



Introducción a C++

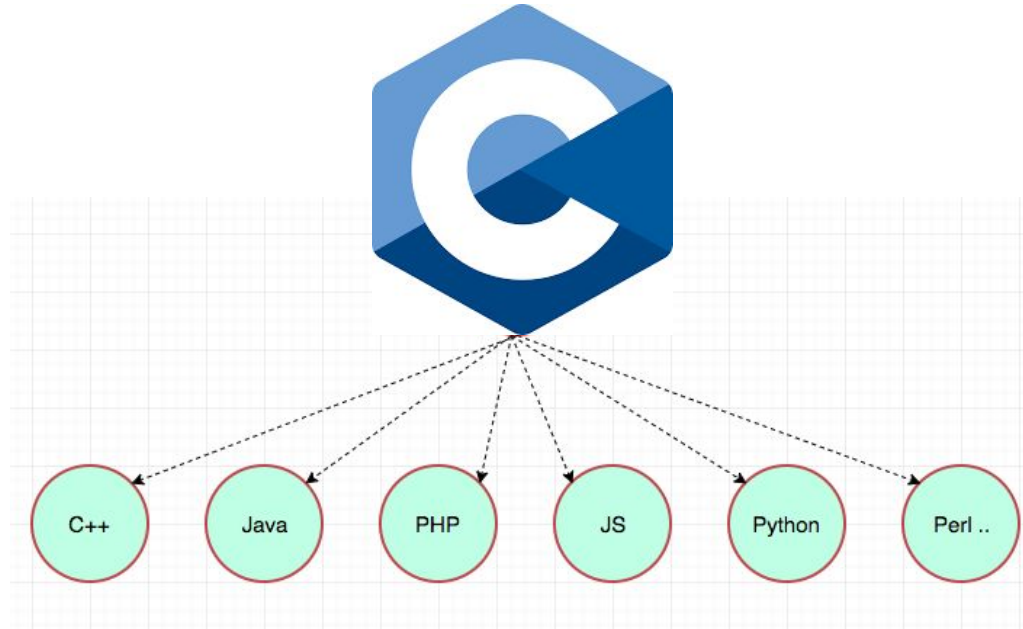
Diego Useche - dh.useche@uniandes.edu.co

Metodos Computacionales II

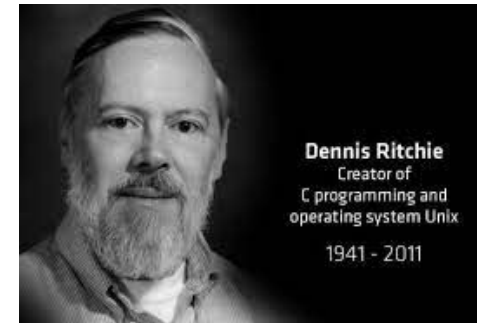
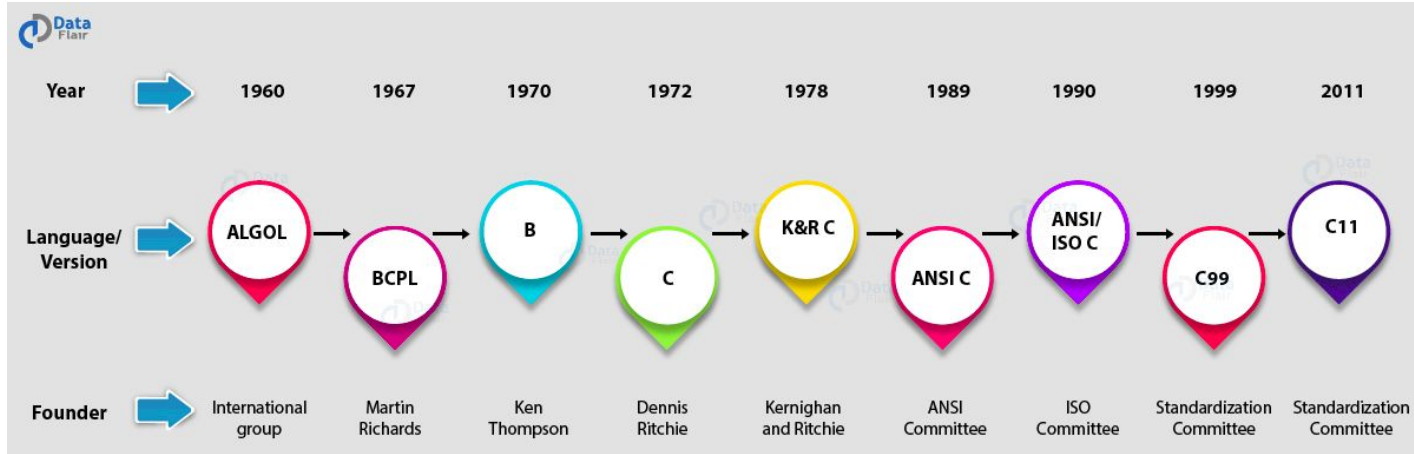
Physics Department, Universidad de los Andes, Bogotá



