STUDY GUIDE FOR MODULE NO. 3

Unit 3 – Network Topology

MODULE OVERVIEW

In this module, we're going to discuss the network topology. A topology is a graphical depiction of the layout of a computer network. The topology of a network is the geometric representation of all links and nodes of a network—the structure, consisting of transmission links and processing nodes, which provides communications connectivity between nodes in a network. A ***link*** is the physical transmission path that transfers data from one device to another. A ***node*** is a network addressable device.

MODULE LEARNING OBJECTIVES

At the end of this, students are expected to:

1. Explain and compare the different topologies.

LEARNING CONTENTS (Types of Topology)

Topology is the term used to describe how devices are connected and how messages flow from device to device.

There are two types of network topologies:

1. The **physical topology** describes the way the network is wired. It is an actual layout of the computer cables and other network devices
2. The **logical topology** describes the way messages are sent. It gives insights about network's physical design.

Common Physical Topology

1. **Bus Topology**

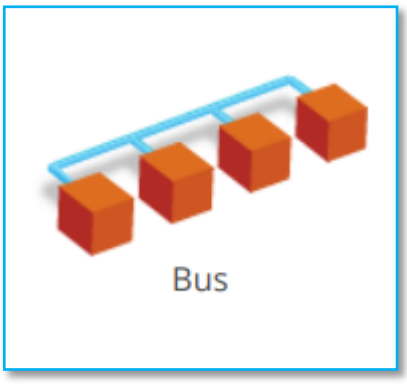

Figure1. Bus Topology
(*source labsimapp.testout.com*)

Figure 1 shows the layout of bus topology. Bus topology uses a single cable which connects all the included nodes. The main cable acts as a spine for the entire network. One of the computers in the network acts as the computer server. When it has two endpoints, it is known as a **linear bus topology**.

When using a bus topology:
- Signals travel from one node to all other nodes.
- A device called a terminator is placed at both ends of the trunk cable.
- Terminators absorb signals and prevent them from reflecting repeatedly back and forth on the cable.
- It can be difficult to isolate cabling problems.

A broken cable anywhere on the bus breaks the termination and prevents communications between any devices on the network.

2. Star Topology

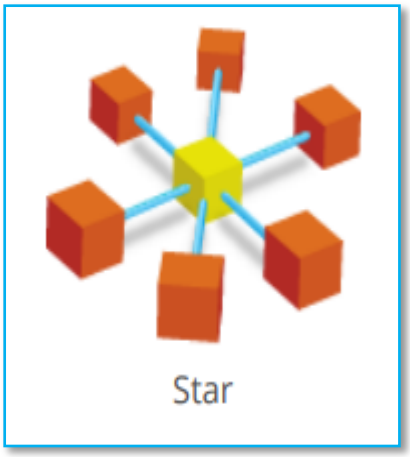

Figure 2. Star Topology
(*source labsimapp.testout.com*)

❖ A star topology, as shown in figure 2, uses a hub or switch to connect all network to a single physical location. This is the most popular type of topology for a LAN.

❖ This layout is easy to troubleshoot, setup and modify. Also, cabling problems usually affect only one node.

❖ In Star topology, addition, deletion, and moving of the devices are easy. Moreover, it offers fast performance with few nodes and very low network traffic.

❖ Herein, if the hub or concentrator fails, attached nodes are disabled. Also, performance depends on the hub's capacity.

❖ Additionally, cost of installation is costly and a damaged cable or lack of proper termination may bring the network down.

3. Ring Topology

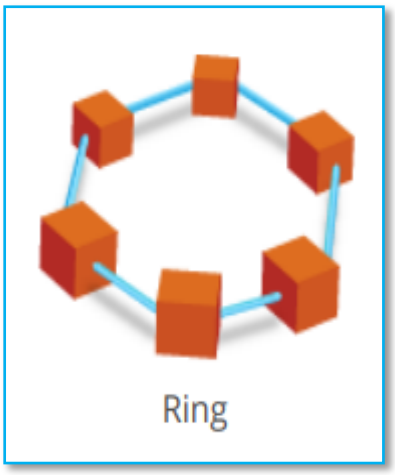

Figure 3. Ring Topology
(*source labsimapp.testout.com*)

As presented in Figure 3, Ring topology connects neighboring nodes until they form a ring. Signals travel in one direction around the ring and each device on the network acts as a repeater to send the signal to the next device.

It is called a ring topology as its formation is like a ring. Here, every computer is connected to another computer and the last node is combined with a first one. It gives equal access to all the computers and does error checking in a faster way.

Additionally, installation requires careful planning to create a continuous ring. Also, isolating problems can require going to several physical locations along the ring and malfunctioning node or cable break can prevent signals from reaching nodes further along on the ring which makes it difficult to troubleshoot.

