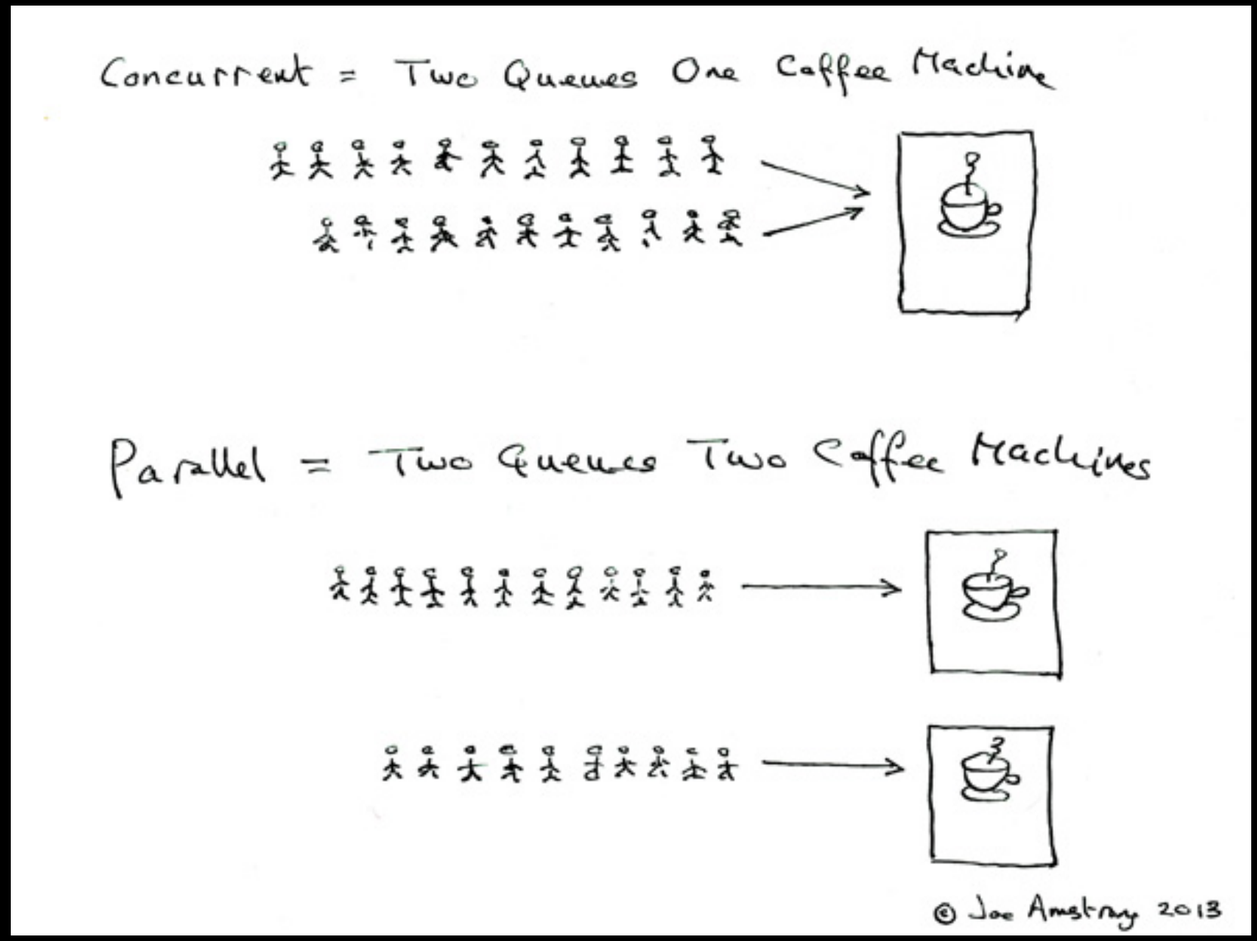
Tutorial 1

Objective

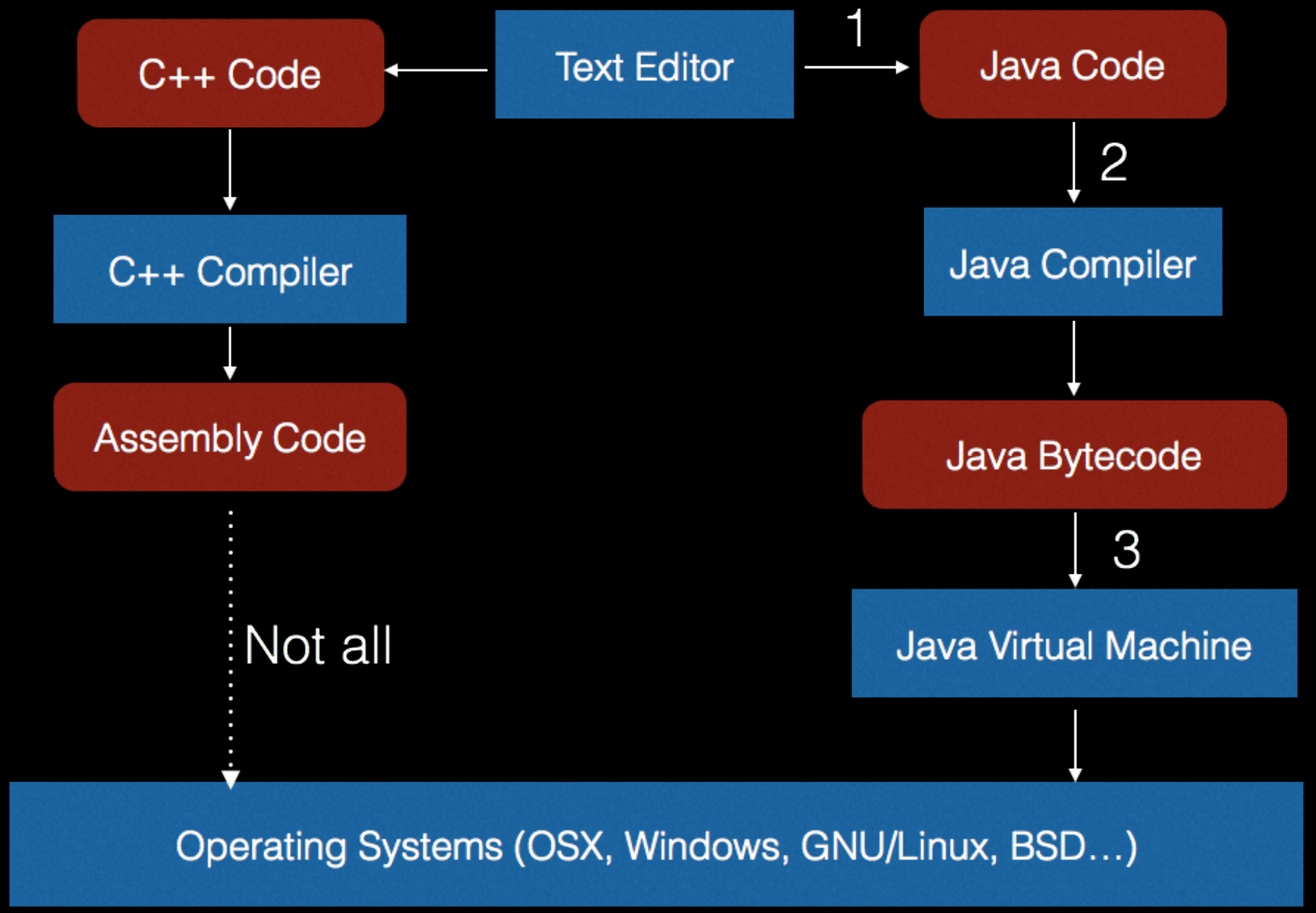
Synchronization mechanism on Concurrent Programming using Java

Concurrent vs Parallel



What's Java ?

- Object Oriented Programming Language
- Imperative Language (vs Functional)
- Static & Strong type (vs Dynamic Type)
- Cross platform


C++ Code
Text Editor
1
Java Code
2
C++ Compiler
Java Compiler
Assembly Code
Java Bytecode
3
Not all
Java Virtual Machine
Operating Systems (OSX, Windows, GNU/Linux, BSD…)

1. Creating Java source code

- Using a text editor to create HelloWorld.java

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

2. Compiling Java Source Code

- Launch terminal
- Run `javac HelloWorld.java` to compile
- Output is HelloWorld.class

3. Launching Java Application

- Run `java HelloWorld` to run the application
- HelloWorld is a public class which has an entrance
- Application entrance `static void main` method

Toolkits

- Free to choose operating system (**GNU/Linux, OSX**, Windows)
- IDEs : Intellij, Eclipse, Netbean
- Editors: Sublime Text, Vim, Emacs, Atom, ...

