

Chapter-5

Chipset

A Chipset is a collection of electronic component on a motherboard that manages data flow between the components. It's often called the "glue" of the motherboard because it facilitates communication b/w all the connected components.

How it works

1. The Chipset acts as a traffic controller, managing how each component interacts.
2. It sends signals back and forth to manage operations.
3. It handles data differently depending on its type, such as audio, video or system-level tasks.
4. It also coordinates tasks that require communication among multiple components simultaneously.

* What it does

- * Ensures the stability and efficiency of bus.
- * provides interfaces for the computer, such as USB, SATA and PCI. Manages power consumption and voltage to ensure the stable operation of the computer system.

Types:-

1. Northbridge:- Handle high-speed communication b/w CPU, RAM and GPU.

2. South Bridge:- Manages slower peripherals like USB, audio, storage (HDD/SSD) and network interfaces.

• used in Intel & AMD architectures before integration into a single chip.

2. Modern Chipset Architecture

• Newer architecture integrate most functions of Northbridge into the CPU itself.

• The Chipset (also called platform controller Hub (PCH) in Intel system) handles I/O device (USB, audio, storage).

• This design improves power efficiency and reduces latency.

Key Features

1. CPU Compatibility

2. Memory support

3. PCIe (Peripheral Component Interconnect Express)

4. Storage support

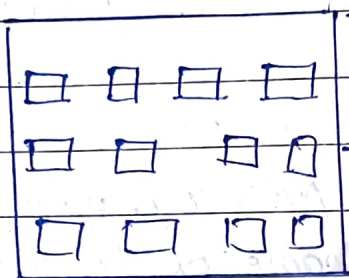
5. Overclocking capability.

6. Integrated Graphics support

7. Connectivity features.

Chapter-5

Chipsets



manage data
flow

between different
different devices

multiple
electronic ~~devices~~
chips

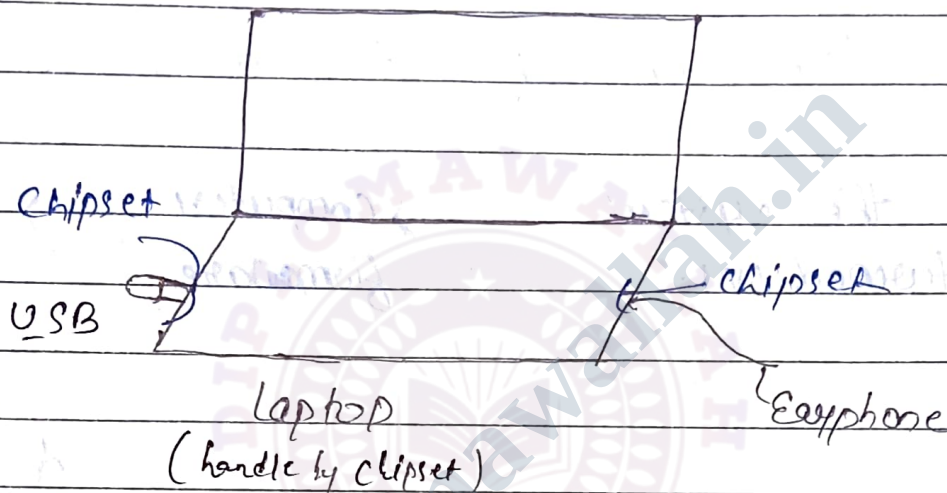
Roughly all chipsets → provides a communication between other components.

- How the each components/ devices interact with each other.
- Handles the data differently depending upon the type i.e. audio, video etc.

Ⓢ

Q. what it does?

- Stability, mobility while communicating
- Interface with connectors.
- Manage power consumption.



Why?

- 1) CPU speed
- 2) Load. Reduces of CPU as work gets divided.
- 3) Smooth operation.

Types

- 1) North Bridge $\rightarrow$ Speed $\uparrow$ (CPU speed is high)
(CPU $\rightarrow$ RAM)
- 2) South Bridge $\rightarrow$ Slow Speed (printer, hard drive etc.)
- 3) PCH $\rightarrow$ North Bridge + South Bridge (both work)

* If we are copying or pasting a file from E drive to F drive, at that time database and address bus, both get equally active to do the work.