Origins of C++: Based on C language



Origins of C++: Origins of C language



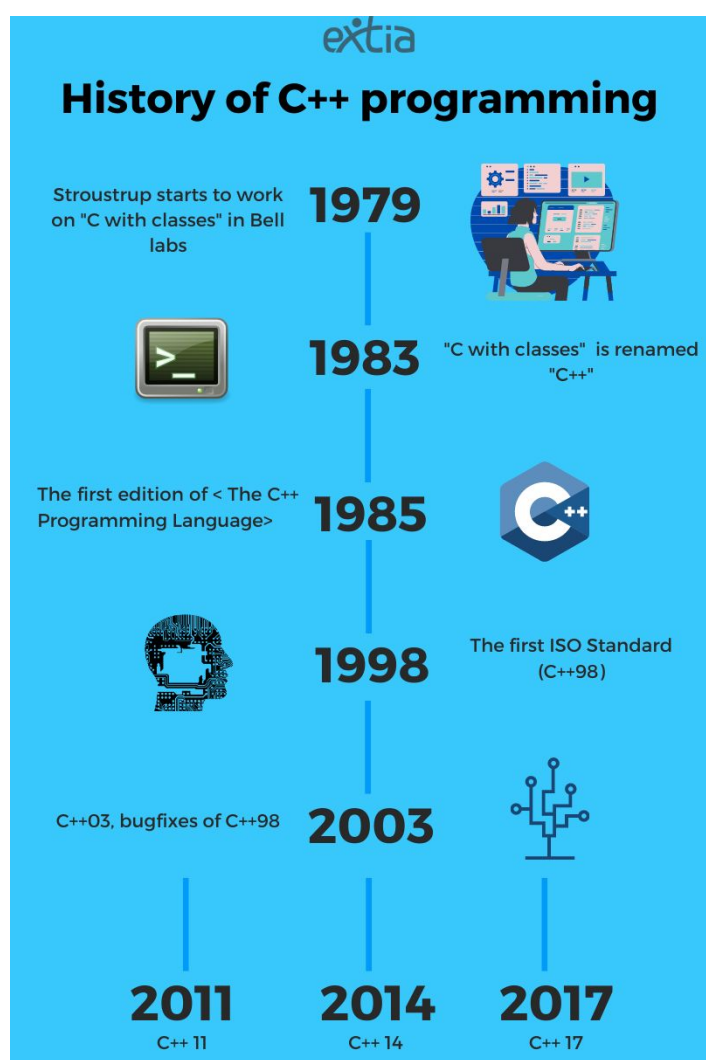
Bell
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Photo taken from <https://data-flair.training/blogs/c-tutorial/>

Origins of C++



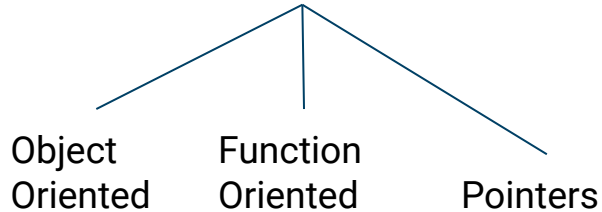
Bjarne Stroustrup, ATT Labs



C++ vs Python vs Java

C – printf()
Vs
C++ – cout<<
Vs
Java – println()
Vs
Python – print()