4. Point to Point Topology

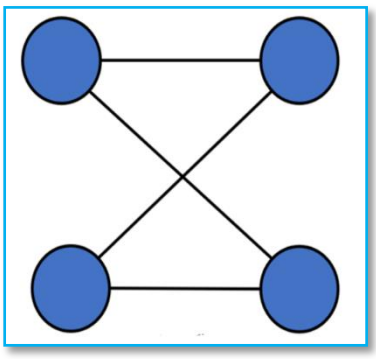

Figure 4. Point-to-point topology
(*source guru99.com*)

Point-to-point topology, as displayed in Figure 4, is consists of a direct link between two computers. This is faster and highly reliable than other types of connections since there is a direct connection. It is the easiest of all the network topologies. No need for a network operating system and no need for any dedicated network technicians because each user sets their permissions.

Herein, the biggest drawback is that it only be used for small areas where computers are in close proximity. There is no security besides the permissions. Users often do not require to log onto their workstations.

5. Mesh Topology

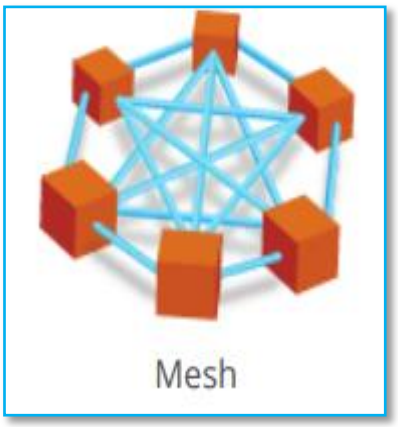

Figure 5. Mesh Topology
(*source labsimapp.testout.com*)

A ***mesh topology***, Figure 5, exists when there are multiple paths between any two nodes on a network. It is created using point-to-point connections. This increases the network's fault tolerance because alternate paths can be used when one path fails.

Two types:

1. **Partial Mesh** – few devices are joined with just two or three devices.
2. **Full Mesh** – devices are directly attached with each other.

Mesh topology has many links, thus if any single route is blocked, then other routes must be used for data communication. Additionally, it supports you to prevent the chances of network failure by joining all the systems to a central node.

In this topology, installation is complex because every node is connected to every node. Likewise, every system has its privacy and security. It also requires a large space to run the cables and more space for dedicated links. Because of the amount of cabling and the number of input-outputs, it is expensive to implement.

6. Tree Topology

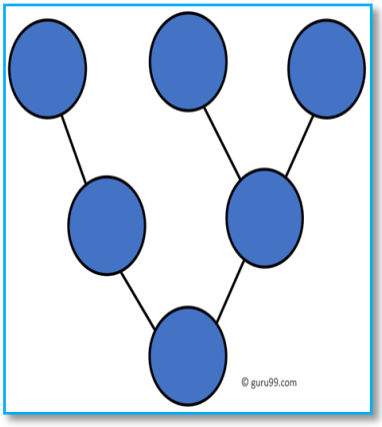

Figure 6. Tree topology
(*source guru99.com*)

Tree topology, Figure 6, is a combination of a star topology and a bus topology. Here, a root node and all other nodes are connected which form a hierarchy. Also, this topology is a very common network which is similar to a bus and star topology. In addition, this topology is easy to manage and maintain, failure of one node never affects the rest of the network, node expansion is fast and easy, and detection of error is an easy process.

In contrast, this topology is heavily cabled and if more nodes are added, then its maintenance is difficult. Additionally, if the hub fails, attached nodes are also disabled.

7. Hybrid Topology

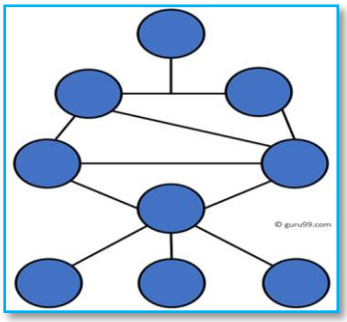

Figure 7. Hybrid topology
(*source guru99.com*)

Figure 7 shows a combination of two or more topology which is known as ***Hybrid topology***. This topology always produced when two different basic network topologies are connected. Moreover, it is scalable so you can increase your network size.

On the other hand, the design of this topology is complex and it is one of the costliest processes. Its installation and fault detection is difficult.

LEARNING CONTENTS (Choosing a Network)

How to select a Network Topology?

There's nobody size-fits-all with regards to network topology. What is ideal for one organization might be woefully deficient in another. The following are the key variables you should focus on while choosing a network topology

1. **Budget**

   A dependable guideline is to never settle on innovation obtainment choices dependent on cost alone. There's no denying however that you can just shortened your coat as indicated by your material. On the off chance that a topology is unreasonably expensive, it's off the table regardless of how completely fit it very well may be for your circumstance.

