Session 2

- Features of Java
- Compiler
- Interpreter
- Difference between Compiler and Interpreter
- Introduction to:-

* JDK(Java Development Kit)
*JRE(Java Runtime Environment)
* JVM(Java Virtual machine)
*JIT(Just-In-Time) Compiler

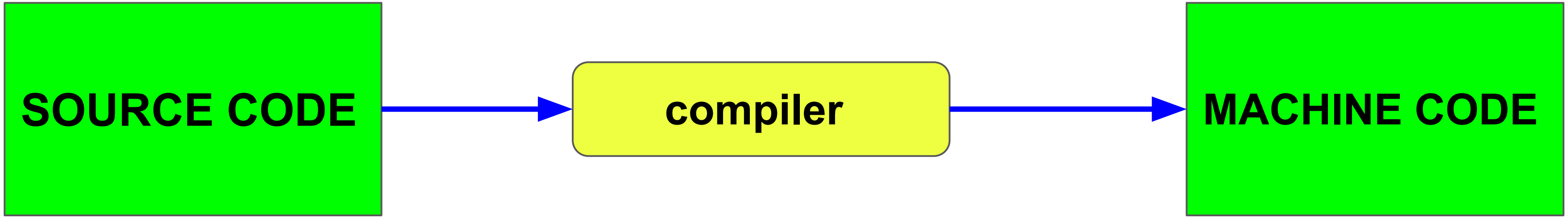
FEATURES OF JAVA

- ★ Simple:- Java is simple as it removes all the complexities such as pointers, operator overloading ,as we find it in C++ or any other language.
- ★ Portable:- Java is platform independent which means that any application written on one platform can easily ported to another platform.
- ★ Object-Oriented:- Everything is considered to be an object which has some properties and behaviour and all the operations are performed using these objects.
- ★ Dynamic:- It has an ability to adapt to an evolving environment which supports dynamic memory allocation due to which memory wastage is reduced and performance of the application is increased.
- ★ Robust:- Java has a strong memory management system.It helps in eliminating errors as it checks the code during compile time as well as runtime.
- ★ Platform Independent:-Java provides platform independence which leads to a facility of portability. Being platform-independent means a program compiled on one machine can be executed on any machine in the world without any change. Java achieves platform independence by using the concept of the BYTE code.The Java compiler never converts the source code to machine code like that of the C/C++ compiler.Instead, it converts the source code into an intermediate code called the byte code and this byte code is further translated to machine-dependent form by another layer of software called JVM (Java Virtual Machine).

- ★ Secure:-Java also provides security features to the programmers. Security problems like virus threat, tampering, eavesdropping, impersonation can be handled or minimized using Java. Encryption and Decryption features to secure the data .
- ★ Compiled & Interpreted:-Java programming language uses both a compiler and interpreter. Java programs are compiled to generate bytecode files then JVM interprets the bytecode file during execution. Along with this JVM also uses a JIT compiler (it increases the speed of execution).
- ★ Multithreaded:-Thread is a lightweight and independent subprocess of a running program that shares resources and when multiple threads run simultaneously is called Multi-threading. In many applications, multiple tasks run simultaneously, For example, Google Docs where while typing text, the spell check and autocorrect task are runs simultaneously.
- ★ Distributed: Java employs a distributed language system that allows you to securely move and access code between different machines. This makes Java fully compatible with any programming environment. It also simultaneously enables it to support high bandwidth requirements, reduce latency, and increase output.

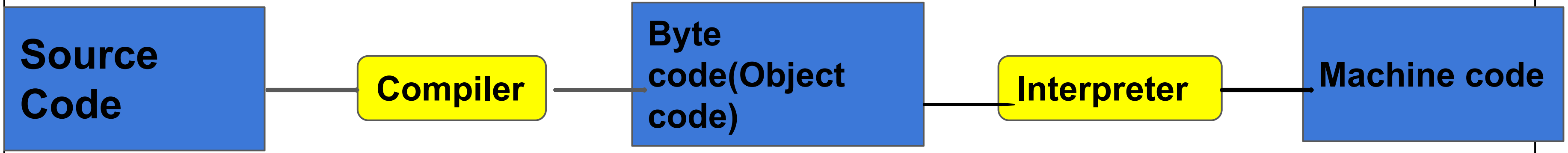
Compiler

- It is a computer program that transforms code written in high level programming language into the machine code.
- It is a program which translate the human readable code to a language a computer processor understands.(binary 0’s and 1’s).



