



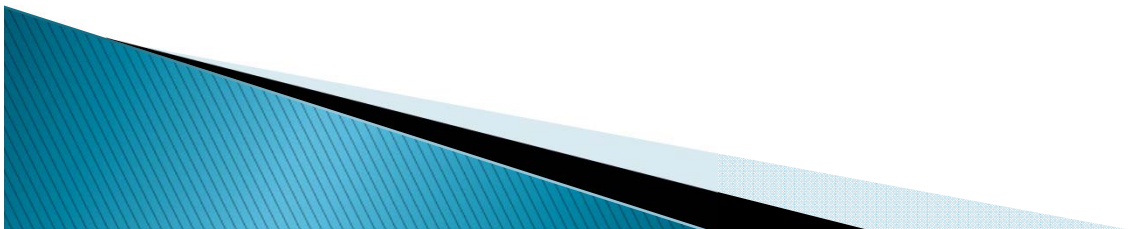
Computer Networks

an intro

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Preference

- ▶ Introduction and History
- ▶ Basic Network Components
- ▶ Network topologies
- ▶ Sample networks
- ▶ Course Book
- ▶ References



Syllabus

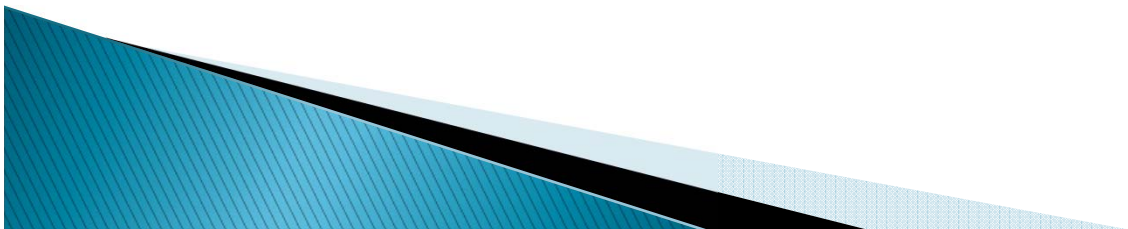
Network

- ▶ Infrastructures
- ▶ Components
- ▶ Topologies
- ▶ Protocols
 - OSI
 - TCP/IP



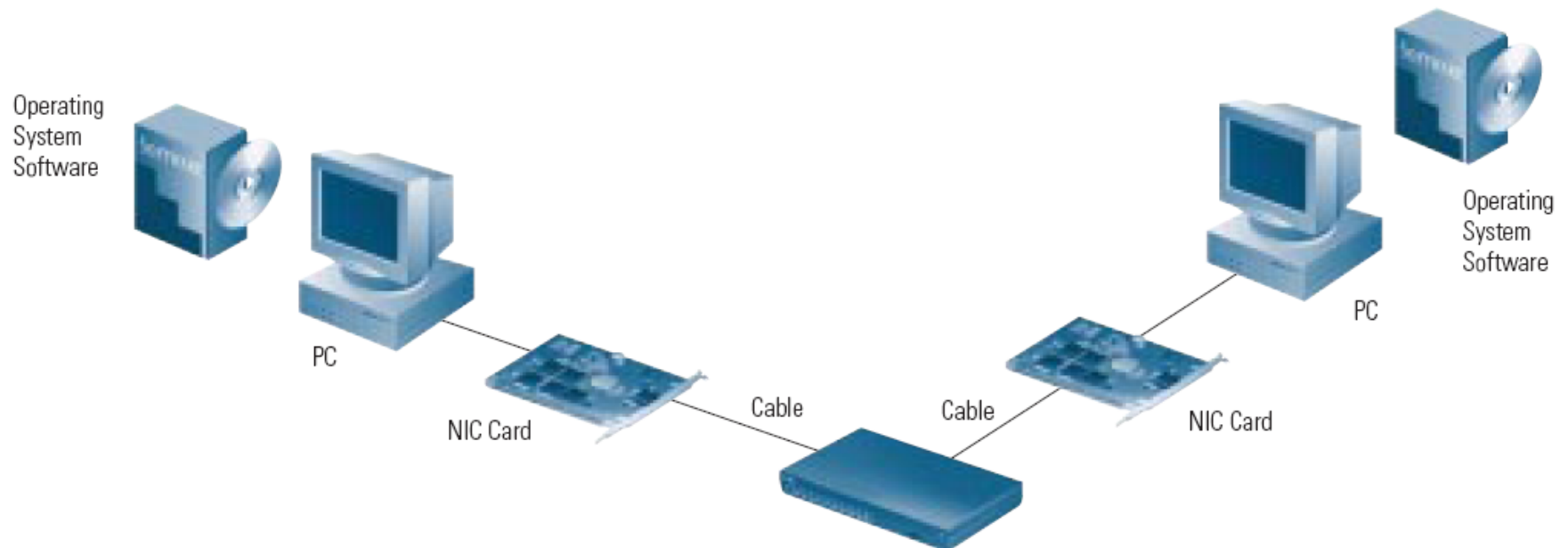
Introduction & History

- ▶ sharing of resources and information among devices connected to the network
- ▶ The [Advanced Research Projects Agency \(ARPA\)](#) funded the design of the [Advanced Research Projects Agency Network \(ARPANET\)](#) for the United States Department of Defense. It was the first operational computer network in the world. Development of the network began in 1969, based on designs developed during the 1960s. ^[1]



