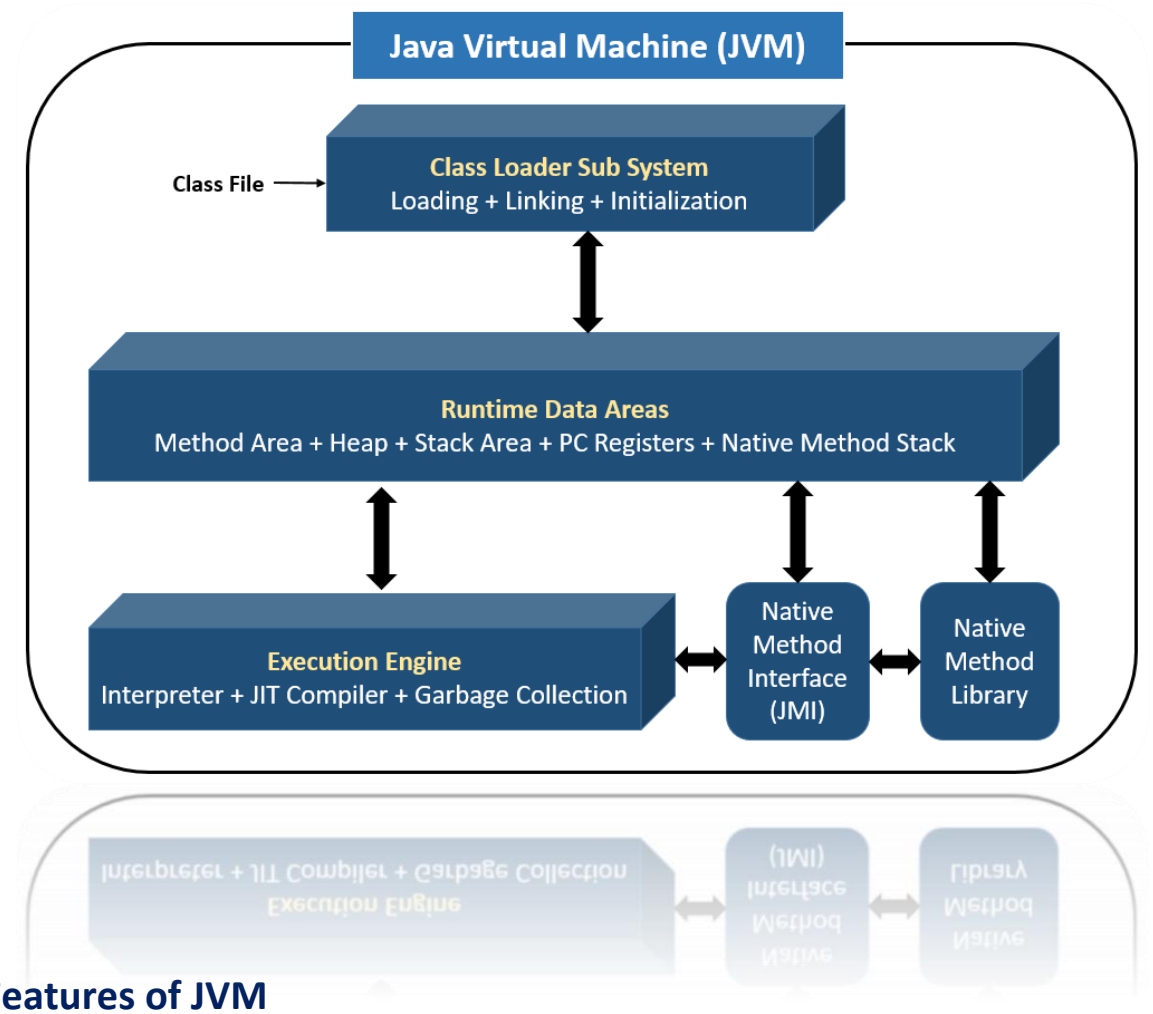
JAVA JDK,JVM ,JRE

JVM (Java Virtual Machine)

Java Virtual Machine (JVM) is an abstract machine responsible for compiling and executing Java code. It is a part of the Java Runtime Environment (JRE), which calls the main function of a program.

