Course Overview

- **Instructor:**
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- **Text:**

- **Grading:**
  - CS420: Assignments, Three Exams
  - CS520: Assignments, Three Exams, Term Project
Syllabus and Scope of Course

• We will cover most of the chapters with selected topics from other sources
• This course will introduce you to the concepts, terminology, and approaches used in data communication systems.
• I expect you to walk away from this class being familiar with a wide variety of concepts and protocols (and detailed knowledge of some of them). In the future you should be able to use this knowledge to:
  — make intelligent decisions about network use, design and management,
  — be able to pick up and learn details of a particular system as you need it
  — be able to quickly find protocol descriptions and problem solutions/discussions
  — be able to discuss data communication systems with supervisors and co-workers on the job
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
## Communications Tasks

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Simplified Communications Model - Diagram

(a) General block diagram

(b) Example
Simplified Data Communications Model

1. Input information $m$
2. Input data $g(t)$
3. Transmitted signal $s(t)$
4. Received signal $r(t)$
5. Output data $g'(t)$
6. Output information $m'$
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, e.g.,
  — Wide Area Network (WAN)
  — Local Area Network (LAN)
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)
Circuit Switching

- Dedicated communications path established for the duration of the conversation
- e.g., telephone network
Packet Switching

- Small “chunks” (packets) of data at a time
- Data sent may be out of sequence
- Packets passed from node to node between source and destination
- Used for terminal to computer and computer to computer communications
Frame Relay

- Packet switching systems have large overhead 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 Mbps to Gbps
- Constant data rate using packet switching technique
Local Area Networks

- Smaller scope
  - Building or small campus
- Usually owned by same organization as attached devices
- Data rates much higher
- Usually broadcast systems
- Now some switched systems and ATM are being introduced
LAN Configurations

- Switched
  - Switched Ethernet
    - May be single or multiple switches
  - ATM LAN
  - Fibre Channel

- Wireless
  - Mobility
  - Ease of installation
Metropolitan Area Networks

- MAN
- Middle ground between LAN and WAN
- Private or public network
- High speed
- Large area
Networking Configuration

Residential user

High-speed link (e.g. SONET)

Internet service provider (ISP)

Internet

ATM switch

Firewall host

High-speed link

Ethernet switch

Information server

LAN PCs and workstations

Private WAN

Router

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