Technical English
Chapter Two

Computer networks

Before reading the text, try to find the names of different components of a network. Use the words below

hub	server	clients	router
repeater	switch	bridge	peripherals

1. …….. An intermediary device containing multiple ports, which allows the communication between servers and desktops connected to each other via telephone or fiber optic cables.
2. …….. A hardware or software-based virtual device in data link layer which is responsible for connecting various devices in a local network.
3. …….. A network connecting device at network layer, which is used to connect several networks or multiple switches.
4. …….. When you are connected to a network, you are able to share many of these devices on the network.
5. …….. A central computer in a network to which all desktop computers connect; it stores data files and application software programs.

Reading section

A At the age of information explosion, it is not strange that creating, storing and communicating information has become so elaborated and specialized that a new, modern industry is needed for carrying out all these functions. That is exactly where information technology (IT) comes in. As old as the middle of 20th century, IT can be defined as the study and use of systems (including computers, storage, telecommunication and networking devices, infrastructures and processes) to create, process, retrieve, secure, transfer and exchange all forms of electronic data. In other words, IT involves anything related to computing technology. So does computer hardware, software, and networking. In Chapter 1, we examined different aspects of a computer, i.e. hardware and software; now, let's turn to the other aspects of IT: Networks and networking.

A computer network is a group of computers that use a set of common communication protocols for sharing not only data files, information and software applications, but also hardware like printers, scanners, faxes, monitors, desktops and graphics. This communication could be within a limited area, for example an office, building, or local area which is called Local Area Network or LAN. On the other hand, they could be among far-reaching systems across the globe, referred to as WAN (Wide Area Network, such as the Internet). This traditional distinction is now blurred as it is possible to have LAN connections remotely over telephone links. The communication can be through waves (satellite signals, Wi-Fi), fiber optic cables, coaxial cables or ordinary telephone lines. Ethernet is a connection technology connecting multiple devices in a WAN or LAN. It establishes a bridge between WAN and LAN.

B

Networks were primarily used to connect a number of computers in governmental agencies and organizations to share files. Today, networks are used for many different purposes mainly sharing devices, functions and features and generally exchanging information and communication such as sending e-mails, accessing databases, e-commerce and distributed systems. A distributed system is a set of networked systems wherein every computer performs part of the work they are assigned to and are best at. Networking is a way to increase productivity without the need to use paper prints, copies, physical documents, posting, telephoning and individual resources./

C

Similar to a computer system, networks may also have hardware (network interfaces) and software components. These include servers, clients, transmission media, shared data, shared printers, hardware and software resources, network interface cards (controller or center abbreviated as NIC), a local operating system (LOS) and network operating system (NOS). As well as these, there is also a need for a set of rules or protocols for defining and operationalizing a network.

Generally speaking, there are three main components in a computer network. ……., ……. and …… .