- JVM facilitates a platform-independent way of executing Java source code. Its basis on WORA (Write Once Run Anywhere).
- It has a class loader, runtime data area, execution engine, and libraries.
- JVM comes with JIT(Just-in-Time) compiler that converts Java source code into machine code.

First, the Java compiler compiles a Java file into a Java .class file. Then, the **.class** file works as an input into the JVM, which loads and executes the class file.



Features of JVM

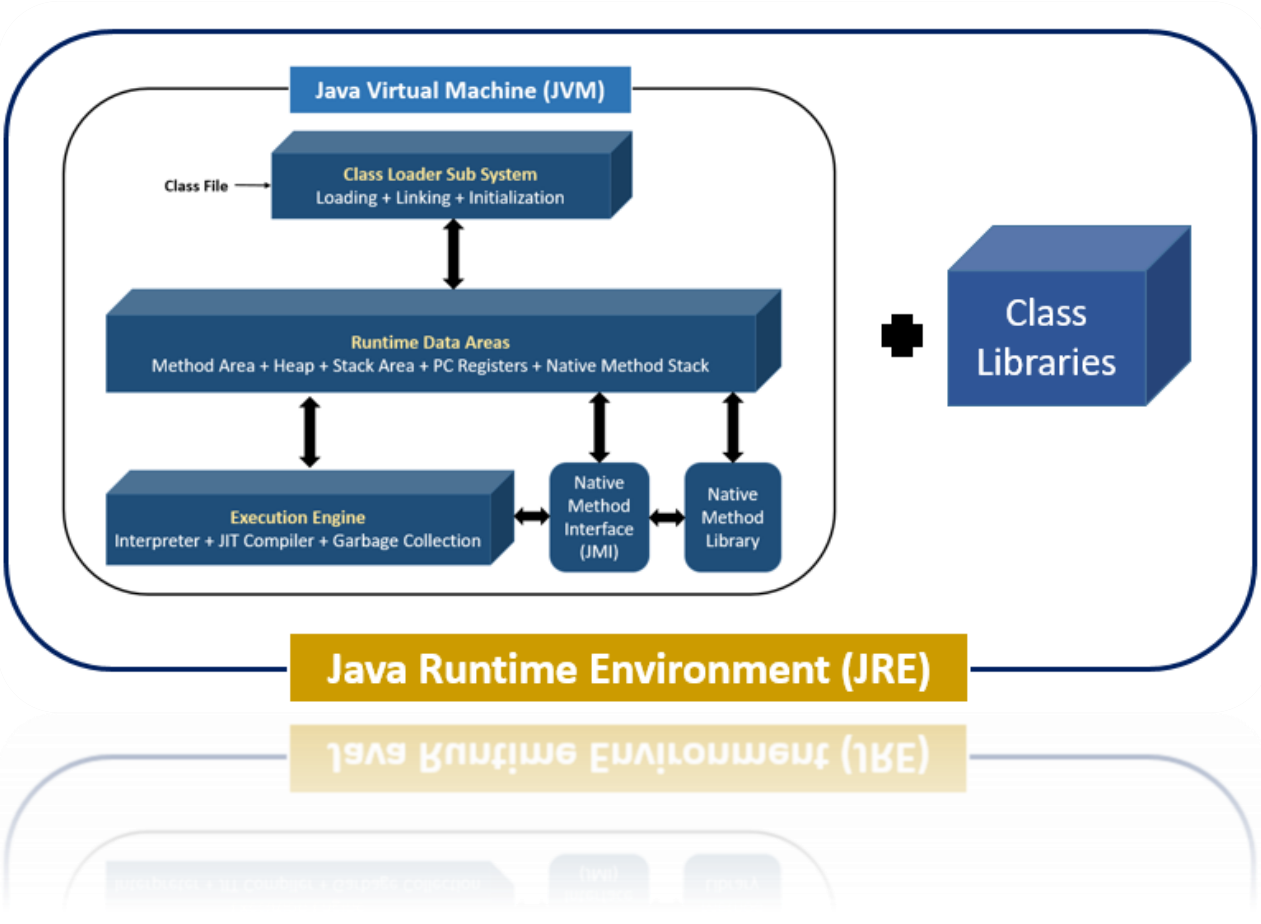
- It converts byte code to the machine language.
- JVM provides basic Java functions like memory management, security, garbage collection, etc.
- Runs the program by utilizing JRE's libraries and files.
- JVM is an integral part of JRE.
- It can execute the Java program line by line. Therefore, it is also known as an interpreter.
- The main functions of JVM include loading, linking, initializing, and compiling the program.
- Note: JVM can't be installed alone. As JVM is a part of JRE, you need to install JRE. JVM comes within it.

