CS1001

Lecture 7

Overview

- Computer Networks
- The Internet
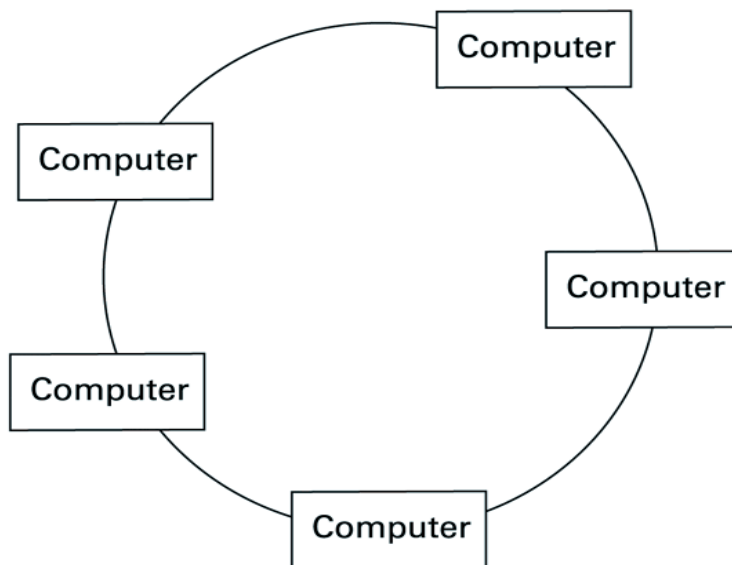- Internet Services
- Markup Languages

Goals

- Learn fundamentals of networking
- Understand Internet Services
- Examine network security issues
- What is a "Markup Language"?

Assignments

- Brookshear: Ch 3.5, 3.6, 3.7 (Read)
- Know factual material (bolded terms) in 3.5, 3.6, 3.7
- Read linked documents on these slides (slides will be posted in courseworks)
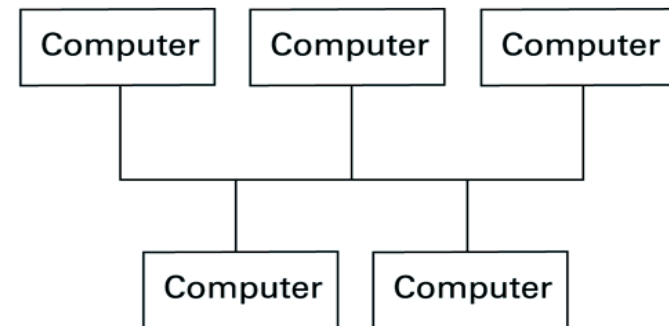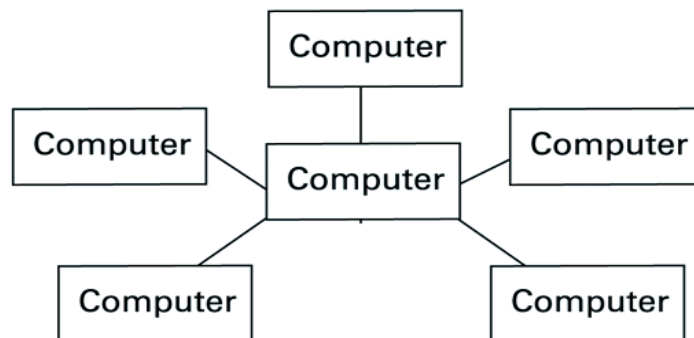
Figure 3.10: Network topologies

