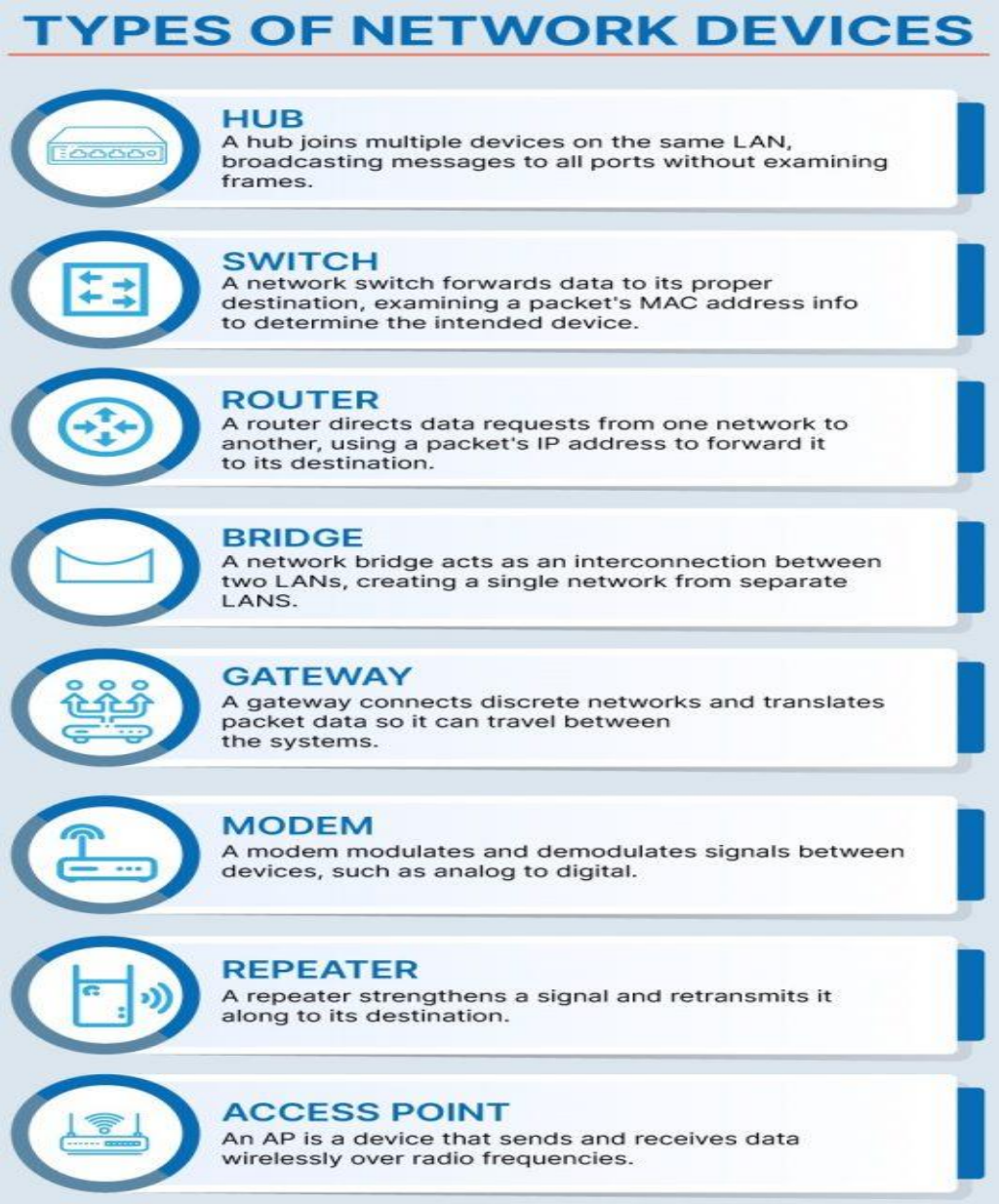
Semester: V | Subject: Computer Network | Academic Year: 2023-24

Module -1

Network Devices

Network devices are physical devices that allow hardware on a computer network to interact and communicate with one another. *In layman's terms, we can describe network devices in computer networks as the devices that connect fax machines, computers, printers, and other electronic devices to the network.*

Network Devices types



Hub

A hub is one of the simplest networking devices that connects several computers or other network devices when referring to networking (network devices hub). *In layman's terms, a hub is a hardware device that allows multiple devices or connections to connect to a computer.*

A USB hub, for example, allows multiple USB devices to connect with one computer, even if that computer only has one USB connection. Depending on the hub, the number of ports on a USB hub can range from 4 to over 100, and it *operates at the Physical layer (Layer 1) of the Open Systems Interconnection (OSI) model.*

The top three advantages of the hub network device are:

- Easy to install
- Inexpensive
- It does not affect the performance of the network seriously

The top three disadvantages of the hub network device are:

- Can not filter information
- It can not reduce the network traffic
- Broadcast of the data happens to all the port

Switch

A ***switch is a physical circuitry part that controls the flow of signals in networking*** (network devices switch). A switch enables you to open or close a connection. When the switch is opened, a signal or power can pass through the connection. When the switch is closed, the flow is stopped, and the circuit connection is broken.