JRE(Java Runtime Environment)

JRE software includes JVM and class libraries to run Java programs independently. Although it can execute the code. Yet, JRE comes bundled with Java Development Kit (JDK) to provide a complete application development experience.

- The JRE includes class libraries along with JVM and its supporting files. Note: It does not include separate tools, such as a debugger for Java development.
- JRE comprises significant package classes such as util, math, AWT, lang, and various runtime libraries.

JRE = JVM + Class Libraries (For Running the Java Applications).



Features of JRE

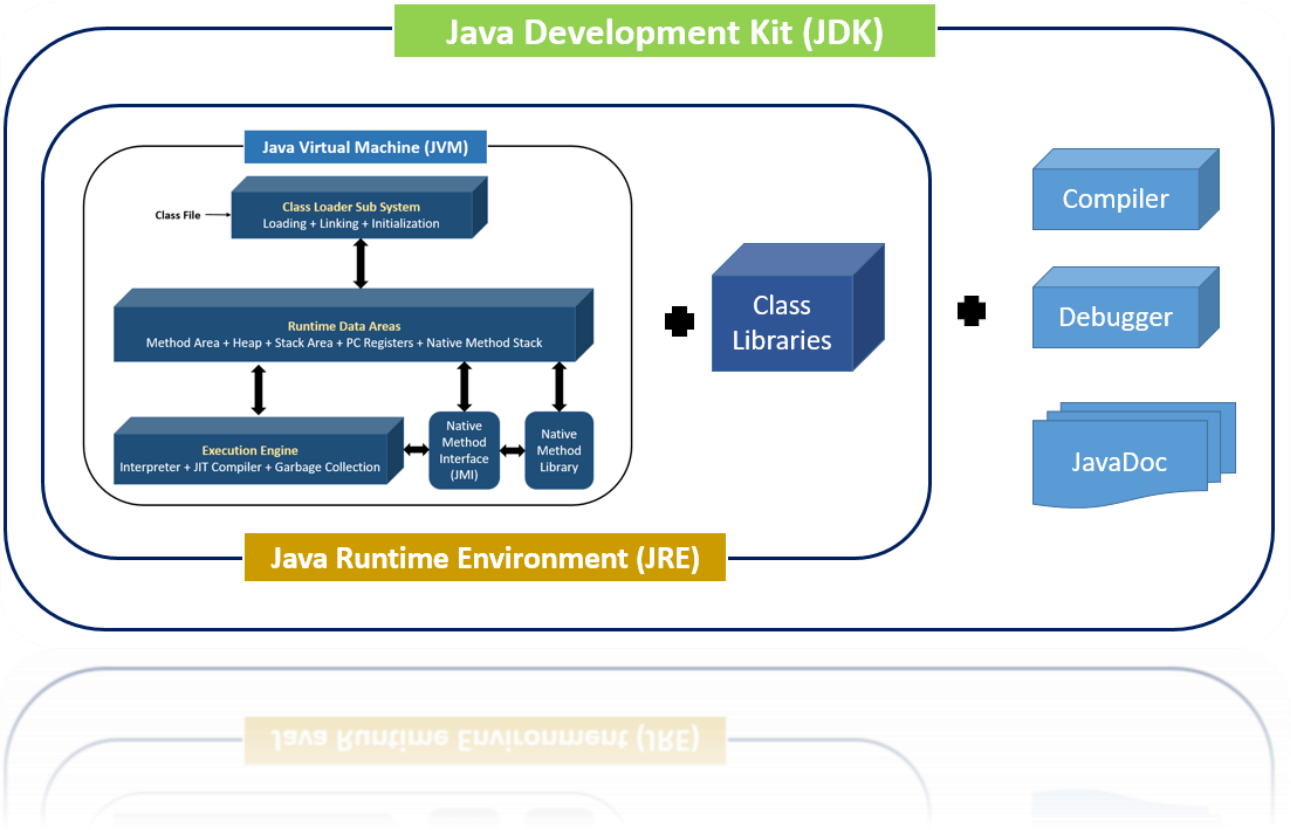
- JRE consists of a set of tools to help the JVM run. In addition, it includes a few deployment tools such as Java Plug-in and Java Web Start.
- A User can efficiently run a Java code with JRE only. However, JRE doesn't allow writing the program.
- JRE appends various integration libraries like the JDBC (Java Database Connectivity), JNDI (Java Naming and Directory Interface), RMI (Remote Method Invocation), etc.
- Along with JVM, it consists of a virtual machine client for Java HotSpot.

