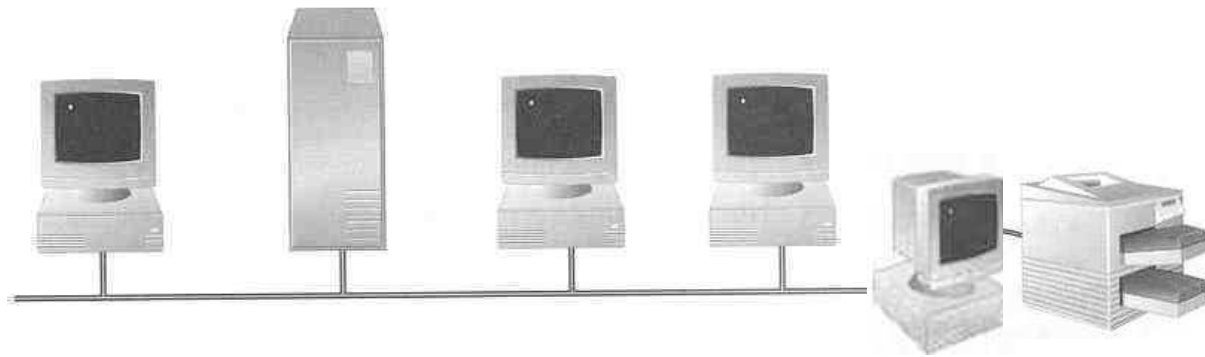Peer-to-peer

Server-based

Introduction to Networking
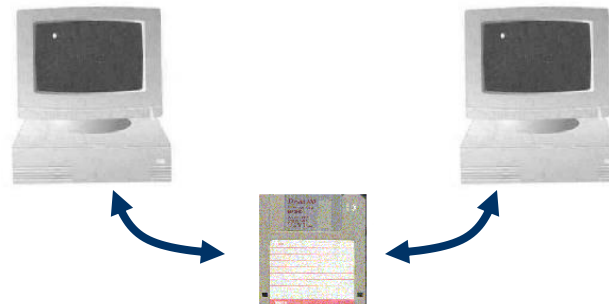
What is a Network?

A **network** consists of 2 or more computers **connected** together, and they can **communicate** and **share** resources (e.g. information)
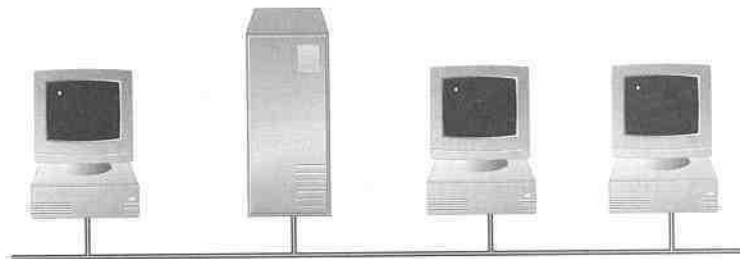
Why Networking?

- **Sharing information — i.e. <u>data communication</u>**
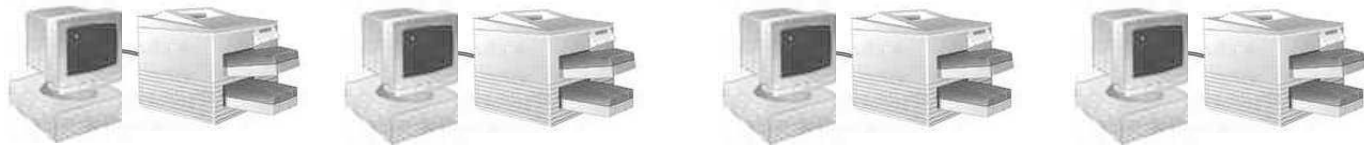
  - **Do you prefer these?**
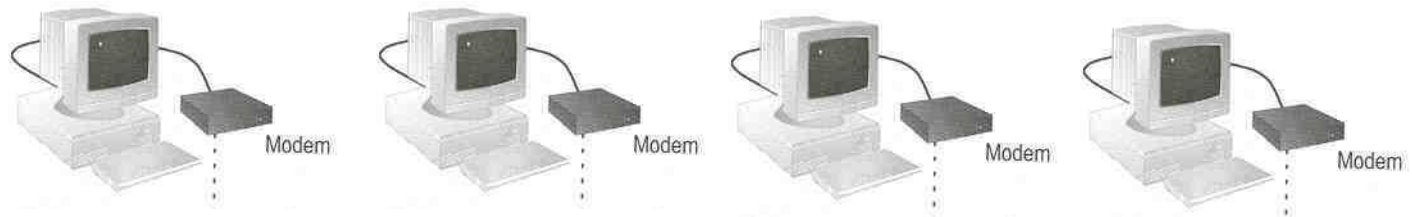
  - **Or this?**

