

CSCI 1304: Programming I

Chapter 1 Introduction

Part 1 Computer Basics

Dr. Nour Almadhoun Alserr

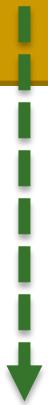
Lecture 2-4

Week 2



Objective

Understand the basics of computer **hardware** and **software**



Programs

Hardware and Memory

Hardware (HW) and Software (SW)

- Computer systems consist of hardware and software.





Hardware (HW) and Software (SW)

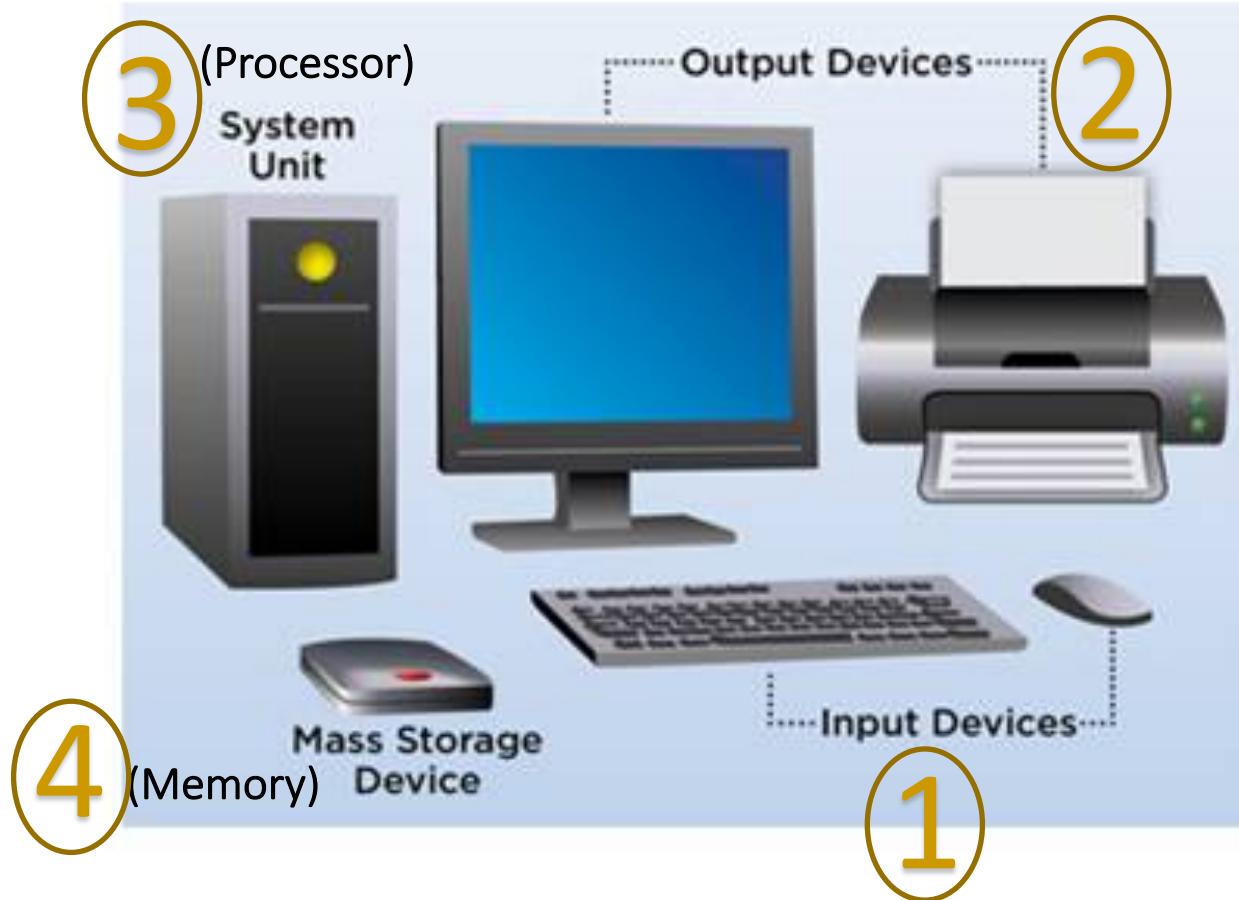
- **Hardware** includes the **physical parts** of computer systems.

- **Software** includes **programs** - sets of instructions for the computer to follow.

- Familiarity with **hardware basics** helps us understand **software**.

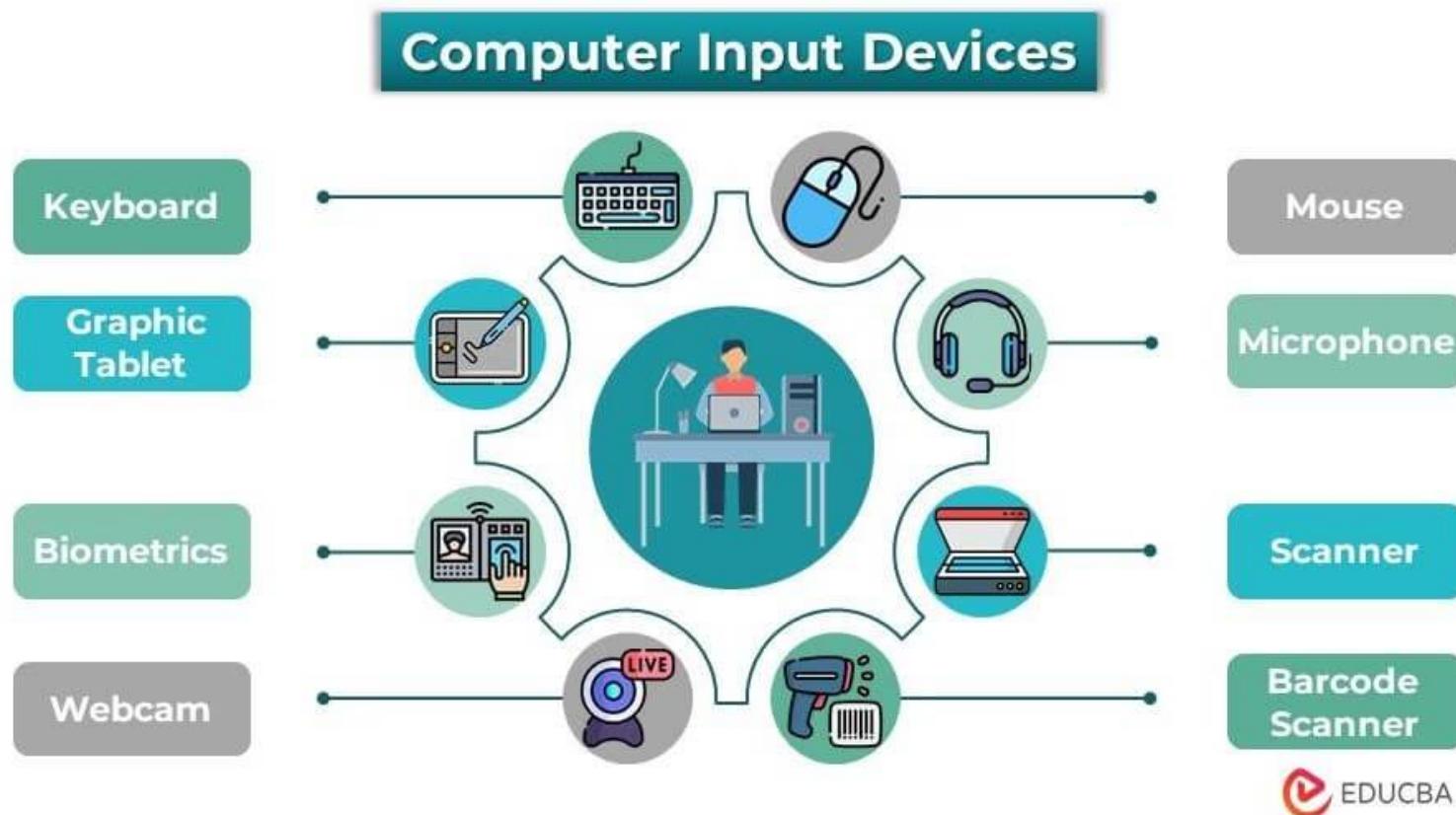
Hardware (HW)

- Most modern computers have similar **components** including:



Hardware (HW)

- Most modern computers have similar **components** including:
 - Input devices (keyboard, mouse, etc.)



