CSN-103: Fundamentals of Object Oriented Programming

The Creation of Java

- Idea was proposed by James Gosling, Patrick Naughton, Chris Warth, Ed Frank, and Mike Sheridan at **Sun Microsystems Inc.** in 1991
- Initially called “Oak”, later renamed “Java” in 1995
- **Primary Motivation:**
  - The need for a platform-independent language
  - Embedded software for consumer electronic devices

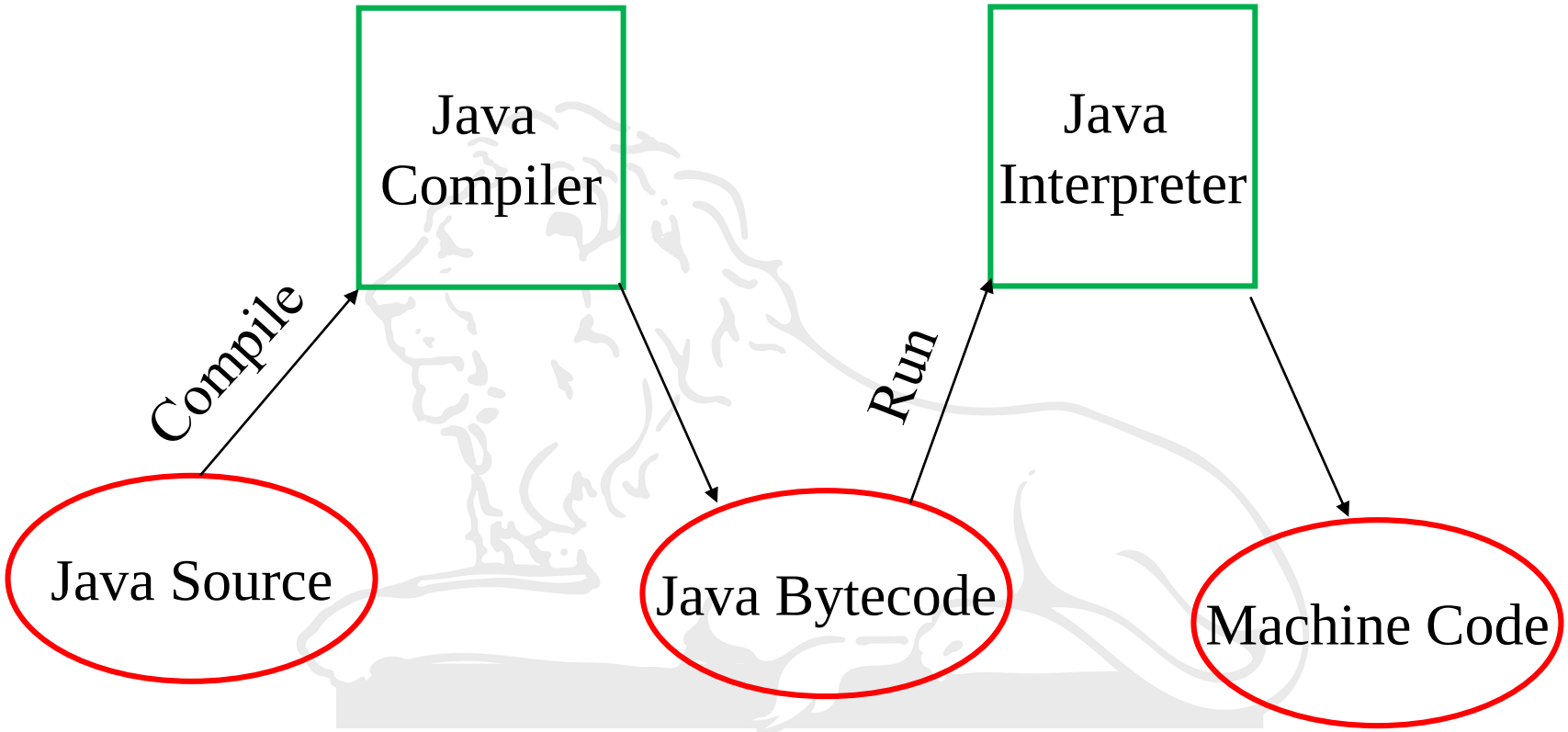
Java Bytecode

- Output of a Java compiler is not an executable code but it is a ***Bytecode***
- Bytecode is executed by Java Virtual Machine- JVM (Java Runtime System)
- JVM is the interpreter for Bytecode → Convert into machine code for execution

Java Bytecode

- Bytecode makes it much easier to execute a program in wide variety of environments: **Portable**
- Only JVM needs to be implemented for each platform
- Details of JVM will differ from platform to platform
- Performance issue: Slower