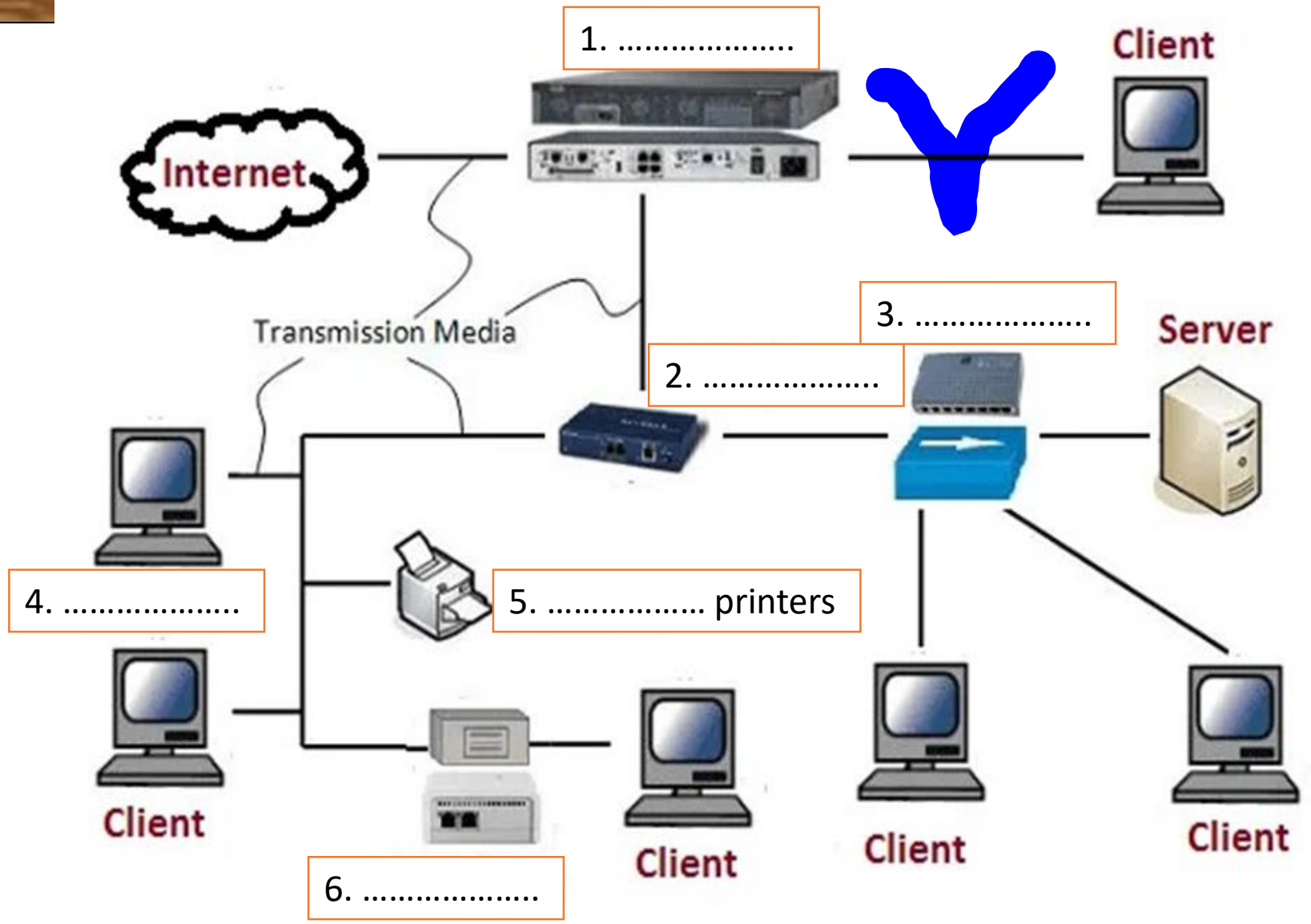
C

The main computers in a network that provide services are called servers and the computers or other electronic devices that use the services provided by the servers are called clients. Transmission media including physical or wireless mediums is the pathway through which data is transferred. Network Interface Cards (NIC) or adapter are hardware pieces installed directly into the motherboard and used to connect computers with the networks. NIC can be of two types: Wired NIC has as internal network card (including a slot on the motherboard for network access) and wireless NIC has an external network card (including wireless or USB-based types). When several computers are connected to a network connection, a distribution center called hub is needed to split network connection. While hubs broadcast entire data on the network, network switches send the data to the correct address destination based on its packet after inspecting the coming packet and determining its source, destination address and routes. The electronic components of a network include routers (connecting different networks and determining the best route or pathway for the clients), modems (modulator/demodulator, used to convert an analogue signal (e.g. of a telephone line) to a digital signal and vice versa), repeaters (regenerating or strengthening signals), bridges (connecting two similar networks with the same protocol based on filtering the content by reading the MAC addresses of both source and destination) and gateways (a hardware device that connects two or more dissimilar networks based on protocols). The functions of these devices are all quite different from one another, even if sometimes they are all integrated into a single device./

D Two common systems of networks are LOS and NOS. A local operating system (LOS) allows PCs to access files, print to a local printer and have and use drives that are located on one computer. The network operating system (NOS) is the software of the network. It serves a similar function that the OS has in an individual computer. It is a program that runs on computers and servers and allows the computers to communicate over the network./

Self-check

Complete the following figure based on the information presented in this text.



Computer Network Components

E

In addition to these hardware and software components, a number of protocols and models are also needed to allow network communication possible. A network protocol is an established set of rules that determine how data is transmitted between different devices in the same network. Essentially, it allows connected devices to communicate with each other, regardless of any differences in their internal processes, structure or design. Network protocols are the reason you can easily communicate with people all over the world, and thus play a critical role in modern digital communications. There are many different types of network protocols, however, the most important ones are communication protocols, security protocols and network management protocols.

E Communication protocols allow different devices to communicate with each other and include the following branches: Automation (as in smart buildings, cloud computing or self-driving vehicles), Instant Messaging and Bluetooth (on smartphones and PCs), Routing (for communication between routers and other network devices), File Transfer (via a physical or digital media) and Internet Protocol (IP; via the Net). Network Management protocols are needed procedures for defining and ensuring the optimal operation of a single network. It includes the following protocols: Connection (establishing and maintaining stable connection among devices), Link Aggregation (allows combining multiple network connections into one link between two devices) and Troubleshooting protocols (allowing network administrators to evaluate quality of a network, diagnose its errors and find ways to fix them). Finally, Security protocols (cryptographic protocols) are responsible for protecting a network, its devices and data against unauthorized access. They involve Encryption (needing passwords or codes to protect data and secure paths), Entity Authentication (creating a system in which all clients of a network need to verify their identity before accessing secure areas) and Transportation Security protocols (protecting data while transmitting it from one device to another). In spite of all these security protocols, a network vulnerability which is a weakness or flaw in software, hardware, or organizational processes, when compromised by a threat, can result in a security breach. Nonphysical network vulnerabilities typically involve software or data while physical network vulnerabilities involve the physical protection of an asset such as locking a server in a rack closet or securing an entry point with different types of turnstile./

Exercises

Reading Comprehension check

Decide whether the following sentences are True, False or Not Mentioned.

1. Computer network is part of IT. …….
2. It is not possible to share a printer via a WAN. …….
3. MAN refers to a metropolitan and PAN refers to a personal network. …….
4. While it's possible to make network connections with fiber-optic cable, it is more cost-effective to connect buildings that may be blocks or miles apart wirelessly. …….
5. Modulation in a network means turning an analogue signal into a digital one. …….
6. Link aggregation protocols are a sub-branch of security protocols. …….

