



## CHAPTER 1

# Introduction to Java Software Development

Shin-Jie Lee (李信杰)

Associate Professor

Computer and Network Center

Department of Computer Science and Information Engineering

National Cheng Kung University



# Origins of the Java Language

- ❑ Created by Sun Microsystems team led by James Gosling (1991)
  - Originally designed for programming home appliances
    - Difficult task because appliances are controlled by a wide variety of computer processors
    - Team developed a two-step translation process to simplify the task of compiler writing for each class of appliances





# Major release versions of Java

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- ☐ JDK 1.0 (January 21, 1996)
- ☐ JDK 1.1 (February 19, 1997)
- ☐ J2SE 1.2 (December 8, 1998)
- ☐ J2SE 1.3 (May 8, 2000)
- ☐ J2SE 1.4 (February 6, 2002)
- ☐ J2SE 5.0 (September 30, 2004)
- ☐ Java SE 6 (December 11, 2006)
- ☐ Java SE 7 (July 28, 2011)
- ☐ Java SE 8 (March 18, 2014)
- ☐ Java SE 9 (Sep 21, 2017)
- ☐ ...
- ☐ Java SE 17



# Typical Java Development Environment

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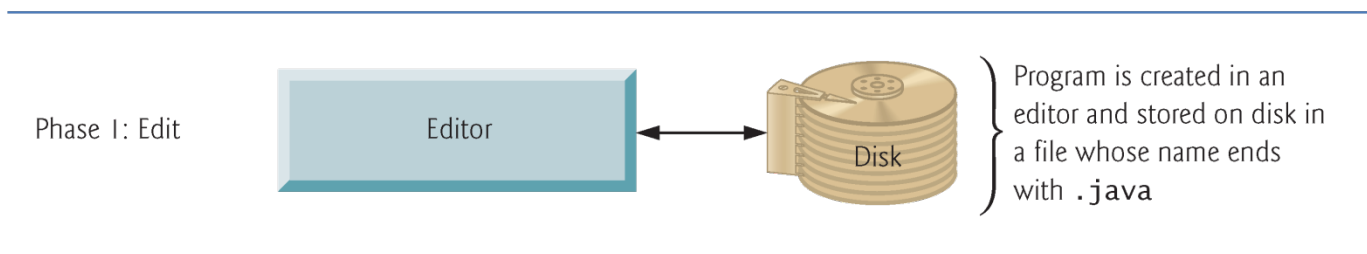
- ❑ Java programs normally go through five phases
  - edit
  - compile
  - load
  - verify
  - execute



# Typical Java Development Environment

□ Phase 1 consists of editing a file

- Type a Java program (**source code**) using the editor.
- Make any necessary corrections.
- Save the program.
- A file name ending with the **.java extension** indicates that the file contains Java source code.





# Typical Java Development Environment

❑ Linux editors: **vi** and **emacs**.

❑ Windows editors:

- Notepad
- EditPlus ([www. edi t pl us. com](http://www.ediplus.com))
- TextPad ([www. text pad. com](http://www.textpad.com))
- jEdit ([www. j edi t. org](http://www.jedit.org)).

❑ Integrated development environments (IDEs)

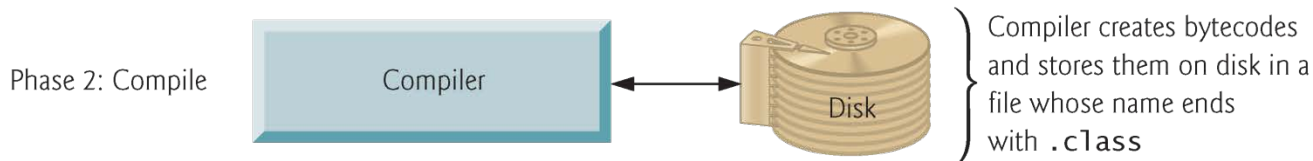
- Provide tools that support the software development process, including editors for writing and editing programs and debuggers for locating **logic errors**
  - E.g. Eclipse ([www. ecl i pse. org](http://www.eclipse.org))



# Typical Java Development Environment

## □ Phase 2: Compiling a Java Program into Bytecodes

- Use the command `javac` (the **Java compiler**) to **compile** a program. For example, to compile a program called `Welcome.java`, you'd type
  - `javac Welcome.java`
- If the program compiles, the compiler produces a **.class** file called `Welcome.class` that contains the compiled version of the program.





