COMP163

Introduction to Computer Programming

Introduction and Overview of the Hardware

Reading

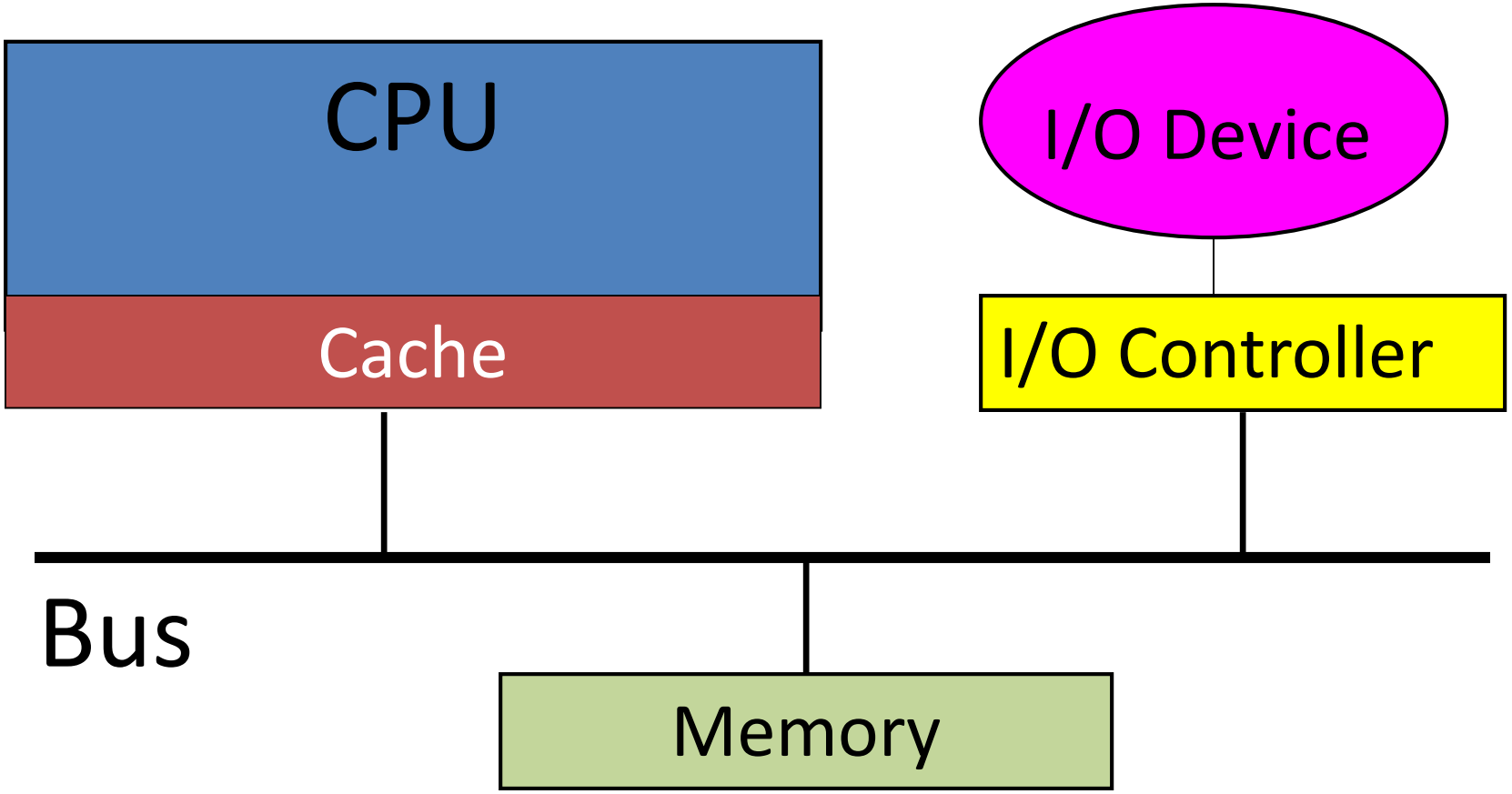
- Read chapter 1 of the online textbook

What is the difference between a simple calculator and a computer?

