Networking Devices - Detailed Notes

I What are Networking Devices?

Networking devices are hardware components that connect computers, smartphones, printers, and other devices together to form a network.

They help in data transmission, communication, and management between devices.

1. Network Interface Card (NIC)

- What it is :

A hardware component that allows a computer to connect to a network. It

can be wired (Ethernet card) or wireless (Wi-Fi card).

- Function:

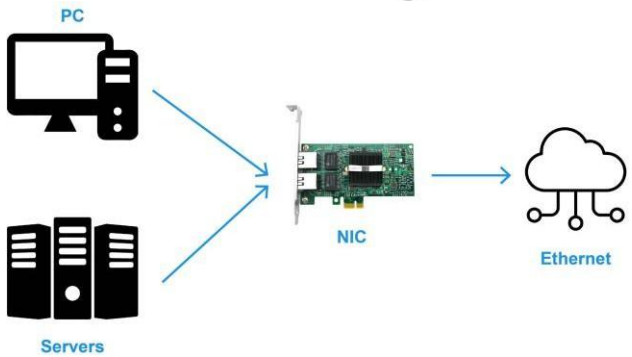
Converts data from the computer into signals that can travel through cables or air. Every

NIC has a unique MAC address (like a permanent ID).

- Example:

The Ethernet port on your computer.

The Wi-Fi adapter in laptops or smartphones.



2. Modem

- What it is:

Short for Modulator–Demodulator.

A device that connects your home network to the Internet (through your ISP).

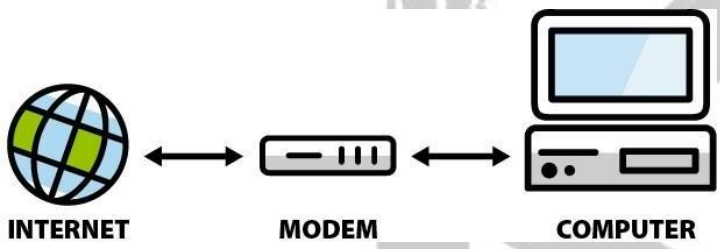
- Function:

Converts digital signals from your computer into analog signals that can travel through telephone lines.

Converts incoming analog signals back to digital form.

- Example:

The device that connects your home computer to the Internet via broadband or DSL.



3. Hub

- What it is:

A basic device used to connect multiple computers in a local network (LAN).

- Function:

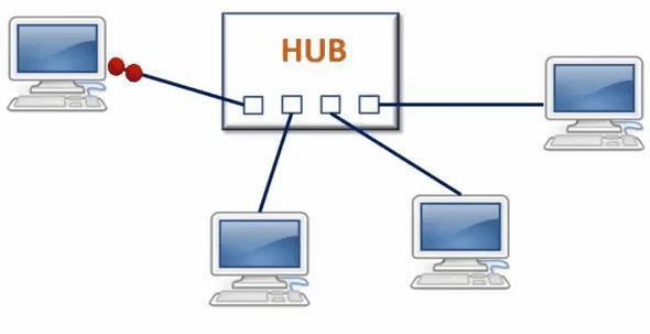
It broadcasts data to all devices connected to it, even if the data is meant for only one.

Works on Layer 1 (Physical Layer) of the OSI model.

- Example:

Like a multi-socket power strip, but for network cables. Disadvantage:

Not secure or efficient — it causes network traffic and collisions.



4. Switch

- What it is:

A smarter version of a hub that connects multiple devices in a LAN.

Works on Layer 2 (Data Link Layer).

- Function:

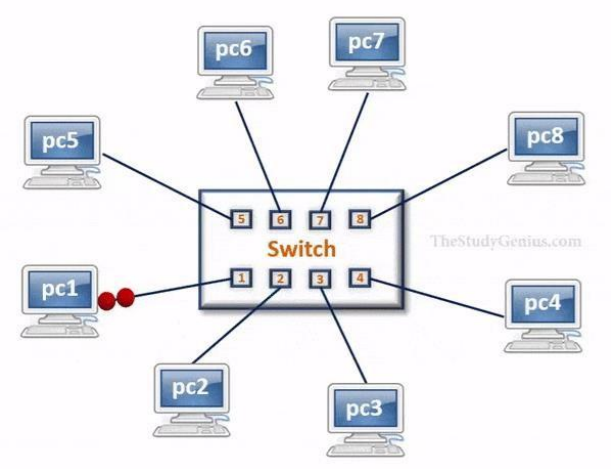
Sends data only to the device it's meant for (using MAC addresses).

Reduces data collisions and increases speed.

- Example:

Used in offices to connect multiple computers within one floor or building. Advantages over Hub:

Faster, more secure, and efficient.



5. Router

- What it is:

A device that connects different networks together (for example, your home network to the Internet).

- Function:

Routes data packets from one network to another using IP addresses.

Works on Layer 3 (Network Layer).

Provides Wi-Fi in homes and offices.

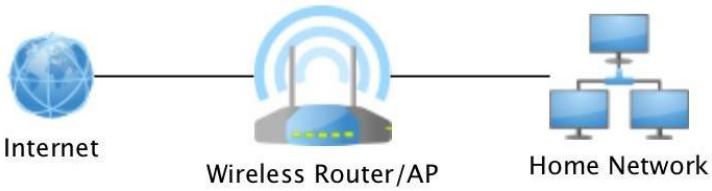
- Example:

Your home Wi-Fi router that connects multiple devices to the Internet.

Advantages:

Connects multiple networks.