# Typical Java Development Environment

- ❑ Java compiler translates Java source code into **bytecodes** that represent the tasks to execute.
  - Bytecodes are platform independent
  - Bytecodes are executed by the **Java Virtual Machine (JVM)**—a part of the JDK and the foundation of the Java platform.
    - `java Welcome`

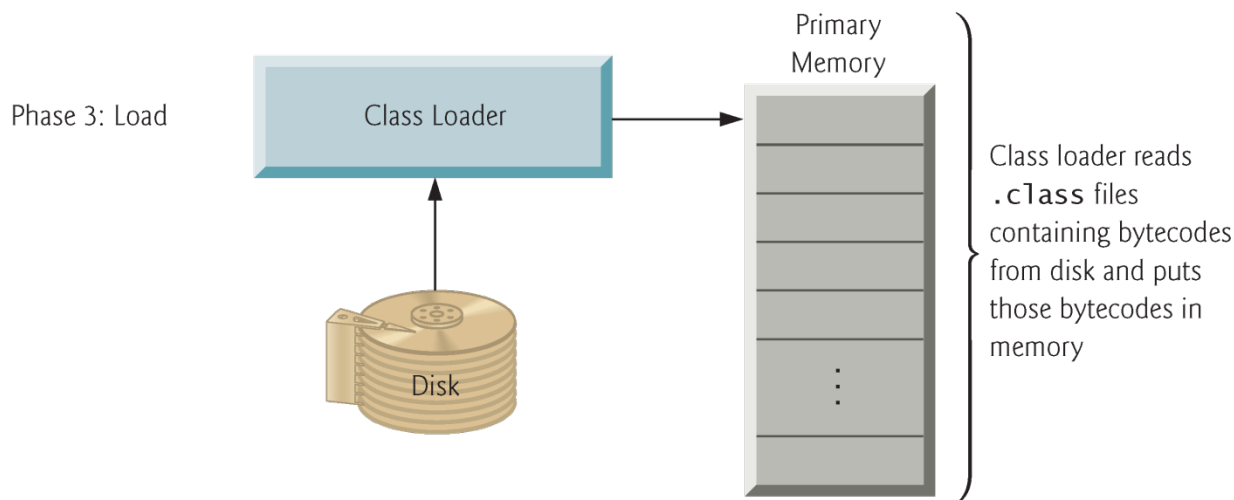




# Typical Java Development Environment

## ❑ Phase 3: Loading a Program into Memory

- The JVM places the program in memory to execute it—this is known as **loading**.
- **Class loader** takes the `.class` files containing the program's bytecodes and transfers them to primary memory.
- Also loads any of the `.class` files provided by Java that your program uses.

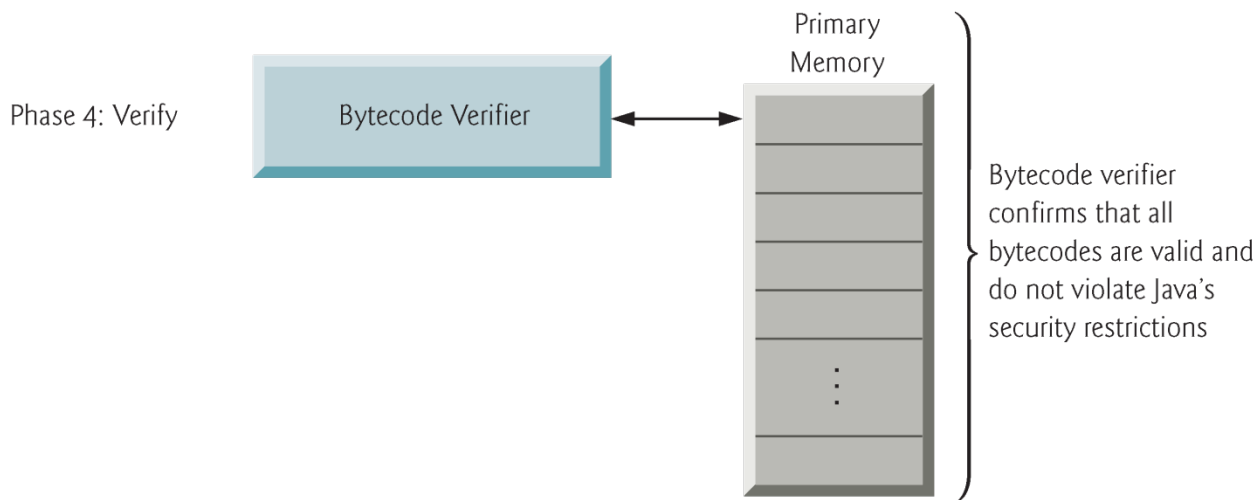




# Typical Java Development Environment

## □ Phase 4: Bytecode Verification

- As the classes are loaded, the **bytecode verifier** examines their bytecodes
- Ensures that they're valid and do not violate Java's security restrictions.