* Power on self Test (POST)

When the system is turned on. → Computer firmware → BIOS, UEFI
↓
to determine if all the components are running successfully or not.

Ex: CPU M/m Storage Controller Keyboard, Mouse, 'entire system running smoothly or not'

* 3 times Speed

↳ Keyboard

* 1 time Speed

↳ System on.

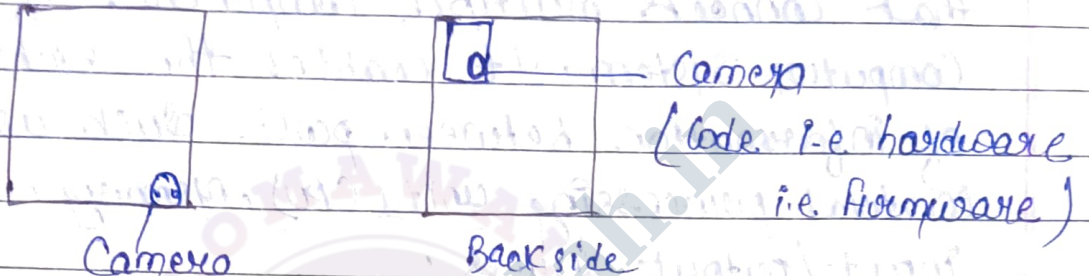
Firmware
Code/Program



Firmware

It is a type of Code/Program embedded into Hardware devices to help them effectively.

Firmware
Flashlight
glows according
to condition.

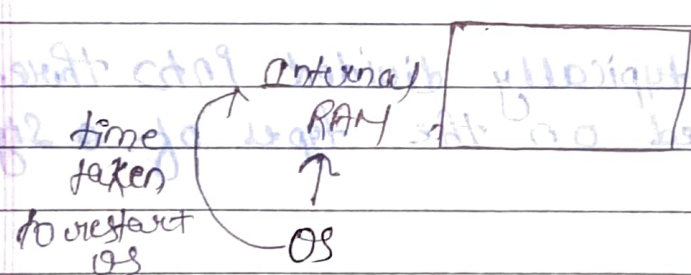


Software
(Front side)

Booting

Warm
Hang-on

Cold
power on after off



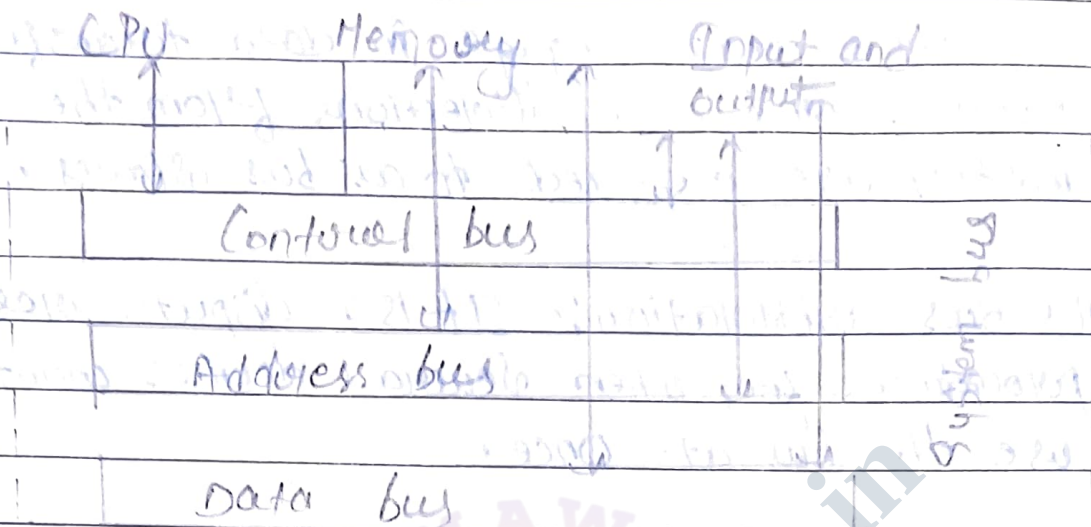
Bus

A bus structure in a computer organization is essentially a shared communication pathway that connects multiple components of the computer system. It enables the exchange of information between parts such as the central processing unit (CPU), memory, and input/output devices.