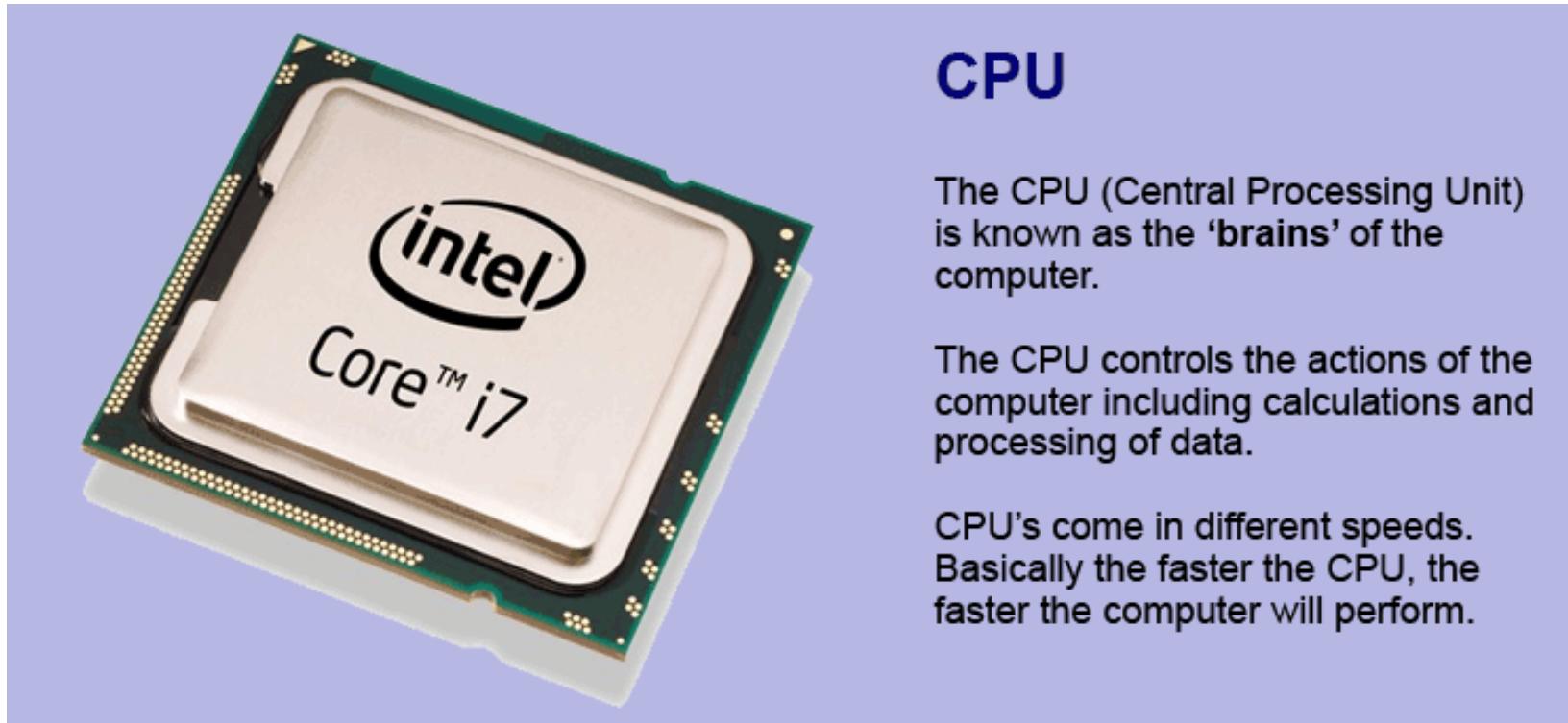
Hardware (HW)

- Most modern computers have similar **components** including:
 - Output devices (display screen, printer, etc.)



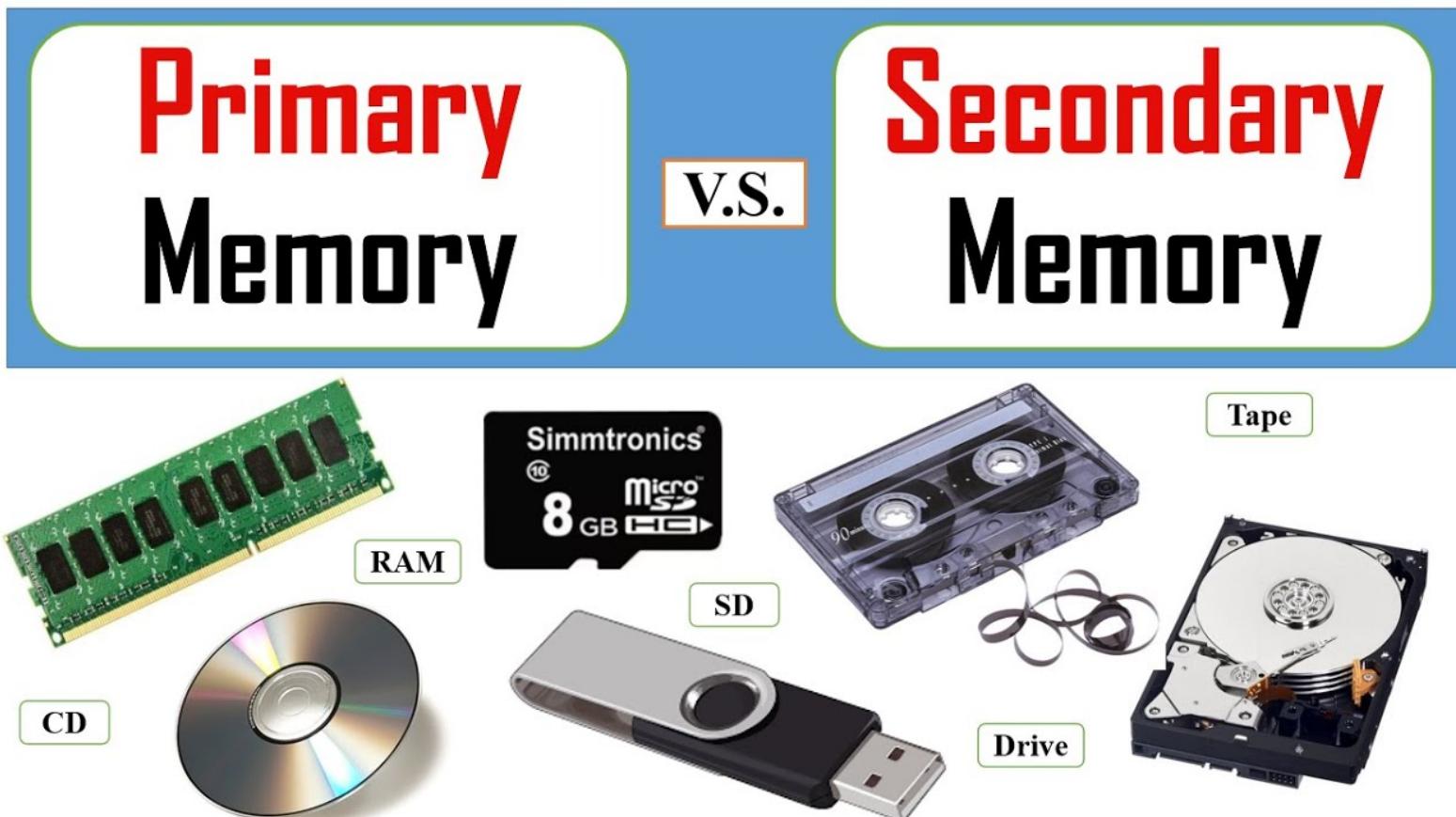
Hardware (HW)