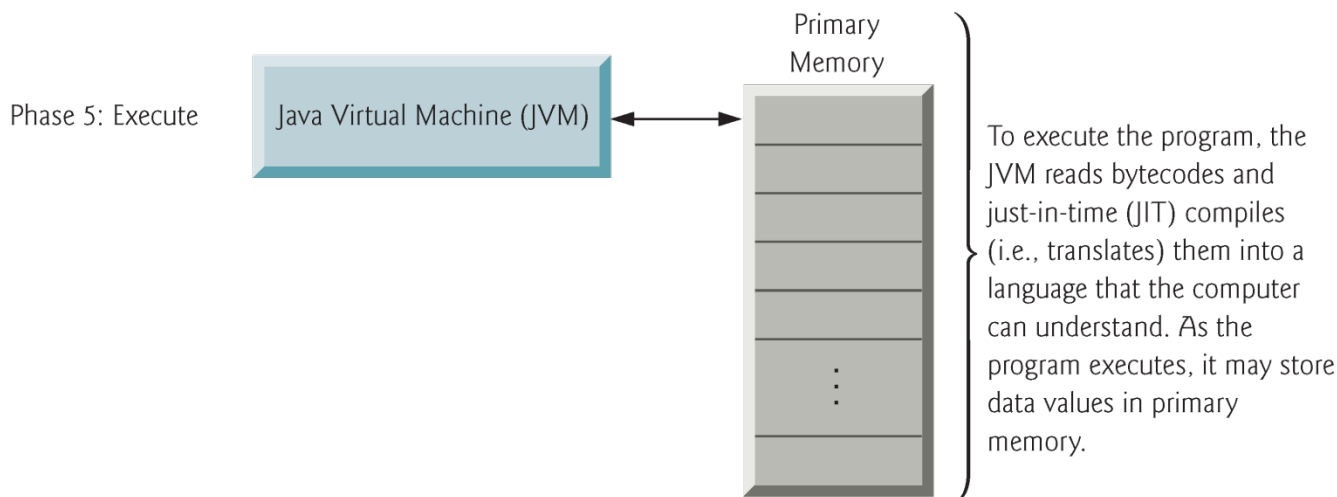




# Typical Java Development Environment

## ❑ Phase 5: Execution

- The JVM **executes** the program's bytecodes.
- JVMs typically execute bytecodes using a combination of interpretation and so-called **just-in-time (JIT) compilation**.
- Analyzes the bytecodes as they're interpreted
- A **just-in-time (JIT) compiler**—known as the **Java HotSpot compiler**—translates the bytecodes into the underlying computer's machine language.





# Installing the JDK

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- ❑ The **javac.exe** program is the compiler, which means it's the program that turns code you can read (the code you write in Java) into code your computer can read (the collection of 0s and 1s that a computer needs when it runs a program).
- ❑ The **java.exe** program runs the programs that you write.



# Installing the JDK

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❑ Get the latest version of the JDK

➤ <https://www.oracle.com/java/technologies/download>  
[s/](#)



# Installing Eclipse

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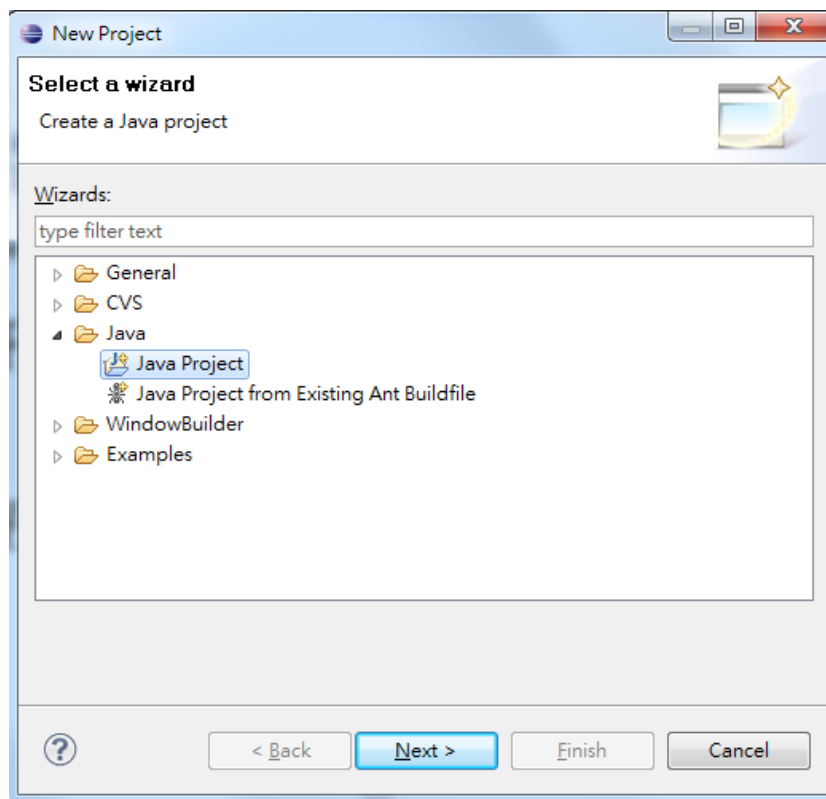
- ☐ **<http://www.eclipse.org/downloads/> in a web browser.**
- ☐ **Choose Eclipse IDE for Java Developers**



