What Is a Java Program?

ORACLE

Objectives

After completing this lesson, you should be able to:

- Contrast the terms “platform-dependent” and “platform-independent”
- Describe the purpose of the JVM
- Explain the difference between a procedural program and an object-oriented program
- Describe the purpose of `javac` and `java` executables
- Verify the Java version on your system
- Compile and run a Java program from the command line

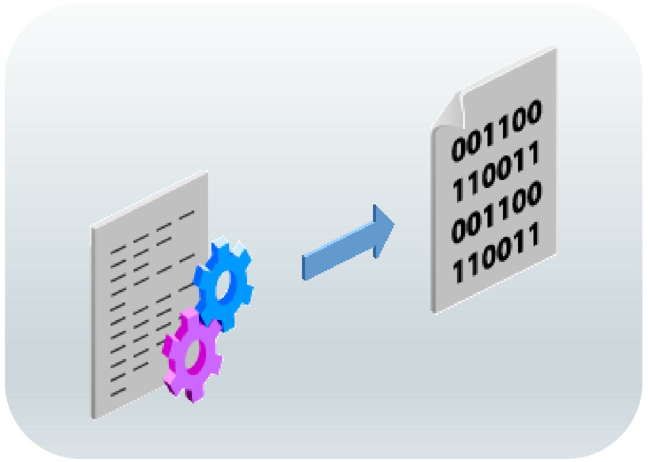
Topics

- Introduction to computer programs
- Introduction to the Java language
- Verifying the Java development environments
- Running and testing a Java program

