MODULE 3

MOTHERBOARD

I INTRODUCTION

Motherboard is a main (PCB) printed circuit board. Where are all the components or devices are connected directly and indirectly.

Types of motherboard

1. integrated motherboard
2. non-integrated motherboard
3. desktop motherboard
4. laptop motherboard
5. server mother board
6. at motherboard
7. atx motherboard

Types of motherboard based on **devices they support**

1. Integrated motherboard
2. Non-integrated motherboard

1. Integrated motherboard

- An integrated system board has multiple components integrated into the board itself.
- These may include the CPU video card, sound card and various controller cards.

2.Non-integrated motherboard

- Non-integrated system board uses installable components and expansion cards. For example, non-integrated system board may allow you to upgrade the video card by removing the old one and installing a new one.
- Non-integrated motherboards typically have several PCI (Peripheral Component Interconnect) expansion slots as well.

Types of motherboard based on form factor

1. AT

2. ATX

1. AT MOTHERBOARD

- AT(Advanced Technology) motherboard is a motherboard which has Dimensions of the order of something up to 12 x 13 in. , while Baby AT motherboards can be up to 8.5 x 13 in..

2. ATX MOTHERBOARD

- Advanced technology extended, or popularly Known as the atx, are the motherboard which the Intel produced in mid 90`s as an Improvement from the previously working Motherboard such as AT and Baby AT.

- The most common size for desktop computers, measuring 12 x 9.6 in.

TYPES OF MOTHERBOARDS BASED ON USE

1. Desktop motherboard
2. Laptop Motherboard
3. Server motherboard

1. DESKTOP MOTHERBOARD

• Desktop motherboards are used in personal or desktop computers. As it is used for applications at home and office, this type of motherboard is the most basic.

2. LAPTOP MOTHERBOARD

- Laptop motherboard is used to connect different parts of a laptop system.
- These motherboards generally have very advanced features as compared to the desktop motherboard and most of the functions have been integrated into the laptop motherboard

3. SERVER MOTHERBOARD

• Server motherboards are more advanced than desktop motherboards and are designed to offer high-end services which are more reliable and ready to operate in 24*7 environments.

II Components of motherboard

A. Expansion slots
B. Processor socket
C. Coprocessor
D. Memory modules
E. BIOS and CMOS
F. Chipset
G. Super I/O chip
H. ROM BIOS

A. Expansion Slot

- An expansion slot is a socket on the motherboard that is used to insert an expansion card (or circuit board), which provides additional features to a computer such as video, sound, advanced graphics, Ethernet or memory.

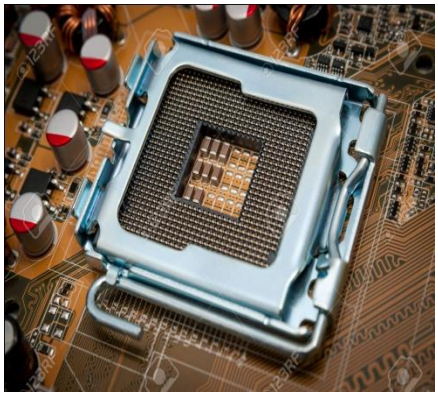
Example.

- Sound card or Multimedia
- LAN card.
- SCSI controller card.
- Internal Modem card.
- TV tuner card.

- □ Additional hard disc controller card

B. Central Processing Unit (CPU) Socket (CPU Socket)

- A CPU socket is a single connector between a microprocessor and motherboard.
- A CPU socket is a distinct mount used only for the CPU on the motherboard to ensure correct circuit chip insertion.
- A CPU socket also has a lock to prevent CPU movement, and its design helps secure heat sink placement above the CPU.



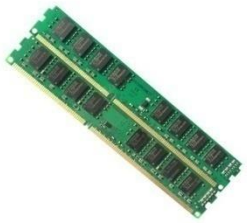
C. Coprocessor

- A coprocessor is a computer processor used to supplement the functions of the primary processor (the CPU).
- Operations performed by the coprocessor may be floating point arithmetic, graphics, signal

processing, string processing, cryptography or I/O interfacing with peripheral devices.

D. memory module

- A memory module is a circuit board that contains DRAM integrated circuits that are installed into the memory slot on a computer motherboard.
- Below is an image of a 512 MB DIMM computer memory module and the most common type of memory used today.



E. BIOS(ROM) AND CMOS

- The BIOS (Basic Input/Output System) is firmware stored in a chip(ROM) on your computer's motherboard. It is the first program that runs when you turn on your computer.
- The BIOS performs the POST(Power-on Self-Test), which initializes and tests your computer's hardware. Then it locates and runs your bootstrap program(booting) and loads the operating system directly. If we want to move to setup, we

use any function key to get into the setup. So, this setup program is also fed in ROM.

