

LECTURE #5

TOPOLOGY

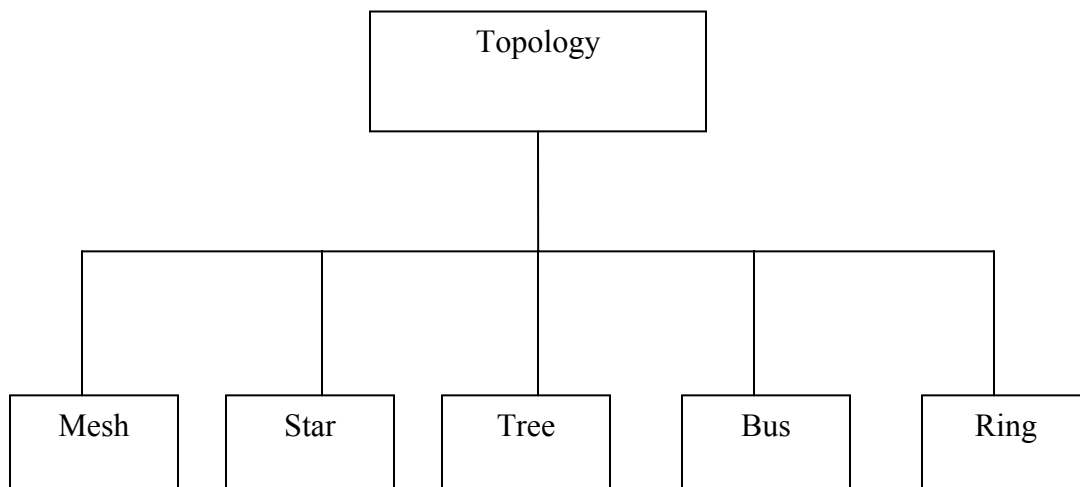
“The Topology is the geometric representation of the relationship of the links and the linking devices (Nodes) in a Network”

Or

“Topology defines the physical or the Logical Agreement of Links in a Network”

Topology of a Network is suggestive of how a network is laid out. It refers to the specific configuration and structure of the connections between the Links and the Nodes. Two or more devices connect to a Link and two or more Links form a Topology

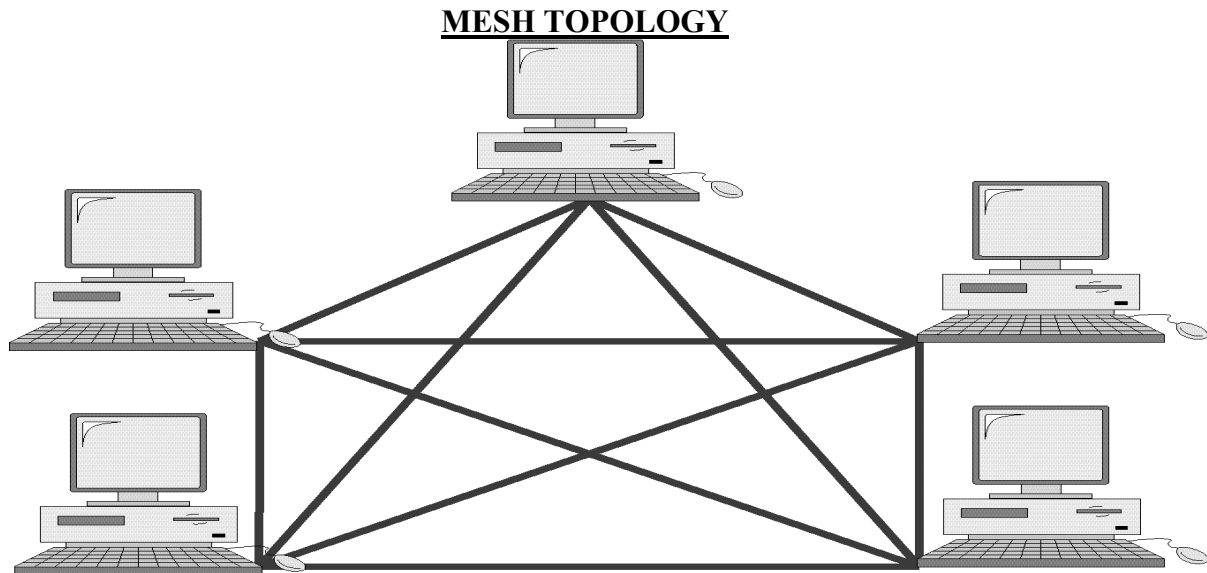
Categories of TOPOLOGY



- ✓ Question: What to consider when choosing a Topology?????????
- ✓ Answer: Relative status of the devices to be linked.