Basic Network Components

Basic Networking Components



Most networks consist of at least two computers, network interface cards, cabling, network operating system software, and a hub.

Wiring and Cable

- ▶ Three primary types of wiring (also referred to as “media”)



Twisted Pair



Coaxial



Fiber-Optic

Wiring and Cable – cont

▶ Twisted-pair

- In several standards:

- Category 3 wire is often used for phone lines – *Ethernet*
- Category 5 wire are the current networking standards – *Fast Ethernet*

▶ Coaxial

- resembles round cable TV wiring

▶ Fiber-optic

- reserved for connections between “*backbone*” devices in larger networks
- the most reliable wiring but also the most expensive

Wireless technologies

▶ Terrestrial Microwave

- low-gigahertz range
- line-of-sight communication (approx. 30 miles apart)

▶ Communications Satellites

- The satellites are stationed in space, typically 22,000 miles above the equator

▶ Cellular and PCS Systems

- divided to different geographic area
- low-power transmitter or radio relay antenna device to relay calls



Wireless technologies – cont

▶ Wireless LANs

- Wireless local area network
- spread spectrum technology
- Exp: IEEE 802.11b

▶ Bluetooth

- short range wireless technology
- 1 Mbps with range from 10 to 100 meters

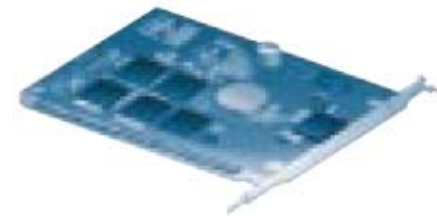
▶ The Wireless Web

- use of World Wide Web through equipments like cellular phones, pagers, PDAs...
- offers anytime/anywhere connection



Hardware components

- ▶ Network interface cards (NICs or adapters)



Network Interface Card

- ▶ Hubs or repeaters
 - forward any data packets they receive over one port from one workstation



Hub

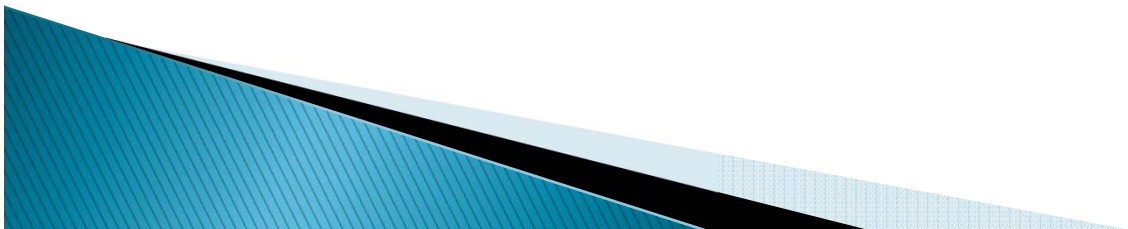
Hardware components – cont

▶ Modems

- Used for “dialup” communications
- Work with ordinary telephone lines
- Converts digital to analog signals (and vice versa)
- modulating and demodulating

▶ Bridges

- Smarter than hubs
- connect multiple network segments



Hardware components – cont

▶ Switches

- Smarter than hubs & bridges
 - basically multiple bridges in a single device
- forwards data packets only to the appropriate port
- support multiple “conversations”



Switch

Hardware components – cont

▶ Routers

- Smarter than switches and bridges
- “**routing table**” is used to find the efficient way for packets to travel to their destination



Router

Network Classification

- ▶ Local area network (LAN)
 - Ethernet and Fast Ethernet
- ▶ Wide area network (WAN)
- ▶ Metropolitan area network (MAN)
- ▶ Personal area network (PAN)
- ▶ Virtual private network (VPN)
- ▶ Home area network (HAN)
- ▶ Campus area network (CAN)
- ▶ Storage area network (SAN)
- ▶ Intranets and extranets



Network topologies

▶ Ethernet

- since the late 1970s
- based on **carrier sense multiple access with collision detection (CSMA/CD)**
- **network is “quiet”**: an Ethernet workstation can send data packets only when no other packets are traveling on the network.
- **“collision”**: If multiple stations sense an opening and start sending at the same time
- 10 Mbps



