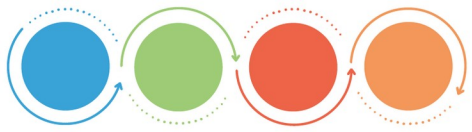


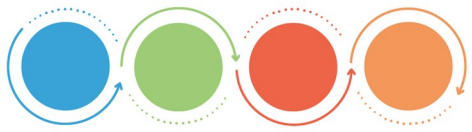
Communication Technology and the Internet

Chekwoti Aramadhan
Islamic University in Uganda



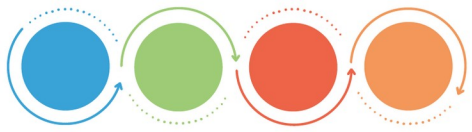
5 mins

- What surprised you the most in the last lecture?



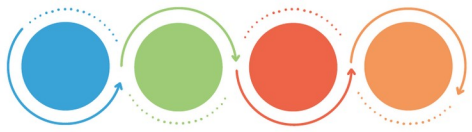
Network Topology

- What is a network topology?



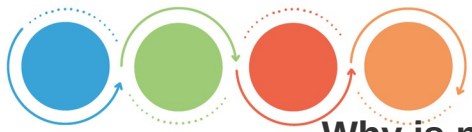
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- You have been tasked to design a network topology for your school
- Identify the different network topologies that could be used to solve the problem.



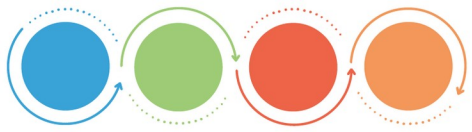
Network Topology

- Network topology is the way a network is arranged, including the physical or logical description of how links and nodes are set up to relate to each other.
- Nodes usually include devices such as switches, routers and software with switch and router features



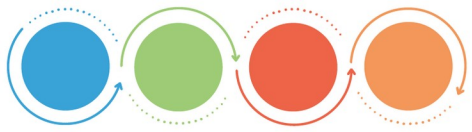
Why is network topology important?

- The layout of your network is important for several reasons.
- Above all, it plays an essential role in how and how well your network functions.
- Choosing the right topology for your company's operational model can increase performance while making it easier to locate faults,
- troubleshoot errors,
- and more effectively allocate resources across the network to ensure optimal network health.
- A streamlined and properly managed network topology can increase energy and data efficiency, which can in turn help to reduce operational and maintenance costs.



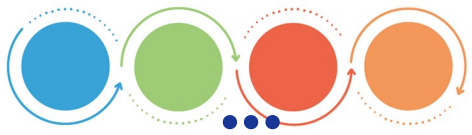
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- Network diagrams are an important reference point in helping to diagnose network issues, as they can represent physical and logical layouts

