Data Communications and Networks

CS461: Computer Networks and Communications

HiLCoE - School of Computer Science and Technology

Lecture 1

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Data Comms

Networks

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What Is Data Communications?

- When we communicate we are sharing information
  - Local sharing, e.g. face-to-face
  - Remote sharing, e.g. over some distance
- Data: information being shared, e.g. text, numbers, images, audio, video
- Data Communications: exchange of data between two (or more) devices via some transmission medium

Effective Data Communications

Delivery: the data must be delivered to the correct destination

Accuracy: the data received must be accurate representation of the data sent

Timeliness: the data should be delivered within a reasonable time

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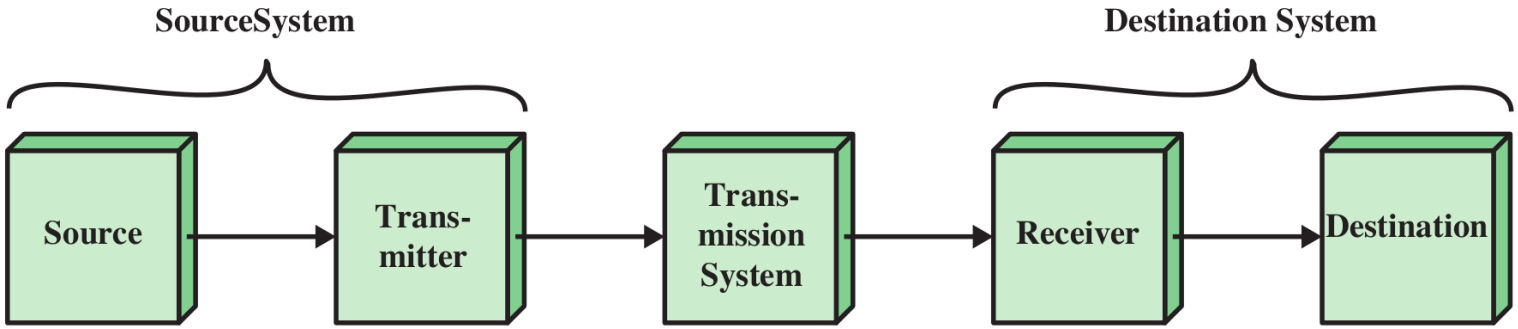
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Simplified Communications Model



Source: Device that generates data to be transmitted

Transmitter: Converts data from source into transmittable signals

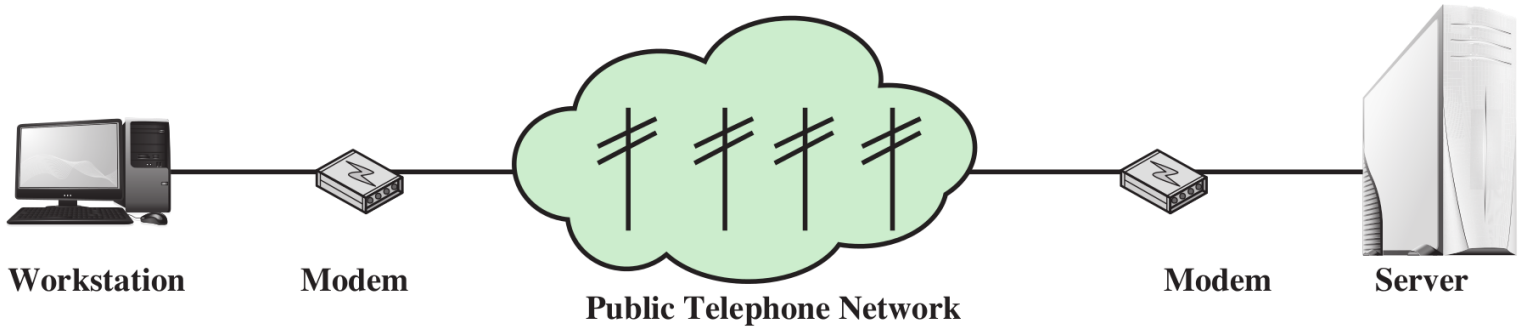
Transmission system: Carries data from source to destination

