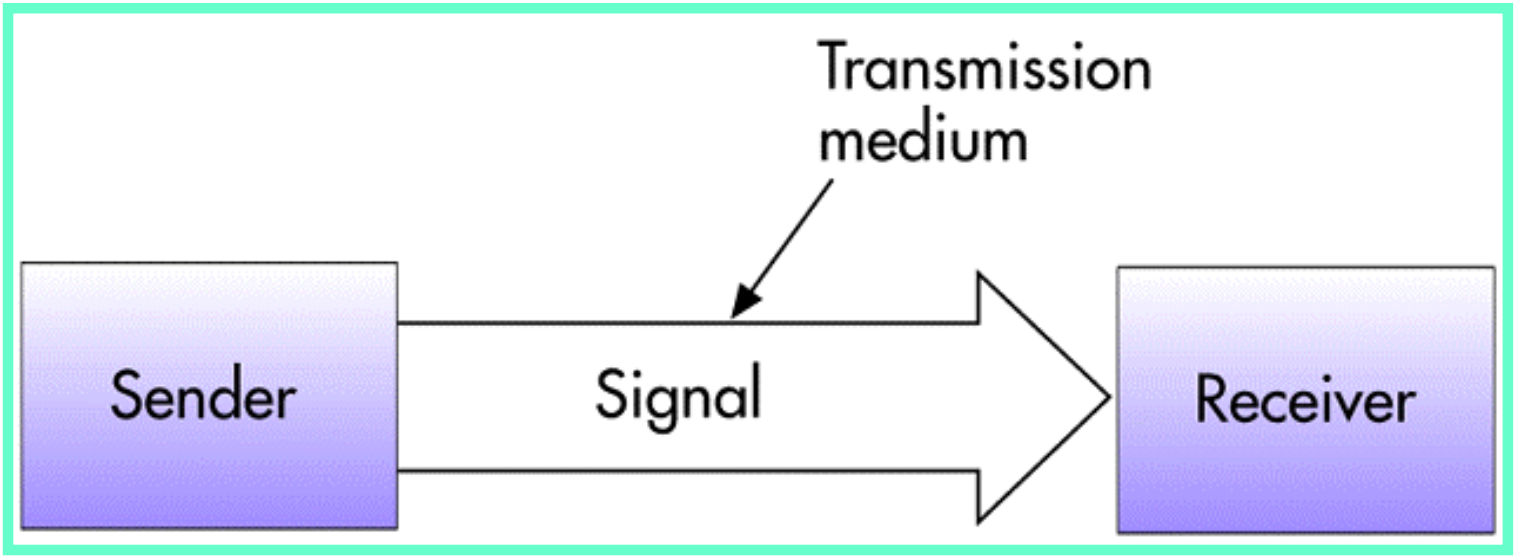
Telekomunikasi dan Jaringan

Dasar Dasar Sistem Informasi

Communications

- Communications
  - The message (data and information) is communicated via the signal. The transmission medium “carries” the signal.



Telecommunications

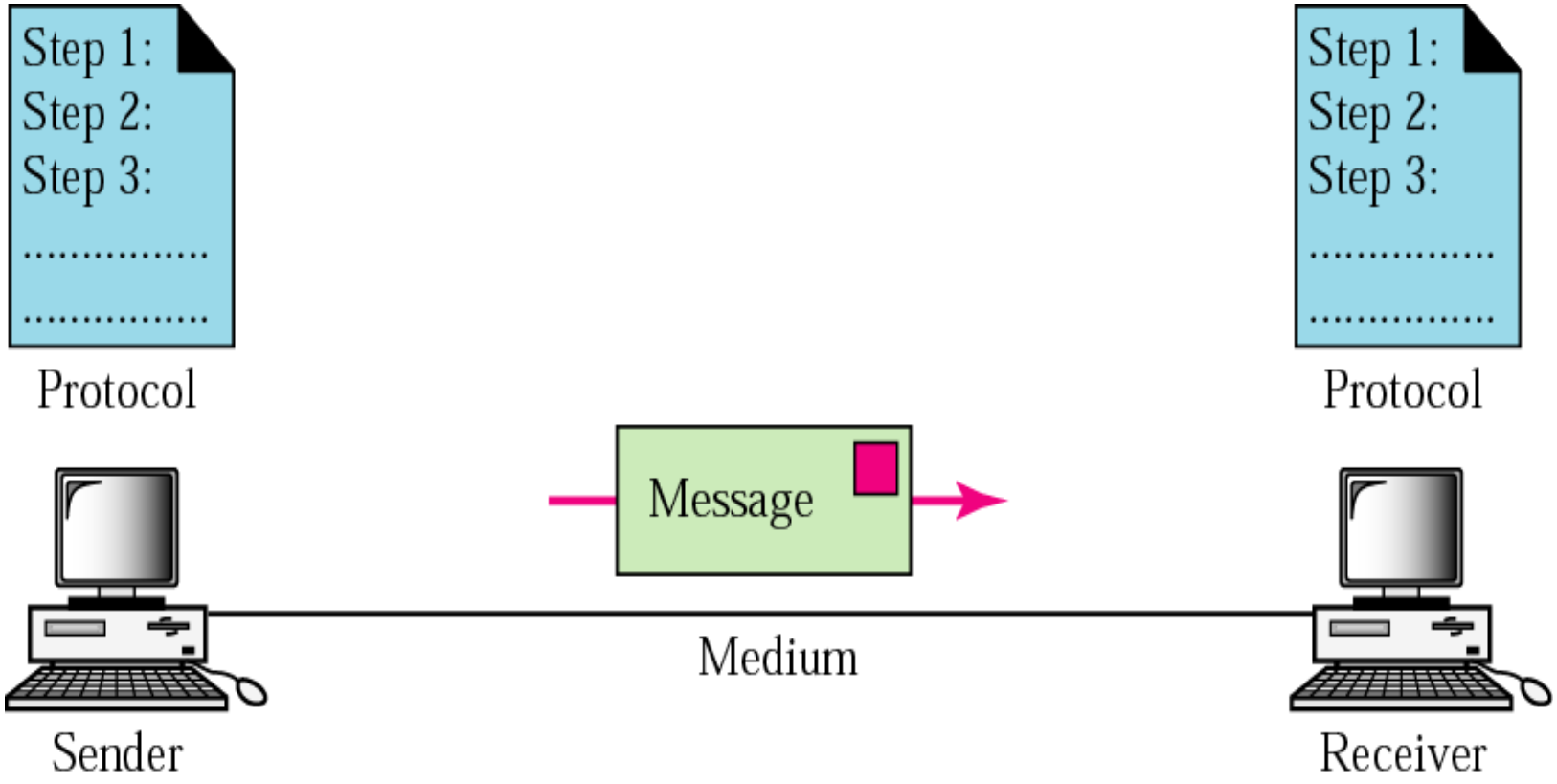
- Telecommunications
  - The electronic transmission of signals for communications, including such means as:
    - Telephone
    - Radio
    - Television

Telecommunication medium
Anything that carries an electronic signal and interfaces between a sending device and a receiving device.

Data Communications

- Data communications
  - A specialized subset of telecommunications that refers to the electronic collection, processing, and distribution of data -- typically between computer system hardware devices.

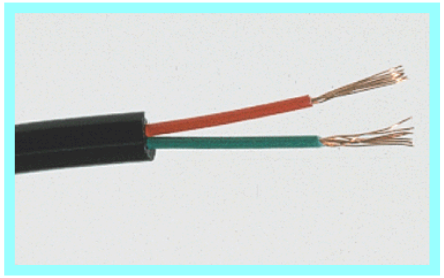
Data Communications

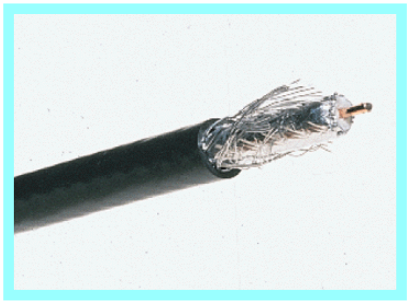


Computer Network

- Computer Network
  - The communications media, devices, and software needed to connect two or more computer systems and/or devices.
  - Used to share hardware, programs, and databases across the organization.
  - Fosters teamwork, innovative ideas, and new business strategies.

Types of Telecommunication Media

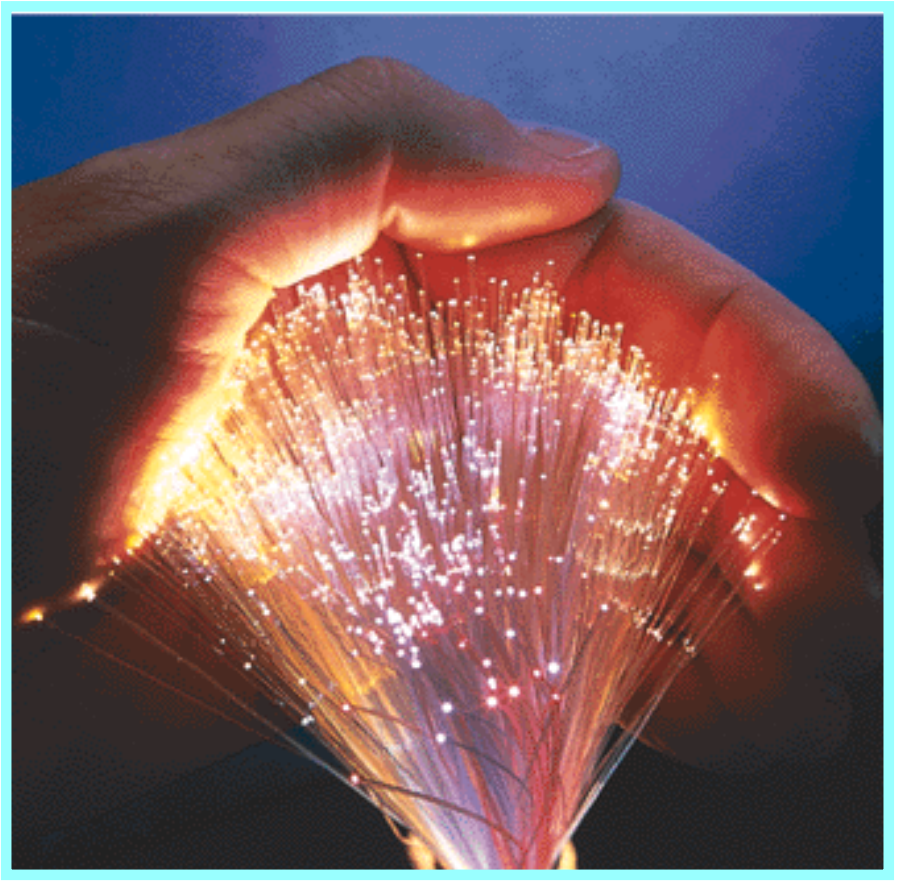




- Twisted Pair Wire Cable
  - Insulated pairs of wires historically used in telephone service and to connect computer devices.
- Coaxial Cable
  - Consists of an inner conductor wire surrounded by insulation, called the dielectric. The dielectric is surrounded by a conductive shield, which is surrounded by a non-conductive jacket. Coaxial cable has better data transmission rate than twisted pair.

Types of Telecommunication Media

- Fiber-optic Cable
  - Many extremely thin strands of glass or plastic bound together in a sheathing which transmits signals with light beams. Can be used for voice, data, and video.



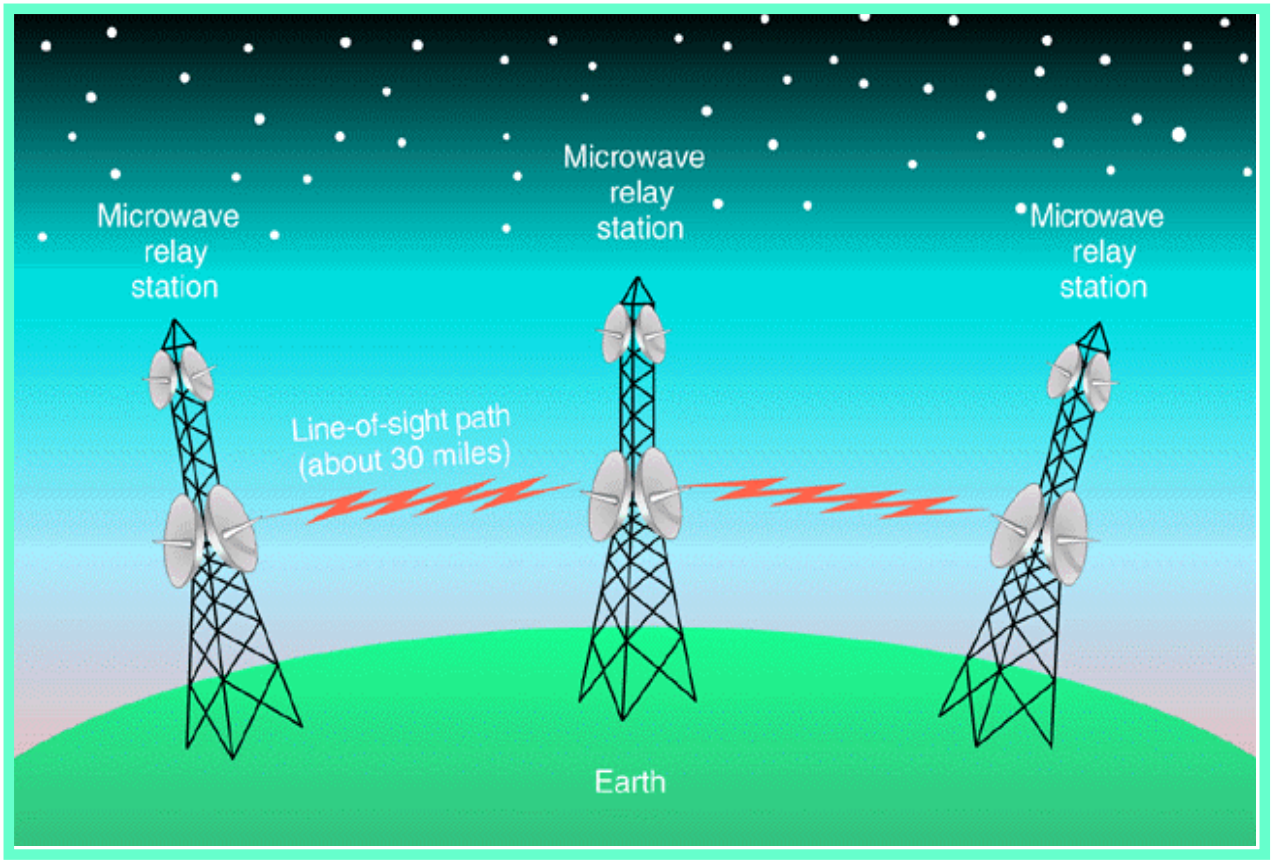
Types of Telecommunication Media

Microwave Communications

Line-of-sight devices which must be placed in relatively high locations.