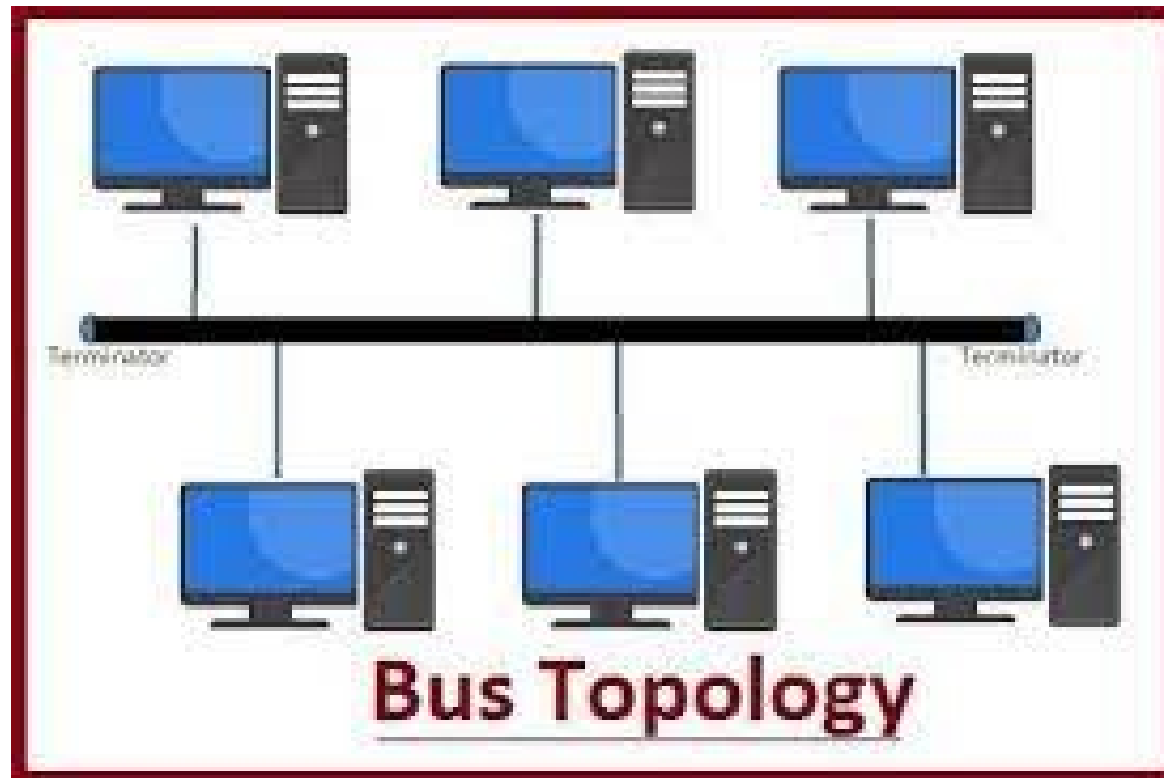


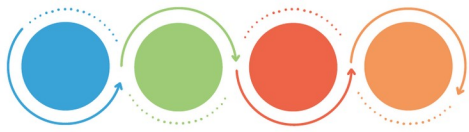
Types of Network topologies

- **Physical** –refers to the actual connections (wires, cables, etc.) of how the network is arranged.
- Setup, maintenance, and provisioning tasks require insight into the physical network.
- **Logical** –is a higher-level *idea* of how the network is set up, including which nodes connect to each other and in which ways, as well as how data is transmitted through the network.
- Logical network topology includes any virtual and cloud resources.



- **Bus network.** In the bus network topology, every node is connected in series along a single cable.



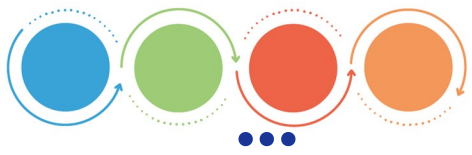


▪ **Pros:**

- Easy installation
- Fewer cables required than Mesh and star topology
- Good for small businesses
- Low cost
- Easy to manage and expand

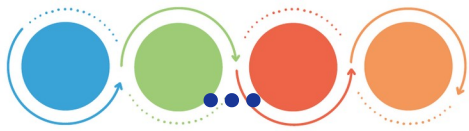
▪ **Cons:**

- Backbone performance is critical
- Easily congested on busy periods
- Efficiency decreases rapidly with each added node
- Data can only travel in one direction at any point in time
- Single point of failure. If the cable fails then the entire network will go down.



- **Star network.** In this topology, a central device connects to all other nodes through a central hub.