# Creating Your First Project

- ❑ From the File menu, select New, and then select Project.

Eclipse's New Project window.

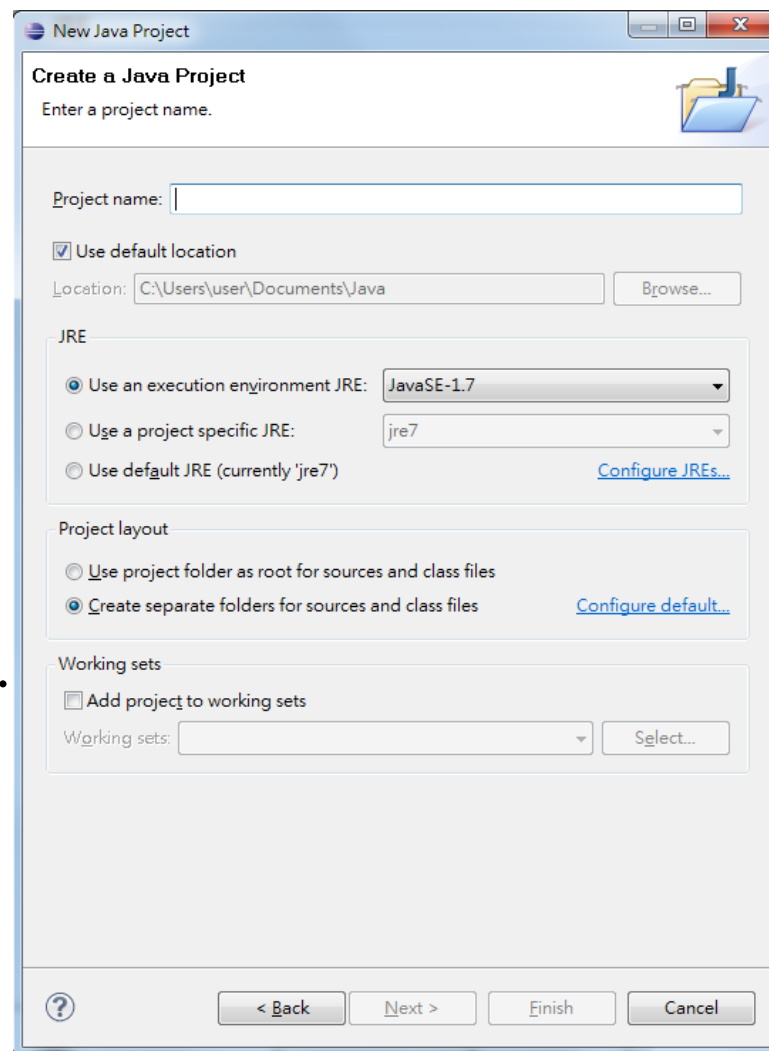




# Creating Your First Project

- ❑ 2. In the New Project window, double-click Java Project.

Eclipse's New Java Project window.