Hardware and Software

- Hardware is the electronics of the computer. Hardware is physical stuff you can touch.
- Software is the program that runs on the hardware
- Software allow the same hardware to be used for many different purposes
- We will be writing software in this class

Basic Computer Components



Central Processing Unit

- Contains the control logic that initiates most activities in the computer
- The Arithmetic Logic Units of the CPU perform the math and logic calculations
- It is the CPU that executes a Java program

Bus

- The bus is a set of parallel wires that connect the CPU, memory and I/O controllers
- It has logic to determine who can use the bus at any given instant
- Controlled by the chipset

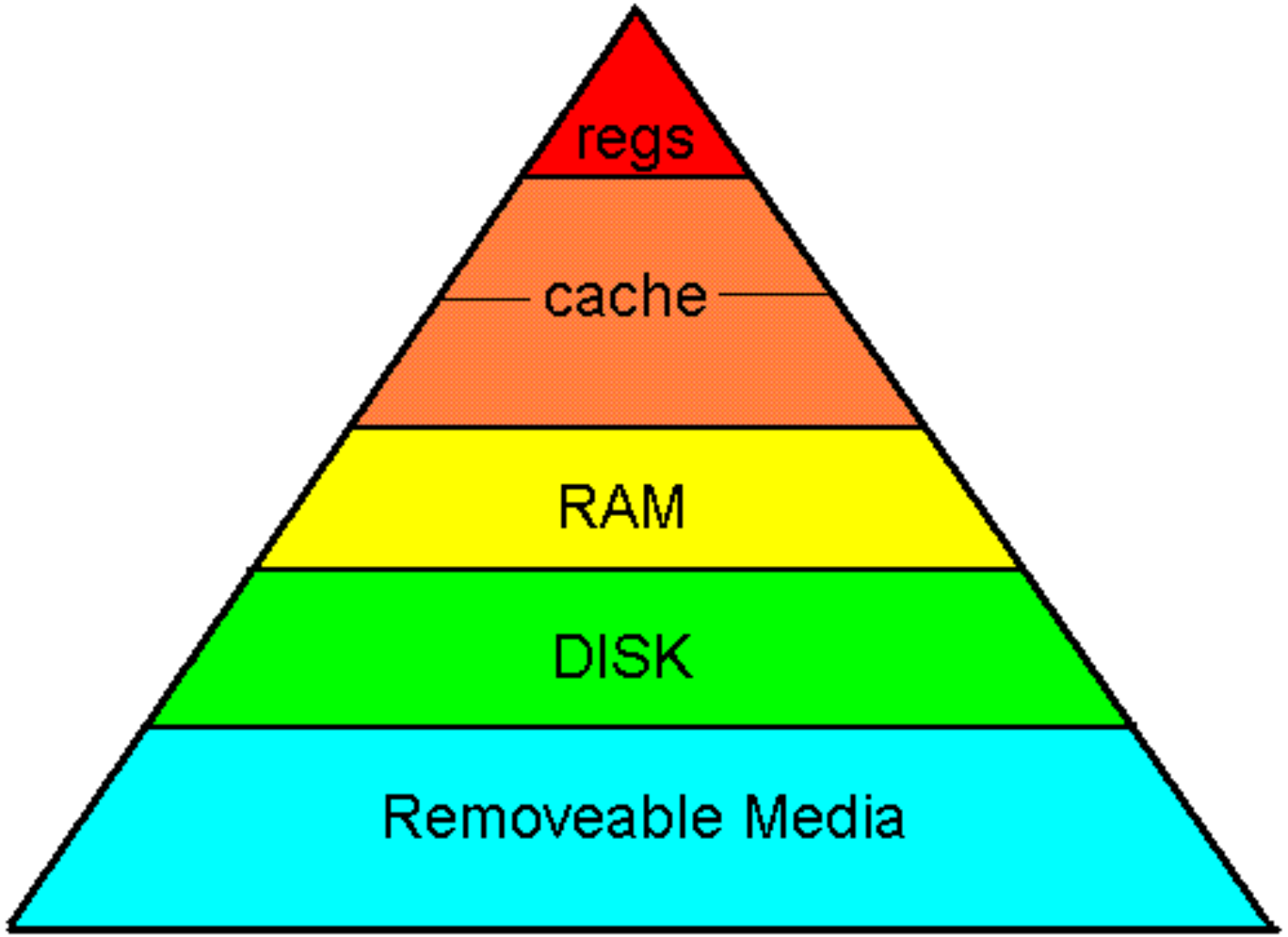
I/O Controllers

- Direct the flow of data to and from I/O devices
- The CPU sends a request to the I/O controller to initiate I/O
- I/O controllers run independently and in parallel with the CPU
- I/O devices include the screen, keyboard, network, printer, disk, mouse, etc.

