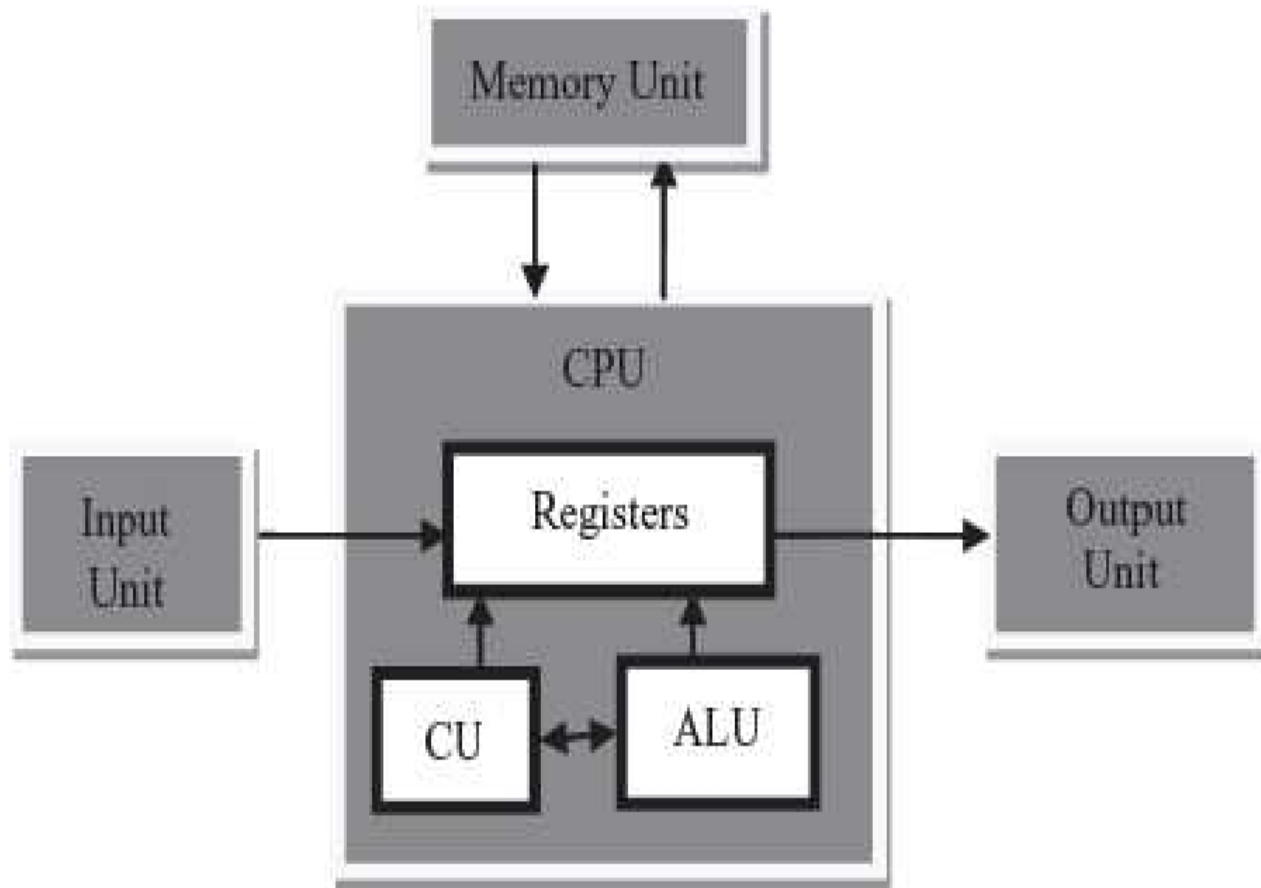


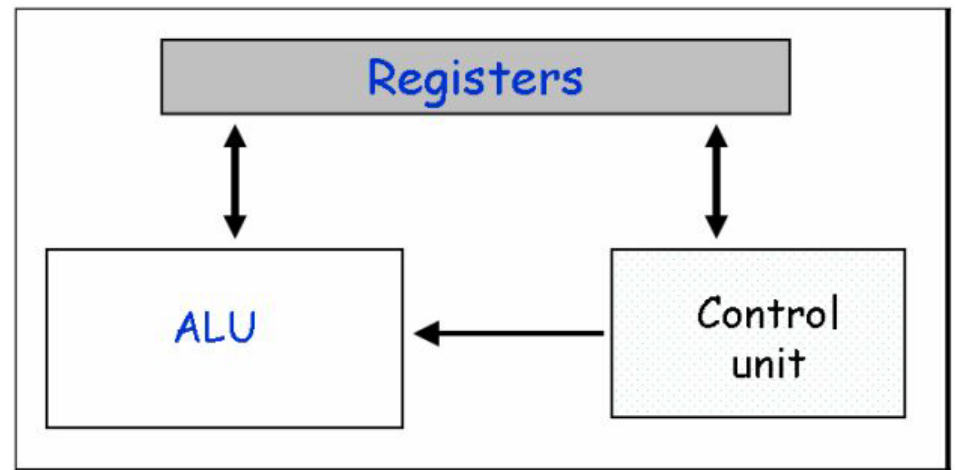
Computer System Hardware

Computer Hardware



The computer system hardware interaction

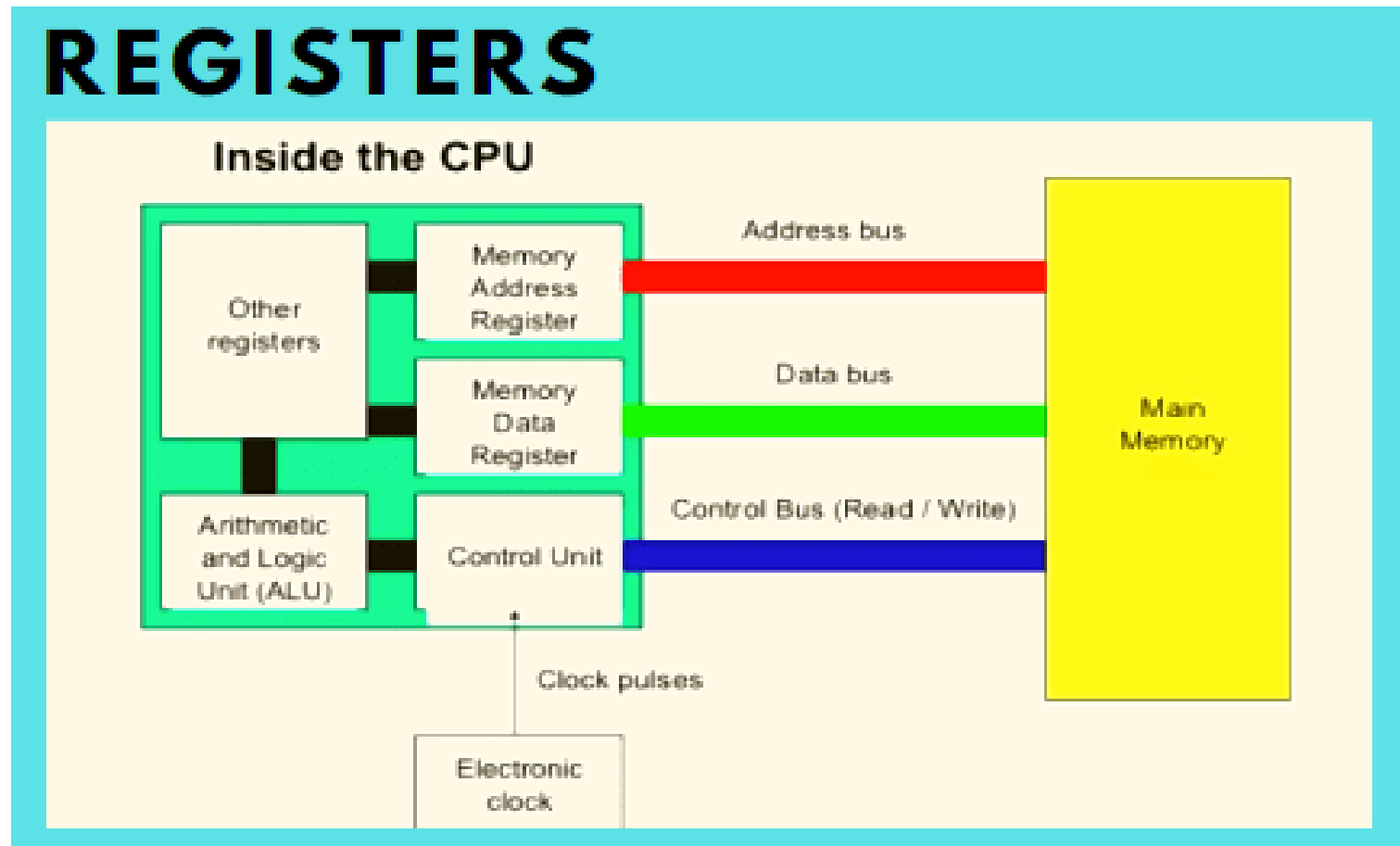
CPU Components



- **Arithmetic and Logic Unit - ALU** performs arithmetic operations and logical operations.
- **Control Unit** organizes the processing of data and instructions. It acts as a supervisor and, controls and coordinates