   Regardless, independent of what your favored topology is, there'll quite often be a lower-evaluated elective that is close to as compelling. On evaluating matters, bus and ring topologies are very financially savvy while star, mesh, tree and hybrid topologies are costly.

2. **Hardware Resources**

   Specific network topologies work best with certain equipment. Furthermore, before you settle on a choice on topology to implement, work on inventory of your present equipment. You may likewise as of now have the equipment expected to execute a particular kind of topology. So instead of purchasing everything without any preparation, such existing assets give you a head start.

   For example, you may have equipment restrictions, say, the length of the network cable. All things considered; you'd go for topology that requires minimal measure of cable for joining hubs. Bus and star topologies perform quite well in such manner.

3. **Ease of Implementation**

   On the off chance that you'll get an outsider to install as well as keep up your organization, at that point the intricacy of the organization topology you pick is maybe a non-issue. A skilled systems administration expert will have the training and experience expected to grasp what every topology involves and execute it likewise.

   In any case, that you hope to leave network operation in the possession of beginners or people without the necessary IT training, at that point the simplicity of the topology ought to be the most important in your decision. For this situation, the bus and star geographies score quite well. The mesh, tree and hybrid, then again, are unpredictable and hard for a layman to connect or understand.

4. **Size of Network**

   How many devices will be on your network? How geographically distributed are they? How remote from the ‘center’ is the furthest device? Some topologies are insufficient or expensive when applied to large networks. A topology that works perfectly for a 5-device network may prove a disaster when applied to a 10,000-device organization.

   Part of the inventorying process we referred to in point 2 ought to incorporate determining the total number of devices to be interconnected. Armed with this information, you can choose the topology that would best serve the purpose. The tree topology works well with large networks. The bus topology is best suited for small organizations.

5. Reliability

With regards to reliability, network topologies aren't made equivalent. If you are searching for high unwavering quality since you are in an industry where even concise personal time and postponements are disliked (for example banking), at that point network reliability is a basic thought. Pick the topology that conveys the most elevated reliability.

Ring topology performs really well under weighty loads however is inclined to a solitary purpose of disappointment. Star topology doesn't rely upon any hub however the network will fall if the hub fails. Mesh and hybrid topologies score most noteworthy on the unwavering reliability front.

6. Future Expansion

If you anticipate that your organization should fill in size in the medium to long-term, select a network topology that is promptly adaptable. Recognize the topology that is not difficult to add new hubs to, without adversely influencing network execution or the client experience of different gadgets on the organization.

The tree topology is the most viable with future development necessities as it's genuinely simple to expand or contract the organization. The bus topology is additionally simple to grow yet just partly which is the reason it would just work for little organizations.

LEARNING CONTENTS (Choosing a Network)

Here are additional important points for selecting the best topology to create a network in your organization:

- Bus topology is surely least expensive to install a network.
- If you want to use a shorter cable or you planning to expand the network in future, then star topology is the best choice for you.
- If you want to use twisted pair cable for networking, then you should build star topologies.

LEARNING ACTIVITY 1 (Quiz)

Direction. Read each item carefully. Choose and encircle the correct answer.

1. Which network topology is best for a small number of computers?
   a. Bus c. Star
   b. Ring d. Hybrid
2. Which was the earliest type of network used?
   a. Ring c. Star
   b. Bus d. Mesh
3. Which type of network needs a server?
   a. Star c. Ring
   b. Bus d. all of the above
4. What advantage does a Bus have over a Ring?
   a. If one computer fails, the network keeps working.
   b. It uses less cable
   c. Provides slow and effective communication from one computer only.
   d. All of the above.
5. Why is a Ring network more secure than a Bus?
   a. Because you need to hack all computers on a Ring network to see all the network traffic.
   b. Because buses have lots of windows.
   c. Because it is a closed loop.
   d. None of the above

6. Which network topology is the most secure?
   a. Ring c. Star
   b. Bus d. Tree
7. Which of the following network topologies contains a backbone which runs the length of the network?
   a. Bus c. Star
   b. Ring d. Tree
8. What piece of hardware is usually at the center of a star network?
   a. Hub c. Server
   b. Router d. Modem
9. What topology uses token passing?
   a. Ring c. Star
   b. Bus d. Tree
10. What type of network is hub based and named after a fish?
    a. Star c. Mesh
    b. Ring d. Hybrid

SUMMARY

In this module we learned about network topology. We learned that there are two topology categories. There's the physical topology and the logical topology. The physical topology describes the way networks are physically wired. And the logical topology describes the way the network transmits data and operates.

REFERENCES

E-BOOK

Network Topologies. (2013). In K. L. Lerner & B. W. Lerner (Eds.), *Computer Sciences* (2nd ed., Vol. 2, pp. 154-156). Macmillan Reference USA. https://link.gale.com/apps/doc/CX2761000126/GVRL?u=phpsu&sid=GVRL&xid=f02e74e2

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