What Is Networking?
- **Networks** are simply a group of computers connected by cable or other media so they can share information.
- Networks made sharing data much easier and more efficient for users.

Before Networking
- Data is copied to a floppy disk and carried to another computer, this is the only option for sharing data.

After Networked
- When companies combine specialized software with a computer network, they can track and utilize information to help make the business run smoothly.
- Users can share information throughout the building, the city, the country, and the world.

After Networked (Continued)
- Through the network, we can share:
  - Printers
  - Fax devices
  - Electronic messages
  - Files and/or documents
  - Modems
  - Data
  - Messages

Network Considerations
- **Sharing files** -- It is useful only if everyone is working with the same version of the file.
- **Fault tolerance** -- There needs to be an effective system of backing up data.
- **Administration** -- Someone needs to be in charge of sharing resources and managing security.
Network Components

- **Server**: Powerful computer that provides services to the other computers on the network.
- **Client**: Computer that uses the services that a server provides. The client is usually less powerful than the server.
- **Peer**: A computer that acts as both a client and a server.
- **Media**: Physical connection between the devices on a network.

Resources: Anything available to a client on a network is considered a resource. Printers, data, fax devices, and other networked devices and information are resources.

User: Any person that uses a client to access resources on the network.

Protocol: Protocols are written rules used for communications. They are the languages that computers use to talk to each other over a network.

Components on a Network

Networking Models

- Network models describe how information is processed by the computers on the network.
- There are three basic models of networks.
  - Centralized
  - Collaborated
  - Distributed

Centralized Computing

- Centralized networks gave users the ability to access the mainframe from a remote location.
- Keeps all the data in one location, assuring that everyone is working with the same information.

Advantages
- Ease of backup
  - data is all stored on the server, the servers are the only systems that need to be backed up.
- Security
  - everything is done on the server, terminals do not require a floppy drive -- the chances of the network being infected with a virus are low.
- Low cost
  - the terminals are inexpensive because they require no real processing or storage capability of their own.
Centralized Computing (Continued)

- Disadvantages
  - Slow network access
    - the computing is done by the server, it can be slow.
    - when it comes to variety applications, they will be set up separated and it's no longer efficient to have them operate from the same centralized server.
  - Connectivity can become a large problem on centralized network.
  - Fewer options.

Distributed Computing

- Data storage and processing is done on the local workstation in a distributed network.
- This type of network accommodates users with a variety of needs.

Distributed Computing

- Advantages
  - Quick access
    - Each computer can store and process its own data.
    - Moving these tasks from the server to the workstation allows for quicker access to data.
  - Multiple uses
    - With each workstation handling its own processing of data, users can be doing many types of work simultaneously.

Distributed Computing

- Disadvantages:
  - Virus susceptibility
    - Any user can introduce an infected file, which may quickly spread throughout the network.
  - Backup difficulty
    - If data is spread throughout the network, it can be difficult to back up all needed files
  - File synchronization
    - When files are stored in several locations, making sure all users are working with the same version can be difficult.

Collaborative Computing

- Collaborative computing allows computers to share processing power across a network.

Collaborative Computing

- Advantages
  - Extremely fast
    - this type of network can be faster because users are not limited to the processing power of one system to complete tasks.
  - Multiple uses
    - this type of network is similar to distributed computing in its ability to share resources and data.
Collaborative Computing

- Disadvantages:
  - Susceptible to viruses
  - Difficult to back up
  - File synchronization

Different Network Types

- Peer-to-Peer
- Server-based

Peer-to-Peer Networking

- In a peer-to-peer network, each workstation acts as both a client and a server.
- Data and resources are distributed throughout the network, and each user is responsible for sharing data and resources connected to their system.

A Peer-to-Peer Network

Advantages

- Inexpensive
- Easy setup
- Easy maintenance
  - the peer-to-peer model does not need a powerful dedicated server, it is usually the cheapest type of network to install. All that is needed to connect several individual systems and create a peer-to-peer network are network adapters, cable or other transmission media, and the operating system.