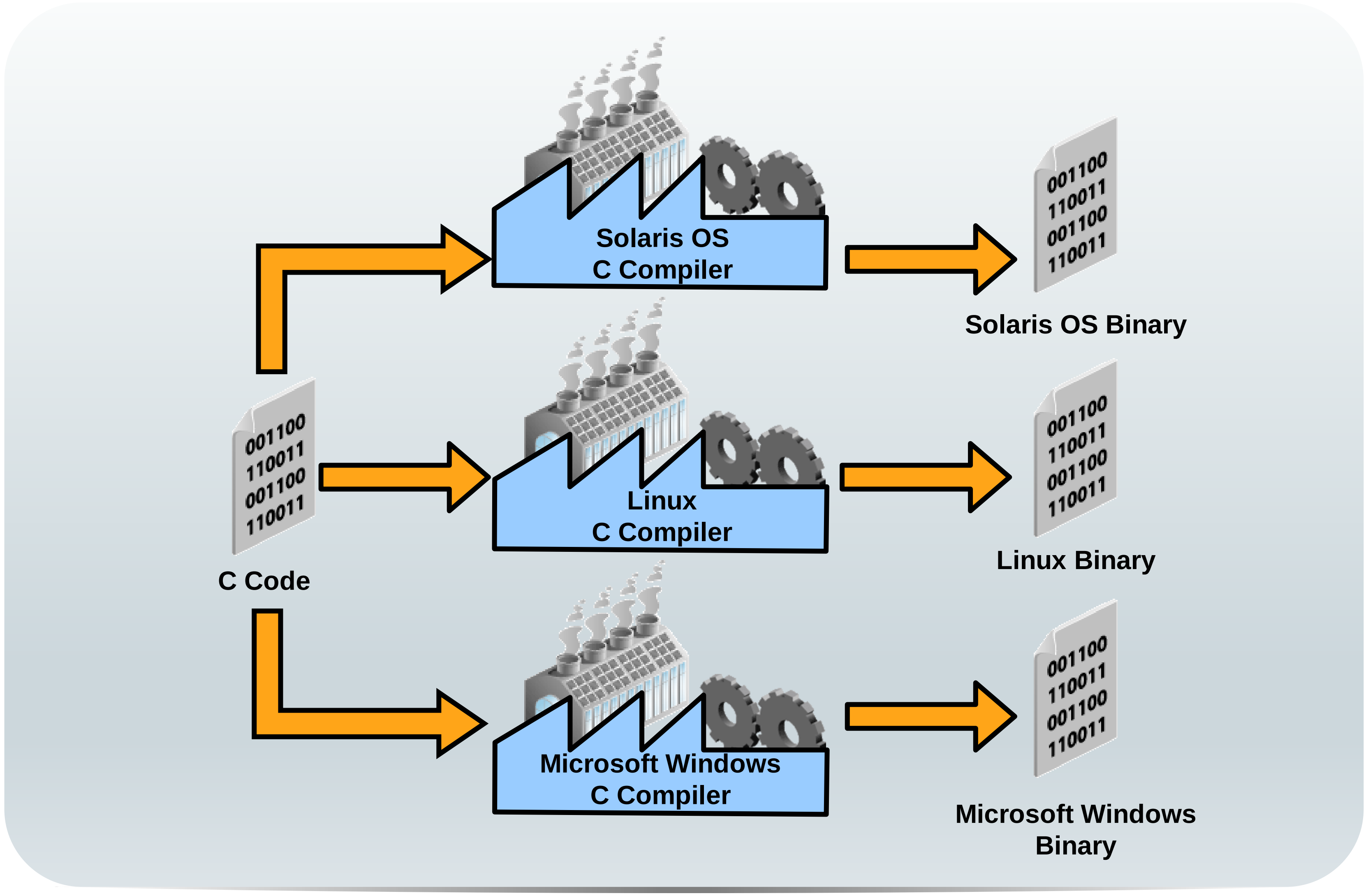
Purpose of a Computer Program

A computer program is a set of instructions that run on a computer or other digital device.

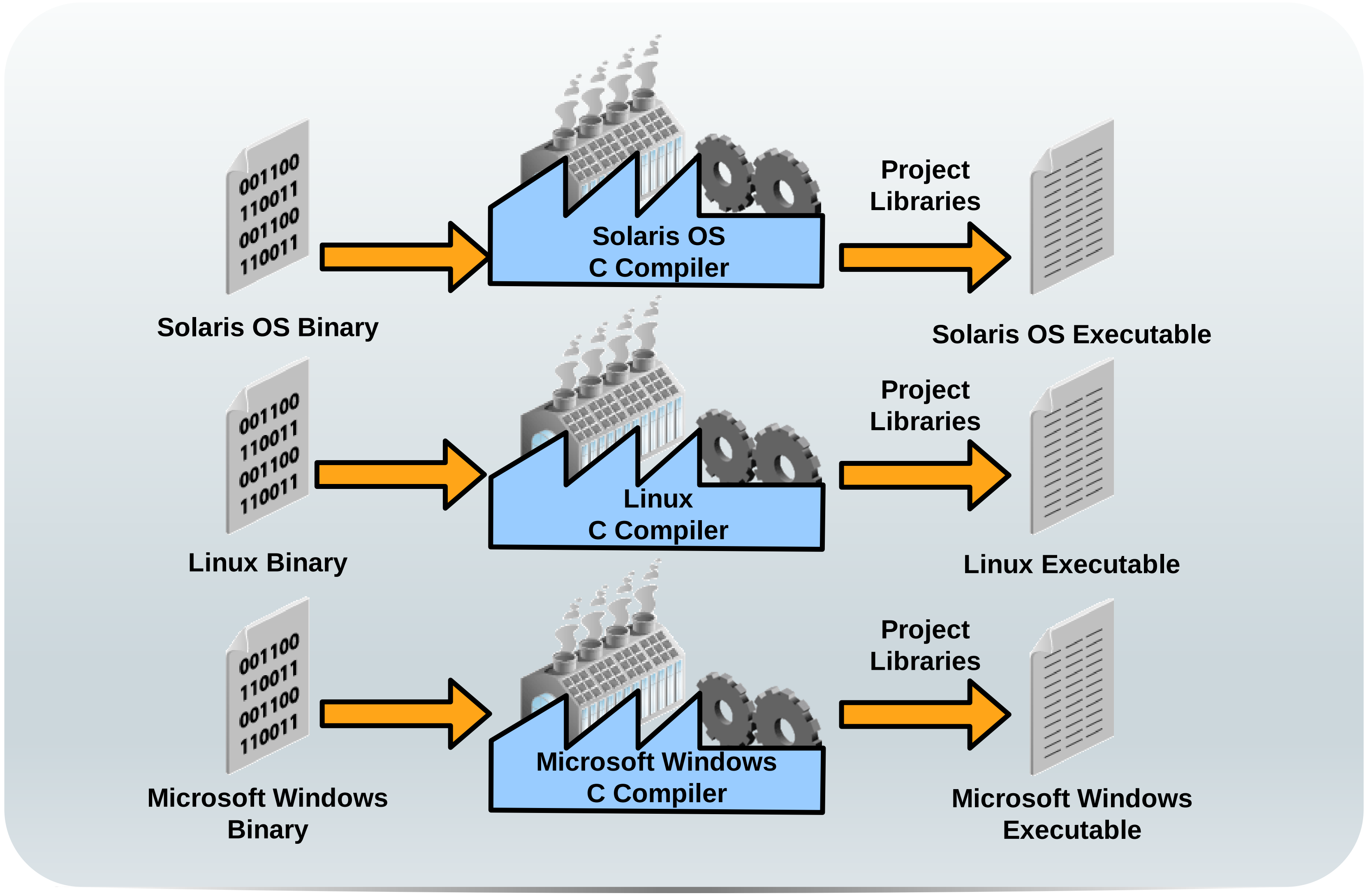
- At the machine level, the program consists of binary instructions (1s and 0s).
  - Machine code
- Most programs are written in *high-level* code (readable).
  - Must be translated to machine code