Recommend to do assignment on your own machine

(Other TAs may require you demo on Lab's machines)

Installation

1. Java Development Kit (Oracle JDK or OpenJDK)
2. IDEs or editors
3. Run HelloWorld by IDE

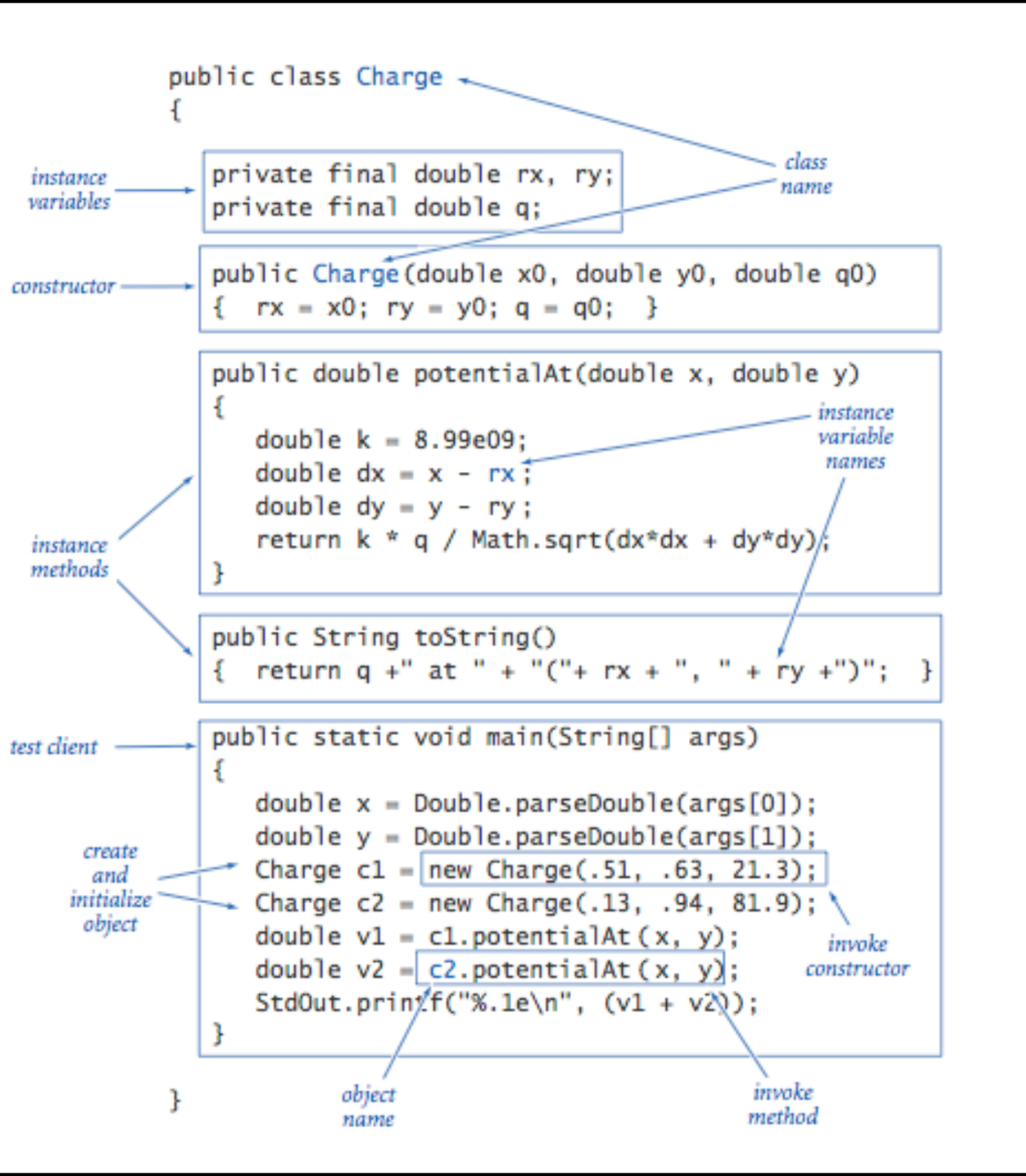
Java Quick Started

Application structure

- An application includes classes
- A class includes fields and methods
- A method is composited by statements
- An application is started at **main entry**

