Unit 8

COMMUNICATIONS

1.1. Read and translate the following phrases.

The field of communications, the transmission of information, hexagonal-shaped cells, the internal combustion engine, scientific and technical research, converge computer and communication technologies, continuous smoothly varied signals, discrete on/off signals, cellular telephones, the appropriate hardware and software, a world-wide network, computer-related devices, a single entity.

1.2. Learn key words and word-combinations.

burst (n) – пакет
bus (n) – шина
bus network – магістральна мережа
circuit switching – перемикання каналів
collision (n) – колізія; конфлікт
compress (v) – ущільнювати
CSMA/CD (Carrier Sense Multiple Access with Collision Detection) – груповий доступ з контролем носія і виявленням конфліктів
data communications – передавання даних
data network – мережа даних
gateway (n) – шлюз (міжмереживний)
ISDN (Integrated Service Digital Network) – цифрова мережа інтегрованих послуг
LAN (local area network) – локальна мережа
MAN (metropolitan area network) – міжміська мережа
network (n) – мережа
packet (n) – пакет
packet switching – комутація пакетів
public voice network – мережа засобів зв'язку
ring (n) – кільце

ring network – кільцева мережа
star topology – зіркова топологія
telecommunications – телезв'язок і дистанційне передавання даних
token (n) – естафета
token passing – естафетне передавання
upgrade (n) – нова версія
WAN (wide-area network) – міжрегіональна мережа зв'язку

1.3. Read and translate the text.

Computer Networks

The field of communications is experi-encing rapid and dramatic change. Traditionally, **telecommunications** has been the transmission of information over long distances by means of telephone, Teletype, radio, or television. **Data communications** has been the exchange of data between computer-related devices. Today, these distinctions have blurred as the two have been converging into networks – a group of computers and other devices connected by communication facilities – in which information is processed and communicated in the form of sound, data, and images over common media.

What does this change mean for society? Just as during the late 1800s and early 1900s global societies were shaped by such technologies as ships, electricity, and the internal combustion engine, so in the late 1900s and early 2000s, they will be shaped by converging computer and communication technologies. The increased capabilities of the networks allow providers to offer a wider variety of communication services (e.g., video, facsimile, data, and multimedia services) than the traditional voice services. How we obtain news and entertainment, conduct business and education, and ac-complish scientific and technical research will all be affected.

Networks can be **analog,** in which information is represented by continuous smoothly varying signals, or **digital,** in which information is represented by discrete on/off signals. Analog signals are an older technology developed by the telephone industry for voice conversations before computers were invented. Analog signals are also used in existing television networks, as well as VCRs, cassette tapes, laser videodisks, phonograph records, and existing cellular telephones. Analog signals are application-

specific. Every analog signal is different from every other because they mimic the shape, timing, and character of the signal they record.

Digital signals are a newer technology found in computer systems, local-area networks, compact disks, and high-definition television (HDTV). Digital signals are discrete on/off signals that can be easily stored, compressed, edited, and manipulated. The telephone industry is in the process of converting to an all-digital network called **Integrated Services Digital Network (ISDN)** and similar upgrades are proposed for cellular telephone networks.

There are three major categories of networks distinguished primarily by geography: wide-area networks, metropolitan-area networks, and local-area networks.

Wide-area networks (**WANs)** provide communications across a country or the entire world. The telephone network is the most pervasive example. It is often viewed as a single entity, even though it is made up of a variety of separate companies. Using the telephone network, for example, it is possible for any two computers, equipped with the appropriate hardware and software, to communicate with one another. It is also possible for a traveller to withdraw cash from his or her own bank account from an automatic teller machine (ATM) in Tokyo or London. More and more banks, as well as other businesses, are linking together in a worldwide network to make automated transactions around the world as easy as they are around the corner.

Metropolitan-area networks (**MANs)** provide communications across and among major metropolitan areas. Public-safety agencies such as police and fire departments, companies, operate and maintain their own private networks. They use MANs to allow their mobile "out-of-office" workers to talk to, and to pass data back and forth to one another.

Local-area networks (LANs) provide communications within specific buildings or facilities. This type of network could be used, for example, in a company where computers are located in the sales, accounting, production, and purchasing departments. Each computer would handle the applications unique to its department. When communication among the computers is required, the computers pass data to one another over the network. For example, purchasing information must be passed to the accounting department for inclusion in the accounts payable system, or production-scheduling information must be passed to the purchasing department for use by the purchasing and inventory systems.

