JAVA ARCHITECTURE

What is Java?

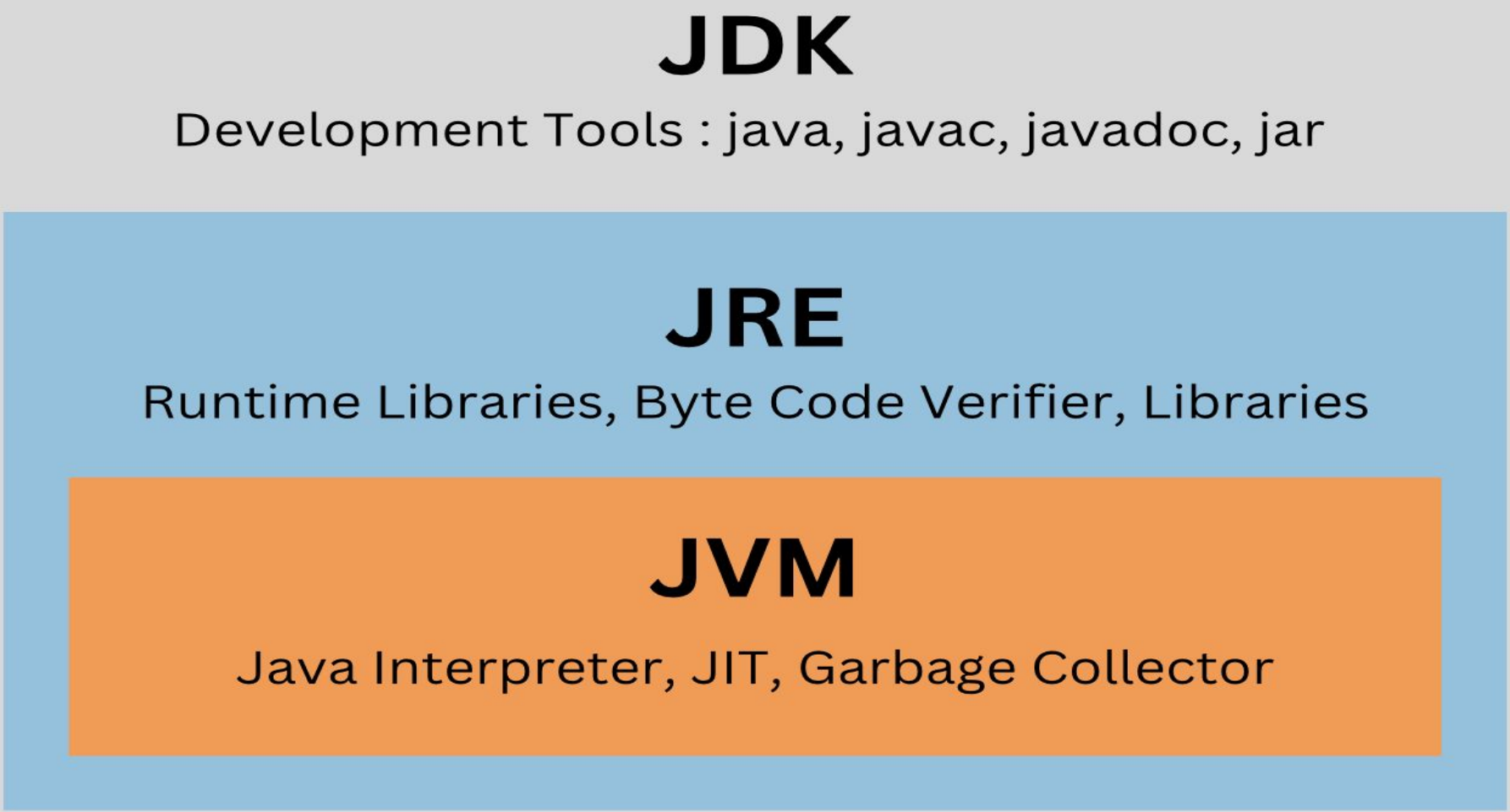
High-level, class-based, object-oriented programming language.

Characteristics of Java

- **Platform-independent**: Runs on JVM, making it cross-platform.
- **Object-oriented**: Focus on objects rather than functions.
- **Robust and secure**: Features like garbage collection and exception handling.
- **Multithreaded and high performance**: Supports concurrent threads.

