

# CS 420/520

## Data Communication Systems

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- Course Overview

- **Instructor:**

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    - <http://www.cs.uidaho.edu/~krings/CS420>

- **Text:**

- *Data and Computer Communications*, William Stallings, Prentice Hall.

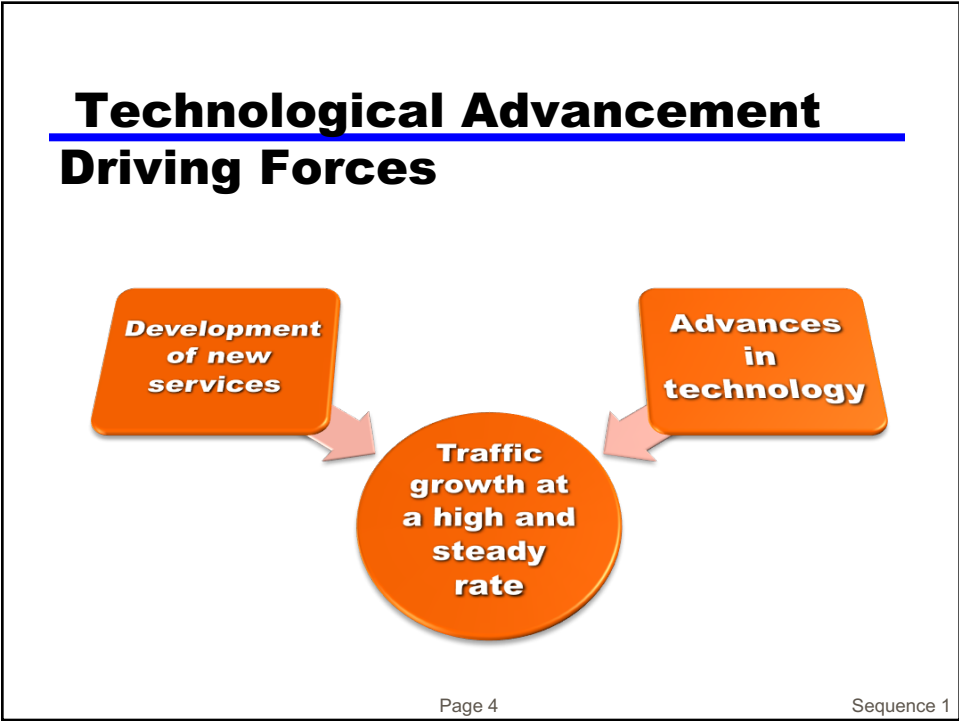
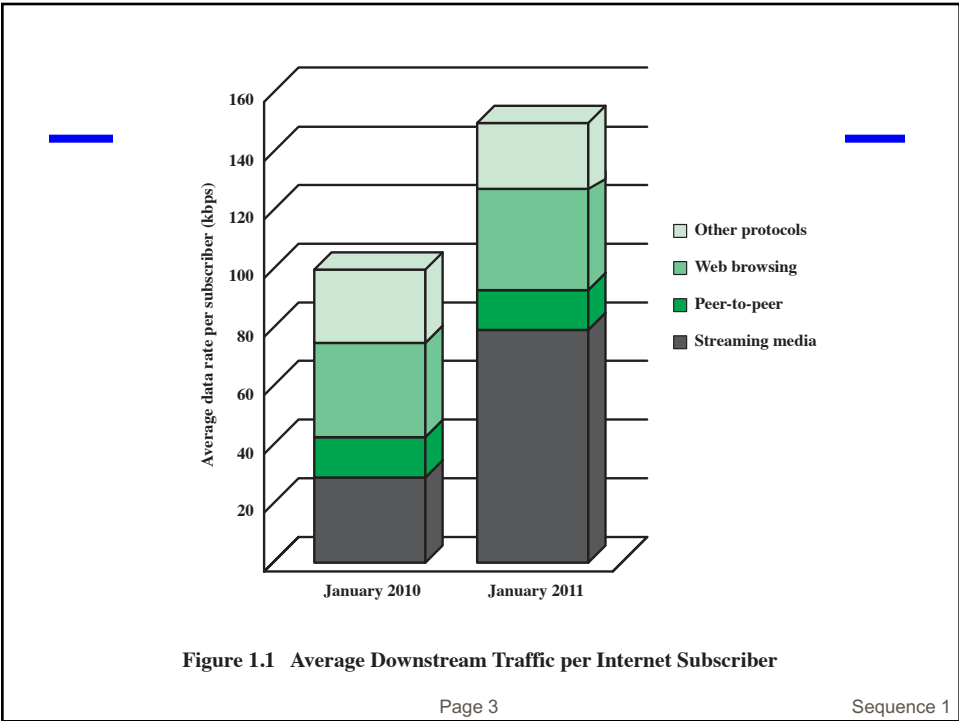
- **Grading:**