- **Sharing hardware or software**

  - **E.g. print document**

- **Centralize administration and support**
  - **E.g. Internet-based, so everyone can access the same administrative or support application from their PCs**

How many kinds of Networks?

- **Depending on one's perspective, we can classify networks in different ways**

    - **Based on transmission media: Wired (UTP, coaxial cables, fiber-optic cables) and Wireless**

    - **Based on network size: LAN and WAN (and MAN)**

    - **Based on management method: Peer-to-peer and Client/Server**

    - **Based on topology (connectivity): Bus, Star, Ring …**

        :

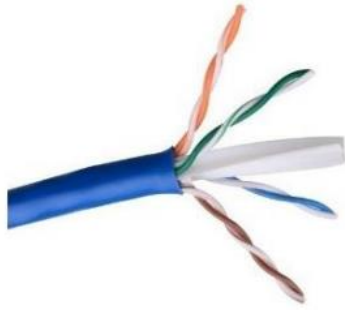   :

Transmission Media

- **Two main categories:**
  - **Guided** — wires, cables
  - **Unguided** — wireless transmission, e.g. radio, microwave, infrared, sound, sonar
- **We will concentrate on guided media here:**
  - **Twisted-Pair cables:**
    - **Unshielded Twisted-Pair (UTP) cables**
    - **Shielded Twisted-Pair (STP) cables**
  - **Coaxial cables**
  - **Fiber-optic cables**

Coaxial Cable Design

Outer Jacket

Braided Copper Shielding

Copper Conductor

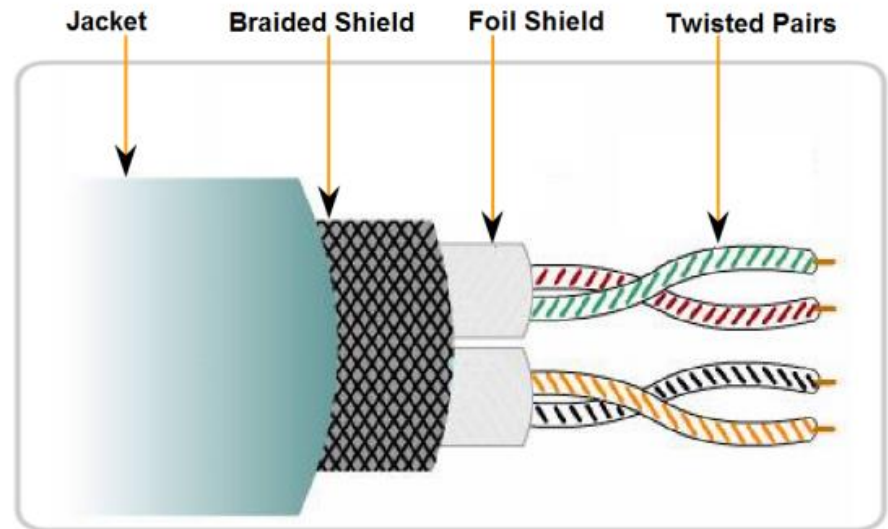Plastic Insulation
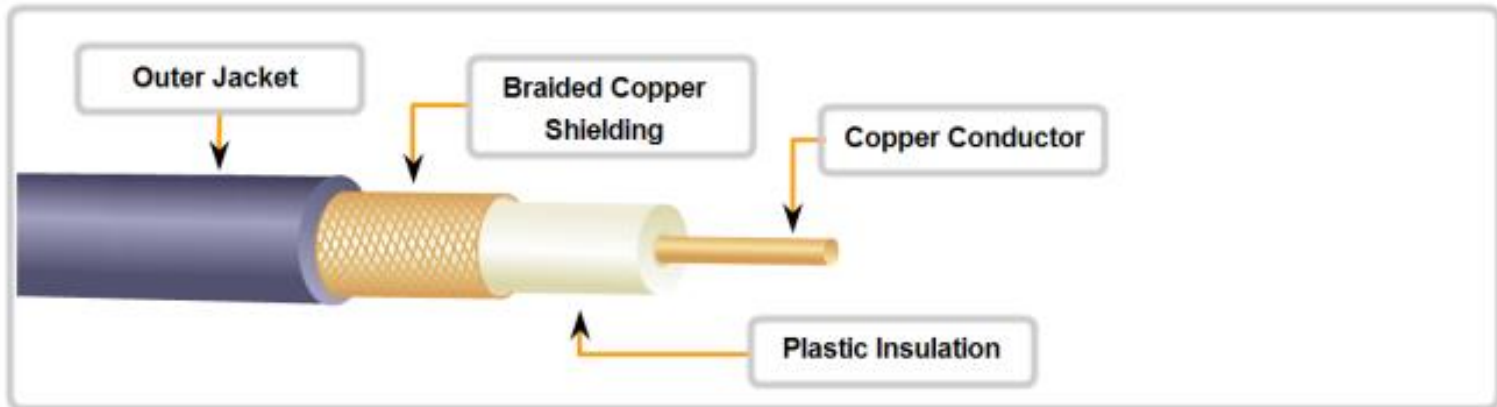
Coaxial Connectors

