

CPP STREAM CLASSES

The C++ Stream Classes

As mentioned, Standard C++ provides support for its I/O system in `<iostream>`. In this header, a rather complicated set of class hierarchies is defined that supports I/O operations. The I/O classes begin with a system of template classes. As explained earlier, a template class defines the form of a class without fully specifying the data upon which it will operate. Once a template class has been defined, specific instances of it can be created. As it relates to the I/O library, Standard C++ creates two specializations of the I/O template classes: one for 8-bit characters and another for wide characters. This book will use only the 8-bit character classes since they are by far the most common. But the same techniques apply to both.

The C++ I/O system is built upon two related but different template class hierarchies. The first is derived from the low-level I/O class called `basic_streambuf`. This class supplies the basic, low-level input and output operations, and provides the underlying support for the entire C++ I/O system. Unless you are doing advanced I/O programming, you will not need to use `basic_streambuf` directly. The class hierarchy that you will most commonly be working with is derived from `basic_ios`. This is a high-level I/O class that provides formatting, error checking, and status information related to stream I/O. (A base class for `basic_ios` is called `ios_base`, which defines several nontemplate traits used by `basic_ios`.) `basic_ios` is used as a base for several derived classes, including `basic_istream`, `basic_ostream`, and `basic_iostream`. These classes are used to create streams capable of input, output, and input/output, respectively. As explained, the I/O library creates two specializations of the template class hierarchies just described: one for 8-bit characters and one for wide characters.

Here is a list of the mapping of template class names to their character and wide-character versions.

Template Class	Characterbased Class	Wide-Characterbased Class
basic_streambuf	streambuf	wstreambuf
basic_ios	ios	wios
basic_istream	istream	wistream
basic_ostream	ostream	wostream
basic_iostream	iostream	wiostream
basic_fstream	fstream	wfstream
basic_ifstream	ifstream	wifstream
basic_ofstream	ofstream	wofstream

The character-based names will be used throughout the remainder of this book, since they are the names that you will normally use in your programs. They are also the same names that were used by the old I/O library. This is why the old and the new I/O library are compatible at the source code level.

One last point: The **ios** class contains many member functions and variables that control or monitor the fundamental operation of a stream. It will be referred to frequently. Just remember that if you include **<iostream>** in your program, you will have access to this important class.

C++'s Predefined Streams

When a C++ program begins execution, four built-in streams are automatically opened.

They are:

Stream	Meaning Standard	Default Device
cin	input Standard output	Keyboard
cout	Standard error output	Screen
cerr	Buffered version of cerr	Screen
clog		Screen

Streams **cin**, **cout**, and **cerr** correspond to C's **stdin**, **stdout**, and **stderr**.

By default, the standard streams are used to communicate with the console. However, in environments that support I/O redirection (such as DOS, Unix, OS/2, and Windows), the standard streams can be redirected to other devices or files. For the sake of simplicity, the examples in this chapter assume that no I/O redirection has occurred. Standard C++ also defines these four additional streams : **win**, **wout**, **werr**, and **wlog**. These are wide-character versions of the standard streams. Wide characters are of type **wchar_t** and are generally 16-bit quantities. Wide characters are used to hold the large character sets associated with some human languages.

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