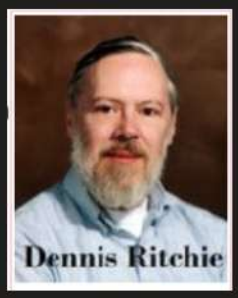
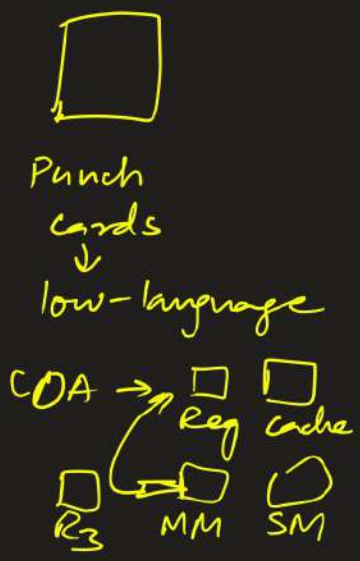
C Programming Lecture 1

Monday, 3 June 2024 6:59 PM

- **C programming language** was developed in 1972 by Dennis Ritchie at bell laboratories of AT&T (American Telephone & Telegraph), located in the U.S.A.
- **Dennis Ritchie** is known as the **founder of the C language.**
- It was developed to overcome the problems of previous languages such as B, BCPL, etc.
- Initially, C language was developed to be used in **UNIX operating system.** It inherits many features of previous languages such as B and BCPL.



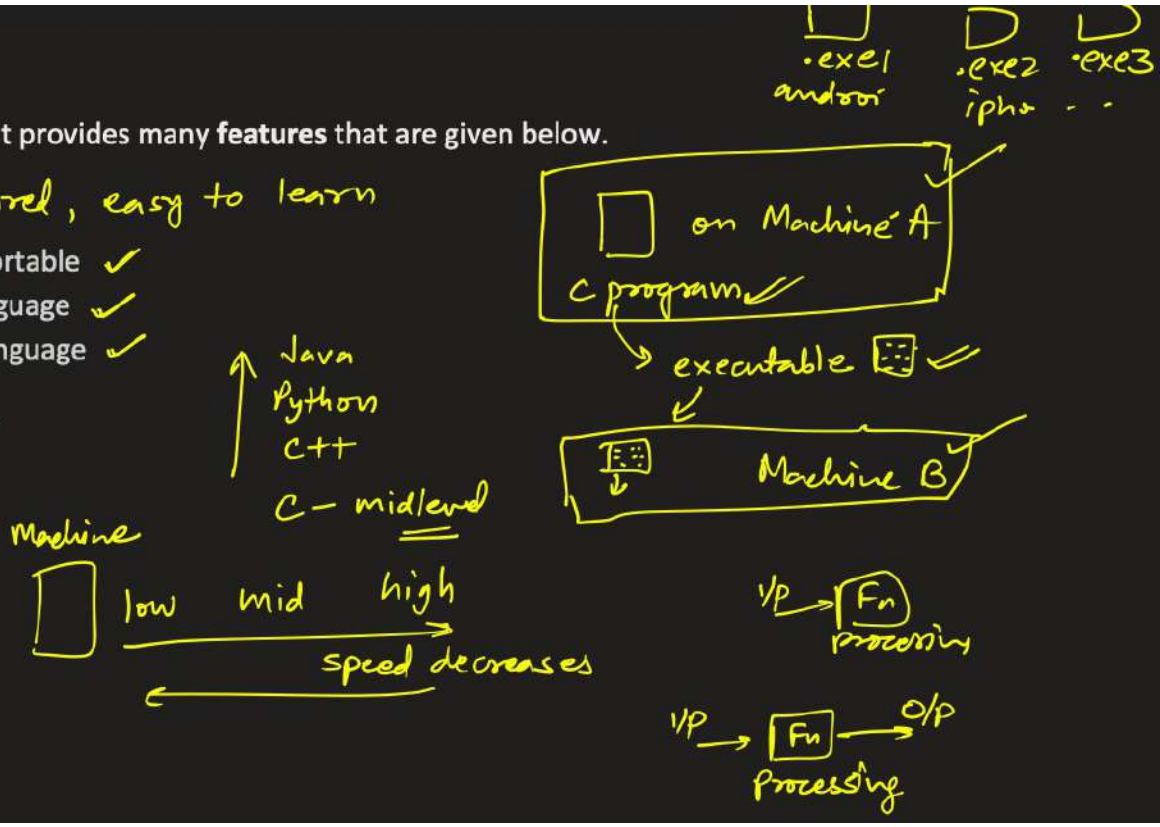


Language	Year	Developed By
Algol	1960	International Group
BCPL	1967	Martin Richard
B	1970	Ken Thompson
Traditional C	1972	Dennis Ritchie
K & R C	1978	Kernighan & Dennis Ritchie
ANSI C	1989	ANSI Committee
ANSI/ISO C	1990	ISO Committee
C99	1999	Standardization Committee

Features of C Language

C is the widely used language. It provides many **features** that are given below.