- CS420: Assignments, Three Exams
    - CS520: Assignments, Three Exams, Term Project

## Syllabus and Scope of Course

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- 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



## Notable Trends

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### Trend toward faster and cheaper, in both computing and communication

- More powerful computers supporting more demanding applications
- The increasing use of optical fiber and high-speed wireless has brought transmission prices down and greatly increased capacity

### Today's networks are more "intelligent"

- Differing levels of quality of service (QoS)
- Variety of customizable services in the areas of network management and security

### The Internet, the Web, and associated applications have emerged as dominant features for both business and personal network landscapes

- "Everything over IP"
- Intranets and extranets are being used to isolate proprietary information

### Mobility

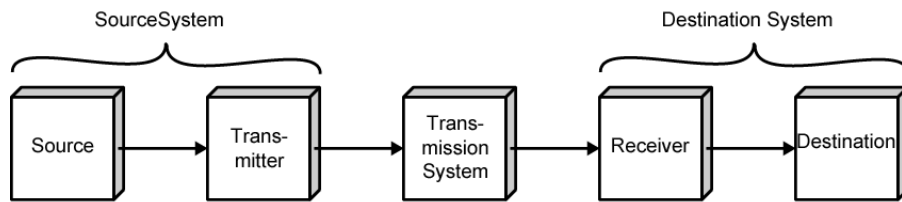
- iPhone, Droid, and iPad have become drivers of the evolution of business networks and their use
- Enterprise applications are now routinely delivered on mobile devices
- Cloud computing is being embraced

## A Communications Model

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- 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

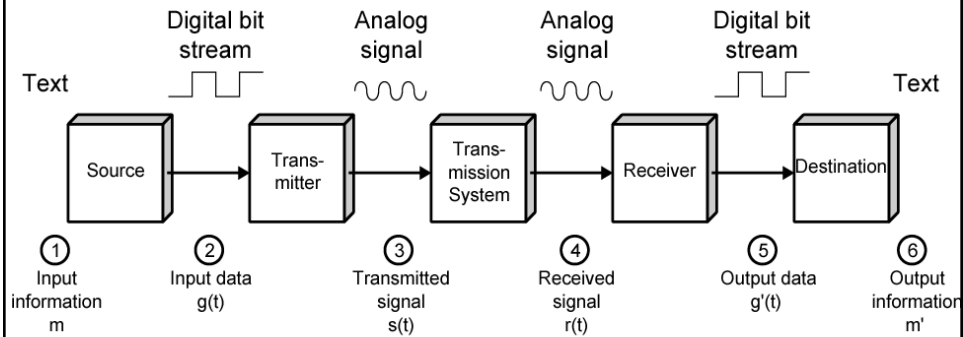
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# Communications Tasks

Transmission system utilization  
 Interfacing  
 Signal generation  
 Synchronization  
 Exchange management  
 Error detection and correction  
 Flow control

Addressing  
 Routing  
 Recovery  
 Message formatting  
 Security  
 Network management

## Simplified Data Communications Model



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Sequence 1

## Transmission Lines

The basic building block of any communications facility is the transmission line

The business manager is concerned with a facility providing the required capacity, with acceptable reliability, at minimum cost

Capacity

Reliability

Cost

**Transmission Line**

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Sequence 1

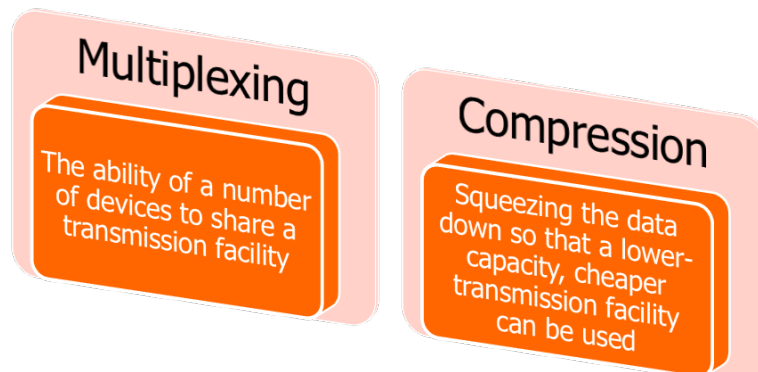
# Transmission Mediums

Two mediums currently driving the evolution of data communications transmission are:

