

MANAGEMENT INFORMATION SYSTEMS 8/E

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Chapter 10

Data Communications

Objectives

- Understand data communication basics.
- Know the data transmission speed for communication between computers.
- Be familiar with local area networks, metropolitan area networks, wide area networks, and the Internet of networks.
- Understand the two main local area network protocols-- Token-Ring and Ethernet.
- Understand the data communication services provided by public telephone systems, also known as common carriers.
- Be familiar with communications hardware that supports networking.

Communication Basics

- **Computer communications is at three levels**
 - Application level
 - Computer level
 - Communication channel
- **Protocol**
 - Set of rules for communications
 - OSI Standard

OSI Reference Model

Layer	Name	Purpose
7	Application Layer	Application-to-application communication
6	Presentation Layer	Manage data representation conversions
5	Session Layer	Establish and maintain communication channel
4	Transport Layer	Guarantee end-to-end integrity of transmission
3	Network Layer	Route data between network addresses
2	Data Link Layer	Move data from one network address to another
1	Physical Layer	Put data onto and off of the network media

ISO Website



Protocols for Computer Communication

- Early computers
 - Terminals
 - Sneaker net
- System Network Architecture (SNA)
 - Established by IBM in 1974
 - Proprietary
- Token-Ring
 - Host computer controlled
 - peer-to-peer

Protocols for Computer Communication

■ Ethernet

- Xerox working with Intel and Digital Equipment Corporation developed this protocol
- Non-proprietary
- Defined by IEEE
- Works on a single transmission line
- No token is passed

Packets

- Piece of the total data to be communicated, combined with the address of the destination computer for the data and other control information.

Transmission Control Protocol/Internet Protocol (TCP/IP) is one of the more important packet switching protocols

Network Addresses

■ Address

- Four-part set of numbers
- Each from 0 to 255

■ Internet Service Providers (ISPs)

- User connects through common carrier

■ Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol (PPP)

- Protocols for users at home

Protocols for Public Phone Systems

- X.25
 - analog
 - older protocol
- Integrated Services Digital Network (ISDN)
 - Digital
 - Can carry voice, data, and video

Protocols for Public Phone Systems (cont.)

