



SNS COLLEGE OF TECHNOLOGY COIMBATORE



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DEPARTMENT OF MCA

Course Name : 23CAT601 - DATA COMMUNICATION AND NETWORK

Class : I Year / I Semester

Unit III – NETWORK AND SWITCHING, NETWORK DEVICES

Topic 4 – INTERNETWORKING DEVICES

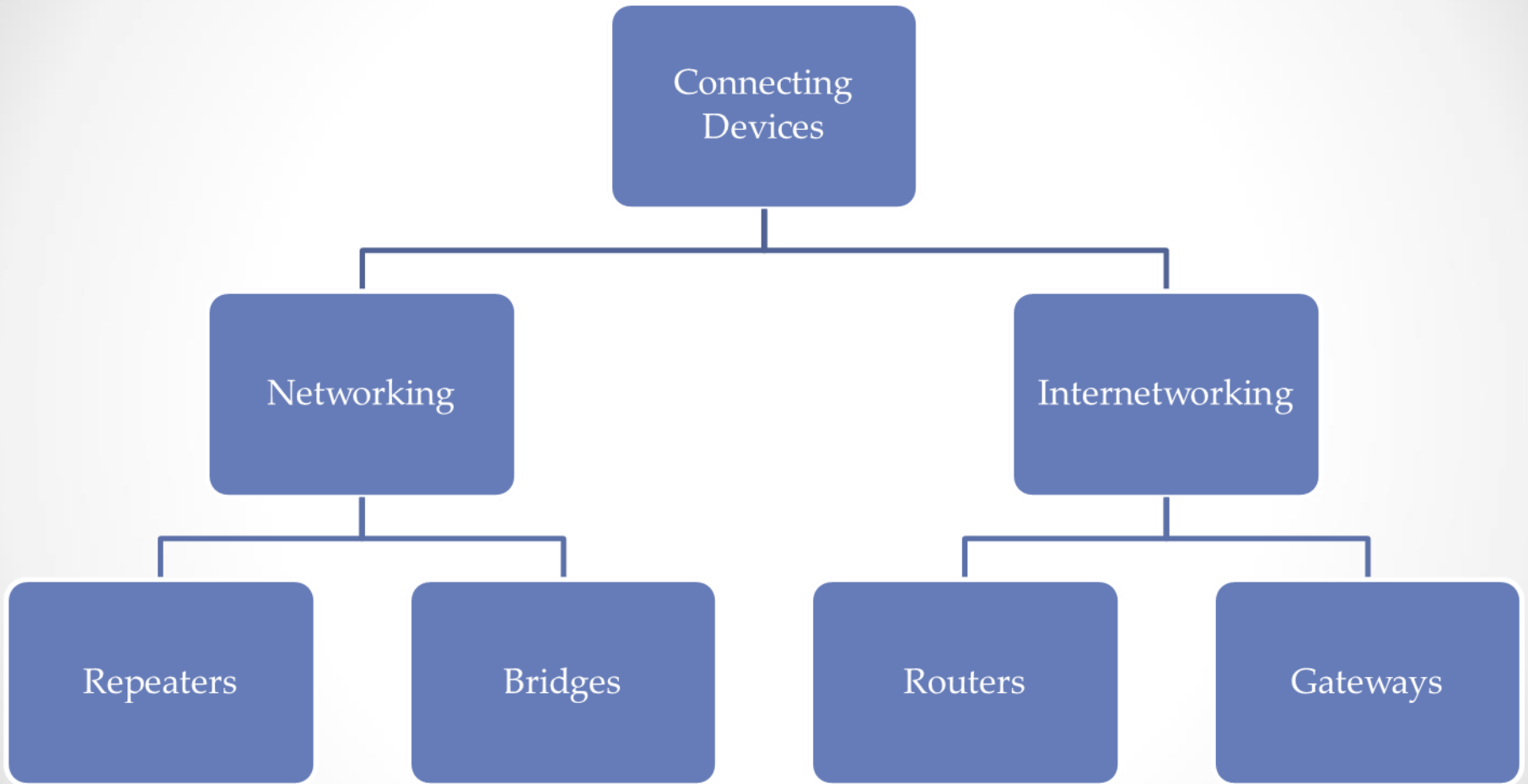


Networking and Internetworking Devices



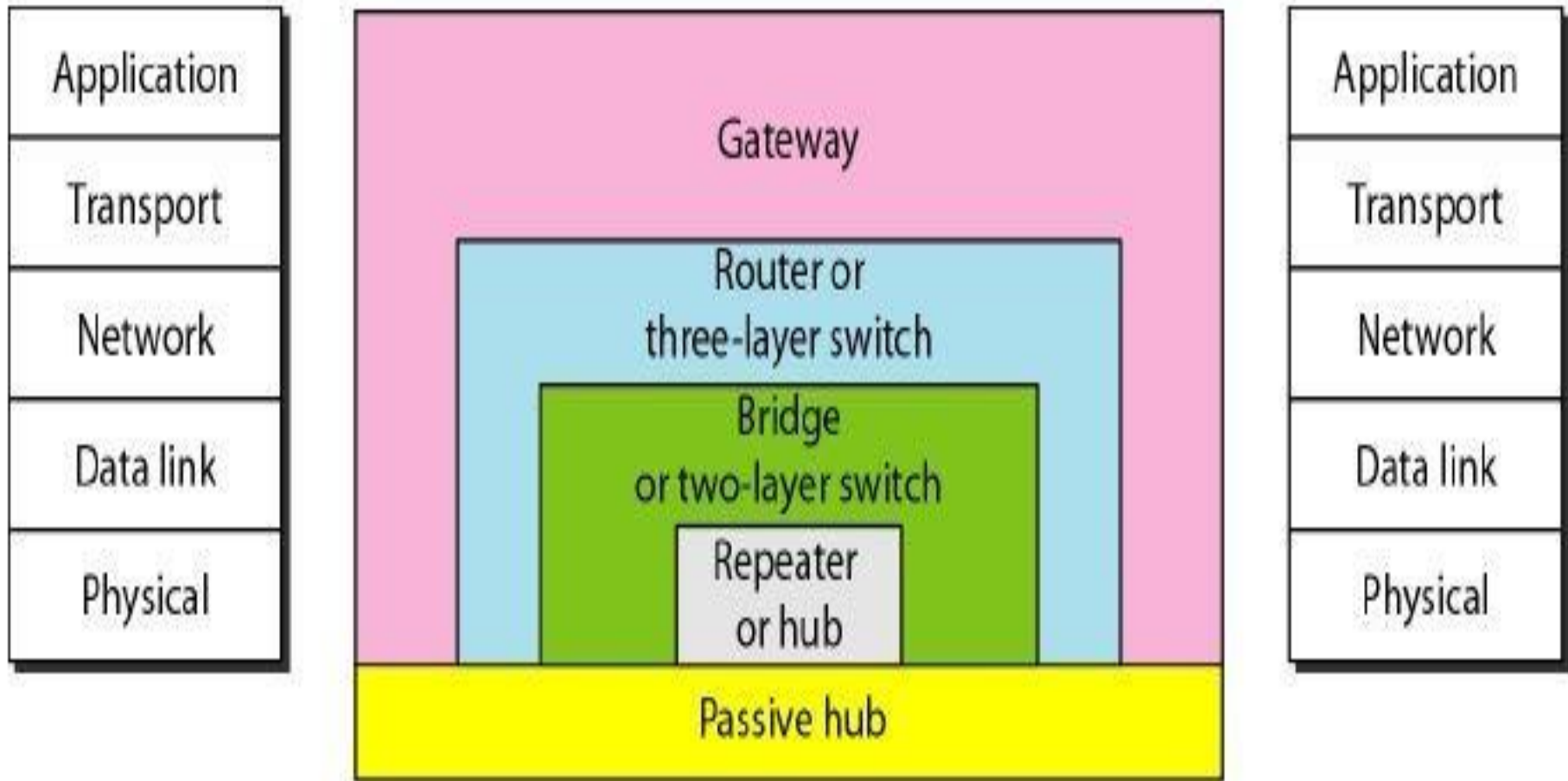
- **Network devices:** Components used to connect computers or other electronic devices together so that they can share files or resources like printers or fax machines. Devices used to setup a Local Area Network (LAN) are the most common types of network devices used by the public.

