Lab – 2

Write a difference between

* Hub vs switch
* Switch vs Router
* Router vs Gateway

Write a working of network device

* Switch
* Router
* Gateway

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| HUB | SWITCH | Router |
| A [Hub](https://www.geeksforgeeks.org/advantages-and-disadvantages-of-hub/) is just a connector that connects the wires coming from different sides. There is no signal processing or regeneration. It is an electronic device that operates only on physical layers of the [OSI model](https://www.geeksforgeeks.org/open-systems-interconnection-model-osi/). | Switch is a point to point communication device. It operates at the [data link layer](https://www.geeksforgeeks.org/data-link-layer/) of OSI model. It uses switching table to find out the correct destination. | 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 |
| Hub is a physical layer device i.e. layer 1. | Switch is a data link layer device i.e. layer 2. | Router is a network layer device i.e. layer 3. |
| A Hub works on the basis of broadcasting. | Switch works on the basis of MAC address. | A router works on the basis of IP address. |
| At least single network is required to connect. | At least single network is required to connect. | Router needs at least two networks to connect. |
| Not widely used nowadays | Widely used |  |

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| Router | Gateway |
| A router primarily handles data packets within a network, routing them based on their destination IP address. | A gateway, on the other hand, bridges networks with different protocols, acting as a translator and connection point between them, often used to connect a local network to the internet. |
| * **Function:** Direct data packets between network devices based on IP addresses. | * **Function:** Connect networks with different protocols and data formats. |
| * **Operation:** Typically operate at layer 3 of the OSI model. | * **Operation:** Can operate at multiple layers of the OSI model, including layers 5, 6, and 7. |
| * **Purpose:** Efficiently manage traffic within a network, optimizing data transfer paths. | * **Purpose:** Translate data, manage security, and provide access between dissimilar networks, such as a local network and the internet. |
| * **Example:**Connecting a home network to the internet through a modem. | * **Example:** A firewall or a gateway that connects a local network to the internet. |

Write a working of network device

* Switch

The Switch is a network device that is used to segment the networks into different subnetworks called subnets or LAN segments. It is responsible for filtering and forwarding the packets between LAN segments based on MAC address.

Switches have many ports, and when data arrives at any port, the destination address is examined first and some checks are also done and then it is processed to the devices. Different types of communication are supported here like unicast, multicast, and broadcast communication.

**Features of Network Switches**

* It operates in the Data Link Layer in the [OSI Model](https://www.geeksforgeeks.org/layers-of-osi-model/).
* It performs error checking before forwarding data.
* It transfers the data only to the device that has been addressed.
* It operates in full duplex mode.
* It allocates each [LAN](https://www.geeksforgeeks.org/lan-full-form/) segment to a limited bandwidth.
* It uses Unicast (one-to-one), multicast (one-to-many), and broadcast (one-to-all) transmission modes.
* Packet-switching techniques are used to transfer data packets from source to destination.
* Switches have a more significant number of ports.

**Why Are Network Switches Valuable?**

Switches are one of the most important things for transferring information between different endpoints. Some of the benefits are mentioned below.

* Switches are having [full-duplex communication](https://www.geeksforgeeks.org/transmission-modes-computer-networks/) which helps in making effective use of bandwidth.
* Switches help to provide a wired connection to printers, IoT devices, wireless points, and many more devices.
* IoT Devices send data through Network Switches that help in making smarter surroundings with the help of [Artificial Intelligence](https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/).
* Network Devices are made with the help of Switches that carry a large number of traffic in telecommunication.
* Write a working on Router

A Router is a networking device that forwards data packets between computer networks. One or more[packet-switched networks](https://www.geeksforgeeks.org/packet-switched-network-psn-in-networking/)or subnetworks can be connected using a router. By sending data packets to their intended IP addresses, it manages traffic between different networks and permits several devices to share an Internet connection. Although there are many kinds of routers, the majority of them transfer data between LANs (local area networks) and WANs (wide area networks).

**Working of Router:**

Consider a router as an air traffic controller, and consider data packets as planes flying to various airports (or networks). Each packet must be directed as quickly as possible to its destination, just as each plane has a distinct destination and travels a distinct route. A router assists in guiding data packets to their intended [IP address](https://www.geeksforgeeks.org/what-is-an-ip-address/), just like an air traffic controller ensures that aircraft reach their destinations without getting lost or experiencing significant disruptions in a route.

An internal [routing table](https://www.geeksforgeeks.org/routing-tables-in-computer-network/), which is a list of routes to different network destinations, is used by a router to effectively direct packets. In order to determine the destination of a packet, the router first scans its header. Then, it consults the routing table. Forward packet to next packet.

A gateway is a network connectivity device that connects two different configuration networks. Gateways are also known as protocol converters, because they play an important role in converting protocols supported by traffic on different networks. As a result, it allows smooth communication between two networks. It works as the entry-exit point for a network because all traffic that passes across the networks must pass through the gateway. A gateway monitors and controls all the incoming and outgoing network traffic. Gateways are also known as protocol converters In this article, we are going to discuss all important points related to Gateways.

**Features of Gateways**

Gateways provide a wide variety of features. Some of these are:

* A gateway is situated at a network edge and manages all data that enters or exits the network.
* A gateway is distinct from other network devices in that it can operate at any layer of the [OSI model](https://www.geeksforgeeks.org/open-systems-interconnection-model-osi/).
* Gateways made the transmission more feasible as it queued up all the data and divided it into small packets of data rather than sending it bulk.
* Gateways provide security within the network.

**How Gateways Work?**

* The gateway receives data from devices within the network.
* After receiving data the gateway intercept and analyze data packets, which include analyzing packet header, payload etc.
* Based on the analysis of the data packets, the gateway calculate an appropriate destination address of [data packet](https://www.geeksforgeeks.org/what-is-packet-sniffing/). It then routes the data packets to their destination address.
* In some cases, the gateway might also want to transform the format of the obtained data to ensure compatibility at the receiver.
* Once the data packets have been analyzed, routed, and converted, then the gateway sends the last packets to their respective destinations address inside the network.