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# **Information Technology Workshop-1 (ITWS1)**

**Instructor - Shiv Ram Dubey**

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**Computer Basics**

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# Overview of Discussion

What is computer?

Previous Class -

- What is a computer?

- What can computers do?

- What do computers understand?

- How to convert from Binary-Decimal-Hexa?

This Class -

- What are the computer basics?

- How do computers solve problems?

- What is computer science?

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# Common Computer Types

Super computers

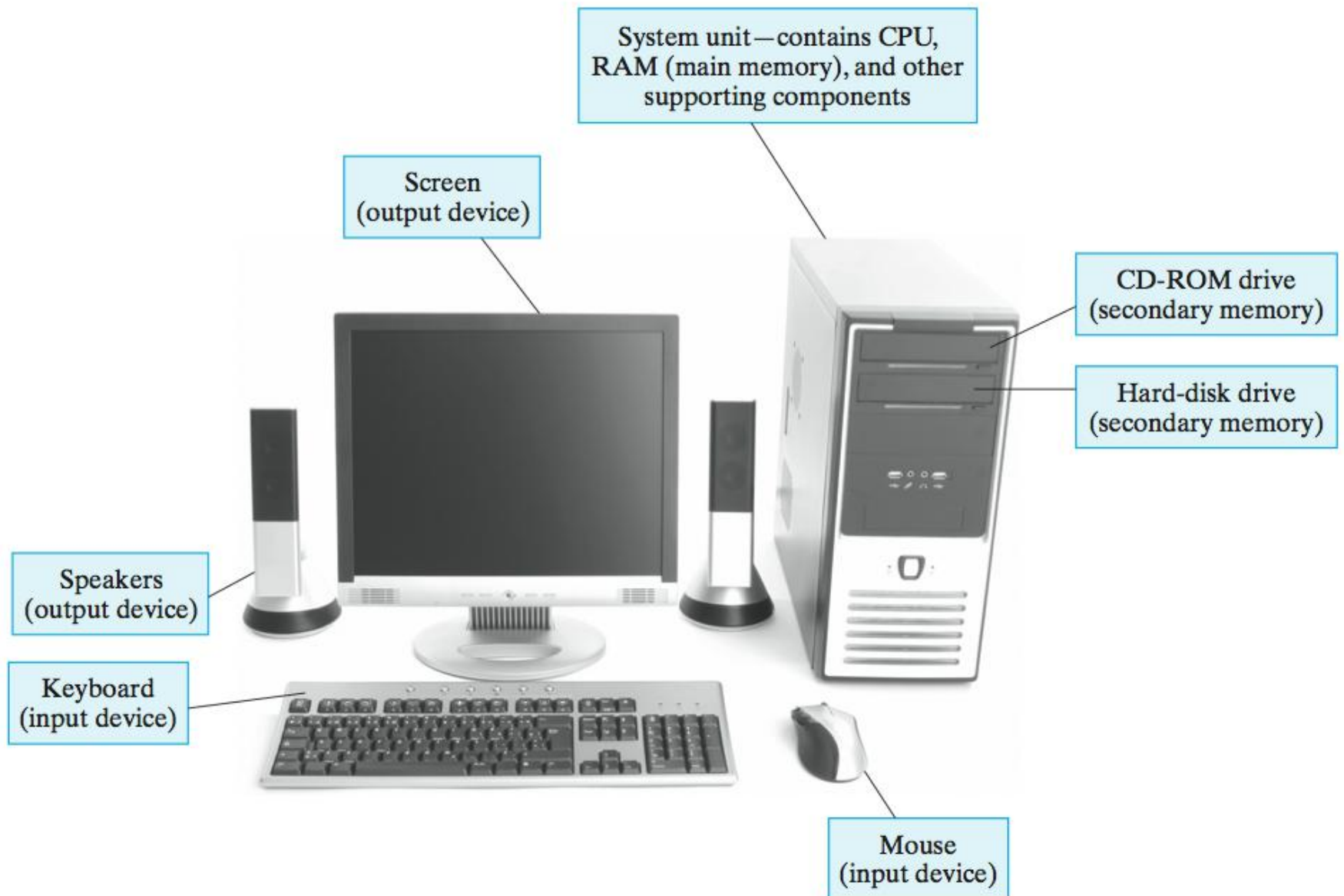
Desktop computers

Laptop computers

Palmtop computers



# Common Desktop Hardware



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# Hardware vs. Software

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# Hardware vs. Software

## *Hardware -*

Monitor,  
Keyboard,  
Mouse,  
Hard drive

## *Software -*

Operating system  
Word processing program  
Web browser  
C compiler

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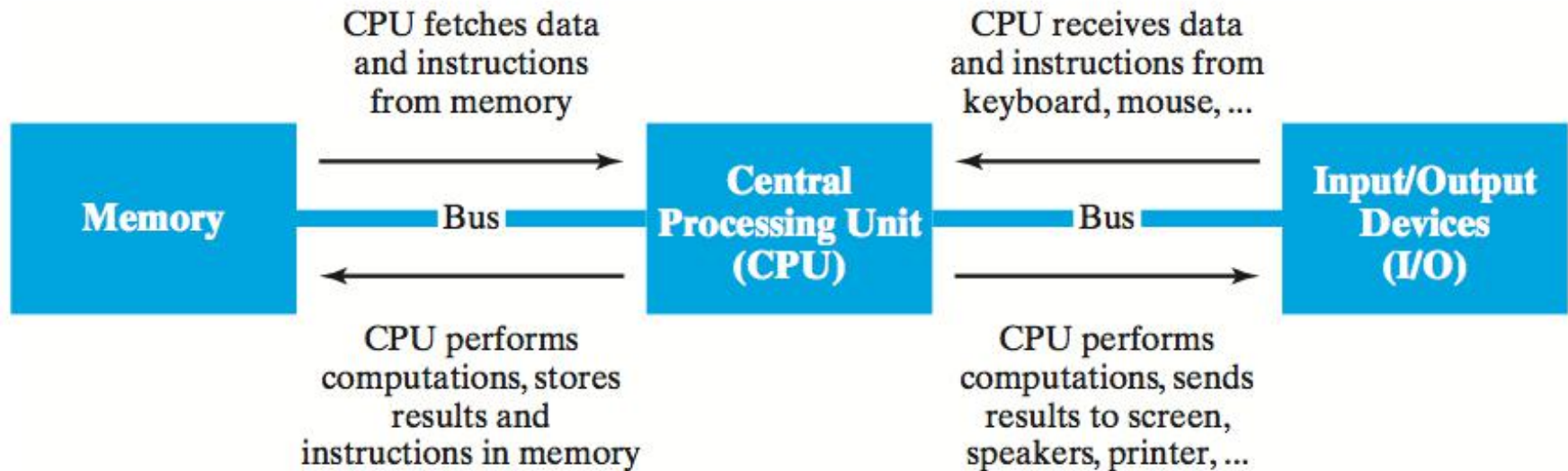
# Desktop Specifications