- **An internetwork** is a collection of individual networks, connected by intermediate networking devices, that functions as a single large network.





Connecting Devices



Five categories of connecting devices



Hubs

A hub is used as a central point of connection among media segments.

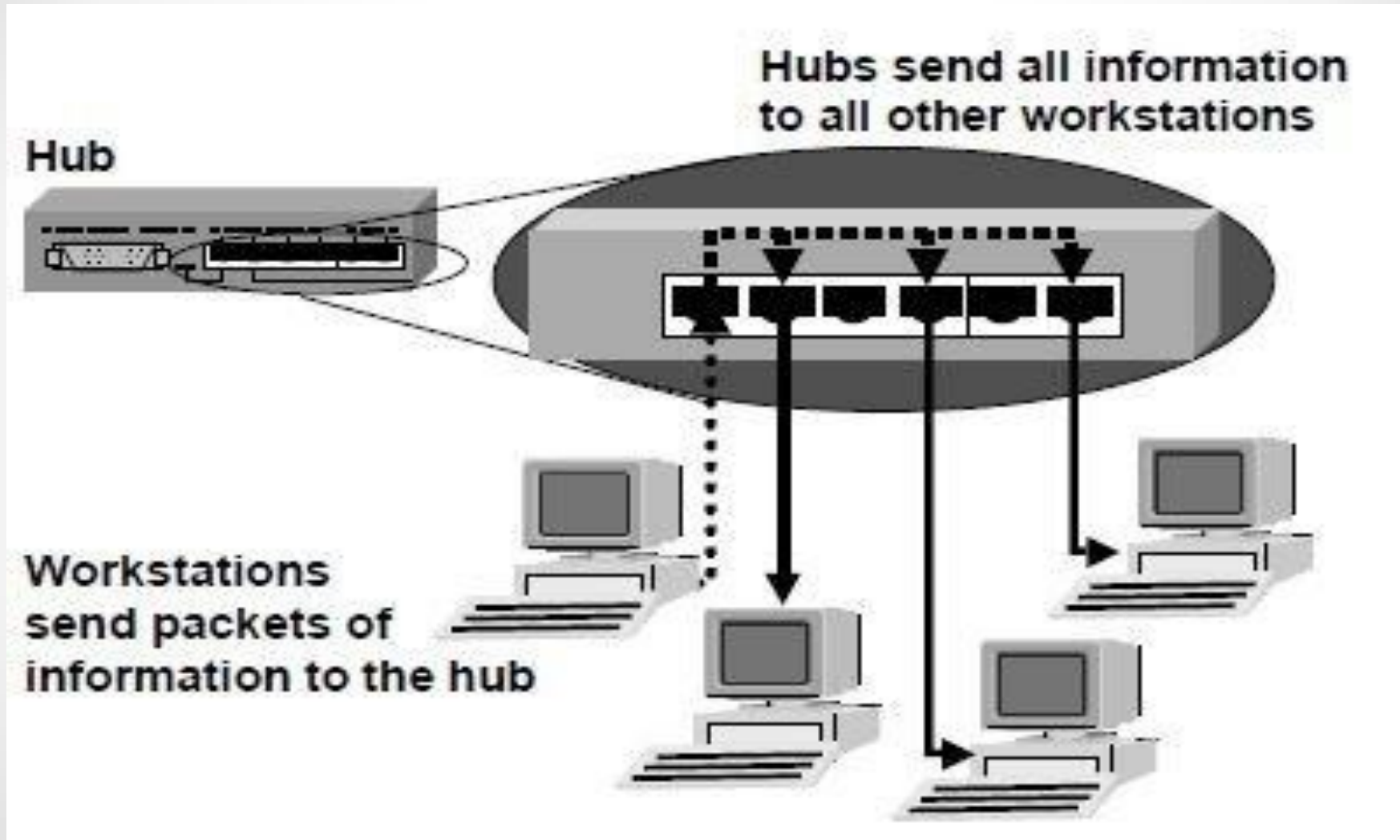
Cables from network devices plug in to the ports on the hub

Types of HUBS :

- 1. A **passive hub** is just a connector. It connects the wires coming from different branches. The signal pass through a passive hub without regeneration or amplification. Connect several networking cables together.*
- 2. **Active hubs or Multiport repeaters**-They regenerate or amplify the signal before they are retransmitted.*



