Topology is the blueprint of how a network communicates with different devices. This communication could be wired or wireless.

Wired communication or topology has multiple layouts such as Star Topology, Ring Topology, Bus Topology, and Mesh Topology. Whereas wireless topology are infrastructure, ad hoc, and wireless mesh topology

*Table 1: Wired Topology (What is Network Topology? Best Guide to Types & Diagrams, 2019)*

|  |  |  |  |
| --- | --- | --- | --- |
| **Topology** | **Layout** | **Advantage** | **Disadvantage** |
| Star Topology | * Most common network topology * Consists of devices connected to a central wiring point such as hub or switch | * Functions as a repeater, which helps prevent data loss * Stable and secure – each device is connected independently to the central point; hence it does not affect other devices in case of failure * Simple and straightforward | * If the central point fails, also called single point of failure, then all devices are affected * Overall bandwidth and performance of the network is limited by the central node’s configuration and technical specifications * Expensive to set up and operate |
| Ring Topology | * Network connection in a loop * Each device has exactly two neighbors * Data can travel through the loop in one or both direction | * When data is transmitted, packets also travel along the loop * Repeaters can be used to ensure packets arrive correctly and without data loss * Reduce risk of packet collision; hence efficient at transmitting data without errors * Cost-effective and inexpensive * Easy to troubleshoot | * Failure in connection can affect the whole network * Scalability – all devices on network share bandwidth; hence, addition of more devices can contribute to communication delays * Inconvenient and costly – entire network must be taken offline to reconfigure |
| Bus Topology | * All devices on a network are connected along a single cable running in a single direction from one end of the network to the other * Also called “line topology” or backbone topology” * Data flow follows route of cable | * Good, cost-effective for smaller network * Can add more nodes easily by joining additional cables | * Vulnerable – failure in wiring affects the whole network * Not ideal for networks with huge traffic |
| Mesh Topology | * Devices in the network are interconnected * Two methods of data transmission – routing (use of logic to determine the shortest distance from the source to destination) and flooding (information is sent to all nodes within the network) | * Handles failure very well * Reliable and stable – complex degree of interconnectivity makes network resistant to failure | * Labor-intensive * Time-consuming to set up * Can be costly |

*Table 2: Wireless Topology*

|  |  |  |  |
| --- | --- | --- | --- |
| **Topology** | **Layout** | **Advantages** | **Disadvantages** |
| Infrastructure (iPoint, 2011) | * Uses a combination of wired and wireless devices * Similar to Star Topology * Commonly used to extend a wired LAN to include wireless devices through a base station known as an access point (AP) or wireless access point (WAP) * Example: Wi-Fi connection set up in a single home | * Convenience, mobility, and productivity – allow users to access network resources at any convenient location * Deployment, expandability, and cost – can serve a suddenly-increased number of users with the existing equipment | * Failure in AP or WAP can affect whole network * Security may be compromised * Range – may be insufficient in larger structure, or requires additional AP * Reliability – subject to interference * Speed – typically slower than wired networks * Can be costly to satisfy larger structure |
| Ad Hoc (Wood, 2019) (Mitchell, 2020) | * Devices communicate directly between each other without an access point * Commonly used to connect a small number of computers or wireless devices * Each device is responsible for its own security * Example: Hotspot from mobile device to a laptop | * Router free * Mobility – can be created on the fly in nearly any situations * Speed – can be created from scratch with little settings changes and no additional software or hardware requirement | * Security * No signal strength monitoring which can lead to difficulty in maintaining a stable connection * Speed – typically slower than infrastructure mode |
| Wireless Mesh (Gordon, 2020) | * Similar to wired mesh topology * Devices are interconnected wirelessly * Example: Google Nest Wifi, Netgear Orbi | * Resistant to problems – failure in one AP is neglectable because other APs will reroute the data * Easy scalability – doesn’t require additional routers * Easy to add range * Network can self-optimize and find the fastest route to transmit data | * Increased workload for each node – each node must transmit data as well as act as a router (acting like an endpoint and a route) * Initial network setup can be complicated * Low power network can have latency issues * Increased power consumption for each node |

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