CMOS

- When you make changes to your BIOS configuration, the settings are not stored on the BIOS chip itself. Instead, they are stored on a special memory chip, which is referred to as "the CMOS."

- CMOS stands for "Complementary Metal-Oxide-Semiconductor."

- Like most RAM chips, the chip that stores your BIOS settings is manufactured using the CMOS process. It holds a small amount of data, usually 256 bytes.

- The information on the CMOS chip includes what types of disk drives are installed on your computer, the current date and time of your system clock, and your computer's boot sequence.

CMOS battery

- The CMOS battery is a lithium-ion battery about the size of a coin.
- It can hold a charge for up to ten years before needing to be replaced.
- If your CMOS battery dies, your BIOS settings will reset to their defaults when your computer is turned off.

F. CHIPSET

- A chipset is a group of interdependent motherboard chips or integrated circuits that control the flow of data and instructions between the central processing unit (CPU) or microprocessor and external devices.
- A chipset controls external buses, memory cache and some peripherals.

Type of chipset

The term chipset often refers to a specific pair of chips on the motherboard:

- The **northbridge and the southbridge.**
- **The northbridge** links the CPU to very high-speed devices, especially RAM and graphics controllers, and the

- **southbridge** connects to lower-speed peripheral buses (such as PCI or ISA). In many modern chipsets, the southbridge contains some on-chip integrated peripherals, such as Ethernet, USB, and audio devices.

G. super I/O chip

- Super i/o chip is a single chip which controls Slower i/o devices which are not controlled by South bridge.

H. ROM BIOS

- All motherboards include a small block of Read Only Memory (ROM) which is separate from the main system memory used for loading and running software.
- The BIOS will most likely be stored in a 32-pin chip, which can typically be identified by a silver or gold sticker that shows the name of the BIOS company.
- The BIOS comprises several separate routines, serving different functions. The first part runs as soon as the machine is powered on. It inspects the computer to determine what hardware is fitted and then conducts some simple tests to check that everything is functioning normally

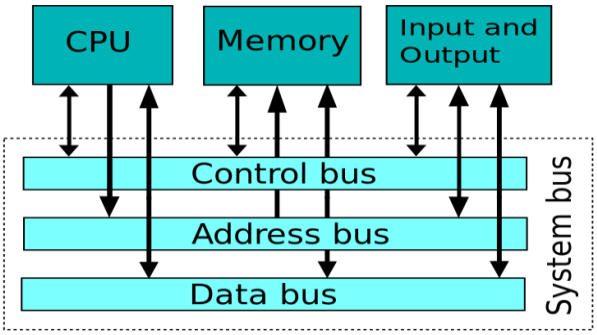
II. SYSTEM BUSES

Definition - What does *System Bus* mean?

- The system bus is a pathway composed of cables and connectors used to carry data between a computer microprocessor and the main memory.
- The bus provides a communication path for the data and control signals moving between the major components of the computer system.
- **The system bus works by combining the functions of the three main buses: namely,**
- **1. Data bus**
- **2. Address bus**
- **3. control buses**. Each of the three buses has its separate characteristics and responsibilities.

The system bus combines the functions of the three main buses, which are as follows:

- The control bus carries the control, timing and coordination signals to manage the various functions across the system.
- The address bus is used to specify memory locations for the data being transferred.
- The data bus, which is a bidirectional path, carries the actual data between the processor, the memory and the peripherals.



A. The Internal Processor Bus: data, address, and control bus

- A bus is a pathway for digital signals to rapidly move data.
- There are three internal buses associated with processors: the data bus, address bus, and control bus. Together, these three make up the "system bus."
- The system bus is an internal bus, intended to connect the processor with internal hardware devices, and is also called the "local" bus, Front Side Bus, or is sometimes loosely referred to as the "memory bus."

B. Memory Bus

- The memory bus is a type of computer bus, usually in the form of a set of wires or conductors which connects electrical components and allow transferring of data and addresses from the main

memory to the central processing unit (CPU) or a memory controller.

