INST0031 Systems Management

Lecture 5

Network management, system maintenance and user support

What we will cover today

- What are computer networks?
- Why computer networks are important?
- Brief look at some network management aspects setup, planning, installation
 - Computer network types
 - Computer network topology
 - Computer network connections
 - Network IP/ DNS / Protocols
 - Network Protocols
- Day-to-day administration and management tasks
- Support issues and options
- Other miscellaneous related bits & pieces!

What are computer networks?

- A set of connected computers and digital devices to facilitate and improve communication and resource sharing between users.
 - o Y drive on campus server
 - o Printers available throughout campus
 - 0 ...

Why are computer networks important?

- They provide pervasive, reliable, secure access to information and resources.
 - Available upon users request
 - Services are reliable in terms of validity of resources
 - Only authorised users can access the information or resources.

Why use computer networks?

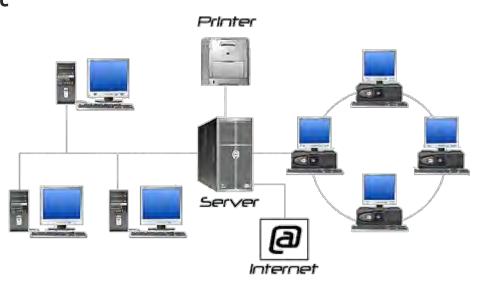
- Information Sharing
 - O Uniform, quick and reliable delivery of data. Electronic mail, HTTP, FTP, streaming media etc
- Resource Sharing
 - O Shared printers, plotters, data storages, special hardware etc
- Improved Reliability
 - o Eliminate single points of failure through replication.
- Improved Scalability
 - A mainframe costs much more than a number of computers collaborating

Impact of Computer Networks

- Networks are reshaping the organizations and society in many ways:
 - O Numerous ways to reach people:
 - email, chat, newsgroups etc.
 - Delivery of content
 - audio, video, news
 - o Online Services
 - Shopping, Banking, medical information tracking etc.
 - o Many new previously not encountered problems
 - Privacy violations, copyright infringement, legal inadequacies etc.

Computer Networks

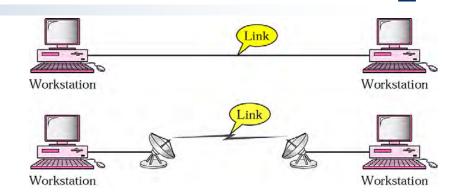
- A computer network is an interconnected collection of autonomous computers
- Interconnected means that the computers can exchange information
- Autonomous means that no computer can control another one that is connected to the network



Type of Connection

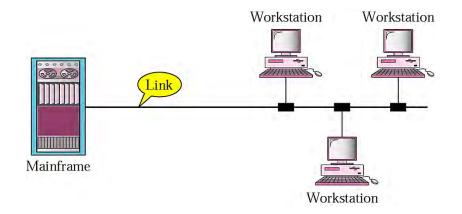
Point-to-Point Connection:

Dedicated link between two devices. The entire capacity of the link is reserved for transmission between those two devices.



• Multipoint Connection:

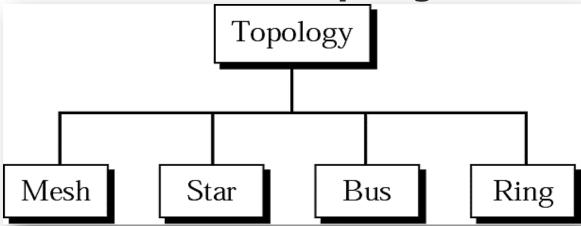
More than two devices share a single link. The channel's capacity is shared, either spatially or temporally.



Physical Topology

Physical Topology refers to the way in which a network is laid out physically. It is a geometric representation of the relationship of all the links and all devices.

The Four Basic Topologies Are:



MESH TOPOLOGY

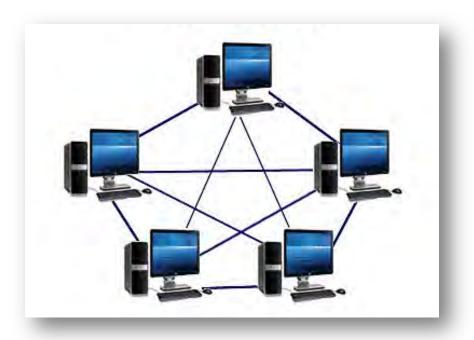
Every device has a dedicated point-to-point link to every other device.

Advantages:

- Guarantees full capacity
- Robustness
- Privacy/security
- Fault identification/isolation

Disadvantages:

- Amount of Cabling
- Number of I/O Ports
- Expensive



For n nodes, how many connections are there?

Bus Topology

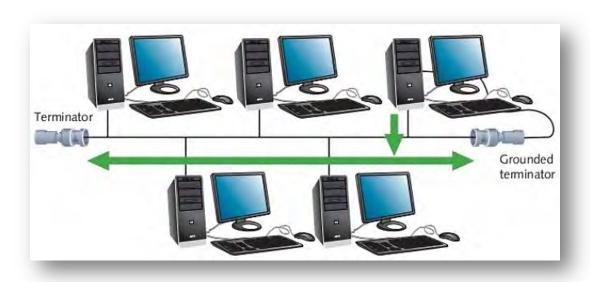
A bus topology is a multipoint connection. One long cable acts as a backbone to link all devices.