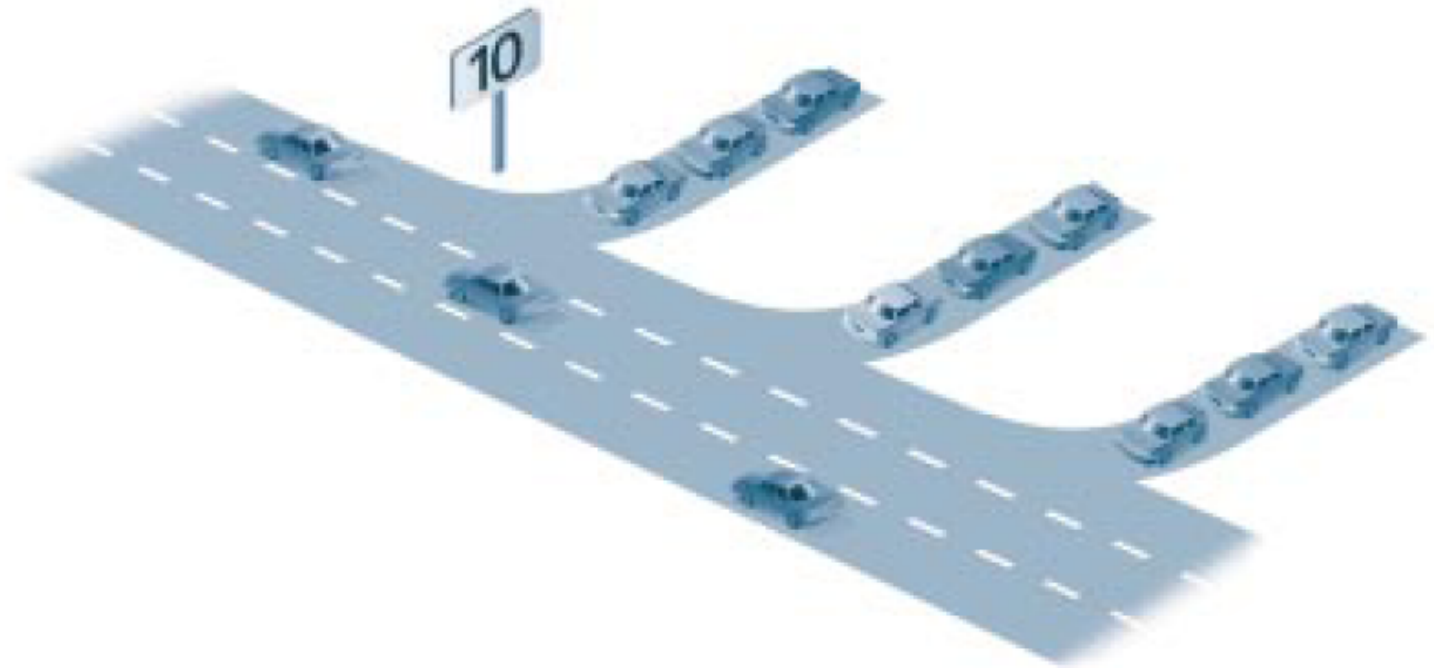
Network topologies – cont

Shared Ethernet



Network topologies – cont

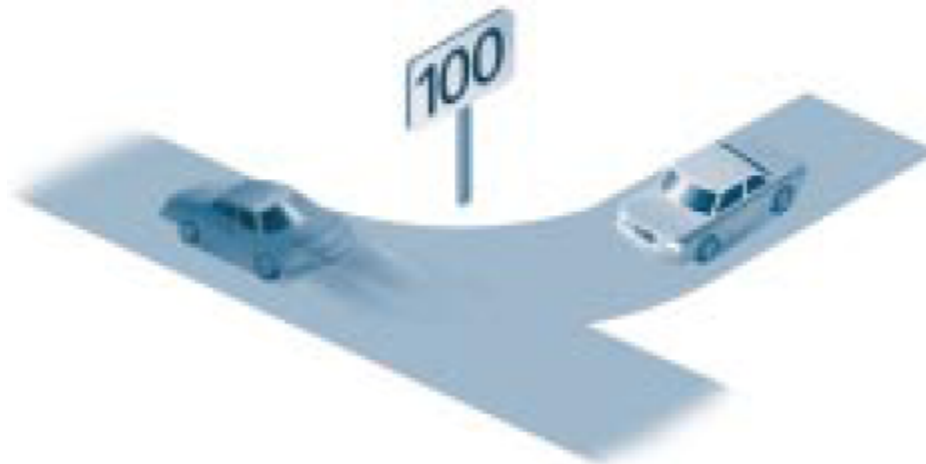
Switched Ethernet



Network topologies – cont

- ▶ Fast Ethernet
 - 100 Mbps
 - UTP cat 5

