

## Network Connectivity

- Network
  - Composed of
    - Communication media
      - Cable
    - Connects
      - Computers
      - Printers
      - Storage devices
      - Network communication equipment
    - Software
      - Client software
      - Network Operating system
        - Enables coordination of network activities and the sharing of resources(printers, files, communication equipment)
        - Server
          - Machine running a NOS which provides resources
            - Files
            - programs
  - Definition
    - A system of computing devices, computing resources, information resources, and communication devices that are linked together by communication cable or radio waves
  - Reasons for a network
    - Share resources
      - Printers
      - Tape drives – archival storage
    - Increase productivity
      - Sharing of files
      - Email
      - Ecommerce
      - Electronic conferencing
    - Save money
      - By reducing amount of resources
        - Printers
        - Software, installed on server not on individual machine
    - Network Operating Systems
      - Novell Netware
        - 1982
      - windows for workgroups
        - 1993

- peer to peer
  - could connect to servers
  - share files, printers, email
- windows 3.1
  - client, could connect to Netware and others
- windows 95
  - advanced peer to peer
  - connect to other type of networks (TCP/IP)
- Windows NT 3.51
  - 1994
  - compete with other NOS
- others
  - UNIX
  - Banyan Vines
  - Pathworks
  - Lan Manager
    - Microsoft, prior to NT
- Basics
  - Topology
    - Physical design of a network and the way in which a data carrying signal travels form point to point
    - Types
      - Bus
        - All machines off same cable
      - Ring
        - Data carrying signal goes from station to station around a ring until it reaches destination
      - Star
        - Hub in middle, all communication go through hub
          - Hubs
            - Passive
              - Just pass signal on
            - Active
              - Signal amplified before it goes on
              - Supports more computers
  - terminology
    - Packet
      - Consists of data, called payload, and communication control information contained in a header containing routing information used by communication devices to forward data on
    - Frame

- Consists of data and communication control information contained in a header containing
- Backbones
  - Segments that join main networks
- Protocol
  - purpose
    - Formatting guidelines for network communications
    - Coordinate network communications
    - Encapsulating data and communication control information
    - Enable communications over a long distance
    - Enable remote users to dial into the computer
  - Transport Protocols
    - Ethernet
      - Only one station can transmit at a time
      - Two transmit – collision
      - Uses
        - CSMA/CD
          - Carrier Sense Multiple Access with collision detection
      - NIC card looks at address encoded in incoming signal, if it contains its address, it will process further
      - If signal is twice the strength, at least two stations transmitted simultaneously
        - Detecting signal sends jam signal
        - All stations wait a given time before transmitting again
          - Wait time form generating a random number
      - Use bus topology or star
    - Token Ring
      - Easily expanded
      - Only one network station transmits at a time
      - Sequence of frame and packet transmission is controlled by a specialized frame called a token

- Transmitting station waits to transmit until it has token
- Sending packet with token included
- Destination station - places frame back on network to go back to sender with bits changed to indicate it was received
- Use ring topology
- Initially 4 Mb, IBM has developed a 100MB
- Communication Protocols
  - IPX
    - Internet Packet Exchange
      - Developed to allow network file server to communicate with client
      - Developed by Novell
        - Adoption of Xerox XNS protocol
      - Encapsulates data and transport within a host transport protocol
      - Connectionless protocol
        - Minimal checking to ensure packet reaches its destination, leaves job to transport protocol
      - SPX – used when reliable communications required
        - Sequence packet exchange
        - Connection oriented communication – database
  - NetBeui
    - 1990's
    - main protocol for LAN Manager
    - used with early versions of NT
    - Network basic input/output system (NetBIOS)
      - Technique to interface software with network services
    - Advantages

- Low use of memory resources
- Quick transport of information on small networks
- Strong error detection and recovery
- Relatively easy configuration in the host operating system
- Disadvantages
  - Not designed to carry routing information
    - Limits use to small systems
    - Cannot be sent to only a portion of segmented network
- TCP/IP
  - Transmission Control Protocol/Internet Control
    - One of oldest
    - Developed for long distance networking
    - ARPANET
    - Protocol of Internet
    - TCP
      - Establish communication session between computers
      - Ensure data transmission are accurate
      - Encapsulates, transmits and receives payload data
      - Close communication session
    - IP
      - Handles packet addressing
      - Handles packet routing
      - Fragments packets as needed for transport



- Device that joins networks and that can route packets to a specific network on the basis of a routing table it creates for this purpose
  - Can also be used as firewalls
- LAN and WANs
  - Local area networks
  - Wide are networks
- RAS
  - Remote access service
    - Allows dialup
    - Part of NT