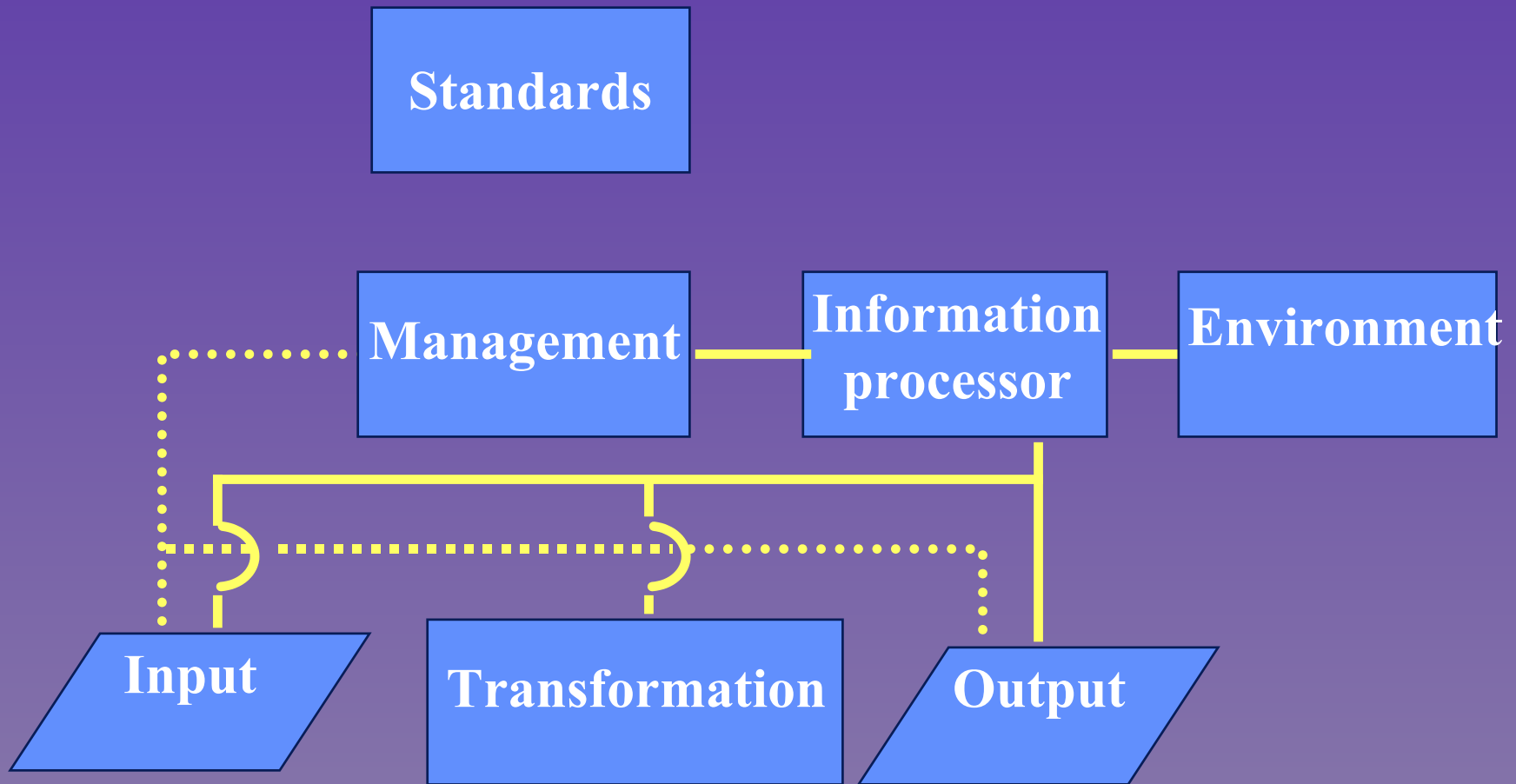
■ Frame Relays

- Move to fiber optics

■ Asynchronous Transfer Mode (ATM)

