CMPE 150 -- Introduction to Computer Networks

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- Web site: http://www.soe.ucsc.edu/classes/cmpe150/Winter09/
- Text: Tannenbaum: Computer Networks
  (4th edition – available in bookstore, etc. )
Tannenbaum: Computer Networks (Prentice-Hall) 4th edition
Reference

Stallings: Data and Computer Communications (Prentice Hall)
Other Networking Courses

- CE 151  Network Administration
- CE 152  Protocols
- CE 156  Network Programming
- CE 107  Stochastic System Analysis
- EE 103  Signals and Systems
- CE 154  Data Communication
- CE 153  Digital Signal Processing
- EE 151  Communications Systems
- CE 108  Data Compression
- CE 163  Multimedia
- CS 111  Operating Systems
- CE 80N  General Education on Networks
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Grading

- Midterms 40% (20% each)
- Class quizzes 25% *
- Final Exam 35%
- Problem Assignments 0 to -10 % **

* Plan for four (unannounced) 15 minute in-class quizzes. Lowest score will be dropped. No makeup for missed quizzes. In class quizzes will aggregate to count 25% of grade – thus a bit more than another mid-term.

** Problem assignments to be turned in – and only those on time will be credited. Students will start with full credit for problem assignments – but if not completed with good performance up to 10 % deduction will be made from total exam score.

- No credit for work that is not your own.
Academic Integrity

http://www.ucsc.edu/academics/academic_integrity/index.html

http://www.cse.ucsc.edu/advising/undergraduate/pdf/soehandbook0203.pdf

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Source: The Navigator http://reg.ucsc.edu/navigator/chapter1.html
Some Current Topics

- **Digital TV**
  - [http://www.spectrum.ieee.org/oct05/1911](http://www.spectrum.ieee.org/oct05/1911)

- **Ultra Wideband WiMedia Standard**

- **New Cisco Edge Router**

- **HD videoconferencing**

- **Cloud Computing / Networked Attached Storage**

- **Home Media Center (Windows Vista, etc.)**
NAS

[Image of a Maxtor NAS device]
Network Attached Storage

Maxtor Shared Storage™ II
2TB Dual Drive

Sharing
Access files, including digital video, music, and photos from any networked PC or Mac for enhanced productivity, seamless workflow, and easy file sharing and printing.

2TB Storage
2TB capacity stores up to 33,320 hours of digital music, 640,000 digital photos, 2,000 hours of digital video, 900 two-hour DVD-quality movies, or 1,000 exciting games.

Automatic Backup
No-hassle backup. Back up all the computers on your network automatically to a single location.

Automatic Data Mirroring
RAID 1 automatically duplicates a copy of your data for an extra level of security (up to 500GB).

Media Streaming
Play back photos, videos, and music to your networked home entertainment center® for more enjoyment. (*Requires UPnP® AV-certified adapter)

Drag and Sort™
Just drag documents onto the Shared Storage II icon and Maxtor’s Drag and Sort organizes your files, placing them in appropriate shared folders.

Maxtor Simple View™
Provides at-a-glance views of backup and storage status for all users.

Password Protection
Set privacy levels on shared folders for full public access or limited access for an extra measure of security.

Simple Setup
Plug in, connect the Ethernet cable, and the Maxtor Shared Storage II automatically configures to your network. Within minutes you can set up the Maxtor Shared Storage II to appear as a local hard drive on every configured PC and Mac on your network.