The bus provides a framework for transmitting data, memory addresses, and control signals. It is a crucial component of the computer's internal architecture, allowing the various parts of the system to interact efficiently and ensuring smooth operation.

The bus is typically divided into three categories based on the types of signals it carries:

1. data bus
2. Address bus
3. Control bus



* Functionalities or Components or Features

A typical computer bus is made up of a number of essential parts that control its performance and operation.

1. Bus protocol:- It specifies the guidelines and practices for data transport, including arbitration, addressing and error-detection protocols.

2. The device known as the bus master is in charge of starting and managing data transfer on the bus.

3. Devices that engage in data transfer activities and obey directions from the bus master are referred to as bus slaves.

4. Bus arbitration: It is a dispute resolution procedure for when several devices want to use the bus at once.

Computer Bus?

A bus is a set of physical connections (cables, circuits etc) that can be shared by multiple hardware components to communicate with one another. Memory and input/output devices are connected to the central processing unit through a group of lines called a bus.

Types of Computer Bus:-

Address Bus

Data Bus

Control Bus

1. Address Bus

A collection of wires to identify particular location in memory is called Address Bus.

→ The information used to describe the memory location travels along the address bus.

2. Data Bus

A collection of wires through which data is transmitted from one part of a computer to another is called Data Bus.

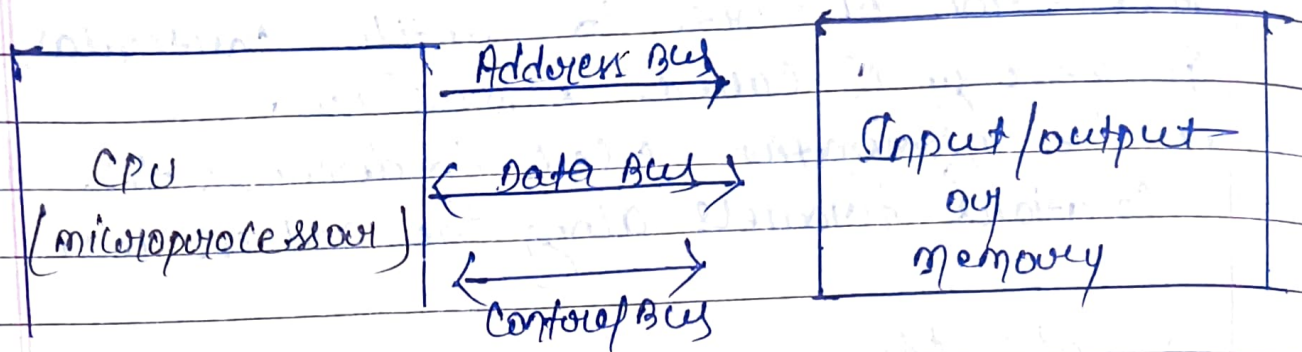
→ Databus can be thought of as highway on which data travels within a computer.

* The main objective of data bus is to transfer of the data b/w microprocessor to input/output devices or memory.

3. Control Bus

The connection that carry control information b/w CPU and other devices within the computer is called Control Bus.

* The main objective of control bus is all signals controller carried from processor to other hardware device.



Q. What is power-on Self Test (POST)?

→ A power on self test (POST) is an operation initiated by a computer after it has been turned on but before it boots up the OS.

→ The computer firmware - BIOS, unified Extensible Firmware Interface (UEFI) or another system - carries out this operation by running a diagnostic testing sequence to determine if the computer essential hardware is working properly.

Post
UEFI
Bit

Why are power on self tests important?
power on self tests are an essential part of system troubleshooting because the bootup can only proceed if the software is working correctly; if the software is not working, the BIOS produces an error message.

This is important because numerous essential programs are loaded when system boots up.

How power on self test works?

The way in which a computer carries out the POST process depends on the system's hardware architecture and installed firmware.

This typically includes the following devices: processor, memory, storage, controllers, keyboards, pointer device and system timer.

Ex - hardware lights might flash, or the screen might display a company logo.