Hubs Connect Workstations Together





1. Hubs operate at the physical layer of the OSI model.
2. Hubs propagate signals through the network
3. They cannot filter network traffic
4. They cannot determine best path



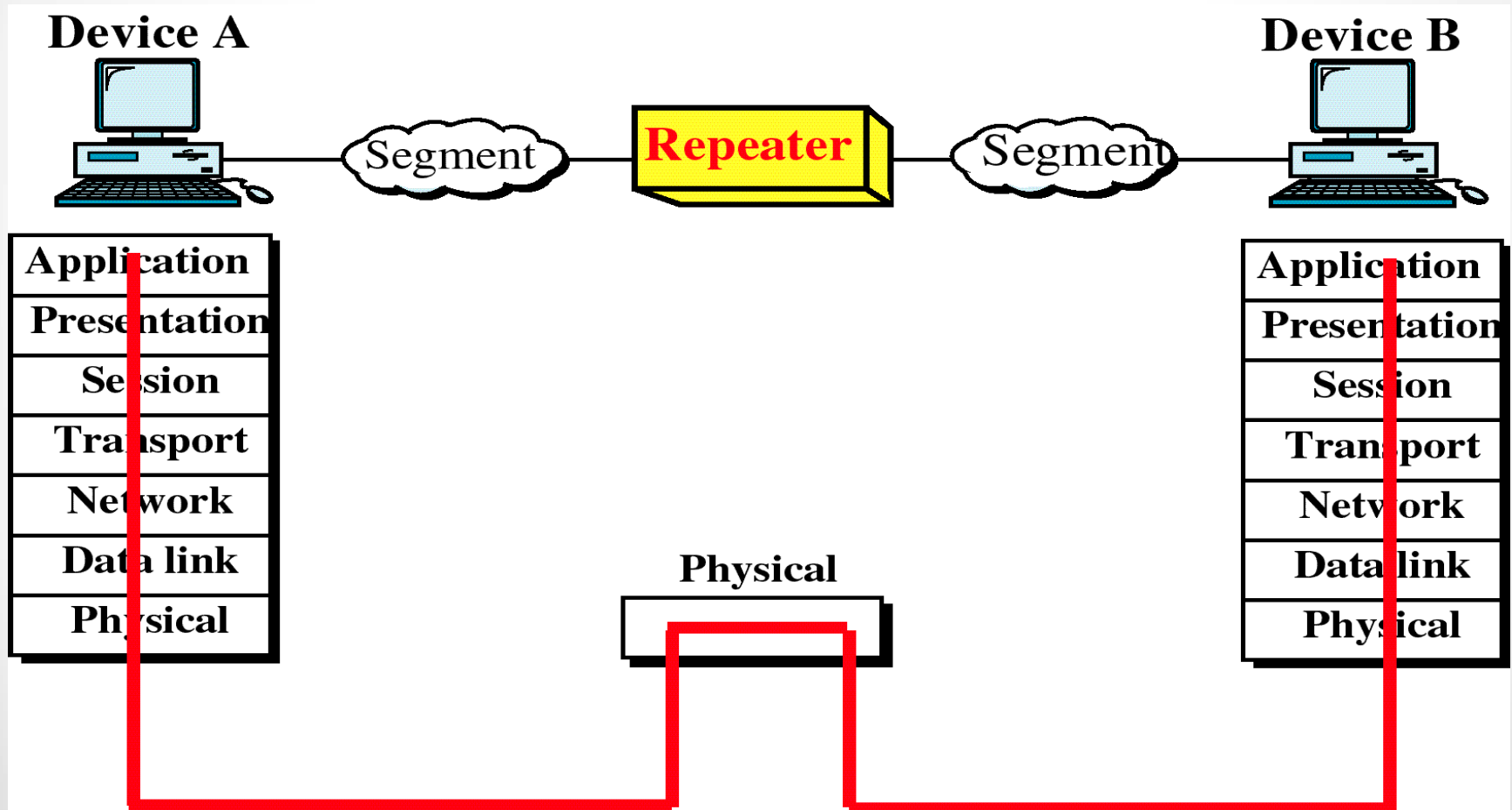
Repeater

- A repeater is a device that operates only at the PHYSICAL layer.
- A repeater can be used to increase the length of the network by eliminating the effect of attenuation on the signal.
- It connects two segments of the same network , overcoming the distance limitations of the transmission media.
- A repeater forwards every frame; it has no filtering capability
- A repeater is a generator , not an amplifier.
- Repeaters can connect segments that have the same access method.(CSMA/CD , Token Passing, Polling , etc.)