B. Answer the following questions based on the text.

1. According to the text, the difference between LAN and WAN is ……

a. not as distinct as it was before

b. related to the bandwidth of the network

c. a matter of the capacity of their servers

d. the regulation of CPU based on the system clock

2. At first, networks were used for …… .

a. sharing scanners and desktops b. communicating confidential information

c. governmental purposes d. factories and businesses

3. According to the text, Ethernet is ……. .

a. the same as LAN

b. the interface of LAN and WAN

c. a form of WAN used inside a department

d. a local network among neighboring districts

B. Answer the following questions based on the text.

4. Which sentence is NOT true about NIC?

a. C can stand for card, controller or center

b. It is installed on the back pane

c. It is used to connect computers with a network

d. It can be wired or wireless

5. A smart home can be an example of ……. protocols.

a. Entity Authentication b. Instant Messaging c. Encryption d. Automation

6. All of the following are correct about network vulnerability EXCEPT that …….

a. it may be combined with a threat.

b. physical network vulnerabilities involve data.

c. hardware, software and organizational processes are its source.

d. it can lead to a security breach.

C. The reading passage of this chapter has five sections, A-E. Choose the correct heading for each section from the list of the suggested headings below.

i. How router, switch and hub differ from each other
ii. Definition of a computer network and its different types
iii. Components of a computer network
iv. Different types of security protocols
v. Computer network security: Then and now
vi. Definition and different aspects of IT
vii. What are different network protocol types?
viii. Classification of routing algorithms
ix. The main operating systems of a network

- A …….
- B …….
- C …….
- D …….
- E …….

Vocabulary exercises

Match the words with their definitions.

1.	retrieve	.c.....	**a.** It takes the signals that come from your ISP and translates them into an Internet connection for your Wi-Fi router to broadcast
2.	protocol	....h...	**b.** a cylindrical dielectric waveguide (nonconducting waveguide) that transmits light along its axis through the process of total internal reflection
3.	blurred	..e....	**c.** to search for, locate and get back information that has been stored in the memory of a computer
4.	fiber optic	..b.....	**d.** securing digital data using one or more mathematical techniques
5.	client	...i....	**e.** distorted; unclear
6.	packet	....g...	**f.** to convert digital to analogue data
7.	encryption	..d.....	**g.** a small segment of larger data over a network including control information and user data
8.	modem	.a.....	**h.** also referred to as an access method, it is a standard used to define a method of exchanging data over a computer network
			i. any number of computers or computer-controlled devices that provide a user with access to a network

B. Fill in the blanks with the appropriate words (extra choices).

authentication	Ethernet	distributed system	turnstiles
troubleshooting	administrators	parse destination	e-commerce

1. Many offices and organizations which deal with sensitive and confidential information must use a/n …… in their internal networks to decrease their vulnerability to hacking.
2. Unlike other identification solutions such as passwords, verification by email or fingerprints, digital onboarding uses unique mathematical and dynamic patterns that make this system one of the safest …… by matching the incoming image with a set of training images in a database and granting access to the users.
3. An important …….. strategy for network connection is through a query called ping (Packet Internet or Inter-Network Groper) which is a basic Internet program testing requests in computer network administration to verify whether a specific IP address is accessible.

B. Fill in the blanks with the appropriate words (extra choices).

authentication	Ethernet	distributed system		turnstiles
troubleshooting	administrators	parse	destination	e-commerce

4. Access control to networks is done by checking to see if a user's credentials match the credentials in a database of verified users or in a data …….. server to assure secure systems, secure processes and enterprise information security.
5. Network …….. involves a wide array of operational duties and tasks that help a network to run efficiently by designing, installing and evaluating a network, executing backups, and provisions for solving problems, securing access and protecting against any intrusion.
6. If you execute a DNS check (nslookup command prompt) for a site such as yahoo.com and receive errors such as “Timed Out” or “Network is Unreachable” it may indicate that the problem initiates in the DNS server of your …….. .

Language Focus
Making Comparisons

We can compare features (adjectives) and functions (adverbs) to show equivalence, non-equivalence, and parallelism. There are a number of expressions and words used in each of these categories.

1) Words and expressions used to show equivalence

as (many, much, few, little) ……..as	similar-similarly	both
the same…….as	equal-equally	each
similar to	compared to	either
the same	compared with	all
be similar	be like	every
be equal to	alike	neither

- **Look at the following examples:**
- Your business will run **as** efficiently, securely and productively **as** possible.
- A smart phone **like** a computer needs an operating system.
- A computer virus and a virus in the human body are **alike**.
- **All** of the computers and printers on the network are called nodes of the network.
- SSL and TLS are **both** cryptographic protocols that provide authentication and data encryption between servers, machines, and applications.
-

2. Words and expressions used to show non-equivalence:

not as (many, much, few, little) ……. as	unlike
…-er than, more … than, fewer … than, less … than	not the same as
the …-est …… (of all), the most ……, the least …….	not all
not similar to	unequal- unequally
not equal to	not like

⇒ **Look at the following examples:**

- ❖ Self-assembling materials provide a **better**, **more** efficient and **faster** way to make transistors **than** traditional methods.
- ❖ **Unlike** switches which are the connecting device of a local network, routers are the connecting device of multi networks.
- ❖ **The most** expensive types of PC computers are gaming computers.
- ❖ **Not all** graphic cards support the Direct X 11.
- ❖ Computers function **unequally** due to the capacity and speed of their RAM.