BOOTING

"boot" refers to the entire process of starting up a computer, including initializing hardware and loading the operating system.

Booting is the process of starting a computer or restarting its operating system. It involves loading the operating system into the computer's main memory.

Types of booting

(1) cold booting

Starting a computer after it has been turned off, starting up, POWER ON STATE. This is also called hard booting.

Warm booting

Restarting the operating system after a system crash or freeze. This is done through the operating system.

In other words, it is called "^{soft} Cold" boot because the system is starting up from Cold State where it was completely power off. It is in contrast to a "^{hard} warm" boot, which refers to restarting the system without powering it off completely.

Firmware

Firmware is a form of microcode/program embedded into hardware devices to help them operate effectively. Hardware like cameras, mobiles, phone, network cards, optical ^{drives} devices, printer, router etc. all rely on firmware built into their memory to function smoothly.

Firmware is often referred to as "software for hardware". Firmware provides instruction to help hardware start up, communicate with other devices, and perform basic tasks while software installed onto a device and used for browsing the internet, word processing, listening music etc.

POST-checking
BIOS-load

UEFI & BIOS difference
unified Extensible firmware interface

BIOS i.e. [Computer Start up] → [BIOS] → [which wake up the computer hardware components]

after that the boot loader load the OS into the Internal RAM so that it shows display to the user.

The problem we face with BIOS is 16-bit processor mode, and only have 1MB of space, so to load OS & waking multiple devices (S/w & H/w) at once ⇒ Trouble, speed ↓, Time ↑

* ~~UEFI~~ POST work is only to testify the system whether all the system, OS, software, hardware all are working properly or not.

BIOS work is to wake up all the software, hardware, OS, components at the given amount of time (milliSeconds)

BIOS - post ✓
UEFI - post ✗

UEFI i.e. it also help the OS to connect with the H/W & firmware at a proper time

its basic work is to
→ Initialize the H/W compo
→ start the OS
→ interface / merge the communication b/w OS & H/W

Thus faster boot secure boot support large files (2TB). Graphics features & Advanced M/W

it also directly boots the OS whenever required (replacing POST)

UEFI

- 1) 2TB m/m
- 2) Fast Boot POST not required.
- 3) Secure startup of OS
- 4) Graphics high advance interface high

BIOS

✗

POST required.

non-secure

less Graphics

UEFI

UEFI (Unified Extensible Firmware Interface) is a specific type of firmware that manages the early stages of the boot process, offering advanced features like a graphical interface, faster startup times, and enhanced security compared to older BIOS systems.

* UEFI is a modern way to execute the "boot" function on a computer.

* It is a modern Firmware Interface that replaces the older BIOS in computers.

* It mainly works to store important information about the device initialization which is stored on a special part of disc.

* It is time-efficient.

* It bridges the gap between computer's hardware and operating system, allowing for better compatibility, security and functionality.

* It makes the computer start faster.

SCSI - Small Computer System Interface aka high performance system interface to multiple devices to connect and transfer data

Ex) (hard disk, scanner)

• SCSI adapter card

↳ PCI or PCIe slot

there have year

10. UEFI acts as a middleman

• Connect Firmware to the operating system.

2. Function of UEFI

• Initializes hardware component

• Start the operating system.

• Interface between OS and the individual components.

• Advantage of UEFI over BIOS

• Secure Boot

• Faster Boot Times

• Support larger drives (> 2 TB ; GPT format)

• Graphical interface, & advanced features.

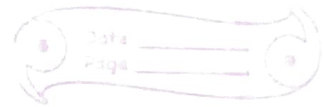
* Q. How the BIOS works and how it is different from UEFI?

When your computer starts up, BIOS loads and wakes up the computer hardware components, making sure they are working properly. Then it loads to initialize windows or any operating system you have installed.

Cache, M/M

Cloud computing memory

Boot time
→ Time taken to active.



Memory

Primary Memory/
Main memory

Secondary Memory/
Auxiliary memory

← RAM

ROM

→ SRAM (Static RAM)

→ PROM (erase - 1 times)

→ DRAM (Dynamic RAM)

→ EPROM (UV lights)

→ EEPROM (Right now)
(latest)

→ CD

→ DVD

→ Hard Disk

→ Magnetic Disk

→ Magnetic tape

→ USB

Static RAM:- statically, inbuilt all simple features
i.e. calls, video, audio i.e. General work of
a mobile phone.