Interpreter

- It is a computer program that implements the JVM.it is responsible for reading and executing the program.
- It is designed in such a way that it can read the code and translate it instruction by instruction.



Source Code

Compiler

Byte code(Object code)

Interpreter

Machine code

(ref. To Java)

Difference between Compiler and Interpreter

COMPILER

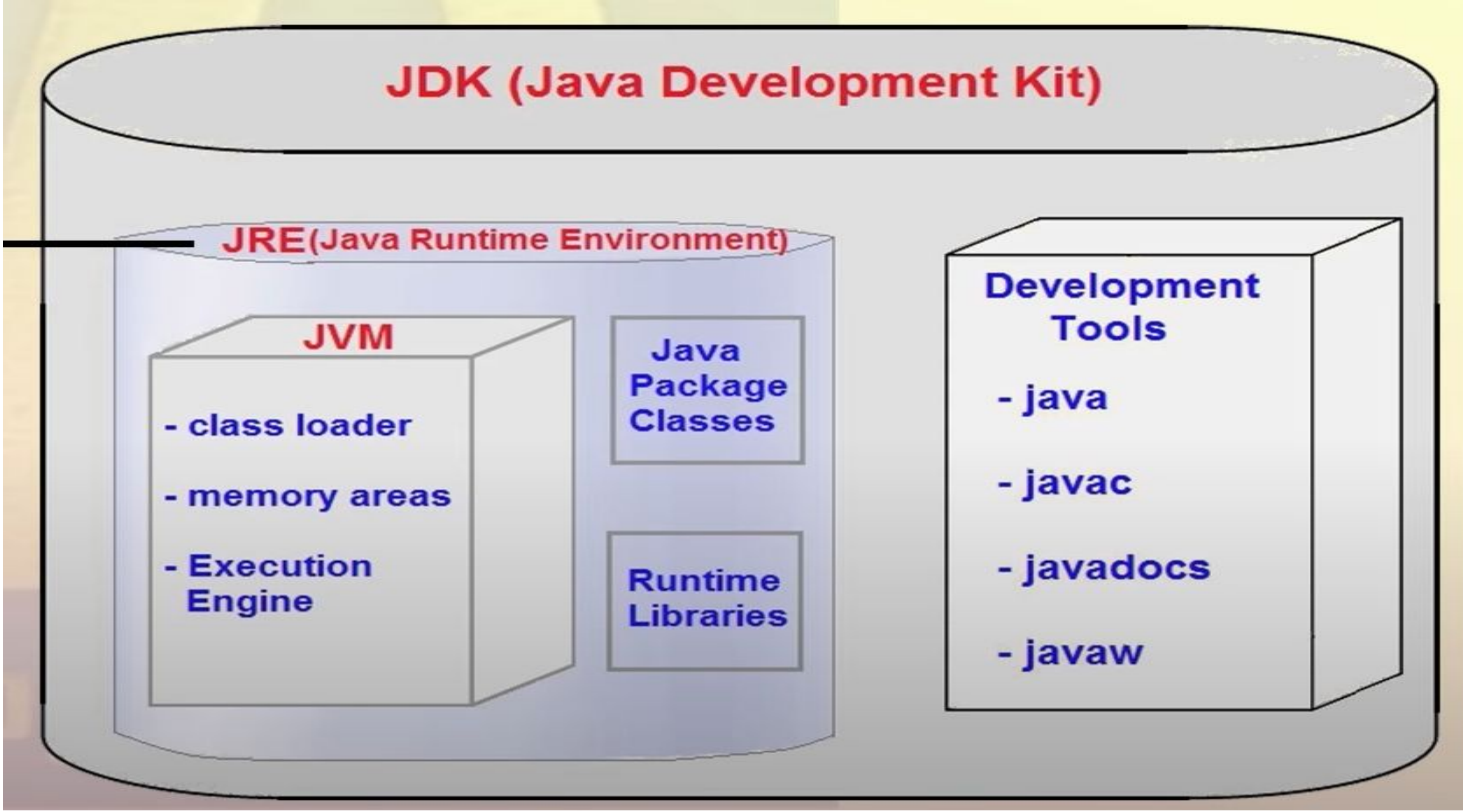
- Translate the entire program at once
- Execution is fast
- Takes more time to compile the code
- Generates the intermediate object code
- All the errors are shown once at the end of the compilation.

