

# **Introduction to Networks, Protocols and Network Reference Models**

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## Globally connected



"A picture of the earth in a space station. Network networking networked, computer communication." by pixabay.com is in the Public Domain, CC0

Allows for a world without boundaries

Transform the way we work, learn and perform daily tasks



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## What is a network?

- A network is the connection of at least two computer systems, either through cables or wireless links.
- It includes various devices to allow for resource sharing and sharing of information.
- End devices or systems in today's networks encompass a wide range of devices, including computers, servers, telephones, cell phones, and industry-automation machines.
- Networks exist everywhere, from local setups like home offices and branch offices to global networks like the Internet.

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## **Overview of Network components**

A network infrastructure is composed of three broad categories.

- Devices (End-devices and Intermediary Network devices)
- Media (Wired and Wireless)
- Services

# Benefits of Networks

## 1. Efficient Information Sharing:

- Networks allow efficient sharing of information among individuals, organizations, and countries.
- Applications include traditional file sharing, multimedia (voice, video), and more.

## 2. Economies of Scale:

- Increased productivity and cost reduction due to shared resources.

## 3. Global Accessibility:

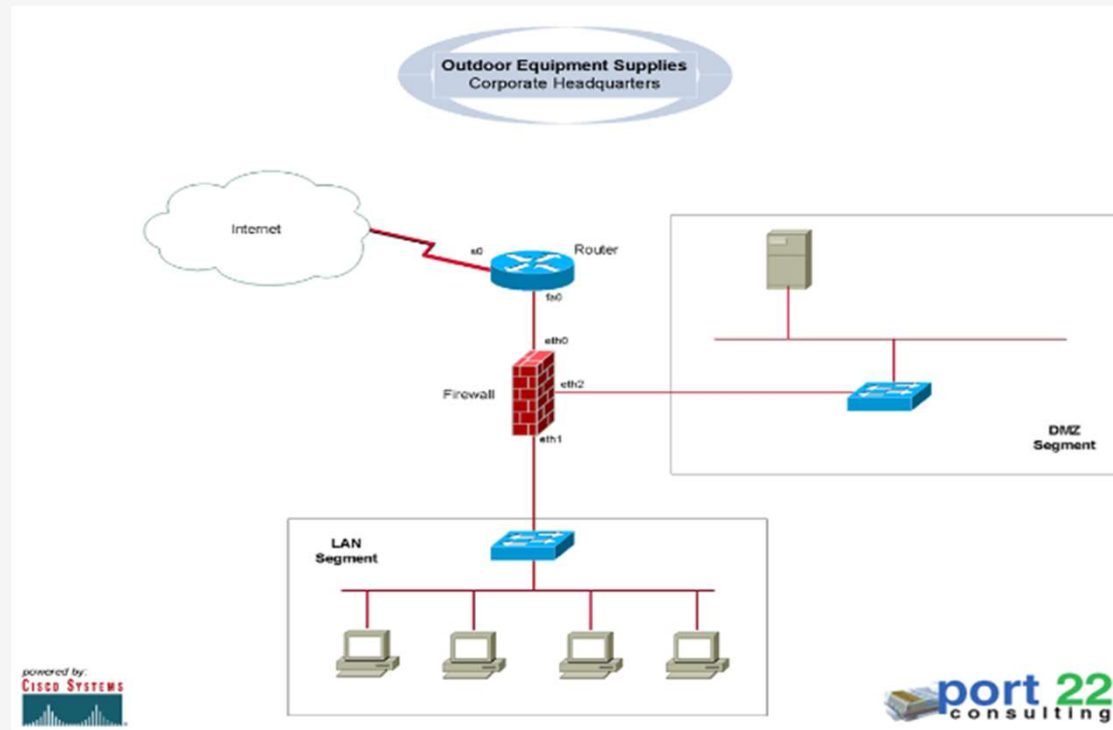
- Physical location is no longer critical.

## 4. Resource Centralization:

- Resources (e.g., cameras, printers, network storage) can be centralized to avoid duplication.
- Backup devices on the network reduce local backups on individual machines.

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# Simple network topology



"Network Diagram - Corporate Office" by Chris Meller is licensed under CC BY 2.0

# The internet

## 1. Internet Overview:

- The Internet comprises interconnected LANs and WANs.

## 2. LANs and WANs:

- LANs connect computers within a limited area.
- WANs connect LANs across larger geographic regions. WANs use copper wires, fiber optic cables, and wireless transmissions.

## 3. Ownership and Structure:

- The Internet is not owned by any individual or group.
- Multiple groups maintain the structure of the internet

# Topologies

## Bus Topology

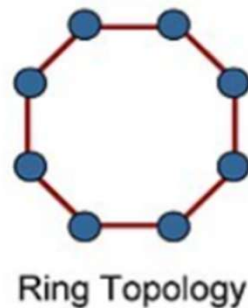
In a physical bus topology, machines are effectively connected to a single cable. This is typically using coaxial cable.



## Ring Topology

All devices are connected to each other in the form of a loop or ring with different cables used.

Failure of one machine will affect the ring completely, representing a single point of failure, therefore a dual ring would provide for more redundancy and availability.

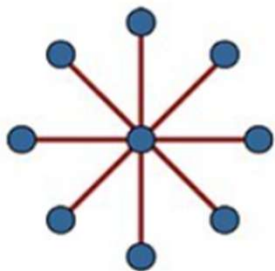


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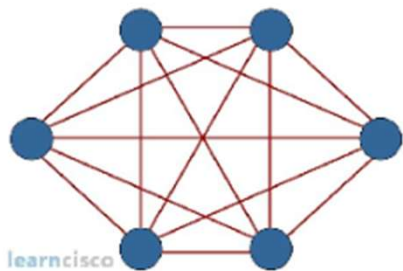
# Topologies

## Star Topology

Uses a central device to connect all other devices such as a switch. Improves reliability because the failure of one link would only affect that machine. However, failure of the switch would represent a single point of failure, therefore some redundancy mechanisms need to be used.



Star Topology



Mesh Topology

## Mesh Topology

All devices are connected to one another, resulting in the highest levels of redundancy and fault tolerance. This is expensive to implement though, and it is typically seen in WAN environments in connectivity between branch offices and central locations. There is no single point of failure, but it will still be sometimes too expensive to implement, and that is why there are other options that include partial mesh.