ITS323

Data Comms &
Networks

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Data Communications and Networks

ITS323: Introduction to Data Communications

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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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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
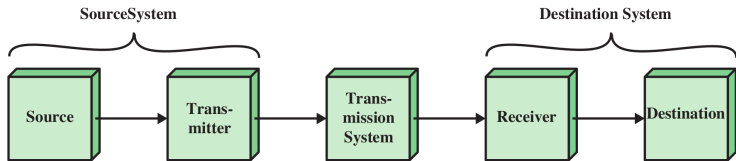
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Simplified Communications Model

Source: Device that generates data to be transmitted

Transmitter: Converts data from source into transmittable signals

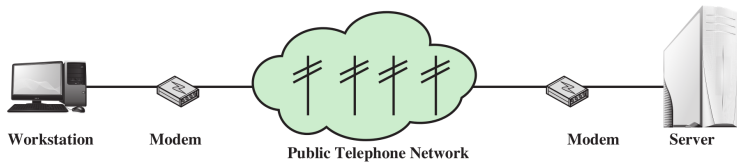Transmission system: Carries data from source to destination

Receiver: Converts received signal into data

Destination: Takes and uses incoming data

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Simplified Communications Model

An Example

Workstation   **Modem**   **Public Telephone Network**   **Modem**   **Server**

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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	

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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
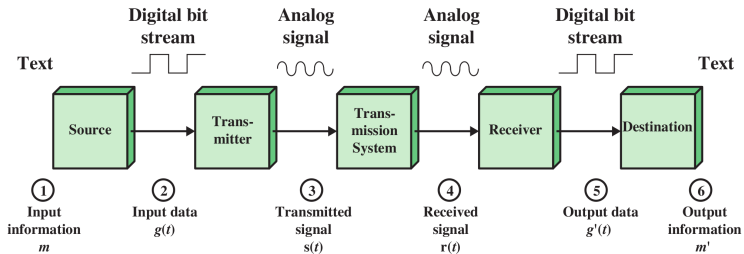
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A Data Communications Model

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

Source → Transmitter → Transmission 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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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

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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

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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

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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

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Origins

▶ Evolved from US Department of Defence research
network, ARPANET (developed in 1969)

▶ Used packet switching technology (whereas telephone
networks used circuit switching)

▶ Development and standardization of the Internet suite
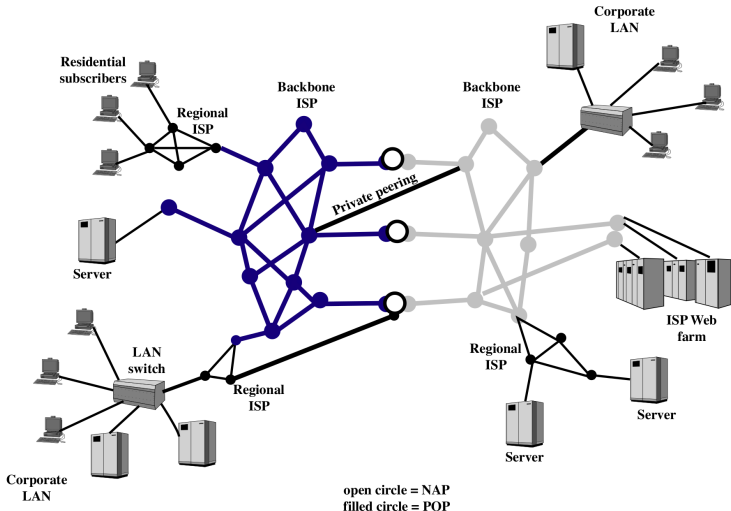of protocols: TCP/IP

What is The Internet?

▶ Collection of networks connected together using
common software: Internet Protocol (IP)

▶ Although network technologies differ, any computer can
communicate with any other computer (providing they
are using IP)

Key Elements of the Internet

Hosts, routers and (sub-)networks
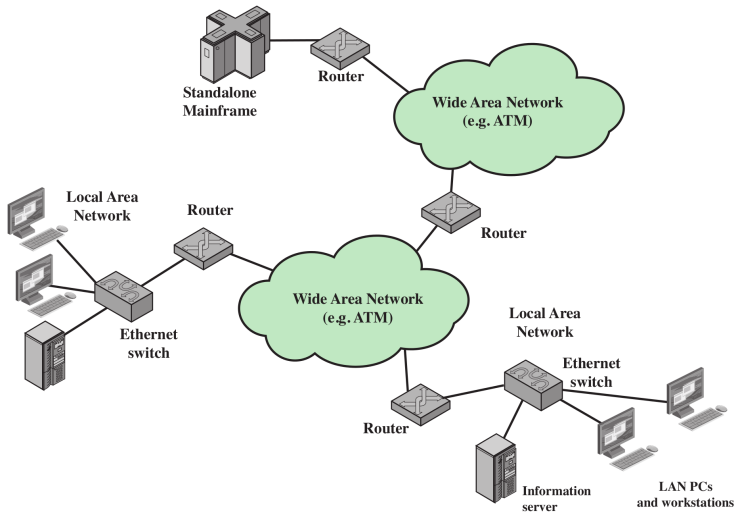
Simplified View of Portion of Internet

open circle = NAP
filled circle = POP

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Example: SIIT

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Example: SIIT

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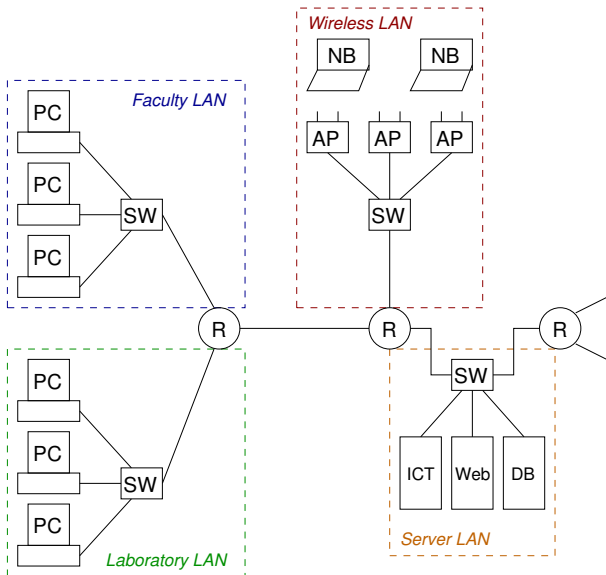
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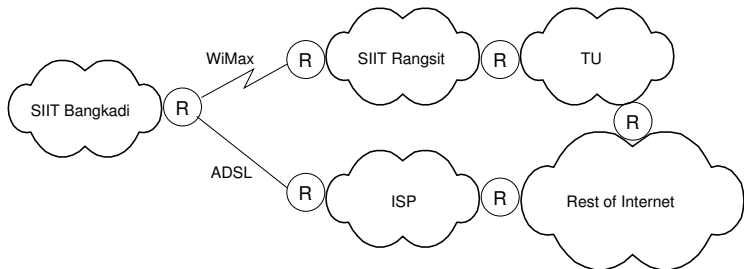
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Example: Thailand Internet

See http://internet.nectec.or.th/