Microwave Usage

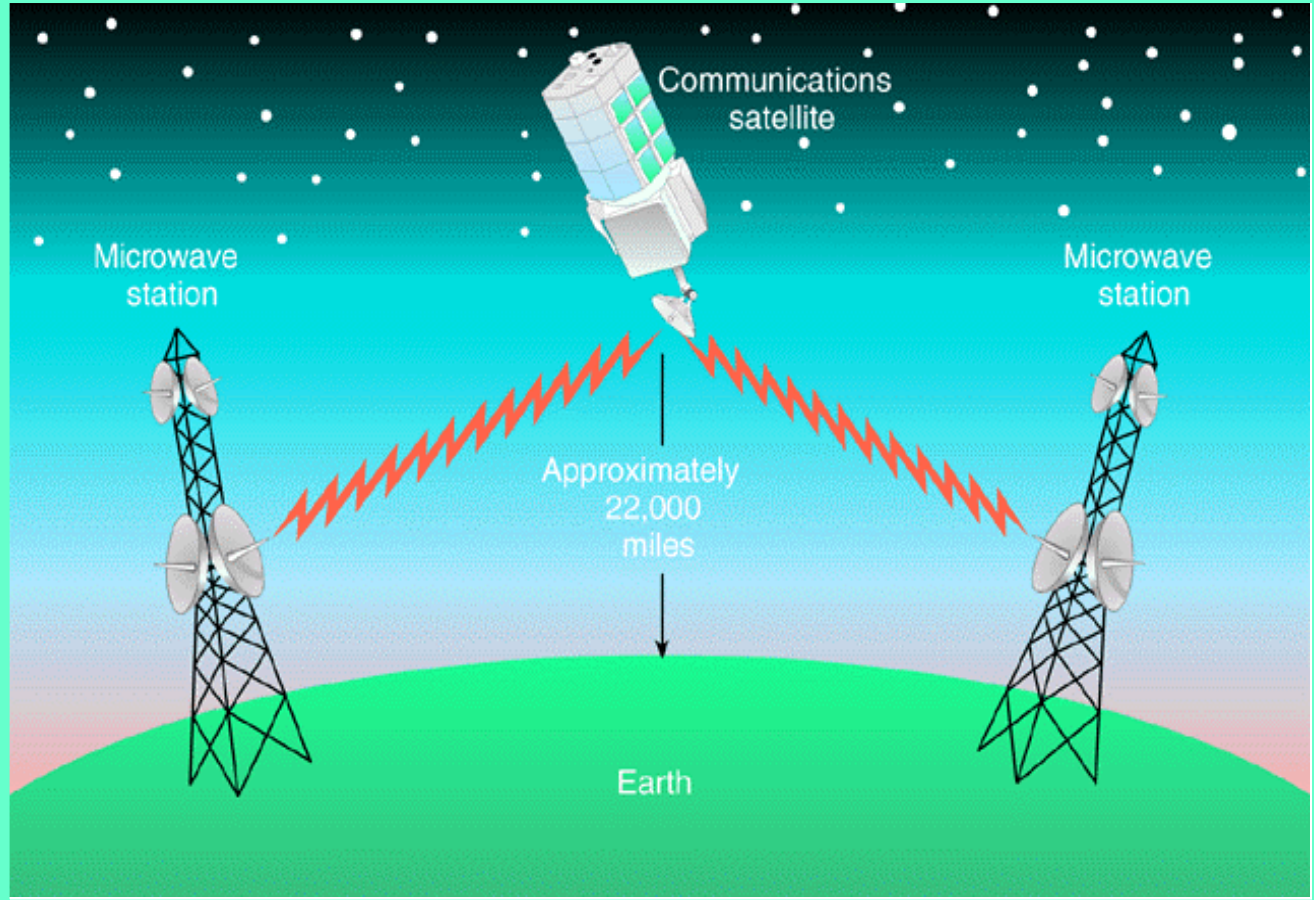
Information is converted to a microwave signal, sent through the air to a receiver, and recovered.



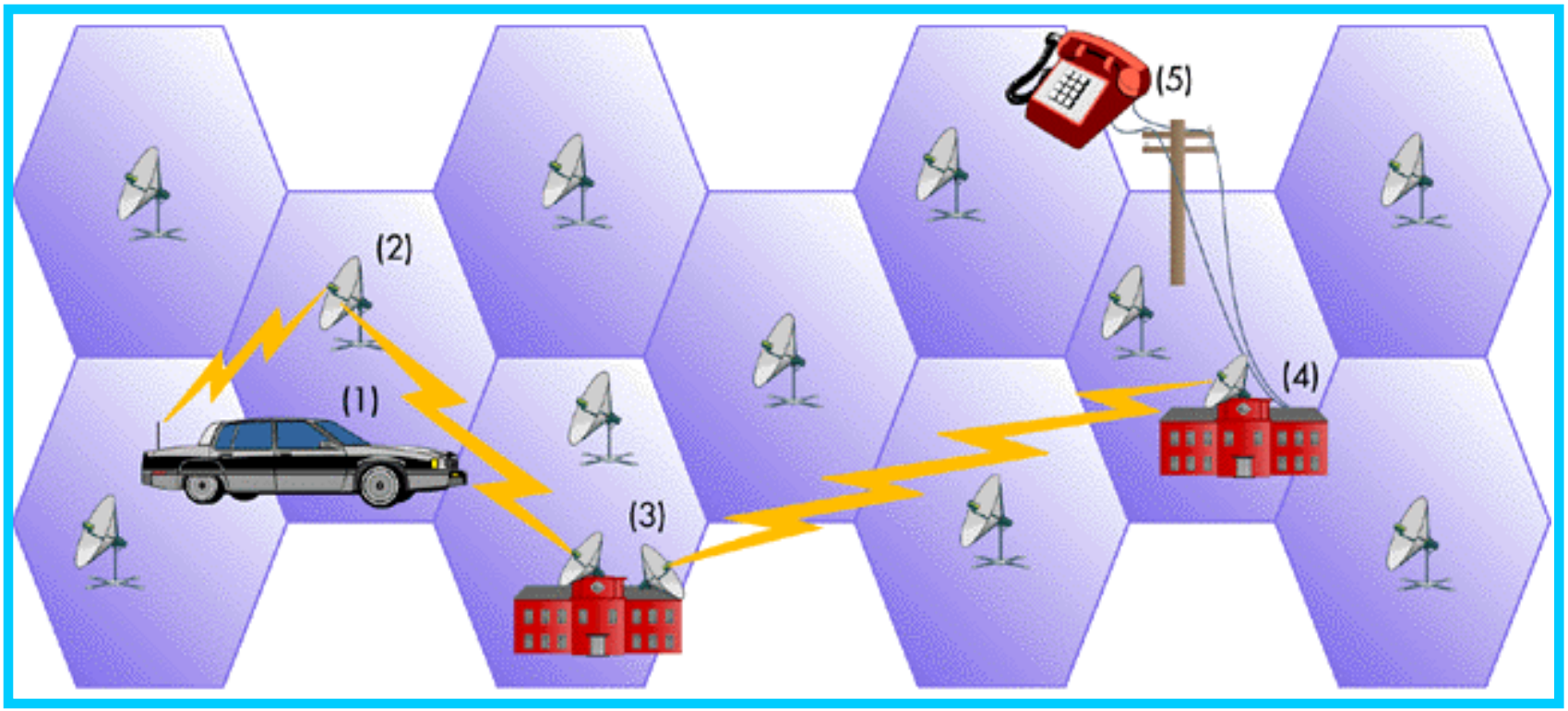
Types of Telecommunication Media

Satellite Transmission

Communications satellites are relay stations that receive signals from one earth station and rebroadcast them to another.



Types of Telecommunication Media



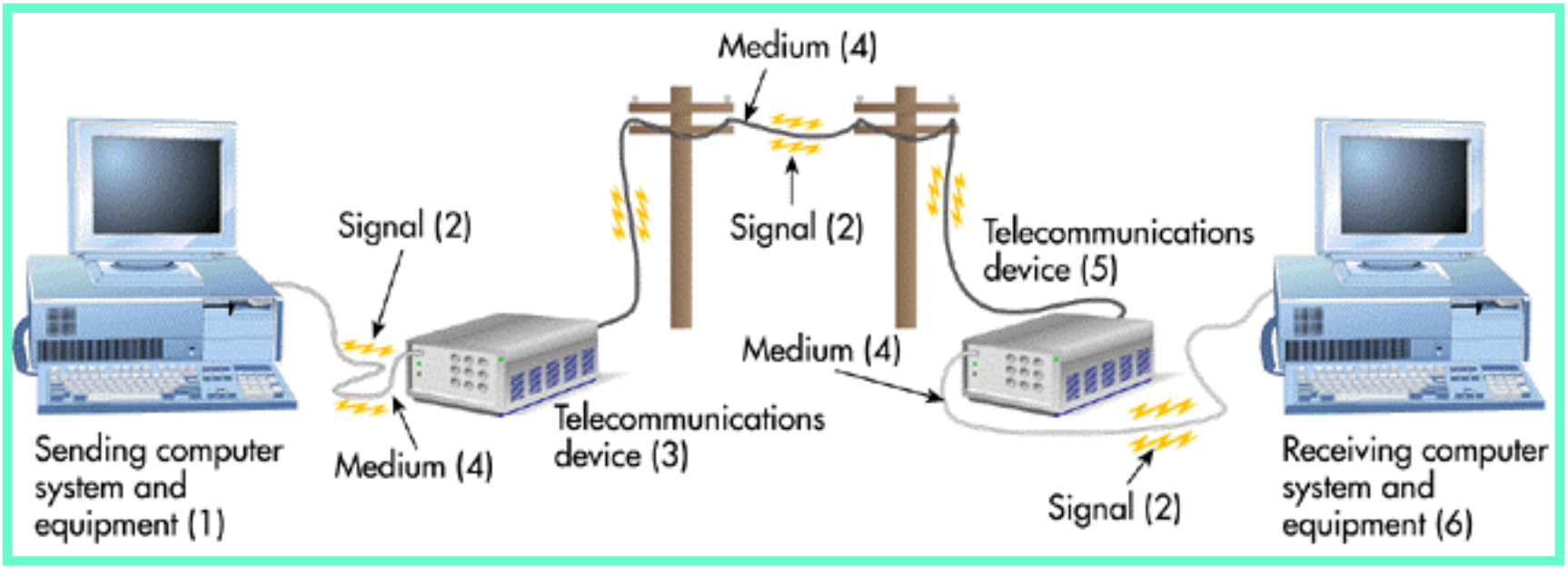
Cellular Transmission

Signals from cells are transmitted to a receiver and integrated into the regular network.

Types of Telecommunication Media

- Infrared Transmission
  - Involves sending signals through the air via light waves.
    - Requires line-of-sight and short distances (a few hundred yards)
    - Used to connect various computing devices such as handheld computers

Telecommunications System



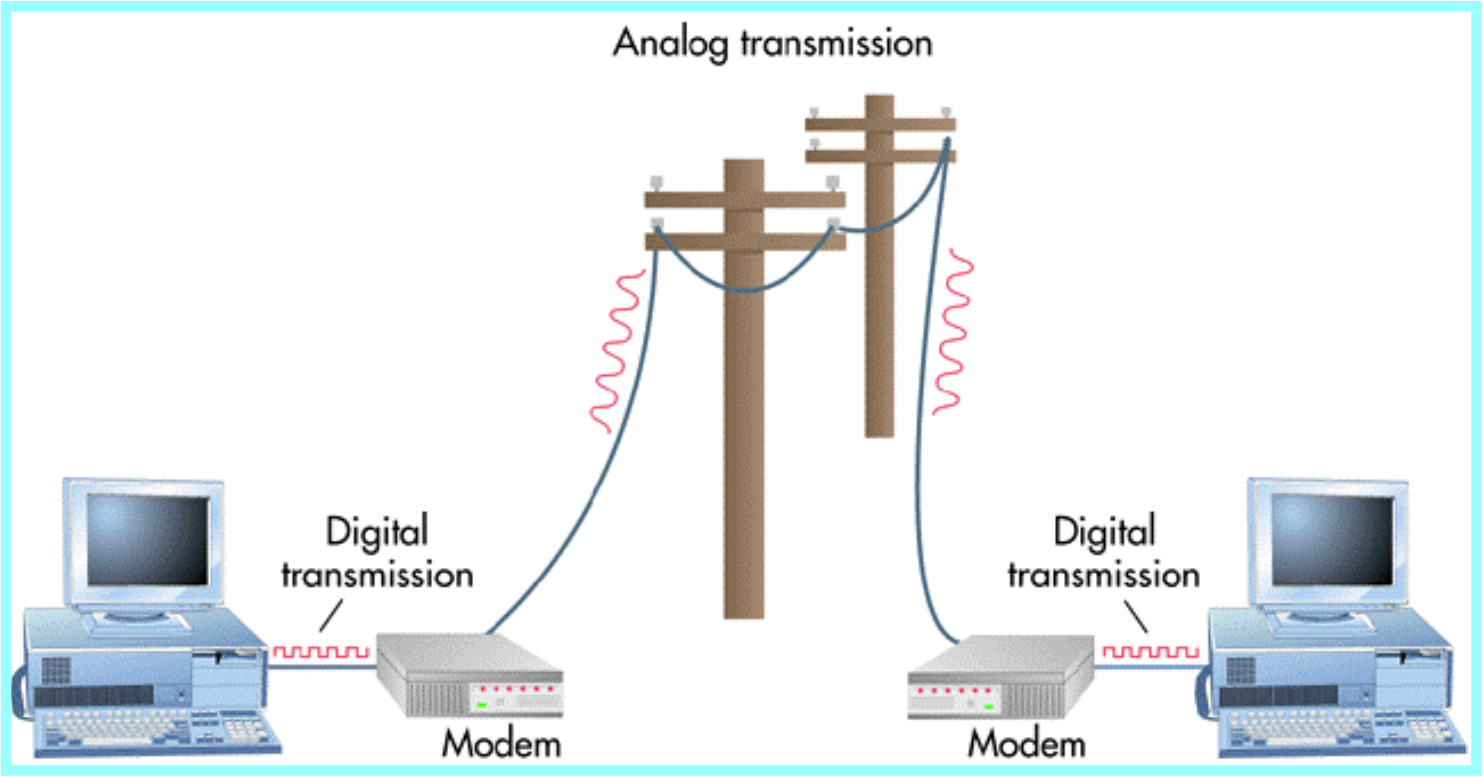
Telecommunication Devices

Relay signals between computer systems and transmission media.