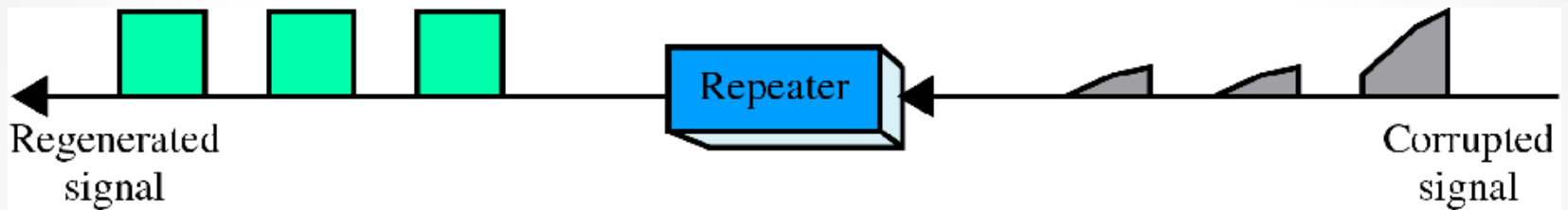


Repeater and OSI model

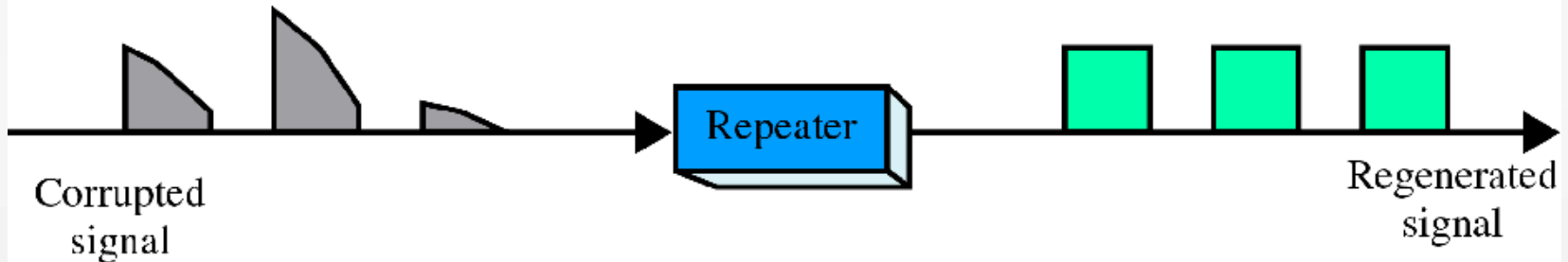




Function of repeater

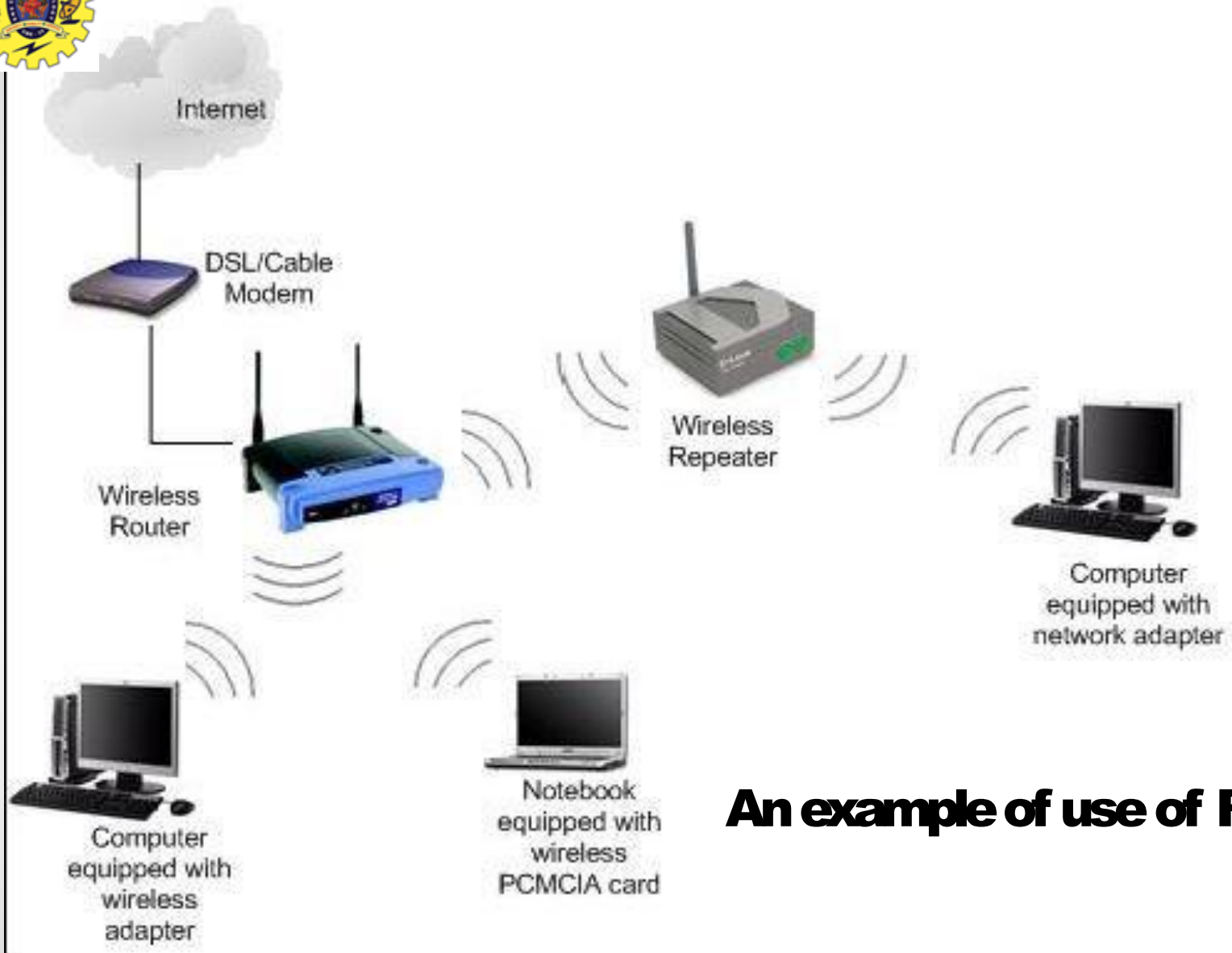


(a) Right-to-left transmission.



(b) Left-to-right transmission.

Repeater is not exactly as same as Amplifier



An example of use of Repeater

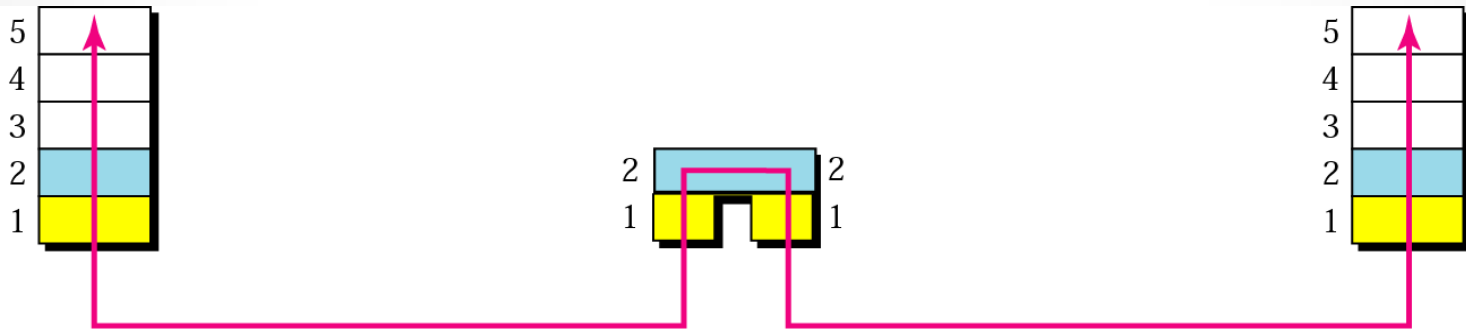


Bridge

1. Operates in both the *PHYSICAL* and the data link layer.
2. it regenerates the signal it receives.
3. The bridge can check the *PHYSICAL* / MAC addresses (source and destination) contained in the frame.
4. A bridge has a table used in filtering decisions.
5. It can check the destination address of a frame and decide if the frame should be forwarded or dropped.
6. If the frame is to be forwarded, the decision must specify the port.
7. A bridge has a table that maps address to ports.

