MODULE 1: PROGRAMMING IN JAVA

Week 2

Most Essential Learning Competencies: *At the end of the course, you must be able to:*

1. Describe the key features of Java technology Write, compile, and run a simple Java technology application
2. Define the function of the Java Virtual Machine (JVM™) and Garbage Collection
3. List the three tasks performed by the Java platform that handle code security

Reading Activity

What is the Java™ Technology?

Java technology is:

- A programming language
- A development environment
- An application environment
- A deployment environment
- It is similar in syntax to C++
- It is used for developing both applets and applications

Primary Goals of the Java Technology

Provides an easy-to-use language by:

- Avoiding many pitfalls of other languages
- Being object-oriented
- Enabling users to create streamlined and clear code

Provides an interpreted environment for:

- Improved speed of development
- Code portability
- Enables users to run more than one thread of activity

• Loads classes dynamically; that is, at the time they are needed

• Supports changing programs dynamically during runtime by loading classes from disparate sources

• Furnishes better security

The following features fulfill these goals:

- The Java Virtual Machine (JVM™)
- Garbage collection
- The Java Runtime Environment (JRE)
- JVM tool interface

The Java Virtual Machine

- Instruction set (central processing unit [CPU])
- Register set
- Class file format
- Stack
- Garbage-collected heap
- Memory area
- Fatal error reporting
- High-precision timing support
- The majority of type checking is done when the code is compiled
- Implementation of the JVM approved by Sun Microsystems must be able to run any compliant class file.
- The JVM executes on multiple operating environments.

Garbage Collection

• Allocated memory that is no longer needed should be deallocated.

• In other languages, deallocation is the programmer's responsibility.

• The Java programming language provides a system-level thread to track memory allocation.

• Garbage collection has the following characteristics:

- Checks for and frees memory no longer needed
- Is done automatically
- Can vary dramatically across JVM implementations

The Java Runtime Environment

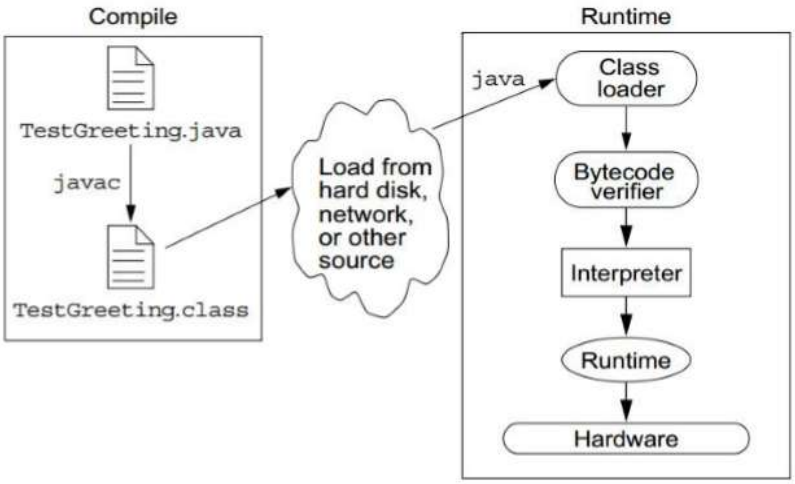

Figure 2.1 Java Application Environment

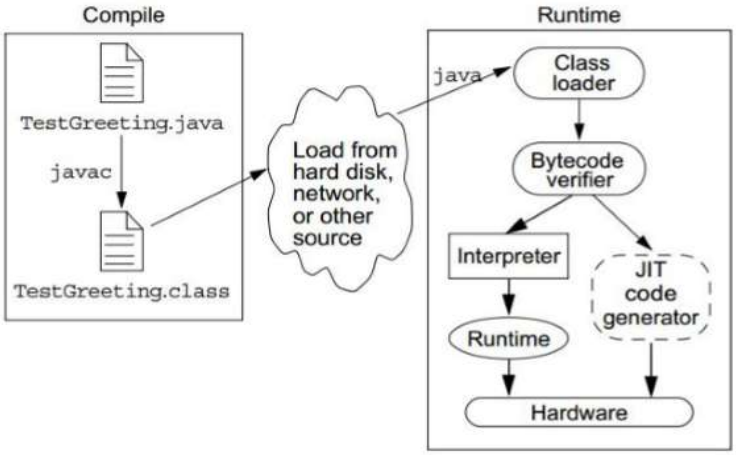

Figure 2.2 Operation of JRE with a Just-In-Time (JIT) Compiler

JVM™ Tasks

The JVM performs three main tasks:

- Loads code
- Verifies code
- Executes code

The Class Loader

- Loads all classes necessary for the execution of a program
- Maintains classes of the local file system in separate namespaces
- Prevents spoofing

The Bytecode Verifier Ensures that:

- The code adheres to the JVM specification.
- The code does not violate system integrity.
- The code causes no operand stack overflows or underflows.
- The parameter types for all operational code are correct.
- No illegal data conversions (the conversion of integers to pointers) have occurred.