Telecommunication Devices

- Analog Signal
  - E.G. Electricity current
- Digital Signal
  - A signal represented by bits
- Modems
  - Devices that translate data from digital to analog and analog to digital

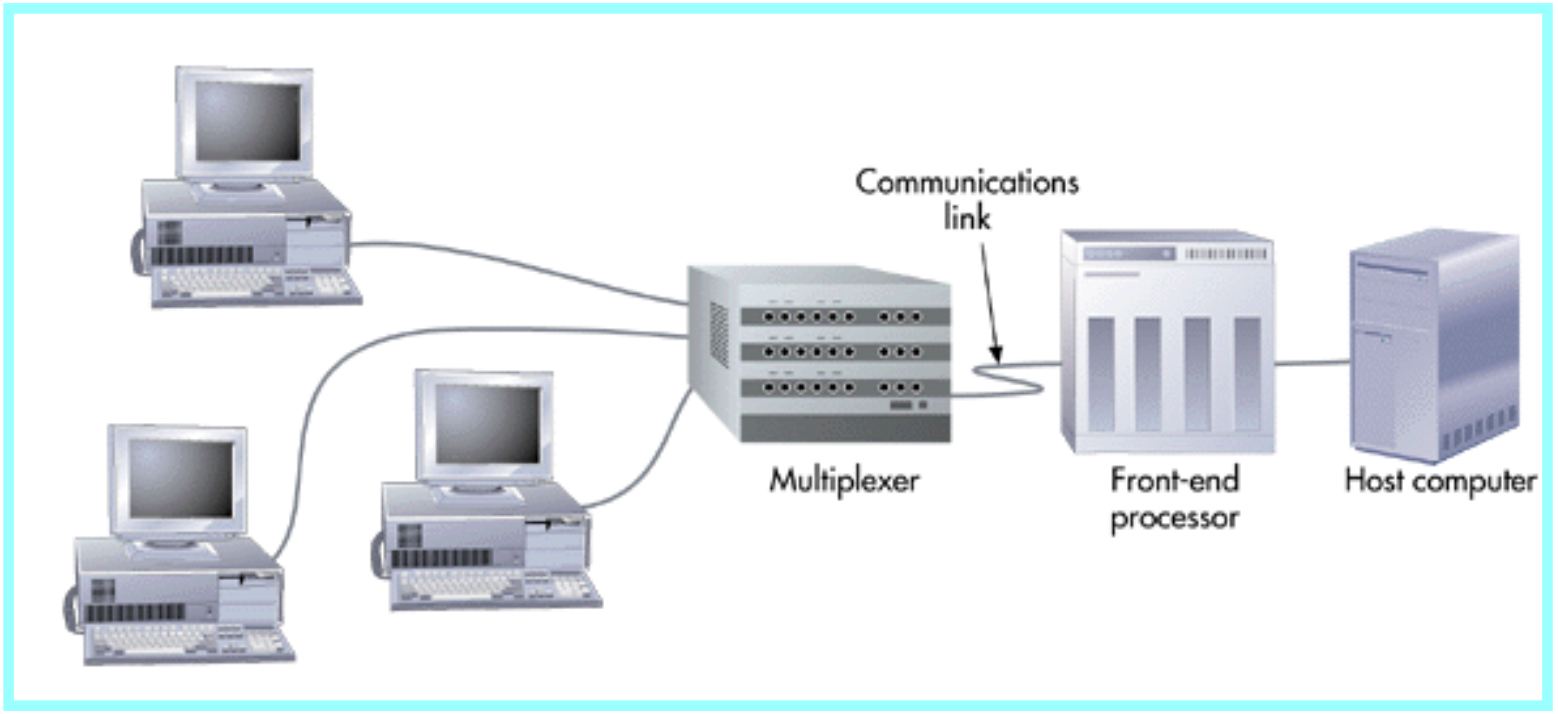
Device: Modem



Modem

Modulates a digital signal into an analog signal for transmission via analog medium, then demodulates the signal into digital for receiving.

Device: Multiplexer



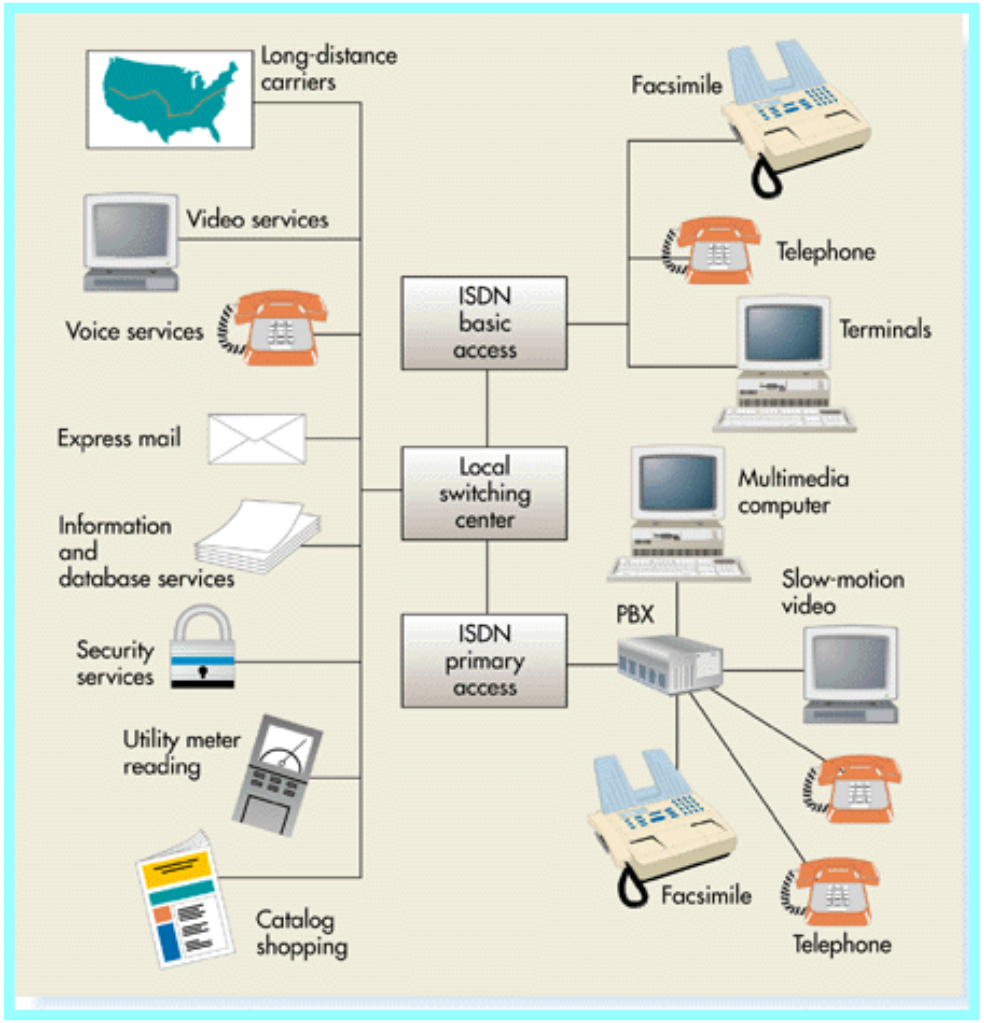
Multiplexer

Allows several telecommunications signals to be transmitted over a single communications medium at the same time.

Media: Integrated Services Digital Network (ISDN)

ISDN

Technology that uses existing common-carrier lines to simultaneously transmit voice, video, and image data in digital form.



Distributed Processing

- Centralized Processing
  - Data processing that occurs in a single location or facility.
- Distributed Processing
  - Data processing that occurs when computers are placed at remote locations but are connected to each other via telecommunications devices.
  - The computers are connected as a computer network.

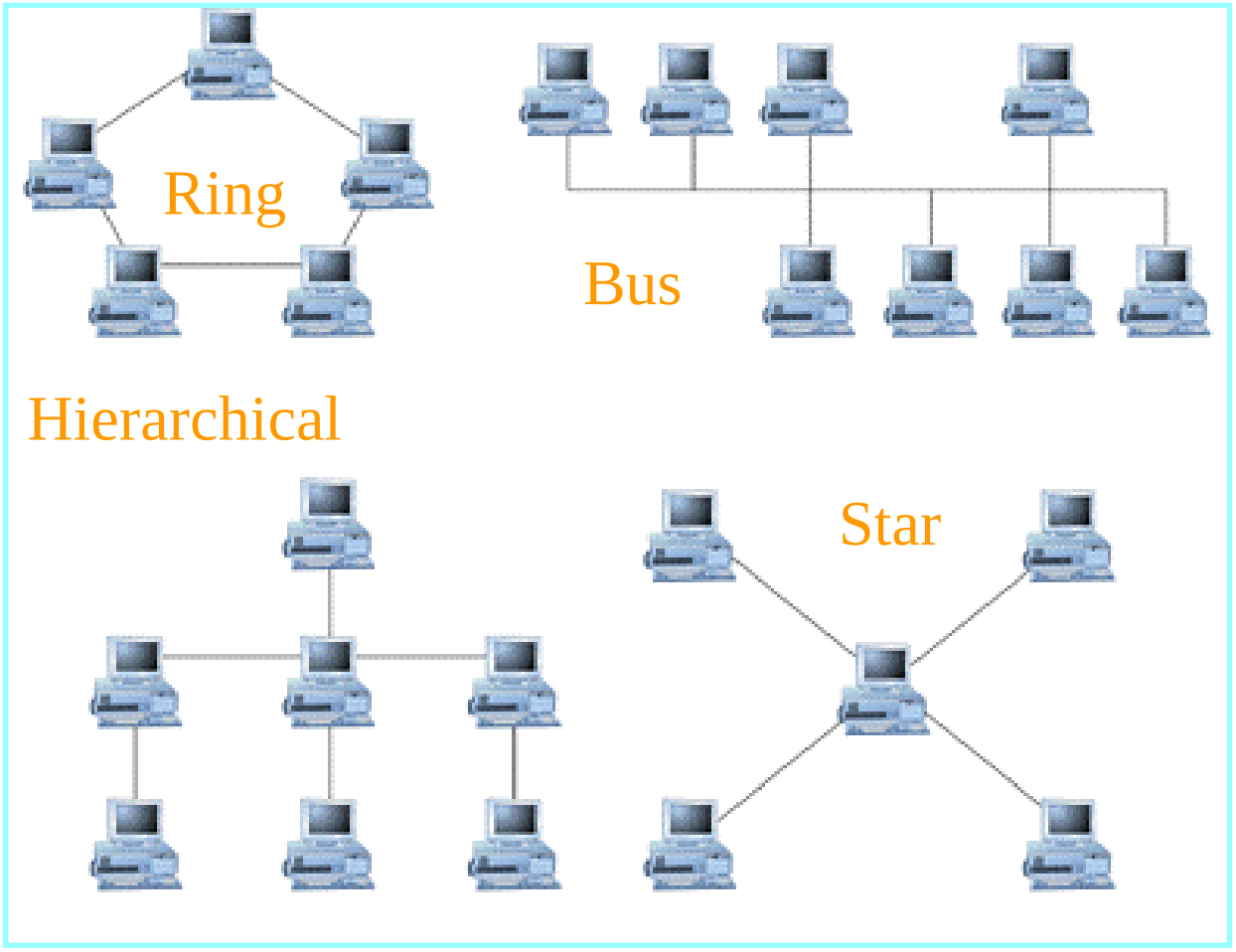
Network Types

- By Topology
  - A model that describes how computers are connected
  - A logical model that describes how networks are structured or configured

Network Types

- Structured
  - Ring
  - Bus
  - Star
  - Hierarchical
  - Hybrid
- Unstructured
  - Mobile Adhoc Network (MANET)

Network Topologies



Network Topologies

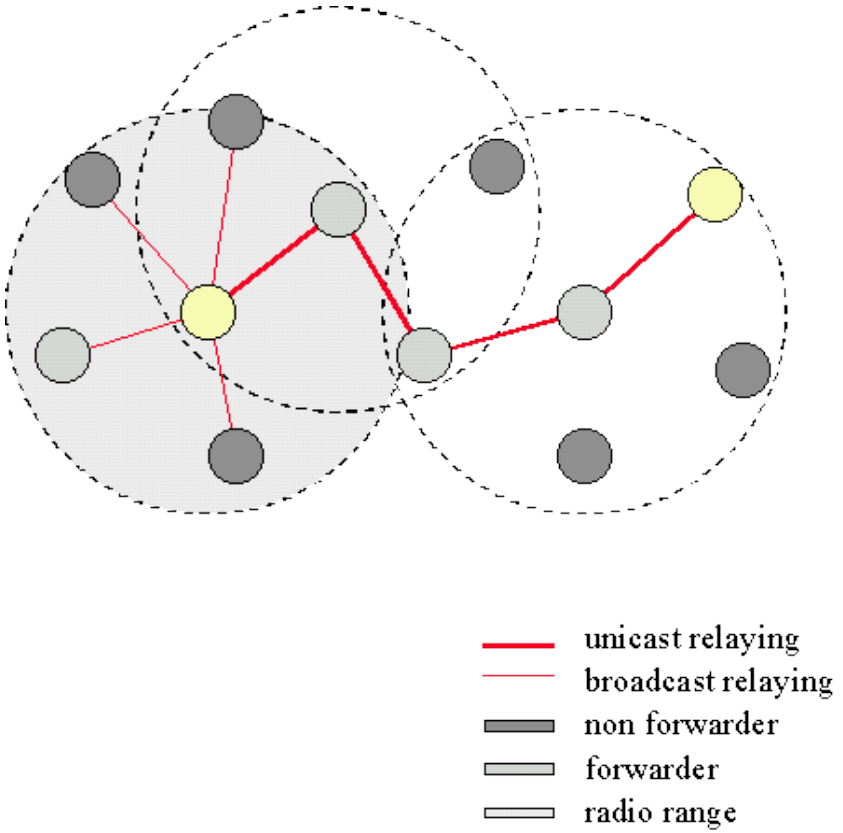
- For local area networks, not for the Internet
- Ring
  - A typology that contains computers and computer devices placed in a ring.
- Bus
  - Computers and computer devices are on a single line. Each device can communicate directly to all devices on the bus.
- Star
  - All computers are connected via a central hub.

Network Topologies

- Hierarchical
  - Uses treelike structures with messages passed along the branches of the hierarchy
- Hybrid
  - A mix of different kinds of structured topologies. It is what exactly the Internet looks like.
- Mobile Adhoc Network
  - It is unstructured network topology
  - Structure is changing dynamically. EG. Network of mobile phone.

