

Lecture 16 Roadmap

Learn about the Internetworking Devices

- Repeaters
- Hubs
- Switches
- Bridges
- Routers

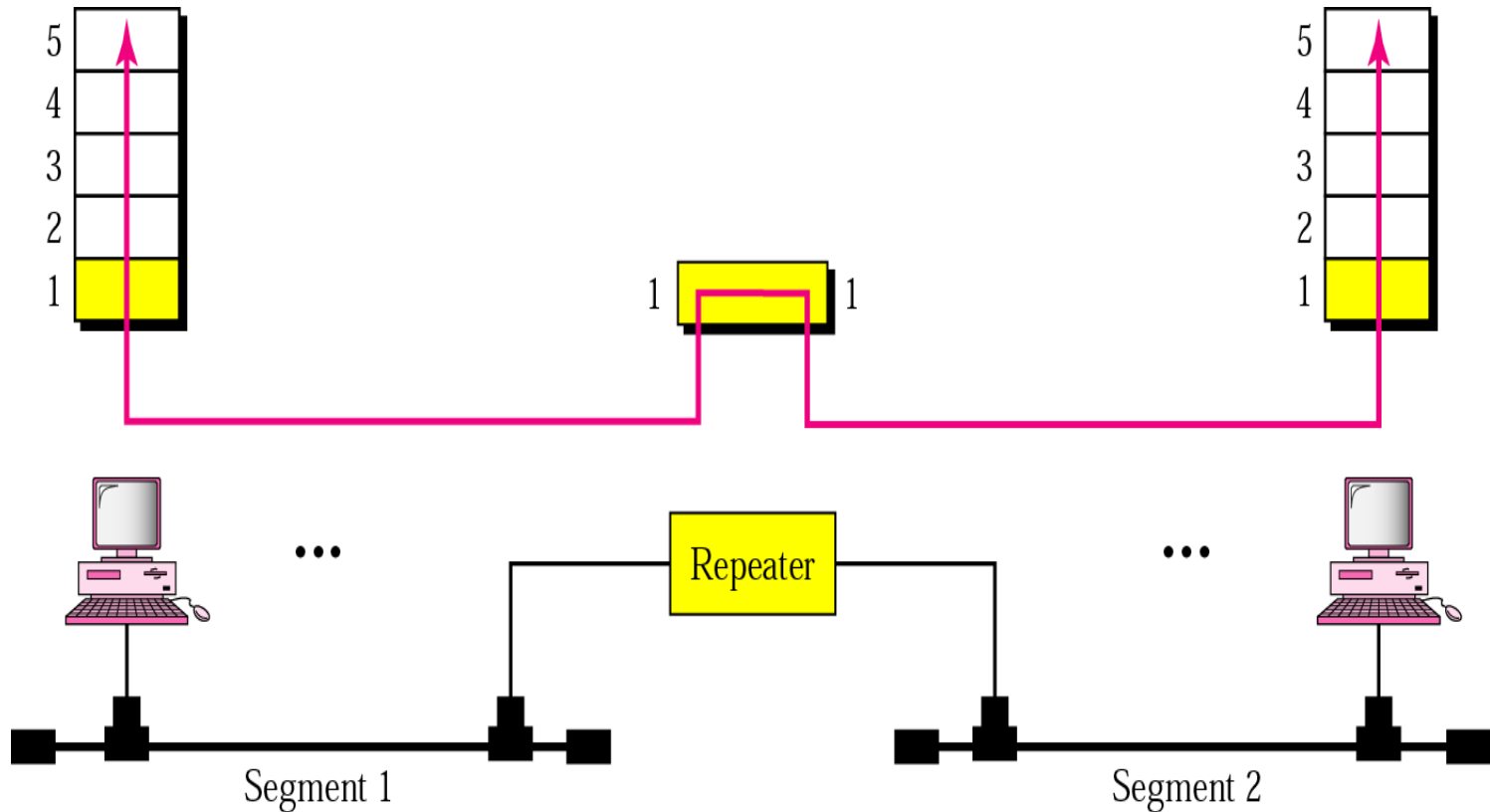
Repeaters

- Operates only in the physical layer.
- Used to overcome attenuation for digital signaling in a LAN
- It extends the physical length of the LAN
- It receives the (weak) signal and regenerates the original bit pattern.
- A repeater is a regenerator not an amplifier