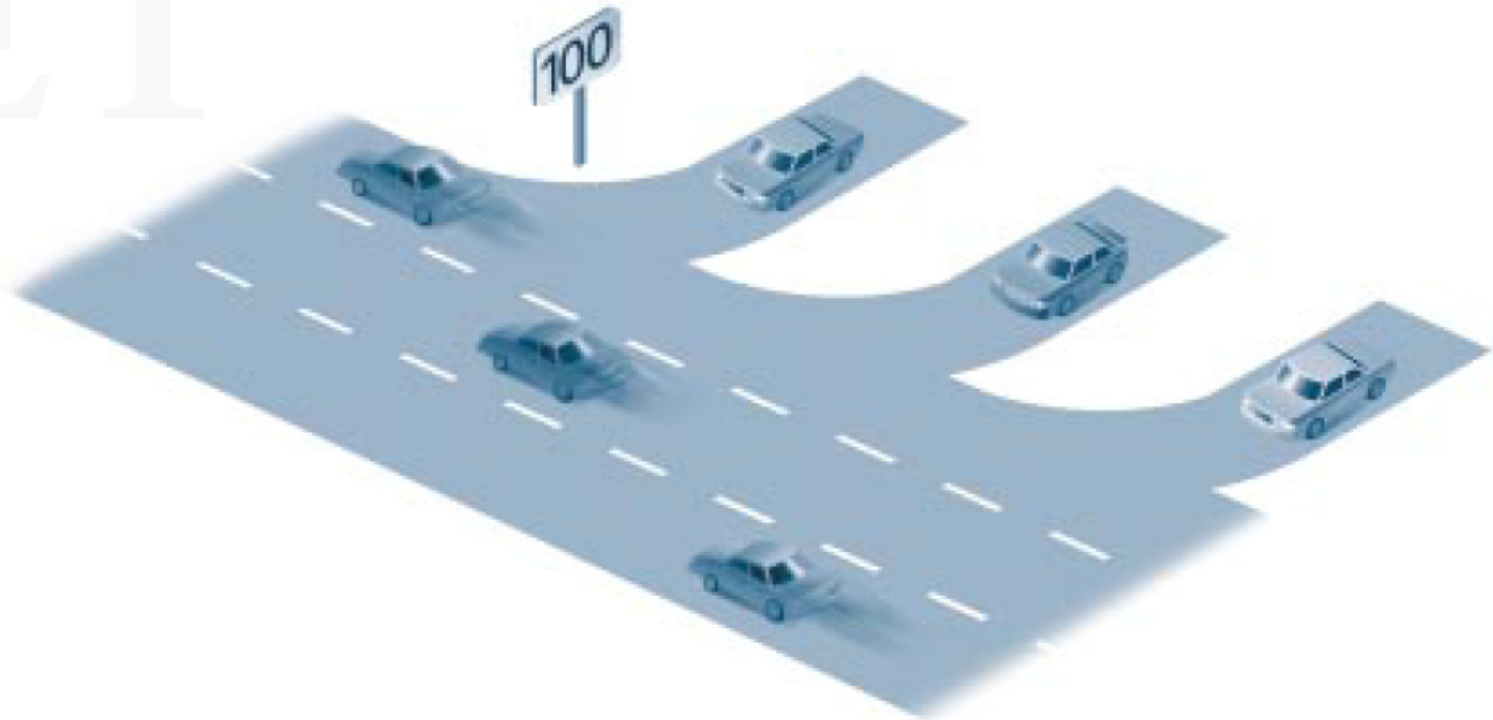
Shared Fast Ethernet



Network topologies – cont

Switched Fast Ethernet

ET



Network topologies – cont

- ▶ Token Ring
 - “token-passing” technology
 - an alternative to Ethernet’s collision-detection method