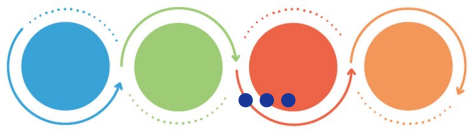


▪ **Pros:**

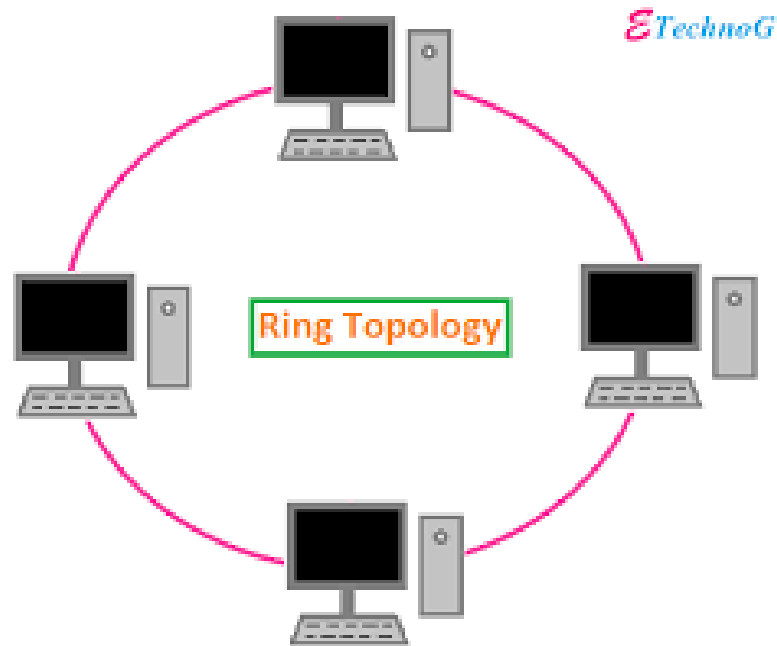
- Easy to manage from one point – the switch
- Easy to add and remove nodes
- Durable
- Low cable usage
- Good for small businesses

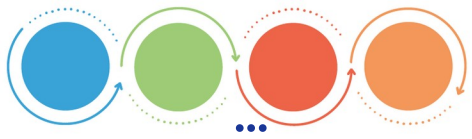
▪ **Cons:**

- Requires specialist network hardware (the switch)
- Makes the network reliant on the switch's performance
- A finite number of switch ports limits the network's size



- **Ring network.** In the ring network topology, the nodes are connected in a closed-loop configuration.
- Some rings pass data in one direction only, while others are capable of transmission in both directions.
- These bidirectional ring networks are more resilient than bus networks since traffic can reach a node by moving in either direction.



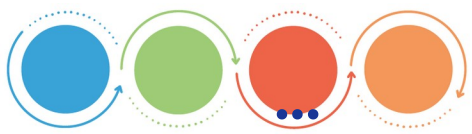


▪ **Pros:**

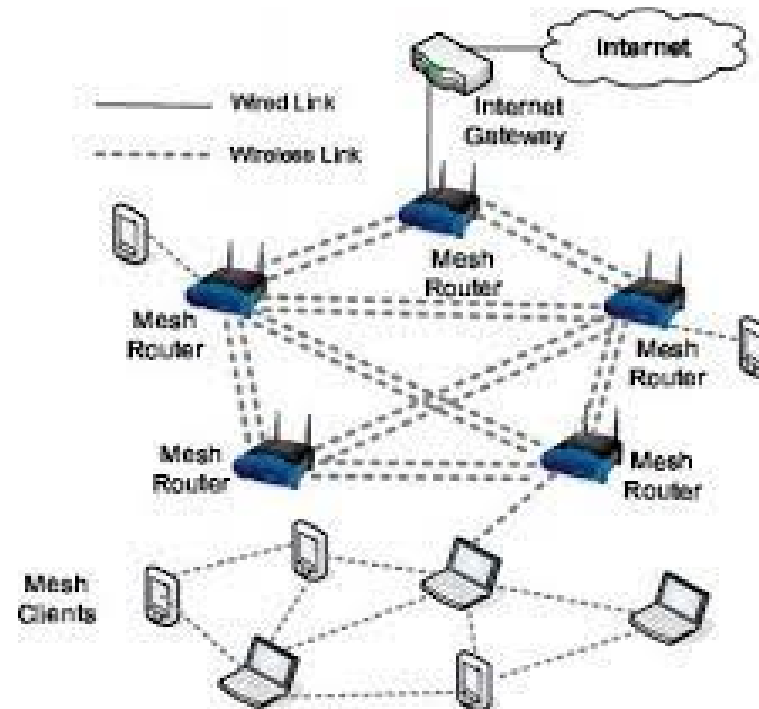
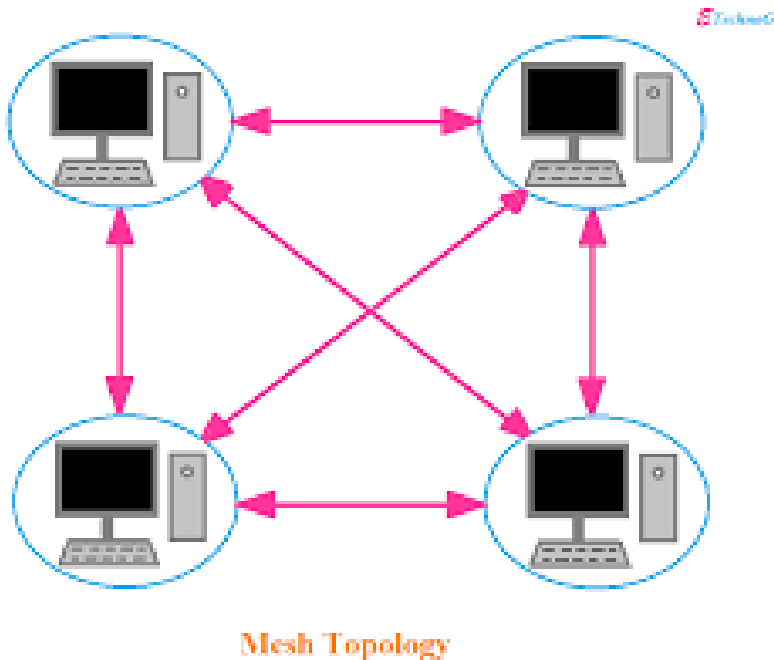
- Low incidence of collision
- Low cost
- Suitable for small businesses
- Dual ring option provides continuity through redundancy