Advantages:

- Ease of installation
- Less cabling

Disadvantages:

- Hard fault isolation
- Fault in the bus



Ring Topology

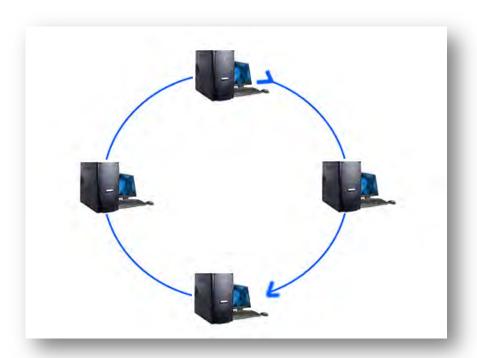
- Each device has a dedicated point-to-point connection with the two devices on either side.
- A signal is passed along the ring in one direction, from device to device until it reaches the destination.
- Each device incorporates a repeater.

Advantages:

- Easy installation
- Fault isolation

Disadvantages:

• Unidirectional traffic



Star Topology

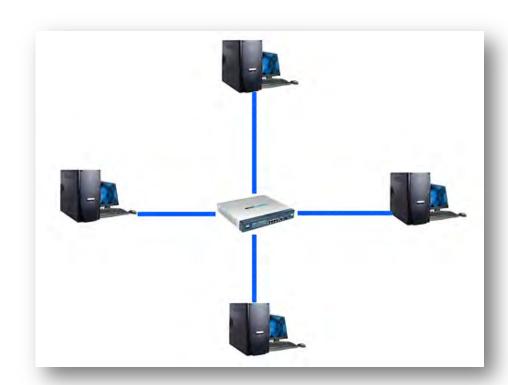
Each device has a dedicated point-to-point link only to a central controller (hub or switch).

Advantages:

- Less expensive
- Robustness
- Fault identification

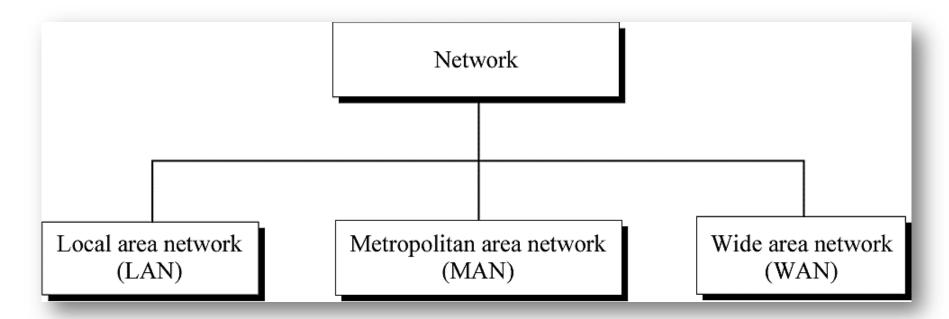
Disadvantages:

Amount of Cabling



Categories of Networks

In which category a network falls is determined by its size, its ownership, the distance it covers and its physical architecture.

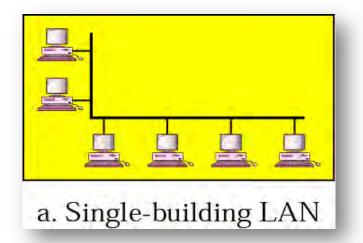


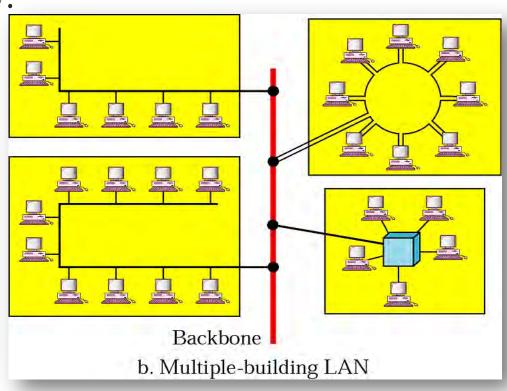
Local Area Networks

 Usually privately owned and links the devices in a single office, building, or campus.

They are distinguished by their transmission

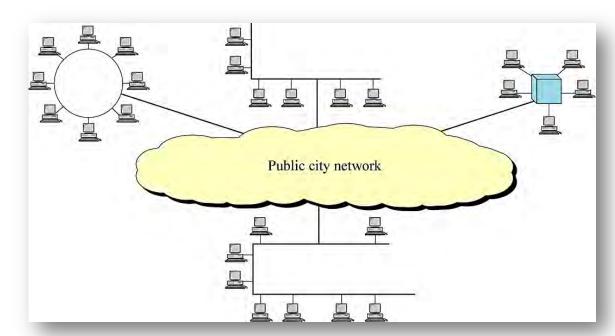
media and topology.