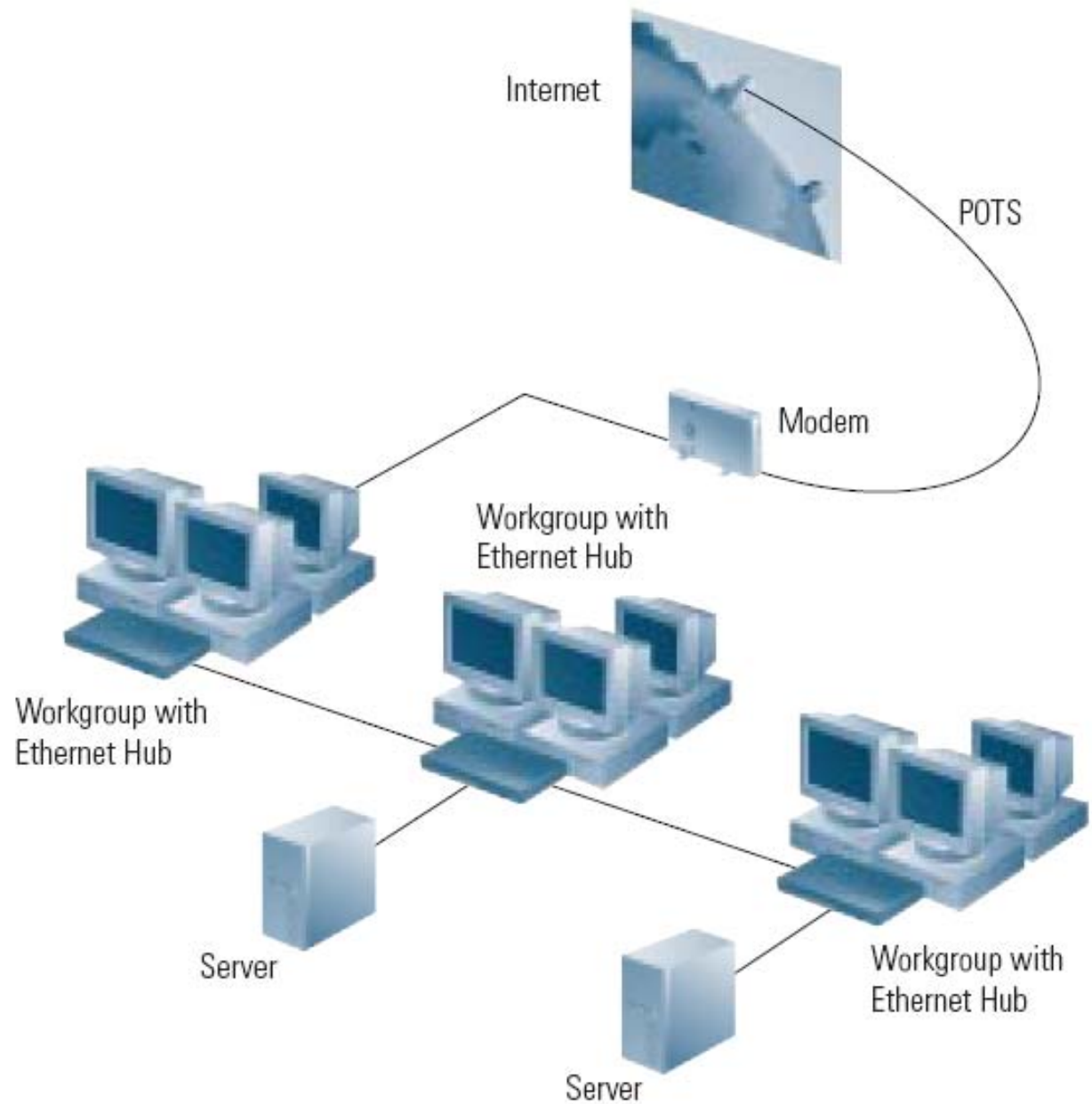
Network topologies – cont

- ▶ Leased Lines



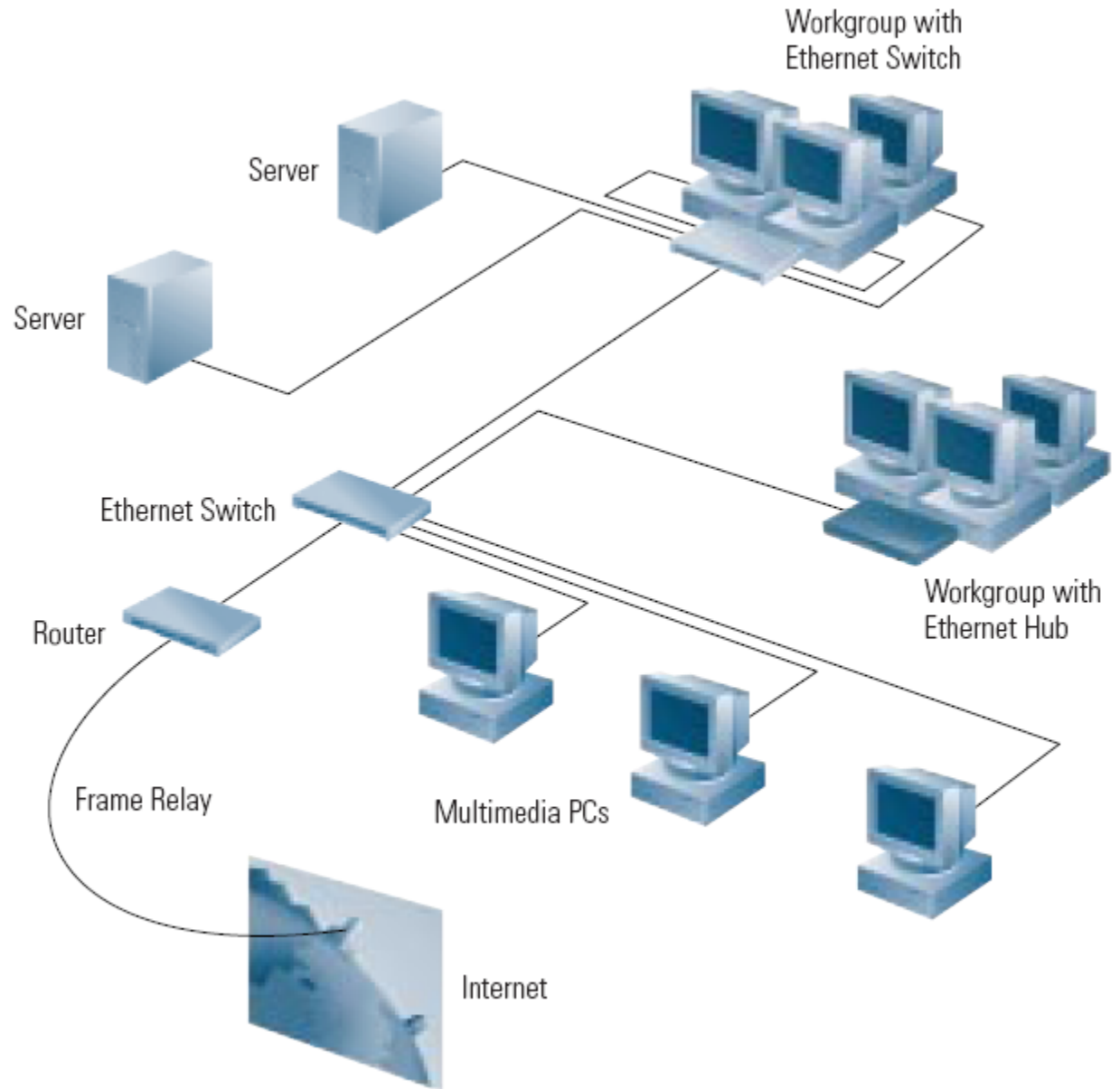
Sample. 1

A Local-Area Network at a Campus



