe, with the exception that calling `reset()` while there are unfinished `run()`, `run_one()`, `poll()` or `poll_one()` calls results in undefined behaviour.

Synchronous and asynchronous operations

Synchronous operations on I/O objects implicitly run the `io_service` object for an individual operation. The `io_service` functions `run()`, `run_one()`, `poll()` or `poll_one()` must be called for the `io_service` to perform asynchronous operations on behalf of a C++ program. Notification that an asynchronous operation has completed is delivered by invocation of the associated handler. Handlers are invoked only by a thread that is currently calling any overload of `run()`, `run_one()`, `poll()` or `poll_one()` for the `io_service`.

Effect of exceptions thrown from handlers

If an exception is thrown from a handler, the exception is allowed to propagate through the throwing thread's invocation of `run()`, `run_one()`, `poll()` or `poll_one()`. No other threads that are calling any of these functions are affected. It is then the responsibility of the application to catch the exception.

After the exception has been caught, the `run()`, `run_one()`, `poll()` or `poll_one()` call may be restarted **without** the need for an intervening call to `reset()`. This allows the thread to rejoin the `io_service` object's thread pool without impacting any other threads in the pool.

For example:

```
boost::asio::io_service io_service;
...
for (;;)
{
  try
  {
    io_service.run();
    break; // run() exited normally
  }
  catch (my_exception& e)
  {
    // Deal with exception as appropriate.
  }
}
```

Stopping the io_service from running out of work

Some applications may need to prevent an `io_service` object's `run()` call from returning when there is no more work to do. For example, the `io_service` may be being run in a background thread that is launched prior to the application's asynchronous operations. The `run()` call may be kept running by creating an object of type `io_service::work`:

```
boost::asio::io_service io_service;
boost::asio::io_service::work work(io_service);
...
```

To effect a shutdown, the application will then need to call the `io_service` object's `stop()` member function. This will cause the `io_service` `run()` call to return as soon as possible, abandoning unfinished operations and without permitting ready handlers to be dispatched.

Alternatively, if the application requires that all operations and handlers be allowed to finish normally, the work object may be explicitly destroyed.

```
boost::asio::io_service io_service;
auto_ptr<boost::asio::io_service::work> work(
    new boost::asio::io_service::work(io_service));
...
work.reset(); // Allow run() to exit.
```

The io_service class and I/O services

Class `io_service` implements an extensible, type-safe, polymorphic set of I/O services, indexed by service type. An object of class `io_service` must be initialised before I/O objects such as sockets, resolvers and timers can be used. These I/O objects are distinguished by having constructors that accept an `io_service&` parameter.

I/O services exist to manage the logical interface to the operating system on behalf of the I/O objects. In particular, there are resources that are shared across a class of I/O objects. For example, timers may be implemented in terms of a single timer queue. The I/O services manage these shared resources.

Access to the services of an `io_service` is via three function templates, `use_service()`, `add_service()` and `has_service()`.

In a call to `use_service<Service>()`, the type argument chooses a service, making available all members of the named type. If `Service` is not present in an `io_service`, an object of type `Service` is created and added to the `io_service`. A C++ program can check if an `io_service` implements a particular service with the function template `has_service<Service>()`.

Service objects may be explicitly added to an `io_service` using the function template `add_service<Service>()`. If the `Service` is already present, the `service_already_exists` exception is thrown. If the owner of the service is not the same object as the `io_service` parameter, the `invalid_service_owner` exception is thrown.

Once a service reference is obtained from an `io_service` object by calling `use_service()`, that reference remains usable as long as the owning `io_service` object exists.

All I/O service implementations have `io_service::service` as a public base class. Custom I/O services may be implemented by deriving from this class and then added to an `io_service` using the facilities described above.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::add_service

Add a service object to the `io_service`.

```
template<
    typename Service>
friend void add_service(
    io_service & ios,
    Service * svc);
```

This function is used to add a service to the `io_service`.

Parameters

ios — The `io_service` object that owns the service.

svc — The service object. On success, ownership of the service object is transferred to the `io_service`. When the `io_service` object is destroyed, it will destroy the service object by performing:

```
delete static_cast<io_service::service*>(svc)
```

Exceptions

boost::asio::service_already_exists	Thrown if a service of the given type is already present in the `io_service`.
boost::asio::invalid_service_owner	Thrown if the service's owning `io_service` is not the `io_service` object specified by the ios parameter.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::dispatch

Request the `io_service` to invoke the given handler.

```
template<
    typename CompletionHandler>
void dispatch(
    CompletionHandler handler);
```

This function is used to ask the `io_service` to execute the given handler.

The `io_service` guarantees that the handler will only be called in a thread in which the `run()`, `run_one()`, `poll()` or `poll_one()` member functions is currently being invoked. The handler may be executed inside this function if the guarantee can be met.

Parameters

handler — The handler to be called. The `io_service` will make a copy of the handler object as required. The function signature of the handler must be:

```
void handler();
```

io_service::has_service

Determine if an `io_service` contains a specified service type.

```
template<
    typename Service>
friend bool has_service(
    io_service & ios);
```

This function is used to determine whether the `io_service` contains a service object corresponding to the given service type.

Parameters

ios — The `io_service` object that owns the service.

Return Value

A boolean indicating whether the `io_service` contains the service.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::io_service

Constructor.

```
io_service();
  » more...

explicit io_service(
    std::size_t concurrency_hint);
  » more...
```

io_service::io_service (1 of 2 overloads)

Constructor.

```
io_service();
```

io_service::io_service (2 of 2 overloads)

Constructor.

```
io_service(
    std::size_t concurrency_hint);
```

Construct with a hint about the required level of concurrency.

Parameters

concurrency_hint A suggestion to the implementation on how many threads it should allow to run simultaneously.

io_service::poll

Run the `io_service` object's event processing loop to execute ready handlers.

```
std::size_t poll();
  » more...

std::size_t poll(
    boost::system::error_code & ec);
  » more...
```

io_service::poll (1 of 2 overloads)

Run the `io_service` object's event processing loop to execute ready handlers.

```
std::size_t poll();
```

The `poll()` function runs handlers that are ready to run, without blocking, until the `io_service` has been stopped or there are no more ready handlers.

Return Value

The number of handlers that were executed.

Exceptions

boost::system::system_error	Thrown on failure.

io_service::poll (2 of 2 overloads)

Run the `io_service` object's event processing loop to execute ready handlers.

```
std::size_t poll(
    boost::system::error_code & ec);
```

The `poll()` function runs handlers that are ready to run, without blocking, until the `io_service` has been stopped or there are no more ready handlers.

Parameters

ec	Set to indicate what error occurred, if any.

Return Value

The number of handlers that were executed.

io_service::poll_one

Run the `io_service` object's event processing loop to execute one ready handler.

```
std::size_t poll_one();
  » more...

std::size_t poll_one(
    boost::system::error_code & ec);
  » more...
```

io_service::poll_one (1 of 2 overloads)

Run the `io_service` object's event processing loop to execute one ready handler.

```
std::size_t poll_one();
```

The `poll_one()` function runs at most one handler that is ready to run, without blocking.

Return Value

The number of handlers that were executed.

Exceptions

boost::system::system_error	Thrown on failure.

io_service::poll_one (2 of 2 overloads)

Run the `io_service` object's event processing loop to execute one ready handler.

```
std::size_t poll_one(
    boost::system::error_code & ec);
```

The `poll_one()` function runs at most one handler that is ready to run, without blocking.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of handlers that were executed.

io_service::post

Request the `io_service` to invoke the given handler and return immediately.

```
template<
    typename CompletionHandler>
void post(
    CompletionHandler handler);
```

This function is used to ask the `io_service` to execute the given handler, but without allowing the `io_service` to call the handler from inside this function.

The `io_service` guarantees that the handler will only be called in a thread in which the `run()`, `run_one()`, `poll()` or `poll_one()` member functions is currently being invoked.

Parameters

handler The handler to be called. The `io_service` will make a copy of the handler object as required. The function signature of the handler must be:

```
void handler();
```

io_service::reset

Reset the `io_service` in preparation for a subsequent `run()` invocation.

```
void reset();
```

This function must be called prior to any second or later set of invocations of the `run()`, `run_one()`, `poll()` or `poll_one()` functions when a previous invocation of these functions returned due to the `io_service` being stopped or running out of work. This function allows the `io_service` to reset any internal state, such as a "stopped" flag.

This function must not be called while there are any unfinished calls to the `run()`, `run_one()`, `poll()` or `poll_one()` functions.

io_service::run

Run the `io_service` object's event processing loop.

```
std::size_t run();
  » more...

std::size_t run(
    boost::system::error_code & ec);
  » more...
```

io_service::run (1 of 2 overloads)

Run the `io_service` object's event processing loop.

```
std::size_t run();
```

The `run()` function blocks until all work has finished and there are no more handlers to be dispatched, or until the `io_service` has been stopped.

Multiple threads may call the `run()` function to set up a pool of threads from which the `io_service` may execute handlers. All threads that are waiting in the pool are equivalent and the `io_service` may choose any one of them to invoke a handler.

The `run()` function may be safely called again once it has completed only after a call to `reset()`.

Return Value

The number of handlers that were executed.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The `run()` function must not be called from a thread that is currently calling one of `run()`, `run_one()`, `poll()` or `poll_one()` on the same `io_service` object.

The `poll()` function may also be used to dispatch ready handlers, but without blocking.

io_service::run (2 of 2 overloads)

Run the `io_service` object's event processing loop.

```
std::size_t run(
    boost::system::error_code & ec);
```

The `run()` function blocks until all work has finished and there are no more handlers to be dispatched, or until the `io_service` has been stopped.

Multiple threads may call the `run()` function to set up a pool of threads from which the `io_service` may execute handlers. All threads that are waiting in the pool are equivalent and the `io_service` may choose any one of them to invoke a handler.

The `run()` function may be safely called again once it has completed only after a call to `reset()`.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of handlers that were executed.

Remarks

The `run()` function must not be called from a thread that is currently calling one of `run()`, `run_one()`, `poll()` or `poll_one()` on the same `io_service` object.

The `poll()` function may also be used to dispatch ready handlers, but without blocking.

io_service::run_one

Run the `io_service` object's event processing loop to execute at most one handler.

```
std::size_t run_one();
  » more...

std::size_t run_one(
    boost::system::error_code & ec);
  » more...
```

io_service::run_one (1 of 2 overloads)

Run the `io_service` object's event processing loop to execute at most one handler.

```
std::size_t run_one();
```

The `run_one()` function blocks until one handler has been dispatched, or until the `io_service` has been stopped.

Return Value

The number of handlers that were executed.

Exceptions

boost::system::system_error Thrown on failure.

io_service::run_one (2 of 2 overloads)

Run the `io_service` object's event processing loop to execute at most one handler.

```
std::size_t run_one(
    boost::system::error_code & ec);
```

The `run_one()` function blocks until one handler has been dispatched, or until the `io_service` has been stopped.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of handlers that were executed.

io_service::stop

Stop the `io_service` object's event processing loop.

```
void stop();
```

This function does not block, but instead simply signals the `io_service` to stop. All invocations of its `run()` or `run_one()` member functions should return as soon as possible. Subsequent calls to `run()`, `run_one()`, `poll()` or `poll_one()` will return immediately until `reset()` is called.

io_service::use_service

Obtain the service object corresponding to the given type.

```
template<
    typename Service>
friend Service & use_service(
    io_service & ios);
```

This function is used to locate a service object that corresponds to the given service type. If there is no existing implementation of the service, then the `io_service` will create a new instance of the service.

Parameters

ios The `io_service` object that owns the service.

Return Value

The service interface implementing the specified service type. Ownership of the service interface is not transferred to the caller.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::wrap

Create a new handler that automatically dispatches the wrapped handler on the `io_service`.

```
template<
    typename Handler>
unspecified wrap(
    Handler handler);
```

This function is used to create a new handler function object that, when invoked, will automatically pass the wrapped handler to the `io_service` object's dispatch function.

Parameters

handler The handler to be wrapped. The `io_service` will make a copy of the handler object as required. The function signature of the handler must be:

```
void handler(A1 a1, ... An an);
```

Return Value

A function object that, when invoked, passes the wrapped handler to the `io_service` object's dispatch function. Given a function object with the signature:

```
R f(A1 a1, ... An an);
```

If this function object is passed to the wrap function like so:

```
io_service.wrap(f);
```

then the return value is a function object with the signature

```
void g(A1 a1, ... An an);
```

that, when invoked, executes code equivalent to:

```
io_service.dispatch(boost::bind(f, a1, ... an));
```

io_service::~io_service

Destructor.

```
~io_service();
```

On destruction, the `io_service` performs the following sequence of operations:

- For each service object svc in the io_service set, in reverse order of the beginning of service object lifetime, performs svc->shutdown_service().
- Uninvoked handler objects that were scheduled for deferred invocation on the io_service, or any associated strand, are destroyed.
- For each service object svc in the io_service set, in reverse order of the beginning of service object lifetime, performs delete static_cast<io_service::service*>(svc).

Remarks

The destruction sequence described above permits programs to simplify their resource management by using `shared_ptr<>`. Where an object's lifetime is tied to the lifetime of a connection (or some other sequence of asynchronous operations), a `shared_ptr` to the object would be bound into the handlers for all asynchronous operations associated with it. This works as follows:

- When a single connection ends, all associated asynchronous operations complete. The corresponding handler objects are destroyed, and all shared_ptr references to the objects are destroyed.
- To shut down the whole program, the io_service function stop() is called to terminate any run() calls as soon as possible. The io_service destructor defined above destroys all handlers, causing all shared_ptr references to all connection objects to be destroyed.

io_service::id

Class used to uniquely identify a service.

```
class id :
  noncopyable
```

Member Functions

Name	Description
id	Constructor.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::id::id

Constructor.

```
id();
```

io_service::service

Base class for all `io_service` services.

```
class service :
  noncopyable
```

Member Functions

Name	Description
get_io_service	Get the io_service object that owns the service.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.

Protected Member Functions

Name	Description
service	Constructor.
~service	Destructor.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::service::get_io_service

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

io_service::service::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

io_service::service::service

Constructor.

```
service(
    boost::asio::io_service & owner);
```

Parameters

owner The `io_service` object that owns the service.

io_service::service::~service

Destructor.

```
virtual ~service();
```

io_service::strand

Provides serialised handler execution.

```
class strand
```

Member Functions

Name	Description
dispatch	Request the strand to invoke the given handler.
get_io_service	Get the io_service associated with the strand.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the strand.
post	Request the strand to invoke the given handler and return immediately.
strand	Constructor.
wrap	Create a new handler that automatically dispatches the wrapped handler on the strand.
~strand	Destructor.

The `io_service::strand` class provides the ability to post and dispatch handlers with the guarantee that none of those handlers will execute concurrently.

Order of handler invocation

Given:

- a strand object s
- an object a meeting completion handler requirements
- an object a1 which is an arbitrary copy of a made by the implementation
- an object b meeting completion handler requirements
- an object b1 which is an arbitrary copy of b made by the implementation

if any of the following conditions are true:

- s.post(a) happens-before s.post(b)
- s.post(a) happens-before s.dispatch(b), where the latter is performed outside the strand
- s.dispatch(a) happens-before s.post(b), where the former is performed outside the strand
- s.dispatch(a) happens-before s.dispatch(b), where both are performed outside the strand

then `asio_handler_invoke(a1, &a1)` happens-before `asio_handler_invoke(b1, &b1)`.

Note that in the following case:

```
async_op_1(..., s.wrap(a));
async_op_2(..., s.wrap(b));
```

the completion of the first async operation will perform `s.dispatch(a)`, and the second will perform `s.dispatch(b)`, but the order in which those are performed is unspecified. That is, you cannot state whether one happens-before the other. Therefore none of the above conditions are met and no ordering guarantee is made.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/strand.hpp`

Convenience header: `boost/asio.hpp`

io_service::strand::dispatch

Request the strand to invoke the given handler.

```
template<
    typename Handler>
void dispatch(
    Handler handler);
```

This function is used to ask the strand to execute the given handler.

The strand object guarantees that handlers posted or dispatched through the strand will not be executed concurrently. The handler may be executed inside this function if the guarantee can be met. If this function is called from within a handler that was posted or dispatched through the same strand, then the new handler will be executed immediately.

The strand's guarantee is in addition to the guarantee provided by the underlying `io_service`. The `io_service` guarantees that the handler will only be called in a thread in which the io_service's run member function is currently being invoked.

Parameters

handler — The handler to be called. The strand will make a copy of the handler object as required. The function signature of the handler must be:

```
void handler();
```

io_service::strand::get_io_service

Get the `io_service` associated with the strand.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the strand uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the strand will use to dispatch handlers. Ownership is not transferred to the caller.

io_service::strand::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the strand.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the strand uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the strand will use to dispatch handlers. Ownership is not transferred to the caller.

io_service::strand::post

Request the strand to invoke the given handler and return immediately.

```
template<
    typename Handler>
void post(
    Handler handler);
```

This function is used to ask the strand to execute the given handler, but without allowing the strand to call the handler from inside this function.

The strand object guarantees that handlers posted or dispatched through the strand will not be executed concurrently. The strand's guarantee is in addition to the guarantee provided by the underlying `io_service`. The `io_service` guarantees that the handler will only be called in a thread in which the io_service's run member function is currently being invoked.

Parameters

handler — The handler to be called. The strand will make a copy of the handler object as required. The function signature of the handler must be:

```
void handler();
```

io_service::strand::strand

Constructor.

```
strand(
    boost::asio::io_service & io_service);
```

Constructs the strand.

Parameters

io_service The `io_service` object that the strand will use to dispatch handlers that are ready to be run.

io_service::strand::wrap

Create a new handler that automatically dispatches the wrapped handler on the strand.

```
template<
    typename Handler>
unspecified wrap(
    Handler handler);
```

This function is used to create a new handler function object that, when invoked, will automatically pass the wrapped handler to the strand's dispatch function.

Parameters

handler The handler to be wrapped. The strand will make a copy of the handler object as required. The function signature of the handler must be:

```
void handler(A1 a1, ... An an);
```

Return Value

A function object that, when invoked, passes the wrapped handler to the strand's dispatch function. Given a function object with the signature:

```
R f(A1 a1, ... An an);
```

If this function object is passed to the wrap function like so:

```
strand.wrap(f);
```

then the return value is a function object with the signature

```
void g(A1 a1, ... An an);
```

that, when invoked, executes code equivalent to:

```
strand.dispatch(boost::bind(f, a1, ... an));
```

io_service::strand::~strand

Destructor.

```
~strand();
```

Destroys a strand.

Handlers posted through the strand that have not yet been invoked will still be dispatched in a way that meets the guarantee of non-concurrency.

io_service::work

Class to inform the `io_service` when it has work to do.

```
class work
```

Member Functions

Name	Description
get_io_service	Get the io_service associated with the work.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the work.
work	Constructor notifies the io_service that work is starting. Copy constructor notifies the io_service that work is starting.
~work	Destructor notifies the io_service that the work is complete.

The work class is used to inform the `io_service` when work starts and finishes. This ensures that the `io_service` object's `run()` function will not exit while work is underway, and that it does exit when there is no unfinished work remaining.

The work class is copy-constructible so that it may be used as a data member in a handler class. It is not assignable.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

io_service::work::get_io_service

Get the `io_service` associated with the work.

```
boost::asio::io_service & get_io_service();
```

io_service::work::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the work.

```
boost::asio::io_service & io_service();
```

io_service::work::work

Constructor notifies the `io_service` that work is starting.

```
explicit work(
    boost::asio::io_service & io_service);
  » more...
```

Copy constructor notifies the `io_service` that work is starting.

```
work(
    const work & other);
  » more...
```

io_service::work::work (1 of 2 overloads)

Constructor notifies the `io_service` that work is starting.

```
work(
    boost::asio::io_service & io_service);
```

The constructor is used to inform the `io_service` that some work has begun. This ensures that the `io_service` object's `run()` function will not exit while the work is underway.

io_service::work::work (2 of 2 overloads)

Copy constructor notifies the `io_service` that work is starting.

```
work(
    const work & other);
```

The constructor is used to inform the `io_service` that some work has begun. This ensures that the `io_service` object's `run()` function will not exit while the work is underway.

io_service::work::~work

Destructor notifies the `io_service` that the work is complete.

```
~work();
```

The destructor is used to inform the `io_service` that some work has finished. Once the count of unfinished work reaches zero, the `io_service` object's `run()` function is permitted to exit.

ip::address

Implements version-independent IP addresses.

```
class address
```

Member Functions

Name	Description
address	Default constructor. Construct an address from an IPv4 address. Construct an address from an IPv6 address. Copy constructor.
from_string	Create an address from an IPv4 address string in dotted decimal form, or from an IPv6 address in hexadecimal notation.
is_v4	Get whether the address is an IP version 4 address.
is_v6	Get whether the address is an IP version 6 address.
operator=	Assign from another address. Assign from an IPv4 address. Assign from an IPv6 address.
to_string	Get the address as a string in dotted decimal format.
to_v4	Get the address as an IP version 4 address.
to_v6	Get the address as an IP version 6 address.

Friends

Name	Description
operator!=	Compare two addresses for inequality.
operator<	Compare addresses for ordering.
operator==	Compare two addresses for equality.

Related Functions

Name	Description
operator<<	Output an address as a string.

The `ip::address` class provides the ability to use either IP version 4 or version 6 addresses.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/address.hpp`

Convenience header: `boost/asio.hpp`

ip::address::address

Default constructor.

```
address();
  » more...
```

Construct an address from an IPv4 address.

```
address(
    const boost::asio::ip::address_v4 & ipv4_address);
  » more...
```

Construct an address from an IPv6 address.

```
address(
    const boost::asio::ip::address_v6 & ipv6_address);
  » more...
```

Copy constructor.

```
address(
    const address & other);
  » more...
```

ip::address::address (1 of 4 overloads)

Default constructor.

```
address();
```

ip::address::address (2 of 4 overloads)

Construct an address from an IPv4 address.

```
address(
    const boost::asio::ip::address_v4 & ipv4_address);
```

ip::address::address (3 of 4 overloads)

Construct an address from an IPv6 address.

```
address(
    const boost::asio::ip::address_v6 & ipv6_address);
```

ip::address::address (4 of 4 overloads)

Copy constructor.

```
address(
    const address & other);
```

ip::address::from_string

Create an address from an IPv4 address string in dotted decimal form, or from an IPv6 address in hexadecimal notation.

```
static address from_string(
    const char * str);
  » more...

static address from_string(
    const char * str,
    boost::system::error_code & ec);
  » more...

static address from_string(
    const std::string & str);
  » more...

static address from_string(
    const std::string & str,
    boost::system::error_code & ec);
  » more...
```

ip::address::from_string (1 of 4 overloads)

Create an address from an IPv4 address string in dotted decimal form, or from an IPv6 address in hexadecimal notation.

```
static address from_string(
    const char * str);
```

ip::address::from_string (2 of 4 overloads)

Create an address from an IPv4 address string in dotted decimal form, or from an IPv6 address in hexadecimal notation.

```
static address from_string(
    const char * str,
    boost::system::error_code & ec);
```

ip::address::from_string (3 of 4 overloads)

Create an address from an IPv4 address string in dotted decimal form, or from an IPv6 address in hexadecimal notation.

```
static address from_string(
    const std::string & str);
```

ip::address::from_string (4 of 4 overloads)

Create an address from an IPv4 address string in dotted decimal form, or from an IPv6 address in hexadecimal notation.

```
static address from_string(
    const std::string & str,
    boost::system::error_code & ec);
```

ip::address::is_v4

Get whether the address is an IP version 4 address.

```
bool is_v4() const;
```

ip::address::is_v6

Get whether the address is an IP version 6 address.

```
bool is_v6() const;
```

ip::address::operator!=

Compare two addresses for inequality.

```
friend bool operator!=(
    const address & a1,
    const address & a2);
```

Requirements

Header: `boost/asio/ip/address.hpp`

Convenience header: `boost/asio.hpp`

ip::address::operator<

Compare addresses for ordering.

```
friend bool operator<(
    const address & a1,
    const address & a2);
```

Requirements

Header: `boost/asio/ip/address.hpp`

Convenience header: `boost/asio.hpp`

ip::address::operator<<

Output an address as a string.

```
template<
    typename Elem,
    typename Traits>
std::basic_ostream< Elem, Traits > & operator<<(
    std::basic_ostream< Elem, Traits > & os,
    const address & addr);
```

Used to output a human-readable string for a specified address.

Parameters

os The output stream to which the string will be written.

addr The address to be written.

Return Value

The output stream.

ip::address::operator=

Assign from another address.

```
address & operator=(
    const address & other);
  » more...
```

Assign from an IPv4 address.

```
address & operator=(
    const boost::asio::ip::address_v4 & ipv4_address);
  » more...
```

Assign from an IPv6 address.

```
address & operator=(
    const boost::asio::ip::address_v6 & ipv6_address);
  » more...
```

ip::address::operator= (1 of 3 overloads)

Assign from another address.

```
address & operator=(
    const address & other);
```

ip::address::operator= (2 of 3 overloads)

Assign from an IPv4 address.

```
address & operator=(
    const boost::asio::ip::address_v4 & ipv4_address);
```

ip::address::operator= (3 of 3 overloads)

Assign from an IPv6 address.

```
address & operator=(
    const boost::asio::ip::address_v6 & ipv6_address);
```

ip::address::operator==

Compare two addresses for equality.

```
friend bool operator==(
    const address & a1,
    const address & a2);
```

Requirements

Header: `boost/asio/ip/address.hpp`

Convenience header: `boost/asio.hpp`

ip::address::to_string

Get the address as a string in dotted decimal format.

```
std::string to_string() const;
  » more...

std::string to_string(
    boost::system::error_code & ec) const;
  » more...
```

ip::address::to_string (1 of 2 overloads)

Get the address as a string in dotted decimal format.

```
std::string to_string() const;
```

ip::address::to_string (2 of 2 overloads)

Get the address as a string in dotted decimal format.

```
std::string to_string(
    boost::system::error_code & ec) const;
```

ip::address::to_v4

Get the address as an IP version 4 address.

```
boost::asio::ip::address_v4 to_v4() const;
```

ip::address::to_v6

Get the address as an IP version 6 address.

```
boost::asio::ip::address_v6 to_v6() const;
```

ip::address_v4

Implements IP version 4 style addresses.

```
class address_v4
```

Types

Name	Description
bytes_type	The type used to represent an address as an array of bytes.

Member Functions

Name	Description
address_v4	Default constructor. Construct an address from raw bytes. Construct an address from a unsigned long in host byte order. Copy constructor.
any	Obtain an address object that represents any address.
broadcast	Obtain an address object that represents the broadcast address. Obtain an address object that represents the broadcast address that corresponds to the specified address and net-mask.
from_string	Create an address from an IP address string in dotted decimal form.
is_class_a	Determine whether the address is a class A address.
is_class_b	Determine whether the address is a class B address.
is_class_c	Determine whether the address is a class C address.
is_multicast	Determine whether the address is a multicast address.
loopback	Obtain an address object that represents the loopback address.
netmask	Obtain the netmask that corresponds to the address, based on its address class.
operator=	Assign from another address.
to_bytes	Get the address in bytes.
to_string	Get the address as a string in dotted decimal format.
to_ulong	Get the address as an unsigned long in host byte order.

Friends

Name	Description
operator!=	Compare two addresses for inequality.
operator<	Compare addresses for ordering.
operator<=	Compare addresses for ordering.
operator==	Compare two addresses for equality.
operator>	Compare addresses for ordering.
operator>=	Compare addresses for ordering.

Related Functions

Name	Description
operator<<	Output an address as a string.

The `ip::address_v4` class provides the ability to use and manipulate IP version 4 addresses.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::address_v4

Default constructor.

```
address_v4();
  » more...
```

Construct an address from raw bytes.

```
explicit address_v4(
    const bytes_type & bytes);
  » more...
```

Construct an address from a unsigned long in host byte order.

```
explicit address_v4(
    unsigned long addr);
  » more...
```

Copy constructor.

```
address_v4(
    const address_v4 & other);
  » more...
```

ip::address_v4::address_v4 (1 of 4 overloads)

Default constructor.

```
address_v4();
```

ip::address_v4::address_v4 (2 of 4 overloads)

Construct an address from raw bytes.

```
address_v4(
    const bytes_type & bytes);
```

ip::address_v4::address_v4 (3 of 4 overloads)

Construct an address from a unsigned long in host byte order.

```
address_v4(
    unsigned long addr);
```

ip::address_v4::address_v4 (4 of 4 overloads)

Copy constructor.

```
address_v4(
    const address_v4 & other);
```

ip::address_v4::any

Obtain an address object that represents any address.

```
static address_v4 any();
```

ip::address_v4::broadcast

Obtain an address object that represents the broadcast address.

```
static address_v4 broadcast();
  » more...
```

Obtain an address object that represents the broadcast address that corresponds to the specified address and netmask.

```
static address_v4 broadcast(
    const address_v4 & addr,
    const address_v4 & mask);
  » more...
```

ip::address_v4::broadcast (1 of 2 overloads)

Obtain an address object that represents the broadcast address.

```
static address_v4 broadcast();
```

ip::address_v4::broadcast (2 of 2 overloads)

Obtain an address object that represents the broadcast address that corresponds to the specified address and netmask.

```
static address_v4 broadcast(
    const address_v4 & addr,
    const address_v4 & mask);
```

ip::address_v4::bytes_type

The type used to represent an address as an array of bytes.

```
typedef boost::array< unsigned char, 4 > bytes_type;
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::from_string

Create an address from an IP address string in dotted decimal form.

```
static address_v4 from_string(
    const char * str);
  » more...

static address_v4 from_string(
    const char * str,
    boost::system::error_code & ec);
  » more...

static address_v4 from_string(
    const std::string & str);
  » more...

static address_v4 from_string(
    const std::string & str,
    boost::system::error_code & ec);
  » more...
```

ip::address_v4::from_string (1 of 4 overloads)

Create an address from an IP address string in dotted decimal form.

```
static address_v4 from_string(
    const char * str);
```

ip::address_v4::from_string (2 of 4 overloads)

Create an address from an IP address string in dotted decimal form.

```
static address_v4 from_string(
    const char * str,
    boost::system::error_code & ec);
```

ip::address_v4::from_string (3 of 4 overloads)

Create an address from an IP address string in dotted decimal form.

```
static address_v4 from_string(
    const std::string & str);
```

ip::address_v4::from_string (4 of 4 overloads)

Create an address from an IP address string in dotted decimal form.

```
static address_v4 from_string(
    const std::string & str,
    boost::system::error_code & ec);
```

ip::address_v4::is_class_a

Determine whether the address is a class A address.

```
bool is_class_a() const;
```

ip::address_v4::is_class_b

Determine whether the address is a class B address.

```
bool is_class_b() const;
```

ip::address_v4::is_class_c

Determine whether the address is a class C address.

```
bool is_class_c() const;
```

ip::address_v4::is_multicast

Determine whether the address is a multicast address.

```
bool is_multicast() const;
```

ip::address_v4::loopback

Obtain an address object that represents the loopback address.

```
static address_v4 loopback();
```

ip::address_v4::netmask

Obtain the netmask that corresponds to the address, based on its address class.

```
static address_v4 netmask(
    const address_v4 & addr);
```

ip::address_v4::operator!=

Compare two addresses for inequality.

```
friend bool operator!=(
    const address_v4 & a1,
    const address_v4 & a2);
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::operator<

Compare addresses for ordering.

```
friend bool operator<(
    const address_v4 & a1,
    const address_v4 & a2);
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::operator<<

Output an address as a string.

```
template<
    typename Elem,
    typename Traits>
std::basic_ostream< Elem, Traits > & operator<<(
    std::basic_ostream< Elem, Traits > & os,
    const address_v4 & addr);
```

Used to output a human-readable string for a specified address.

Parameters

os The output stream to which the string will be written.

addr The address to be written.

Return Value

The output stream.

ip::address_v4::operator<=

Compare addresses for ordering.

```
friend bool operator<=(
    const address_v4 & a1,
    const address_v4 & a2);
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::operator=

Assign from another address.

```
address_v4 & operator=(
    const address_v4 & other);
```

ip::address_v4::operator==

Compare two addresses for equality.

```
friend bool operator==(
    const address_v4 & a1,
    const address_v4 & a2);
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::operator>

Compare addresses for ordering.

```
friend bool operator>(
    const address_v4 & a1,
    const address_v4 & a2);
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::operator>=

Compare addresses for ordering.

```
friend bool operator>=(
    const address_v4 & a1,
    const address_v4 & a2);
```

Requirements

Header: `boost/asio/ip/address_v4.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v4::to_bytes

Get the address in bytes.

```
bytes_type to_bytes() const;
```

ip::address_v4::to_string

Get the address as a string in dotted decimal format.

```
std::string to_string() const;
  » more...

std::string to_string(
    boost::system::error_code & ec) const;
  » more...
```

ip::address_v4::to_string (1 of 2 overloads)

Get the address as a string in dotted decimal format.

```
std::string to_string() const;
```

ip::address_v4::to_string (2 of 2 overloads)

Get the address as a string in dotted decimal format.

```
std::string to_string(
    boost::system::error_code & ec) const;
```

ip::address_v4::to_ulong

Get the address as an unsigned long in host byte order.

```
unsigned long to_ulong() const;
```

ip::address_v6

Implements IP version 6 style addresses.

```
class address_v6
```

Types

Name	Description
bytes_type	The type used to represent an address as an array of bytes.

Member Functions

Name	Description
address_v6	Default constructor. Construct an address from raw bytes and scope ID. Copy constructor.
any	Obtain an address object that represents any address.
from_string	Create an address from an IP address string.
is_link_local	Determine whether the address is link local.
is_loopback	Determine whether the address is a loopback address.
is_multicast	Determine whether the address is a multicast address.
is_multicast_global	Determine whether the address is a global multicast address.
is_multicast_link_local	Determine whether the address is a link-local multicast address.
is_multicast_node_local	Determine whether the address is a node-local multicast address.
is_multicast_org_local	Determine whether the address is a org-local multicast address.
is_multicast_site_local	Determine whether the address is a site-local multicast address.
is_site_local	Determine whether the address is site local.
is_unspecified	Determine whether the address is unspecified.
is_v4_compatible	Determine whether the address is an IPv4-compatible address.
is_v4_mapped	Determine whether the address is a mapped IPv4 address.
loopback	Obtain an address object that represents the loopback address.
operator=	Assign from another address.
scope_id	The scope ID of the address.
to_bytes	Get the address in bytes.
to_string	Get the address as a string.
to_v4	Converts an IPv4-mapped or IPv4-compatible address to an IPv4 address.
v4_compatible	Create an IPv4-compatible IPv6 address.
v4_mapped	Create an IPv4-mapped IPv6 address.