Memory

- The internal memory is Random Access Memory (RAM)
- Both data and program instructions are kept in RAM
- Instructions must be in RAM to be executed
- 8 binary bits are grouped into a **byte**
- 4 bytes (32 bits) are grouped into a **word**
- 8 bytes (64 bits) are grouped into a **long** word

Memory Hierarchy



Programming Languages

- We will be writing software in the Java programming language
- There are hundreds of programming languages
- Programs must be written ***EXACTLY*** correct
- Any syntax error (i.e. missing comma) will generate an error
- There is lots of punctuation

Example Java Program

```
// A simple Java program
public class FirstDay {
    public static void main( String[] args) {
        System.out.println("My first program");
    }
}
```

Comments

- Programs are written for both computers and humans to read
- Comments are notes for humans that the compiler ignores
- There are two formats for comments

```
// the rest of the line is a comment
/*  everything is ignored
                until */
```

- Javadoc comments start with */** more to come */*

Reserved Words

- Some words are special in Java. They are part of the Java language. You cannot use reserved words for names.
- **class public static void** are reserved words used in the example program
- All Java reserved words are all lower case
- Java is case sensitive. Upper and lower case letters are different.

Statements

- A statement is a line of a Java program
- One logical line can be spread over several lines on the screen.

```
System.out.println(
                    "My first program"
                );
```

- Every Java statement ends with a semi-colon ;

Blocks

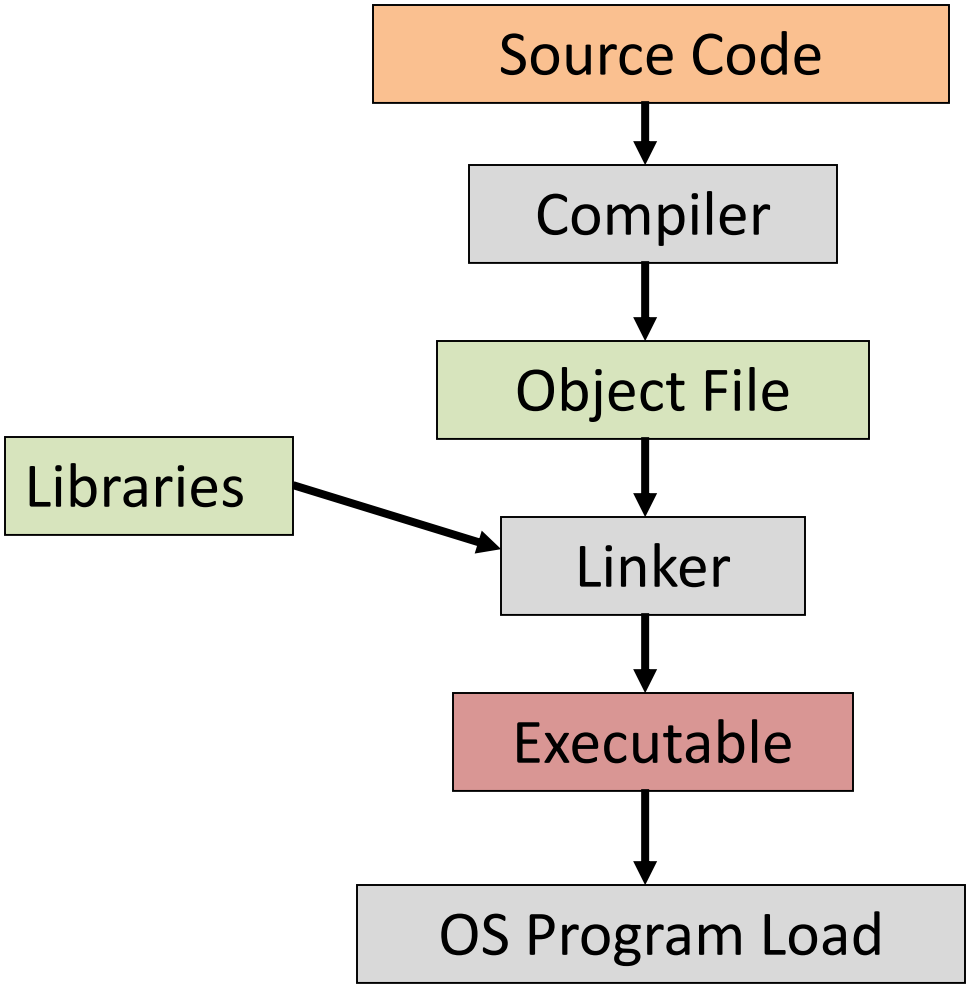
- A block is a bunch of statements surrounded by curly brackets **{** *block stuff* **}**
- Every class has a class block
- Every method has a method block
- Almost any place you can put a Java statement, you can also put a block
- Blocks can be nested