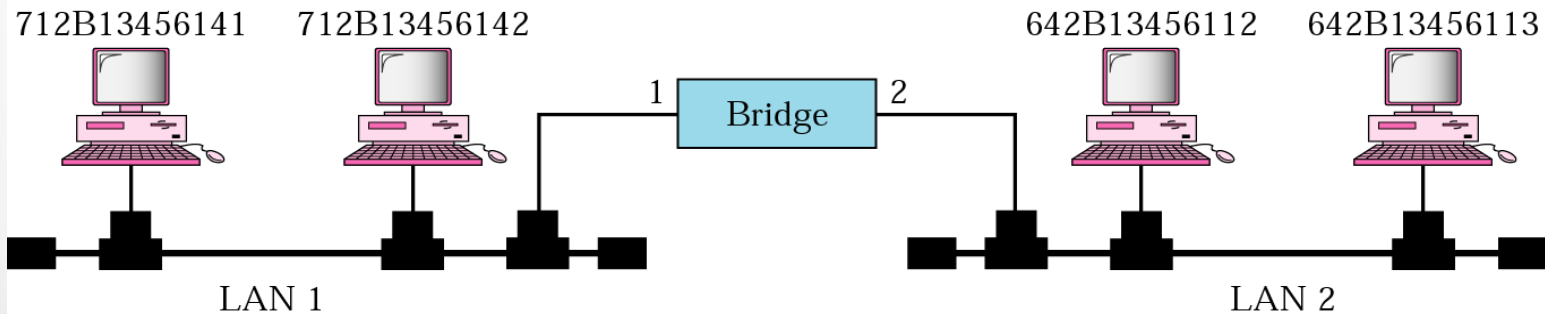


Bridge



Address	Port
712B13456141	1
712B13456142	1
642B13456112	2
642B13456113	2

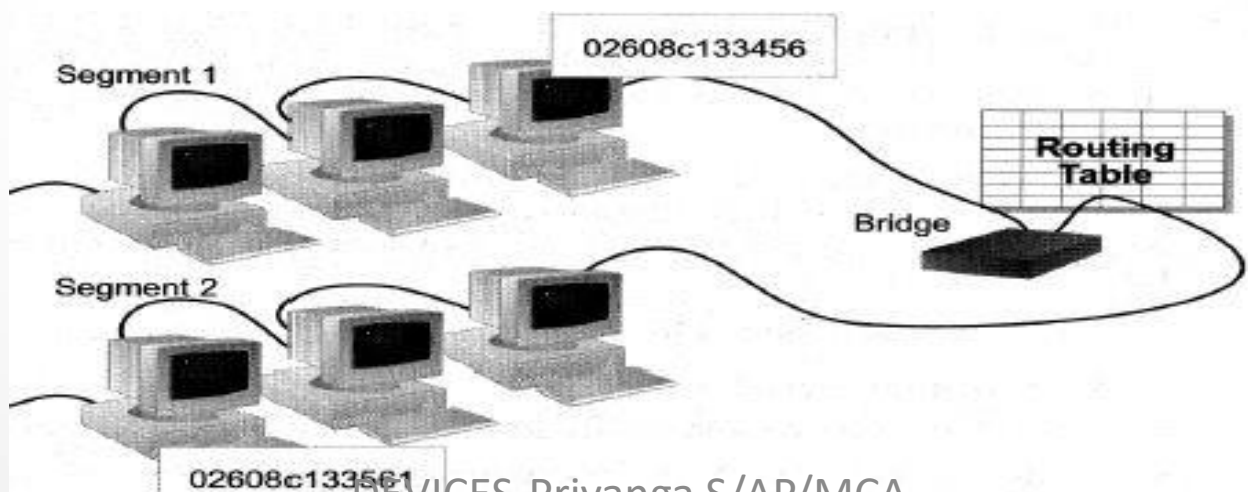
Bridge Table





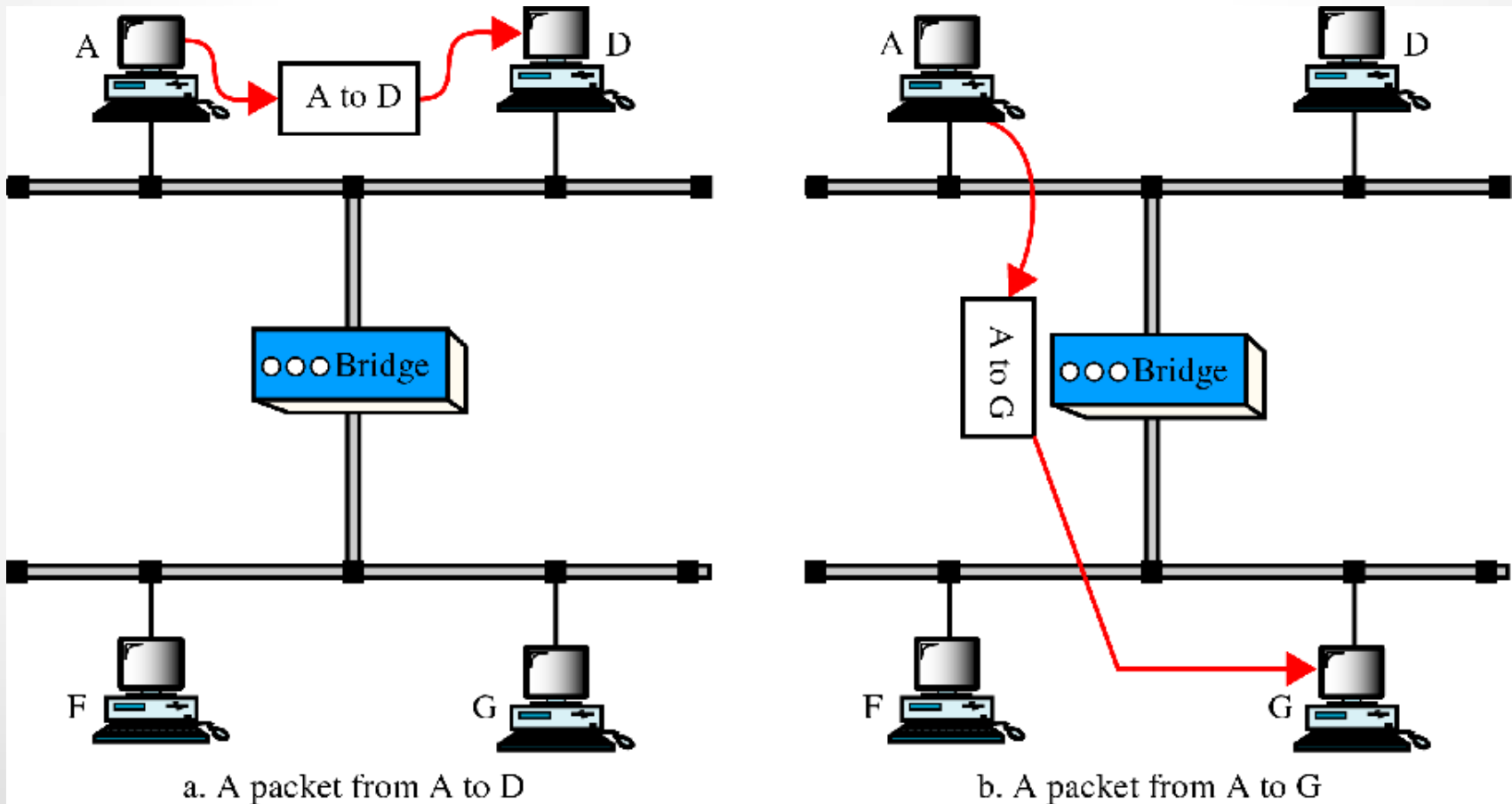
How Bridges Work

- Bridges work at the Media Access Control Sub-layer of the OSI model
- Routing table is built to record the segment no. of address
- If destination address is in the same segment as the source address, stop transmit
- Otherwise, forward to the other segment





Function of a bridge





Characteristics of Bridges

Routing Tables: Contains one entry per station of network to which bridge is connected. Is used to determine the network of destination station of a received packet.