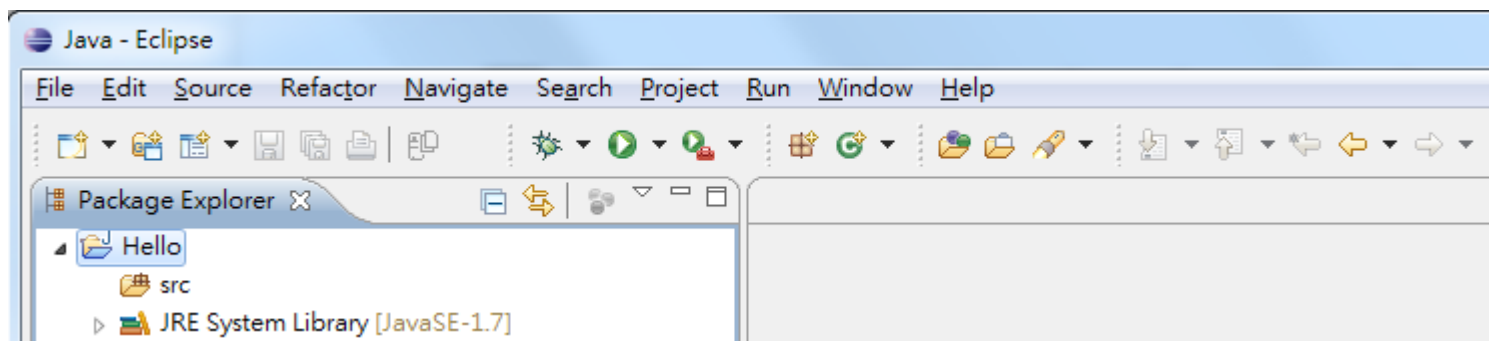




# Creating Your First Project

- ☐ 3. Type **Hello** in the Project name field.
- ☐ 4. Click OK.

The main area of the Eclipse IDE.





# Creating the Program

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- ❑ To create a class with a main method for your first program, follow these steps:
  - Right-click the **Hello** project in the Eclipse Package Explorer, choose New, and then choose Class.



# Creating the Program

Eclipse's New Java Class window.

The screenshot shows the 'New Java Class' dialog box in Eclipse. The title bar says 'New Java Class'. Inside, there's a 'Java Class' section with a warning icon and text: 'The use of the default package is discouraged.' Below this, there are three rows for 'Source folder:', 'Package:', and 'Enclosing type:', each with a text field and a 'Browse...' button. The 'Name:' field contains 'Hello'. The 'Modifiers:' section has radio buttons for 'public' (selected), 'default', 'private', and 'protected', and checkboxes for 'abstract', 'final', and 'static'. The 'Superclass:' field contains 'java.lang.Object' with a 'Browse...' button. The 'Interfaces:' section has an empty list box with 'Add...' and 'Remove' buttons. Below these, there's a section 'Which method stubs would you like to create?' with checkboxes for 'public static void main(String[] args)' (checked), 'Constructors from superclass', and 'Inherited abstract methods' (checked). At the bottom, there's a question 'Do you want to add comments? (Configure templates and default value [here](#))' with a 'Generate comments' checkbox. The bottom of the dialog has a help icon, 'Finish', and 'Cancel' buttons.

**New Java Class**

**Java Class**  
⚠ The use of the default package is discouraged.

Source folder: Hello/src Browse...

Package: (default) Browse...

☐ Enclosing type: Browse...

Name: Hello

Modifiers: ☒ public ☐ default ☐ private ☐ protected  
☐ abstract ☐ final ☐ static

Superclass: java.lang.Object Browse...

Interfaces: Add...  
Remove

Which method stubs would you like to create?

☒ public static void main(String[] args)  
☐ Constructors from superclass  
☒ Inherited abstract methods

Do you want to add comments? (Configure templates and default value [here](#))  
☐ Generate comments

? Finish Cancel



# Creating the Program

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- 2. In the Package field, type whatever you like for the package.
- 3. Check the checkbox that gives you a **main** method (**public static void main (String args[])**).



# Creating the Program

## Example: Preliminary Hello class

```
public class Hello {  
    /**  
     * @param args  
     */  
    public static void main(String[] args) {  
        // TODO Auto-generated method stub  
    }  
}
```



# Creating the Program

- 4. Within the **main** method, type:  
**System.out.println("Hello, World!");**