BNC

N type

F type

The connector used on a UTP cable is called as RJ-45 (Registered Jack 45) connector. Below picture shows an RJ45 jack:

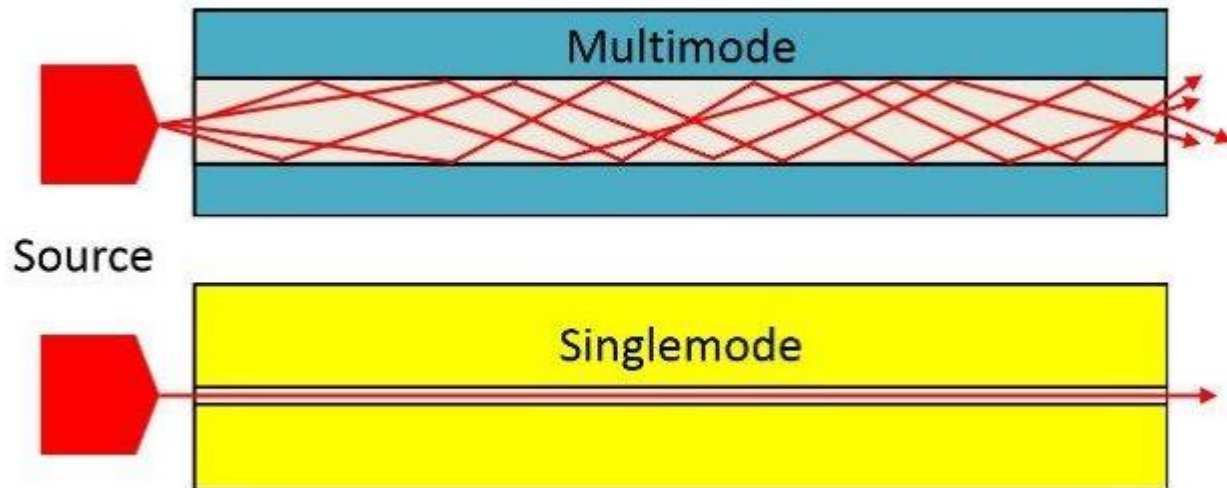## Shielded Twisted-Pair (STP) Cable

Jacket   Braided Shield   Foil Shield   Twisted Pairs

Optical Fiber Cabling:

LAN and WAN

- **Local Area Network (LAN)**
  - **Small network, short distance**
    - **A room, a floor, a building**
    - **Limited by no. of computers and distance covered**
    - **Usually one kind of technology throughout the LAN**
    - **Serve a department within an organization**
  - **Examples:**
    - **Network inside the Student Computer Room**
    - **Network inside your home**

