**M.Utemisov West Kazakhstan State University**

***Ж.С.Иксекбаева,***
***Г.Х.Хажгалиева,***
***А.Х.Касымова***

# *Colltction of practical fnd test tasks for Information and Communication Technologies*

**Uralsk, 2018**

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# PREFACE

Since the late 1990s access to information and communication technologies (ICTs) has seen tremendous growth—driven primarily by the wireless technologies and liberalization of telecommunications markets. Mobile communications have evolved from simple voice and text services to diversified innovative applications and mobile broadband Internet. By the end of 2011, the number of mobile-cellular subscriptions reached approximately 6 billion globally. The number of individuals using the Internet has risen constantly and reached an estimated 2.4 billion while the number of fixed (wired)-broadband subscriptions reached almost 600 million at the end of 2011.

The impacts of ICTs cross all sectors. Research has shown that investment in information and communication technologies is associated with such economic benefits as higher productivity, lower costs, new economic opportunities, job creation, innovation, and increased trade. ICTs also help provide better services in health and education, and strengthen social cohesion.

This book includes indicators covering the economic and social context, the structure of the information and communication technology sector, sector efficiency and capacity, and sector performance related to access, usage, quality, affordability, trade, and applications.

Today's society is shaped by sudden growth and development of the information technology (IT) resulting with its great dependency on the knowledge and competence of individuals from the IT area. Although this dependency is growing day by day, the human right to education and information is not extended to the IT area. Problems that are affecting society as a whole are emerging, creating gaps and distancing people from the main reason and motivation for advancement-opportunity.

We hope that this education will help you in mastering basic computer skills and with that hope we wish you to learn as much as you can, and therefore become an active member of modern ICT society.

The compilation of this book Information and Communication Technologies (ICT) was motivated by the desire to provide a concise book which can benefit students to understand the concepts of energy and environment topics.

This textbook Information and Communication Technologies (ICT) provides all the requirements of the students, i.e. comprehensive coverage of theory, fundamental concepts and objective type questions articulated in a lucid language. The concise presentation will help the readers grasp the theory of this subject with clarity and apply them with ease to solve objective questions quickly. At the end of each chapter are given sets of practice question and exercises that will allow the readers to evaluate their understanding of the topics and sharper their question solving skills.

For each topic in the textbook there are theoretical material and practical examples. After the theoretical material the practice work and assignments for self-study should follow.

The textbook is intended for students of higher and secondary specialized educational institutions. We hope that this tutorial will be very useful, as well as teachers of computer science.

# UNIT I
# ICT IN CORE SECTORS OF DEVELOPMENT. ICT STANDARDIZATION

## 1.1 Definition of ICT. Subject ICT and its purposes

***Information and Communication Technology*** (ICT) is an extended term for information technology (IT) which stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information.

The term ICT is also used to refer to the convergence of audio-visual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution and management.

However, ICT has no universal definition, as "the concepts, methods and applications involved in ICT are constantly evolving on an almost daily basis." The broadness of ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form, e.g. personal computers, digital television, email, robots. For clarity, Zuppo provided an ICT hierarchy where all levels of the hierarchy "contain some degree of commonality in that they are related to technologies that facilitate the transfer of information and various types of electronically mediated communications". Skills Framework for the Information Age is one of many models for describing and managing competencies for ICT professionals for the 21st century.

ICT refers to the devices used to communicate between computers. Information communication technology (ICT) has greatly impacted and enhanced global socialization and interactions.

In fact information technology has taken over nearly every aspect of our daily lives from commerce (buying and selling) to leisure and even culture. Today, mobile phones, desktop computers, hand held devices, emails and the use of Internet has become a central part of

our culture and society. These technologies play a vital role in our day to day operations.

ICT has made global social and cultural interaction very easy. We now live in an interdependent global society, where people can interact and communicate swiftly and efficiently. News and information can now be transmitted in minutes. Individuals can easily stay in contact with members of their families who reside in other countries or make new friends across the world.

Examples of information and communication technology (ICT) tools used for these purposes are emails, instant messaging (IM), Chat rooms and social networking websites, such as Facebook and Twitter, Skype, iPhones, cellular phones and similar applications.

ICT made a major contribution towards the elimination of language barriers - people speaking different languages can connect and socialize or trade in real time via the Internet. This is made possible with the use of language translators.

There are many advantages of the new ICT technology:

***Processing of data is much faster on a computer***.

Example: Calculating an annual budget on a spreadsheet is instantaneous, doing the calculations by hand would take some time.

***Repetitive processing can be better done using computerized machinery.***

Example: Humans get tired, lose concentration and generally fed up if they have to repeat the same task over and over again. Robotic machinery will perform the same task repeatedly with consistent quality and never need a break, or software programs can be written to process all the records in a database.

***Searching for data is much faster.***

Example: Finding a patient's record in a doctor's surgery can be done in seconds on a computerized database system, whereas it would take a receptionist some minutes to locate a folder in a paper filing system.

***Data storage capacity is almost limitless in a computer system.***

Example: Large quantities of data can be stored on hard discs or media such as CDs or DVDs instead of needing enormous quantities of paper and many large filing cabinets.

***Data communications are fast and accurate. Data transmitted over a network will arrive at its destination anywhere in the world in just a few seconds.***

Example: A computer user can place an order for an item on an Internet website and it will be received immediately - posting an order in the mail would take a day or two to arrive.

***Data can be output on a computer in a variety of different formats***.

Example: Annual sales figures for a retail business can be printed as a spreadsheet, displayed as a graph, or as a multimedia presentation involving text, sound, graphics and animations.

***In as much as the advantages of IT are numerous, it is important to mention some of its major disadvantages to the society.***

A significant disadvantage is that older generations find it difficult to catch up with the ever changing and numerous technologies available today. Fear of change, resistance to change and inability to catch up with rapid technology evolution are areas to note.

The issue of digital divide cannot be ignored. In the world today, there are people in the society who are not in the position to take advantage of available technology. This may be due to poverty or geographical location. For example, access to technology can be said to be limited in many developing countries and these may result in lesser opportunities for economical and social development.

How can ICT be used effectively across a variety of sectors to help achieve the Millennium Development Goals? What can we learn from ICT pilot projects in developing countries about proper design, sustainability and impact of such interventions? infoDev commissioned in 2003 a detailed analysis of seventeen ICT-for-development projects it had funded in the past several years to capture lessons about how, and why, such projects succeed or fail.

The widespread hope within the international development community that ICTs could be a powerful tool of development and poverty reduction, and of achieving the Millennium Development Goals, led to a proliferation of donor-funded ICT-for-development pilot projects in several sectors in a wide range of countries in the past decade. Yet, by the time the international community was preparing to convene in Geneva in November 2003 for the first phase of the World Summit on the Information Society (WSIS), there was a growing uneasiness about the lack of detailed information on the implementation of these projects, and rigorous evaluation of their impact.

To contribute to a sober assessment of this experience, and to promote a dialogue about how to conduct such assessments, infoDev commissioned in 2003 a detailed review of a cross-section of 17 of the more than 100 ICT pilot projects it had funded in the past several years. The main criterion for selecting projects for this analysis was to be as representative as possible of the various environments (political, economic, social and geographic) in which infoDev had been funding projects since its inception. An effort was also made to provide a balanced sample of more and less "successful" projects.

Rather than selecting the "best projects", priority was given to those initiatives likely to offer the richest lessons and knowledge about how, and under what conditions, such initiatives succeed or fail to have a sustainable impact on the lives of their intended beneficiaries. The analysis focuses in particular on the ways in which, and the extent to which, these projects contributed to the Millennium Development Goals.

**Standardization of ICT in Kazakhstan**

Head of the state, Nursultan Nazarbayev, initiated a Nation plan "100 specific steps", oriented to production modernization, increasing of investment activity, prevention of reduced income and creating new vacancies. All this will promote employment of population, including ICT field. Head of the state, Nursultan Nazarbayev, initiated a Nation plan "100 specific steps", oriented to production modernization, increasing of investment activity, prevention of reduced income and creating new vacancies. All this will promote employment of population, including ICT field. Currently, Zerde National Info communication Holding JSC based on the National qualification framework has developed an "ICT" field qualifications framework. "ICT" field qualifications framework served as a basis for developing of professional standards. The following actions were conducted by Zerde National Info communication Holding JSC to develop professional standards: the expert work was carried out on identification of the needs in ICT specialists onto 5 and 10-year period in terms of dynamic growth balance model, macroeconomic forecasts of country development and emersion of new ICT trends; based on conducted works the most-coveted 10 professions of occupational standards have been identified on 2015; 10 focus groups on each developed occupied standard were carried out together with ICT specialists of the Republic of Kazakhstan, National Chamber of

Entrepreneurs, representatives of "EPAM" company and representatives of the Republic of Belarus. 10 projects of professional standards were developed and approved by Subsectorial Council on the development of technological and professional education and formation of qualification system in the informatization sphere. At the moment projects are at the stage of approval. While developing of professional standards international experience was taken into account (EU countries' experience), experience of the Republic of Belarus, Russian Federation and Ukraine.

**Control questions:**

1. What is Information and communications technology?
2. What areas ICT could be used?
3. What advantages of using ICT?
4. How can ICT be used effectively across a variety of sectors to help achieve the Millennium Development Goals?
5. Where Kazakhstan`s standardization of ICT was presented? And what about it?

## 1.2 Number systems. Transfer numbers from one number system to another. Arithmetic in the number systems

**Decimal to Other Base System**

Steps:

1. Divide the decimal number to be converted by the value of the new base.
2. Get the remainder from Step 1 as the rightmost digit (least significant digit) of new base number.
3. Divide the quotient of the previous divide by the new base.
4. Record the remainder from Step 3 as the next digit (to the left) of the new base number.

Repeat Steps 3 and 4, getting remainders from right to left, until the quotient becomes zero in Step 3.

The last remainder thus obtained will be the most significant digit (MSD) of the new base number.

Example: Decimal Number: $25_{10}$

Table 1.1 Calculating Binary Equivalent

| ***Step*** | ***Operation*** | ***Result*** | ***Remainder*** |
|---|---|---|---|
| Step 1 | 25 / 2 | 12 | 1 |
| Step 2 | 12 / 2 | 6 | 0 |
| Step 3 | 6 / 2 | 3 | 0 |
| Step 4 | 3 / 2 | 1 | 1 |
| Step 5 | 1 / 2 | 0 | 1 |

As mentioned in Steps 2 and 4, the remainders have to be arranged in the reverse order so that the first remainder becomes the least significant digit (LSD) and the last remainder becomes the most significant digit (MSD).

Decimal Number: $29_{10}$ = Binary Number: $11001_2$.

**Other base system to Decimal System**

Steps:

1. Determine the column (positional) value of each digit (this depends on the position of the digit and the base of the number system).
2. Multiply the obtained column values (in Step 1) by the digits in the corresponding columns.
3. Sum the products calculated in Step 2. The total is the equivalent value in decimal.

Example: Binary Number: $11101_2$

Table 1.2 Calculating Decimal Equivalent

| ***Step*** | ***Binary Number*** | ***Decimal Number*** |
|---|---|---|
| Step 1 | $11001_2$ | $((1 * 2^4) + (1 * 2^3) + (0 * 2^2) + (0 * 2^1) + (1 * 2^0))_{10}$ |
| Step 2 | $11001_2$ | $(16 + 8 + 0 + 0 + 1)_{10}$ |
| Step 3 | $11001_2$ | $25_{10}$ |

Binary Number: $11001_2$ = Decimal Number: $25_{10}$

**Other Base System to Non-Decimal System**

Steps:

1. Convert the original number to a decimal number (base 10).
2. Convert the decimal number so obtained to the new base number.

Example: Octal Number: $25_8$

***Step 1: Convert to Decimal***

Table 1.3 Convert to Decimal

| ***Step*** | ***Octal Number*** | ***Decimal Number*** |
|---|---|---|
| Step 1 | $25_8$ | $((2 * 8^1) + (5 * 8^0))_{10}$ |
| Step 2 | $25_8$ | $(16 + 5 )_{10}$ |
| Step 3 | $25_8$ | $21_{10}$ |

Octal Number: $25_8$ = Decimal Number: $21_{10}$

***Step 2: Convert Decimal to Binary***

Table 1.4 Convert Decimal to Binary

| ***Step*** | ***Operation*** | ***Result*** | ***Remainder*** |
|---|---|---|---|
| Step 1 | 21 / 2 | 10 | 1 |
| Step 2 | 10 / 2 | 5 | 0 |
| Step 3 | 5 / 2 | 2 | 1 |
| Step 4 | 2 / 2 | 1 | 0 |
| Step 5 | 1 / 2 | 0 | 1 |

Decimal Number: $21_{10}$ = Binary Number: $10101_2$

Octal Number: $25_8$ = Binary Number: $10101_2$

***Shortcut method - Binary to Octal***

Steps:

1. Divide the binary digits into groups of three (starting from the right).
2. Convert each group of three binary digits to one octal digit.

Example: Binary Number $10101_2$

Table 1.5 Calculating Octal Equivalent

| ***Step*** | ***Binary Number*** | ***Octal Number*** |
|---|---|---|
| Step 1 | $10101_2$ | 010 101 |
| Step 2 | $10101_2$ | $2_8$ $5_8$ |
| Step 3 | $10101_2$ | $25_8$ |

Binary Number: $10101_2$ = Octal Number: $25_8$

**Shortcut method - Octal to Binary**

Steps:

1. Convert each octal digit to a 3 digit binary number (the octal digits may be treated as decimal for this conversion).
2. Combine all the resulting binary groups (of 3 digits each) into a single binary number.

Example: Octal Number $25_8$

Table 1.6 Calculating Binary Equivalent

| ***Step*** | ***Octal Number*** | ***Binary Number*** |
|---|---|---|
| Step 1 | $25_8$ | $2_{10}\ 5_{10}$ |
| Step 2 | $25_8$ | $010_2\ 101_2$ |
| Step 3 | $25_8$ | $010101_2$ |

Octal Number: $25_8$ = Binary Number: $10101_2$

**Shortcut method - Binary to Hexadecimal**

Steps:

1. Divide the binary digits into groups of four (starting from the right).
2. Convert each group of four binary digits to one hexadecimal symbol.

***Exercise 1.1***

1. Give the definition: number systems, base
2. What the multiplicity of sexadecimal number system?
3. Write down expanded forms of numbers:
   a) $10110_{(2)}$
   b) $10110_{(10)}$
   c) $6,CA_{(16)}$
4. Count and write down an answer in following number system:
   a) $231_{(10)}+100_{(2)}$ (decimal system)
   b) $153_{(10)}+10_{(2)}$ (binary system)
   c) $1001_{(2)}-110_{(2)}$ (binary system)
   d) $101_{(2)}*10_{(2)}$ (binary system)

***Exercise 1.2***

1. Give the definition: number systems, bit
2. What the multiplicity of octonary number system?
3. Write down expanded forms of numbers:

a) $3{,}2_{(10)}$
b) $11101_{(8)}$
c) $11101_{(16)}$

4. Count and write down an answer in following number system:
   a) $103_{(10)}+111_{(2)}$ (decimal system)
   b) $205_{(10)}+11_{(2)}$ (binary system)
   c) $1101_{(2)}-10_{(2)}$ (binary system)
   d) $100_{(2)}*11_{(2)}$ (binary system)

## 1.3 Boolean algebra. LOGIC operations. Formula and their conversion

### Booleans & Logical Operators

Numeric variables can store a whole range of different numbers. Boolean variables can only store two values referred to as Yes or No, True or False, 1 or 0. Obviously we never use booleans to perform calculations because of their limited range. We use booleans to evaluate conditions.

### Boolean Parameter

In Grasshopper, booleans can be used in several ways. The boolean parameter is a container for one or multiple boolean values, while the Boolean Toggle allows you to quickly change between single true and false values as inputs.

Figure 1.1 Boolean Toggle - double click the boolean value to toggle between true and false

### Logical operators

Logical operators mostly work on booleans and they are indeed very logical. As you will remember, booleans can only have two values. Boolean mathematics were developed by George Boole (1815-1864) and today they are at the very core of the entire digital industry. Boolean algebra provides us with tools to analyze, compare and

describe sets of data. Although Boole originally defined six boolean operators we will only discuss three of them:

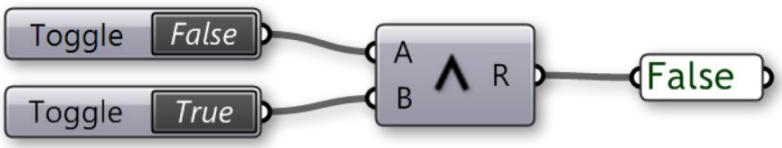
1. ***Not***
2. ***And***
3. ***Or***

The Not operator is a bit of an oddity among operators, because it doesn't require two values. Instead, it simply inverts the one on the right. Imagine we have a script which checks for the existence of a bunch of Block definitions in Rhino. If a block definition does not exist, we want to inform the user and abort the script.

Figure 1.2 ***Not*** operator

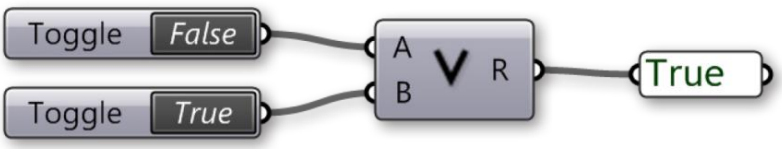
And and Or take two arguments on either side. The And operator requires both of them to be True in order for it to evaluate to True. The Or operator is more than happy with a single True value.

As you can see, the problem with Logical operators is not the theory, it's what happens when you need a lot of them to evaluate something. Stringing them together quickly results in convoluted code; not to mention operator precedence problems.




| A | B | Result |
|---|---|---|
| True | True | True |
| True | False | False |
| False | True | False |
| False | False | False |

Figure 1.3 ***And*** operator




| A | B | Result |
|---|---|---|
| True | True | True |
| True | False | True |
| False | True | True |
| False | False | False |

Figure 1.4 ***Or*** operator

A good way to exercise your own boolean logic is to use Venn diagrams. A Venn diagram is a graphical representation of boolean sets, where every region contains a (sub)set of values that share a common property. The most famous one is the three-circle diagram:

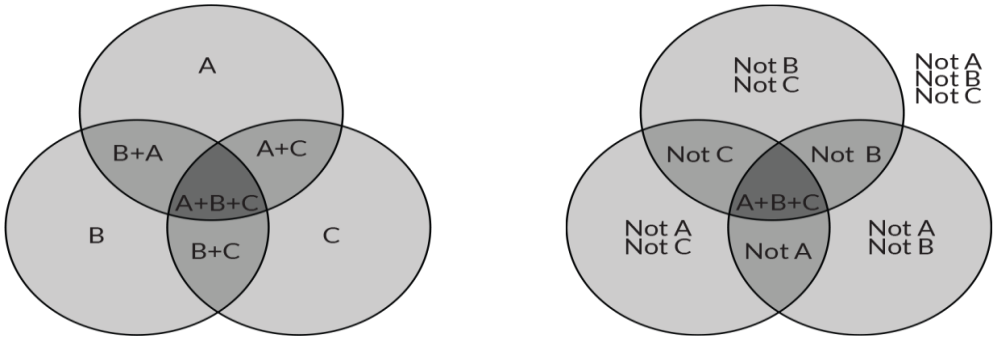



Figure 1.5(a) A Venn diagram of boolean sets

Every circular region contains all values that belong to a set; the top circle for example marks off set {A}. Every value inside that circle evaluates True for {A} and every value not in that circle evaluates False for {A}. By coloring the regions we can mimic boolean evaluation in programming code:

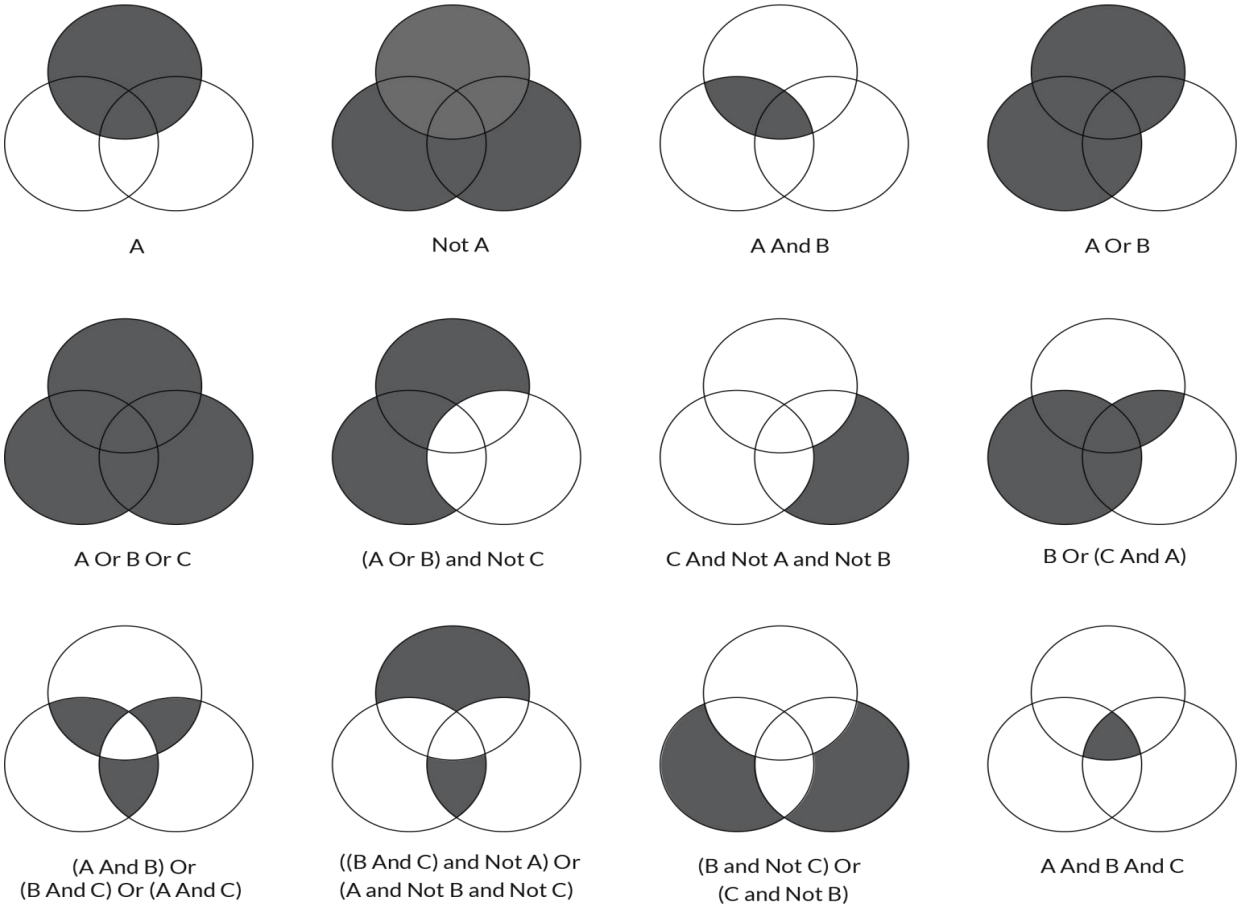



Figure 1.5(b) A Venn diagram of boolean sets

**Logic Signals**

There are a number of different systems for representing binary information in physical systems. Here are a few:

- A voltage signal with zero (0) corresponding to 0 volts and one (1) corresponding to five or three volts.
- A sinusoidal signal with zero corresponding to some frequency, and one corresponding to some other frequency.
- A current signal with zero corresponding to 4 milliamps and one corresponding to 20 milliamps.
- And one last way is to use switches, OPEN for "0" and CLOSED for "1".
- (And there are more ways!)

Think Binary!

Let's examine a typical situation. You have some sort of device that generates a logic signal.

- It could be a telephone that converts your voice signal into a sequence of zeros and ones.
- It could be the thermostat on the wall that generates a 1 when the temperature is too low, and a 0 when the temperature is above the set point temperature.

The logic signal, A, takes on values of 0 (FALSE, OFF) or 1 (TRUE, ON). That signal might really be a voltage, a switch closure, etc. However, we want to think in terms of zeros and ones, not in terms of the values of the voltage.

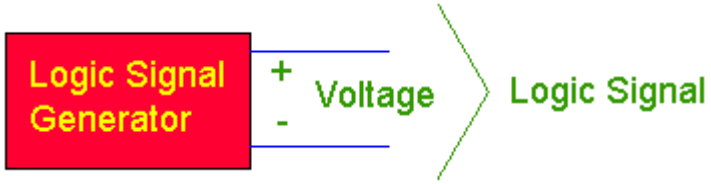



Figure 1.6 Logic Signal Generator

**Operations on Logic Signals**

Once we have the concept of a logic signal we can talk about operations that can be performed on logic signals. Begin by assuming we have two logic signals, A and B. Then assume that those two signals form an input set to some circuit that takes two logic signals as inputs, and has an output that is also a logic signal. That situation is represented below.

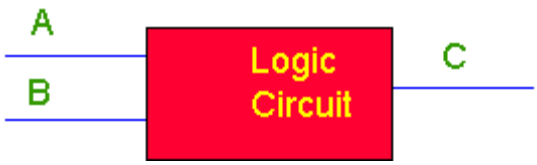



Figure 1.7 Logic Circuit

The output, C, depends upon the inputs, A and B. There are many different ways that C could depend upon A and B. The output, C, is a function, - a logic function - of the inputs, A and B. IWe will examine a few basic logic functions - AND, OR and NOT functions and start learning the circuitry that you use to implement those functions.

**Logic Gates**

If we think of two signals, A and B, as representing a truth value of two different propositions, then A could be either TRUE (a logical 1) or FALSE (a logical 0). B can take on the same values. Now consider a situation in which the output, C, is TRUE only when both A is TRUE and B is TRUE. We can construct a truth table for this situation. In that truth table, we insert all of the possible combinations of inputs, A and B, and for every combination of A and B we list the output, C.

Table 1.7 An AND Example

| A | B | C |
|---|---|---|
| False | False | False |
| False | True | False |
| True | False | False |
| True | True | True |

| A | B | C |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

Let's imagine a physician prescribing two drugs. For some conditions drug A is prescribed, and for other conditions drug B is prescribed. Taken separately each drug is safe. When used together dangerous side effects are produced.

A = Truth of the statement "Drug 'A' is prescribed."

B = Truth of the statement "Drug 'B' is prescribed."

C = Truth of the statement "The patient is in danger."

Then, the truth table below shows when the patient is in danger. Notice that C is TRUE when both A AND B are true and only then!

