# Assignment 1: Comparative analysis of different networks topology

Data Communication and Computer Network CSE 339

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Mesh | Ring | Bus | Star |
|  | Mesh - In mesh topology each device is connected to every other device on the network through a dedicated point-to-point link. When we say dedicated it means that the link only carries data for the two connected devices only. Lets say we have n devices in the network then each device must be connected with (n-1) devices of the network. Number of links in a mesh topology of n devices would be n(n-1)/2. | **Ring** – Each node in a ring topology connects to exactly two other nodes. This forms a single pathway for signals through each node of the network, which resembles a ring. Messages or frames travel through the entire ring and can theoretically be picked up and/or read by any device on the ring. | **Bus –**In a bus topology, all devices (or nodes) are connected together through a common link called the bus. Each node on the bus receives all the network traffic. | **Star** – Also known as a spoke and hub configuration, in this setup devices are connected not to one another but rather to a central master/controller or hub. So messages can’t be passed from one device to another directly but must go through the central master/controller. |
|  | **No data loss:** No data traffic issues as there is a dedicated link between two devices which means the link is only available for those two devices. |  |  | **Less expensive:** Less expensive because each device only need one I/O port and needs to be connected with hub with one link. |
|  | **Reliable:** Mesh topology is reliable and robust as failure of one link doesn’t affect other links and the communication between other devices on the network. |  |  | **Easier to install** |
|  | **Secure:** Mesh topology is secure because there is a point to point link thus unauthorized access is not possible. |  |  | **Cost effective:** Less amount of cables required because each device needs to be connected with the hub only. |
|  | **Easy to troubleshoot:** Fault detection is easy as there is a separate connection between each devices. |  |  | **Robust:** If one link fails, other links will work just fine. |
|  | **Fast communication:** As there is a dedication connection between two devices on a network, the communication is fast. |  |  | **Easy to troubleshoot:** Easy fault detection because the link can be easily identified. |
|  | Amount of wires required to connected each system is tedious and headache. |  |  |  |
|  | Since each device needs to be connected with other devices, number of I/O ports required must be huge. |  |  |  |
|  | Scalability issues because a device cannot be connected with large number of devices with a dedicated point to point link. |  |  |  |
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| **BASIS FOR COMPARISON** | **STAR TOPOLOGY** | **MESH TOPOLOGY** | **BASIS FOR COMPARISON** | **STAR TOPOLOGY** | **RING TOPOLOGY** |
| --- | --- | --- | --- | --- | --- |
| Organisation or Architecture structure | The peripheral nodes are connected to the central node (ex. hub, switch or router). | It contains at least two nodes with two or more paths between them. |  |  | Every node has two branches connected to a node either side of it. |
| Installation and reconfiguration | Easier | Difficult | Amount of cabling required | Larger | Less as compared to star topology |
| Point of failure | Hub |  |  |  | Every node in the ring |
| Robustness | Intermediate | Highly robust | Data traversal | All data passes through the central network connection. | Data moves in only one direction around the ring till it arrives the destination. |
| Cabling requirements | Uses twisted pair cables which cover distance up to 100 meters. | Twisted pair, coaxial, fibre optic cable, any of the cable type can be used depending on the type of networks. |  |  |  |
| Routing mechanism | All the information is routed from the central network connection. | Information is directly routed from one device to another. | Fault isolation | Easy | Difficult |
| Complexity | Simple | Quite complex | Troubleshooting | The other nodes are affected only in the case of a hub failure. | When a node goes down the information continues to transfer till the damaged node. |
| Scalability | Good | Poor | Network expansion | A new cable is plugged in from the new node to the hub. | In order to add a new node, a connection must be broken which turns down the network. |
| Cost | Comparatively less than Mesh but higher than Ring. | Higher - Expensive due to extensive cabling. |  |  | Lower |
| **BASIS FOR COMPARISON** | **STAR TOPOLOGY** | **MESH TOPOLOGY** | **BASIS FOR COMPARISON** | **STAR TOPOLOGY** | **RING TOPOLOGY** |

|  | **BASIS FOR COMPARISON** | **STAR TOPOLOGY** | **RING TOPOLOGY** |
| --- | --- | --- | --- |
| 1 | Architecture structure | Peripheral nodes are linked to the central device known as a hub. | Every node has two branches connected to a node either side of it. |
| 2 | Amount of cabling required | Larger | Less as compared to star topology |
| 3 | Point of failure | Hub | Every node in the ring |
| 4 | Data traversal | All data passes through the central network connection. | Data moves in only one direction around the ring till it arrives the destination. |
| 5 | Network expansion | A new cable is plugged in from the new node to the hub. | In order to add a new node, a connection must be broken which turns down the network. |
| 6 | Fault isolation | Easy | Difficult |
| 7 | Troubleshooting | The other nodes are affected only in the case of a hub failure. | When a node goes down the information continues to transfer till the damaged node. |
| 8 | Cost | High | Low |

**Differences between Star Topology and Bus Topology:**

| S.NO. | Star Topology | Bus Topology |
| --- | --- | --- |
| 1. | Star topology is a topology in which all devices are connected to a central hub. | Bus topology is a topology where each device is connected to a single cable which is known as the backbone. |
| 2. | In star topology, if the central hub fails then the whole network fails. | In a Bus topology, the failure of the network cable will cause the whole network to fail. |
| 3. | Management of high traffic and performance of the network is highly dependent on the capacity of the central hub. | Bus topology can not effectively manage a terminator’s high amount of traffic as if there is high traffic then the performance of the network is affected. |
| 4. | Star topology does not have any terminator. | Bus topology has a terminators at both ends of the network. |
| 5. | Star topology has a high implementation cost because of the central hub and extra wires required for connection. | Bus topology is less expensive than a star topology. |
| 6. | Data transmission is faster in a star topology. | In a Bus topology, the data is transmitted slower as compared to a star topology. |
| 7. | In star topology the communication between nodes is done through a central hub, a message from the sender node reaches the central hub first then it is transmitted to the receiver node. | In a Bus topology, the data from a sender device to a receiver device is sent directly. |
| 8. | Expansion is easier. | Expansion of network i.e. addition of new node is difficult. |
| 9. | Fault identification and isolation are relatively easier. | Fault identification and isolation are not easier. |
| 10. | Chances of data collision are less, | Data collisions occur frequently |

***Network topology:*** Network topology is the arrangement of the elements (links, nodes, etc.) of a communication network. Network topology can be used to define or describe the arrangement of various types of telecommunication networks, including command and control radio networks,[3] industrial fieldbuses and computer networks. Network topology is the topological structure of a network and may be depicted physically or logically. It is an application of graph theory wherein communicating devices are modelled as nodes and the connections between the devices are modelled as links or lines between the nodes. Physical topology is the placement of the various components of a network (e.g., device location and cable installation), while logical topology illustrates how data flows within a network. Distances between nodes, physical interconnections, transmission rates, or signal types may differ between two different networks, yet their logical topologies may be identical.