- Most modern computers have similar **components** including:
 - A processor



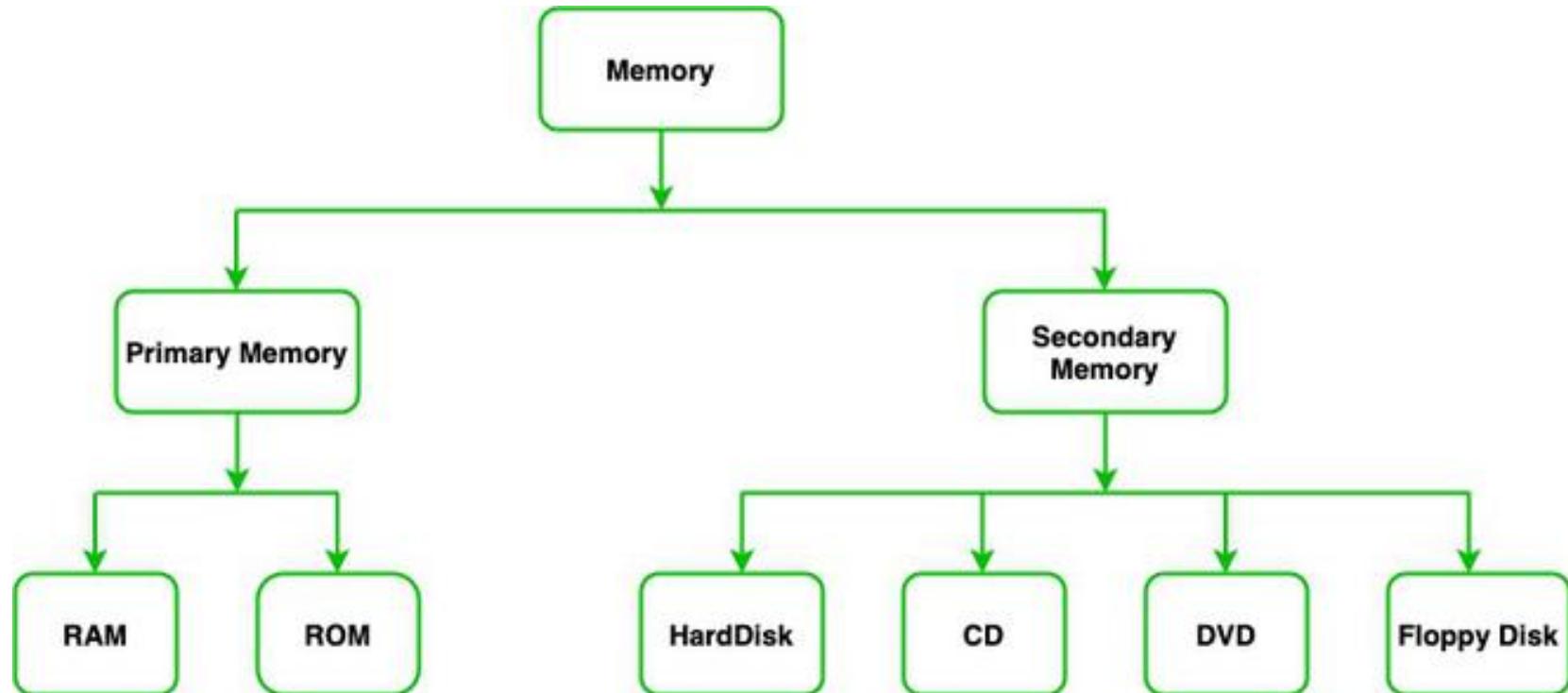
Hardware (HW)

- Most modern computers have similar **components** including:
 - Two kinds of memory (**main** memory and **auxiliary/secondary** memory).



Hardware (HW)

- Most modern computers have similar **components** including:
 - Two kinds of memory (**main** memory and **auxiliary/secondary** memory).



Processor

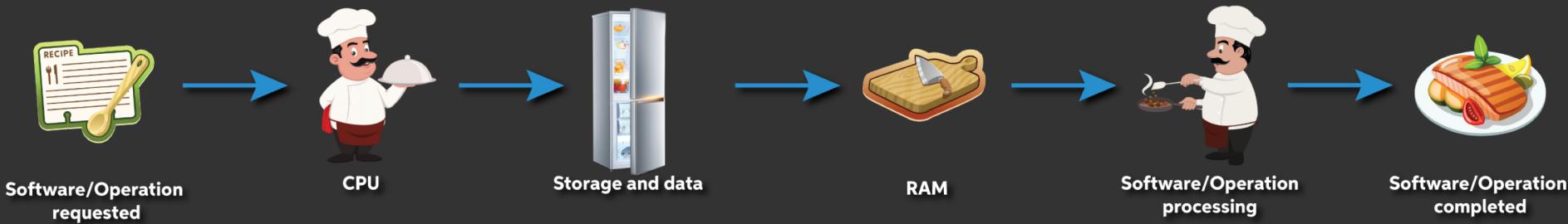
- Also called the **CPU** (central processing unit) or the *chip* (e.g. intel Core i7).



Processor

- The processor **processes** a program's instructions.
- It can process only very simple instructions.
- The power of computing comes from **speed** and **program complexity**.

