Introduction to Networks

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1 What's a Network?

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What's a Network?

A **network** is two or more computer systems linked together by some form of the transmission medium that enables them to share information

What's a Network?

Provides services like:

- Access to shared files/folders
- Access to printers/scanners
- Email applications
- Database applications
- Web applications
- Voice over IP (VoIP)
- Multimedia conferencing
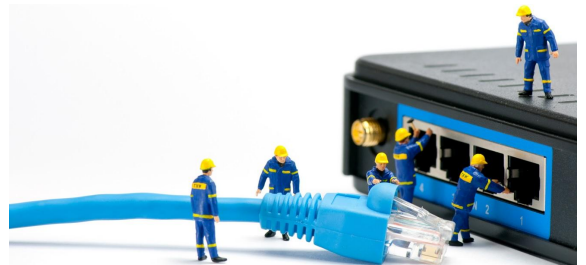
What's a Network?

Features of Computer Network

- **Performance** → Response time
- **Data Sharing**
- **Backup**
- **Reliability** → No failures!
- **Security** → Keep data safe!
- **Scalability** → New systems can be added
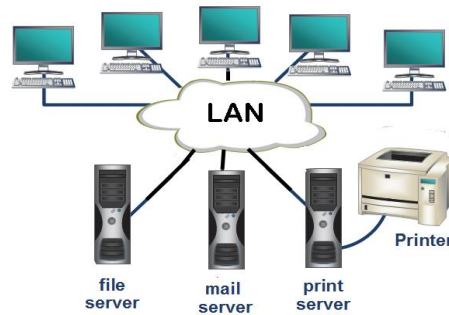- **Software and hardware compatibility**

2 Local Area Network (LAN)

Local Area Network (LAN)

A LAN is a **local** network

- Could be as small as two computers or large, with thousands of devices connected
- Usually restricted to spanning a particular geographic location

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A company in a single building is considered as LAN

True   False

A company consisting of multiple buildings in the same area is considered as LAN
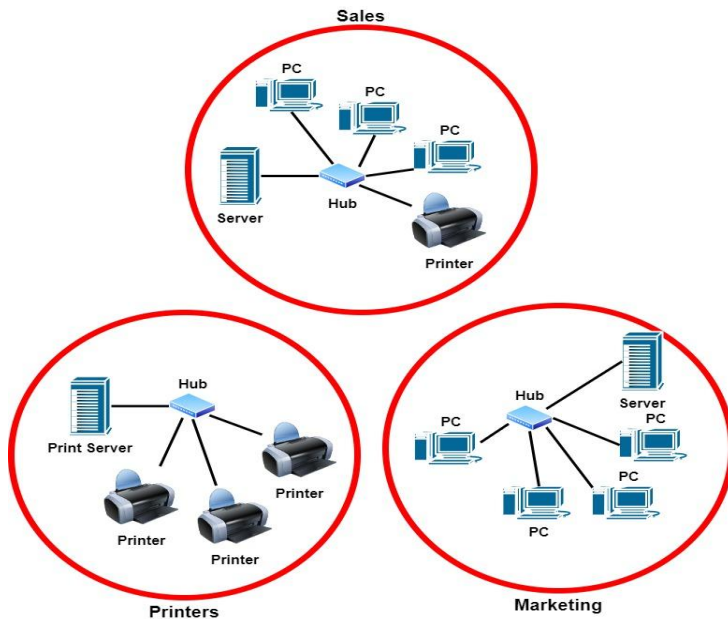
True

False

Local Area Network (LAN)

LAN's size and the distance a LAN can span is not restricted

But it's best to split a big LAN into smaller logical zones known as **workgroups** to make administration easier
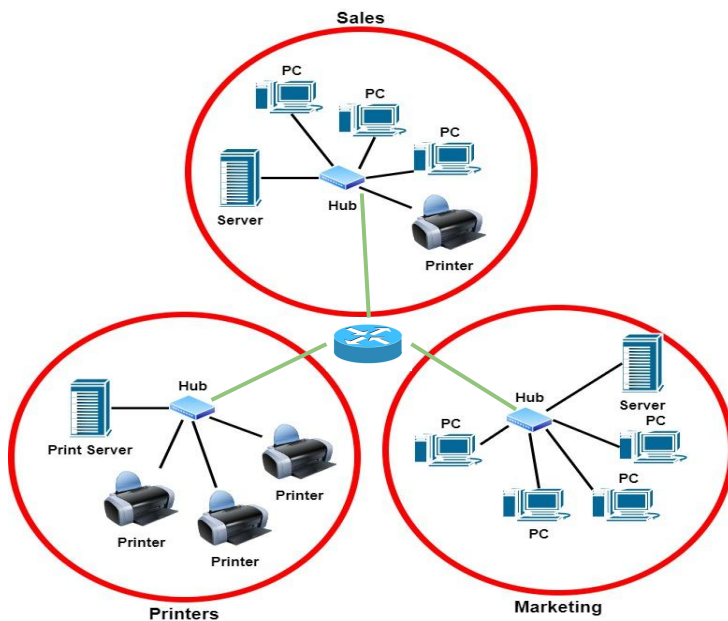
Local Area Network (LAN)