- **Wide Area Network (WAN)**
  - **A network that uses long-range telecommunication links to connect 2 or more LANs/computers housed in different places far apart.**
    - **Towns, states, countries**
  - **Examples:**
    - **Internet**

Your home

WAN

USA

Student Computer Center
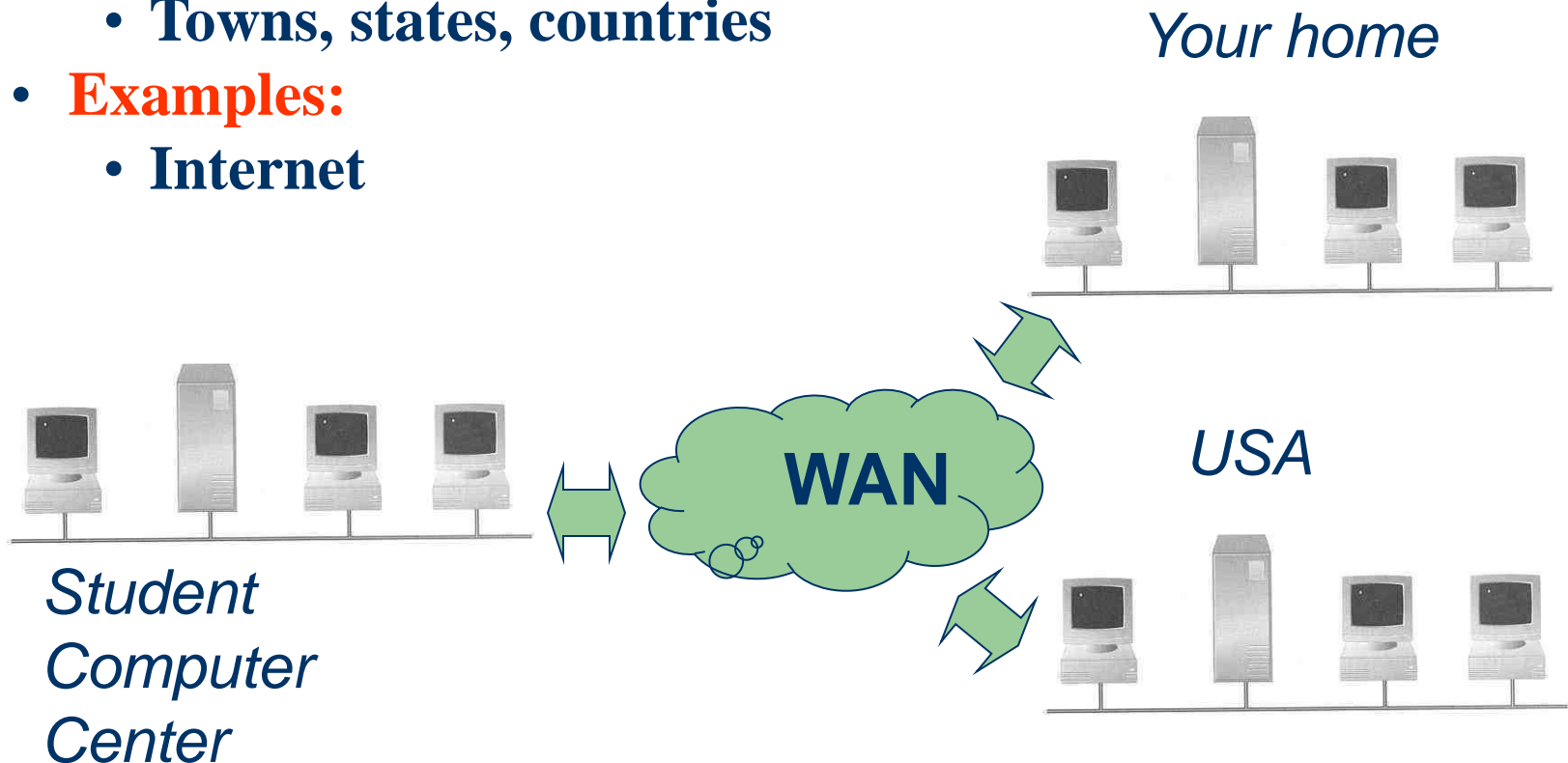
- ***Metropolitan Area Network (MAN)***
- is a large computer network that usually spans a city or a large campus
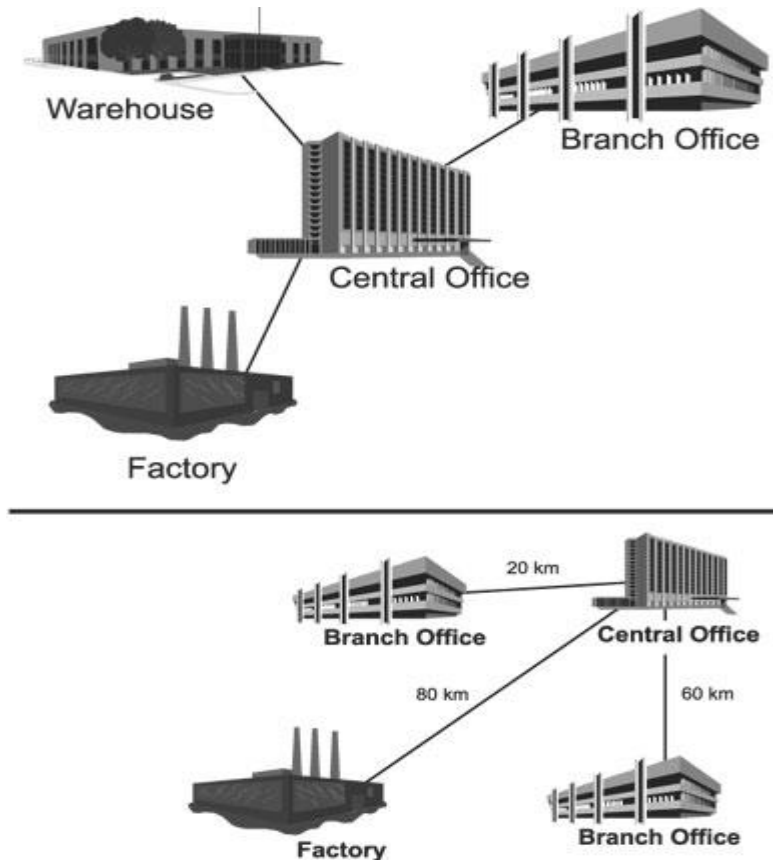
Peer-to-Peer Networks