JDK(Java Development Kit)

Java Development Kit (JDK) is a complete software environment for building applications and applets using the Java programming language. It is platform-dependent. Therefore, it has different OS platform versions for Windows, Linux, Mac, etc. It allows reading, writing, and executing the Java program.

- Includes various tools required for writing Java programs.
- It includes an appletviewer, Java application launcher, debugger, compiler, etc.
- JDK also consists of JRE for executing Java programs.
- The Java application launcher helps in opening a JRE. Then, it loads the necessary details and executes the program's main method.

JDK = Development Tools + JRE (Java Runtime Environment)



Features of JDK

- JDK provides an environment for developing and executing the Java source code.
- It includes all the functionalities of JRE and JVM.
- JDK helps developers to handle the exceptions using multiple extensions in a single catch block.
- It has various other development tools like the debugger, compiler, etc.
- It is platform-dependent. Moreover, users can easily install JDK on Operating systems like Unix, Mac, Windows, etc.

Difference between JVM, JRE, and JDK

JDK	JRE	JVM
JDK stands for Java Development Kit.	JRE stands for Java Runtime Environment.	JVM stands for Java Virtual Machine.
It is a software development kit that helps in the development of applications in Java. Along with JRE, the JDK includes other various development tools.	It is a software package that provides Java class libraries with JVM. Moreover, it includes other components for running Java applications.	It is a platform-independent abstract machine with a loader, runtime data, and execution engine. It is also known as a Java interpreter.
JDK is platform-dependent. For each OS platform (Linux, Windows, Mac, etc.) users are required to install a different JDK.	JRE is also platform-dependent, like JDK.	Unlike JDK and JRE, JVM is platform-independent, which means users won't require different JVM for each OS platform.
It consists of various tools for debugging, monitoring, and developing Java applications.	It contains various supporting files for JVM and the class libraries that help JVM run the program.	JVM particularly does not consist of any tools for software development.
JDK is the superset of JRE.	JRE is the subset of JDK.	JVM is a subset of JRE.
JDK comes with the installer for OS.	JRE only contains an environment to execute source code.	JVM is bundled in both software, JDK and JRE.