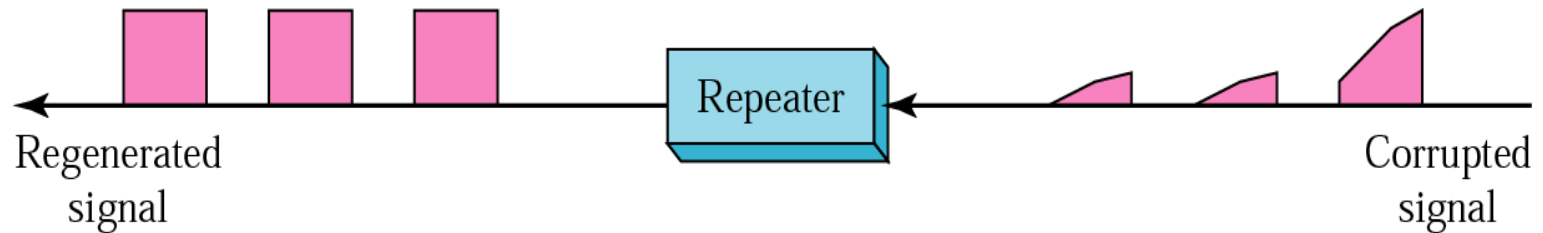
Repeaters

- It connects segments of a single LAN
- A repeater forwards every frame, it has no filtering capability, e.g. can be used to overcome the 10Base5 Ethernet length restriction.
- It cannot connect two LANs using different protocols. It is used within a single LAN.

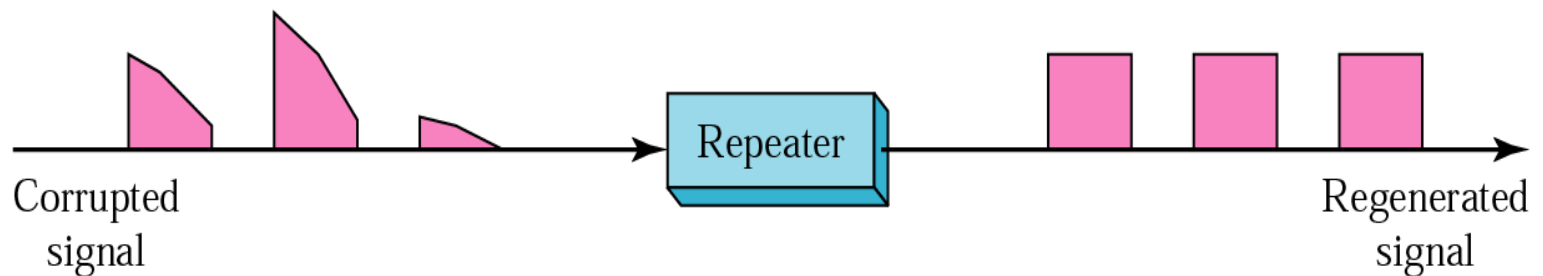
Repeaters



Function of a repeater



a. Right-to-left transmission.