Network Topologies

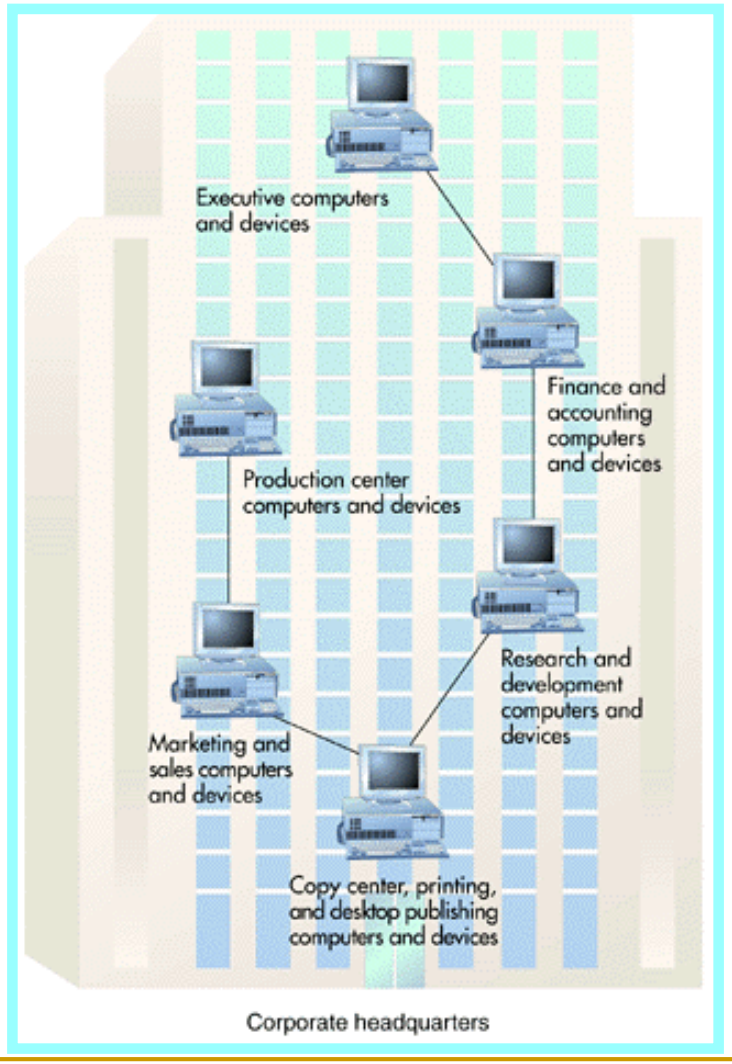
- Mobile Adhoc Network
  - Network does not have specify topology
  - Each computer in the network is moving around without locating in a fixed location
  - Sending and receiving messages are difficulty problems



Network Types by Size

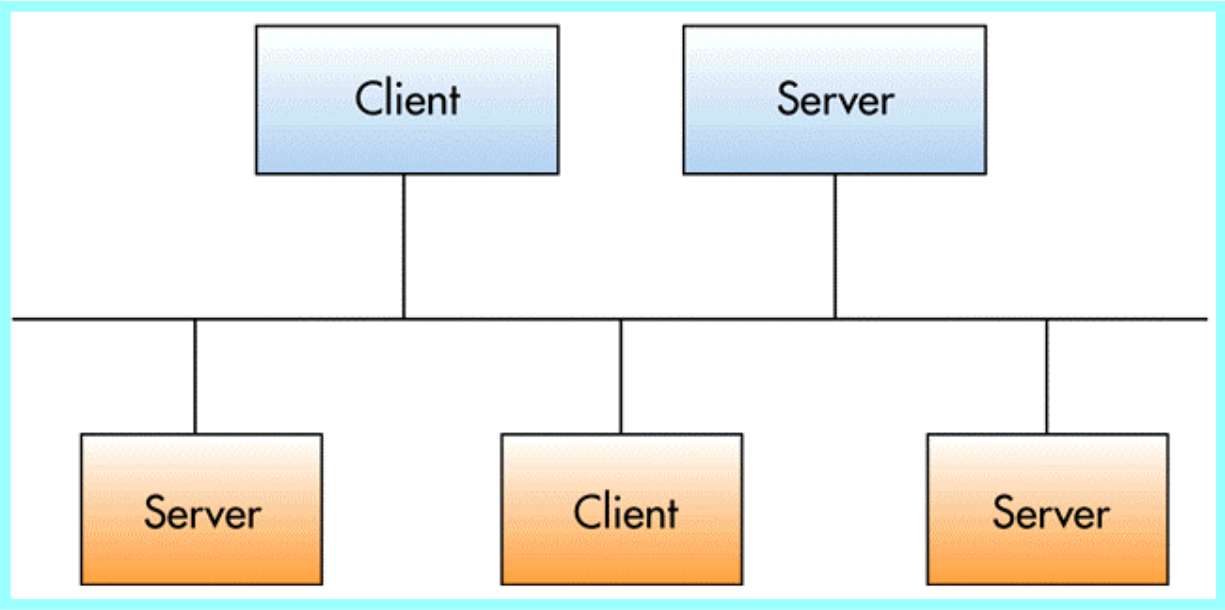
- Local Area Network (LAN)
  - Connects computer systems and devices in the same geographic area (can be Ring, Bus, Hierarchical, Star, Hybrid)
- Wide Area Network (WAN)
  - Ties together large geographic regions using microwave and satellite transmission or telephone lines.
- International Network
  - Links systems between countries.

LAN & WAN


Executive computers and devices
Finance and accounting computers and devices
Production center computers and devices
Research and development computers and devices
Marketing and sales computers and devices
Copy center, printing, and desktop publishing computers and devices
Corporate headquarters


North America

Client/Server Connection



- Applications and databases reside on specialized host computers.
- Servers do most or all of the processing and transmit the results to the client.

Advantages & Disadvantages of Client/Server

- Advantages
  - Reduced cost potential
  - Improved Performance
  - Increased Security
- Disadvantages
  - Increased cost potential
  - Loss of control
  - Complex multi-vendor environment

Communications Software

- Communications Software
  - Provides error checking, message formatting, communications logs, data security and privacy, and translation capabilities for networks.
- Network Operating System (NOS)
  - Systems software that controls the computer systems and devices on a network and allows them to communicate with each other.
- Network Management Software
  - Enables a manager on a networked desktop to monitor the use of individual computers and shared hardware, scan for viruses, and ensure compliance with software licenses.

Protocols

- Protocol
  - Rules that ensure communications among computers of different types and from different manufacturers.
  - Rules that determine the form of signal being transmitted, encoded, error detection and correction, etc.

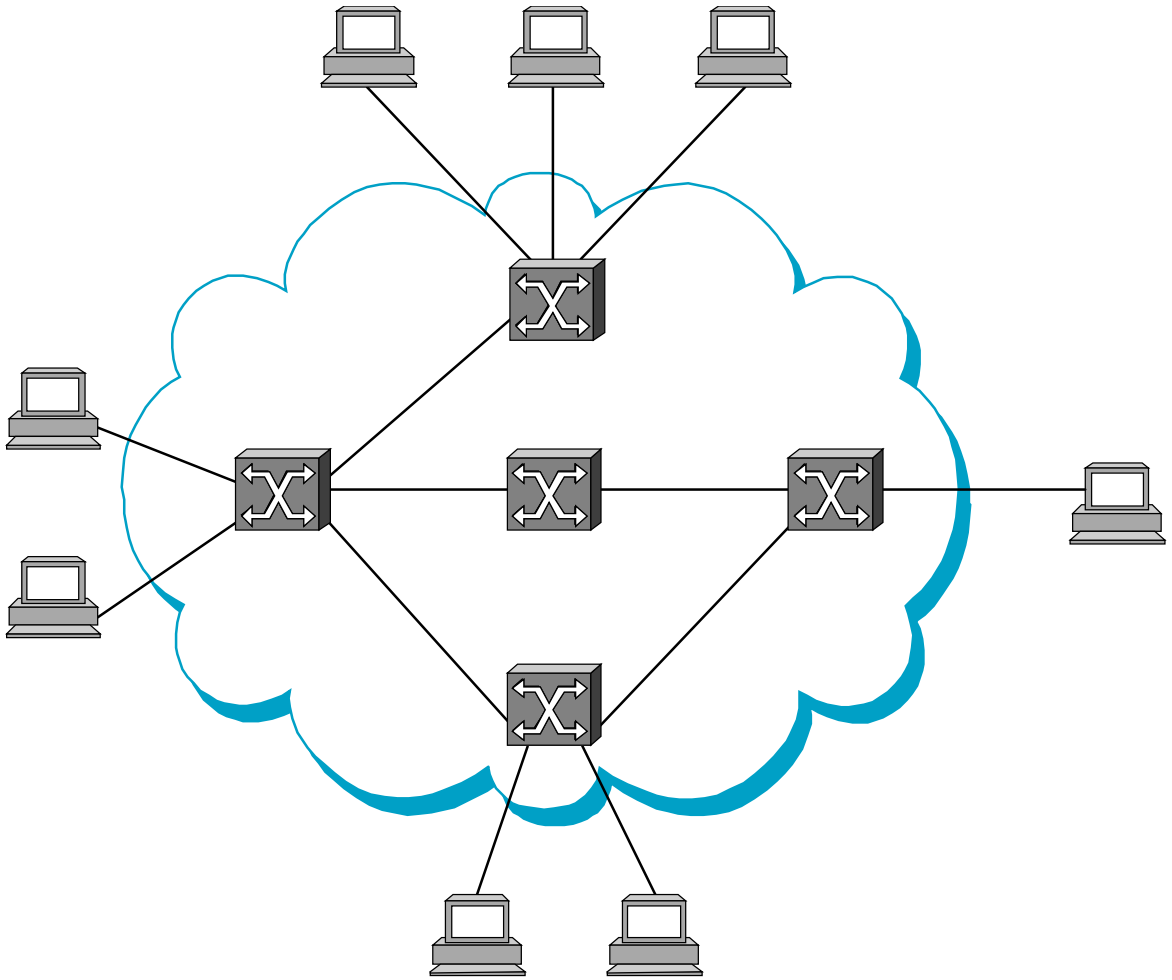
Protocols

- OSI 7-Layers Model
  - Serves as a standard model for network architectures and is endorsed by the International Standards Committee. Communication functions are represented in seven layers to promote the development of modular networks. Designed to permit communication among different computers from different operating systems.

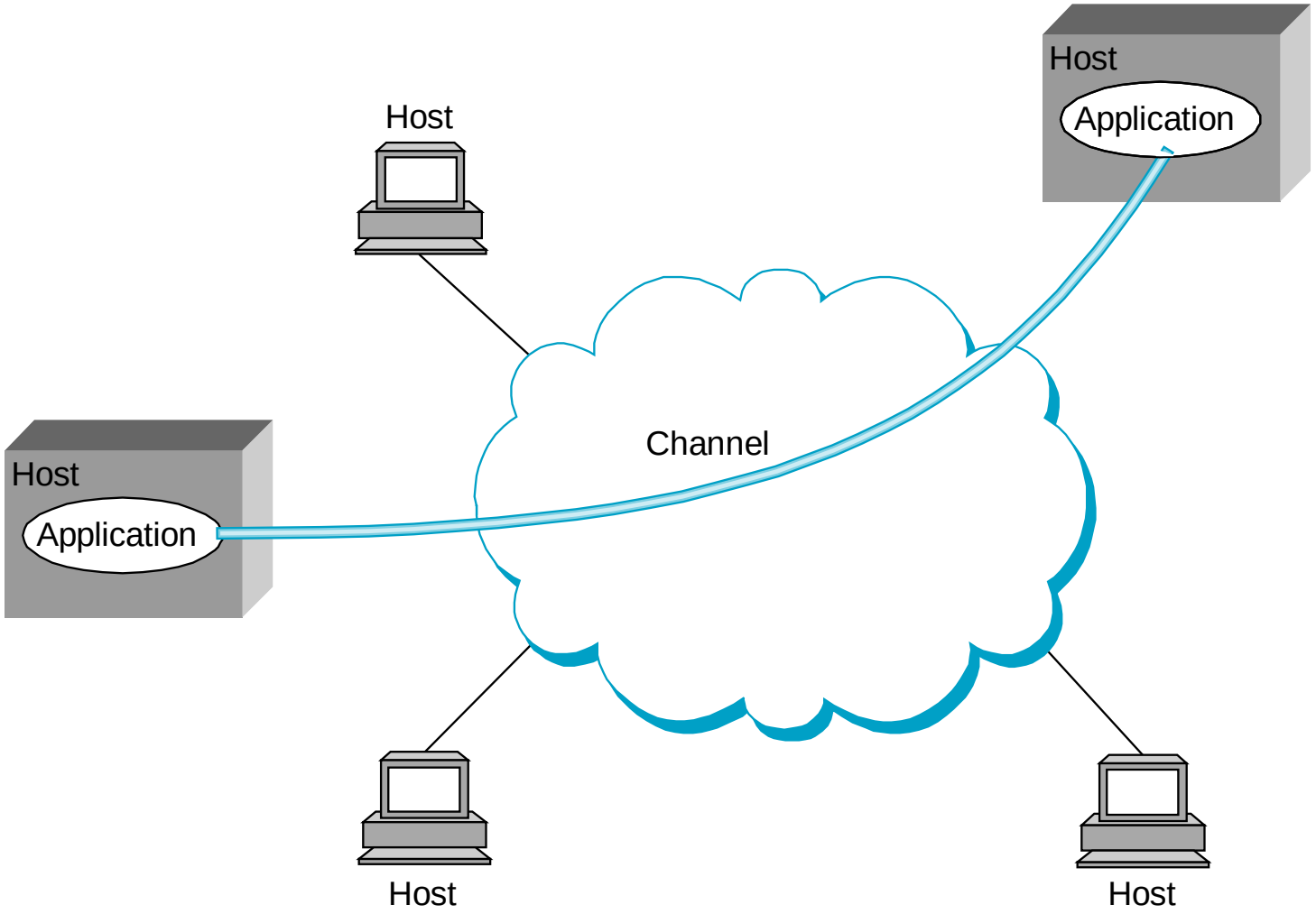
Protocols

- Transmission Control Protocol/Internet Protocol (TCP/IP)
  - Standard originally developed by the U.S. government to link defense research agencies; it is the primary communication protocol of the Internet.
- Systems Network Architecture (SNA)
  - IBM communication protocol for LAN.
- Ethernet
  - Protocol standard developed for LANs using a bus topology.
  - X.400 and X.500
  - An international standard for message handling and network directories.

