

C- Programming

Introduction to C Programming

Overview of C

- Based on applications different programming languages were developed
 - FORTRAN was developed for scientific calculation
 - COBAL was developed for data processing
 - PASCAL was general application etc
- There was need for a programming language which would be used to develop both application programs and system programs

“C was a new programming language which was developed”

- C is a general-purpose, high-level language that was originally developed by Dennis M. Ritchie to develop the UNIX operating system.
- C is derived from two early programming language such as
 - BCPL(Basic Combined Programming Language)
 - B programming language
- C can be executed on any operating system such as UNIX, LINX, Windows operating systems etc.
- C language is considered as the mother language of all the modern programming languages because most of the programming languages follow C syntax, for example, C++, Java, C#, etc.
- C is called as ***procedural language*** because a procedure is known as a function, method, routine, subroutine, etc. A procedural language specifies a series of steps for the program to solve the problem.

A procedural language breaks the program into functions, data structures, etc.

- C as a ***structured programming*** language because a structured programming language is a subset of the procedural language.

Structure means to break a program into parts or blocks so that it may be easy to understand.

Importance of C

- C was initially used for system software's.
- Some examples of the use of C to develop –Operating Systems, Language Compilers, Assemblers, Text Editors, Print Spoolers, Network Drivers, Modern Programs, databases, Language Interpreters, Utilities.

Characteristic of C

- C is robust language whose rich set of built-in functions and operators can be used to write complex programs.
- C is a general purpose programming language.
- C is a structured programming language.
- Helps in development of system software.
- Small size- C has only 32 keywords Hence it is easy to learn when compared to other language.
- As C is a structured programming, C enables the users to think of the problem in terms of functions/modules where the collections of all modules make a complete program. Hence it easy for program debugging, testing and maintenance.
- C programs make use of operators and data types, they are fast and efficient.
- C supports pointers to refer computer memory , array, structure and functions.
- C is a core language for many other programming language like C++, Java or Perl
- C is a portable language i.e a C program written for one computer can be run on another computer with little or no modification.
- C is a extensible language as it enables the user to add his/her own functions to the C library.

Features of C

- It is simple and easy to learn.
- It is a powerful language whose rich set of built-in functions and operators can be used to write any complex program.
- Programs written in C are fast and efficient .This is due to its variety of data types and powerful operators.
- It is a High-Level programming language.
- It is a case sensitive programming language.
- It is a syntax-based programming language.
- It is highly portable i.e, C program written for one computer can run on another

computer with little or no modification.

- It is called as structured programming because complex program can be divided into set of modules. This makes the program debugging, testing and maintenance easier.

Structure of C Program with an Example

```
Documentation or comment section
Pre-processor directives/ Header files
main()
{
Declarations;
Statements;
}
User-created sub-programs or functions
{
Local declarations;
Statements;
}
```

The structure of the C program includes the following steps:

1. Documentation or comment section
2. Pre-processor directives/ Header files
3. main() function
4. Pair of Braces { }
5. Declarations and statements
6. User-created sub-programs or functions

Documentation or comment section

- Comments are non-executable statements. Compiler won't execute statements in comment section.
- It includes the statement specified at the beginning of a program, such as a program's **name, date, description, and title.**

It is represented in two different forms

- ✓ Double slash (\\) – Single line comment
- ✓ Begin with /* and ends with */ - Multiple line comment

Pre-processor directives/ Header files

- The statements begin with #(hash) are called as pre-processor directives.
- The preprocessor section contains all the header files and symbolic constants used in a program. Header files contains some in-built functions.

main() function

- Every C program should contain a particular function called main(), which identifies the beginning of the program.
- Execution of every C program should starts with the main() function. No C program is executed without the main () function. The function main() should be written in lowercase letters and not be terminated by a semicolon.
- There must be only one main() function in every C program.

Pair of Braces {}

- The body of the program should be written inside the pair of braces.
- The pair of braces indicates the beginning and end of any function.
- All the statements between the braces form the function body.

Function body contains a set of instructions to perform certain task.

Declarations and statements

- This section is called a body of the program.
- The *declaration* part represents all the variables, arrays, functions etc., with the data types used in the program.
- The *statements* include the instructions written with the syntax to perform certain operations such as input or output.
- All program executable statements must end with a semicolon ; (except loops and control statements).