Two relationships are possible in a network

- **PEER-TO-PEER:** Devices share the link equally
- **PRIMARY-SECONDARY:** One device controls traffic and the others must transmit through it



- Every device has **dedicated** a point-to-point link to every other device
- **Dedicated**: Means that the link carries traffic only between these two devices
- $\frac{n(n-1)}{2}$ Links to connect 'n' devices
- Each device must have $n-1$ I/O Ports

Example Mesh Topology

In figure above, we have 5 Nodes, therefore:

- ✓ No. of Links= $5(5-1)/2 = 10$
- ✓ No. of I/O Ports= $5-1 = 4$

🌈 **This increase exponentially with increase in No. of Nodes**

- ✓ e.g. for 6 nodes = 15 Links
- ✓ 7 Nodes=21 Links

❖ **Advantages of Mesh Topology**

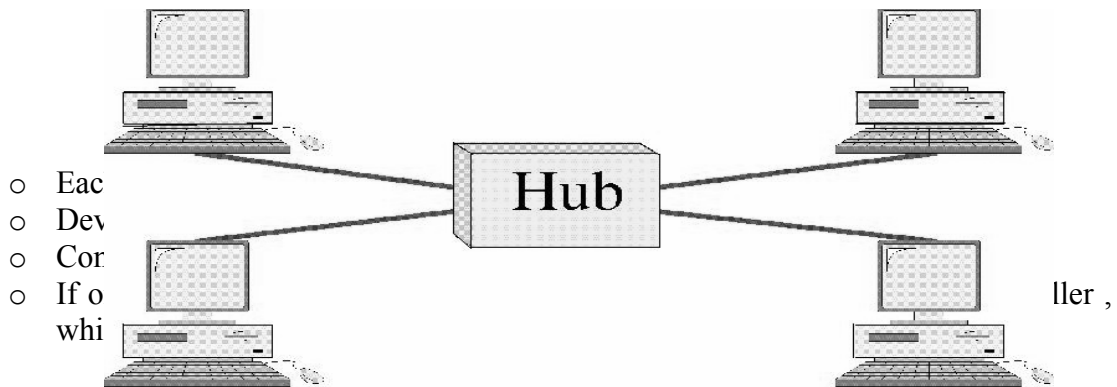
- Use of Dedicated links guarantees that each connection can carry its own load. This eliminates Traffic Problems as in case of Shared Link
- Mesh Topology is robust. If one link fails, it does not effect other links
- Security & Privacy due to dedicated links
- Point – to –Point links make Fault Identification easy

❖ **Disadvantages of Mesh Topology**

- Amount of Cabling
 - ✓ Makes Installation & Reconfiguration difficult
 - ✓ Sheer bulk of wiring can be greater than the available space
- Number of I/O Ports Required
 - ✓ Hardware required to connect each link can be prohibitively expensive

✚ **Therefore, Mesh topology has limited use**

Star Topology



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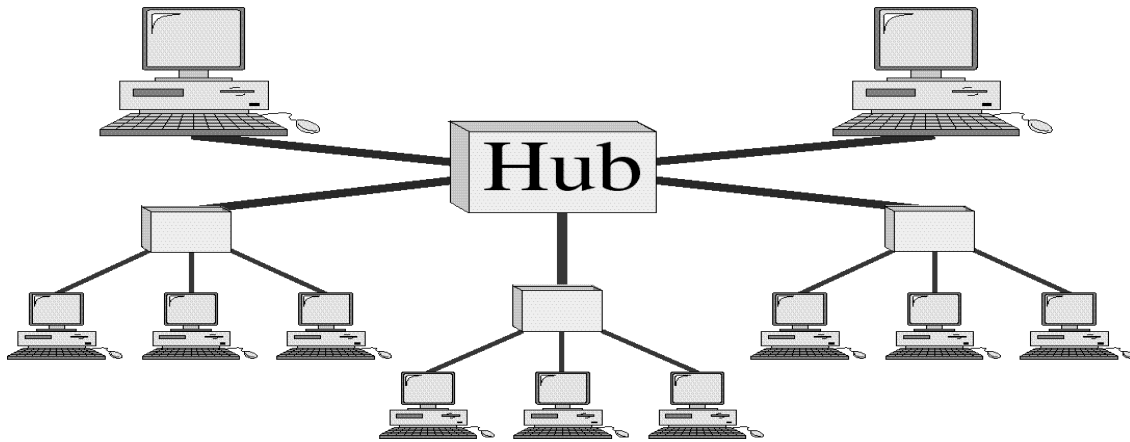
❖ Adv

