Intro to LAN/WAN

Introduction

Topics

- Use of networks
- Network structure
- Implementation of networks

Let’s Get Started!

- Networking today: “Where are they?”
  - Powerful computers are cheap
  - Networks are everywhere
- Blurred lines: “What are they?”
  - multi-processors
  - devices
  - local networks
  - metropolitan networks
  - long-haul networks

Computer Networks: Our Definition

An interconnected collection of *autonomous* computers

interconnected: can exchange information

- via fiber, copper, wireless

☞ autonomous: no master-slave

- not multiprocessors
- not computer with devices

Computer Network Components

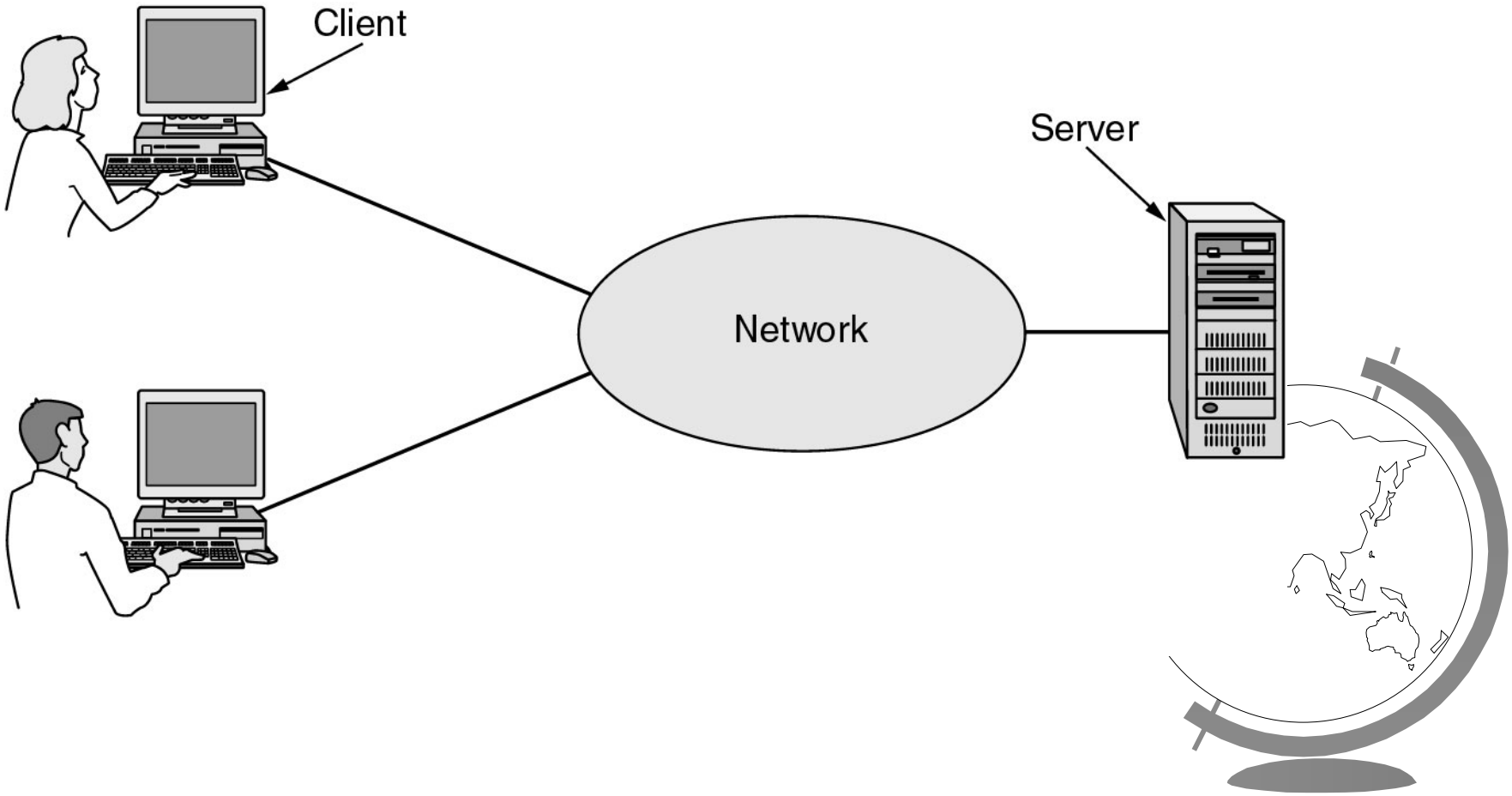
- Hardware
  - "physically" connects machines (can send signals)
- Software
  - Protocols specify services the network uses and the sequence of actions
  - Make the network hardware convenient
    - (Sound familiar? ala Operating System!)
- Software more important
  - (But may want to check with ECE :-))
- this class: upper layers, limited material on hardware