3. Words and expressions used to show parallel comparisons:

the more (less)…….., the more (less) ……..	the …-er ……, the more (less) ……	the more (less) …….., the …-er ……

❑ **Look at the following examples:**

- The **greater** the capacity of RAM, the **faster** the efficiency of the CPU.
- The **less** traffic your page gets, the **less** visibility it has.
- The **more** training you give to a network, the **better** it will perform.

Language Focus Exercises

A. Fill in the blanks with the appropriate expressions from the above tables and the adjectives/adverbs in parentheses.

1. Mainframes are usually ……..… types of all computers. (expensive)
2. In signal processing, the system looks for ……..… match in its databases, copies it into its memory and then displays it for the user. (close)
3. A clipboard can be ……..……..a PC in processing data, however, they may be ……..… regarding their storage capacity. (remarkable/powerful)
4. To achieve ……..… results in your search in a database, you need to choose ……..…. keywords as possible. (convincing/relevant)
5. Modern processors can solve arithmetic problems thousands of times …….... a human brain. (fast)
6. In case you do not have a powerful RAM, multitasking can lead to a much ……..…. processing speed in different tasks. (slow)

B. Choose the appropriate comparison word or expression from the box below to complete the following sentences (more choices are provided).

both	more than		compared to	equally	similarly
the more	equal	not all	more	same	unlike

1. Computer multitasking is the process of …….. one program being executed by a computer at the same time.
2. While there are many different types of cloud computing, …… of them will be a good fit for your business.
3. If controlling the environments of a cloud is important to your industry, then private cloud computing can offer …….. security and control.

B. Choose the appropriate comparison word or expression from the box below to complete the following sentences (more choices are provided).

both	more than		compared to	equally	similarly
the more	equal	not all	more	same	unlike

4. …… RAM your computer has for temporary storage, the smoother the computer will run.

5. …….. living intelligence of humans who think with the brain located in their body, artificial intelligence of machines is not able to create meaning.

6. Through backpropagation, a deep neural network model is able to process data from output to input, as …….. the feed-forward or unidirectional process of less complicated networks.

Follow-up section

A. Complementary Reading

Cloze: Read the following text and complete the blanks with the suggested words (extra choices)

unauthorized	stack	malicious	exploits	reinfection
access	scans	parses	traffic	projection

- Networks contain layers, as represented by the OSI (Open System Interconnection) model. Data passes through these layers as it travels between devices. All layers in the ……1…… must be safeguarded for the network to be considered secure. Network security is the protection of the underlying networking infrastructure from ……2…… access, misuse, or theft. It involves creating a secure infrastructure for devices, applications and users to work in a secure manner. Network security combines multiple layers of defenses at the edge and in the network in that each layer implements certain policies and controls. Authorized users gain ……3…… to network resources, but …..4…… actors are blocked from carrying out …..5….. and threats.

Follow-up section

A. Complementary Reading

Cloze: Read the following text and complete the blanks with the suggested words (extra choices)

unauthorized	stack	malicious	exploits	reinfection
access	scans	parses	traffic	projection

- There are many different types of network security. A firewall is a network security device that monitors incoming and outgoing network .....6..... and decides whether to allow or block specific traffic based on a set of defined security rules. An intrusion prevention system (IPS) ……7…… network traffic to actively block attacks. Secure IPS appliances do this by correlating huge amounts of global threat intelligence to not only block such activities but also track the progression of suspect files and malware across the network to prevent the spread of …..8…. and outbreaks.

- **Listening: Listen for specific details**

Scan the following QR code. Watch the clip on how a DNS server work and do the following exercise. Study the questions before watching. Then listen and try to answer the questions. If you are not able to do this in the first run, do not stop and playback the clip; watch it one time completely and then watch for a second time and complete the exercise.

1. Regarding the comparison between humans and computers, it is NOT true that …. .

a. Humans are identified by names.

b. Computers over a network talk to each other by names.

c. IP addresses are instances of numbers used for computer communication.

2. Which item is correct about DNS?

a. It is used to bridge the gap between computers.

b. It converts domain names to IP addresses.

c. It searches its database to find a matching domain name.

3. Which one is NOT given as a reason why we do not type the IP addresses of websites? Since …

a. we are not accustomed to memorizing and dealing with numbers

b. there are millions of websites on the internet

c. the DNS server changes domains to IPs very easily.

4. Fill in the blanks with appropriate words from the text.

a. A DNS is like a …… wherein you find names.

b. When the resolver receives the IP address, it will store it in its …… .

c. Thirteen of root servers are located round the world and operated by …… organizations.

5. Write the name of each of these servers:

a. …… It is basically the same as our internet service provider.

b. …… When it receives the query, it will check its own cache memory to find an IP address for the webpage you are looking for.

c. …… They are the highest level at the DNS hierarchy.

d. …… It helps the resolver to find the IP address.

e. …… It stores the address information for top domains like .com .net .org, etc.

f. …… It is the server that responds with the IP address of the webpage you are looking for.