# Desktop Specifications

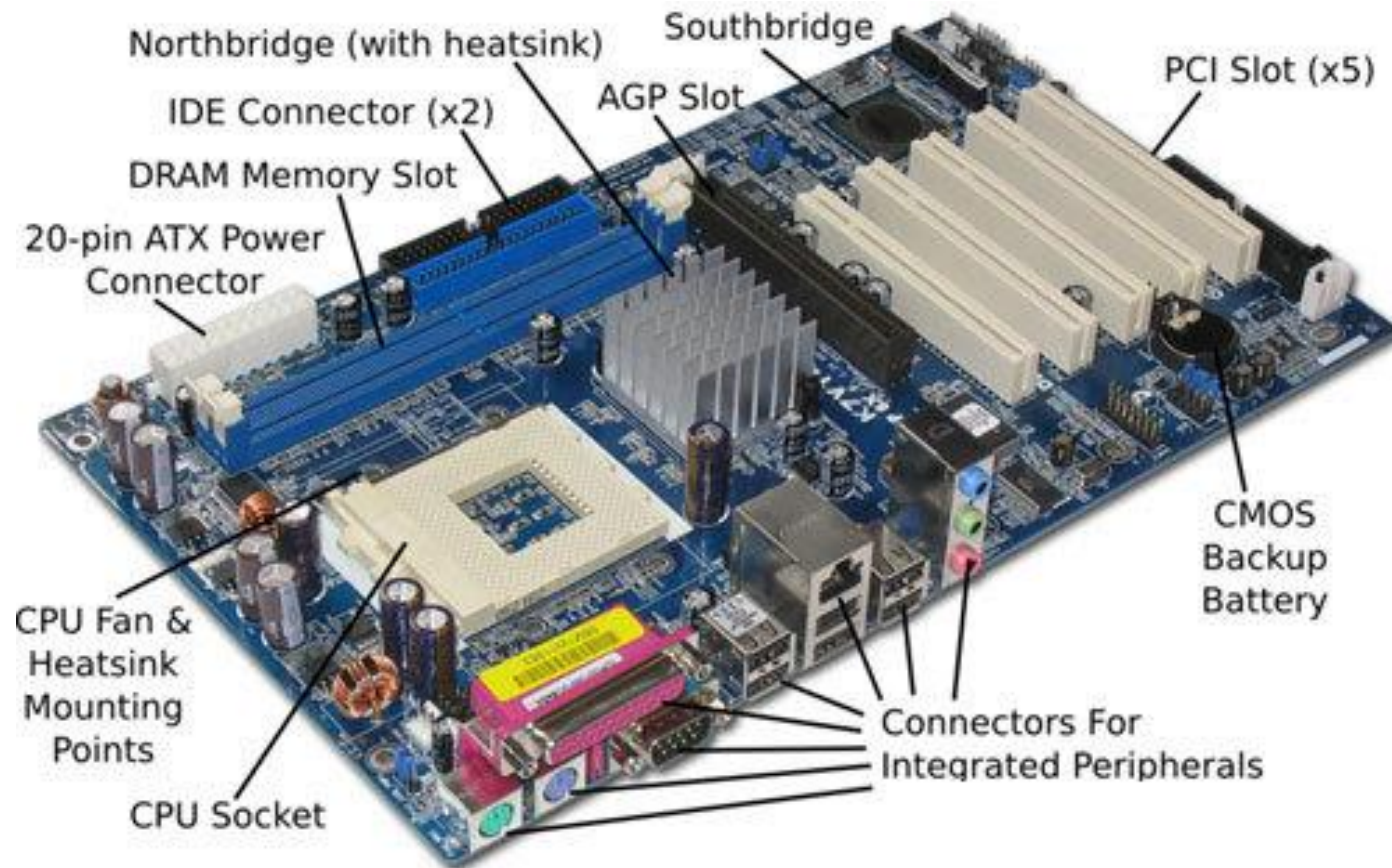
		Desktop System 1	Desktop System 2
HARDWARE	CPU	2.2 GHz Intel Celeron 450	3.2 GHz Intel Core i5
	Memory		
	Cache	512 KB cache	4 MB cache
	RAM	4 GB RAM	8 GB RAM
	Hard Drive	320 GB hard drive	1 TB hard drive
	CD-ROM/DVD	DVD+/-RW drive	DVD+/-RW drive
	Input/Output		
	Keyboard	USB multifunction keyboard	wireless multifunction keyboard
	Pointing Device	USB optical mouse	wireless optical mouse
	Screen	20" HD flatscreen monitor	24" HD flatscreen monitor
SOFTWARE	Speakers	Multimedia Speaker System	Dolby Surround Sound Speakers
	Network Adapter	Integrated 10/100/1000 Ethernet	Integrated 10/100/1000 Ethernet Integrated wireless card & antenna
	Operating System	Windows 7 Home Premium	Windows 7 Professional
	Web Browser	Internet Explorer 8	Internet Explorer 8
	Productivity Suite	Microsoft Works 9	Microsoft Office Professional 2007
	Security	McAfee Security Center	McAfee Security Center