Uses of Computer Networks

- Business Applications
- Home Applications
- Mobile Users
- Social Issues

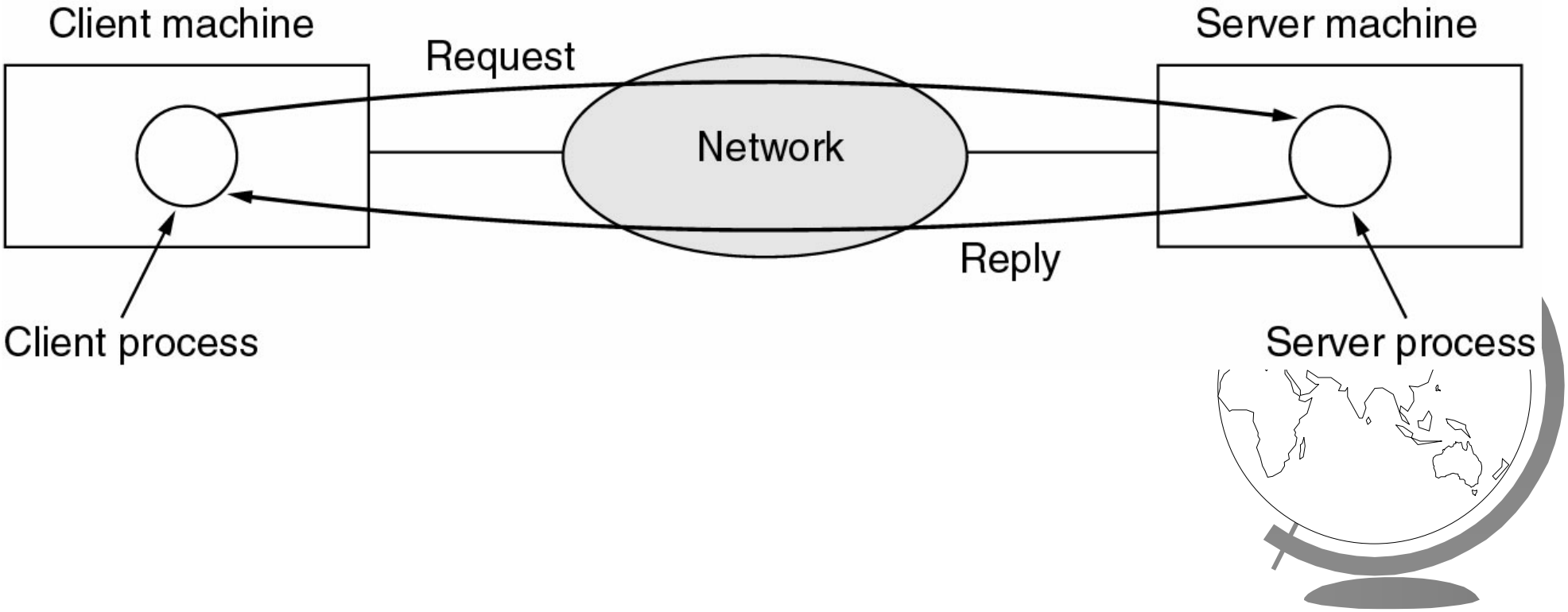
Business Applications of Networks

- A network with two clients and one server.