- **Peer-to-peer network is also called workgroup**
- **No hierarchy among computers ⇒ all are equal**
- **No administrator responsible for the network**

Peer-to-peer

- **Advantages** of peer-to-peer networks:
    - **Low cost**
    - **Simple to configure**
    - **User has full accessibility of the computer**

- **Disadvantages** of peer-to-peer networks:
    - **May have duplication in resources**
    - **Difficult to uphold security policy**

- **Where peer-to-peer network is appropriate:**
    - **10 or less users**
    - **No specialized services required**
    - **Security is not an issue**

Clients and Servers

- **Network Clients (Workstation)**
  - Computers that request network resources or services
- **Network Servers**
  - Computers that manage and provide network resources and services to clients
    - Usually have more processing power, memory and hard disk space than clients
    - Run Network Operating System that can manage not only data, but also users, groups, security, and applications on the network
    - Servers often have a more stringent requirement on its performance and reliability

- **Advantages of client/server networks**
  - **Facilitate resource sharing – centrally administrate and control**
  - **Facilitate system backup**
  - **Enhance security – only administrator can have access to Server**
  - **Support more users – difficult to achieve with peer-to-peer networks**
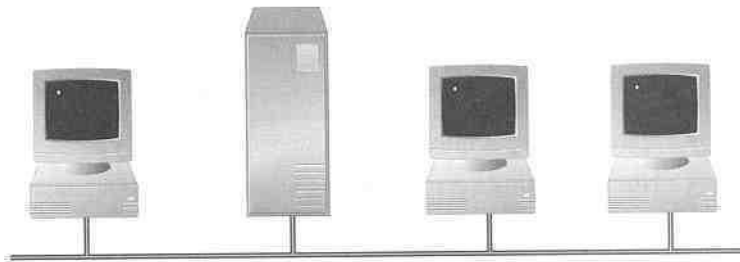
- **Disadvantages of client/server networks**
  - **High cost for Servers**
  - **Need expert to configure the network**
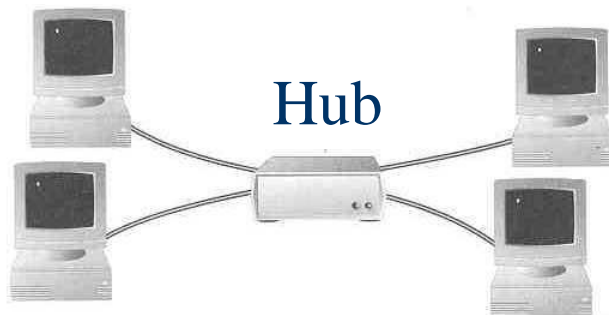 - **Introduce a single point of failure to the system**