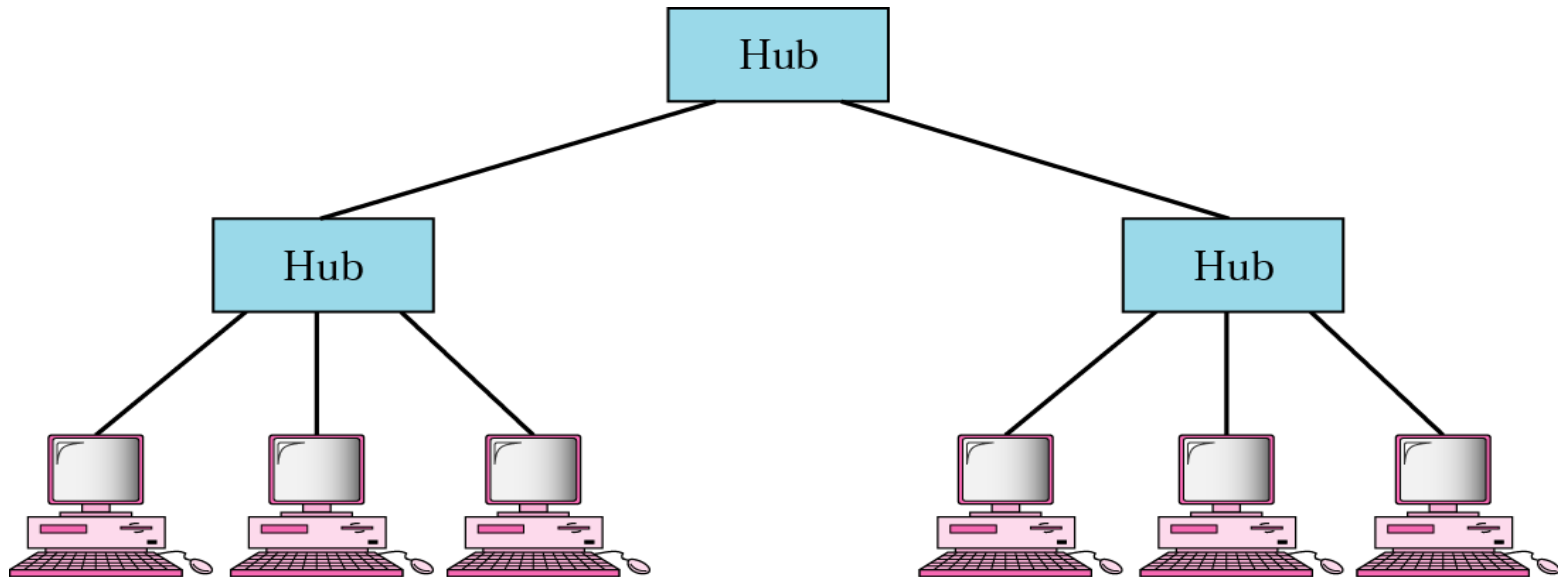


b. Left-to-right transmission.

Hubs

- Unintelligent device works at the Physical layer
- Used in Star topology of LAN e.g. used in 10BaseT
- Can be called a multi-port repeater
- All devices in the same collision domain
- All devices in the same broadcast domain
- Devices share the same bandwidth

Hubs



Switches and Bridges

Switches

Mostly used within a LAN in place of a HUB in star topology

Bridges

Mostly used to connect two similar or different Networks

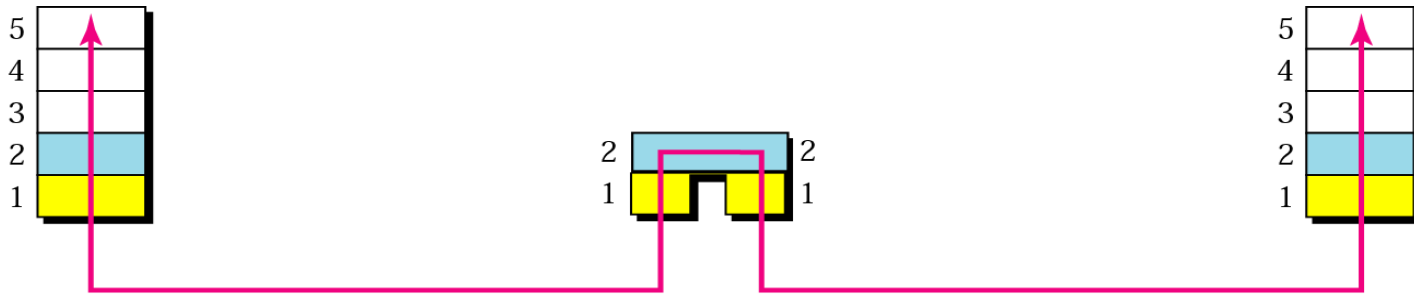
Similarities

Both are called Layer 2 devices (Data Link Layer)