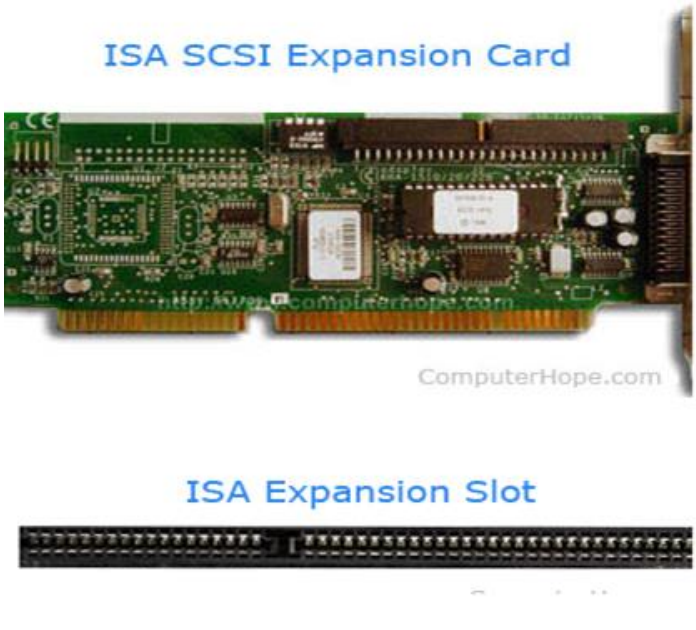
- A memory bus is made up of two parts: **the data bus and the address bus**.
- The data bus is responsible for the transfer of information between the memory and the chipset.
- The address bus communicates with the system on where specific information can be located or stored when data either enters or leaves the memory

C. Input/output bus

- The input/output bus or IO bus is the pathway used for input and output devices to communicate with the computer processor.
- I/O buses connect the CPU to all other components, except RAM.
- Data are moved on the buses from one component to another, and data from other components to the CPU and RAM.
- The I/O buses differ from the system bus in speed. Their speed will always be lower than the system bus speed.
- On modern PCs, you will usually find four buses:

 The ISA bus, which is an old low speed bus, soon to be excluded from the PC design.

- An Industry Standard Architecture bus (ISA bus) is a computer bus that allows **additional expansion cards** to be connected to a computer's motherboard.
- It is a standard bus architecture for IBM compatibles



EISA(Extended Industry Standard Architecture)

Extended Industry Standard Architecture (EISA) is a bus architecture that extends the Industry Standard Architecture (ISA) from 16 bits to 32 bits.

EISA is also known as Extended ISA.

The EISA bus is compatible with older ISA buses with 8-bit or 16-bit data paths. Two 32-bit data path slots are the same width as one 16-bit ISA slot.

- **The PCI bus, which is a new high speed bus.**

- Conventional PCI, often shortened to PCI, is a local computer bus for **attaching hardware devices** in a computer.
- PCI is the initial for **Peripheral Component Interconnect** and is part of the PCI LocalBus standard.

 The USB bus (*Universal Serial Bus)*, which is a new low speed bus.

- A Universal Serial Bus (USB) is a common interface that enables communication between devices and a host controller such as a personal computer (PC).
- It connects peripheral devices such as digital cameras, mice, keyboards, printers, scanners, media devices, external hard drives and flash drives

 The AGP bus which solely is used for the graphics card.

- The Accelerated Graphics Port (AGP) was designed as a **high-speed point-to-point channel for attaching a video card to a computer system,** primarily to assist in the acceleration of 3D computer graphics.
- It was originally designed as a successor to PCI-type connections for video cards.

IV MOTHERBOARD SELECTION CRITERIA

Motherboard Selection Criteria (Knowing What to Look For)

It helps to think like an engineer when you make your selection. Consider every aspect and detail of the motherboards in question. For instance, you should consider both present usage as well as any future uses and upgrades. Technical support at a professional (as opposed to a user) level is extremely important.

The following list includes some of the most important criteria to consider when selecting a motherboard:

- **Motherboard chipset:**

The motherboard chipset is the backbone of a system and it is the single most important part you'll consider. Compare the features of the available chipsets to ensure that the board will do what you want. For example, some chipsets include support for faster memory, PCIe 2.x cards, SATA 3Gbps drives, and optional RAID capabilities

- Processor socket:

The processor socket on a motherboard dictates the specific processor makes and models you will be able to install.

- Memory:

The type and amount of memory compatible with a system depends on the motherboard you choose. Most motherboards today support either DDR2(Double Data Rate2) or DDR3 memory, in single, dual, or triple-channel operation.

- Form factor:

  The form factor indicates the **size and shape of the board**, and must be compatible with the chassis or case and power supply.

- Bus slots:

  Current systems offer one to five or more PCI (Peripheral Component Interconnect) and PCI Express slots (depending on the form factor).

- Other built-in interfaces

Ideally, a motherboard should contain as many built-in standard controllers and interfaces as possible. Most boards feature integrated USB, sound, and LAN (look for those offering gigabit Ethernet), whereas others also have integrated video, FireWire, eSATA, dual LAN adapters, and more.