A.Discussion panel

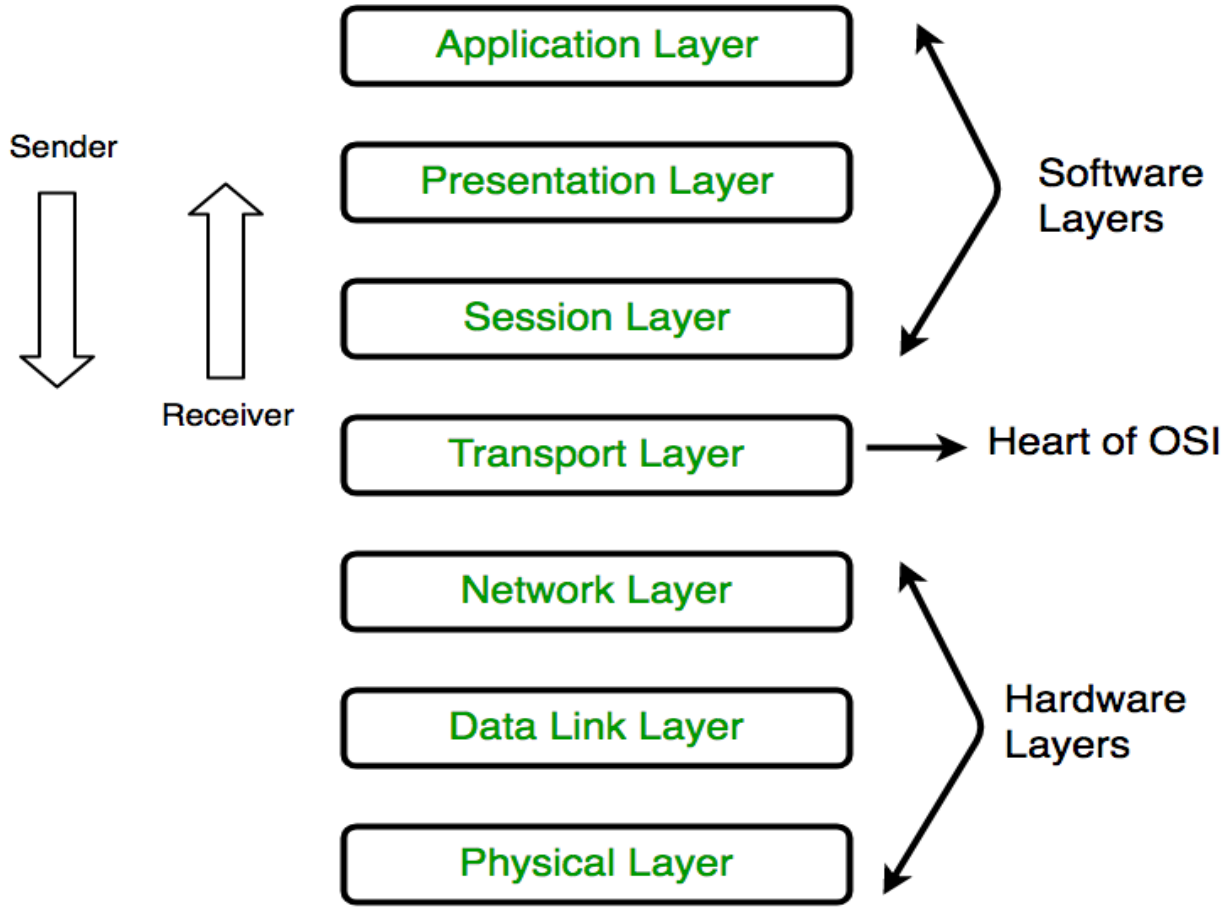
- **You can talk about the following topic in class or as a presentation.**

- Benefits and vulnerabilities exposed in VPNs.