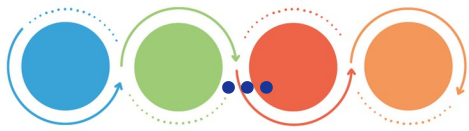
▪ **Cons:**

- One faulty node will bring the entire network down
- Requires extensive preventative maintenance and monitoring
- Performance declines rapidly with each additional node
- Reorganizing the network requires a full system shutdown



- **Mesh Topology** Each node is connected to every other node with a direct link.
- This topology creates a very reliable network, but requires a large amount of cable and is difficult to administer.
- Wifi networks make this topology more feasible.





▪ **Pros:**

- High speeds data transfers
- Durable network that isn't dependent on any one node
- Very secure
- Suitable for high-value networks for small to middle-sized networks
- Easy to identify faulty equipment

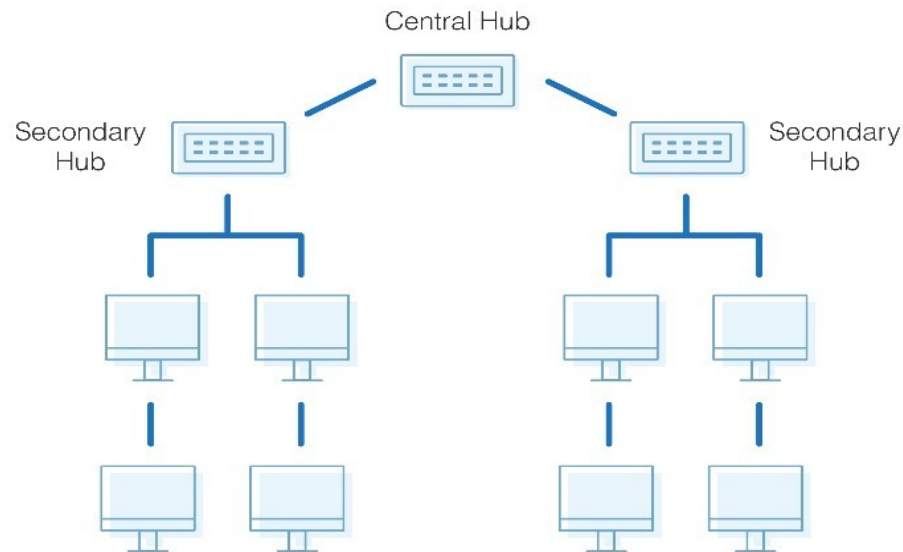
▪ **Cons:**

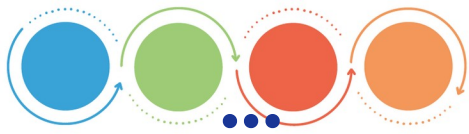
- Requires a very large amount of cable
- Can be difficult to secrete all the cable
- Takes a long time to set up
- Requires meticulous planning
- There is a limit to the number of cables each computer can accommodate

Tree topology

- The tree topology structure gets its name from how the central node functions as a sort of trunk for the network, with nodes extending outward in a hierarchical fashion.