Components of Java Architecture

- JVM
- JRE
- JDK


JDK
Development Tools : java, javac, javadoc, jar
JRE
Runtime Libraries, Byte Code Verifier, Libraries
JVM
Java Interpreter, JIT, Garbage Collector

JAVA VIRTUAL MACHINE

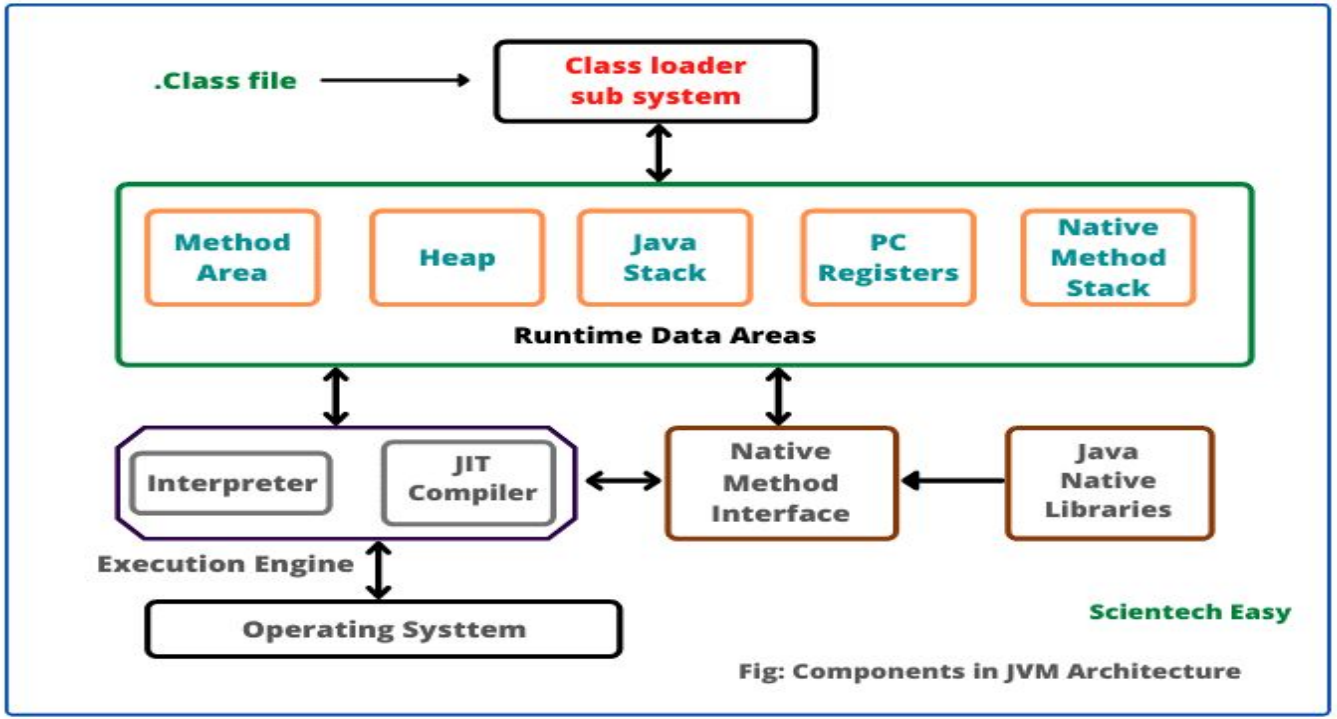


Fig: Components in JVM Architecture

Java Runtime Environment

The JRE software builds a runtime environment in which Java programs can be executed. The JRE is the on-disk system that takes your Java code, combines it with the needed libraries, and starts the JVM to execute it.