1. Simple ✓ → structured, easy to learn
2. Machine Independent or Portable ✓
3. Mid-level programming language ✓
4. Structured programming language ✓
5. Rich Library ✓
6. Memory Management ✓
7. Fast Speed ✓
8. Pointers ✓
9. Recursion ✓



First C Program

First C Program

```
// Hello World Program
#include <stdio.h>
void main() {

    printf("Hello World");
    return 0;
}
```

General Overview of a Simple C Program's Structure:

The ***general architecture*** of a simple ***C program*** typically consists of several vital components. Below is an outline of the essential elements and their purposes:

- **Header Files:**

The ***#include directives*** at the beginning of the program are used to include ***header files. Header files*** provide function ***prototypes*** and ***definitions*** that allow the C compiler to understand the functions used in the program.

- **Main Function:**

Every ***C program*** starts with the ***main function***. It is the program's entry point, and execution starts from here.
The ***main function*** has a ***return type*** of ***int***, indicating that it should return an integer value to the operating system upon completion.

- **Variable Declarations:**

Before using any variables, you should declare them with their ***data types***. This section is typically placed after the ***main function's*** curly opening brace.

- **Statements and Expressions:**

This section contains the ***actual instructions*** and ***logic*** of the program. C programs are composed of statements that perform ***actions*** and ***expressions*** that compute values.

- **Comments:**

Comments are used to provide ***human-readable*** explanations within the code. They are not executed and do not affect the program's functionality. In C, comments are denoted by ***//*** for ***single-line comments*** and ***/* */*** for ***multi-line comments***.

- **Functions:**

C programs can include ***user-defined*** functions and ***blocks*** of code that perform specific tasks. Functions help modularize the code and make it more organized and manageable.

- **Return Statement:**

Use the ***return statement*** to terminate a function and return a value to the caller function. A ***return statement*** with a value of ***0*** typically indicates a successful execution in the ***main function***, whereas a ***non-zero value*** indicates an error or unexpected termination.

- **Standard Input/Output:**

C has ***library functions*** for reading user ***input*** ***(scanf)*** and printing output to the console ***(printf)***. These functions are found in C programs and are part of the standard I/O library (***stdio.h*** header file). It is essential to include these fundamental features correctly while writing a simple C program to ensure optimal functionality and readability.

GNU → GNU not UNIX GCC → GNU C compiler

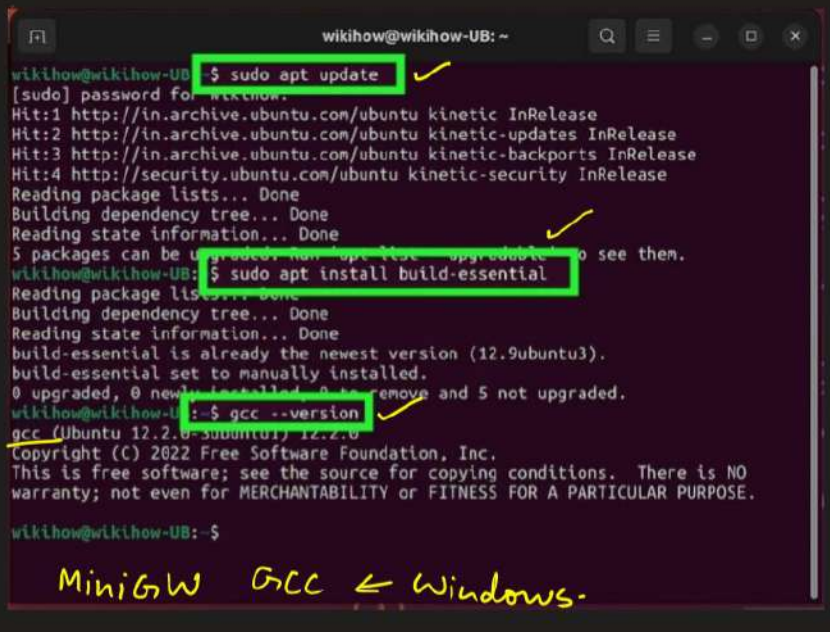
Install your distribution's build tools. Most versions of Linux don't come with GCC already installed. Fortunately, it's easy to install GCC and other required tools (including *make*, G++, and general development libraries) for compiling software on any version of Linux:

- **Ubuntu, Debian, & Linux Mint:**

```
sudo apt update

sudo apt install build-essential

gcc --version
```