- Smaller packet size
- Faster transmission speeds

Data Communications Links the General Systems Model Elements

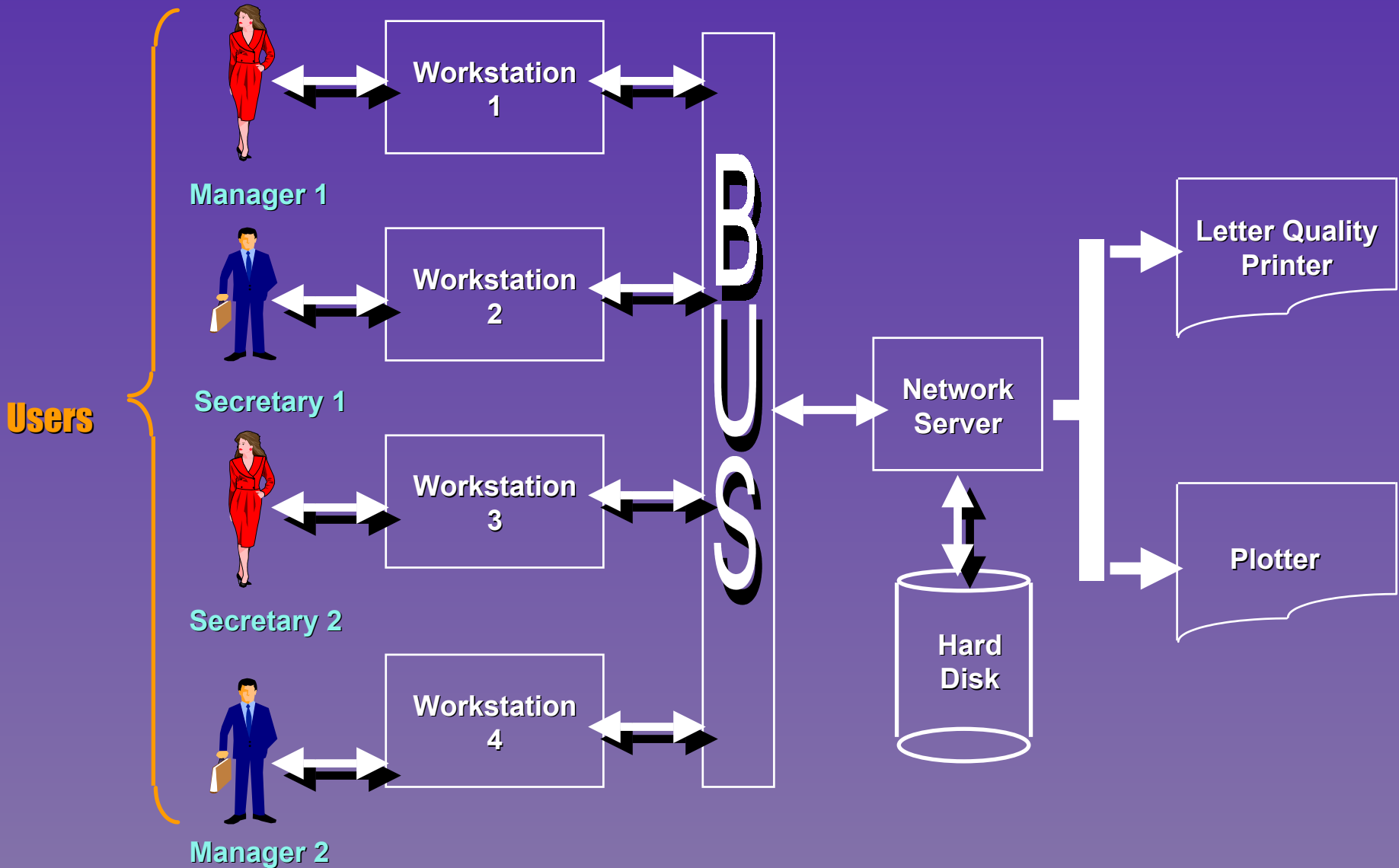


Networks

- Each device must be connected to the communications medium via a network interface card (NIC)

Types of Networks

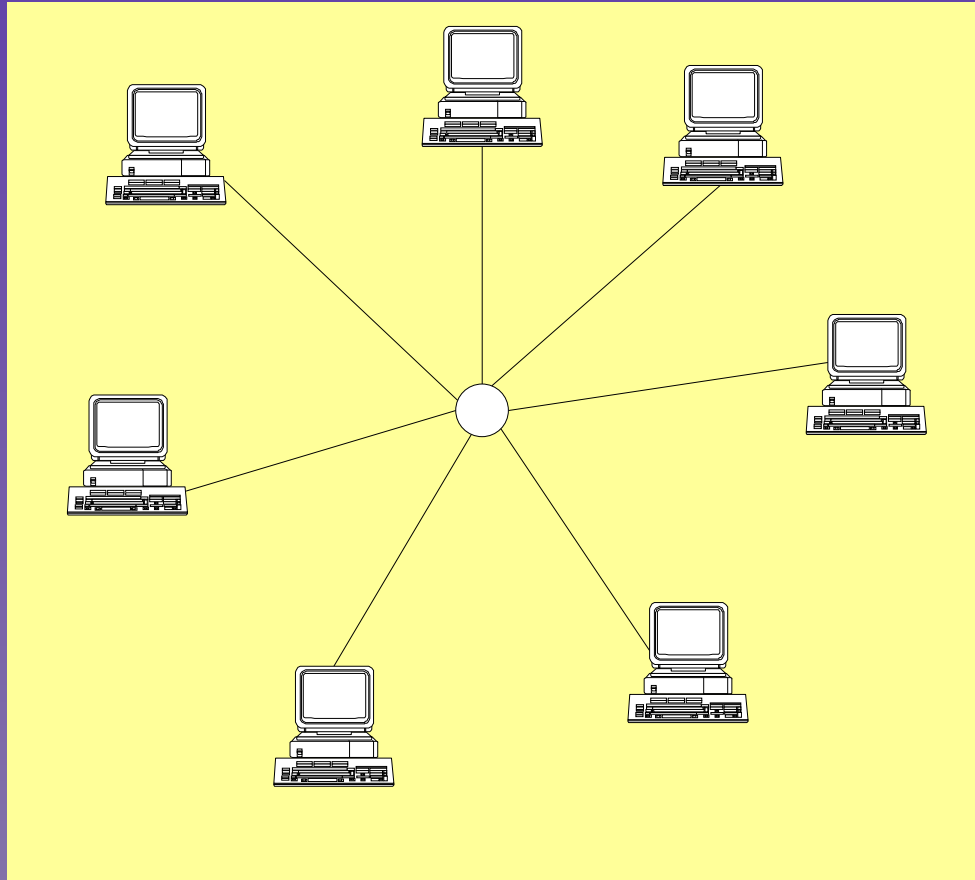
- LAN (local area network)
 - Limited area but could include 100 or so micros
 - Facilitates office automation
- MAN (metropolitan area networks)
 - spans one city/metropolitan area
- WAN (wide area network)
 - Covers a large geographic area
 - Includes a wide variety of circuits
 - Usually includes host computers



