HNDIT1032 Computer and Network Systems

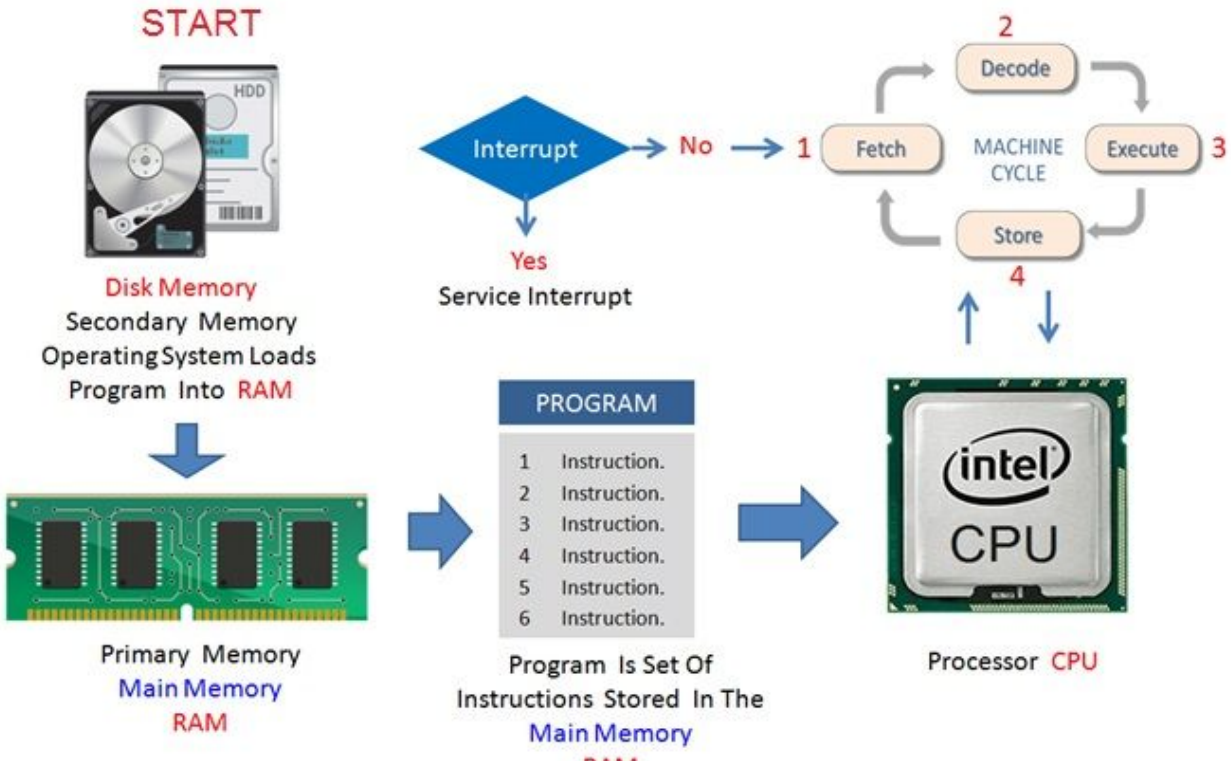
Week 08- Instruction Life Cycle and System Buses

Instruction Cycle

- The primary responsibility of a computer processor is to execute a sequential set of instructions that constitute a program.
- CPU executes each instruction in a series of steps, called instruction cycle.

Steps in Instruction Cycle

- Fetching
- Decoding
- Executing
- Storing



Fetching

- The processor fetches the instruction from the memory.
- The fetched instruction is placed in the Instruction Register.
- Program Counter holds the address of next instruction to be fetched and is incremented after each fetch.

Decoding

- The instruction that is fetched is broken down into parts or decoded.
- The instruction is translated into commands so that they correspond to those in the CPU's instruction set.

Executing

- Executing The decoded instruction or the command is executed.
- CPU performs the operation implied by the program instruction.
- For example, if it is an ADD instruction, addition is performed.

Storing

- CPU writes back the results of execution, to the computer's memory.

Microprocessor

- A processor's instruction set is a determining factor in its architecture.
- Reduced Instruction Set Computer (RISC).
  - AMD and Cyrix are based on CISC.
- Complex Instruction Set Computer (CISC).
  - Apple Mac G3 and PowerPC are based on RISC.