How a computer processor works

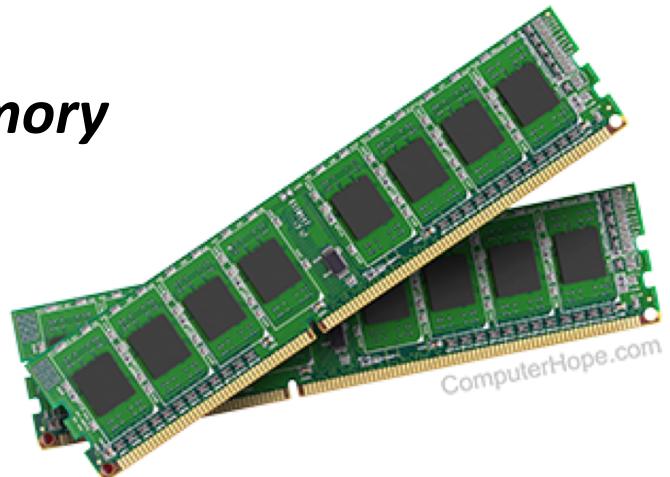


Memory

- Memory holds
 - ❑ Programs
 - ❑ Data for the computer to process
 - ❑ The results of intermediate processing
- Two kinds of memory
 - ❑ Main memory
 - ❑ Auxiliary memory

Main Memory

- Working memory used to store
 - The current program
 - The data the program is using
 - The results of intermediate calculations
- Usually measured in megabytes (MB) and gigabytes (GB) (e.g. 8 gigabytes of RAM)
 - RAM is short for ***random access memory***
 - A *byte* is a quantity of memory



Bit and Byte

= bit and byte =

Bit (binary digit, bit)

Measurement unit that can only have two values, 0 and 1

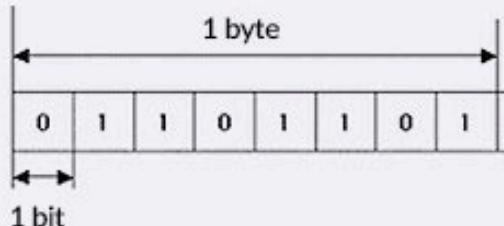


0 OFF FALSE
1 ON TRUE

Byte

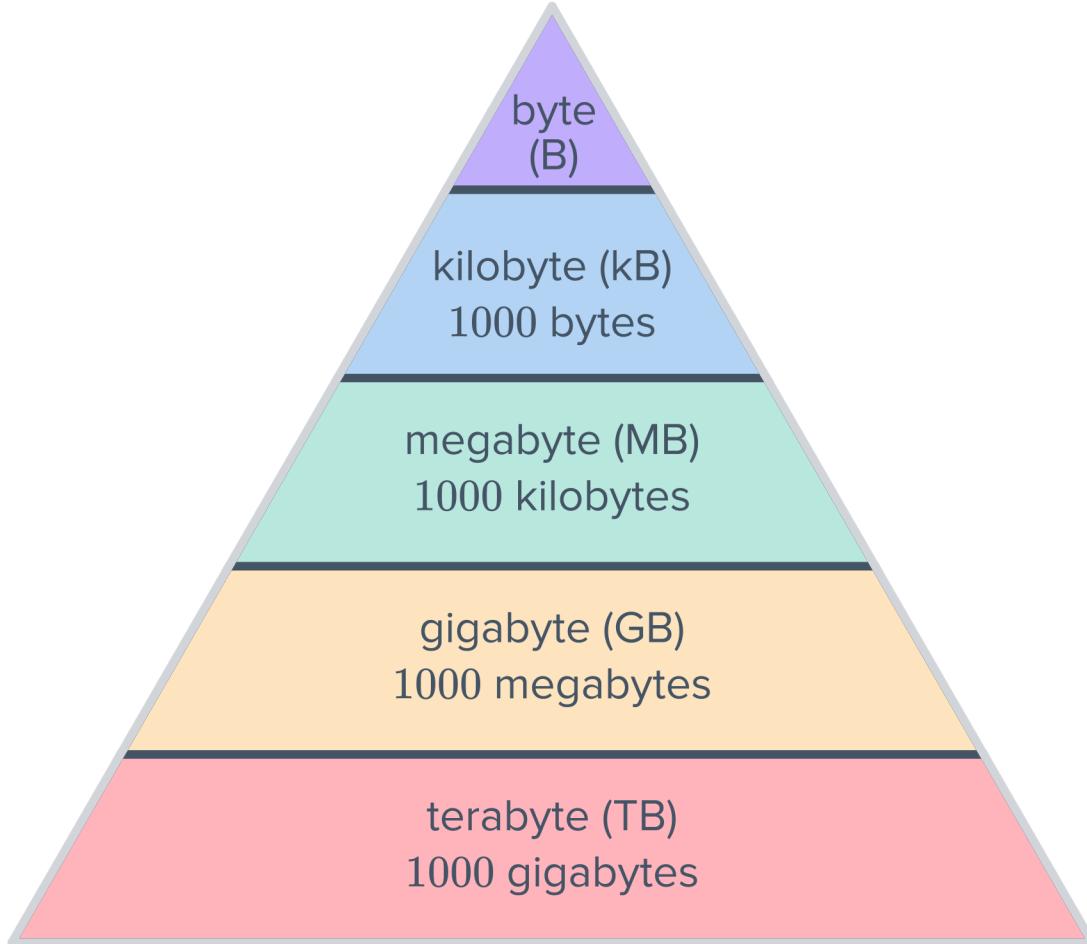
Unit that indicates the amount of data, consisting of eight bytes

bits



Samsung Semiconstoy
samsungsemiconstoy.com

Bit and Byte



Secondary (Auxiliary) Memory

- Disk drives, CDs, DVDs, flash drives, etc.
- More or less permanent (nonvolatile)
- Usually measured in gigabytes (GB) (e.g. 512 gigabyte hard drive)



Memory

- **Volatile memory** stores data when a computer is on but erases it as soon as the computer is switched off (e.g. RAM).
- **Non-volatile memory** remains in a computer even after the system shuts off (e.g. hard disk).

Bytes and Memory Locations

FIGURE 1.1 Main Memory

	<i>Bytes</i>
•	
•	
•	
Byte addresses	
3021	11110000
3022	11001100
3023	10101010
3024	11001110
3025	00110001
3026	11100001
3027	01100011
3028	10100010
3029	01111111
3030	10000001
3031	10111100
•	
•	
•	

2-byte memory location at address 3021

1-byte memory location at address 3023

3-byte memory location at address 3024

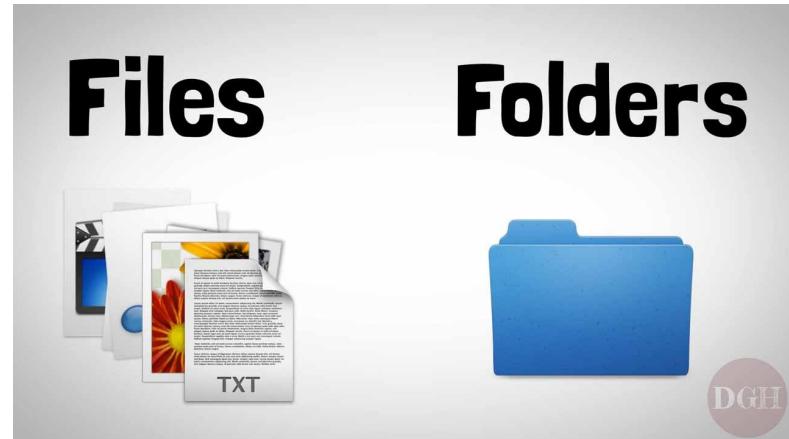
2-byte memory location at address 3027

Storing Data

- Data of all kinds (numbers, letters, strings of characters, audio, video, even programs) are encoded and stored using **1s and 0s**.
- When more than a single byte is needed, **several adjacent bytes** are used.
 - The address of the first byte is the address of the unit of bytes (Groups of adjacent bytes can serve as a single memory location).

Files

- Large groups of bytes in **auxiliary memory** are called *files*.
- Files have names.
- Files are organized into groups called *directories* or *folders*.