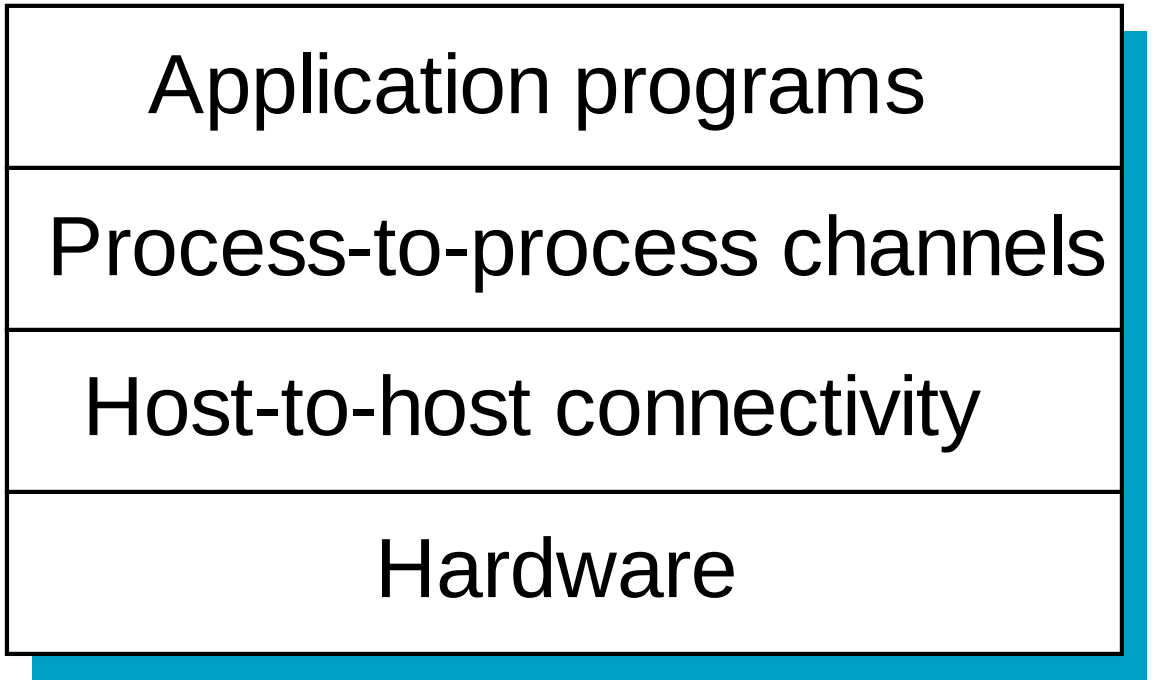
Protocol (Idea)



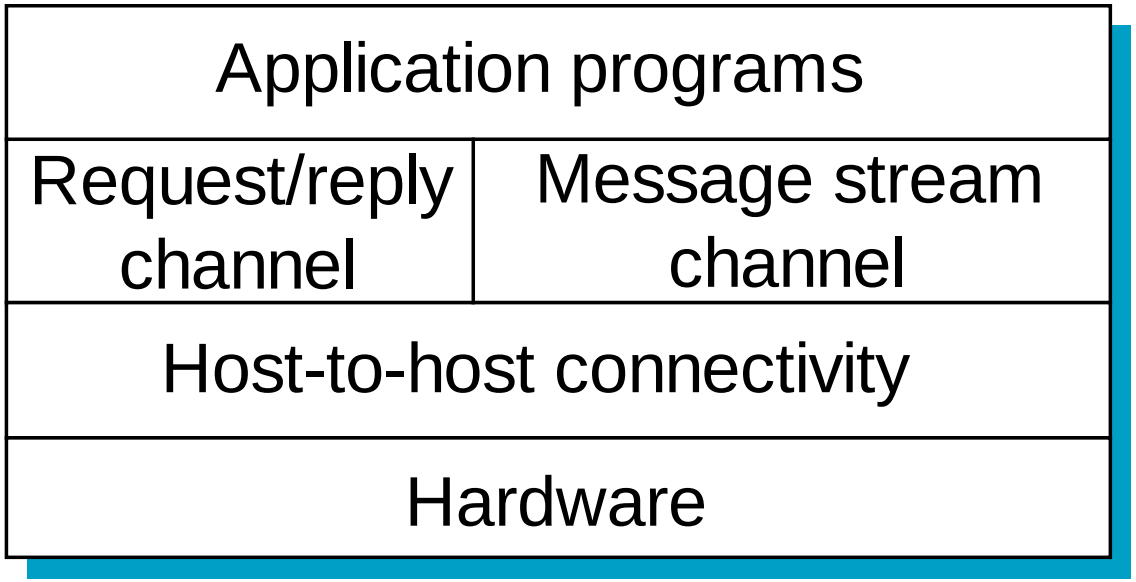
Protocol (Idea)



Protocol (Idea)

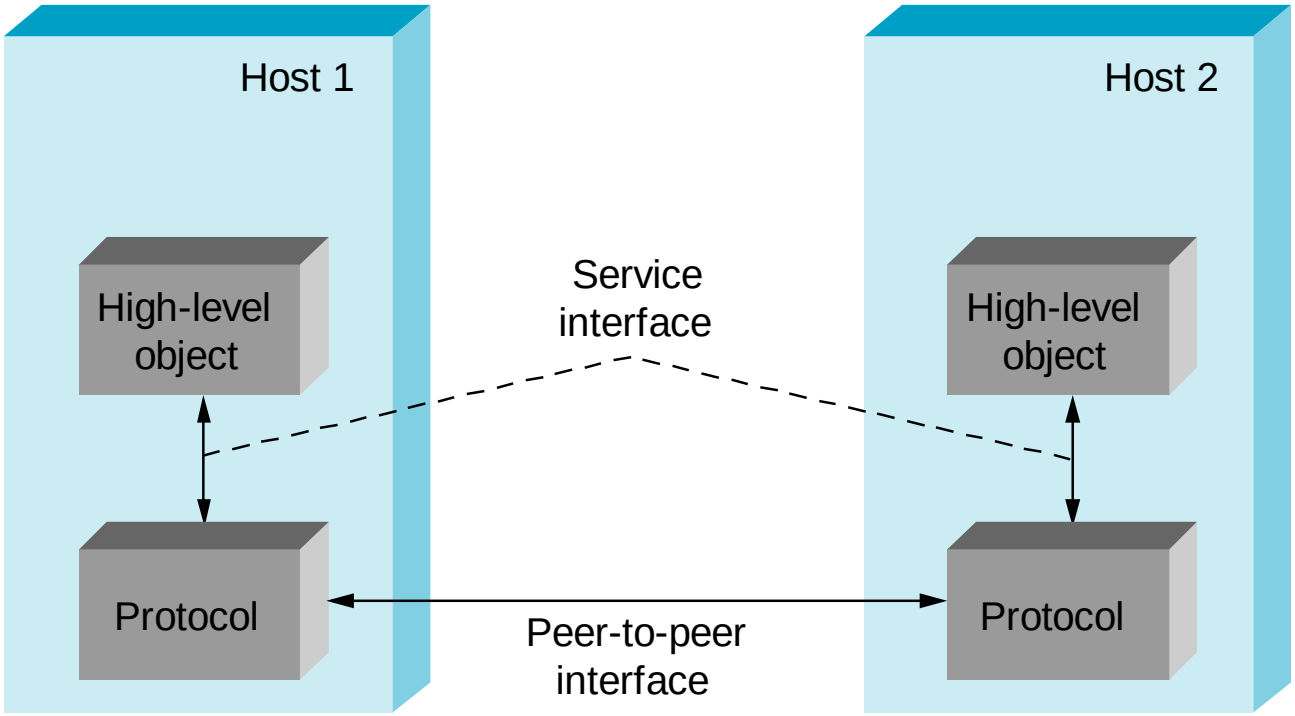


Protocol (Idea)

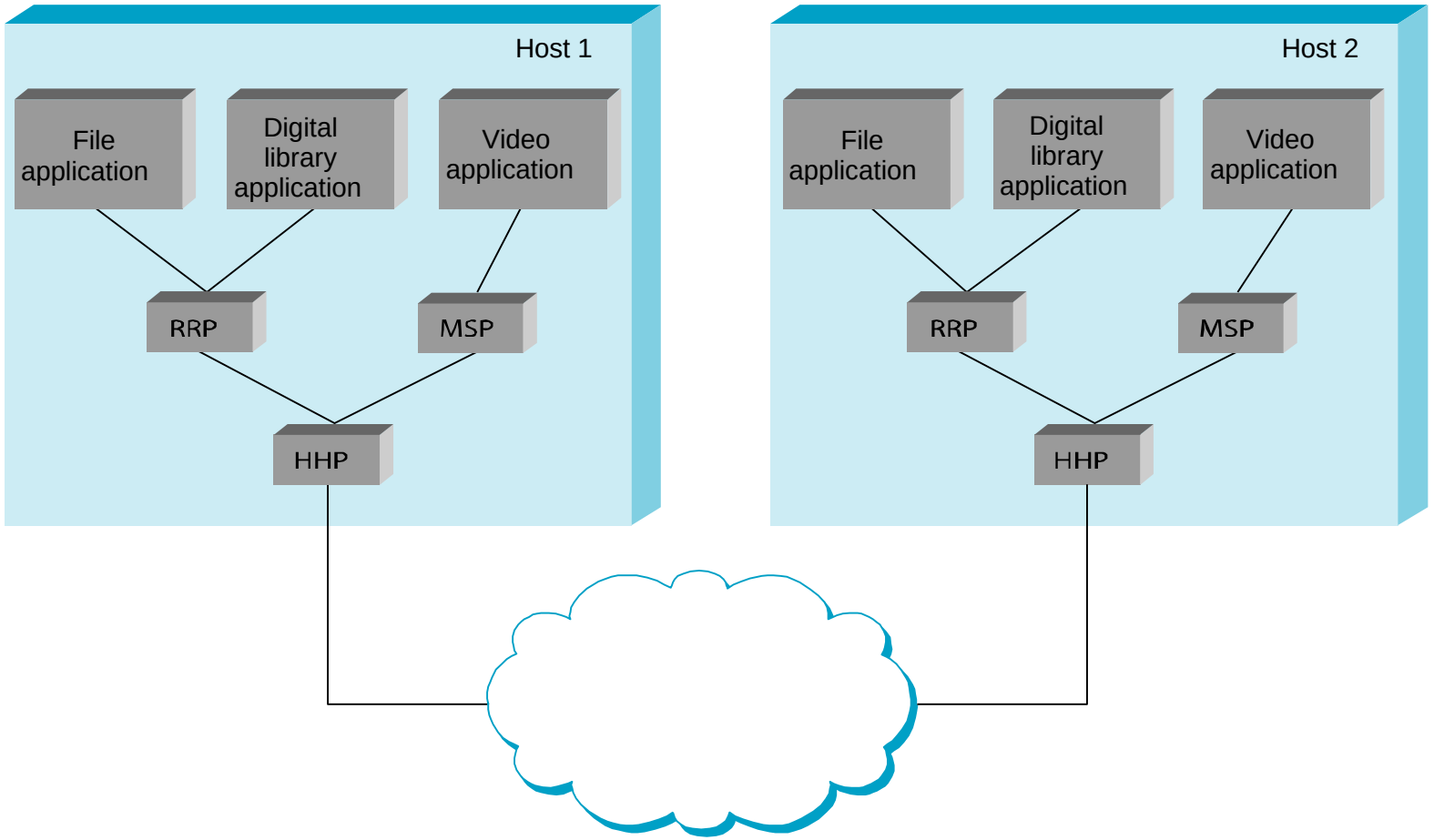


- When and how to start a channel?
- When and how to close a channel?
- How to protect the channel against invasion?
- How to handle multiple applications?

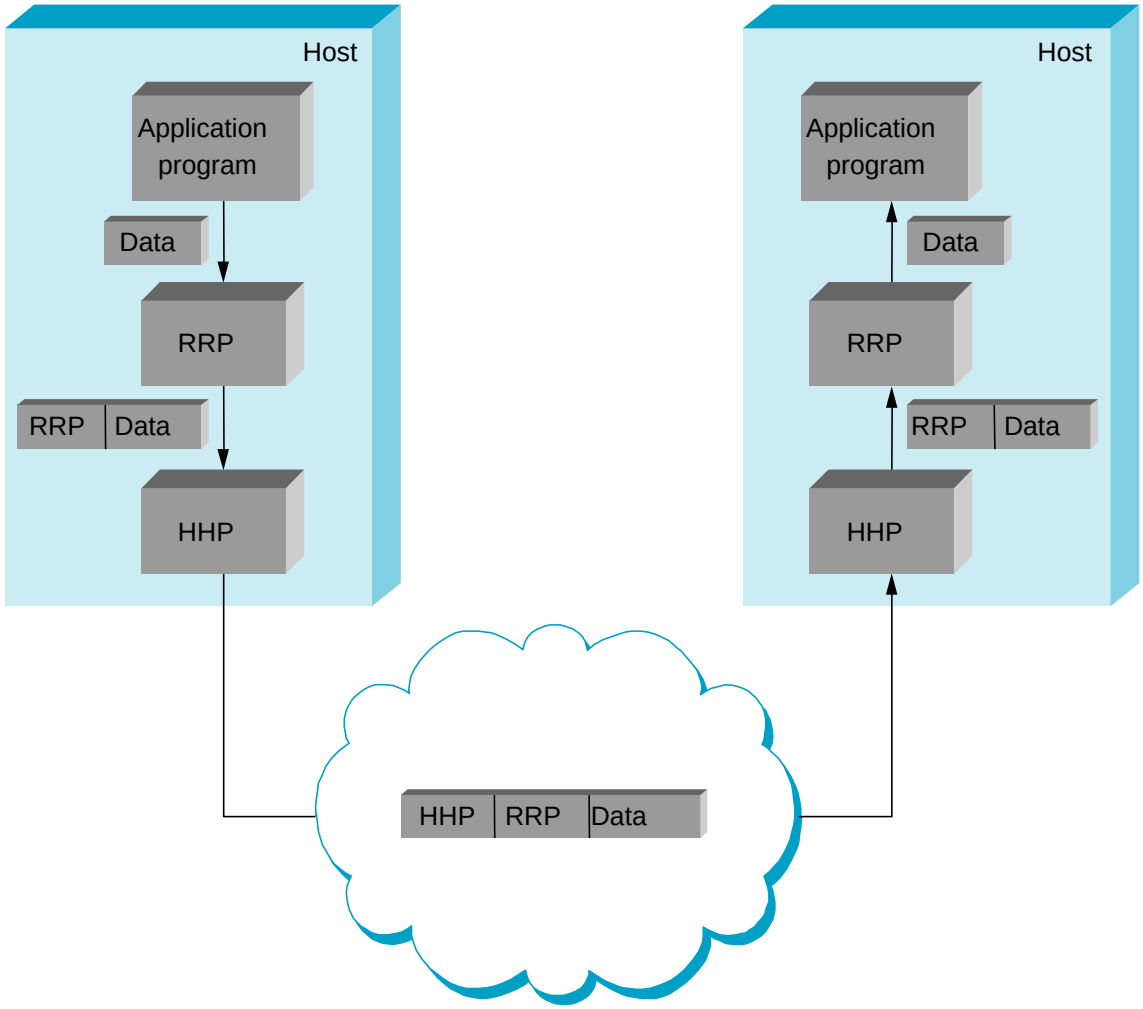
Protocol (Idea)