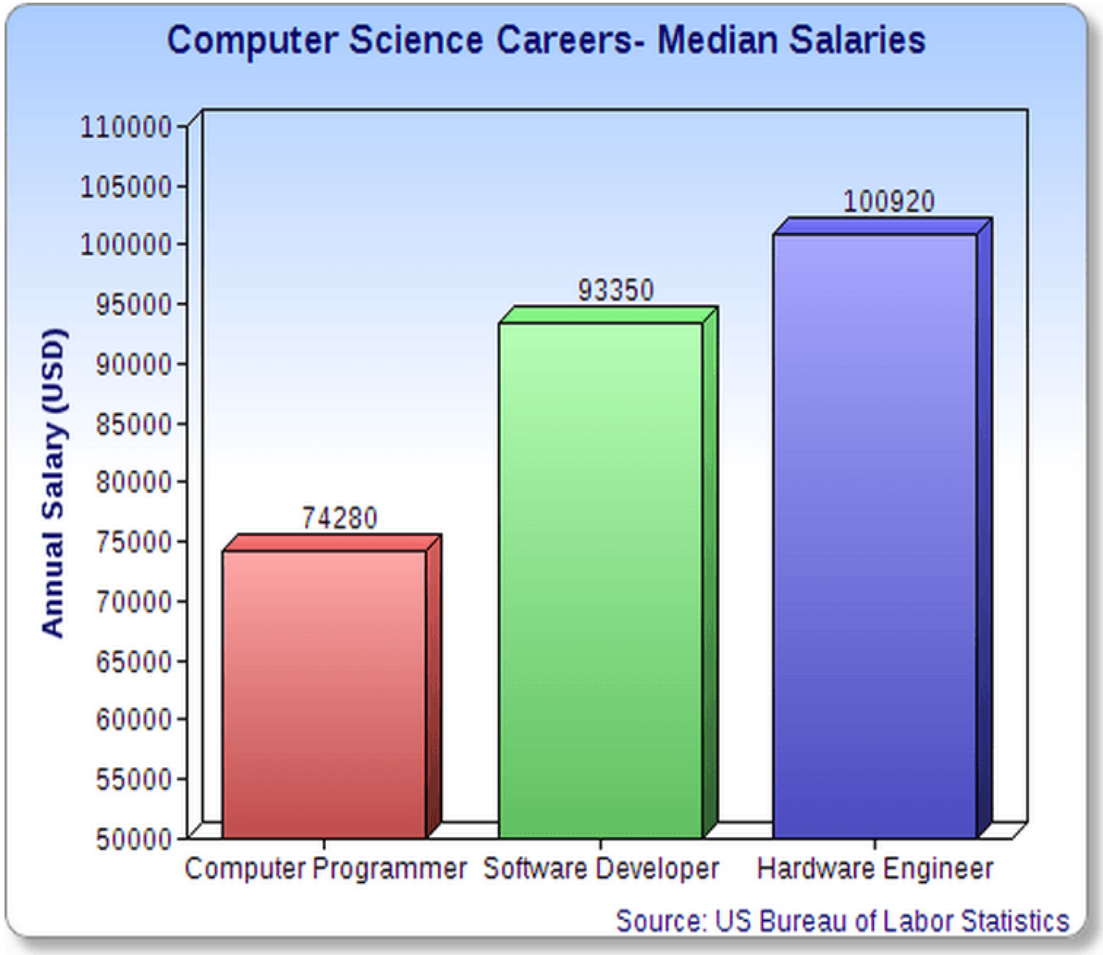
Writing

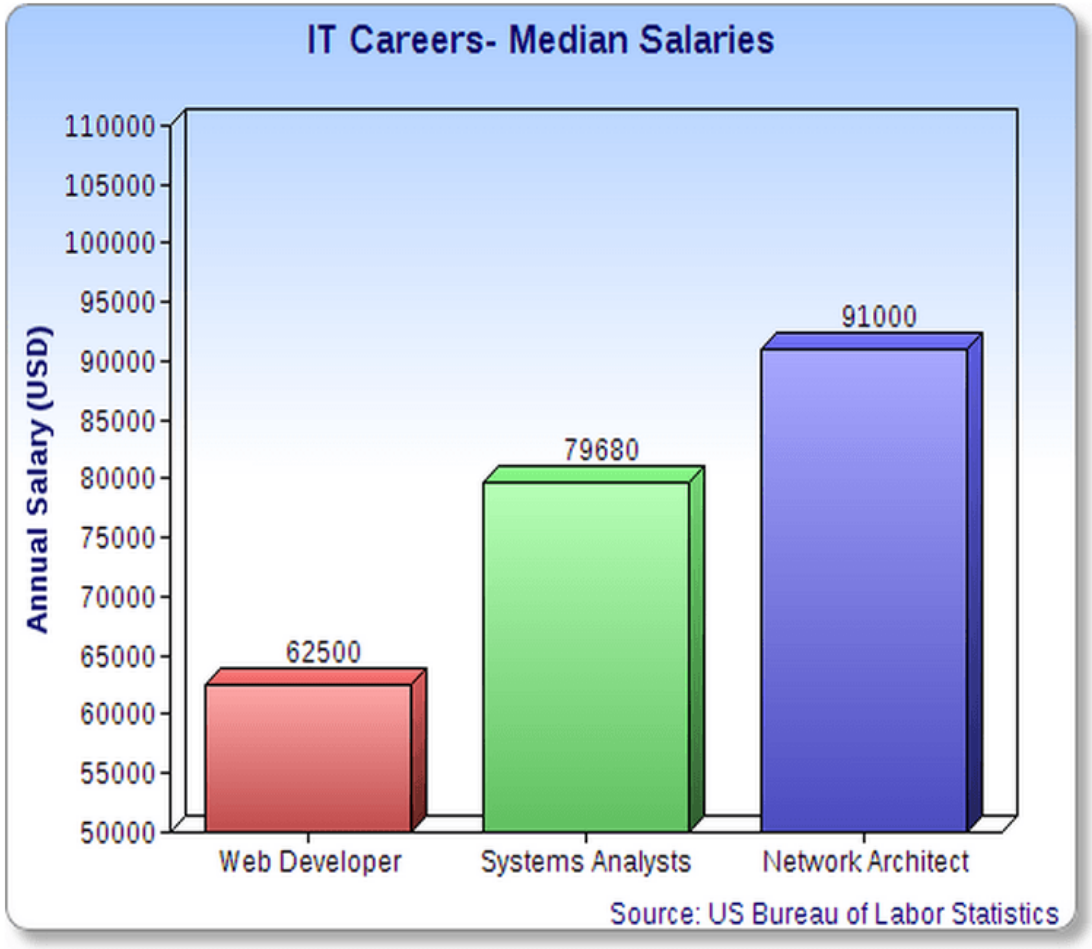
- A very common type of academic writing is expository writing based on a table, graph (bar, line or pie graph), chart, figure and process, which display procedural, statistical and numerical information. It tests your ability to select and report the main features, describe and compare data, identify significance and describe trends and processes in factual information. This type of writing must start with a topic sentence introducing the table or figure. Look at the following examples.

Example 1: The figure (or Figure 1) presents different hardware and software layers of a computer network.



