

Introduction to Java programming

JAVA was developed by Sun Microsystems Inc in 1991, later acquired by Oracle Corporation. It was developed by James Gosling and Patrick Naughton. It is a simple programming language. Writing, compiling and debugging a program is easy in java. It helps to create modular programs and reusable code.

Java terminology

Before we start learning Java, let's get familiar with common java terms.

Java Virtual Machine (JVM)

This is generally referred as JVM. Before, we discuss about JVM let's see the phases of program execution. Phases are as follows: we write the program, then we compile the program and at last we run the program.

- 1) Writing of the program is of course done by java programmer like you and me.
- 2) Compilation of program is done by javac compiler, javac is the primary java compiler included in java development kit (JDK). It takes java program as input and generates java bytecode as output.
- 3) In third phase, JVM executes the bytecode generated by compiler. This is called program run phase.

So, now that we understood that the primary function of JVM is to execute the bytecode produced by compiler. **Each operating system has different JVM, however the output they produce after execution of bytecode is same across all operating systems.** That is why we call java as platform independent language.

bytecode

As discussed above, javac compiler of JDK compiles the java source code into bytecode so that it can be executed by JVM. The bytecode is saved in a .class file by compiler.

Java Development Kit(JDK)

While explaining JVM and bytecode, I have used the term JDK. Let's discuss about it. As the name suggests this is complete java development kit that includes JRE (Java Runtime

Environment), compilers and various tools like JavaDoc, Java debugger etc.

In order to create, compile and run Java program you would need JDK installed on your computer.

Java Runtime Environment(JRE)

JRE is a part of JDK which means that JDK includes JRE. When you have JRE installed on your system, you can run a java program however you won't be able to compile it. JRE includes JVM, browser plugins and applets support. When you only need to run a java program on your computer, you would only need JRE.

Main Features of JAVA

Java is a platform independent language

Compiler(javac) converts source code (.java file) to the byte code(.class file). As mentioned above, JVM executes the bytecode produced by compiler. This byte code can run on any platform such as Windows, Linux, Mac OS etc. Which means a program that is compiled on windows can run on Linux and vice-versa. Each operating system has different JVM, however the output they produce after execution of bytecode is same across all operating systems. That is why we call java as platform independent language.

Java is an Object Oriented language

Object oriented programming is a way of organizing programs as collection of objects, each of which represents an instance of a class.

4 main concepts of Object Oriented programming are:

1. Abstraction
2. Encapsulation
3. Inheritance
4. Polymorphism

Simple

Java is considered as one of simple language because it does not have complex features like Operator overloading, Multiple inheritance, pointers and Explicit memory allocation.

Robust Language

Robust means reliable. Java programming language is developed in a way that puts a lot of emphasis on early checking for possible errors, that's why java compiler is able to detect errors that are not easy to detect in other programming languages. The main features of java that makes it robust are garbage collection, Exception Handling and memory allocation.

Secure

We don't have pointers and we cannot access out of bound arrays (you get `ArrayIndexOutOfBoundsException` if you try to do so) in java. That's why several security flaws like stack corruption or buffer overflow is impossible to exploit in Java.

Java is distributed

Using java programming language we can create distributed applications. RMI(Remote Method Invocation) and EJB(Enterprise Java Beans) are used for creating distributed applications in java. In simple words: The java programs can be distributed on more than one systems that are connected to each other using internet connection. Objects on one JVM (java virtual machine) can execute procedures on a remote JVM.

Multithreading

Java supports multithreading. Multithreading is a Java feature that allows concurrent execution of two or more parts of a program for maximum utilisation of CPU.

Portable

As discussed above, java code that is written on one machine can run on another machine. The platform independent byte code can be carried to any platform for execution that makes java code portable.