

### Practical 3 : Configuration, Management and Administration of various networking and Internetworking Devices.

- \*NIC      \* Gateway
- \*Hub      \* Repeater
- \*switch   \* Bridge
- \* Router   \* Cables

#### Hardware Requirment:

Nic , Gateway , Hub , Repeater , Switch , Bridge , Router , Cables

#### Hub:

When referring to a **network**, a **hub** is the most basic **networking** device that connects multiple **computers** or other **network** devices together. Unlike a **network** switch or router, a **network hub** has no routing tables or intelligence on where to send information and broadcasts all **network** data across each connection.



#### Switch:

A **network switch** (also called **switching** hub, bridging hub, officially MAC bridge) is a **computer networking** device that connects devices on a **computer network** by using packet **switching** to receive, process, and forward data to the destination device.

A network switch is a multiport [network bridge](#) that uses [hardware addresses](#) to process and forward data at the [data link layer](#) (layer 2) of the [OSI model](#). Some switches can also process data at the [network layer](#) (layer 3) by additionally incorporating [routing](#) functionality. Such switches are commonly known as layer-3 switches or [multilayer switches](#).

Switches for [Ethernet](#) are the most common form of network switch. The first Ethernet switch was introduced by [Kalpana](#) in 1990.<sup>[3]</sup> Switches also exist for other types of networks including [Fibre Channel](#), [Asynchronous Transfer Mode](#), and [InfiniBand](#).



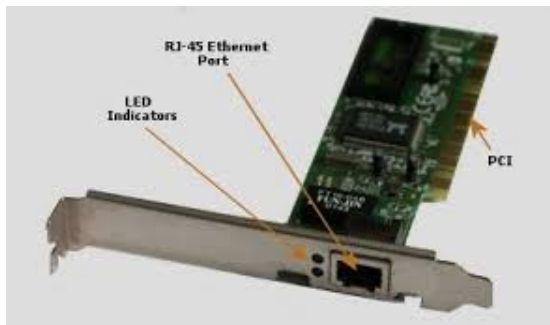
## Data Communication And Networking Practicals

### Nic:

A **network interface controller** (NIC, also known as a **network interface card**, **network adapter**, **LAN adapter** or **physical network interface**, and by similar terms) is a [computer hardware](#) component that connects a [computer](#) to a [computer network](#).

Early network interface controllers were commonly implemented on [expansion cards](#) that plugged into a [computer bus](#). The low cost and ubiquity of the [Ethernet](#) standard means that most newer computers have a network interface built into the [motherboard](#).

Modern network interface controllers offer advanced features such as [interrupt](#) and [DMA](#) interfaces to the host processors, support for multiple receive and transmit queues, partitioning into multiple logical interfaces, and on-controller network traffic processing such as the [TCP offload engine](#).



### Router:

A **router**<sup>[a]</sup> is a [networking device](#) that forwards [data packets](#) between [computer networks](#). Routers perform the traffic directing functions on the [Internet](#). Data sent through the internet, such as a [web page](#) or [email](#), is in the form of data packets. A packet is typically [forwarded](#) from one router to another router through the networks that constitute an [internetwork](#) (e.g. the Internet) until it reaches its destination [node](#).

A router is connected to two or more data lines from different IP networks. When a data packet comes in on one of the lines, the router reads the [network address](#) information in the packet header to determine the ultimate destination. Then, using information in its [routing table](#) or [routing policy](#), it directs the packet to the next network on its journey.

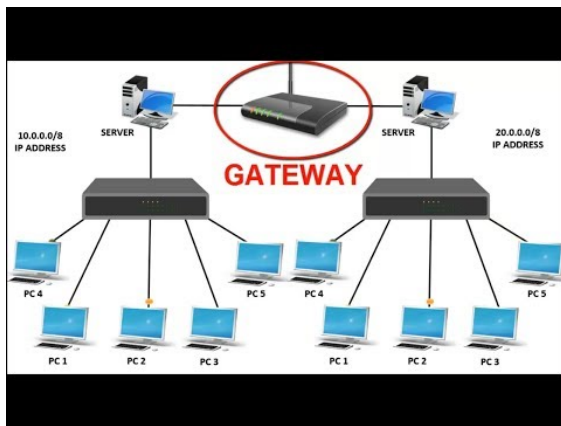
The most familiar type of IP routers are [home and small office routers](#) that simply forward [IP packets](#) between the home computers and the Internet. An example of a router would be the owner's cable or DSL router, which connects to the Internet through an [Internet service provider](#) (ISP). More sophisticated routers, such as enterprise routers, connect large business or ISP networks up to the powerful [core routers](#) that forward data at high speed along the [optical fiber](#) lines of the [Internet backbone](#).