**AND GATES**

An AND function can be implemented electrically using a device known as an AND gate. You might imagine a system in which zero (0) is represented by zero (0) volts, and one (1) is represented by three (3) volts, for example. If we are going to use electrical devices we need some sort of symbolic representation. There is a standard symbol for an AND gate shown below.

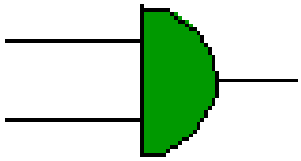


Figure 1.8 Standard symbol for an AND gate

Often in lab work it's helpful to use an LED to show when a signal is 0 or 1. Usually a 1 is indicated with an LED that is ON (i.e. glowing). You can use the buttons below to check out this AND gate (Note what an AND gate symbol looks like!) with a simulated LED. Note the following in the simulation (and you can use this in your lab experiments).

- To get a logical zero, connect the input of the gate to ground to have zero (0) volts input.
- To get a logical one, connect the input of the gate to a five (5) volts source to have five volts at the input.
- Each button controls one switch (two buttons - two switches) so that you can control the individual inputs to the gate.

Each time you click a button, you toggle the switch to the opposite position

We now have two ways of representing an AND gate, the truth table and the circuit diagram. However, there is a third way of representing this information - a symbolic way - that will take us toward Boolean algebra.

Let us consider our variables, A, B and C to be algebraic variables, but algebraic variables that can only take on two values, 0 and 1. Then we represent the AND function symbolically in either of two ways.

$C = A \cdot B$ or $C = AB$

Some will prefer always to insert the dot between the variables so that the AND operation is clearly indicated. Many times, the context will allow you just to use AB, without a dot between A and B, but if there is a variable named AB, then confusion can arise.

Assume you have an AND gate with two inputs, A and B. Determine the output, C, for the following cases.

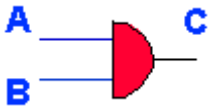



Figure 1.9 An AND gate

**OR Gates**

Consider a case where a pressure can be high and a temperature can be high Let's assume we have two sensors that measure temperature and pressure.. The first sensor has an output, T, that is 1 when a temperature in a boiler is too high, and 0 otherwise. The second sensor produces an output, P, that is 1 when the pressure is too high, and 0otherwise. Now, for the boiler, we have a dangerous situation when either the temperature or the pressure is too high. It only takes one. Let's construct a truth table for this situation. The output, D, is 1 when danger exists.

Table 1.8 An OR Example

| A | B | C |
|---|---|---|
| False | False | False |
| False | True | True |
| True | False | True |
| True | True | True |

| A | B | C |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

What we have done is defined an OR gate. An OR gate is a gate for which the output is 1 whenever one or more of the inputs is 1. The output of an OR gate is 0 only when all inputs are 0. Shown below is a schematic symbol for an OR gate, together with the simulated LEDs and input buttons so that you can explore OR gate behavior.

In terms of Boolean variables, the truth table for an OR gate looks like this.

**NOT Gates (Inverters)**

A third important logical element is the inverter. An inverter does pretty much what it says. If the input is 0, the output is 1.

Conversely, if the input is 1, the output is 0. The symbol for an inverter is shown below. Again, you can putter with this inverter with the simulated LEDs. X is the input to the inverter.

The output is NOT X represented as ~1 or: $\overline{X}$

The truth table for an inverter is pretty simple since there is only one input. Call the input A, and the output C, and the truth table is:

Table 1.8 An OR Example

| A | C |
|---|---|
| 0 | 1 |
| 1 | 0 |

***Exercise 1.3***

You need to control two pumps that supply two different concentrations of reactant to a chemical process. The strong reactant is used when pH is very far from the desired value, and the weak reactant when pH is close to desired.

You need to ensure that only one of the two pumps runs at any time. Each pump controller responds to standard logic signals, that is when the input to the pump controller is 1, the pump operates, and when that input is 0, the pump does not operate.

***Exercise 1.4***

You have a bunch of two-input AND gates (IC chips), OR gates and Inverters, and you need to design a logic circuit to control the pumps. You can generate a signal that is 1 when Pump S is ON, and 0 when Pump W is ON. Can you design the circuit?

In order to solve the problem, consider that the pump controls should receive logical inverse signals. When one pump signal is one, the other is zero. Given that recognition this circuit should work. Here, if X is 1, Pump S pumps.

Notice the simple way we can use a switch and a five volt supply to produce a single logic signal that is ""0"" (ground) or 1 (5 volts).

***Exercise 1.5***

Assume you have an AND gate with two inputs, A and B. Determine the output, C, for the following cases.

A = 1, B = 0

A = 0, B = 1

If either input is one, what is the output?

***Exercise 1.6***

Assume you have an OR gate with two inputs, A and B. Determine the output, C, for the following cases.

A = 1, B = 0

A = 0, B = 1

If either input is zero, what is the output?

***Exercise 1.7***

Simplify logical expressions

1) F=(A and B) or not (B or C),

if A=true, B=false, C=true. Compile truth table

2) F = (A v B) → (B v C)

## UNIT 2
## INTRODUCTION TO COMPUTER SYSTEMS. ARCHITECTURE OF COMPUTER SYSTEMS

### 2.1 History of the computer systems

Computer systems are usually divided into some categories according to their processing capabilities. Generally, any device that can perform numerical calculations, even an adding machine, may be called a computer but nowadays this term is used especially for digital computers. Personal computer (PC), either as any adding machine - an electronic scheme, running under programs.

Computers that once weighed 30 tons now may weigh a little as 1 kilograms. Microchips and microprocessors have considerably reduced the cost of the electronic components required in a computer. Computers come in many sizes and shapes such as special-purpose, workstation, laptop, desktop, minicomputers, supercomputers.

A personal computer (PC) is a general-purpose computer, whose size, capabilities, and original sale price makes it useful for individuals, and which is intended to be operated directly by an end-user with no intervening computer operator. This contrasted with the batch processing or time-sharing models which allowed larger, more expensive minicomputer and mainframe systems to be used by many people, usually at the same time. Large data processing systems require a full-time staff to operate efficiently.

Computers in the form of personal desktop computers, laptops and tablets have become such an important part of everyday living that it can be difficult to remember a time when they did not exist. In reality, computers as they are known and used today are still relatively new. Although computers have technically been in use since the abacus approximately 5000 years ago, it is modern computers that have had the greatest and most profound effect on society. The first full-sized digital computer in history was developed in 1944. Called the Mark I, this computer was used only for calculations and weighed five tons. Despite its size and limited ability it was the first of many that would start off generations of computer development and growth.

***First Generation Computers.*** First generation computers bore little resemblance to computers of today, either in appearance or performance. The first generation of computers took place from 1940

to 1956 and was extremely large in size. The inner workings of the computers at that time were unsophisticated. These early machines required magnetic drums for memory and vacuum tubes that worked as switches and amplifiers. It was the vacuum tubes that were mainly responsible for the large size of the machines and the massive amounts of heat that they released. These computers produced so much heat that they regularly overheated despite large cooling units. First generation computers also used a very basic programming language that is referred to as machine language.

***Second Generation Computers.*** The second generation (from 1956 to 1963) of computers managed to do away with vacuum tubes in lieu of transistors. This allowed them to use less electricity and generate less heat. Second generation computers were also significantly faster than their predecessors. Another significant change was in the size of the computers, which were smaller. Transistor computers also developed core memory which they used alongside magnetic storage.

***Third Generation Computers.*** From 1964 to 1971 computers went through a significant change in terms of speed, courtesy of integrated circuits. Integrated circuits, or semiconductor chips, were large numbers of miniature transistors packed on silicon chips. This not only increased the speed of computers but also made them smaller, more powerful, and less expensive. In addition, instead of the punch cards and the printouts of previous systems, keyboards and monitors were now allowing people to interact with computing machines.

***Fourth Generation Computers.*** The changes with the greatest impact occurred in the years from 1971 to 2010. During this time technology developed to a point where manufacturers could place millions of transistors on a single circuit chip. This was called monolithic integrated circuit technology. It also heralded the invention of the Intel 4004 chip which was the first microprocessor to become commercially available in 1971. This invention led to the dawn of the personal computer industry. By the mid-70s, personal computers such as the Altair 8800 became available to the public in the form of kits and required assembly. By the late 70s and early 80s assembled personal computers for home use, such as the Commodore Pet, Apple II and the first IBM computer, were making their way onto the market. Personal computers and their ability to create networks eventually would lead to the Internet in the early 1990s. The fourth generation of

computers also saw the creation of even smaller computers including laptops and hand-held devices. Graphical user interface, or GUI, was also invented during this time. Computer memory and storage also went through major improvements, with an increase in storage capacity and speed.

***The Fifth Generation of Computers.*** In the future, computer users can expect even faster and more advanced computer technology. Computers continue to develop into advanced forms of technology. Fifth generation computing has yet to be truly defined, as there are numerous paths that technology is taking toward the future of computer development. For instance, research is ongoing in the fields of nanotechnology, artificial intelligence, as well as quantum computation (Figure 2.1).

**Computer Classification, By Size and Power**

Computers can be generally classified by size and power as follows, though there is considerable overlap:

- ***personal computer:*** a small, single-user computer based on a microprocessor. In addition to the microprocessor, a personal computer has a keyboard for entering data, a monitor for displaying information, and a storage device for saving data.
- ***workstation:*** a powerful, single-user computer. A workstation is like a personal computer, but it has a more powerful microprocessor and a higher-quality monitor.
- ***minicomputer:*** a multi-user computer capable of supporting from 10 to hundreds of users simultaneously.
- ***mainframe:*** a powerful multi-user computer capable of supporting many hundreds or thousands of users simultaneously.
- ***supercomputer:*** an extremely fast computer that can perform hundreds of millions of instructions per second.

## 2.2 Components of the computer

Modern computers are electronic and digital. The actual machinery - wires, transistors, and circuits - is called ***hardware***; the instructions and data are called ***software***.

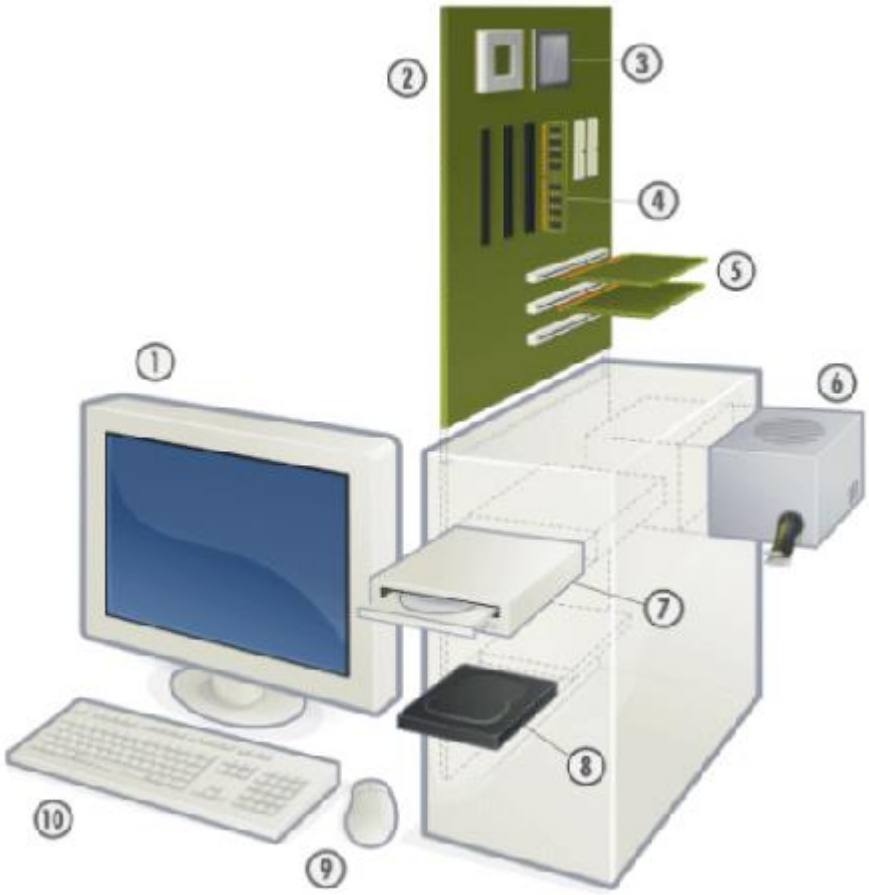



Figure 2.1 Exploded view of personal computer system
(1) Display unit, (2) Main board, (3) Central Processing Unit, (4) Plug-in memory module, (5) Plug-in circuit boards, (6) Power Supply Unit, (7) CD/DVD-ROM drive, (8) Hard Disk Drive, (9) Mouse, (10) Keyboard

All general-purpose computers require the following hardware components:

- ***memory:*** enables a computer to store, at least temporarily, data and programs.
- ***mass storage device:*** allows a computer to permanently retain large amounts of data. Common mass storage devices include disk drives and tape drives.
- ***input device:*** usually a keyboard and mouse, the input device is the conduit through which data and instructions enter a computer.
- ***output device:*** a display screen, printer, or other device that lets you see what the computer has accomplished.
- ***central processing unit (CPU):*** the heart of the computer, this is the component that actually executes instructions.

In addition to these components, many others make it possible for the basic components to work together efficiently. For example, every computer requires a bus that transmits data from one part of the computer to another.

Table 2.1 The common computer components

| № | COMPONENT | PURPOSE |
|---|---|---|
| 1 | Motherboard | The motherboard or mainboard is the main circuitboard which interconnects to all other components. The motherboard allows communication and power to flow throughout the computer system. |
| 2 | Processor (CPU) | The Central Processing Unit (CPU) is the brain of the computer system. This is the part of the computer which processes all inputs and decides how they will be outputed. |
| 3 | Memory (RAM) | Random Access Memory (RAM) is your computers short term memory and enables the computer system to perform multitasking functions such as copy and paste or type information into a word document without it saving. |
| 4 | Video/Graphics Card | The Video/Graphics Card is responsible for receiving visual inputs and displaying (outputing) all visual data. Graphics processing has a very difficult task which is why modern graphics cards now have Graphics Processor Units (GPU) which work like a CPU but for visual data only. This allows quicker rendering of 3D images and streaming of high definition video and leaves the CPU free to work on all other data. |
| 5 | Network Interface Card (NIC) | The Network Interface Card (NIC) allows your computer system to communicate and pass data to other computer systems within a Local Area Network (LAN) or over the internet to Wide Area Networks (WAN). |
| 6 | Hard Drive (HDD) | The Hard Drive (HDD) is the long term storage for your computer system. Hard Drives are used to archive and store data for future retreival. |
| 7 | CD/DVD Drive (ROM) | The CD/DVD ROM Drive allows your computer system to read data from external media like CDs and DVDs. Generally there are two types of CD/DVD ROM; readers and writers (burners). |
| 8 | Sound Card | The Sound Card allows for the input (Microphones) and output (Speakers) of audio related data. |

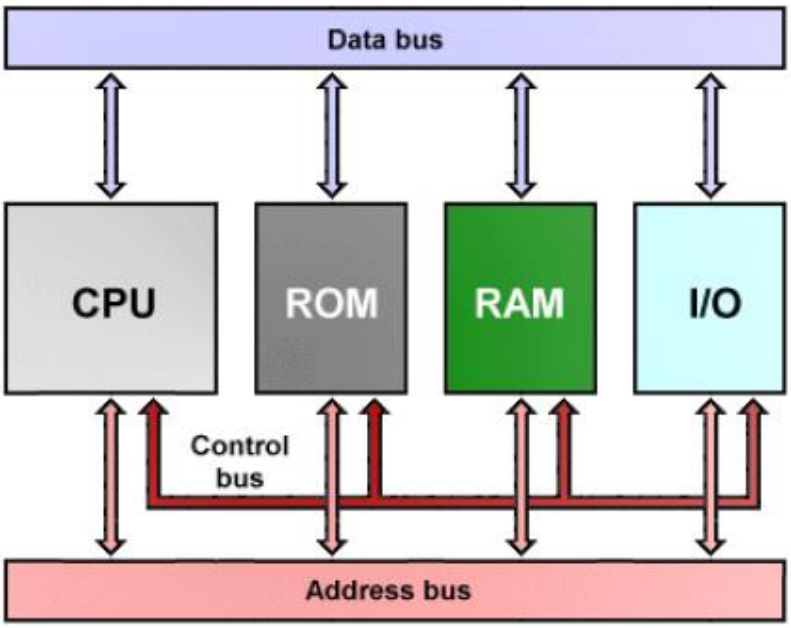



Figure 2.2 The core components in a personal computer

***The principle of program management.*** The essence of the principle of the software controlling the computer is reduced to the following three statements:

– Any work performed by a computer program;
– The executable program is in memory;
– Program runs automatically.

The program executed by the computer, a sequence of commands. In order to ensure the consistent execution of commands does the following:

To address the first command adds the length (in bytes), so the address is determined by the second team. After performing the second team added to its address and its length is determined by the address of the third team, etc. If the process is broken, the process of conditional branch.

The operation code - the code in the operative part , determines what operation is performed , takes 8- bit. Microoperation - elementary action inside a computer.

The address part - the part where you store addresses, commands are one- , two-, and three-address unnumbered ( message is used to reduce the number of accesses to RAM ).

Command register - a register, after being placed in which the body of the command will be executed . Teams split into micro-ops .

Microcode and micro are in constant memory.Each microinstruction can fit one or more micro.

The principle of program management is that after telling the machine address of the first team of the program and entering the body of this command in the command register , the program runs itself. Next, there is no external control is not required. This principle is performed at the level of the commands and the microcode level .

**Control questions:**

1. The object of study of computer science?
2. What is the general structure of modern science?
3. The place of the computer in the sciences?
4. What is the address of memory organization?
5. What is associative memory organization?
6. What is a stack of memory organization?
7. How is memory speed?
8. What are the provisions of the Body of Principles for the software controlling the computer?

***Exercise 2.1***

Label the diagram with the correct items 1-11.

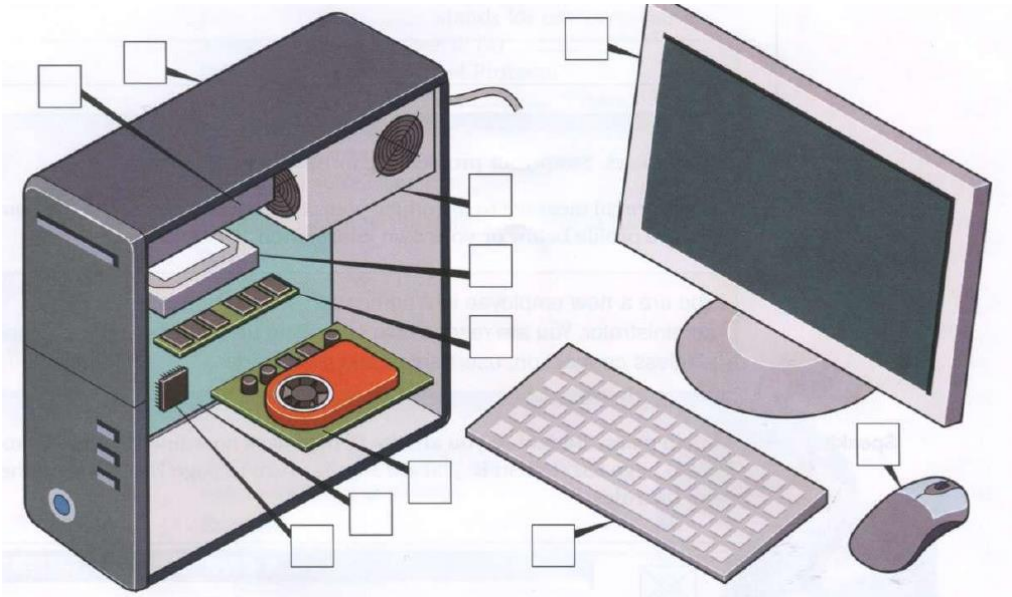


Figure 2.3 Personal computer

1. monitor
2. case
3. motherboard
4. CPU (Central Processing Unit or Processor)
5. main memory (RAM)

6. expansion cards (video, graphic)
7. power supply unit
8. optical disk drive
9. hard disk drive
10. keyboard
11. mouse

***Exercise 2.2***

Match each item in Column A with its function in Column B. Then describe its function in two ways.

| A Item | B Function |
|---|---|
| RAM | controls the cursor |
| processor | inputs data through keys like a typewriter |
| mouse | displays the output from a computer on a screen |
| clock | reads DVD-ROMs |
| 3.5" floppy drive | reads and writes to removable magnetic disks |
| monitor | holds instructions which are needed to start up the computer |
| keyboard | holds data read or written to it by the processor |
| DVD-ROM drive | provides extremely fast access for sections of a program and its data |
| cache | controls the timing of signals in the computer |
| ROM | controls all the operations in a computer |

***Exercise 2.3***

Put these instructions for opening a computer in the correct sequence.

a) Release the two catches underneath and lift up to remove panel.
b) Shut down your computer by choosing Shut Down from the Apple menu or the Special menu.
c) If there are security screws on the vertical plate on the back of the computer, remove them with a Philips screwdriver.
d) Unplug all the cables except the power cord from your computer.
e) Pulling gently, slide the tray out.

***Exercise 2.4***

**How a Disk Cache Works**

Disk caching works in essentially the same way whether you have a cache on your disk controller or you are using a software-based solution. The CPU requests specific data from the cache. In some

cases, the information will already be there and the request can be met without accessing the hard disk. If the requested information isn't in the cache, the data is read from the disk along with a large chunk of adjacent information. The cache then makes room for the new data by replacing old. Depending on the algorithm that is being applied, this may be the information that has been in the cache the longest, or the information that is the least recently used. The CPU's request can then be met, and the cache already has the adjacent data loaded in anticipation of that information being requested next.

1) Read the text to find the answers to these questions. Match the terms in Table A with the statements in Table B.

| Table A | Table B |
|---|---|
| Cache hit | The process of writing changes only to the cache and not to main memory unless the space is used to cache new data |
| Cache controller | The amount of data transferred to the cache at any one time |
| Cache coherency | The process of writing directly to both the cache and main memory at the same time |
| Write-through cache | The processor is successful in finding the data in the cache |
| Write-back cache | Ensuring that any changes written to main memory are reflected within the cache and vice versa |
| Line size | The logic circuits used to control the cache process |

2) Mark the following as True or False:

a) Cache memory is faster than RAM.
b) The processor looks for data in the main memory first.
c) Write-through cache is faster than write-back cache.
d) Write-back cache requires a more intelligent cache controller.
e) Most programs use instructions that are stored in sequence in memory.
f) Most cache controllers transfer one item of data at a time.
g) Hardware and software disk caches work in much the same way.

**UNIT 3**
**SOFTWARE. OPERATING SYSTEMS**

Software is a set of programs, which is designed to perform a well-defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software −

- System Software
- Application Software
- Service Software (Special)

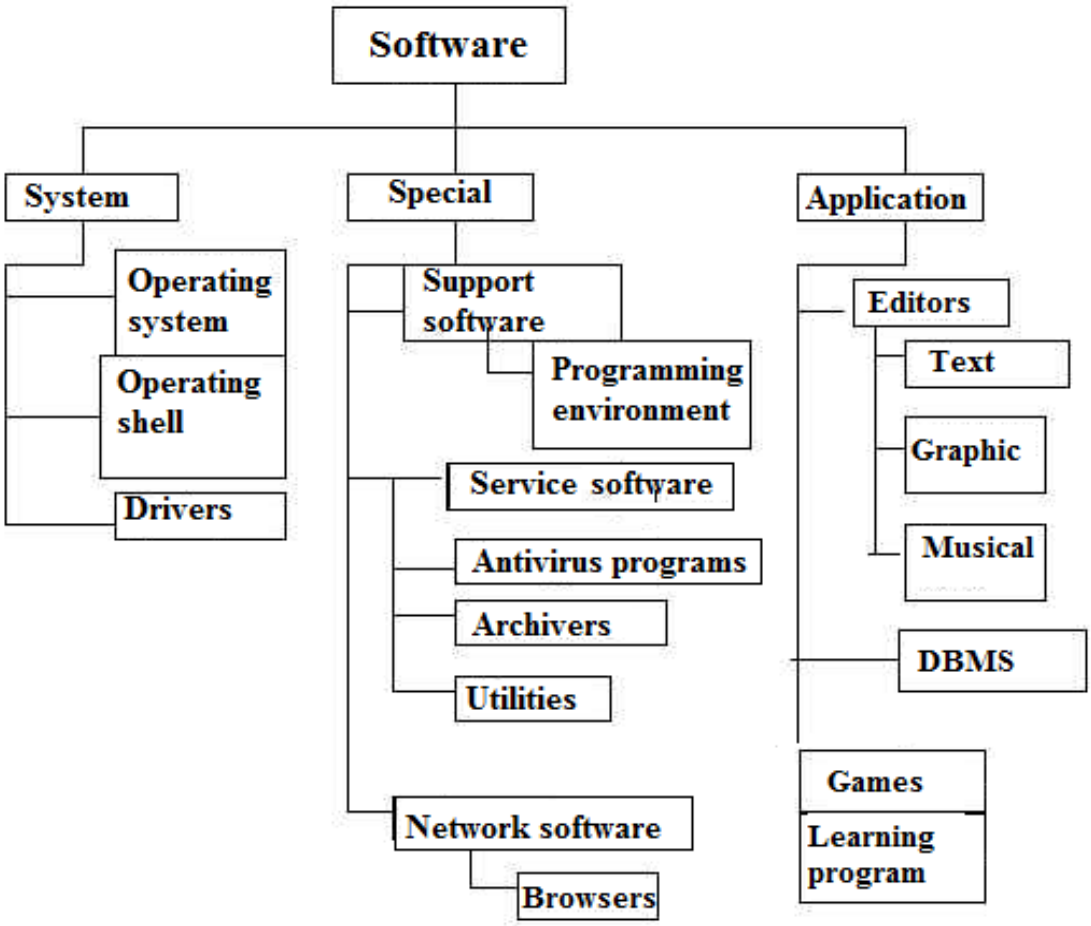



Figure 3.1 Types of software

The ***system software*** is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself. System software is generally prepared by the computer manufacturers. These software products comprise of programs written in low-level languages, which interact with the hardware at a very basic level. System software serves as the interface between the hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers, etc.

System software includes:

- ***Operating systems*** **–** which are essential collections of software that manage resources and provides common services for other software that runs "on top" of them. Supervisory programs, boot loaders, shells and window systems are core parts of operating systems. In practice, an operating system comes bundled with additional software (including application software) so that a user can potentially do some work with a computer that only has one operating system.
- ***Device drivers*** **–** which operate or control a particular type of device that is attached to a computer. Each device needs at least one corresponding device driver; because a computer typically has at minimum at least one input device and at least one output device, a computer typically needs more than one device driver.
- ***Utilities*** **–** which are computer programs designed to assist users in the maintenance and care of their computers.

