

Data Communication

Introduction

Course Information

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Text Books

Data Communications and Networking,
Behrouz Forouzan, McGraw-Hill
Science/Engineering/Math; 5th edition, ISBN-
10: 0073376221

Data Communications, Computer Networks,
and Open Systems (4th Edition), Fred Halsall,
Addison-Wesley, ISBN-10: 020142293X

Course Syllabus

- Data communication networks and open system standards
 - Standards-ISO
 - Open Systems
 - Network Models- OSI model
 - Physical Structures
- The Physical Layer
 - Analog and Digital Signals
 - Transmission Impairments
 - Attenuation and distortion
 - Signal propagation delay
 - Noise
 - Data Rate Limits and Performance
 - Analog Transmission and Modulation
 - Multiplexing and Spreading
 - Transmission Media Types
 - Twisted pair
 - Coaxial cables
 - Fiber optics
 - Radio waves
 - Public carrier circuits
 - Analog PSTN
 - ADSL
 - Cable TV Networks

Course Syllabus (cont.)

- Error Detection and Error Correction
 - Types of Error
 - Hamming Distance
 - Parity Bits
 - Cyclic Redundancy Check (CRC)
 - Error Correction using Multiple Parity Bits
- Data Link Layer
 - Repeat Request (RQ)
 - Sliding Window (Go Back N, Selective Repeat)
 - Framing
 - Link management
 - Point-to-Point Protocol (PPP)
 - Ethernet
 - Fast Ethernet
 - Wireless LANs
- Connecting devices
 - Hubs/Repeaters
 - Switches
 - Bridges
 - Routers

Lab Works

- MATLAB will be used for :
 - Computing and drawing waveforms
 - Computing error detection/correction codes
 - Computing frame header values for a given data
 - Simulating flow control
- Term project should be done using a network simulator (preferably packet tracer)

Evaluation

- Midterm 30%
- Final 40%
- Quiz 15%
- Exercise and Lab works 15%
- Attendance in lab/lecture sessions is mandatory

Introduction to Computer Networks

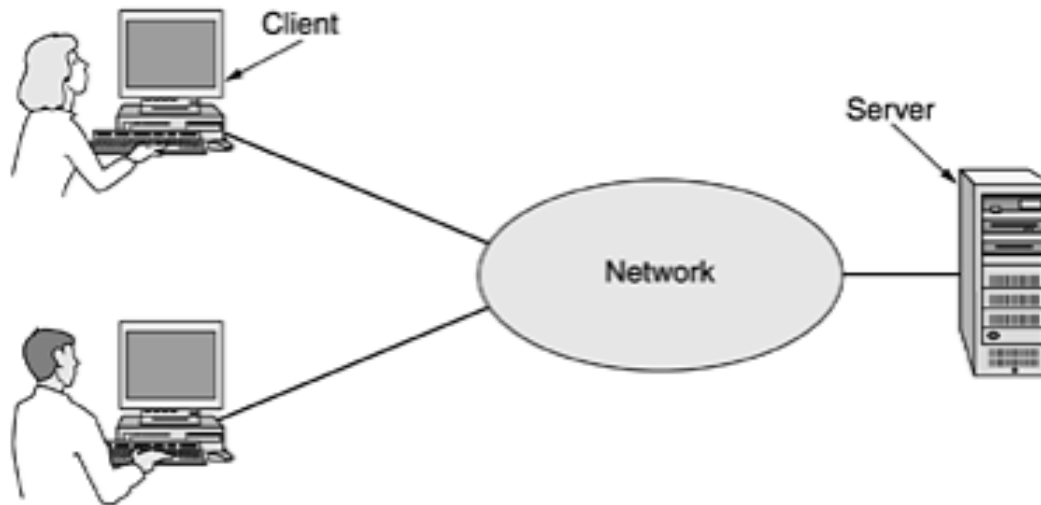
- What is a computer network?
- Why do we need a computer network?
- What are the main components of a computer network?

What Is a Computer Network

- A network is a collection of autonomous computers interconnected by a single technology. Two computers are said to be interconnected if they are able to exchange information.

Computer Network Applications

- Physical resource sharing
- Sharing information
- Sharing applications (Client-Server Model)



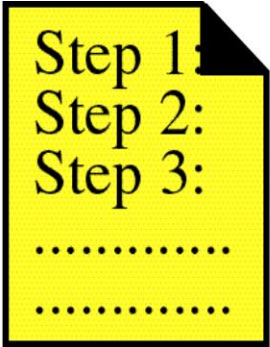
Computer Network Applications

- Providing a powerful communication medium
 - Email
 - Video conferencing
- Doing business electronically
- Access to remote information
- Person-to-person communication (Phone calls, etc.)
- Interactive entertainment
- Many more

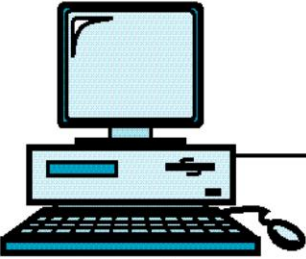
Components of a Computer Network

- **Message.** The message is the information (data) to be communicated.
- **Sender.** The sender is the device that sends the data message. It can be a computer, workstation, telephone handset, video camera, and so on.
- **Receiver.** The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.
- **Transmission medium.** The transmission medium is the physical path by which a message travels from sender to receiver.
- **Protocol.** A protocol is a set of rules that govern data communications. It represents an agreement between the communicating devices. Without a protocol, two devices may be connected but not communicating.

