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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	Broadcasts data to all connected devices (broadcast transmission).	Supports unicast , multicast , and broadcast transmissions.
2	Typically has 4 to 12 ports.	Can have 24 to 48 ports.
3	All ports share a single collision domain.	Different ports have their own collision domains.
4	Operates in half duplex mode.	Operates in full duplex mode.
5	Doesn't provide packet filtering.	Provides packet filtering.

Switch and Router

No.	Switch	Router
1	Forwards data within a network (local communication).	Routes data between networks, including the internet.
2	Doesn't store IP addresses; focuses on MAC addresses.	Stores and manages IP addresses.
3	Manages local traffic efficiently.	Handles traffic between different networks.
4	Basic security; doesn't filter traffic as extensively.	Provides security features like NAT, firewall, and access control.
5	Essential for connecting networks and accessing the internet.	Used within a network to connect devices (computers, printers, etc.).



Router and Gateway

No.	Router	Gateway
1	A router is a hardware device responsible for receiving, analyzing, and forwarding data packets to other networks.	A gateway serves as a "gate" between networks, enabling traffic flow.
2	It determines the destination IP address of the packet and finds the best way to transfer it using forwarding tables and headers.	It acts as an entrance for nodes in the network, especially when different protocols are involved.
3	outers operate in local area networks (LANs) and wide area networks (WANs).	Gateways handle protocol conversion, making them more complex than routers or switches
4	They support dynamic routing and operate at layers 3 and 4 of the OSI model.	In workplaces, gateways route traffic from workstations to external networks. At home, they provide internet access.

Working of below network devices:

1. Switch

switch is a device that connects multiple devices within a local area network (LAN) and efficiently manages data traffic between them. It primarily operates at the Data Link layer (Layer 2) of the OSI model. A switch learns the MAC addresses of devices connected to its ports by examining incoming data packets. It records the source MAC address and the corresponding port in its MAC address table. When a data packet arrives, the switch checks the destination MAC address and forwards the packet to the appropriate port based on its MAC address table. If the destination MAC address is unknown, the switch floods the packet to all ports except the source port. This process minimizes network collisions and improves efficiency by ensuring data is sent only to the intended recipient. Some switches, known as Layer 3 switches, also perform routing functions based on IP addresses, managing traffic between different subnets.



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2. Router

A router is a networking device that directs data packets between different networks, operating primarily at the Network layer (Layer 3) of the OSI model. It determines the best path for data to travel from the source to the destination using routing tables and protocols. When a data packet arrives at a router, the router examines the packet's destination IP address and consults its routing table to find the most efficient route. It then forwards the packet to the next hop, which could be another router or the destination device.

Routers use various routing protocols, such as OSPF, BGP, and RIP, to communicate with other routers, sharing information about network topology and ensuring optimal path selection. Routers also perform Network Address Translation (NAT) to enable multiple devices on a local network to share a single public IP address. Additionally, they provide security features like firewalls and VPN support to protect network traffic. By efficiently managing data traffic, routers play a crucial role in maintaining the connectivity and performance of both local and wide-area networks (WANs).

3. Gateway

A gateway is a network node that connects two different networks using different protocols, enabling communication between them. It operates at multiple layers of the OSI model, typically at the Transport, Session, and Application layers. The primary function of a gateway is protocol translation, allowing data to flow seamlessly between networks that otherwise couldn't communicate.

When a data packet arrives at a gateway, the gateway reads the packet's protocol and translates it into a protocol compatible with the destination network. For example, a gateway can convert email messages from one email system to another or translate IP addresses for traffic moving between a private network and the internet.

Gateways also manage data traffic, perform data encryption and decryption, and provide security features such as firewalls. They can act as a proxy server, filtering and caching content to improve network performance. By handling protocol conversions and providing secure, efficient data transmission, gateways are essential for enabling communication across diverse network environments.