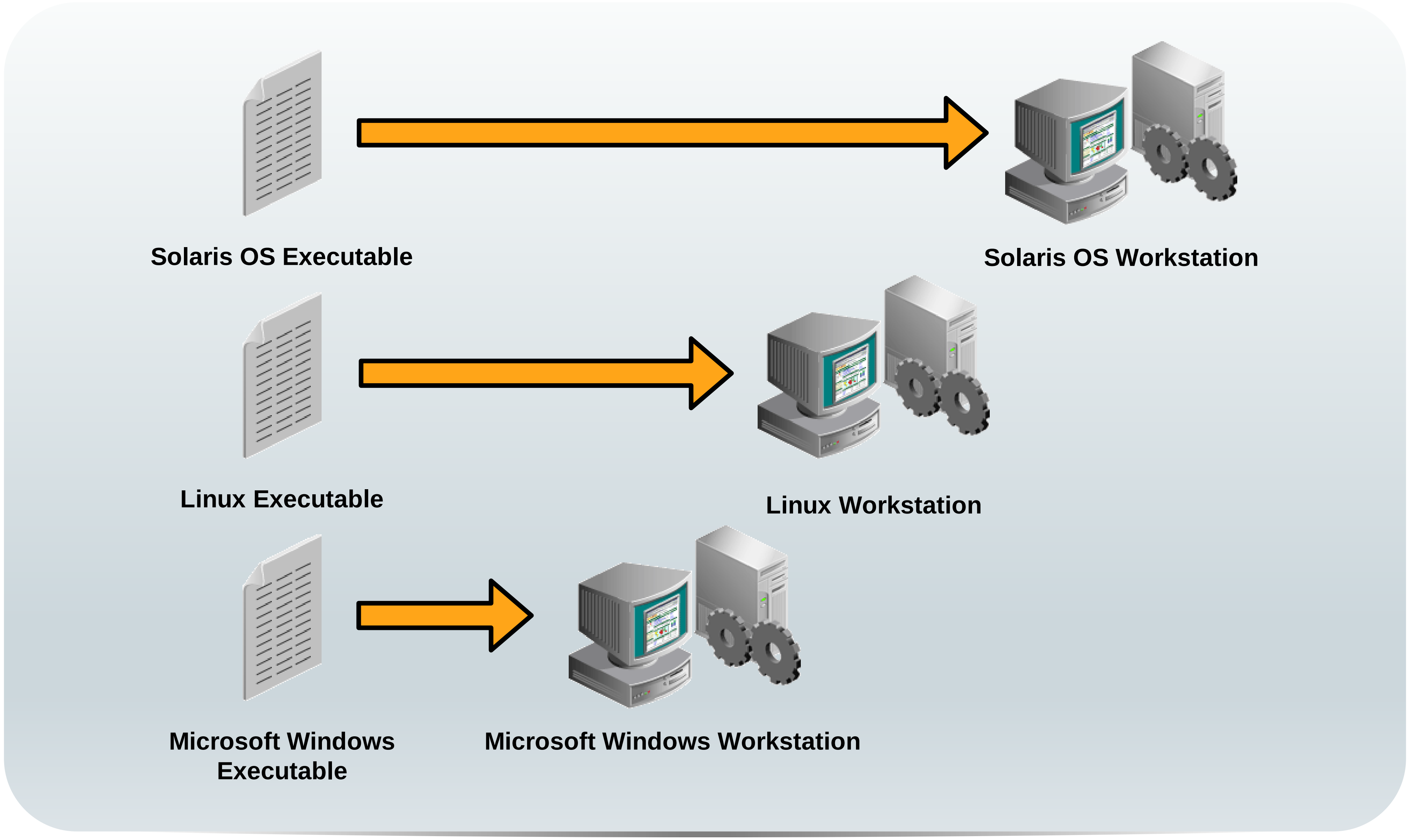
Translating High-Level Code to Machine Code



