Accelerating Information Technology Innovation
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Lecture 1: Introduction to Java

AITI Nigeria Summer 2012
University of Lagos.

Agenda

- First Lab ….. Class is Hands on remember ?
- Recap – Previously on AITI ☺
- What makes Java special?
- Advantages and disadvantages to using Java.
- Methodology for developing applications.

Recap - Teaching Style

- Emphasis on self-learning:
  - We will encourage you to discover your own answers
  - The most important skill you will ever learn
- Emphasis on participation:
  - Ask questions during lecture
  - Provide constructive criticism
  - Suggest course topics
  - Interrupt if we use jargon or idioms

Recap - Self-Learning

- Use MIT's OpenCourseWare website to teach yourself Java
- Website: http://ocw.mit.edu
- ebooks
- Why self-teach?
  - Move beyond the course curriculum
  - Develop a more advanced final project
  - We are here to help!

Recap - Student Evaluation

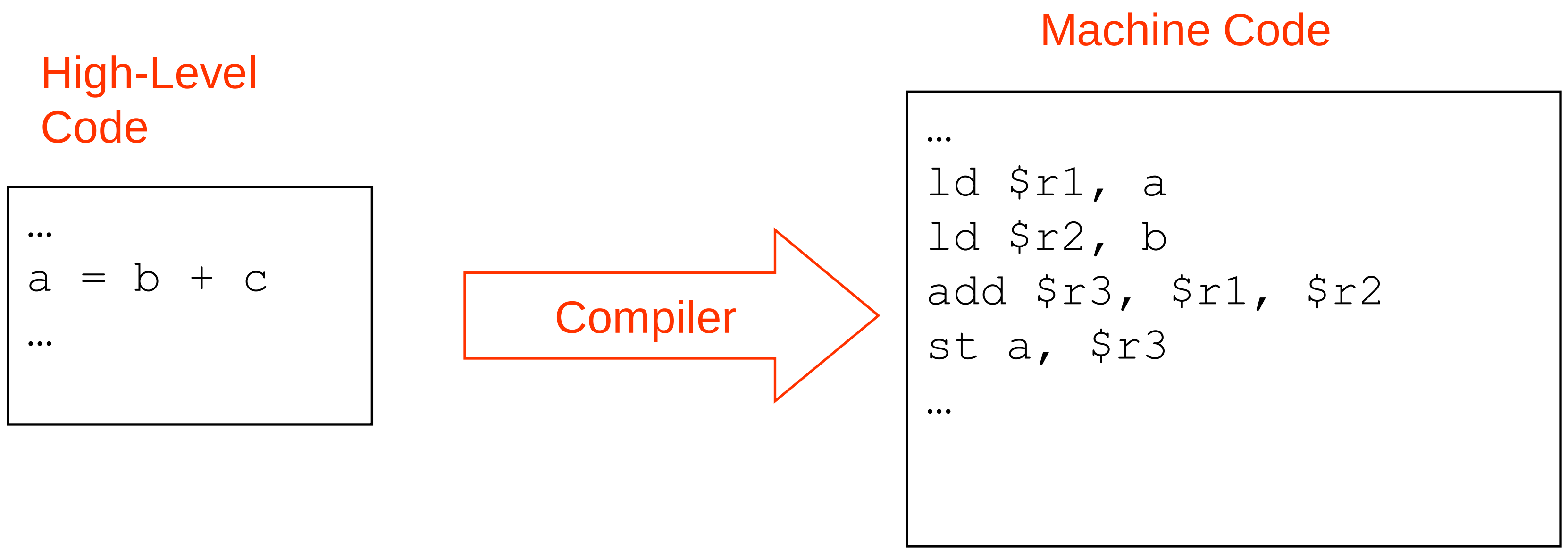
- There are no tests!
- Students will be evaluated on labs and projects:
- Labs:
  - Design/Code
  - Output
  - Post-lab interview
- Projects:
  - Idea
  - Milestone Presentations
  - Demo

Recap - Collaboration

- Students are encouraged to collaborate on labs and projects.
- However, copying code without understanding is not allowed.
- Zero tolerance
  - If found copying, .. Well, we are not sure if you belong in the class. Its always better to ask for clarification than to copy!!