A Local Area Network

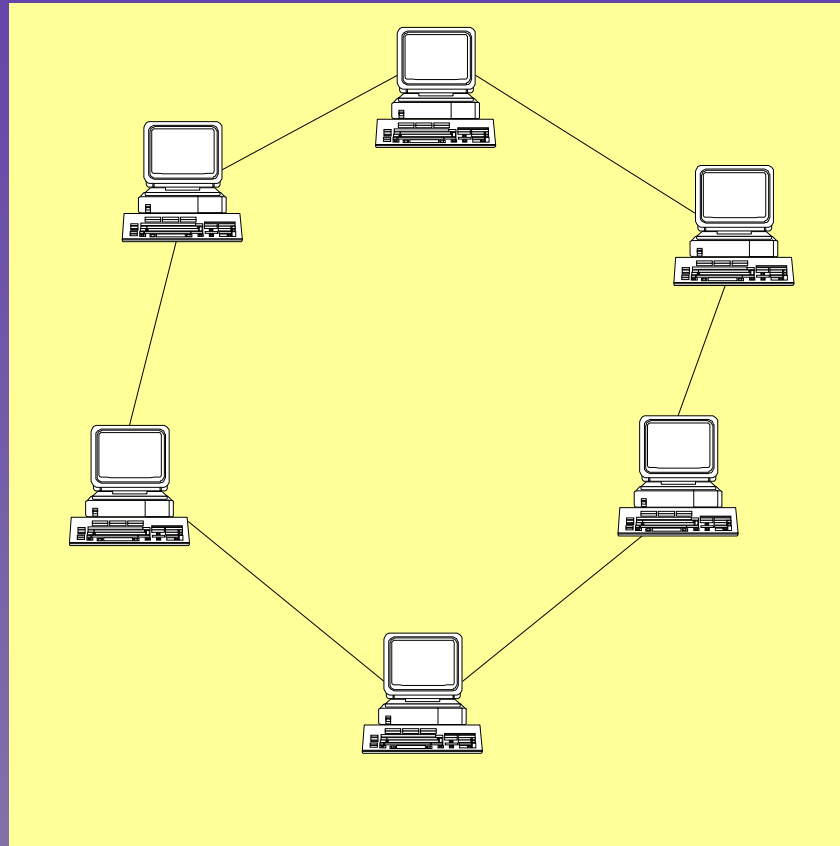
Common LAN Topologies

Star



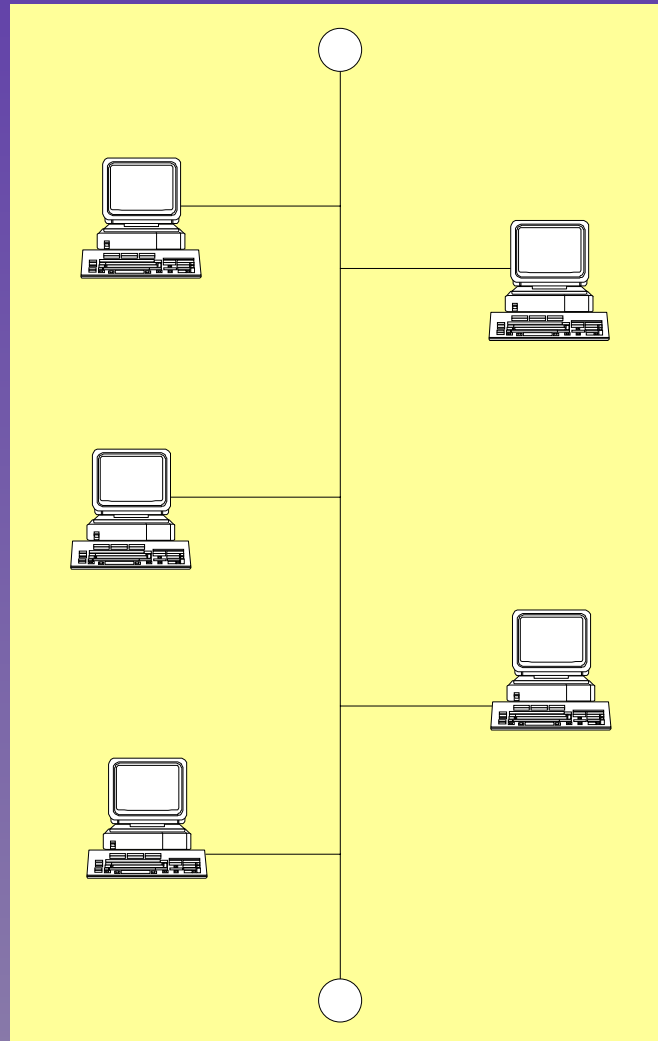