Friends

Name	Description
operator!=	Compare two addresses for inequality.
operator<	Compare addresses for ordering.
operator<=	Compare addresses for ordering.
operator==	Compare two addresses for equality.
operator>	Compare addresses for ordering.
operator>=	Compare addresses for ordering.

Related Functions

Name	Description
operator<<	Output an address as a string.

The `ip::address_v6` class provides the ability to use and manipulate IP version 6 addresses.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::address_v6

Default constructor.

```
address_v6();
  » more...
```

Construct an address from raw bytes and scope ID.

```
explicit address_v6(
    const bytes_type & bytes,
    unsigned long scope_id = 0);
  » more...
```

Copy constructor.

```
address_v6(
    const address_v6 & other);
  » more...
```

ip::address_v6::address_v6 (1 of 3 overloads)

Default constructor.

```
address_v6();
```

ip::address_v6::address_v6 (2 of 3 overloads)

Construct an address from raw bytes and scope ID.

```
address_v6(
    const bytes_type & bytes,
    unsigned long scope_id = 0);
```

ip::address_v6::address_v6 (3 of 3 overloads)

Copy constructor.

```
address_v6(
    const address_v6 & other);
```

ip::address_v6::any

Obtain an address object that represents any address.

```
static address_v6 any();
```

ip::address_v6::bytes_type

The type used to represent an address as an array of bytes.

```
typedef boost::array< unsigned char, 16 > bytes_type;
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::from_string

Create an address from an IP address string.

```
static address_v6 from_string(
    const char * str);
  » more...

static address_v6 from_string(
    const char * str,
    boost::system::error_code & ec);
  » more...

static address_v6 from_string(
    const std::string & str);
  » more...

static address_v6 from_string(
    const std::string & str,
    boost::system::error_code & ec);
  » more...
```

ip::address_v6::from_string (1 of 4 overloads)

Create an address from an IP address string.

```
static address_v6 from_string(
    const char * str);
```

ip::address_v6::from_string (2 of 4 overloads)

Create an address from an IP address string.

```
static address_v6 from_string(
    const char * str,
    boost::system::error_code & ec);
```

ip::address_v6::from_string (3 of 4 overloads)

Create an address from an IP address string.

```
static address_v6 from_string(
    const std::string & str);
```

ip::address_v6::from_string (4 of 4 overloads)

Create an address from an IP address string.

```
static address_v6 from_string(
    const std::string & str,
    boost::system::error_code & ec);
```

ip::address_v6::is_link_local

Determine whether the address is link local.

```
bool is_link_local() const;
```

ip::address_v6::is_loopback

Determine whether the address is a loopback address.

```
bool is_loopback() const;
```

ip::address_v6::is_multicast

Determine whether the address is a multicast address.

```
bool is_multicast() const;
```

ip::address_v6::is_multicast_global

Determine whether the address is a global multicast address.

```
bool is_multicast_global() const;
```

ip::address_v6::is_multicast_link_local

Determine whether the address is a link-local multicast address.

```
bool is_multicast_link_local() const;
```

ip::address_v6::is_multicast_node_local

Determine whether the address is a node-local multicast address.

```
bool is_multicast_node_local() const;
```

ip::address_v6::is_multicast_org_local

Determine whether the address is a org-local multicast address.

```
bool is_multicast_org_local() const;
```

ip::address_v6::is_multicast_site_local

Determine whether the address is a site-local multicast address.

```
bool is_multicast_site_local() const;
```

ip::address_v6::is_site_local

Determine whether the address is site local.

```
bool is_site_local() const;
```

ip::address_v6::is_unspecified

Determine whether the address is unspecified.

```
bool is_unspecified() const;
```

ip::address_v6::is_v4_compatible

Determine whether the address is an IPv4-compatible address.

```
bool is_v4_compatible() const;
```

ip::address_v6::is_v4_mapped

Determine whether the address is a mapped IPv4 address.

```
bool is_v4_mapped() const;
```

ip::address_v6::loopback

Obtain an address object that represents the loopback address.

```
static address_v6 loopback();
```

ip::address_v6::operator!=

Compare two addresses for inequality.

```
friend bool operator!=(
    const address_v6 & a1,
    const address_v6 & a2);
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::operator<

Compare addresses for ordering.

```
friend bool operator<(
    const address_v6 & a1,
    const address_v6 & a2);
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::operator<<

Output an address as a string.

```
template<
    typename Elem,
    typename Traits>
std::basic_ostream< Elem, Traits > & operator<<(
    std::basic_ostream< Elem, Traits > & os,
    const address_v6 & addr);
```

Used to output a human-readable string for a specified address.

Parameters

os The output stream to which the string will be written.

addr The address to be written.

Return Value

The output stream.

ip::address_v6::operator<=

Compare addresses for ordering.

```
friend bool operator<=(
    const address_v6 & a1,
    const address_v6 & a2);
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::operator=

Assign from another address.

```
address_v6 & operator=(
    const address_v6 & other);
```

ip::address_v6::operator==

Compare two addresses for equality.

```
friend bool operator==(
    const address_v6 & a1,
    const address_v6 & a2);
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::operator>

Compare addresses for ordering.

```
friend bool operator>(
    const address_v6 & a1,
    const address_v6 & a2);
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::operator>=

Compare addresses for ordering.

```
friend bool operator>=(
    const address_v6 & a1,
    const address_v6 & a2);
```

Requirements

Header: `boost/asio/ip/address_v6.hpp`

Convenience header: `boost/asio.hpp`

ip::address_v6::scope_id

The scope ID of the address.

```
unsigned long scope_id() const;
  » more...

void scope_id(
    unsigned long id);
  » more...
```

ip::address_v6::scope_id (1 of 2 overloads)

The scope ID of the address.

```
unsigned long scope_id() const;
```

Returns the scope ID associated with the IPv6 address.

ip::address_v6::scope_id (2 of 2 overloads)

The scope ID of the address.

```
void scope_id(
    unsigned long id);
```

Modifies the scope ID associated with the IPv6 address.

ip::address_v6::to_bytes

Get the address in bytes.

```
bytes_type to_bytes() const;
```

ip::address_v6::to_string

Get the address as a string.

```
std::string to_string() const;
  » more...

std::string to_string(
    boost::system::error_code & ec) const;
  » more...
```

ip::address_v6::to_string (1 of 2 overloads)

Get the address as a string.

```
std::string to_string() const;
```

ip::address_v6::to_string (2 of 2 overloads)

Get the address as a string.

```
std::string to_string(
    boost::system::error_code & ec) const;
```

ip::address_v6::to_v4

Converts an IPv4-mapped or IPv4-compatible address to an IPv4 address.

```
address_v4 to_v4() const;
```

ip::address_v6::v4_compatible

Create an IPv4-compatible IPv6 address.

```
static address_v6 v4_compatible(
    const address_v4 & addr);
```

ip::address_v6::v4_mapped

Create an IPv4-mapped IPv6 address.

```
static address_v6 v4_mapped(
    const address_v4 & addr);
```

ip::basic_endpoint

Describes an endpoint for a version-independent IP socket.

```
template<
    typename InternetProtocol>
class basic_endpoint
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
address	Get the IP address associated with the endpoint. Set the IP address associated with the endpoint.
basic_endpoint	Default constructor. Construct an endpoint using a port number, specified in the host's byte order. The IP address will be the any address (i.e. INADDR_ANY or in6addr_any). This constructor would typically be used for accepting new connections. Construct an endpoint using a port number and an IP address. This constructor may be used for accepting connections on a specific interface or for making a connection to a remote endpoint. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
port	Get the port associated with the endpoint. The port number is always in the host's byte order. Set the port associated with the endpoint. The port number is always in the host's byte order.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `ip::basic_endpoint` class template describes an endpoint that may be associated with a particular socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_endpoint::address

Get the IP address associated with the endpoint.

```
boost::asio::ip::address address() const;
  » more...
```

Set the IP address associated with the endpoint.

```
void address(
    const boost::asio::ip::address & addr);
  » more...
```

ip::basic_endpoint::address (1 of 2 overloads)

Get the IP address associated with the endpoint.

```
boost::asio::ip::address address() const;
```

ip::basic_endpoint::address (2 of 2 overloads)

Set the IP address associated with the endpoint.

```
void address(
    const boost::asio::ip::address & addr);
```

ip::basic_endpoint::basic_endpoint

Default constructor.

```
basic_endpoint();
  » more...
```

Construct an endpoint using a port number, specified in the host's byte order. The IP address will be the any address (i.e. INADDR_ANY or in6addr_any). This constructor would typically be used for accepting new connections.

```
basic_endpoint(
    const InternetProtocol & protocol,
    unsigned short port_num);
  » more...
```

Construct an endpoint using a port number and an IP address. This constructor may be used for accepting connections on a specific interface or for making a connection to a remote endpoint.

```
basic_endpoint(
    const boost::asio::ip::address & addr,
    unsigned short port_num);
  » more...
```

Copy constructor.

```
basic_endpoint(
    const basic_endpoint & other);
  » more...
```

ip::basic_endpoint::basic_endpoint (1 of 4 overloads)

Default constructor.

```
basic_endpoint();
```

ip::basic_endpoint::basic_endpoint (2 of 4 overloads)

Construct an endpoint using a port number, specified in the host's byte order. The IP address will be the any address (i.e. INADDR_ANY or in6addr_any). This constructor would typically be used for accepting new connections.

```
basic_endpoint(
    const InternetProtocol & protocol,
    unsigned short port_num);
```

Examples

To initialise an IPv4 TCP endpoint for port 1234, use:

```
boost::asio::ip::tcp::endpoint ep(boost::asio::ip::tcp::v4(), 1234);
```

To specify an IPv6 UDP endpoint for port 9876, use:

```
boost::asio::ip::udp::endpoint ep(boost::asio::ip::udp::v6(), 9876);
```

ip::basic_endpoint::basic_endpoint (3 of 4 overloads)

Construct an endpoint using a port number and an IP address. This constructor may be used for accepting connections on a specific interface or for making a connection to a remote endpoint.

```
basic_endpoint(
    const boost::asio::ip::address & addr,
    unsigned short port_num);
```

ip::basic_endpoint::basic_endpoint (4 of 4 overloads)

Copy constructor.

```
basic_endpoint(
    const basic_endpoint & other);
```

ip::basic_endpoint::capacity

Get the capacity of the endpoint in the native type.

```
std::size_t capacity() const;
```

ip::basic_endpoint::data

Get the underlying endpoint in the native type.

```
data_type * data();
  » more...

const data_type * data() const;
  » more...
```

ip::basic_endpoint::data (1 of 2 overloads)

Get the underlying endpoint in the native type.

```
data_type * data();
```

ip::basic_endpoint::data (2 of 2 overloads)

Get the underlying endpoint in the native type.

```
const data_type * data() const;
```

ip::basic_endpoint::data_type

The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.

```
typedef implementation_defined data_type;
```

Requirements

Header: `boost/asio/ip/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_endpoint::operator!=

Compare two endpoints for inequality.

```
friend bool operator!=(
    const basic_endpoint< InternetProtocol > & e1,
    const basic_endpoint< InternetProtocol > & e2);
```

Requirements

Header: `boost/asio/ip/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_endpoint::operator<

Compare endpoints for ordering.

```
friend bool operator<(
    const basic_endpoint< InternetProtocol > & e1,
    const basic_endpoint< InternetProtocol > & e2);
```

Requirements

Header: `boost/asio/ip/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_endpoint::operator<<

Output an endpoint as a string.

```
std::basic_ostream< Elem, Traits > & operator<<(
    std::basic_ostream< Elem, Traits > & os,
    const basic_endpoint< InternetProtocol > & endpoint);
```

Used to output a human-readable string for a specified endpoint.

Parameters

os	The output stream to which the string will be written.
endpoint	The endpoint to be written.

Return Value

The output stream.

ip::basic_endpoint::operator=

Assign from another endpoint.

```
basic_endpoint & operator=(
    const basic_endpoint & other);
```

ip::basic_endpoint::operator==

Compare two endpoints for equality.

```
friend bool operator==(
    const basic_endpoint< InternetProtocol > & e1,
    const basic_endpoint< InternetProtocol > & e2);
```

Requirements

Header: `boost/asio/ip/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_endpoint::port

Get the port associated with the endpoint. The port number is always in the host's byte order.

```
unsigned short port() const;
  » more...
```

Set the port associated with the endpoint. The port number is always in the host's byte order.

```
void port(
    unsigned short port_num);
  » more...
```

ip::basic_endpoint::port (1 of 2 overloads)

Get the port associated with the endpoint. The port number is always in the host's byte order.

```
unsigned short port() const;
```

ip::basic_endpoint::port (2 of 2 overloads)

Set the port associated with the endpoint. The port number is always in the host's byte order.

```
void port(
    unsigned short port_num);
```

ip::basic_endpoint::protocol

The protocol associated with the endpoint.

```
protocol_type protocol() const;
```

ip::basic_endpoint::protocol_type

The protocol type associated with the endpoint.

```
typedef InternetProtocol protocol_type;
```

Requirements

Header: `boost/asio/ip/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_endpoint::resize

Set the underlying size of the endpoint in the native type.

```
void resize(
    std::size_t size);
```

ip::basic_endpoint::size

Get the underlying size of the endpoint in the native type.

```
std::size_t size() const;
```

ip::basic_resolver

Provides endpoint resolution functionality.

```
template<
    typename InternetProtocol,
    typename ResolverService = resolver_service<InternetProtocol>>
class basic_resolver :
  public basic_io_object< ResolverService >
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
iterator	The iterator type.
protocol_type	The protocol type.
query	The query type.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
async_resolve	Asynchronously perform forward resolution of a query to a list of entries. Asynchronously perform reverse resolution of an endpoint to a list of entries.
basic_resolver	Constructor.
cancel	Cancel any asynchronous operations that are waiting on the resolver.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
resolve	Perform forward resolution of a query to a list of entries. Perform reverse resolution of an endpoint to a list of entries.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `ip::basic_resolver` class template provides the ability to resolve a query to a list of endpoints.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver::async_resolve

Asynchronously perform forward resolution of a query to a list of entries.

```
template<
    typename ResolveHandler>
void async_resolve(
    const query & q,
    ResolveHandler handler);
  » more...
```

Asynchronously perform reverse resolution of an endpoint to a list of entries.

```
template<
    typename ResolveHandler>
void async_resolve(
    const endpoint_type & e,
    ResolveHandler handler);
  » more...
```

ip::basic_resolver::async_resolve (1 of 2 overloads)

Asynchronously perform forward resolution of a query to a list of entries.

```
template<
    typename ResolveHandler>
void async_resolve(
    const query & q,
    ResolveHandler handler);
```

This function is used to asynchronously resolve a query into a list of endpoint entries.

Parameters

q — A query object that determines what endpoints will be returned.

handler — The handler to be called when the resolve operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  resolver::iterator iterator             // Forward-only iterator that can
                                          // be used to traverse the list
                                          // of endpoint entries.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

A default constructed iterator represents the end of the list.

A successful resolve operation is guaranteed to pass at least one entry to the handler.

ip::basic_resolver::async_resolve (2 of 2 overloads)

Asynchronously perform reverse resolution of an endpoint to a list of entries.

```
template<
    typename ResolveHandler>
void async_resolve(
    const endpoint_type & e,
    ResolveHandler handler);
```

This function is used to asynchronously resolve an endpoint into a list of endpoint entries.

Parameters

e — An endpoint object that determines what endpoints will be returned.

handler The handler to be called when the resolve operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  resolver::iterator iterator             // Forward-only iterator that can
                                          // be used to traverse the list
                                          // of endpoint entries.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

A default constructed iterator represents the end of the list.

A successful resolve operation is guaranteed to pass at least one entry to the handler.

ip::basic_resolver::basic_resolver

Constructor.

```
basic_resolver(
    boost::asio::io_service & io_service);
```

This constructor creates a `ip::basic_resolver`.

Parameters

io_service The `io_service` object that the resolver will use to dispatch handlers for any asynchronous operations performed on the timer.

ip::basic_resolver::cancel

Cancel any asynchronous operations that are waiting on the resolver.

```
void cancel();
```

This function forces the completion of any pending asynchronous operations on the host resolver. The handler for each cancelled operation will be invoked with the `boost::asio::error::operation_aborted` error code.

ip::basic_resolver::endpoint_type

The endpoint type.

```
typedef InternetProtocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

ip::basic_resolver::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

ip::basic_resolver::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

ip::basic_resolver::iterator

The iterator type.

```
typedef InternetProtocol::resolver_iterator iterator;
```

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver::protocol_type

The protocol type.

```
typedef InternetProtocol protocol_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver::query

The query type.

```
typedef InternetProtocol::resolver_query query;
```

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver::resolve

Perform forward resolution of a query to a list of entries.

```
iterator resolve(
    const query & q);
  » more...

iterator resolve(
    const query & q,
    boost::system::error_code & ec);
  » more...
```

Perform reverse resolution of an endpoint to a list of entries.

```
iterator resolve(
    const endpoint_type & e);
  » more...

iterator resolve(
    const endpoint_type & e,
    boost::system::error_code & ec);
  » more...
```

ip::basic_resolver::resolve (1 of 4 overloads)

Perform forward resolution of a query to a list of entries.

```
iterator resolve(
    const query & q);
```

This function is used to resolve a query into a list of endpoint entries.

Parameters

q A query object that determines what endpoints will be returned.

Return Value

A forward-only iterator that can be used to traverse the list of endpoint entries.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

A default constructed iterator represents the end of the list.

A successful call to this function is guaranteed to return at least one entry.

ip::basic_resolver::resolve (2 of 4 overloads)

Perform forward resolution of a query to a list of entries.

```
iterator resolve(
    const query & q,
    boost::system::error_code & ec);
```

This function is used to resolve a query into a list of endpoint entries.

Parameters

q A query object that determines what endpoints will be returned.

ec Set to indicate what error occurred, if any.

Return Value

A forward-only iterator that can be used to traverse the list of endpoint entries. Returns a default constructed iterator if an error occurs.

Remarks

A default constructed iterator represents the end of the list.

A successful call to this function is guaranteed to return at least one entry.

ip::basic_resolver::resolve (3 of 4 overloads)

Perform reverse resolution of an endpoint to a list of entries.

```
iterator resolve(
    const endpoint_type & e);
```

This function is used to resolve an endpoint into a list of endpoint entries.

Parameters

e An endpoint object that determines what endpoints will be returned.

Return Value

A forward-only iterator that can be used to traverse the list of endpoint entries.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

A default constructed iterator represents the end of the list.

A successful call to this function is guaranteed to return at least one entry.

ip::basic_resolver::resolve (4 of 4 overloads)

Perform reverse resolution of an endpoint to a list of entries.

```
iterator resolve(
    const endpoint_type & e,
    boost::system::error_code & ec);
```

This function is used to resolve an endpoint into a list of endpoint entries.

Parameters

e An endpoint object that determines what endpoints will be returned.

ec Set to indicate what error occurred, if any.

Return Value

A forward-only iterator that can be used to traverse the list of endpoint entries. Returns a default constructed iterator if an error occurs.

Remarks

A default constructed iterator represents the end of the list.

A successful call to this function is guaranteed to return at least one entry.

ip::basic_resolver::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

ip::basic_resolver::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef ResolverService service_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_entry

An entry produced by a resolver.

```
template<
    typename InternetProtocol>
class basic_resolver_entry
```

Types

Name	Description
endpoint_type	The endpoint type associated with the endpoint entry.
protocol_type	The protocol type associated with the endpoint entry.

Member Functions

Name	Description
basic_resolver_entry	Default constructor. Construct with specified endpoint, host name and service name.
endpoint	Get the endpoint associated with the entry.
host_name	Get the host name associated with the entry.
operator endpoint_type	Convert to the endpoint associated with the entry.
service_name	Get the service name associated with the entry.

The `ip::basic_resolver_entry` class template describes an entry as returned by a resolver.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/basic_resolver_entry.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_entry::basic_resolver_entry

Default constructor.

```
basic_resolver_entry();
  » more...
```

Construct with specified endpoint, host name and service name.

```
basic_resolver_entry(
    const endpoint_type & endpoint,
    const std::string & host_name,
    const std::string & service_name);
  » more...
```

ip::basic_resolver_entry::basic_resolver_entry (1 of 2 overloads)

Default constructor.

```
basic_resolver_entry();
```

ip::basic_resolver_entry::basic_resolver_entry (2 of 2 overloads)

Construct with specified endpoint, host name and service name.

```
basic_resolver_entry(
    const endpoint_type & endpoint,
    const std::string & host_name,
    const std::string & service_name);
```

ip::basic_resolver_entry::endpoint

Get the endpoint associated with the entry.

```
endpoint_type endpoint() const;
```

ip::basic_resolver_entry::endpoint_type

The endpoint type associated with the endpoint entry.

```
typedef InternetProtocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver_entry.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_entry::host_name

Get the host name associated with the entry.

```
std::string host_name() const;
```

ip::basic_resolver_entry::operator endpoint_type

Convert to the endpoint associated with the entry.

```
operator endpoint_type() const;
```

ip::basic_resolver_entry::protocol_type

The protocol type associated with the endpoint entry.

```
typedef InternetProtocol protocol_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver_entry.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_entry::service_name

Get the service name associated with the entry.

```
std::string service_name() const;
```

ip::basic_resolver_iterator

An iterator over the entries produced by a resolver.

```
template<
    typename InternetProtocol>
class basic_resolver_iterator
```

Member Functions

Name	Description
basic_resolver_iterator	Default constructor creates an end iterator.
create	Create an iterator from an addrinfo list returned by getaddrinfo. Create an iterator from an endpoint, host name and service name.

The `ip::basic_resolver_iterator` class template is used to define iterators over the results returned by a resolver.

The iterator's value_type, obtained when the iterator is dereferenced, is:

```
const basic_resolver_entry<InternetProtocol>
```

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/basic_resolver_iterator.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_iterator::basic_resolver_iterator

Default constructor creates an end iterator.

```
basic_resolver_iterator();
```

ip::basic_resolver_iterator::create

Create an iterator from an addrinfo list returned by getaddrinfo.

```
static basic_resolver_iterator create(
    boost::asio::detail::addrinfo_type * address_info,
    const std::string & host_name,
    const std::string & service_name);
  » more...
```

Create an iterator from an endpoint, host name and service name.

```
static basic_resolver_iterator create(
    const typename InternetProtocol::endpoint & endpoint,
    const std::string & host_name,
    const std::string & service_name);
  » more...
```

ip::basic_resolver_iterator::create (1 of 2 overloads)

Create an iterator from an addrinfo list returned by getaddrinfo.

```
static basic_resolver_iterator create(
    boost::asio::detail::addrinfo_type * address_info,
    const std::string & host_name,
    const std::string & service_name);
```

ip::basic_resolver_iterator::create (2 of 2 overloads)

Create an iterator from an endpoint, host name and service name.

```
static basic_resolver_iterator create(
    const typename InternetProtocol::endpoint & endpoint,
    const std::string & host_name,
    const std::string & service_name);
```

ip::basic_resolver_query

An query to be passed to a resolver.

```
template<
    typename InternetProtocol>
class basic_resolver_query :
  public ip::resolver_query_base
```

Types

Name	Description
protocol_type	The protocol type associated with the endpoint query.

Member Functions

Name	Description
basic_resolver_query	Construct with specified service name for any protocol. Construct with specified service name for a given protocol. Construct with specified host name and service name for any protocol. Construct with specified host name and service name for a given protocol.
hints	Get the hints associated with the query.
host_name	Get the host name associated with the query.
service_name	Get the service name associated with the query.

Data Members

Name	Description
address_configured	Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.
all_matching	If used with v4_mapped, return all matching IPv6 and IPv4 addresses.
canonical_name	Determine the canonical name of the host specified in the query.
numeric_host	Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.
numeric_service	Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.
passive	Indicate that returned endpoint is intended for use as a locally bound socket endpoint.
v4_mapped	If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

The `ip::basic_resolver_query` class template describes a query that can be passed to a resolver.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/basic_resolver_query.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_query::address_configured

Inherited from ip::resolver_query_base.

Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.

```
static const int address_configured = implementation_defined;
```

ip::basic_resolver_query::all_matching

Inherited from ip::resolver_query_base.

If used with v4_mapped, return all matching IPv6 and IPv4 addresses.

```
static const int all_matching = implementation_defined;
```

ip::basic_resolver_query::basic_resolver_query

Construct with specified service name for any protocol.

```
basic_resolver_query(
    const std::string & service_name,
    int flags = passive|address_configured);
  » more...
```

Construct with specified service name for a given protocol.

```
basic_resolver_query(
    const protocol_type & protocol,
    const std::string & service_name,
    int flags = passive|address_configured);
  » more...
```

Construct with specified host name and service name for any protocol.

```
basic_resolver_query(
    const std::string & host_name,
    const std::string & service_name,
    int flags = address_configured);
  » more...
```

Construct with specified host name and service name for a given protocol.

```
basic_resolver_query(
    const protocol_type & protocol,
    const std::string & host_name,
    const std::string & service_name,
    int flags = address_configured);
  » more...
```

ip::basic_resolver_query::basic_resolver_query (1 of 4 overloads)

Construct with specified service name for any protocol.

```
basic_resolver_query(
    const std::string & service_name,
    int flags = passive|address_configured);
```

ip::basic_resolver_query::basic_resolver_query (2 of 4 overloads)

Construct with specified service name for a given protocol.

```
basic_resolver_query(
    const protocol_type & protocol,
    const std::string & service_name,
    int flags = passive|address_configured);
```

ip::basic_resolver_query::basic_resolver_query (3 of 4 overloads)

Construct with specified host name and service name for any protocol.

```
basic_resolver_query(
    const std::string & host_name,
    const std::string & service_name,
    int flags = address_configured);
```

ip::basic_resolver_query::basic_resolver_query (4 of 4 overloads)

Construct with specified host name and service name for a given protocol.

```
basic_resolver_query(
    const protocol_type & protocol,
    const std::string & host_name,
    const std::string & service_name,
    int flags = address_configured);
```

ip::basic_resolver_query::canonical_name

Inherited from ip::resolver_query_base.

Determine the canonical name of the host specified in the query.

```
static const int canonical_name = implementation_defined;
```

ip::basic_resolver_query::hints

Get the hints associated with the query.

```
const boost::asio::detail::addrinfo_type & hints() const;
```

ip::basic_resolver_query::host_name

Get the host name associated with the query.

```
std::string host_name() const;
```

ip::basic_resolver_query::numeric_host

Inherited from ip::resolver_query_base.

Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.

```
static const int numeric_host = implementation_defined;
```

ip::basic_resolver_query::numeric_service

Inherited from ip::resolver_query_base.

Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.

```
static const int numeric_service = implementation_defined;
```

ip::basic_resolver_query::passive

Inherited from ip::resolver_query_base.

Indicate that returned endpoint is intended for use as a locally bound socket endpoint.

```
static const int passive = implementation_defined;
```

ip::basic_resolver_query::protocol_type

The protocol type associated with the endpoint query.

```
typedef InternetProtocol protocol_type;
```

Requirements

Header: `boost/asio/ip/basic_resolver_query.hpp`

Convenience header: `boost/asio.hpp`

ip::basic_resolver_query::service_name

Get the service name associated with the query.

```
std::string service_name() const;
```

ip::basic_resolver_query::v4_mapped

Inherited from ip::resolver_query_base.

If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

```
static const int v4_mapped = implementation_defined;
```

ip::host_name

Get the current host name.

```
std::string host_name();
  » more...

std::string host_name(
    boost::system::error_code & ec);
  » more...
```

Requirements

Header: `boost/asio/ip/host_name.hpp`

Convenience header: `boost/asio.hpp`

ip::host_name (1 of 2 overloads)

Get the current host name.

```
std::string host_name();
```

ip::host_name (2 of 2 overloads)

Get the current host name.

```
std::string host_name(
    boost::system::error_code & ec);
```

ip::icmp

Encapsulates the flags needed for ICMP.

```
class icmp
```

Types

Name	Description
endpoint	The type of a ICMP endpoint.
resolver	The ICMP resolver type.
resolver_iterator	The type of a resolver iterator.
resolver_query	The type of a resolver query.
socket	The ICMP socket type.

Member Functions

Name	Description
family	Obtain an identifier for the protocol family.
protocol	Obtain an identifier for the protocol.
type	Obtain an identifier for the type of the protocol.
v4	Construct to represent the IPv4 ICMP protocol.
v6	Construct to represent the IPv6 ICMP protocol.

Friends

Name	Description
operator!=	Compare two protocols for inequality.
operator==	Compare two protocols for equality.

The `ip::icmp` class contains flags necessary for ICMP sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::endpoint

The type of a ICMP endpoint.

```
typedef basic_endpoint< icmp > endpoint;
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
address	Get the IP address associated with the endpoint. Set the IP address associated with the endpoint.
basic_endpoint	Default constructor. Construct an endpoint using a port number, specified in the host's byte order. The IP address will be the any address (i.e. INADDR_ANY or in6addr_any). This constructor would typically be used for accepting new connections. Construct an endpoint using a port number and an IP address. This constructor may be used for accepting connections on a specific interface or for making a connection to a remote endpoint. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
port	Get the port associated with the endpoint. The port number is always in the host's byte order. Set the port associated with the endpoint. The port number is always in the host's byte order.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `ip::basic_endpoint` class template describes an endpoint that may be associated with a particular socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::family

Obtain an identifier for the protocol family.

```
int family() const;
```

ip::icmp::operator!=

Compare two protocols for inequality.

```
friend bool operator!=(
    const icmp & p1,
    const icmp & p2);
```

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::operator==

Compare two protocols for equality.

```
friend bool operator==(
    const icmp & p1,
    const icmp & p2);
```

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::protocol

Obtain an identifier for the protocol.

```
int protocol() const;
```

ip::icmp::resolver

The ICMP resolver type.

```
typedef basic_resolver< icmp > resolver;
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
iterator	The iterator type.
protocol_type	The protocol type.
query	The query type.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
async_resolve	Asynchronously perform forward resolution of a query to a list of entries. Asynchronously perform reverse resolution of an endpoint to a list of entries.
basic_resolver	Constructor.
cancel	Cancel any asynchronous operations that are waiting on the resolver.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
resolve	Perform forward resolution of a query to a list of entries. Perform reverse resolution of an endpoint to a list of entries.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `ip::basic_resolver` class template provides the ability to resolve a query to a list of endpoints.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::resolver_iterator

The type of a resolver iterator.

```
typedef basic_resolver_iterator< icmp > resolver_iterator;
```

Member Functions

Name	Description
basic_resolver_iterator	Default constructor creates an end iterator.
create	Create an iterator from an addrinfo list returned by getaddrinfo. Create an iterator from an endpoint, host name and service name.

The `ip::basic_resolver_iterator` class template is used to define iterators over the results returned by a resolver.

The iterator's value_type, obtained when the iterator is dereferenced, is:

```
const basic_resolver_entry<InternetProtocol>
```

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::resolver_query

The type of a resolver query.

```
typedef basic_resolver_query< icmp > resolver_query;
```

Types

Name	Description
protocol_type	The protocol type associated with the endpoint query.

Member Functions

Name	Description
basic_resolver_query	Construct with specified service name for any protocol. Construct with specified service name for a given protocol. Construct with specified host name and service name for any protocol. Construct with specified host name and service name for a given protocol.
hints	Get the hints associated with the query.
host_name	Get the host name associated with the query.
service_name	Get the service name associated with the query.

Data Members

Name	Description
address_configured	Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.
all_matching	If used with v4_mapped, return all matching IPv6 and IPv4 addresses.
canonical_name	Determine the canonical name of the host specified in the query.
numeric_host	Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.
numeric_service	Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.
passive	Indicate that returned endpoint is intended for use as a locally bound socket endpoint.
v4_mapped	If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

The `ip::basic_resolver_query` class template describes a query that can be passed to a resolver.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::socket

The ICMP socket type.

```
typedef basic_raw_socket< icmp > socket;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive on a connected socket.
async_receive_from	Start an asynchronous receive.
async_send	Start an asynchronous send on a connected socket.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_raw_socket	Construct a basic_raw_socket without opening it. Construct and open a basic_raw_socket. Construct a basic_raw_socket, opening it and binding it to the given local endpoint. Construct a basic_raw_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
receive	Receive some data on a connected socket.
receive_from	Receive raw data with the endpoint of the sender.

Name	Description
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on a connected socket.
send_to	Send raw data to the specified endpoint.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_raw_socket` class template provides asynchronous and blocking raw-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/icmp.hpp`

Convenience header: `boost/asio.hpp`

ip::icmp::type

Obtain an identifier for the type of the protocol.

```
int type() const;
```

ip::icmp::v4

Construct to represent the IPv4 ICMP protocol.

```
static icmp v4();
```

ip::icmp::v6

Construct to represent the IPv6 ICMP protocol.

```
static icmp v6();
```

ip::multicast::enable_loopback

Socket option determining whether outgoing multicast packets will be received on the same socket if it is a member of the multicast group.

```
typedef implementation_defined enable_loopback;
```

Implements the IPPROTO_IP/IP_MULTICAST_LOOP socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::multicast::enable_loopback option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::multicast::enable_loopback option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/ip/multicast.hpp`

Convenience header: `boost/asio.hpp`

ip::multicast::hops

Socket option for time-to-live associated with outgoing multicast packets.

```
typedef implementation_defined hops;
```

Implements the IPPROTO_IP/IP_MULTICAST_TTL socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::multicast::hops option(4);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::multicast::hops option;
socket.get_option(option);
int ttl = option.value();
```

Requirements

Header: `boost/asio/ip/multicast.hpp`

Convenience header: `boost/asio.hpp`

ip::multicast::join_group

Socket option to join a multicast group on a specified interface.

```
typedef implementation_defined join_group;
```

Implements the IPPROTO_IP/IP_ADD_MEMBERSHIP socket option.