Filtering: Is used by bridge to allow only those packets destined to the remote network. Packets are filtered with respect to their destination and multicast addresses.

Forwarding: The process of passing a packet from one network to another.

Learning Algorithm: The process by which the bridge learns how to reach stations on the internetwork.



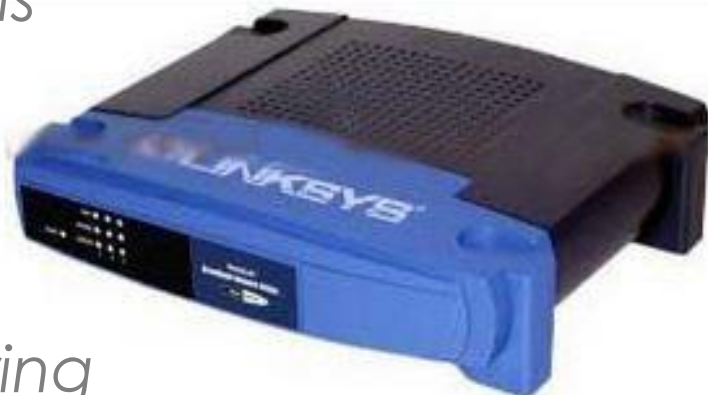
Advantages And Disadvantages Of Bridges

Advantages of using a bridge

- *Extend physical network*
- *Reduce network traffic with minor segmentation*
- *Creates separate collision domains*
- *Reduce collisions*
- *Connect different architecture*

Disadvantages of using bridges

- *Slower than repeaters due to filtering*
- *Do not filter broadcasts*
- *More expensive than repeaters*