3 LANs, each has its own workgroup

Local Area Network (LAN)

A LAN with 3 workgroups

3

Common Network Components

Common Network Components

- **Node** ⟶ - A point or joint where a connection takes place
  - Can be a computer or device

- **Station** ⟶ A node on a wireless network

- PC	- Printer
- Laptop	- Router
- Server	- Switch
- Smartphone	- etc.

Some examples of Node

Common Network Components

- **Host** ➡️
  - Requires IP Address
  - Can be a client or server

- **Workstation** ➡️
  - Powerful computer designed for technical or scientific applications
  - Used by one person at a time

Common Network Components

- **Server** ➡️ A powerful computer used to store files and run programs centrally

- **Client** ➡️ A device that makes request from a server

|	
- Web Server	- Application Server
- Proxy Server	- DNS Server
- Mail Server	- File Server
- Print Server	- Telephony Server

Common types of servers

Common Network Components

- **Segment** ⟶ - Refers to a specific physical region of a network
  - Typical usage is to describe the link between a computer and a switch
  - Another usage is to refer to a region of the network where all the nodes use the same type of transmission media

- **Backbone** ⟶ A fast link between other segments of a network

Common Network Components

- **Transmission Media** ⟶ - A communication channel between **nodes** that carries the information from the sender to the receiver
  - Data is transmitted through the electromagnetic signals
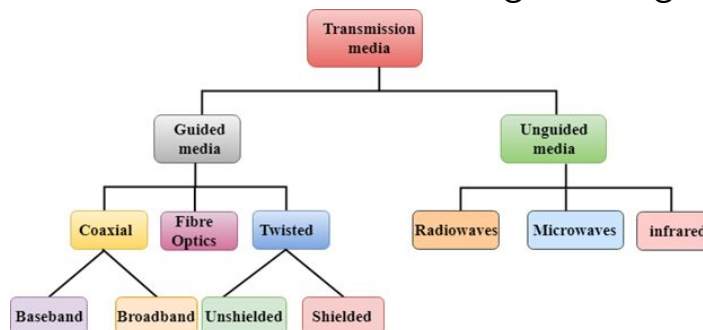
4 Wide Area Network (WAN)

Wide Area Network (WAN)

A **WAN** is a collection of computers and devices connected by a communications network over a wide geographic area

WANs are commonly connected either through the Internet or special arrangements made with phone companies or other service providers

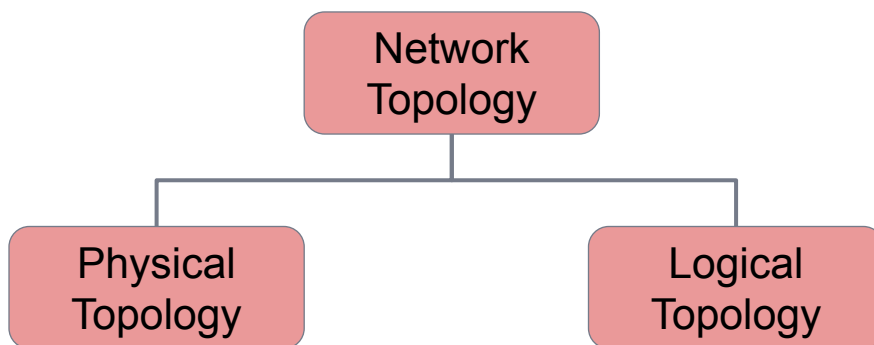The **Internet** is considered the **largest WAN** in the world

Network Topology

Network Topology

Network topology is the description of the arrangement of **nodes** and **connections** in a network
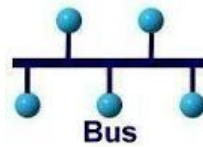
```
                    Network
                    Topology
                       |
        ┌──────────────┴──────────────┐
    Physical                       Logical
    Topology                       Topology
```

Network Topology

A **physical topology** details how devices are physically connected

Depends on:
- Office layout
- Troubleshooting techniques
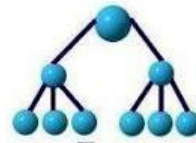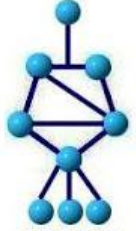- Cost of installation
- Type of cable used
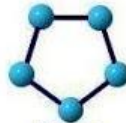
Network Topology

Logical topology describes the way in which a network transmits information from network/computer to another