Examples

Setting the option to join a multicast group:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::address multicast_address =
  boost::asio::ip::address::from_string("225.0.0.1");
boost::asio::ip::multicast::join_group option(multicast_address);
socket.set_option(option);
```

Requirements

Header: `boost/asio/ip/multicast.hpp`

Convenience header: `boost/asio.hpp`

ip::multicast::leave_group

Socket option to leave a multicast group on a specified interface.

```
typedef implementation_defined leave_group;
```

Implements the IPPROTO_IP/IP_DROP_MEMBERSHIP socket option.

Examples

Setting the option to leave a multicast group:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::address multicast_address =
  boost::asio::ip::address::from_string("225.0.0.1");
boost::asio::ip::multicast::leave_group option(multicast_address);
socket.set_option(option);
```

Requirements

Header: `boost/asio/ip/multicast.hpp`

Convenience header: `boost/asio.hpp`

ip::multicast::outbound_interface

Socket option for local interface to use for outgoing multicast packets.

```
typedef implementation_defined outbound_interface;
```

Implements the IPPROTO_IP/IP_MULTICAST_IF socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::address_v4 local_interface =
  boost::asio::ip::address_v4::from_string("1.2.3.4");
boost::asio::ip::multicast::outbound_interface option(local_interface);
socket.set_option(option);
```

Requirements

Header: `boost/asio/ip/multicast.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_query_base

The `ip::resolver_query_base` class is used as a base for the `ip::basic_resolver_query` class templates to provide a common place to define the flag constants.

```
class resolver_query_base
```

Protected Member Functions

Name	Description
~resolver_query_base	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
address_configured	Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.
all_matching	If used with v4_mapped, return all matching IPv6 and IPv4 addresses.
canonical_name	Determine the canonical name of the host specified in the query.
numeric_host	Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.
numeric_service	Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.
passive	Indicate that returned endpoint is intended for use as a locally bound socket endpoint.
v4_mapped	If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

Requirements

Header: `boost/asio/ip/resolver_query_base.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_query_base::address_configured

Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.

```
static const int address_configured = implementation_defined;
```

ip::resolver_query_base::all_matching

If used with v4_mapped, return all matching IPv6 and IPv4 addresses.

```
static const int all_matching = implementation_defined;
```

ip::resolver_query_base::canonical_name

Determine the canonical name of the host specified in the query.

```
static const int canonical_name = implementation_defined;
```

ip::resolver_query_base::numeric_host

Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.

```
static const int numeric_host = implementation_defined;
```

ip::resolver_query_base::numeric_service

Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.

```
static const int numeric_service = implementation_defined;
```

ip::resolver_query_base::passive

Indicate that returned endpoint is intended for use as a locally bound socket endpoint.

```
static const int passive = implementation_defined;
```

ip::resolver_query_base::v4_mapped

If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

```
static const int v4_mapped = implementation_defined;
```

ip::resolver_query_base::~resolver_query_base

Protected destructor to prevent deletion through this type.

```
~resolver_query_base();
```

ip::resolver_service

Default service implementation for a resolver.

```
template<
    typename InternetProtocol>
class resolver_service :
  public io_service::service
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The type of a resolver implementation.
iterator_type	The iterator type.
protocol_type	The protocol type.
query_type	The query type.

Member Functions

Name	Description
async_resolve	Asynchronously resolve a query to a list of entries. Asynchronously resolve an endpoint to a list of entries.
cancel	Cancel pending asynchronous operations.
construct	Construct a new resolver implementation.
destroy	Destroy a resolver implementation.
get_io_service	Get the io_service object that owns the service.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
resolve	Resolve a query to a list of entries. Resolve an endpoint to a list of entries.
resolver_service	Construct a new resolver service for the specified io_service.
shutdown_service	Destroy all user-defined handler objects owned by the service.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/ip/resolver_service.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_service::async_resolve

Asynchronously resolve a query to a list of entries.

```
template<
    typename Handler>
void async_resolve(
    implementation_type & impl,
    const query_type & query,
    Handler handler);
  » more...
```

Asynchronously resolve an endpoint to a list of entries.

```
template<
    typename ResolveHandler>
void async_resolve(
    implementation_type & impl,
    const endpoint_type & endpoint,
    ResolveHandler handler);
  » more...
```

ip::resolver_service::async_resolve (1 of 2 overloads)

Asynchronously resolve a query to a list of entries.

```
template<
    typename Handler>
void async_resolve(
    implementation_type & impl,
    const query_type & query,
    Handler handler);
```

ip::resolver_service::async_resolve (2 of 2 overloads)

Asynchronously resolve an endpoint to a list of entries.

```
template<
    typename ResolveHandler>
void async_resolve(
    implementation_type & impl,
    const endpoint_type & endpoint,
    ResolveHandler handler);
```

ip::resolver_service::cancel

Cancel pending asynchronous operations.

```
void cancel(
    implementation_type & impl);
```

ip::resolver_service::construct

Construct a new resolver implementation.

```
void construct(
    implementation_type & impl);
```

ip::resolver_service::destroy

Destroy a resolver implementation.

```
void destroy(
    implementation_type & impl);
```

ip::resolver_service::endpoint_type

The endpoint type.

```
typedef InternetProtocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/ip/resolver_service.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

ip::resolver_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

ip::resolver_service::implementation_type

The type of a resolver implementation.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/ip/resolver_service.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

ip::resolver_service::iterator_type

The iterator type.

```
typedef InternetProtocol::resolver_iterator iterator_type;
```

Requirements

Header: `boost/asio/ip/resolver_service.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_service::protocol_type

The protocol type.

```
typedef InternetProtocol protocol_type;
```

Requirements

Header: `boost/asio/ip/resolver_service.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_service::query_type

The query type.

```
typedef InternetProtocol::resolver_query query_type;
```

Requirements

Header: `boost/asio/ip/resolver_service.hpp`

Convenience header: `boost/asio.hpp`

ip::resolver_service::resolve

Resolve a query to a list of entries.

```
iterator_type resolve(
    implementation_type & impl,
    const query_type & query,
    boost::system::error_code & ec);
  » more...
```

Resolve an endpoint to a list of entries.

```
iterator_type resolve(
    implementation_type & impl,
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
  » more...
```

ip::resolver_service::resolve (1 of 2 overloads)

Resolve a query to a list of entries.

```
iterator_type resolve(
    implementation_type & impl,
    const query_type & query,
    boost::system::error_code & ec);
```

ip::resolver_service::resolve (2 of 2 overloads)

Resolve an endpoint to a list of entries.

```
iterator_type resolve(
    implementation_type & impl,
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

ip::resolver_service::resolver_service

Construct a new resolver service for the specified `io_service`.

```
resolver_service(
    boost::asio::io_service & io_service);
```

ip::resolver_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

ip::tcp

Encapsulates the flags needed for TCP.

```
class tcp
```

Types

Name	Description
acceptor	The TCP acceptor type.
endpoint	The type of a TCP endpoint.
iostream	The TCP iostream type.
no_delay	Socket option for disabling the Nagle algorithm.
resolver	The TCP resolver type.
resolver_iterator	The type of a resolver iterator.
resolver_query	The type of a resolver query.
socket	The TCP socket type.

Member Functions

Name	Description
family	Obtain an identifier for the protocol family.
protocol	Obtain an identifier for the protocol.
type	Obtain an identifier for the type of the protocol.
v4	Construct to represent the IPv4 TCP protocol.
v6	Construct to represent the IPv6 TCP protocol.

Friends

Name	Description
operator!=	Compare two protocols for inequality.
operator==	Compare two protocols for equality.

The `ip::tcp` class contains flags necessary for TCP sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::acceptor

The TCP acceptor type.

```
typedef basic_socket_acceptor< tcp > acceptor;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of an acceptor.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
accept	Accept a new connection. Accept a new connection and obtain the endpoint of the peer.
assign	Assigns an existing native acceptor to the acceptor.
async_accept	Start an asynchronous accept.
basic_socket_acceptor	Construct an acceptor without opening it. Construct an open acceptor. Construct an acceptor opened on the given endpoint. Construct a basic_socket_acceptor on an existing native acceptor.
bind	Bind the acceptor to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the acceptor.
close	Close the acceptor.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the acceptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the acceptor is open.
listen	Place the acceptor into the state where it will listen for new connections.
local_endpoint	Get the local endpoint of the acceptor.
native	Get the native acceptor representation.
open	Open the acceptor using the specified protocol.
set_option	Set an option on the acceptor.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket_acceptor` class template is used for accepting new socket connections.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Example

Opening a socket acceptor with the SO_REUSEADDR option enabled:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
boost::asio::ip::tcp::endpoint endpoint(boost::asio::ip::tcp::v4(), port);
acceptor.open(endpoint.protocol());
acceptor.set_option(boost::asio::ip::tcp::acceptor::reuse_address(true));
acceptor.bind(endpoint);
acceptor.listen();
```

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::endpoint

The type of a TCP endpoint.

```
typedef basic_endpoint< tcp > endpoint;
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
address	Get the IP address associated with the endpoint. Set the IP address associated with the endpoint.
basic_endpoint	Default constructor. Construct an endpoint using a port number, specified in the host's byte order. The IP address will be the any address (i.e. INADDR_ANY or in6addr_any). This constructor would typically be used for accepting new connections. Construct an endpoint using a port number and an IP address. This constructor may be used for accepting connections on a specific interface or for making a connection to a remote endpoint. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
port	Get the port associated with the endpoint. The port number is always in the host's byte order. Set the port associated with the endpoint. The port number is always in the host's byte order.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `ip::basic_endpoint` class template describes an endpoint that may be associated with a particular socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::family

Obtain an identifier for the protocol family.

```
int family() const;
```

ip::tcp::iostream

The TCP iostream type.

```
typedef basic_socket_iostream< tcp > iostream;
```

Member Functions

Name	Description
basic_socket_iostream	Construct a basic_socket_iostream without establishing a connection. Establish a connection to an endpoint corresponding to a resolver query.
close	Close the connection.
connect	Establish a connection to an endpoint corresponding to a resolver query.
rdbuf	Return a pointer to the underlying streambuf.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::no_delay

Socket option for disabling the Nagle algorithm.

```
typedef implementation_defined no_delay;
```

Implements the IPPROTO_TCP/TCP_NODELAY socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::tcp::no_delay option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::operator!=

Compare two protocols for inequality.

```
friend bool operator!=(
    const tcp & p1,
    const tcp & p2);
```

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::operator==

Compare two protocols for equality.

```
friend bool operator==(
    const tcp & p1,
    const tcp & p2);
```

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::protocol

Obtain an identifier for the protocol.

```
int protocol() const;
```

ip::tcp::resolver

The TCP resolver type.

```
typedef basic_resolver< tcp > resolver;
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
iterator	The iterator type.
protocol_type	The protocol type.
query	The query type.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
async_resolve	Asynchronously perform forward resolution of a query to a list of entries. Asynchronously perform reverse resolution of an endpoint to a list of entries.
basic_resolver	Constructor.
cancel	Cancel any asynchronous operations that are waiting on the resolver.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
resolve	Perform forward resolution of a query to a list of entries. Perform reverse resolution of an endpoint to a list of entries.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `ip::basic_resolver` class template provides the ability to resolve a query to a list of endpoints.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::resolver_iterator

The type of a resolver iterator.

```
typedef basic_resolver_iterator< tcp > resolver_iterator;
```

Member Functions

Name	Description
basic_resolver_iterator	Default constructor creates an end iterator.
create	Create an iterator from an addrinfo list returned by getaddrinfo. Create an iterator from an endpoint, host name and service name.

The `ip::basic_resolver_iterator` class template is used to define iterators over the results returned by a resolver.

The iterator's value_type, obtained when the iterator is dereferenced, is:

```
const basic_resolver_entry<InternetProtocol>
```

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::resolver_query

The type of a resolver query.

```
typedef basic_resolver_query< tcp > resolver_query;
```

Types

Name	Description
protocol_type	The protocol type associated with the endpoint query.

Member Functions

Name	Description
basic_resolver_query	Construct with specified service name for any protocol. Construct with specified service name for a given protocol. Construct with specified host name and service name for any protocol. Construct with specified host name and service name for a given protocol.
hints	Get the hints associated with the query.
host_name	Get the host name associated with the query.
service_name	Get the service name associated with the query.

Data Members

Name	Description
address_configured	Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.
all_matching	If used with v4_mapped, return all matching IPv6 and IPv4 addresses.
canonical_name	Determine the canonical name of the host specified in the query.
numeric_host	Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.
numeric_service	Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.
passive	Indicate that returned endpoint is intended for use as a locally bound socket endpoint.
v4_mapped	If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

The `ip::basic_resolver_query` class template describes a query that can be passed to a resolver.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::socket

The TCP socket type.

```
typedef basic_stream_socket< tcp > socket;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_read_some	Start an asynchronous read.
async_receive	Start an asynchronous receive.
async_send	Start an asynchronous send.
async_write_some	Start an asynchronous write.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_stream_socket	Construct a basic_stream_socket without opening it. Construct and open a basic_stream_socket. Construct a basic_stream_socket, opening it and binding it to the given local endpoint. Construct a basic_stream_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
read_some	Read some data from the socket.

Name	Description
receive	Receive some data on the socket. Receive some data on a connected socket.
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.
write_some	Write some data to the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_stream_socket` class template provides asynchronous and blocking stream-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/tcp.hpp`

Convenience header: `boost/asio.hpp`

ip::tcp::type

Obtain an identifier for the type of the protocol.

```
int type() const;
```

ip::tcp::v4

Construct to represent the IPv4 TCP protocol.

```
static tcp v4();
```

ip::tcp::v6

Construct to represent the IPv6 TCP protocol.

```
static tcp v6();
```

ip::udp

Encapsulates the flags needed for UDP.

```
class udp
```

Types

Name	Description
endpoint	The type of a UDP endpoint.
resolver	The UDP resolver type.
resolver_iterator	The type of a resolver iterator.
resolver_query	The type of a resolver query.
socket	The UDP socket type.

Member Functions

Name	Description
family	Obtain an identifier for the protocol family.
protocol	Obtain an identifier for the protocol.
type	Obtain an identifier for the type of the protocol.
v4	Construct to represent the IPv4 UDP protocol.
v6	Construct to represent the IPv6 UDP protocol.

Friends

Name	Description
operator!=	Compare two protocols for inequality.
operator==	Compare two protocols for equality.

The `ip::udp` class contains flags necessary for UDP sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::endpoint

The type of a UDP endpoint.

```
typedef basic_endpoint< udp > endpoint;
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
address	Get the IP address associated with the endpoint. Set the IP address associated with the endpoint.
basic_endpoint	Default constructor. Construct an endpoint using a port number, specified in the host's byte order. The IP address will be the any address (i.e. INADDR_ANY or in6addr_any). This constructor would typically be used for accepting new connections. Construct an endpoint using a port number and an IP address. This constructor may be used for accepting connections on a specific interface or for making a connection to a remote endpoint. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
port	Get the port associated with the endpoint. The port number is always in the host's byte order. Set the port associated with the endpoint. The port number is always in the host's byte order.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `ip::basic_endpoint` class template describes an endpoint that may be associated with a particular socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::family

Obtain an identifier for the protocol family.

```
int family() const;
```

ip::udp::operator!=

Compare two protocols for inequality.

```
friend bool operator!=(
    const udp & p1,
    const udp & p2);
```

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::operator==

Compare two protocols for equality.

```
friend bool operator==(
    const udp & p1,
    const udp & p2);
```

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::protocol

Obtain an identifier for the protocol.

```
int protocol() const;
```

ip::udp::resolver

The UDP resolver type.

```
typedef basic_resolver< udp > resolver;
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
iterator	The iterator type.
protocol_type	The protocol type.
query	The query type.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
async_resolve	Asynchronously perform forward resolution of a query to a list of entries. Asynchronously perform reverse resolution of an endpoint to a list of entries.
basic_resolver	Constructor.
cancel	Cancel any asynchronous operations that are waiting on the resolver.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
resolve	Perform forward resolution of a query to a list of entries. Perform reverse resolution of an endpoint to a list of entries.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `ip::basic_resolver` class template provides the ability to resolve a query to a list of endpoints.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::resolver_iterator

The type of a resolver iterator.

```
typedef basic_resolver_iterator< udp > resolver_iterator;
```

Member Functions

Name	Description
basic_resolver_iterator	Default constructor creates an end iterator.
create	Create an iterator from an addrinfo list returned by getaddrinfo. Create an iterator from an endpoint, host name and service name.

The `ip::basic_resolver_iterator` class template is used to define iterators over the results returned by a resolver.

The iterator's value_type, obtained when the iterator is dereferenced, is:

```
const basic_resolver_entry<InternetProtocol>
```

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::resolver_query

The type of a resolver query.

```
typedef basic_resolver_query< udp > resolver_query;
```

Types

Name	Description
protocol_type	The protocol type associated with the endpoint query.

Member Functions

Name	Description
basic_resolver_query	Construct with specified service name for any protocol. Construct with specified service name for a given protocol. Construct with specified host name and service name for any protocol. Construct with specified host name and service name for a given protocol.
hints	Get the hints associated with the query.
host_name	Get the host name associated with the query.
service_name	Get the service name associated with the query.

Data Members

Name	Description
address_configured	Only return IPv4 addresses if a non-loopback IPv4 address is configured for the system. Only return IPv6 addresses if a non-loopback IPv6 address is configured for the system.
all_matching	If used with v4_mapped, return all matching IPv6 and IPv4 addresses.
canonical_name	Determine the canonical name of the host specified in the query.
numeric_host	Host name should be treated as a numeric string defining an IPv4 or IPv6 address and no name resolution should be attempted.
numeric_service	Service name should be treated as a numeric string defining a port number and no name resolution should be attempted.
passive	Indicate that returned endpoint is intended for use as a locally bound socket endpoint.
v4_mapped	If the query protocol family is specified as IPv6, return IPv4-mapped IPv6 addresses on finding no IPv6 addresses.

The `ip::basic_resolver_query` class template describes a query that can be passed to a resolver.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::socket

The UDP socket type.

```
typedef basic_datagram_socket< udp > socket;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive on a connected socket.
async_receive_from	Start an asynchronous receive.
async_send	Start an asynchronous send on a connected socket.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_datagram_socket	Construct a basic_datagram_socket without opening it. Construct and open a basic_datagram_socket. Construct a basic_datagram_socket, opening it and binding it to the given local endpoint. Construct a basic_datagram_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
receive	Receive some data on a connected socket.
receive_from	Receive a datagram with the endpoint of the sender.

Name	Description
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on a connected socket.
send_to	Send a datagram to the specified endpoint.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_datagram_socket` class template provides asynchronous and blocking datagram-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/ip/udp.hpp`

Convenience header: `boost/asio.hpp`

ip::udp::type

Obtain an identifier for the type of the protocol.

```
int type() const;
```

ip::udp::v4

Construct to represent the IPv4 UDP protocol.

```
static udp v4();
```

ip::udp::v6

Construct to represent the IPv6 UDP protocol.

```
static udp v6();
```

ip::unicast::hops

Socket option for time-to-live associated with outgoing unicast packets.

```
typedef implementation_defined hops;
```

Implements the IPPROTO_IP/IP_UNICAST_TTL socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::unicast::hops option(4);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::ip::unicast::hops option;
socket.get_option(option);
int ttl = option.value();
```

Requirements

Header: `boost/asio/ip/unicast.hpp`

Convenience header: `boost/asio.hpp`

ip::v6_only

Socket option for determining whether an IPv6 socket supports IPv6 communication only.

```
typedef implementation_defined v6_only;
```

Implements the IPPROTO_IPV6/IP_V6ONLY socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::v6_only option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::ip::v6_only option;
socket.get_option(option);
bool v6_only = option.value();
```

Requirements

Header: `boost/asio/ip/v6_only.hpp`

Convenience header: `boost/asio.hpp`

is_match_condition

Type trait used to determine whether a type can be used as a match condition function with read_until and async_read_until.

```
template<
    typename T>
struct is_match_condition
```

Data Members

Name	Description
value	The value member is true if the type may be used as a match condition.

Requirements

Header: `boost/asio/read_until.hpp`

Convenience header: `boost/asio.hpp`

is_match_condition::value

The value member is true if the type may be used as a match condition.

```
static const bool value;
```

is_read_buffered

The `is_read_buffered` class is a traits class that may be used to determine whether a stream type supports buffering of read data.

```
template<
    typename Stream>
class is_read_buffered
```

Data Members

Name	Description
value	The value member is true only if the Stream type supports buffering of read data.

Requirements

Header: `boost/asio/is_read_buffered.hpp`

Convenience header: `boost/asio.hpp`

is_read_buffered::value

The value member is true only if the Stream type supports buffering of read data.

```
static const bool value;
```

is_write_buffered

The `is_write_buffered` class is a traits class that may be used to determine whether a stream type supports buffering of written data.

```
template<
    typename Stream>
class is_write_buffered
```

Data Members

Name	Description
value	The value member is true only if the Stream type supports buffering of written data.

Requirements

Header: `boost/asio/is_write_buffered.hpp`

Convenience header: `boost/asio.hpp`

is_write_buffered::value

The value member is true only if the Stream type supports buffering of written data.

```
static const bool value;
```

local::basic_endpoint

Describes an endpoint for a UNIX socket.

```
template<
    typename Protocol>
class basic_endpoint
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
basic_endpoint	Default constructor. Construct an endpoint using the specified path name. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
path	Get the path associated with the endpoint. Set the path associated with the endpoint.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `local::basic_endpoint` class template describes an endpoint that may be associated with a particular UNIX socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/local/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

local::basic_endpoint::basic_endpoint

Default constructor.

```
basic_endpoint();
  » more...
```

Construct an endpoint using the specified path name.

```
basic_endpoint(
    const char * path);
  » more...

basic_endpoint(
    const std::string & path);
  » more...
```

Copy constructor.

```
basic_endpoint(
    const basic_endpoint & other);
  » more...
```

local::basic_endpoint::basic_endpoint (1 of 4 overloads)

Default constructor.

```
basic_endpoint();
```

local::basic_endpoint::basic_endpoint (2 of 4 overloads)

Construct an endpoint using the specified path name.

```
basic_endpoint(
    const char * path);
```

local::basic_endpoint::basic_endpoint (3 of 4 overloads)

Construct an endpoint using the specified path name.

```
basic_endpoint(
    const std::string & path);
```

local::basic_endpoint::basic_endpoint (4 of 4 overloads)

Copy constructor.

```
basic_endpoint(
    const basic_endpoint & other);
```

local::basic_endpoint::capacity

Get the capacity of the endpoint in the native type.

```
std::size_t capacity() const;
```

local::basic_endpoint::data

Get the underlying endpoint in the native type.

```
data_type * data();
  » more...

const data_type * data() const;
  » more...
```

local::basic_endpoint::data (1 of 2 overloads)

Get the underlying endpoint in the native type.

```
data_type * data();
```

local::basic_endpoint::data (2 of 2 overloads)

Get the underlying endpoint in the native type.

```
const data_type * data() const;
```

local::basic_endpoint::data_type

The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.

```
typedef implementation_defined data_type;
```

Requirements

Header: `boost/asio/local/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

local::basic_endpoint::operator!=

Compare two endpoints for inequality.

```
friend bool operator!=(
    const basic_endpoint< Protocol > & e1,
    const basic_endpoint< Protocol > & e2);
```

Requirements

Header: `boost/asio/local/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

local::basic_endpoint::operator<

Compare endpoints for ordering.

```
friend bool operator<(
    const basic_endpoint< Protocol > & e1,
    const basic_endpoint< Protocol > & e2);
```

Requirements

Header: `boost/asio/local/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

local::basic_endpoint::operator<<

Output an endpoint as a string.

```
std::basic_ostream< Elem, Traits > & operator<<(
    std::basic_ostream< Elem, Traits > & os,
    const basic_endpoint< Protocol > & endpoint);
```

Used to output a human-readable string for a specified endpoint.

Parameters

os	The output stream to which the string will be written.
endpoint	The endpoint to be written.

Return Value

The output stream.

local::basic_endpoint::operator=

Assign from another endpoint.

```
basic_endpoint & operator=(
    const basic_endpoint & other);
```

local::basic_endpoint::operator==

Compare two endpoints for equality.

```
friend bool operator==(
    const basic_endpoint< Protocol > & e1,
    const basic_endpoint< Protocol > & e2);
```

Requirements

Header: `boost/asio/local/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

local::basic_endpoint::path

Get the path associated with the endpoint.

```
std::string path() const;
  » more...
```

Set the path associated with the endpoint.

```
void path(
    const char * p);
  » more...

void path(
    const std::string & p);
  » more...
```

local::basic_endpoint::path (1 of 3 overloads)

Get the path associated with the endpoint.

```
std::string path() const;
```

local::basic_endpoint::path (2 of 3 overloads)

Set the path associated with the endpoint.

```
void path(
    const char * p);
```

local::basic_endpoint::path (3 of 3 overloads)

Set the path associated with the endpoint.

```
void path(
    const std::string & p);
```

local::basic_endpoint::protocol

The protocol associated with the endpoint.

```
protocol_type protocol() const;
```

local::basic_endpoint::protocol_type

The protocol type associated with the endpoint.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/local/basic_endpoint.hpp`

Convenience header: `boost/asio.hpp`

local::basic_endpoint::resize

Set the underlying size of the endpoint in the native type.

```
void resize(
    std::size_t size);
```

local::basic_endpoint::size

Get the underlying size of the endpoint in the native type.

```
std::size_t size() const;
```

local::connect_pair

Create a pair of connected sockets.

```
template<
    typename Protocol,
    typename SocketService1,
    typename SocketService2>
void connect_pair(
    basic_socket< Protocol, SocketService1 > & socket1,
    basic_socket< Protocol, SocketService2 > & socket2);
  » more...

template<
    typename Protocol,
    typename SocketService1,
    typename SocketService2>
boost::system::error_code connect_pair(
    basic_socket< Protocol, SocketService1 > & socket1,
    basic_socket< Protocol, SocketService2 > & socket2,
    boost::system::error_code & ec);
  » more...
```

Requirements

Header: `boost/asio/local/connect_pair.hpp`

Convenience header: `boost/asio.hpp`

local::connect_pair (1 of 2 overloads)

Create a pair of connected sockets.

```
template<
    typename Protocol,
    typename SocketService1,
    typename SocketService2>
void connect_pair(
    basic_socket< Protocol, SocketService1 > & socket1,
    basic_socket< Protocol, SocketService2 > & socket2);
```

local::connect_pair (2 of 2 overloads)

Create a pair of connected sockets.

```
template<
    typename Protocol,
    typename SocketService1,
    typename SocketService2>
boost::system::error_code connect_pair(
    basic_socket< Protocol, SocketService1 > & socket1,
    basic_socket< Protocol, SocketService2 > & socket2,
    boost::system::error_code & ec);
```

local::datagram_protocol

Encapsulates the flags needed for datagram-oriented UNIX sockets.

```
class datagram_protocol
```

Types

Name	Description
endpoint	The type of a UNIX domain endpoint.
socket	The UNIX domain socket type.

Member Functions

Name	Description
family	Obtain an identifier for the protocol family.
protocol	Obtain an identifier for the protocol.
type	Obtain an identifier for the type of the protocol.

The `local::datagram_protocol` class contains flags necessary for datagram-oriented UNIX domain sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/local/datagram_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::datagram_protocol::endpoint

The type of a UNIX domain endpoint.

```
typedef basic_endpoint< datagram_protocol > endpoint;
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
basic_endpoint	Default constructor. Construct an endpoint using the specified path name. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
path	Get the path associated with the endpoint. Set the path associated with the endpoint.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `local::basic_endpoint` class template describes an endpoint that may be associated with a particular UNIX socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/local/datagram_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::datagram_protocol::family

Obtain an identifier for the protocol family.

```
int family() const;
```

local::datagram_protocol::protocol

Obtain an identifier for the protocol.

```
int protocol() const;
```

local::datagram_protocol::socket

The UNIX domain socket type.

```
typedef basic_datagram_socket< datagram_protocol > socket;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive on a connected socket.
async_receive_from	Start an asynchronous receive.
async_send	Start an asynchronous send on a connected socket.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_datagram_socket	Construct a basic_datagram_socket without opening it. Construct and open a basic_datagram_socket. Construct a basic_datagram_socket, opening it and binding it to the given local endpoint. Construct a basic_datagram_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
receive	Receive some data on a connected socket.
receive_from	Receive a datagram with the endpoint of the sender.

Name	Description
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on a connected socket.
send_to	Send a datagram to the specified endpoint.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_datagram_socket` class template provides asynchronous and blocking datagram-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/local/datagram_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::datagram_protocol::type

Obtain an identifier for the type of the protocol.

```
int type() const;
```

local::stream_protocol

Encapsulates the flags needed for stream-oriented UNIX sockets.

```
class stream_protocol
```

Types

Name	Description
acceptor	The UNIX domain acceptor type.
endpoint	The type of a UNIX domain endpoint.
iostream	The UNIX domain iostream type.
socket	The UNIX domain socket type.

Member Functions

Name	Description
family	Obtain an identifier for the protocol family.
protocol	Obtain an identifier for the protocol.
type	Obtain an identifier for the type of the protocol.

The `local::stream_protocol` class contains flags necessary for stream-oriented UNIX domain sockets.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/local/stream_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::stream_protocol::acceptor

The UNIX domain acceptor type.

```
typedef basic_socket_acceptor< stream_protocol > acceptor;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of an acceptor.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
accept	Accept a new connection. Accept a new connection and obtain the endpoint of the peer.
assign	Assigns an existing native acceptor to the acceptor.
async_accept	Start an asynchronous accept.
basic_socket_acceptor	Construct an acceptor without opening it. Construct an open acceptor. Construct an acceptor opened on the given endpoint. Construct a basic_socket_acceptor on an existing native acceptor.
bind	Bind the acceptor to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the acceptor.
close	Close the acceptor.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the acceptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the acceptor is open.
listen	Place the acceptor into the state where it will listen for new connections.
local_endpoint	Get the local endpoint of the acceptor.
native	Get the native acceptor representation.
open	Open the acceptor using the specified protocol.
set_option	Set an option on the acceptor.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_socket_acceptor` class template is used for accepting new socket connections.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Example

Opening a socket acceptor with the SO_REUSEADDR option enabled:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
boost::asio::ip::tcp::endpoint endpoint(boost::asio::ip::tcp::v4(), port);
acceptor.open(endpoint.protocol());
acceptor.set_option(boost::asio::ip::tcp::acceptor::reuse_address(true));
acceptor.bind(endpoint);
acceptor.listen();
```

Requirements

Header: `boost/asio/local/stream_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::stream_protocol::endpoint

The type of a UNIX domain endpoint.

```
typedef basic_endpoint< stream_protocol > endpoint;
```

Types

Name	Description
data_type	The type of the endpoint structure. This type is dependent on the underlying implementation of the socket layer.
protocol_type	The protocol type associated with the endpoint.

Member Functions

Name	Description
basic_endpoint	Default constructor. Construct an endpoint using the specified path name. Copy constructor.
capacity	Get the capacity of the endpoint in the native type.
data	Get the underlying endpoint in the native type.
operator=	Assign from another endpoint.
path	Get the path associated with the endpoint. Set the path associated with the endpoint.
protocol	The protocol associated with the endpoint.
resize	Set the underlying size of the endpoint in the native type.
size	Get the underlying size of the endpoint in the native type.

Friends

Name	Description
operator!=	Compare two endpoints for inequality.
operator<	Compare endpoints for ordering.
operator==	Compare two endpoints for equality.

Related Functions

Name	Description
operator<<	Output an endpoint as a string.

The `local::basic_endpoint` class template describes an endpoint that may be associated with a particular UNIX socket.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/local/stream_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::stream_protocol::family

Obtain an identifier for the protocol family.

```
int family() const;
```

local::stream_protocol::iostream

The UNIX domain iostream type.

```
typedef basic_socket_iostream< stream_protocol > iostream;
```

Member Functions

Name	Description
basic_socket_iostream	Construct a basic_socket_iostream without establishing a connection. Establish a connection to an endpoint corresponding to a resolver query.
close	Close the connection.
connect	Establish a connection to an endpoint corresponding to a resolver query.
rdbuf	Return a pointer to the underlying streambuf.

Requirements

Header: `boost/asio/local/stream_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::stream_protocol::protocol

Obtain an identifier for the protocol.

```
int protocol() const;
```

local::stream_protocol::socket

The UNIX domain socket type.

```
typedef basic_stream_socket< stream_protocol > socket;
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
endpoint_type	The endpoint type.
implementation_type	The underlying implementation type of I/O object.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
lowest_layer_type	A basic_socket is always the lowest layer.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
native_type	The native representation of a socket.
non_blocking_io	IO control command to set the blocking mode of the socket.
protocol_type	The protocol type.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
service_type	The type of the service that will be used to provide I/O operations.
shutdown_type	Different ways a socket may be shutdown.

Member Functions

Name	Description
assign	Assign an existing native socket to the socket.
async_connect	Start an asynchronous connect.
async_read_some	Start an asynchronous read.
async_receive	Start an asynchronous receive.
async_send	Start an asynchronous send.
async_write_some	Start an asynchronous write.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
basic_stream_socket	Construct a basic_stream_socket without opening it. Construct and open a basic_stream_socket. Construct a basic_stream_socket, opening it and binding it to the given local endpoint. Construct a basic_stream_socket on an existing native socket.
bind	Bind the socket to the given local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close the socket.
connect	Connect the socket to the specified endpoint.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the socket.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint of the socket.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native socket representation.
open	Open the socket using the specified protocol.
read_some	Read some data from the socket.

Name	Description
receive	Receive some data on the socket. Receive some data on a connected socket.
remote_endpoint	Get the remote endpoint of the socket.
send	Send some data on the socket.
set_option	Set an option on the socket.
shutdown	Disable sends or receives on the socket.
write_some	Write some data to the socket.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_stream_socket` class template provides asynchronous and blocking stream-oriented socket functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/local/stream_protocol.hpp`

Convenience header: `boost/asio.hpp`

local::stream_protocol::type

Obtain an identifier for the type of the protocol.

```
int type() const;
```

mutable_buffer

Holds a buffer that can be modified.

```
class mutable_buffer
```

Member Functions

Name	Description
mutable_buffer	Construct an empty buffer. Construct a buffer to represent a given memory range.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new modifiable buffer that is offset from the start of another.