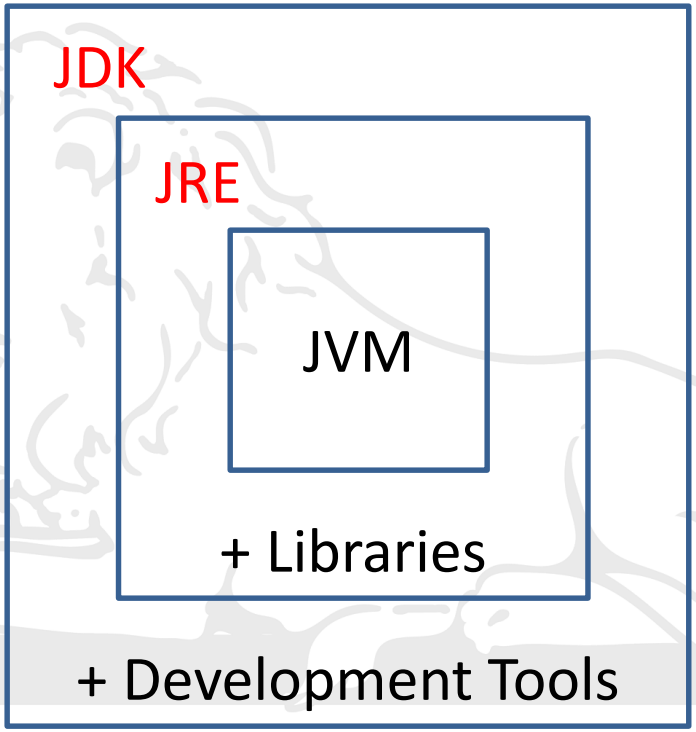
Compiling and Running Java Program



JVM vs. JRE vs. JDK

- **JVM – Java Virtual machine(JVM)**
  - JVM is responsible for executing the java bytecode line by line hence it is also known as interpreter
  - JVM allows Java to be a "portable language" (*write once, run anywhere*)
- **JRE – Java Runtime Environment**
  - Provides environment to only run (not develop) the java program onto your machine.
  - JRE includes JVM and libraries (**standard** programs and subroutines)
  - JRE is only used by them who only want to run the Java Programs i.e. end users of your system
- **JDK – Java Development Kit**
  - 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 programs and applications
  - Note : JDK is meant for Java Developers

JVM vs. JRE vs. JDK



Java Prerequisites

- You (as a Programmer) must have:
  - A text editor
  - The Java Development Kit (JDK)
    - Includes the Java Compiler and JVM

Setting Up Java

1. Download Java (JDK)
2. Install Java (JDK)
3. Update Path environmental variable
4. Verify Installation

Downloading Java

- Downloading and installing Java is easy and free. There are a couple ways by which you can get Java
  - Online download
  - Offline download

- It can be downloaded here for different platforms:
  - https://www.oracle.com/technetwork/java/javase/downloads/index.html
    - Accept License Agreement
    - Select OS

