Programming in C++ / 1ˢᵗ Stage   Diyala University - College of Engineering
Prepared by: Asst. lect. Ahmed Mahmood   Computer Engineering Department
Lecture 2

C++ PROGRAMMING LANGUAGE

Introduction to programming:

Programming language: is a formal computer language designed to make a way of communication between computer and humans (programmers).

Program: is a set of instructions that do a specific task. These instructions are written according to the rules of the language used.

We can divide the programming language into:

1- Low- level languages

Assembly, Machine language.

2- High- level languages

C, C++, C#, Java, PHP, VB

An overview of programming languages:

Cpl	in the early 1960	Christopher Strachey
Bcpl	1966	Martin Richards
B	1969	Ken Thompson, Dennis Ritchie
C	1972	Dennis Ritchie
C++	1983	C++ was developed by Bjarne Stroustrup starting in 1979 at Bell Labs in Murray Hill, New Jersey, as an enhancement to the C language and originally named C with Classes but later it was renamed C++ in 1983.

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C++ Programming language: C++ is regarded as a middle-level language, as it comprises a combination of both high-level and low-level language features.

C++ is derived from the C language. It is a superset of C: Almost every correct statement in C is also a correct statement in C++, although the reverse is not true.
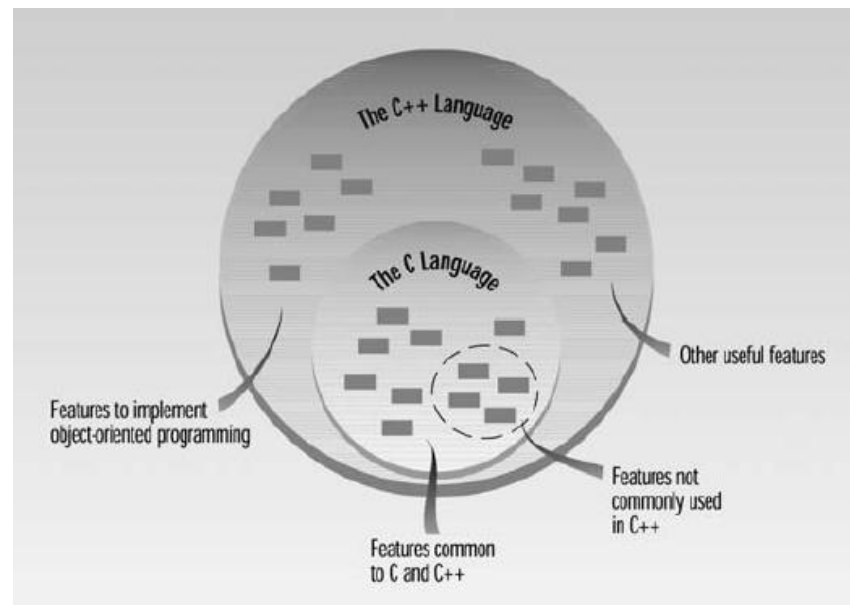
C++ fully supports object-oriented programming, including the four pillars of object-oriented development:
- Encapsulation
- Data hiding
- Inheritance
- Polymorphism

Standard Libraries: Standard C++ consists of three important parts:

- The core language giving all the building blocks including variables, data types and literals, etc.
- The C++ Standard Library giving a rich set of functions manipulating files, strings, etc.
- The Standard Template Library (STL) giving a rich set of methods manipulating data structures, etc.

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Use of C++:

- C++ is used by hundreds of thousands of programmers in essentially every application domain.

- C++ is being highly used to write device drivers and other software that rely on direct manipulation of hardware under real-time constraints.

- C++ is widely used for teaching and research because it is clean enough for successful teaching of basic concepts.

- Anyone who has used either an Apple Macintosh or a PC running Windows has indirectly used C++ because the primary user interfaces of these systems are written in C++.

C++ Program Structure:

Each program written in C++ language consists of 3 following parts:

Header	Header files (Libraries)
Middle	Preprocessor Directive
Main Function	Main function

Let's look at a very simple C++ program. This program is called FIRST, so its source file is FIRST.CPP. It simply prints a sentence on the screen. Here it is:

```
#include <iostream>
using namespace std;
int main()
{
cout<< " This is my first C++ program"<<endl;
return 0;
}
```

- The C++ language defines several headers, which contain information that is either necessary or useful to your program. For this program, the header **<iostream>** is needed.

Note: We can write the header between **<iostream>** Or between **"iostream"**

- The line **using namespace std**; tells the compiler to use the std namespace. Namespaces are a relatively recent addition to C++.

Note: Instead of writing (**using namespace std;**) before the main function, we can write (std) before each statement inside the program as follows:

std::cout << " This is my first C++ program "<<endl;

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- The line **int main()** is the main function where program execution begins.

- The next line **cout << "This is my first C++ program"**; causes the message "This is my first C++ program" to be displayed on the screen. **The operator << is called the insertion or put to operator**

- The next line **return 0;** terminates main() function and causes it to return the value 0 to the calling process.

The rules that must be observed when writing any program in C++ language:

1- The program should start with   **#include <header files>**
2- The main function should start with **brace {** and end with **brace }**
3- C++ language written in small letters.
4- Every statement in C++ should end with **semicolon ;**

Escape Sequences

There are certain characters in C++ when they are preceded by a backslash they will have special meaning and they are used to represent like newline (\n) or tab (\t). Here, you have a list of some of such escape sequence codes:

Escape sequence	Meaning
\n	Newline
\r	Return
\t	Horizontal Tab
\v	Vertical tab
\a	Bell (beep)
\b	Backspace
\f	Form feed
\\	Backslash
\'	Single quotation mark
\"	Double quotation marks
\?	? character
\ooo	Octal number of one to three digits
\xdd	Hexadecimal notation

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Example: Follow the following program and Write the output:

```cpp
#include <iostream>
using namespace std;
int main()
{
cout << "Hello\n\tWorld\n\n";
cout << "\"Run, Spot, run,\" she said.";
return 0;
}
```

Output:

```
Hello
        World

"Run, Spot, run," she said.
```

Comment:

 Comments are an important part of any program. They are explanatory statements that you can include in the C++ code. These comments help anyone reading the source code. All programming languages allow for some form of comments.

 C++ supports single-line and multi-line comments. All characters available inside any comment are ignored by C++ compiler.

Comment Syntax

 C++ comments start with /* and end with */. For example:

```cpp
/* This is a comment */

/* C++ comments can also
span multiple
lines
 */
```

 A comment can also start with //, extending to the end of the line. For example:

```cpp
#include <iostream>
using namespace std;
main()
{
cout << "Hello World"; // prints Hello World
return 0;
}
```

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The Errors in C++

The errors can be divided into:

1- **Compile Time:** They lead to a lack of implementation of the program.

  a- Syntax errors

      cot

      cout

  b- errors of rules

      cout<<"hello"

      cout<<"hello";

2- **Run Time:** They lead to the implementation of the program, but wrong.

  a- Logical errors

    A program designed to find a multiplying two numbers, but it finds the sum of the two numbers.

  b- Exception errors

    5/0

Examples: Find the errors for the following program:

```
#includ<iostrem>
using namspace std;
int main()
{
    cout << "Hello world!" << endl
    return 0;
}
```

Solution:

```
#include<iostream>
using namespace std;
int main()
{
    cout << "Hello world!" << endl;
    return 0;
}
```

References:
- Object-Oriented Programming in C++, Fourth Edition
- Tutorials Point https://www.tutorialspoint.com/cplusplus/