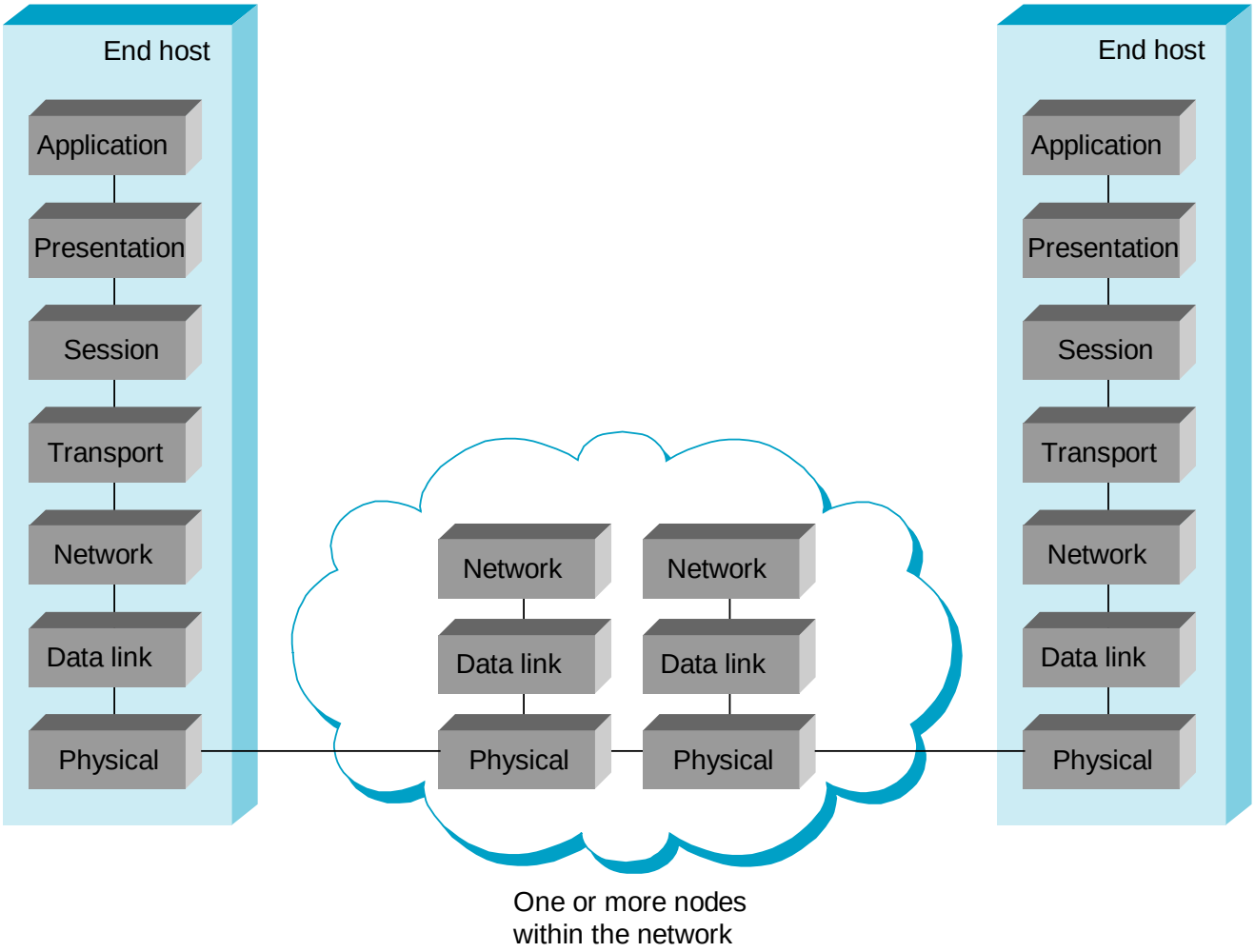
Protocol (Idea)



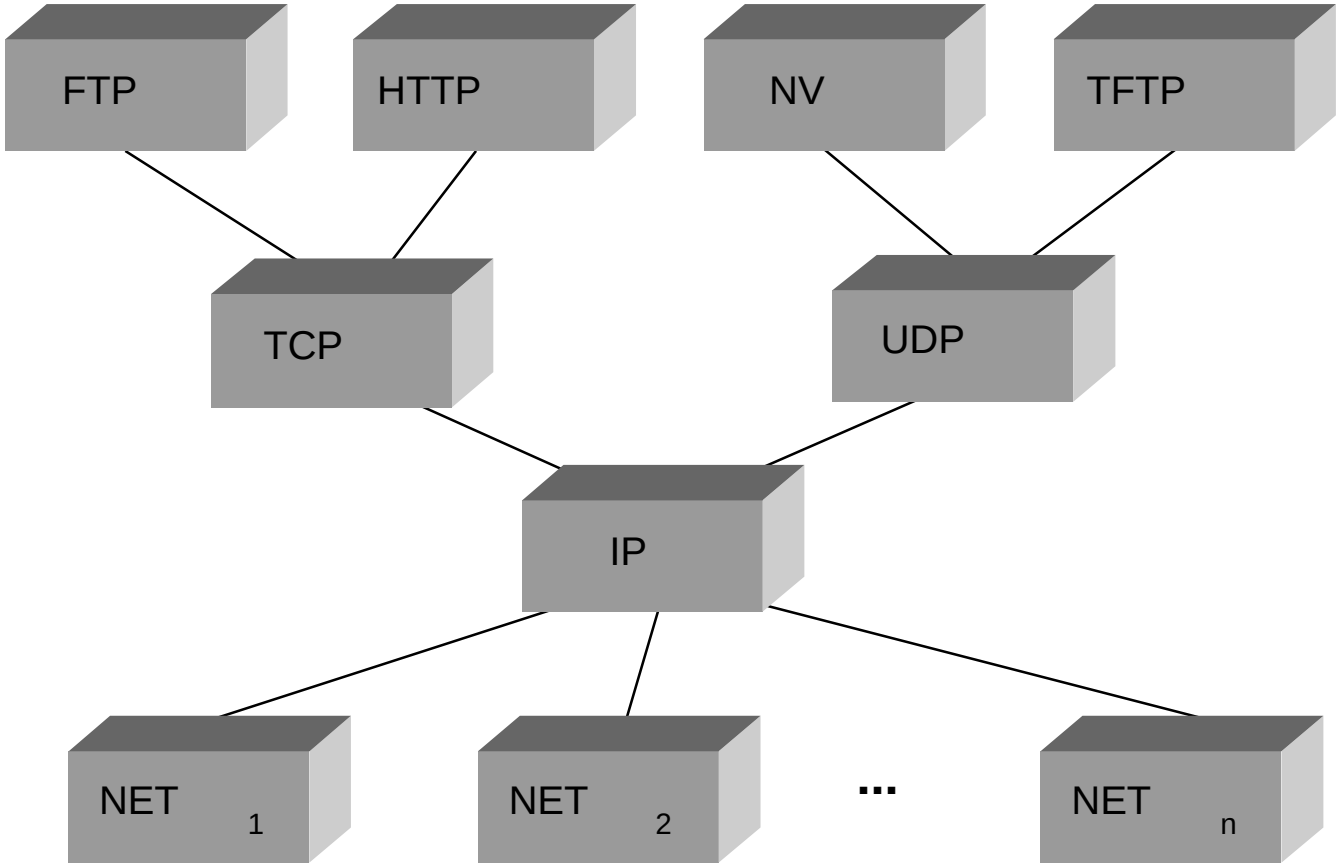
Protocol (Idea)



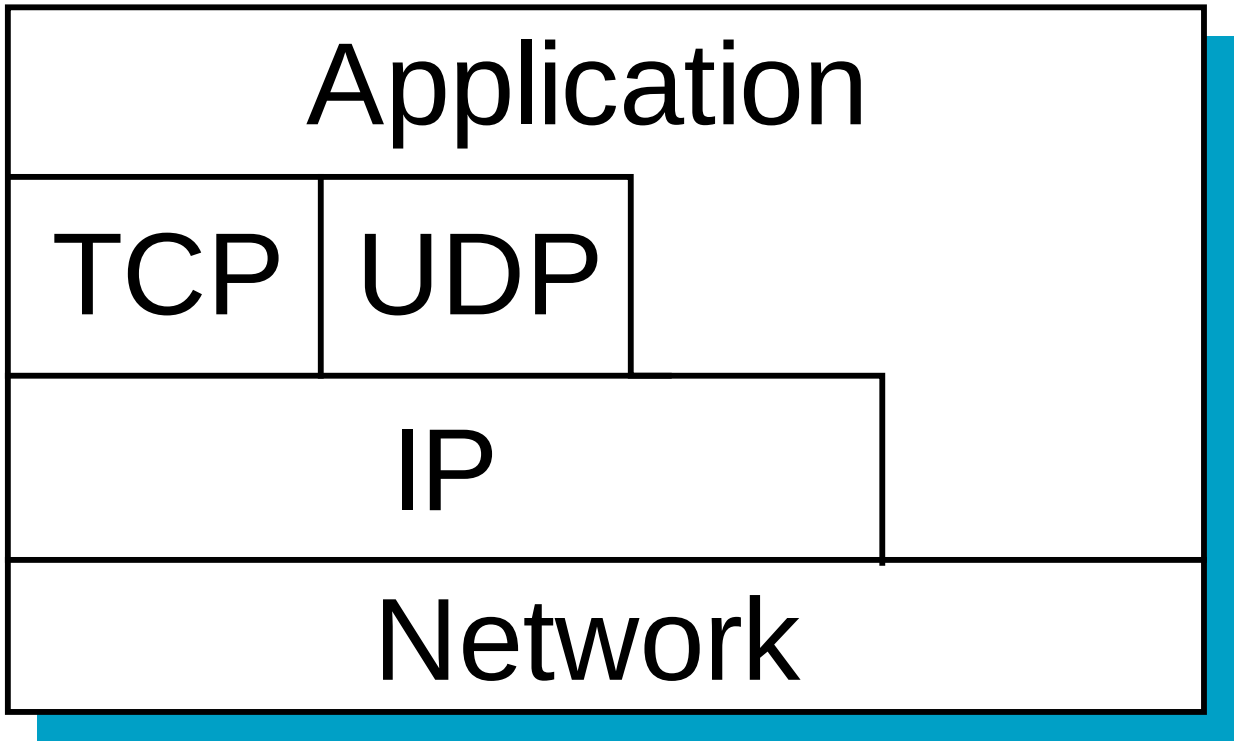
Protocol (OSI 7 Layers Model)



Protocol (TCP/IP)



Protocol (TCP/IP)



Applications

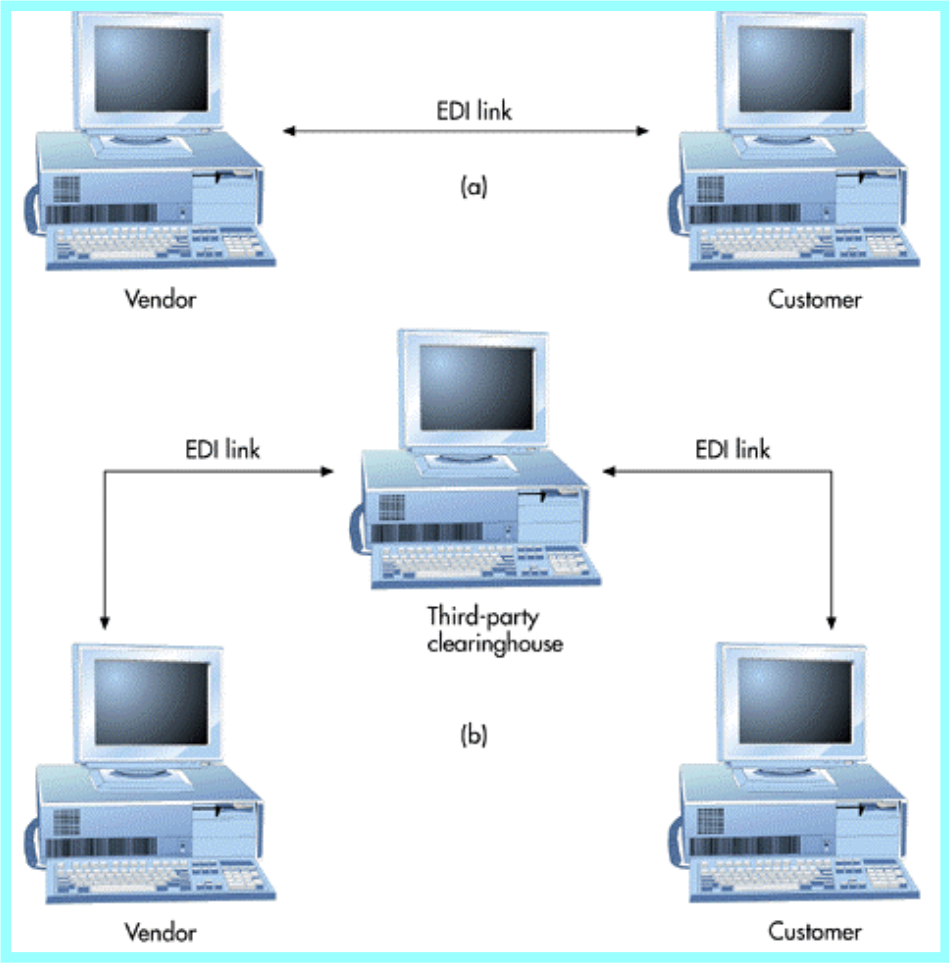
- Linking Personal Computers to Mainframe Computers
  - Download and upload information.
- Voice Mail
  - Enables users to leave, receive, and store verbal messages for and from other users.
- Electronic Mail (e-mail)
  - Enables a sender to connect a computer to a network, type messages, and send it to another person on the network.