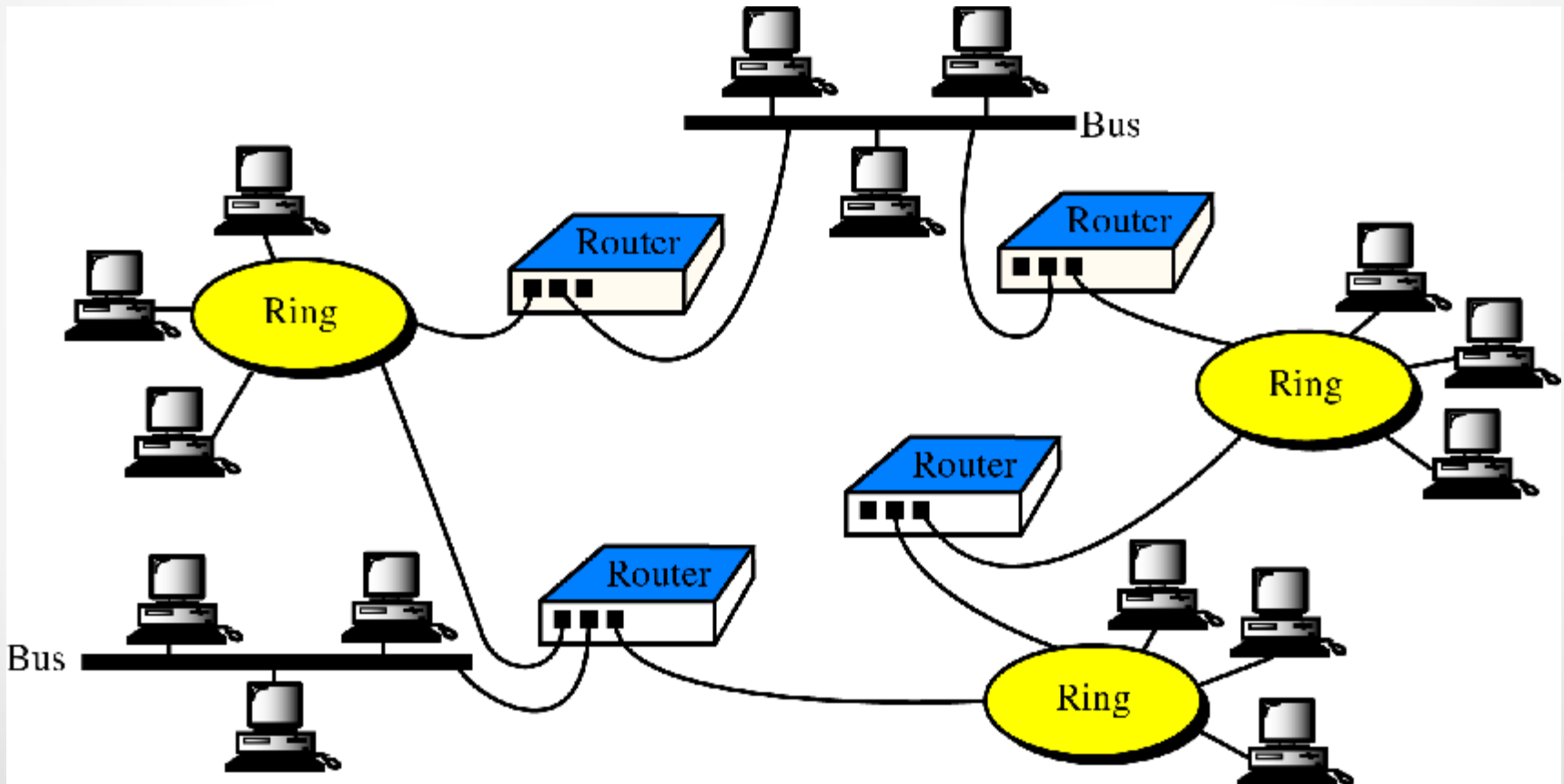
Routers

1. Routes packets based on their logical addresses (host-to-host addressing).
2. A router normally connects LANs and WANs in the Internet and has a routing table that is used for making decision about the route.
3. The routing tables are normally dynamic and are updated using routing protocols.
4. Routers can increase network efficiency by filtering out broadcast traffic between networks, thus reducing unnecessary traffic between networks.





Routers in an internet





Routing Tables

- *Routers contain internal tables of information called routing tables that keep track of all known network addresses and possible paths throughout the internetwork, along with cost of reaching each network.*
- *Because routers use destination network addresses of packets, they work only if the configured network protocol is a routable protocol such as TCP/IP or IPX/SPX. This is different from bridges, which are protocol independent.*



Some Types

Static routers: configured manually with all network addresses and paths in the internetwork.

Dynamic routers: These automatically create their routing tables by listening to network traffic.

Routing tables are the means by which a router selects the fastest or nearest path to the next "hop" on the way to a data packet's final destination. This process is done through the use of routing metrics.

Routing metrics which are the means of determining how much distance or time a packet will require to reach the final destination. Routing metrics are provided in different forms.

Hop is simply a router that the packet must travel through.

Ticks measure the time it takes to traverse a link.



Routers versus Bridges

Addressing

1. Routers are explicitly addressed.
2. Bridges are not addressed.

Availability

1. Routers can handle failures in links, stations, and other routers.
2. Bridges use only source and destination MAC address, which does not guarantee delivery of frames.

Message Size

1. Routers can perform fragmentation on packets and thus handle different packet sizes.
2. Bridges cannot do fragmentation and should not forward a frame which is too big for the next LAN.