Local-area networks have many different topologies, or ways in which computers can be connected to the network. Throughout the history of networks, the **star topology,** in which a central controller connected terminals or personal computers, was the dominant form of connectivity. Today, the two most common topologies are called **ring** and **bus** networks.

Ring Networks. Computers on a ring network are hooked together one after the other to form one continuous ring. To access each computer, a piece of software called a token is passed around the ring. A token is the electronic equivalent of an envelope. It contains a destination address and a fixed amount of information. The most popular token method is called **token passing,** in which one token at a time passes from computer to computer and carries messages around the network.

Bus networks. On a bus network computers are simply connected by a cable routed along a path in the vicinity of each device that must be connected to it. The most popular bus network is called Ethernet. Bus networks allow multiple messages to be sent simultaneously. This is often accomplished by "listening" to the network to see if any computer is transmit-ting. If the network is free, the computer can send its data. If two computers accidentally send data at the same time, a **collision** occurs, and after detecting the collision, the computers wait a random amount of time to transmit again. This access control method goes by the name of **Carrier Sense Multiple Access with Collision Detection (CSMA/CD***).*

The three major categories of networks are not mutually exclusive. A mobile worker using a portable computer can send a message to a co-worker in a cross-country office because the networks can be linked through **gateways** – devices used to connect dissimilar networks. For example, the mobile worker's message might first be transmitted to a local cellular base station, switched to the telephone network and carried across the country to the co-worker's office, then transferred via gateway into the office LAN.

There are two means of relaying information over networks: circuit switching and packet switching. In the case of making a telephone connection between Odessa and Mykolaiv, the phone company uses **circuit switching** to find a free circuit, or **physical link**, among the many possible alternatives between the two cities, and keeps that circuit open for the duration of the call. If the call consists of two computers talking to one another, they may only be exchanging short **bursts** of data and spending the majority of their time waiting for additional data. Regardless of whether transmitting or

waiting, the circuit is still connected, and the user is paying for the connect time, which results in a very inefficient use of bandwidth.

Packet switching breaks messages into smaller units called **packets**. Each packet contains the address of its destination and the data to be sent. An analogy can be found in the postal system, where letters (data) are placed in addressed envelopes, sent by truck or plane through the mail (channel), and delivered to the proper receiving address. With packet switching, messages are broken into packets that are transmitted in short bursts over a communication network to the specified address, where they are reassembled into the original message.

Whereas circuit switching makes a physical connection between two points, packet switching makes a **virtual connection**. By sending data in small packets, each with its own address, time and space on a network can be allocated more effectively. Many small packets can be routed over many different paths on the network instead of large messages routed over a single path. If errors occur, usually only a single packet of data is lost instead of the entire message. If different paths in the network go down, packets can easily be rerouted because no physical connection has been established, only a virtual connection.

1.4. Translate the following words and words-combinations into English so that you could form compound nouns.

Телефонна мережа, пристрої (засоби) зв'язку, комп'ютерні техно-логії, перемикання каналів, комутація пакетів, мережа зв'язку, зіркова топологія, магістральна мережа, метод керування доступом, базова станція, виявлення колізій (конфліктів), кільцева мережа, телефонний зв'язок, телефонна промисловість, мережа даних.

1.5. Give English equivalents of the following words and word-combinations.

Забезпечувати зв'язок, відповідне апаратне і програмне забезпечення, сфера зв'язку, стирати (згладжувати) відмінності, сходитися в мережу, сотовий телефон, усувати необхідність, оробляти (керувати) програму, взаємовиключний, передавати інформацію по мережі, фізичний зв'язок, віртуальний зв'язок, смуга частот, ефективно розміщувати, встановити фізичний зв'язок, передавати через шлюз, обмінюватись пакетами даних.

1.6. Fill in the blanks with the words from the text.

1. A data communications network is a group of _____ inter-connected by communications circuits so that users can share data, software programs and hardware resources.
2. _____ is a network contained in a relatively small area.
3. Dissimilar networks can be interconnected by _____, devices that help manage communications, control traffic on a large networks and translate protocols.
4. The Internet is the example of a _____network.
5. _____is an international standard for transmitting digital text, sound, voice and video data over telephone lines.
6. For long-distance or world-wide communications, computers and LANs are usually connected into a _____ network to form a single integrated network.