Client-Server Application

- Client-server model involves requests and replies.

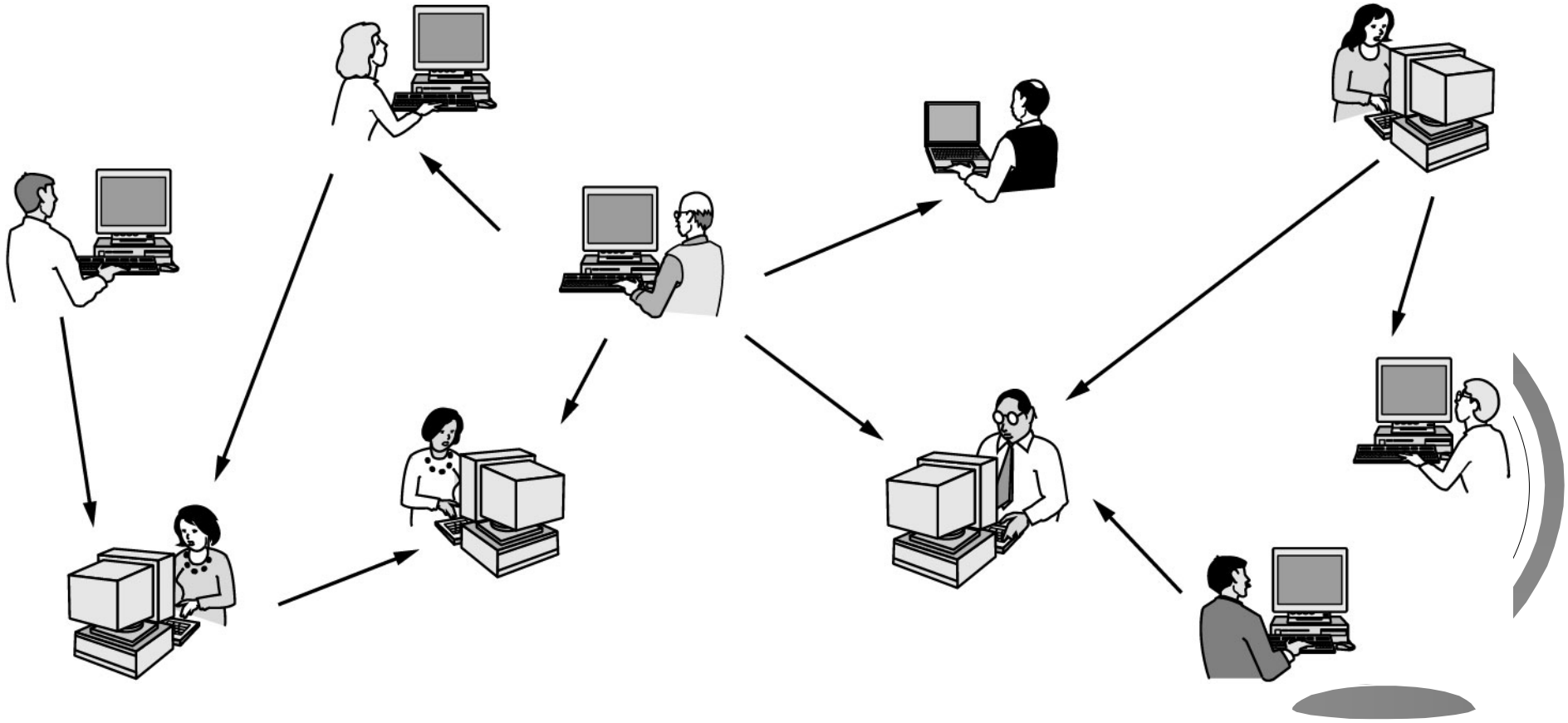


Home Network Applications

- Access to remote information (*google)*
- Person-to-person communication (*IM, VoIP)*
- Interactive entertainment (*Online games)*
- Electronic commerce *(Amazon)*

Peer-to-Peer Networking

- No fixed clients and servers in peer-to-peer system.