Starting Point - Compiler

- A program that translates a programming language into machine code is called a *compiler*



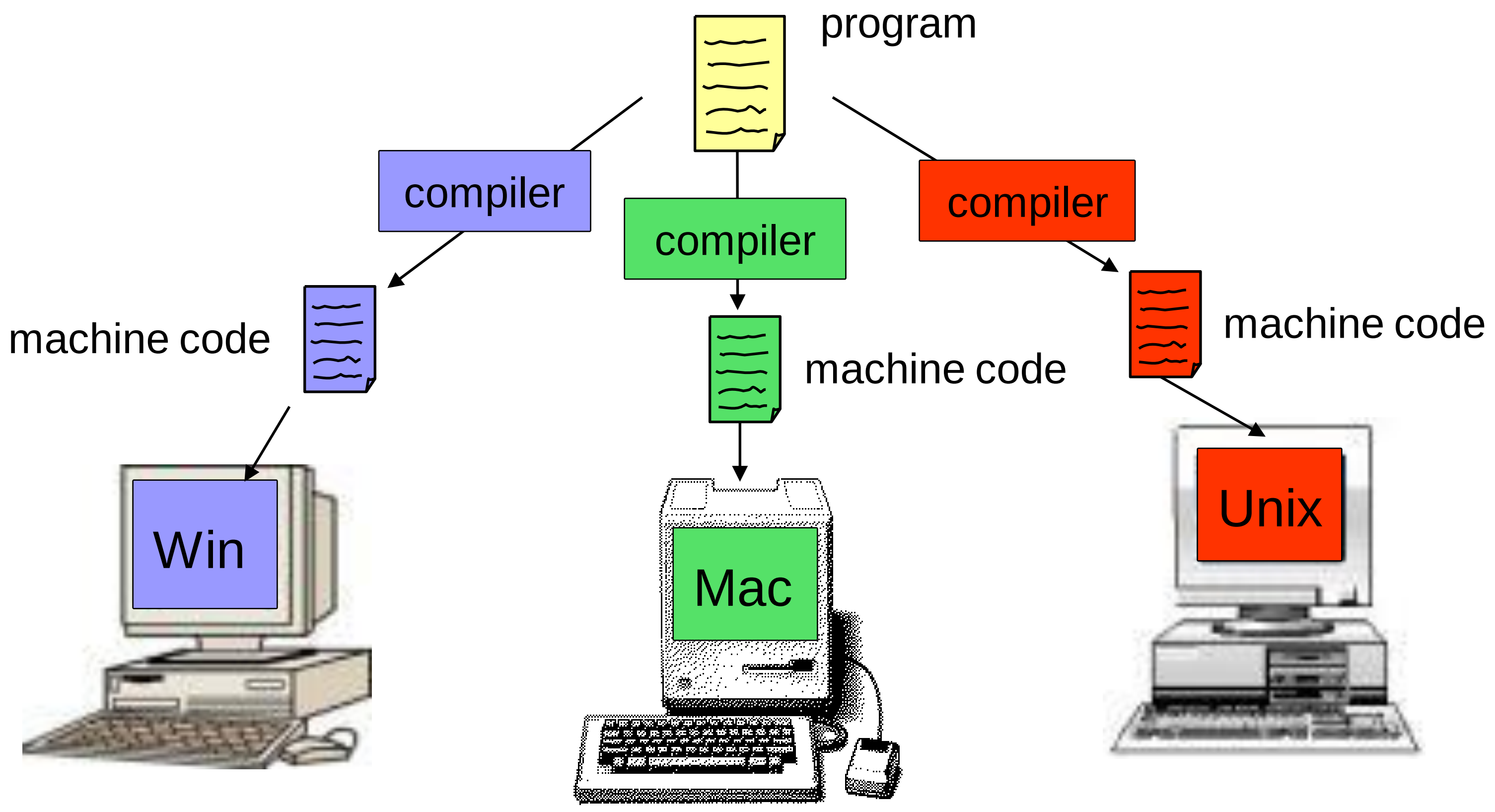
```
…
a = b + c
…
```

```
…
ld $r1, a
ld $r2, b
add $r3, $r1, $r2
st a, $r3
…
```