1.7. Translate into English.

1. Для забезпечення зв'язку між локальними мережами застосовуються засоби міжмережної взаємодії, які називаються мостами і маршрутизаторами.
2. Мости використовують для зв'язку мереж з однаковими комунікаційними системами, наприклад, для зв'язку двох мереж Ethernet.
3. Маршрутизатори сполучають мережі з різними комунікаційними системами, оскільки вони мають засоби перетворення пакетів одного формату на інший.
4. Існують мости-маршрутизатори, що об'єднують функції двох систем.
5. Для забезпечення зв'язку з різними комп'ютерними системами призначені шлюзи.

1.8. Substitute the underlined word or phrase with the most suitable word from the box.

Connect	join	many	at the same time	protocols	widespread
send	via	with	common	architecture	configuration
numerous	transmit	structure	dissimilar	different	

1. Bus networks allow <u>multiple</u> messages to be <u>sent simultaneously.</u>
2. Dissimilar networks can be <u>linked through</u> gateways.

3. The physical distribution of the devices and their interconnecting communication circuits is known as network "topology".
4. The software consists of the rules which determine the formats by which information can be exchanged between different networks.
5. Internet and Arpanet transfer data and e-mail for university researchers and academicians, commercial groups and ordinary people.
6. The telephone network is the most pervasive example.

1.9. Answer the questions.

1. What does the convergence of data communications and telecommunications mean for society?
2. What is the difference between analog and digital networks?
3. What are the main categories of networks? In what way are they distinguished?
4. What are the two most common topologies of local-area networks?
5. What are two basic means of relaying information over networks? Which of them is more effective? Why?
6. What are the benefits of connecting computers and peripherals in a network?
7. What are the advantages of packet switching over circuit switching?

2.1. Read and translate the following words and word-combinations.

Carry conversations, a flexible metallic shielding, a filament of glass, through open space, around the world, wide-area wireless communications, infrared technology, a popular wireless medium, cordless telephones, communication satellites, geosynchronous satellite-based communication, communication application.

2.2. Learn the key words and word-combinations.

amplify (v) – підсилювати
bandwidth (n) – ширина смуги частот
coaxial cable – коаксіальний кабель
communication channel – канал зв'язку
compression (n) – ущільнення
convert (v) – перетворювати
convey (v) – передавати
FDDI (Fiber Distributed Data Interface) – протокол обміну розподіленими даними через світлопровід

fiber-optic cable – волоконно-оптичний кабель
frequency (n) – частота
frequency-division multiplexing – частотне ущільнювання
geosynchronous (adj) – геосинхронний
hertz (n) – герц
microwave (n) – мікрохвиля
per unit of time – за одиницю часу
remote-control device – пристрій дистанційного контролю
repeater antenna – ретрансляторна антена
satellite channel – супутниковий канал
shrink (v) – ущільнювати
time slot – інтервал часу
time-division multiplexing – ущільнювання у часі
time-sharing service – послуги в режимі розподілу часу
twisted-pair cable – вита пара

2.3. Read and translate the text.

Communication Channels

A **communication channel** is a transmission path for electrical or optical signals. All communication channels use the medium of electromagnetic waves, such as radio waves, light waves, and microwaves, which differ only in their frequency. **Frequency** is a measure of the number of waves that are transmitted per second and is measured in hertz. By converting one kind of wave, such as sound, into another, such as radio, waves can be made to carry conversations, data, and video around the world. There are two categories of communication channels: wired and wireless.

Several different types of wire are commonly used to implement communication channels. The simplest and least expensive medium is called **twisted-pair wire.** The wires that connect your telephone to the local telephone office are an example of twisted-pair wires. Another common medium is the **coaxial cable,** which is wire surrounded by a flexible metallic shielding. A familiar example is found in cable TV connections. Coaxial cables have much higher capacity than do twisted-pair wires but are more expensive. The newest form of cable that is replacing coaxial cable is called a **fibre-optic cable,** which is made of optical fibres. An optical fibre is a

filament of glass about the same size in diameter as a human hair. It uses light instead of electricity to transmit information. In theory, a fibre-optic cable can replace a wire in any application.

The second category of communication channel uses waves transmitted through open space. This category includes microwaves, light waves, and radio waves.