Switches and Bridges

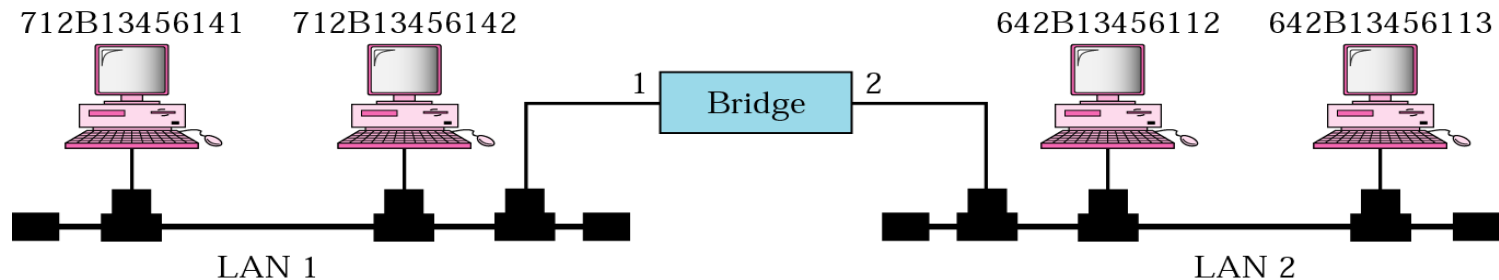
- Both filters the traffic on the basis of MAC address
- Each segment has its own collision domain
- All segments are in the same broadcast domain

Switches and Bridges



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

Bridge Table



Routers

A router is Layer 3 i.e. Network Layer device

It doesn't support broadcasting

Each segment has separate collision and broadcast domains.

Use Layer 3 addresses : IP addresses

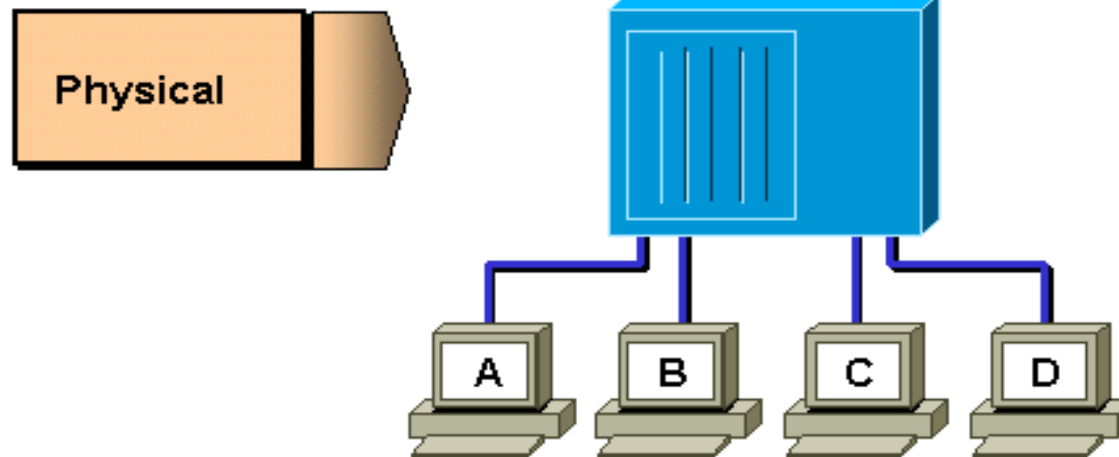
Main function performed is Routing using the IP addresses

Maintains routing tables.