Components of a Computer Network



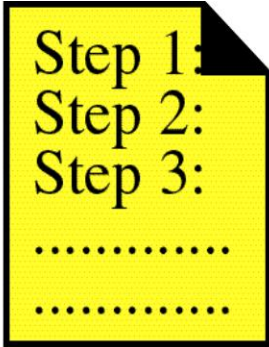
Protocol



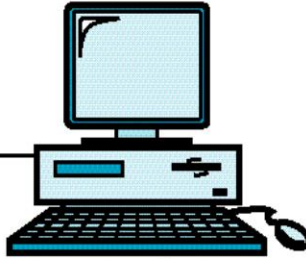
Sender



Medium



Protocol



Receiver

Data Communications

- The word data refers to *information* presented in whatever form is agreed upon by the parties creating and using the data.
- Data communications are the *exchange of data* between two devices via some form of transmission medium such as a wire cable.

Some Issues

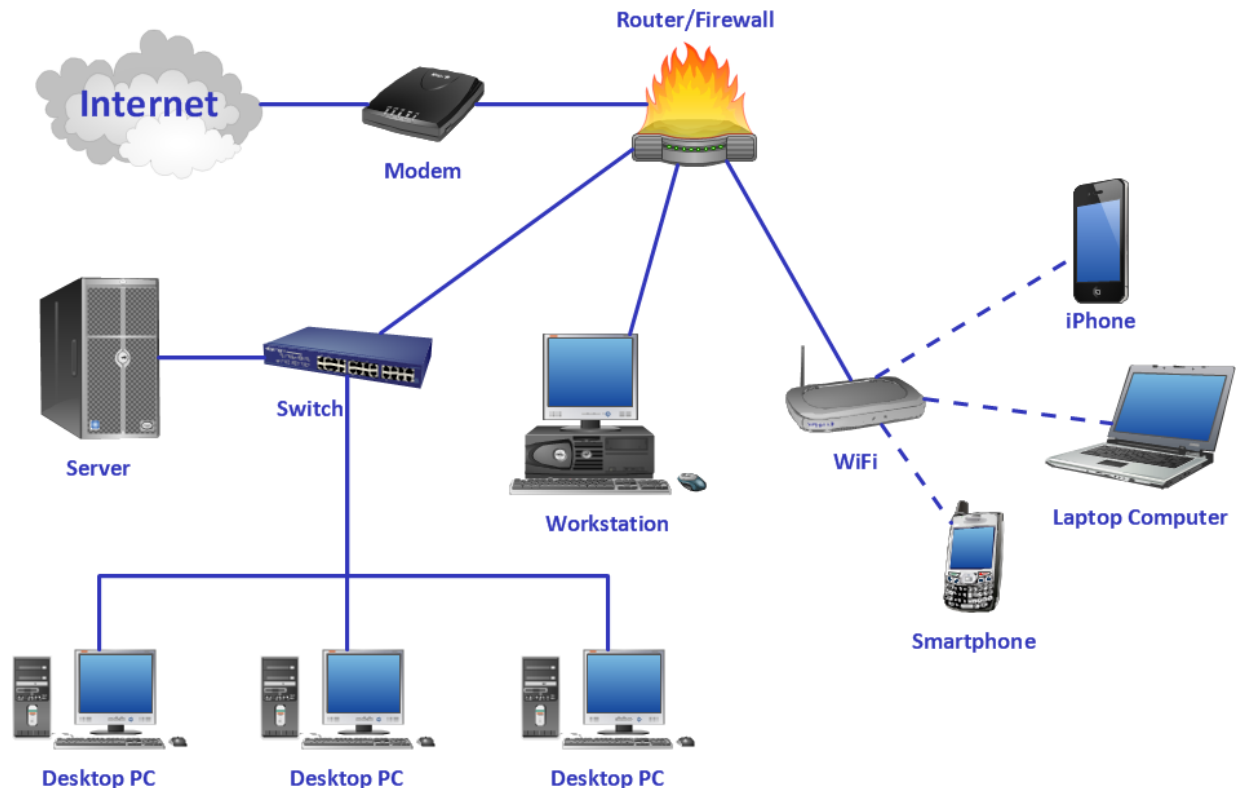
- What kind of media can be used for connecting computers?
- How can the computers in a network be arranged?
- How can digital data be transmitted over a medium?
- How can a message find its route to a destination?
- What if a message is lost or corrupted?

Standards

- All above issues (and many more) are considered in network standards.
- Standards provide guidelines to manufacturers, government agencies, and other service providers to ensure the kind of interconnectivity necessary in international communications.
- Standards define network hardware and software

Network Hardware

- Networking hardware includes all computers, peripherals, interface cards, and other equipment needed to perform data-processing and communications within the network.



Network Software

- Network software is defined in terms of communication protocols.
- A communications protocol is a set of rules for exchanging information over network links.

Questions