An early form of wide-area wireless communication used microwaves to transmit and receive information. This type of system is capable of transmitting at higher capacities than are twisted-pair wires (twisted pair) or most coaxial cables. However, microwave systems are expensive because they require **relay stations** with **repeater antennas** every 20 to 30 miles (32 to 48 kilometres). Relay stations are needed because microwave systems can only transmit data on a "line-of-sight" path. Each station is placed in line with the next**, amplifies** the signal received, and transmits it to the next relay station in the chain.

Infrared light waves are used as a communication channel, but only for short distances. Your television or VCR **remote-control device** is an example of an infrared communication channel. Infrared technology is also used in local-area networks to connect computers and devices in the same office. Infrared is also a popular wireless medium for portable hand-held computers. For example, two users of infrared-equipped handheld computers could exchange electronic business cards by simply pointing the devices at one another, or connect to a local-area network in the same room to send and receive messages.

Radio waves are the most common wireless communication medium. They are transmitted by antennas, which can send or receive the waves. For local-area networks, one technology is called spread-spectrum radio, which is similar to the technology used in cordless telephones and garage door openers.

In the case of metropolitan-area networks, one antenna is located in the mobile device, the other at the base station in the geographic cells. In wide-area networks, one antenna is located on the ground, the other in a satellite. Some communication satellites are placed in orbit 22,300 miles (35,680 kilometres) above the Earth's surface. At this orbit, called geosynchronous, it takes exactly 24 hours to circle the earth, so the satellite appears to be stationary to the ground station. Television programs, telephone calls, and data can be transmitted from one continent to another using geosynchronous sat-

ellite-based communication channel. A major aspect of a communication channel is its capacity or the rate at which it can transfer information. The capacities of different communication channels can vary greatly and are not directly related to the physical medium. A coaxial cable, for example, can have as high a capacity as a satellite channel. Networks can convey information at a wide range of speeds, ranging from a few thousand bits per second for sending a brief text message, to tens of millions of bits per second for sending video images.

The term **bandwidth** refers to the amount of data that is transmitted over the network per unit of time, typically expressed as bits per second.

Bandwidth is related to the needs of the communication application. For example, typing characters on a keyboard is limited by the typing speed of the user, so only a small bandwidth is needed for such an application. In an application such as linking a personal computer to a time-sharing computer service, data are typically transmitted at 1200 to 9600 bits per second.

Several channel technologies have been developed that provide the higher bandwidth that is required for nonvoice applications. Ethernet and token-ring technologies provide 4- to 16-megabit-per-second packet-switched bandwidth for local-area network applications. The telephone companies have developed two versions of ISDN (Integrated Services Digital Network). The 1.5-megabit-per-second version is capable of supporting compressed video. Another recent channel technology is called Frame Relay. It is packet-based and can operate at 64,000 to 45 million bits per second. The Fibre Distributed Data Interchange (FDDI) is a token-based LAN technology that operates at 100 million bits per second. Broadband ISDN is a technology that offers high speed (up to 150 million bits per second), as well as the promise of a common network for all communications that could replace specialized networks for voice, data, and video.

Traffic over a communication channel is rarely smooth and continuous. Just as freeways are jammed during rush hour and empty late at night, or electrical consumption rises dramatically on a hot evening when air conditioners and appliances are turned on, communication channels also have peaks and valleys. Similarly, adding more lanes to already-crowded freeways does not necessarily solve the traffic problem, and adding more capacity to a communication channel does not necessarily provide better communication capability. Other solutions involve more effective utilization of the bandwidth that is already there.

Compression (and **decompression**) is a technique for shrinking huge data files for storage and transmission. In our highway analogy, compression is the equivalent of carpooling. By packing more data into each packet, the capacity of an existing channel can be used more effectively.

A **multiplexer** is a device that allows multiple communication signals to share one communication channel. This lowers communication costs by allowing more efficient use of a channel.

Frequency-division multiplexing involves dividing the transmission channel into different frequencies. Data from each user are then sent over a specific frequency. Radio is a familiar analogy. You can switch among radio stations and listen to each one without interference because each radio station is broadcasting at a different frequency. A typical telephone coaxial cable is capable of carrying 10,000 simultaneous voice conversations simply by frequency-division multiplexing the signals that represent individual conversations.