# von Neumann Architecture



# Motherboard

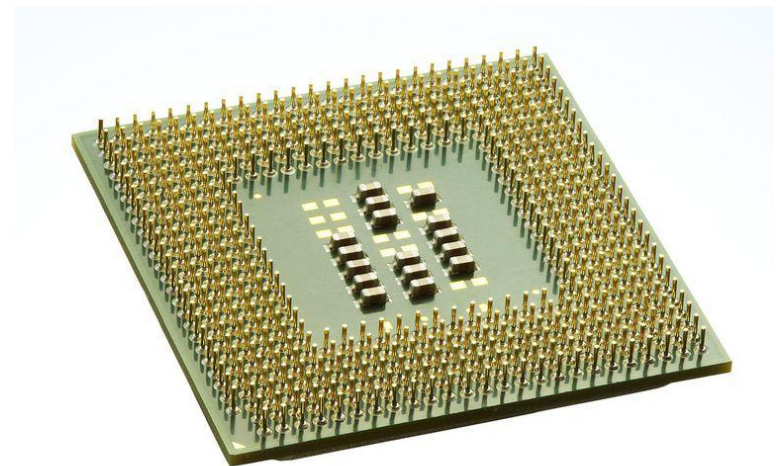


# CPU - "brain" of Computer

Made of *circuitry* – electronic components wired together to control the flow of electrical signals

Circuitry is embedded in a small silicon chip, 1-2 inches square

Most complex part of a computer (Millions of individual components)

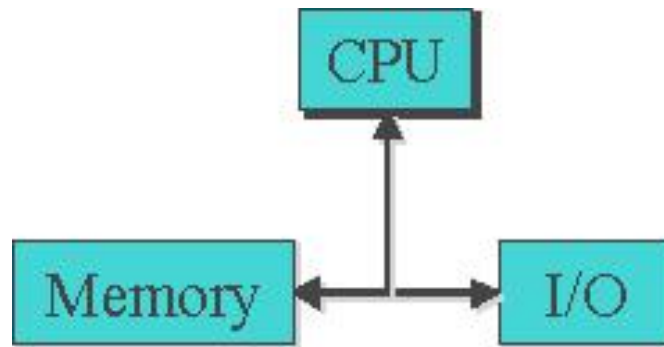


# CPU Working

Obtains data and instructions from memory/IO

Carries out instructions

Stores/places results back to memory/IO

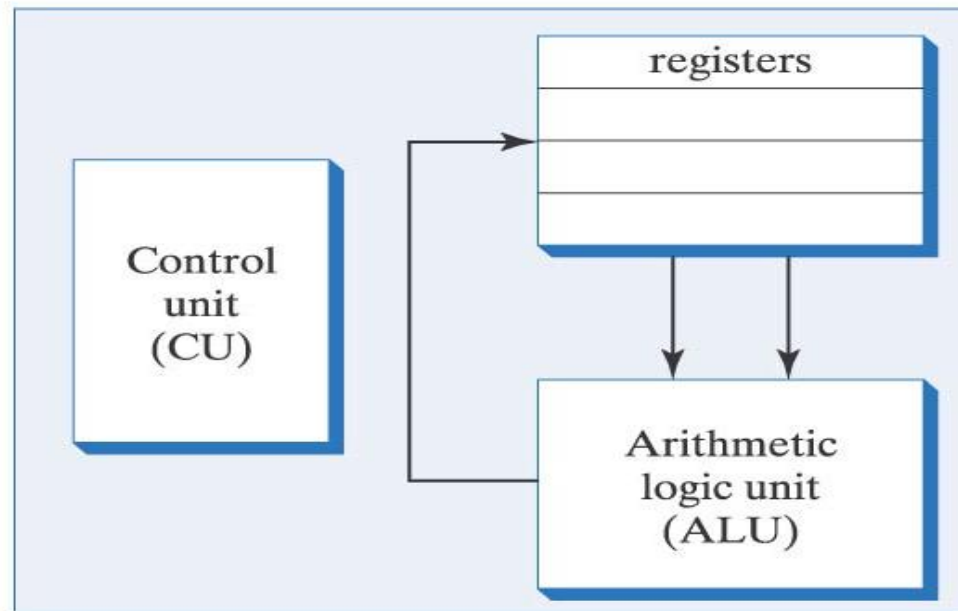


# CPU Subunits

Arithmetic Logic Unit (ALU)