Forwarding

1. Routers forward a message to a specific destination.
2. Bridges forward a message to an outgoing network.

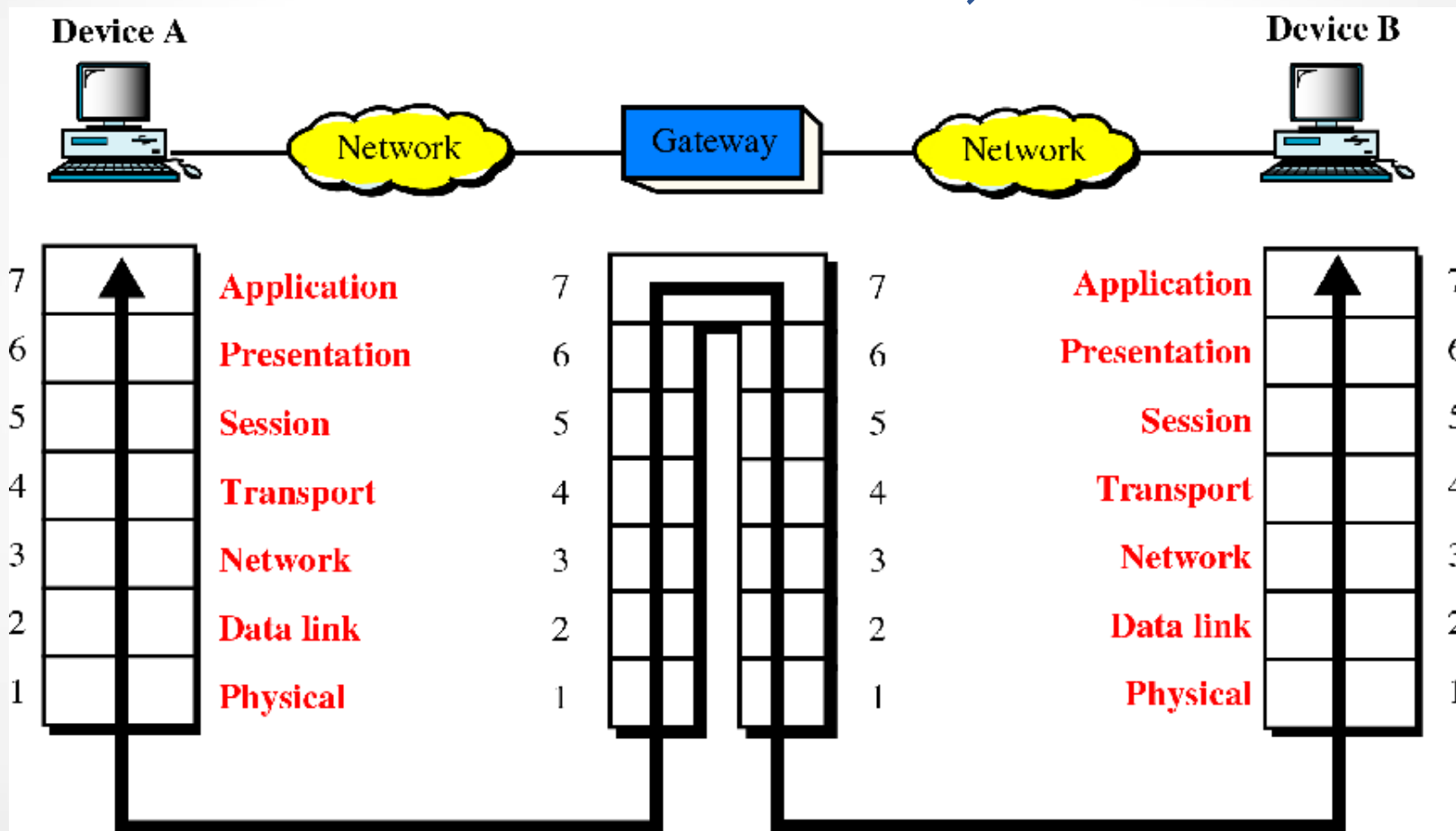


Gateways

- Gateways are multi-purpose connection devices. They are able to convert the format of data in one computing environment to a format that is usable in another computer environment (for example, AppleTalk and DECnet).
- The term gateway is sometimes used when referring to a router. For the purpose of this lesson, gateways are devices that link different network types and protocols. For example, gateways translate different electronic mail protocols and convey email across the Internet

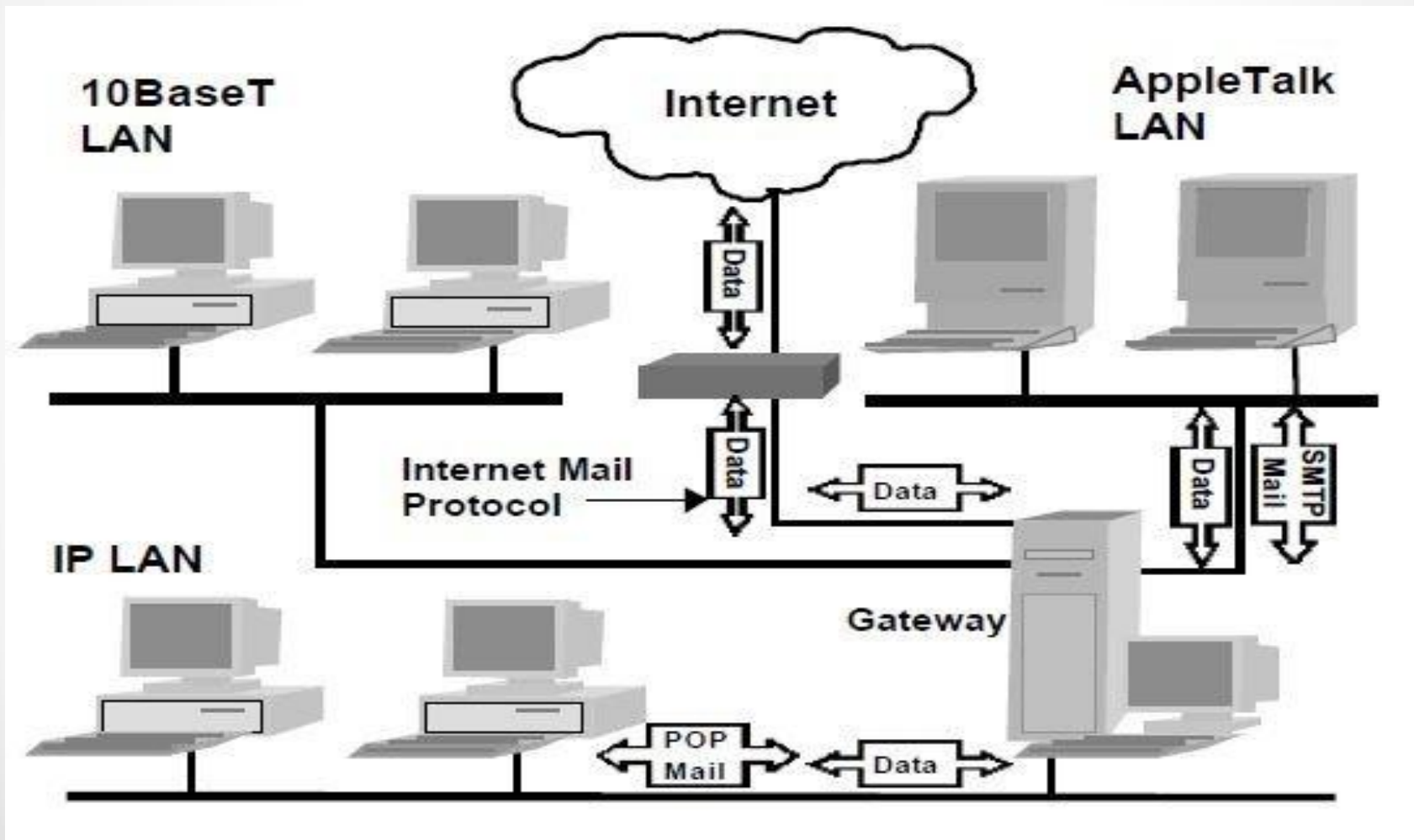


Gateways (protocol converter)





Gateways Translate Different Network Protocols





Examples

- *E-mail gateways-for example, a gateway that receives Simple Mail Transfer Protocol (SMTP) e-mail, translates it into a standard X.400 format, and forwards it to its destination*
- *Gateway Service for NetWare (GSNW), which enables a machine running Microsoft Windows NT Server or Windows Server to be a gateway for Windows clients so that they can access file and print resources on a NetWare server*



Brouters



Brouters are a combination of router and bridge. This is a special type of equipment used for networks that can be either bridged or routed, based on the protocols being forwarded. Brouters are complex, fairly expensive pieces of equipment and as such are rarely used.

A Brouter transmits two types of traffic at the exact same time: bridged traffic and routed traffic.



NIC(Network Interface Card)

Network Interface Card, or NIC is a hardware card installed in a computer so it can communicate on a network. The network adapter provides one or more ports for the network cable to connect to, and it transmits and receives data onto the network cable.

Wireless Lan card





Network Interface Adapter Functions:

- *Data encapsulation*
- *Signal encoding and decoding*
- *transmission and reception*
- *Data buffering Serial/parallel conversion Media access control*





Thank You