The `mutable_buffer` class provides a safe representation of a buffer that can be modified. It does not own the underlying data, and so is cheap to copy or assign.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

mutable_buffer::buffer_cast

Cast a non-modifiable buffer to a specified pointer to POD type.

```
template<
    typename PointerToPodType>
PointerToPodType buffer_cast(
    const mutable_buffer & b);
```

mutable_buffer::buffer_size

Get the number of bytes in a non-modifiable buffer.

```
std::size_t buffer_size(
    const mutable_buffer & b);
```

mutable_buffer::mutable_buffer

Construct an empty buffer.

```
mutable_buffer();
  » more...
```

Construct a buffer to represent a given memory range.

```
mutable_buffer(
    void * data,
    std::size_t size);
  » more...
```

mutable_buffer::mutable_buffer (1 of 2 overloads)

Construct an empty buffer.

```
mutable_buffer();
```

mutable_buffer::mutable_buffer (2 of 2 overloads)

Construct a buffer to represent a given memory range.

```
mutable_buffer(
    void * data,
    std::size_t size);
```

mutable_buffer::operator+

Create a new modifiable buffer that is offset from the start of another.

```
mutable_buffer operator+(
    const mutable_buffer & b,
    std::size_t start);
  » more...

mutable_buffer operator+(
    std::size_t start,
    const mutable_buffer & b);
  » more...
```

mutable_buffer::operator+ (1 of 2 overloads)

Create a new modifiable buffer that is offset from the start of another.

```
mutable_buffer operator+(
    const mutable_buffer & b,
    std::size_t start);
```

mutable_buffer::operator+ (2 of 2 overloads)

Create a new modifiable buffer that is offset from the start of another.

```
mutable_buffer operator+(
    std::size_t start,
    const mutable_buffer & b);
```

mutable_buffers_1

Adapts a single modifiable buffer so that it meets the requirements of the MutableBufferSequence concept.

```
class mutable_buffers_1 :
  public mutable_buffer
```

Types

Name	Description
const_iterator	A random-access iterator type that may be used to read elements.
value_type	The type for each element in the list of buffers.

Member Functions

Name	Description
begin	Get a random-access iterator to the first element.
end	Get a random-access iterator for one past the last element.
mutable_buffers_1	Construct to represent a given memory range. Construct to represent a single modifiable buffer.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new modifiable buffer that is offset from the start of another.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

mutable_buffers_1::begin

Get a random-access iterator to the first element.

```
const_iterator begin() const;
```

mutable_buffers_1::buffer_cast

Inherited from mutable_buffer.

Cast a non-modifiable buffer to a specified pointer to POD type.

```
template<
    typename PointerToPodType>
PointerToPodType buffer_cast(
    const mutable_buffer & b);
```

mutable_buffers_1::buffer_size

Inherited from mutable_buffer.

Get the number of bytes in a non-modifiable buffer.

```
std::size_t buffer_size(
    const mutable_buffer & b);
```

mutable_buffers_1::const_iterator

A random-access iterator type that may be used to read elements.

```
typedef const mutable_buffer * const_iterator;
```

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

mutable_buffers_1::end

Get a random-access iterator for one past the last element.

```
const_iterator end() const;
```

mutable_buffers_1::mutable_buffers_1

Construct to represent a given memory range.

```
mutable_buffers_1(
    void * data,
    std::size_t size);
  » more...
```

Construct to represent a single modifiable buffer.

```
explicit mutable_buffers_1(
    const mutable_buffer & b);
  » more...
```

mutable_buffers_1::mutable_buffers_1 (1 of 2 overloads)

Construct to represent a given memory range.

```
mutable_buffers_1(
    void * data,
    std::size_t size);
```

mutable_buffers_1::mutable_buffers_1 (2 of 2 overloads)

Construct to represent a single modifiable buffer.

```
mutable_buffers_1(
    const mutable_buffer & b);
```

mutable_buffers_1::operator+

Create a new modifiable buffer that is offset from the start of another.

```
mutable_buffer operator+(
    const mutable_buffer & b,
    std::size_t start);
  » more...

mutable_buffer operator+(
    std::size_t start,
    const mutable_buffer & b);
  » more...
```

mutable_buffers_1::operator+ (1 of 2 overloads)

Inherited from mutable_buffer.

Create a new modifiable buffer that is offset from the start of another.

```
mutable_buffer operator+(
    const mutable_buffer & b,
    std::size_t start);
```

mutable_buffers_1::operator+ (2 of 2 overloads)

Inherited from mutable_buffer.

Create a new modifiable buffer that is offset from the start of another.

```
mutable_buffer operator+(
    std::size_t start,
    const mutable_buffer & b);
```

mutable_buffers_1::value_type

The type for each element in the list of buffers.

```
typedef mutable_buffer value_type;
```

Member Functions

Name	Description
mutable_buffer	Construct an empty buffer. Construct a buffer to represent a given memory range.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new modifiable buffer that is offset from the start of another.

The `mutable_buffer` class provides a safe representation of a buffer that can be modified. It does not own the underlying data, and so is cheap to copy or assign.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

null_buffers

An implementation of both the ConstBufferSequence and MutableBufferSequence concepts to represent a null buffer sequence.

```
class null_buffers
```

Types

Name	Description
const_iterator	A random-access iterator type that may be used to read elements.
value_type	The type for each element in the list of buffers.

Member Functions

Name	Description
begin	Get a random-access iterator to the first element.
end	Get a random-access iterator for one past the last element.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

null_buffers::begin

Get a random-access iterator to the first element.

```
const_iterator begin() const;
```

null_buffers::const_iterator

A random-access iterator type that may be used to read elements.

```
typedef const mutable_buffer * const_iterator;
```

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

null_buffers::end

Get a random-access iterator for one past the last element.

```
const_iterator end() const;
```

null_buffers::value_type

The type for each element in the list of buffers.

```
typedef mutable_buffer value_type;
```

Member Functions

Name	Description
mutable_buffer	Construct an empty buffer. Construct a buffer to represent a given memory range.

Related Functions

Name	Description
buffer_cast	Cast a non-modifiable buffer to a specified pointer to POD type.
buffer_size	Get the number of bytes in a non-modifiable buffer.
operator+	Create a new modifiable buffer that is offset from the start of another.

The `mutable_buffer` class provides a safe representation of a buffer that can be modified. It does not own the underlying data, and so is cheap to copy or assign.

Requirements

Header: `boost/asio/buffer.hpp`

Convenience header: `boost/asio.hpp`

placeholders::bytes_transferred

An argument placeholder, for use with boost::bind(), that corresponds to the bytes_transferred argument of a handler for asynchronous functions such as `boost::asio::basic_stream_socket::async_write_some` or `boost::asio::async_write`.

```
unspecified bytes_transferred;
```

Requirements

Header: `boost/asio/placeholders.hpp`

Convenience header: `boost/asio.hpp`

placeholders::error

An argument placeholder, for use with boost::bind(), that corresponds to the error argument of a handler for any of the asynchronous functions.

```
unspecified error;
```

Requirements

Header: `boost/asio/placeholders.hpp`

Convenience header: `boost/asio.hpp`

placeholders::iterator

An argument placeholder, for use with boost::bind(), that corresponds to the iterator argument of a handler for asynchronous functions such as boost::asio::basic_resolver::resolve.

```
unspecified iterator;
```

Requirements

Header: `boost/asio/placeholders.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor

Provides POSIX descriptor functionality.

```
template<
    typename DescriptorService>
class basic_descriptor :
  public basic_io_object< DescriptorService >,
  public posix::descriptor_base
```

Types

Name	Description
bytes_readable	IO control command to get the amount of data that can be read without blocking.
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_descriptor is always the lowest layer.
native_type	The native representation of a descriptor.
non_blocking_io	IO control command to set the blocking mode of the descriptor.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native descriptor to the descriptor.
basic_descriptor	Construct a basic_descriptor without opening it. Construct a basic_descriptor on an existing native descriptor.
cancel	Cancel all asynchronous operations associated with the descriptor.
close	Close the descriptor.
get_io_service	Get the io_service associated with the object.
io_control	Perform an IO control command on the descriptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the descriptor is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native descriptor representation.

Protected Member Functions

Name	Description
~basic_descriptor	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `posix::basic_descriptor` class template provides the ability to wrap a POSIX descriptor.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::assign

Assign an existing native descriptor to the descriptor.

```
void assign(
    const native_type & native_descriptor);
  » more...

boost::system::error_code assign(
    const native_type & native_descriptor,
    boost::system::error_code & ec);
  » more...
```

posix::basic_descriptor::assign (1 of 2 overloads)

Assign an existing native descriptor to the descriptor.

```
void assign(
    const native_type & native_descriptor);
```

posix::basic_descriptor::assign (2 of 2 overloads)

Assign an existing native descriptor to the descriptor.

```
boost::system::error_code assign(
    const native_type & native_descriptor,
    boost::system::error_code & ec);
```

posix::basic_descriptor::basic_descriptor

Construct a `posix::basic_descriptor` without opening it.

```
explicit basic_descriptor(
    boost::asio::io_service & io_service);
  » more...
```

Construct a `posix::basic_descriptor` on an existing native descriptor.

```
basic_descriptor(
    boost::asio::io_service & io_service,
    const native_type & native_descriptor);
  » more...
```

posix::basic_descriptor::basic_descriptor (1 of 2 overloads)

Construct a `posix::basic_descriptor` without opening it.

```
basic_descriptor(
    boost::asio::io_service & io_service);
```

This constructor creates a descriptor without opening it.

Parameters

io_service	The `io_service` object that the descriptor will use to dispatch handlers for any asynchronous operations performed on the descriptor.

posix::basic_descriptor::basic_descriptor (2 of 2 overloads)

Construct a `posix::basic_descriptor` on an existing native descriptor.

```
basic_descriptor(
    boost::asio::io_service & io_service,
    const native_type & native_descriptor);
```

This constructor creates a descriptor object to hold an existing native descriptor.

Parameters

io_service	The `io_service` object that the descriptor will use to dispatch handlers for any asynchronous operations performed on the descriptor.
native_descriptor	A native descriptor.

Exceptions

boost::system::system_error	Thrown on failure.

posix::basic_descriptor::bytes_readable

Inherited from posix::descriptor_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::descriptor_base::bytes_readable command(true);
descriptor.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::cancel

Cancel all asynchronous operations associated with the descriptor.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

posix::basic_descriptor::cancel (1 of 2 overloads)

Cancel all asynchronous operations associated with the descriptor.

```
void cancel();
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

posix::basic_descriptor::cancel (2 of 2 overloads)

Cancel all asynchronous operations associated with the descriptor.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

posix::basic_descriptor::close

Close the descriptor.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

posix::basic_descriptor::close (1 of 2 overloads)

Close the descriptor.

```
void close();
```

This function is used to close the descriptor. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error Thrown on failure.

posix::basic_descriptor::close (2 of 2 overloads)

Close the descriptor.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the descriptor. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

posix::basic_descriptor::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

posix::basic_descriptor::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

posix::basic_descriptor::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::io_control

Perform an IO control command on the descriptor.

```
template<
    typename IoControlCommand>
void io_control(
    IoControlCommand & command);
  » more...

template<
    typename IoControlCommand>
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

posix::basic_descriptor::io_control (1 of 2 overloads)

Perform an IO control command on the descriptor.

```
template<
    typename IoControlCommand>
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the descriptor.

Parameters

command The IO control command to be performed on the descriptor.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::posix::stream_descriptor::bytes_readable command;
descriptor.io_control(command);
std::size_t bytes_readable = command.get();
```

posix::basic_descriptor::io_control (2 of 2 overloads)

Perform an IO control command on the descriptor.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the descriptor.

Parameters

command The IO control command to be performed on the descriptor.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::posix::stream_descriptor::bytes_readable command;
boost::system::error_code ec;
descriptor.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

posix::basic_descriptor::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

posix::basic_descriptor::is_open

Determine whether the descriptor is open.

```
bool is_open() const;
```

posix::basic_descriptor::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

posix::basic_descriptor::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `posix::basic_descriptor` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

posix::basic_descriptor::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `posix::basic_descriptor` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

posix::basic_descriptor::lowest_layer_type

A `posix::basic_descriptor` is always the lowest layer.

```
typedef basic_descriptor< DescriptorService > lowest_layer_type;
```

Types

Name	Description
bytes_readable	IO control command to get the amount of data that can be read without blocking.
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_descriptor is always the lowest layer.
native_type	The native representation of a descriptor.
non_blocking_io	IO control command to set the blocking mode of the descriptor.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native descriptor to the descriptor.
basic_descriptor	Construct a basic_descriptor without opening it. Construct a basic_descriptor on an existing native descriptor.
cancel	Cancel all asynchronous operations associated with the descriptor.
close	Close the descriptor.
get_io_service	Get the io_service associated with the object.
io_control	Perform an IO control command on the descriptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the descriptor is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native descriptor representation.

Protected Member Functions

Name	Description
~basic_descriptor	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `posix::basic_descriptor` class template provides the ability to wrap a POSIX descriptor.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::native

Get the native descriptor representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the descriptor. This is intended to allow access to native descriptor functionality that is not otherwise provided.

posix::basic_descriptor::native_type

The native representation of a descriptor.

```
typedef DescriptorService::native_type native_type;
```

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::non_blocking_io

Inherited from posix::descriptor_base.

IO control command to set the blocking mode of the descriptor.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::descriptor_base::non_blocking_io command(true);
descriptor.io_control(command);
```

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

posix::basic_descriptor::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef DescriptorService service_type;
```

Requirements

Header: `boost/asio/posix/basic_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_descriptor::~basic_descriptor

Protected destructor to prevent deletion through this type.

```
~basic_descriptor();
```

posix::basic_stream_descriptor

Provides stream-oriented descriptor functionality.

```
template<
    typename StreamDescriptorService = stream_descriptor_service>
class basic_stream_descriptor :
  public posix::basic_descriptor< StreamDescriptorService >
```

Types

Name	Description
bytes_readable	IO control command to get the amount of data that can be read without blocking.
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_descriptor is always the lowest layer.
native_type	The native representation of a descriptor.
non_blocking_io	IO control command to set the blocking mode of the descriptor.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native descriptor to the descriptor.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_stream_descriptor	Construct a basic_stream_descriptor without opening it. Construct a basic_stream_descriptor on an existing native descriptor.
cancel	Cancel all asynchronous operations associated with the descriptor.
close	Close the descriptor.
get_io_service	Get the io_service associated with the object.
io_control	Perform an IO control command on the descriptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the descriptor is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native descriptor representation.
read_some	Read some data from the descriptor.
write_some	Write some data to the descriptor.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `posix::basic_stream_descriptor` class template provides asynchronous and blocking stream-oriented descriptor functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::assign

Assign an existing native descriptor to the descriptor.

```
void assign(
    const native_type & native_descriptor);
  » more...

boost::system::error_code assign(
    const native_type & native_descriptor,
    boost::system::error_code & ec);
  » more...
```

posix::basic_stream_descriptor::assign (1 of 2 overloads)

Inherited from posix::basic_descriptor.

Assign an existing native descriptor to the descriptor.

```
void assign(
    const native_type & native_descriptor);
```

posix::basic_stream_descriptor::assign (2 of 2 overloads)

Inherited from posix::basic_descriptor.

Assign an existing native descriptor to the descriptor.

```
boost::system::error_code assign(
    const native_type & native_descriptor,
    boost::system::error_code & ec);
```

posix::basic_stream_descriptor::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read data from the stream descriptor. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be read. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes read.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The read operation may not read all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is read before the asynchronous operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
descriptor.async_read_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

posix::basic_stream_descriptor::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write data to the stream descriptor. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be written to the descriptor. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes written.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The write operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
descriptor.async_write_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

posix::basic_stream_descriptor::basic_stream_descriptor

Construct a `posix::basic_stream_descriptor` without opening it.

```
explicit basic_stream_descriptor(
    boost::asio::io_service & io_service);
  » more...
```

Construct a `posix::basic_stream_descriptor` on an existing native descriptor.

```
basic_stream_descriptor(
    boost::asio::io_service & io_service,
    const native_type & native_descriptor);
  » more...
```

posix::basic_stream_descriptor::basic_stream_descriptor (1 of 2 overloads)

Construct a `posix::basic_stream_descriptor` without opening it.

```
basic_stream_descriptor(
    boost::asio::io_service & io_service);
```

This constructor creates a stream descriptor without opening it. The descriptor needs to be opened and then connected or accepted before data can be sent or received on it.

Parameters

io_service	The `io_service` object that the stream descriptor will use to dispatch handlers for any asynchronous operations performed on the descriptor.

posix::basic_stream_descriptor::basic_stream_descriptor (2 of 2 overloads)

Construct a `posix::basic_stream_descriptor` on an existing native descriptor.

```
basic_stream_descriptor(
    boost::asio::io_service & io_service,
    const native_type & native_descriptor);
```

This constructor creates a stream descriptor object to hold an existing native descriptor.

Parameters

io_service	The `io_service` object that the stream descriptor will use to dispatch handlers for any asynchronous operations performed on the descriptor.
native_descriptor	The new underlying descriptor implementation.

Exceptions

boost::system::system_error	Thrown on failure.

posix::basic_stream_descriptor::bytes_readable

Inherited from posix::descriptor_base.

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::descriptor_base::bytes_readable command(true);
descriptor.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::cancel

Cancel all asynchronous operations associated with the descriptor.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

posix::basic_stream_descriptor::cancel (1 of 2 overloads)

Inherited from posix::basic_descriptor.

Cancel all asynchronous operations associated with the descriptor.

```
void cancel();
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

posix::basic_stream_descriptor::cancel (2 of 2 overloads)

Inherited from posix::basic_descriptor.

Cancel all asynchronous operations associated with the descriptor.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

posix::basic_stream_descriptor::close

Close the descriptor.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

posix::basic_stream_descriptor::close (1 of 2 overloads)

Inherited from posix::basic_descriptor.

Close the descriptor.

```
void close();
```

This function is used to close the descriptor. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

posix::basic_stream_descriptor::close (2 of 2 overloads)

Inherited from posix::basic_descriptor.

Close the descriptor.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the descriptor. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

posix::basic_stream_descriptor::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

posix::basic_stream_descriptor::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

posix::basic_stream_descriptor::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::io_control

Perform an IO control command on the descriptor.

```
void io_control(
    IoControlCommand & command);
  » more...

boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
  » more...
```

posix::basic_stream_descriptor::io_control (1 of 2 overloads)

Inherited from posix::basic_descriptor.

Perform an IO control command on the descriptor.

```
void io_control(
    IoControlCommand & command);
```

This function is used to execute an IO control command on the descriptor.

Parameters

command The IO control command to be performed on the descriptor.

Exceptions

boost::system::system_error Thrown on failure.

Example

Getting the number of bytes ready to read:

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::posix::stream_descriptor::bytes_readable command;
descriptor.io_control(command);
std::size_t bytes_readable = command.get();
```

posix::basic_stream_descriptor::io_control (2 of 2 overloads)

Inherited from posix::basic_descriptor.

Perform an IO control command on the descriptor.

```
boost::system::error_code io_control(
    IoControlCommand & command,
    boost::system::error_code & ec);
```

This function is used to execute an IO control command on the descriptor.

Parameters

command The IO control command to be performed on the descriptor.

ec Set to indicate what error occurred, if any.

Example

Getting the number of bytes ready to read:

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::posix::stream_descriptor::bytes_readable command;
boost::system::error_code ec;
descriptor.io_control(command, ec);
if (ec)
{
  // An error occurred.
}
std::size_t bytes_readable = command.get();
```

posix::basic_stream_descriptor::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

posix::basic_stream_descriptor::is_open

Inherited from posix::basic_descriptor.

Determine whether the descriptor is open.

```
bool is_open() const;
```

posix::basic_stream_descriptor::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

posix::basic_stream_descriptor::lowest_layer (1 of 2 overloads)

Inherited from posix::basic_descriptor.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `posix::basic_descriptor` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

posix::basic_stream_descriptor::lowest_layer (2 of 2 overloads)

Inherited from posix::basic_descriptor.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `posix::basic_descriptor` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

posix::basic_stream_descriptor::lowest_layer_type

Inherited from posix::basic_descriptor.

A `posix::basic_descriptor` is always the lowest layer.

```
typedef basic_descriptor< StreamDescriptorService > lowest_layer_type;
```

Types

Name	Description
bytes_readable	IO control command to get the amount of data that can be read without blocking.
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_descriptor is always the lowest layer.
native_type	The native representation of a descriptor.
non_blocking_io	IO control command to set the blocking mode of the descriptor.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native descriptor to the descriptor.
basic_descriptor	Construct a basic_descriptor without opening it. Construct a basic_descriptor on an existing native descriptor.
cancel	Cancel all asynchronous operations associated with the descriptor.
close	Close the descriptor.
get_io_service	Get the io_service associated with the object.
io_control	Perform an IO control command on the descriptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the descriptor is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native descriptor representation.

Protected Member Functions

Name	Description
~basic_descriptor	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `posix::basic_descriptor` class template provides the ability to wrap a POSIX descriptor.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::native

Inherited from posix::basic_descriptor.

Get the native descriptor representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the descriptor. This is intended to allow access to native descriptor functionality that is not otherwise provided.

posix::basic_stream_descriptor::native_type

The native representation of a descriptor.

```
typedef StreamDescriptorService::native_type native_type;
```

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::non_blocking_io

Inherited from posix::descriptor_base.

IO control command to set the blocking mode of the descriptor.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::descriptor_base::non_blocking_io command(true);
descriptor.io_control(command);
```

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::read_some

Read some data from the descriptor.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

posix::basic_stream_descriptor::read_some (1 of 2 overloads)

Read some data from the descriptor.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

This function is used to read data from the stream descriptor. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers	One or more buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error	Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
descriptor.read_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

posix::basic_stream_descriptor::read_some (2 of 2 overloads)

Read some data from the descriptor.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to read data from the stream descriptor. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers	One or more buffers into which the data will be read.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

posix::basic_stream_descriptor::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

posix::basic_stream_descriptor::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef StreamDescriptorService service_type;
```

Requirements

Header: `boost/asio/posix/basic_stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::basic_stream_descriptor::write_some

Write some data to the descriptor.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

posix::basic_stream_descriptor::write_some (1 of 2 overloads)

Write some data to the descriptor.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

This function is used to write data to the stream descriptor. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers — One or more data buffers to be written to the descriptor.

Return Value

The number of bytes written.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
descriptor.write_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

posix::basic_stream_descriptor::write_some (2 of 2 overloads)

Write some data to the descriptor.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to write data to the stream descriptor. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers One or more data buffers to be written to the descriptor.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes written. Returns 0 if an error occurred.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

posix::descriptor_base

The `posix::descriptor_base` class is used as a base for the `posix::basic_stream_descriptor` class template so that we have a common place to define the associated IO control commands.

```
class descriptor_base
```

Types

Name	Description
bytes_readable	IO control command to get the amount of data that can be read without blocking.
non_blocking_io	IO control command to set the blocking mode of the descriptor.

Protected Member Functions

Name	Description
~descriptor_base	Protected destructor to prevent deletion through this type.

Requirements

Header: `boost/asio/posix/descriptor_base.hpp`

Convenience header: `boost/asio.hpp`

posix::descriptor_base::bytes_readable

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::descriptor_base::bytes_readable command(true);
descriptor.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/posix/descriptor_base.hpp`

Convenience header: `boost/asio.hpp`

posix::descriptor_base::non_blocking_io

IO control command to set the blocking mode of the descriptor.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::posix::stream_descriptor descriptor(io_service);
...
boost::asio::descriptor_base::non_blocking_io command(true);
descriptor.io_control(command);
```

Requirements

Header: `boost/asio/posix/descriptor_base.hpp`

Convenience header: `boost/asio.hpp`

posix::descriptor_base::~descriptor_base

Protected destructor to prevent deletion through this type.

```
~descriptor_base();
```

posix::stream_descriptor

Typedef for the typical usage of a stream-oriented descriptor.

```
typedef basic_stream_descriptor stream_descriptor;
```

Types

Name	Description
bytes_readable	IO control command to get the amount of data that can be read without blocking.
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_descriptor is always the lowest layer.
native_type	The native representation of a descriptor.
non_blocking_io	IO control command to set the blocking mode of the descriptor.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native descriptor to the descriptor.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_stream_descriptor	Construct a basic_stream_descriptor without opening it. Construct a basic_stream_descriptor on an existing native descriptor.
cancel	Cancel all asynchronous operations associated with the descriptor.
close	Close the descriptor.
get_io_service	Get the io_service associated with the object.
io_control	Perform an IO control command on the descriptor.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the descriptor is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native descriptor representation.
read_some	Read some data from the descriptor.
write_some	Write some data to the descriptor.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `posix::basic_stream_descriptor` class template provides asynchronous and blocking stream-oriented descriptor functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/posix/stream_descriptor.hpp`

Convenience header: `boost/asio.hpp`

posix::stream_descriptor_service

Default service implementation for a stream descriptor.

```
class stream_descriptor_service :
  public io_service::service
```

Types

Name	Description
implementation_type	The type of a stream descriptor implementation.
native_type	The native descriptor type.

Member Functions

Name	Description
assign	Assign an existing native descriptor to a stream descriptor.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
cancel	Cancel all asynchronous operations associated with the descriptor.
close	Close a stream descriptor implementation.
construct	Construct a new stream descriptor implementation.
destroy	Destroy a stream descriptor implementation.
get_io_service	Get the io_service object that owns the service.
io_control	Perform an IO control command on the descriptor.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the descriptor is open.
native	Get the native descriptor implementation.
read_some	Read some data from the stream.
shutdown_service	Destroy all user-defined descriptorr objects owned by the service.
stream_descriptor_service	Construct a new stream descriptor service for the specified io_service.
write_some	Write the given data to the stream.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/posix/stream_descriptor_service.hpp`

Convenience header: `boost/asio.hpp`

posix::stream_descriptor_service::assign

Assign an existing native descriptor to a stream descriptor.

```
boost::system::error_code assign(
    implementation_type & impl,
    const native_type & native_descriptor,
    boost::system::error_code & ec);
```

posix::stream_descriptor_service::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    ReadHandler descriptorr);
```

posix::stream_descriptor_service::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    WriteHandler descriptorr);
```

posix::stream_descriptor_service::cancel

Cancel all asynchronous operations associated with the descriptor.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

posix::stream_descriptor_service::close

Close a stream descriptor implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

posix::stream_descriptor_service::construct

Construct a new stream descriptor implementation.

```
void construct(
    implementation_type & impl);
```

posix::stream_descriptor_service::destroy

Destroy a stream descriptor implementation.

```
void destroy(
    implementation_type & impl);
```

posix::stream_descriptor_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

posix::stream_descriptor_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

posix::stream_descriptor_service::implementation_type

The type of a stream descriptor implementation.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/posix/stream_descriptor_service.hpp`

Convenience header: `boost/asio.hpp`

posix::stream_descriptor_service::io_control

Perform an IO control command on the descriptor.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    implementation_type & impl,
    IoControlCommand & command,
    boost::system::error_code & ec);
```

posix::stream_descriptor_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

posix::stream_descriptor_service::is_open

Determine whether the descriptor is open.

```
bool is_open(
    const implementation_type & impl) const;
```

posix::stream_descriptor_service::native

Get the native descriptor implementation.

```
native_type native(
    implementation_type & impl);
```

posix::stream_descriptor_service::native_type

The native descriptor type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/posix/stream_descriptor_service.hpp`

Convenience header: `boost/asio.hpp`

posix::stream_descriptor_service::read_some

Read some data from the stream.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

posix::stream_descriptor_service::shutdown_service

Destroy all user-defined descriptorr objects owned by the service.

```
void shutdown_service();
```

posix::stream_descriptor_service::stream_descriptor_service

Construct a new stream descriptor service for the specified `io_service`.

```
stream_descriptor_service(
    boost::asio::io_service & io_service);
```

posix::stream_descriptor_service::write_some

Write the given data to the stream.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

raw_socket_service

Default service implementation for a raw socket.

```
template<
    typename Protocol>
class raw_socket_service :
  public io_service::service
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The type of a raw socket.
native_type	The native socket type.
protocol_type	The protocol type.

Member Functions

Name	Description
assign	Assign an existing native socket to a raw socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive.
async_receive_from	Start an asynchronous receive that will get the endpoint of the sender.
async_send	Start an asynchronous send.
async_send_to	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
bind	
cancel	Cancel all asynchronous operations associated with the socket.
close	Close a raw socket implementation.
connect	Connect the raw socket to the specified endpoint.
construct	Construct a new raw socket implementation.
destroy	Destroy a raw socket implementation.
get_io_service	Get the io_service object that owns the service.
get_option	Get a socket option.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint.
native	Get the native socket implementation.
open	
raw_socket_service	Construct a new raw socket service for the specified io_service.
receive	Receive some data from the peer.
receive_from	Receive raw data with the endpoint of the sender.
remote_endpoint	Get the remote endpoint.
send	Send the given data to the peer.
send_to	Send raw data to the specified endpoint.

Name	Description
set_option	Set a socket option.
shutdown	Disable sends or receives on the socket.
shutdown_service	Destroy all user-defined handler objects owned by the service.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/raw_socket_service.hpp`

Convenience header: `boost/asio.hpp`

raw_socket_service::assign

Assign an existing native socket to a raw socket.

```
boost::system::error_code assign(
    implementation_type & impl,
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

raw_socket_service::async_connect

Start an asynchronous connect.

```
template<
    typename ConnectHandler>
void async_connect(
    implementation_type & impl,
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

raw_socket_service::async_receive

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
```

raw_socket_service::async_receive_from

Start an asynchronous receive that will get the endpoint of the sender.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive_from(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    ReadHandler handler);
```

raw_socket_service::async_send

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
```

raw_socket_service::async_send_to

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send_to(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    WriteHandler handler);
```

raw_socket_service::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

raw_socket_service::available

Determine the number of bytes available for reading.

```
std::size_t available(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

raw_socket_service::bind

```
boost::system::error_code bind(
    implementation_type & impl,
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

raw_socket_service::cancel

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

raw_socket_service::close

Close a raw socket implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

raw_socket_service::connect

Connect the raw socket to the specified endpoint.

```
boost::system::error_code connect(
    implementation_type & impl,
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

raw_socket_service::construct

Construct a new raw socket implementation.

```
void construct(
    implementation_type & impl);
```

raw_socket_service::destroy

Destroy a raw socket implementation.

```
void destroy(
    implementation_type & impl);
```

raw_socket_service::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/raw_socket_service.hpp`

Convenience header: `boost/asio.hpp`

raw_socket_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

raw_socket_service::get_option

Get a socket option.

```
template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    const implementation_type & impl,
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

raw_socket_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

raw_socket_service::implementation_type

The type of a raw socket.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/raw_socket_service.hpp`

Convenience header: `boost/asio.hpp`

raw_socket_service::io_control

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    implementation_type & impl,
    IoControlCommand & command,
    boost::system::error_code & ec);
```

raw_socket_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

raw_socket_service::is_open

Determine whether the socket is open.

```
bool is_open(
    const implementation_type & impl) const;
```

raw_socket_service::local_endpoint

Get the local endpoint.

```
endpoint_type local_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

raw_socket_service::native

Get the native socket implementation.

```
native_type native(
    implementation_type & impl);
```

raw_socket_service::native_type

The native socket type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/raw_socket_service.hpp`

Convenience header: `boost/asio.hpp`

raw_socket_service::open

```
boost::system::error_code open(
    implementation_type & impl,
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

raw_socket_service::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/raw_socket_service.hpp`

Convenience header: `boost/asio.hpp`

raw_socket_service::raw_socket_service

Construct a new raw socket service for the specified `io_service`.

```
raw_socket_service(
    boost::asio::io_service & io_service);
```

raw_socket_service::receive

Receive some data from the peer.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

raw_socket_service::receive_from

Receive raw data with the endpoint of the sender.

```
template<
    typename MutableBufferSequence>
std::size_t receive_from(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    endpoint_type & sender_endpoint,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

raw_socket_service::remote_endpoint

Get the remote endpoint.

```
endpoint_type remote_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

raw_socket_service::send

Send the given data to the peer.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

raw_socket_service::send_to

Send raw data to the specified endpoint.

```
template<
    typename ConstBufferSequence>
std::size_t send_to(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    const endpoint_type & destination,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

raw_socket_service::set_option

Set a socket option.

```
template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    implementation_type & impl,
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

raw_socket_service::shutdown

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    implementation_type & impl,
    socket_base::shutdown_type what,
    boost::system::error_code & ec);
```

raw_socket_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

read

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename MutableBufferSequence>
std::size_t read(
    SyncReadStream & s,
    const MutableBufferSequence & buffers);
  » more...

template<
    typename SyncReadStream,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncReadStream,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read(
    SyncReadStream & s,
    basic_streambuf< Allocator > & b);
  » more...

template<
    typename SyncReadStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
```

```
  » more...

template<
    typename SyncReadStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...
```

Requirements

Header: `boost/asio/read.hpp`

Convenience header: `boost/asio.hpp`

read (1 of 6 overloads)

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename MutableBufferSequence>
std::size_t read(
    SyncReadStream & s,
    const MutableBufferSequence & buffers);
```

This function is used to read a certain number of bytes of data from a stream. The call will block until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
buffers	One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the stream.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::read(s, boost::asio::buffer(data, size));
```

See the buffer documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

Remarks

This overload is equivalent to calling:

```
boost::asio::read(
    s, buffers,
    boost::asio::transfer_all());
```

read (2 of 6 overloads)

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition);
```

This function is used to read a certain number of bytes of data from a stream. The call will block until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's read_some function.

Parameters

s — The stream from which the data is to be read. The type must support the SyncReadStream concept.

buffers — One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the stream.

completion_condition — The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest read_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the stream's read_some function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::read(s, boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

read (3 of 6 overloads)

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to read a certain number of bytes of data from a stream. The call will block until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's read_some function.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
buffers	One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the stream.
completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest read_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the stream's read_some function.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes read. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

read (4 of 6 overloads)

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read(
    SyncReadStream & s,
    basic_streambuf< Allocator > & b);
```

This function is used to read a certain number of bytes of data from a stream. The call will block until one of the following conditions is true:

- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function.

Parameters

s — The stream from which the data is to be read. The type must support the SyncReadStream concept.

b — The `basic_streambuf` object into which the data will be read.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

Remarks

This overload is equivalent to calling:

```
boost::asio::read(
    s, b,
    boost::asio::transfer_all());
```

read (5 of 6 overloads)

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
```

This function is used to read a certain number of bytes of data from a stream. The call will block until one of the following conditions is true:

- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's read_some function.

