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Lab Practical #02:

Study of different network devices in detail.

Practical Assignment #02:

1. Give difference between below network devices.

- Hub and Switch
- Switch and Router
- Router and Gateway

2. Working of below network devices:

- Repeater
- Modem((DSL and ADSL)
- Hub
- Bridge
- Switch
- Router
- Gateway

Hub and Switch

No.	Hub	Switch
1	Hub is operated on Physical layer of OSI model.	While switch is operated on Data link layer of OSI Model.
2	Hub is a broadcast type transmission.	While switch is a Unicast, multicast and broadcast type transmission
3	Hub has 4/12 ports.	While switch can have 24 to 48 ports.
4	In hub, there is only one collision domain.	While in switch, different ports have own collision domain.
5	Hub is a half-duplex transmission mode.	While switch is a full duplex transmission mode.

Switch and Router

No.	Switch	Router
1	While the main objective of switch is to connect various devices simultaneously.	The main objective of router is to connect various networks simultaneously.
2	While it works in data link layer.	It works in network layer.
3	While switch is used by only LAN.	Router is used by LAN as well as MAN.
4	While through switch data is sent in the form of frame.	Through the router, data is sent in the form of packets.
5	While there is no collision taking place in full duplex switch.	There is less collision taking place in the router

Router and Gateway

No.	Router	Gateway
1	It is a hardware device that is responsible for receiving, analyzing, and forwarding data packets to other networks.	It is a device that is used for communication among networks that have a different set of protocols.
2	It supports dynamic routing.	It does not support dynamic routing.
3	The main function of a router is routing the traffic from one network to the other.	The main function of a gateway is to translate one protocol to the other.
4	A router operates on layer 3 and layer 4 of the OSI model.	A gateway operates up to layer 5 of the OSI model.
5	It is hosted on only the dedicated applications.	It is hosted on dedicated applications, physical servers, or virtual applications.

Working of below network devices:

1) Switch :

- It operates in the Data Link Layer in the OSI Model.
- It performs error checking before forwarding data.
- It transfers the data only to the device that has been addressed.
- It operates in full duplex mode.
- It allocates each LAN segment to a limited bandwidth.
- It uses Unicast (one-to-one), multicast (one-to-many), and broadcast (one-to-all) transmission modes.
- Packet-switching techniques are used to transfer data packets from source to destination.
- Switches have a more significant number of ports.

2) Router :

- A router determines a packet's future path by examining the destination IP address of the header and comparing it to the routing database. The list of routing tables outlines how to send the data to a specific network location. They use a set of rules to determine the most effective way to transmit the data to the specified IP address.
- To enable communication between other devices and the internet, routers utilize a modem, such as a cable, fibre, or DSL modem. Most routers include many ports that can connect a variety of devices to the internet simultaneously. In order to decide where to deliver data and where traffic is coming from, it needs routing tables.
- A routing table primarily specifies the router's default path. As a result, it might not determine the optimum path to forward the data for a particular packet. For instance, the office router directs all networks to its internet service provider through a single default channel.
- Static and dynamic tables come in two varieties in the router. The dynamic routing tables are automatically updated by dynamic routers based on network activity, whereas the static routing tables are configured manually.



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3) Gateway:

- Gateways provide a wide variety of features.
- A gateway is situated at a network edge and manages all data that enters or exits the network.
- A gateway is distinct from other network devices in that it can operate at any layer of the OSI model.
- Gateways made the transmission more feasible as it queued up all the data and divided it into small packets of data rather than sending it bulk.
- Gateways provide security within the network.

4) Bridge:

- A bridge is a network device used to connect two or more network segments, making them function as a single network.
- Operates at the Data Link Layer (Layer 2) of the OSI model.
- Filters traffic based on MAC addresses.
- Forwards or blocks data based on the destination MAC address.
- Reduces traffic by dividing a large network into smaller segments.
- Improves performance and reduces collisions.
- Transparent Bridge: Learns MAC addresses automatically.
- Maintains a table of MAC addresses to identify which device is on which segment.
- Filters data so that it only forwards frames to the necessary segment.
- Used in small or legacy networks to segment traffic and reduce congestion.

5) Hub:

- A hub is a basic networking device that connects multiple computers in a LAN and transmits data to all connected devices.
- Operates at the Physical Layer (Layer 1) of the OSI model.
- Simply receives data and broadcasts it to all ports, regardless of the destination.
- A hub has no MAC address learning capability.
- It doesn't differentiate between devices.
- All connected devices share the same bandwidth, which reduces overall network efficiency.
- All ports belong to the same collision domain, increasing the chances of collisions.
- Like switches and bridges, all ports in a hub are in the same broadcast domain
- Previously used in small, simple LANs, but now largely replaced by switches.

6) Modem(DSL and ADSL):

- **DSL:**
- DSL is a technology that enables high-speed data transmission over ordinary twisted-pair telephone lines.
- It allows for an "always-on" internet connection, eliminating the need to dial-up.
- DSL modems convert digital data from a computer into analog signals for transmission over telephone lines and vice versa.
- A DSL modem is essential for accessing the internet via DSL technology



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- **ADSL:**
- ADSL is a specific type of DSL that provides faster download speeds than upload speeds.
- This is suitable for typical internet usage like browsing, streaming, and downloading.
- ADSL modems use a micro-filter on the subscriber's telephone line to separate voice and data signals, allowing for simultaneous phone and internet use.
- The "asymmetric" nature of ADSL means it allocates more bandwidth to downstream (download) traffic.

7) Repeater:

- A repeater is a network device that receives a signal, amplifies or regenerates it, and retransmits it to extend the range of a network.
- Operates at the Physical Layer (Layer 1) of the OSI model.
- Used to extend the distance over which data can travel in a network.
- Helps overcome signal attenuation (weakening of signals over long distances).
- Receives weak or corrupted signals.
- Regenerates the original signal.
- Transmits the restored signal to the next segment.
- Used in LANs to connect distant network segments.
- In wireless networks to extend Wi-Fi signal coverage.