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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:
   * Repeter
   * Modem(DSL and ADSL)
   * Hub
   * Bridge
   * Switch
   * Router
   * Gateway

# Hub and Switch

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| **No.** | **Hub** | **Switch** |
| **1** | A hub is a basic networking device that connects multiple computers in a local area  network (LAN). It broadcasts data to all connected devices. | A switch connects devices within a LAN and uses MAC addresses to forward data only to the destination device |
| **2** | Operates at the physical layer (Layer 1) of the OSI model. It sends data to all ports, regardless of the destination | Operates at the data link layer (Layer 2) and sometimes at the network layer (Layer 3) of the OSI model. It forwards data to the specific  port where the destination device is connected |
| **3** | Less efficient due to data collision and  bandwidth sharing among all connected devices | More efficient, reduces data collisions, and provides better bandwidth utilization |
| **4** | No intelligence in data processing; simply repeats incoming data to all ports | Has intelligence to learn MAC addresses and  create a MAC address table for forwarding data accurately |
| **5** | Outdated and largely replaced by switches | Widely used in modern LANs |

**Switch and Router**

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| **No.** | **Switch** | **Router** |
| **1** | A switch connects devices within a single network (typically a Local Area Network or LAN)  and uses MAC addresses to forward data to the correct destination | A router connects multiple networks (such as connecting a LAN to a WAN or the internet)  and uses IP addresses to forward data to the correct destination network |
| **2** | Operates at Layer 2 (Data Link layer) of the OSI model, although some switches operate at  Layer 3 (Network layer) and can perform routing functions (Layer 3 switches). | Operates at Layer 3 (Network layer) of the OSI model |

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| **3** | Primarily used to connect computers, printers, and servers within a small to medium-sized LAN | Used to connect different networks, such as a  home or office network to the internet, or different LANs within a large organization |
| **4** | All ports on a switch are in the same broadcast  domain unless VLANs (Virtual Local Area Networks) are implemented | Each port on a router is in a different  broadcast domain, helping to limit broadcast traffic |
| **5** | Enhances performance by reducing collision domains and efficiently managing network traffic | Directs data between networks and manages traffic, ensuring efficient and secure  communication between different network segments |

# Router and Gateway

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| **No.** | **Router** | **Gateway** |
| **1** | A router is a device that forwards data packets between computer networks. | A gateway is a network device that acts as a  "gateway" between two different networks, often with different protocols. |
| **2** | It directs traffic within a single network or between different networks. | It translates data from one protocol or format  to another, enabling communication between incompatible systems. |
| **3** | Routers operate at the Network layer (Layer 3) of the OSI model. | Gateways can operate at various layers of the  OSI model, often at the Transport layer (Layer 4) or higher. |
| **4** | Can manage traffic between different subnets. | Can provide additional services like caching, load balancing, or firewall functionalities. |
| **5** | Connecting home or office devices to the internet. | Connecting a company's internal network to  the internet, while handling differences in protocols |

**Working of below network devices:**

1. Switch
   * **A switch receives incoming data packets and stores them in its memory.**
   * **It then analyzes the destination MAC address of each packet and determines which port to forward the packet to.**
   * **The switch only sends the packet to the specific port that leads to the addressed device, rather than broadcasting it to all connected devices like a hub would.**
   * **This filtering process makes switches more efficient than hubs, as they conserve network bandwidth and reduce collisions.**

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1. Router
   * **Receiving incoming packets: A router receives incoming packets from various sources, such as computers, servers, or other routers.**
   * **Examining packet headers: The router examines the packet headers to determine the source and destination IP addresses, as well as other relevant information.**
   * **Routing decision: Based on the packet headers, the router makes a routing decision, determining where to forward the packet to reach its destination.**
   * **Forwarding packets: The router forwards the packet to the next hop on the path to the destination network.**
   * **Repeating the process: The process is repeated at each router along the path until the packet reaches its final destination.**
2. Gateway
   * **Receiving incoming packets: A gateway receives incoming packets from various sources, such as computers, servers, or other gateways.**
   * **Examining packet headers: The gateway examines the packet headers to determine the source and destination IP addresses, as well as other relevant information.**
   * **Routing decision: Based on the packet headers, the gateway makes a routing decision, determining where to forward the packet to reach its destination.**
   * **Forwarding packets: The gateway forwards the packet to the next hop on the path to the destination network.**
   * **Repeating the process: The process is repeated at each gateway along the path until the packet reaches its final destination.**