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Lab Practical #03:

Study of different network devices in detail.

Practical Assignment #03:

1. Give difference between below network devices.
 - Hub and Switch
 - Switch and Router
 - Router and Gateway
2. Working of below network devices:
 - Switch
 - Router
 - Gateway

Hub and Switch

No.	Hub	Switch
1	It operates upon the physical layer of OSI Model.	It operates on the Data Link Layer of OSI Model.
2	Data sent to one port is transmitted to all other ports.	Data is sent only to devices with their MAC Address.
3	They do not filter or manage the traffic in any way.	They maintain a MAC Address table to determine the destination of data packets.
4	Bandwidth is shared among all devices connected to the hub.	Bandwidth is not shared.
5	Generally less expensive than switches.	More expensive than hubs.

Switch and Router

No.	Switch	Router
1	It operates on the Data Link Layer of OSI Model.	Operates on the Network layer of OSI Model.
2	Data is sent only to devices with their MAC Address.	They determine the best path for data packets to reach their destination.
3	Traffic is not handled whereas the MAC Address is maintained.	Routers can handle the traffic between LANs, WANs or the Internet.
4	Bandwidth is not shared.	They perform packet forwarding based on Destination IP Address.
5	Doesn't have features of Firewall.	Routers may have features like Firewall, quality of Service.

Router and Gateway

No.	Router	Gateway
1	Used to route data packets between different networks based on IP Address.	It is a device that acts as an interface between different networks with different protocols.
2	Operated on the Network layer of OSI Model.	It operates on various layers of OSI Model.
3	It determines the best path for data packets to reach their destination.	They perform protocol conversion to ensure compatibility and seamless communication.
4	They use Routing tables, protocols to make forwarding packets.	Can also perform encryption/decryption and other facilitate communication.
5	Essential for connecting LANs to each other or to the internet.	Translates protocols to enable communication between networks.

Working of below network devices:

1. Switch

i. Frame Reception:

⇒ **Data Link Layer (Layer 2):** When a switch receives a data frame from a device connected to one of its ports, it reads the frame's header to extract the destination MAC address.

ii. MAC Address Table:

⇒ **Learning Process:** The switch maintains a MAC address table (also known as a forwarding table or CAM table). Initially, this table is empty.

iii. Full Duplex Communication:

⇒ **Simultaneous Communication:** Switches support full-duplex communication, allowing devices to send and receive data simultaneously on dedicated links.

2. Router

i. Packet Forwarding:

⇒ Routers analyse the destination address of data packets and use routing tables to decide the best path for forwarding them.

ii. Network Segmentation:



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- ⇒ Routers connect multiple networks, such as a local area network (LAN) and a wide area network (WAN), allowing them to communicate while maintaining separate network segments.

iii. Network Address Translation (NAT):

- ⇒ Routers can perform NAT, allowing multiple devices on a local network to share a single public IP address. This enhances security and conserves IP addresses.

3. Gateway

i. Protocol Translation:

- ⇒ Gateways translate data between different network protocols, enabling communication between systems that use different protocols. For example, a gateway might convert data from a TCP/IP network to an older protocol used by legacy systems.

ii. Data Transformation:

- ⇒ Gateways can modify data as it passes through, adjusting formats, data types, or structures to make them compatible with the destination network or application.

iii. Management and Monitoring:

- ⇒ Gateways provide management interfaces for configuring settings, monitoring network traffic, and troubleshooting issues.