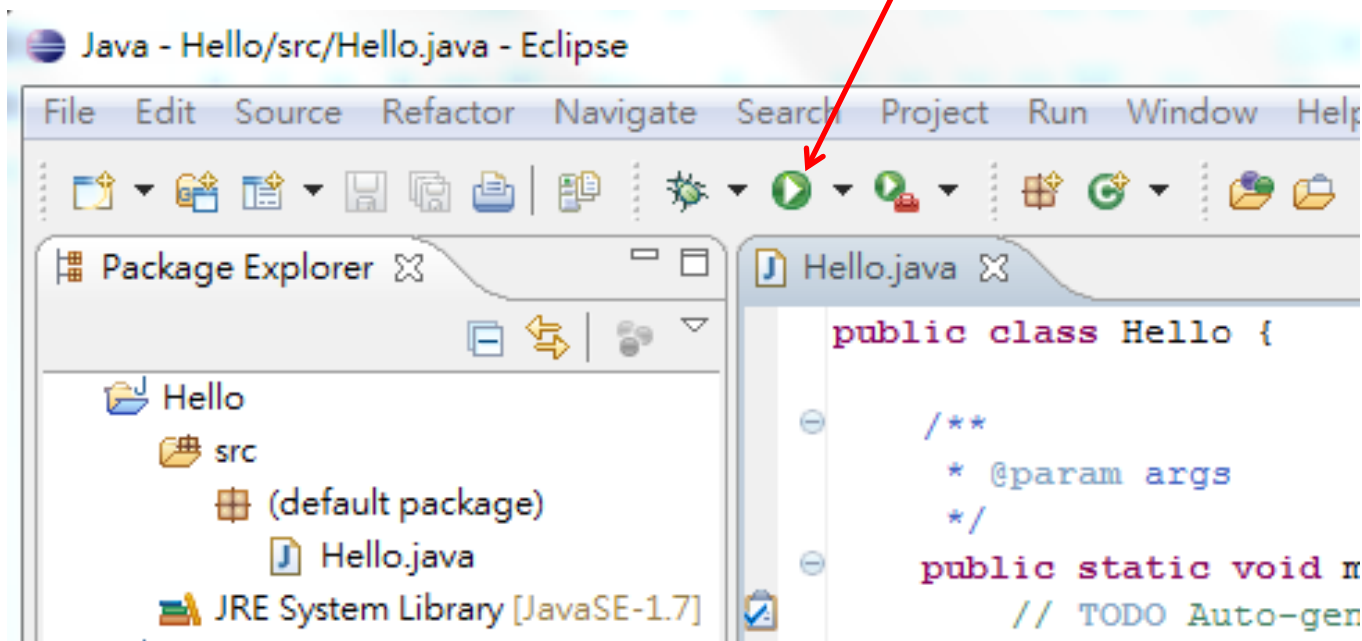
## Example: Basic Hello program

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



# Run the Program

Run Button





# Adding More Functionality

- ❑ The **args** array holds all the values that were provided to the Java runtime engine when someone started your program.

## Example: Reading arguments

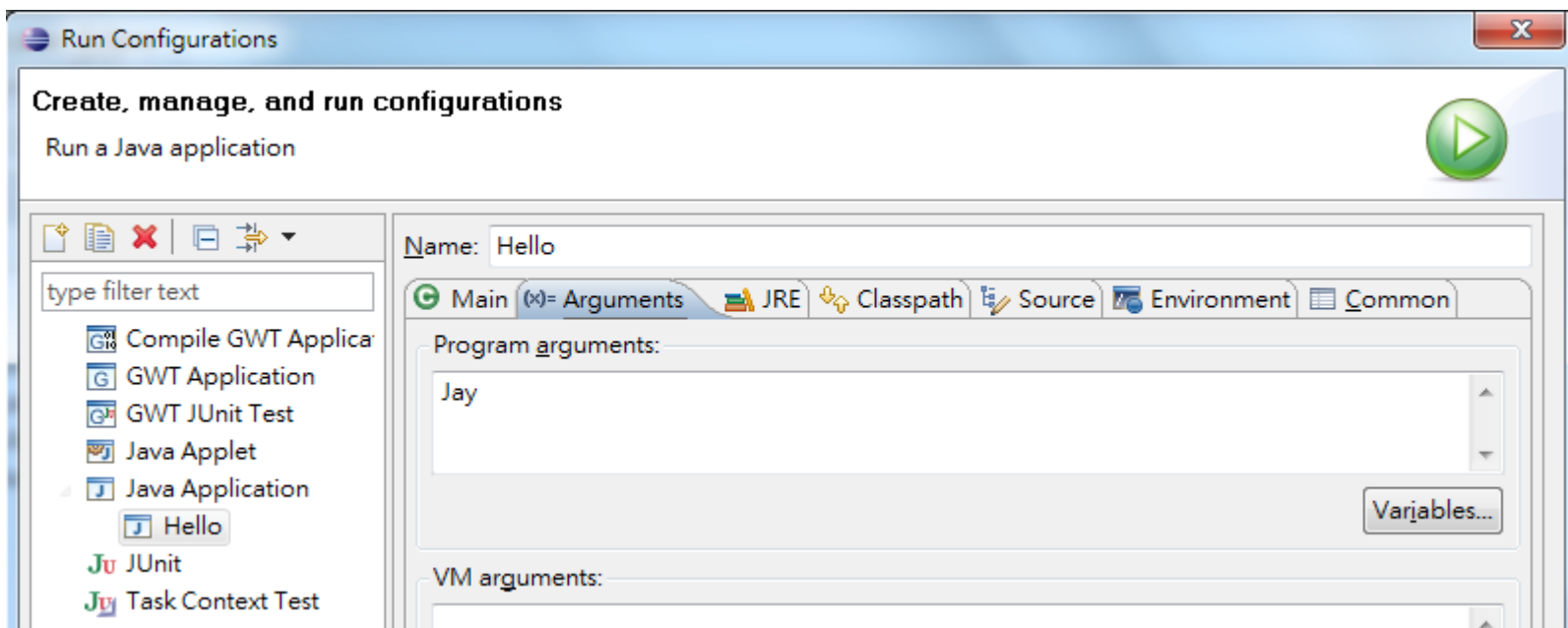
```
public class Hello {  
    public static void main(String[] args) {  
        System.out.println("Hello, " +  
            args[0] + " !");  
    }  
}
```