Parameters

s — The stream from which the data is to be read. The type must support the SyncReadStream concept.

b — The `basic_streambuf` object into which the data will be read.

completion_condition — The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest read_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the stream's read_some function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

read (6 of 6 overloads)

Attempt to read a certain amount of data from a stream before returning.

```
template<
    typename SyncReadStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t read(
    SyncReadStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to read a certain number of bytes of data from a stream. The call will block until one of the following conditions is true:

- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's read_some function.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
b	The `basic_streambuf` object into which the data will be read.

completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:
	
	`std::size_t completion_condition(`
	`  // Result of latest read_some operation.`
	`  const boost::system::error_code& error,`
	
	`  // Number of bytes transferred so far.`
	`  std::size_t bytes_transferred`
	`);`
	
	A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the stream's read_some function.

ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes read. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

read_at

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename MutableBufferSequence>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers);
  » more...

template<
    typename SyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncRandomAccessReadDevice,
    typename Allocator>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b);
  » more...

template<
    typename SyncRandomAccessReadDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncRandomAccessReadDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t read_at(
```

```
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...
```

Requirements

Header: `boost/asio/read_at.hpp`

Convenience header: `boost/asio.hpp`

read_at (1 of 6 overloads)

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename MutableBufferSequence>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers);
```

This function is used to read a certain number of bytes of data from a random access device at the specified offset. The call will block until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the device's read_some_at function.

Parameters

d	The device from which the data is to be read. The type must support the SyncRandomAccessReadDevice concept.
offset	The offset at which the data will be read.
buffers	One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the device.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::read_at(d, 42, boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

Remarks

This overload is equivalent to calling:

```
boost::asio::read_at(
    d, 42, buffers,
    boost::asio::transfer_all());
```

read_at (2 of 6 overloads)

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition);
```

This function is used to read a certain number of bytes of data from a random access device at the specified offset. The call will block until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's read_some_at function.

Parameters

d	The device from which the data is to be read. The type must support the SyncRandomAccessReadDevice concept.
offset	The offset at which the data will be read.
buffers	One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the device.

completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:
	
	`std::size_t completion_condition(`
	`  // Result of latest read_some_at operation.`
	`  const boost::system::error_code& error,`
	
	`  // Number of bytes transferred so far.`
	`  std::size_t bytes_transferred`
	`);`
	
	A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the device's read_some_at function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To read into a single data buffer use the `buffer` function as follows:

```
boost::asio::read_at(d, 42, boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

read_at (3 of 6 overloads)

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename MutableBufferSequence,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to read a certain number of bytes of data from a random access device at the specified offset. The call will block until one of the following conditions is true:

- The supplied buffers are full. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's read_some_at function.

Parameters

d	The device from which the data is to be read. The type must support the SyncRandomAccessReadDevice concept.
offset	The offset at which the data will be read.
buffers	One or more buffers into which the data will be read. The sum of the buffer sizes indicates the maximum number of bytes to read from the device.
completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest read_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the device's read_some_at function.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes read. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

read_at (4 of 6 overloads)

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename Allocator>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b);
```

This function is used to read a certain number of bytes of data from a random access device at the specified offset. The call will block until one of the following conditions is true:

- An error occurred.

This operation is implemented in terms of zero or more calls to the device's read_some_at function.

Parameters

d — The device from which the data is to be read. The type must support the SyncRandomAccessReadDevice concept.

offset — The offset at which the data will be read.

b — The `basic_streambuf` object into which the data will be read.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

Remarks

This overload is equivalent to calling:

```
boost::asio::read_at(
    d, 42, b,
    boost::asio::transfer_all());
```

read_at (5 of 6 overloads)

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
```

This function is used to read a certain number of bytes of data from a random access device at the specified offset. The call will block until one of the following conditions is true:

- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's read_some_at function.

Parameters

d — The device from which the data is to be read. The type must support the SyncRandomAccessReadDevice concept.

offset — The offset at which the data will be read.

b — The `basic_streambuf` object into which the data will be read.

completion_condition — The function object to be called to determine whether the read operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest read_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the device's read_some_at function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

read_at (6 of 6 overloads)

Attempt to read a certain amount of data at the specified offset before returning.

```
template<
    typename SyncRandomAccessReadDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t read_at(
    SyncRandomAccessReadDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to read a certain number of bytes of data from a random access device at the specified offset. The call will block until one of the following conditions is true:

- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's read_some_at function.

Parameters

d	The device from which the data is to be read. The type must support the SyncRandomAccessReadDevice concept.
offset	The offset at which the data will be read.
b	The `basic_streambuf` object into which the data will be read.

completion_condition	The function object to be called to determine whether the read operation is complete. The signature of the function object must be:
	
	`std::size_t completion_condition(`
	`  // Result of latest read_some_at operation.`
	`  const boost::system::error_code& error,`
	
	`  // Number of bytes transferred so far.`
	`  std::size_t bytes_transferred`
	`);`
	
	A return value of 0 indicates that the read operation is complete. A non-zero return value indicates the maximum number of bytes to be read on the next call to the device's read_some_at function.

ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes read. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

read_until

Read data into a streambuf until it contains a delimiter, matches a regular expression, or a function object indicates a match.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    char delim);
  » more...

template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    char delim,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const std::string & delim);
  » more...

template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const std::string & delim,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const boost::regex & expr);
  » more...

template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const boost::regex & expr,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncReadStream,
    typename Allocator,
    typename MatchCondition>
std::size_t read_until(
    SyncReadStream & s,
```

```
    boost::asio::basic_streambuf< Allocator > & b,
    MatchCondition match_condition,
    typename boost::enable_if< is_match_condition< MatchCondition > >::type *  = 0);
  » more...

template<
    typename SyncReadStream,
    typename Allocator,
    typename MatchCondition>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    MatchCondition match_condition,
    boost::system::error_code & ec,
    typename boost::enable_if< is_match_condition< MatchCondition > >::type *  = 0);
  » more...
```

Requirements

Header: `boost/asio/read_until.hpp`

Convenience header: `boost/asio.hpp`

read_until (1 of 8 overloads)

Read data into a streambuf until it contains a specified delimiter.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    char delim);
```

This function is used to read data into the specified streambuf until the streambuf's get area contains the specified delimiter. The call will block until one of the following conditions is true:

- The get area of the streambuf contains the specified delimiter.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the streambuf's get area already contains the delimiter, the function returns immediately.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
b	A streambuf object into which the data will be read.
delim	The delimiter character.

Return Value

The number of bytes in the streambuf's get area up to and including the delimiter.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond the delimiter. An application will typically leave that data in the streambuf for a subsequent read_until operation to examine.

Example

To read data into a streambuf until a newline is encountered:

```
boost::asio::streambuf b;
boost::asio::read_until(s, b, '\n');
std::istream is(&b);
std::string line;
std::getline(is, line);
```

read_until (2 of 8 overloads)

Read data into a streambuf until it contains a specified delimiter.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    char delim,
    boost::system::error_code & ec);
```

This function is used to read data into the specified streambuf until the streambuf's get area contains the specified delimiter. The call will block until one of the following conditions is true:

- The get area of the streambuf contains the specified delimiter.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the streambuf's get area already contains the delimiter, the function returns immediately.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
b	A streambuf object into which the data will be read.
delim	The delimiter character.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes in the streambuf's get area up to and including the delimiter. Returns 0 if an error occurred.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond the delimiter. An application will typically leave that data in the streambuf for a subsequent read_until operation to examine.

read_until (3 of 8 overloads)

Read data into a streambuf until it contains a specified delimiter.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const std::string & delim);
```

This function is used to read data into the specified streambuf until the streambuf's get area contains the specified delimiter. The call will block until one of the following conditions is true:

- The get area of the streambuf contains the specified delimiter.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the streambuf's get area already contains the delimiter, the function returns immediately.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
b	A streambuf object into which the data will be read.
delim	The delimiter string.

Return Value

The number of bytes in the streambuf's get area up to and including the delimiter.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond the delimiter. An application will typically leave that data in the streambuf for a subsequent read_until operation to examine.

Example

To read data into a streambuf until a newline is encountered:

```
boost::asio::streambuf b;
boost::asio::read_until(s, b, "\r\n");
std::istream is(&b);
std::string line;
std::getline(is, line);
```

read_until (4 of 8 overloads)

Read data into a streambuf until it contains a specified delimiter.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const std::string & delim,
    boost::system::error_code & ec);
```

This function is used to read data into the specified streambuf until the streambuf's get area contains the specified delimiter. The call will block until one of the following conditions is true:

- The get area of the streambuf contains the specified delimiter.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the streambuf's get area already contains the delimiter, the function returns immediately.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
b	A streambuf object into which the data will be read.
delim	The delimiter string.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes in the streambuf's get area up to and including the delimiter. Returns 0 if an error occurred.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond the delimiter. An application will typically leave that data in the streambuf for a subsequent read_until operation to examine.

read_until (5 of 8 overloads)

Read data into a streambuf until some part of the data it contains matches a regular expression.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const boost::regex & expr);
```

This function is used to read data into the specified streambuf until the streambuf's get area contains some data that matches a regular expression. The call will block until one of the following conditions is true:

- A substring of the streambuf's get area matches the regular expression.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the streambuf's get area already contains data that matches the regular expression, the function returns immediately.

Parameters

s The stream from which the data is to be read. The type must support the SyncReadStream concept.

b A streambuf object into which the data will be read.

expr The regular expression.

Return Value

The number of bytes in the streambuf's get area up to and including the substring that matches the regular expression.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond that which matched the regular expression. An application will typically leave that data in the streambuf for a subsequent read_until operation to examine.

Example

To read data into a streambuf until a CR-LF sequence is encountered:

```
boost::asio::streambuf b;
boost::asio::read_until(s, b, boost::regex("\r\n"));
std::istream is(&b);
std::string line;
std::getline(is, line);
```

read_until (6 of 8 overloads)

Read data into a streambuf until some part of the data it contains matches a regular expression.

```
template<
    typename SyncReadStream,
    typename Allocator>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    const boost::regex & expr,
    boost::system::error_code & ec);
```

This function is used to read data into the specified streambuf until the streambuf's get area contains some data that matches a regular expression. The call will block until one of the following conditions is true:

- A substring of the streambuf's get area matches the regular expression.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the streambuf's get area already contains data that matches the regular expression, the function returns immediately.

Parameters

s The stream from which the data is to be read. The type must support the SyncReadStream concept.

b A streambuf object into which the data will be read.

expr The regular expression.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes in the streambuf's get area up to and including the substring that matches the regular expression. Returns 0 if an error occurred.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond that which matched the regular expression. An application will typically leave that data in the streambuf for a subsequent read_until operation to examine.

read_until (7 of 8 overloads)

Read data into a streambuf until a function object indicates a match.

```
template<
    typename SyncReadStream,
    typename Allocator,
    typename MatchCondition>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    MatchCondition match_condition,
    typename boost::enable_if< is_match_condition< MatchCondition > >::type *  = 0);
```

This function is used to read data into the specified streambuf until a user-defined match condition function object, when applied to the data contained in the streambuf, indicates a successful match. The call will block until one of the following conditions is true:

- The match condition function object returns a std::pair where the second element evaluates to true.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the match condition function object already indicates a match, the function returns immediately.

Parameters

s The stream from which the data is to be read. The type must support the SyncReadStream concept.

b A streambuf object into which the data will be read.

match_condition The function object to be called to determine whether a match exists. The signature of the function object must be:

```
pair<iterator, bool> match_condition(iterator begin, iterator end);
```

where `iterator` represents the type:

```
buffers_iterator<basic_streambuf<Allocator>::const_buffers_type>
```

The iterator parameters `begin` and `end` define the range of bytes to be scanned to determine whether there is a match. The `first` member of the return value is an iterator marking one-past-the-end of the bytes that have been consumed by the match function. This iterator is used to calculate the `begin` parameter for any subsequent invocation of the match condition. The `second` member of the return value is true if a match has been found, false otherwise.

Return Value

The number of bytes in the streambuf's get area that have been fully consumed by the match function.

Exceptions

boost::system::system_error	Thrown on failure.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond that which matched the function object. An application will typically leave that data in the streambuf for a subsequent

The default implementation of the `is_match_condition` type trait evaluates to true for function pointers and function objects with a `result_type` typedef. It must be specialised for other user-defined function objects.

Examples

To read data into a streambuf until whitespace is encountered:

```
typedef boost::asio::buffers_iterator<
    boost::asio::streambuf::const_buffers_type> iterator;

std::pair<iterator, bool>
match_whitespace(iterator begin, iterator end)
{
  iterator i = begin;
  while (i != end)
    if (std::isspace(*i++))
      return std::make_pair(i, true);
  return std::make_pair(i, false);
}
...
boost::asio::streambuf b;
boost::asio::read_until(s, b, match_whitespace);
```

To read data into a streambuf until a matching character is found:

```
class match_char
{
public:
  explicit match_char(char c) : c_(c) {}

  template <typename Iterator>
  std::pair<Iterator, bool> operator()(
      Iterator begin, Iterator end) const
  {
    Iterator i = begin;
    while (i != end)
      if (c_ == *i++)
        return std::make_pair(i, true);
    return std::make_pair(i, false);
  }

private:
  char c_;
};

namespace asio {
  template <> struct is_match_condition<match_char>
    : public boost::true_type {};
} // namespace asio
...
boost::asio::streambuf b;
boost::asio::read_until(s, b, match_char('a'));
```

read_until (8 of 8 overloads)

Read data into a streambuf until a function object indicates a match.

```
template<
    typename SyncReadStream,
    typename Allocator,
    typename MatchCondition>
std::size_t read_until(
    SyncReadStream & s,
    boost::asio::basic_streambuf< Allocator > & b,
    MatchCondition match_condition,
    boost::system::error_code & ec,
    typename boost::enable_if< is_match_condition< MatchCondition > >::type *  = 0);
```

This function is used to read data into the specified streambuf until a user-defined match condition function object, when applied to the data contained in the streambuf, indicates a successful match. The call will block until one of the following conditions is true:

- The match condition function object returns a std::pair where the second element evaluates to true.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's read_some function. If the match condition function object already indicates a match, the function returns immediately.

Parameters

s	The stream from which the data is to be read. The type must support the SyncReadStream concept.
b	A streambuf object into which the data will be read.
match_condition	The function object to be called to determine whether a match exists. The signature of the function object must be:

```
pair<iterator, bool> match_condition(iterator begin, iterator end);
```

where `iterator` represents the type:

```
buffers_iterator<basic_streambuf<Allocator>::const_buffers_type>
```

The iterator parameters `begin` and `end` define the range of bytes to be scanned to determine whether there is a match. The `first` member of the return value is an iterator marking one-past-the-end of the bytes that have been consumed by the match function. This iterator is used to calculate the `begin` parameter for any subsequent invocation of the match condition. The `second` member of the return value is true if a match has been found, false otherwise.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes in the streambuf's get area that have been fully consumed by the match function. Returns 0 if an error occurred.

Remarks

After a successful read_until operation, the streambuf may contain additional data beyond that which matched the function object. An application will typically leave that data in the streambuf for a subsequent

The default implementation of the `is_match_condition` type trait evaluates to true for function pointers and function objects with a `result_type` typedef. It must be specialised for other user-defined function objects.

serial_port

Typedef for the typical usage of a serial port.

```
typedef basic_serial_port serial_port;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_serial_port is always the lowest layer.
native_type	The native representation of a serial port.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native serial port to the serial port.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_serial_port	Construct a basic_serial_port without opening it. Construct and open a basic_serial_port. Construct a basic_serial_port on an existing native serial port.
cancel	Cancel all asynchronous operations associated with the serial port.
close	Close the serial port.
get_io_service	Get the io_service associated with the object.
get_option	Get an option from the serial port.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the serial port is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native serial port representation.
open	Open the serial port using the specified device name.
read_some	Read some data from the serial port.
send_break	Send a break sequence to the serial port.
set_option	Set an option on the serial port.
write_some	Write some data to the serial port.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `basic_serial_port` class template provides functionality that is common to all serial ports.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/serial_port.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base

The `serial_port_base` class is used as a base for the `basic_serial_port` class template so that we have a common place to define the serial port options.

```
class serial_port_base
```

Types

Name	Description
baud_rate	Serial port option to permit changing the baud rate.
character_size	Serial port option to permit changing the character size.
flow_control	Serial port option to permit changing the flow control.
parity	Serial port option to permit changing the parity.
stop_bits	Serial port option to permit changing the number of stop bits.

Protected Member Functions

Name	Description
~serial_port_base	Protected destructor to prevent deletion through this type.

Requirements

Header: `boost/asio/serial_port_base.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base::~serial_port_base

Protected destructor to prevent deletion through this type.

```
~serial_port_base();
```

serial_port_base::baud_rate

Serial port option to permit changing the baud rate.

```
class baud_rate
```

Member Functions

Name	Description
baud_rate	
load	
store	
value	

Implements changing the baud rate for a given serial port.

Requirements

Header: `boost/asio/serial_port_base.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base::baud_rate::baud_rate

```
baud_rate(
    unsigned int rate = 0);
```

serial_port_base::baud_rate::load

```
boost::system::error_code load(
    const BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec);
```

serial_port_base::baud_rate::store

```
boost::system::error_code store(
    BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec) const;
```

serial_port_base::baud_rate::value

```
unsigned int value() const;
```

serial_port_base::character_size

Serial port option to permit changing the character size.

```
class character_size
```

Member Functions

Name	Description
character_size	
load	
store	
value	

Implements changing the character size for a given serial port.

Requirements

Header: `boost/asio/serial_port_base.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base::character_size::character_size

```
character_size(
    unsigned int t = 8);
```

serial_port_base::character_size::load

```
boost::system::error_code load(
    const BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec);
```

serial_port_base::character_size::store

```
boost::system::error_code store(
    BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec) const;
```

serial_port_base::character_size::value

```
unsigned int value() const;
```

serial_port_base::flow_control

Serial port option to permit changing the flow control.

```
class flow_control
```

Types

Name	Description
type	

Member Functions

Name	Description
flow_control	
load	
store	
value	

Implements changing the flow control for a given serial port.

Requirements

Header: `boost/asio/serial_port_base.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base::flow_control::flow_control

```
flow_control(
    type t = none);
```

serial_port_base::flow_control::load

```
boost::system::error_code load(
    const BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec);
```

serial_port_base::flow_control::store

```
boost::system::error_code store(
    BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec) const;
```

serial_port_base::flow_control::type

```
enum type
```

Values

none

software

hardware

serial_port_base::flow_control::value

```
type value() const;
```

serial_port_base::parity

Serial port option to permit changing the parity.

```
class parity
```

Types

Name	Description
type	

Member Functions

Name	Description
load	
parity	
store	
value	

Implements changing the parity for a given serial port.

Requirements

Header: `boost/asio/serial_port_base.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base::parity::load

```
boost::system::error_code load(
    const BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec);
```

serial_port_base::parity::parity

```
parity(
    type t = none);
```

serial_port_base::parity::store

```
boost::system::error_code store(
    BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec) const;
```

serial_port_base::parity::type

```
enum type
```

Values

none

odd

even

serial_port_base::parity::value

```
type value() const;
```

serial_port_base::stop_bits

Serial port option to permit changing the number of stop bits.

```
class stop_bits
```

Types

Name	Description
type	

Member Functions

Name	Description
load	
stop_bits	
store	
value	

Implements changing the number of stop bits for a given serial port.

Requirements

Header: `boost/asio/serial_port_base.hpp`

Convenience header: `boost/asio.hpp`

serial_port_base::stop_bits::load

```
boost::system::error_code load(
    const BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec);
```

serial_port_base::stop_bits::stop_bits

```
stop_bits(
    type t = one);
```

serial_port_base::stop_bits::store

```
boost::system::error_code store(
    BOOST_ASIO_OPTION_STORAGE & storage,
    boost::system::error_code & ec) const;
```

serial_port_base::stop_bits::type

```
enum type
```

Values

one

onepointfive

two

serial_port_base::stop_bits::value

```
type value() const;
```

serial_port_service

Default service implementation for a serial port.

```
class serial_port_service :
  public io_service::service
```

Types

Name	Description
implementation_type	The type of a serial port implementation.
native_type	The native handle type.

Member Functions

Name	Description
assign	Assign an existing native handle to a serial port.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close a serial port implementation.
construct	Construct a new serial port implementation.
destroy	Destroy a serial port implementation.
get_io_service	Get the io_service object that owns the service.
get_option	Get a serial port option.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the handle is open.
native	Get the native handle implementation.
open	Open a serial port.
read_some	Read some data from the stream.
send_break	Send a break sequence to the serial port.
serial_port_service	Construct a new serial port service for the specified io_service.
set_option	Set a serial port option.
shutdown_service	Destroy all user-defined handler objects owned by the service.
write_some	Write the given data to the stream.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/serial_port_service.hpp`

Convenience header: `boost/asio.hpp`

serial_port_service::assign

Assign an existing native handle to a serial port.

```
boost::system::error_code assign(
    implementation_type & impl,
    const native_type & native_handle,
    boost::system::error_code & ec);
```

serial_port_service::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

serial_port_service::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

serial_port_service::cancel

Cancel all asynchronous operations associated with the handle.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

serial_port_service::close

Close a serial port implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

serial_port_service::construct

Construct a new serial port implementation.

```
void construct(
    implementation_type & impl);
```

serial_port_service::destroy

Destroy a serial port implementation.

```
void destroy(
    implementation_type & impl);
```

serial_port_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

serial_port_service::get_option

Get a serial port option.

```
template<
    typename GettableSerialPortOption>
boost::system::error_code get_option(
    const implementation_type & impl,
    GettableSerialPortOption & option,
    boost::system::error_code & ec) const;
```

serial_port_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

serial_port_service::implementation_type

The type of a serial port implementation.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/serial_port_service.hpp`

Convenience header: `boost/asio.hpp`

serial_port_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

serial_port_service::is_open

Determine whether the handle is open.

```
bool is_open(
    const implementation_type & impl) const;
```

serial_port_service::native

Get the native handle implementation.

```
native_type native(
    implementation_type & impl);
```

serial_port_service::native_type

The native handle type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/serial_port_service.hpp`

Convenience header: `boost/asio.hpp`

serial_port_service::open

Open a serial port.

```
boost::system::error_code open(
    implementation_type & impl,
    const std::string & device,
    boost::system::error_code & ec);
```

serial_port_service::read_some

Read some data from the stream.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

serial_port_service::send_break

Send a break sequence to the serial port.

```
boost::system::error_code send_break(
    implementation_type & impl,
    boost::system::error_code & ec);
```

serial_port_service::serial_port_service

Construct a new serial port service for the specified `io_service`.

```
serial_port_service(
    boost::asio::io_service & io_service);
```

serial_port_service::set_option

Set a serial port option.

```
template<
    typename SettableSerialPortOption>
boost::system::error_code set_option(
    implementation_type & impl,
    const SettableSerialPortOption & option,
    boost::system::error_code & ec);
```

serial_port_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

serial_port_service::write_some

Write the given data to the stream.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

service_already_exists

Exception thrown when trying to add a duplicate service to an `io_service`.

```
class service_already_exists
```

Member Functions

Name	Description
service_already_exists	

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

service_already_exists::service_already_exists

```
service_already_exists();
```

socket_acceptor_service

Default service implementation for a socket acceptor.

```
template<
    typename Protocol>
class socket_acceptor_service :
  public io_service::service
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The native type of the socket acceptor.
native_type	The native acceptor type.
protocol_type	The protocol type.

Member Functions

Name	Description
accept	Accept a new connection.
assign	Assign an existing native acceptor to a socket acceptor.
async_accept	Start an asynchronous accept.
bind	Bind the socket acceptor to the specified local endpoint.
cancel	Cancel all asynchronous operations associated with the acceptor.
close	Close a socket acceptor implementation.
construct	Construct a new socket acceptor implementation.
destroy	Destroy a socket acceptor implementation.
get_io_service	Get the io_service object that owns the service.
get_option	Get a socket option.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the acceptor is open.
listen	Place the socket acceptor into the state where it will listen for new connections.
local_endpoint	Get the local endpoint.
native	Get the native acceptor implementation.
open	Open a new socket acceptor implementation.
set_option	Set a socket option.
shutdown_service	Destroy all user-defined handler objects owned by the service.
socket_acceptor_service	Construct a new socket acceptor service for the specified io_service.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/socket_acceptor_service.hpp`

Convenience header: `boost/asio.hpp`

socket_acceptor_service::accept

Accept a new connection.

```
template<
    typename SocketService>
boost::system::error_code accept(
    implementation_type & impl,
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type * peer_endpoint,
    boost::system::error_code & ec);
```

socket_acceptor_service::assign

Assign an existing native acceptor to a socket acceptor.

```
boost::system::error_code assign(
    implementation_type & impl,
    const protocol_type & protocol,
    const native_type & native_acceptor,
    boost::system::error_code & ec);
```

socket_acceptor_service::async_accept

Start an asynchronous accept.

```
template<
    typename SocketService,
    typename AcceptHandler>
void async_accept(
    implementation_type & impl,
    basic_socket< protocol_type, SocketService > & peer,
    endpoint_type * peer_endpoint,
    AcceptHandler handler);
```

socket_acceptor_service::bind

Bind the socket acceptor to the specified local endpoint.

```
boost::system::error_code bind(
    implementation_type & impl,
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

socket_acceptor_service::cancel

Cancel all asynchronous operations associated with the acceptor.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

socket_acceptor_service::close

Close a socket acceptor implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

socket_acceptor_service::construct

Construct a new socket acceptor implementation.

```
void construct(
    implementation_type & impl);
```

socket_acceptor_service::destroy

Destroy a socket acceptor implementation.

```
void destroy(
    implementation_type & impl);
```

socket_acceptor_service::endpoint_type

The endpoint type.

```
typedef protocol_type::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/socket_acceptor_service.hpp`

Convenience header: `boost/asio.hpp`

socket_acceptor_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

socket_acceptor_service::get_option

Get a socket option.

```
template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    const implementation_type & impl,
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

socket_acceptor_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

socket_acceptor_service::implementation_type

The native type of the socket acceptor.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/socket_acceptor_service.hpp`

Convenience header: `boost/asio.hpp`

socket_acceptor_service::io_control

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    implementation_type & impl,
    IoControlCommand & command,
    boost::system::error_code & ec);
```

socket_acceptor_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

socket_acceptor_service::is_open

Determine whether the acceptor is open.

```
bool is_open(
    const implementation_type & impl) const;
```

socket_acceptor_service::listen

Place the socket acceptor into the state where it will listen for new connections.

```
boost::system::error_code listen(
    implementation_type & impl,
    int backlog,
    boost::system::error_code & ec);
```

socket_acceptor_service::local_endpoint

Get the local endpoint.

```
endpoint_type local_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

socket_acceptor_service::native

Get the native acceptor implementation.

```
native_type native(
    implementation_type & impl);
```

socket_acceptor_service::native_type

The native acceptor type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/socket_acceptor_service.hpp`

Convenience header: `boost/asio.hpp`

socket_acceptor_service::open

Open a new socket acceptor implementation.

```
boost::system::error_code open(
    implementation_type & impl,
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

socket_acceptor_service::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/socket_acceptor_service.hpp`

Convenience header: `boost/asio.hpp`

socket_acceptor_service::set_option

Set a socket option.

```
template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    implementation_type & impl,
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

socket_acceptor_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

socket_acceptor_service::socket_acceptor_service

Construct a new socket acceptor service for the specified `io_service`.

```
socket_acceptor_service(
    boost::asio::io_service & io_service);
```

socket_base

The `socket_base` class is used as a base for the `basic_stream_socket` and `basic_datagram_socket` class templates so that we have a common place to define the shutdown_type and enum.

```
class socket_base
```

Types

Name	Description
broadcast	Socket option to permit sending of broadcast messages.
bytes_readable	IO control command to get the amount of data that can be read without blocking.
debug	Socket option to enable socket-level debugging.
do_not_route	Socket option to prevent routing, use local interfaces only.
enable_connection_aborted	Socket option to report aborted connections on accept.
keep_alive	Socket option to send keep-alives.
linger	Socket option to specify whether the socket lingers on close if unsent data is present.
message_flags	Bitmask type for flags that can be passed to send and receive operations.
non_blocking_io	IO control command to set the blocking mode of the socket.
receive_buffer_size	Socket option for the receive buffer size of a socket.
receive_low_watermark	Socket option for the receive low watermark.
reuse_address	Socket option to allow the socket to be bound to an address that is already in use.
send_buffer_size	Socket option for the send buffer size of a socket.
send_low_watermark	Socket option for the send low watermark.
shutdown_type	Different ways a socket may be shutdown.

Protected Member Functions

Name	Description
~socket_base	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
max_connections	The maximum length of the queue of pending incoming connections.
message_do_not_route	Specify that the data should not be subject to routing.
message_out_of_band	Process out-of-band data.
message_peek	Peek at incoming data without removing it from the input queue.

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::broadcast

Socket option to permit sending of broadcast messages.

```
typedef implementation_defined broadcast;
```

Implements the SOL_SOCKET/SO_BROADCAST socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::broadcast option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::bytes_readable

IO control command to get the amount of data that can be read without blocking.

```
typedef implementation_defined bytes_readable;
```

Implements the FIONREAD IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::bytes_readable command(true);
socket.io_control(command);
std::size_t bytes_readable = command.get();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::debug

Socket option to enable socket-level debugging.

```
typedef implementation_defined debug;
```

Implements the SOL_SOCKET/SO_DEBUG socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::debug option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::do_not_route

Socket option to prevent routing, use local interfaces only.

```
typedef implementation_defined do_not_route;
```

Implements the SOL_SOCKET/SO_DONTROUTE socket option.

Examples

Setting the option:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::udp::socket socket(io_service);
...
boost::asio::socket_base::do_not_route option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::enable_connection_aborted

Socket option to report aborted connections on accept.

```
typedef implementation_defined enable_connection_aborted;
```

Implements a custom socket option that determines whether or not an accept operation is permitted to fail with `boost::asio::error::connection_aborted`. By default the option is false.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::enable_connection_aborted option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::keep_alive

Socket option to send keep-alives.

```
typedef implementation_defined keep_alive;
```

Implements the SOL_SOCKET/SO_KEEPALIVE socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option(true);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::keep_alive option;
socket.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::linger

Socket option to specify whether the socket lingers on close if unsent data is present.

```
typedef implementation_defined linger;
```

Implements the SOL_SOCKET/SO_LINGER socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option(true, 30);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::linger option;
socket.get_option(option);
bool is_set = option.enabled();
unsigned short timeout = option.timeout();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::max_connections

The maximum length of the queue of pending incoming connections.

```
static const int max_connections = implementation_defined;
```

socket_base::message_do_not_route

Specify that the data should not be subject to routing.

```
static const int message_do_not_route = implementation_defined;
```

socket_base::message_flags

Bitmask type for flags that can be passed to send and receive operations.

```
typedef int message_flags;
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::message_out_of_band

Process out-of-band data.

```
static const int message_out_of_band = implementation_defined;
```

socket_base::message_peek

Peek at incoming data without removing it from the input queue.

```
static const int message_peek = implementation_defined;
```

socket_base::non_blocking_io

IO control command to set the blocking mode of the socket.

```
typedef implementation_defined non_blocking_io;
```

Implements the FIONBIO IO control command.

Example

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::non_blocking_io command(true);
socket.io_control(command);
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::receive_buffer_size

Socket option for the receive buffer size of a socket.

```
typedef implementation_defined receive_buffer_size;
```

Implements the SOL_SOCKET/SO_RCVBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::receive_low_watermark

Socket option for the receive low watermark.

```
typedef implementation_defined receive_low_watermark;
```

Implements the SOL_SOCKET/SO_RCVLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::receive_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::reuse_address

Socket option to allow the socket to be bound to an address that is already in use.

```
typedef implementation_defined reuse_address;
```

Implements the SOL_SOCKET/SO_REUSEADDR socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option(true);
acceptor.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::acceptor acceptor(io_service);
...
boost::asio::socket_base::reuse_address option;
acceptor.get_option(option);
bool is_set = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::send_buffer_size

Socket option for the send buffer size of a socket.

```
typedef implementation_defined send_buffer_size;
```

Implements the SOL_SOCKET/SO_SNDBUF socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option(8192);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_buffer_size option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::send_low_watermark

Socket option for the send low watermark.

```
typedef implementation_defined send_low_watermark;
```

Implements the SOL_SOCKET/SO_SNDLOWAT socket option.

Examples

Setting the option:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option(1024);
socket.set_option(option);
```

Getting the current option value:

```
boost::asio::ip::tcp::socket socket(io_service);
...
boost::asio::socket_base::send_low_watermark option;
socket.get_option(option);
int size = option.value();
```

Requirements

Header: `boost/asio/socket_base.hpp`

Convenience header: `boost/asio.hpp`

socket_base::shutdown_type

Different ways a socket may be shutdown.

```
enum shutdown_type
```

Values

shutdown_receive	Shutdown the receive side of the socket.
shutdown_send	Shutdown the send side of the socket.
shutdown_both	Shutdown both send and receive on the socket.

socket_base::~socket_base

Protected destructor to prevent deletion through this type.

```
~socket_base();
```

ssl::basic_context

SSL context.

```
template<
    typename Service>
class basic_context :
  public ssl::context_base
```

Types

Name	Description
file_format	File format types.
impl_type	The native implementation type of the locking dispatcher.
method	Different methods supported by a context.
options	Bitmask type for SSL options.
password_purpose	Purpose of PEM password.
service_type	The type of the service that will be used to provide context operations.
verify_mode	Bitmask type for peer verification.

Member Functions

Name	Description
add_verify_path	Add a directory containing certificate authority files to be used for performing verification.
basic_context	Constructor.
impl	Get the underlying implementation in the native type.
load_verify_file	Load a certification authority file for performing verification.
set_options	Set options on the context.
set_password_callback	Set the password callback.
set_verify_mode	Set the peer verification mode.
use_certificate_chain_file	Use a certificate chain from a file.
use_certificate_file	Use a certificate from a file.
use_private_key_file	Use a private key from a file.
use_rsa_private_key_file	Use an RSA private key from a file.
use_tmp_dh_file	Use the specified file to obtain the temporary Diffie-Hellman parameters.
~basic_context	Destructor.

Data Members

Name	Description
default_workarounds	Implement various bug workarounds.
no_sslv2	Disable SSL v2.
no_sslv3	Disable SSL v3.
no_tlsv1	Disable TLS v1.
single_dh_use	Always create a new key when using tmp_dh parameters.
verify_client_once	Do not request client certificate on renegotiation. Ignored unless verify_peer is set.
verify_fail_if_no_peer_cert	Fail verification if the peer has no certificate. Ignored unless verify_peer is set.
verify_none	No verification.
verify_peer	Verify the peer.

Requirements

Header: `boost/asio/ssl/basic_context.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::basic_context::add_verify_path

Add a directory containing certificate authority files to be used for performing verification.