Linked to Platform-Specific Libraries



Platform-Dependent Programs



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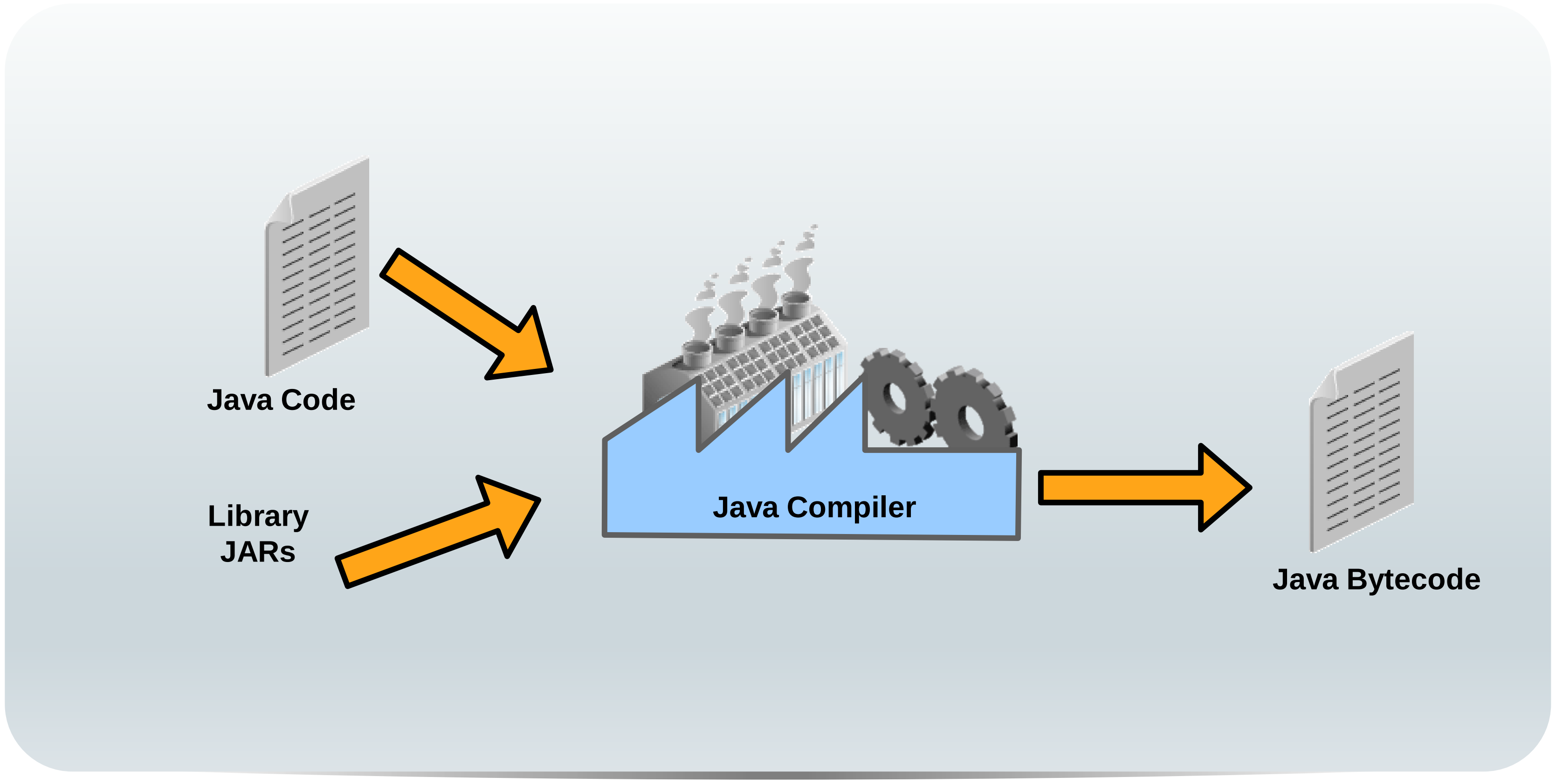
Key Features of the Java Language