Registers

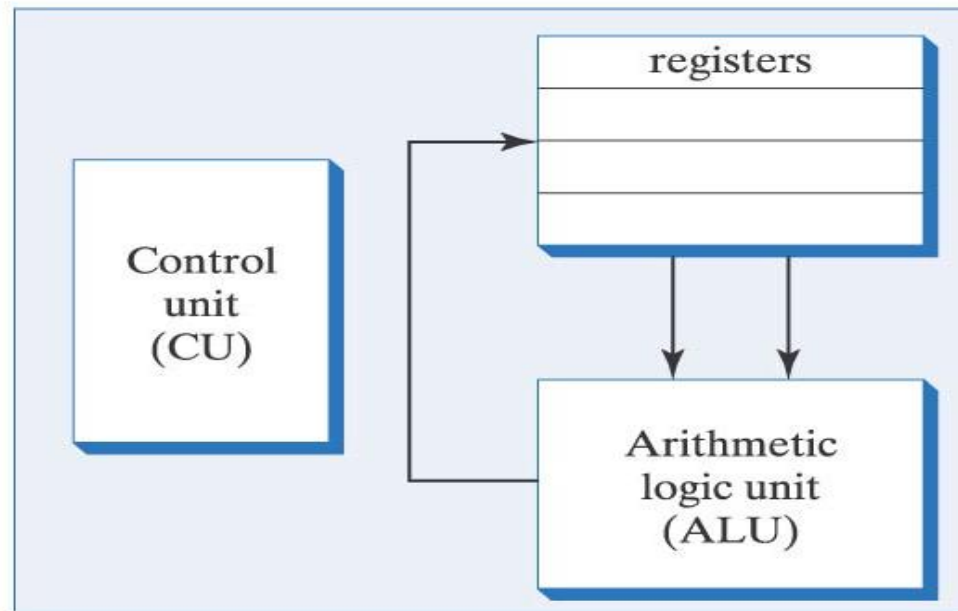
Control Unit (CU)