Common LAN Topologies

Ring

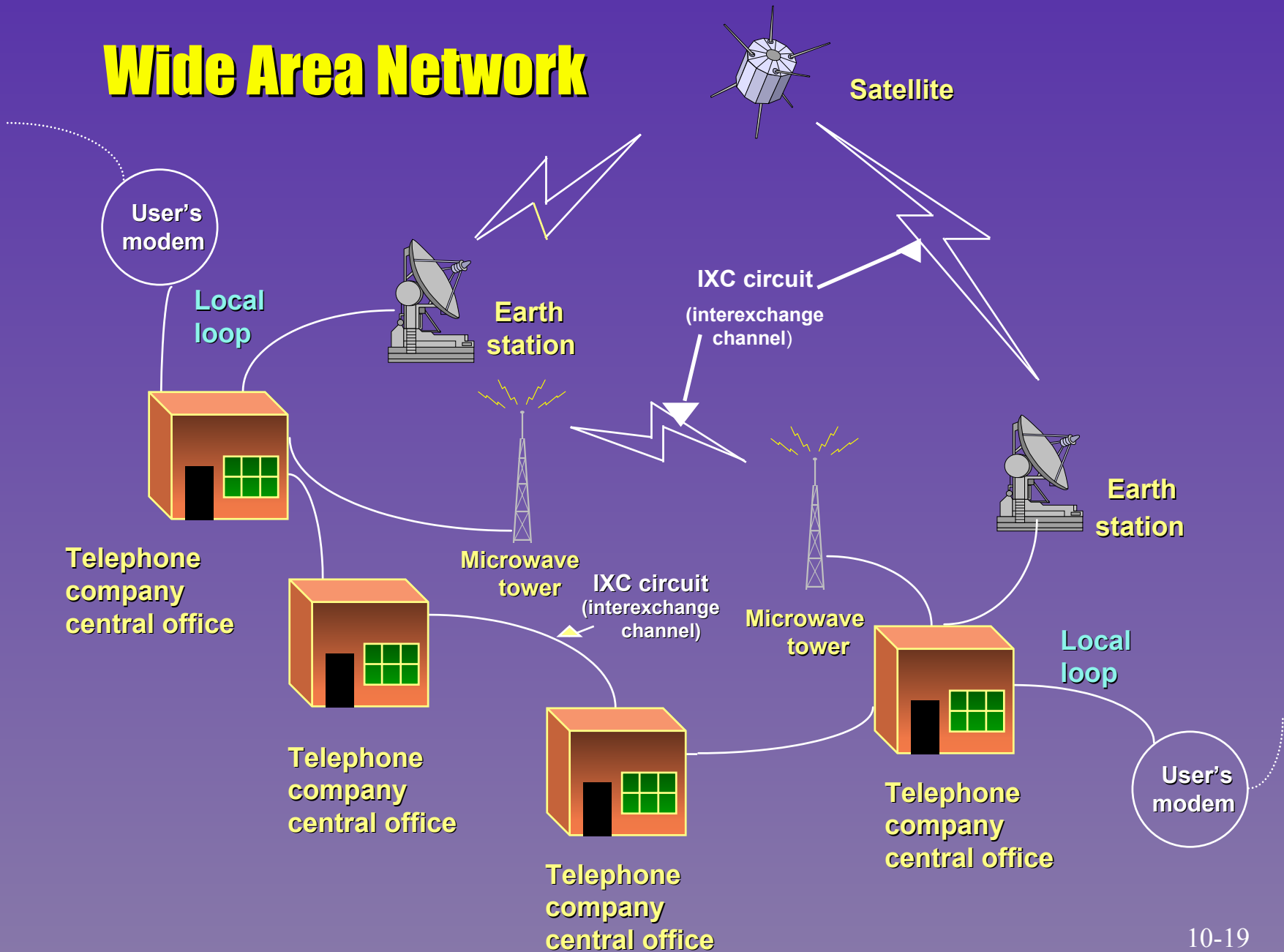


Common LAN Topologies

Bus



Wide Area Network



Types of Networks (cont.)