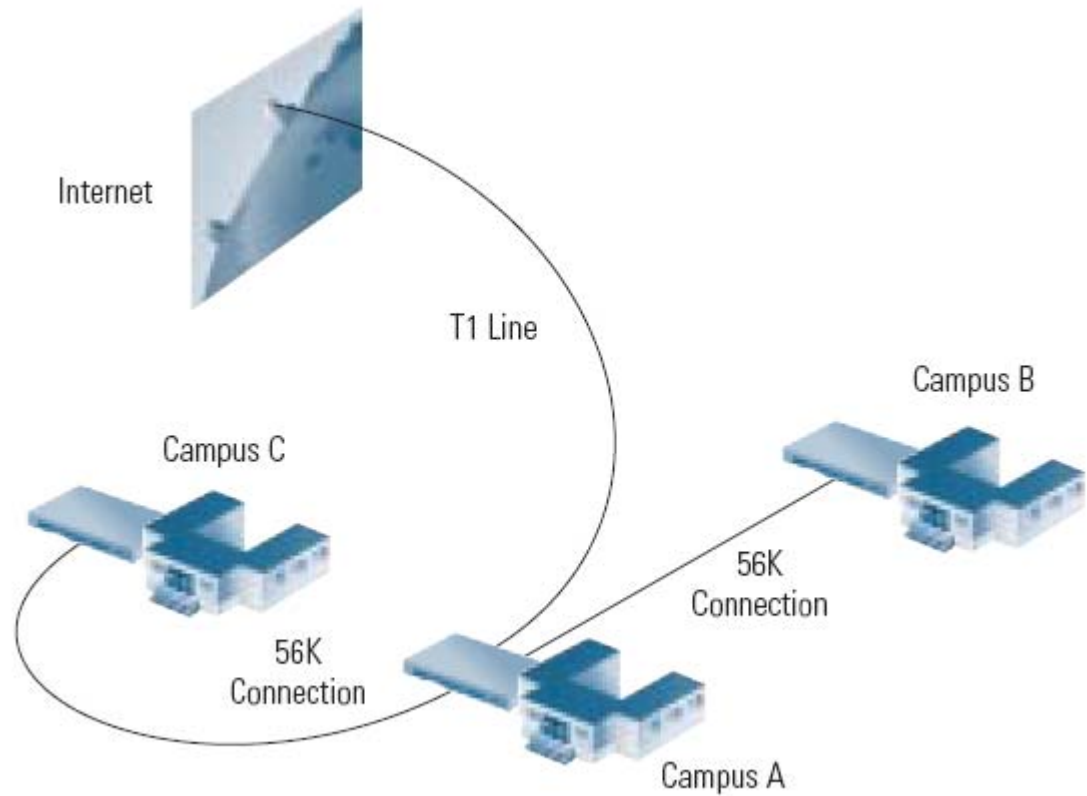
Sample. 2

Growing LAN



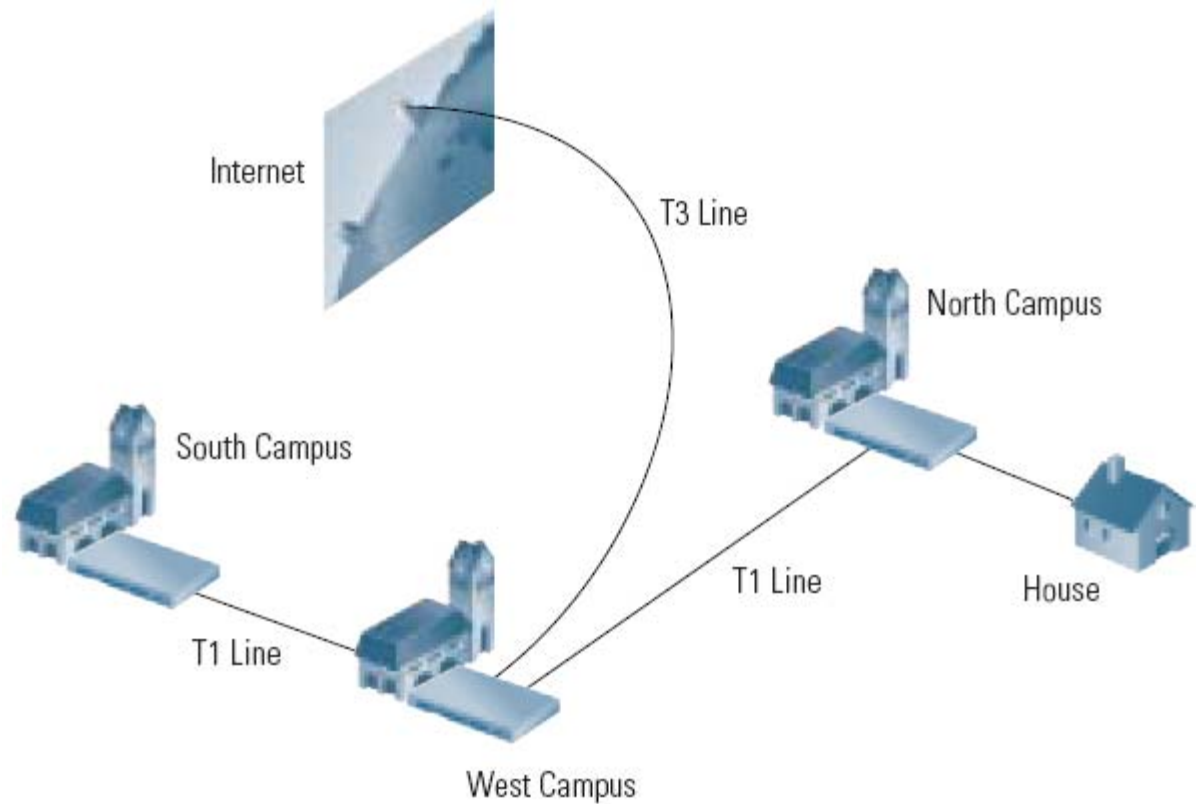
Sample. 3

Wide-Area Network



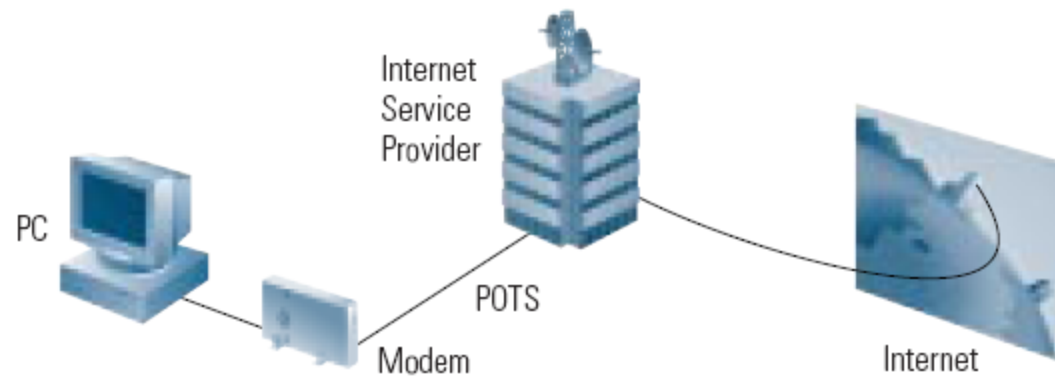
Sample. 4

Community College WAN