# Adding More Functionality

- ❑ 1. From the Run menu, choose Run Configurations.  
The Run Configurations window.



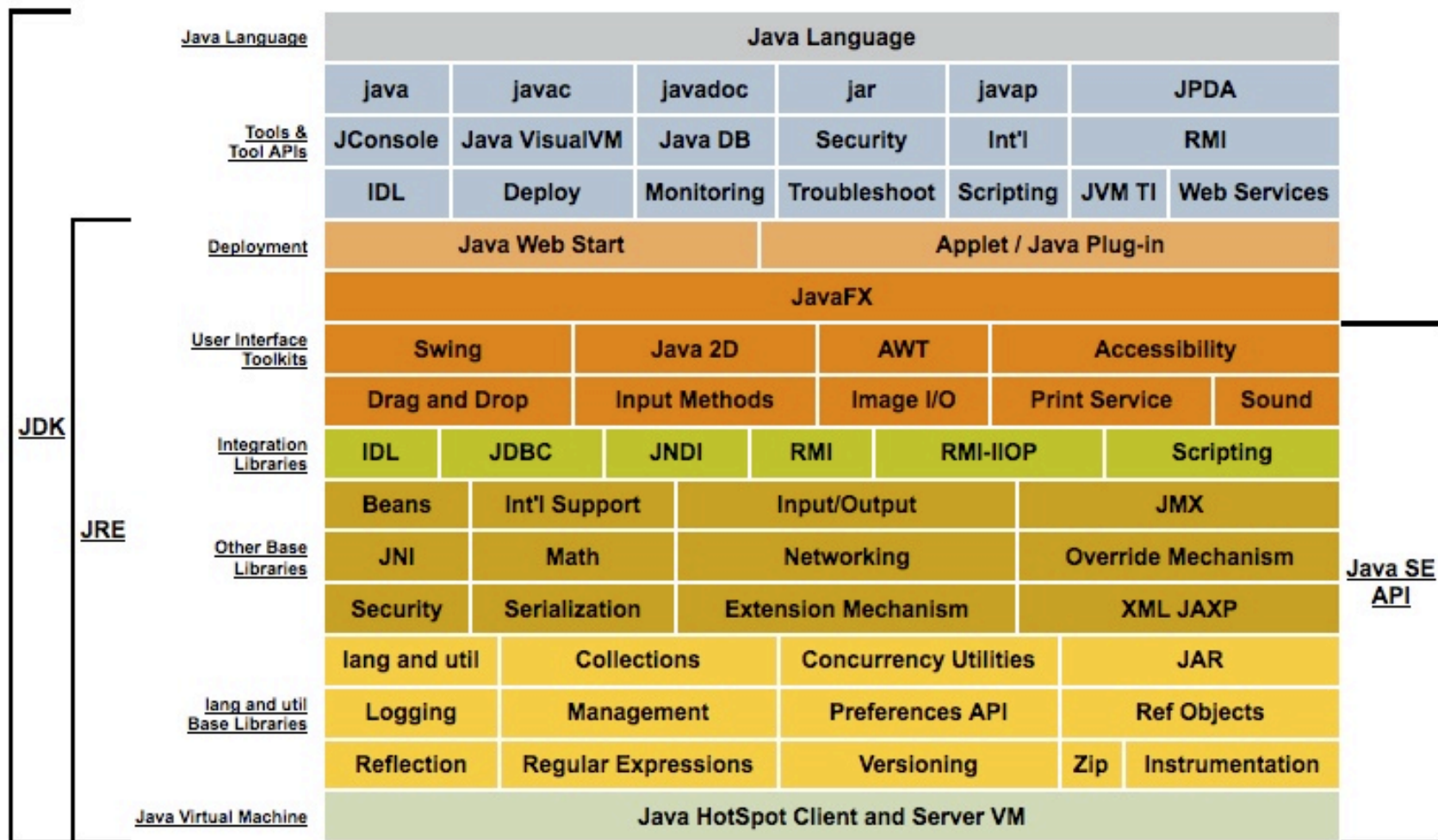
- ❑ 2. In the **Arguments** tab, type your name.
- ❑ 3. Click the **Run** button.



