Programming in Java: lecture 1

- Overview of the course
- Java Virtual Machine (JVM)
- Building blocks of programs
- Object Oriented Programming
- Eclipse
- Hello World

Slides made for use with ”Introuction to Programming Using Java” by David J. Eck
Some figures are taken from ”Introuction to Programming Using Java” by David J. Eck

Overview of the course

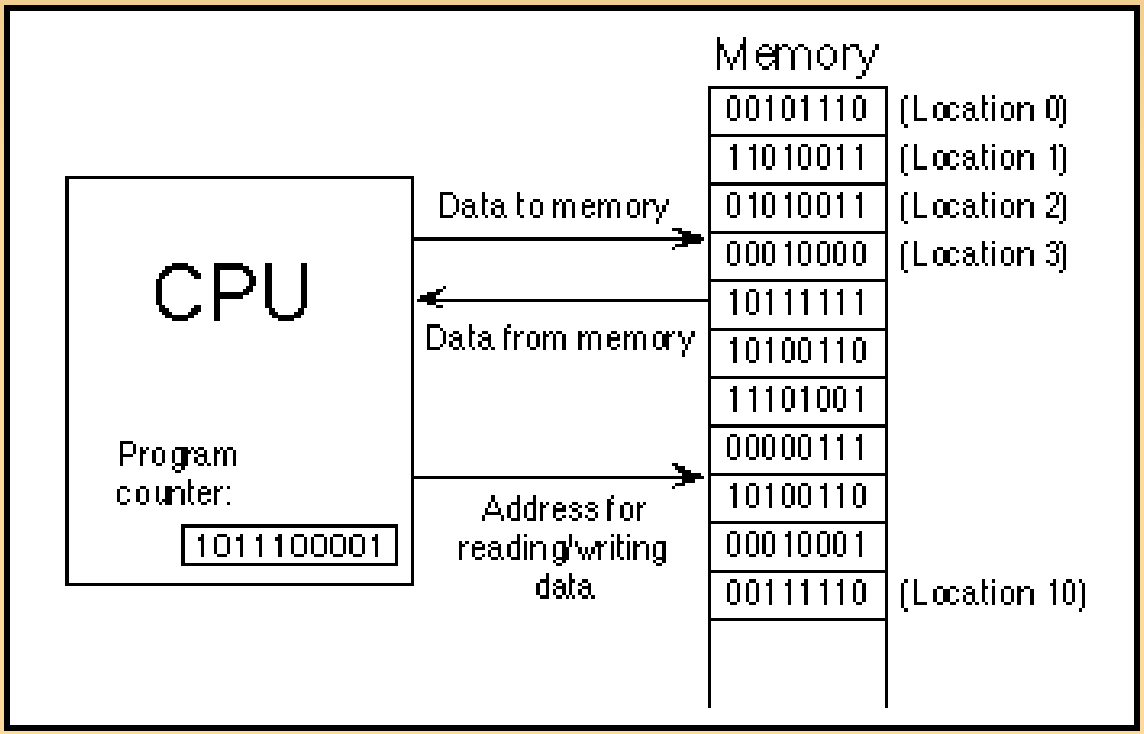
- Purpose: Learn to program
  - Basic Programming
    - Control structures, data types
    - Searching and sorting
    - Recursion
  - Knowledge of Object Oriented Programming
    - Inheritance and Polymorphism
    - Later you will have: OOP and OOA&D
- Exam: Written test

Java Virtual Machine

- Why a virtual machine
- What do we mean by “virtual”
- Explain a regular machine
- Java and Java Byte Code

