

**Date: 1/ 07/2024**

### **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	Hub is operated on Physical layer in OSI Model.	Switch is operated on Data Link Layer of OSI Model.
2	Hub is a broadcast type Transmission.	Switch is Unicast, multicast and broadcast type transmission.
3	Hub have 4/12 ports.	Switch can have 24 to 48 ports.
4	Hub is a half-duplex transmission mode.	Switch is a full duplex transmission mode.
5	Speed of original hub 10Mbps and modern internet hub is 100Mbps.	Maximum speed is 10Mbps to 100Mbps.

### **Switch and Router**

No.	Switch	Router
1	It works in Data Link Layer.	It works in Network Layer.
2	Switch is used by only LAN.	Router is Used by LAN as well as MAN.
3	There is no Collison taking place in full duplex switch.	There is less Collison taking place in the router.
4	Switch needs at least single network is to connect.	Router needs at least two network to connect.
5	Maximum speed is 10Mbps to 100Mbps.	Maximum speed for wireless is 1-10Mbps and maximum speed for wired connections is 100Mbps.

## Router and Gateway

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

- **Broadcast Handling:** Switches handle broadcast packets by forwarding them to all ports except the port on which they were received. This ensures that broadcast messages, intended for all devices in the network, reach their destinations effectively.
- **MAC Address Learning:** When a switch receives a data packet, it reads the MAC address of the source device from the packet header. It then associates this MAC address with the port on which the packet arrived. This process is called MAC address learning.
- **Switching Table:** The switch maintains a table (MAC address table or forwarding table) that maps MAC addresses to the corresponding switch ports. This table is dynamically updated as the switch learns the MAC addresses of devices connected to its ports.
- **Packet Forwarding:** When a data packet arrives at a switch, the switch looks up the destination MAC address in its forwarding table. If it finds a match, it forwards the packet only to the port where the destination device is connected, reducing unnecessary traffic on other ports.

### 2. Router

- **Routing and Forwarding:** Routers make decisions on how to forward data packets between different networks based on the destination IP address. They use routing algorithms and maintain routing tables to determine the best path or next hop for each packet.

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- **Network Address Translation (NAT):** Routers often perform Network Address Translation, translating private IP addresses used within a LAN into a single public IP address visible on the internet. This allows multiple devices within a network to share a single public IP address.
- **Packet Filtering and Security:** Routers can filter packets based on criteria such as source or destination IP address, port number, or protocol type. This filtering capability enhances network security by blocking unauthorized access attempts and preventing malicious traffic from entering the network.
- **Quality of Service (QoS):** Routers can prioritize certain types of traffic over others using Quality of Service mechanisms. This ensures that time-sensitive applications such as VoIP (Voice over IP) or video streaming receive sufficient bandwidth and minimal latency, improving overall network performance and user experience.

### **3. Gateway**

- **Interconnection:** Gateways serve as intermediaries between different networks, translating data formats and protocols to facilitate communication between networks with different architectures.
- **Protocol Translation:** They convert data between the protocols used on different networks, ensuring seamless communication across heterogeneous networks, such as translating between TCP/IP and IPX/SPX protocols.
- **Address Mapping:** Gateways map addresses from one network to another, such as converting between MAC addresses and IP addresses, to route data packets correctly.
- **Security and Routing:** They enforce security policies, inspect incoming and outgoing traffic, and may include firewall capabilities to protect networks from unauthorized access and malicious threats.