# CPU Datapath Cycle

*CPU datapath:* Registers - ALU - Registers

*CPU datapath cycle*



# CPU Datapath Cycle

CPU speed = the number of CPU cycles per second

p e.g., an 800MHz CPU can perform 800 million cycles per second

p e.g., a 1.4GHz CPU can perform 1.4 billion cycles per second

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# CPU Datapath Cycle

CPUs cannot be compared solely on the basis of their speeds

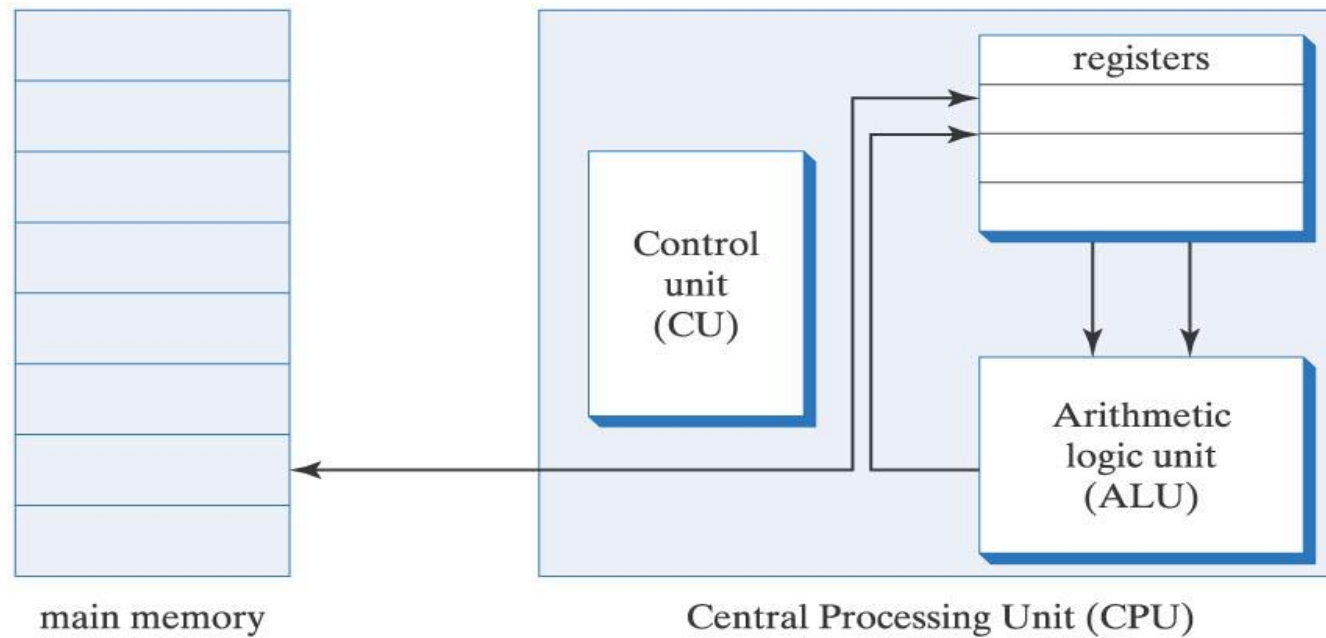


# CPU Datapath Cycle

CPUs cannot be compared solely on the basis of their speeds

- p Different instructions sets
- p A slower CPU + richer instructions -> some tasks faster
- p Number of cores

# CPU and Main Memory



# Memory

1 bit	→ 2 values	0 1
2 bits	→ 4 values	00 01 10 11
3 bits	→ 8 values	000 001 010 011 100 101 110 111
4 bits	→ 16 values	0000 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011 1100 1101 1111
5 bits	→ 32 values	00000 00001 00010 00011 00100 00101 00110 00111 01000 01001 01010 ...
6 bits	→ 64 values	000000 000001 000010 000011 000100 000101 000110 000111 001000 ...
7 bits	→ 128 values	0000000 0000001 0000010 0000011 0000100 0000101 0000110 0000111 ...
8 bits	→ 256 values	00000000 00000001 00000010 00000011 00000100 00000101 00000110 ...
9 bits	→ 512 values	000000000 000000001 000000010 000000011 000000100 000000101 ...
10 bits	→ 1,024 values	0000000000 0000000001 0000000010 0000000011 0000000100 0000000101 ...
.		
.		
.		
N bits	→ $2^N$ values	

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# Memory Capacity

Usually specified in bytes

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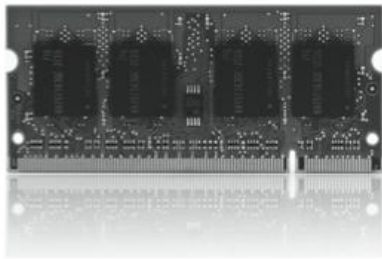
byte	→ 8 bits
kilobyte (KB)	→ $2^{10}$ bytes = 1,024 bytes (= 8,192 bits)
megabyte (MB)	→ $2^{20}$ bytes = 1,048,576 bytes (= 8,388,608 bits)
gigabyte (GB)	→ $2^{30}$ bytes = 1,073,741,824 bytes (= 8,589,934,592 bits)
terabyte (TB)	→ $2^{40}$ bytes = 1,099,511,627,776 bytes (= 8,796,093,022,208 bits)

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# Memory Types

# Memory Types

Main memory (or Primary memory)  
Secondary memory



RAM chips



Hard disk



Flash drive



Compact disk (CD)

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# Main Memory Data Transfer

Note:

Data must be copied from main memory into registers  
BEFORE it can be operated on.