Tree Topology





▪ **Pros:**

- Blends bus and star topologies
- Easy to manage
- Easy to expand
- Suitable for middle-sized businesses

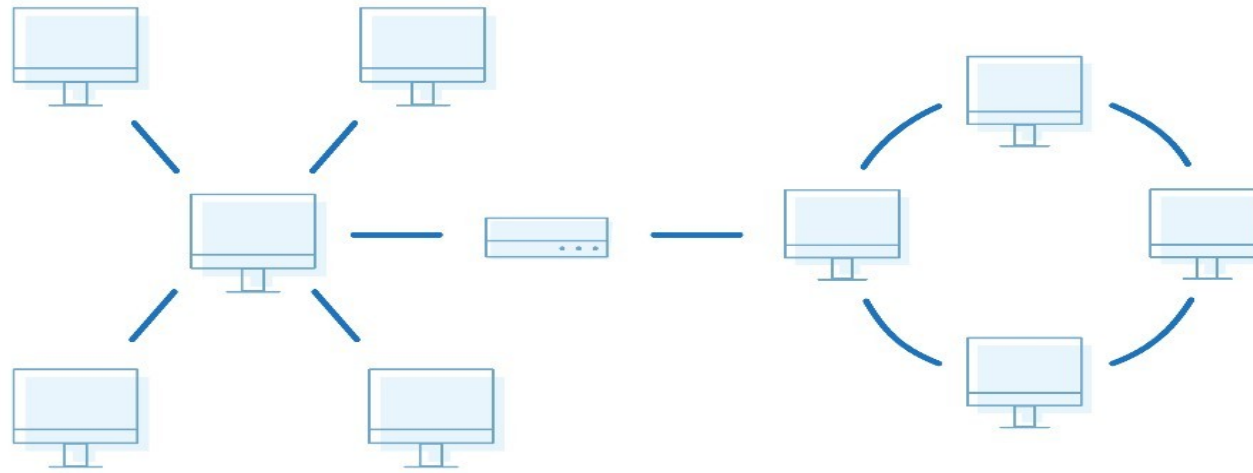
▪ **Cons:**

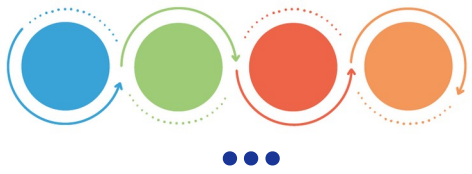
- The network is dependent on the health of the root node
- Requires networking expertise
- Involves a lot of cable
- Larger implementations require monitoring software
- Can get expensive

Hybrid topology

- Hybrid topologies combine two or more different topology structures

Hybrid Topology





▪ **Pros:**

- Very flexible
- Suitable for middle-sized and large organizations
- Infinitely extendible
- Adaptable to optimize equipment use

▪ **Cons:**

- Requires professional management
- Needs monitoring software
- Equipment costs are high



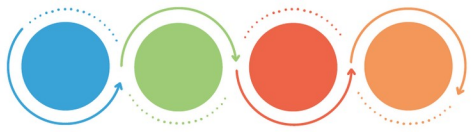
Network Mapping software

- Datadog live network mapping
- Draw.io
- Edraw
- Lucidchart
- ManageEngine OpManager network mapping
- Microsoft Visio
- NetTerrain Logical
- SolarWinds Network Topology Mapper
- Spiceworks network mapping
- etc



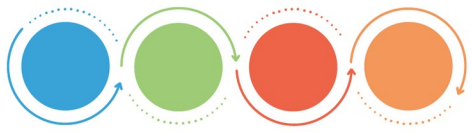
Choosing a network topology

- There is a range of factors that you need to take into account when choosing which topology to use.
- Before choosing a topology you'll want to closely consider the following:
 - Length of cable needed
 - Cable type
 - Cost
 - Scalability



Group Project

- In your groups, Imagine you are the head of ICT in your school and you are expected to set up a school network to accommodate 80 computers. Identify a suitable topology and any tool of your choice.
- Draw a network topology map for your school network
- Design a network of your school using any virtual tool of your choice.
- *Presentations will on 7 and 9 October 2024 during the test week*



End of presentation