***Application software*** products are designed to satisfy a particular need of a particular environment. All software applications prepared in the computer lab can come under the category of Application software.

Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text. It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are the following − Microsoft Office Suite Software, Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Adobe Photoshop, Internet Explorer, etc.

***Service Software*** includes programs (utilities), the most common ones are the following: WinRar, WinZip, APBackUp, Acronis True Image, Kaspersky Antivirus, DrWeb, NortonAntivirus, Sisoft Sandra, Norton System Information.

## 3.1 Operating System

The Operating System is a program with the following features −

- An operating system is a program that acts as an interface between the software and the computer hardware.
- It is an integrated set of specialized programs used to manage overall resources and operations of the computer.
- It is a specialized software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.

The objectives of the operating system are −

- To make the computer system convenient to use in an efficient manner.
- To hide the details of the hardware resources from the users.
- To provide users a convenient interface to use the computer system.
- To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.
- To manage the resources of a computer system.
- To keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users.
- To provide efficient and fair sharing of resources among users and programs.

**Characteristics of Operating System**

Here is a list of some of the most prominent characteristic features of Operating Systems −

- ***Memory Management*** − Keeps track of the primary memory, i.e. what part of it is in use by whom, what part is not in use, etc. and allocates the memory when a process or program requests it.
- ***Processor Management*** − Allocates the processor (CPU) to a process and deallocates the processor when it is no longer required.
- ***Device Management*** − Keeps track of all the devices. This is also called I/O controller that decides which process gets the device, when, and for how much time.

- ***File Management*** − Allocates and de-allocates the resources and decides who gets the resources.
- ***Security*** − Prevents unauthorized access to programs and data by means of passwords and other similar techniques.
- ***Job Accounting*** − Keeps track of time and resources used by various jobs and/or users.
- ***Control Over System Performance*** − Records delays between the request for a service and from the system.
- ***Interaction with the Operators*** − Interaction may take place via the console of the computer in the form of instructions. The Operating System acknowledges the same, does the corresponding action, and informs the operation by a display screen.
- ***Error-detecting Aids*** − Production of dumps, traces, error messages, and other debugging and error-detecting methods.
- ***Coordination Between Other Software and Users*** − Coordination and assignment of compilers, interpreters, assemblers, and other software to the various users of the computer systems.

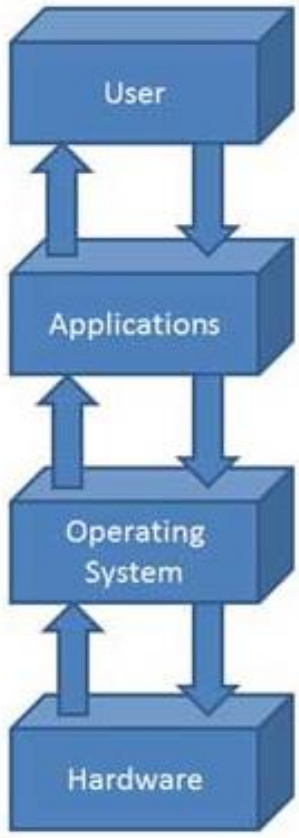



Figure 3.2 Operating system interfaces

***Operating System (OS)*** – a set of programs that are designed to control the computer and the computer processes, as well as for organizing user interaction with the equipments.

**Operating System Functions**

- Manages computer processes and computer resources: disk space, memory, mouse, printer, etc.
- It is a "mediator" between the computer and the user.
- It supports user interface to make it easier to control computer.

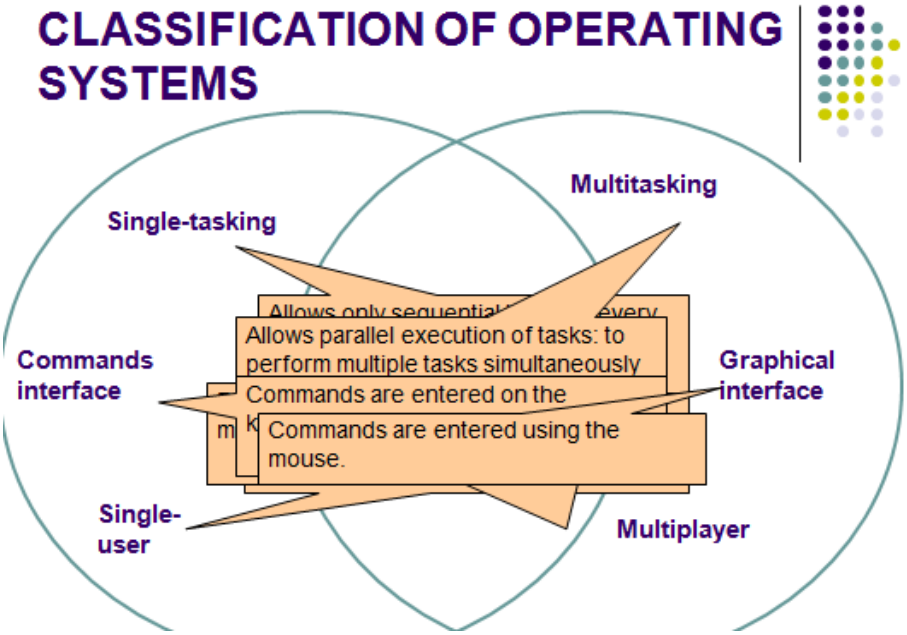



Figure 3.3 Classification of operating systems

**Control questions:**

1. Why do you need an operating system?
2. Name the basic classification of operating systems.
3. How does the operating system load?
4. What programs are there in the standard menu Windows?
5. How to run a calculator?
6. How to create a shortcut?
7. What is Windows Explorer?
8. How to rename a file or folder name?
9. What is the interface?
10. What is the OS and what it performs the basic functions?
11. On what grounds can classify the OS?

***Exercise 3.1***

Work with objects OS Windows. Folder

- Create a folder on the desktop named STUDENT;
- At the root of the working disk folder, create a folder named WKSU;
- Open the newly created folder and create a subfolder in it with your name;
- Change the name of a subfolder on GMU-11;
- Use the main menu Run, download the Notepad text editor (notepad.exe executable file). Type in a topic about myself in English. And save the file in the GMU-11 folder.

***Exercise 3.2***

Work with objects OS Windows. Accessories tools

- Create a desktop shortcut for a program named Calculator.
- To perform calculations (calc.exe executable program file). To determine the storage location of the program you can use the Find item in the main menu.
- Using the shortcut you created, run the calculator.
- Calculate:

$= \mathrm{Cos}^2(\pi/2)$ $=5!+\frac{ln10+\sqrt[3]{5}}{7^2}$ $= \sqrt{256} + 144^{\frac{1}{2}}$

***Exercise 3.3***

Work with objects OS Windows. Windows Explorer

- Start the standard File Explorer and further actions with objects perform it. View of the window of Windows Explorer
- In the C drive, set the display mode of the object List, Table
- Sort the icons in the C drive size in the forward and reverse.

***Exercise 3.4***

Consider a logical addressspace of 64 pages of 1024 words each, mapped onto a physical memory of 32 frames.

a. How many bits are there in the logical address?

b. How many bits are there in the physical address?

***Exercise 3.5***

An operating system supports a paged virtual memory, using a central processor with a cycle time of 1 microsecond. It costs an additional 1 microsecond to access a page other than the current one. Pages have 1000 words, and the paging device is a drum that rotates at 3000 revolution per minute and transfers 1 million words per second. The following statistical measurements were obtained from the system:

- 1 percent of all instructions executed accessed a page other than the current page.
- Of the instructions that accessed another page, 80 percent accessed a page already in memory.
- When a new page was required, the replaced page was modified 50 percent of the time.

Calculate the effective instruction time on this system, assuming that the system is running one process only and that the processor is idle during drum transfers.

***Exercise 3.6***

1. Create folders in the 'c' drive of you computer as shown in the above picture.
2. Share the 'PYP 002' in your computer so that other users on the network can access this folder.
3. Compress the folder 'PYP 002' so as to save some disc space.

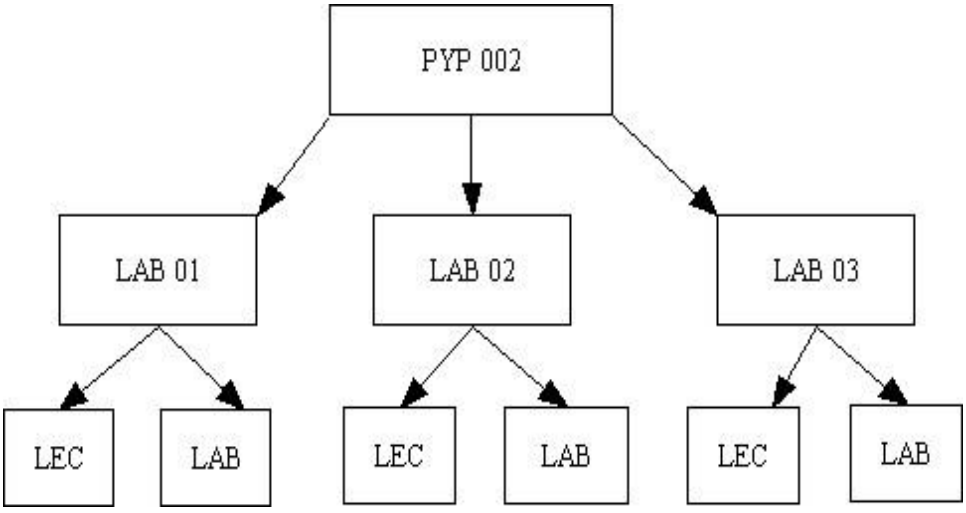



Figure 3.4 Tree of folders

## UNIT 4
## HUMAN-COMPUTER INTERACTION

Human–computer interaction (commonly referred to as HCI) researches the design and use of computer technology, focused on the interfaces between people (users) and computers.

Researchers in the field of HCI both observe the ways in which humans interact with computers and design technologies that let humans interact with computers in novel ways.

As a field of research, human-computer interaction is situated at the intersection of computer science, behavioral sciences, design, media studies, and several other fields of study. The term was popularized by Stuart K. Card, Allen Newell, and Thomas P. Moran in their seminal 1983 book, The Psychology of Human-Computer Interaction, although the authors first used the term in 1980 [1] and the first known use was in 1975. The term connotes that, unlike other tools with only limited uses (such as a hammer, useful for driving nails but not much else), a computer has many uses and this takes place as an open-ended dialog between the user and the computer. The notion of dialog likens human-computer interaction to human-to-human interaction, an analogy which is crucial to theoretical considerations in the field.

Humans interact with computers in many ways; and the interface between humans and the computers they use is crucial to facilitating this interaction. Desktop applications, internet browsers, handheld computers, and computer kiosks make use of the prevalent graphical (GUI) of today. Voice user interfaces (VUI) are used for speech recognition and synthesizing systems, and the emerging multi-modal and gestalt User Interfaces (GUI) allow humans to engage with embodied character agents in a way that cannot be achieved with other interface paradigms. The growth in human-computer interaction field has been in quality of interaction, and in different branching in its history. Instead of designing regular interfaces, the different research branches have had different focus on the concepts of multimodality rather than unimodality, intelligent adaptive interfaces rather than command/action based ones, and finally active rather than passive interfaces.

Human-computer interaction (HCI) is the study and planned design of human and computer activities. HCI uses productivity,

safety and entertainment to support and fulfill human-computer activities and is applied to various types of computer systems, including air traffic control, nuclear processing, offices and computer gaming. HCI systems are easy, safe, effective and enjoyable.

Software engineering focuses on the production of software application solutions, whereas HCI focuses on discovering methods and techniques that support people. HCI designers always consider HCI usability and user experience goals for effective user interaction. Not all usability and user experience goals apply to every interactive computer system because certain combinations are incompatible. HCI designers also consider potential contexts, tasks at hand and computer system users.

Humans interact with computers through a user interface. This includes software, such as what is displayed on the computer monitor, and hardware, such as the mouse, keyboard and other peripheral devices. As a result, the study of HCI focuses on user satisfaction. Attention to human machine interaction is important, because a poor interface can make it hard for users to benefit from even the simplest systems. In a corporate or factory setting, a poor user interface could have more severe consequences.

Poorly designed human-machine interfaces can lead to many unexpected problems. A classic example of this is the Three Mile Island accident, a nuclear meltdown accident, where investigations concluded that the design of the human–machine interface was at least partly responsible for the disaster. Similarly, accidents in aviation have resulted from manufacturers' decisions to use non-standard flight instrument or throttle quadrant layouts: even though the new designs were proposed to be superior in basic human–machine interaction, pilots had already ingrained the "standard" layout and thus the conceptually good idea actually had undesirable results.

Leading academic research centers include CMU's Human-Computer Interaction Institute, GVU Center at Georgia Tech, and the University of Maryland Human–Computer Interaction Lab.

Human–computer interaction studies the ways in which humans make, or don't make, use of computational artifacts, systems and infrastructures. In doing so, much of the research in the field seeks to improve human-computer interaction by improving the usability of computer interfaces. How usability is to be precisely understood, how it relates to other social and cultural values and when it is, and when it

may not be a desirable property of computer interfaces is increasingly debated.

Much of the research in the field of human-computer interaction takes an interest in:

- Methods for designing novel computer interfaces, thereby optimizing a design for a desired property such as, e.g., learn ability or efficiency of use.
- Methods for implementing interfaces, e.g., by means of software libraries.
- Methods for evaluating and comparing interfaces with respect to their usability and other desirable properties.
- Methods for studying human computer use and its sociocultural implications more broadly.
- Models and theories of human computer use as well as conceptual frameworks for the design of computer interfaces, such as, e.g., cognitivist user models, Activity Theory or ethnomethodological accounts of human computer use.
- Perspectives that critically reflect upon the values that underlie computational design, computer use and HCI research practice.

Researchers in HCI are interested in developing new design methodologies, experimenting with new devices, prototyping new software and hardware systems, exploring new interaction paradigms, and developing models and theories of interaction.

**Control questions:**

1. What are Human–computer interaction?
2. What helps people to interact with computers?
3. What is the interest of a significant part of research in the field of human-computer interaction?
4. How open your computer's file system?
5. What are keyboard shortcuts?

**Exercise 4.1**

Read the text.

## Graphical User Interface

PCs use a graphical user interface (GUI), and they each have their own look and feel.

***Start Button.*** In most versions of Windows, you'll click the Start button to open the Start menu.

***Taskbar.*** The taskbar contains shortcuts to applications, the date and time, and more. When you open a program or file, it will appear on the taskbar, and you can easily switch between different programs by selecting them on the taskbar.

***Date and Time Settings.*** On the right side of the taskbar, you will see the date and time. There will also be shortcuts to various settings, like Internet settings and sound volume.

***Desktop.*** The desktop is the main workspace of your computer. From here, you can access files, folders, and more. You can also customize the desktop by choosing a desktop background image, also known as a wallpaper.

***Items on the Desktop.*** You can keep folders, files, and shortcuts on the desktop so they'll be easily accessible.

***Recycle Bin.*** When you delete a file, it is moved to the Recycle Bin. This allows you to recover the file if you change your mind. To permanently delete the file, you will need to empty the Recycle Bin.

***Open Folders.*** When you double-click a folder, it will open in a specialized program called File Explorer (also known as Windows Explorer). This allows you to navigate to the specific folder or file you want.

***Shortcuts on the Taskbar.*** Some programs will have shortcuts on the taskbar for easy access.

**Exercise 4.2**

**Opening your computer's file system**

Whether you're using a PC the file system icon will be in the bottom-left part of the screen. On a PC, the **File Explorer icon** looks like a folder, as in the image below.

**Basic navigation**

Whether you're using Windows Explorer or Finder, basic navigation will work the same way. If you see the file you want, you can double-click it with your mouse. Otherwise, you can use the **Navigation pane** on the left side of the window to select a different location.

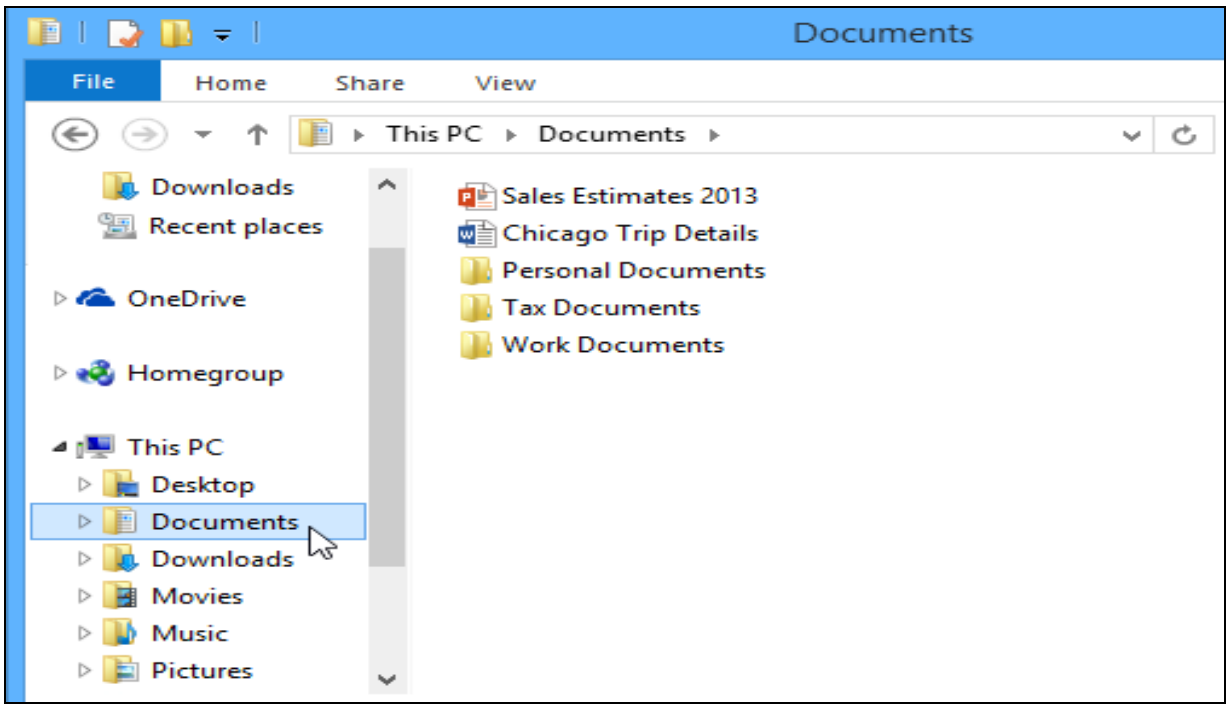



Figure 4.1 Navigation pane

## Exercise 4.3

## Opening files and applications

Each application on your computer has a group of **file types**—or **formats**—it is able to open. When you **double-click** a file, your computer will automatically use the correct application to open it.

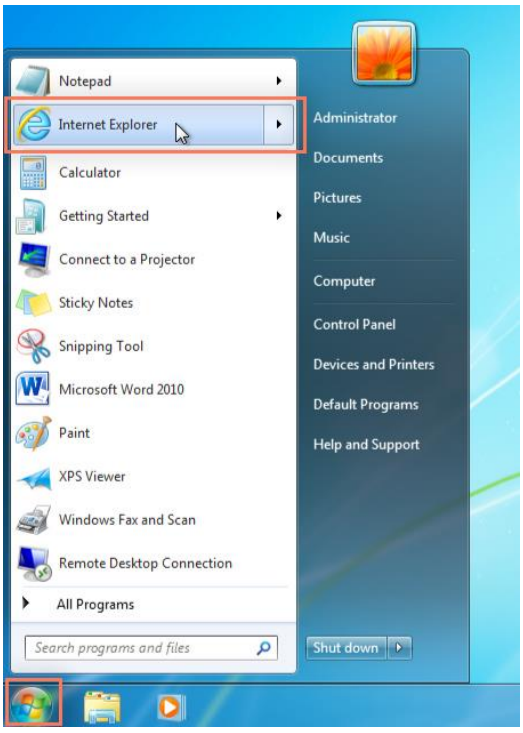



Figure 4.2 Opening Internet Explorer

However, there may be times you may want to open an application directly, instead of just opening a file.

- To open an application in **Windows**, click the **Start** button, then select the desired application. If you don't see the one you want, you can click **All Programs**/**All Apps** to see a full list, or simply **type the name of the application** on your keyboard to search for it. In the example below, we're opening **Internet Explorer**.

**Exercise 4.4**

**Shutting down your computer**

When you're done using your computer, it's important to **shut it down properly**.

- To shut down **Windows**, click the **Start** button, then select **Shut down** (in some versions, this may say **Turn Off Computer** or look like the power symbol).

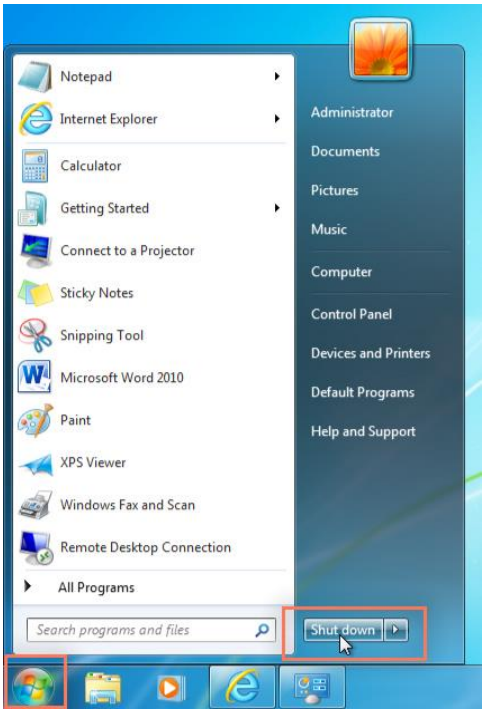



Figure 4.3 Shut down

***Exercise 4.5***

**Learning Windows 7: Desktop Themes and Backgrounds**

When getting a new Windows computer, the first thing many people do is tweak the background and themes to change the look and feel. In this article we will show you how to change themes and

backgrounds, find hidden themes, and create a background slideshow on your desktop.

**Change Themes and Backgrounds**

Here we take a look at the default theme for Windows 7.

Figure 4.4 Default theme for Windows 7

If you want to customize the look and feel of Windows 7, a great place to start is with Themes and Backgrounds. To change the appearance right click an empty area on the desktop and select Personalize.

In the screen that opens you can go through and try out different ones from Aero Themes to High Contrast Themes.

For example here we take a look at the Landscapes Aero Theme. You'll notice it changes the Background and color of the window border colors. It also changes the sounds specific to the Landscapes theme.

Figure 4.5 The Landscapes Aero Theme

The Background will change images periodically. You can adjust time intervals by going into Personalization and clicking on Desktop Background, which will be set to Slide Show by default.

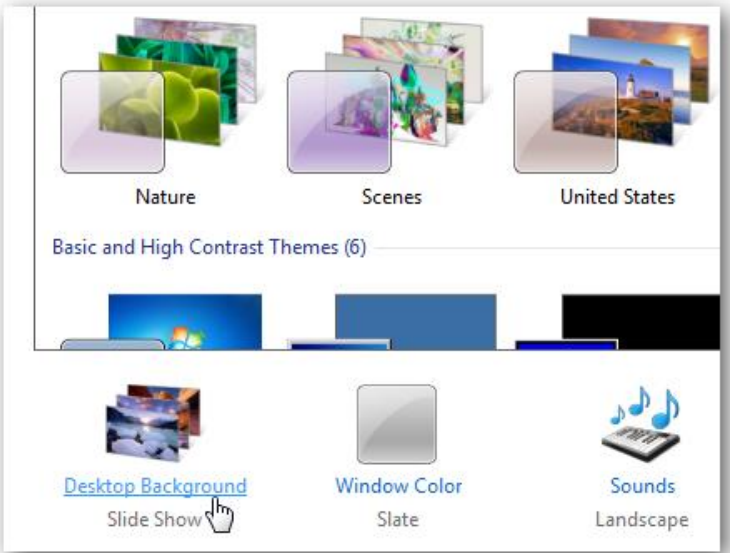



Figure 4.6 Desktop Background

Here you can decide which background pictures are shown, how often they change, and the picture position. In this example one of the Landscapes pictures is unselected, it will change every 10 minutes, and are set to shuffle.

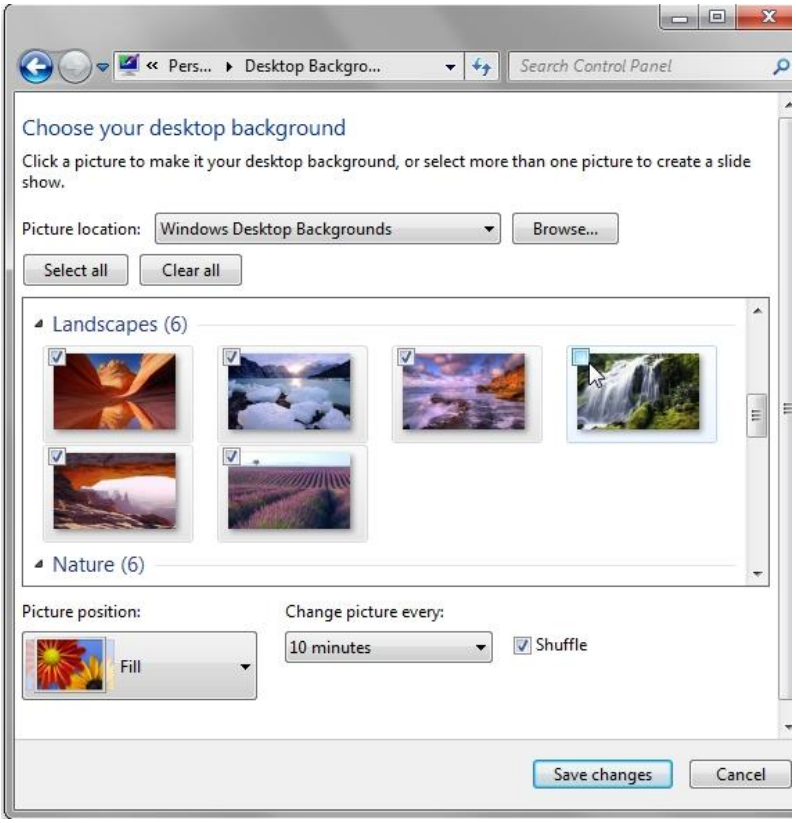



Figure 4.7 Change, and the picture position

You don’t have to use the pictures for the specific Themes either. You can go through all of the pictures and select the ones you want in different categories like something in Characters for example. There are several different default pictures to choose from. Click the Picture location drop down menu to explore different categories.