```
void add_verify_path(
    const std::string & path);
  » more...

boost::system::error_code add_verify_path(
    const std::string & path,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::add_verify_path (1 of 2 overloads)

Add a directory containing certificate authority files to be used for performing verification.

```
void add_verify_path(
    const std::string & path);
```

This function is used to specify the name of a directory containing certification authority certificates. Each file in the directory must contain a single certificate. The files must be named using the subject name's hash and an extension of ".0".

Parameters

path The name of a directory containing the certificates.

Exceptions

boost::system::system_error Thrown on failure.

ssl::basic_context::add_verify_path (2 of 2 overloads)

Add a directory containing certificate authority files to be used for performing verification.

```
boost::system::error_code add_verify_path(
    const std::string & path,
    boost::system::error_code & ec);
```

This function is used to specify the name of a directory containing certification authority certificates. Each file in the directory must contain a single certificate. The files must be named using the subject name's hash and an extension of ".0".

Parameters

path The name of a directory containing the certificates.

ec Set to indicate what error occurred, if any.

ssl::basic_context::basic_context

Constructor.

```
basic_context(
    boost::asio::io_service & io_service,
    method m);
```

ssl::basic_context::default_workarounds

Inherited from ssl::context_base.

Implement various bug workarounds.

```
static const int default_workarounds = implementation_defined;
```

ssl::basic_context::file_format

Inherited from ssl::context_base.

File format types.

```
enum file_format
```

Values

asn1 ASN.1 file.

pem PEM file.

ssl::basic_context::impl

Get the underlying implementation in the native type.

```
impl_type impl();
```

This function may be used to obtain the underlying implementation of the context. This is intended to allow access to context functionality that is not otherwise provided.

ssl::basic_context::impl_type

The native implementation type of the locking dispatcher.

```
typedef service_type::impl_type impl_type;
```

Requirements

Header: `boost/asio/ssl/basic_context.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::basic_context::load_verify_file

Load a certification authority file for performing verification.

```
void load_verify_file(
    const std::string & filename);
  » more...

boost::system::error_code load_verify_file(
    const std::string & filename,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::load_verify_file (1 of 2 overloads)

Load a certification authority file for performing verification.

```
void load_verify_file(
    const std::string & filename);
```

This function is used to load one or more trusted certification authorities from a file.

Parameters

filename	The name of a file containing certification authority certificates in PEM format.

Exceptions

boost::system::system_error	Thrown on failure.

ssl::basic_context::load_verify_file (2 of 2 overloads)

Load a certification authority file for performing verification.

```
boost::system::error_code load_verify_file(
    const std::string & filename,
    boost::system::error_code & ec);
```

This function is used to load the certificates for one or more trusted certification authorities from a file.

Parameters

filename	The name of a file containing certification authority certificates in PEM format.
ec	Set to indicate what error occurred, if any.

ssl::basic_context::method

Inherited from ssl::context_base.

Different methods supported by a context.

```
enum method
```

Values

sslv2	Generic SSL version 2.
sslv2_client	SSL version 2 client.
sslv2_server	SSL version 2 server.

sslv3	Generic SSL version 3.
sslv3_client	SSL version 3 client.
sslv3_server	SSL version 3 server.
tlsv1	Generic TLS version 1.
tlsv1_client	TLS version 1 client.
tlsv1_server	TLS version 1 server.
sslv23	Generic SSL/TLS.
sslv23_client	SSL/TLS client.
sslv23_server	SSL/TLS server.

ssl::basic_context::no_sslv2

Inherited from ssl::context_base.

Disable SSL v2.

```
static const int no_sslv2 = implementation_defined;
```

ssl::basic_context::no_sslv3

Inherited from ssl::context_base.

Disable SSL v3.

```
static const int no_sslv3 = implementation_defined;
```

ssl::basic_context::no_tlsv1

Inherited from ssl::context_base.

Disable TLS v1.

```
static const int no_tlsv1 = implementation_defined;
```

ssl::basic_context::options

Inherited from ssl::context_base.

Bitmask type for SSL options.

```
typedef int options;
```

Requirements

Header: `boost/asio/ssl/basic_context.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::basic_context::password_purpose

Inherited from ssl::context_base.

Purpose of PEM password.

```
enum password_purpose
```

Values

for_reading	The password is needed for reading/decryption.
for_writing	The password is needed for writing/encryption.

ssl::basic_context::service_type

The type of the service that will be used to provide context operations.

```
typedef Service service_type;
```

Requirements

Header: `boost/asio/ssl/basic_context.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::basic_context::set_options

Set options on the context.

```
void set_options(
    options o);
  » more...

boost::system::error_code set_options(
    options o,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::set_options (1 of 2 overloads)

Set options on the context.

```
void set_options(
    options o);
```

This function may be used to configure the SSL options used by the context.

Parameters

o	A bitmask of options. The available option values are defined in the `ssl::context_base` class. The options are bitwise-ored with any existing value for the options.

Exceptions

boost::system::system_error	Thrown on failure.

ssl::basic_context::set_options (2 of 2 overloads)

Set options on the context.

```
boost::system::error_code set_options(
    options o,
    boost::system::error_code & ec);
```

This function may be used to configure the SSL options used by the context.

Parameters

o A bitmask of options. The available option values are defined in the `ssl::context_base` class. The options are bitwise-ored with any existing value for the options.

ec Set to indicate what error occurred, if any.

ssl::basic_context::set_password_callback

Set the password callback.

```
template<
    typename PasswordCallback>
void set_password_callback(
    PasswordCallback callback);
  » more...

template<
    typename PasswordCallback>
boost::system::error_code set_password_callback(
    PasswordCallback callback,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::set_password_callback (1 of 2 overloads)

Set the password callback.

```
template<
    typename PasswordCallback>
void set_password_callback(
    PasswordCallback callback);
```

This function is used to specify a callback function to obtain password information about an encrypted key in PEM format.

Parameters

callback The function object to be used for obtaining the password. The function signature of the handler must be:

```
std::string password_callback(
  std::size_t max_length,  // The maximum size for a password.
  password_purpose purpose // Whether password is for reading or writing.
);
```

The return value of the callback is a string containing the password.

Exceptions

boost::system::system_error	Thrown on failure.

ssl::basic_context::set_password_callback (2 of 2 overloads)

Set the password callback.

```
template<
    typename PasswordCallback>
boost::system::error_code set_password_callback(
    PasswordCallback callback,
    boost::system::error_code & ec);
```

This function is used to specify a callback function to obtain password information about an encrypted key in PEM format.

Parameters

callback	The function object to be used for obtaining the password. The function signature of the handler must be:
	
	`std::string password_callback(`
	`  std::size_t max_length,  // The maximum size for a password.`
	`  password_purpose purpose // Whether password is for reading or writing.`
	`);`
	
	The return value of the callback is a string containing the password.

ec	Set to indicate what error occurred, if any.

ssl::basic_context::set_verify_mode

Set the peer verification mode.

```
void set_verify_mode(
    verify_mode v);
  » more...

boost::system::error_code set_verify_mode(
    verify_mode v,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::set_verify_mode (1 of 2 overloads)

Set the peer verification mode.

```
void set_verify_mode(
    verify_mode v);
```

This function may be used to configure the peer verification mode used by the context.

Parameters

v	A bitmask of peer verification modes. The available verify_mode values are defined in the `ssl::context_base` class.

Exceptions

boost::system::system_error	Thrown on failure.

ssl::basic_context::set_verify_mode (2 of 2 overloads)

Set the peer verification mode.

```
boost::system::error_code set_verify_mode(
    verify_mode v,
    boost::system::error_code & ec);
```

This function may be used to configure the peer verification mode used by the context.

Parameters

v A bitmask of peer verification modes. The available verify_mode values are defined in the `ssl::context_base` class.

ec Set to indicate what error occurred, if any.

ssl::basic_context::single_dh_use

Inherited from ssl::context_base.

Always create a new key when using tmp_dh parameters.

```
static const int single_dh_use = implementation_defined;
```

ssl::basic_context::use_certificate_chain_file

Use a certificate chain from a file.

```
void use_certificate_chain_file(
    const std::string & filename);
  » more...

boost::system::error_code use_certificate_chain_file(
    const std::string & filename,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::use_certificate_chain_file (1 of 2 overloads)

Use a certificate chain from a file.

```
void use_certificate_chain_file(
    const std::string & filename);
```

This function is used to load a certificate chain into the context from a file.

Parameters

filename The name of the file containing the certificate. The file must use the PEM format.

Exceptions

boost::system::system_error Thrown on failure.

ssl::basic_context::use_certificate_chain_file (2 of 2 overloads)

Use a certificate chain from a file.

```
boost::system::error_code use_certificate_chain_file(
    const std::string & filename,
    boost::system::error_code & ec);
```

This function is used to load a certificate chain into the context from a file.

Parameters

filename	The name of the file containing the certificate. The file must use the PEM format.
ec	Set to indicate what error occurred, if any.

ssl::basic_context::use_certificate_file

Use a certificate from a file.

```
void use_certificate_file(
    const std::string & filename,
    file_format format);
  » more...

boost::system::error_code use_certificate_file(
    const std::string & filename,
    file_format format,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::use_certificate_file (1 of 2 overloads)

Use a certificate from a file.

```
void use_certificate_file(
    const std::string & filename,
    file_format format);
```

This function is used to load a certificate into the context from a file.

Parameters

filename	The name of the file containing the certificate.
format	The file format (ASN.1 or PEM).

Exceptions

boost::system::system_error	Thrown on failure.

ssl::basic_context::use_certificate_file (2 of 2 overloads)

Use a certificate from a file.

```
boost::system::error_code use_certificate_file(
    const std::string & filename,
    file_format format,
    boost::system::error_code & ec);
```

This function is used to load a certificate into the context from a file.

Parameters

filename The name of the file containing the certificate.

format The file format (ASN.1 or PEM).

ec Set to indicate what error occurred, if any.

ssl::basic_context::use_private_key_file

Use a private key from a file.

```
void use_private_key_file(
    const std::string & filename,
    file_format format);
  » more...

boost::system::error_code use_private_key_file(
    const std::string & filename,
    file_format format,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::use_private_key_file (1 of 2 overloads)

Use a private key from a file.

```
void use_private_key_file(
    const std::string & filename,
    file_format format);
```

This function is used to load a private key into the context from a file.

Parameters

filename The name of the file containing the private key.

format The file format (ASN.1 or PEM).

Exceptions

boost::system::system_error Thrown on failure.

ssl::basic_context::use_private_key_file (2 of 2 overloads)

Use a private key from a file.

```
boost::system::error_code use_private_key_file(
    const std::string & filename,
    file_format format,
    boost::system::error_code & ec);
```

This function is used to load a private key into the context from a file.

Parameters

filename The name of the file containing the private key.

format The file format (ASN.1 or PEM).

ec Set to indicate what error occurred, if any.

ssl::basic_context::use_rsa_private_key_file

Use an RSA private key from a file.

```
void use_rsa_private_key_file(
    const std::string & filename,
    file_format format);
  » more...

boost::system::error_code use_rsa_private_key_file(
    const std::string & filename,
    file_format format,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::use_rsa_private_key_file (1 of 2 overloads)

Use an RSA private key from a file.

```
void use_rsa_private_key_file(
    const std::string & filename,
    file_format format);
```

This function is used to load an RSA private key into the context from a file.

Parameters

filename The name of the file containing the RSA private key.

format The file format (ASN.1 or PEM).

Exceptions

boost::system::system_error Thrown on failure.

ssl::basic_context::use_rsa_private_key_file (2 of 2 overloads)

Use an RSA private key from a file.

```
boost::system::error_code use_rsa_private_key_file(
    const std::string & filename,
    file_format format,
    boost::system::error_code & ec);
```

This function is used to load an RSA private key into the context from a file.

Parameters

filename The name of the file containing the RSA private key.

format The file format (ASN.1 or PEM).

ec Set to indicate what error occurred, if any.

ssl::basic_context::use_tmp_dh_file

Use the specified file to obtain the temporary Diffie-Hellman parameters.

```
void use_tmp_dh_file(
    const std::string & filename);
  » more...

boost::system::error_code use_tmp_dh_file(
    const std::string & filename,
    boost::system::error_code & ec);
  » more...
```

ssl::basic_context::use_tmp_dh_file (1 of 2 overloads)

Use the specified file to obtain the temporary Diffie-Hellman parameters.

```
void use_tmp_dh_file(
    const std::string & filename);
```

This function is used to load Diffie-Hellman parameters into the context from a file.

Parameters

filename The name of the file containing the Diffie-Hellman parameters. The file must use the PEM format.

Exceptions

boost::system::system_error Thrown on failure.

ssl::basic_context::use_tmp_dh_file (2 of 2 overloads)

Use the specified file to obtain the temporary Diffie-Hellman parameters.

```
boost::system::error_code use_tmp_dh_file(
    const std::string & filename,
    boost::system::error_code & ec);
```

This function is used to load Diffie-Hellman parameters into the context from a file.

Parameters

filename The name of the file containing the Diffie-Hellman parameters. The file must use the PEM format.

ec Set to indicate what error occurred, if any.

ssl::basic_context::verify_client_once

Inherited from ssl::context_base.

Do not request client certificate on renegotiation. Ignored unless verify_peer is set.

```
static const int verify_client_once = implementation_defined;
```

ssl::basic_context::verify_fail_if_no_peer_cert

Inherited from ssl::context_base.

Fail verification if the peer has no certificate. Ignored unless verify_peer is set.

```
static const int verify_fail_if_no_peer_cert = implementation_defined;
```

ssl::basic_context::verify_mode

Inherited from ssl::context_base.

Bitmask type for peer verification.

```
typedef int verify_mode;
```

Requirements

Header: `boost/asio/ssl/basic_context.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::basic_context::verify_none

Inherited from ssl::context_base.

No verification.

```
static const int verify_none = implementation_defined;
```

ssl::basic_context::verify_peer

Inherited from ssl::context_base.

Verify the peer.

```
static const int verify_peer = implementation_defined;
```

ssl::basic_context::~basic_context

Destructor.

```
~basic_context();
```

ssl::context

Typedef for the typical usage of context.

```
typedef basic_context< context_service > context;
```

Types

Name	Description
file_format	File format types.
impl_type	The native implementation type of the locking dispatcher.
method	Different methods supported by a context.
options	Bitmask type for SSL options.
password_purpose	Purpose of PEM password.
service_type	The type of the service that will be used to provide context operations.
verify_mode	Bitmask type for peer verification.

Member Functions

Name	Description
add_verify_path	Add a directory containing certificate authority files to be used for performing verification.
basic_context	Constructor.
impl	Get the underlying implementation in the native type.
load_verify_file	Load a certification authority file for performing verification.
set_options	Set options on the context.
set_password_callback	Set the password callback.
set_verify_mode	Set the peer verification mode.
use_certificate_chain_file	Use a certificate chain from a file.
use_certificate_file	Use a certificate from a file.
use_private_key_file	Use a private key from a file.
use_rsa_private_key_file	Use an RSA private key from a file.
use_tmp_dh_file	Use the specified file to obtain the temporary Diffie-Hellman parameters.
~basic_context	Destructor.

Data Members

Name	Description
default_workarounds	Implement various bug workarounds.
no_sslv2	Disable SSL v2.
no_sslv3	Disable SSL v3.
no_tlsv1	Disable TLS v1.
single_dh_use	Always create a new key when using tmp_dh parameters.
verify_client_once	Do not request client certificate on renegotiation. Ignored unless verify_peer is set.
verify_fail_if_no_peer_cert	Fail verification if the peer has no certificate. Ignored unless verify_peer is set.
verify_none	No verification.
verify_peer	Verify the peer.

Requirements

Header: `boost/asio/ssl/context.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::context_base

The `ssl::context_base` class is used as a base for the `ssl::basic_context` class template so that we have a common place to define various enums.

```
class context_base
```

Types

Name	Description
file_format	File format types.
method	Different methods supported by a context.
options	Bitmask type for SSL options.
password_purpose	Purpose of PEM password.
verify_mode	Bitmask type for peer verification.

Protected Member Functions

Name	Description
~context_base	Protected destructor to prevent deletion through this type.

Data Members

Name	Description
default_workarounds	Implement various bug workarounds.
no_sslv2	Disable SSL v2.
no_sslv3	Disable SSL v3.
no_tlsv1	Disable TLS v1.
single_dh_use	Always create a new key when using tmp_dh parameters.
verify_client_once	Do not request client certificate on renegotiation. Ignored unless verify_peer is set.
verify_fail_if_no_peer_cert	Fail verification if the peer has no certificate. Ignored unless verify_peer is set.
verify_none	No verification.
verify_peer	Verify the peer.

Requirements

Header: `boost/asio/ssl/context_base.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::context_base::default_workarounds

Implement various bug workarounds.

```
static const int default_workarounds = implementation_defined;
```

ssl::context_base::file_format

File format types.

```
enum file_format
```

Values

asn1 ASN.1 file.

pem PEM file.

ssl::context_base::method

Different methods supported by a context.

```
enum method
```

Values

sslv2 Generic SSL version 2.

sslv2_client	SSL version 2 client.
sslv2_server	SSL version 2 server.
sslv3	Generic SSL version 3.
sslv3_client	SSL version 3 client.
sslv3_server	SSL version 3 server.
tlsv1	Generic TLS version 1.
tlsv1_client	TLS version 1 client.
tlsv1_server	TLS version 1 server.
sslv23	Generic SSL/TLS.
sslv23_client	SSL/TLS client.
sslv23_server	SSL/TLS server.

ssl::context_base::no_sslv2

Disable SSL v2.

```
static const int no_sslv2 = implementation_defined;
```

ssl::context_base::no_sslv3

Disable SSL v3.

```
static const int no_sslv3 = implementation_defined;
```

ssl::context_base::no_tlsv1

Disable TLS v1.

```
static const int no_tlsv1 = implementation_defined;
```

ssl::context_base::options

Bitmask type for SSL options.

```
typedef int options;
```

Requirements

Header: `boost/asio/ssl/context_base.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::context_base::password_purpose

Purpose of PEM password.

```
enum password_purpose
```

Values

for_reading	The password is needed for reading/decryption.
for_writing	The password is needed for writing/encryption.

ssl::context_base::single_dh_use

Always create a new key when using tmp_dh parameters.

```
static const int single_dh_use = implementation_defined;
```

ssl::context_base::verify_client_once

Do not request client certificate on renegotiation. Ignored unless verify_peer is set.

```
static const int verify_client_once = implementation_defined;
```

ssl::context_base::verify_fail_if_no_peer_cert

Fail verification if the peer has no certificate. Ignored unless verify_peer is set.

```
static const int verify_fail_if_no_peer_cert = implementation_defined;
```

ssl::context_base::verify_mode

Bitmask type for peer verification.

```
typedef int verify_mode;
```

Requirements

Header: `boost/asio/ssl/context_base.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::context_base::verify_none

No verification.

```
static const int verify_none = implementation_defined;
```

ssl::context_base::verify_peer

Verify the peer.

```
static const int verify_peer = implementation_defined;
```

ssl::context_base::~context_base

Protected destructor to prevent deletion through this type.

```
~context_base();
```

ssl::context_service

Default service implementation for a context.

```
class context_service :
  public io_service::service
```

Types

Name	Description
impl_type	The type of the context.

Member Functions

Name	Description
add_verify_path	Add a directory containing certification authority files to be used for performing verification.
context_service	Constructor.
create	Create a new context implementation.
destroy	Destroy a context implementation.
get_io_service	Get the io_service object that owns the service.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
load_verify_file	Load a certification authority file for performing verification.
null	Return a null context implementation.
set_options	Set options on the context.
set_password_callback	Set the password callback.
set_verify_mode	Set peer verification mode.
shutdown_service	Destroy all user-defined handler objects owned by the service.
use_certificate_chain_file	Use a certificate chain from a file.
use_certificate_file	Use a certificate from a file.
use_private_key_file	Use a private key from a file.
use_rsa_private_key_file	Use an RSA private key from a file.
use_tmp_dh_file	Use the specified file to obtain the temporary Diffie-Hellman parameters.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/ssl/context_service.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::context_service::add_verify_path

Add a directory containing certification authority files to be used for performing verification.

```
boost::system::error_code add_verify_path(
    impl_type & impl,
    const std::string & path,
    boost::system::error_code & ec);
```

ssl::context_service::context_service

Constructor.

```
context_service(
    boost::asio::io_service & io_service);
```

ssl::context_service::create

Create a new context implementation.

```
void create(
    impl_type & impl,
    context_base::method m);
```

ssl::context_service::destroy

Destroy a context implementation.

```
void destroy(
    impl_type & impl);
```

ssl::context_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

ssl::context_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

ssl::context_service::impl_type

The type of the context.

```
typedef implementation_defined impl_type;
```

Requirements

Header: `boost/asio/ssl/context_service.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::context_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

ssl::context_service::load_verify_file

Load a certification authority file for performing verification.

```
boost::system::error_code load_verify_file(
    impl_type & impl,
    const std::string & filename,
    boost::system::error_code & ec);
```

ssl::context_service::null

Return a null context implementation.

```
impl_type null() const;
```

ssl::context_service::set_options

Set options on the context.

```
boost::system::error_code set_options(
    impl_type & impl,
    context_base::options o,
    boost::system::error_code & ec);
```

ssl::context_service::set_password_callback

Set the password callback.

```
template<
    typename PasswordCallback>
boost::system::error_code set_password_callback(
    impl_type & impl,
    PasswordCallback callback,
    boost::system::error_code & ec);
```

ssl::context_service::set_verify_mode

Set peer verification mode.

```
boost::system::error_code set_verify_mode(
    impl_type & impl,
    context_base::verify_mode v,
    boost::system::error_code & ec);
```

ssl::context_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

ssl::context_service::use_certificate_chain_file

Use a certificate chain from a file.

```
boost::system::error_code use_certificate_chain_file(
    impl_type & impl,
    const std::string & filename,
    boost::system::error_code & ec);
```

ssl::context_service::use_certificate_file

Use a certificate from a file.

```
boost::system::error_code use_certificate_file(
    impl_type & impl,
    const std::string & filename,
    context_base::file_format format,
    boost::system::error_code & ec);
```

ssl::context_service::use_private_key_file

Use a private key from a file.

```
boost::system::error_code use_private_key_file(
    impl_type & impl,
    const std::string & filename,
    context_base::file_format format,
    boost::system::error_code & ec);
```

ssl::context_service::use_rsa_private_key_file

Use an RSA private key from a file.

```
boost::system::error_code use_rsa_private_key_file(
    impl_type & impl,
    const std::string & filename,
    context_base::file_format format,
    boost::system::error_code & ec);
```

ssl::context_service::use_tmp_dh_file

Use the specified file to obtain the temporary Diffie-Hellman parameters.

```
boost::system::error_code use_tmp_dh_file(
    impl_type & impl,
    const std::string & filename,
    boost::system::error_code & ec);
```

ssl::stream

Provides stream-oriented functionality using SSL.

```
template<
    typename Stream,
    typename Service = stream_service>
class stream :
  public ssl::stream_base
```

Types

Name	Description
handshake_type	Different handshake types.
impl_type	The native implementation type of the stream.
lowest_layer_type	The type of the lowest layer.
next_layer_type	The type of the next layer.
service_type	The type of the service that will be used to provide stream operations.

Member Functions

Name	Description
async_handshake	Start an asynchronous SSL handshake.
async_read_some	Start an asynchronous read.
async_shutdown	Asynchronously shut down SSL on the stream.
async_write_some	Start an asynchronous write.
get_io_service	Get the io_service associated with the object.
handshake	Perform SSL handshaking.
impl	Get the underlying implementation in the native type.
in_avail	Determine the amount of data that may be read without blocking.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
next_layer	Get a reference to the next layer.
peek	Peek at the incoming data on the stream.
read_some	Read some data from the stream.
shutdown	Shut down SSL on the stream.
stream	Construct a stream.
write_some	Write some data to the stream.
~stream	Destructor.

The stream class template provides asynchronous and blocking stream-oriented functionality using SSL.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Example

To use the SSL stream template with an `ip::tcp::socket`, you would write:

```
boost::asio::io_service io_service;
boost::asio::ssl::context context(io_service, boost::asio::ssl::context::sslv23);
boost::asio::ssl::stream<boost::asio::ip::tcp::socket> sock(io_service, context);
```

Requirements

Header: `boost/asio/ssl/stream.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream::async_handshake

Start an asynchronous SSL handshake.

```
template<
    typename HandshakeHandler>
void async_handshake(
    handshake_type type,
    HandshakeHandler handler);
```

This function is used to asynchronously perform an SSL handshake on the stream. This function call always returns immediately.

Parameters

type — The type of handshaking to be performed, i.e. as a client or as a server.

handler — The handler to be called when the handshake operation completes. Copies will be made of the handler as required. The equivalent function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation.
);
```

ssl::stream::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read one or more bytes of data from the stream. The function call always returns immediately.

Parameters

buffers — The buffers into which the data will be read. Although the buffers object may be copied as necessary, ownership of the underlying buffers is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The equivalent function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes read.
);
```

Remarks

The async_read_some operation may not read all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is read before the asynchronous operation completes.

ssl::stream::async_shutdown

Asynchronously shut down SSL on the stream.

```
template<
    typename ShutdownHandler>
void async_shutdown(
    ShutdownHandler handler);
```

This function is used to asynchronously shut down SSL on the stream. This function call always returns immediately.

Parameters

handler — The handler to be called when the handshake operation completes. Copies will be made of the handler as required. The equivalent function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error // Result of operation.
);
```

ssl::stream::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write one or more bytes of data to the stream. The function call always returns immediately.

Parameters

buffers — The data to be written to the stream. Although the buffers object may be copied as necessary, ownership of the underlying buffers is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The equivalent function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes written.
);
```

Remarks

The async_write_some operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the blocking operation completes.

ssl::stream::get_io_service

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the stream uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that stream will use to dispatch handlers. Ownership is not transferred to the caller.

ssl::stream::handshake

Perform SSL handshaking.

```
void handshake(
    handshake_type type);
  » more...

boost::system::error_code handshake(
    handshake_type type,
    boost::system::error_code & ec);
  » more...
```

ssl::stream::handshake (1 of 2 overloads)

Perform SSL handshaking.

```
void handshake(
    handshake_type type);
```

This function is used to perform SSL handshaking on the stream. The function call will block until handshaking is complete or an error occurs.

Parameters

type The type of handshaking to be performed, i.e. as a client or as a server.

Exceptions

boost::system::system_error Thrown on failure.

ssl::stream::handshake (2 of 2 overloads)

Perform SSL handshaking.

```
boost::system::error_code handshake(
    handshake_type type,
    boost::system::error_code & ec);
```

This function is used to perform SSL handshaking on the stream. The function call will block until handshaking is complete or an error occurs.

Parameters

type The type of handshaking to be performed, i.e. as a client or as a server.

ec Set to indicate what error occurred, if any.

ssl::stream::handshake_type

Different handshake types.

```
enum handshake_type
```

Values

client Perform handshaking as a client.

server Perform handshaking as a server.

ssl::stream::impl

Get the underlying implementation in the native type.

```
impl_type impl();
```

This function may be used to obtain the underlying implementation of the context. This is intended to allow access to stream functionality that is not otherwise provided.

ssl::stream::impl_type

The native implementation type of the stream.

```
typedef service_type::impl_type impl_type;
```

Requirements

Header: `boost/asio/ssl/stream.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream::in_avail

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
  » more...

std::size_t in_avail(
    boost::system::error_code & ec);
  » more...
```

ssl::stream::in_avail (1 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail();
```

This function is used to determine the amount of data, in bytes, that may be read from the stream without blocking.

Return Value

The number of bytes of data that can be read without blocking.

Exceptions

boost::system::system_error Thrown on failure.

ssl::stream::in_avail (2 of 2 overloads)

Determine the amount of data that may be read without blocking.

```
std::size_t in_avail(
    boost::system::error_code & ec);
```

This function is used to determine the amount of data, in bytes, that may be read from the stream without blocking.

Parameters

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes of data that can be read without blocking.

ssl::stream::io_service

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the stream uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that stream will use to dispatch handlers. Ownership is not transferred to the caller.

ssl::stream::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

ssl::stream::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of stream layers.

Return Value

A reference to the lowest layer in the stack of stream layers. Ownership is not transferred to the caller.

ssl::stream::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of stream layers.

Return Value

A const reference to the lowest layer in the stack of stream layers. Ownership is not transferred to the caller.

ssl::stream::lowest_layer_type

The type of the lowest layer.

```
typedef next_layer_type::lowest_layer_type lowest_layer_type;
```

Requirements

Header: `boost/asio/ssl/stream.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream::next_layer

Get a reference to the next layer.

```
next_layer_type & next_layer();
```

This function returns a reference to the next layer in a stack of stream layers.

Return Value

A reference to the next layer in the stack of stream layers. Ownership is not transferred to the caller.

ssl::stream::next_layer_type

The type of the next layer.

```
typedef boost::remove_reference< Stream >::type next_layer_type;
```

Requirements

Header: `boost/asio/ssl/stream.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream::peek

Peek at the incoming data on the stream.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

ssl::stream::peek (1 of 2 overloads)

Peek at the incoming data on the stream.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers);
```

This function is used to peek at the incoming data on the stream, without removing it from the input queue. The function call will block until data has been read successfully or an error occurs.

Parameters

buffers The buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error Thrown on failure.

ssl::stream::peek (2 of 2 overloads)

Peek at the incoming data on the stream.

```
template<
    typename MutableBufferSequence>
std::size_t peek(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to peek at the incoming data on the stream, withoutxi removing it from the input queue. The function call will block until data has been read successfully or an error occurs.

Parameters

buffers The buffers into which the data will be read.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

ssl::stream::read_some

Read some data from the stream.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

ssl::stream::read_some (1 of 2 overloads)

Read some data from the stream.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

This function is used to read data from the stream. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers The buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

ssl::stream::read_some (2 of 2 overloads)

Read some data from the stream.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to read data from the stream. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers	The buffers into which the data will be read.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

ssl::stream::service_type

The type of the service that will be used to provide stream operations.

```
typedef Service service_type;
```

Requirements

Header: `boost/asio/ssl/stream.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream::shutdown

Shut down SSL on the stream.

```
void shutdown();
  » more...

boost::system::error_code shutdown(
    boost::system::error_code & ec);
  » more...
```

ssl::stream::shutdown (1 of 2 overloads)

Shut down SSL on the stream.

```
void shutdown();
```

This function is used to shut down SSL on the stream. The function call will block until SSL has been shut down or an error occurs.

Exceptions

boost::system::system_error	Thrown on failure.

ssl::stream::shutdown (2 of 2 overloads)

Shut down SSL on the stream.

```
boost::system::error_code shutdown(
    boost::system::error_code & ec);
```

This function is used to shut down SSL on the stream. The function call will block until SSL has been shut down or an error occurs.

Parameters

ec	Set to indicate what error occurred, if any.

ssl::stream::stream

Construct a stream.

```
template<
    typename Arg,
    typename Context_Service>
stream(
    Arg & arg,
    basic_context< Context_Service > & context);
```

This constructor creates a stream and initialises the underlying stream object.

Parameters

arg	The argument to be passed to initialise the underlying stream.
context	The SSL context to be used for the stream.

ssl::stream::write_some

Write some data to the stream.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

ssl::stream::write_some (1 of 2 overloads)

Write some data to the stream.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

This function is used to write data on the stream. The function call will block until one or more bytes of data has been written successfully, or until an error occurs.

Parameters

buffers The data to be written.

Return Value

The number of bytes written.

Exceptions

boost::system::system_error Thrown on failure.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

ssl::stream::write_some (2 of 2 overloads)

Write some data to the stream.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to write data on the stream. The function call will block until one or more bytes of data has been written successfully, or until an error occurs.

Parameters

buffers The data to be written to the stream.

ec Set to indicate what error occurred, if any.

Return Value

The number of bytes written. Returns 0 if an error occurred.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

ssl::stream::~stream

Destructor.

```
~stream();
```

ssl::stream_base

The `ssl::stream_base` class is used as a base for the `ssl::stream` class template so that we have a common place to define various enums.

```
class stream_base
```

Types

Name	Description
handshake_type	Different handshake types.

Protected Member Functions

Name	Description
~stream_base	Protected destructor to prevent deletion through this type.

Requirements

Header: `boost/asio/ssl/stream_base.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream_base::handshake_type

Different handshake types.

```
enum handshake_type
```

Values

client Perform handshaking as a client.

server Perform handshaking as a server.

ssl::stream_base::~stream_base

Protected destructor to prevent deletion through this type.

```
~stream_base();
```

ssl::stream_service

Default service implementation for an SSL stream.

```
class stream_service :
  public io_service::service
```

Types

Name	Description
impl_type	The type of a stream implementation.

Member Functions

Name	Description
async_handshake	Start an asynchronous SSL handshake.
async_read_some	Start an asynchronous read.
async_shutdown	Asynchronously shut down SSL on the stream.
async_write_some	Start an asynchronous write.
create	Create a new stream implementation.
destroy	Destroy a stream implementation.
get_io_service	Get the io_service object that owns the service.
handshake	Perform SSL handshaking.
in_avail	Determine the amount of data that may be read without blocking.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
null	Return a null stream implementation.
peek	Peek at the incoming data on the stream.
read_some	Read some data from the stream.
shutdown	Shut down SSL on the stream.
shutdown_service	Destroy all user-defined handler objects owned by the service.
stream_service	Construct a new stream service for the specified io_service.
write_some	Write some data to the stream.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/ssl/stream_service.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream_service::async_handshake

Start an asynchronous SSL handshake.

```
template<
    typename Stream,
    typename HandshakeHandler>
void async_handshake(
    impl_type & impl,
    Stream & next_layer,
    stream_base::handshake_type type,
    HandshakeHandler handler);
```

ssl::stream_service::async_read_some

Start an asynchronous read.

```
template<
    typename Stream,
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    impl_type & impl,
    Stream & next_layer,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

ssl::stream_service::async_shutdown

Asynchronously shut down SSL on the stream.