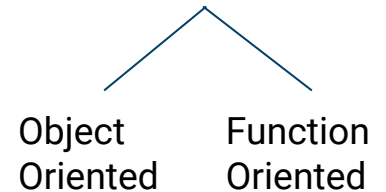
C++



Java

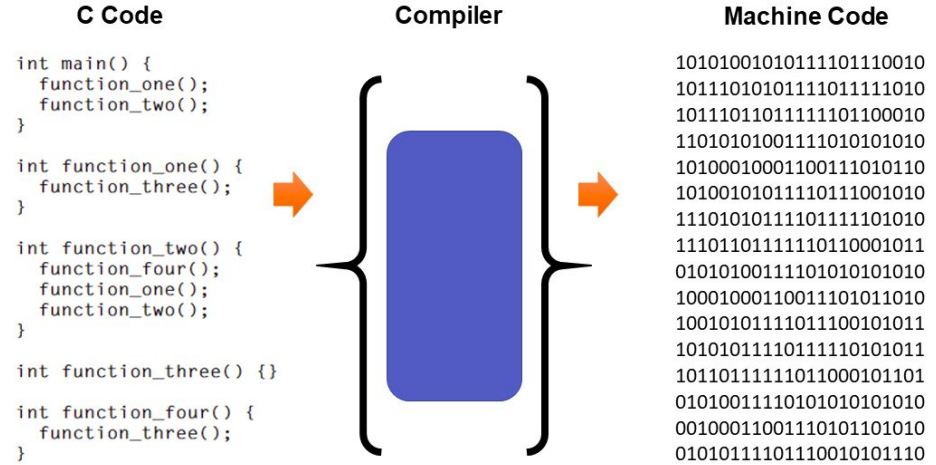


Python



Compiler vs Interpreter language

C++, uses a compiler to convert the whole code to machine language



Python, uses an interpreter to convert line by line code to machine language

```
>>> 3 + 7
10
>>> 3 < 15
True
>>> 'print me'
'print me'
>>> print 'print me'
print me
>>>
```

Images taken from

<https://www.astateofdata.com/python-programming/can-python-be-compiled/>

<https://slidesplayer.com/slide/15826241/>

Compilation of C++

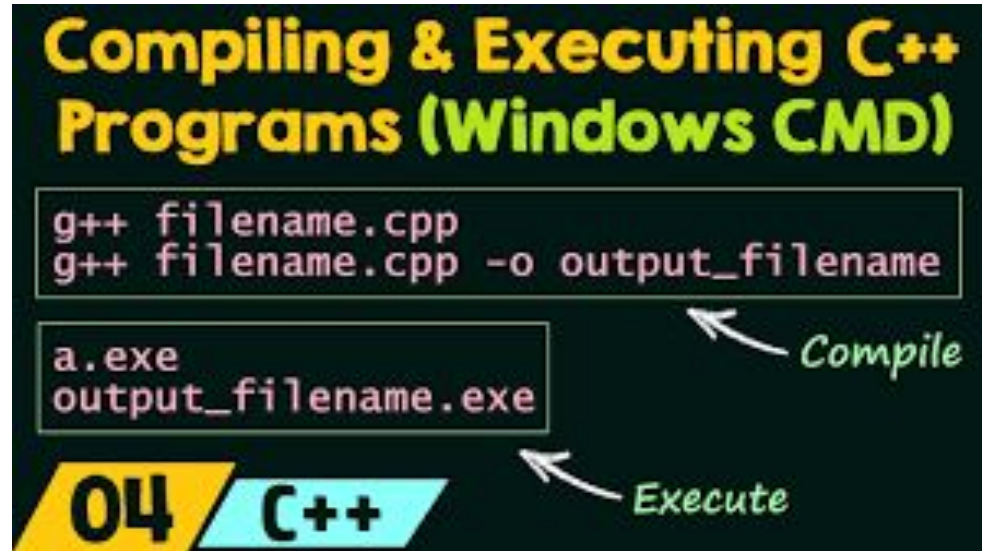


Image taken from <https://www.youtube.com/watch?v=BdnpFbODLc0>

Initial program

- # to include libraries

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

int main()
{

    return 0;
}
```


Namespace and hello world

- cout without namespace would be std::cout

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

int main()
{
    cout << "Hello world!";
    return 0;
}
```

Comment code

- multiline comment `/* */`
- single line comment `//`

```
/*We are going to  
   print "Hello world!" */  
  
   cout << "Hello world!"; // prints Hello world!
```