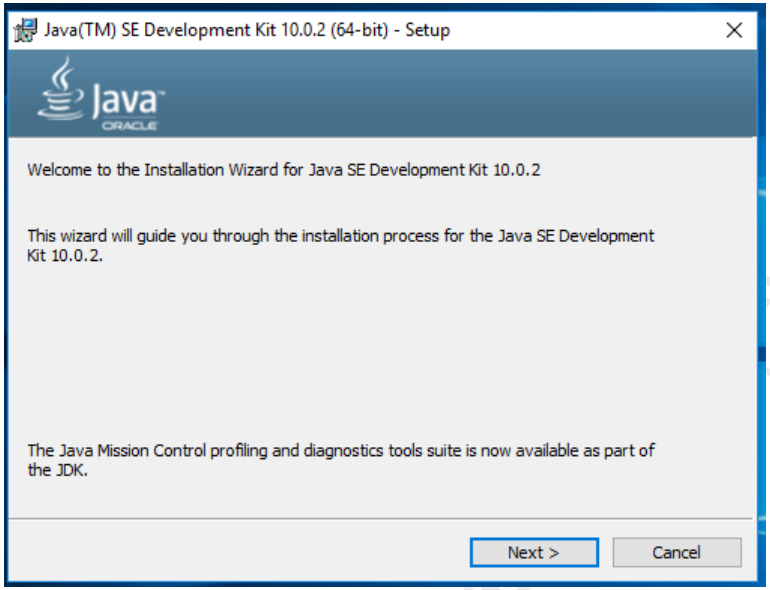
OR

  - Click or the following link

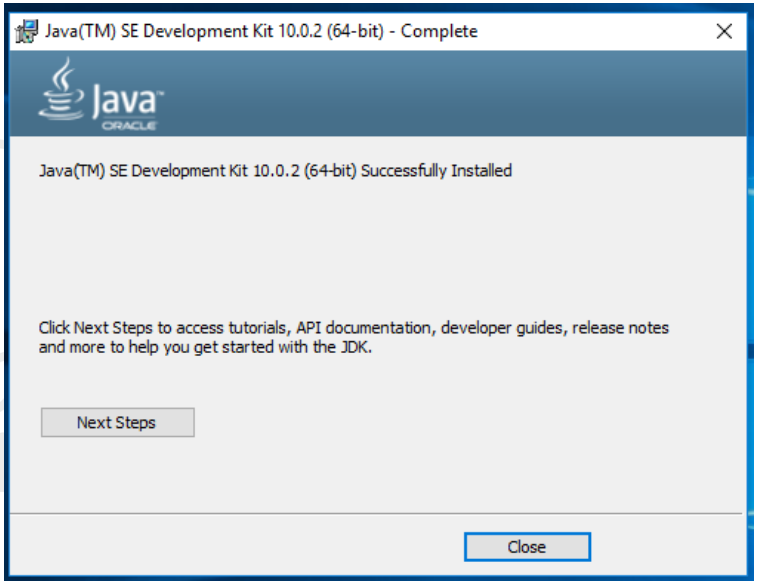
https://drive.google.com/file/d/1xIic4BmfJNd_ps4As0CKaCVeyNoWL3U4/view?usp=sharing

Installing Java (Windows)

- Once the file is downloaded successfully, double-click on the saved file to start the installation process
- Click the **Next** button to continue with the installation

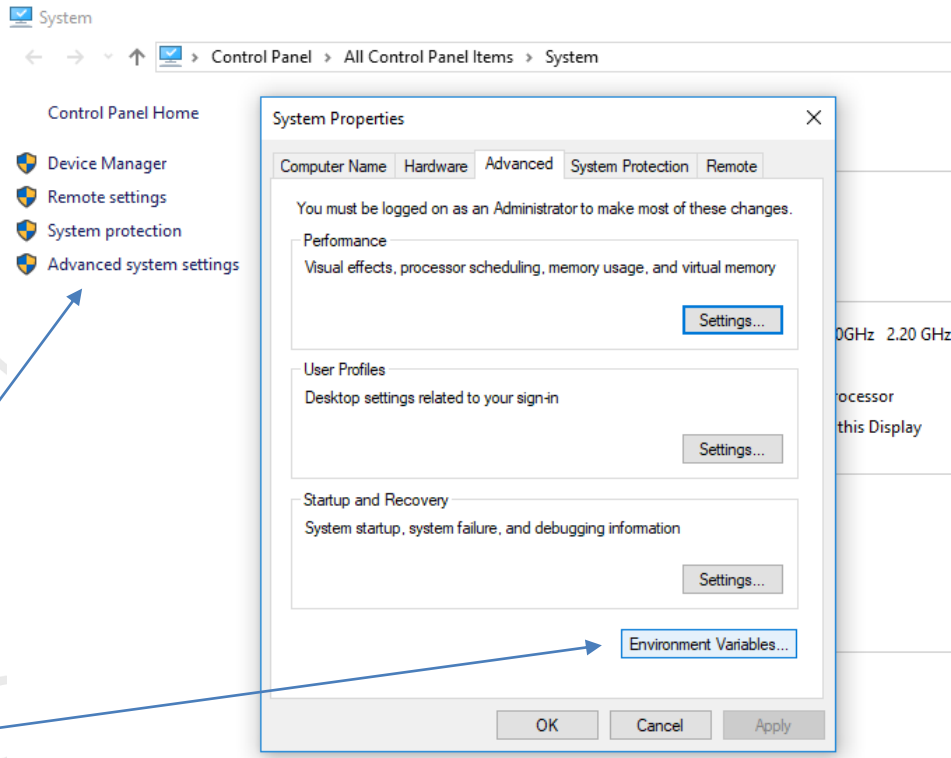


- Click on Close button to finish the installation



Set the Path (Windows)

- The **Path** environmental variable should be updated to include path to bin directory
- Right Click **My Computer** (or This PC) → Select Properties
- Select **Advanced System Settings**
- In **Advanced** tab → Select **Environment Variables**