Example 2: These charts compare the highest-paying jobs in computer science and IT careers from 2012 to 2020





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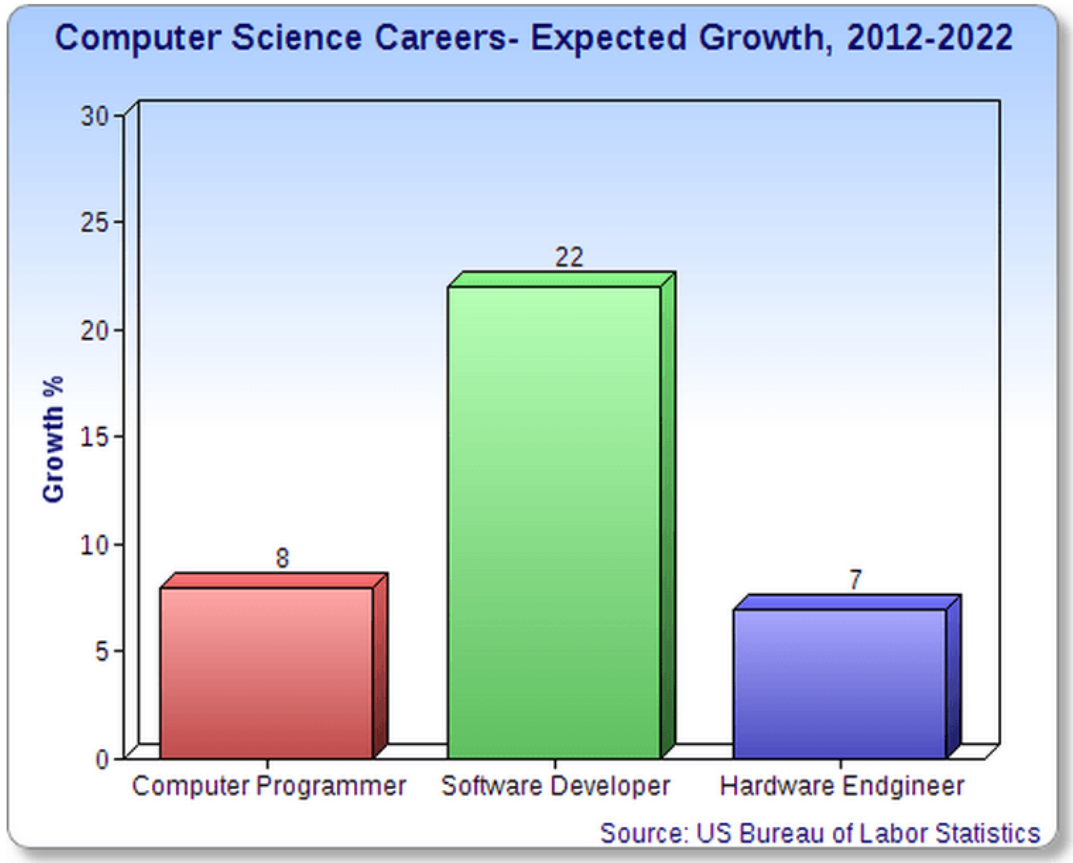
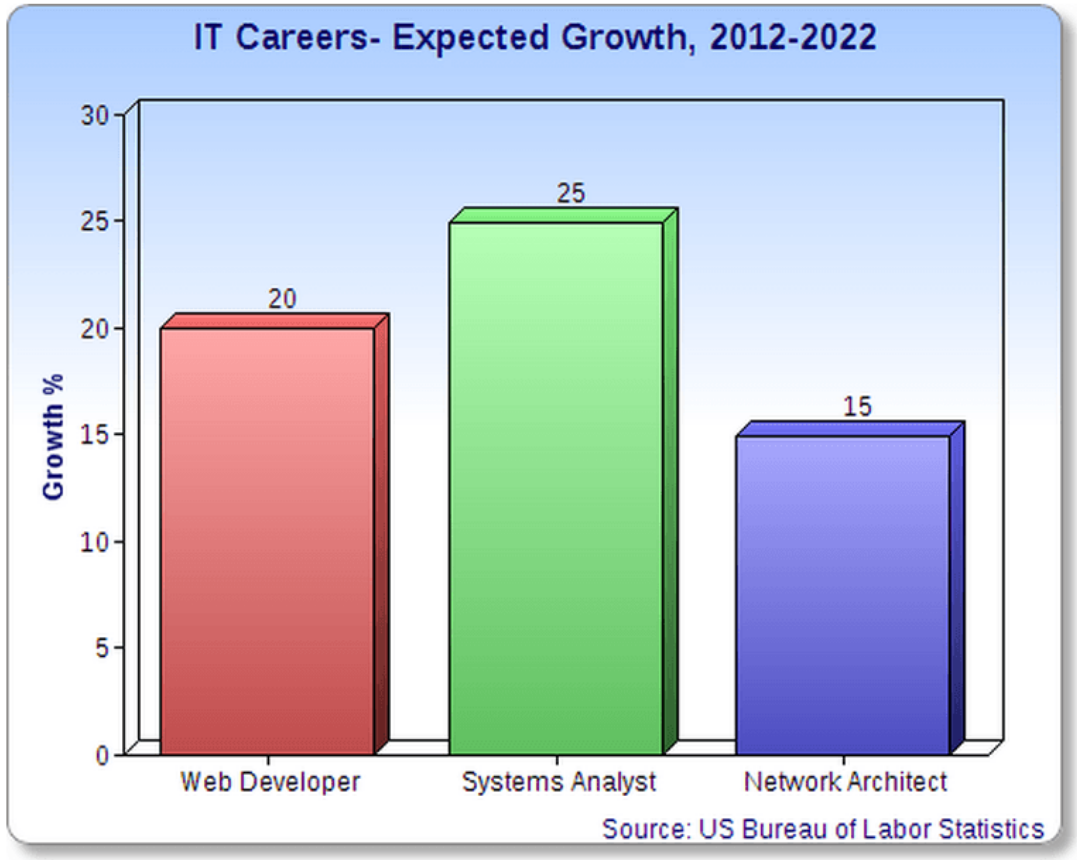