Metropolitan Area Network

- Provides long distance transmission over large geographical areas
- They utilize public, leased, or private communication devices and can span unlimited number of miles.



Wide Area Network

- Provides long distance transmission over large geographical areas
- They utilize public, leased, or private communication devices and can span unlimited number of miles.



Internetwork

- Incompatibilities among network technologies
- Interconnection of heterogeneous networks through special hardware and software is called internetwork or internet and provide a universal

service.

Global



https://youtu.be/n7mtJ3ZV6xM

Complexity In Networking

- Computer networking is a very complex subject.
 - Many networking technologies with different features
 - O Multiple organizations created networking standards independently, not all compatible
 - Multiple technologies exist for interconnecting two or more networks
 - No simple and uniform terminology for networking concepts

Network Protocols

- In computer networks communication occurs between entities in different systems.
- But two entities can not send bit streams to each other and expect to be understood. For communication to occur, the entities must agree on a protocol (a set of rules that govern data communication).
- A protocol defines what is communicated, how it is communicated and when it is communicated.

Network IP/ DNS / Protocols

- IP Internet Protocol
- - V4: 75.123.253.255.
- - V6:
 - 2600:1005:b062:61e4:74d7:f292:802c:fbfd
 - o Local (internal) vs Public (external)
 - o Dynamic vs Static
- DNS Domain Name Server

Network Protocols

- TCP/IP transmission control protocol/Internet protocol
- HTTP Hypertext Transfer Protocol
- HTTPS Hypertext Transfer Protocol Secure
- FTP File Transfer Protocol
- Email Protocols:
 - POP3 Post Office Protocol
 - SMTP Simple Mail Transfer Protocol
 - o IMAP Internet Message Access Protocol
- VoIP Voice over Internet Protocol

Network design considerations

- Standardization of Hardware and Software
- Type and variety of services
- Redundancy and Backing Up
- Disaster Recovery Plan
- Future Growth of the Organization
- Connectivity and Security

Setting up a network - planning & design

- How many users?
- Identify users and relationships
- Identify workgroups
- Determine server needs
- Analyse workgroup connections
- Record for future use!

Setting up a network - planning & design

- Physical planning
 - o machine rooms?
 - o open/closed access
 - o initial network diagram
- Network product specification and selection
- Install, test & document!

Setting up a network - installation sequence

- Awareness "training" for users
- Setup hardware & test (server & workstations)
 - Ensure all active elements work when standalone
- Install and test cabling

Setting up a network - installation sequence

- Install and test system software (server & workstations)
- Initiate and test applications
- Train users
- MANAGE THE SYSTEM

Network security

- Separate session later, but needs consideration at setup
- Information structure and access control
 - O How will the information be accessed?
 - Design of directory structure with security in mind.
- Access permissions and rights

Tasks

- System planning
 - o Importance of forward planning
- User control
 - Disk allocations
- File weeding/maintenance
 - o Date-based removal/deletion
- Backups

Backups

- Value of central backups
- Strategies for backup
 - o Full
 - Incremental
- Backup logs
- Importance of offsite storage

Backup methods

- Online and offline backup
 - o Tape
 - o Removables
 - o Mirrors
 - o RAID
- Who is responsible in small organisations?
 - o Personal and corporate data
- Backup restoration

Monitoring useage

- "Big brother is watching you"
- Realtime monitoring
- Logging
 - o counting accesses
 - reviewing activities
 - o full keystroke/data capture
- Site/function blocking
- Monitoring capacity

Anti-virus procedures

- Will address in more detail later, but key management aspects are
 - Effects of network security
 - Standard antivirus loading
 - o Cleanup/flagging facilities
 - Backup reloading
 - Source trace/lockout
- People are the weak link!

Support

- Technical support
 - o In-house vs out-house?
 - More in maintenance (below)
- Troubleshooting problems
 - Local vs Central
 - o Identifying errors/error logging
- Realtime monitoring
- User support

User Support

- Helpdesks
- Manpower
- Expertise
- Problem logs & support systems
- System logs/diaries
- Formal and informal support
- The importance of
 GOOD RECORDS OF SYSTEM OPERATIONS

User Support

- Communicating with users
 - Message of the day
 - Broadcast messaging
- Forced logouts/shutdowns
- External access
- Training
- Rules and regulations

Maintenance

- of hardware
- of software
- of the system

Other related considerations

- Permissible downtime
- System criticality
 - o risk assessment
 - o backup systems?
 - o manual alternatives?
- Day's data?
- Power cuts?
- Cost/possibility of DATA recovery/loss

Other bits and pieces

- Consistency/variance on workstation setup local or net boot, dual boot
 - Hardware compatibility/capability
- Local vs network drives, shared drives
- Customising environments login scripts

Other bits and pieces

- Software licences
- Network software
- Applications software
 - o site
 - o per terminal
 - o concurrent user
- Record locking and related issues
- Upgrades

In Summary

- Fundamentally just like any other management task - about
 - o planning
 - o monitoring
 - o control

Questions?



OK...

Take a break!