Time-division multiplexing involves dividing the channel on the basis of fixed time intervals called **time slots.** For example, many digital channels are divided into 24 time slots less than a millionth of a second long, which repeat in cycles of 24. Thus, each user's data are separated in time from all other users' data. By assigning a user time-slot number 12, for example, that user's data will always occupy time-slot number 12.

2.4. Translate the following phrases so that you could form compound nouns.

Канал зв'язку, мікрохвильові системи, ретрансляторна антена, засіб зв'язку, супутник зв'язку, наземна станція, супутниковий канал, схема ущільнення, канал передачі, інтервал часу, ретрансляторні станції, можливості зв'язку.

2.5. Give English equivalents of the following phrases.

Споживання електроенергії, численні сигнали зв'язку, на основі фіксованих інтервалів часу, цифрові канали, ефективне використання смуги частот, для зберігання і передавання, без завад, пристрій дистанційного контролю, передавати і одержувати інформацію, посилати і одержувати повідомлення, підсилювати сигнал, використовувати світло замість електрики, бути безпосередньо з'єднаними з фізичним середовищем.

2.6. Find synonyms.

Differ, require, locate, restrict, method, vary, need, shrink, share, connect, link, transmit, situate, exact, involve, replace, convey, sharp, include, substitute, transfer, needs, compress, common, requirements, divide, widespread, send, limit, technique.

2.7. Fill in the blanks with the most suitable words from the text.

1. Networks can be connected together by either _____ lines or _____ canals.
2. Modern telecommunications use _____ cables because data can be transmitted at a very high speed through extremely wide bandwidth of glass fibres.
3. A technique for shrinking huge data files for storage and transmission is called _____.
4. _____ cables require little physical space, they avoid electromagnetic interference and they are safe because they do not carry electricity.
5. A device that allow multiple communication signals to share one communication channel is called a _____.
6. _____ involves dividing the transmission channel into different frequencies.
7. _____ involves dividing the transmission channel into time slots.
8. Frequency is measured in _____.

2.8. Explain the following terms in your own words.

Compression, bandwidth, communication channel, multiplexing.

2.9. Answer the questions.

1. What physical medium is used by all communication channels?
2. In what units is frequency measured?
3. What types of wire are commonly used to implement communication channel?
4. What are the advantages of fibre-optic cable in comparison with twisted-pair wire and coaxial cable?
5. What are the main categories of communication channels?
6. What types of waves does a communication channel use?
7. What type of waves is the most common wireless communication medium? Why?
8. Are the capacities of different communication channels directly related to the physical medium?

9. What is compression necessary for?
10. How does a multiplexer function?

3.1. Read and translate the following word-combinations.

A hardware component, vice versa, with the advent, in conjunction with, built-in telephone, digitize the image, to convert the signals, a telephone-jack connection, terminate the connection, reliable and convenient to use, facsimile transmission.

3.2. Learn key words and word-combinations.

acoustic modem – акустичний модем
acoustic coupler – гніздо для під'єднання телефону
analog telephone line – аналогова телефонна лінія
digital signal – цифровий сигнал
digitize (v) – перетворювати у цифрову форму
facsimile (n) – факсиміле; точна копія
RF (radio-frequency) modem – радіочастотний модем
resolution (n) – роздільна здатність
telephone-jack connection – сполучення через телефонне гніздо
terminate the connection – закінчувати зв'язок

3.3. Read and translate the text.

Modems

The most common piece of data communication hardware in use today is the modem (short for modulator demodulator). It is popular because the most convenient communication channel is the analog telephone line. A modem at each end of the channel performs the function of converting digital signals into analog signals and vice versa.

Several types of modems are commonly used. The earliest form is the acoustic modem. It consists of an acoustic coupler designed to hold the handset of an ordinary telephone as well as modem circuits to convert the signals and to interface with a terminal or personal computer. With the advent of the standard telephone-jack connection, newer modems have taken on a slightly different form. They consist of the interface circuits along with a standard plug into which the telephone jack fits. These newer modems are typically more reliable and convenient to use. Specialized modems designed

for much higher transmission rates (up to 19,200 bits per second) are used in conjunction with communication channels that support the higher speeds. In wireless metropolitan-area networks, radio-frequency (RF) modems perform the same functions as their wired counterparts.

Facsimile or FAX is a method for electronically copying and transmitting an image. FAX machines send and receive images over telephone lines. They scan documents, digitize the image, and transmit the information to another FAX machine, which reconstructs the image and prints it.