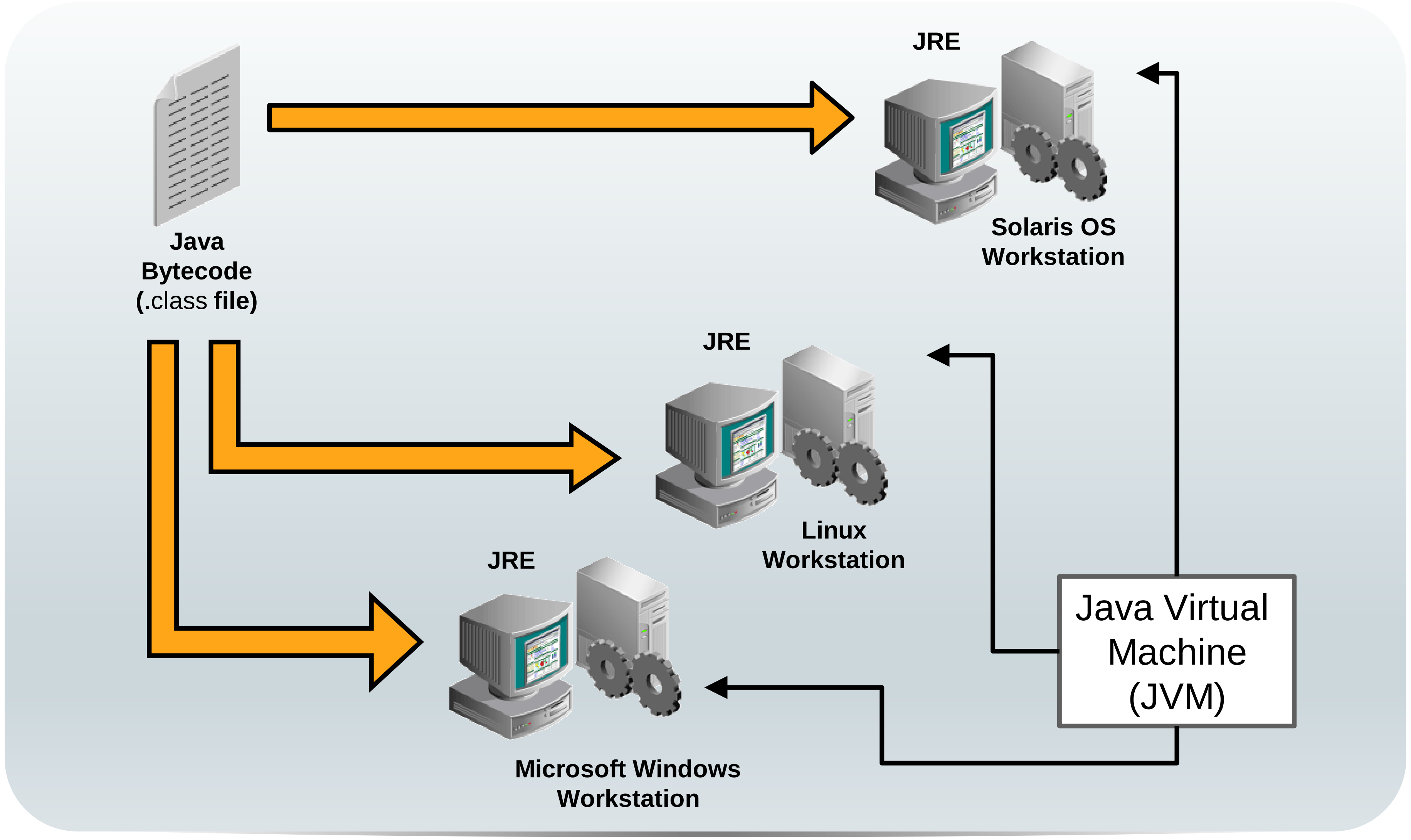
Some of the features that set Java apart from most other languages are that:

- It is platform-independent
- It is object-oriented

Java Is Platform-Independent

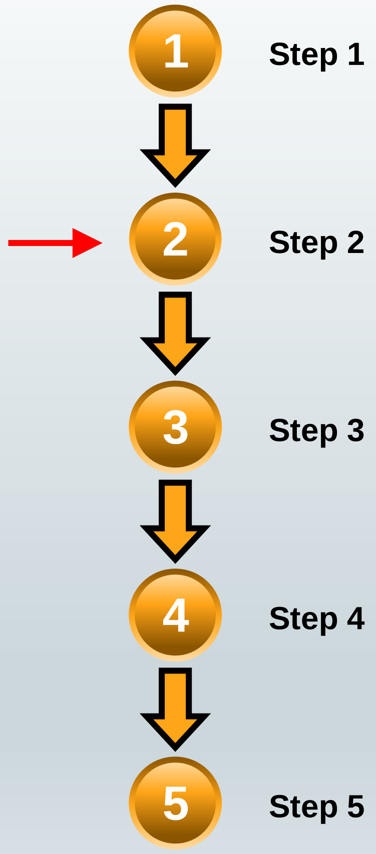


Java Programs Run In a Java Virtual Machine


JRE
Solaris OS Workstation
Java Bytecode (.class file)
JRE
Linux Workstation
JRE
Microsoft Windows Workstation
Java Virtual Machine (JVM)