# Main Memory Data Transfer

Note:

Data must be copied from main memory into registers  
BEFORE it can be operated on

- n Data transfer takes much longer than a single datapath cycle.
- n Fetch multiple instructions at once
- n Predict and prefetch

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# Memory (cont.)

High-end computers tend to have

**More main memory -**

To allow for quick access to more data and programs

**More secondary memory -**

To allow for storing more long-term data

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# Input/Output (I/O)

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# Input/Output (I/O)

## Input device -

keyboard, mouse, track pad, microphone, scanner

## Output device -

monitor, speaker, printer

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# Operating Systems

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# Operating Systems

*Operating System (OS) -*

A collection of programs that controls -

how the CPU, memory, and I/O devices work together

# Operating Systems

## *Kernel:*

Manages the CPU's operations

Controls how data and instructions are loaded and executed by the CPU

Coordinates other hardware components

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# Operating Systems

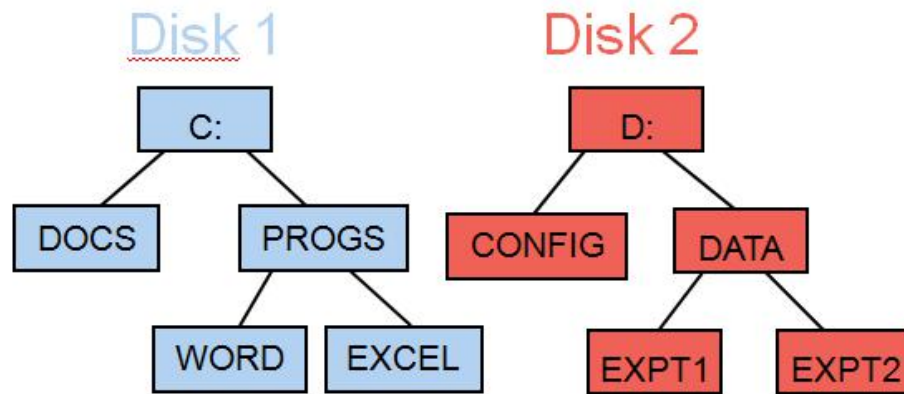
## *File system:*

Organizes and manages files and directories

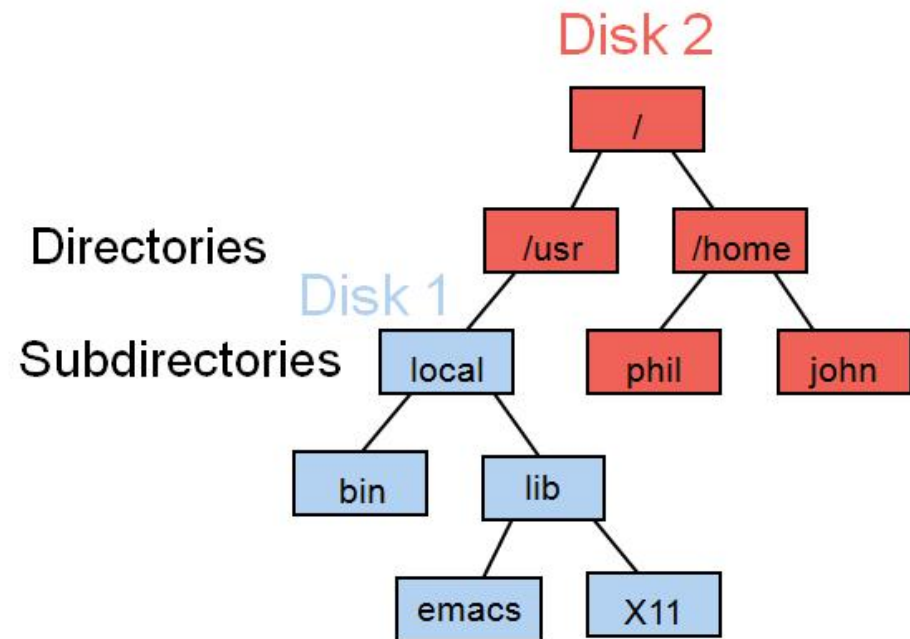


# Operating Systems

*File system organisation:*