**Exercise 4.6**

**Create a Custom Theme**

So now you’ve played around with the default pictures and themes but you want to make your own and customize it up a bit. You can use your own pictures…click on the Browse button then navigate to the directory where your pictures are located.

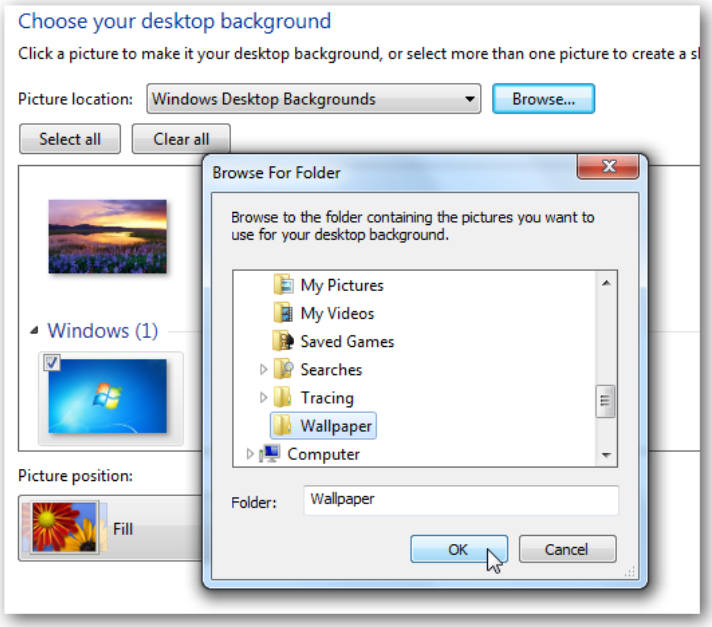



Figure 4.8 The Browse button

Then the images in that folder will be displayed and you can use them for backgrounds.

Figure 4.9 Window color

Once you have a picture selected for the Background Screen you can then start customizing other features like the Window color.

You have several choices of different colors and can mix them around to get it to your liking. You can change the sounds of your theme too.

Here you can go through different sound schemes and see how they will sound for different program events like logon, system notifications, low battery alarm…etc.

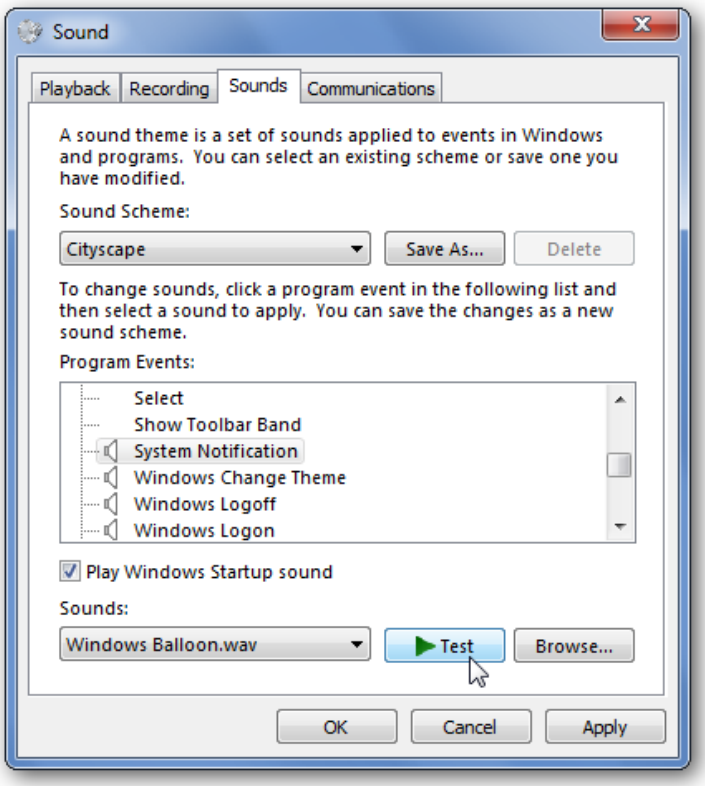



Figure 4.10 Sounds

You might also want to select a screensaver to go along with the theme.

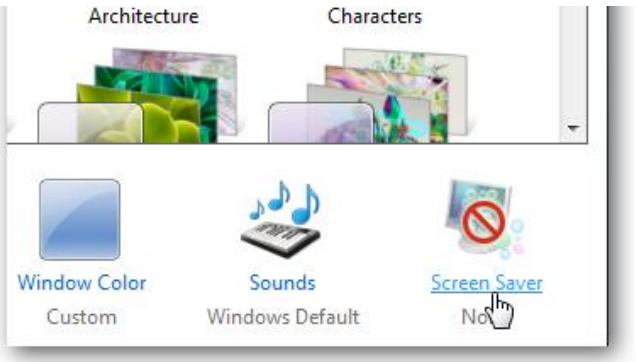



Figure 4.11 Screensaver

Choose the Screen Saver you want to use and customize its settings then hit OK.

If you end up with a theme you like you can save it under the My Themes category.

Figure 4.12 Save theme as

You can also share your custom themes with friends, family, and co-workers. Right-click on the theme you want to share and select *Save theme for sharing.*

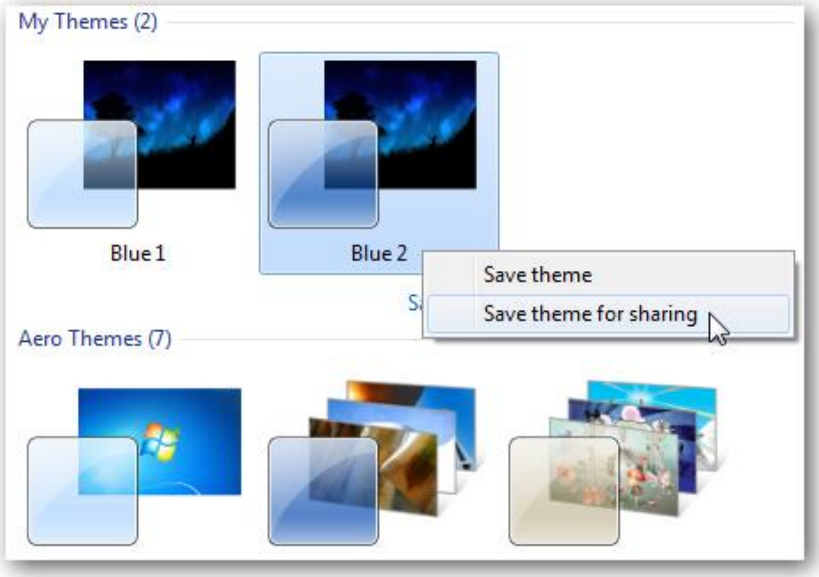



Figure 4.13 Save theme for sharing

Give it a name and it will be stored in My Documents folder, then you can share it with your family via Homegroup or email the file to them.

To use the custom theme, they will just need to double click on the theme pack file.

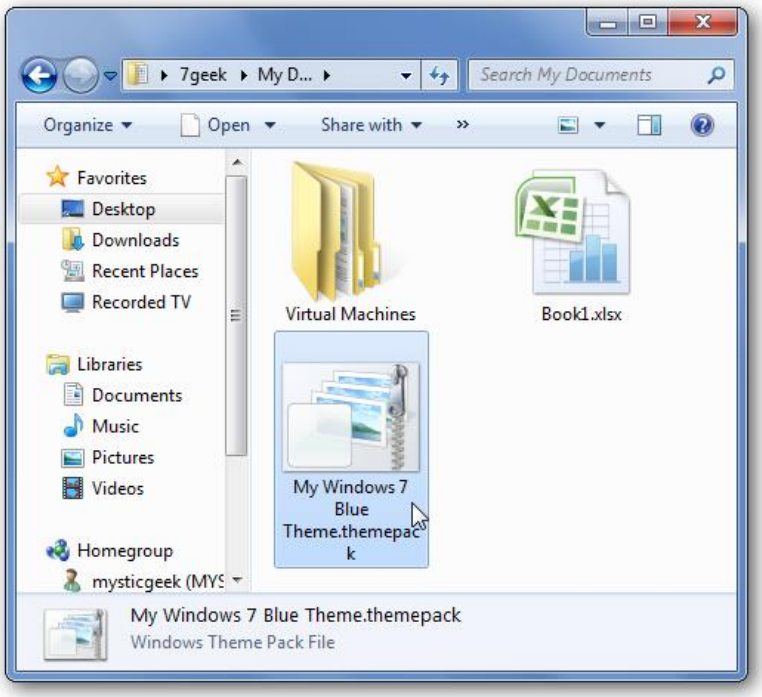



Figure 4.14 My Documents

**Exercise 4.7**

Keyboard shortcuts are **keys or a combination of keys** you can press on your keyboard to perform a variety of tasks. Using keyboard shortcuts is often **faster than using a mouse** because you can keep both hands on the keyboard. Keyboard shortcuts are also **universal**, which means you can use many of the same shortcuts in a **variety of applications**. For example, you can use the shortcuts to copy and paste text in a word processor and in a web browser.

**Using shortcuts**

Many keyboard shortcuts require you to **press two or more keys in a specific order**. For example, to perform the shortcut **Ctrl+X**, you would press and hold the **Ctrl** key, then press the **X** key, then release.

You'll use the **Ctrl (Control)** or **Alt** key to perform most keyboard shortcuts. You'll find these keys near the bottom-left corner of your keyboard.

**Working with text**

These keyboard shortcuts are useful when working with text in word processors, email applications, and more. They can help you perform **commonly repeated tasks**, like **copying and pasting** text.

- **Ctrl+X**: Cut the selected text.
- **Ctrl+C**: Copy the selected text.
- **Ctrl+V**: Paste the copied or cut text.

- **Ctrl+A**: Select all of the text on the page or in the active window.
- **Ctrl+B**: Bold the selected text.
- **Ctrl+I**: Italicize the selected text.
- **Ctrl+U**: Underline the selected text.

**Working with files and applications**

You can use keyboard shortcuts to **open**, **close**, and **switch** applications. When working with a file, like a Microsoft Word document, shortcuts can be used to **createnew files**, **find words**, and **print**.

- **Ctrl+Alt+Delete**: Force an unresponsive or frozen program to quit. This keyboard shortcut opens the **Task Manager**. You can then select the unresponsive application and close it.

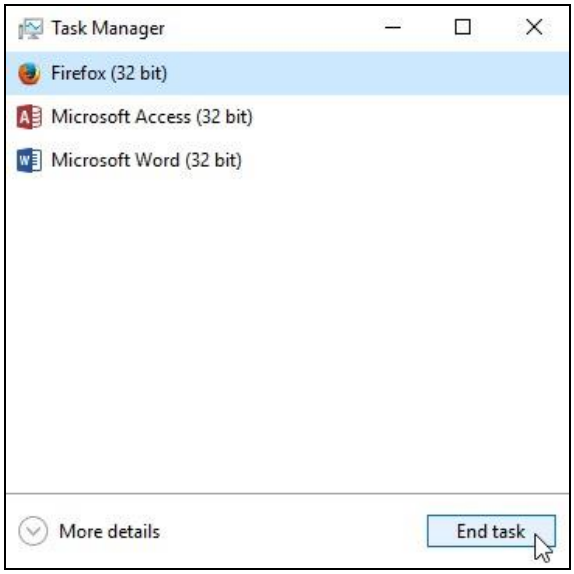



Figure 4.15 Task Manager

- **Delete**: Send a selected file or files to the **Recycle Bin**.
- **Enter**: Open a selected application or file.
- **Ctrl+N**: Create a new file.
- **Ctrl+O**: Open an existing file.
- **Ctrl+S**: Save the current file.
- **Ctrl+Z**: Undo the previous action. If you want to redo the action, press **Ctrl+Y**.
- **Windows key** : Open the Start menu (or the Start screen in Windows 8).

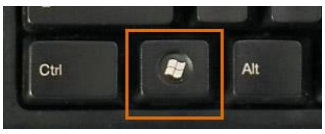


Figure 4.16 Windows key

**Exercise 4.8**

**Internet shortcuts**

Keyboard shortcuts can also be used to **navigate your web browser**. Many of the **text shortcuts** above are also useful online, like the shortcuts for **selecting**, **copying**, and **pasting** text into your web browser's address bar. Note that some of these shortcuts may work a bit differently depending on the web browser you're using.

- **Ctrl+N**: Open a new browser window.
- **Ctrl+T**: Open a new browser tab.
- **Ctrl+D**: Bookmark the current page.
- **Ctrl+B**: View bookmarks.
- **Ctrl+J**: View recently downloaded files.

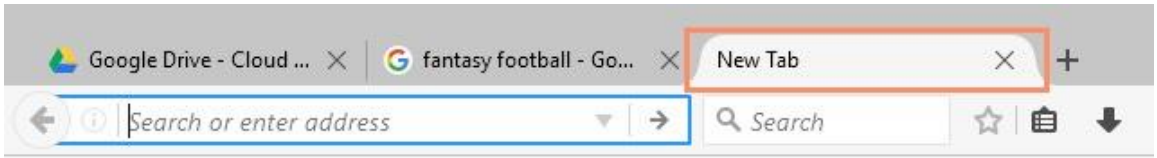


Figure 4.17 New browser tab

**Using the Alt key to navigate menus**

When you press the **Alt key**, you will have access to all of the menus in the current application. This means you can perform almost any task with just your keyboard. For example, you can type **Alt+F+X** to quit an application. When performing these shortcuts, you will not need to hold down the **Alt** key.

**Finding more keyboard shortcuts**

In many applications, you'll find keyboard shortcuts next to menu items.

In some applications, you may need to hover over a button to display its keyboard shortcut.

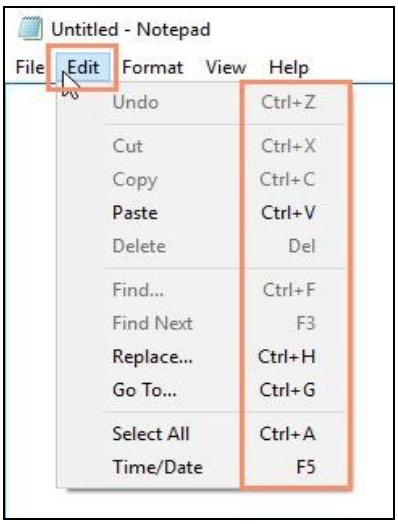



Figure 4.18 Keyboard shortcuts next to menu items

**Exercise 4.9**

1. Complete the sentence:

*1) The window that occupies the entire screen is called ....*

*2) The window that occupies part of the screen is called ....*

*3) The window represented as an icon is called ....*

*4) A window whose headline is highlighted in color is called ...*

2. Open various windows on the monitor screen, find all the main types of objects (program, document, regular folder, shortcut) and copy them to the created folder "Objects".

3. Set the correspondence between the menu name and its feature according to the table.

Table 4.1. Menu names

| **Menu name** | **Menu feature** |
|---|---|
| 1) Main (horizontal) menu | A) Selects the basic operations with the operating system |
| 2) Main menu | B) Contains possible actions with the object selected on the monitor screen. |
| 3) Icon menu | C) Appears as a result of selecting a horizontal menu item |
| 4) Context menu | D) The menu to which the user always has access. |
| 5) System menu | E) Menu items are presented not in the form of text, but in the form of pictograms |
| 6) Drop-down (vertical) menu | F) Designed to organize user interaction with the program. |

# UNIT 5
# DATABASE SYSTEMS

## 5.1 Databases

A database is an organized collection of data. A relational database, more restrictively, is a collection of schemas, tables, queries, reports, views, and other elements. Database designers typically organize the data to model aspects of reality in a way that supports processes requiring information, such as (for example) modelling the availability of rooms in hotels in a way that supports finding a hotel with vacancies.

A database-management system (DBMS) is a computer-software application that interacts with end-users, other applications, and the database itself to capture and analyze data. A general-purpose DBMS allows the definition, creation, querying, update, and administration of databases. Well-known DBMSs include MySQL, PostgreSQL, EnterpriseDB, MongoDB, MariaDB, Microsoft SQL Server, Oracle, Sybase, SAP HANA, MemSQL, SQLite and IBM DB2.

What is a ***Database****?*

- A structured collection of similar information that can be searched and sorted.
- A database is made up of files, records and fields.
- A database is an organised, structured collection of similar information.
- A database can be stored on paper (manual) or on a computer (electronic).
- A program that is used for organising data on a computer is called a database package.
- Data is organised in a database as files, records and fields:

A ***file*** is a collection of ***records***. Data in a database is saved on the computer as a data file and contains data on a particular topic e.g. a Films data file.

A ***record*** is a collection of ***fields***. A record is a collection of organised data on a particular person or item.

A ***field*** is a single item of information. A field is part of a record that holds a particular piece of data e.g. Surname.

Database software allows you to create and manage a database. A database is a collection of data organized to allow access, retrieval, and use of that data.

*Advantages of an electronic database?*

- Information is immediately available.
- Records can be processed quickly.
- Records can be processed accurately

All of this is impossible in a manual system!

*Features of a Database?*

Databases have many of the features common to a general purpose package. There are some special features of a database

- Create fields
- Add and alter records
- Search
- Sort

**Create Fields**

The first step on setting up a database is deciding on the fields it requires. Fields hold the information you want to store. You can set the size and type of a field.

Size: You can decide how many characters a field can hold.

Type: Fields can hold different types of data: text, number, Date and time

**Sort Records**

Sorting allows you to organise records into a particular order:

- alphabetic
- numeric
- ascending (1,2,3,4,5…)
- descending (Z, Y, X, W …)

The sort is done by choosing which field the database is to be sorted into e.g. sort alphabetically by surname.

Database software allows you to create and manage a database. A database is a collection of data organized to allow access, retrieval, and use of that data.

## 5.1 Database Management System Microsoft Access

***Microsoft Access***, also known as Microsoft Office Access, is a database management system from Microsoft that combines the

relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It is a member of the Microsoft Office suite of applications, included in the Professional and higher editions or sold separately.

Microsoft Access stores data in its own format based on the Access Jet Database Engine. It can also import or link directly to data stored in other applications and databases.

Software developers and data architects can use Microsoft Access to develop application software, and "power users" can use it to build software applications. Like other Office applications, Access is supported by Visual Basic for Applications, an object-oriented programming language that can reference a variety of objects including DAO (Data Access Objects), ActiveX Data Objects, and many other ActiveX components. Visual objects used in forms and reports expose their methods and properties in the VBA programming environment, and VBA code modules may declare and call Windows operating-system functions.

A database is a computer program for storing information in an easily retrievable form. It is used mainly to store text and numbers (for example, the Library catalogue, which includes the author, title, class number and accession number for each book).

*The main objects of the Access Database and their purpose:*

***Table:*** A table stores data about an entity (a person, place, or thing) and is the basic element in any database.

***Query:*** A query answers a question about the database. The most common type of query specifies a set of criteria, then searches the database to retrieve the records that satisfy that criteria.

***Forms*** - user-friendly layouts to display data on the screen (either in a table or from a query)

***Reports*** - output files, ready for printing

***Pages*** - for creating/editing WWW pages

***Macros*** - lists of commands to perform particular functions

***Modules*** - programs which expert users write in a programming language called Access Basic to perform tailor-made functions not generally available

*Data Types in Access*

An AutoNumber field creates unique values automatically when Access creates a new record. The AutoNumber field is primarily used for Primary Keys in Access.

***Text.*** A Text field can contain values that are text, numeric or a combination of both. A text field can contain a maximum length of 255 characters.

***Memo***. A much larger version of the text field, allowing storage of up to 2 GB of data.

***Number***. The Number field can store numeric values up to 16 bytes of data.

***Date/Time***. The Date/Time field allows storage of date and time information.

***Currency***. The Currency data type stores values in a monetary format.

***Yes/No***. Boolean data storage of true/false values.

***OLE Object***. The OLE Object field stores images, documents, graphs etc. from Office and Windows based programs.

***Hyperlink***. The Hyperlink field type is used to store web addresses.

***Attachment***The Attachment field type is used to store images, spreadsheet files, documents, charts and other types of supported files to the records in your database. This is a new feature that has been introduced with Microsoft Access 2007.

**Control questions:**

1. What is a database, DBMS?
2. What is a field and record?
3. What is a advantages of an electronic database?
4. What is a features of a Database?
5. Which the paramerts will be set for the field?
6. What is a search Records?
7. Which is types sort data do you know?

**Exercise 5.1**

**Create a database from scratch**

To create a new database, do the following:

1. Start Access. On the New tab in Backstage view, click Blank Database or Blank Web Database. On the right, type a name for your database in the File Name box. To change the location in which you create the file, click Browse Button image next to the File Name box, browse to and select the new location, and then click OK.

2. Click Create. Access creates the database, and then opens an empty table (named Table1) in Datasheet view.

3. Access puts the cursor in the first empty cell in the Click to Add column of the new table.

4. To add data, begin typing — or you can paste data from another source, as described in the section Paste data from another source into an Access table, later in this article.

*Notes:*

Entering data in Datasheet view is designed to be very similar to entering data in an Excel worksheet. The main restriction is that data must be entered in contiguous rows and columns, starting at the upper-left corner of the datasheet. You should not try to format your data by including blank rows or columns as you might do in an Excel worksheet, because doing so will waste space in your table. The table merely contains your data. All visual presentation of that data will be done in the forms and reports that you design later.

The table structure is created while you enter data. Any time that you add a new column to the datasheet, a new field is defined in the table. Access sets the data type of the field based on the type of data that you enter. For example, if you have a column in which you have entered only date values, Access will set the data type of that field to Date/Time. If you later attempt to enter a non-date value (such as a name or a phone number) in that field, Access displays a message informing you that the value does not match the data type of the column. When possible, you should plan your table so that each column contains the same type of data, whether it is text, dates, numbers, or some other type. This makes it much easier to build queries, forms, and reports that select just the data that you want.

5. If you do not want to enter data yet, click Close Button image

**Exercise 5.2**

Create a new database and create a table structure with information about the students of your group.

- Open the Access program.
- Click the **New Database** button and click the **OK** button. In the **File name** field, enter your file name as the database name. This will be the name of your personal database.
- Click the **Create** button.

- In the next window, select the type of document to be created. You create tables, so select the **Table** tab. There are several options, but you select Design View and click OK. The Design View window appears.
- In the upper left cell, enter the field name (type the word "last name", not your last name) and press the Enter key. In the next cell, a data type appears, by default it is set to Text. Any other is selected using the drop-down menu. The transition from cell to cell is carried out by one of the following methods: mouse; by pressing the Enter key; arrows; Tab key.
- Fill in the fields in the Design View with the data from Table 5.1.

Table 5.1 Fields of Table 1

| Field name | Data type |
|---|---|
| Surname | Text |
| Name | Text |
| Middle Name | Text |
| Year of birth | Numeric |
| Group | Numeric |
| Subgroup | Numeric |

- Save the table.
- In the window that appears, type the name of the **List** table and click the **OK** button. You will be prompted to create a key field- a unique entry field that makes it convenient to associate tables. In this variant, numbers will appear, the number of records.
- Answer **YES**.
- Switch to table mode. Entering the data you will produce in this mode, filling the cells of the table. The value of the ID field will change automatically.
- Fill in the database with values. The number of entries should be 10.
- Save your entries. As a result, you have obtained the table with which you will work.

*Edit the cells.*

- Replace the surname at number 2 with another. To do this, select the cell to be edited and select a new name.

- Replace the year of birth by 1986. To do this, click on the desired cell and it opens for editing. Delete the previous entry and enter a new one.
- Look carefully at the table and correct your mistakes.

*Sort the values of the table.*

Sort it out:

1. Surnames - alphabetically (put a marker on any name in the column and click the sort button on the toolbar.

2. First name - alphabetically

3. Group number - descending

4. Year of birth - descending. Ascending from A to Z. Descending from A to A.

*Learn the functions: save, open, close.*

- Save the current table.
- Click the button in the upper-right corner of the table window to close the table.
- Repeat the operation again, as a result of which you close the current database. In this window, you can create a new database, or you can open an existing database to continue working.
- Open your database again using the commands File - Open - The name of your database - Open.

*Search for records by pattern.*

- Position the cursor in the Last name field.
- Click the Search button, which allows you to find entries for the entered value. As a result, a dialog box appears.
- Type the surname under number 3 in the sample field and click the Find button.

Present the teacher to the finished work and complete the work with Access.

- Select the menu item File - output
- If you have performed any actions in the database, you will be asked if you want to save the changes. Respond affirmatively to this question.

**Exercise 5.3**

*Create a database of two tables.*

Open the database created in the previous lesson.

- Call up the Access program.

- Switch on the mouse **Open** the database, select from the list of your database and click on the **OK** button.

*Delete the List table.*

- Select the table name and click the **Delete** button.
- When prompted to confirm the deletion of the table, answer **Yes**.

*Create a Group table.*

- Select the Create tab and click on the Table button.
- Leave the table mode and press the **OK** button. An empty table that has not been resolved. The field type will be selected automatically depending on the information entered.
- Rename Field 1. Enter the name of the training group field and press Enter.
- Rename Field 2 in the Teacher field. Save the table with the name of the Group. On the creation of a key field, answer negatively.
- Go to the **Design view** and see how the fields are defined. Make the key group field by placing the cursor on the key of the field. The data type of the group field is set to numeric, count it with the mouse from the drop-down list.
- Save and close the table.

*Create a form*

The easiest way to create a form is to have the table open that you want the form to populate.

- Click on the Create Tab
- Go to the Forms Group
- Click on FORM

The from is created and you are in layout view. You can move items around from this view, but when you are ready to enter data you will need to change to Form View.

- Go to the HOME Tab
- Click View
- Click Form View

Start entering data. If you want to look through the records then use the buttons at the bottom of the screen they are just like those on all the electric devices you all use today. If you want to enter new data then click on the button that is the blue arrow pointing right with a star. Enter in the new data for the first field

- Press TAB to go to the next field
- Press SHIFT+TAB to go to the previous field

- Press TAB at the end of the fields on the screen will save that record and bring you to the next empty record.