User-created sub-programs or functions

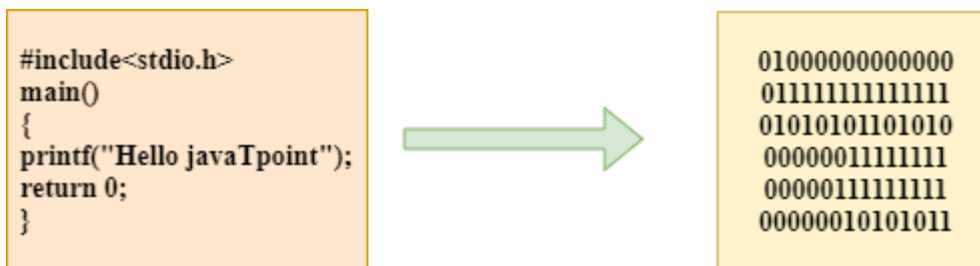
- These are sub-programs or functions created by the user to perform specific tasks.
- The user-defined functions contain a set of statements to perform a particular operation.
- They may be written before or after the main function.

Simple C Program

```
/* C Program to print Hello World*/  
#include<stdio.h>  
int main()  
{  
printf("Hello World ");  
return 0;  
}
```

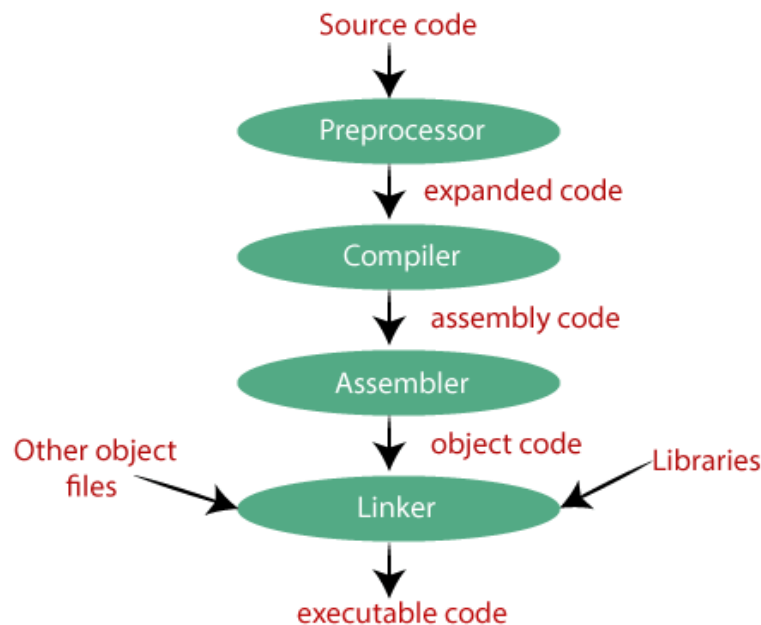
- The first statement in the program */* C Program to print Hello World */* is a statement which is ignored by the compiler. It gives the name of the program.
- The second line *#include<stdio.h>* tells the compiler to include the standard input/output library or header files into the program.
- *int main()* is the main function where the program execution begins. *int* is the return value of the main function. After all the statements in the program the last statement is *return 0*. It returns an integer to the operating system.
- *printf("Hello World ");* *printf()* is used to display message on the output screen.
- *return 0*. This is a return command that is used to return the value 0 to the operating system to give indication that there is no error during the execution of the program.

What is a compilation?



- The compilation is a process of converting the source code into object code. It is done with the help of the compiler.
- The compiler checks the source code for the syntactical or structural errors, and if the source code is error-free, then it generates the object code.

Compilation process in C



- **Preprocessor**
The source code is the code which is written in a text editor and the source code file is saved with an extension ".c".
This source code is first passed to the preprocessor, and then the preprocessor expands this code. After expanding the code, the expanded code is passed to the compiler.
- **Compiler**
The compiler converts this code into assembly code.
- **Assembler**
The assembly code is converted into object code by using an assembler. The name of the object file generated by the assembler is the same as the source file. The extension of the object file in ".obj"
If the name of the source file is 'hello.c', then the name of the object file would be 'hello.obj'.
- **Linker**
The main working of the linker is to combine the object code of library files with the object code of our program. After the successful compilation a program can be executed to see the output. Executed program files will be stored in a computer with extension of .exe