The Structure of TestGreeting.java

The Greeting.java Class

```
public class Greeting {

public void greet() {

System.out.println(“hi”);

}

}
```

The TestGreeting Application

- Comment lines
- Class declaration
- The main method
- Method body

The Greeting Class

- Class declaration
- The greet method

Compiling and Running the TestGreeting Program

- Compile TestGreeting.java:

  javac TestGreeting.java

- The Greeting.java is compiled automatically.
- Run the application by using the following command:

  java TestGreeting

- Locate common compile and runtime errors.

Compile-Time Errors

- javac: Command not found
- Greeting.java:4: cannot resolve symbol symbol :

method printl (java.lang.String) location:

class java.io.PrintStream System.out.printl("hi");

^

- TestGreet.java:4: Public class TestGreeting must be defined in a file called "TestGreeting.java".

Runtime Errors

- Can't find class TestGreeting
- Exception in thread "main"

java.lang.NoSuchMethodError: main

Watch Video Resources

1. **History of the Java Programming Language**
   https://youtu.be/tnkDNAwNjKI
2. **Simple Java Application using Netbeans**
   https://youtu.be/I2wvhRUVNTM
3. **Syntax, Logic, Runtime errors in Java**
   https://youtu.be/Ou74ZhrG2mM
4. **Understanding compile time vs runtime errors**
   https://youtu.be/CGcGerGHa0k

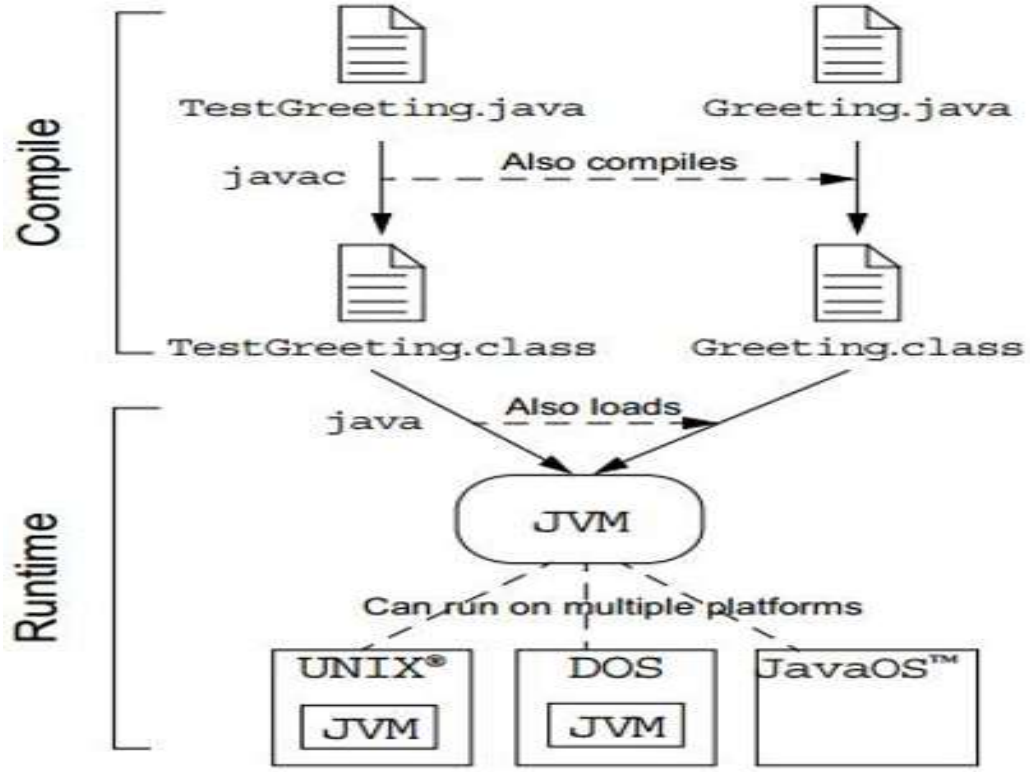

Figure 2.3 Java Technology Runtime Environment

Self-Check

Quiz 2.1

Instructions: *Write your answer on the Answer Sheet (AS) provided in this module.*

A. Definition/Enumeration. (2-points each)

1. Enumerate the Primary Goals of the Java Technology.
2. Enumerate the Java Virtual Machine.
3. Enumerate the Garbage Collection.
4. Enumerate the Main Tasks of JVM.
5. Enumerate the Class Loader.

Insights

Insights 2.1

Instructions: *Write your thought on the Insight Sheet (IS) provided in this module.*

We wanted to know how deep your understandings about the topics presented in the module. Your answer will be graded accordingly using the prescribed rubrics. In your own words (at least 200 words):

1. The difference between Compile time and Runtime errors.
2. The importance of Java Technology in the industrial revolution.

Internet References

1. https://www.youtube.com/
2. https://www.youtube.com/user/discospiff/about
3. https://www.youtube.com/channel/UCHJxTc5MKaB0ivakoxEcEYQ
4. Phoenix Publishing House Inc.