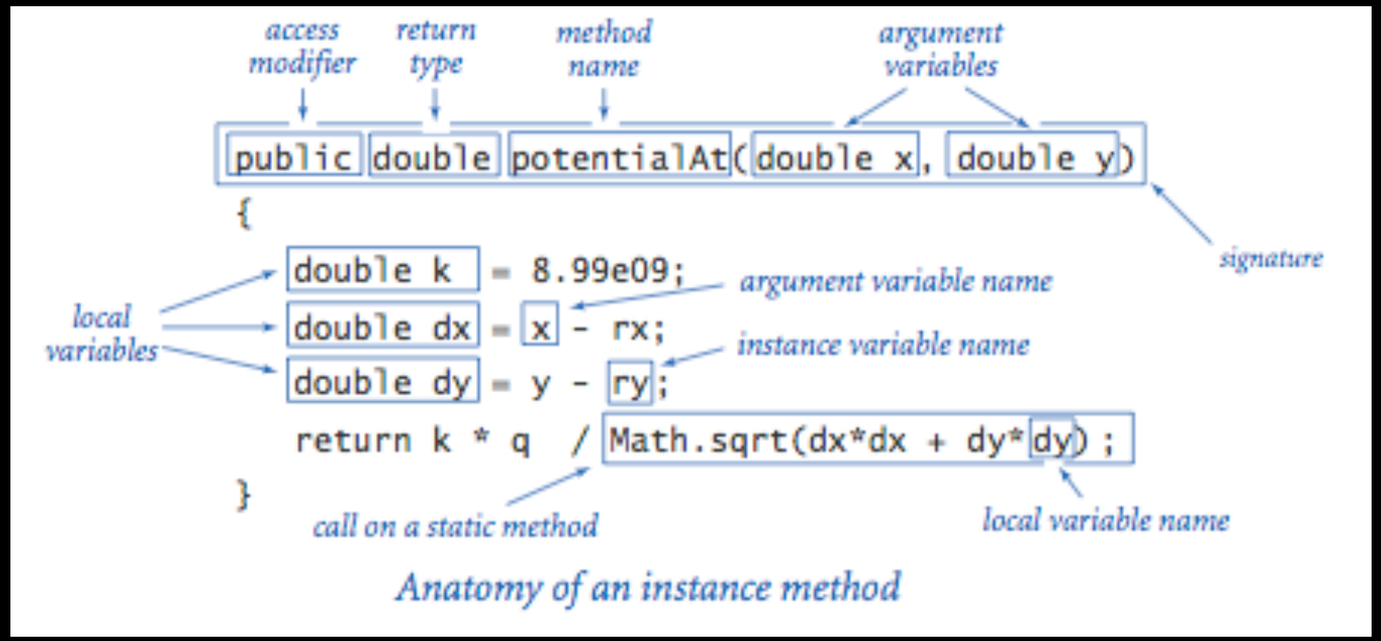
Class

- Fields are properties of instance
- Methods are behaviours
- Constructors are used to initialized instances
- Static vs Instance



Method

- **Signature:** Method Type, Name, Return Type, Arguments
- **Body:** Statements



Constructor

Special method to initialize instance of class

```
class Student {
    private int id;
    private String name;
    public Student(int id, String name) {
        this.id = id;
        this.name = name;
    }
}
```

Statements

- Declaration
- Assignment
- Conditional statements (if and switch)
- Invoking
- Loop statements (for, while, do while)
- Return statement

Builtin Types

type	*set of values*	*common operators*	*sample literal values*
`int`	integers	`+ - * / %`	`99 -12 2147483647`
`double`	floating-point numbers	`+ - * /`	`3.14 -2.5 6.022e23`
`boolean`	boolean values	`&& || !`	`true false`
`char`	characters		`'A' '1' '%' '\n'`
`String`	sequences of characters	`+`	`"AB" Hello" "2.5"`

Declaration & Assignment

```
int x;
int y = 10;
String name = "Concordia University";
Student st = new Student(123, "Name"); //Create student with name and id
```

Conditional Statement

```
if (x < 10) {

}else {

}

//Comment line

if (x == 10) {

}
```

Selection Statement

```
switch(day) {
    case 0: System.out.println("Sun"); break;
    case 1: System.out.println("Mon"); break;
}
```

Loop Statements

```
for(int i = 0; i < N; i++) {

}

while(i < N) {
    i += 1;
}
```

Return Statement

- Stops execution of method
- Returns value

```
public double maxWithoutElse(double d1, double d2) {
    if(d1 < d2) {
        return d2;
    }
    return d1;
}
```

Assembling

```
class Mathematician {
    //Property
    private String name;

    //Constructor
    public Mathematician(String name) {
        this.name = name;
    }

    //Instance method
    public int calculateFactorial(int n) {
        int result = 1;
        for(int i = 2; i <= n; ++i) {
            result *= i;
        }
        return result;
    }
}
```

Invoking it

```
class MyApp {
  public static void main(String[] args) {
    int n = 5;
    Mathematician m = new Mathematician("Anonymous");
    int factorial = m.calculateFactorial(n);
    System.out.println("Methematican says: " + n + "! = " + factorial);
  }
}
```

Arrays

```
String[] weekend = { "Saturday", "Sunday" };
int[] grades = {1, 2, ,3, 4, 5, 6, 7, 8, 9, 10};
int g1 = grades[0];
```

- Indexing starts from **0**
- Multiple dimension array

Sources

1. http://introcs.cs.princeton.edu/java/11cheatsheet/images/built-in.png
2. http://joearms.github.io/images/con*and*par.jpg