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### Gateway:

A network gateway provides interoperability between networks and contains devices, such as protocol translators, [impedance matchers](#), rate converters, [fault](#) isolators, or [signal](#) translators. A network gateway requires the establishment of mutually acceptable administrative procedures between the networks using the gateway. Network gateways, known as protocol translation gateways or mapping gateways, can perform protocol conversions to connect networks with different network protocol technologies. For example, a network gateway connects an office or home [intranet](#) to the [Internet](#). If an office or home computer user wants to load a [web page](#), at least two network gateways are accessed—one to get from the office or home network to the Internet and one to get from the Internet to the computer that serves the web page.



### Repeater:

In [telecommunications](#), a **repeater** is an electronic device that receives a [signal](#) and retransmits it. Repeaters are used to extend transmissions so that the signal can cover longer distances or be received on the other side of an obstruction.

Some types of repeaters broadcast an identical signal, but alter its method of transmission, for example, on another frequency or [baud rate](#).

There are several different types of repeaters; a **telephone repeater** is an [amplifier](#) in a [telephone line](#), an [optical repeater](#) is an [optoelectronic](#) circuit that amplifies the light beam in an [optical fiber cable](#); and a [radio repeater](#) is a [radio receiver](#) and [transmitter](#) that retransmits a radio signal.

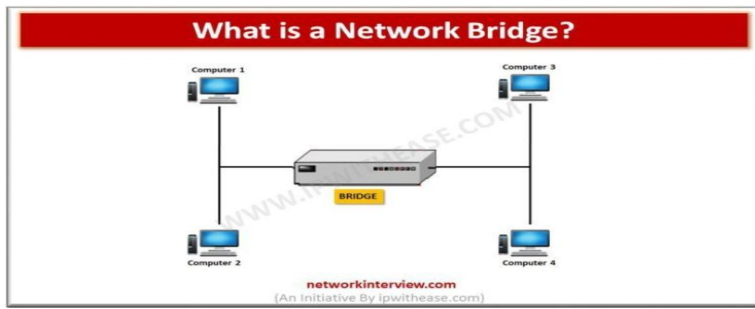


### Bridge:

A **network bridge** is a [computer networking device](#) that creates a single aggregate network from multiple [communication networks](#) or [network segments](#). This function is called **network bridging**.<sup>[1]</sup> Bridging is distinct from [routing](#). Routing allows multiple networks to communicate independently and yet remain separate, whereas bridging connects two separate networks as if they were a

## Data Communication And Networking Practicals

single network.<sup>[2]</sup> In the [OSI model](#), bridging is performed in the [data link layer](#) (layer 2). If one or more segments of the bridged network are [wireless](#), the device is known as a **wireless bridge**.



- **Cables:**

1 **Twisted pair:** A twisted pair can be used as a [balanced line](#), which as part of a [balanced circuit](#) can greatly reduce the effect of noise currents induced on the line by coupling of electric or magnetic fields. The idea is that the currents induced in each of the two wires are very nearly equal. The twisting ensures that the two wires are on average the same distance from the [interfering source](#) and are affected equally. The noise thus produces a [common-mode signal](#) which can be cancelled at the receiver by detecting the difference signal only, the latter being the wanted signal.

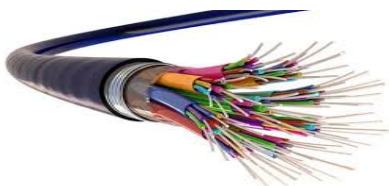
[Common-mode rejection](#) starts to fail on untwisted wires when the noise source is close to the signal wires; the closer wire will couple with the noise more strongly and the receiver will be unable to eliminate it. This problem is especially apparent in telecommunication cables where pairs in the same cable lie next to each other for many miles. Twisting the pairs counters this effect as on each half twist the wire nearest to the noise-source is exchanged. Provided the interfering source remains uniform, or nearly so, over the distance of a single twist, the induced noise will remain common-mode.



