

Data Communications and Networks

ITS323: Introduction to Data Communications

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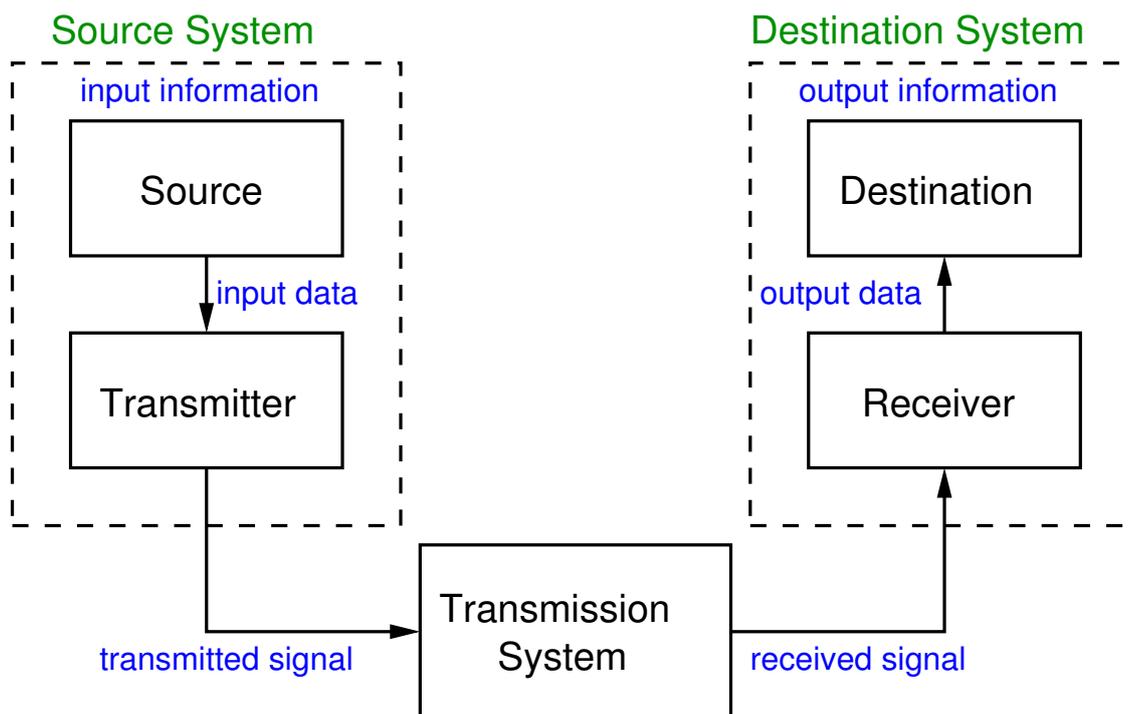
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What Is Data Communications?

- ▶ 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

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A Model of Communication Systems



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A Model of Communication Systems

Aim: transfer information from source to destination

Source: Device that generates data to be transmitted

Transmitter: Converts data from source into transmittable signals

Transmission system: Carries data from source to destination

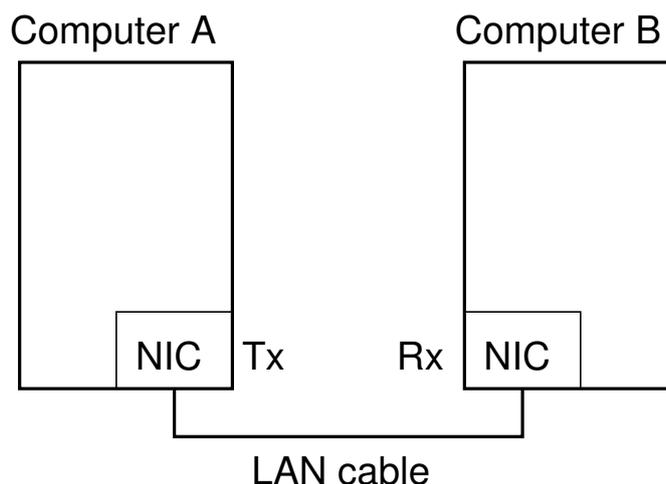
- ▶ Maybe simple as a single link/cable
- ▶ Or a complex network, e.g. the Internet