*Query in the Access*

- **Click the Query Wizard Icon:** The query wizard simplifies the creation of new queries. The alternative is to use the Query Design view, which facilitates the creation of more sophisticated queries but is more complicated to use.
- **Select a Query Type**. Access will ask you to choose the type of query you wish to create. For our purposes, we will use the Simple Query Wizard. Select this and click OK to continue.
- **Select the Appropriate Table From the Pull-Down Menu:** The Simple Query Wizard will open. It includes a pull-down menu. When you select the pull-down menu, you'll be presented with a listing of all the tables and queries currently stored in your Access database. These are the valid data sources for your new query. In this example, we want to first select the List table which contains information about the students of your group.
- Choose the Fields You Wish to Appear in the Query Results: You can do this by either double-clicking on them or by single clicking first on the field name and then on the ">" icon. As you do this, the fields will move from the Available Fields listing to the Selected Fields listing. Notice that there are three other icons offered. The ">>" icon will select all available fields. The "<" icon allows you to remove the highlighted field from the Selected Fields list while the "<<" icon removes all selected fields. In this example, we want to select the Surname, Name and Year of birth from the List table.
- Click On Next: When you're finished adding fields to your query, click the Next button to continue.
- Choose the Type of Results You Would Like to Produce: We want to produce a full listing of surnames, names and their years of births, so choose the Detail option here and click the Next button to continue.
- Give Your Query a Title: You're almost done! On the next screen, you can give your query a title. Select something descriptive that will help you recognize this query later. We'll call this query "data of birth."

- Click On Finish: You'll be presented with the query results. Notice that the tab presenting this results contains the name of your query.
- Now you're armed with a powerful tool to apply to your database needs.

**Exercise 5.4**

1. Write a query for a select of student names that begin with the letter “A” (Like “A*”).
2. Write a query for a select of students who were born from 1995 and 2000.
3. Create a query, which displays the list of students whose number group ends on the number "5"
4. Create a query, which displayed the list of students sorted of the name
5. Create a form which consist of the fields: *Surname, Name, Group.*

# UNIT 6
# DATA ANALYSIS

***Data Analysis*** is a process of inspecting, cleaning, transforming and modeling data with the goal of discovering useful information, suggesting conclusions and supporting decision-making

Several data analysis techniques exist encompassing various domains such as business, science, social science, etc. with a variety of names. The major data analysis approaches are −

- Data Mining
- Business Intelligence
- Statistical Analysis
- Predictive Analytics
- Text Analytics

Data Analysis is a process of collecting, transforming, cleaning, and modeling data with the goal of discovering the required information. The results so obtained are communicated, suggesting conclusions, and supporting decision-making. Data visualization is at times used to portray the data for the ease of discovering the useful patterns in the data. The terms Data Modeling and Data Analysis mean the same.

Data Analysis Process consists of the following phases that are iterative in nature −

- Data Requirements Specification
- Data Collection
- Data Processing
- Data Cleaning
- Data Analysis
- Communication

## 6.1 Data Analysis with Excel

Microsoft Excel provides several means and ways to analyze and interpret data. The data can be from various sources. The data can be converted and formatted in several ways. It can be analyzed with the relevant Excel commands, functions and tools - encompassing Conditional Formatting, Ranges, Tables, Text functions, Date functions, Time functions, Financial functions, Subtotals, Quick

Analysis, Formula Auditing, Inquire Tool, What-if Analysis, Solvers, Data Model, PowerPivot, PowerView, PowerMap, etc.

Excel provide commands, functions and tools that make your data analysis tasks easy. You can avoid many time consuming and/or complex calculations using Excel.

***Ranges and Tables***. The data that you have can be in a range or in a table. Certain operations on data can be performed whether the data is in a range or in a table.

***Sheet Area***. The area where you enter data. The flashing vertical bar is called the insertion point and it represents the location where text will appear when you type.

***Row Bar***. Rows are numbered from 1 onwards and keeps on increasing as you keep entering data. Maximum limit is 1,048,576 rows.

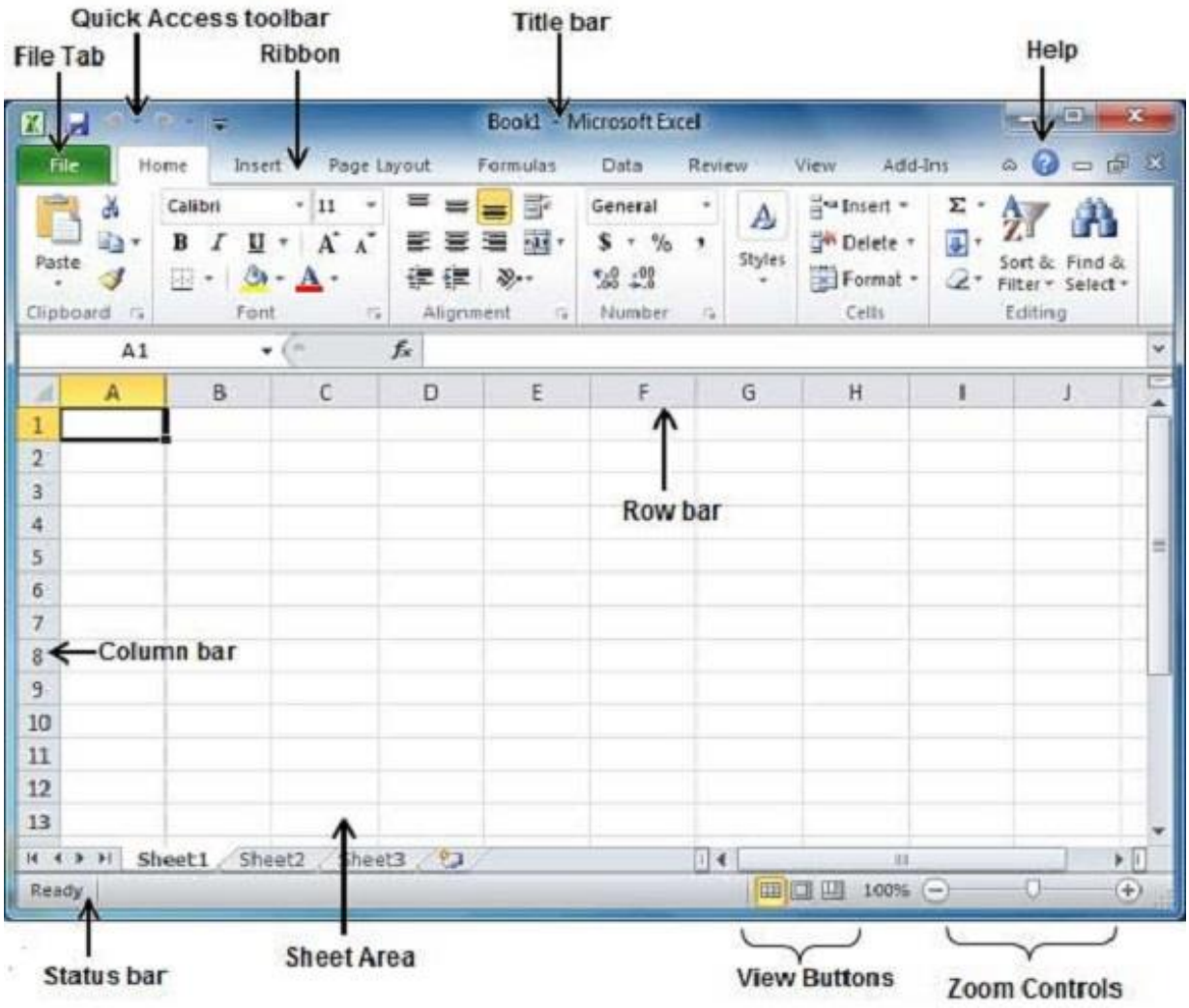



Figure 6.1 The Table in Excel

***Column Bar***. Columns are numbered from A onwards and keeps on increasing as you keep entering data. After Z, it will start the series of AA, AB and so on. Maximum limit is 16,384 columns.

***Status Bar***. This displays the sheet information as well as the insertion point location. From left to right, this bar can contain the total number of pages and words in the document, language etc.

You can configure the status bar by right-clicking anywhere on it and by selecting or deselecting options from the provided list.

**Cell Introduction**

The intersection of rows and columns is called **cell**. Cell is identified with **Combination of column header and row number**. For example − A1, A2.

**Formatting Cell**

MS Excel Cell can hold different types of data like Numbers, Currency, Dates, etc. You can set the cell type in various ways as shown below −

- Right Click on the cell » Format cells » Number.
- Click on the Ribbon from the ribbon.

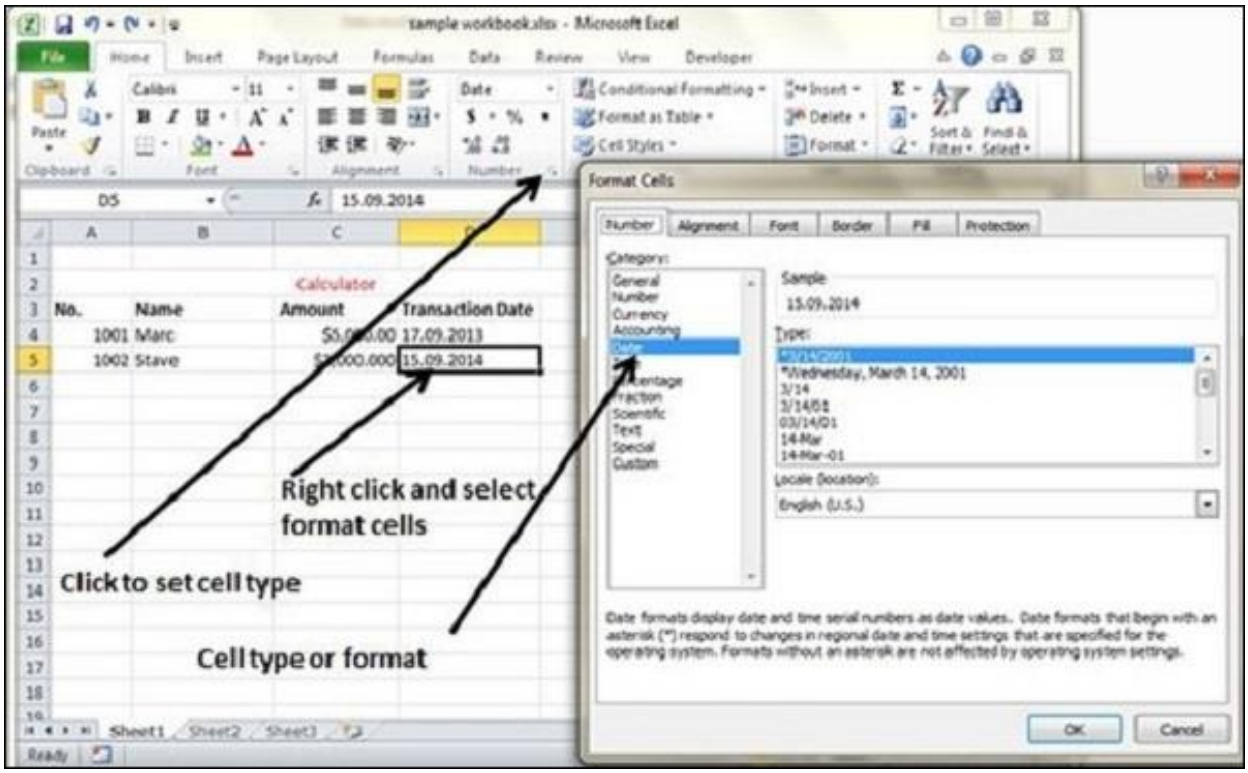



Figure 6.2 Various Cell Formats

Below are the various cell formats.

- **General** − This is the default cell format of Cell.
- **Number** − This displays cell as number with separator.
- **Currency** − This displays cell as currency i.e. with currency sign.
- **Accounting** − Similar to Currency, used for accounting purpose.
- **Date** − Various date formats are available under this like 17-09-2013, 17th-Sep-2013, etc.
- **Time** − Various Time formats are available under this, like 1.30PM, 13.30, etc.
- **Percentage** − This displays cell as percentage with decimal places like 50.00%.
- **Fraction** − This displays cell as fraction like 1/4, 1/2 etc.
- **Scientific** − This displays cell as exponential like 5.6E+01.
- **Text** − This displays cell as normal text.
- **Special** − Special formats of cell like Zip code, Phone Number.
- **Custom** − You can use custom format by using this.

You can create and use an Excel table to manage and analyze data easily. Further, with Excel Tables you get built-in Filtering, Sorting, and Row Shading that ease your reporting activities.

***Sorting data*** is an integral part of Data Analysis. You can arrange a list of names in alphabetical order, compile a list of sales figures from highest to lowest, or order rows by colors or icons. Sorting data helps you quickly visualize and understand your data better, organize and find the data that you want, and ultimately make more effective decisions.

You can sort by columns or by rows. Most of the sorts that you use will be column sorts.

You can sort data in one or more columns by

- text (A to Z or Z to A)
- numbers (smallest to largest or largest to smallest)
- dates and times (oldest to newest and newest to oldest)
- a custom list (E.g. Large, Medium, and Small)
- format, including cell color, font color, or icon set

Sort criteria for a table are saved with the workbook such that you can reapply the sort to that table every time you open the workbook. Sort criteria are not saved for a range of cells. For multicolumn sorts or for sorts that take a long time to create, you can convert the range to a table. Then, you can reapply the sort when you open a workbook.

Filtering allows you to extract data that meets the defined criteria from a given Range or table. This is a quick way to display only the information that is needed by you.

You can Filter data in a Range, table or PivotTable.

You can filter data by −

- Selected values
- Text filters if the column you selected contains text
- Date filters if the column you selected contains dates
- Number filters if the column you selected contains numbers
- Number filters if the column you selected contains numbers
- Font color if the column you selected contains font with color
- Cell icon if the column you selected contains cell icons
- Advanced filter
- Using slicers

In a table, the column headers are automatically tagged to filters, known as **AutoFilters**. **AutoFilter** is represented by the arrow next to column header. Each **AutoFilter** has filter options based on the type of data you have in that column. For example, if the column contains numbers, when you click on the arrow next to the column header, **Number Filter Options** appear.

**Visualizing Data with Charts**

In Excel, charts are used to make a graphical representation of any set of data. A chart is a visual representation of the data, in which the data is represented by symbols such as bars in a Bar Chart or lines in a Line Chart. Excel provides you with many chart types and you can choose one that suits your data or you can use the Excel Recommended Charts option to view charts customized to your data and select one of those.

**Inserting Data**

For **inserting data** in **MS Excel,** just activate the cell type text or number and press enter or Navigation keys.

For inserting formula in MS Excel go to the formula bar, enter the formula and then press enter or navigation key. See the screen-shot below to understand it.

For modifying the cell content just activate the cell, enter a new value and then press enter or navigation key to see the changes. See the screen-shot below to understand it.

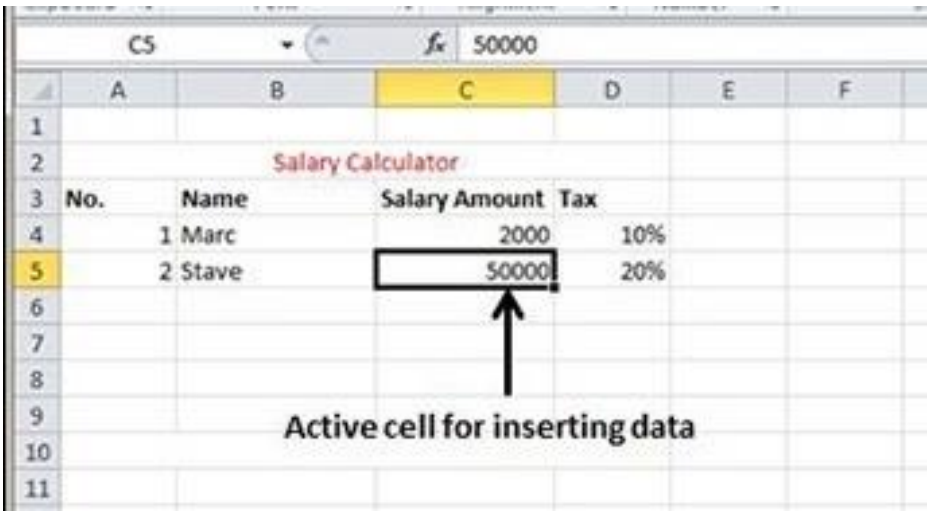



Figure 6.3 Inserting Data

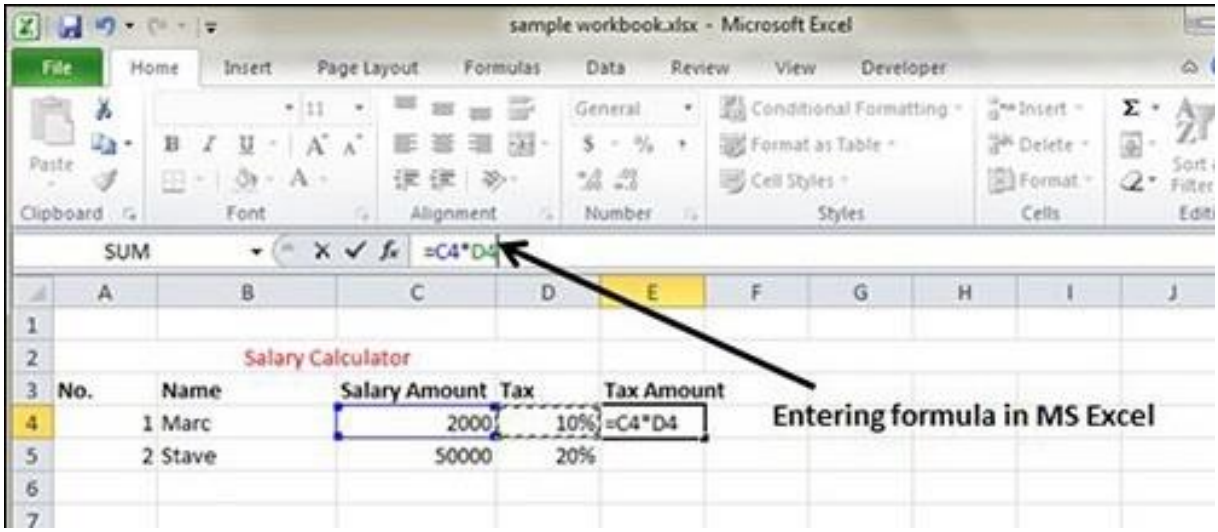



Figure 6.4 Inserting Formula

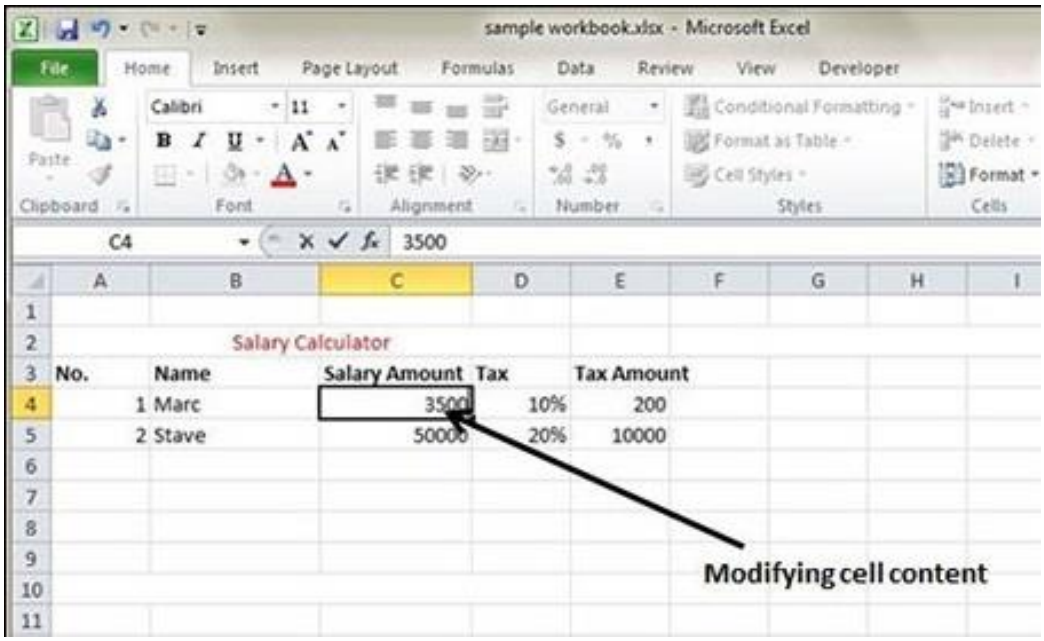



Figure 6.5 Modifying Cell Content

**Control questions:**

1. What is a Data Analysis, Data Analysis with Excel?
2. What is a row and column?
3. How is called intersection of rows and columns?
4. Which the various cell formats?
5. What is a Sorting data and Filtering?

**Exercises 6.1**

Open a new excel sheet and type this data. We've shown a sample data in the table.

Table 6.1 Data of orders

| OrderDate | Region | Rep | Item | Units | Unit Cost | Total |
|---|---|---|---|---|---|---|
| 1/6/2010 | East | Jones | Pencil | 95 | 1.99 | ? |
| 1/23/2010 | Central | Kivell | Binder | 50 | 19.99 | ? |
| 2/9/2010 | Central | Jardine | Pencil | 36 | 4.99 | ? |
| 2/26/2010 | Central | Gill | Pen | 27 | 19.99 | ? |
| 3/15/2010 | West | Sorvino | Pencil | 56 | 2.99 | ? |
| 4/1/2010 | East | Jones | Binder | 60 | 4.99 | ? |
| 4/18/2010 | Central | Andrews | Pencil | 75 | 1.99 | ? |
| 5/5/2010 | Central | Jardine | Pencil | 90 | 4.99 | ? |
| 5/22/2010 | West | Thompson | Pencil | 32 | 1.99 | ? |
| 6/8/2010 | East | Jones | Binder | 60 | 8.99 | ? |
| 6/25/2010 | Central | Morgan | Pencil | 90 | 4.99 | ? |
| 7/12/2010 | East | Howard | Binder | 29 | 1.99 | ? |
| 7/29/2010 | East | Parent | Binder | 81 | 19.99 | ? |
| 8/15/2010 | East | Jones | Pencil | 35 | 4.99 | ? |

Enter the formula to calculate the desired value. In our example, we'll type =E2*F2

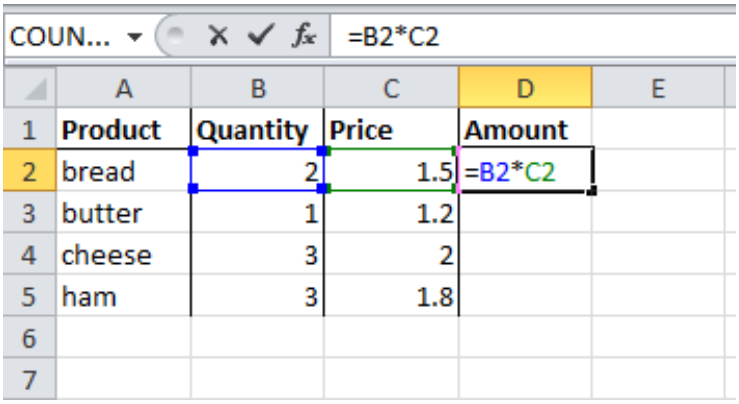
**Exercises 6.2**

*Cell References*

Cell references in Excel are very important. Understand the difference between relative, absolute and mixed reference, and you are on your way to success.

*Relative Reference*

By default, Excel uses relative reference. See the formula in cell D2 below. Cell D2 references (points to) cell B2 and cell C2. Both references are relative.




| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | **Product** | **Quantity** | **Price** | **Amount** | |
| 2 | bread | 2 | 1.5 | =B2*C2 | |
| 3 | butter | 1 | 1.2 | | |
| 4 | cheese | 3 | 2 | | |
| 5 | ham | 3 | 1.8 | | |
| 6 | | | | | |
| 7 | | | | | |

Figure 6.6 Relative reference

Select cell D2, click on the lower right corner of cell D2 and drag it down to cell D5.

Cell D3 references cell B3 and cell C3. Cell D4 references cell B4 and cell C4. Cell D5 references cell B5 and cell C5. In other words: each cell references its two neighbors on the left.

*Absolute Reference*

See the formula in cell E3 below.

1. To create an absolute reference to cell H3, place a $ symbol in front of the column letter and row number of cell H3 ($H$3) in the formula of cell E3.

2. Now we can quickly drag this formula to the other cells.

The reference to cell H3 is fixed (when we drag the formula down and across). As a result, the correct lengths and widths in inches are calculated.

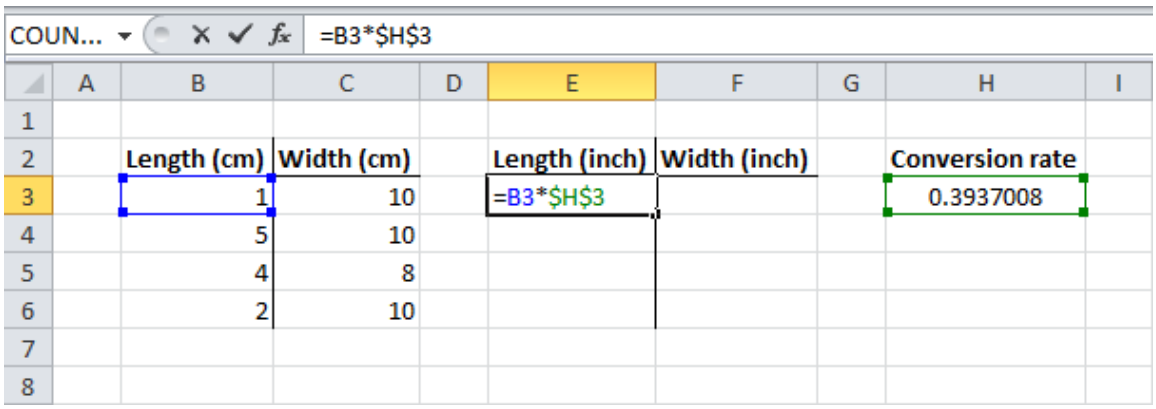



Figure 6.7 Absolute reference

**Exercises 6.3**

Select the cell that will contain the formula. In our example, we'll select cell D3.

