

## JAVA

- Java is a **programming language** and a **platform**. Java is a high level, robust, object-oriented and secure programming language.
- Java was developed by *Sun Microsystems* (which is now the subsidiary of Oracle) in the year 1995.
- *James Gosling* is known as the father of Java.
- Before Java, its name was *Oak*.
- Since Oak was already a registered company, so James Gosling and his team changed the name from Oak to Java

Note: Oracle Corporation acquired Sun Microsystem in 2010. Now java is under license of Oracle corporation

### Java is divided into 3 parts

- 1) J2SE / JSE (Java Standard Edition) → For stand-alone applications development
- 2) J2EE / JEE (Java Enterprise Edition) → For Web applications development
- 3) J2ME / JME (Java Micro / Mobile Edition) → For Mobile applications development
- 4) Java FX--→ It is used to develop rich internet applications.

## What we can develop using Java

Using Java, we can develop several kinds of applications like

- 1) Stand-alone applications
- 2) Web applications
- 3) Mobile Applications
- 4) Games
- 5) Servers
- 6) Databases and much more

## Java Features

A list of the most important features of the Java language is given below.

1. Simple
2. Object-Oriented
3. Portable
4. Platform independent
5. Secured
6. Robust
7. Architecture neutral
8. Interpreted
9. High Performance
10. Multithreaded
11. Distributed
12. Dynamic

## Simple

Java is easy to learn and its syntax is quite simple, clean and easy to understand. The confusing and ambiguous concepts of C++ are either left out in Java or they have been re-implemented in a cleaner way.

Ex: Pointers and Operator Overloading are not there in java

## Object-oriented

Java is an object-oriented programming language. Everything in Java is an object.

Object-oriented programming (OOPs) is a methodology that simplifies software development and maintenance by providing some rules.

Basic concepts of OOPs are:

1. Object
2. Class
3. Inheritance
4. Polymorphism
5. Abstraction
6. Encapsulation

## Robust

The English meaning of Robust is strong. Java is robust because:

- It uses strong memory management.
- Java provides automatic garbage collection which runs on the Java Virtual Machine to get rid of objects which are not being used by a Java application anymore.
- There are exception handling and the type checking mechanism in Java. All these points make Java robust.

## Portable

Java is portable because it facilitates you to carry the Java bytecode to any platform. It doesn't require any implementation.

## Multi-threaded

- A thread is like a separate program, executing concurrently.
- We can write Java programs that deal with many tasks at once by defining multiple threads.
- The main advantage of multi-threading is that it doesn't occupy memory for each thread.
- It shares a common memory area. Threads are important for multi-media, Web applications, et

## Secured

Java is best known for its security. With Java, we can develop virus-free systems.

Java is secured because:

- No explicit pointer
- Java Programs run inside a virtual machine sandbox

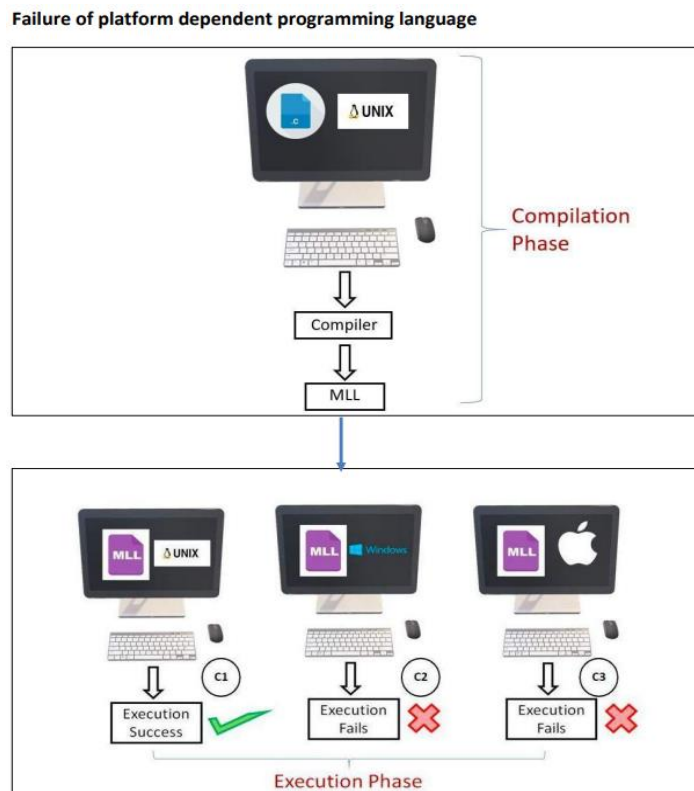
## Platform Independent

- Java is platform independent because it is different from other languages like C, C++, etc.
- C, C++ are compiled into platform specific machines while Java is a write once, run anywhere language.
- A platform is the hardware or software environment in which a program runs.
- Java code can be executed on multiple platforms, for example, Windows, Linux, Sun Solaris, Mac/OS, etc.
- Java code is compiled by the compiler and converted into bytecode.
- This bytecode is a platform-independent code because it can be run on multiple platforms, i.e., Write Once and Run Anywhere (WORA)

What is Platform?