Early computers, such as the Altair, used switches as input. A network switch is much more advanced than a hub, but it isn't as advanced as a router and ***operates at the Data Link layer (Layer 2) of the OSI model.***

The top three advantages of the switch network device are:

- Increases the available bandwidth of the network.
- It helps in reducing the workload on individual host PCs
- Increases the performance of the network

The top three disadvantages of the switch network device are:

- They are more costly than network bridges.
- Broadcast traffic can be problematic.
- Network connectivity problems are challenging to track down via the network switch.

Router

In regards to networking (network devices router), ***a router is a piece of hardware that receives, analyses, and forwards incoming packets to another network.*** Routers examine incoming packets to determine the correct target IP address and send the packet to that address.

Routers typically connect LANs and WANs and use a rapidly updating routing table to make routing decisions for data packets. Edge routers, core routers, virtual routers, wireless routers, and various other types of routers are available, and they ***operate at the Network layer (Layer 3) of the OSI model.***

The top three advantages of the router network device are:

- Connects various network architectures such as ethernet and token ring, among others.
- Reduces network traffic by establishing collision domains as well as broadcast domains.
- Chooses the best path across the internetwork using dynamic routing algorithms.

The top three disadvantages of the router network device are:

- They work with routable network protocols.
- More expensive than other network devices.

- They are slower because they must analyze data from layer 1 to layer 3.

Bridge

In regards to networking (network devices bridge), a bridge is a device that connects two LANs or two segments of the same LAN. Networking bridges are also known as **network bridges** and **bridging**. There are two types of bridges: the ***Transparent bridge*** and the ***Source Routing bridge***.

Bridges, unlike routers, are protocol independent in that they can forward packets without analyzing and re-routing messages. Bridging, in a nutshell, connects two smaller networks to form a more extensive network.

Bridges' primary function in network architecture is to store and forward frames between the various segments that the bridge connects. They transfer frames using hardware Media Access Control (MAC) addresses. Bridges can forward or prevent data crossing by analyzing the MAC addresses. A bridge ***operates at the OSI model's Data Link layer (Layer 2).***

The top three advantages of the bridge network device are:

- Reduces collisions
- Reduces network traffic with minor segmentation
- Connects similar network types with different cabling

The top three disadvantages of the bridge network device are:

- Does not filter broadcasts
- More expensive compared to repeaters
- Slower compare to repeaters due to the filtering process

Gateway

When referring to networking (network devices gateway), a gateway is a networked device that serves as an entry point into another network. A wireless router, for example, is frequently used as the default gateway in a home network. In short, a gateway acts as a messenger agent, taking data from one network, interpreting it, and transferring it to another. Gateways, also known as protocol converters, can ***operate at any OSI model layer.***

The top three advantages of the gateway network device are:

- Allows to broaden the network
- Handles traffic issues effectively
- Permits to link two different kinds of networks

The top three disadvantages of the gateway network device are:

- Never filter data
- Costly and difficult to manage
- Protocol conversion is performed, thus resulting in a slower transmission rate.

Modem

In regards to networking (network devices modem), a modem is a piece of hardware that enables a computer to transmit and receive data over telephone lines. In a nutshell, a modem is a piece of hardware that connects a computer or router to a broadband network.

When a signal is sent, the device converts digital data to an analog audio signal and sends it over a phone line. Similarly, when an analog signal is received, it is converted back to a digital signal by the modem. Onboard modems, internal modems, external modems, and removable modems are all examples of modems. A modem ***operates at the OSI model's physical layer (Layer 1) or Data link layer (Layer 2), depending on the type.***

The top three advantages of the modem network device are:

- Easily allows connecting LAN to internet
- Converts digital signal into an analog signal
- When compared to the hub, the speed is slow

The top three disadvantages of the modem network device are:

- It only serves as a bridge between the LAN and the internet.
- It cannot maintain its network traffic.
- The modem is unaware of its destination path.

Repeater

With regards to networking (network devices repeater), a repeater is an item that boosts the strength of a signal so that it can travel longer distances without losing quality. These devices are commonly used in networks to help data reach further destinations.

A range extender or wireless repeater, for example, is a repeater that extends the range and strength of a Wi-Fi signal. A repeater is effective in office buildings, schools, and factories where a single wireless router cannot reach all areas. A repeater ***operates at the OSI model's physical layer (Layer 1).***

The top three advantages of the repeater network device are:

- Repeaters are simple to set up and inexpensive.
- Repeaters do not necessitate any additional processing.
- They can connect signals with various types of cables.

The top three disadvantages of the repeater network device are:

- Repeaters are unable to connect disparate networks.
- They are unable to distinguish between actual signals and noise.
- They will not be able to reduce network traffic.

Access Point

In terms of networking, an access point (AP) is a wireless network device that acts as a portal for devices to connect to a local area network. Access points can extend an existing network's wireless coverage and increase the number of users who can connect. Wireless access points (WAPs) are devices that combine a transmitter and receiver (transceiver) to form a wireless LAN (WLAN). The access point *operates at the OSI model's Data Link layer (Layer 2).*

The top three advantages of the access point network device are:

- Installing is easier and faster.
- Allows data transmission even when the user is moving.
- It is simple to extend to places where wires and cables are inaccessible.

The top three disadvantages of the access point network device are:

- The range of network devices is limited, which causes issues for many users.
- Installing this network device is difficult and time-consuming.
- Because these network devices are susceptible to interference, fog and radiation can cause them to malfunction.