Using a FAX machine is similar to making a telephone call. To send a FAX, you first use the FAX's built-in telephone to dial the number of another FAX machine. After a connection is established, you insert your document into the FAX machine. When the transmission is suc-cessfully completed, the FAX machine provides feedback and terminates the connection. Receiving a FAX is automatic. The FAX machine must, of course, be turned on and connected to a phone line. An incoming call triggers the FAX to begin receiving the document. This type of point-to-point communication requires the sending and receiving FAX machines to be connected simultaneously.

To make sure that FAX machines from different manufacturers can communicate with one another, all vendors have adopted standard protocols from the Consultative Committee for International Telephony and Telegraphy (CCITT). FAX machines can be combined with other computer and communication technologies. FAX boards that contain a built-in modem and plug into one of the expansion slots inside of a personal computer enable facsimile transmission of word-processing documents without first making a paper copy. By using communication software, the document can be sent to a FAX machine or a comparably equipped computer.

For two devices to communicate, they must "speak the same language". What is communicated, and how and when it is communicated must conform to some mutually agreed-upon conventions. A **protocol** is a formal set of rules for specifying the format and relationship when exchanging data among communicating devices.

Because communication between dissimilar devices is extremely complex, it is desirable to standardize protocols so that any device can use them. Two systems, no matter how different, can communicate if they use standard protocols. Also, a set of protocols instead of a single protocol is usually needed. These protocols are arranged in a hierarchy of layers. The top layers provide services in support of the applications; the bottom layers are concerned with transmitting information between communicating devices.

By treating each layer independently, it becomes possible to change a protocol at one layer without affecting the other layers. For example, as higher-speed communication technology emerges, only the lower-level protocols need to change. The application can continue to function without having to "know" the details of the physical communication channel.

3.4. Read the text again and match the following terms with their definitions.

Modem	Protocol	Facsimile	Communication channel

a. a method for electronically copying and transmitting an image
b. a hardware device that converts digital signals from computer to analog signals for transmitting through the telephone system, and vice versa
c. a set of rules which determines the formats by which information may be exchanged between different systems
d. a transmission path for electrical or optical signals

3.5. Answer the questions.
1. What is the idea behind the modem?
2. How is the modem connected to a telephone line?
3. How does a fax machine operate?
4. What is the protocol used for?

4.1. Translate the following words and word-combinations.

Advanced electronic-mail systems, local area network software, subscribe to, integrate in, electronic mail, service provider, initial fee, via personal computers, one-to-one communications, many-to-many communications, a face-to-face conference, retrieve information from, computer-based collaborative work, tap into, available over the Internet.

4.2. Learn key words and word-combinations.

electronic mail – електронна пошта
electronic mailbox – електронна поштова скринька
disk subsystem – дискова підсистема
password (n) – пароль
message system – система повідомлень

electronic community – електронна спільнота
electronic bulletin board – електронна дошка об'яв
provider (n) – провайдер (організація або юридична особа)
presentation graphics – супровідна графіка
real-time collaboration – співробітництво у реальному масштабі часу
use charge – плата за користування
username (n) – ім'я користувача

4.3. Read and translate the text.

Communication Applications

Electronic mail is an application that handles the sending and receiving of electronic messages. Usually the messages are short pieces of text, but advanced electronic-mail systems have the capability to integrate spreadsheets, presentation graphics, voice, or video in a message. To use electronic mail, you need communication software and a modem.

Although electronic mail is usually included in local-area network software, most people subscribe to an electronic mail service provider. After you pay an initial fee, you receive an account, a username, a pass-word, and an electronic mailbox. The **password** is a private code that you use to sign on to the service. It is known only to you (and to the service provider). The username is a public code – the address that others use to send messages to you. The **electronic mailbox** is a file stored on disk, in which each message in the mailbox corresponds to a record in the file. Electronic mailboxes are usually stored in large computer systems with large disk subsystems. Mail can be sent to and read from mailboxes as well as being stored there. People use electronic mailboxes to communicate by processing electronic mail on a message-by-message basis, reading messages, and, in turn, acting on them. Because you are the only person who knows your own password, you are responsible for paying the use charges that accrue to your account.

Electronic mail has an advantage over the telephone when it is necessary to communicate complex data such as a document. It is possible to combine the two into an integrated system that reads your electronic mail using voice synthesis.