System Buses

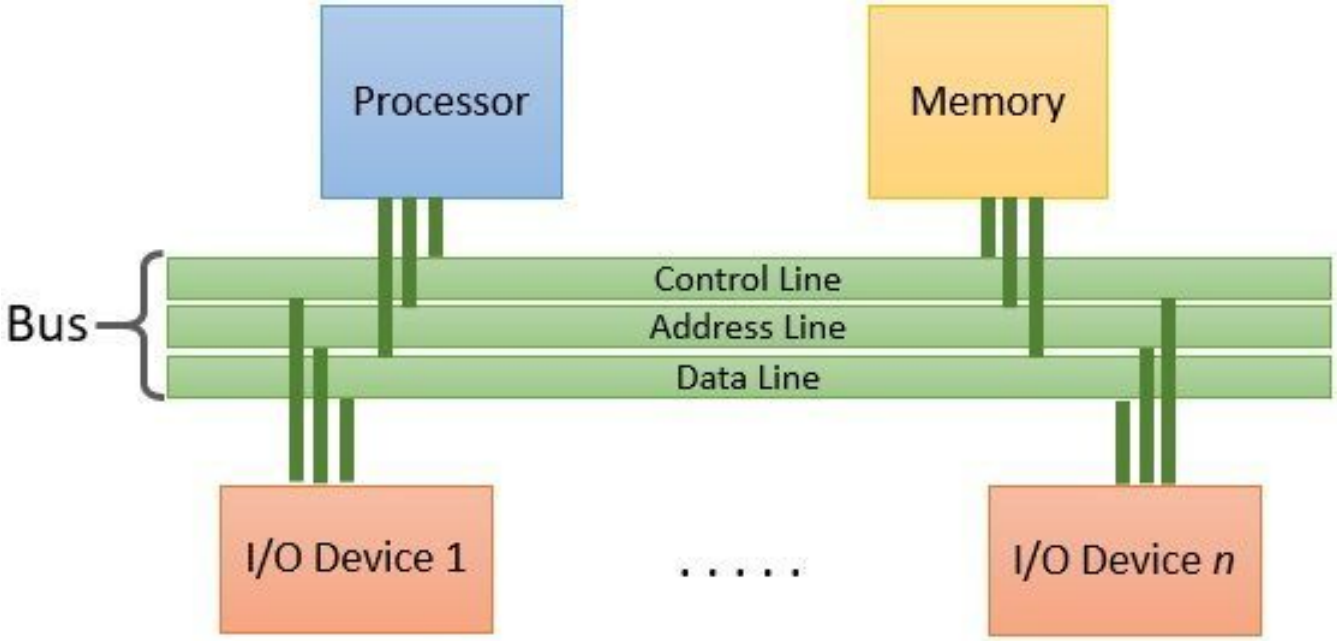
- Bus is a set of electronic signal pathways that allows information and signals to travel between components inside or outside of a computer.
- The different components of computer, i.e., CPU, I/O unit, and memory unit are connected with each other by a bus.

System Buses

- A bus is a set of wires used for interconnection, where each wire can carry one bit of data.
- A bus width is defined by the number of wires in the bus.
- A computer bus can be divided into two types—Internal Bus and External Bus.
- The Internal Bus connects components inside the motherboard like, CPU and system memory.
- It is also called the System Bus.

System Buses

- Data Bus
- Address Bus
- Control Bus



Data Bus

- Data Bus transfers data between the CPU and memory.
- The bus width of a data bus affects the speed of computer.
- The size of data bus defines the size of the processor.
- A processor can be 8, 16, 32 or 64-bit processor.
- An 8–bit processor has 8 wire data bus and carry 1 byte of data.

Address Bus

- Address Bus connects CPU and RAM with set of wires similar to data bus.
- The width of address bus determines the maximum number of memory locations the computer can address.

Control Bus

- Control Bus specifies whether data is to be read or written to the memory, etc.