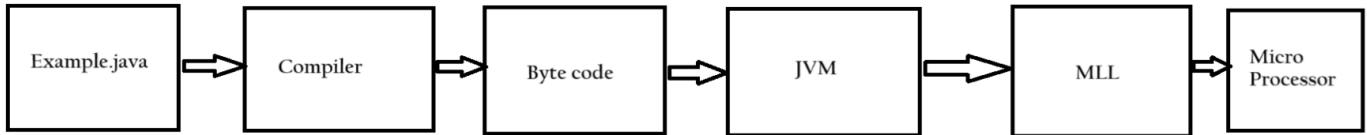
Computer is a combination of hardware and software this is called as "PLATFORM". Hardware mostly refers to microprocessor. Software mostly refers to Operating System. The combination of microprocessor and OS is called as platform.

For example: i5 is processor and Windows 10 is OS. This is platform.

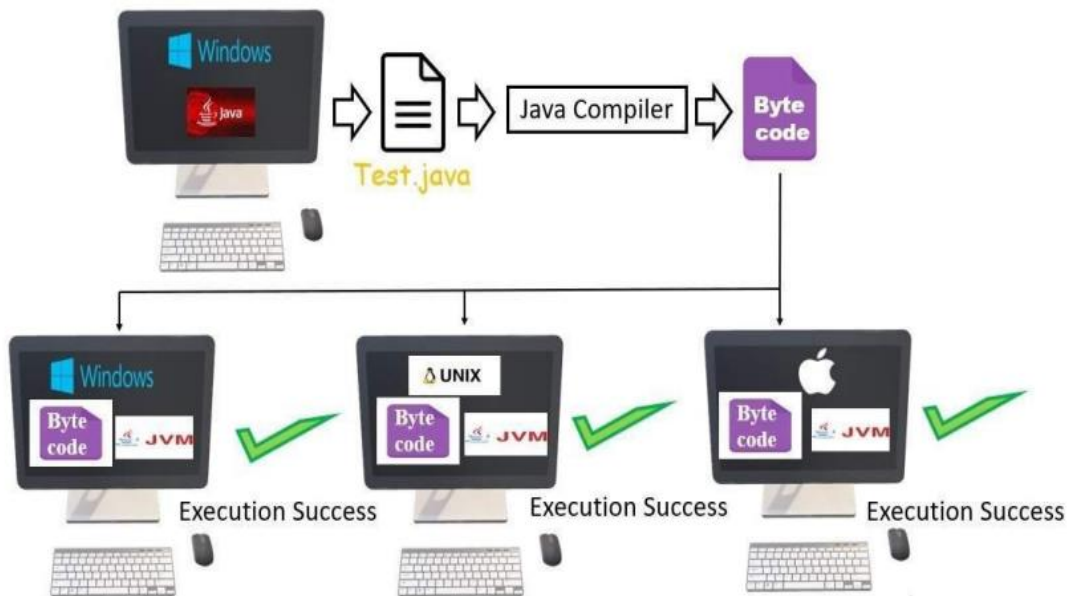


C , C++ execution process (platform dependent language)

## JAVA Execution Process



JAVA Execution Process



## PLATFORM INDEPENDENCE

JAVA designed its own compiler called as Java Compiler which converts HLL into byte codes. This byte code is given to Java Virtual Machine (JVM) which converts it to MLL.