the activity of the other units of computer. CU also holds the CPU's Instruction Set, which is a list of all operations that the CPU can perform.
- **Registers** are type of memory (high speed) located inside the CPU that can temporarily hold data (processing and control) such as IR and PC.

Registers

- ❑ The number of registers and the size of each register in a CPU helps to determine the power and the speed of a CPU.



Registers

- ❑ The size of a register may be 8, 16, 32 or 64 bits.
- ❑ Example: **32-bit CPU** is one in which each register is 32 bits wide and its CPU can manipulate 32 bits of data at a time.
- ❑ **64-bit processor** can process the data twice as fast as one with 32-bit processor.

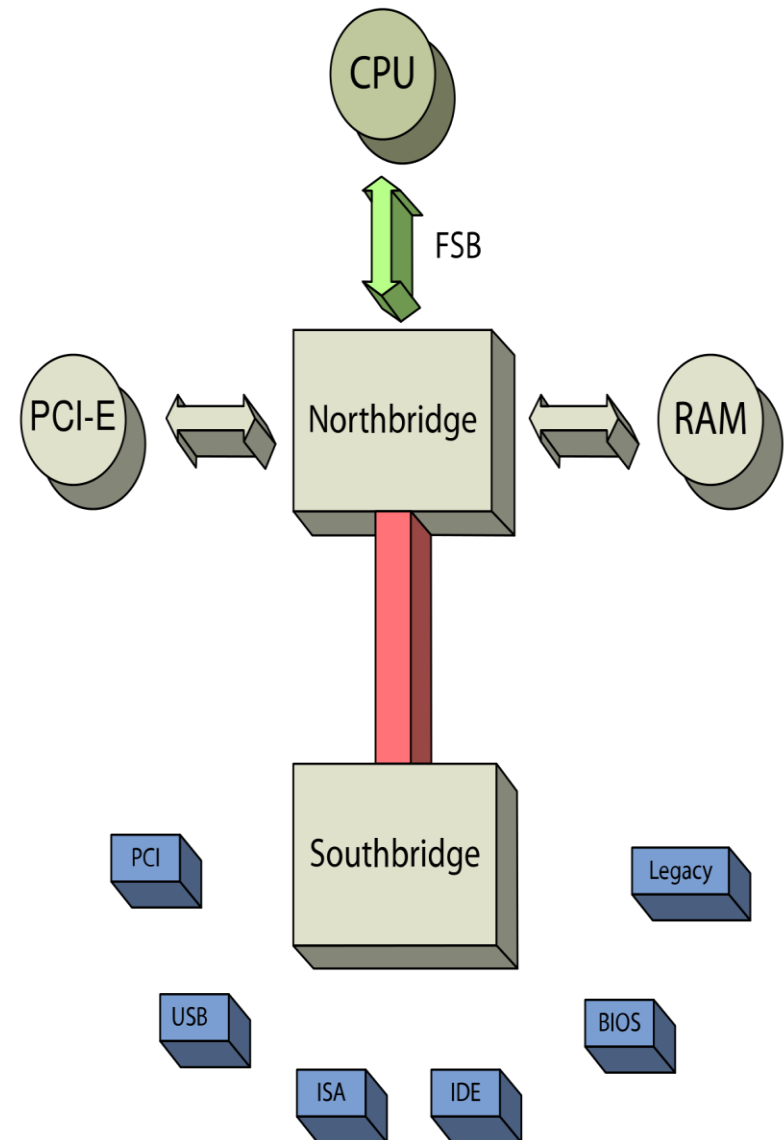
Northbridge / Southbridge

NORTHBRIDGE

It handles communications between the CPU, RAM, AGP (Video Card) or PCI Express, and the Southbridge.