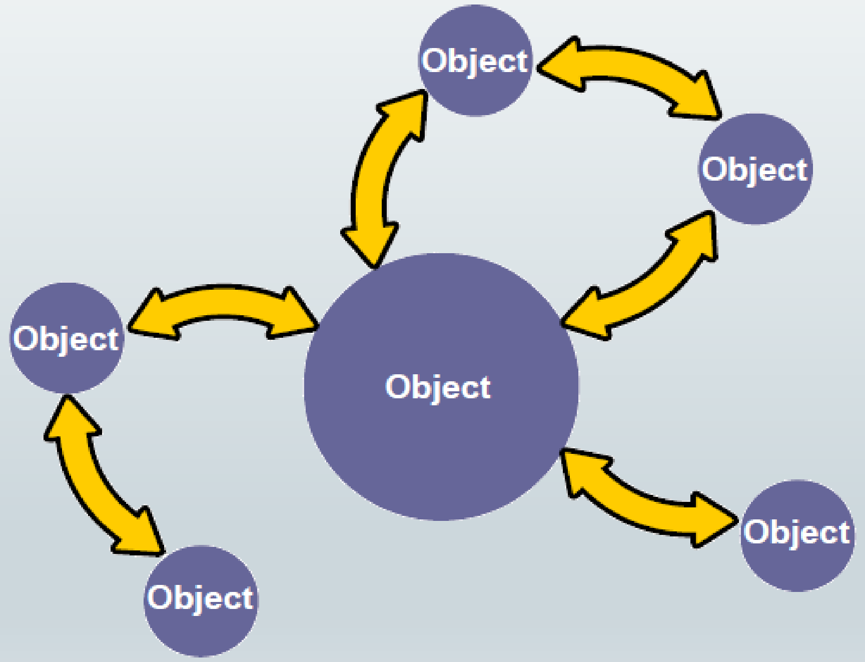
Procedural Programming Languages

- Many early programming languages followed a paradigm called *Procedural Programming.*
- These languages use a sequential pattern of program execution.
- Drawbacks to procedural programming:
  - Difficult to translate real-world use cases to a sequential pattern
  - Difficult to maintain programs
  - Difficult to enhance as needed



Java Is an Object-Oriented Language

- Interaction of objects
- No prescribed sequence
- Benefits:
  - Modularity
  - Information hiding
  - Code reuse
  - Maintainability



Topics

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- Verifying the Java development environment
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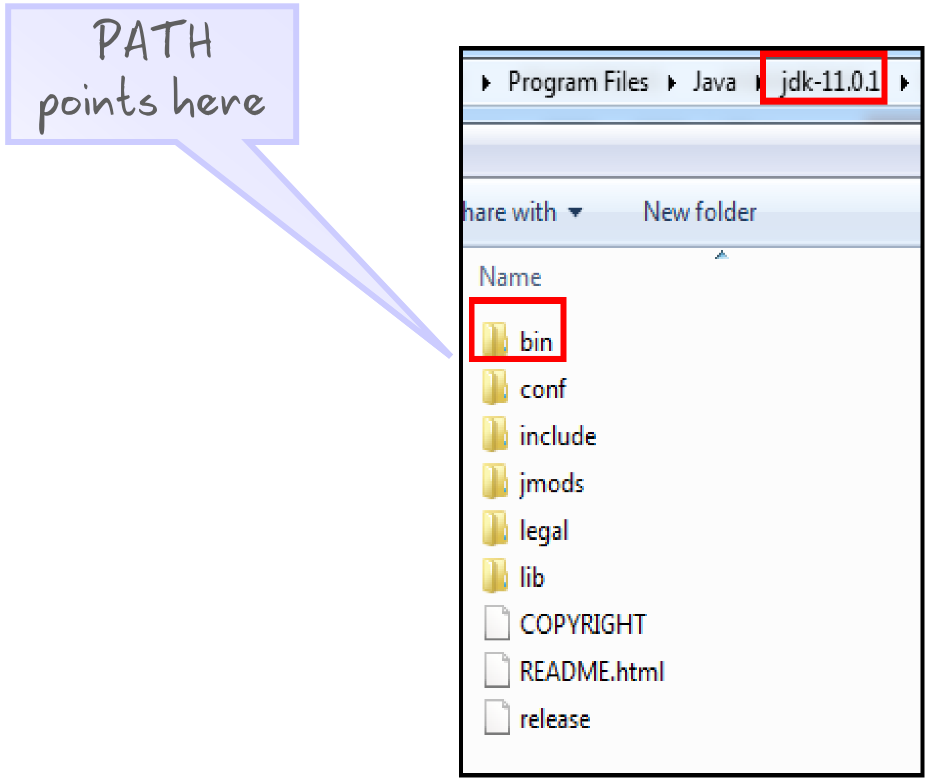
Verifying the Java Development Environment

1. Download and install the Java Development Kit (JDK) from oracle.com/java.
2. Examine the environment.
3. Compile and run a Java application by using the command line.