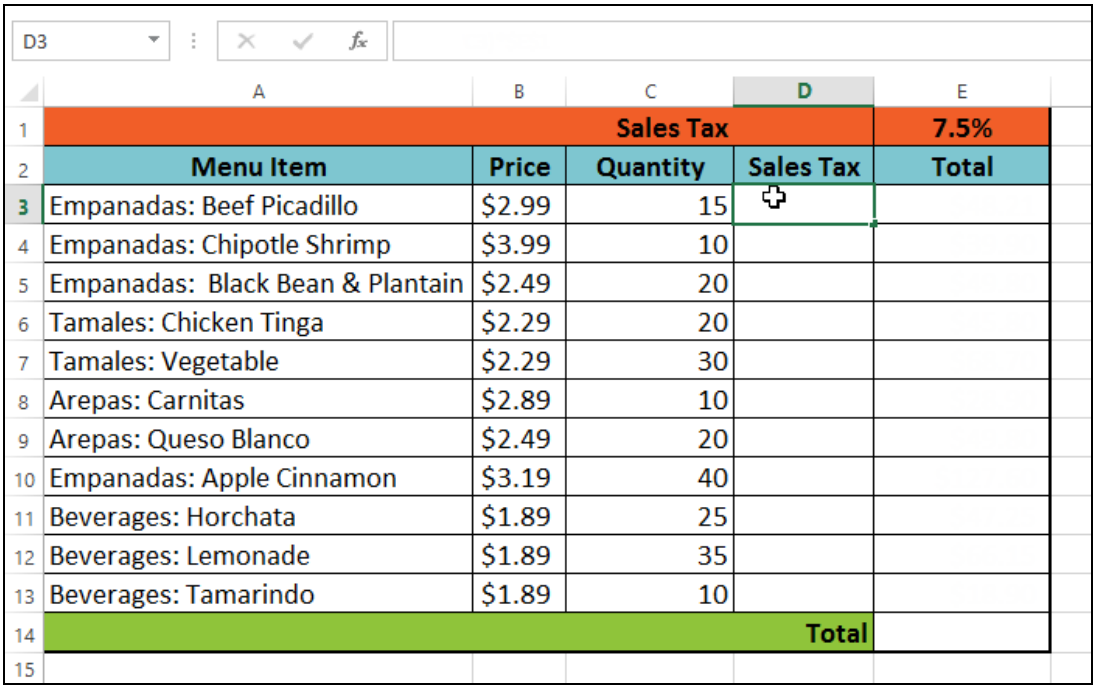



Figure 6.8 Relative and absolute reference

Enter the formula to calculate the desired value. In our example, we'll type =(B3*C3)*$E$1.

**Exercises 6.4**

*Chart in Excel*

A simple chart in Excel can say more than a sheet full of numbers. As you'll see, creating charts is very easy.

To create a line chart, execute the following steps.

1. Select the range A1:D7.

2. On the Insert tab, in the Charts group, choose Line, and select Line with Markers.

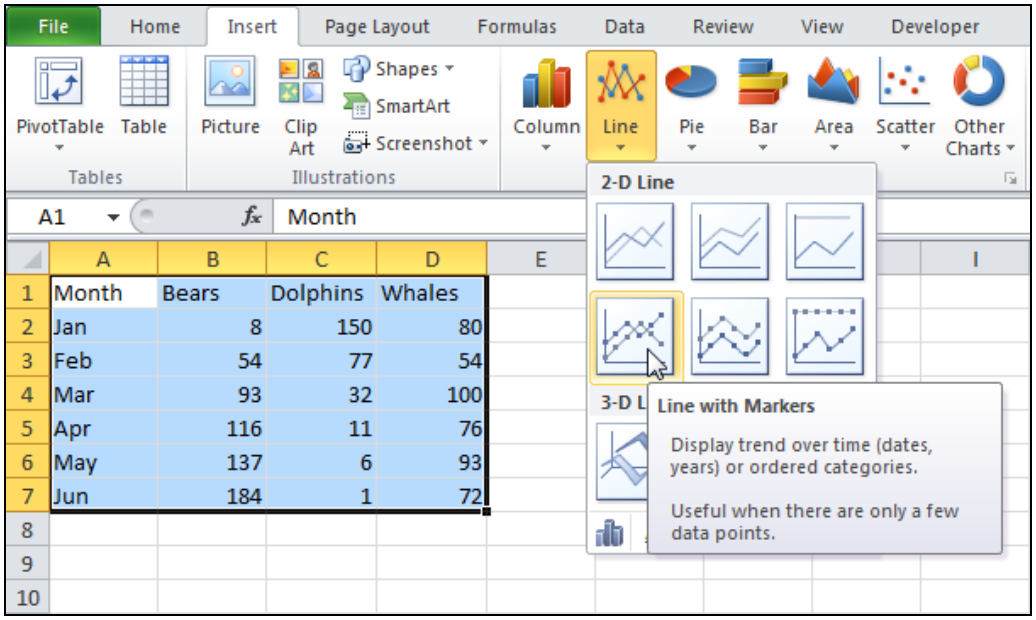



Figure 6.9 Create a Chart

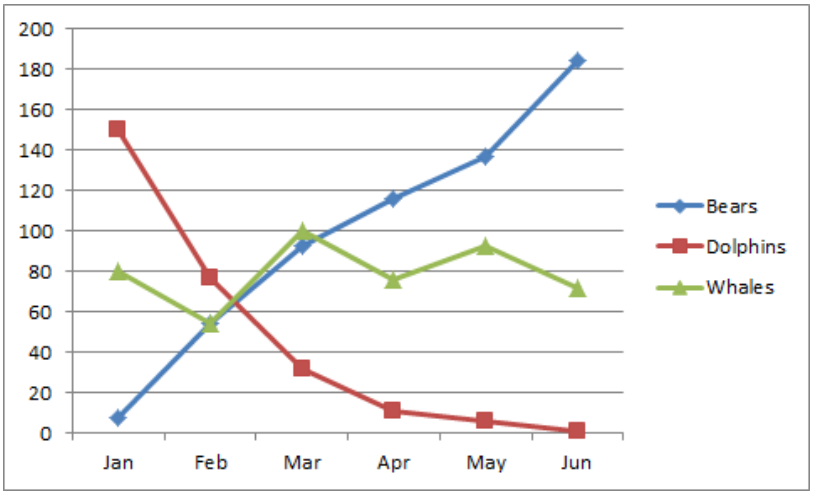



Figure 6.10 Result

You can easily change to a different type of chart at any time.

1. Select the chart.

2. On the Insert tab, in the Charts group, choose Column, and select Clustered Column.

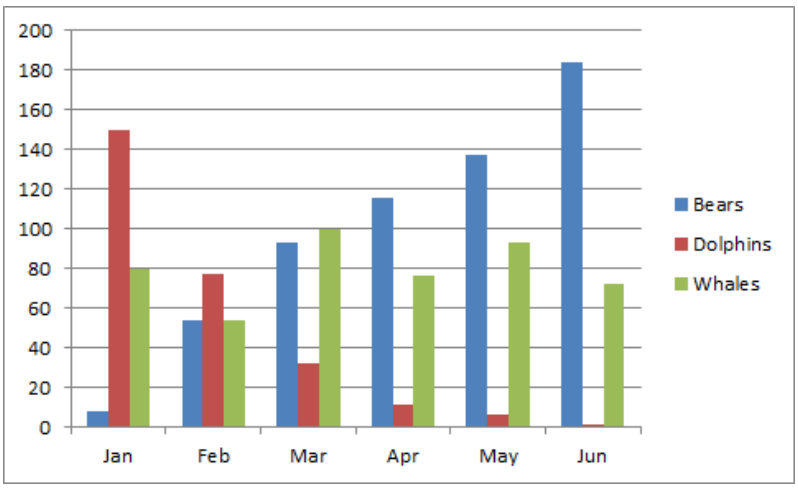


Figure 6.11 Change Chart Type

*Switch Row/Column*

If you want the animals, displayed on the vertical axis, to be displayed on the horizontal axis instead, execute the following steps.

1. Select the chart. The Chart Tools contextual tab activates.
2. On the Design tab, click Switch Row/Column.

*Chart Title*

To add a chart title, execute the following steps.

1. Select the chart. The Chart Tools contextual tab activates.
2. On the Layout tab, click Chart Title, Above Chart.
3. Enter a title. For example, Population

*Legend Position*

By default, the legend appears to the right of the chart. To move the legend to the bottom of the chart, execute the following steps.

1. Select the chart. The Chart Tools contextual tab activates.
2. On the Layout tab, click Legend, Show Legend at Bottom.

*Data Labels*

You can use data labels to focus your readers' attention on a single data series or data point.

1. Select the chart. The Chart Tools contextual tab activates.
2. Click an orange bar to select the Jun data series. Click again on an orange bar to select a single data point.
3. On the Layout tab, click Data Labels, Outside End.

# UNIT 7
# NETWORKS AND TELECOMMUNICATIONS

## 7. 1 Introduction to networks and telecommunications

### Networks

***Networks*** are a collection of computers and devices connected together. Using hardware and software, these interconnected computing devices can communicate with each other through defined rules of data communications. In a network, computers can exchange and share information and resources.

The purpose of a computer communications network is to allow moving information from one point to another inside the network.

Networks characterized based on their geographical coverage, speed, capacities. And networks are categorized based on the following characteristics:

- Network coverage: LAN, MAN, WAN
- Network topologies: how the computers are connected together
- Network technologies
- Network architecture.

### Network security

***Network security*** consists of provisions and policies adopted by the network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of the computer network and its network-accessible resources. Network security is the authorization of access to data in a network, which is controlled by the network administrator. Users are assigned an ID and password that allows them access to information and programs within their authority. Network security is used on a variety of computer networks, both public and private, to secure daily transactions and communications among businesses, government agencies and individuals.

### Telecommunications

The word ***telecommunications*** comes from the Greek prefix tele, which means distant, combined with the Latin word communicare, which means to share.

Telecommunications, also known as telecom, is the exchange of information over significant distances by electronic means and refers

to all types of voice, data and video transmission. This is a broad term that includes a wide range of information transmitting technologies such as telephones (wired and wireless), microwave communications, fiber optics, satellites, radio and television broadcasting, the internet and telegraphs.

A complete, single telecommunications circuit consists of two stations, each equipped with a transmitter and a receiver. The transmitter and receiver at any station may be combined into a single device called a transceiver. The medium of signal transmission can be via electrical wire or cable (also known as "copper"), optical fiber, electromagnetic fields or light. The free space transmission and reception of data by means of electromagnetic fields is called wireless communications.

**Types of telecommunications and networks**

The simplest form of telecommunications takes place between two stations, but it is common for multiple transmitting and receiving stations to exchange data among themselves. Such an arrangement is called a telecommunications network.

The ***internet*** is the largest example of a telecommunications network. On a smaller scale, examples include:

- Corporate and academic wide-area networks (WANs)
- Telephone networks
- Cellular networks
- Police and fire communications systems
- Taxi dispatch networks
- Groups of amateur radio operators
- Broadcast networks

Data is transmitted in a telecommunications circuit by means of an electrical signal called the carrier or the carrier wave. In order for a carrier to convey information, some form of modulation is required. The mode of modulation can be broadly categorized as either analog or digital.

In analog modulation, some aspect of the carrier is varied in a continuous fashion. The oldest form of analog modulation is amplitude modulation (AM), which is still used in radio broadcasting at some frequencies. Digital modulation actually predates analog modulation; the earliest form was Morse code. Modern telecommunications use IPs (internet protocols) to carry data across underlying physical transmissions.

**Telecommunications service providers**

Telecommunications systems are generally run by telecommunications service providers, also known as communications service providers. These providers historically offered telephone and related services and now offer a variety of internet and WAN services, as well as metropolitan area network and global services.

In many countries, telecom service providers were primarily government owned and operated, but that is no longer the case, and many have been privatized. The International Telecommunication Union is the United Nations agency that administers telecommunications and broadcasting regulations, although most countries also have their own government agencies to set and enforce telecommunications guidelines. In the United States, the Federal Communications Commission is the primary regulatory agency.

Within the large umbrella of companies that provide different types of telecommunications services are internet service providers, wireless service providers, radio and television broadcasters, cable companies, satellite television providers and managed service providers.

**Different Types of Networks**

There are many ways in which different networks can be classified, such as their size, capabilities and the geographical distance they cover. A network is simply a group of two or more computer systems linked together in some way so that they can share data between them. Different types of networks provide different services, and require different things to work properly.

Most network types are known as different types of ‘area’ networks – this is due to the history of networks, and dates back to the time when computer networks were defined by their literal scale. This is no longer always the case due to new technology. Some of the most common types of network you are likely to encounter are detailed here below:

**Local Area Network (LAN)**

This is one of the original categories of network, and one of the simplest. LAN networks connect computers together over relatively small distances, such as within a single building or within a small group of buildings.

Figure 7.1 Local Area Network (LAN)

Homes often have LAN networks too, especially if there is more than one device in the home. Often they do not contain more than one subnet, if any, and are usually controlled by a single administrator. They do not have to be connected to the internet to work, although they can be.

**Wide Area Network (WAN)**

This is another of the original categories of network, and slightly more complex in nature. WAN networks connect computers together over large physical distances, remotely connecting them over one huge network and allowing them to communicate even when far apart. The Internet is a WAN, and connects computers all around the world together.

LANs connect to WANs, such as the internet, using routers to transfer data and information quickly and securely. WANs are usually too large to be controlled by one administrator, and so usually have collective ownership, or in the case of the internet, is publicly owned.

**How do LANs and WANs connect?**

LANs, such as those within a private home, usually have a modem in their residence which is connected to an Internet Service Provider. This provider assigns an IP address to the modem, which is a unique number that is given to all devices capable of connecting to the internet, including any computers, phones or consoles within the home too. While all devices in LAN can communicate with each other without using the internet, if a device wants to communicate with another which is on another LAN, they can connect to the internet and send information over the WAN.

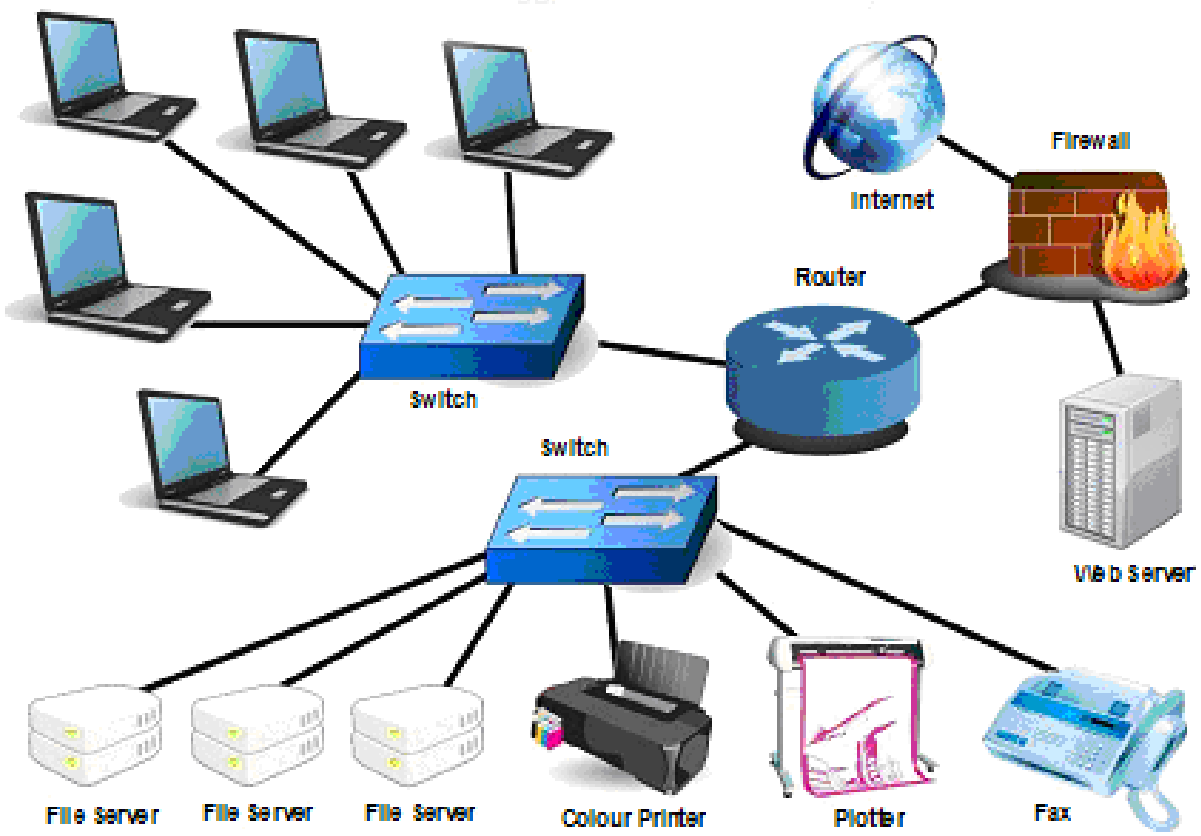



Figure 7.2 Wide Area Network (WAN)

This is achieved using a router, which receives data from devices and routes it down the quickest virtual path to its destination, going through a number of gateways on the way. First a central gateway, which divides the LAN from the WAN, and then others which send the data from one to the next, until it arrives at its final destination – the other device which is being communicated with. This all happens at a very fast speed over modern broadband modems, due to efficient and effective protocols and rules being established to control and manage data.

There are also other types of network you may encounter. Some of these are different, but most are simply developed from LAN and WAN networks to have slight difference and adapt to different user needs. These include:

***Metropolitan Area Network*** – This is a network which is larger than a LAN but smaller than a WAN, and incorporates elements of both. It typically spans a town or city and is owned by a single person or company, such as a local council or a large company.

**Topology LAN**

A local area network (LAN) is a group of computers and associated devices that share a common communications line or wireless link to a server. Typically, a LAN encompasses computers and peripherals connected to a server within a distinct geographic area such as an office or a commercial establishment. Computers and other mobile devices use a LAN connection to share resources such as a printer or network storage.

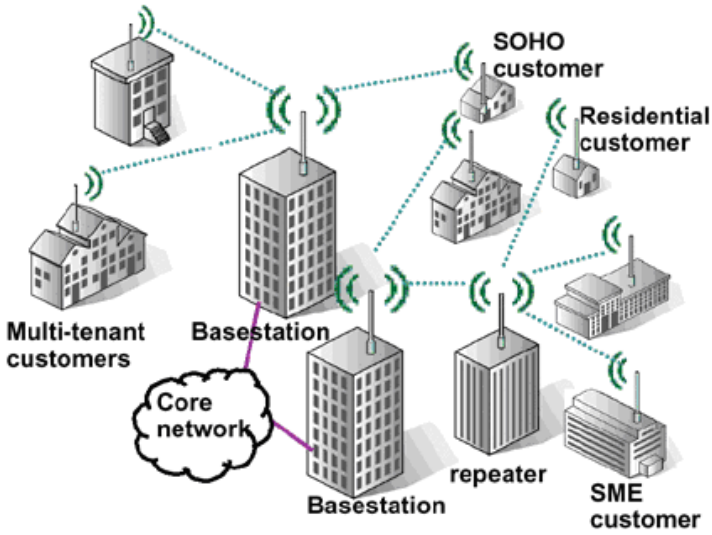



Figure 7.3 Metropolitan Area Network

A local area network may serve as few as two or three users (for example, in a small-office network) or several hundred users in a larger office. LAN networking comprises cables, switches, routers and other components that let users connect to internal servers, websites and other LANs via wide area networks.

Ethernet and Wi-Fi are the two primary ways to enable LAN connections. Ethernet is a specification that enables computers to communicate with each other. Wi-Fi uses radio waves to connect computers to the LAN. Other LAN technologies, including Token Ring, Fiber Distributed Data Interface and ARCNET, have lost favor as Ethernet and Wi-Fi speeds have increased. The rise of virtualization has fueled the development of virtual LANs, which allows network administrators to logically group network nodes and partition their networks without the need for major infrastructure changes.

Typically, a suite of application programs can be kept on the LAN server. Users who need an application frequently can download it once and then run it from their local device. Users can order printing

and other services as needed through applications run on the LAN server. A user can share files with others stored on the LAN server; read and write access is maintained by a network administrator. A LAN server may also be used as a web server if safeguards are taken to secure internal applications and data from outside access.

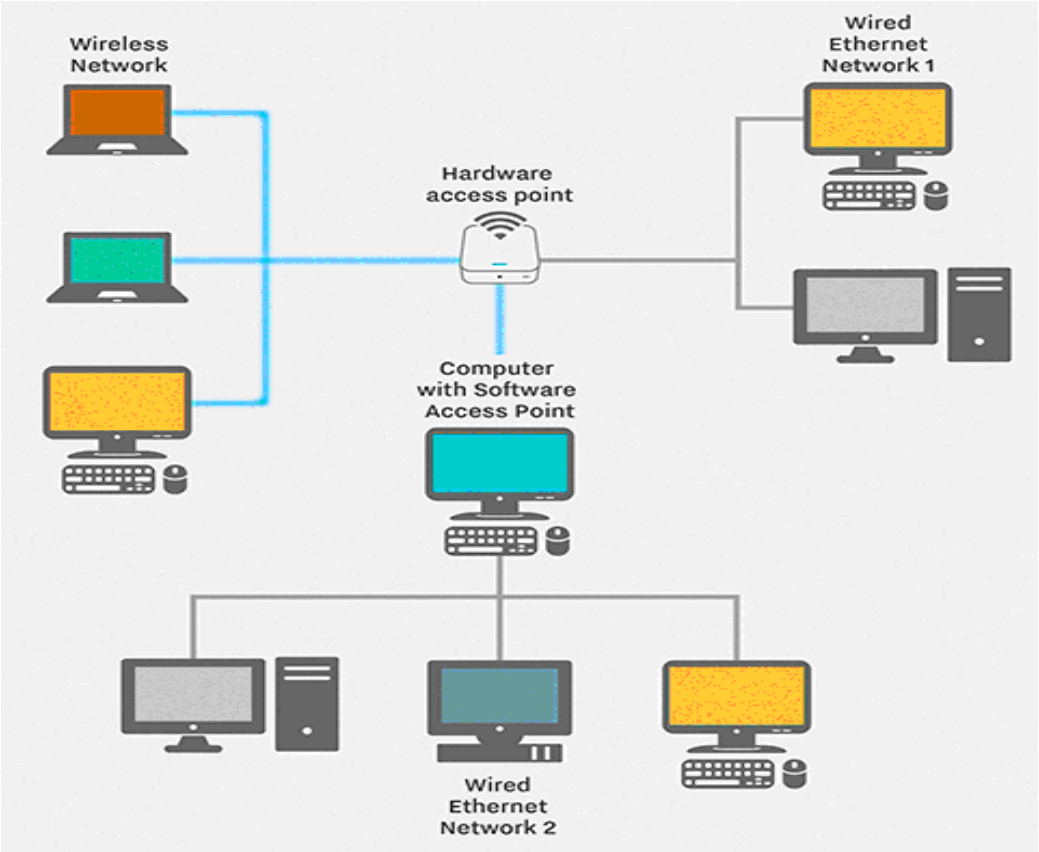



Figure 7.4 Ethernet

In some situations, a wireless LAN, or Wi-Fi, may be preferable to a wired LAN connection because of its flexibility and cost. Companies are assessing WLANs as primary means of connectivity as the number of smartphones, tablets and other mobile devices proliferates.

## 7.2 Types of topologies

### LAN network topologies

There are two types of topologies: ***Physical and Logical***. The physical topology of a network refers to the layout of cables, computers and other peripherals. Try to imagine yourself in a room

with a small network, you can see network cables coming out of every computer that is part of the network, then those cables plug into a hub or switch. What you're looking at is the physical topology of that network !

Logical topology is the method used to pass the information between the computers. In other words, looking at that same room, if you were to try to see how the network works with all the computers talking (think of the computers generating traffic and packets of data going everywhere on the network) you would be looking at the logical part of the network. The way the computers will be talking to each other and the direction of the traffic is controlled by the various protocols (like Ethernet) or, if you like, rules.

If we used token ring, then the physical topology would have to change to meet the requirements of the way the token ring protocol works (logically).

If it's all still confusing, consider this: The physical topology describes the layout of the network, just like a map shows the layout of various roads, and the logical topology describes how the data is sent accross the network or how the cars are able to travel (the direction and speed) at every road on the map.

The most common types of physical topologies, which we are going to analyze, are: Bus, Hub/Star and Ring

**The Physical Bus Topology**

Bus topology is fairly old news and you probably won't be seeing much of these around in any modern office or home.

With the Bus topology, all workstations are connect directly to the main backbone that carries the data. Traffic generated by any computer will travel across the backbone and be received by all workstations. This works well in a small network of 2-5 computers, but as the number of computers increases so will the network traffic and this can greatly decrease the performance and available bandwidth of your network.

As you can see in the above example, all computers are attached to a continuous cable which connects them in a straight line. The arrows clearly indicate that the packet generated by Node 1 is transmitted to all computers on the network, regardless the destination of this packet.

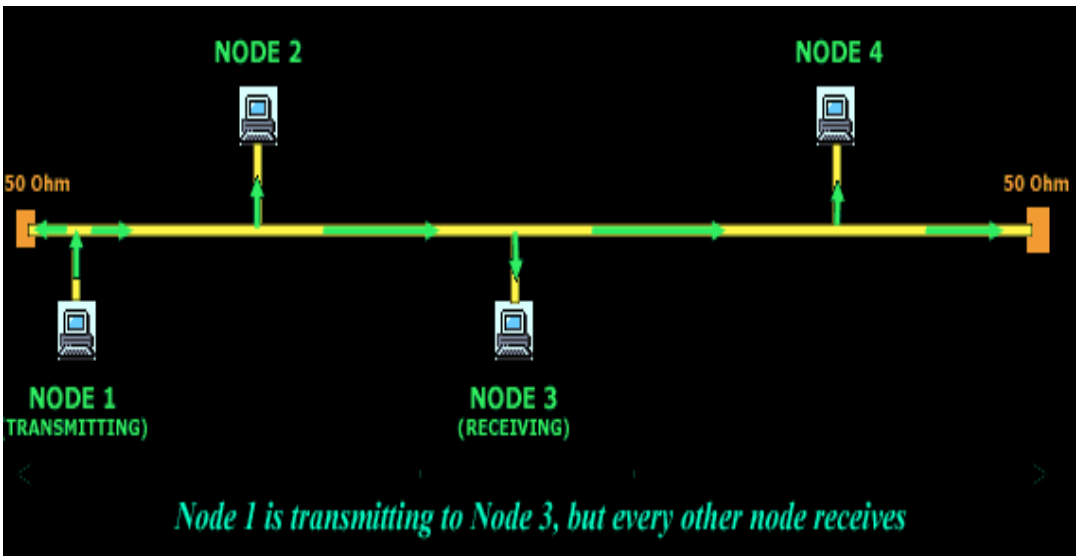



Figure 7.5 Bus Topology

Also, because of the way the electrical signals are transmitted over this cable, its ends must be terminated by special terminators that work as "shock absorbers", absorbing the signal so it won't reflect back to where it came from. The value of 50Ohms has been selected after carefully taking in consideration all the electrical characteristics of the cable used, the voltage that the signal which runs through the cables, the maximum and minimum length of the bus and a few more.

If the bus is damaged anywhere in its path, then it will most certainly cause the network to stop working or, at the very least, cause big communication problems between the workstations.