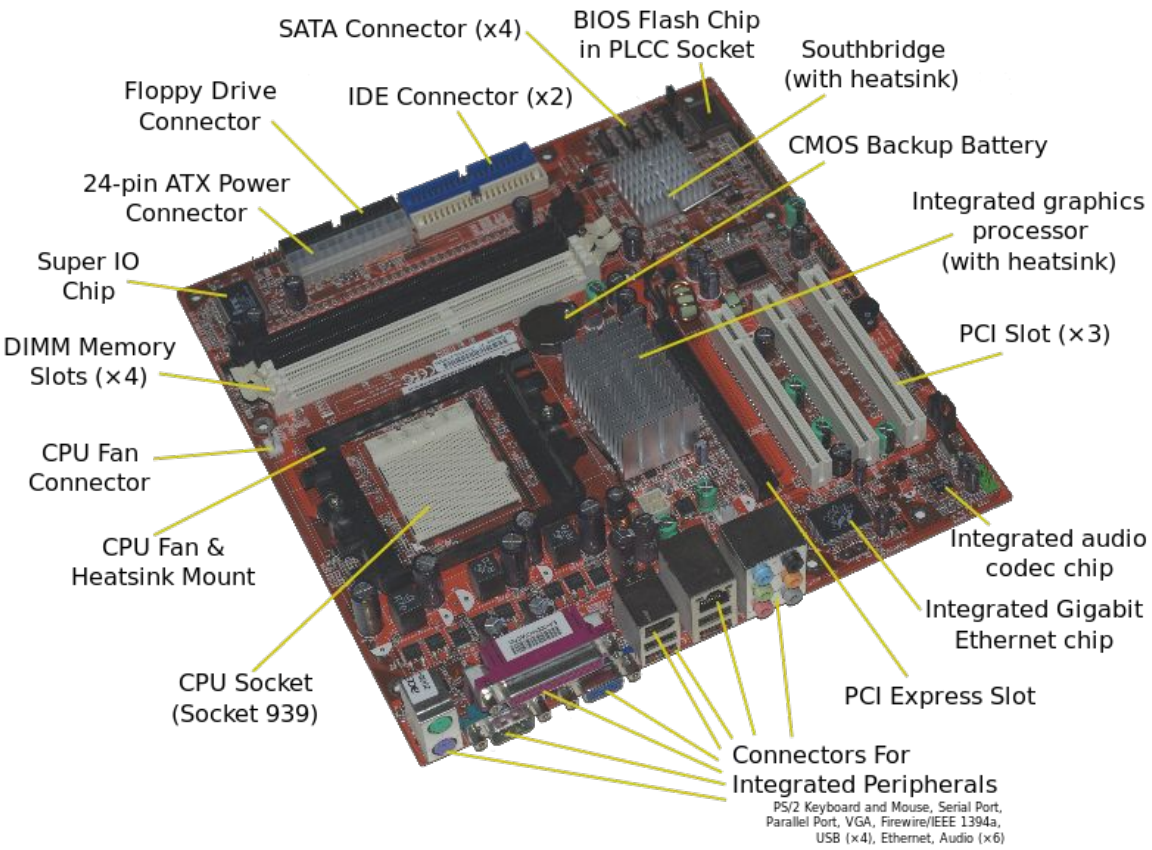
Motherboard

The computer is built up around a motherboard.

It is a large Printed Circuit Board (PCB), having many chips, connectors and other electronics mounted on it.

The motherboard is the hub, which is used to connect all the essential components of a computer.

The layout of Motherboard



Ports and Interfaces

- Serial Port— to connect old peripherals.
- Parallel Port— to connect old printers.
- USB Ports—to connect newer peripherals
- RJ45 connector (called LAN or Ethernet port)
- VGA connector for connecting a monitor.
- Audio plugs (line-in, line-out and microphone).
- PS/2 port to connect mouse and keyboard into PC.

Expansion Slots

- ISA (Industry Standard Architecture) slot—To connect modem and input devices.
- PCI (Peripheral Component InterConnect) slot—To connect audio, video and graphics.
- AGP (Accelerated Graphic Port) slot—A fast port for a graphics card.

BIOS

- BIOS It is the basic program used as an interface between the operating system and the motherboard.
- BIOS contain the instructions for the starting up of the computer.
- The BIOS runs when the computer is switched on.
- It performs a Power On Self Test (POST) that checks that the hardware is functioning properly and the hardware devices are present.

References

- Clements, A., The Principles of Computer Hardware, Oxford University Press (4th Ed), 2006.