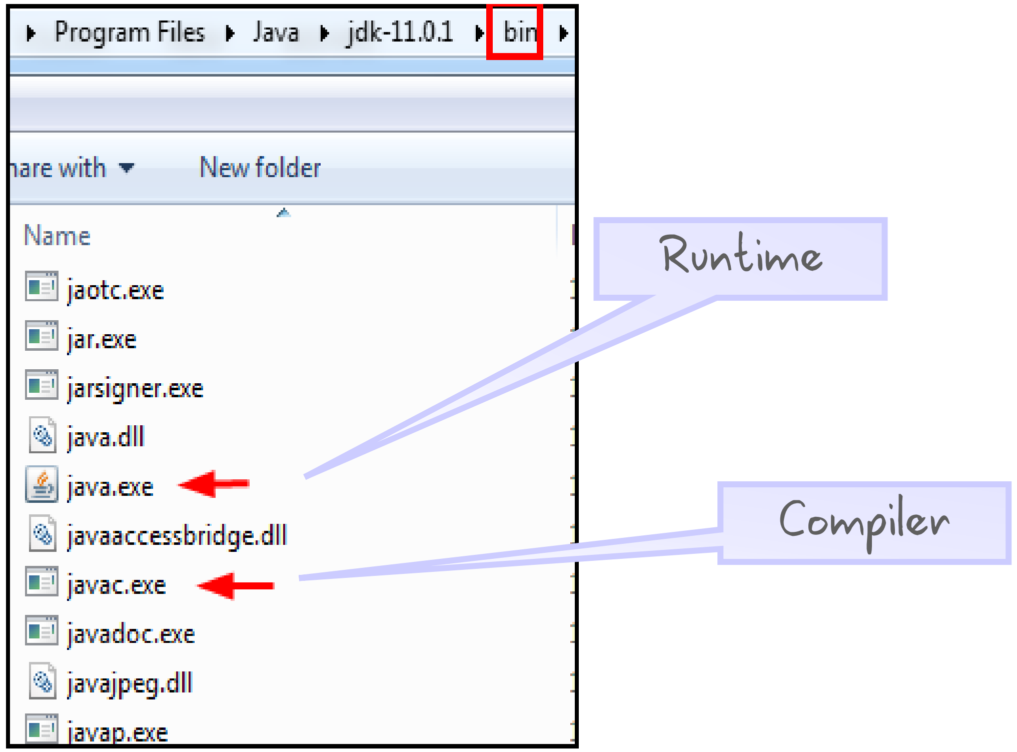
Examining the Installed JDK: The Tools



Program Files ▸ Java ▸ jdk-11.0.1 ▸

hare with ▾ New folder

Name
- bin
- conf
- include
- jmods
- legal
- lib
- COPYRIGHT
- README.html
- release



Program Files ▸ Java ▸ jdk-11.0.1 ▸ bin ▸

hare with ▾ New folder

Name
- jaotc.exe
- jar.exe
- jarsigner.exe
- java.dll
- java.exe
- javaaccessbridge.dll
- javac.exe
- javadoc.exe
- javajpeg.dll
- javap.exe