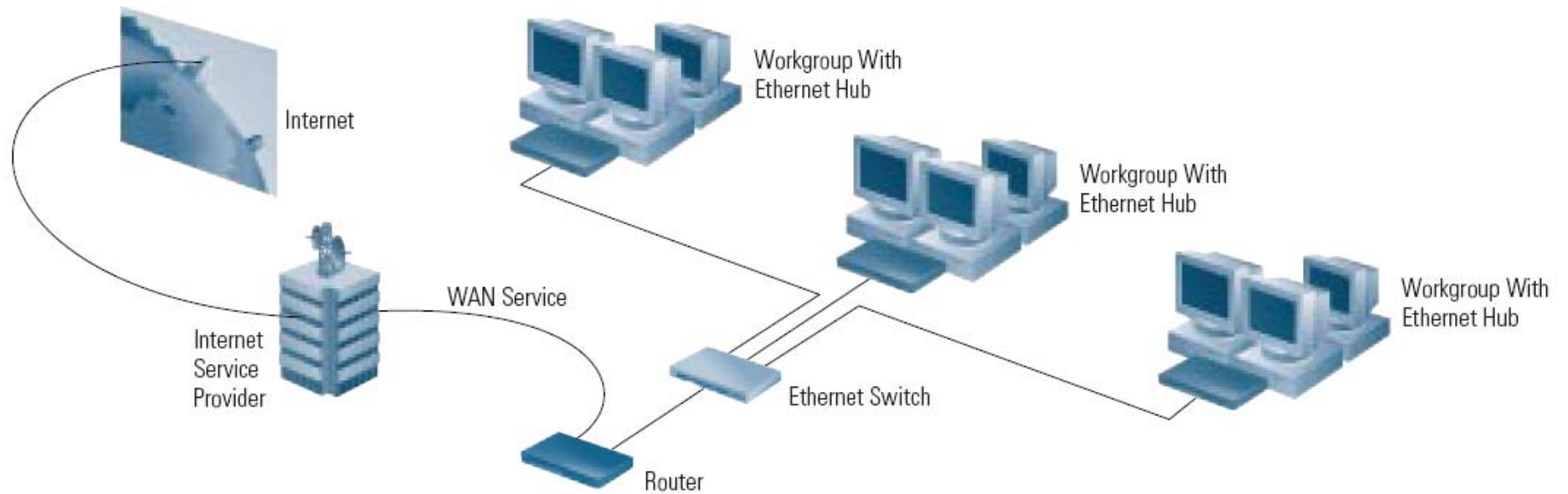
Sample. 3

Dialup Access



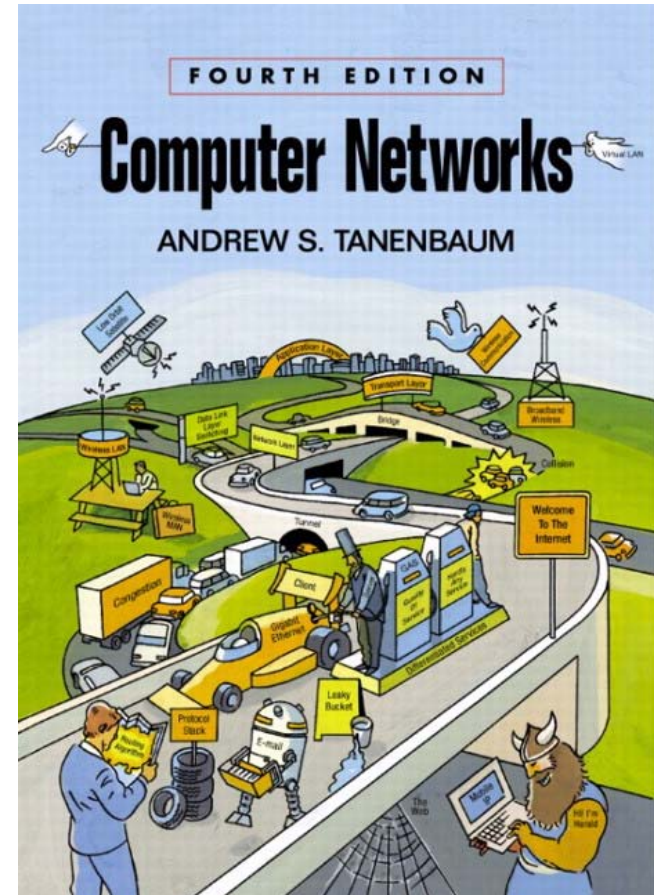
Sample. 4

Shared Access



Book

- ▶ A. S. Tanenbaum, Computer Networks, 4th edition, Prentice Hall, 2003



References

- 1) http://en.wikipedia.org/w/index.php?title=Computer_network
- 2) <http://www.scom.uminho.pt/uploads/Apoio%20-%20Doc%20Tec%20-%20educationplb.pdf>