eg:--Java , C,C++

INTERPRTER

- Translate the code instruction by instruction
- Execution is slow
- Takes less time
- Does not generates the intermediate object code
- It interprets the program until an error is found

eg:- Python, PHP, Ruby,Pearl



JDK (Java Development Kit)

JRE(Java Runtime Environment)

JVM

- class loader
- memory areas
- Execution Engine

Java Package Classes

Runtime Libraries

Development Tools

- java
- javac
- javadocs
- javaw

Let’s understand with the structure

- ➢ The outer part is called JDK.
- ➢ Inside JDK there are some development tools.
  - java
  - javac
  - javadoc
  - javaw
- ➢ In JDK comes JRE, so we can say

  JDK=JRE+development tool

- ➢ In JRE comes
  - Java Package classes
  - Runtime Libraries
- ➢ In JRE one more important part comes that is JVM. So we can say

  JRE=Java Package classes+Runtime libraries+JVM

- In JVM there are 3 modules
- Class loader
- Memory area
- Execution engine

So, In JDK->JRE exists and in JRE->JVM exists

Main work of JDK,JVM and JRE

JDK

JDK is a key platform component for building Java applications. JDK allows the developers to create Java programs that can be executed and run by JVM and JRE. It is a Kit or package that include

- Development tools
- JRE

JRE

It is an installation package that provides an environment to only run(not to create) the java programs or application onto your machine.It include:-

- Java Package classes
- Runtime libraries
- JVM

JVM

It is the machine which will verify the byte code and execute on any platform.

When you run the java program, java compiler compiles the java code to an intermediate language ,ie, byte code. This file is known as classfile with the extension .class.

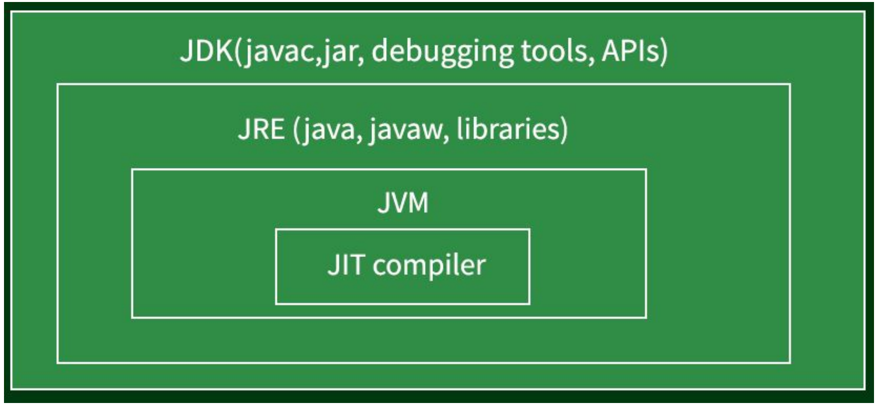
Once the class file is ready it can be executed in any machine which has JVM in it. This makes the Java platform independent.

Note:- Java is a platform independent language but JVM is platform dependent. We cannot execute the class file in those system which does not contain JVM.

JIT

The Just-In-Time (JIT) compiler is an essential part of the JRE i.e. Java Runtime Environment. The JIT compiler helps improve the performance of Java programs by compiling bytecodes into native machine code at run time. The JIT compiler is enabled by default.

When we write a program in any programming language it requires converting that code in the machine-understandable form because the machine only understands the binary language. The compiler is a computer program that converts the high-level language to machine level code. The Java programming language uses the compiler named 'javac'. It converts the high-level language code into bytecode. JIT is a part of the JVM that optimizes the performance of the application.The JIT compilation is also known as dynamic compilation.



JDK(javac,jar, debugging tools, APIs)
JRE (java, javaw, libraries)
JVM
JIT compiler