ASSALAMU'ALAIKUM

Computer Hardware

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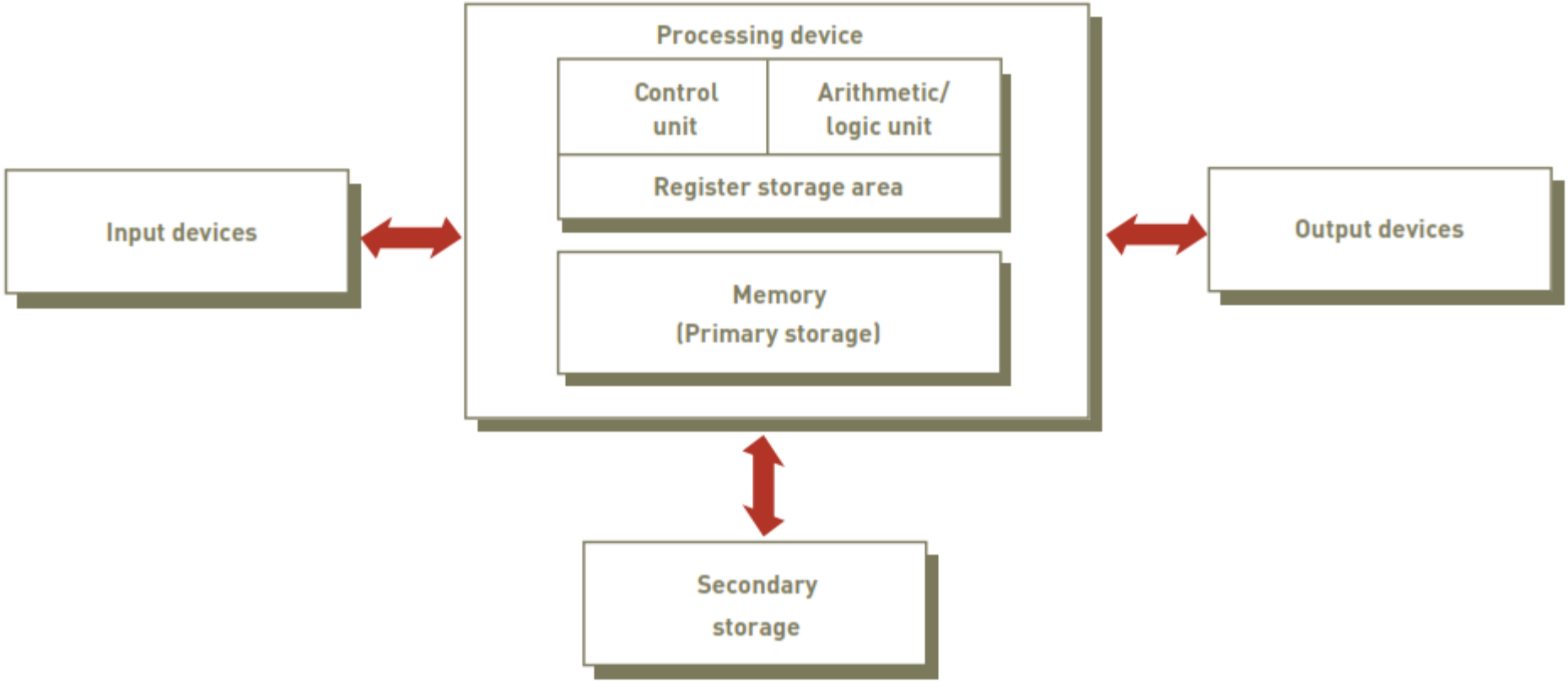
Agenda

- Hardware Components
- Hardware Components in Action
- Memory Characteristics and Functions
- Types of Memory
- Multiprocessing

Hardware Components

- **Computer system hardware components include devices that perform**
  - Input, processing, datastorage, and output



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❖ CPU ➔

- The arithmetic logic unit,
  - The arithmetic logic unit (**ALU**)performs mathematical calculations and makes logical comparisons.
- The control unit
  - The **control** unit sequentially accesses program instructions, decodes them, and coordinates the flow of data in and out of the ALU, registers, primary storage, and even secondary storage and various output devices.
- The register
  - **Registers** are high-speed storage areas used to temporarily hold small units of program instructions and data immediately before, during, and after execution by the CPU.