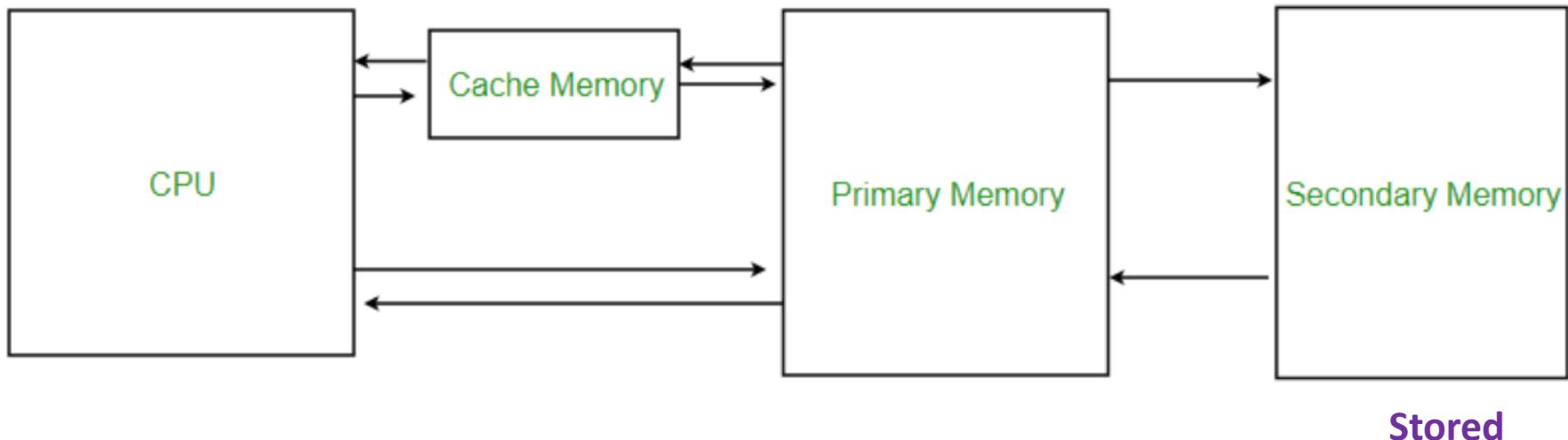



The screenshot shows a Mac OS X desktop environment. The Dock at the bottom contains icons for Finder, Dock View, Applications, and others. A Finder window is open, displaying a list of files and folders in the 'Desktop' folder. The sidebar on the left lists 'AirDrop', 'Recents', 'Applications', 'Documents', 'Desktop' (which is selected), and 'Downloads'. The main list in the Finder window includes:

File/Folder	Last Modified	Type
Java	Today at 06:17	Folder
Software and Web Engineering WDMM 3314	Yesterday at 21:39	Folder
GitHub-Materials	Yesterday at 21:20	Folder
Desktop	13 September 2023 at 20:14	Folder
Yusuf76.jpeg	19 July 2021 at 11:02	206 KB JPEG Image
Nour-Resume.pdf	20 July 2020 at 12:53	325 KB PDF Document

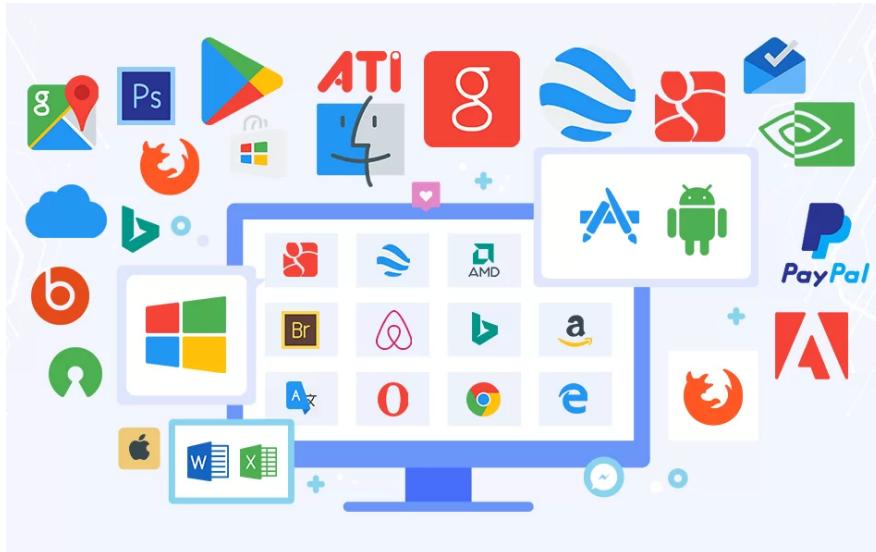
Files

- Java programs are stored in files.
- Programs files are copied from auxiliary memory to main memory in order to be run.

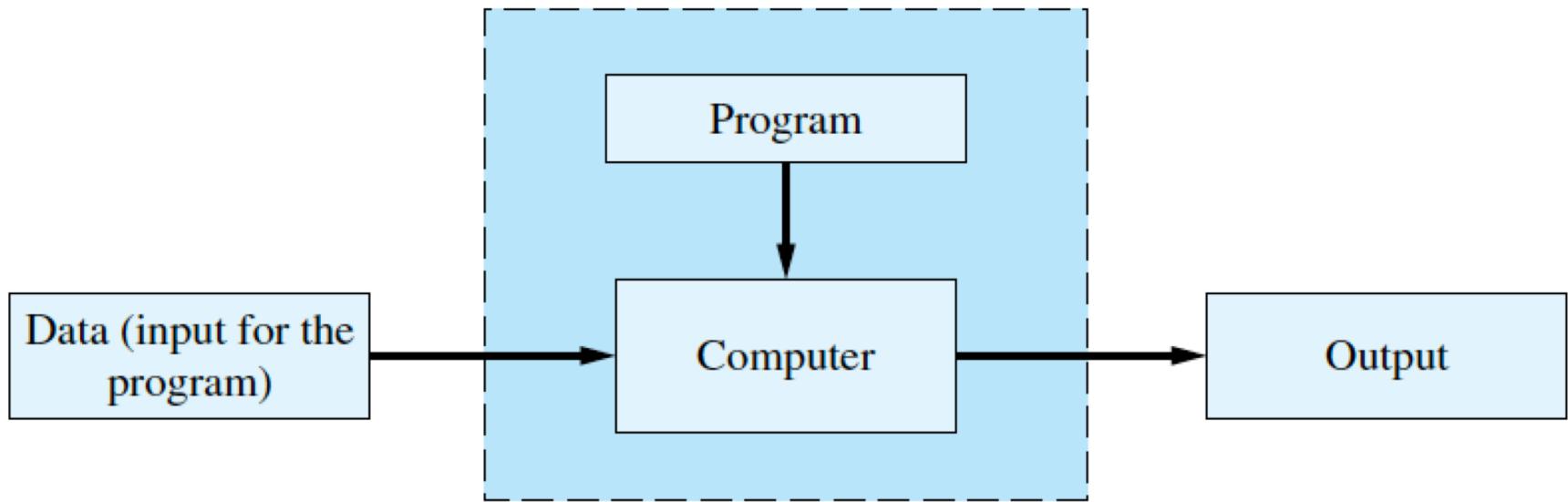


Programs

- A *program* is a set of **instructions** for a computer to **follow**.
- We use programs almost daily (email, word processors, video games, bank ATMs, etc.).
- Following the instructions is called *running* or *executing* the program.

