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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	Operates at the Physical Layer (Layer 1) of the OSI model	Operates at the Data Link Layer (Layer 2)
2	Broadcasts data to all connected devices	Forwards data only to the intended recipient using MAC addresses
3	No MAC address learning capability	Learns and stores MAC addresses in a table
4	Works in half-duplex mode only	Supports full-duplex communication
5	Less efficient and more prone to collisions	More efficient with reduced collisions
6	orbits of electrical signals are used	utilizes frames and packets
7	A passive device is a hub.	A switch is a functioning device.

Switch and Router

No.	Switch	Router
1	Connects devices within a local network (LAN)	Connects multiple networks (LAN to WAN)
2	Uses MAC addresses to forward data	Uses IP addresses to route data
3	Operates at Layer 2 (some at Layer 3)	Operates at Layer 3 of the OSI model
4	No NAT (Network Address Translation) support	Supports NAT to share a single IP among devices
5	Mainly used for internal communication	Used to connect to the internet or other networks

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6	Through switch data is sent in the form of frame .	While through the router, data is sent in the form of packets .
7	There is no collision taking place in full duplex switch.	While there is less collision taking place in the router.

Router and Gateway

No.	Router	Gateway
1	Routes data between similar networks	Connects different networks with different protocols
2	Works at Network Layer (Layer 3)	Can operate at any OSI layer, often Layer 5 or higher
3	Uses routing tables and protocols like RIP, OSPF	Performs protocol conversion if needed
4	Typically used in home and office networks	Used in enterprise or cross-platform systems
5	Does not modify data format	May translate data formats and protocols
6	It is hosted on only the dedicated applications.	It is hosted on dedicated applications, physical servers or virtual applications.
7	The additional features provided by a router are Wireless networking, Static routing, NAT, DHCP server etc.	The additional features provided by a gateway are network access control, protocol conversion etc.

Working of below network devices:

1. Switch

- Switch is a network device which is used to enable the **connection establishment** and **connection termination** on the basis of need. Switch is operated on **Data link layer**. In this **packet filtering** is available. It is type of **full duplex transmission** mode and it is also called **efficient bridge**.
- Basically, it is a kind of bridge that provides **better connections**. It is a kind of device that set up and stop the connections according to the requirements needed at that time. It comes up with many features such as **flooding, filtering and frame transmission**.



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2. Router

- Routers are the **multiport devices** and more sophisticated as compared to repeaters and bridges. It contains a **routing table** that enables it to make decision about the route i.e. to determine which of several possible paths between the **source and destination** is the best for a particular transmission.
- It works on the network layer 3 and used in **LANs, MANs and WANs**. It stores IP address and maintains address on its own.



3. Gateway

- A gateway acts as a **translator** between networks using **different protocols**. It receives data, analyzes it, converts it into a **compatible format**, and forwards it to the **destination network**. It's essential for **cross-platform communication**, such as between a **private network** and the **internet**.

4. Repeater

- A repeater is a network device used to **regenerate and amplify** signals in a network to extend the **transmission distance**. It works at the **Physical Layer (Layer 1)** of the OSI model.
- When the signal weakens due to **long-distance transmission**, the repeater boosts the signal to its original **strength without changing the data content**. It's mainly used in wired networks like **Ethernet** to overcome **signal attenuation**.

5. Modem (DSL and ADSL)

- A **modem** (short for modulator-demodulator) is a device that converts **digital data** from a computer into **analog** for transmission over telephone lines and vice versa. It works at both the **Physical Layer (Layer 1)** and **Data Link Layer (Layer 2)**.
- **DSL (Digital Subscriber Line)** and **ADSL (Asymmetric DSL)** modems allow high-speed internet over regular telephone lines. ADSL provides higher download speeds than upload speeds, making it ideal for typical internet users.



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6. Hub

- A hub is a basic networking device that **connects multiple computers** in a **LAN**. It operates at the **Physical Layer (Layer 1)** and transmits data to **all ports** regardless of the destination, resulting in unnecessary data traffic.
- It has no **intelligence** to filter data or know the **destination address**. It's mainly used in small networks for simple data sharing and is considered **outdated** due to its **inefficiency** compared to **switches**.

7. Bridge

- A bridge is a device used to **divide a network** into **segments** and **reduce traffic**. It works at the **Data Link Layer (Layer 2)** and uses **MAC addresses** to filter and forward data between **network segments**.
- It connects two or more LANs to make them function as a single network, helping to manage traffic and **improve performance**. Bridges can also help **isolate collision** domains.