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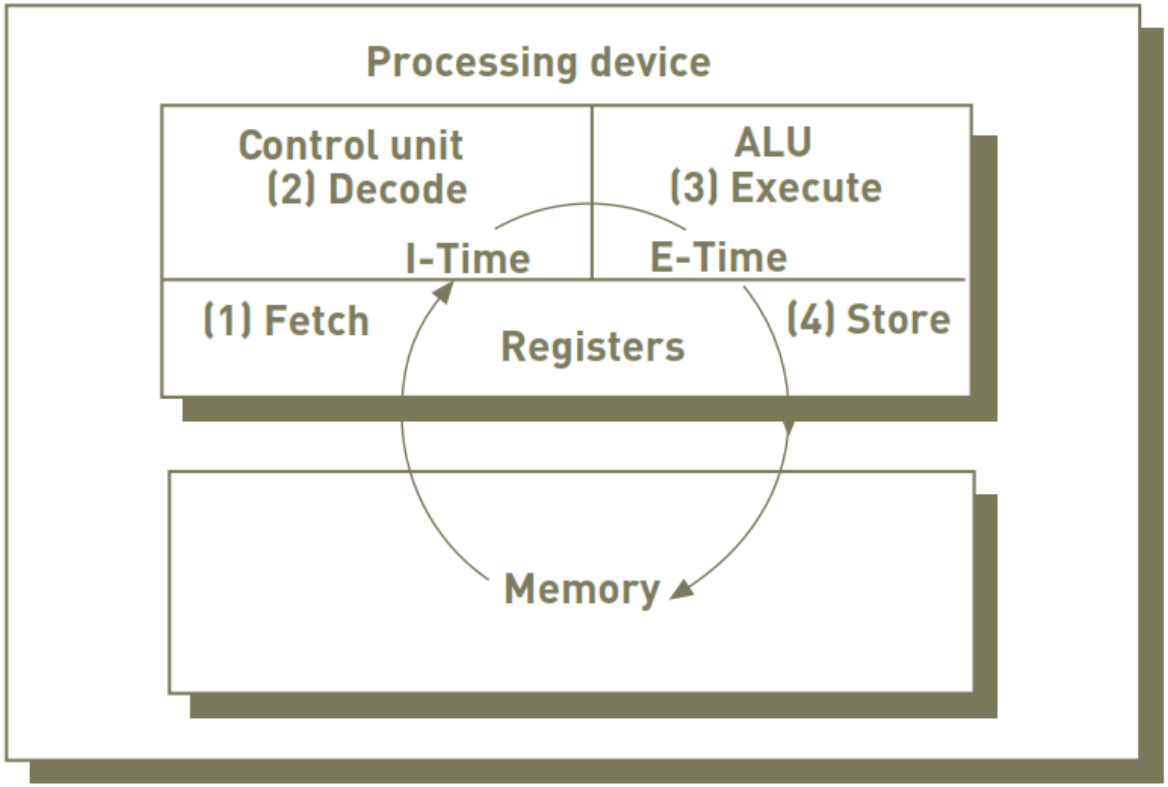
- **Primary storage,**
  - also called main memory or memory, is closely associated with the CPU.
  - Memory holds program instructions and data immediately before or after the registers.

Hardware Components in Action

- **Executing any machine-level instruction involves two phases:**
  - Instruction and execution.



Memory Characteristics and Functions

❖ Storage Capacity

Name	Abbreviation	Number of Bytes
Byte	B	1
Kilobyte	KB	2^{10} or approximately 1,024 bytes
Megabyte	MB	2^{20} or 1,024 kilobytes (about 1 million)
Gigabyte	GB	2^{30} or 1,024 megabytes (about 1 billion)
Terabyte	TB	2^{40} or 1,024 gigabytes (about 1 trillion)
Petabyte	PB	2^{50} or 1,024 terabytes (about 1 quadrillion)
Exabyte	EB	2^{60} or 1,024 petabytes (about 1 quintillion)

Types of Memory

Memory Type	Abbreviation	Name	Description
Volatile	**RAM**	**Random access memory**	**Volatile storage devices that lose their contents if the current is turned off or disrupted.**
	SRAM	Static Random Access Memory	Byte-addressable storage used for high-speed registers and caches.
	DRAM	Dynamic Random Access Memory	Byte-addressable storage used for the main memory in a computer.
	DDR SDRAM	Double Data Rate Synchronous Dynamic Random Access Memory	An improved form of DRAM.

Nonvolatile	ROM	Read-only memory	**Nonvolatile storage devices that do not lose their contents if the current is turned off or disrupted.**
	PROM	Programmable read-only memory	Memory used to hold data and instructions that can never be changed. PROMs are programmed in an external device like EPROMs.
	EPROM	Erasable programmable read-only memory	Programmable ROM that can be erased and reused. Erasure is caused by shining an intense ultraviolet light through a window that is designed into the memory chip. EPROM chips are initially written in an external programmer device and must be removed from the circuit board and placed back in the device for reprogramming.
	EEPROM	Electrically erasable programmable read-only memory	User-modifiable read-only memory that can be erased and reprogrammed repeatedly through the application of higher than normal electrical voltage.
	Flash		Used for storage modules for USB drives and digital camera memory cards. Able to erase a block of data in a flash.
	NOR Flash		Flash memory that supports 1-byte random access so that machine instructions can be fetched and executed directly from the flash chip just like computers fetch instructions from main memory.
	NAND Flash		Flash Translation Layer software enables NAND flash memory cards and USB drives to look like a regular disk drive to the operating system.
	FeRAM		Can hold data in memory even when the power is disconnected and offers the higher speed of SDRAM.
	PCM	Phase Change Memory	One of a number of new memory technologies that may eventually replace flash memory.
	MRAM	Magnetoresistive random access memory	A nonvolatile random access memory chip based on magnetic polarization that reads and writes data faster than flash memory.