Collaborative work. Computer-based collaborative work electronically encompasses the follow-ing:

5. Accessing and collecting information.
6. Distributing tasks across a network.
7. Collaborating with other information workers.
8. Planning and holding conferences and meetings.
9. Communicating the results.

Collaborative computing may be as simple as a message system that links people throughout an organization, or it may entail software that facilitates people working together electronically as a team to produce proposals or other documents.

An **electronic conference** involves groups of people who meet by communicating with one another via personal computers. It uses the same technology as electronic mail, but whereas electronic mail is associated with one-to-one communications, electronic conferencing is associated with many-to-many communications. For example, suppose ten people wanted to set up an electronic conference. In a face-to-face conference, the participants need to meet simultaneously, whereas the electronic conference eliminates the need for simultaneous participation. Electronic conferences can extend over a period of days or weeks, and are also effective for holding a meeting in which the people are not located in the same area.

Many large corporations use their networks of computers to help facilitate face-to-face meetings. Agendas are sent electronically to all participants' electronic mailboxes before the meeting. During the meeting, one person electronically records minutes and notes. Then followup activities are electronically scheduled, and the results of the meeting are automatically posted in the participants' electronic mailboxes. Such systems make communication more effective, permit better use of people's time, and help to resolve issues much faster than older manual methods.

An alternative to face-to-face meetings involves the use of a video conference – real-time collaboration between people using video, voice, and data. Personal computers equipped with small cameras and special software can send and receive live motion video in a small window on the computer's screen. Another window on the screen serves as a shared "chalkboard" that lets participants point out details, make annotations, and transfer files between computers. The results are simultaneously displayed on each personal computer. At the same time, people can work individually: They can retrieve information from previous meetings, access other files, or work on parts of a group project.

The Internet. Electronic mail, electronic conferencing, and computer-based collaborative work are the forerunners of what some people are calling electronic communities, which would link groups of scientists, researchers, businesspeople, and students with information and access to colleagues around the world.

By tapping into the Internet, users can send electronic mail to millions of other computer users all around the world. Once on the network, users can access electronic bulletin boards and conferences that feature a diverse variety of topics ranging from electrical engineering to Shakespeare, to television soap operas, to AIDS, and access databases available over the Internet. Even cable television is available via the Internet.

Most individuals access the Internet through services such as Compu-Serve or Prodigy, which provide an Internet gateway. Businesses often use commercial providers such as Performance Systems and Advanced Networks & Services. In colleges and universities, students are often given free Internet accounts that enable them to collaborate with students and professors around their university and around the world.

4.4. Explain the following terms in your own words.

E-mail, electronic mailbox, a video conference, an electronic bulletin board, an electronic, conference.

4.5. Which data communication services would you use for each of these requirements?

1. To send a personal message to a friend who is at a different workstation.
2. To send a copy of a paper document, for instance, a scientific article.
3. To access massive databases, containing all kinds of information.
4. To receive shareware and public domain programs from a user (a group).
5. To find out weather forecasts and sports information from television.

a) fax
b) electronic mail
c) teletext
d) local bulletin board
e) commercial online service

4.6. Fill in the blanks with the words from the text.

1. The Internet is the largest global _____ connecting millions of users all over the world.
2. Users can _____ commercial and non-commercial services of the USA, Canada, Australia and many European countries.
3. _____ is one of the earliest and most popular services provided by the Internet.
4. _____ is real-time collaboration between people using video, voice and data.
5. Most users access the Internet through _____ such as CompuServe and Prodigy.

4.7. Put the verb into the correct form.

1. The Internet which was used mainly by researchers, _____ more popular in business spheres.(become)
2. Prodigy's services _____ particularly at shoppers and the needs of children.(aim)
3. Telecommunications _____ for hundreds of different applications.(use)
4. Electronic mail _____ some special hardware.(require)
5. The Internet _____ very rapid growth in traffic.(experience)

4.8. Proverbs for the Internet. Try to guess what proverbs they originated from.

1. Home is where you hang your @.
2. You cannot teach a new mouth old clicks.
3. Too many clicks spoiled the browse.
4. Do not buy more than you can view.
5. The user and his leisure time are soon parted.
6. There is no place like http://www.home.com
7. Give a man a fish and you feed him for a day: teach him how to use the Net and he won't bother you for weeks.