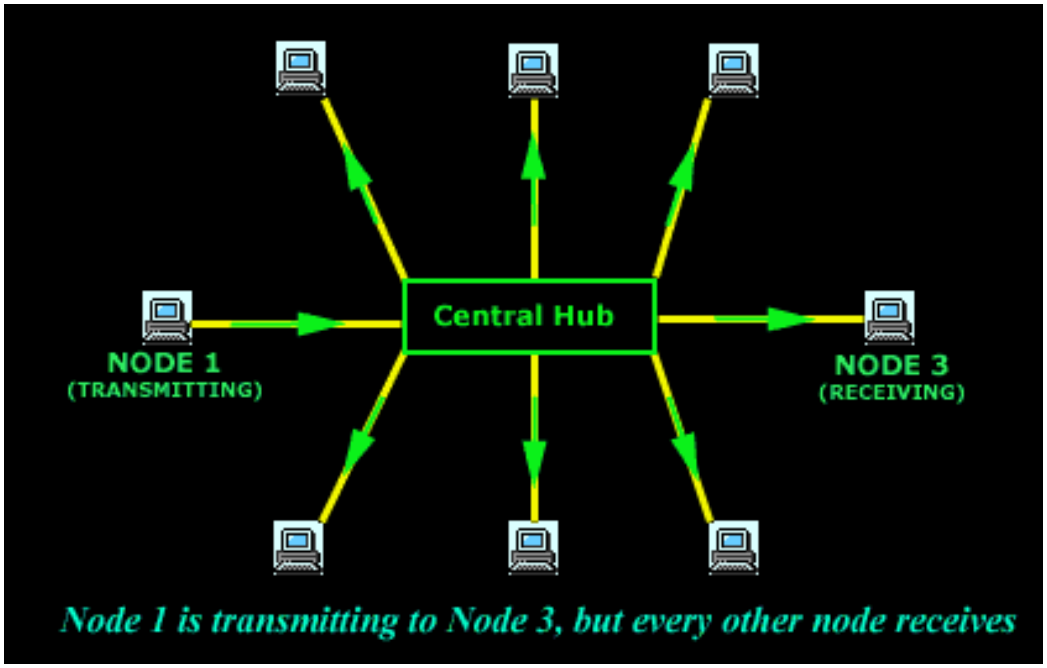



Figure 7.6 Star or Hub Topology

**The Physical Hub Or Star Topology**

The Star or Hub topology is one of the most common network topologies found in most offices and home networks. It has become very popular in contrast to the bus type (which we just spoke about), because of the cost and the ease of troubleshooting.

The disadvantage of using this topology is that because each computer is connected to a central hub or switch, if this device fails, the entire network fails!

**The Physical Ring Topology**

In the ring topology, computers are connected on a single circle of cable. Unlike the bus topology, there are no terminated ends.

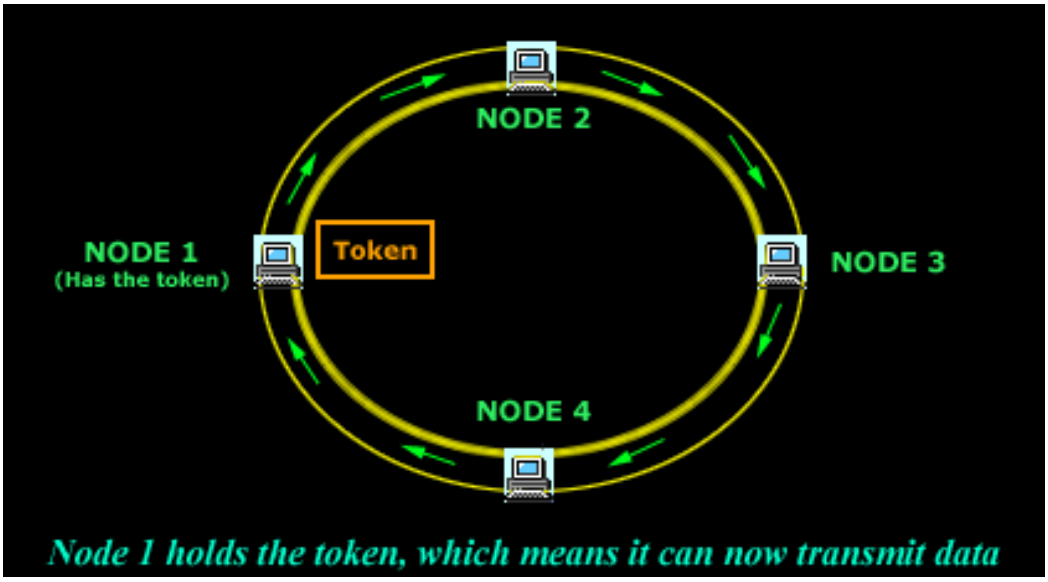



Figure 7.7 Ring Topology

The signals travel around the loop in one direction and pass through each computer, which acts as a repeater to boost the signal and send it to the next computer. On a larger scale, multiple LANs can be connected to each other in a ring topology by using Thicknet coaxial or fiber-optic cable.

The method by which the data is transmitted around the ring is called token passing. IBM's token ring uses this method. A token is a special series of bits that contains control information. Possession of the token allows a network device to transmit data to the network. Each network has only one token.

**The Physical Mesh Topology**

In a mesh topology, each computer is connected to every other computer by a separate cable. This configuration provides redundant

paths through the new work, so if one computer blows up, you don't lose the network. On a large scale, you can connect multiple LANs using mesh topology with leased telephone lines, Thicknet coaxial cable or fiber optic cable.

Again, the big advantage of this topology is its backup capabilities by providing multiple paths through the network.

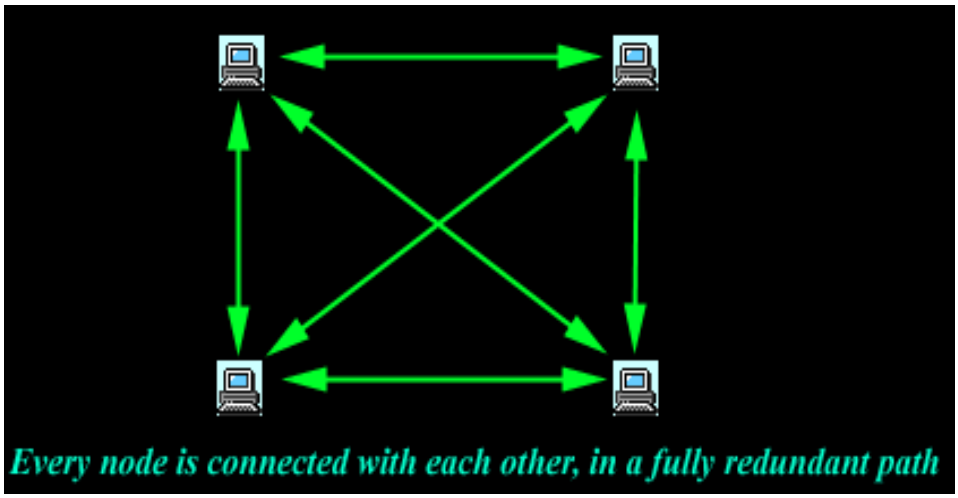



Figure 7.8 Mesh Topology

**The Physical Hybrid Topology**

With the ***hybrid topology***, two or more topologies are combined to form a complete network. For example, a hybrid topology could be the combination of a star and bus topology. These are also the most common in use.

**Star-Bus**

In a ***star-bus topology***, several star topology networks are linked to a bus connection. In this topology, if a computer fails, it will not affect the rest of the network. However, if the central component, or hub, that attaches all computers in a star, fails, then you have big problems since no computer will be able to communicate.

**Star-Ring**

In the Star-Ring topology, the computers are connected to a central component as in a star network. These components, however, are wired to form a ring network.

Like the star-bus topology, if a single computer fails, it will not affect the rest of the network. By using token passing, each computer in a star-ring topology has an equal chance of communicating. This allows for greater network traffic between segments than in a star-bus topology.

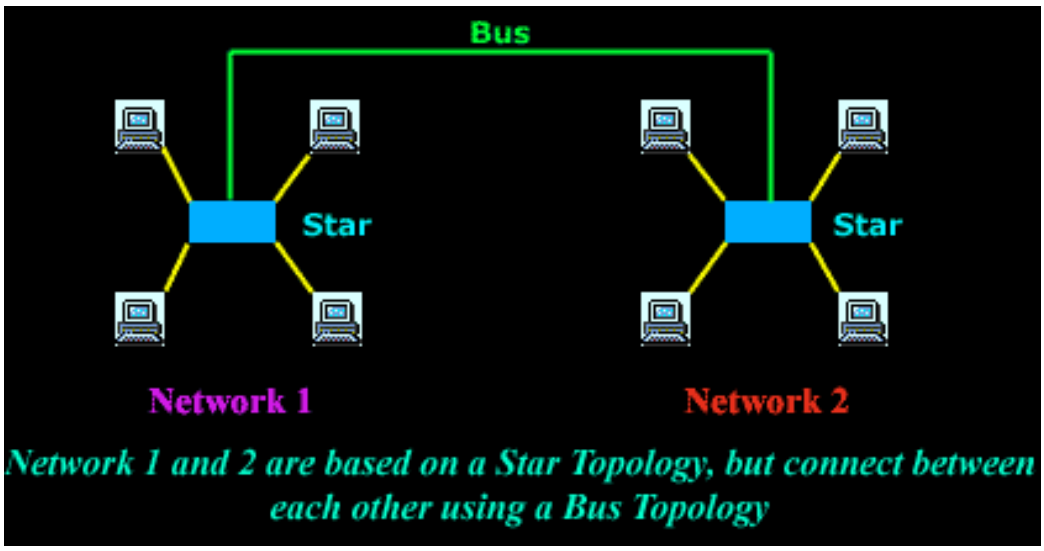



Figure 7.9 Hybrid – Star Bus Topology

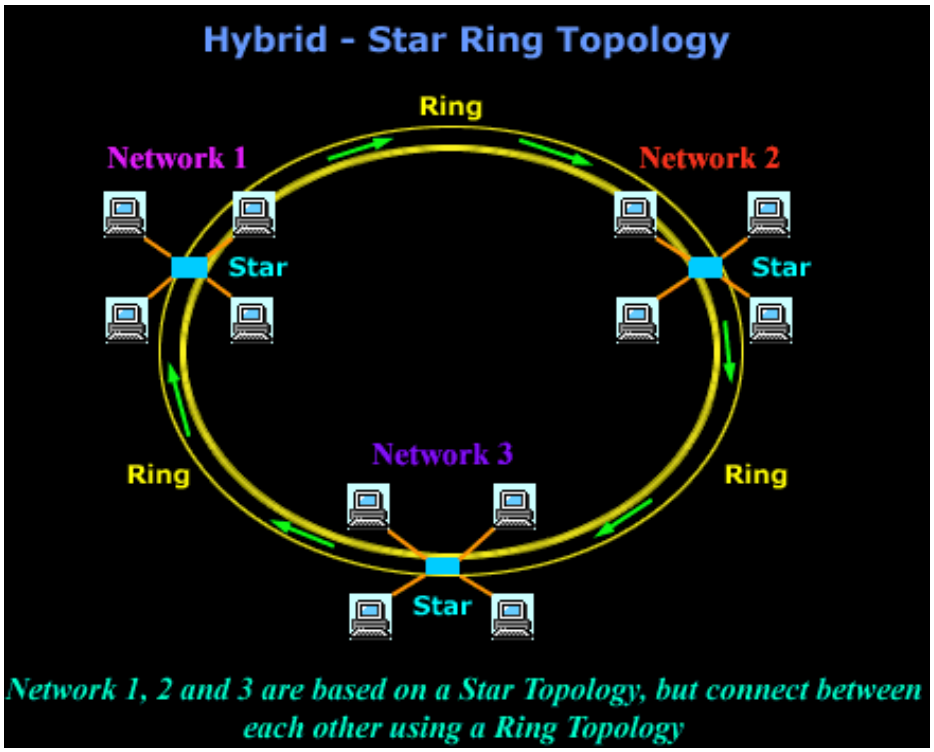



Figure 7.10 Hybrid – Star Ring Topology

**Control questions:**

1. What is the a network?
2. What are its hardware components?
3. What is the difference between a local area network and a wide area network?
4. What advantages do you think networks have?
5. How many topologies do you know?

**Exercise 7.1**

With the help of the diagrams identify these hardware components of the network.

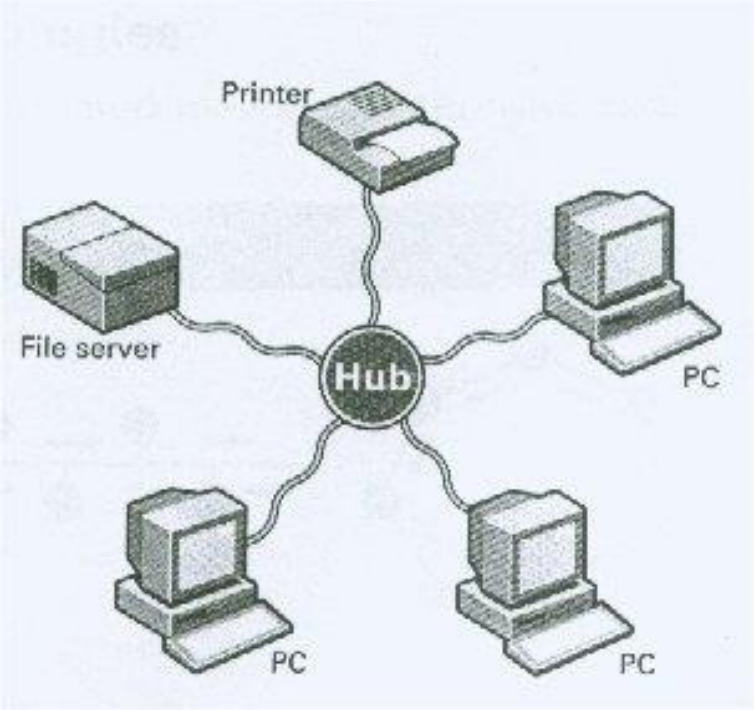



Figure 7.11 Hardware components of the network

1. _____ Most networks have at least one central computer which all the desktop computers connect to. This is the most important computer on your network. It stores the data files and application software programs that the users need to access or share with others.
2. _____ This is the desktop or notebook computer on your desk. It is linked to the server, and can access files and applications on it. Each computer on the network has a device called a network interface card which connects the computer to the network. Many computers come with these cards fitted as standard.
3. _____ Once you have a network you can share any number of these, including printers, scanners, CD-ROM drivers, and backup devices.
4. _____ Desktops typically connect via telephone-type cabling to this intermediary device, which enables communication between servers and desktops.

**Exercise 7.2**

Study these diagrams. They show four network topologies. Try to match each diagram with the correct name

**1 ring** **2 bus** **3 star** **4 mesh**

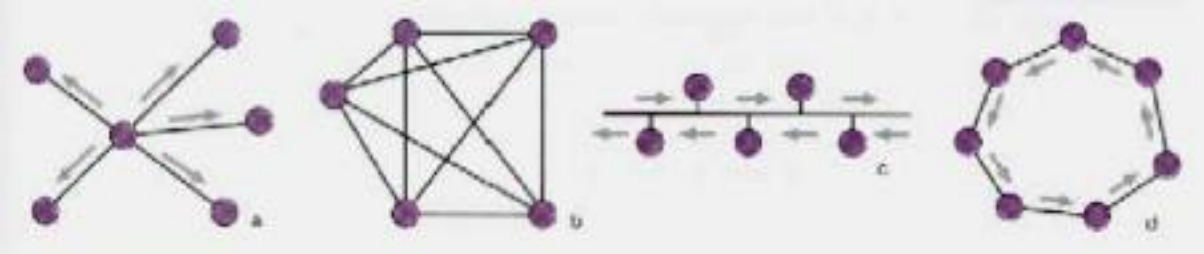


Figure 7.12 Network topologies

**Exercise 7.3**

Complete this dialogue with the words in the box

| | | | | |
|---|---|---|---|---|
| about | change | devices | necessary | problem |
| speed | should | user | what | |

Aidar: I have a problem with the network download (1) _____. What can you suggest?

Ashat: Why don't you (2) _____ the hub?

Aidar: I don't think that will work. The hub is fine.

Ashat: OK. How (3) _____ adding a repeater then?

Aidar: Hmm, I'm not sure it will help. It's not a (4) _____ with the signal strength.

Ashat: OK, then you should check the cables and network (5) _____ to make sure that they are compatible with your network.

Aidar: (6) _____ about changing the modem?

Ashat: I don't think it's (7) _____. I think it's a problem with the bridge, switch or the router. You (8) look at the specifications.

Aidar: OK, I will. Thanks for your help.

Ashat: Why don't you check (9) _____ recommendations on the Internet as well?

Aidar: Good idea. I'll do that.

**Exercise 7.4**

What computer networks do you use in your work or studies? What do you use the networks for? How do you access the networks?

**Exercise 7.5**

Read Katharina's email to Agatha. Complete this email the words in the box.

| | | | |
|---|---|---|---|
| Equipment | Internet | LAN | recommend |
| remote | Should | VPN | WAN |

***Dear Agatha***

Following our meeting last week, please find my recommendations for your business. I think you (1) _____ set up a LAN, or Local Area Network, and a WAN, or Wide Area Network, for your needs. A (2) _____ connects devices over a small area, for example your apartment and the shop. In addition, you should connect office (3) _____, such as the printer, scanner and fax machine, to your LAN because you can then share these devices between users.

I'd recommend that we connect the LAN to a (4) _____ so you can link to the Internet and sell your products. In addition, I'd _____ we set up a Virtual Private Network so that you have a (6) _____ access to your company's LAN, when you travel.

(7) _____ is a private network that uses a public network, usually the (8) _____, to connect remote sites or users together.

Let's meet on Friday to discuss these recommendations.

*Best regards*

*Katharina*.

**Exercise 7.6**

With the help of this diagram, try to describe the function of these components of a typical network system:

1 a file server
2 a bridge
3 a router
4 a backbone
5 a LAN
6 a gateway
7 a modem

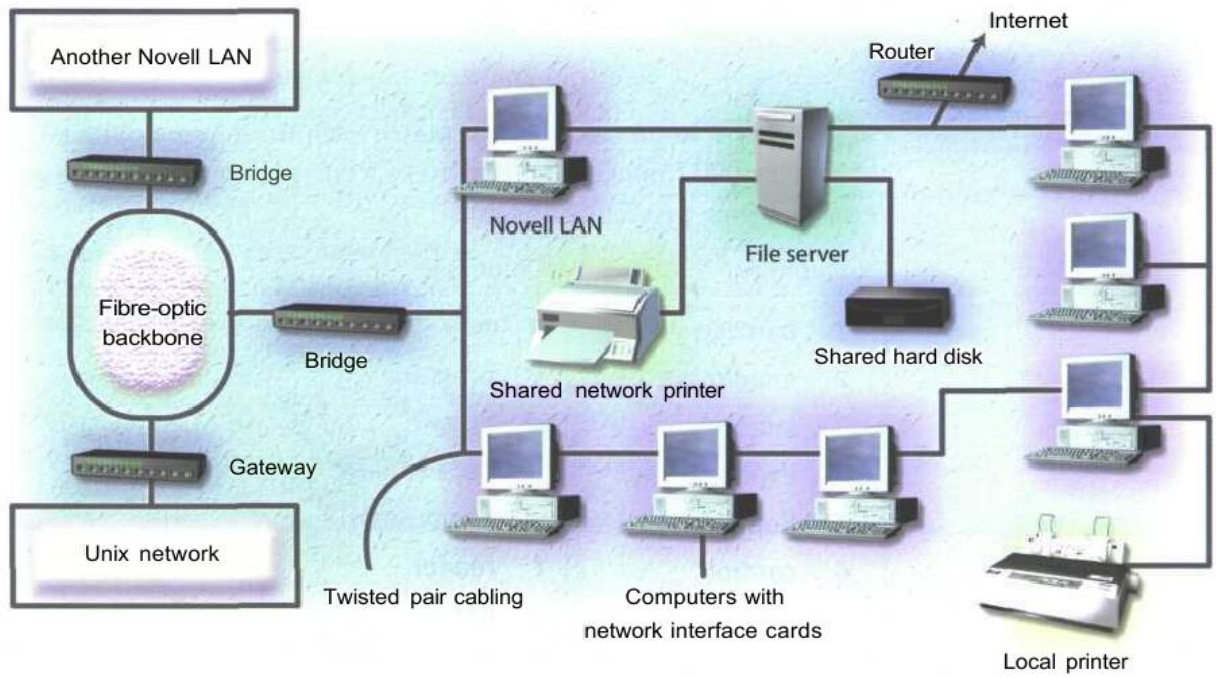



Figure 7.13 Components of a typical LAN

# UNIT 8
# CYBER SECURITY

## 8.1 Introduction to Cybersecurity

***Cybersecurity*** is the practice of defending computers and servers, mobile devices, electronic systems, networks and data from malicious attacks. It is also known as information technology security or electronic information security. The term is broad-ranging and applies to everything from computer security to disaster recovery and end-user education.

The threats countered by cyber-security are three-fold:***Cyber crime***, which includes single actors or groups targeting systems for financial gain; ***Cyber war***, which often involves information gathering and is politically motivated; and ***Cyber terror***, which is intended to undermine electronic systems and cause panic or fear.

Common methods used by attackers to control computers or networks include *viruses, worms, spyware and Trojans.* Viruses and worms can self-replicate and damage files or systems, while spyware and Trojans are often used for surreptitious data collection. The average user typically comes in contact with malicious code via an unsolicited email attachment or by downloading programs that look legitimate, but in fact carry a malware payload.

First, cyber security relies on cryptographic protocols used to encrypt emails, files and other critical data. This not only protects information that is transmitted but also guards against loss or theft. In addition, end user security software scans computers for pieces of malicious code, quarantines this code and then removes it from the machine. In more extreme cases — such as a boot sector infection — these systems are able to completely wipe a computer.

Electronic security protocols also focus on malware detection — ideally in real time. Many use what's known as "heuristic analysis" to evaluate the behavior of a program in addition to its code, helping to defend against viruses or Trojans that can change their shape with each execution (polymorphic and metamorphic malware). By allowing potentially malicious programs to execute in a virtual bubble separate from a user's network, security programs can analyze any action taken and increase their knowledge of malicious code behavior.

Cybersecurity is the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organization and user's assets.

Organization and user's assets include connected computing devices, personnel, infrastructure, applications, services, telecommunications systems, and the totality of transmitted and/or stored information in the cyber environment.

Cybersecurity strives to ensure the attainment and maintenance of the security properties of the organization and user's assets against relevant security risks in the cyber environment. The general security objectives comprise the following:

- Availability
- Integrity, which may include authenticity and non-repudiation
- Confidentiality

***Availability***

For any information system to serve its purpose, the information must be available when it is needed. This means that the computing systems used to store and process the information, the security controls used to protect it, and the communication channels used to access it must be functioning correctly. High availability systems aim to remain available at all times, preventing service disruptions due to power outages, hardware failures, and system upgrades. Ensuring availability also involves preventing denial-of-service attacks, such as a flood of incoming messages to the target system essentially forcing it to shut down.

***Integrity***

In information security, data integrity means maintaining and assuring the accuracy and completeness of data over its entire life-cycle. This means that data cannot be modified in an unauthorized or undetected manner. Information security systems typically provide message integrity in addition to data confidentiality.

***Non-repudiation***

In law, non-repudiation implies one's intention to fulfill their obligations to a contract. It also implies that one party of a transaction cannot deny having received a transaction nor can the other party deny having sent a transaction. Note: This is also regarded as part of Integrity.

***Confidentiality***

In information security, confidentiality "is the property, that information is not made available or disclosed to unauthorized individuals, entities, or processes" (Except ISO27000).

**Cybersecurity is an evolving discipline** focused on providing the best protection for electronic systems in the face of evolving threats.

## 8.2 Classifications of threats of Computer Information

Cybersecurity involves protecting information and systems from **major cyber threats**, such as cyber terrorism, cyber warfare, and cyber espionage. In their most disruptive form, cyber threats take aim at secret, political, military, or infrastructural assets of a nation, or its people. Cyber security is therefore a critical part of any governments' security strategy.

***Cyber Terrorism***

Cyber terrorism is the disruptive use of information technology by terrorist groups to further their ideological or political agenda. This takes the form of attacks on networks, computer systems, and telecommunication infrastructures.

***Cyber Warfare***

Cyber warfare involves nation-states using information technology to penetrate another nation's networks to cause damage or disruption. Cyber warfare attacks are primarily executed by hackers who are well trained in exploiting the intricacies of computer networks and operate under the auspices and support of the nation-states. Rather than "shutting down" a target's key networks, a cyber warfare attack may intrude networks for the purpose of compromising valuable data, degrading communications, impairing infrastructural services such as transportation and medical services, or interrupting commerce.

***Cyber Spionage***

Cyber spionage is the practice of using information technology to obtain secret information without permission from its owners or holders. Cyber espionage is most often used to gain strategic, economic, political, or military advantage. It is conducted through the use of cracking techniques and malware.

With cyber threats in a state of rapid and continuous evolution, keeping pace in cyber security strategy and operations is a major challenge to governments. Cyber security is a serious concern to private enterprise as well, given the threat to intellectual property and privately-held critical infrastructure.

## 8.3 Types of Computer Security Threats

The classification of the types of information security threats is made on the way the information in the system is compromised upon. There are the passive threats and the active threats. The passive threats are very difficult to detect and equally difficult to prevent as well. Then there are the active threats. Since these threats continue to make changes to the system, they are easy to find out and fix as well.

**Virus:** The most common of the types of cyber threats are the viruses. They infect different files on the computer network or on the stand alone systems. Most people fall prey to the viruses, as they trick the person into taking some action, like clicking on a malicious link, downloading a malicious file, etc. It is from these links and files, that the virus is transmitted to the computer. There are also cases of the viruses been a part of an email attachment, which may be downloaded from the internet. In some cases, the viruses can also spread through infected portable data storage as well. Hence, it is important to have an antivirus on the system, which can not only detect the virus, but be able to get rid of them as well.

There are different types of viruses which can be classified according to their origin, techniques, types of files they infect, where they hide, the kind of damage they cause, the type of operating system, or platform they attack. Let us have a look at few of them.

***Memory Resident Virus***

These viruses fix themselves in the computer memory and get activated whenever the OS runs and infects all the files that are then opened. This type of virus hides in the RAM and stays there even after the malicious code is executed. It gets control over the system memory and allocates memory blocks through which it runs its own code, and executes the code when any function is executed.

