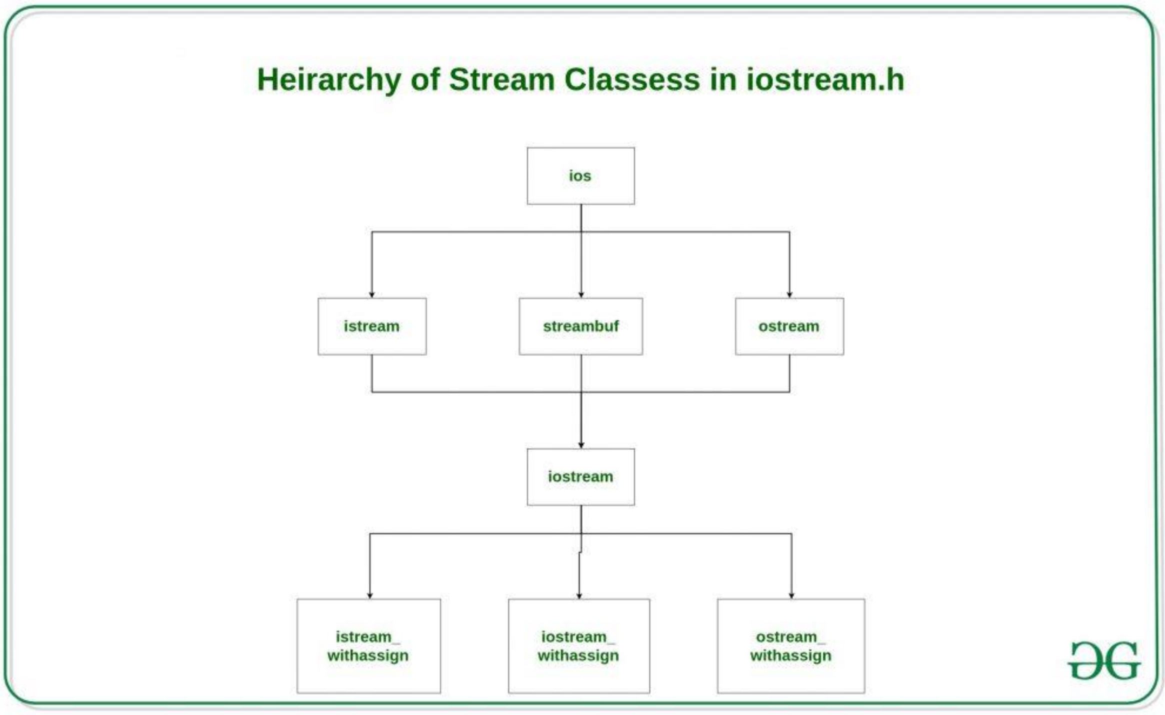
C++ Stream Classes Structure

In C++ there are number of stream classes for defining various streams related with files and for doing input-output operations. All these classes are defined in the file **iostream.h**. Figure given below shows the hierarchy of these classes.



1. **ios class** is topmost class in the stream classes hierarchy. It is the base class for **istream, ostream,** and **streambuf** class.

2. **istream** and **ostream** serves the base classes for **iostream** class. The class **istream** is used for input and **ostream** for the output.

3. Class **ios** is indirectly inherited to **iostream** class using **istream** and **ostream**. To avoid the duplicity of data and member functions of **ios** class, it is declared as virtual base class when inheriting in **istream** and **ostream** as

```
class istream: virtual public ios
{
};
```

```
class ostream: virtual public ios
{
};
```

The **_withassign classes** are provided with extra functionality for the assignment operations that's why **_withassign** classes.

Facilities provided by these stream classes.

1. **The ios class:** The ios class is responsible for providing all input and output facilities to all other stream classes.

2. **The istream class:** This class is responsible for handling input stream. It provides number of function for handling chars, strings and objects such as **get, getline, read, ignore, putback** etc..
   Example:

- CPP14

```
#include <iostream>
using namespace std;

int main()
{
    char x;

    // used to scan a single char
    cin.get(x);

    cout << x;
}
```

Input:

g

Output:

g

The ostream class: This class is responsible for handling output stream. It provides number of function for handling chars, strings and objects such as **write, put** etc..
Example:

- CPP14

```cpp
#include <iostream>
using namespace std;

int main()
{
    char x;

    // used to scan a single char
    cin.get(x);

    // used to put a single char onto the screen.
    cout.put(x);
}
```

1. **Input:**

g

Output:

g

The iostream: This class is responsible for handling both input and output stream as both **istream class** and o**stream class** is inherited into it. It provides function of both **istream class** and o**stream class** for handling chars, strings and objects such as **get, getline, read, ignore, putback, put, write** etc..
Example:

- CPP14

```cpp
#include <iostream>
using namespace std;

int main()
{

    // this function display
    // ncount character from array
    cout.write("geeksforgeeks", 5);
}
```

Output:

geeks

istream_withassign class: This class is variant of **istream** that allows object assignment. The predefined object **cin** is an object of this class and thus may be reassigned at run time to a different **istream** object.
Example: To show that **cin** is object of **istream** class.

- CPP14

```cpp
#include <iostream>
using namespace std;

class demo {
public:
    int dx, dy;

    // operator overloading using friend function
    friend void operator>>(demo& d, istream& mycin)
    {
        // cin assigned to another object mycin
        mycin >> d.dx >> d.dy;
    }
};

int main()
{
    demo d;
    cout << "Enter two numbers dx and dy\n";

    // calls operator >> function and
    // pass d and cin as reference
    d >> cin; // can also be written as operator >> (d, cin) ;

    cout << "dx = " << d.dx << "\tdy = " << d.dy;
}
```

Input:

```
4 5
```

Output:

```
Enter two numbers dx and dy

4 5

dx = 4  dy = 5
```

ostream_withassign class: This class is variant of **ostream** that allows object assignment. The predefined objects **cout, cerr, clog** are objects of this class and thus may be reassigned at run time to a different **ostream** object.
Example: To show that **cout** is object of **ostream** class.

- CPP14

```
#include <iostream>
using namespace std;

class demo {
public:
    int dx, dy;

    demo()
    {
        dx = 4;
        dy = 5;
    }

    // operator overloading using friend function
    friend void operator<<(demo& d, ostream& mycout)
    {
        // cout assigned to another object mycout
        mycout << "Value of dx and dy are \n";
        mycout << d.dx << " " << d.dy;
    }
};

int main()
{
    demo d; // default constructor is called

    // calls operator << function and
    // pass d and cout as reference
    d << cout; // can also be written as operator << (d, cout) ;
}
```

Output:

```
Value of dx and dy are

4 5
```