**Fiber optic transmissions**  
and  
**Wireless transmissions**

# Transmission Services

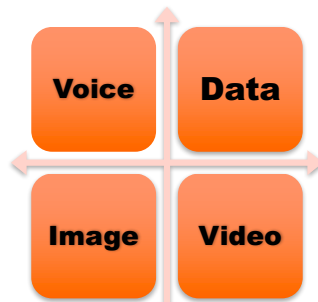
- Remain the most costly component of a communications budget
- Two major approaches to greater efficiency:



## **Networking**

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**Advances in technology have led to greatly increased capacity and the concept of integration, allowing equipment and networks to work simultaneously**



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Sequence 1

## **Networking**

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- 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)

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Sequence 1

## **Wide Area Networks**

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- 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**

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



## **Packet Switching**

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- 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**

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- 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

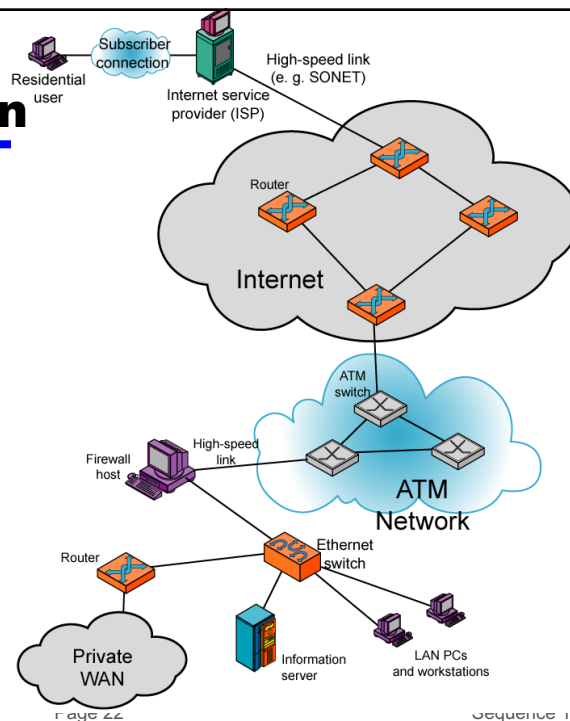
## **Local Area Networks**

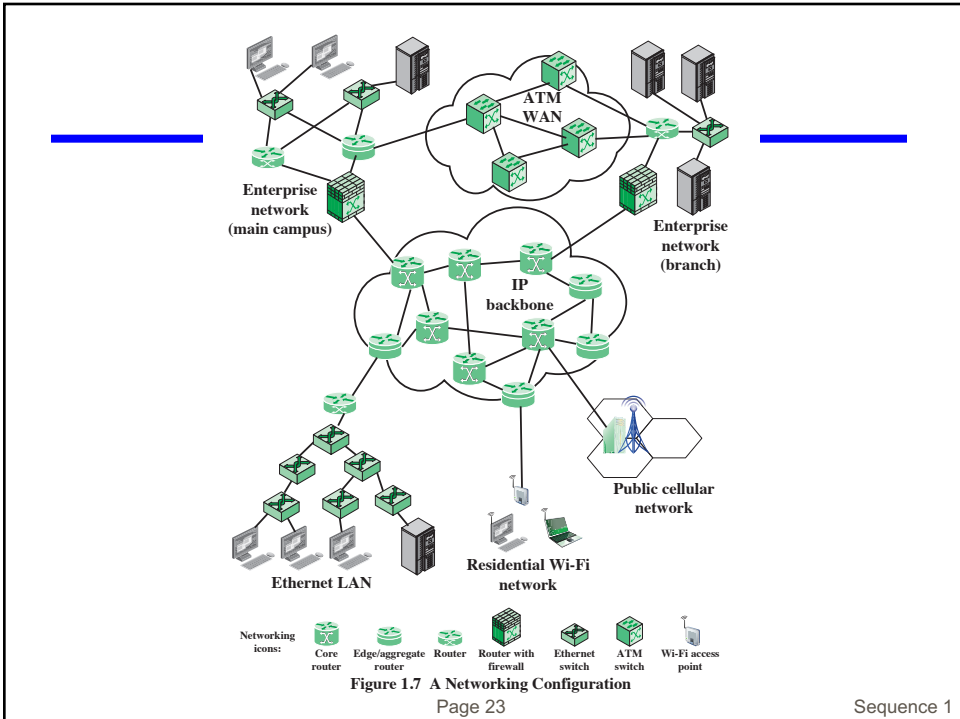
- Smaller scope
  - Building or small campus
- Usually owned by same organization as attached devices
- Data rates much higher
- Usually broadcast systems
- Now some switched systems and ATM are being introduced

## Metropolitan Area Networks

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

## Networking Configuration





Sequence 1