- Typically, we must have a compiler for each operating system/machine combination (*platform*)

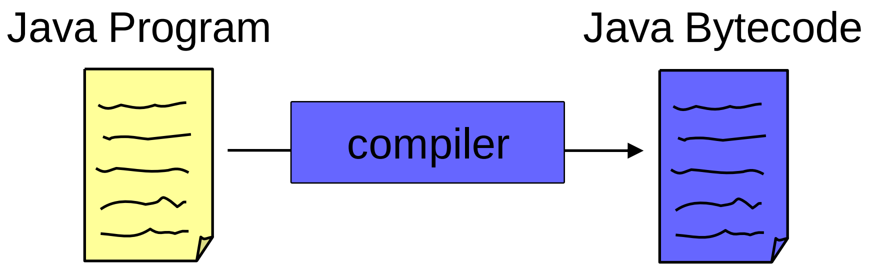
Compiling Computer Programs

- Because different platforms require different machine code, you must compile programs separately for each platform, *then* execute the machine code.



The Java Compiler is Different!

- The Java compiler produces an intermediate format called *bytecode.*

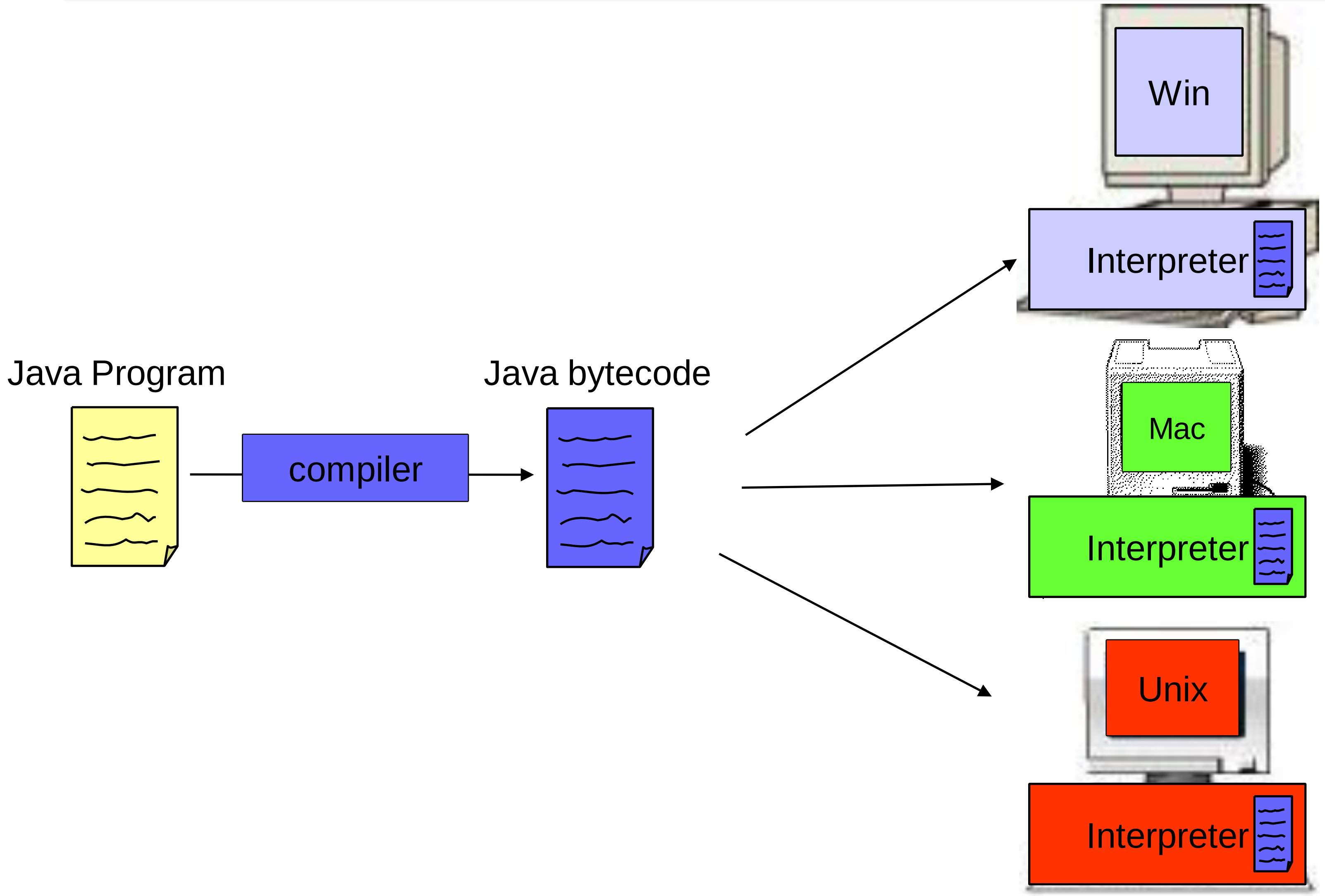


- Bytecode is not machine code for any real computer.
- Bytecode is machine code for a model computer.
  - This model computer is called the *Java Virtual Machine.*

Java Interpreter

- A Java *Interpreter* is required to execute the bytecode on a real computer.
- A Java Interpreter converts the bytecode into machine code.
  - As the program executes
  - *Simulate* the execution of the Java Virtual Machine on the real computer
- You can run bytecode on any computer that has a Java Interpreter (JRE) installed!
  - Only have to compile once
  - Can distribute the same bytecode to everyone

The Java Approach



Advantages of Using Java

- Once a Java program is compiled you can run the bytecode on any device with a Java Interpreter.
  - Because you do not have to recompile the program for each machine, Java is *device independent.*
- Java is safe. The Java language and compiler restrict certain operations to prevent errors.
  - Would you want an application to have total control of your phone?
    - Make calls, send SMS messages?
- Java standardizes many useful structures and operations such as lists, managing network connections, and providing graphical user interfaces

Disadvantages of Using Java

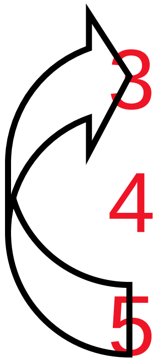
- Running bytecode through an interpreter is not as fast as running machine code
  - But this disadvantage is slowly disappearing

- Using device specific features (e.g., bluetooth) is difficult sometimes because Java is device-independent.