Dynamic RAM:- Graphics ↑, HD Quality ↑, Games, Youtube
youtube i.e. pixels ↑

CMOS Battery:- (Complementary metal - oxide - semiconductor)

→ Date & time after power on

→ password check

→ Boot time

→ Time taken for system requirements.

units of m/m

Bit = 0.1

Nibble = 4 bits

Byte = 8 bits

~~1000000000~~

1 KB = 2^{10} bytes = 1024 bytes

1 MB = 2^{20} bytes = 1024 KB

1 GB = 2^{30} bytes = 1024 MB

1 TB = 2^{40} bytes = 1024 GB

1 Petabyte = 1024 TB = 2^{50} byte

1 Exabyte = 1024 PB = 2^{60} byte

1 Zettabyte = 1024 EB = 2^{70} byte

1 Yottabyte = 1024 ZB = 2^{80} byte

1 Brontobyte = 1024 YB = 2^{90} byte

1 Geopbyte = 1024 BB = 2^{100} byte

Answer

index -	0	1	2	3
	A	J	I	T
	100	102	104	106

A $\rightarrow 2 = 65 - 90$
a $\rightarrow 2 = 97 - 122$

A B C D
65 66 67 68

PRIVANKA

P $\rightarrow 100$ 80	A - 65
R $\rightarrow 101$ 82	
F $\rightarrow 73$	
Y $\rightarrow 89$	
A $\rightarrow 65$	
N $\rightarrow 78$	
K $\rightarrow 75$	

ASCII to Binary

P → 80

10864200

64 32 16 8 4 2 1

1 0 1 0 0 0 0

R → 82

64 32 16 8 4 2 1

1 0 1 0 1 1 0

I → 73

64 32 16 8 4 2 1

1 0 0 1 0 0 1

Y → 89

64 32 16 8 4 2 1

1 0 1 1 0 0 1

A →

64 32 16 8 4 2 1

1 0 0 0 0 0 1

n - 78

64 32 16 8 4 2 1

1 0 0 1 1 1 0

K → 75

64 32 16 8 4 2 1

1 0 0 1 0 1 1

A → 64

1 0 0 0 0 0 1

P → 1010000

R → 1010110

I → 1001001

Y → 1011001

A → 1000001

n → 1001110

K → 1001011

A → 1000001

IDE ports

An IDE (Integrated Drive Electronic) port on a motherboard is an interface that connects storage devices like hard disk drives (HDDs) and optical drives (ODDs) to the computer.

An IDE Interface is an Industry Standard Adapter for connecting IDE devices and enabling them to communicate with each other.

At one time, most computers included at least one IDE interface built into the motherboard.

How Does the IDE works?

1. IDE uses a flat ribbon cable to transfer data b/w the storage devices and the computer.
2. The cable has ~~just~~ multiple connectors to attach to the motherboard and the storage device.
3. IDE uses parallel communication to transfer data.

11. m

* CMOS Battery

A CMOS (Complementary Metal oxide semiconductor) battery is a small, coin shaped battery found on a computer's motherboard. It provides power to the CMOS chip, which stores important system information such as the date, time and hardware settings in the CMOS memory.

The CMOS battery serves several functions in your computer:

1. Maintain System Time and Date: It keeps the real-time clock (RTC) running even when the computer is powered off, ensuring the correct date and time are maintained.
2. preserves BIOS settings:- It ensures that your BIOS (Basic Input/output system) settings are retained b/w restarts, preventing the system from reverting to default settings.
3. Enable Quick Startups:- By maintaining BIOS setting, it allows for faster boot times and ensures the operating system loads correctly.
4. Supports power management:- It helps manage low-power states when the computer is in sleep or hibernation mode.

The CMOS battery primary function is to provide continuous power to the CMOS chip, which stores critical system information.

1. System time and date
2. Hardware configurations.
3. Boot sequence settings
4. power management settings
5. password settings (if applicable).