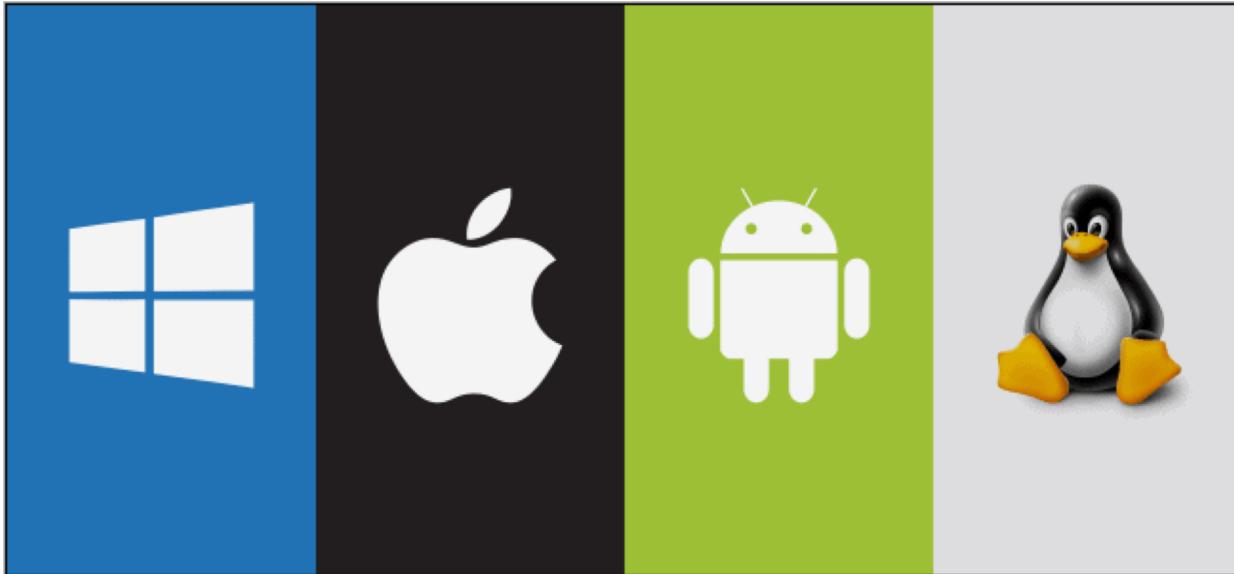


Running a Program



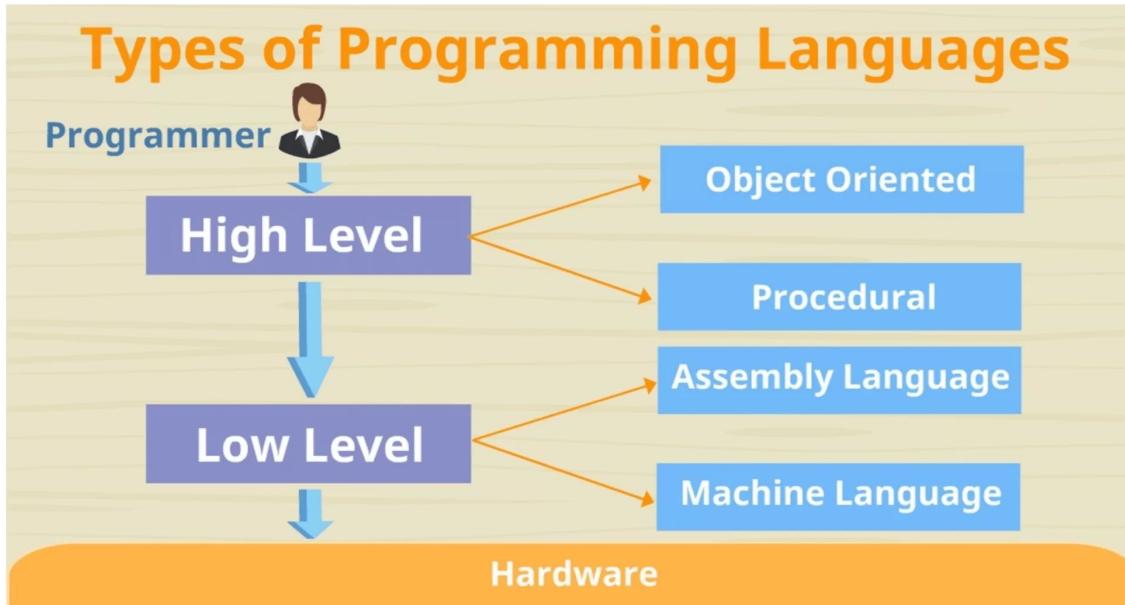
Operating System (OS)

- The OS is a **supervisory program** that oversees the operation of the computer.
- The operating system **retrieves** and **starts** program for you.