Exchanges information with other routers

Responsible for routing the packet from source network to the destination network.

Hubs operate at Physical layer

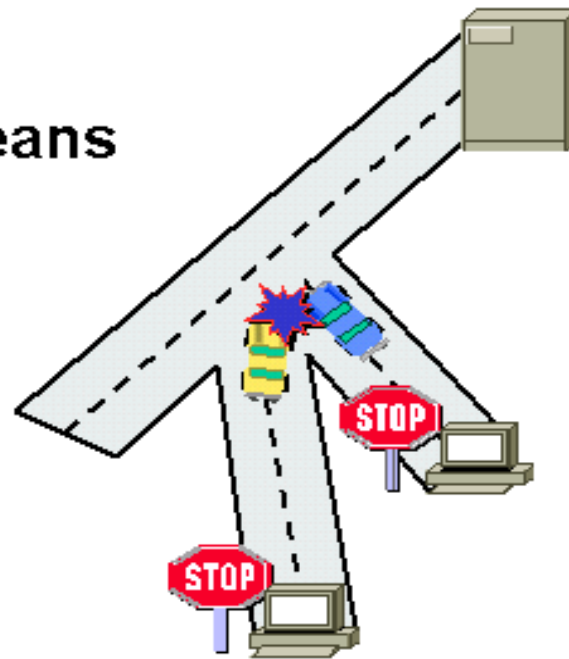


- All devices in the same collision domain
- All devices in the same broadcast domain
- Devices share the same bandwidth

Hubs operate at Physical layer

Hubs: One Collision Domain

- More end stations means more collisions
- CSMA/CD is used



Hubs and Switches

When a workstation transmits data to a hub, the hub immediately resends the data frame out all connecting links.

It can interconnect two or more workstations, but like a bridge, it observes traffic flow and learns.

When a frame arrives at a switch, the switch examines the destination address and forwards the frame out the one necessary connection.