```
template<
    typename Stream,
    typename ShutdownHandler>
void async_shutdown(
    impl_type & impl,
    Stream & next_layer,
    ShutdownHandler handler);
```

ssl::stream_service::async_write_some

Start an asynchronous write.

```
template<
    typename Stream,
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    impl_type & impl,
    Stream & next_layer,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

ssl::stream_service::create

Create a new stream implementation.

```
template<
    typename Stream,
    typename Context_Service>
void create(
    impl_type & impl,
    Stream & next_layer,
    basic_context< Context_Service > & context);
```

ssl::stream_service::destroy

Destroy a stream implementation.

```
template<
    typename Stream>
void destroy(
    impl_type & impl,
    Stream & next_layer);
```

ssl::stream_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

ssl::stream_service::handshake

Perform SSL handshaking.

```
template<
    typename Stream>
boost::system::error_code handshake(
    impl_type & impl,
    Stream & next_layer,
    stream_base::handshake_type type,
    boost::system::error_code & ec);
```

ssl::stream_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

ssl::stream_service::impl_type

The type of a stream implementation.

```
typedef implementation_defined impl_type;
```

Requirements

Header: `boost/asio/ssl/stream_service.hpp`

Convenience header: `boost/asio/ssl.hpp`

ssl::stream_service::in_avail

Determine the amount of data that may be read without blocking.

```
template<
    typename Stream>
std::size_t in_avail(
    impl_type & impl,
    Stream & next_layer,
    boost::system::error_code & ec);
```

ssl::stream_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

ssl::stream_service::null

Return a null stream implementation.

```
impl_type null() const;
```

ssl::stream_service::peek

Peek at the incoming data on the stream.

```
template<
    typename Stream,
    typename MutableBufferSequence>
std::size_t peek(
    impl_type & impl,
    Stream & next_layer,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

ssl::stream_service::read_some

Read some data from the stream.

```
template<
    typename Stream,
    typename MutableBufferSequence>
std::size_t read_some(
    impl_type & impl,
    Stream & next_layer,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

ssl::stream_service::shutdown

Shut down SSL on the stream.

```
template<
    typename Stream>
boost::system::error_code shutdown(
    impl_type & impl,
    Stream & next_layer,
    boost::system::error_code & ec);
```

ssl::stream_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

ssl::stream_service::stream_service

Construct a new stream service for the specified `io_service`.

```
stream_service(
    boost::asio::io_service & io_service);
```

ssl::stream_service::write_some

Write some data to the stream.

```
template<
    typename Stream,
    typename ConstBufferSequence>
std::size_t write_some(
    impl_type & impl,
    Stream & next_layer,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

strand

Typedef for backwards compatibility.

```
typedef boost::asio::io_service::strand strand;
```

Member Functions

Name	Description
dispatch	Request the strand to invoke the given handler.
get_io_service	Get the io_service associated with the strand.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the strand.
post	Request the strand to invoke the given handler and return immediately.
strand	Constructor.
wrap	Create a new handler that automatically dispatches the wrapped handler on the strand.
~strand	Destructor.

The `io_service::strand` class provides the ability to post and dispatch handlers with the guarantee that none of those handlers will execute concurrently.

Order of handler invocation

Given:

- a strand object s
- an object a meeting completion handler requirements
- an object a1 which is an arbitrary copy of a made by the implementation
- an object b meeting completion handler requirements
- an object b1 which is an arbitrary copy of b made by the implementation

if any of the following conditions are true:

- s.post(a) happens-before s.post(b)
- s.post(a) happens-before s.dispatch(b), where the latter is performed outside the strand
- s.dispatch(a) happens-before s.post(b), where the former is performed outside the strand
- s.dispatch(a) happens-before s.dispatch(b), where both are performed outside the strand

then `asio_handler_invoke(a1, &a1)` happens-before `asio_handler_invoke(b1, &b1)`.

Note that in the following case:

```
async_op_1(..., s.wrap(a));
async_op_2(..., s.wrap(b));
```

the completion of the first async operation will perform `s.dispatch(a)`, and the second will perform `s.dispatch(b)`, but the order in which those are performed is unspecified. That is, you cannot state whether one happens-before the other. Therefore none of the above conditions are met and no ordering guarantee is made.

Thread Safety

Distinct objects: Safe.

Shared objects: Safe.

Requirements

Header: `boost/asio/strand.hpp`

Convenience header: `boost/asio.hpp`

stream_socket_service

Default service implementation for a stream socket.

```
template<
    typename Protocol>
class stream_socket_service :
  public io_service::service
```

Types

Name	Description
endpoint_type	The endpoint type.
implementation_type	The type of a stream socket implementation.
native_type	The native socket type.
protocol_type	The protocol type.

Member Functions

Name	Description
assign	Assign an existing native socket to a stream socket.
async_connect	Start an asynchronous connect.
async_receive	Start an asynchronous receive.
async_send	Start an asynchronous send.
at_mark	Determine whether the socket is at the out-of-band data mark.
available	Determine the number of bytes available for reading.
bind	Bind the stream socket to the specified local endpoint.
cancel	Cancel all asynchronous operations associated with the socket.
close	Close a stream socket implementation.
connect	Connect the stream socket to the specified endpoint.
construct	Construct a new stream socket implementation.
destroy	Destroy a stream socket implementation.
get_io_service	Get the io_service object that owns the service.
get_option	Get a socket option.
io_control	Perform an IO control command on the socket.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the socket is open.
local_endpoint	Get the local endpoint.
native	Get the native socket implementation.
open	Open a stream socket.
receive	Receive some data from the peer.
remote_endpoint	Get the remote endpoint.
send	Send the given data to the peer.
set_option	Set a socket option.
shutdown	Disable sends or receives on the socket.
shutdown_service	Destroy all user-defined handler objects owned by the service.
stream_socket_service	Construct a new stream socket service for the specified io_service.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/stream_socket_service.hpp`

Convenience header: `boost/asio.hpp`

stream_socket_service::assign

Assign an existing native socket to a stream socket.

```
boost::system::error_code assign(
    implementation_type & impl,
    const protocol_type & protocol,
    const native_type & native_socket,
    boost::system::error_code & ec);
```

stream_socket_service::async_connect

Start an asynchronous connect.

```
template<
    typename ConnectHandler>
void async_connect(
    implementation_type & impl,
    const endpoint_type & peer_endpoint,
    ConnectHandler handler);
```

stream_socket_service::async_receive

Start an asynchronous receive.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_receive(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    ReadHandler handler);
```

stream_socket_service::async_send

Start an asynchronous send.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_send(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    WriteHandler handler);
```

stream_socket_service::at_mark

Determine whether the socket is at the out-of-band data mark.

```
bool at_mark(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

stream_socket_service::available

Determine the number of bytes available for reading.

```
std::size_t available(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

stream_socket_service::bind

Bind the stream socket to the specified local endpoint.

```
boost::system::error_code bind(
    implementation_type & impl,
    const endpoint_type & endpoint,
    boost::system::error_code & ec);
```

stream_socket_service::cancel

Cancel all asynchronous operations associated with the socket.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

stream_socket_service::close

Close a stream socket implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

stream_socket_service::connect

Connect the stream socket to the specified endpoint.

```
boost::system::error_code connect(
    implementation_type & impl,
    const endpoint_type & peer_endpoint,
    boost::system::error_code & ec);
```

stream_socket_service::construct

Construct a new stream socket implementation.

```
void construct(
    implementation_type & impl);
```

stream_socket_service::destroy

Destroy a stream socket implementation.

```
void destroy(
    implementation_type & impl);
```

stream_socket_service::endpoint_type

The endpoint type.

```
typedef Protocol::endpoint endpoint_type;
```

Requirements

Header: `boost/asio/stream_socket_service.hpp`

Convenience header: `boost/asio.hpp`

stream_socket_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

stream_socket_service::get_option

Get a socket option.

```
template<
    typename GettableSocketOption>
boost::system::error_code get_option(
    const implementation_type & impl,
    GettableSocketOption & option,
    boost::system::error_code & ec) const;
```

stream_socket_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

stream_socket_service::implementation_type

The type of a stream socket implementation.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/stream_socket_service.hpp`

Convenience header: `boost/asio.hpp`

stream_socket_service::io_control

Perform an IO control command on the socket.

```
template<
    typename IoControlCommand>
boost::system::error_code io_control(
    implementation_type & impl,
    IoControlCommand & command,
    boost::system::error_code & ec);
```

stream_socket_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

stream_socket_service::is_open

Determine whether the socket is open.

```
bool is_open(
    const implementation_type & impl) const;
```

stream_socket_service::local_endpoint

Get the local endpoint.

```
endpoint_type local_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

stream_socket_service::native

Get the native socket implementation.

```
native_type native(
    implementation_type & impl);
```

stream_socket_service::native_type

The native socket type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/stream_socket_service.hpp`

Convenience header: `boost/asio.hpp`

stream_socket_service::open

Open a stream socket.

```
boost::system::error_code open(
    implementation_type & impl,
    const protocol_type & protocol,
    boost::system::error_code & ec);
```

stream_socket_service::protocol_type

The protocol type.

```
typedef Protocol protocol_type;
```

Requirements

Header: `boost/asio/stream_socket_service.hpp`

Convenience header: `boost/asio.hpp`

stream_socket_service::receive

Receive some data from the peer.

```
template<
    typename MutableBufferSequence>
std::size_t receive(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

stream_socket_service::remote_endpoint

Get the remote endpoint.

```
endpoint_type remote_endpoint(
    const implementation_type & impl,
    boost::system::error_code & ec) const;
```

stream_socket_service::send

Send the given data to the peer.

```
template<
    typename ConstBufferSequence>
std::size_t send(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    socket_base::message_flags flags,
    boost::system::error_code & ec);
```

stream_socket_service::set_option

Set a socket option.

```
template<
    typename SettableSocketOption>
boost::system::error_code set_option(
    implementation_type & impl,
    const SettableSocketOption & option,
    boost::system::error_code & ec);
```

stream_socket_service::shutdown

Disable sends or receives on the socket.

```
boost::system::error_code shutdown(
    implementation_type & impl,
    socket_base::shutdown_type what,
    boost::system::error_code & ec);
```

stream_socket_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

stream_socket_service::stream_socket_service

Construct a new stream socket service for the specified `io_service`.

```
stream_socket_service(
    boost::asio::io_service & io_service);
```

streambuf

Typedef for the typical usage of `basic_streambuf`.

```
typedef basic_streambuf streambuf;
```

Types

Name	Description
const_buffers_type	The type used to represent the input sequence as a list of buffers.
mutable_buffers_type	The type used to represent the output sequence as a list of buffers.

Member Functions

Name	Description
basic_streambuf	Construct a basic_streambuf object.
commit	Move characters from the output sequence to the input sequence.
consume	Remove characters from the input sequence.
data	Get a list of buffers that represents the input sequence.
max_size	Get the maximum size of the basic_streambuf.
prepare	Get a list of buffers that represents the output sequence, with the given size.
size	Get the size of the input sequence.

Protected Member Functions

Name	Description
overflow	Override std::streambuf behaviour.
reserve	
underflow	Override std::streambuf behaviour.

The `basic_streambuf` class is derived from `std::streambuf` to associate the streambuf's input and output sequences with one or more character arrays. These character arrays are internal to the `basic_streambuf` object, but direct access to the array elements is provided to permit them to be used efficiently with I/O operations. Characters written to the output sequence of a `basic_streambuf` object are appended to the input sequence of the same object.

The `basic_streambuf` class's public interface is intended to permit the following implementation strategies:

- A single contiguous character array, which is reallocated as necessary to accommodate changes in the size of the character sequence. This is the implementation approach currently used in Asio.
- A sequence of one or more character arrays, where each array is of the same size. Additional character array objects are appended to the sequence to accommodate changes in the size of the character sequence.
- A sequence of one or more character arrays of varying sizes. Additional character array objects are appended to the sequence to accommodate changes in the size of the character sequence.

The constructor for `basic_streambuf` accepts a `size_t` argument specifying the maximum of the sum of the sizes of the input sequence and output sequence. During the lifetime of the `basic_streambuf` object, the following invariant holds:

```
size() <= max_size()
```

Any member function that would, if successful, cause the invariant to be violated shall throw an exception of class `std::length_error`.

The constructor for `basic_streambuf` takes an Allocator argument. A copy of this argument is used for any memory allocation performed, by the constructor and by all member functions, during the lifetime of each `basic_streambuf` object.

Examples

Writing directly from an streambuf to a socket:

```
boost::asio::streambuf b;
std::ostream os(&b);
os << "Hello, World!\n";

// try sending some data in input sequence
size_t n = sock.send(b.data());

b.consume(n); // sent data is removed from input sequence
```

Reading from a socket directly into a streambuf:

```
boost::asio::streambuf b;

// reserve 512 bytes in output sequence
boost::asio::streambuf::mutable_buffers_type bufs = b.prepare(512);

size_t n = sock.receive(bufs);

// received data is "committed" from output sequence to input sequence
b.commit(n);

std::istream is(&b);
std::string s;
is >> s;
```

Requirements

Header: `boost/asio/streambuf.hpp`

Convenience header: `boost/asio.hpp`

time_traits< boost::posix_time::ptime >

Time traits specialised for posix_time.

```
template<>
struct time_traits< boost::posix_time::ptime >
```

Types

Name	Description
duration_type	The duration type.
time_type	The time type.

Member Functions

Name	Description
add	Add a duration to a time.
less_than	Test whether one time is less than another.
now	Get the current time.
subtract	Subtract one time from another.
to_posix_duration	Convert to POSIX duration type.

Requirements

Header: `boost/asio/time_traits.hpp`

Convenience header: `boost/asio.hpp`

time_traits< boost::posix_time::ptime >::add

Add a duration to a time.

```
static time_type add(
    const time_type & t,
    const duration_type & d);
```

time_traits< boost::posix_time::ptime >::duration_type

The duration type.

```
typedef boost::posix_time::time_duration duration_type;
```

Requirements

Header: `boost/asio/time_traits.hpp`

Convenience header: `boost/asio.hpp`

time_traits< boost::posix_time::ptime >::less_than

Test whether one time is less than another.

```
static bool less_than(
    const time_type & t1,
    const time_type & t2);
```

time_traits< boost::posix_time::ptime >::now

Get the current time.

```
static time_type now();
```

time_traits< boost::posix_time::ptime >::subtract

Subtract one time from another.

```
static duration_type subtract(
    const time_type & t1,
    const time_type & t2);
```

time_traits< boost::posix_time::ptime >::time_type

The time type.

```
typedef boost::posix_time::ptime time_type;
```

Requirements

Header: `boost/asio/time_traits.hpp`

Convenience header: `boost/asio.hpp`

time_traits< boost::posix_time::ptime >::to_posix_duration

Convert to POSIX duration type.

```
static boost::posix_time::time_duration to_posix_duration(
    const duration_type & d);
```

transfer_all

Return a completion condition function object that indicates that a read or write operation should continue until all of the data has been transferred, or until an error occurs.

```
unspecified transfer_all();
```

This function is used to create an object, of unspecified type, that meets CompletionCondition requirements.

Example

Reading until a buffer is full:

```
boost::array<char, 128> buf;
boost::system::error_code ec;
std::size_t n = boost::asio::read(
    sock, boost::asio::buffer(buf),
    boost::asio::transfer_all(), ec);
if (ec)
{
  // An error occurred.
}
else
{
  // n == 128
}
```

Requirements

Header: `boost/asio/completion_condition.hpp`

Convenience header: `boost/asio.hpp`

transfer_at_least

Return a completion condition function object that indicates that a read or write operation should continue until a minimum number of bytes has been transferred, or until an error occurs.

```
unspecified transfer_at_least(
    std::size_t minimum);
```

This function is used to create an object, of unspecified type, that meets CompletionCondition requirements.

Example

Reading until a buffer is full or contains at least 64 bytes:

```
boost::array<char, 128> buf;
boost::system::error_code ec;
std::size_t n = boost::asio::read(
    sock, boost::asio::buffer(buf),
    boost::asio::transfer_at_least(64), ec);
if (ec)
{
  // An error occurred.
}
else
{
  // n >= 64 && n <= 128
}
```

Requirements

Header: `boost/asio/completion_condition.hpp`

Convenience header: `boost/asio.hpp`

use_service

```
template<
    typename Service>
Service & use_service(
    io_service & ios);
```

This function is used to locate a service object that corresponds to the given service type. If there is no existing implementation of the service, then the `io_service` will create a new instance of the service.

Parameters

ios The `io_service` object that owns the service.

Return Value

The service interface implementing the specified service type. Ownership of the service interface is not transferred to the caller.

Requirements

Header: `boost/asio/io_service.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_handle

Provides Windows handle functionality.

```
template<
    typename HandleService>
class basic_handle :
  public basic_io_object< HandleService >
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
basic_handle	Construct a basic_handle without opening it. Construct a basic_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.

Protected Member Functions

Name	Description
~basic_handle	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_handle` class template provides the ability to wrap a Windows handle.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/basic_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_handle::assign

Assign an existing native handle to the handle.

```
void assign(
    const native_type & native_handle);
  » more...

boost::system::error_code assign(
    const native_type & native_handle,
    boost::system::error_code & ec);
  » more...
```

windows::basic_handle::assign (1 of 2 overloads)

Assign an existing native handle to the handle.

```
void assign(
    const native_type & native_handle);
```

windows::basic_handle::assign (2 of 2 overloads)

Assign an existing native handle to the handle.

```
boost::system::error_code assign(
    const native_type & native_handle,
    boost::system::error_code & ec);
```

windows::basic_handle::basic_handle

Construct a `windows::basic_handle` without opening it.

```
explicit basic_handle(
    boost::asio::io_service & io_service);
  » more...
```

Construct a `windows::basic_handle` on an existing native handle.

```
basic_handle(
    boost::asio::io_service & io_service,
    const native_type & native_handle);
  » more...
```

windows::basic_handle::basic_handle (1 of 2 overloads)

Construct a `windows::basic_handle` without opening it.

```
basic_handle(
    boost::asio::io_service & io_service);
```

This constructor creates a handle without opening it.

Parameters

io_service	The `io_service` object that the handle will use to dispatch handlers for any asynchronous operations performed on the handle.

windows::basic_handle::basic_handle (2 of 2 overloads)

Construct a `windows::basic_handle` on an existing native handle.

```
basic_handle(
    boost::asio::io_service & io_service,
    const native_type & native_handle);
```

This constructor creates a handle object to hold an existing native handle.

Parameters

io_service	The `io_service` object that the handle will use to dispatch handlers for any asynchronous operations performed on the handle.
native_handle	A native handle.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_handle::cancel

Cancel all asynchronous operations associated with the handle.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

windows::basic_handle::cancel (1 of 2 overloads)

Cancel all asynchronous operations associated with the handle.

```
void cancel();
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_handle::cancel (2 of 2 overloads)

Cancel all asynchronous operations associated with the handle.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

windows::basic_handle::close

Close the handle.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

windows::basic_handle::close (1 of 2 overloads)

Close the handle.

```
void close();
```

This function is used to close the handle. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error Thrown on failure.

windows::basic_handle::close (2 of 2 overloads)

Close the handle.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the handle. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

windows::basic_handle::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

windows::basic_handle::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

windows::basic_handle::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/windows/basic_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_handle::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

windows::basic_handle::is_open

Determine whether the handle is open.

```
bool is_open() const;
```

windows::basic_handle::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

windows::basic_handle::lowest_layer (1 of 2 overloads)

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `windows::basic_handle` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

windows::basic_handle::lowest_layer (2 of 2 overloads)

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `windows::basic_handle` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

windows::basic_handle::lowest_layer_type

A `windows::basic_handle` is always the lowest layer.

```
typedef basic_handle< HandleService > lowest_layer_type;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
basic_handle	Construct a basic_handle without opening it. Construct a basic_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.

Protected Member Functions

Name	Description
~basic_handle	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_handle` class template provides the ability to wrap a Windows handle.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/basic_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_handle::native

Get the native handle representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the handle. This is intended to allow access to native handle functionality that is not otherwise provided.

windows::basic_handle::native_type

The native representation of a handle.

```
typedef HandleService::native_type native_type;
```

Requirements

Header: `boost/asio/windows/basic_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_handle::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

windows::basic_handle::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef HandleService service_type;
```

Requirements

Header: `boost/asio/windows/basic_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_handle::~basic_handle

Protected destructor to prevent deletion through this type.

```
~basic_handle();
```

windows::basic_random_access_handle

Provides random-access handle functionality.

```
template<
    typename RandomAccessHandleService = random_access_handle_service>
class basic_random_access_handle :
  public windows::basic_handle< RandomAccessHandleService >
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
async_read_some_at	Start an asynchronous read at the specified offset.
async_write_some_at	Start an asynchronous write at the specified offset.
basic_random_access_handle	Construct a basic_random_access_handle without opening it. Construct a basic_random_access_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.
read_some_at	Read some data from the handle at the specified offset.
write_some_at	Write some data to the handle at the specified offset.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_random_access_handle` class template provides asynchronous and blocking random-access handle functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/basic_random_access_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_random_access_handle::assign

Assign an existing native handle to the handle.

```
void assign(
    const native_type & native_handle);
  » more...

boost::system::error_code assign(
    const native_type & native_handle,
    boost::system::error_code & ec);
  » more...
```

windows::basic_random_access_handle::assign (1 of 2 overloads)

Inherited from windows::basic_handle.

Assign an existing native handle to the handle.

```
void assign(
    const native_type & native_handle);
```

windows::basic_random_access_handle::assign (2 of 2 overloads)

Inherited from windows::basic_handle.

Assign an existing native handle to the handle.

```
boost::system::error_code assign(
    const native_type & native_handle,
    boost::system::error_code & ec);
```

windows::basic_random_access_handle::async_read_some_at

Start an asynchronous read at the specified offset.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some_at(
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read data from the random-access handle. The function call always returns immediately.

Parameters

offset — The offset at which the data will be read.

buffers — One or more buffers into which the data will be read. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes read.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The read operation may not read all of the requested number of bytes. Consider using the `async_read_at` function if you need to ensure that the requested amount of data is read before the asynchronous operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
handle.async_read_some_at(42, boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_random_access_handle::async_write_some_at

Start an asynchronous write at the specified offset.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some_at(
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write data to the random-access handle. The function call always returns immediately.

Parameters

offset — The offset at which the data will be written.

buffers — One or more data buffers to be written to the handle. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes written.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The write operation may not transmit all of the data to the peer. Consider using the `async_write_at` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
handle.async_write_some_at(42, boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_random_access_handle::basic_random_access_handle

Construct a `windows::basic_random_access_handle` without opening it.

```
explicit basic_random_access_handle(
    boost::asio::io_service & io_service);
  » more...
```

Construct a `windows::basic_random_access_handle` on an existing native handle.

```
basic_random_access_handle(
    boost::asio::io_service & io_service,
    const native_type & native_handle);
  » more...
```

windows::basic_random_access_handle::basic_random_access_handle (1 of 2 overloads)

Construct a `windows::basic_random_access_handle` without opening it.

```
basic_random_access_handle(
    boost::asio::io_service & io_service);
```

This constructor creates a random-access handle without opening it. The handle needs to be opened before data can be written to or or read from it.

Parameters

io_service	The `io_service` object that the random-access handle will use to dispatch handlers for any asynchronous operations performed on the handle.

windows::basic_random_access_handle::basic_random_access_handle (2 of 2 overloads)

Construct a `windows::basic_random_access_handle` on an existing native handle.

```
basic_random_access_handle(
    boost::asio::io_service & io_service,
    const native_type & native_handle);
```

This constructor creates a random-access handle object to hold an existing native handle.

Parameters

io_service	The `io_service` object that the random-access handle will use to dispatch handlers for any asynchronous operations performed on the handle.
native_handle	The new underlying handle implementation.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_random_access_handle::cancel

Cancel all asynchronous operations associated with the handle.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

windows::basic_random_access_handle::cancel (1 of 2 overloads)

Inherited from windows::basic_handle.

Cancel all asynchronous operations associated with the handle.

```
void cancel();
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_random_access_handle::cancel (2 of 2 overloads)

Inherited from windows::basic_handle.

Cancel all asynchronous operations associated with the handle.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

windows::basic_random_access_handle::close

Close the handle.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

windows::basic_random_access_handle::close (1 of 2 overloads)

Inherited from windows::basic_handle.

Close the handle.

```
void close();
```

This function is used to close the handle. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_random_access_handle::close (2 of 2 overloads)

Inherited from windows::basic_handle.

Close the handle.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the handle. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec Set to indicate what error occurred, if any.

windows::basic_random_access_handle::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

windows::basic_random_access_handle::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

windows::basic_random_access_handle::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/windows/basic_random_access_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_random_access_handle::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

windows::basic_random_access_handle::is_open

Inherited from windows::basic_handle.

Determine whether the handle is open.

```
bool is_open() const;
```

windows::basic_random_access_handle::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

windows::basic_random_access_handle::lowest_layer (1 of 2 overloads)

Inherited from windows::basic_handle.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `windows::basic_handle` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

windows::basic_random_access_handle::lowest_layer (2 of 2 overloads)

Inherited from windows::basic_handle.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `windows::basic_handle` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

windows::basic_random_access_handle::lowest_layer_type

Inherited from windows::basic_handle.

A `windows::basic_handle` is always the lowest layer.

```
typedef basic_handle< RandomAccessHandleService > lowest_layer_type;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
basic_handle	Construct a basic_handle without opening it. Construct a basic_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.

Protected Member Functions

Name	Description
~basic_handle	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_handle` class template provides the ability to wrap a Windows handle.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/basic_random_access_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_random_access_handle::native

Inherited from windows::basic_handle.

Get the native handle representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the handle. This is intended to allow access to native handle functionality that is not otherwise provided.

windows::basic_random_access_handle::native_type

The native representation of a handle.

```
typedef RandomAccessHandleService::native_type native_type;
```

Requirements

Header: `boost/asio/windows/basic_random_access_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_random_access_handle::read_some_at

Read some data from the handle at the specified offset.

```
template<
    typename MutableBufferSequence>
std::size_t read_some_at(
    boost::uint64_t offset,
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t read_some_at(
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

windows::basic_random_access_handle::read_some_at (1 of 2 overloads)

Read some data from the handle at the specified offset.

```
template<
    typename MutableBufferSequence>
std::size_t read_some_at(
    boost::uint64_t offset,
    const MutableBufferSequence & buffers);
```

This function is used to read data from the random-access handle. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

offset — The offset at which the data will be read.

buffers — One or more buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read_at` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
handle.read_some_at(42, boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_random_access_handle::read_some_at (2 of 2 overloads)

Read some data from the handle at the specified offset.

```
template<
    typename MutableBufferSequence>
std::size_t read_some_at(
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to read data from the random-access handle. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

offset — The offset at which the data will be read.

buffers — One or more buffers into which the data will be read.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read_at` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

windows::basic_random_access_handle::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

windows::basic_random_access_handle::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef RandomAccessHandleService service_type;
```

Requirements

Header: `boost/asio/windows/basic_random_access_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_random_access_handle::write_some_at

Write some data to the handle at the specified offset.

```
template<
    typename ConstBufferSequence>
std::size_t write_some_at(
    boost::uint64_t offset,
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t write_some_at(
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

windows::basic_random_access_handle::write_some_at (1 of 2 overloads)

Write some data to the handle at the specified offset.

```
template<
    typename ConstBufferSequence>
std::size_t write_some_at(
    boost::uint64_t offset,
    const ConstBufferSequence & buffers);
```

This function is used to write data to the random-access handle. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

offset — The offset at which the data will be written.

buffers — One or more data buffers to be written to the handle.

Return Value

The number of bytes written.

Exceptions

boost::system::system_error — Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The write_some_at operation may not write all of the data. Consider using the `write_at` function if you need to ensure that all data is written before the blocking operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
handle.write_some_at(42, boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_random_access_handle::write_some_at (2 of 2 overloads)

Write some data to the handle at the specified offset.

```
template<
    typename ConstBufferSequence>
std::size_t write_some_at(
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to write data to the random-access handle. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

offset — The offset at which the data will be written.

buffers — One or more data buffers to be written to the handle.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes written. Returns 0 if an error occurred.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write_at` function if you need to ensure that all data is written before the blocking operation completes.

windows::basic_stream_handle

Provides stream-oriented handle functionality.

```
template<
    typename StreamHandleService = stream_handle_service>
class basic_stream_handle :
  public windows::basic_handle< StreamHandleService >
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_stream_handle	Construct a basic_stream_handle without opening it. Construct a basic_stream_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.
read_some	Read some data from the handle.
write_some	Write some data to the handle.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_stream_handle` class template provides asynchronous and blocking stream-oriented handle functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/basic_stream_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_stream_handle::assign

Assign an existing native handle to the handle.

```
void assign(
    const native_type & native_handle);
  » more...

boost::system::error_code assign(
    const native_type & native_handle,
    boost::system::error_code & ec);
  » more...
```

windows::basic_stream_handle::assign (1 of 2 overloads)

Inherited from windows::basic_handle.

Assign an existing native handle to the handle.

```
void assign(
    const native_type & native_handle);
```

windows::basic_stream_handle::assign (2 of 2 overloads)

Inherited from windows::basic_handle.

Assign an existing native handle to the handle.

```
boost::system::error_code assign(
    const native_type & native_handle,
    boost::system::error_code & ec);
```

windows::basic_stream_handle::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

This function is used to asynchronously read data from the stream handle. The function call always returns immediately.

Parameters

buffers — One or more buffers into which the data will be read. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the read operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes read.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The read operation may not read all of the requested number of bytes. Consider using the `async_read` function if you need to ensure that the requested amount of data is read before the asynchronous operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
handle.async_read_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_stream_handle::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

This function is used to asynchronously write data to the stream handle. The function call always returns immediately.

Parameters

buffers — One or more data buffers to be written to the handle. Although the buffers object may be copied as necessary, ownership of the underlying memory blocks is retained by the caller, which must guarantee that they remain valid until the handler is called.

handler — The handler to be called when the write operation completes. Copies will be made of the handler as required. The function signature of the handler must be:

```
void handler(
  const boost::system::error_code& error, // Result of operation.
  std::size_t bytes_transferred           // Number of bytes written.
);
```

Regardless of whether the asynchronous operation completes immediately or not, the handler will not be invoked from within this function. Invocation of the handler will be performed in a manner equivalent to using `boost::asio::io_service::post()`.

Remarks

The write operation may not transmit all of the data to the peer. Consider using the `async_write` function if you need to ensure that all data is written before the asynchronous operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
handle.async_write_some(boost::asio::buffer(data, size), handler);
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_stream_handle::basic_stream_handle

Construct a `windows::basic_stream_handle` without opening it.

```
explicit basic_stream_handle(
    boost::asio::io_service & io_service);
  » more...
```

Construct a `windows::basic_stream_handle` on an existing native handle.

```
basic_stream_handle(
    boost::asio::io_service & io_service,
    const native_type & native_handle);
  » more...
```

windows::basic_stream_handle::basic_stream_handle (1 of 2 overloads)

Construct a `windows::basic_stream_handle` without opening it.

```
basic_stream_handle(
    boost::asio::io_service & io_service);
```

This constructor creates a stream handle without opening it. The handle needs to be opened and then connected or accepted before data can be sent or received on it.

Parameters

io_service	The `io_service` object that the stream handle will use to dispatch handlers for any asynchronous operations performed on the handle.

windows::basic_stream_handle::basic_stream_handle (2 of 2 overloads)

Construct a `windows::basic_stream_handle` on an existing native handle.

```
basic_stream_handle(
    boost::asio::io_service & io_service,
    const native_type & native_handle);
```

This constructor creates a stream handle object to hold an existing native handle.

Parameters

io_service	The `io_service` object that the stream handle will use to dispatch handlers for any asynchronous operations performed on the handle.
native_handle	The new underlying handle implementation.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_stream_handle::cancel

Cancel all asynchronous operations associated with the handle.

```
void cancel();
  » more...

boost::system::error_code cancel(
    boost::system::error_code & ec);
  » more...
```

windows::basic_stream_handle::cancel (1 of 2 overloads)

Inherited from windows::basic_handle.

Cancel all asynchronous operations associated with the handle.

```
void cancel();
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_stream_handle::cancel (2 of 2 overloads)

Inherited from windows::basic_handle.

Cancel all asynchronous operations associated with the handle.

```
boost::system::error_code cancel(
    boost::system::error_code & ec);
```

This function causes all outstanding asynchronous read or write operations to finish immediately, and the handlers for cancelled operations will be passed the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

windows::basic_stream_handle::close

Close the handle.

```
void close();
  » more...

boost::system::error_code close(
    boost::system::error_code & ec);
  » more...
```

windows::basic_stream_handle::close (1 of 2 overloads)

Inherited from windows::basic_handle.

Close the handle.

```
void close();
```

This function is used to close the handle. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Exceptions

boost::system::system_error	Thrown on failure.

windows::basic_stream_handle::close (2 of 2 overloads)

Inherited from windows::basic_handle.

Close the handle.

```
boost::system::error_code close(
    boost::system::error_code & ec);
```

This function is used to close the handle. Any asynchronous read or write operations will be cancelled immediately, and will complete with the `boost::asio::error::operation_aborted` error.

Parameters

ec	Set to indicate what error occurred, if any.

windows::basic_stream_handle::get_io_service

Inherited from basic_io_object.

Get the `io_service` associated with the object.

```
boost::asio::io_service & get_io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

windows::basic_stream_handle::implementation

Inherited from basic_io_object.

The underlying implementation of the I/O object.

```
implementation_type implementation;
```

windows::basic_stream_handle::implementation_type

Inherited from basic_io_object.

The underlying implementation type of I/O object.

```
typedef service_type::implementation_type implementation_type;
```

Requirements

Header: `boost/asio/windows/basic_stream_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_stream_handle::io_service

Inherited from basic_io_object.