Receiver: Converts received signal into data

Destination: Takes and uses incoming data

Simplified Communications Model

An Example



Communications Tasks

Simplified communications model makes it look easy . . . but there are many tasks to be performed in a data communications system

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

Categorizing Communication Technologies

Data Communications: transmitting signals in reliable and efficient manner; focusses on individual links

Networks: communications across set of links; Wide Area Networks, Local Are Networks, The Internet

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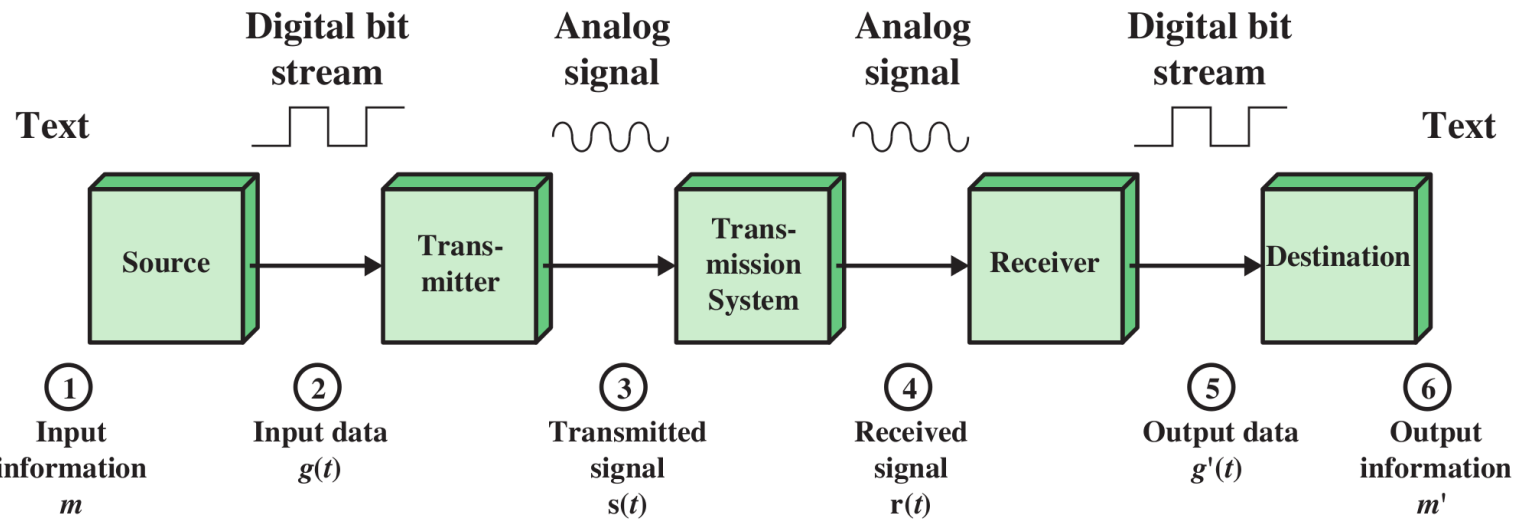
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A Data Communications Model



Transmission Line

- Transmission line (or system) is key part of communications system
- "Link" between transmitter and receiver
- Needs to provide required capacity, with acceptable reliability at minimum cost

The Transmission of Information

Transmission and Transmission Media

- How to convert information into transmittable electromagnetic signal?
- What transmission media to use?

Communication Techniques

- How to encode information into a signal?
- How to deal with errors?

Transmission Efficiency

- How to efficiently utilize/share communications system?

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Networks

- Demand for any user to communicate with any other machine/user
- Require:
  - Communication software (see The Internet)
  - Communication network technologies: WANs and LANs

Wide Area Networks

- Span a large geographical area
- Require crossing of public right-of-ways
- Rely on links of common carriers (telecommunication companies)
- Carries data of multiple organisations
- How to find path across a network?
- How to deliver data across the network?
- Example technologies: ATM, Frame Relay, SDH

Local Area Networks

- Small coverage area, e.g. building, campus
- Owned and operated by organisation owning end-devices
- Higher internal (per user) data rates compared to WANs
- How to arrange nodes in a LAN?
- How to share LAN amongst multiple users?
- Example technologies: Ethernet, Wireless LAN