Home Network Applications

- Forms of e-commerce.

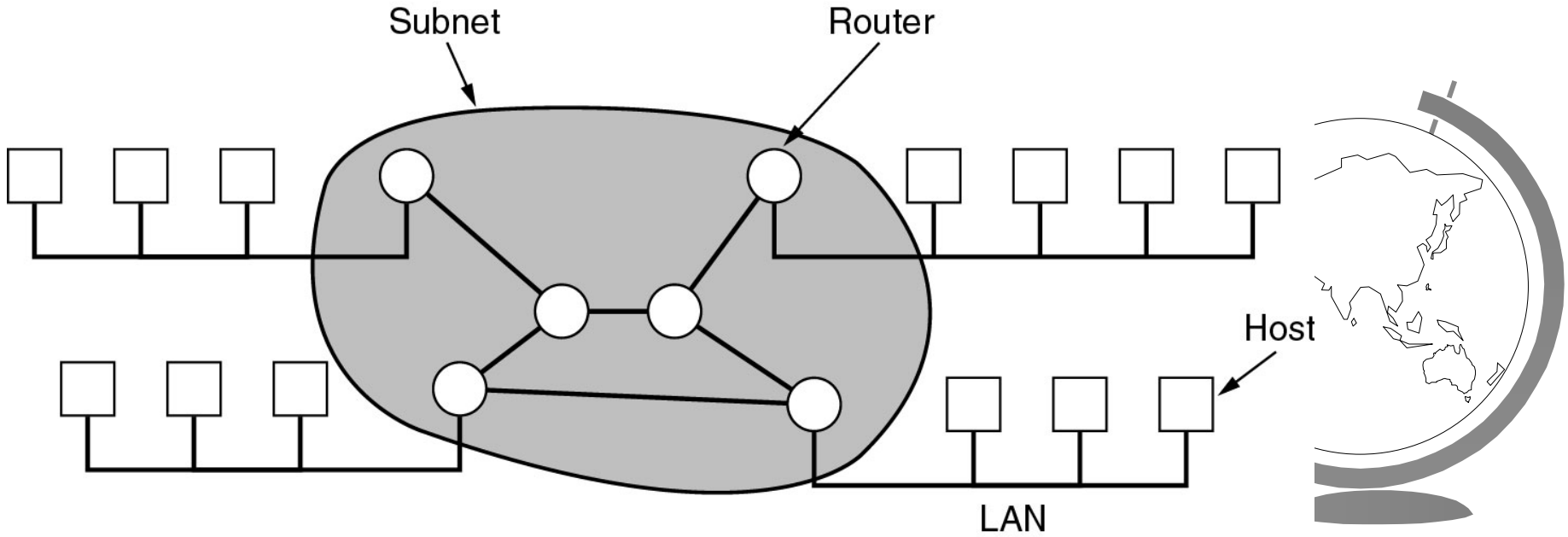
Tag	Full name	Example
B2C	Business-to-consumer	Ordering books on-line
B2B	Business-to-business	Car manufacturer ordering tires from supplier
G2C	Government-to-consumer	Government distributing tax forms electronically
C2C	Consumer-to-consumer	Auctioning second-hand products on-line
P2P	Peer-to-peer	File sharing

Effect on Society

- "Information Superhighway"
- Electronic "conversations"
  - email, message boards, messenger chat
  - different than face-to-face, phone, mail
- World Wide Web
  - instant sharing of information
  - true "desk-top-publishing"
  - electronic retailing

