

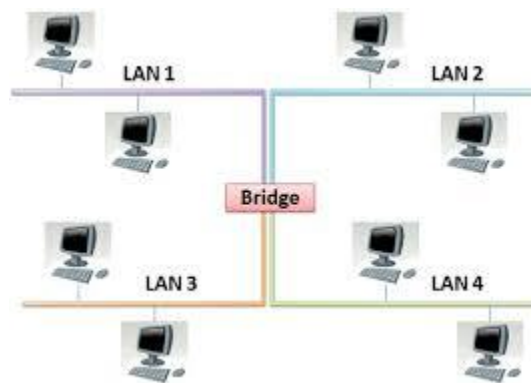
Connecting the LANs

BRIDGE

A **bridge** is a device that connects two LANs (local area networks), or two segments of the same LAN. It is a type of computer network device that provides interconnection with other bridge networks that use the same protocol.

Bridge devices work at the data link layer of the Open System Interconnect (OSI) model, connecting two different networks together and providing communication between them. Bridges are similar to repeaters and hubs in that they broadcast data to every node. However, bridges maintain the media access control (MAC) address table as soon as they discover new segments, so subsequent transmissions are sent only to the desired recipient.

A network bridge, also known as an Ethernet bridge, connects two segments of a network together. The segments are not independent entities, but are owned and managed by the same organization. The purpose of the bridge is to divide a network into manageable sections.



Advantages of bridges:

- Bridges can extend a network.
- Bridges can act as a repeater.
- They can reduce network traffic on a segment.
- They can subdivide the network communication.
- They increase the available bandwidth to individual nodes.
- Bridges reduce collisions as well.
- Bridges can create separate collision domains.
- They can connect different architectures.

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Disadvantages of bridges:

- They are slower than repeaters.
- Filtering makes them slower.
- They do not filter broadcasts.
- Bridges are more expensive.
- They must use routable protocols.
- They need to understand the protocols which they forward.
- They require a lot of amount for initial configuration.
- These are complex devices.
- These devices are unable to read a specific IP address.
- Its speed is slow.
- Bridges cannot use a firewall as a device.
- They send messages to all the nodes.
- Sending a message to all nodes reduces speed.
- Sending messages to all nodes causes a waste of time.

ROUTER

Router is a **network layer (Layer 3)** of the OSI reference model device that means it can connect multiple computer networks via wired or wireless connections. Network router can receive, analyze, perform the traffic directing functions and forwards data packet from one network to its destination node. A router is a device that forwards packets between networks by processing the routing information included in the packet.

Why Routers?

A router is more capable as compared to other network devices, such as a hub, switch, etc., as these devices are only able to execute the basic functions of the network. For example, a hub is a basic networking device that is mainly used to forward the data between connected devices, but it cannot analyze or change anything with the transferring data. On the other hand, the router has the capability to analyze and modify the data while transferring it over a network, and it can send it to another network.

Functions of a Router:

The router basically performs two major functions:

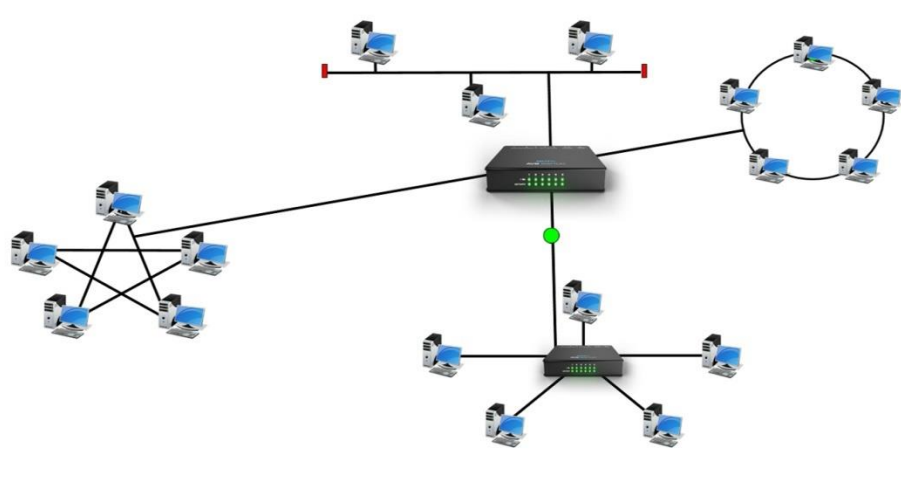
1. Forwarding –

Router receives the packets from its input ports, checks its header, performs some basic functions like checking checksum and then looks up to the routing table to find the appropriate output port to dump the packets onto, and forwards the packets onto that output port.

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2. Routing –

Routing is the process by which the router ascertains what is the best path for the packet to reach the destination, It maintains a routing table which is made using different algorithms by the router only.



How A Router Works

A router examines a packet header's destination IP address and compares it against a routing table to determine the packet's best next hop. Routing tables list directions for forwarding data to particular network destinations, sometimes in the context of other variables, like cost. They amount to an algorithmic set of rules that calculate the best way to transmit traffic toward any given IP address.

A routing table often specifies a default route, which the router uses whenever it fails to find a better forwarding option for a given packet. For example, the typical home office router directs all outbound traffic along a single default route to its internet service provider (ISP).

Routing tables can be static -- i.e., manually configured -- or dynamic. Dynamic routers automatically update their routing tables based on network activity, exchanging information with other devices via routing protocols.

Many routers also perform network address translation (NAT), shielding the private IP addresses of a local area network (LAN) by readdressing all outgoing traffic with a single shared public IP address. NAT helps both conserve globally valid IP addresses and improve network security.

Features of Router

- A router works on the 3rd layer (Network Layer) of the OSI model, and it is able to communicate with its adjacent devices with the help of IP addresses and subnet.

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- A router provides high-speed internet connectivity with the different types of ports like gigabit, fast-Ethernet, and STM link port.
- It allows the users to configure the port as per their requirements in the network.
- Routers' main components are central processing unit (CPU), flash memory, RAM, Non-Volatile RAM, console, network, and interface card.
- Routers are capable of routing the traffic in a large networking system by considering the sub-network as an intact network.
- Routers filter out the unwanted interference, as well as carry out the data encapsulation and decapsulation process.
- Routers provide the redundancy as it always works in master and slave mode.
- It allows the users to connect several LAN and WAN.

Advantage of Router -

- a) Router limits the collision domain.
- b) Router can function on LAN & WAN.
- c) Router can connect different media & architectures.
- d) Router can determine best path/route for data to reach the destination.
- e) Router can filter the broadcasts.

Disadvantage of Router -

- a) Router is more expensive than Hub, Bridge & Switch.
- b) Router only work with routable protocol.
- c) Routing updates consume bandwidth.

Difference between Bridges and Routers

Basis for comparison	Bridge	Router
Operates on	Data link layer	Network layer
Store and Forward	Frame	Packet
Transparency	Bridges are protocol independent and transparent to the end stations.	Routers do not provide station transparency.
Reads	MAC address of the device	IP address of the device

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Basis for comparison	Bridge	Router
Works on	Single broadcast domain	More than one broadcast domain