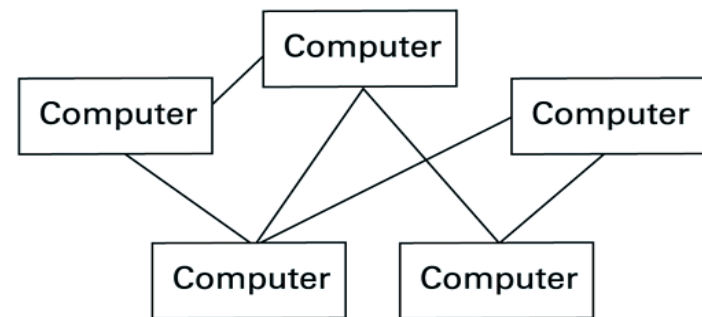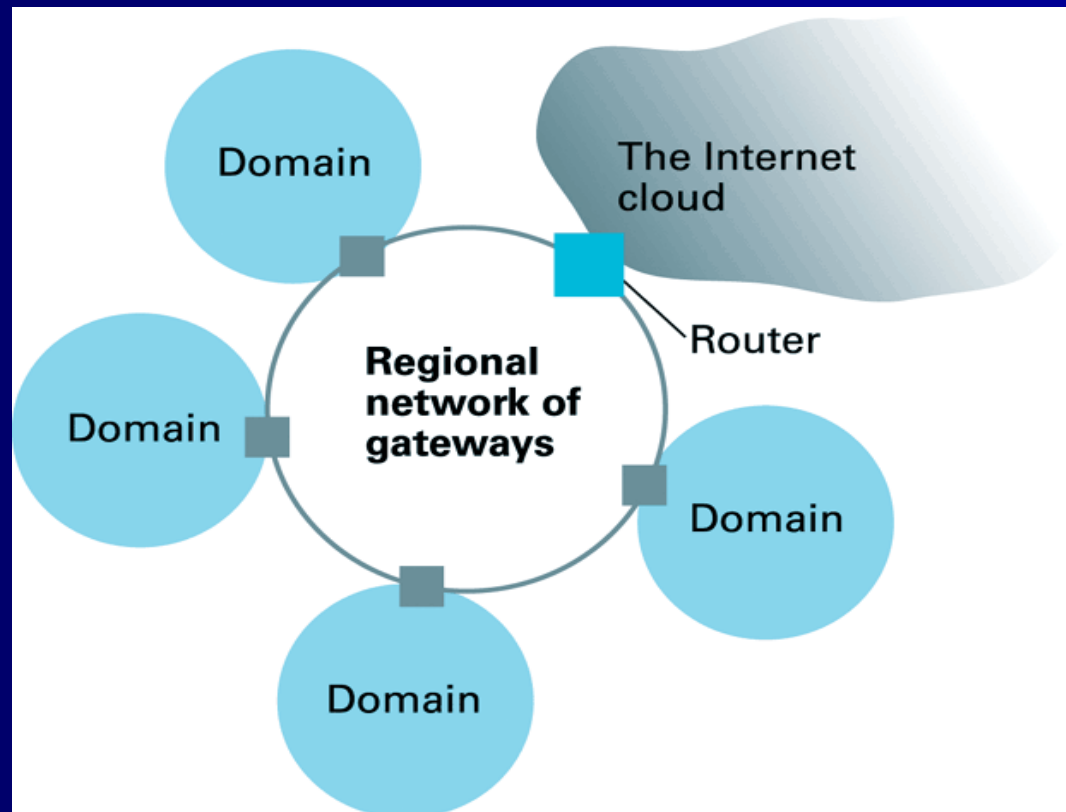# Figure 3.10: Network topologies (continued)

Figure 3.12: A typical approach to connecting to the Internet

Centralization

- Does networking **centralize** or **distribute** information?
  - It facilitates **both**
- Networking facilitates centralized storage and remote access
- Networking *also* facilitates the interchange of data (distributed data)
- http://www.sei.cmu.edu/str/descriptions/clientserver_body.html

The Internet

- Initiated in 1973 by DARPA (ARPANet)
- Distributes different types of information across many computers (servers)
- Centralizes information published by one entity (like a company, etc)

Who "Runs" the Internet?

- Every computer connected to the internet must have a numerical IP (Internet Protocol) Address
  - These numbers are distributed by a U.S.-based non-profit company: ICANN.
- Friendly names map to these numerical addresses (for example: www.columbia.edu maps to 128.59.59.214) This is DNS (Domain Name System)

Who "Runs" the Internet (2)

- Only numerical addresses and the mappings from names to numbers are maintained by central bodies
- Connectivity is established by a number of independent bandwidth providers
- **Routers** direct traffic over the web to their desired destination
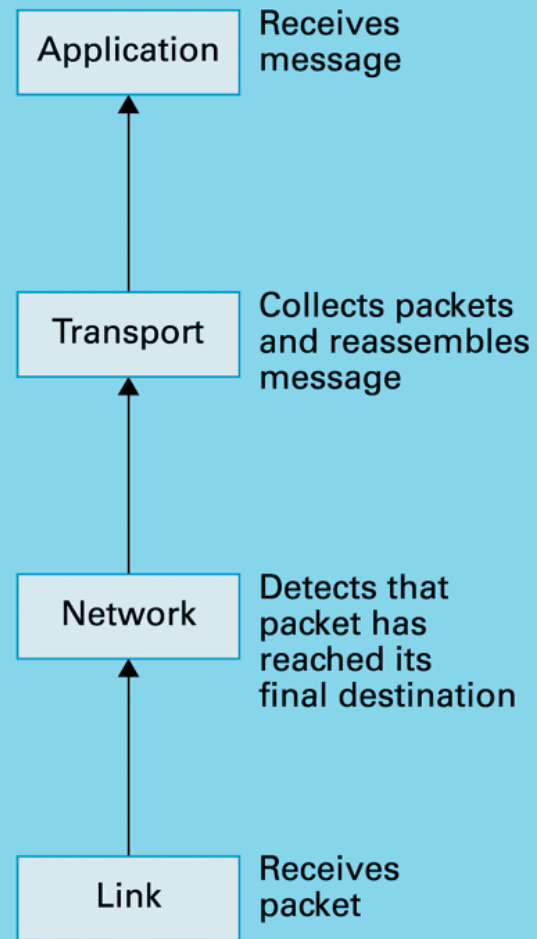- **Correct routing** is a *distributed* responsibility