Applications

- Electronic Software Distribution
  - Involves installing software on a file server for users to share by signing onto the network and requesting that the software be downloaded onto their computers over a network.
- Electronic Document Distribution
  - Transporting documents -- such as sales reports, policy manuals, and advertising brochures -- over communications lines and networks.

Telecommunications Applications
Videoconferencing

Telecommunications Applications EDI



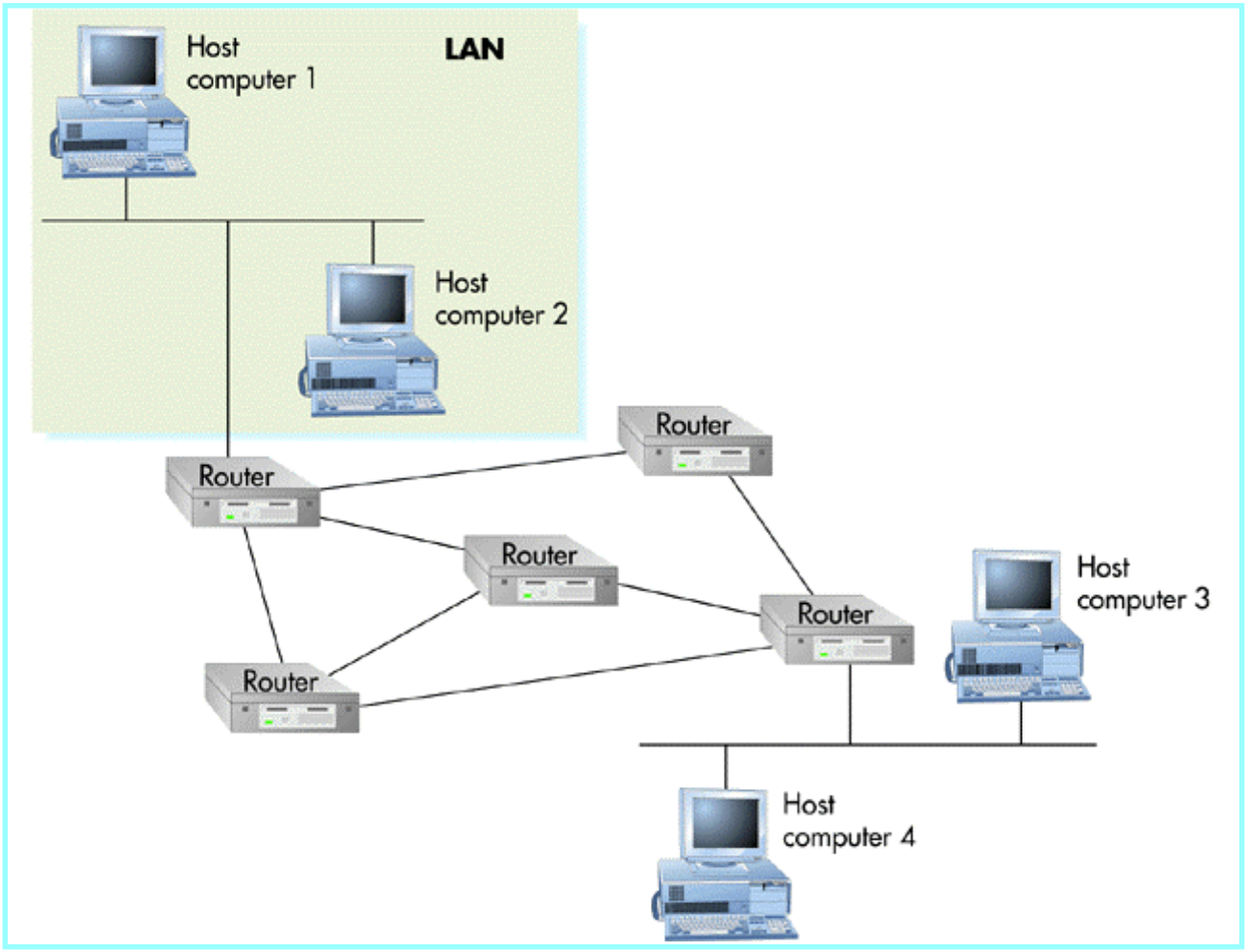
Telecommunications Applications

- Public Network Services
  - Services that give personal computer users access to vast databases and other services, usually for an initial fee plus usage fees.
- Specialized and Regional Information Services
  - Specialized electronic bulletin boards and e-mail services targeting particular interests.
- Distance Learning
  - Use of telecommunications to extend the classroom.

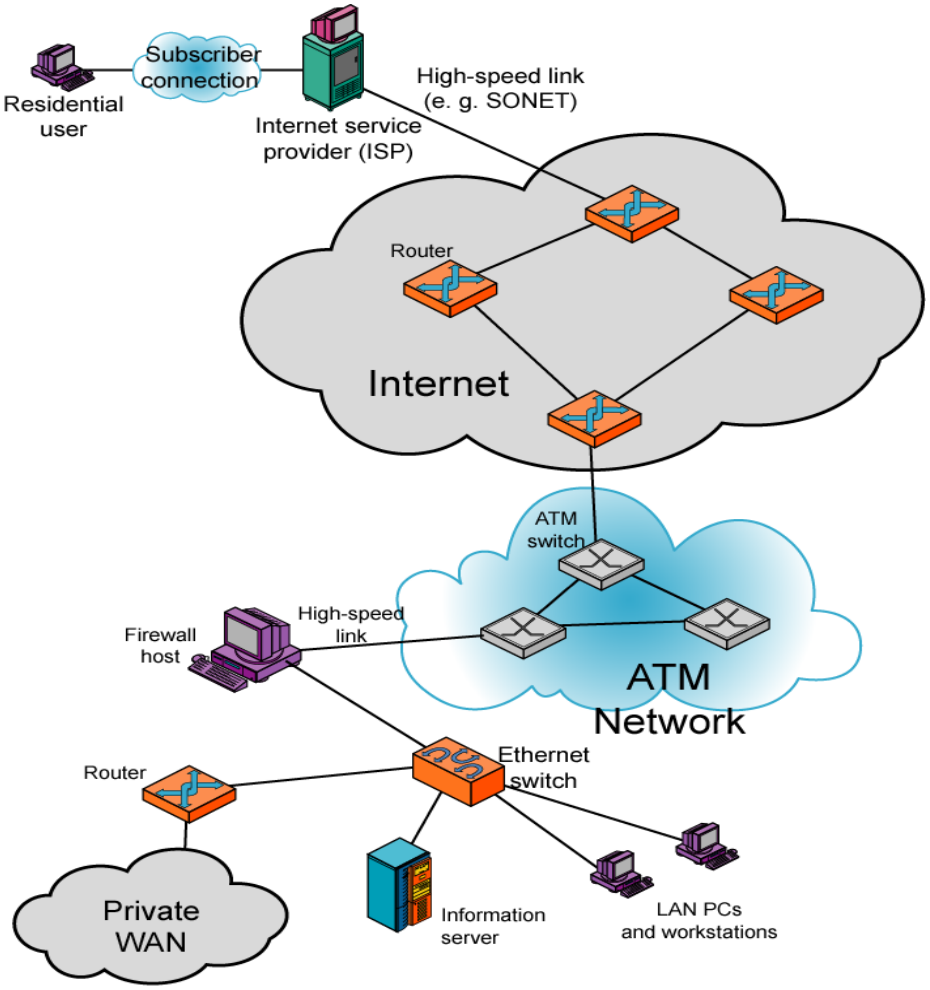
The Internet

Internet Networks
Linked networks that work much the same way -- they pass data around in packets, each of which carries the addresses of its sender and receiver.

The Internet
The Internet transmits data from one computer (called a host) to another.



The Internet



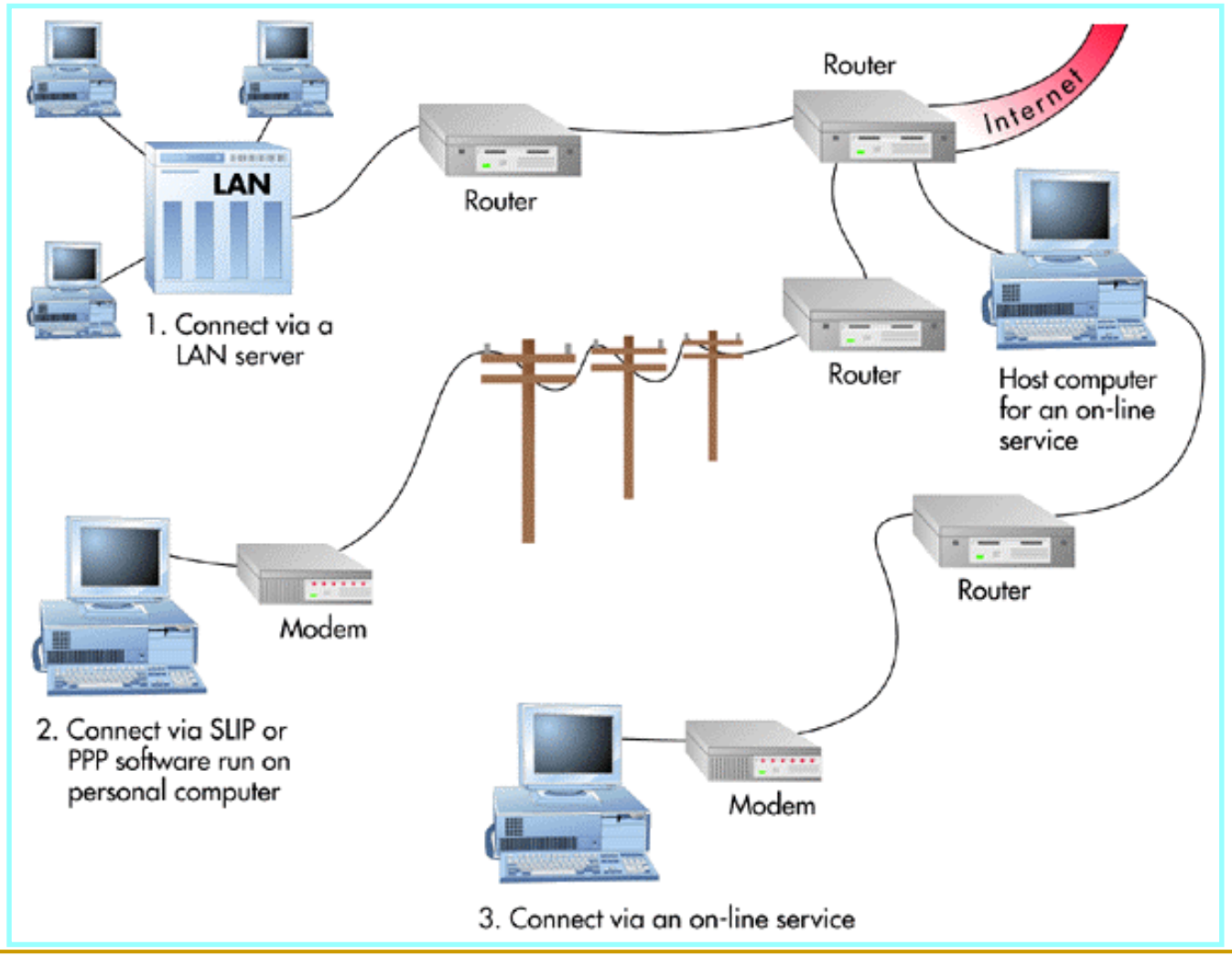
How the Internet Works

- Protocol
  - A protocol that operates at the transport layer and is used in combination with IP by most Internet applications
  - It ensures that computers in Internet can understand the message sending among each others.
- Backbone
  - One of the Internet's high-speed, long distance communications links.
- IP Address/Port
  - IP address is the unique identification on a computer that is connecting to the Internet.
  - Ports are the input/output locations of a computer where messages should send in or out.
  - If an IP address is analogy to a country, then the Port addresses will be analogy to the ports of that country.

Access to the Internet

- LAN Servers
  - Local servers can provide access to the Internet through normal connections (e.g. Ethernet)
- Connection via an On-Line Service
  - Communications protocol (SLIP/PPP) software that transmits packets over telephone lines, allowing dial-up access to the Internet. (Modem access)
  - Examples are American Online (AOL) and Microsoft Network. These services usually require sign-up procedures. (Leased line)

Ways to Access the Internet



Internet Services

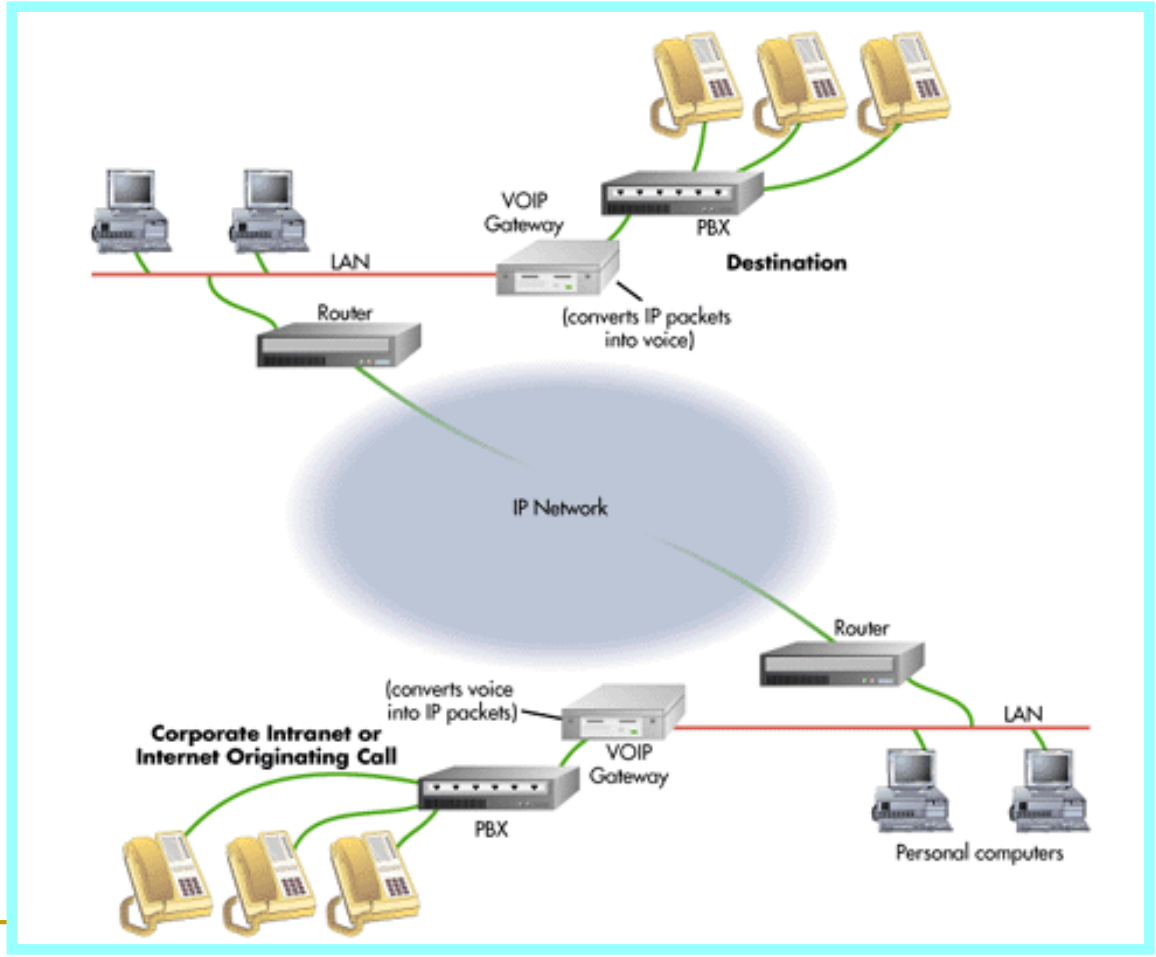
Service	Description
E-mail	Enables you to send text, binary files, sound, and images to others
Telnet	Enables you to log on to another computer and access its public files
FTP	Enables you to copy a file from another computer to your computer
Usenet and newsgroups	Focuses on a particular topic in an on-line discussion group format
Chat rooms	Enables two or more people to carry on on-line text conversations in real time
Internet phone	Enables you to communicate with other Internet users around the world who have equipment and software compatible to yours
Internet videoconferencing	Supports simultaneous voice and visual communications
Content streaming	Enables you to transfer multimedia files over the Internet so that the data stream of voice and pictures plays more or less continuously