## WORKING:

- Let us assume you are writing code using java in your computer which has windows OS. User should save the file with the extension ".java" so that it is consider to be a java file.
- For example, consider Test.java is a file which consist of HLL code.
- Since Machine understands Machine Level code [MLL] not your high-level code [HLL], conversion must happen.
- Let us see how exactly conversion happens in java.
- Initially your HLL code is given as input to compiler but java compiler will not give MLL code as output like C and C++ compiler rather it takes HLL as input and gives a special type of code as output called as "BYTE CODE" which is platform independent.
- Byte code is neither HLL code nor MLL code, hence it is also referred to as intermediate code.
- If you can recollect machine understands only MLL code but java compiler gave you byte code.
- To resolve this, James Gosling provided a software called as "Java virtual Machine"(JVM) which was platform dependent that is different OS have different JVM.
- Since you are writing code on windows OS, you will have to download windows compatible JVM.
- JVM will now convert byte code to machine level code which machine can easily understand. In this way, java achieved platform in dependency using a special type of code which is byte code.



## **JAVA Architecture OR How the JAVA programs will execute in the Back End**

- We will write the program in edit plus / notepad. It is also called as source code which is in human readable format.
- To convert this human readable format into machine readable format, we have to go to command prompt and perform 2 operations
  1. Javac ( java compiler)
  2. Java ( java interpreter)
- Once after writing the program we have to save the file with the extension of .java
- Once after saving we have to give this .java file as an input to the compiler where it will check for 1). Syntax 2). Rules 3). Translate from .java to .class file
- If there is any syntax or rules violation we get compile time error. ➤ If there is no violation then the .class file will be generated.
- .class is an intermediate code which is in byte code format which cannot be understood neither by human nor by machine.
- .class file will be given as input for the interpreter which 1). Reads line by line 2). Execute (JVM) 3). Translate .class file to binary language.
- If we find any abnormal statements like 1/0 which is infinite, which is not defined in java hence we get run time error called Arithmetic exception.

### **JVM [Java virtual machine ] :**

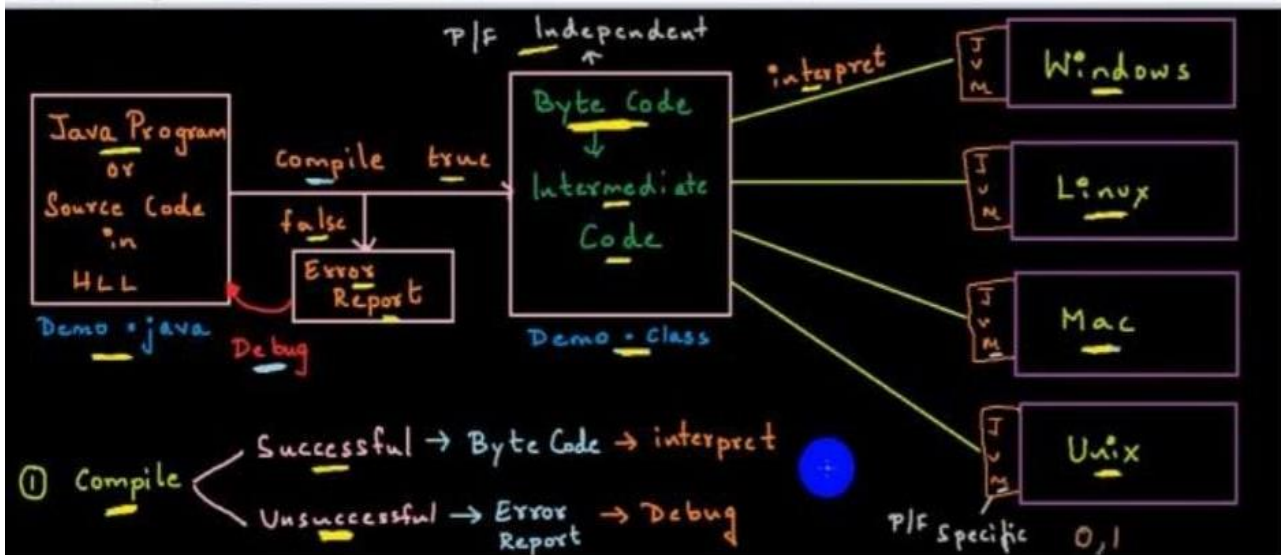
JVM will take care of program execution, memory allocation & de-allocation

### **JRE [Java runtime environment ] :**

It is an environment setup provided to run the java program.

## JDK [Java development kit] :

In this kit which consist of all library files and utilities to develop a java software. All the java program will execute from left to right and top to bottom.



Commands used in java :

1. mkdirs ----Make directories or create a folder
2. cls -----Clear the screen
3. cd -----Change folder or directory
4. cd.. -----Change from current folder to previous folder
5. javac -----java compilation
6. java ---- ----java interpretation / execution

Note :

For compilation Syntax : javac filename.java

For interpretation Syntax : java filename