Network Protocols

- A Protocol is a means for two parties to exchange data. Contains ways of sending/receiving/acknowledging data, error recovery, ability to switch context
- Example: HTTP, SMTP
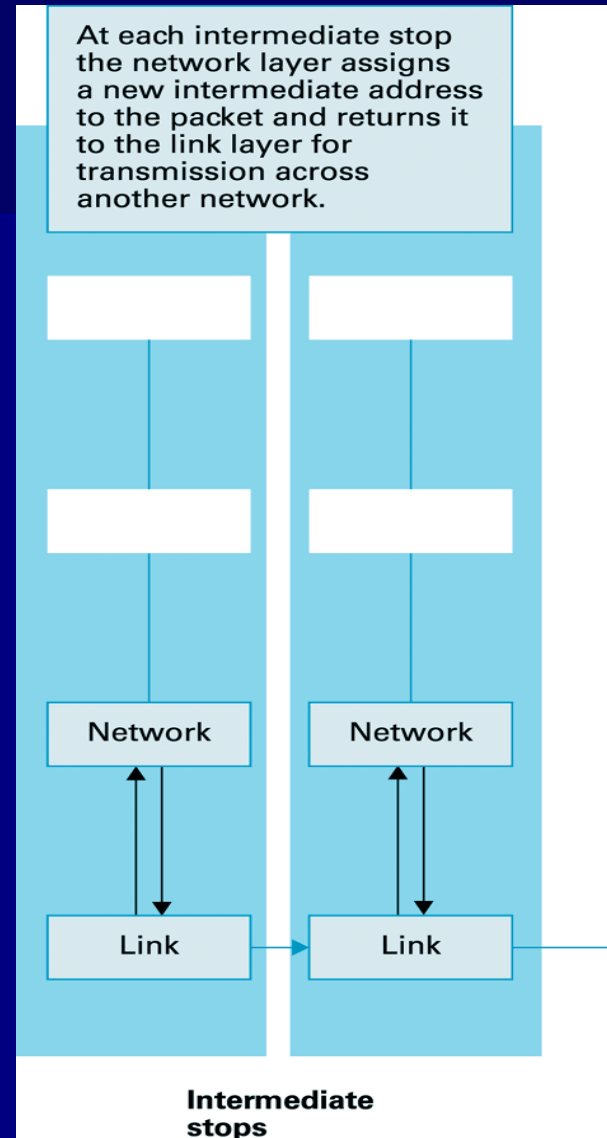
Figure 3.18: The Internet software layers
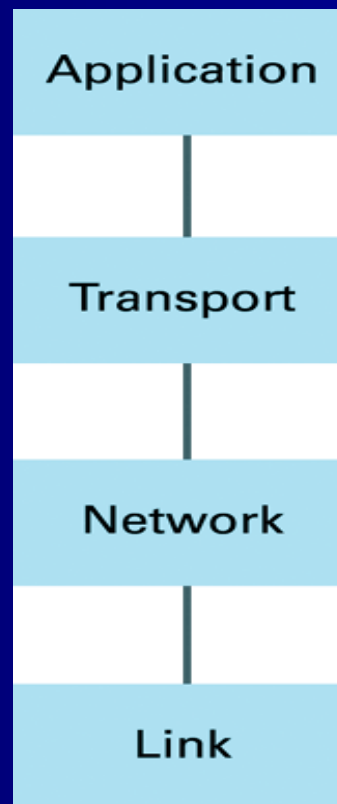
Figure 3.19: Following a message through the Internet

Figure 3.19: Following a message through the Internet (continued)

At each intermediate stop the network layer assigns a new intermediate address to the packet and returns it to the link layer for transmission across another network.

