**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

1. Working of below network devices:
   * Switch
   * Router
   * Gateway

# Hub and Switch

|  |  |  |
| --- | --- | --- |
| No. | Hub | Switch |
| 1 | [Hub](https://www.geeksforgeeks.org/advantages-and-disadvantages-of-hub/) is operated on **Physical layer of OSI model**. | While [switch](https://www.geeksforgeeks.org/what-is-a-network-switch-and-how-does-it-work/) is operated on **Data link**[**layer of OSI Model**](https://www.geeksforgeeks.org/layers-of-osi-model/). |
| 2 | Hub is a broadcast type transmission. | While switch is a Unicast, multicast and broadcast type transmission. |
| 3 | Hub have 4/12 ports. | While switch can have 24 to 48 ports. |
| 4 | In hub, there is only one collision domain. | While in switch, different ports have own collision domain. |
| 5 | Cheaper as compared to switch. | Expensive as compared to HUB. |

# Switch and Router

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| No. | Switch | Router |
| 1 | While the main objective of switch is to connect various devices simultaneously. | The main objective of router is to connect various networks simultaneously. |
| 2 | While it works in [data link layer](https://www.geeksforgeeks.org/data-link-layer/). | It works in [network layer](https://www.geeksforgeeks.org/network-layer-gq/). |
| 3 | While switch is used by only LAN. | Router is used by [LAN](https://www.geeksforgeeks.org/lan-full-form/) as well as [MAN](https://www.geeksforgeeks.org/man-full-form/). |
| 4 | While through switch data is sent in the form of  frame. | Through the router, data is sent in the form of packets. |
| 5 | The types of switching are: [Circuit](https://www.geeksforgeeks.org/circuit-switching-in-computer-network/), [Packet](https://www.geeksforgeeks.org/packet-switching-and-delays-in-computer-network/), and [Message](https://www.geeksforgeeks.org/message-switching-techniques/) Switching. | The types of routing are: [Adaptive and Non-adaptive routing](https://www.geeksforgeeks.org/difference-between-adaptive-and-non-adaptive-routing-algorithms/). |

# Router and Gateway

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| --- | --- | --- |
| 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 supports the dynamic routing. | It does not support dynamic routing. |
| 3 | The main function of a router is routing the traffic from one network to the other. | The main function of a gateway is to translate one protocol to the other. |
| 4 | A router operates on layer 3 and layer 4 of the OSI model. | A gateway operates upto layer 5 of the OSI model. |
| 5 | Working principle of a router is to install routing details for multiple networks and routing traffic based upon the destination address. |  |

# Working of below network devices:

1. **Switch**

Once a device is connected to a switch, the switch notes its media access control (MAC) address, a code that’s baked into the device’s network-interface card (NIC).The NIC attaches to an Ethernet cable that connects to the switch. The switch uses the MAC address to identify which device’s outgoing packets are being sent, and where to deliver incoming packets.

The MAC address identifies the physical device and doesn’t change, while the network layer (Layer 3) IP address, can be assigned dynamically to a device and change over time. (Think of a MAC address as the VIN number on a car, and the IP address as the license plate.)

When a packet enters the switch, the switch reads its header, then matches the destination address or addresses and sends the packet out through the appropriate ports that lead to the destination devices.

To reduce the chance for collisions between network traffic going to and from a switch and a connected device at the same time, most switches offer full-duplex functionality in which packets coming from and going to a device have access to the full bandwidth of the switch connection. (Picture two people talking on smartphones as opposed to a walkie-talkie).

While it’s true that switches operate at Layer 2, they can also operate at Layer 3, which is necessary for them to support virtual LANs (VLANs), logical network segments that can span subnets. In order for traffic to get from one subnet to another it must pass between switches, and this is facilitated by routing capabilities built into the switches.

1. **Router**

Routers connect a modem—like a fiber, cable, or DSL modem—to other devices to allow communication between those devices and the internet. Most routers, including wireless routers, usually feature several network ports to connect numerous devices to the internet simultaneously.

[How to Connect a Router to the Internet](https://www.lifewire.com/connect-router-to-internet-5205326)

A router typically connects physically, using a network cable, to the modem via the internet or WAN port and then physically, again through a network cable, to the network interface card in whatever wired network devices you have. A wireless router can connect using various wireless standards to devices that also support the particular standard used.

The IP address assigned to the WAN or internet connection is a public IP address. The IP address assigned to the local network connection is a private IP address. The private IP address assigned to a router is usually the default gateway for the various devices on the network.

Wireless routers, and wired routers with multiple connections, also act as simple network switches allowing the devices to communicate with each other. For example, several computers connected to a router can be configured to share files and printers among each other.

Routers are like small computers, with a CPU and memory to deal with incoming and outgoing data. Different software, such as DD-WRT, can be loaded on the router, much like an operating system on a computer.

A router operates on the Network layer (layer 3) of the OSI model and uses routing tables to understand where traffic is coming from and where it should go.

1. **Gateway**

It is a point of a network that can access other networks. Usually, in the intranet, a router or node can act as a gateway node or the router that links the networks are called gateways. In large scale enterprises, the computers manage the traffic between enterprise networks are termed as gateway nodes. Such as that the computers used by Internet service providers to link varied users to each other at an instant time to the internet are gateway nodes. In any development team of any commercial enterprise [**computer server**](https://www.educba.com/what-is-server/) functions as gateway nodes and it may also be a proxy server or a firewall at times.

There are many branches, such as [**IoT**](https://www.educba.com/iot-features/), Cloud storage, and Internet-to-orbit gateway. The connection between computers or devices on the internet to computer networks orbiting the earth like human-made spacecraft and satellites is possible by deploying internet to orbit. The cloud storage gateway is a network application that converts cloud storage API like REST and [**SOAP**](https://www.educba.com/what-is-soap/) to block protocols [**such as iSCSI**](https://www.educba.com/what-is-iscsi/), [**CIFS**](https://www.educba.com/cifs-protocol/) or NFS. This gateway allows companies to assimilate private cloud storage apps without transferring to public cloud apps. It is made possible by altering the data protection. An IoT manages the bridge between IoT components in the cloud and user devices like smartphones by establishing a communication link and offers offline services and realtime control of equipment in the field.