**Java APP = Android APP ?**

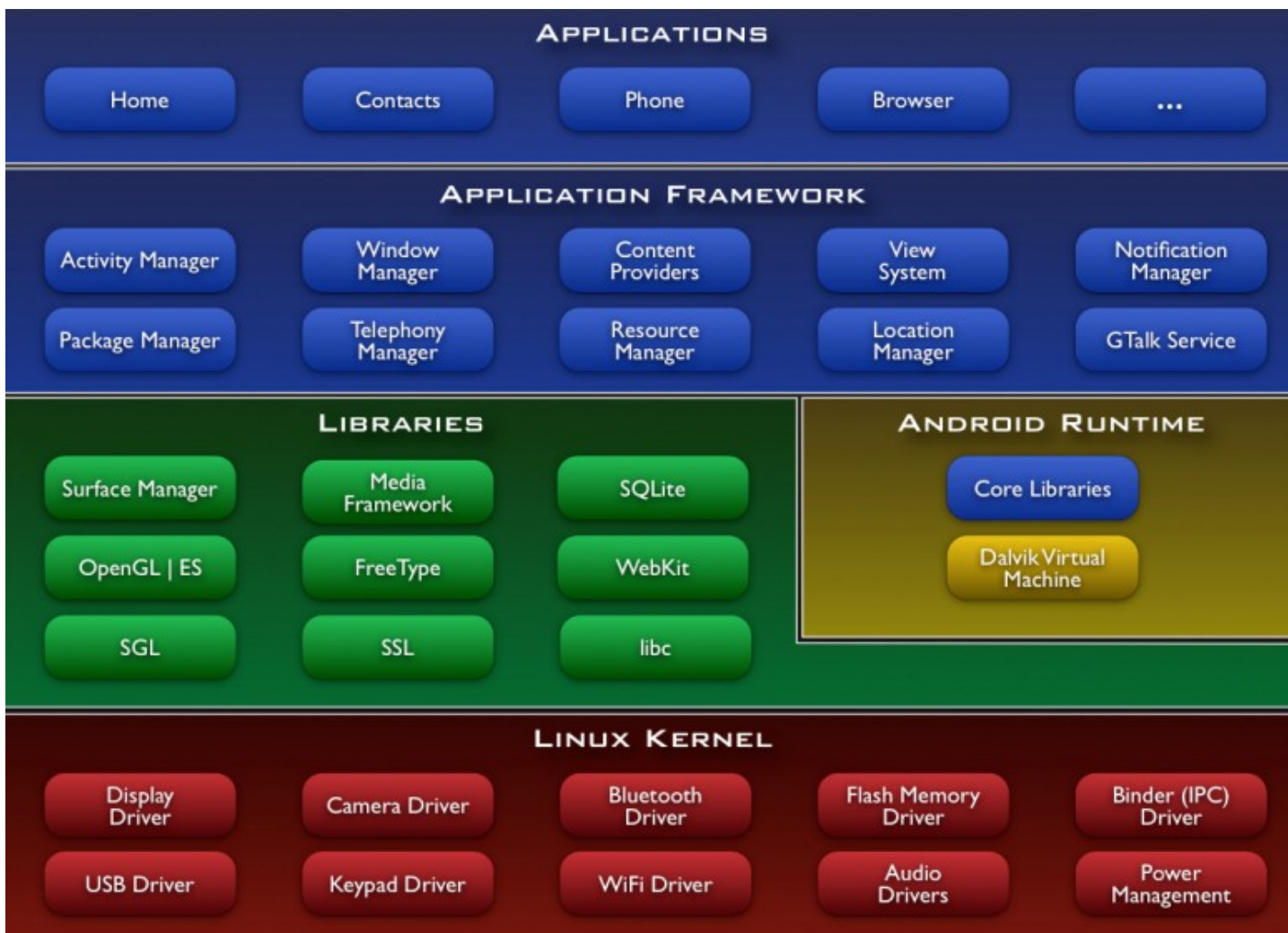


# Java Framework





# Android Framework





# Reference

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- ❑ “Absolute Java”. Walter Savitch. Pearson; 6 edition. 2015