(Deprecated: use `get_io_service()`.) Get the `io_service` associated with the object.

```
boost::asio::io_service & io_service();
```

This function may be used to obtain the `io_service` object that the I/O object uses to dispatch handlers for asynchronous operations.

Return Value

A reference to the `io_service` object that the I/O object will use to dispatch handlers. Ownership is not transferred to the caller.

windows::basic_stream_handle::is_open

Inherited from windows::basic_handle.

Determine whether the handle is open.

```
bool is_open() const;
```

windows::basic_stream_handle::lowest_layer

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
  » more...
```

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
  » more...
```

windows::basic_stream_handle::lowest_layer (1 of 2 overloads)

Inherited from windows::basic_handle.

Get a reference to the lowest layer.

```
lowest_layer_type & lowest_layer();
```

This function returns a reference to the lowest layer in a stack of layers. Since a `windows::basic_handle` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

windows::basic_stream_handle::lowest_layer (2 of 2 overloads)

Inherited from windows::basic_handle.

Get a const reference to the lowest layer.

```
const lowest_layer_type & lowest_layer() const;
```

This function returns a const reference to the lowest layer in a stack of layers. Since a `windows::basic_handle` cannot contain any further layers, it simply returns a reference to itself.

Return Value

A const reference to the lowest layer in the stack of layers. Ownership is not transferred to the caller.

windows::basic_stream_handle::lowest_layer_type

Inherited from windows::basic_handle.

A `windows::basic_handle` is always the lowest layer.

```
typedef basic_handle< StreamHandleService > lowest_layer_type;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
basic_handle	Construct a basic_handle without opening it. Construct a basic_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.

Protected Member Functions

Name	Description
~basic_handle	Protected destructor to prevent deletion through this type.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_handle` class template provides the ability to wrap a Windows handle.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/basic_stream_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_stream_handle::native

Inherited from windows::basic_handle.

Get the native handle representation.

```
native_type native();
```

This function may be used to obtain the underlying representation of the handle. This is intended to allow access to native handle functionality that is not otherwise provided.

windows::basic_stream_handle::native_type

The native representation of a handle.

```
typedef StreamHandleService::native_type native_type;
```

Requirements

Header: `boost/asio/windows/basic_stream_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_stream_handle::read_some

Read some data from the handle.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
  » more...

template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

windows::basic_stream_handle::read_some (1 of 2 overloads)

Read some data from the handle.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers);
```

This function is used to read data from the stream handle. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers One or more buffers into which the data will be read.

Return Value

The number of bytes read.

Exceptions

boost::system::system_error	Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

Example

To read into a single data buffer use the `buffer` function as follows:

```
handle.read_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on reading into multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_stream_handle::read_some (2 of 2 overloads)

Read some data from the handle.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to read data from the stream handle. The function call will block until one or more bytes of data has been read successfully, or until an error occurs.

Parameters

buffers	One or more buffers into which the data will be read.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes read. Returns 0 if an error occurred.

Remarks

The read_some operation may not read all of the requested number of bytes. Consider using the `read` function if you need to ensure that the requested amount of data is read before the blocking operation completes.

windows::basic_stream_handle::service

Inherited from basic_io_object.

The service associated with the I/O object.

```
service_type & service;
```

windows::basic_stream_handle::service_type

Inherited from basic_io_object.

The type of the service that will be used to provide I/O operations.

```
typedef StreamHandleService service_type;
```

Requirements

Header: `boost/asio/windows/basic_stream_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::basic_stream_handle::write_some

Write some data to the handle.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
  » more...

template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
  » more...
```

windows::basic_stream_handle::write_some (1 of 2 overloads)

Write some data to the handle.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers);
```

This function is used to write data to the stream handle. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers	One or more data buffers to be written to the handle.

Return Value

The number of bytes written.

Exceptions

boost::system::system_error	Thrown on failure. An error code of `boost::asio::error::eof` indicates that the connection was closed by the peer.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

Example

To write a single data buffer use the `buffer` function as follows:

```
handle.write_some(boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

windows::basic_stream_handle::write_some (2 of 2 overloads)

Write some data to the handle.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

This function is used to write data to the stream handle. The function call will block until one or more bytes of the data has been written successfully, or until an error occurs.

Parameters

buffers	One or more data buffers to be written to the handle.
ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes written. Returns 0 if an error occurred.

Remarks

The write_some operation may not transmit all of the data to the peer. Consider using the `write` function if you need to ensure that all data is written before the blocking operation completes.

windows::overlapped_ptr

Wraps a handler to create an OVERLAPPED object for use with overlapped I/O.

```
class overlapped_ptr :
  noncopyable
```

Member Functions

Name	Description
complete	Post completion notification for overlapped operation. Releases ownership.
get	Get the contained OVERLAPPED object.
overlapped_ptr	Construct an empty overlapped_ptr. Construct an overlapped_ptr to contain the specified handler.
release	Release ownership of the OVERLAPPED object.
reset	Reset to empty. Reset to contain the specified handler, freeing any current OVERLAPPED object.
~overlapped_ptr	Destructor automatically frees the OVERLAPPED object unless released.

A special-purpose smart pointer used to wrap an application handler so that it can be passed as the LPOVERLAPPED argument to overlapped I/O functions.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/overlapped_ptr.hpp`

Convenience header: `boost/asio.hpp`

windows::overlapped_ptr::complete

Post completion notification for overlapped operation. Releases ownership.

```
void complete(
    const boost::system::error_code & ec,
    std::size_t bytes_transferred);
```

windows::overlapped_ptr::get

Get the contained OVERLAPPED object.

```
OVERLAPPED * get();
  » more...

const OVERLAPPED * get() const;
  » more...
```

windows::overlapped_ptr::get (1 of 2 overloads)

Get the contained OVERLAPPED object.

```
OVERLAPPED * get();
```

windows::overlapped_ptr::get (2 of 2 overloads)

Get the contained OVERLAPPED object.

```
const OVERLAPPED * get() const;
```

windows::overlapped_ptr::overlapped_ptr

Construct an empty `windows::overlapped_ptr`.

```
overlapped_ptr();
  » more...
```

Construct an `windows::overlapped_ptr` to contain the specified handler.

```
template<
    typename Handler>
explicit overlapped_ptr(
    boost::asio::io_service & io_service,
    Handler handler);
  » more...
```

windows::overlapped_ptr::overlapped_ptr (1 of 2 overloads)

Construct an empty `windows::overlapped_ptr`.

```
overlapped_ptr();
```

windows::overlapped_ptr::overlapped_ptr (2 of 2 overloads)

Construct an `windows::overlapped_ptr` to contain the specified handler.

```
template<
    typename Handler>
overlapped_ptr(
    boost::asio::io_service & io_service,
    Handler handler);
```

windows::overlapped_ptr::release

Release ownership of the OVERLAPPED object.

```
OVERLAPPED * release();
```

windows::overlapped_ptr::reset

Reset to empty.

```
void reset();
  » more...
```

Reset to contain the specified handler, freeing any current OVERLAPPED object.

```
template<
    typename Handler>
void reset(
    boost::asio::io_service & io_service,
    Handler handler);
  » more...
```

windows::overlapped_ptr::reset (1 of 2 overloads)

Reset to empty.

```
void reset();
```

windows::overlapped_ptr::reset (2 of 2 overloads)

Reset to contain the specified handler, freeing any current OVERLAPPED object.

```
template<
    typename Handler>
void reset(
    boost::asio::io_service & io_service,
    Handler handler);
```

windows::overlapped_ptr::~overlapped_ptr

Destructor automatically frees the OVERLAPPED object unless released.

```
~overlapped_ptr();
```

windows::random_access_handle

Typedef for the typical usage of a random-access handle.

```
typedef basic_random_access_handle random_access_handle;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
async_read_some_at	Start an asynchronous read at the specified offset.
async_write_some_at	Start an asynchronous write at the specified offset.
basic_random_access_handle	Construct a basic_random_access_handle without opening it. Construct a basic_random_access_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.
read_some_at	Read some data from the handle at the specified offset.
write_some_at	Write some data to the handle at the specified offset.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_random_access_handle` class template provides asynchronous and blocking random-access handle functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/random_access_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::random_access_handle_service

Default service implementation for a random-access handle.

```
class random_access_handle_service :
  public io_service::service
```

Types

Name	Description
implementation_type	The type of a random-access handle implementation.
native_type	The native handle type.

Member Functions

Name	Description
assign	Assign an existing native handle to a random-access handle.
async_read_some_at	Start an asynchronous read at the specified offset.
async_write_some_at	Start an asynchronous write at the specified offset.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close a random-access handle implementation.
construct	Construct a new random-access handle implementation.
destroy	Destroy a random-access handle implementation.
get_io_service	Get the io_service object that owns the service.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the handle is open.
native	Get the native handle implementation.
random_access_handle_service	Construct a new random-access handle service for the specified io_service.
read_some_at	Read some data from the specified offset.
shutdown_service	Destroy all user-defined handler objects owned by the service.
write_some_at	Write the given data at the specified offset.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/windows/random_access_handle_service.hpp`

Convenience header: `boost/asio.hpp`

windows::random_access_handle_service::assign

Assign an existing native handle to a random-access handle.

```
boost::system::error_code assign(
    implementation_type & impl,
    const native_type & native_handle,
    boost::system::error_code & ec);
```

windows::random_access_handle_service::async_read_some_at

Start an asynchronous read at the specified offset.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some_at(
    implementation_type & impl,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

windows::random_access_handle_service::async_write_some_at

Start an asynchronous write at the specified offset.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some_at(
    implementation_type & impl,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

windows::random_access_handle_service::cancel

Cancel all asynchronous operations associated with the handle.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

windows::random_access_handle_service::close

Close a random-access handle implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

windows::random_access_handle_service::construct

Construct a new random-access handle implementation.

```
void construct(
    implementation_type & impl);
```

windows::random_access_handle_service::destroy

Destroy a random-access handle implementation.

```
void destroy(
    implementation_type & impl);
```

windows::random_access_handle_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

windows::random_access_handle_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

windows::random_access_handle_service::implementation_type

The type of a random-access handle implementation.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/windows/random_access_handle_service.hpp`

Convenience header: `boost/asio.hpp`

windows::random_access_handle_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

windows::random_access_handle_service::is_open

Determine whether the handle is open.

```
bool is_open(
    const implementation_type & impl) const;
```

windows::random_access_handle_service::native

Get the native handle implementation.

```
native_type native(
    implementation_type & impl);
```

windows::random_access_handle_service::native_type

The native handle type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/windows/random_access_handle_service.hpp`

Convenience header: `boost/asio.hpp`

windows::random_access_handle_service::random_access_handle_service

Construct a new random-access handle service for the specified `io_service`.

```
random_access_handle_service(
    boost::asio::io_service & io_service);
```

windows::random_access_handle_service::read_some_at

Read some data from the specified offset.

```
template<
    typename MutableBufferSequence>
std::size_t read_some_at(
    implementation_type & impl,
    boost::uint64_t offset,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

windows::random_access_handle_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

windows::random_access_handle_service::write_some_at

Write the given data at the specified offset.

```
template<
    typename ConstBufferSequence>
std::size_t write_some_at(
    implementation_type & impl,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

windows::stream_handle

Typedef for the typical usage of a stream-oriented handle.

```
typedef basic_stream_handle stream_handle;
```

Types

Name	Description
implementation_type	The underlying implementation type of I/O object.
lowest_layer_type	A basic_handle is always the lowest layer.
native_type	The native representation of a handle.
service_type	The type of the service that will be used to provide I/O operations.

Member Functions

Name	Description
assign	Assign an existing native handle to the handle.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
basic_stream_handle	Construct a basic_stream_handle without opening it. Construct a basic_stream_handle on an existing native handle.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close the handle.
get_io_service	Get the io_service associated with the object.
io_service	(Deprecated: use get_io_service().) Get the io_service associated with the object.
is_open	Determine whether the handle is open.
lowest_layer	Get a reference to the lowest layer. Get a const reference to the lowest layer.
native	Get the native handle representation.
read_some	Read some data from the handle.
write_some	Write some data to the handle.

Protected Data Members

Name	Description
implementation	The underlying implementation of the I/O object.
service	The service associated with the I/O object.

The `windows::basic_stream_handle` class template provides asynchronous and blocking stream-oriented handle functionality.

Thread Safety

Distinct objects: Safe.

Shared objects: Unsafe.

Requirements

Header: `boost/asio/windows/stream_handle.hpp`

Convenience header: `boost/asio.hpp`

windows::stream_handle_service

Default service implementation for a stream handle.

```
class stream_handle_service :
  public io_service::service
```

Types

Name	Description
implementation_type	The type of a stream handle implementation.
native_type	The native handle type.

Member Functions

Name	Description
assign	Assign an existing native handle to a stream handle.
async_read_some	Start an asynchronous read.
async_write_some	Start an asynchronous write.
cancel	Cancel all asynchronous operations associated with the handle.
close	Close a stream handle implementation.
construct	Construct a new stream handle implementation.
destroy	Destroy a stream handle implementation.
get_io_service	Get the io_service object that owns the service.
io_service	(Deprecated: use get_io_service().) Get the io_service object that owns the service.
is_open	Determine whether the handle is open.
native	Get the native handle implementation.
read_some	Read some data from the stream.
shutdown_service	Destroy all user-defined handler objects owned by the service.
stream_handle_service	Construct a new stream handle service for the specified io_service.
write_some	Write the given data to the stream.

Data Members

Name	Description
id	The unique service identifier.

Requirements

Header: `boost/asio/windows/stream_handle_service.hpp`

Convenience header: `boost/asio.hpp`

windows::stream_handle_service::assign

Assign an existing native handle to a stream handle.

```
boost::system::error_code assign(
    implementation_type & impl,
    const native_type & native_handle,
    boost::system::error_code & ec);
```

windows::stream_handle_service::async_read_some

Start an asynchronous read.

```
template<
    typename MutableBufferSequence,
    typename ReadHandler>
void async_read_some(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    ReadHandler handler);
```

windows::stream_handle_service::async_write_some

Start an asynchronous write.

```
template<
    typename ConstBufferSequence,
    typename WriteHandler>
void async_write_some(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    WriteHandler handler);
```

windows::stream_handle_service::cancel

Cancel all asynchronous operations associated with the handle.

```
boost::system::error_code cancel(
    implementation_type & impl,
    boost::system::error_code & ec);
```

windows::stream_handle_service::close

Close a stream handle implementation.

```
boost::system::error_code close(
    implementation_type & impl,
    boost::system::error_code & ec);
```

windows::stream_handle_service::construct

Construct a new stream handle implementation.

```
void construct(
    implementation_type & impl);
```

windows::stream_handle_service::destroy

Destroy a stream handle implementation.

```
void destroy(
    implementation_type & impl);
```

windows::stream_handle_service::get_io_service

Inherited from io_service.

Get the `io_service` object that owns the service.

```
boost::asio::io_service & get_io_service();
```

windows::stream_handle_service::id

The unique service identifier.

```
static boost::asio::io_service::id id;
```

windows::stream_handle_service::implementation_type

The type of a stream handle implementation.

```
typedef implementation_defined implementation_type;
```

Requirements

Header: `boost/asio/windows/stream_handle_service.hpp`

Convenience header: `boost/asio.hpp`

windows::stream_handle_service::io_service

Inherited from io_service.

(Deprecated: use `get_io_service()`.) Get the `io_service` object that owns the service.

```
boost::asio::io_service & io_service();
```

windows::stream_handle_service::is_open

Determine whether the handle is open.

```
bool is_open(
    const implementation_type & impl) const;
```

windows::stream_handle_service::native

Get the native handle implementation.

```
native_type native(
    implementation_type & impl);
```

windows::stream_handle_service::native_type

The native handle type.

```
typedef implementation_defined native_type;
```

Requirements

Header: `boost/asio/windows/stream_handle_service.hpp`

Convenience header: `boost/asio.hpp`

windows::stream_handle_service::read_some

Read some data from the stream.

```
template<
    typename MutableBufferSequence>
std::size_t read_some(
    implementation_type & impl,
    const MutableBufferSequence & buffers,
    boost::system::error_code & ec);
```

windows::stream_handle_service::shutdown_service

Destroy all user-defined handler objects owned by the service.

```
void shutdown_service();
```

windows::stream_handle_service::stream_handle_service

Construct a new stream handle service for the specified `io_service`.

```
stream_handle_service(
    boost::asio::io_service & io_service);
```

windows::stream_handle_service::write_some

Write the given data to the stream.

```
template<
    typename ConstBufferSequence>
std::size_t write_some(
    implementation_type & impl,
    const ConstBufferSequence & buffers,
    boost::system::error_code & ec);
```

write

Write a certain amount of data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename ConstBufferSequence>
std::size_t write(
    SyncWriteStream & s,
    const ConstBufferSequence & buffers);
  » more...

template<
    typename SyncWriteStream,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncWriteStream,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncWriteStream,
    typename Allocator>
std::size_t write(
    SyncWriteStream & s,
    basic_streambuf< Allocator > & b);
  » more...

template<
    typename SyncWriteStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t write(
```

```
    SyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncWriteStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...
```

Requirements

Header: `boost/asio/write.hpp`

Convenience header: `boost/asio.hpp`

write (1 of 6 overloads)

Write all of the supplied data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename ConstBufferSequence>
std::size_t write(
    SyncWriteStream & s,
    const ConstBufferSequence & buffers);
```

This function is used to write a certain number of bytes of data to a stream. The call will block until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's write_some function.

Parameters

s	The stream to which the data is to be written. The type must support the SyncWriteStream concept.
buffers	One or more buffers containing the data to be written. The sum of the buffer sizes indicates the maximum number of bytes to write to the stream.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::write(s, boost::asio::buffer(data, size));
```

See the buffer documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

Remarks

This overload is equivalent to calling:

```
boost::asio::write(
    s, buffers,
    boost::asio::transfer_all());
```

write (2 of 6 overloads)

Write a certain amount of data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition);
```

This function is used to write a certain number of bytes of data to a stream. The call will block until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's write_some function.

Parameters

s — The stream to which the data is to be written. The type must support the SyncWriteStream concept.

buffers — One or more buffers containing the data to be written. The sum of the buffer sizes indicates the maximum number of bytes to write to the stream.

completion_condition — The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest write_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the stream's write_some function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::write(s, boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

write (3 of 6 overloads)

Write a certain amount of data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to write a certain number of bytes of data to a stream. The call will block until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's write_some function.

Parameters

s	The stream to which the data is to be written. The type must support the SyncWriteStream concept.
buffers	One or more buffers containing the data to be written. The sum of the buffer sizes indicates the maximum number of bytes to write to the stream.
completion_condition	The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest write_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the stream's write_some function.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes written. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

write (4 of 6 overloads)

Write all of the supplied data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename Allocator>
std::size_t write(
    SyncWriteStream & s,
    basic_streambuf< Allocator > & b);
```

This function is used to write a certain number of bytes of data to a stream. The call will block until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- An error occurred.

This operation is implemented in terms of zero or more calls to the stream's write_some function.

Parameters

s — The stream to which the data is to be written. The type must support the SyncWriteStream concept.

b — The `basic_streambuf` object from which data will be written.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

Remarks

This overload is equivalent to calling:

```
boost::asio::write(
    s, b,
    boost::asio::transfer_all());
```

write (5 of 6 overloads)

Write a certain amount of data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
```

This function is used to write a certain number of bytes of data to a stream. The call will block until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's write_some function.

Parameters

s — The stream to which the data is to be written. The type must support the SyncWriteStream concept.

b — The `basic_streambuf` object from which data will be written.

completion_condition — The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest write_some operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the stream's write_some function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

write (6 of 6 overloads)

Write a certain amount of data to a stream before returning.

```
template<
    typename SyncWriteStream,
    typename Allocator,
    typename CompletionCondition>
std::size_t write(
    SyncWriteStream & s,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to write a certain number of bytes of data to a stream. The call will block until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the stream's write_some function.

Parameters

s	The stream to which the data is to be written. The type must support the SyncWriteStream concept.
b	The `basic_streambuf` object from which data will be written.

completion_condition	The function object to be called to determine whether the write operation is complete. The signature of the function object must be:
	`std::size_t completion_condition(`
	`  // Result of latest write_some operation.`
	`  const boost::system::error_code& error,`
	`  // Number of bytes transferred so far.`
	`  std::size_t bytes_transferred`
	`);`
	A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the stream's write_some function.

ec	Set to indicate what error occurred, if any.

Return Value

The number of bytes written. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

write_at

Write a certain amount of data at a specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename ConstBufferSequence>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers);
  » more...

template<
    typename SyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...

template<
    typename SyncRandomAccessWriteDevice,
    typename Allocator>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b);
  » more...

template<
    typename SyncRandomAccessWriteDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
  » more...

template<
    typename SyncRandomAccessWriteDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t write_at(
```

```
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
  » more...
```

Requirements

Header: `boost/asio/write_at.hpp`

Convenience header: `boost/asio.hpp`

write_at (1 of 6 overloads)

Write all of the supplied data at the specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename ConstBufferSequence>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers);
```

This function is used to write a certain number of bytes of data to a random access device at a specified offset. The call will block until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- An error occurred.

This operation is implemented in terms of zero or more calls to the device's write_some_at function.

Parameters

d	The device to which the data is to be written. The type must support the SyncRandomAccessWriteDevice concept.
offset	The offset at which the data will be written.
buffers	One or more buffers containing the data to be written. The sum of the buffer sizes indicates the maximum number of bytes to write to the device.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::write_at(d, 42, boost::asio::buffer(data, size));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

Remarks

This overload is equivalent to calling:

```
boost::asio::write_at(
    d, offset, buffers,
    boost::asio::transfer_all());
```

write_at (2 of 6 overloads)

Write a certain amount of data at a specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition);
```

This function is used to write a certain number of bytes of data to a random access device at a specified offset. The call will block until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's write_some_at function.

Parameters

d	The device to which the data is to be written. The type must support the SyncRandomAccessWriteDevice concept.
offset	The offset at which the data will be written.
buffers	One or more buffers containing the data to be written. The sum of the buffer sizes indicates the maximum number of bytes to write to the device.

completion_condition	The function object to be called to determine whether the write operation is complete. The signature of the function object must be:
	
	`std::size_t completion_condition(`
	`  // Result of latest write_some_at operation.`
	`  const boost::system::error_code& error,`
	
	`  // Number of bytes transferred so far.`
	`  std::size_t bytes_transferred`
	`);`
	
	A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the device's write_some_at function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

Example

To write a single data buffer use the `buffer` function as follows:

```
boost::asio::write_at(d, 42, boost::asio::buffer(data, size),
    boost::asio::transfer_at_least(32));
```

See the `buffer` documentation for information on writing multiple buffers in one go, and how to use it with arrays, boost::array or std::vector.

write_at (3 of 6 overloads)

Write a certain amount of data at a specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename ConstBufferSequence,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    const ConstBufferSequence & buffers,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to write a certain number of bytes of data to a random access device at a specified offset. The call will block until one of the following conditions is true:

- All of the data in the supplied buffers has been written. That is, the bytes transferred is equal to the sum of the buffer sizes.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's write_some_at function.

Parameters

d	The device to which the data is to be written. The type must support the SyncRandomAccessWriteDevice concept.
offset	The offset at which the data will be written.
buffers	One or more buffers containing the data to be written. The sum of the buffer sizes indicates the maximum number of bytes to write to the device.
completion_condition	The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest write_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the device's write_some_at function.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes written. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

write_at (4 of 6 overloads)

Write all of the supplied data at the specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename Allocator>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b);
```

This function is used to write a certain number of bytes of data to a random access device at a specified offset. The call will block until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- An error occurred.

This operation is implemented in terms of zero or more calls to the device's write_some_at function.

Parameters

d — The device to which the data is to be written. The type must support the SyncRandomAccessWriteDevice concept.

offset — The offset at which the data will be written.

b — The `basic_streambuf` object from which data will be written.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error — Thrown on failure.

Remarks

This overload is equivalent to calling:

```
boost::asio::write_at(
    d, 42, b,
    boost::asio::transfer_all());
```

write_at (5 of 6 overloads)

Write a certain amount of data at a specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition);
```

This function is used to write a certain number of bytes of data to a random access device at a specified offset. The call will block until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's write_some_at function.

Parameters

d	The device to which the data is to be written. The type must support the SyncRandomAccessWriteDevice concept.
offset	The offset at which the data will be written.
b	The `basic_streambuf` object from which data will be written.
completion_condition	The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest write_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the device's write_some_at function.

Return Value

The number of bytes transferred.

Exceptions

boost::system::system_error	Thrown on failure.

write_at (6 of 6 overloads)

Write a certain amount of data at a specified offset before returning.

```
template<
    typename SyncRandomAccessWriteDevice,
    typename Allocator,
    typename CompletionCondition>
std::size_t write_at(
    SyncRandomAccessWriteDevice & d,
    boost::uint64_t offset,
    basic_streambuf< Allocator > & b,
    CompletionCondition completion_condition,
    boost::system::error_code & ec);
```

This function is used to write a certain number of bytes of data to a random access device at a specified offset. The call will block until one of the following conditions is true:

- All of the data in the supplied basic_streambuf has been written.
- The completion_condition function object returns 0.

This operation is implemented in terms of zero or more calls to the device's write_some_at function.

Parameters

d — The device to which the data is to be written. The type must support the SyncRandomAccessWriteDevice concept.

offset — The offset at which the data will be written.

b — The `basic_streambuf` object from which data will be written.

completion_condition — The function object to be called to determine whether the write operation is complete. The signature of the function object must be:

```
std::size_t completion_condition(
  // Result of latest write_some_at operation.
  const boost::system::error_code& error,

  // Number of bytes transferred so far.
  std::size_t bytes_transferred
);
```

A return value of 0 indicates that the write operation is complete. A non-zero return value indicates the maximum number of bytes to be written on the next call to the device's write_some_at function.

ec — Set to indicate what error occurred, if any.

Return Value

The number of bytes written. If an error occurs, returns the total number of bytes successfully transferred prior to the error.

boost::system::is_error_code_enum< boost::asio::error::addrinfo_errors >

```
template<>
struct boost::system::is_error_code_enum< boost::asio::error::addrinfo_errors >
```

Data Members

Name	Description
value	

Requirements

Header: boost/asio/error.hpp

Convenience header: boost/asio.hpp

boost::system::is_error_code_enum< boost::asio::error::addrinfo_errors >::value

```
static const bool value = true;
```

boost::system::is_error_code_enum< boost::asio::error::basic_errors >

```
template<>
struct boost::system::is_error_code_enum< boost::asio::error::basic_errors >
```

Data Members

Name	Description
value	

Requirements

Header: boost/asio/error.hpp

Convenience header: boost/asio.hpp

boost::system::is_error_code_enum< boost::asio::error::basic_errors >::value

```
static const bool value = true;
```

boost::system::is_error_code_enum< boost::asio::error::misc_errors >

```
template<>
struct boost::system::is_error_code_enum< boost::asio::error::misc_errors >
```

Data Members

Name	Description
value	

Requirements

Header: boost/asio/error.hpp

Convenience header: boost/asio.hpp

boost::system::is_error_code_enum< boost::asio::error::misc_errors >::value

```
static const bool value = true;
```

boost::system::is_error_code_enum< boost::asio::error::netdb_errors >

```
template<>
struct boost::system::is_error_code_enum< boost::asio::error::netdb_errors >
```

Data Members

Name	Description
value	

Requirements

Header: boost/asio/error.hpp

Convenience header: boost/asio.hpp

boost::system::is_error_code_enum< boost::asio::error::netdb_errors >::value

```
static const bool value = true;
```

boost::system::is_error_code_enum< boost::asio::error::ssl_errors >

```
template<>
struct boost::system::is_error_code_enum< boost::asio::error::ssl_errors >
```

Data Members

Name	Description
value	

Requirements

Header: `boost/asio/error.hpp`

Convenience header: `boost/asio.hpp`

boost::system::is_error_code_enum< boost::asio::error::ssl_errors >::value

```
static const bool value = true;
```

Revision History

Asio 1.4.4 / Boost 1.42

- Added a new HTTP Server 4 example illustrating the use of stackless coroutines with Asio.
- Changed handler allocation and invocation to use `boost::addressof` to get the address of handler objects, rather than applying `operator&` directly (#2977).
- Restricted MSVC buffer debugging workaround to 2008, as it causes a crash with 2010 beta 2 (#3796, #3822).
- Fixed a problem with the lifetime of handler memory, where Windows needs the `OVERLAPPED` structure to be valid until both the initiating function call has returned and the completion packet has been delivered.
- Don't block signals while performing system calls, but instead restart the calls if they are interrupted.
- Documented the guarantee made by strand objects with respect to order of handler invocation.
- Changed strands to use a pool of implementations, to make copying of strands cheaper.
- Ensured that kqueue support is enabled for BSD platforms (#3626).
- Added a `boost_` prefix to the `extern "C"` thread entry point function (#3809).
- In `getaddrinfo` emulation, only check the socket type (`SOCK_STREAM` or `SOCK_DGRAM`) if a service name has been specified. This should allow the emulation to work with raw sockets.

- Added a workaround for some broken Windows firewalls that make a socket appear bound to 0.0.0.0 when it is in fact bound to 127.0.0.1.
- Applied a fix for reported excessive CPU usage under Solaris (#3670).
- Added some support for platforms that use older compilers such as g++ 2.95 (#3743).

Asio 1.4.3 / Boost 1.40

- Added a new ping example to illustrate the use of ICMP sockets.
- Changed the `buffered*_stream<>` templates to treat 0-byte reads and writes as no-ops, to comply with the documented type requirements for `SyncReadStream`, `AsyncReadStream`, `SyncWriteStream` and `AsyncWriteStream`.
- Changed some instances of the `throw` keyword to `boost::throw_exception()` to allow Asio to be used when exception support is disabled. Note that the SSL wrappers still require exception support (#2754).
- Made Asio compatible with the OpenSSL 1.0 beta (#3256).
- Eliminated a redundant system call in the Solaris `/dev/poll` backend.
- Fixed a bug in resizing of the bucket array in the internal hash maps (#3095).
- Ensured correct propagation of the error code when a synchronous accept fails (#3216).
- Ensured correct propagation of the error code when a synchronous read or write on a Windows HANDLE fails.
- Fixed failures reported when `_GLIBCXX_DEBUG` is defined (#3098).
- Fixed custom memory allocation support for timers (#3107).
- Tidied up various warnings reported by g++ (#1341, #2618).
- Various documentation improvements, including more obvious hyperlinks to function overloads, header file information, examples for the handler type requirements, and adding enum values to the index (#3157, #2620).

Asio 1.4.2 / Boost 1.39

- Implement automatic resizing of the bucket array in the internal hash maps. This is to improve performance for very large numbers of asynchronous operations and also to reduce memory usage for very small numbers. A new macro `BOOST_ASIO_HASH_MAP_BUCKETS` may be used to tweak the sizes used for the bucket arrays. (N.B. this feature introduced a bug which was fixed in Asio 1.4.3 / Boost 1.40.)
- Add performance optimisation for the Windows IOCP backend for when no timers are used.
- Prevent locale settings from affecting formatting of TCP and UDP endpoints (#2682).
- Fix a memory leak that occurred when an asynchronous SSL operation's completion handler threw an exception (#2910).
- Fix the implementation of `io_control()` so that it adheres to the documented type requirements for IoControlCommand (#2820).
- Fix incompatibility between Asio and ncurses.h (#2156).
- On Windows, specifically handle the case when an overlapped `ReadFile` call fails with `ERROR_MORE_DATA`. This enables a hack where a `windows::stream_handle` can be used with a message-oriented named pipe (#2936).
- Fix system call wrappers to always clear the error on success, as POSIX allows successful system calls to modify errno (#2953).
- Don't include termios.h if `BOOST_ASIO_DISABLE_SERIAL_PORT` is defined (#2917).
- Cleaned up some more MSVC level 4 warnings (#2828).

- Various documentation fixes (#2871).

Asio 1.4.1 / Boost 1.38

- Improved compatibility with some Windows firewall software.
- Ensured arguments to `windows::overlapped_ptr::complete()` are correctly passed to the completion handler (#2614).
- Fixed a link problem and multicast failure on QNX (#2504, #2530).
- Fixed a compile error in SSL support on MinGW / g++ 3.4.5.
- Drop back to using a pipe for notification if eventfd is not available at runtime on Linux (#2683).
- Various minor bug and documentation fixes (#2534, #2541, #2607, #2617, #2619).

Asio 1.4.0 / Boost 1.37

- Enhanced CompletionCondition concept with the signature `size_t CompletionCondition(error_code ec, size_t total)`, where the return value indicates the maximum number of bytes to be transferred on the next read or write operation. (The old CompletionCondition signature is still supported for backwards compatibility).
- New windows::overlapped_ptr class to allow arbitrary overlapped I/O functions (such as TransmitFile) to be used with Asio.
- On recent versions of Linux, an eventfd descriptor is now used (rather than a pipe) to interrupt a blocked select/epoll reactor.
- Added const overloads of lowest_layer().
- Synchronous read, write, accept and connect operations are now thread safe (meaning that it is now permitted to perform concurrent synchronous operations on an individual socket, if supported by the OS).
- Reactor-based io_service implementations now use lazy initialisation to reduce the memory usage of an io_service object used only as a message queue.

Asio 1.2.0 / Boost 1.36

- Added support for serial ports.
- Added support for UNIX domain sockets.
- Added support for raw sockets and ICMP.
- Added wrappers for POSIX stream-oriented file descriptors (excluding regular files).
- Added wrappers for Windows stream-oriented `HANDLE`s such as named pipes (requires `HANDLE`s that work with I/O completion ports).
- Added wrappers for Windows random-access `HANDLE`s such as files (requires `HANDLE`s that work with I/O completion ports).
- Added support for reactor-style operations (i.e. they report readiness but perform no I/O) using a new `null_buffers` type.
- Added an iterator type for bytewise traversal of buffer sequences.
- Added new `read_until()` and `async_read_until()` overloads that take a user-defined function object for locating message boundaries.
- Added an experimental two-lock queue (enabled by defining `BOOST_ASIO_ENABLE_TWO_LOCK_QUEUE`) that may provide better `io_service` scalability across many processors.
- Various fixes, performance improvements, and more complete coverage of the custom memory allocation support.

Asio 1.0.0 / Boost 1.35

First release of Asio as part of Boost.

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