Receiver: Converts received signal into data

Destination: Takes and uses incoming data

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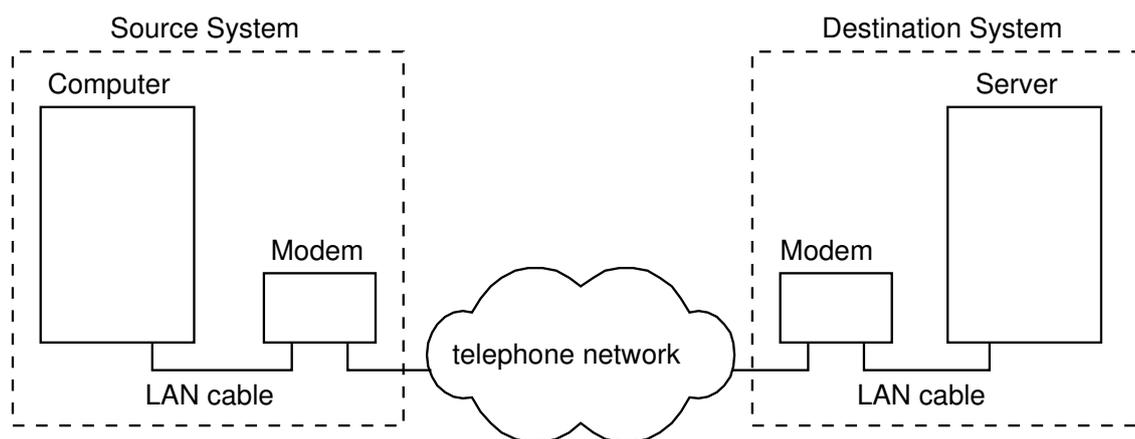
Example: Computer to Computer



- ▶ Transmitter (Tx) is built into source computer (Network Interface Card)
- ▶ Receiver (Rx) is built into destination computer
- ▶ Transmission system is single link between two computers

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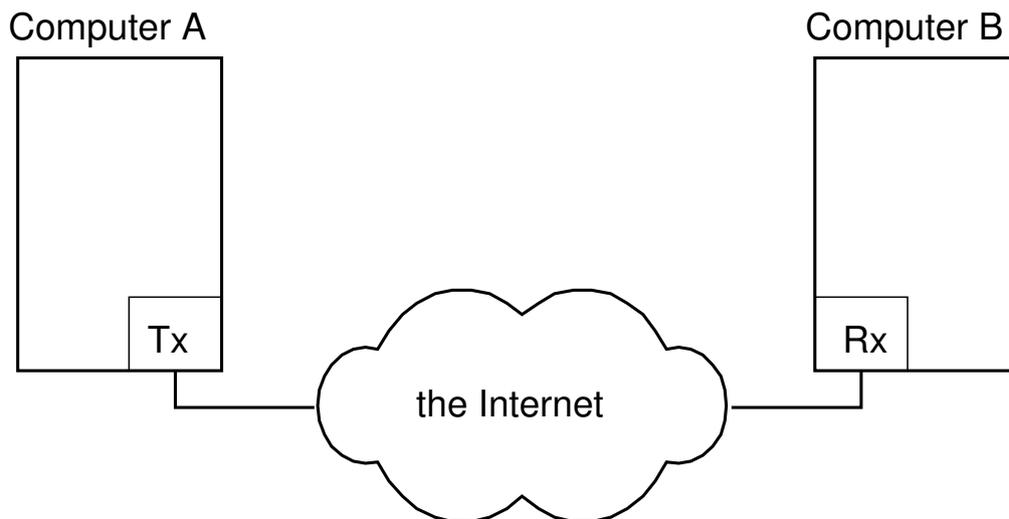
Example: Old Dialup Connection



- ▶ Source and transmitter are separate devices (similar at destination)
- ▶ Transmission system is telephone network