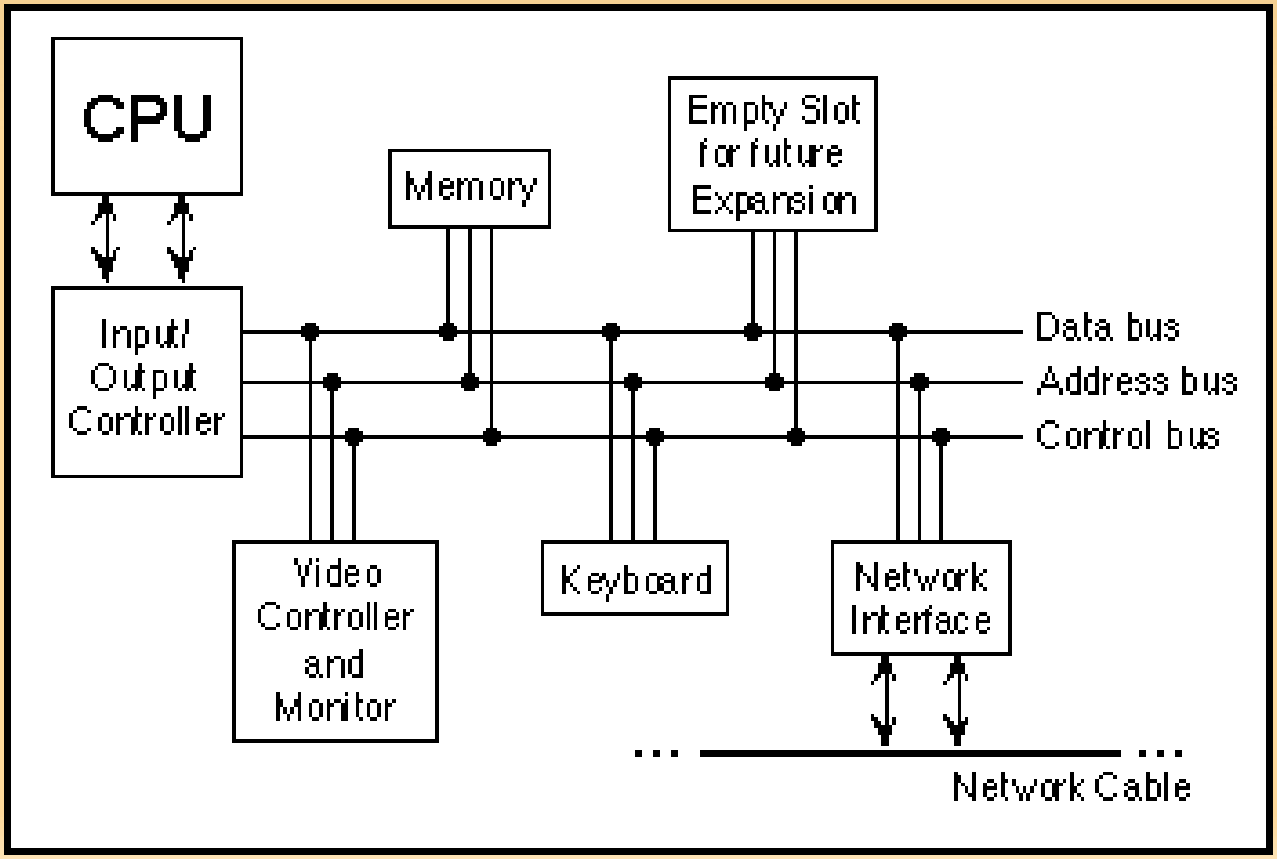
CPU

- Fetch execute cycle
- Machine language



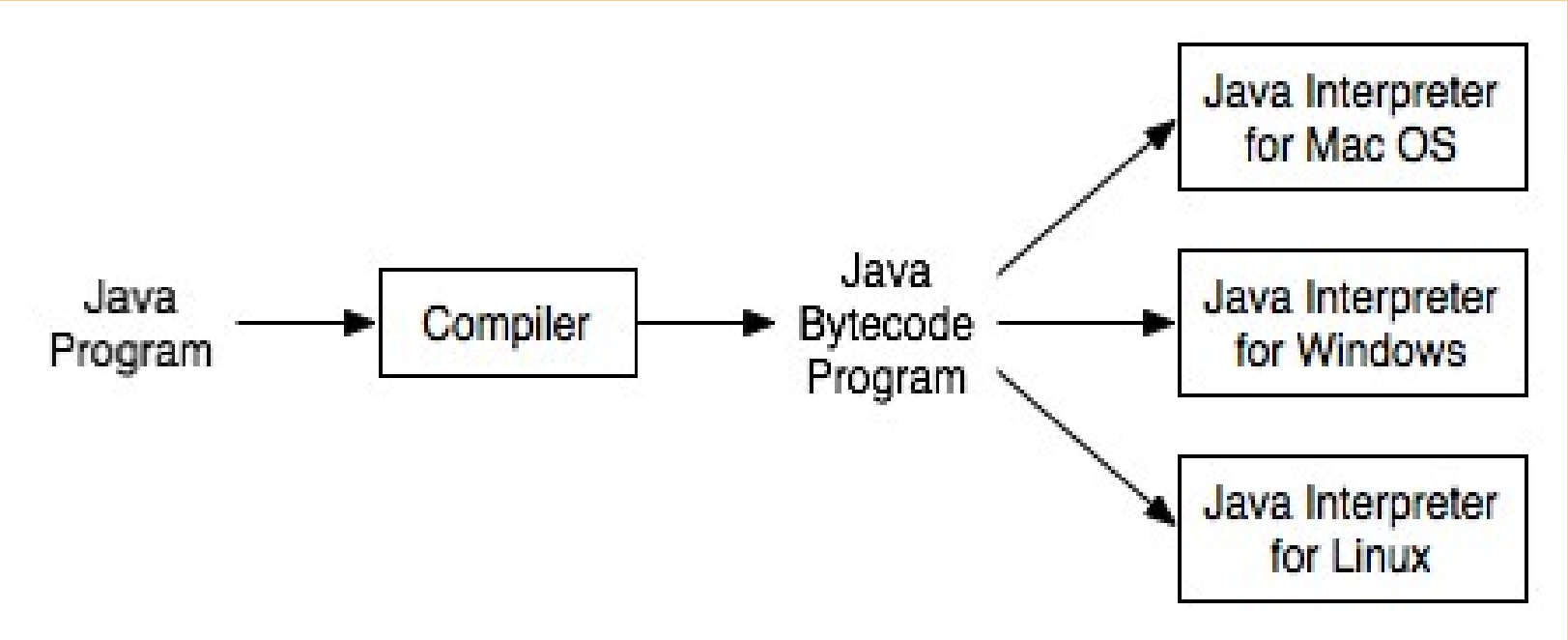
Machine Architecture

- Basic Computer Architecture
- Asynchronous events



Java Virtual Machine

- Why a virtual machine?



Compilation

```
Java Byte Code:
  0:   iconst_2
  1:   istore_1
  2:   iload_1
  3:   sipush  1000
  6:   if_icmpge       44
  9:   iconst_2
  10:  istore_2
  11:  iload_2
  12:  iload_1
  13:  if_icmpge       31
  16:  iload_1
  17:  iload_2
  18:  irem             # remainder
  19:  ifne    25
  22:  goto    38
  25:  iinc    2, 1
  28:  goto    11
  31:  getstatic       #84; //Field java/lang/System.out:Ljava/io/PrintStream;
  34:  iload_1
  35:  invokevirtual   #85; //Method java/io/PrintStream.println:(I)V
  38:  iinc    1, 1
  41:  goto    2
  44:  return
```

```
Java Code:
 for (int i = 2; i < 1000; i++) {
  for (int j = 2; j < i; j++) {
    if (i % j == 0)
      continue outer;
  }
  System.out.println (i);
 }
```

Building blocks of programs

- Data
  - Variables
  - Types
- Instructions
  - Control structures
    - organize code
  - Subroutines
    - reuse

```
Java Code:
 for (int i = 2; i < 1000; i++) {
  for (int j = 2; j < i; j++) {
    if (i % j == 0)
      continue outer;
  }
  System.out.println (i);
 }
```

History of Programming

- Structured programming
  - Divide problem into smaller problems
  - top-down approach
  - Focus on instructions, not data
- Object Oriented Programming
  - Model the problem area
  - bottom-up approach
  - Focus on data, not instructions

Object Oriented Programming

- What is an object?
  - Represents real world objects
  - Data and associated methods (functions).
    - Data hiding
    - Polymorphism
    - Classes
    - Inheritance

Data Hiding

- Ensuring
  - modularity
  - data integrity
- Enabling
  - reuse
  - local modifications