{ *outer* **{***inner***}** *more outer* **}**

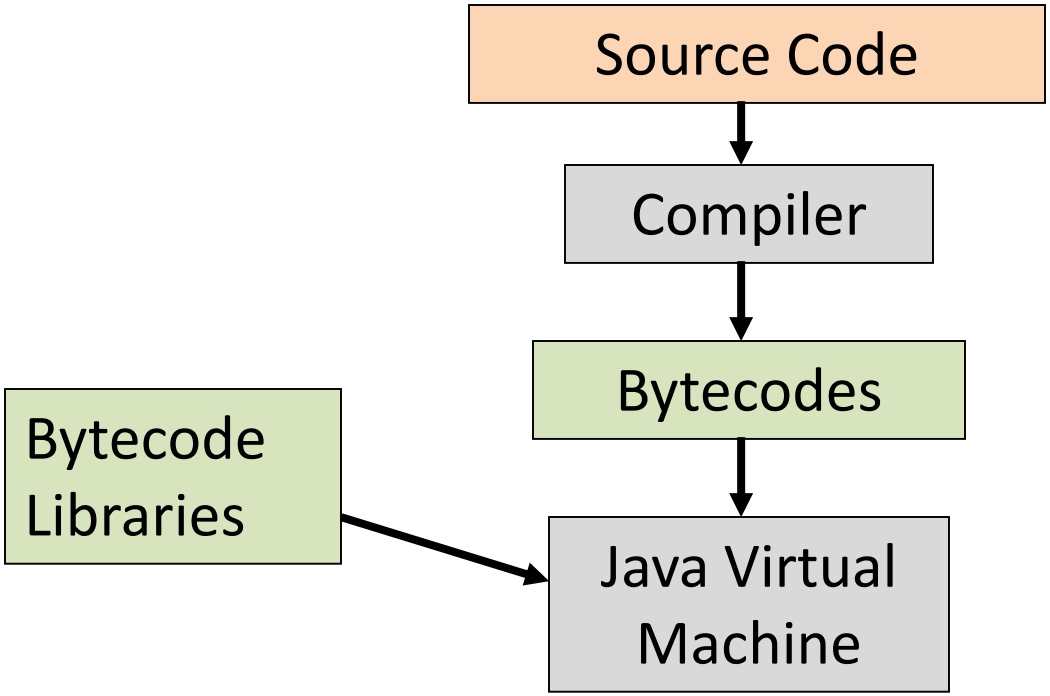
Source Code

- What you type is called the source code of your program
- The source code is not directly run by the computer
- The source code must be compiled into an executable form before the computer can execute it

