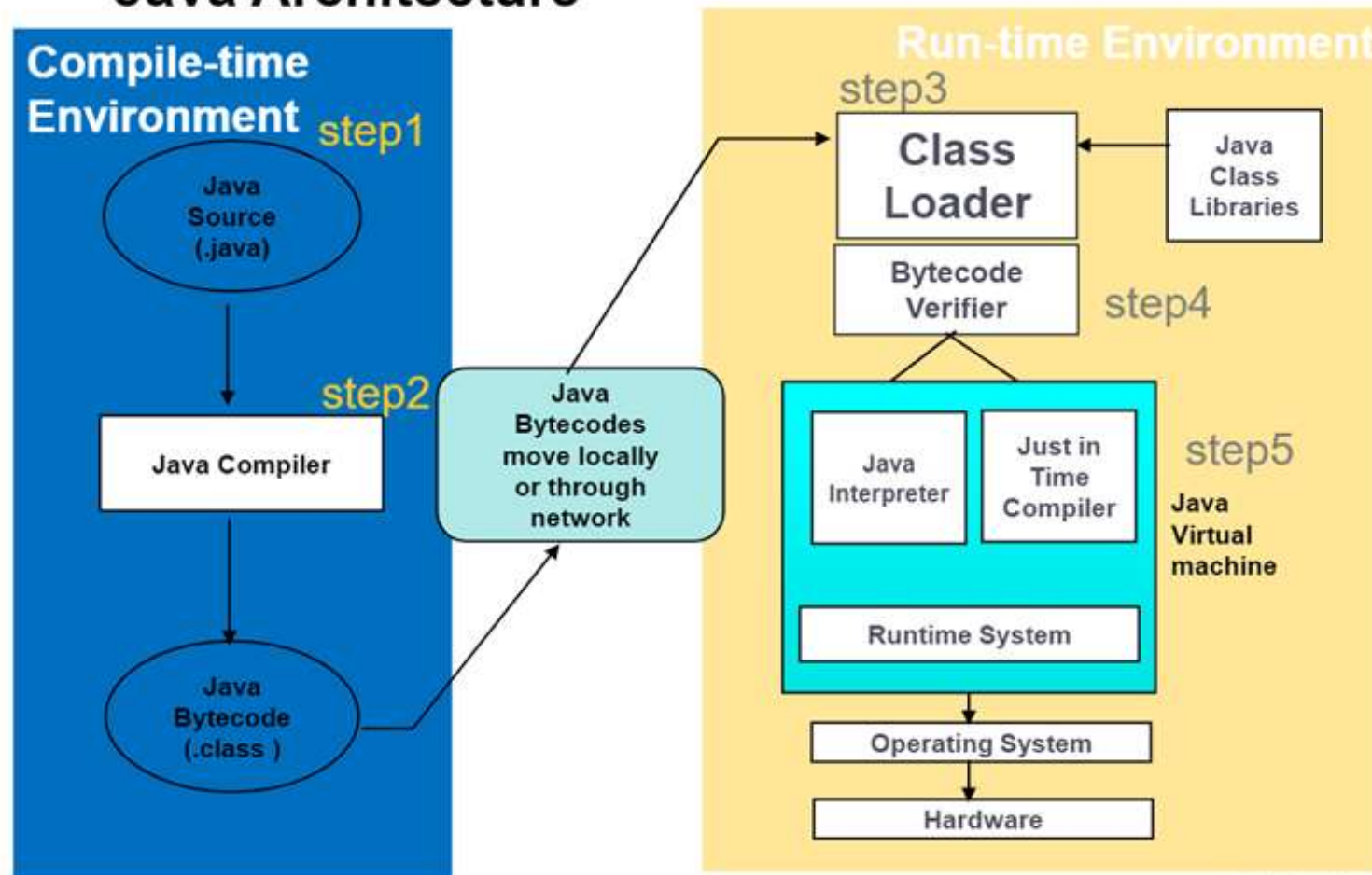COCSIT

ESTED 1982

JAVA
ARCHITECTURE

Java Architecture

wipro

Java Architecture

Java Architecture (Contd.).

Step1:

Create a java source code with .java extension

Step2:

Compile the source code using java compiler, which will create bytecode file with .class extension

Step3:

Class loader reads both the user defined and library classes into the memory for execution

Java Architecture (Contd.).