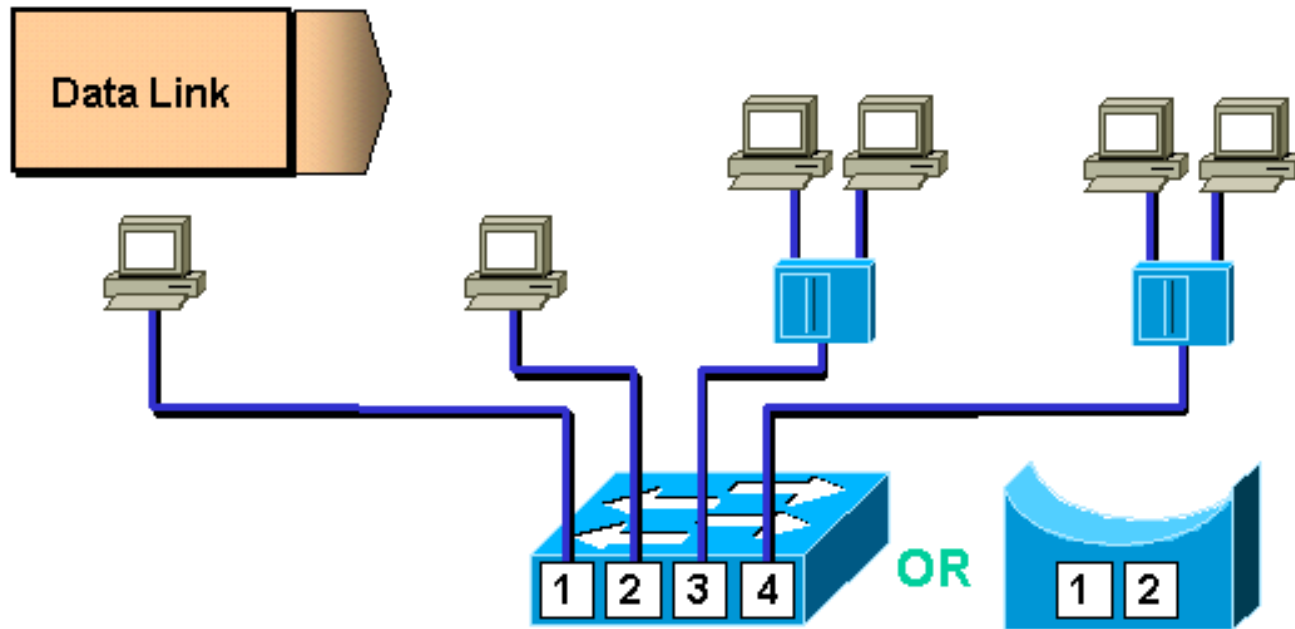
Hubs and Switches

- Workstations that connect to a hub are on a shared segment.
- Workstations that connect to a switch are on a switched segment

States of the Switch

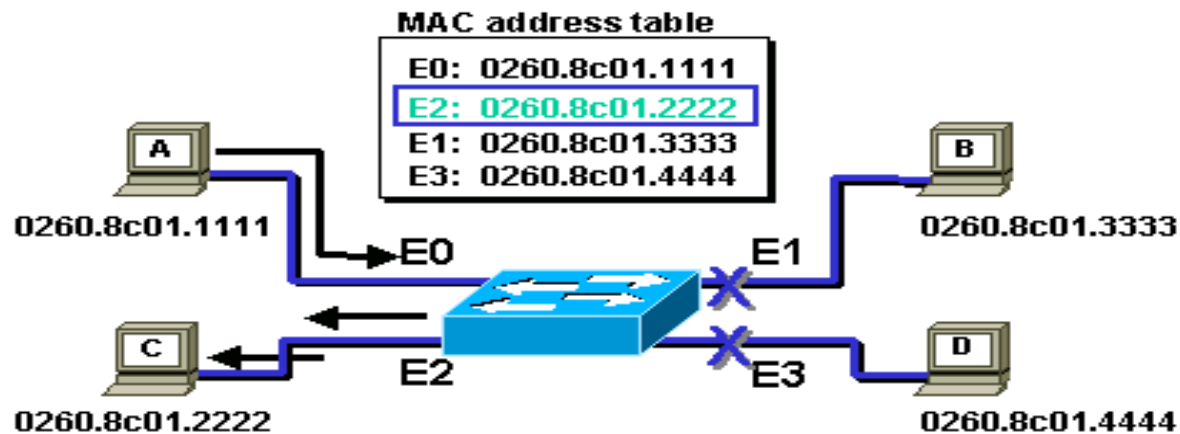
- Learning
- Flooding
- Forwarding
- Filtering
- Aging

Switches and Bridges operate at Data link layer



- Each segment has its own collision domain
- All segments are in the same broadcast domain

How Switches Filter Frames



- Station A sends a frame to station C
- Destination is known, frame is not flooded