Provides IP addressing and security (firewall).



6. Bridge

- What it is:

A device that connects two or more LAN segments (parts of a local network).

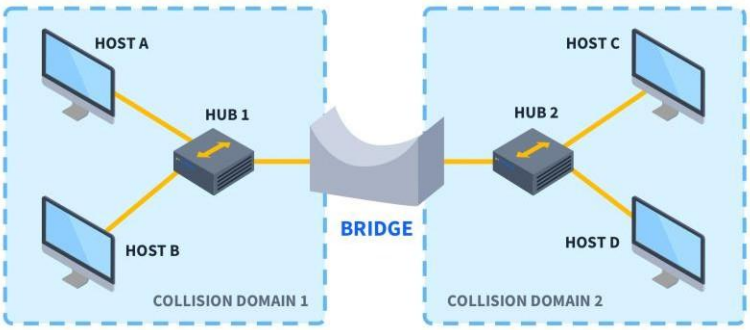
- Function:

Filters traffic between LAN segments based on MAC addresses.

Reduces unnecessary traffic.

- Example:

Used to connect two different sections of a building network.



7. Repeater

- What it is

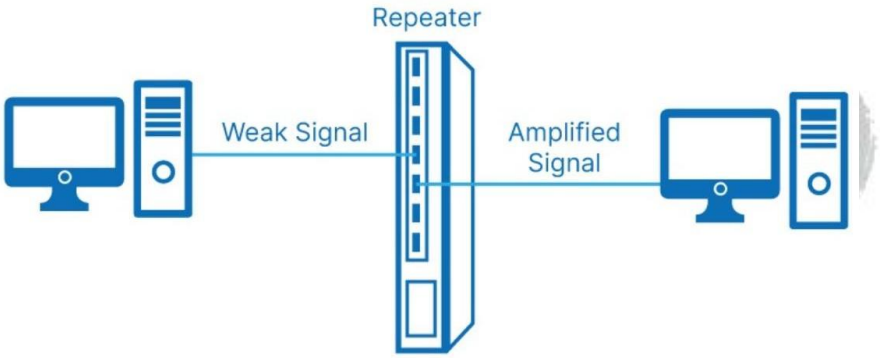
A device that amplifies or regenerates signals in a network.

- Function:

When a signal travels a long distance, it becomes weak (attenuated). The repeater boosts the signal to travel further without loss.

- Example:

Used in long Ethernet cables or Wi-Fi range extenders.



8. Access Point (AP)

- What it is:

A device that allows wireless devices to connect to a wired network.

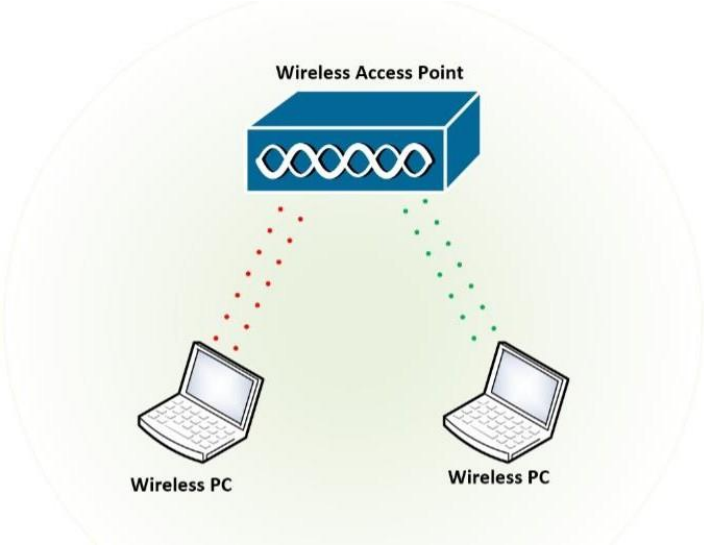
- Function:

Acts as a bridge between wired and wireless parts of a network.

Extends Wi-Fi coverage in large buildings.

- Example:

Installed in schools, offices, and airports for public Wi-Fi.



9. Gateway

- What it is:

A network device that acts as a “gate” between two different networks (e.g., LAN and Internet).

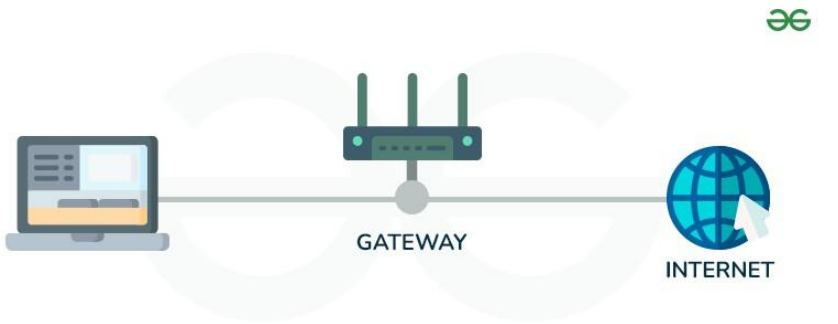
- Function:

Translates data from one network format/protocol to another. Works

on all 7 layers of the OSI model.

- Example:

A home router also acts as a gateway between your private network and the Internet.



Introduction of Gateways

10. Firewall

- What it is:

A security device that monitors and controls incoming and outgoing network traffic.

- Function:

Protects the network from hackers, viruses, and unauthorized access.

Can be hardware-based or software-based.

- Example:

Built into routers, or installed as software on computers