SOUTHBRIDGE

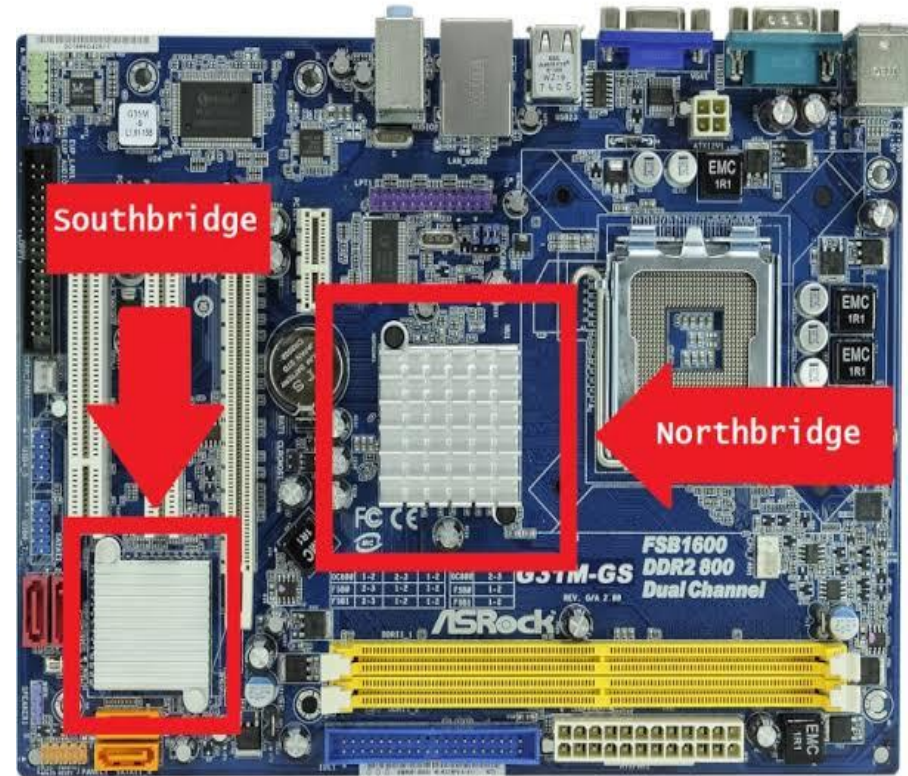
- ❖ The Southbridge is slower than the Northbridge.
- ❖ Information from the CPU has to go through the Northbridge before reaching the Southbridge.
- ❖ IO Controller Hub is the other name for South bridge



Northbridge / Southbridge

South Bridge

North Bridge



Central Processing Unit

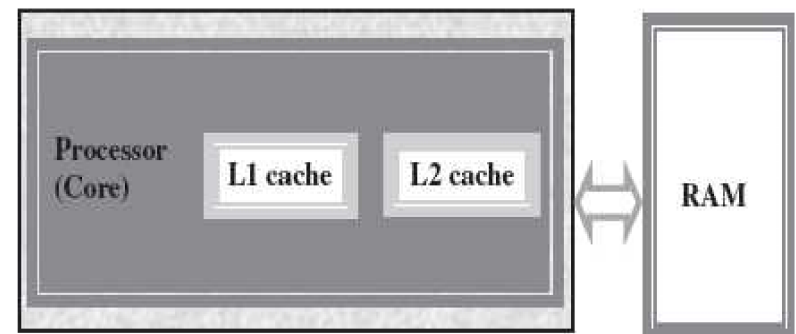
- **Programs** are broken into sequences of (thousands or even millions) very simple **instructions (primitive operations)**, such as "add two numbers" or "copy a value from one location to another."

Instruction cycle (**fetch – decode – execute**)

- CPU gets the program instruction from the memory
- CPU interprets the instruction
- CPU executes the instruction (for example: performs the arithmetic operations required for the processing of data)

Cache memory

- High-speed circuitry to provide extremely fast access to data.
- Small amount (usually Megabytes) to store data, **temporarily**, recently used by the CPU.
- Placed between RAM and CPU.
- Contents are lost when power is turned off (*volatile*).