■ Internet

- Collection of networks
- Public

■ Intranet

- Uses Internet network protocols
- Limits accessibility
- Firewall

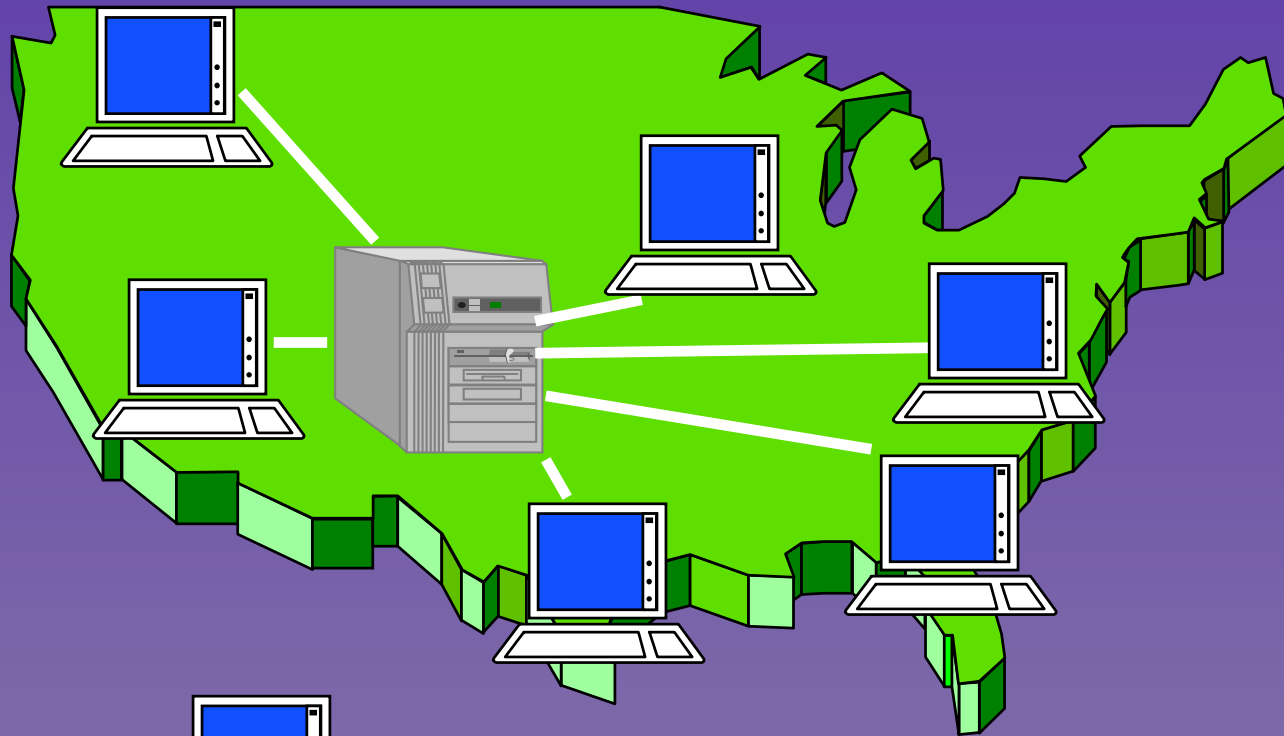
■ Extranet

- For trusted business partners and customers

Control of Data Communications Networks

- Centralized
 - Point-of-sale terminals
 - Data collection terminals
- Distributed processing
 - Receiving computer runs programs that use data
- Client/server processing
 - Mixes centralized and decentralized processing strategies

A Network of Terminals



Legend:

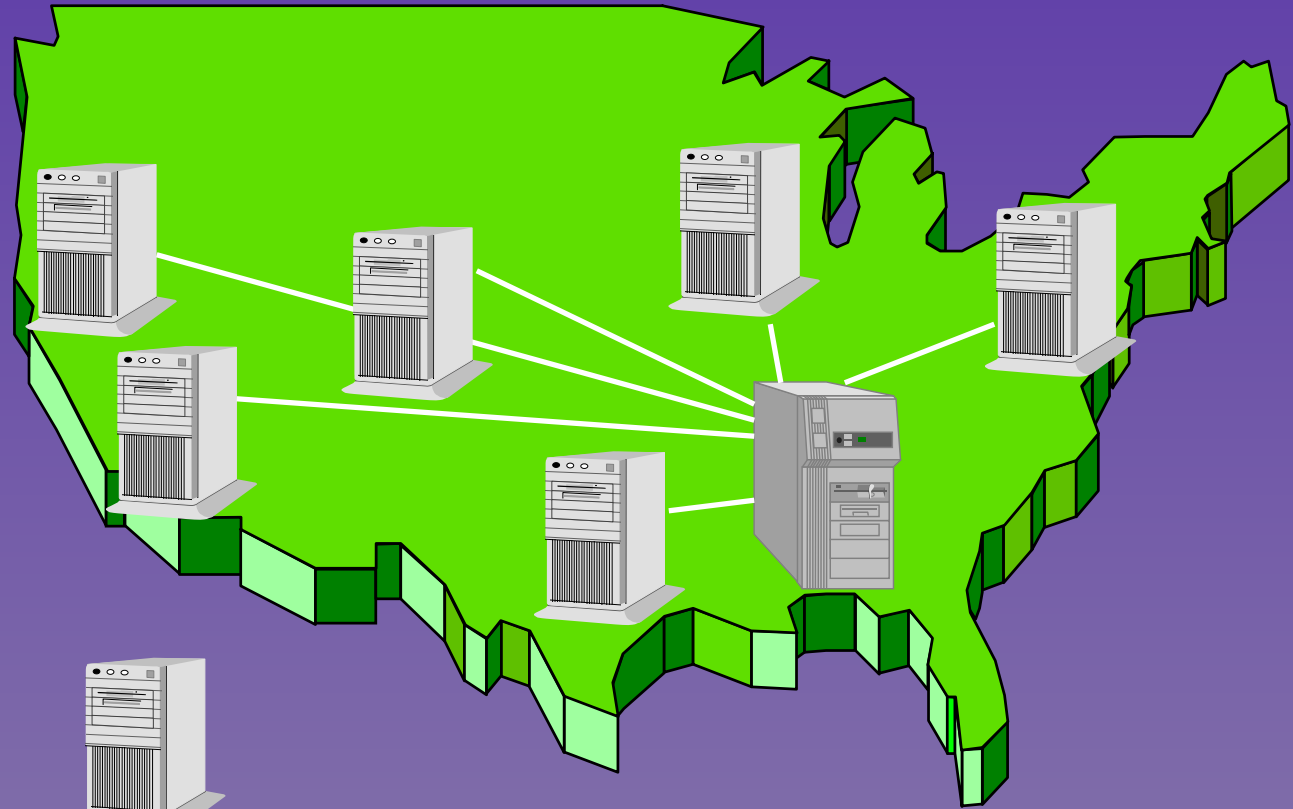


Computer

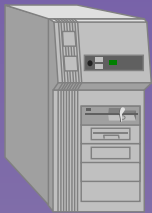


Terminal

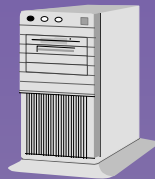
A Distributed Processing Network



Legend:



Central
Computer



Distributed
Computer

Communications Hardware

■ Modem

- Converts digital to analog and vice versa
- Bits per second determines transmission speed
- Local loop

■ Hub

- Receives a data packet from a computer at one end of one spoke of the star topography and copies its contents to all other computers
- Manageable hubs

Data Communications with a Modem



A modem is always required between a telephone and a digital computer

Communications Hardware (cont.)

■ Router

- Device that connects many LANs
- More sophisticated than a bridge
- Process header information of a packet

■ Switch

- Filters data not intended for a computer on a particular network

Communications Connections

■ Private Lines

- Circuit that is always open to communications traffic
- Also called leased line or dedicated line
- Two types
 - » T-1 - Maximum speed just over 1.5 Mbps
 - » T-3 - Maximum speed 43 Mbps
 - » Collections of 64 Kbps connections

Communications Connections (cont.)

- Virtual Private Networks (VPNs)
 - Tunneling software makes Internet connections more secure
 - Privacy through authentication
 - More cost effective than private lines

Network Management

- Digital nervous systems of an organization
- Network planning
 - Anticipates firm's network needs
 - Monitor's performance
- Network Control
 - Determines faults
 - » Errors in data communication
 - » Alerts to potential faults

Network Management (cont.)