Loops in the Switching Networks

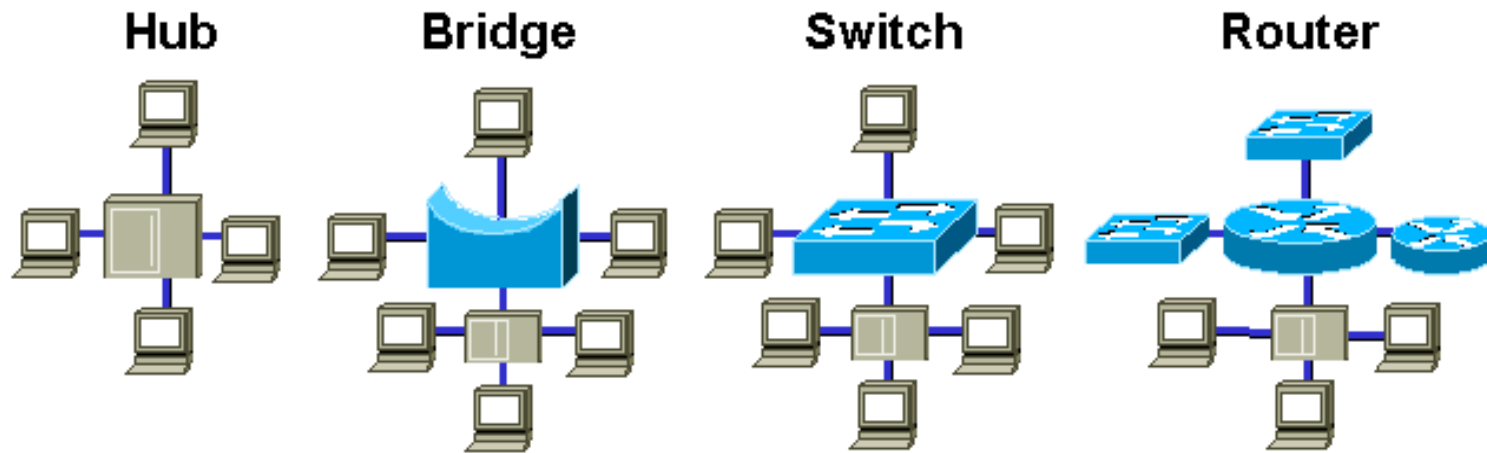
- Redundant Switches
 - **Advantage**
 - Backup Paths
 - **Disadvantage**
 - Undesired Loops
 - **Solution**
 - Spanning Tree Protocol

Spanning Tree Protocol

- Three steps involved
 - Selection of Root Bridge
 - Selection of root & non-root ports
 - Selection of designated bridges and designated ports.

- A switch takes 50s to start up
- Blocking state
 - BPDU
 - Maxage Time 20s
 - Root Bridge is selected
- Listening
 - Forward delay time 15s
 - Root and non-root ports are selected
- Learning
 - Forward delay time 15s
 - Designated ports are selected
- Forwarding

Network Device Domains



Collision Domains:

1

4

4

4

Broadcast Domains:

1

1

1

4

Backbone LANs

A backbone LAN is a high capacity LAN that is used to connect different low-capacity LANs with increased reliability.