Step4:

Bytecode verifier validates all the bytecodes are valid and do not violate Java's security restrictions

Step5:

JVM reads bytecodes and translates into machine code for execution. While execution of the program the code will interact to the operating system and hardware

The 5 phases of Java Programs

Java programs can typically be developed in five stages:

1. Edit

   Use an editor to type Java program (**Welcome.java**)

2. Compile

   - Use a compiler to translate Java program into an intermediate language called bytecodes, understood by Java interpreter (**javac Welcome.java**)

   - Use a compiler to create **.class** file, containing bytecodes (**Welcome.class**)

3. Loading

   Use a class loader to read bytecodes from **.class** file into memory

The 5 phases of Java Programs (Contd.).

4. Verify

   Use a Bytecode verifier to make sure bytecodes are valid and do not violate security restrictions
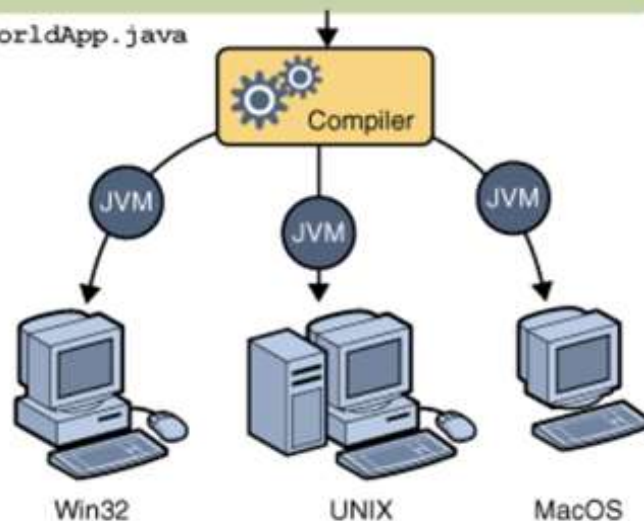
5. Execute

   - Java Virtual Machine (JVM) uses a combination of interpretation and just-in-time compilation to translate bytecodes into machine language

   - Applications are run on user's machine, i.e. executed by interpreter with java command (java Welcome)

Java Virtual Machine

Java Program

```
class HelloWorldApp {
    public static void main(String[] args) {
        System.out.println("Hello World!");
    }
}
```

HelloWorldApp.java

Compiler

JVM   JVM   JVM

Win32   UNIX   MacOS

- The output of the compiler is bytecode

- The bytecodes are executed by JVM

- It is an interpreter which converts the byte code to machine specific instructions and executes

- JVM is platform specific

The Java Architecture – The JVM (Contd.).

- Most modern languages are designed to be compiled

- Compilation is a one-time exercise and executes faster

- Execution of compiled code over the Internet an impossibility

- Executable code always generated to a CPU-OS combination

- Interpreting a Java program into byte code facilitates its execution in a wide variety of environments

The Java Architecture – The JVM (Contd.).

- Only the Java Virtual Machine (JVM) needs to be implemented for each platform

- Once the Java runtime package exists for a given system, any Java program can run on it

- The JVM will differ from platform to platform, and is, platform-specific

- All versions of JVM interprets the Java byte codes.

The Java Architecture – The JVM (Contd.).

- Interpreted code runs much slower compared to executable code

- The use of bytecode enables the Java runtime system to execute programs much faster

- Java facilitates on-the-fly compilation of bytecode into native code

The Java Architecture - The Class Loader

- The class loader is that part of the VM that is important from:
    - A security standpoint
    - Network mobility

- The class loader loads a compiled Java source file (**.class** files represented as bytecode) into the Java Virtual Machine (JVM)

- The bootstrap class loader is responsible for loading the classes, programmer defined classes as well as Java's API classes

The Java Architecture - The Java .class file

- The Java class file is designed for
    - platform independence
    - network mobility

- The class file is compiled to a target JVM, but independent of underlying host platforms

- **The Java class file is a binary file** that has the capability to run on any platform

Quiz

1. Write the correct order of the Java program execution.

A. Class Loader

B. Interpretation

C. Compilation

D. Byte Code Verification

E. Java Source Code

F. Execution

2. Which of the following is used to load a .class file?

A. Class Loader

B. Byte Code Verifier

C. JIT Compiler

D. Interpreter

Quiz(Contd.).

3. **When a java program is compiled, it creates a**

A. an obj file

B. an exe file

C. a .class file

D. a .sh file

4. **The JDK is a superset of the JRE, and contains everything that is in the JRE, plus tools such as the compilers and debuggers necessary for developing applets and applications.**

A. TRUE

B. FALSE