- In order to run a Java program on multiple devices, each must have a Java Interpreter
  - Ex: most Nokia phones come with Java Interpreter

Programming Methodology

1. Specify and analyze the problem
   - Remove ambiguity
   - Decide on inputs/outputs and algorithms
2. Design the program solution
   - Organize problem into smaller pieces
   - Identify existing code to reuse!
3. Implementation (programming)
4. Test and verify implementation
5. Maintain and update program



Writing Good Code

- A program that meets specification is not necessarily good.
- Will you be able to make changes to it?
  - Will *you* understand it after some time?
- Others might need to look at your code
  - Can they understand it?
- Write your program so that is easy to understand and extend!
  - Spend extra time thinking about these issues.

Example Code: Comments

```
/* The HelloWorld class prints “Hello,
World!” to the screen */
public class HelloWorld {
    public static void main(String[] args) {
        // Prints “Hello, World!”
        System.out.println("Hello, World!");
      // Exit the program
      System.exit(0);
    }
}
```

Comments

- *Comments* are used to describe what your code does as an aid for you or others reading your code. The Java compiler ignores them.
- Comments are made using `//`, which comments to the end of the line, or `/* */`, which comments everything inside of it (including multiple lines)
- Two example comments:
  - `/* The HelloWorld class prints “Hello, World!” to the screen */`
  - `// Prints “Hello, World!”`

Comments on Commenting

- You may collaborate on software projects with people around the world who you'll never meet
- Should be able to figure out how code works by reading comments alone
- Anything that is not self-evident needs a comment
- 50% of your code might be comments
- Coding is easy, commenting is not