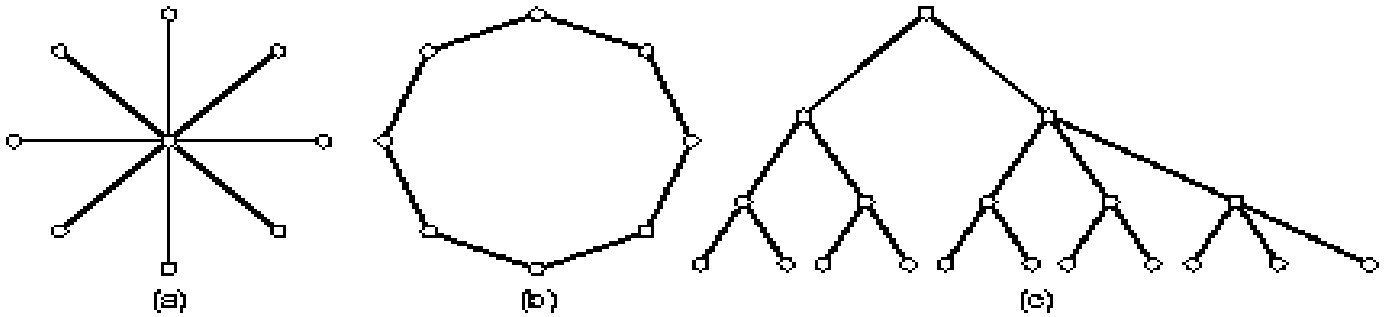
Network Structure

- *Host* or *End-System*
  - a computer that a user logs into to do work
  - attached to network, not part of network (usually)
- *Subnet*
  - everything between hosts
  - transport data from one host to another



Subnet

- *Point-to-Point*
  - Two machines, one at each end of a “wire”
  - Often many point-to-points in a subnet



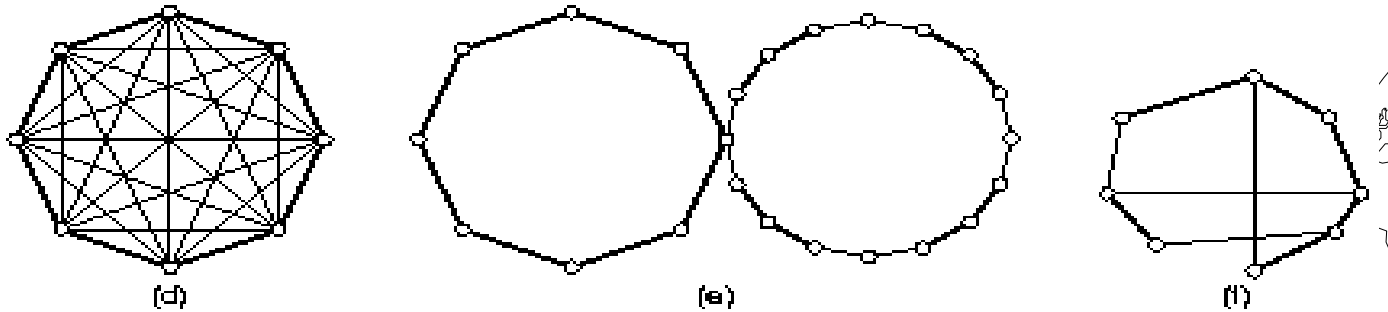
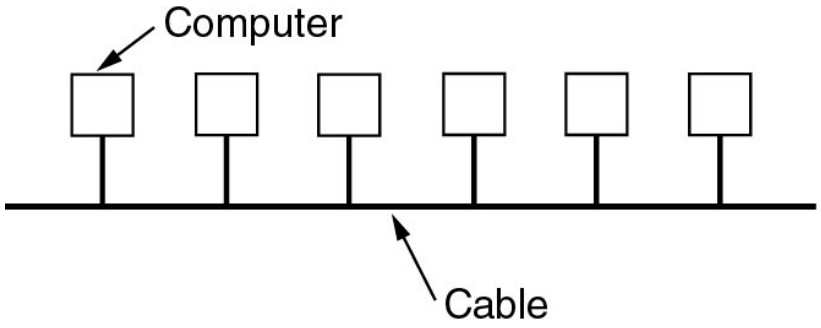