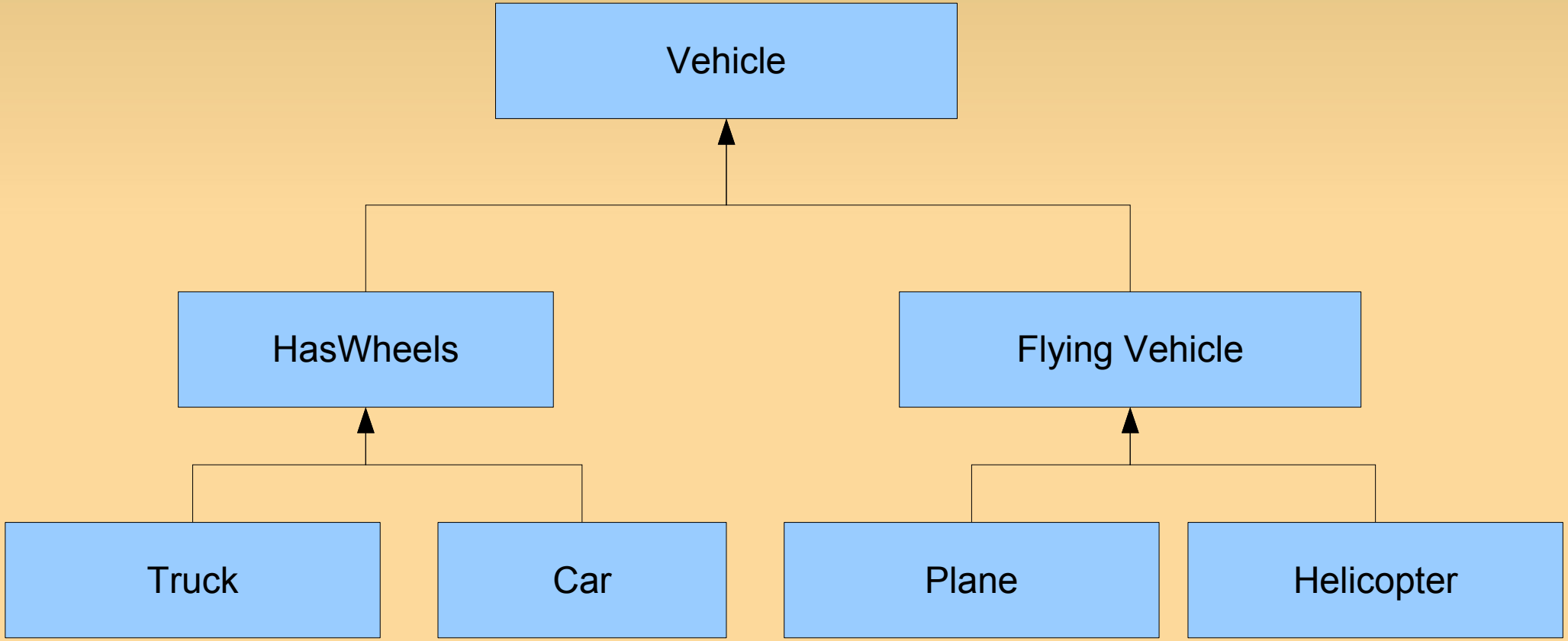
Polymorphism

- The same message send to different objects will have different effects
- Code that operates on data types that we have not defined yet

Classes

- Template
- Description of a group of objects
- Example: Vehicle

Inheritance



Command Line Interface

- Windows: Run Program (cmd)
- Linux: xterm, gterm, ...
- Mac OS: Terminal
- Javac – compiler
  - `> javac HelloWorld.java`
- Java – execution
  - `> java HelloWorld`
  - `Hello World!`

Packages

- Packages
  - `> package mypackage;`
- Compilation with packages
  - Windows
  - `> javac mypackage\HellowWorld.java`
  - Linux
  - `> javac mypackage/HellowWorld.java`

Eclipse Demo

Hello World Example

```
// A program to display the message
// "Hello World!" on standard output
public class HelloWorld {

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

}   // end of class HelloWorld
```