Dissecting Simple Java Programs

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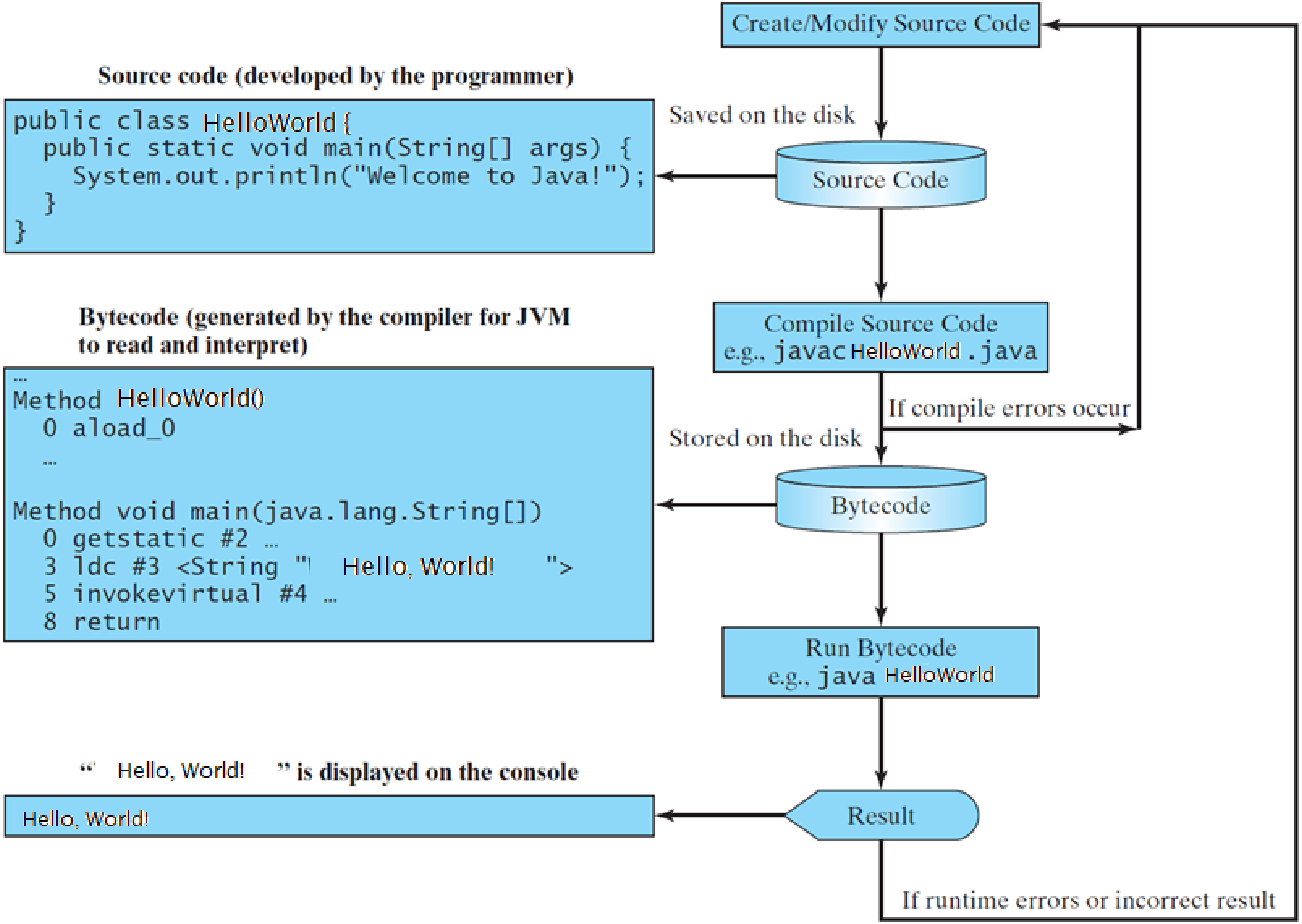
Outlines

- Review simple Java programs
- Review program development process
- More examples

Recall the “Hello, World” program

```
// This program prints Welcome to Java!
public class HelloWorld {
  public static void main(String[] args) {
    System.out.println(“Hello, World!");
  }
}
```