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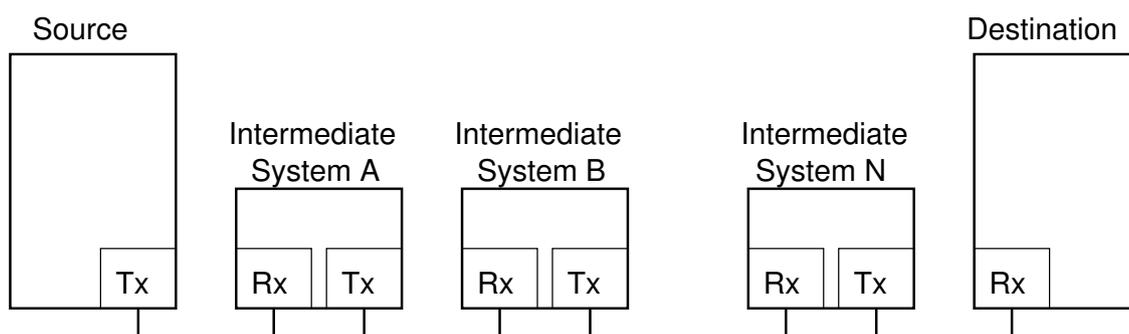
Example: Communications via the Internet



- ▶ Source and transmitter may support different technologies
- ▶ Transmission system is the Internet

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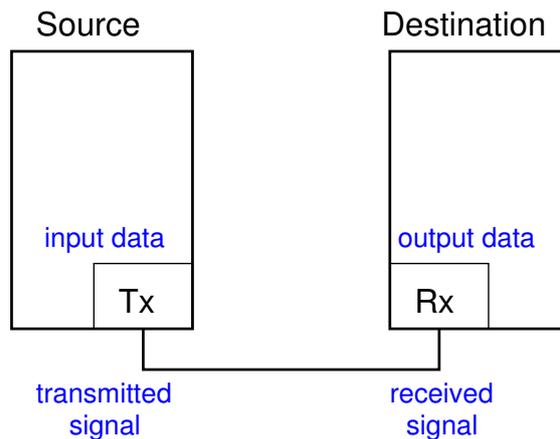
General Model for Communications via a Network



- ▶ Source system generates data
- ▶ Intermediate systems receive signal from previous system and then transmit to next system
- ▶ Destination system receives and processes the data
- ▶ Source and destination are connected via multiple transmission systems (or links) to form a network

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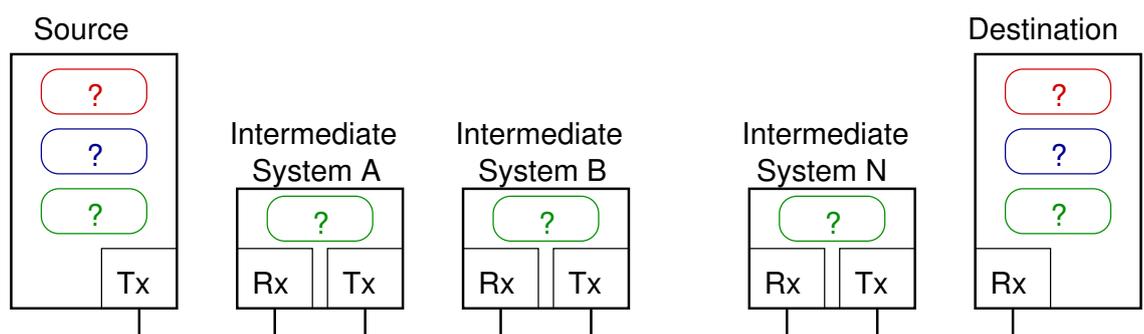
Challenges with Link Communications



- ▶ How to convert information into transmittable signals?
- ▶ What are the characteristics of signals?
- ▶ What transmission media to use?
- ▶ How to efficiently encode data as signals?
- ▶ How to deal with errors?
- ▶ How to share media amongst two or more transmitters?

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Challenges with Networked Communications



- ▶ How do intermediate systems receive/send data?
- ▶ How to select which intermediate systems to send via?
- ▶ What happens if failures within intermediate systems?
- ▶ How to create applications without knowing the details of underlying network and technologies?

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Some Concepts

- ▶ Data is communicated across links by sending signals
- ▶ Digital data is often into divided smaller, manageable chunks called packets (or messages, datagrams, frames)
 - ▶ Often extra information called a header (or trailer) is added to the data to support the data transfer
- ▶ There are many tasks in communication systems; tasks are grouped into layers, e.g.
 - ▶ Tasks for sending signals across a link are part of *physical* layer
 - ▶ Tasks for delivering data across multiple links are part of *network* layer
- ▶ The rules that devices follow for communicating are called protocols
- ▶ To identify which device data should be sent to, addresses are used
- ▶ Standards define protocols that organisations, companies and/or governments have agreed to use