2 **Fiber optics:**

**Fiber-optic communication** is a method of transmitting information from one place to another by sending pulses of [light](#) through an [optical fiber](#). The light forms an [electromagnetic carrier wave](#) that is [modulated](#) to carry information.<sup>[1]</sup> Fiber is [preferred over electrical cabling](#) when high [bandwidth](#), long distance, or immunity to [electromagnetic interference](#) are required.

Optical fiber is used by many telecommunications companies to transmit telephone signals, Internet communication, and cable television signals. Researchers at [Bell Labs](#) have reached internet speeds of over 100 [petabit](#)×kilometer per second using fiber-optic communication.



## Data Communication And Networking Practicals

### 3 Coaxial:

A coaxial cable, as a common example, is a three-dimensional linear structure. It has a wire conductor in the centre (D), a circumferential outer conductor (B), and an insulating medium called the dielectric (C) separating these two conductors. The outer conductor is usually sheathed in a protective PVC outer jacket (A). All these have a common axis.

The dimension and material of the conductors and insulation determine the cable's characteristic impedance and attenuation at various frequencies.

In loudspeaker design, coaxial speakers are a loudspeaker system in which the individual driver units radiate sound from the same point or axis.

A coaxial weapon mount places two weapons on [roughly] the same axis – as the weapons are usually side-by-side or one on top of the other, they are technically par-axial rather than coaxial, however the distances involved mean that they are effectively coaxial as far as the operator is concerned.



### Question & Answers:

- ☐ **Active Hub:** These are the hubs which have their own power supply and can clean, boost and relay the signal along the network. It serves both as a repeater as well as wiring centre. These are used to extend maximum distance between nodes.
- ☐ **Passive Hub:** These are the hubs which collect wiring from nodes and power supply from active hub. These hubs relay signals onto the network without cleaning and boosting them and can't be used to extend distance between nodes.

### : What is a Brouter ?

- ☐ A bridge router or brouter is a network device that works as a bridge and as a router. The brouter routes packets for known protocols and simply forwards all other packets as a bridge would. Brouters operate at both the network layer for routable protocols and at the data link layer for non-routable protocols.

### : Explain Transparent Bridge and Source Routing Bridge in brief.

- ☐ **Transparent Bridges:** These are the bridge in which the stations are completely unaware of the bridge's existence i.e. whether or not a bridge is added or deleted from the network, reconfiguration of the stations is unnecessary. These bridges make use of two processes i.e. bridge forwarding and bridge learning.

## Data Communication And Networking Practicals

□ **Source Routing Bridges:** In these bridges, routing operation is performed by source station and the frame specifies which route to follow. The host can discover route by sending a special frame called discovery frame, which spreads through the entire network using all possible paths to destination.

**: Explain circuit switching, packet switching and message switching in brief.**

□ **Circuit switching:**

- A type of network where the communications between end devices (nodes) must be set up before they can communicate.
- Once set up, the “circuit” is dedicated to the two nodes it connects for the duration of that connection. An example of a circuit-switched network is an analog telephone network. In circuit switching network resources (bandwidth) is divided into pieces and bit delay is constant during a connection.
- The dedicated path/circuit established between sender and receiver provides a guaranteed data rate. The most ubiquitous circuit-switching network is the telephone system, which links together wire segments to create a single unbroken line for each telephone call.

□ **Packet switching:**

- Packet switching is a method of grouping data that is transmitted over a digital network into packets.
- Data in the header are used by networking hardware to direct the packet to its destination where the payload is extracted and used by application software.
- Packet switching entails breaking data into a number of parts that are then packaged in specially formatted units called packets. These are typically routed from source to destination using network switches and routers and then the data is reassembled at the destination.
- The packet switched networks allow any host to send data to any other host without reserving the circuit. Multiple paths between a pair of sender and receiver may exist in a packet switched network. One path is selected between source and destination.

□ **Message Switching:**

- Message switching is a network switching technique in which data is routed in its entirety from the source node to the destination node, one hop at a time.
- Before the advancements in packet switching, message switching acted as an efficient substitute for circuit switching.
- In message switching, the source and destination nodes are not directly connected. Instead, the intermediary nodes (mainly switches) are responsible for transferring the message from one node to the next.