■ Network manager

- Planning, implementing, operating, and controlling a firm's data communications network(s)

■ Staff

- Network analysts (a type of systems analyst)
- Software analysts
- Data Communication Technicians (specialize in hardware)
- LAN managers

Wireless Networks

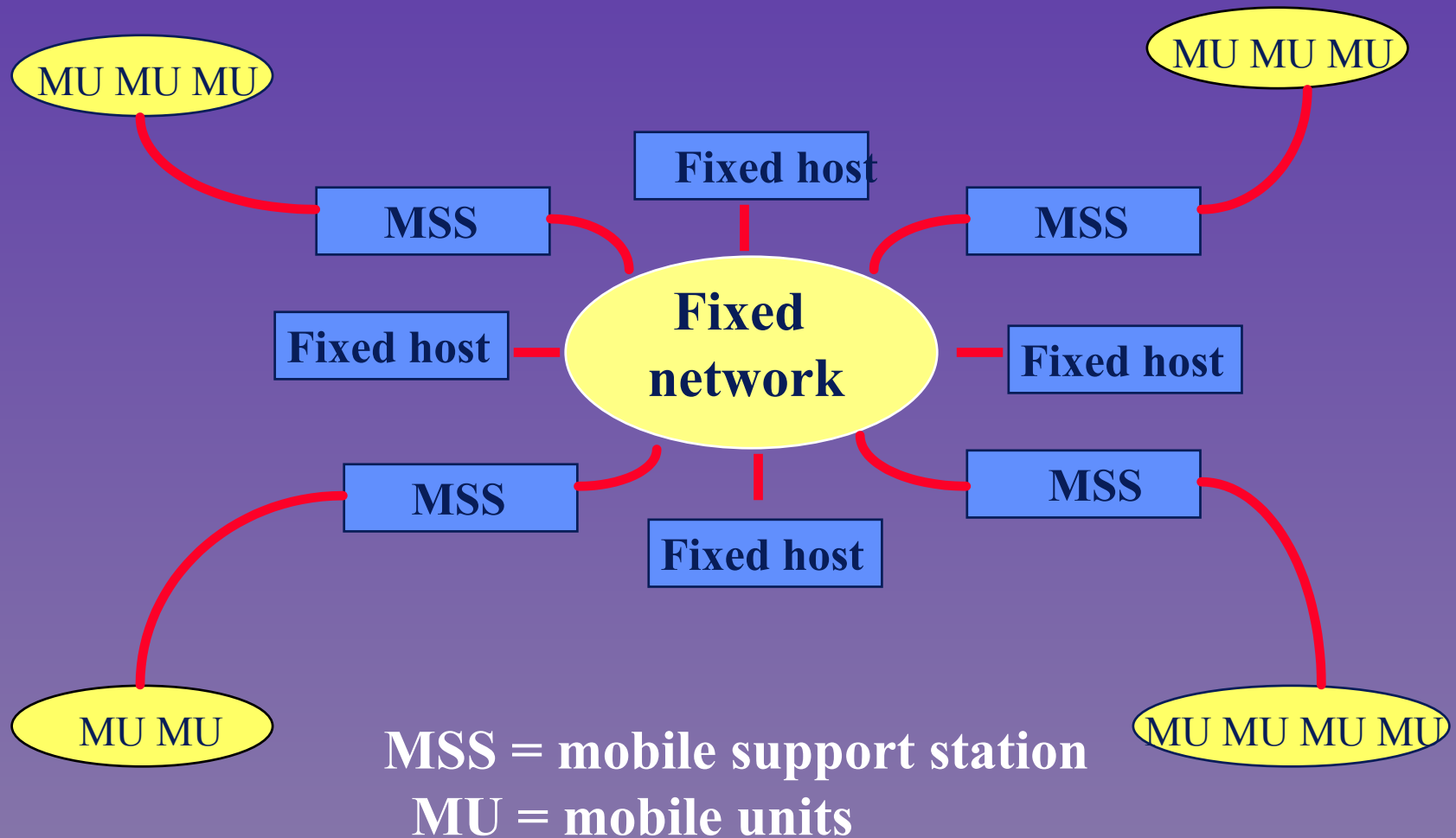
- Cellular networks
 - Hand held telephones
 - Primarily for voice
- Wireless LANs
 - Extensions of regular LANs
- Wide-area wireless networks
 - Nationwide

Wireless Networks (cont.)

- Paging networks
 - Receive only capability

Personal Communications Network (PCN)
is the networking infrastructure for wireless.
It is not yet in place!

A Network with Mobility Capability



Summary

- Data communications enable computers to share information and applications
- Networks
 - LANs
 - MANs
 - WANs
- Communication standards

Summary (cont.)

■ Basic Hardware

- Hubs
- Routers
- Bridges
- Switches

■ Planned growth

Case Study

1. A LAN is a group of computers and other devices connected together by a common medium-- typically in the same building.

A)TRUE

B)FALSE

2. A WAN includes a component of a public phone system or other common carrier.

A)TRUE

B)FALSE