- Less Cabling
- Less Expensive than Mesh as each device need only one link and one I/O Port
- Easy to Install and Reconfigure
- Robust, if a link fails , only that link fails
- Easy Fault Detection

❖ Disadvantages of Star Topology

- Although Cabling required is far less than Mesh
- Still each node must be connected to a Hub , so Cabling is still much more than some other Topologies

Tree Topology



- A variation of Star Topology
- Nodes in a Tree are linked to a central hub that controls the traffic to and from network
- Difference b/w star and tree is not all the devices plug directly into the central HUB
- Majority connects to secondary hub that is connected to central hub

❖ **CENTRAL HUB in Tree Topology**

- Central Hub in a Tree is an **ACTIVE HUB**
- ACTIVE HUB contains a repeater
- Repeater is a hardware device that regenerates the received bit pattern before sending them out.
- Repeater strengthens TX. And increases the distance a signal can travel

❖ **Secondary HUB in Tree Topology**

- Secondary Hub in a Tree may be **Active** or **Passive HUB**
- Passive Hub simply provides physical connection between attached devices

❖ **Advantages of Tree Topology**

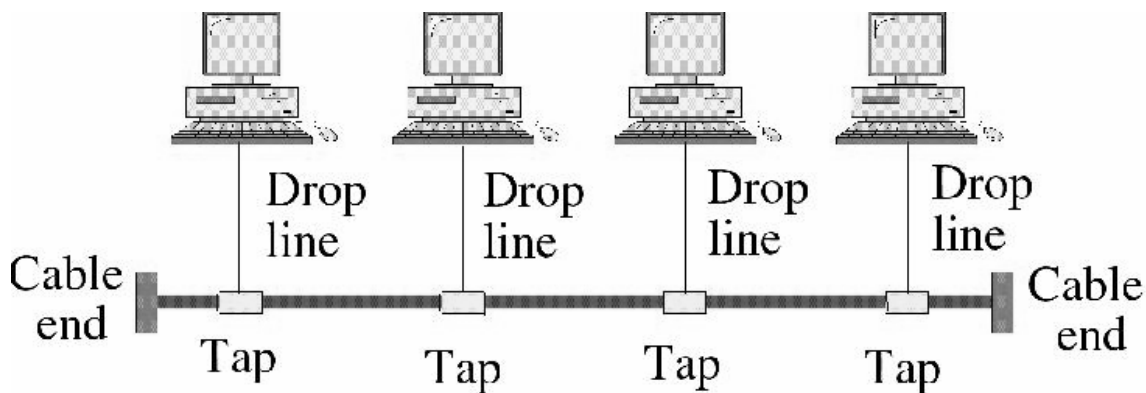
- Because of Secondary Hub, More devices can be attached to a Central Hub and therefore increase the distance a signal can travel
- Enables Differentiated Services: Allows to prioritize communication, e.g. computers attached to one secondary hub can be given priority over others
- Therefore, TIME SENSITIVE data will not have to wait for access to the network
- Rest of the advantages are almost the same as STAR
 - ✓ **Example Tree Topology: Cable TV**

CABLE TV

–Main cable from main office is divided into many branches and each branch is divided into smaller branches and so on

–Hubs are used when cable is divided

BUS TOPOLOGY



- Drop Lines and Taps
- Drop Line is the connection between device and the main cable (Backbone)
 - Tap is a connector that;
 - Splices into the main cable or
 - Punctures the sheathing of a cable to create connection with the metallic core
- Signal degrades as it travels, therefore there is a limit on:
 - ✓ The number of Taps a Bus can support and
 - ✓ The distance between those Taps

❖ Advantages of BUS TOPOLOGY

- Easy to install
 - ✓ Backbone can be laid on the most efficient path and then rest of the nodes can be connected using Drop Lines
- Less cabling than Mesh , Star or Tree
- Difference b/w Star Cabling and Bus Cabling

❖ Disadvantages of BUS Topology

- Difficult Reconfiguration
 - ✓ Difficult to add new devices
 - ✓ adding new devices may require modification of backbone

- No Fault Isolation
 - ✓ A fault or break in backbone can disable communication even on the same side of the problem
 - ✓ Damaged area reflects signals back in the direction of origin creating Noise in both directions

Summary

- ♦ Topology
- ♦ Categories of Topologies

Reading Sections

- ♦ Section 2.2 “Data Communications and Networking” 2nd Edition by Behrouz A. Forouzan