Writing

- Following this introductory topic sentence, now is time to add details based on the information presented. Look at both axes or the head rows and columns. If there is any caption or head titles, study it carefully. Pay attention to all specific details. Use present tense to describe the table, chart or figure unless they provide information about some past event.

A. Based on the above two examples, complete these paragraphs describing their information.

1. The figure presents different hardware and software layers of a computer network. These layers can be classified into three main parts:

……

……

……

……

……..

Writing

2. These charts compare the highest-paying jobs in computer science and IT careers from 2012 to 2020. As can be seen in top charts, in 2012, the highest-paying jobs in computer science and IT were respectively related to……

……

……

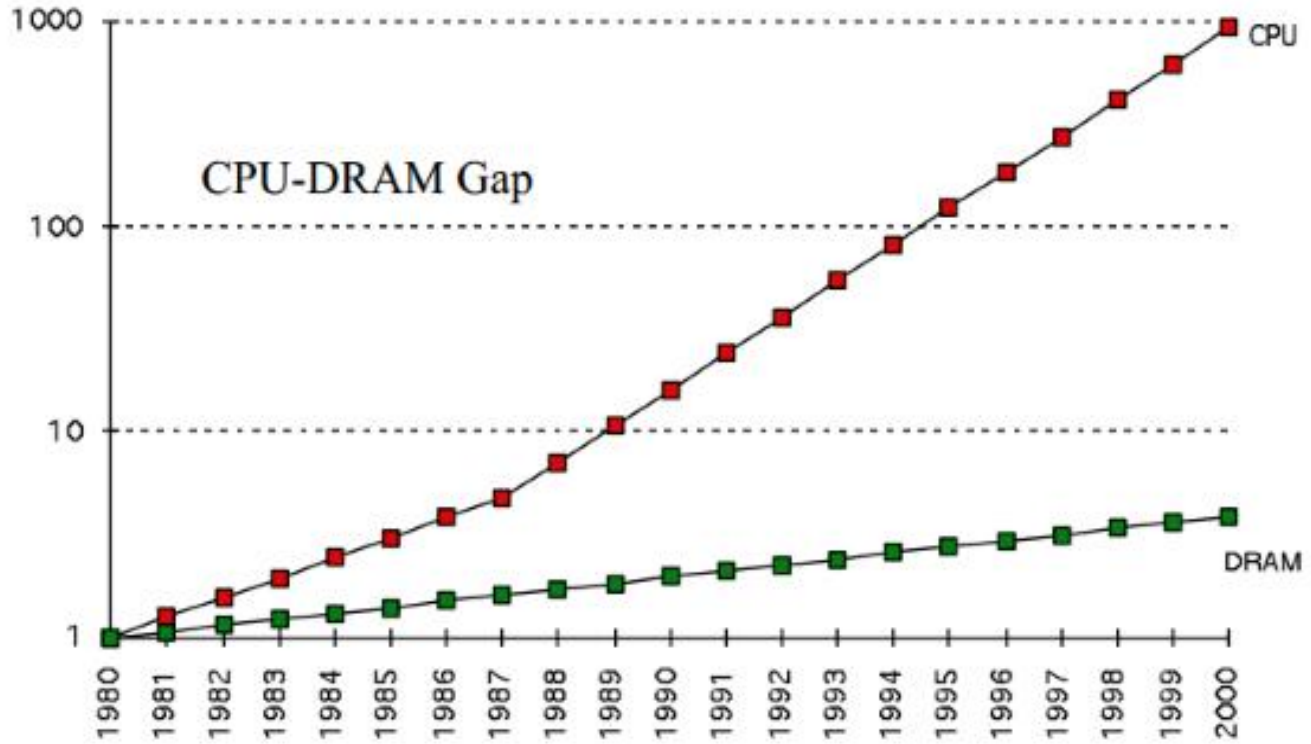
……

……

……

B. Based on the following graph, try to write a short description no more than 150 words.

- Processor vs Memory Performance



1980: no cache in microprocessor;

1995 2-level cache

E. Translation

Translate the following paragraph into fluent Persian.

In the field of networking, the specialist area of Network Security consists of the provisions made in an underlying computer network infrastructure, policies adopted by the network administrator to protect the network and the network-accessible resources from unauthorized access, and consistent and continuous monitoring and measurement of its effectiveness (or lack of it) combined together.

The terms Network Security and Information Security are often used interchangeably. Network Security is generally taken as providing protection at the boundaries of an organization by keeping out intruders (hackers). Information Security, however, explicitly focuses on protecting data resources from malware attack or simple mistakes by people within an organization by use of Data Loss Prevention (DLP) techniques. One of these techniques is to compartmentalize large networks with internal boundaries. Employees have to cross these boundaries and be authenticated when attempting to access protected information.