Declaration of variables

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

int main()
{
    int myVariable = 10; ←
    cout << myVariable;
    return 0;
}
```

Data types

Table 2-6 Integer Data Types

Data Type	Typical Size	Typical Range
short int	2 bytes	-32,768 to +32,767
unsigned short int	2 bytes	0 to +65,535
int	4 bytes	-2,147,483,648 to +2,147,483,647
unsigned int	4 bytes	0 to 4,294,967,295
long int	4 bytes	-2,147,483,648 to +2,147,483,647
unsigned long int	4 bytes	0 to 4,294,967,295
long long int	8 bytes	-9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
unsigned long long int	8 bytes	0 to 18,446,744,073,709,551,615

Table 2-8 Floating Point Data Types on PCs

Data Type	Key Word	Description
Single precision	float	4 bytes. Numbers between $\pm 3.4\text{E-}38$ and $\pm 3.4\text{E}38$
Double precision	double	8 bytes. Numbers between $\pm 1.7\text{E-}308$ and $\pm 1.7\text{E}308$
Long double precision	long double*	8 bytes. Numbers between $\pm 1.7\text{E-}308$ and $\pm 1.7\text{E}308$

Image taken from <https://www.cs.mtsu.edu/~xyang/2170/datatypes.html>

Standard input and standard output (input() and print())

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

int main()
{
    int a, b;
    cout << "Enter a number \n";
    cin >> a;
    cout << "Enter another number \n";
    cin >> b;

    return 0;
}
```

Prefix and postfix

```
x = 5;  
y = ++x;  
// x is 6, y is 6
```

If statement

- put curly brackets { }

```
int a = 55;  
int b = 33;  
if (a > b) {  
    cout << "a is greater than b";  
}
```

While loop

```
int num = 1;
while (num < 6) {
    cout << "Number: " << num << endl;
    num = num + 1;
}
```

← While

```
int a = 0;
do {
    cout << a << endl;
    a++;
} while(a < 5);
```

← Do while

For loop

```
int myArr[5];  
  
for(int x=0; x<5; x++) {  
    myArr[x] = 42;  
}
```

Switch statement to analyze cases

```
int age = 25;
switch (age) {
    case 16:
        cout << "Too young";
        break;
    case 42:
        cout << "Adult";
        break;
    case 70:
        cout << "Senior";
        break;
    default:
        cout << "This is the default case";
}
```

And / Or

```
int age = 20;
if (age > 16 && age < 60) {
    cout << "Accepted!" << endl;
}
```

And: &&

```
int age = 16;
int score = 90;
if (age > 20 || score > 50) {
    cout << "Accepted!" << endl;
}
```

Or: ||

Arrays

```
int arr[] = {11, 35, 62, 555, 989};  
int sum = 0;  
  
for (int x = 0; x < 5; x++) {  
    sum += arr[x];  
}  
  
cout << sum << endl;
```

Multidimensional arrays

```
int x[2][3] = {  
    {2, 3, 4}, // 1st row  
    {8, 9, 10} // 2nd row  
};
```

Functions

must indicate the return type, if not return use "void"



```
int addNumbers(int x, int y) {  
    int result = x + y;  
    return result;  
}  
  
int main() {  
    cout << addNumbers(50, 25);  
}
```

Functions

must indicate the type of parameters



```
int addNumbers(int x, int y) {  
    int result = x + y;  
    return result;  
}  
  
int main() {  
    cout << addNumbers(50, 25);  
}
```

Default parameters

```
int volume(int l=1, int w=1, int h=1) {  
    return l*w*h;  
}  
  
int main() {  
    cout << volume() << endl;  
    cout << volume(5) << endl;  
    cout << volume(2, 3) << endl;  
    cout << volume(3, 7, 6) << endl;  
}
```

Default parameters can be set on python as well.