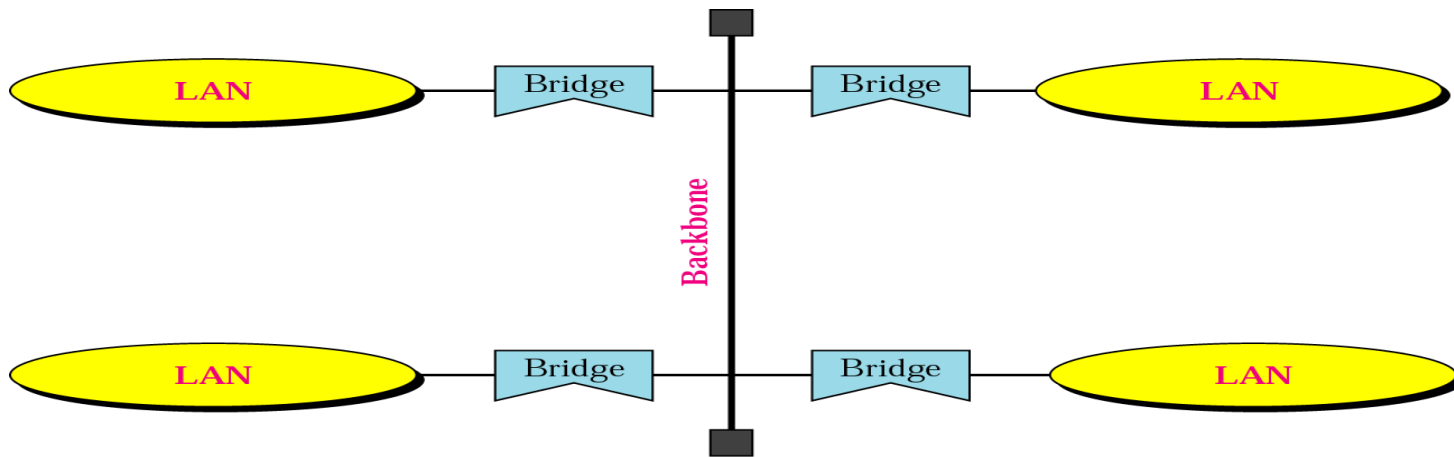
Bus Backbone

In a Bus Backbone, the topology of the backbone is bus. The backbone itself can use one of the protocols that supports a bus topology such as 10Base5, 10Base2.

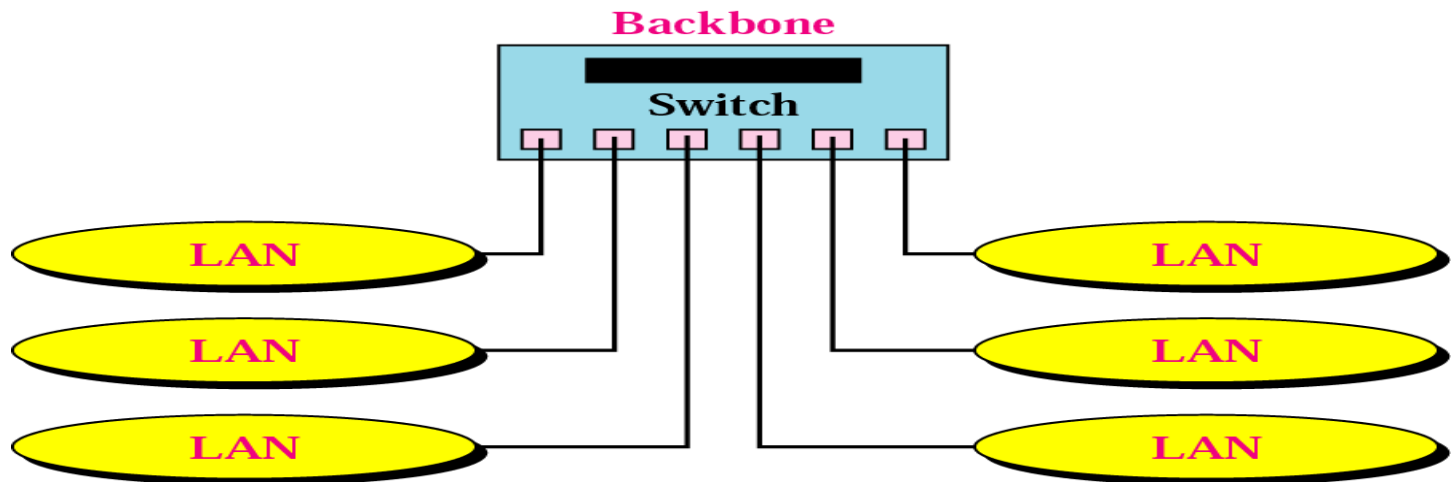
Star Backbone

In Star backbone, the topology of the backbone is star. The backbone is just one switch that connects different LANs.

Bus backbone



Star backbone



References

- For further details:
 - Hubs, switches, bridges, routers visit:
- <http://compnetworking.about.com/library/weekly/aa012801a.htm>
- <http://techrepublic.com.com/5100-6262-5056106-3.html>
- <http://www.hardwarecentral.com/hardwarecentral/tutorials/158/4/>
- <http://www.scit.wlv.ac.uk/~jphb/cp2073/Lecture6.ppt>
- <http://www.techtutorials.info/netdev.html>