Peer-to-Peer Networking (Continued)

- Disadvantages
  - No central administration
  - Scattered data
  - Difficult-to-locate resources
  - Weak security
    - Share-level security requires a user to know the password for a resource before it can be accessed.
  - Dependent on user training
    - The general rule is to stop using peer-to-peer networking once your total number of clients reaches about ten.
When to use peer-to-peer networking

- current network size
  - If the number of computers is small, peer-to-peer is a good choice.
- Security
  - If a network needs share-level security, then peer-to-peer should be used.

Which operating systems can you use in peer-to-peer networking?

- Windows 95
- Windows for Workgroups
- Windows NT Workstation
- OS/2

Server-Based Networks

- In a server-based network, one computer — usually larger than the clients, which is dedicated to handing out files and/or information to clients.
- The server controls the data, as well as printers and other resources the clients need to access.
- Servers are optimized to hand out information as fast as possible.
- More storage space to contain all the data that needs to be shared to the clients.

Advantages:

- Centralized security
  - only need to create and maintain accounts on the server instead of every workstation, you can assign rights to resources easily.
- User-level security
- Dedicated servers
- Easy accessibility
  - Specific users can be granted access to resources using their account on the server.
- Easy backup
  - the server on the network acts as the central repository for almost all information, only need to perform backups to the server.
- Synchronized files

Disadvantages:

- Dependent on an administrator
  - users no longer maintain their own data and security, an administrator must be involved to maintain the network.
- Expensive server
  - Servers can be expensive when compared to a normal workstation, but they also usually have features to help it handle client requests better.
Server-Based Networks (Continued)

- Having multiple servers
  - File and print servers
  - Application servers
  - Specialized servers

File and Printer Servers

- File and Printer Servers
  - They are mainly used to store data and applications.
  - Administrator only needs to update the files on the server to upgrade an application.
  - No application processing is done on the server; everything is done locally on the client.

Application Servers

- Application servers are almost opposite of file and print servers.
- The client application runs in the client.
- Little information is processed by the client, and everything is done by the server.
- For example:
  - database application

Specialized servers

- Mail servers
- Communications servers

Peer-to-Peer or Server-Based

- Two clues:
  - Requires user-level security, or has more than ten clients, it should be a server-based network.
  - The proposed network does or does not have a central server.

Network Services

- File services
- Print services
- Message services
- Directory services
- Application services
File Services

- File transfer
  - Transferring files electronically is the simplest and most common service on the network.
  - The ability to share files and information across a network allows users to share any information they need and make them more productive than ever.
- File storage and migration
  - Online data is stored information that’s readily available on a server.
  - Offline storage devices provide a low-cost solution to storing data.
  - Near-line data is stored information that’s close enough to let users access it.

File Services (Continued)

- File update synchronization
  - This network service keeps track of different versions of the same file.
- Archiving
  - Archiving is the processes of backing up data in case of a hard disk failure.

Print Services

- Queue-based printing allows a client’s application to spool the print job off to a network server so the application thinks the job has printed and lets the user continue to work.
- Fax services.

Message Services

- Message services allow for e-mails with attachment files.
- Groupware applications that use e-mail as their connection backbone are also becoming popular.

Directory Services

- One of the newest services on the networking scene is directory services let you maintain information about all of the objects in your network.
- The network operating systems that support directory services have predefined methods to share and update this information.

Application Services

- Application services are basically a client/server process.
- The server is providing the application service.
Database Services

- One major consideration of a networked database is the coordination of multiple changes.
- All or part of the databases may also be replicated to other servers on a network to distribute the load.

LAN, MAN, and WAN

- Networks are constantly being connected to each other to form larger internets (not to be confused with the popular Internet).
- An internet is a large network made up of connected smaller networks.
- The sizes of networks are generally categorized into three different groups:
  - local area networks (LAN)
  - metropolitan area networks (MAN)
  - wide area networks (WAN)

Local Area Networks

- LAN characteristics:
  - Small areas, usually in one office or building
  - High speed
  - Most inexpensive equipment
  - Low error rates

Metropolitan Area Networks

- MAN characteristics:
  - Larger area than a LAN — usually a large campus or organization spread over a city-size area
  - Slower than a LAN, but faster than a WAN
  - Expensive equipment
  - Moderate error rates
Wide Area Networks

WAN characteristics:
- Can be as large as worldwide
- Usually much slower than LAN speed
- Highest possible error rate of all three types
- Expensive equipment