Source code (developed by the programmer)

```
public class HelloWorld {
  public static void main(String[] args) {
    System.out.println("Welcome to Java!");
  }
}
```

Bytecode (generated by the compiler for JVM to read and interpret)

```
…
Method HelloWorld()
  0 aload_0
  …

Method void main(java.lang.String[])
  0 getstatic #2 …
  3 ldc #3 <String "Hello, World!">
  5 invokevirtual #4 …
  8 return
```

"Hello, World!" is displayed on the console

```
Hello, World!
```

More Examples

- Print “Hello, World!” 3 times
- Compute an expression and print the result

Questions?

Anatomy of a Java Program

- Class name
- Main method
- Statements
- Statement terminator
- Reserved words
- Comments
- Blocks

Class Name

- Every Java program must have at least one class.
- Each class has a name.
  - By convention, class names start with an uppercase letter.
  - Best practice examples
    - HelloWorld
    - HelloWorldThreeTimes
    - TriangleArea
    - CircleArea

Main Method

- In order to run a class, the class must contain a method named main.
- The program is executed from the main method.

Statement

- A statement represents an action or a sequence of actions.
- Example
  - System.out.println(“Hello, World!”)
  - To display the greeting “Hello, World!“.

Statement Terminator

- Every statement in Java ends with a semicolon (;).

Reserved Keywords

- Reserved words or keywords are words that have a specific meaning to the compiler and cannot be used for other purposes in the program.
- Example.
  - “class” is a reserved keyword
  - when the compiler sees the word “class”, it understands that the word after class is the name for the class.
  - Any other keywords have we used?

Blocks

- A pair of braces in a program forms a block that groups components of a program

Special Symbols

Character	Name	Description
{}	Opening and closing braces	Denotes a block to enclose statements.
()	Opening and closing parentheses	Used with methods.
[]	Opening and closing brackets	Denotes an array.
//	Double slashes	Precedes a comment line.
" "	Opening and closing quotation marks	Enclosing a string (i.e., sequence of characters).
;	Semicolon	Marks the end of a statement.

Questions?

Programming Style and Documentation

- Appropriate Comments
- Naming Conventions
- Proper Indentation and Spacing Lines
- Block Styles

Programming Style and Documentation

“*Programs must be written for people to read, and only incidentally for machines to execute.*”

— Harold Abelson, Structure and Interpretation of Computer Programs

Appropriate Comments

- Include a summary at the beginning of the program to explain
  - what the program does,
  - its key features,
  - its supporting data structures, and
  - any unique techniques it uses.
- Include author information
  - Example
    - your name, class section, instructor, date, and a brief description at the beginning of the program.

Naming Convention

- Choose meaningful and descriptive names.
- Class names:
  - Capitalize the first letter of each word in the name. For example, the class name `ComputeExpression`.

Indentation and Spacing

Proper Indentation and Spacing

- Indentation
  - Indent same spaces for code on the same level
- Spacing
  - Use blank line to separate segments of the code.

Block Styles

- Next-line style vs. End-of-line style
- Suggest to use end-of-line style for braces.

Next-line style

```
public class Test
{
  public static void main(String[] args)
  {
    System.out.println("Block Styles");
  }
}
```

End-of-line style

```
public class Test {
  public static void main(String[] args) {
    System.out.println("Block Styles");
  }
}
```

Questions

What if there is an error?

- What kind of error?
  - Compilation errors
  - Runtime errors
  - Logic errors
- How do we deal with errors?
- Let’s write a few more programs

Syntax Errors

- Let’s see several examples

Runtime Errors

- Let’s observe an example
  - Given two numbers, compute the division
  - What if the denominator is 0?
  - An example of runtime error – a situation the program cannot handle

Logic Errors

- Let’s observe an example
  - Given a temperature in Celsius, convert it to Fahrenheit
  - Write the program
  - Does the program produce an expected result?
  - An example of logic error – the situation that the program does not perform the way it was intended to.

Questions

Lab Exercise

- Computer and print out the area and the perimeter of a circle given its radius
    - Recall that
        - Perimeter = $2 \pi r$
        - Area = πr^2