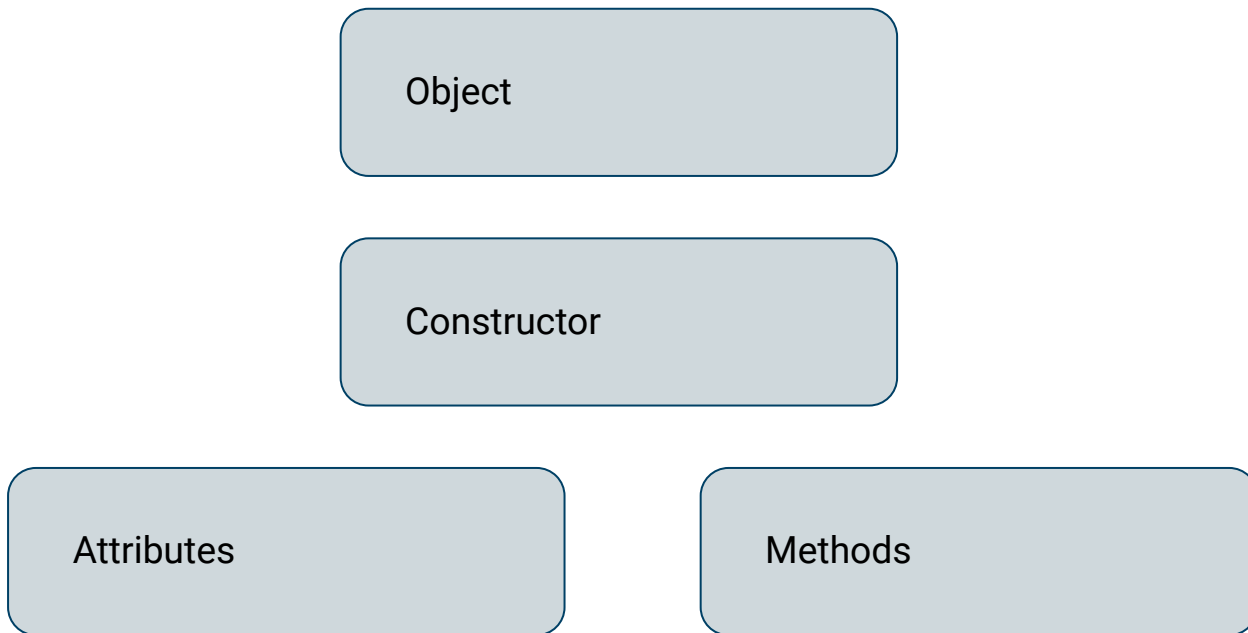
OOP paradigm

- C++ al igual que python permite programar orientado a funciones y orientado a objetos.




OOP Paradigm

- General structure



Classes

Attributes



```
class myClass {  
    private:  
        string name;  
    public:  
        myClass() {  
            cout << "Hey";  
        }  
        void setName(string x) {  
            name = x;  
        }  
        string getName() {  
            return name;  
        }  
};  
  
int main() {  
    myClass myObj;  
  
    return 0;  
}
```


Classes

— Constructor

```
class myClass {  
    private:  
        string name;  
    public:  
        myClass() {  
            cout << "Hey";  
        }  
        void setName(string x) {  
            name = x;  
        }  
        string getName() {  
            return name;  
        }  
};  
  
int main() {  
    myClass myObj;  
  
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}
```

Classes

Functions



```
class myClass {  
    private:  
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    public:  
        myClass() {  
            cout << "Hey";  
        }  
        void setName(string x) {  
            name = x;  
        }  
        string getName() {  
            return name;  
        }  
};  
  
int main() {  
    myClass myObj;  
  
    return 0;  
}
```

Classes



```
class myClass {  
    private:  
        string name;  
    public:  
        myClass() {  
            cout << "Hey";  
        }  
        void setName(string x) {  
            name = x;  
        }  
        string getName() {  
            return name;  
        }  
};  
  
int main() {  
    myClass myObj;  
  
    return 0;  
}
```

Create the object in the main



Example

You have to create a class, named Student, representing the student's details, as mentioned above, and store the data of a student. Create setter and getter functions for each element; that is, the class should at least have following functions:

- `get_age, set_age`
- `get_first_name, set_first_name`
- `get_last_name, set_last_name`
- `get_standard, set_standard`

Also, you have to create another method `to_string()` which returns the string consisting of the above elements, separated by a comma(,). You can refer to stringstream for this.

References

<https://www.cs.mtsu.edu/~xyang/2170/datatypes.html>

<https://www.sololearn.com/>

<https://www.hackerrank.com/>

<https://data-flair.training/blogs/c-tutorial/>

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<https://www.youtube.com/watch?v=BdnpFbODLc0>

<https://www.educba.com/c-stack-vs-heap/>