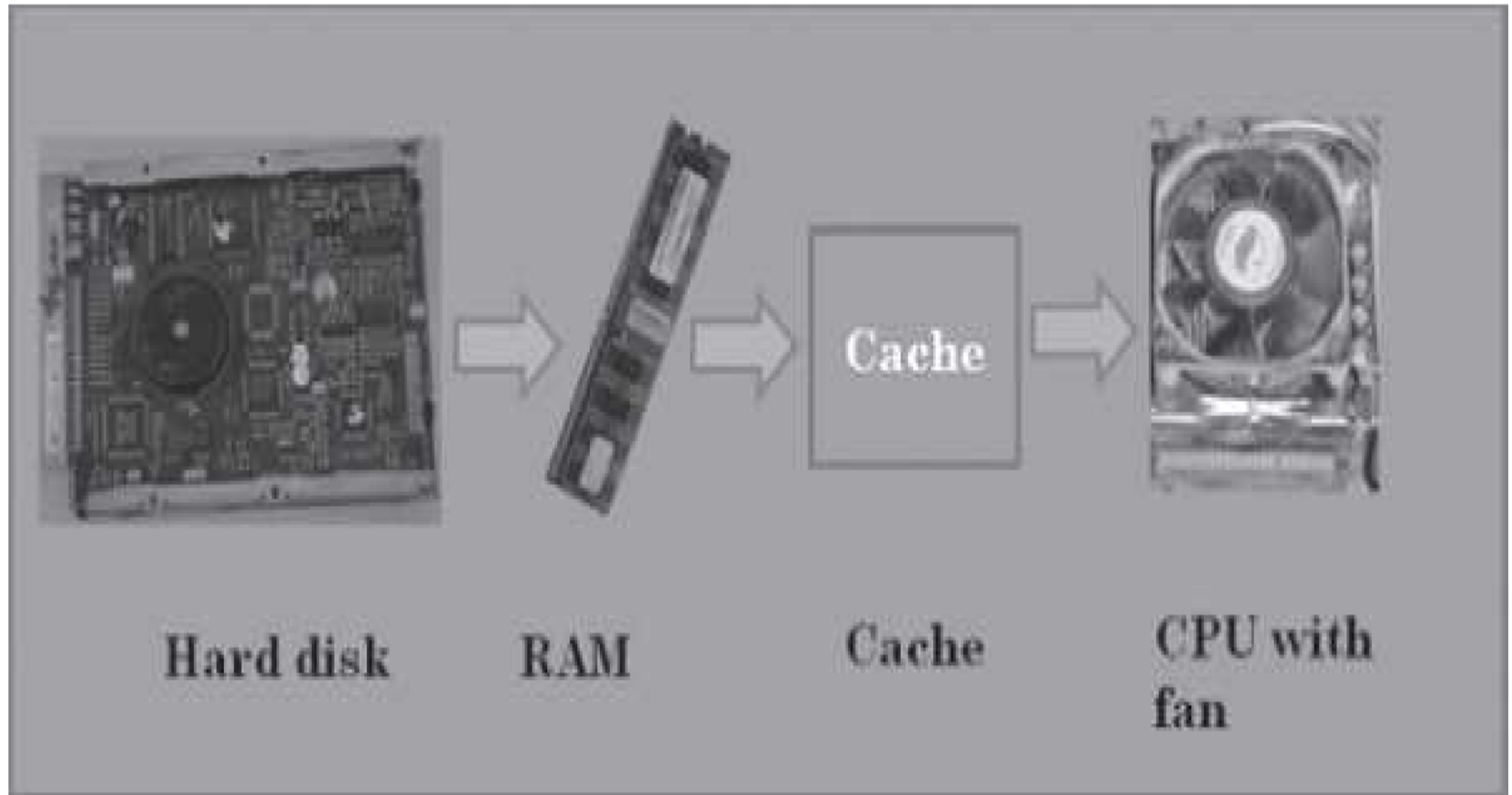
- Internal cache is built into the CPU.
- External cache resides on the motherboard.

BIOS

BIOS chip (Basic Input Output System)