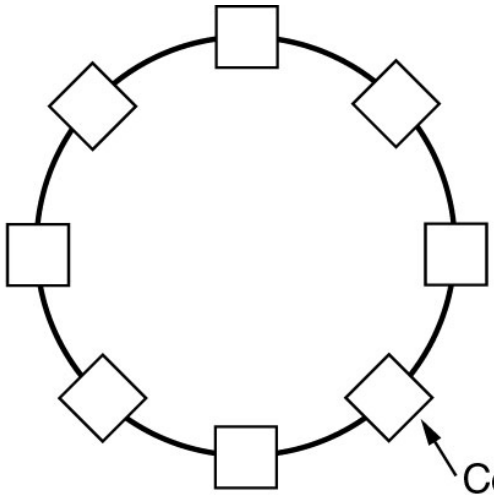
Fig. 1-6. Some possible topologies for a point-to-point subnet. (a) Star. (b) Ring. (c) Tree. (d) Complete. (e) Intersecting rings. (f) Irregular.

Subnet

- *Broadcast*
  - Many (3+) machines sharing a common link
  - When one “speaks”, all hear
  - Two examples of broadcast network below:



(a)



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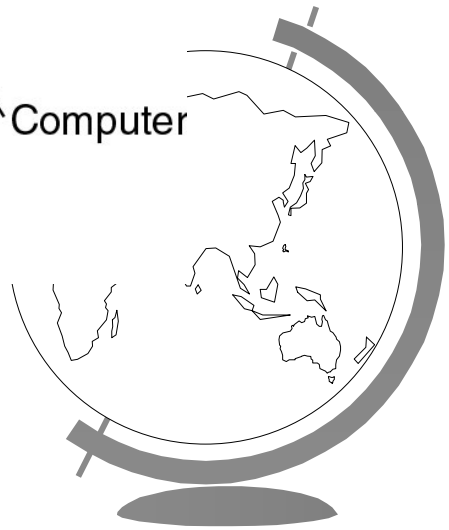

- *Multicast* targets only some
- *Unicast* send to only one

Types of Network Structures

- LAN - Local Area Network
- MAN - Metropolitan Area Network
- WAN - Wide Area Network
- Wireless / Mobile Networks

Broadcast Networks (2)

- Classify interconnected processors by scale.

Interprocessor distance	Processors located in same	Example
1 m	Square meter	Personal area network
10 m	Room	Local area network
100 m	Building	
1 km	Campus	
10 km	City	Metropolitan area network
100 km	Country	Wide area network
1000 km	Continent	
10,000 km	Planet	The Internet

Local Area Networks (LANs)

- Small geographic regions (e.g., building(s))
- High data rates (10-100 Mbps and up)
  - Much higher than connection to ISP
- Low cost (thousands of dollars)
- Typically broadcast

Metropolitan Area Networks (MANs, not MEN)

- Medium-size geographic regions (e.g., entire cities)
- Still no switches, single “wires”
- Example: local cable system

Wide Area Networks (WANs)

- Larger geographic distance (e.g. entire countries)
- Low data rates (56 kbps - 1.5 Mbps (T1), bundle T1 links to get higher rates),
- High cost (tens or hundreds of thousands of dollars per year)
- The *Internet* is a specific WAN

Wireless / Mobile Networks

- Fastest growing network segment
- Notebook computers and portable digital assistants (PDAs) to base
- Portable network for military use
- Note: Wireless is not necessarily mobile
- Example wireless networks: 802.11, bluetooth

Wireless	Mobile	Applications
No	No	Desktop computers in offices
No	Yes	A notebook computer used in a hotel room
Yes	No	Networks in older, unwired buildings
Yes	Yes	Portable office; PDA for store inventory