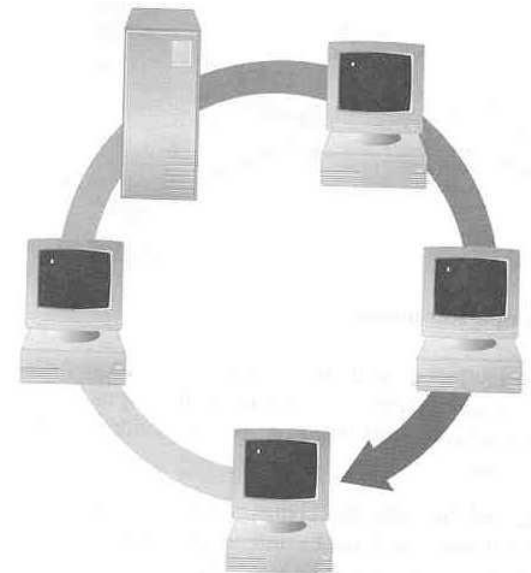# Topology — 3 basic types

- **How so many computers are connected together?**

Bus Topology

Ring Topology

Star Topology
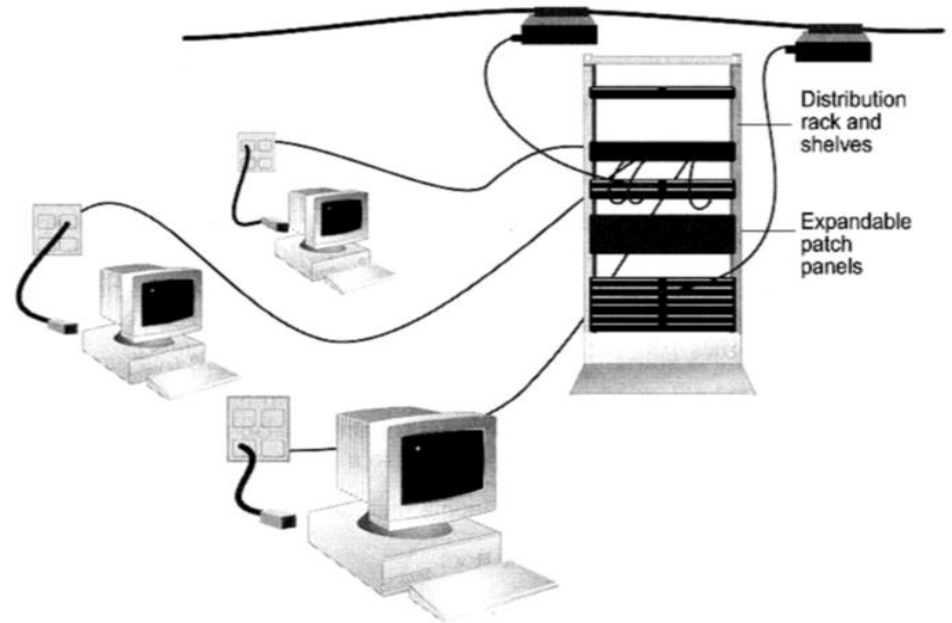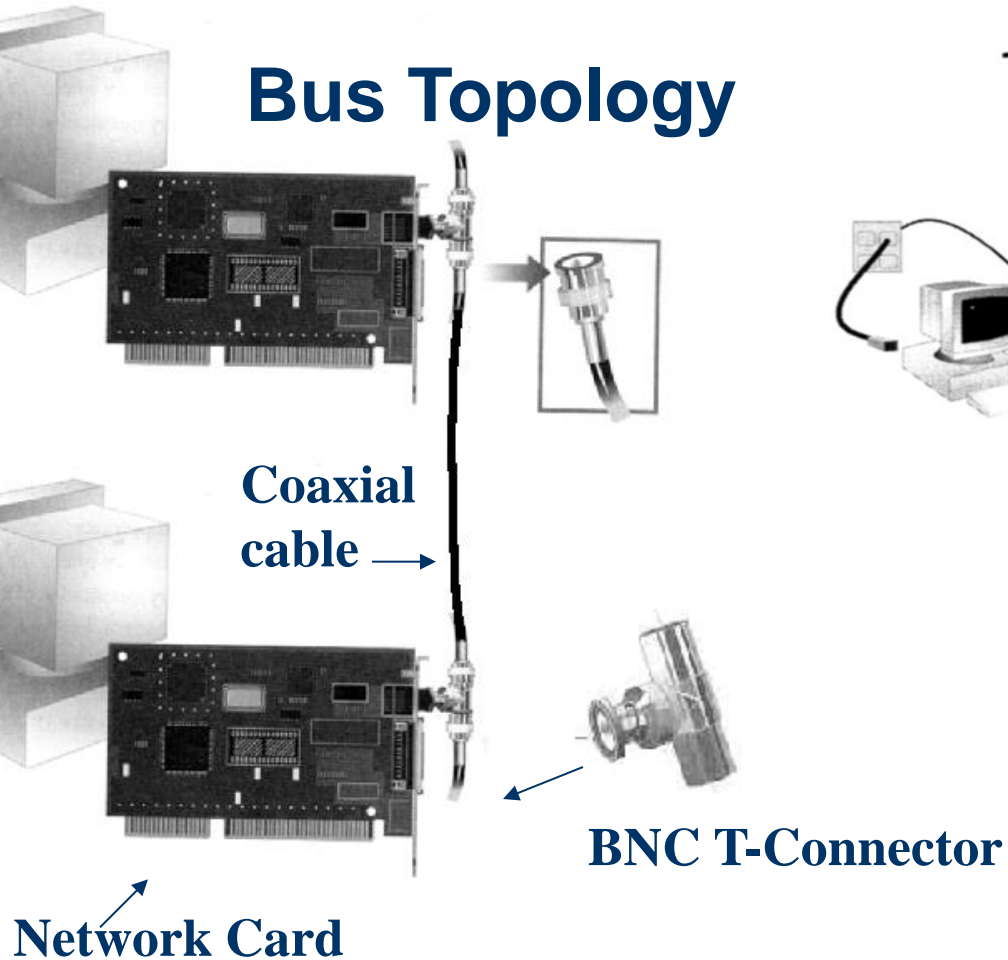
Hub

- **Bus Topology**
  - **Simple and low-cost**
  - **A single cable called a trunk (backbone, segment)**
  - **Only one computer can send messages at a time**
  - **Passive topology - computer only listen for, not regenerate data**

- **Star Topology**
  - **Each computer has a cable connected to a single point**
  - **More cabling, hence higher cost**
  - **All signals transmission through the hub; if down, entire network down**
  - **Depending on the intelligence of hub, two or more computers may send message at the same time**

How to construct a network with Bus / Star Topology?

Bus Topology

Coaxial cable →

Network Card

BNC T-Connector

Star Topology

Distribution rack and shelves

Expandable patch panels

- **Ring Topology**
  - **Every computer serves as a repeater to boost signals**
  - **Typical way to send data:**
    - **Token passing**
      - **only the computer who gets the token can send data**
  - **Disadvantages**
    - **Difficult to add computers**
    - **More expensive**
    - **If one computer fails, whole network fails**