Network

Network

Link

Link

Intermediate stops

Protocols

- There are distinct protocols at *each* of the Link, Network, Transport, Application layers
- Protocols establish standards for exchanging binary data
- Protocols can be optimized for each task (some protocols are good for transferring large files... others are better for transferring streaming video)

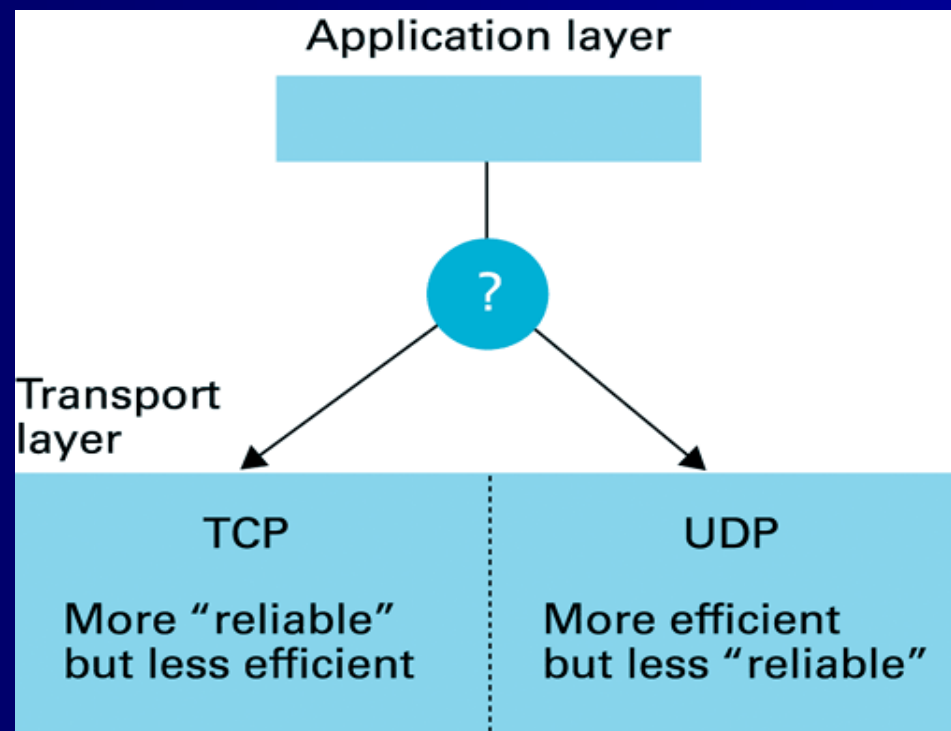# Figure 3.20: Choosing between TCP and UDP
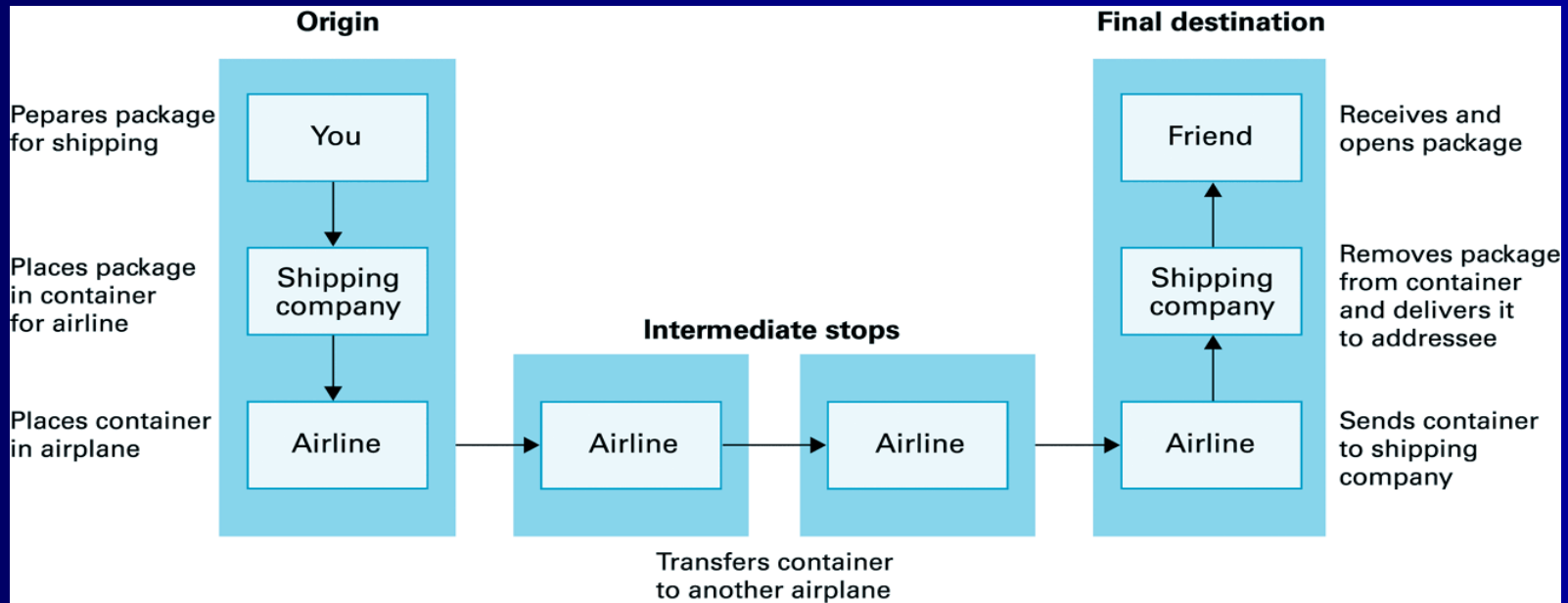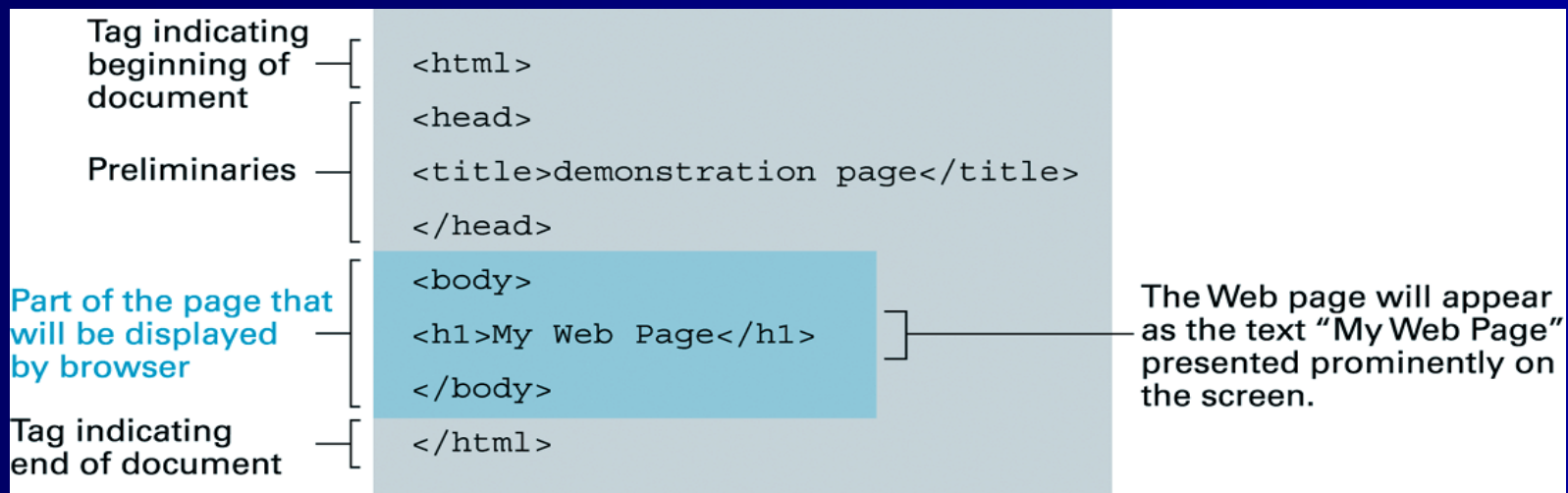
Figure 3.17: Package-shipping example

Figure 3.13: A typical URL

Figure 3.14: A simple Web page expressed in HTML

The Internet

- HTTP (Hypertext Transfer Protocol) is sent OVER TCP/IP (Transmission Control Protocol/Internet Protocol).

- HTTP is a means of efficiently requesting and sending HTML pages/graphics.

- TCP/IP is generic and operates at the lower "Transport" layer

Core Internet Services

- DNS – Translates Names to numerical IP Addresses
- IP Addresses consist of 4 "octets" of data (a number from 0 to 255)
- Issue – Address shortage