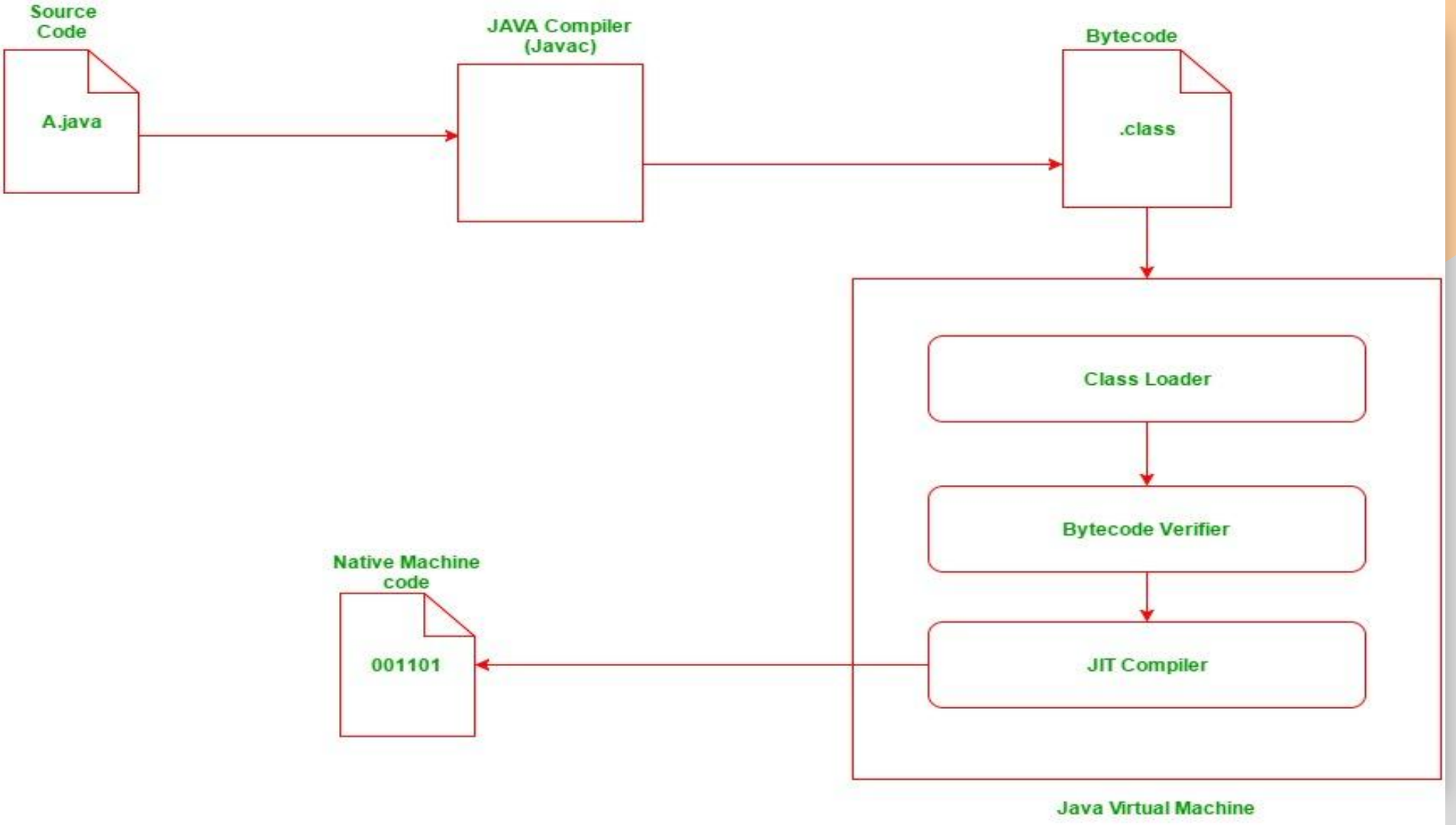
Java Development Kit

The Java Development Kit (JDK) is a software development environment used to develop Java applications and applets. It contains JRE and several development tools, an interpreter/loader (java), a compiler (javac), an archiver (jar), a documentation generator (javadoc) accompanied with another tool.

- **java** : It is the launcher for all the java applications.
- **javac** : Compiler of the java programming languages.
- **javadoc**: It is the API documentation generator.
- **jar**: Creates and manage all the JAR files.

Two Step Execution:

1. Compilation (through OS independent Compiler)
2. Execution(through JVM)


Source Code
A.java
JAVA Compiler (Javac)
Bytecode
.class
Class Loader
Bytecode Verifier
JIT Compiler
Native Machine code
001101
Java Virtual Machine

1.Compilation

First, the source ‘.java’ file is passed through the compiler, which then encodes the source code into a machine-independent encoding, known as **Bytecode**. The content of each class contained in the source file is stored in a separate **‘.class’ file.**

2.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 .** It has 3 stages:

1. ClassLoader
2. Bytecode Verifier
3. Just-In-Time Compiler

Object Oriented Programming

Object-Oriented Programming or OOPs refers to languages that use objects in programming. Object-oriented programming aims to implement real-world entities like inheritance, hiding, polymorphism, etc in programming.

Class:

A class is a user-defined data type. It consists of data members and member functions, which can be accessed and used by creating an instance of that class

Object:

It is a basic unit of Object-Oriented Programming and represents the real-life entities. An Object is an instance of a Class. When a class is defined, no memory is allocated but when it is instantiated (i.e. an object is created) memory is allocated.

Advantages of Using Java

- **Cross-Platform**: Versatile on different systems.
- **Large Community Support**: Strong community with abundant resources.
- **Scalability**: Suitable for small and large applications.
- **Versatility**: Used for desktop, web, enterprise, and mobile applications.

THANK YOU