Selected Usenet Groups

alt.fan.addams.family	alt.life.itself
alt.pets	alt.fan.bevis-n-butthead
alt.autos.camaro	alt.fan.leonardo-dicaprio
alt.cloning	alt.history
alt.fan.u2	alt.music.blues
alt.sports.baseball.cinci-red	alt.music.zz-top
alt.sports.basketball.nba.la-lakers	alt.politics.socialism
alt.sports.college.sec	gov.us.fed.congress.record.house
alt.sports.soccer.european.uk	gov.us.fed.congress.record.senate

VOIP Service

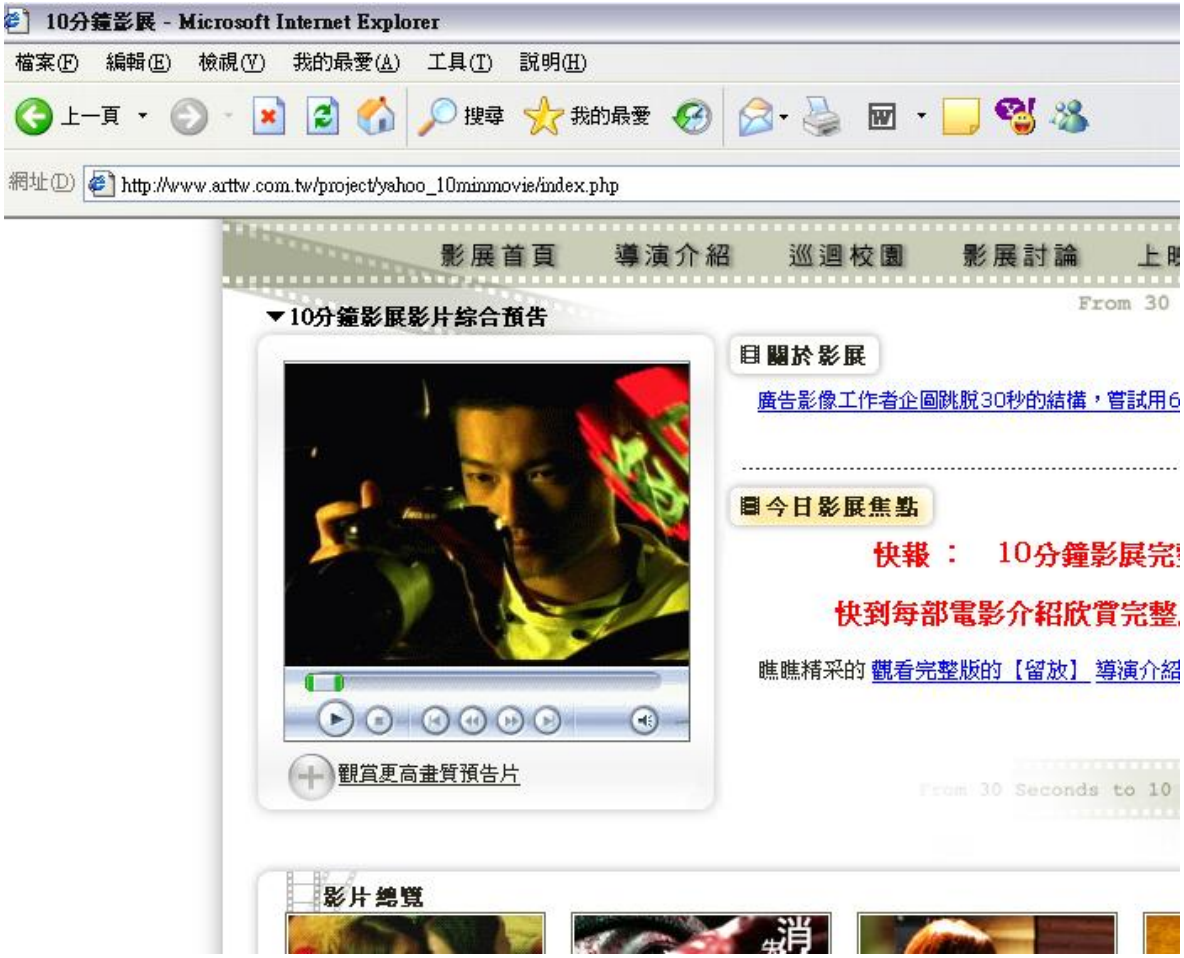
Voice-Over-IP (VOIP)
Technology that enables network managers to route phone calls and fax transmissions over the same network they use for data.



Internet Entertainment

- Content Streaming
  - A method for transferring multimedia files over the Internet so that the data stream of voice and pictures plays continuously, without a break, or very few of them. It also enables users to browse large files in real time.
- IPTV

Internet Entertainment



Information Browsing

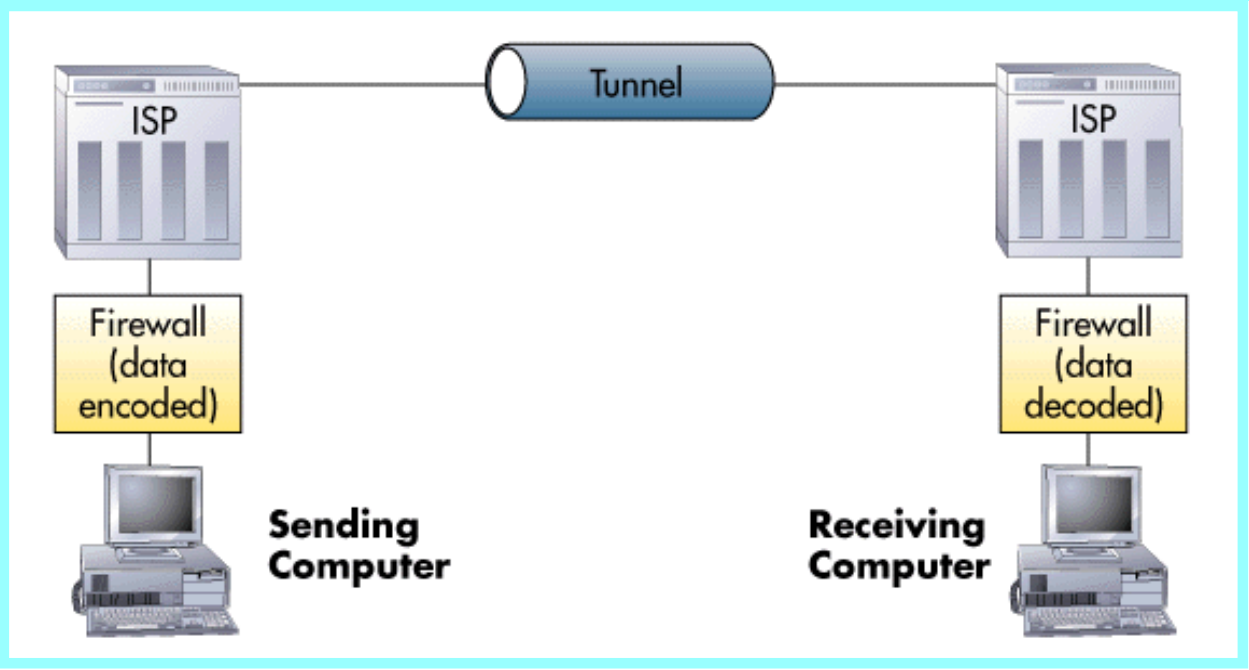
- World Wide Web
  - A collection of tens of thousands of independently-owned computers that work together as one in an Internet service.
- Web Browser
  - Software that creates a unique hypermedia-based menu on your computer screen and provides a graphical interface to the Web.
- Web Page
  - A screen of information sent to a requesting user and presented through a browser.
- Search Engines
  - A search tool for the Web (like card catalogs in libraries).

World Wide Web

Search Engine	Web Address	Search Strategy
Altavista	http://www.altavista.digital.com	Keyword
Excite	http://www.excite.com	Keyword
Galaxy	http://www.einet.net	Subject
Hotbot	http://www.hotbot.com	Keyword
Infoseek	http://www.infoseek.com	Keyword
Lycos	http://www.lycos.com	Keyword
Webcrawler	http://webcrawler.com	Subject
Yahoo!	http://www.yahoo.com	Subject

Virtual Private Network (VPN)

Virtual Private Network (VPN)
A secure connection between two points across the Internet.



Tunneling
The process by which VPNs transfer information by encapsulating traffic in IP packets and sending the packets over the Internet.

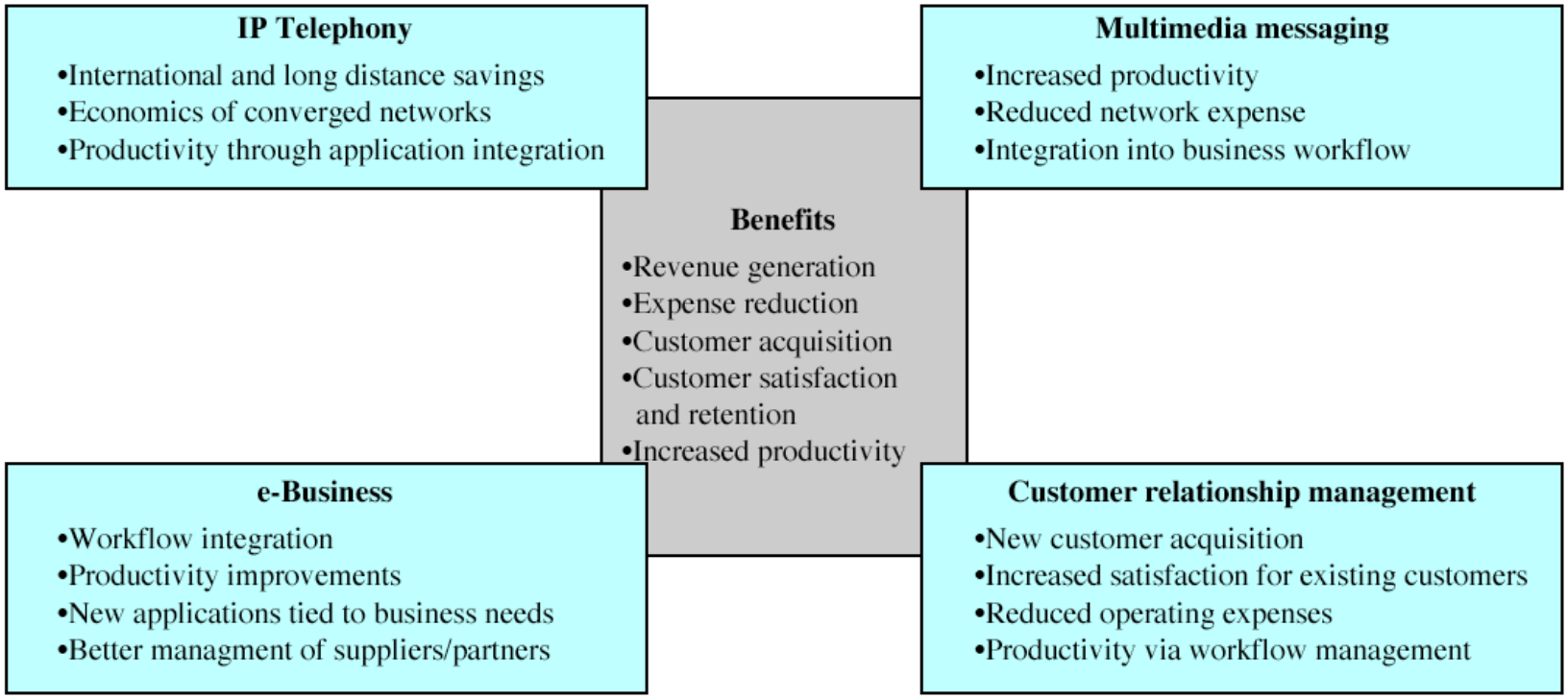
Trends Driving Data Communication

- Traffic growth
  - Increasing number of Internet users
  - Voice & data; local and long distance
- Development of new services
  - Examples: VoIP, IPTV, Online Games
  - In turn drives increased traffic
- Advances in technology
  - Examples: Fiber optics vs copper cable, 2G vs 3G, wired vs wireless
  - Encourage and support increased growth and development

Key Technology Trends

- Faster and cheaper computing and communications
- Increasingly “intelligent” networks
- Growing importance of Internet, intranet and extranet applications
- Increasing use of and dependence on mobile technologies, e.g. personal networks

Applications Driving Enterprise Networks



Model of Enterprise Communications

- 4-layer model of enterprise communications
  - Applications
  - Services
  - Management
  - Infrastructure
- Applications generated by business needs

Types of Business Information

- Text
  - ASCII, Extended ASCII, Unicode, ISO
- Numbers
- Images
- Video
- Voice

Effectiveness of data communication systems

- Performance
  - if the systems can deliver data in a timely manner based on the types of data
- Reliability
  - if the systems can provide non-stop services, measured by the *frequency of failure* or *recovery time of a network after failure*
- Security
  - if the systems can protect the transmitted data from illegal access and/or modification