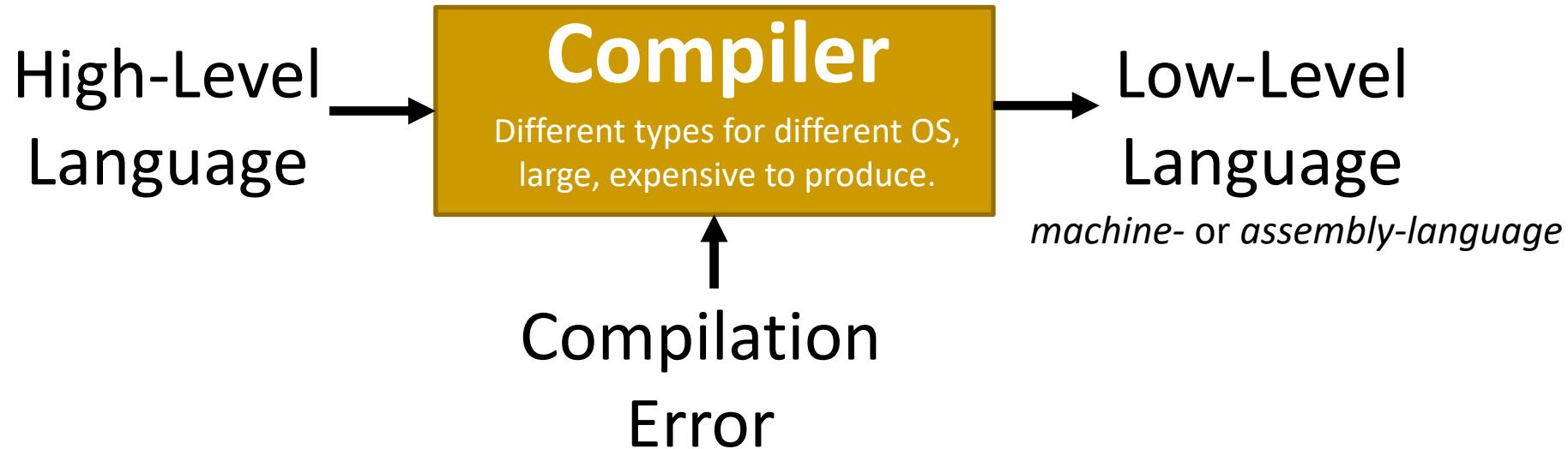
Well-known OS

Programming Languages



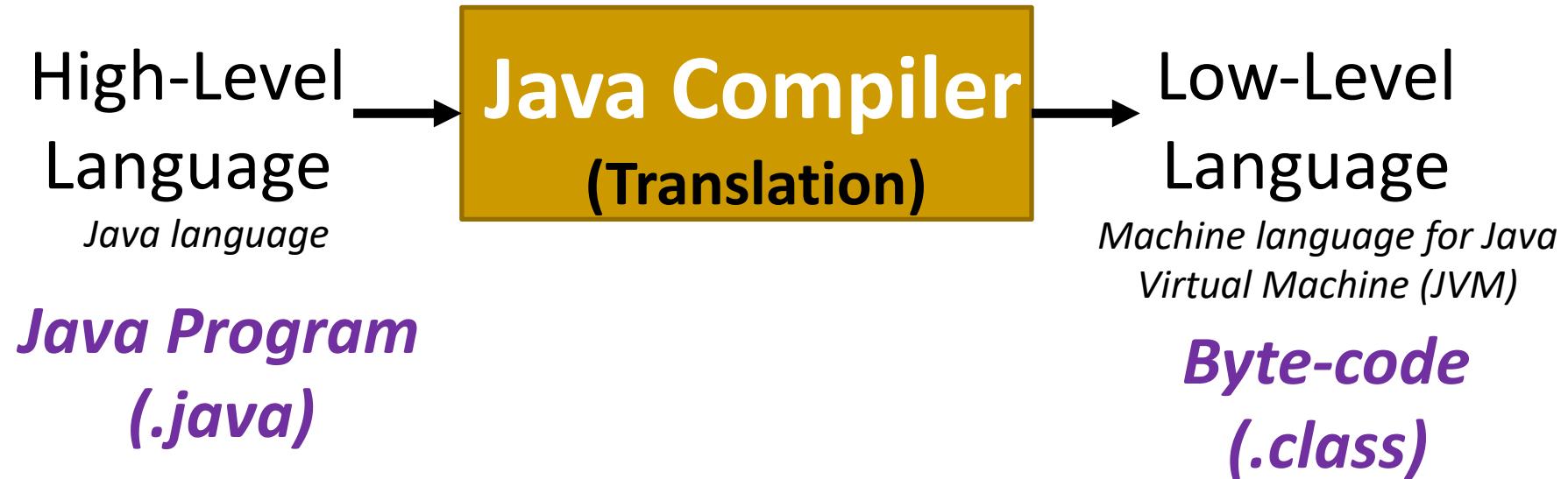
- *High-level languages* are relatively easy to use.
 - Java, C#, C++, Visual Basic, Python, Ruby.
- Unfortunately, computer hardware does not understand high-level languages.

Compilers



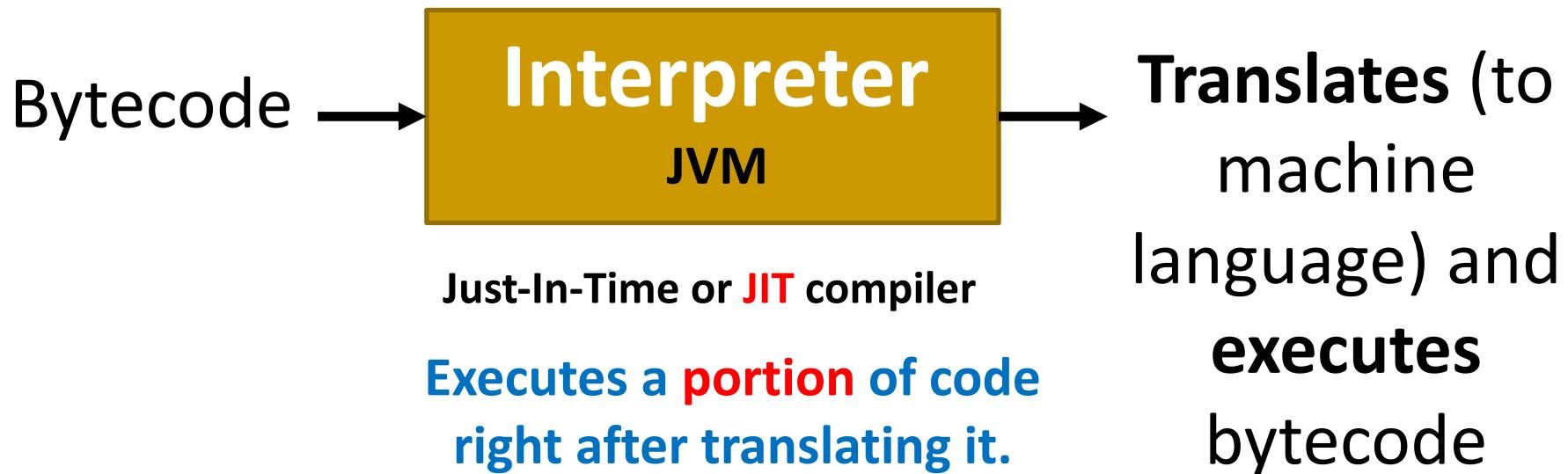
Source program -----> *Object program*
**Translating the entire
program at once**

Java Compilers



- **Byte-code:** **easy** to translate into machine language for **any** particular computer (Java is platform **independent**).

JVM Interpreter



- A **compiled program** generally runs **faster** than an interpreted one.

Compiling, Interpreting, Running

Command Prompt

```
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

C:\Users\BablaD>I:

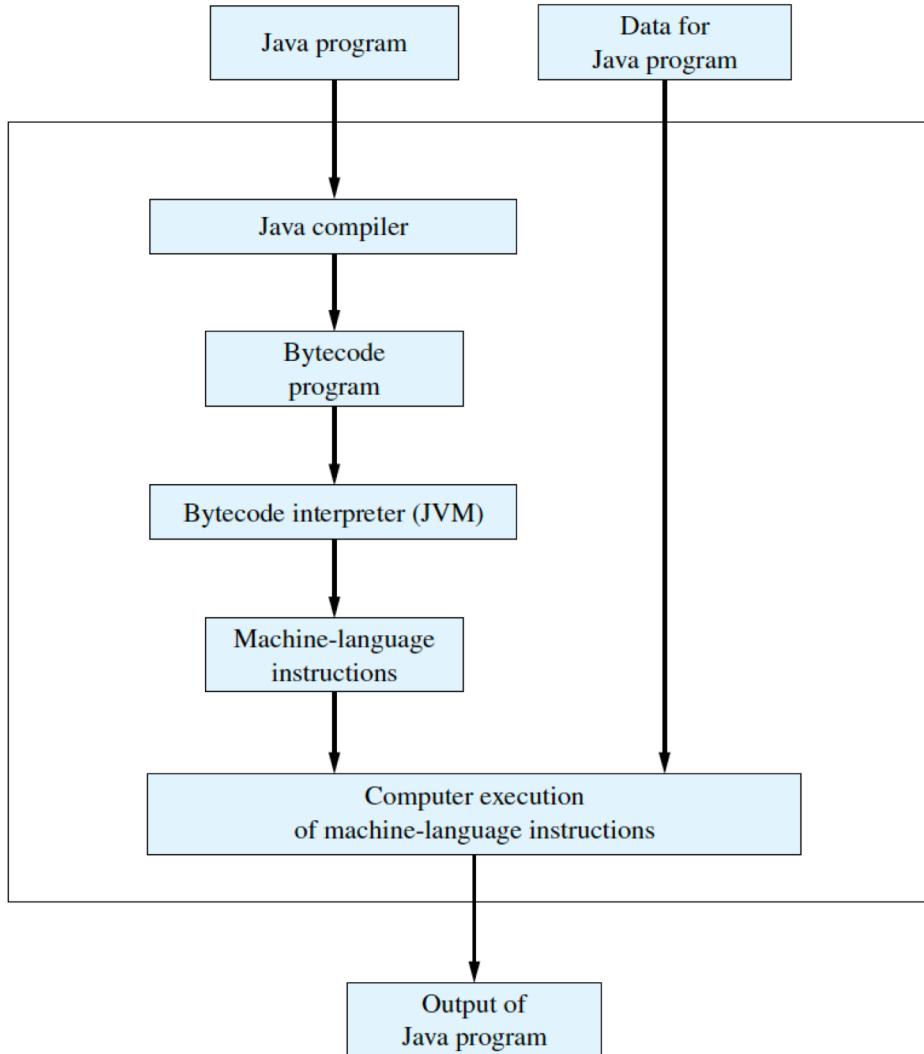
I:>CD I:\Java\jdk1.7.0_25\bin

I:\Java\jdk1.7.0_25\bin>javac Hello.java
I:\Java\jdk1.7.0_25\bin>java Hello
Hello World
I:\Java\jdk1.7.0_25\bin>
```