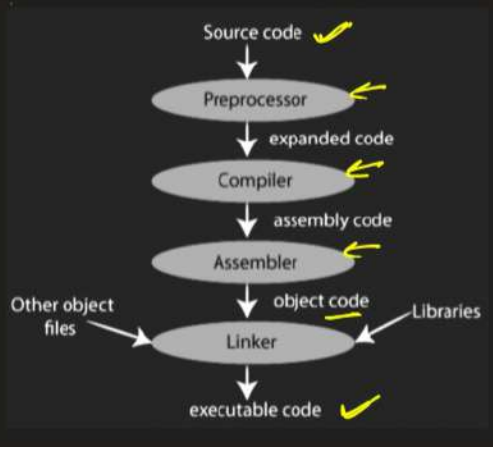
Compilation process in C

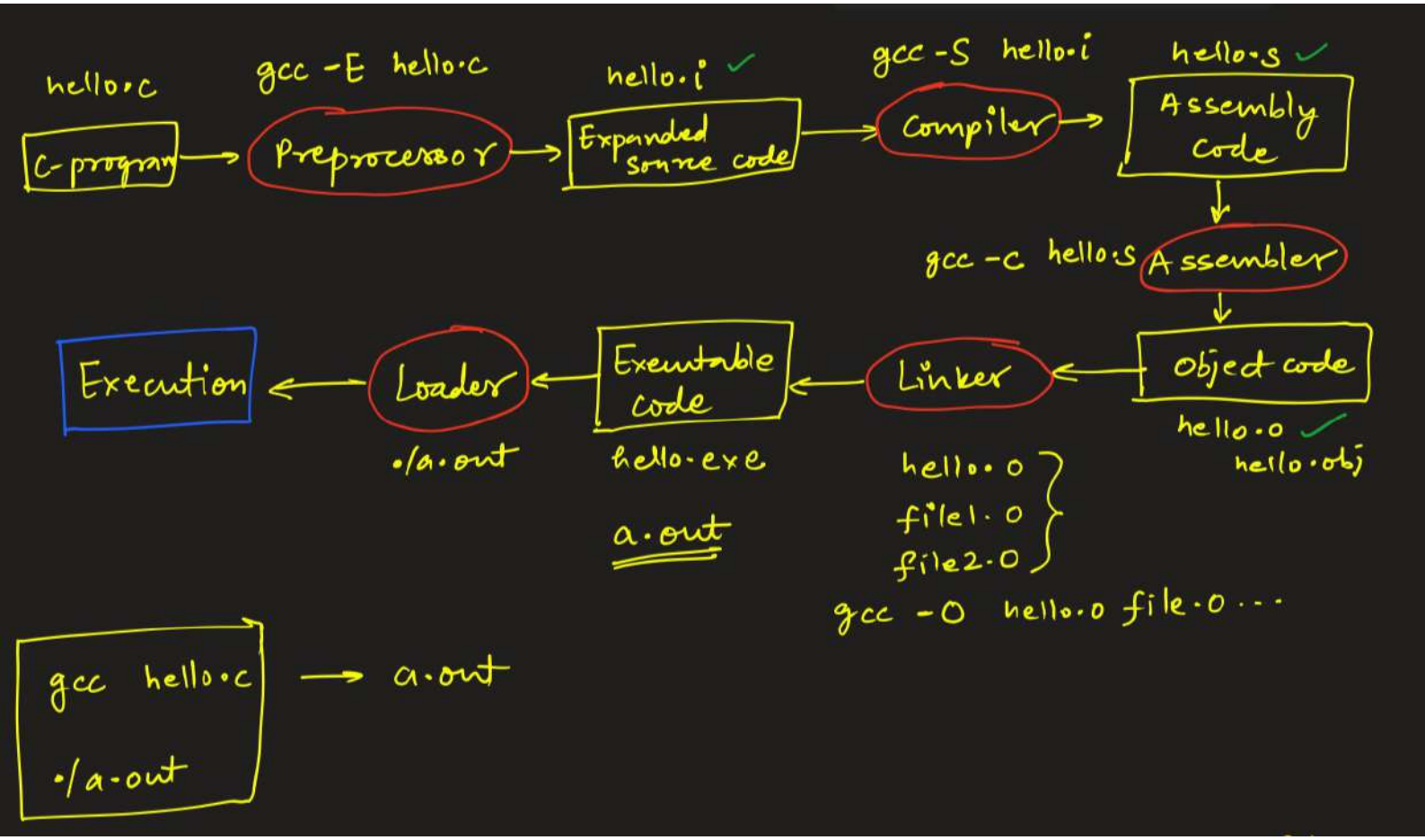
compilation
High-level program → executable
GCC

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.

The following are the phases through which our program passes before being transformed into an executable form:

- **Preprocessor**
- **Compiler**
- **Assembler**
- **Linker**




hello.c
C-program
gcc -E hello.c
Preprocessor
hello.i
Expanded source code
gcc -S hello.i
Compiler
hello.s
Assembly code
gcc -c hello.s
Assembler
Object code
hello.o
hello.obj
Linker
Executable code
hello.exe
a.out
Loader
./a.out
Execution
hello.o
file1.o
file2.o
gcc -o hello.o file.o ...
gcc hello.c
./a.out
a.out

hello.s, hello.i, hello.o are all intermediate temporary files which are deleted automatically when we invoke gcc. If we want to keep them, we can use the following flags alongwith the command:

```
gcc -Wall -save-temps hello.c
```