CS 420/520
Data Communication Systems

- Course Overview
  - **Instructor:**
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    - Office Hours to be announced, or by appointment
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    - http://www.cs.uidaho.edu/~krings/CS420
  - **Text**:
    - *Data and Computer Communications,* William Stallings, 8th edition, Prentice Hall.
  - **Grading**:
    - CS420: Homeworks, Three Exams
    - CS520: Homeworks, 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
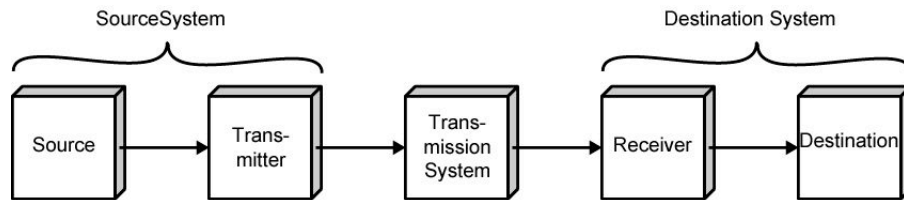
A Communications Model

- 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

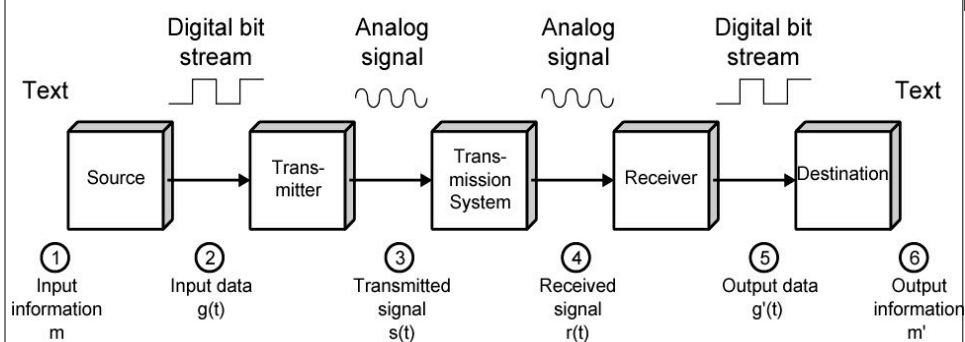| Transmission system utilization	Addressing
Interfacing	Routing
Signal generation	Recovery
Synchronization	Message formatting
Exchange management	Security
Error detection and correction	Network management
Flow control	

Simplified Communications Model - Diagram

SourceSystem

Destination System

| Source | → | Trans-mitter | → | Trans-mission System | → | Receiver | → | Destination |

(a) General block diagram

Workstation   Modem   Public Telephone Network   Modem   Server

(b) Example

Simplified Data Communications Model

| | Digital bit stream | Analog signal | Analog signal | Digital bit stream | |
| Text | | | | | Text |

| Source | → | Trans-mitter | → | Trans-mission System | → | Receiver | → | Destination |

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'

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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
  - 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

- 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

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

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

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