Use the **compiler** to translate the Java program into **byte-code**.

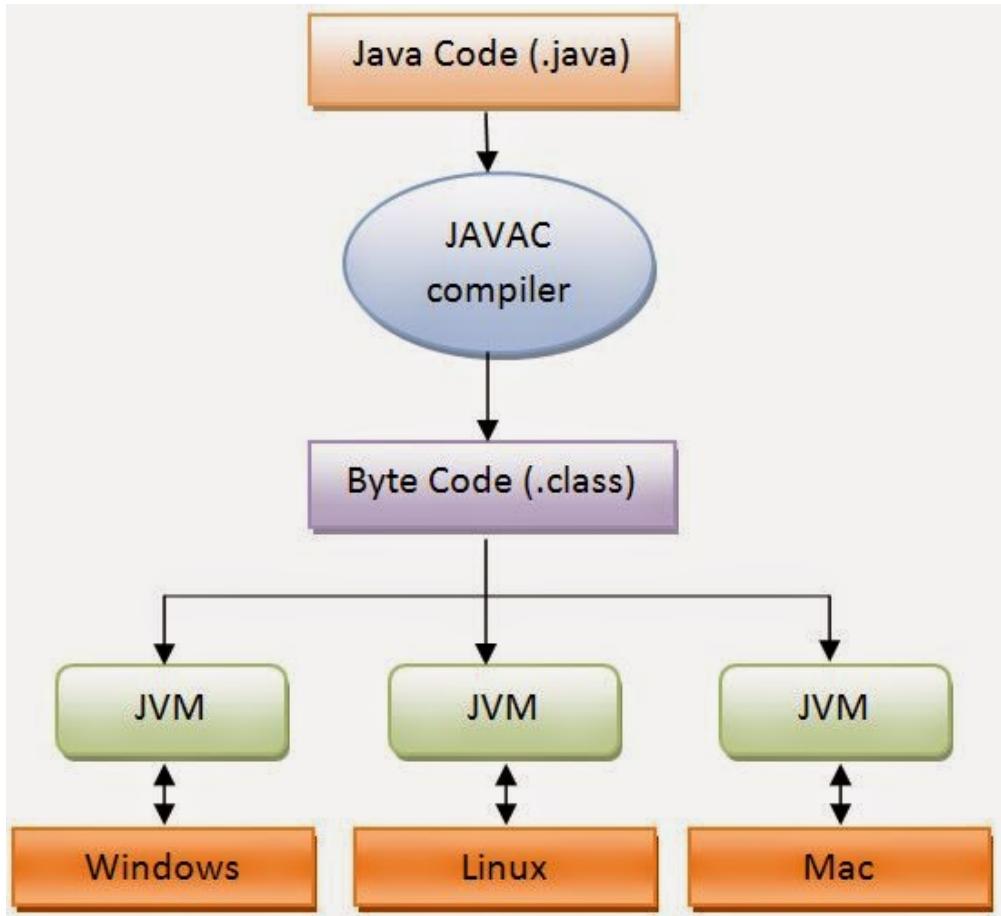
Use the JVM for your computer to translate each **byte-code instruction** into **machine language** and to run the resulting machine-language instructions.

Compiling, Interpreting, Running



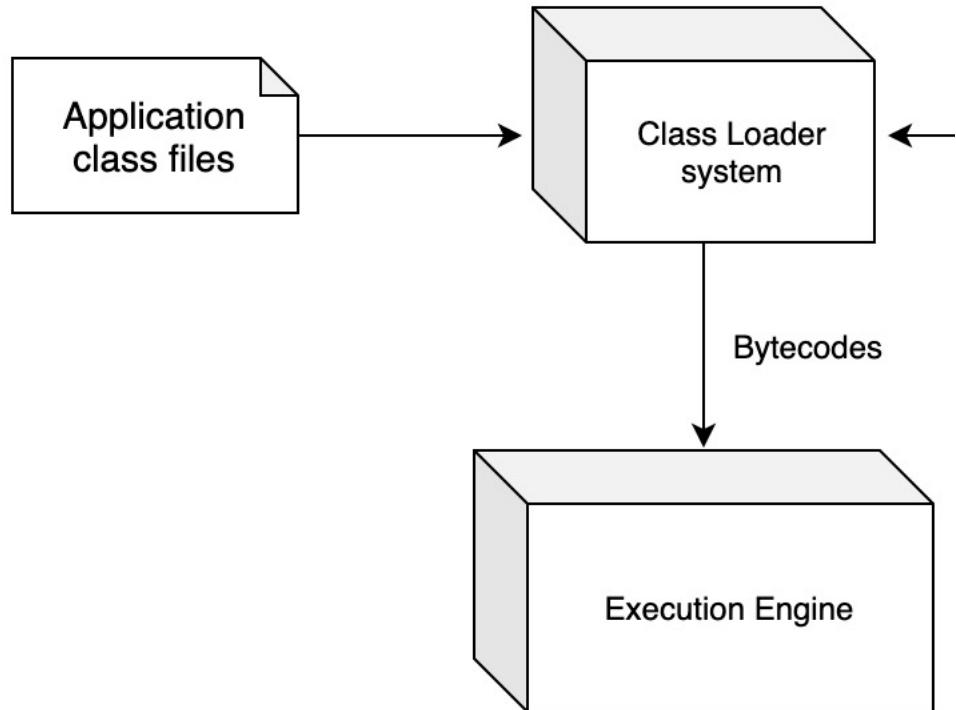
Portability

- Bytecode can be used on **any** computer.
- Bytecode can be sent over the **Internet** and used **anywhere** in the world.
- This makes Java suitable for **Internet applications**.



Class Loader

- A Java program typically consists of several pieces called **classes**.
- Each class may have a **separate author** and each is compiled (translated into byte-code) **separately**.
- A **class loader** (called a **linker** in other programming languages) automatically connects the classes together.



Do you have
any
QUESTIONS
??