Windows

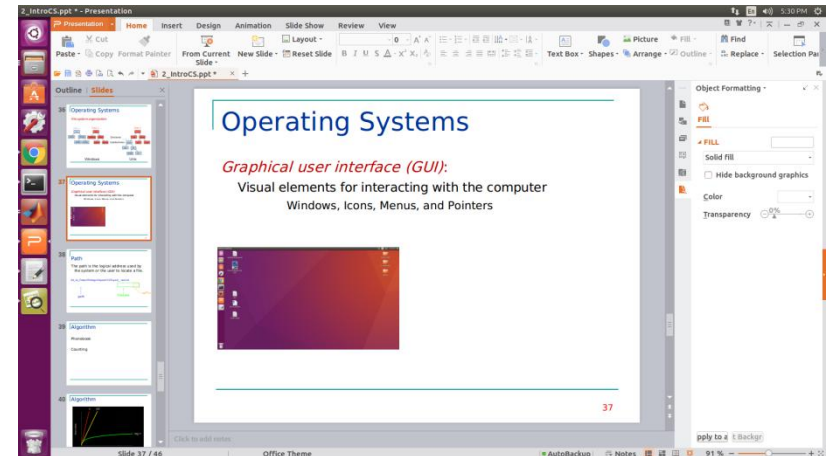
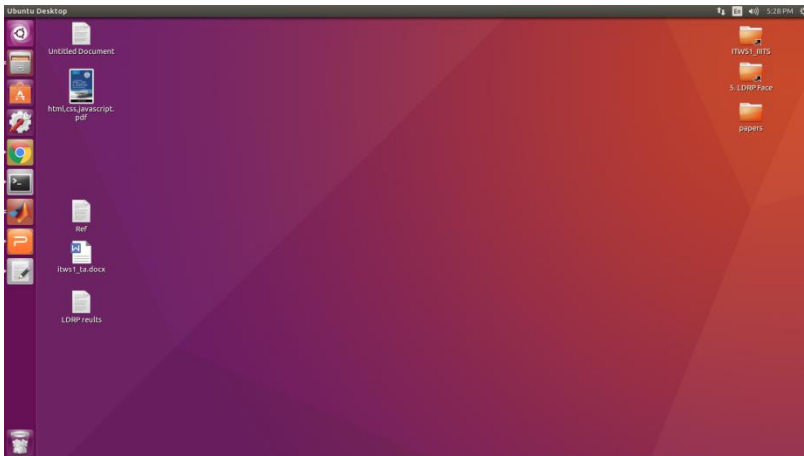


Unix

# Operating Systems

## *Graphical user interface (GUI):*

Visual elements for interacting with the computer  
Windows, Icons, Menus, and Pointers



# Path

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# Path

The path is the logical address used by the system or the user to locate a file.

/bd\_du\_Palais/35/etage/4/appart/12/Dupont\_ Jean.txt

↑  
path

↑ filename  
↑ suffix

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# What is computer science?

## The study of computers

to decide which action is best under certain scenario

which problems can be solved in a reasonable time

the most efficient ways to solve problems

to make information more secure

to improve communication between computers

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# What is computer science?

## The study of computers

to improve the quality of computer programs

to improve programming languages

to improve the human computer interactions

to improve people's access to information

to improve the quality of life using computers

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# Videos on Computer Basics

## Computer Basics

<http://www.youtube.com/watch?v=plsbh6SqfhQ>

## Looking Inside A Computer

<http://www.youtube.com/watch?v=CXWxiADToR0&feature=related>

## How does Your Computer Think

<http://www.youtube.com/watch?v=Q2hmuqS8bwM&feature=related>