It's not the way the network looks or how it is laid out

6 ▸ Physical Network Topologies
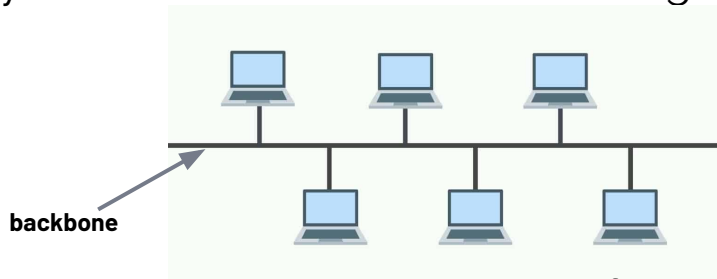
Bus Topology   Star Topology
Ring Topology   Mesh Topology
Tree Topology   Hybrid Topology

Physical Network Topologies

Bus Topology:

Every node is connected in series along a linear path

backbone

✅ Keeps the layout simple

✅ Cost effective

❌ If backbone fails entire network goes down

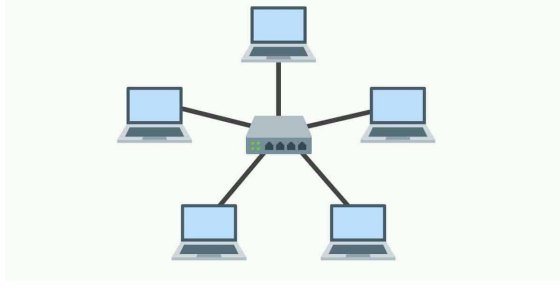❌ Decreased network performance

❌ Not scalable

Physical Network Topologies

Star Topology:

Every node in the network is connected to one central switch

✅ Easy to manage

✅ Requires fewer cables

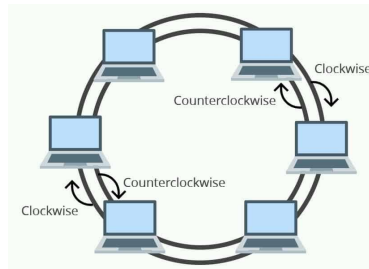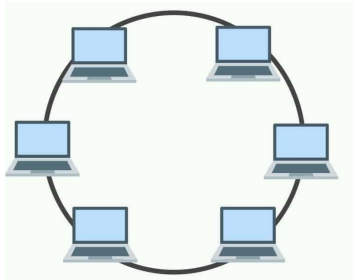❌ If central switch fails entire network goes down

❌ Performance is up to central switch

Physical Network Topologies

Ring Topology:

Every node is connected to each other in a circular format.

✅ Low risk of packet collision

✅ Easy to install

❌ Vulnerable to failure

❌ The more devices added the more communication delay
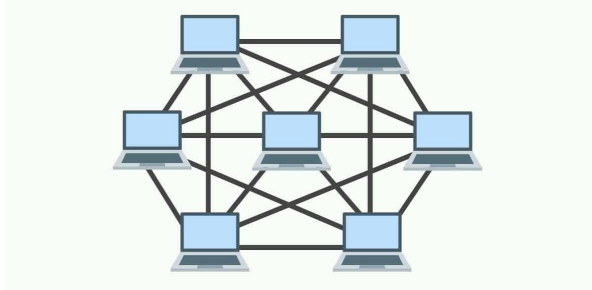
❌ To make changes the network should be shut down

Physical Network Topologies

Mesh Topology:

A point-to-point connection where nodes are interconnected

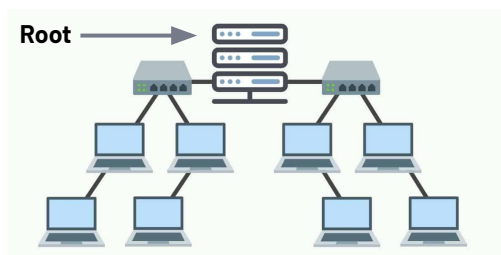

✅ Reliable

❌ Configuration is complex

❌ Expensive

Physical Network Topologies

Tree (Hierarchy) Topology:

A network structure that is shaped like a tree with its many branches

Root →

✅ Scalable

✅ Manageable

❌ Hard to maintain
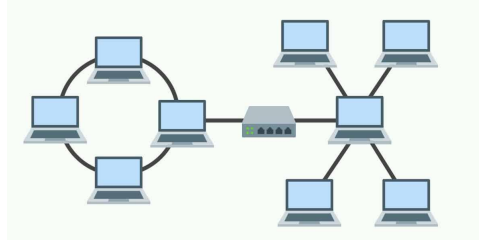
❌ If root fails entire network goes down

Physical Network Topologies

Hybrid Topology:

A combination of two or more types of physical or logical network topologies working together within the same network

✅ Flexibility

❌ Quite complex

❌ Can be quite costly

THANKS!

Any questions?

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