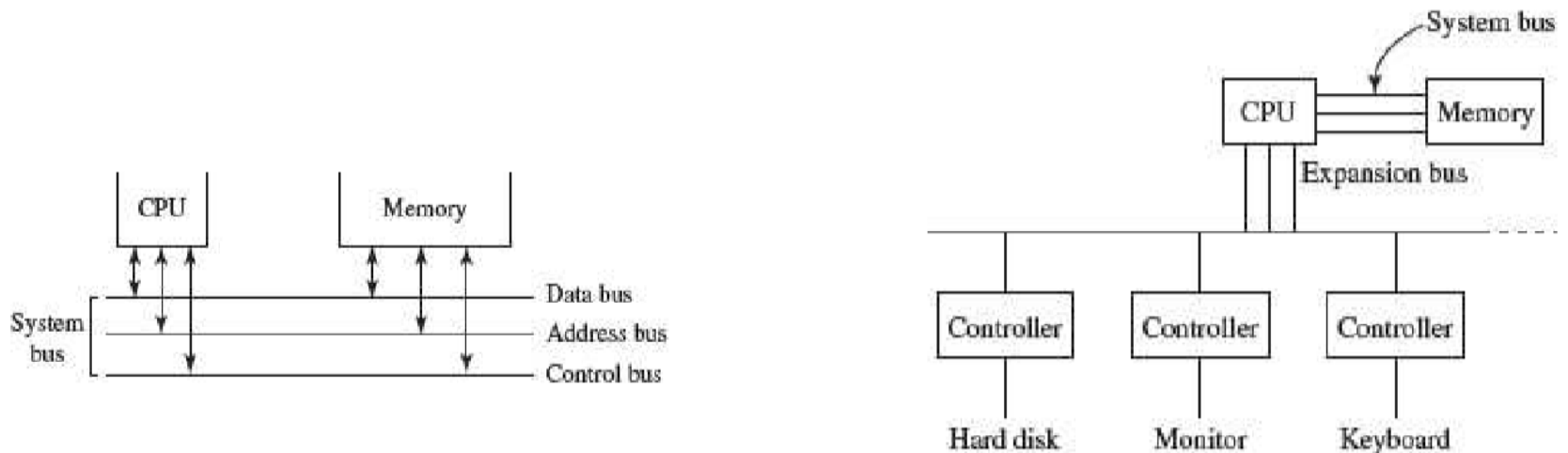
- ❖ is the basic program used as an interface between the operating system and the motherboard
- ❖ power-on self-test (POST) for all hardware components of the system to make sure everything is working properly at system startup
- ❖ bootstrap loader that loads your operating system from the disk into the RAM

Interaction of CPU with memory



Buses

- A bus is a set of wires used for interconnection, where each wire can carry one bit
- the System Bus (Internal bus) connects components inside the motherboard like, CPU and system memory
- The Expansion Bus (External Bus) connects the different external devices, peripherals, expansion slots, I/O ports and drive connections to the rest of computer



System Bus

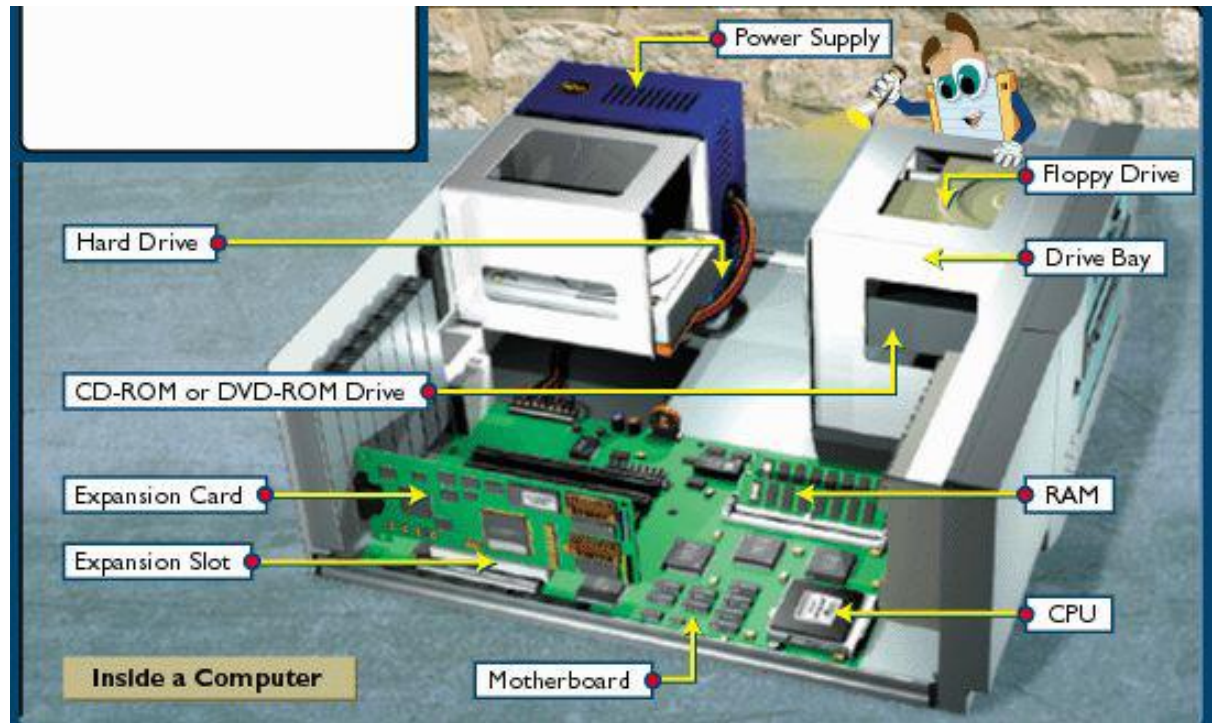
Three buses exist for the transfer of information:

- **Address bus**: The width of address bus determines the maximum number of memory locations the computer can address (**N bits** can represent **2^N different values**).
- **Data bus**: transfers data between the CPU and memory. The bus width of a data bus affects the speed of computer.
- **Control bus**

Performance of a Computer

- Registers
- RAM
- System Clock
 - Clock speed is measured in Hertz, where one Hertz is one clock tick per second
 - Computer systems have a "clock" — to keep all these times synchronized
- Bus
 - CPU bandwidth is generally measured as how many bits is manipulated in each clock cycle.
- Cache Memory

Hardware

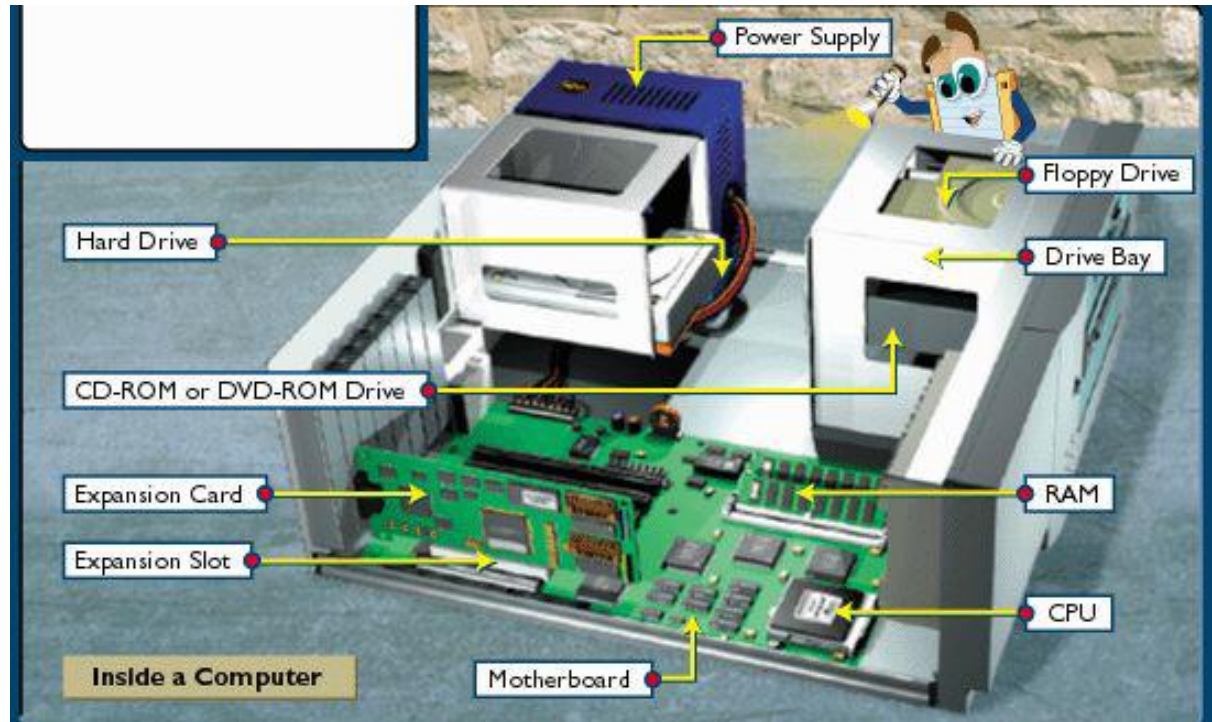


Internal

➤ Motherboard

- The motherboard is a large printed circuit board where the processor, memory and other electronic components are attached.