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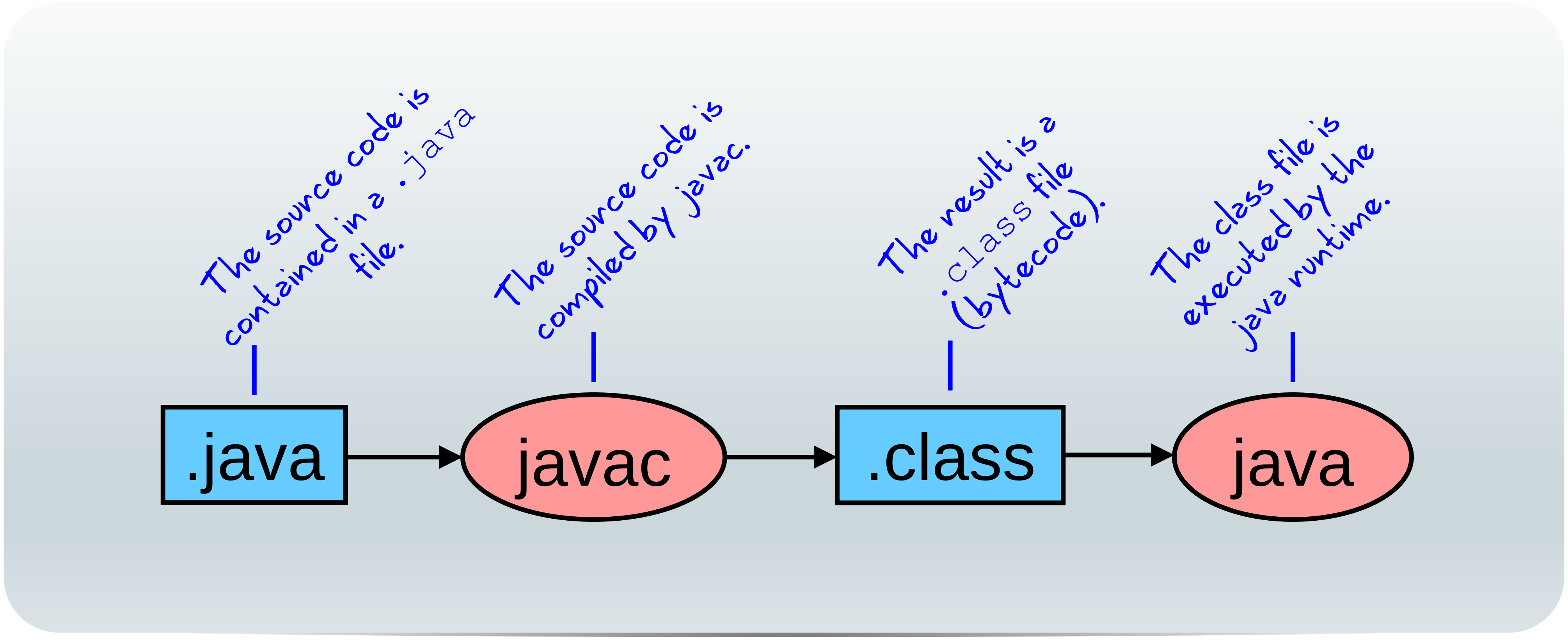
Compiling and Running a Java Program


The source code is contained in a .java file.
The source code is compiled by javac.
The result is a .class file (bytecode).
The class file is executed by the java runtime.
.java
javac
.class
java

Compiling a Program

1. Go to the directory where the source code files are stored.
2. Enter the following command for each `.java` file you want to compile.

- Syntax:

```
javac <source file>
```

- Example:

```
javac SayHello.java
```

Executing (Testing) a Program

1. Go to the directory where the class files are stored.
2. Enter the following for the class file that contains the main method:

- Syntax:

```
java <classname>
```

- Example:

Do not specify .class.

```
java SayHello
```

- Output:

```
Hello World!
```

Output for a Java Program

A Java program can output data in many ways. Here are some examples:

- To a file or database
- To the console
- To a webpage or other user interface

Exercise 2-1

- From a Terminal window, enter `java –version` to see the system's Java version.
- Look for `SayHello.java` in:

  `/labs/02-GettingStarted/Exercises/Exercise1`
- Compile it: `javac SayHello.java`
- Run the resulting class file: `java SayHello`
  - Did you see the output?

JDK 11: Launch Single-File Source-Code Programs

Benefits:

- Skip the compilation "ceremony".
- Run a program with one quick command:

  `java` *`<source file>`*

Requirements:

- Write the entire program as single source file.
- The file may contain any number of classes.
- The top-most class declares a `main` method.

Use Cases:

- Experiment quickly to learn Java.
- Write small utility or "shebang" files.

`Circle.java`

```
public class Test {
  public static void main(String args[]) {
    double area = Circle.findArea(7.5);
    System.out.print("Area of circle=" +area);
  }
}

public class Circle {
  public static double findArea(double radius){
    return Math.PI * radius * radius;
  }
}
```

```
java Circle.java
Area of circle=176.714…
```

Exercise 2-2

- In a terminal window:
- Look for `Circle.java` in:

  `/labs/02-GettingStarted/Exercises/Exercise2`
- Run the file: `java Circle.java`
- Did you see the output?
- Do you see any bytecode file produced?

Quiz

Which of the following is correct? (Choose all that apply.)

a. `javac OrderClass`

b. `java OrderClass`

c. `javac OrderClass.java`

d. `java OrderClass.java`

Summary

In this lesson, you should have learned how to:

- Describe the distinction between high-level language and machine code
- Describe what platform-independence means
- Describe how a Java program is compiled and to what format
- Explain what it means to say that Java is an object-oriented language
- Determine the version number of a Java install
- Compile and run a Java program from the command line