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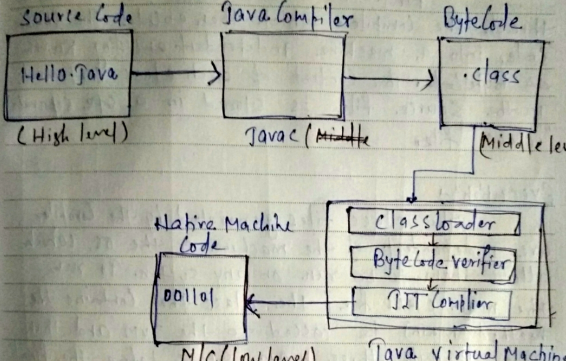
Compilation and Execution of a Java Program



Java being a platform independent Programming language, does not work on one step Compilation. Instead, it involves a two step execution, first through an OS ~~idem~~ independent Compiler, and second in a virtual machine (JVM) which is custom-built for every operating System. The two principle stages are follows:→

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Compilation:-

First the source 'Java' file is passed through the compiler which then encodes the source code into a machine independent encoding known as Byte Code. The content of each class contained in the source file is stored in a separate 'class' file.

Execution:-

The class files generated by the compiler are independent of the machine or the OS, which allows them to be run on any system. To run, the main class file (the class that contains the method main) is passed to the JVM and then goes through three main stages before the final machine code is executed. The stages are:-

- **Class Loader:-** Class loader in Java is a part of the Java Runtime Environment (JRE) which is used to load Java classes into the Java virtual Machine dynamically.
- **Byte Code verifier:-** It checks the code fragment for illegal code that can violate access right to object.

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- **JIT Compiler:-**

This is the final stage encounted by the Java Program and its Job is to Convert the loaded byteCode into machine Code. Cohen using a JIT Compiler, the hardware can execute the native Code.

Ex:→

```
class Hello
{
 public static void main(String args[])
  {
  System.out.println("Welcome to Java World");
  }
}
```

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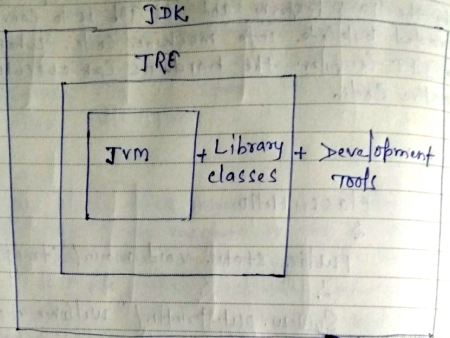
Explain JDK, JRE and JVM :→



JDK:- JDK stands for Java development kit. It is a s/w development environment used for developing Java applications and applets. It includes Java Runtime Environment (JRE), an interpreter/loader (Java), a compiler (javac), an archiver (jar), a documentation generator (Javadoc) and other tools needed in Java development.

JDK = JRE + Development Tool

OR

JDK = JVM + Library + Development Tool

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JRE:→ JRE stands for Java Runtime Environment. The JRE provides the minimum requirements for executing a Java application. # It consists of the Java virtual machine (JVM), core classes and supporting files. JRE is an installation package which provides environment to only run the Java program onto machine. JRE is only used by them who only wants to run the Java Program i.e. end user of our system.

JRE Consists of the following components:→

- deployment technologies:- including deployment, Java web start and Java plug-in.
- User interface toolkits:→ including Abstract window Toolkit (AWT), swing, Java 2D, Accessibility, imageIo, Print service etc.
- Integration libraries:→ including interface definition Language (IDL) Java database Connectivity (JDBC), Remote Method Invocation (RMI) etc.
- Other base libraries:→ including Networking, Override Mechanism, security, Math, Beans etc.

JRE = JVM + Library classes

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JVM:→ JVM stands for Java virtual machine. It is a very important part of both JDK and JRE because it is contained or inbuilt in both. Whatever Java Program run using JRE or JDK goes into JVM and JVM is responsible for executing the Java Program line by line hence it is also known as interpreter.

JVM acts as a runtime engine to run Java applications. JVM is the one that actually calls the main method present in a Java code. JVM is a part of JRE Java applications are called WORA (Write once Run Anywhere). This means a Programmer can develop Java code on one System and can expect it to run on any other Java enabled Systems without any adjustment. This is all possible because of JVM.

When we Compile a .Javafile, .class file (Contain byte-code) with the same class names present in .java file are generated by the Java Compiler. This .class file goes into various steps when we run it.

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