Hardware



➤ Chipset

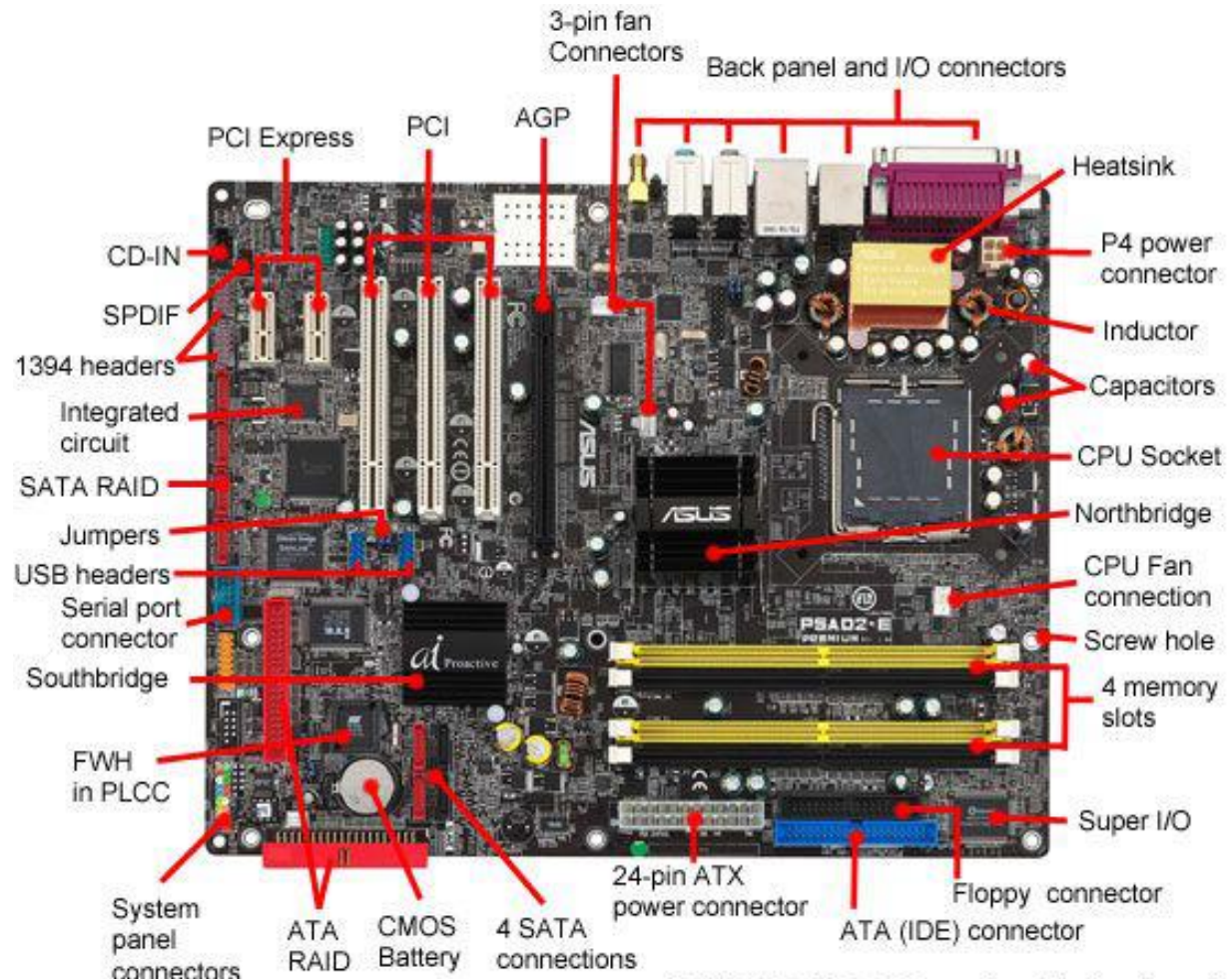
- The chipset is a series of chips attached directly to the motherboard.
- The chipset controls the system and its capabilities. All components communicate with the processor through the chipset.

Hardware

➤ Expansion Slot

(bus slot or expansion port)

- Video card
- Fax / Modem card
- Network card
- Memory slot
- SCSI for HD and CD drives



ASUS P5AD2-E Premium Motherboard

<http://www.computerhope.com>

Hardware

Back Panel and Ports

➤ A port is an interface on a computer to which you can connect a device.

- **Serial Port**
- **Parallel Port**
- **Universal Serial Bus (USB)**