USB Expansion
* USA ports make it easy to add a printer for sharing or connect additional drives for even more storage.
Computer Networking

- Computer to peripheral
  - Serial (RS232, USB,…)
  - Parallel
Computer Networking

- Computer to peripheral
- Computer to computer
- Computer to network (of computers)
Computer Networking

- Computer to peripheral
  - Serial (RS232, USB, ...)
  - Parallel
Computer Networking

- Computer to peripheral
  - Serial
    - RS232
    - USB
    - bluetooth
    - infrared
  - Parallel
Computer Networking

- Computer to Computer
  - hard wire ("null modem")
  - modem to modem
  - client-server
Computer Networking

- Computer to Network (of computers)
  - Ethernet
  - 802.11
  - Internet (TCP/IP)
Local Area Networks

- Smaller scope
  - Building or small campus
- Usually owned by same organization as attached devices
- Data rates much higher
- Early days – “broadcast” systems
- Now switched
Local Area Networks

- Ethernet
- Token-ring
- FDDI
- Fiber Channel
PC Network View

- Ethernet
- 802.11 (a,b,g,n)
- Bluetooth
- Infrared
- Serial
- Parallel
- USB
- Modem
My PC
USB Printer

Canon S530D Properties

Print to the following port(s). Documents will print to the first free checked port.

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<thead>
<tr>
<th>Port</th>
<th>Description</th>
<th>Printer</th>
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<tr>
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<td>Printer Port</td>
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<td>COM2</td>
<td>Serial Port</td>
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<td>COM3</td>
<td>Serial Port</td>
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<tr>
<td>COM4</td>
<td>Serial Port</td>
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<tr>
<td>FILE</td>
<td>Print to File</td>
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<td>USB</td>
<td>Virtual printer port for Canon S530D</td>
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- Enable bidirectional support
- Enable printer pooling
USB Network
## Networking Tasks

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<th>Function</th>
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<td>Interfacing</td>
<td>Routing</td>
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<td>Signal generation</td>
<td>Recovery</td>
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<tr>
<td>Synchronization</td>
<td>Message formatting</td>
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<tr>
<td>Exchange management</td>
<td>Security</td>
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<tr>
<td>Error detection and correction</td>
<td>Network management</td>
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<tr>
<td>Flow control</td>
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A Communications Model

- Source
  - generates data to be transmitted
- Transmitter
  - Converts data into transmittable signals
- Transmission System
  - Carries data
- Receiver
  - Converts received signal into data
- Destination
  - Takes incoming data
Simplified Communications Model - Diagram

(a) General block diagram

(b) Example

Stallings, Fig. 1.1
Key Tasks

- Transmission System Utilization
- Interfacing
- Signal Generation
- Synchronization
- Exchange Management
- Error detection and correction
- Addressing and routing
- Recovery
- Message formatting
- Security
- Network Management
Simplified Data Communications Model

Stallings, Fig. 1.2
Networking

- Point to point communication not usually practical
  - Devices are too far apart
  - Large set of devices would need impractical number of connections
- Solution is a communications network
  - Local Area Network (LAN)
  - Wide Area Network (WAN)
Simplified Network Model

From Stallings – Ch. 1 6th ed.
Wide Area Networks

- Large geographical area
- Crossing public rights of way
- Rely in part on common carrier circuits
- Alternative technologies
  - Circuit switching
  - Packet switching
  - Frame relay
  - Asynchronous Transfer Mode (ATM)
Two Network Views

- Circuit Switching
  - Telephone circuits
- Packet Switching
  - ARPA net
  - TCP/IP
Circuit Switching

- Dedicated communications path established for the duration of the conversation
Packet Switching

- Data sent out of sequence
- Small chunks (packets) of data at a time
- Packets passed from node to node between source and destination
- Used for terminal to computer and computer to computer communications
Integrated Services Digital Network

- ISDN
- Designed to replace public telecom system
- Wide variety of services
- Entirely digital domain
DSL

- Digital Subscriber Line
  - Uses POTS to “Central Office”

- Asymmetric DSL (ADSL)
  - Different “up” and “down” speeds
  - e.g. 3000/500 Kbps
Frame Relay

- Packet switching systems have large overheads to compensate for errors
- Modern systems are more reliable
- Errors can be caught in end system
- Most overhead for error control is stripped out
Asynchronous Transfer Mode

- ATM
- Evolution of frame relay
- Little overhead for error control
- Fixed packet (called cell) length
- Anything from 10Mbps to Gbps
- Constant data rate using packet switching technique