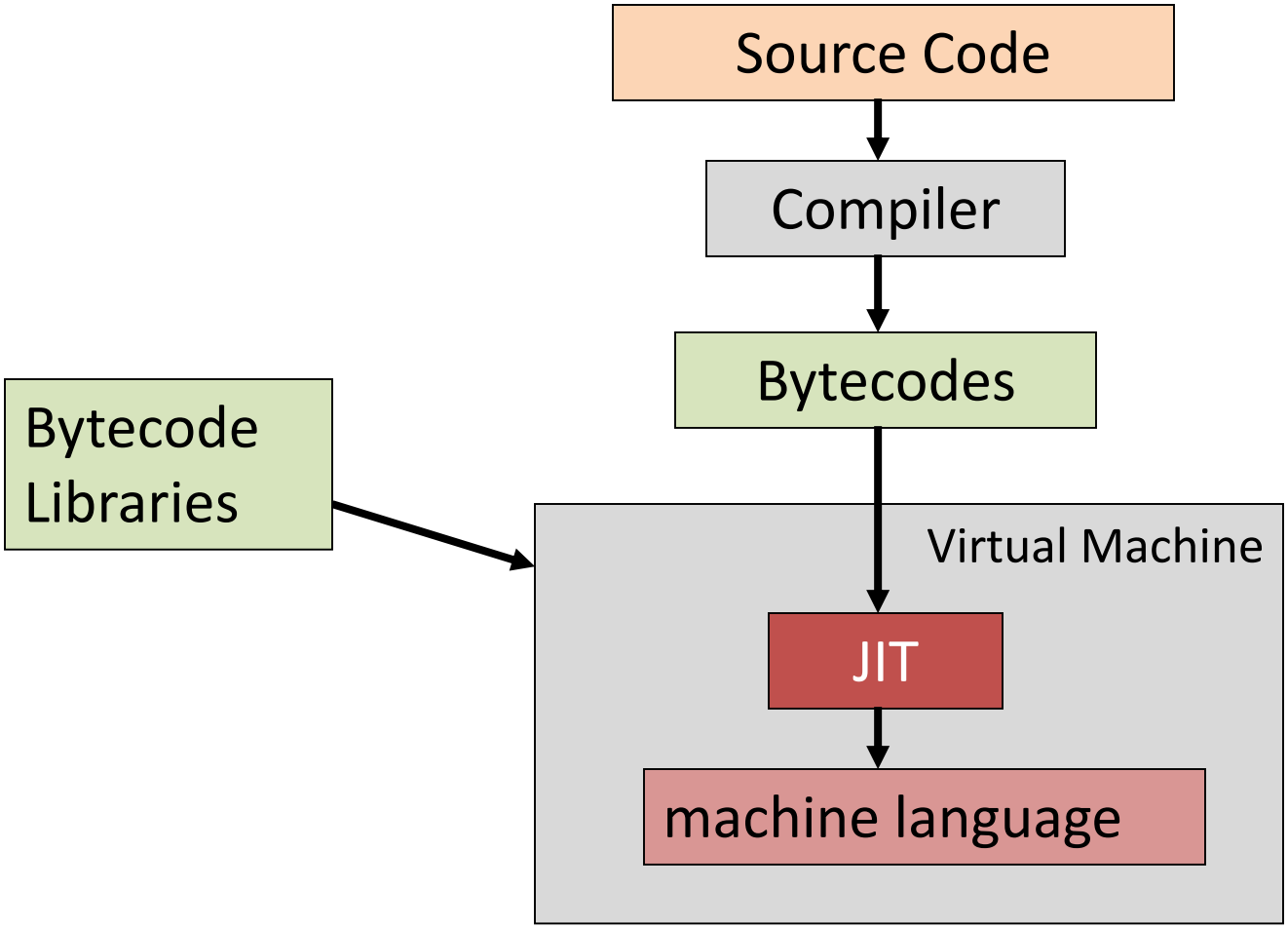
Traditional Program Creation



Traditional Java Programs



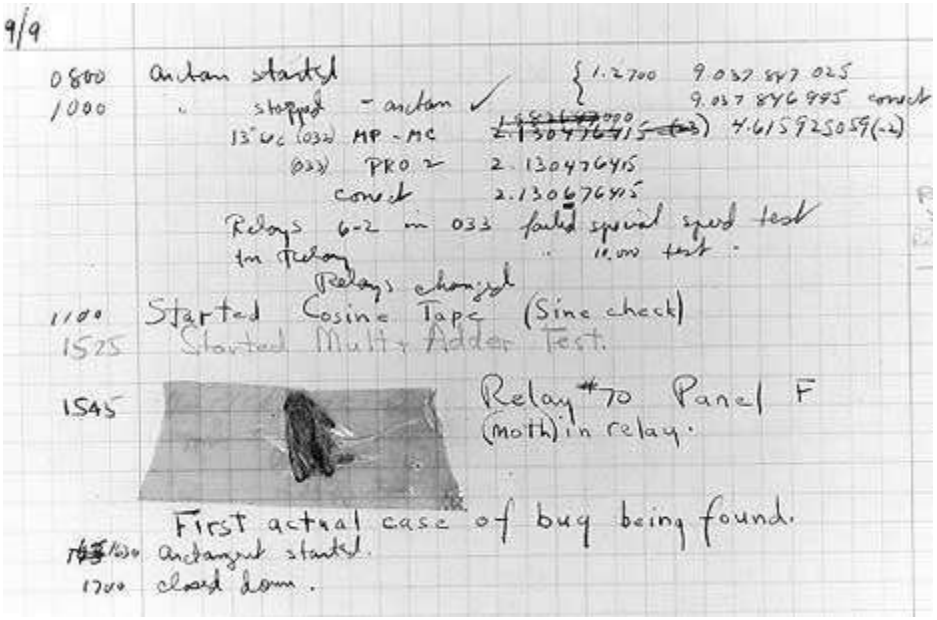
Modern Virtual Machines



Errors

- When programming you will make mistakes.
- There are three types of programming errors
  - **Compile errors** – When you compile your program, the compiler might detect an error (i.e. missing semicolon)
  - **Run time errors** – An error can occur when you program is running (i.e. division by zero)
  - **Logic errors** – Your program might not produce the correct results

Errors in programs are often called "Bugs"



Grace Hopper coined the term ***"bug"*** when she found a moth in the relay of an early computer

Keep Your Cool

- You **will** have errors
- You **will** correct them
- Seek help if you don’t understand the error

Reading

Read chapter 1 of the online textbook