4.9. Answer the questions.

1. What are the advantages of electronic mail over the telephone?
2. What problems can be solved with help of computer-based collaborative work?
3. What are the advantages of a video conference over an electronic conference?
4. What is the role of the Internet in modern life?

5. What is the architecture of the Internet?
6. What hardware and software are necessary to access the Internet?
7. What is the transceiver?
8. What are the most popular transceivers?
9. What is the average speed of transmitting information via the Ethernet?

4.10. Make a report on

1. The Internet as the global information space.
2. The Intranet.
3. The Ethernet.
4. The architecture of the Internet and Ethernet.
5. Services provided by the Internet.
6. Protocols.

Test Yourself

Match the following key terms to the appropriate definition:

A.
1. Telecommunications
2. Data communications
3. Networks
4. Analog
5. Digital
6. Wide-area network
7. Metropolitan area ikm work
8. Local-area net WORK

a. A type of network in which information is represented by continuous smoothly varying signals.
b. The transmission of information over long distances by means of telephone, Teletype, radio.
c. A network that provides communications across and among major areas such as New York, Chicago, or Los Angeles
d. A network that provides communications within specific buildings
e. The transfer of data or information between computer related devices.
f. A network in which information is represented by discrete on / off signals.

g. A net work that provides communications across a country or the entire world.

h. A group of computers and others DEVICES connected by communication facilities.

B.

9. ring network
10. bus network
11. gateway
12. circuit switching
13. packet switching
14. communication channel
15. Bandwidth
16. multiplexer

a. A device used to connect dissimilar networks.

b. A communication channel routed along a path in the vicinity.

c. A transmission path for electrical or optical signals.

d. A device that allows multiple communication signals to share one communication channel.

e. A closed-loop communication channel

f. The amount of data that is transmitted over the network per unit of the time.

g. A method of creating a physical link between two communication devises.

h. A method for breaking messages into smaller units that can be transmitted separately over communication networks.

True/False:

26. The distinction between telecommunications and data communications has become much clearer with the advent of computer networks.

27. Analog signals for communication were developed before computers were invented.

28. Users of metropolitan-area networks include police and fire departments.

29. Metropolitan-area networks are designed to provide communications within specific buildings.

30. The three major categories of networks are mutually exclusive.

31. By sending data in small packets, each with its own address, time and space on a network can be allocated more effectively.

32. Twisted-pair wires are the simplest and least expensive media for communication channels.
33. In theory, a fibre-optic cable can replace a wire in any application.
34. The most convenient communication channel in use today is the telephone line.
35. Infrared light waves are useful for long-distance communications.
36. Modems can handle simultaneous voice and data transmission.
37. Bandwidth is related to the needs of the commu-nication application.
38. Time-based information, such as video and audio, requires high bandwidths to be useful.
39. A disadvantage of facsimile is that the sender and receiver must be connected simultaneously.
40. Video conferencing involves delayed collabora-tion between people.

Multiple Choice:

41. A wire surrounded by a flexible metallic shield is called a
    a. Twisted-pair wire.
    b. Fiber-optic cable.
    c. Coaxial cable.
    d. Telephone wire.
42. Multiplexing allows several users to share a
    a. Central computer.
    b. Local-area network.
    c. Communication channel.
    d. Satellite.
43. For two devices to communicate, they must
    a. Both have modems.
    b. Use wireless networks.
    c. Speak the same language.
    d. All of the above.
44. The most common wireless communication media are
    a. Light waves.
    b. Radio waves.
    c. Microwaves.
    d. None of the above.
    e. None of the above.
45. More effective use of existing bandwidth can be accomplished by
    a. Protocols.
    b. Broadband channels.
    c. Circuit switching.
    d. Packet switching.

46. Facsimile technology for personal computers
    a. Enables computer-to-facsimile transmission.
    b. Enables facsimile transmission without first making a paper copy.
    c. Enables computer-to-computer facsimile.
    d. All of the above.
47. An electronic conference
    a. Requires the participants to meet simultaneously.
    b. Eliminates the need for simulta-neous participation.
    c. Is associated with one-to-one communications.
    d. None of the above.
48. Video conferencing is an alternative to
    a. Electronic mail.
    b. Face-to-face meetings.
    c. Electronic conferencing.
    d. None of the above.
    e. None of the above.