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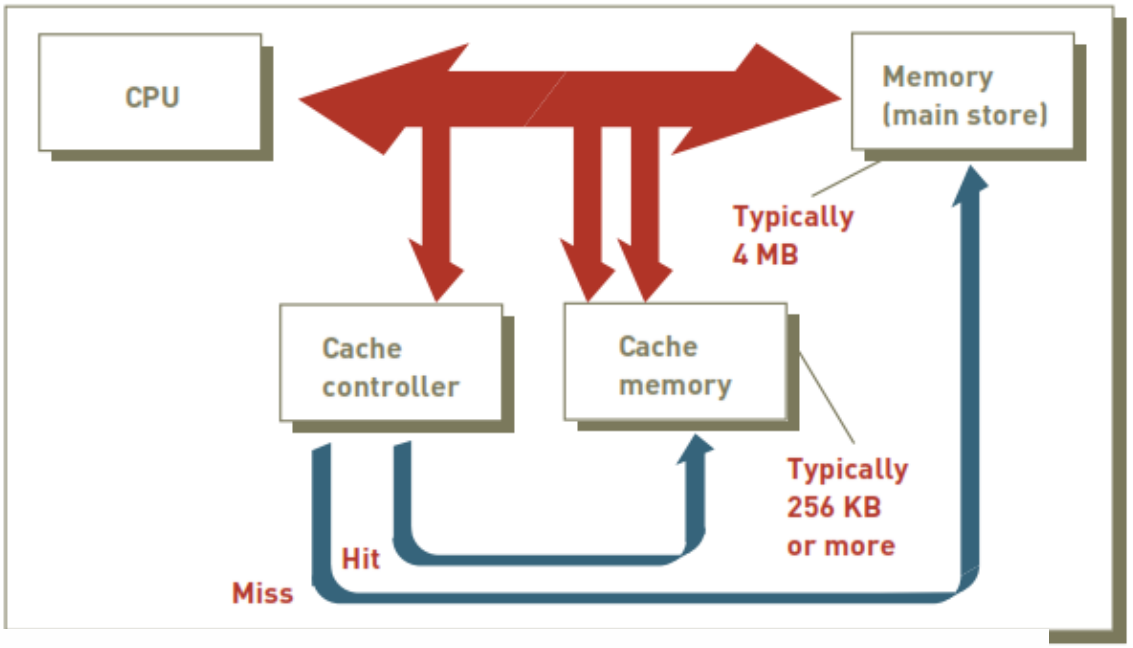
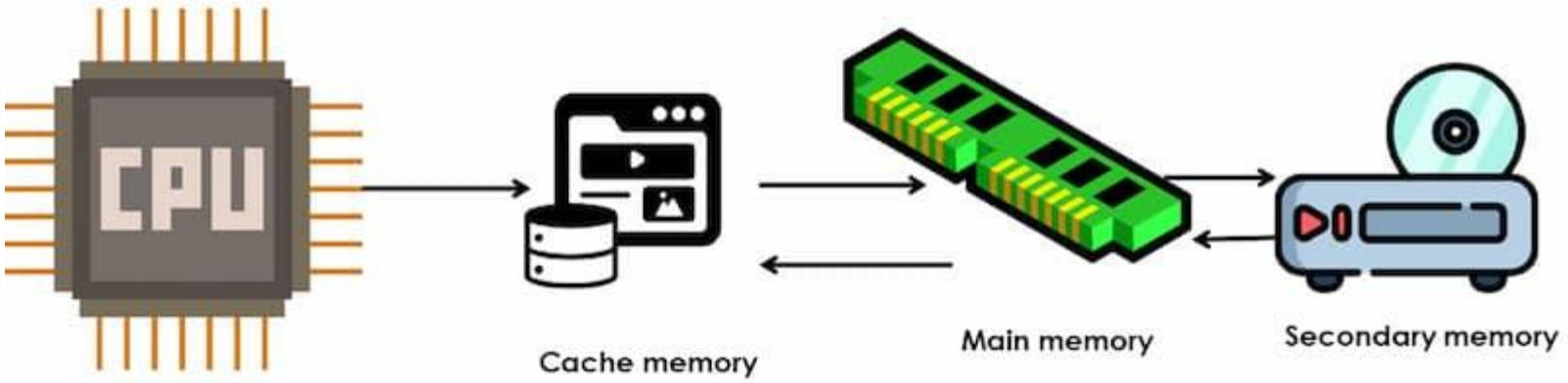
- **Cache memory**

  A type of high-speed memory that a processor can access more rapidly than main memory.





Multiprocessing

Multiprocessing

- The simultaneous execution of two or more instructions at the same time.

Coprocessor

- The part of the computer that speeds processing by executing specific types of instructions while the CPU works on another processing activity.

Multicore microprocessor

- A microprocessor that combines two or more independent processors into a single computer so they can share the workload and improve processing capacity.

❖ **Thank you ☺**