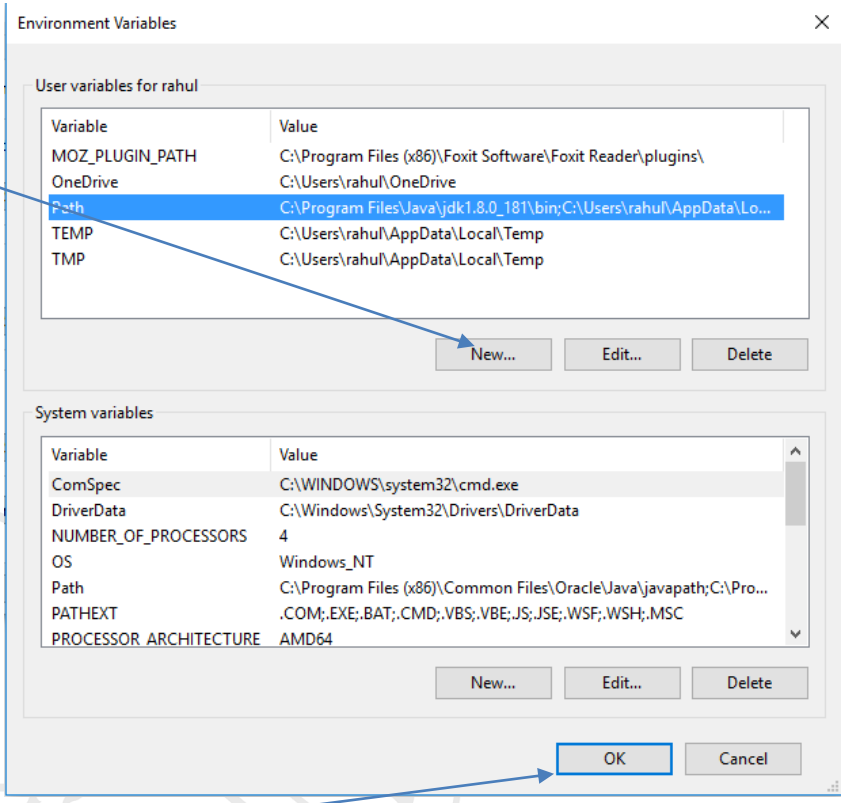
Set the Path (Windows)

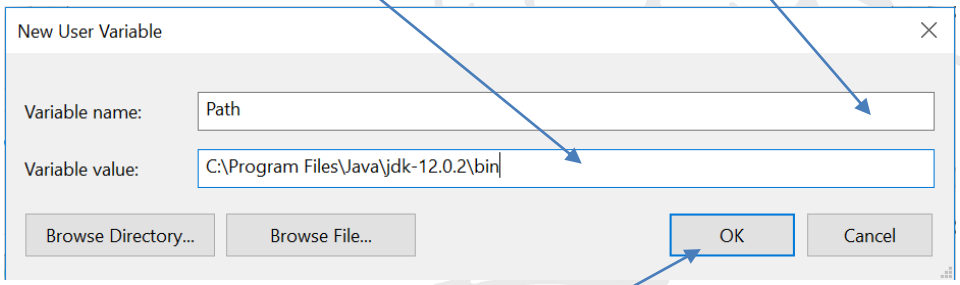
- Click on **New** button
- Set the following entries

  Variable name: Path

  Variable Value:

  C:\Program Files\Java\jdk-12.0.2\bin





- Press **OK** button and you are done

Verify Java

- Go to command prompt/terminal and type **javac**

- It should display **javac** usage with options if installed correctly

A Simple Java Program

```
class Example
{
        public static void main(String args[])
        {
                System.out.println("This is a simple Java program");
        }
                /* This is a comment
                The comment contains multiple lines */
}
```

Things to remember

- The name of the source file is very important.
  - In previous example, the name of the file will be **Example.java**
- The name of the class should match the name of file that holds the program.
- For Java compiler, source file must have **.java** extension.
- In Java, all code must reside inside a class
- Java is a case-sensitive programming language.

Compiling the Program

- **Change the Current Working Directory**
  - Using cd (change directory command)
  - Locate where you have saved your program
- Execute the java compiler (**javac**)
  - C:\>javac Example.java
- Javac compiler will create **Example.class** file
- .class file contains the **bytecode** version of the program
- To execute a bytecode, we need **JVM**

Executing the Program

- To run the program, we need Java Application Launcher called **java**
  - C:\>java Example (not Example.class)

- When the program is run, the following output will be displayed:

This is a simple Java program

Single-File Source-Code Programs

- Early stages of learning Java
  - Writing small utility programs
- Two Steps
  - Compilation: javac
  - Execution: java
- How about running a program supplied as a single file of Java source code?

  C:\>java Example.java

- ONLY supported by JDK 11 and after

Compiling and Running Java Program