***Direct Action Virus***

The main purpose of this virus is to replicate and take action when it is executed. When a specific condition is met, the virus will go into action and infect files in the directory or folder that are specified in the AUTOEXEC.BAT file path. This batch file is always located in the root directory of the hard disk and carries out certain operations when the computer is booted. FindFirst/FindNext technique is used where the code selects a few files as its victims. It also infects the external devices by copying itself on them.

***Overwrite Viruses***

A virus of this kind is characterized by the fact that it deletes the information contained in the files that it infects, rendering them partially or totally useless once they have been infected.

***Boot Sector Virus***

This type of virus affects the boot sector of a hard disk. This is a crucial part of the disk, in which information of the disk itself is stored along with a program that makes it possible to boot (start) the computer from the disk. This type of virus is also called Master Boot Sector Virus or Master Boot Record Virus.

***Macro Virus***

Macro viruses infect files that are created using certain applications or programs that contain macros, like .doc, .xls, .pps, etc. These mini-programs make it possible to automate series of operations so that they are performed as a single action, thereby saving the user from having to carry them out one by one. These viruses automatically infect the file that contains macros, and also infects the templates and documents that the file contains. It's referred to as a type of e-mail virus.

***Polymorphic Virus***

Polymorphic viruses encrypt or encode themselves in a different way (using different algorithms and encryption keys) every time they infect a system. This makes it impossible for antivirus software to find them using string or signature searches (because they are different in each encryption). The virus then goes on to create a large number of copies.

***Companion Virus***

Companion viruses can be considered as a type of file infector virus, like resident or direct action types. They are known as companion

viruses because once they get into the system they 'accompany' the other files that already exist. In other words, to carry out their infection routines, companion viruses can wait in memory until a program is run (resident virus), or act immediately by making copies of themselves (direct action virus).

***Web Scripting Virus***

Many web pages include complex codes in order to create an interesting and interactive content. This code is often exploited to bring about certain undesirable actions.

***Worms***

A worm is a program very similar to a virus; it has the ability to self-replicate and can lead to negative effects on your system. But they can be detected and eliminated by an antivirus software. They don't infect files or damage them, but they replicate so fast that the entire network may collapse.

***Trojans***

Trojans or Trojan horses, unlike viruses, do not reproduce by infecting other files, nor do they self-replicate like worms. In fact, it is a program which disguises itself as a useful program or application.

Beware of the fact that these viruses copy files in your computer (when their carrier program is executed) that can damage your data, and even delete it. The attacker can also program the trojans in such a manner that the information in your computer is accessible to them.

## 8.4 Anti-virus software

Antivirus software is used to prevent, detect, and remove malware. A variety of strategies are typically employed.

Signature-based detection involves searching for known malicious patterns in executable code. It is the most common method. To identify viruses and other malware, antivirus software compares the contents of a file to a dictionary of virus signatures. Because new viruses are being created each day, the signature-based detection approach requires frequent updates of the virus signature dictionary. Traditionally, antivirus software heavily relied upon signatures to identify malware. This can be very effective, but is not effective against new, unknown viruses.

To counter such so-called zero-day threats, heuristics can be used. One type of heuristic approach, generic signatures, can identify new viruses by looking for known malicious code in files.

File emulation is another heuristic approach. It involves executing a program in a virtual environment and logging what actions the program performs. The antivirus software can determine if the program is malicious or not and then carry out the appropriate disinfection actions.

Traditional antivirus software solutions run virus scanners on schedule, on demand and some run scans in real time. If a virus or malware is located the suspect file is usually placed into a quarantine to terminate its chances of disrupting the system. Installed antivirus software running on an individual computer is only one method of guarding against viruses. Other methods are also used, including firewalls and on-line scanners.

Network firewalls prevent unknown programs and Internet processes from accessing the system protected. They may protect against infection from outside the protected computer or LAN, and limit the activity of any malicious software by blocking incoming or outgoing requests on certain TCP/IP ports.

Some antivirus vendors maintain websites with free online scanning capability of the entire computer, critical areas only, local disks, folders or files. Examples include Kaspersky Online Scanner and ESET Online Scanner. Some other online sites provide only scanning of files uploaded by users.

Antivirus software can sometimes have drawbacks. Antivirus software can degrade computer performance. An incorrect user’s decision may lead to a security breach. If the antivirus software employs heuristic detection, success depends on achieving the right balance between false positives and false negatives.

Running multiple antivirus programs concurrently can degrade performance and create conflicts. It is sometimes necessary to temporarily disable virus protection when installing major updates such as Windows Service Packs or updating graphics card drivers.

The definition of good antivirus software has changed quite a lot over the past few years. It's not enough for an antivirus to be just quick and effective in detecting and eliminating threats. It must also consume minimal resources, run quietly in the background, and

update itself as often as possible without requiring any user intervention.

**Control questions:**

1. What is cybersecurity about?
2. What types of computer security threats do you know?
3. What is an antivirus software?
4. What are the general security objectives?
5. Name the classification of viruses.
6. How often should antivirus software be updated (the best way to protect computer)?

***Exercise 8.1***

Check out the Kaspersky Antivirus (Kaspersky Antivirus Security 10.0)

1. Launch Kaspersky Anti-Virus, click the Start button and selecting Programs / Kaspersky Anti-Virus (Kaspersky Antivirus Security 10). There will be opened the main window of Kaspersky Anti-Virus Protection mode (on the Security tab).
2. In the Kaspersky Anti-Virus refer to the components of the main functions of the program and its settings.
3. Check for Updates (date and update methods) anti-virus database. Kaspersky Anti-Virus has a built-in scheduler to automatically update antivirus databases, so the program periodically checks for new anti-virus databases on Kaspersky Lab's servers.
4. But if you run the automatic update of anti-virus databases via the Internet is not possible, you can use the anti-virus database released in ZIP-archives. Archives with anti-virus database are regularly laid out on the Kaspersky Lab website in the zips directory.
5. After downloading, unpack the archive * cumul.zip (a full set of anti-virus database has av-i386-cumul.zip name - is all updates released till the last Sunday) is made in a separate folder. When configuring an update as the update source specified folder with the unpacked archive * cumul.zip.
6. Update the anti-virus database. To do this, in the main window, click on the tab (button) Update in the right frame

that opens, click on the line "Update database". Anti-virus database is updated.

7. Install a floppy disk with files and folders in the drive to a floppy disk or USB flash drive (USB flash drive) to the USB-port.
8. In the main window of Kaspersky Anti-Virus 7.0 the Scan tab, scan removable drives and disc C: for viruses. Check scan results.
9. To scan a folder or file, right-click on the desired folder or file and from the context menu, select "Scan for Viruses". Check scan results.

***Exercise 8.2***

Check out the antivirus software avast! antivirus

1. Run the antivirus program avast! antivirus from the main menu, open window avast! antivirus.
2. In the review learn the basic elements: the menu (check the antivirus settings); icons: Select the folder, removable media, local hard drives; virus vault keys, iavs (to update the anti-virus database), resident scanner.
3. Update the anti-virus database by clicking on the icon iavs.
4. Install one of the removable storage media.
5. Scan removable media, using the window controls avast! antivirus.
6. Scan local drives, using the window controls avast! antivirus.
7. Scan folders, using the window controls avast! antivirus.
8. To scan a folder or file, right-click on the desired folder or file and in context menu select "Scan name folder or file."
9. Implement configuration-resident providers by clicking the left mouse button on the button A to the display panel. Open Access Scanner avast !, which is tuned 7-resident service providers or modules.

***Exercise 8.3***

File Scanning for viruses online

1. Go to the site https://www.virustotal.com/us/ Download any file from the disk. Check the file for the virus.
2. Record the result of the test and the algorithm of actions.
3. Describe 5 antivirus programs, fill out the table

| Name of antivirus program | Characteristics | Terms of use (paid/free) |
|---|---|---|
| | | |

***Exercise 8.4***

Work with the free software

1. Download from the official site https://www.avira.com/ru/free-security-suite free multifunctional software package Avira Free Security Suite, that prevents the tracking of your actions on the Internet, protects your privacy and allows you to significantly accelerate the execution of daily tasks.
2. Run the utility on your computer.
3. Wait for the database to load, cancel the database update.
4. Read the tabs of the program window: Area, Objects, Actions, Settings.
5. Set Scan Area - Drive D :, Objects - Extension Programs, Actions - Request for Treatment, Settings - Report File.
6. Start the scan.
7. After the scan is over, analyze the results.

# UNIT 9
# INTERNET TECHNOLOGIES

## 9.1 Internet

- Internet is a world-wide global system of interconnected computer networks.
- Internet uses the standard Internet Protocol TCP/IP.
- Every computer in internet is identified by a unique IP address.
- IP Address is a unique set of numbers suchas110.22.33.114 which identifies a computer location.
- A special computer DNS DomainNameServer is used to give name to the IP Address so that usercan locate a computer by a name.
- Internet is accessible to every user all over the world.

**Internet Advantages**

Internet covers almost every aspect of life, one can think of.

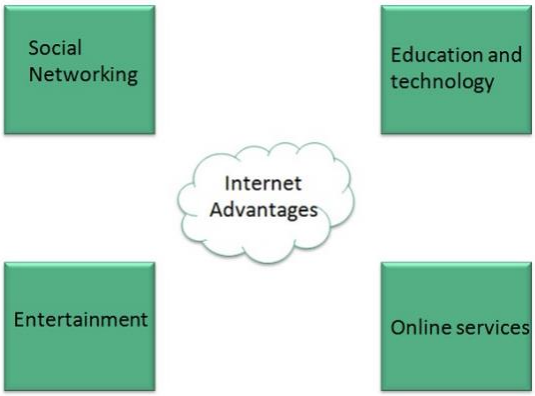



Figure 9.1Internet Advantages

**Internet Disadvantages**

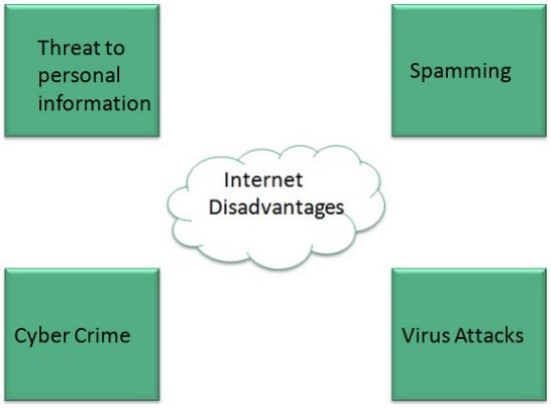



Figure 9.2Internet Disadvantages

## 9.2 TCP/IP Reference Model

TCP/IP model is practical model and is used in the Internet. TCP/IP is acronym of Transmission Control Protocol and Internet Protocol. The TCP/IP model combines the two layers PhysicalandDatalinklayer into one layer i.e. Host-toNetwork layer. The following diagram shows the various layers of TCP/IP model:

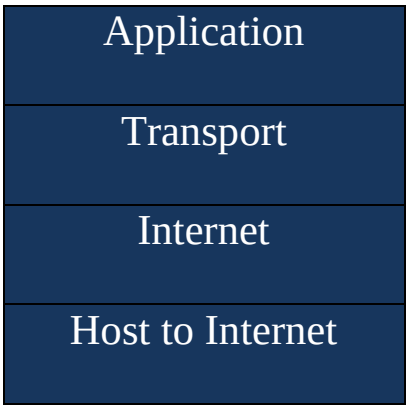



Figure 9.3 TCP/IP model

**ApplicationLayer**

This layer is same as that of the OSI model and performs the following functions: It provides different services such as manipulation of information in several ways, retransferring the files of information, distributing the results etc. The functions such as LOGIN or password checking are also performed by the application layer.

Protocols used: TELNET, FTP, SMTP, DN, HTTP, NNTP are the protocols employed in this layer.

**Transport Layer**

It does the same functions as that of transport layer in OSI model. Here are the key points regarding transport layer: It uses TCP and UDP protocol for end to end transmission. TCP is reliable and connection oriented protocol. TCP also handles flow control. The UDP is not reliable and a connection less protocol also does not perform flow control.

Protocols used: TCP/IP and UDP protocols are employed in this layer.

**Internet Layer**

The function of this layer is to allow the host to insert packets into network and then make them travel independently to the destination.

However, the order of receiving the packet can be different from the sequence they were sent.

Protocols used: Internet Protocol IP is employed in Internet layer.

**Host-to-Network Layer**

This is the lowest layer in TCP/IP model. The host has to connect to network using some protocol, so that it can send IP packets over it. This protocol varies from host to host and network to network.

Protocols used: ARPANET, SATNET, LAN, packet radio are the protocols whichare used in this layer.

## 9.3 Domain Name System Architecture

The Domain name system comprises of Domain Names, Domain Name Space, Name Server that have been described below:

Domain Name is a symbolic string associated with an IP address. There are several domain names available; some of them are generic such as com, edu, gov, net etc, while some country level domain names such as au, in, za, us etc.

Table 9.1 Domain names

| **Administrative** | **Typeoforganization** | **Geographical** | **Country** |
|---|---|---|---|
| org, pro | Non-profit organization | kz | Kazakhztan |
| com, biz | Commercial | fr | France |
| edu | Education | ge | Germany |
| mil | Military | it | Italy |
| gov | Government agency | ru | Russia |
| net | Communication | uk | UnitedKingdom |
| int | International entity | us | USA |

**DomainNameSpace**

The domain name space refers a hierarchy in the internet naming structure. This hierarchy hasmultiple levels *from*0*to*127, with a root at the top. Each domain can be partitioned into subdomains and these can be further partitioned and so on.

1. Name Server

Name server contains the DNS database. This database comprises of various names and their corresponding IP addresses. Since it is not possible for a single server to maintain entire DNS database, therefore, the information is distributed among many DNS servers. Hierarchy of server is same as hierarchy of names. The entire name space is divided into the zones

2. Zones

Zone is collection of nodes subdomains under the main domain. The server maintains a database called zone file for every zone (figure 9.4). The information about the nodes in the sub domain is stored in the servers at the lower levelshowever; the original server keeps reference to these lower levels of servers.

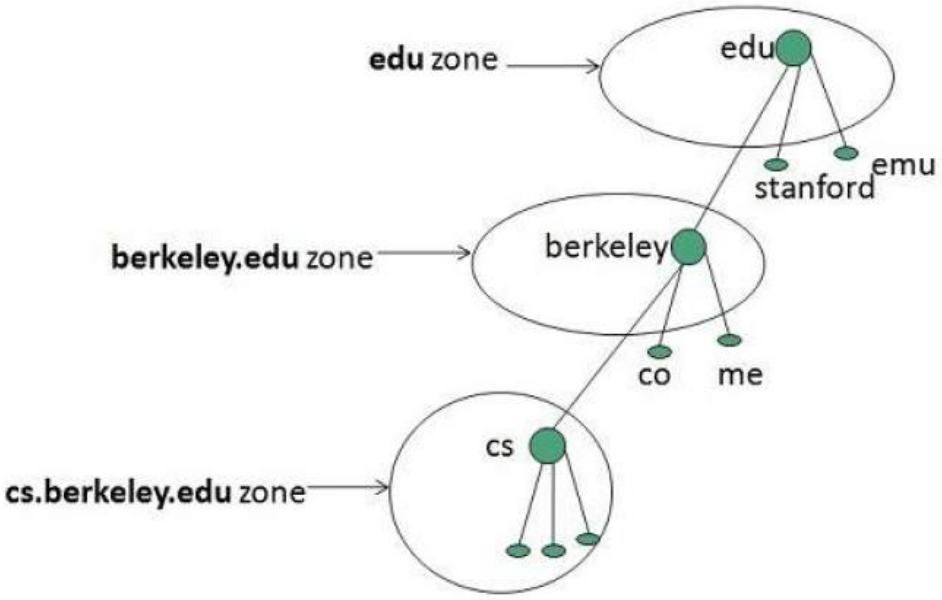



Figure 9.4 Zones and domains

## 9.4 Internet Services

### 1. Communication Services

There are various Communication Services available that offer exchange of information with individuals or groups (table 9.2).

Table 9.2 Thebrief introduction to Internetservices

| № | **Service Description** |
|---|---|
| 1. | **Electronic Mail**<br>Used to send electronic message over the internet. |

| | |
|---|---|
| 2. | **Telnet**<br>Used to log on to a remote computer that is attached to internet. |
| 3. | **Newsgroup**<br>Offers a forum for people to discuss topics of common interests. |
| 4. | **Internet Relay Chat *IRC***<br>Allows the people from all over the world to communicate in real time. |
| 5. | **Mailing Lists**<br>Used to organize group of internet users to share common information through e-mail. |
| 6. | **Internet Telephony *VoIP***<br>Allows the internet users to talk across internet to any PC equipped to receive the call. |
| 7. | **Instant Messaging**<br>Offers real time chat between individuals and group of people. |

## 2. Information Retrieval Services

There exist several Information retrieval services offering easy access to information present on the internet.

Table 9.3 Thebrief introduction to Internetservices

| № | Service Description |
|---|---|
| 1 | **File Transfer Protocol *FTP***<br>Enable the users to transfer files. |
| 2 | **Archie**<br>It's updated database of public FTP sites and their content. It helps to search a file by itsname. |
| 3 | **Gopher**<br>Used to search, retrieve, and display documents on remote sites. |
| 4 | **Very Easy Rodent Oriented Netwide Index to Computer Achieved**<br>VERONICA is gopher based resource. It allows access to the information resource storedon gopher's servers. |

## 3. Web Services

Web services allow exchange of information between applications on the web. Using web services,applications can easily interact with each other.

## Control questions:

1. What is TCP/IP Reference Model?
2. What does mean the architecture of domain names?

3. List the main Internet services.
4. Name Internet advantages and disadvantages.
5. Name the popular internet browsers.
6. What email servers do you use?

***Exercise 9.1***

I. Creating an Email Account

There are several different options for email providers. Some of the more popular providers are Gmail and Yahoo. Signing up for an email account is quick and simple. Here is how you sign up for a Yahoo account:

1. In your web browser, go to yahoo.com
2. Click the "Mail" button in the top right corner
3. Click "Create New Account" button in the box
4. Fill out the required information including your name, username, password, and a few other things.
5. Click "Create Account" button

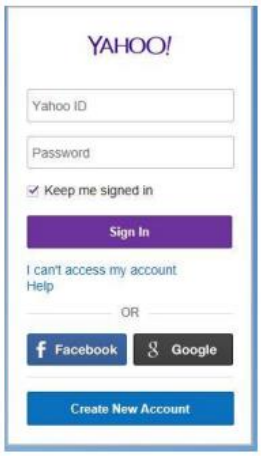



Figure 9.5 Creating account

II. Email Homepage Context

1. Navigation Box – where you compose and access all email folders, contacts, and other email functions. Navigation Box consist of:

- Inbox – the main email folder containing all received emails
- Contacts – contains all your contacts' information
- Calendar – input your events and set reminders to be sent to you
- Notepad – make notes or jot down things to remember later

- Messenger – Yahoo's instant messaging service
- Compose – write a new email • Drafts – contains emails you've started writing but haven't sent yet
- Sent – contains all emails you've sent
- Spam – contains unwanted and/or advertisement "junk" mail
- Trash – contains all emails you've deleted
- Folders – contains all folders that you create to organize your emails
- Recent – shows your recent email activity

2. Search Box – allows you to search for emails using key words or phrases.

3. Action Box – where you carry out organizational actions such as delete, print, and moving email to folders.

- Checkmark Box – allows you to checkmark all emails on the page
- Delete – send an email to the trash folder for deletion
- Move – move your emails to folders you've created
- Spam – mark an email as spam so any future emails from that address will be sent to the spam folder
- More – Mark emails as read or unread, print, and set filters
- View – allows you to sort email, open and close a preview pane, and change the line spacing of emails

4. Viewing Pane – where you see all the emails you have in a folder.

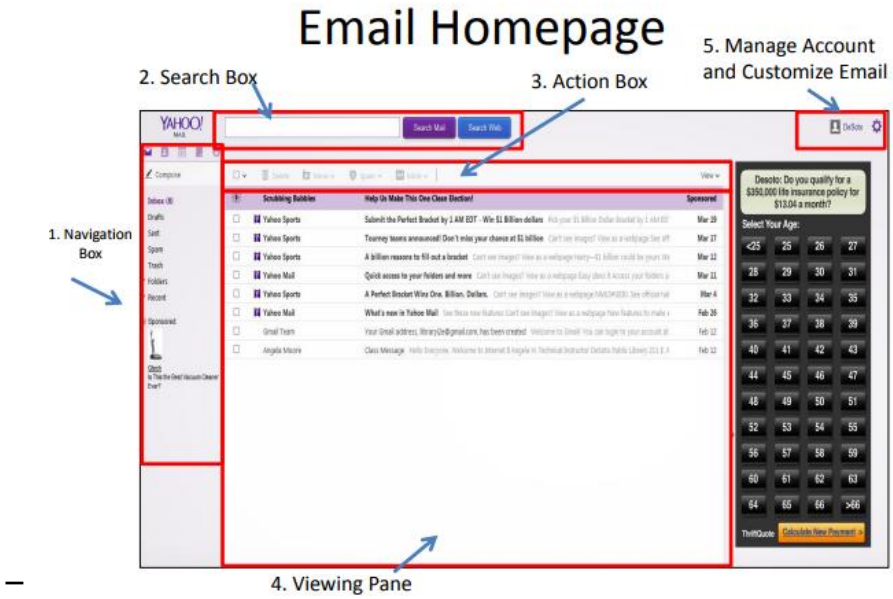
5. Manage Account & Customize Email – contains all your profile and account settings including themes, security, and email settings.

• Manage Account allows you to

- Upload a picture of yourself from Facebook or your computer
- Include information like your birthday, interests, and alternative contact info
- Manage your account info and profile privacy
- Sign out of your account

• Customize Email allows you to

- Change the background theme of your email
- Manage all email settings
- Get Help with Yahoo email




– Figure 9.6 Email Homepage

III. Composing An Email

1. From the navigation box, click Compose. This will open a window where you can compose an email.

2. Enter email addresses in the To line.

3. Access your CC and BCC options by clicking the CC button on the To line.

- CC (Carbon Copy) - adding email addresses to the CC line of an email is a way to send a copy of an email to someone who is not the main recipient. Use CC to keep people informed of topics they may have an interest in.
- BCC (Blind Carbon Copy) - adding email addresses to the BCC line of an email is a way to email multiple recipients without revealing their email addresses to other recipients. This is good idea if you want to protect the privacy of your contacts.

4. In the Subject line, write the main point of your email.

5. Click in the big white box below the “Subject” line. This is the Body of the message.

6. Write a greeting (Hello, Hey, Hi, etc.), write your message, and include a closing at the end (Thanks, Sincerely, etc.) with your name and if appropriate a signature with contact information.

7. Edit your text using the options at the bottom of the box, attach files, spell check, and add emoticons

8. Click the Send button.

IV. Attaching a File

*Method 1*

- Click on the paper clip icon next to the send button
- The Windows Explorer dialog box pops up to your folders
- Click on Documents to choose a file, Pictures to choose a picture, Music to choose music, and Video to choose a video. Select the file you want and click Open.

*Method 2*

- Drag and Drop files is now a feature of Yahoo email
- Open Windows Explorer
- Choose a document, picture, music file, or video
- Drag and drop it into the email

Reading & Replying to an Email

- Reply – send email back to the person who sent it only
- Reply all/Reply to Conversation – send email back to everyone that the email was sent to
- Forward – send a copy of the email to someone else
- Spam – allows you to report an email as a hacked account or phishing scam
- More – allows you to mark as unread, read, starred, and print
- Collapse All/Expand All – minimizes multiple messages in one email for easier viewing

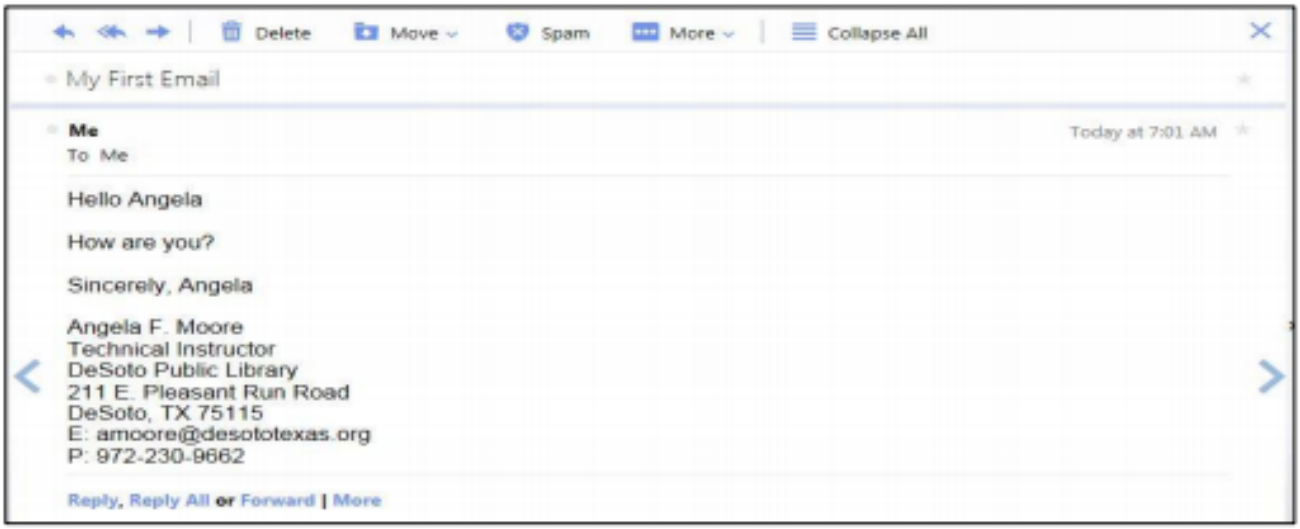



Figure 9.7 Email window

***Exercise 9.2***

I. Creating Folders

- Creating folders allows you to organize your email messages
- Click on Folders in the Navigation Pane
- A menu opens down that shows all the folders you have.
- To move an email into a folder, drag and drop it onto the folder, checkmark it and choose the Move option in the Action Box, or choose the Move option while you have the email open.
- To create a new folder click on the folder icon with a plus sign in it that appears when you hover over 'Folders'

II. Creating Contacts

- Using email allows you to keep an address book of contacts.
- View your contacts by clicking on the Contacts symbol
- New Contact – lets you put in new contact information
- Lists – allow you to create groups to assign contacts to such as family, friends, work, etc. Assigning people to groups not only organizes people by relationship but gives you the option of sending emails to everybody in that group when you compose a new message
- Actions – lets you sort how your contact list is viewed

**Note**: You can also add contacts by opening an email you've received and clicking on the sender's name. This will open a menu where you can select Add to Contacts

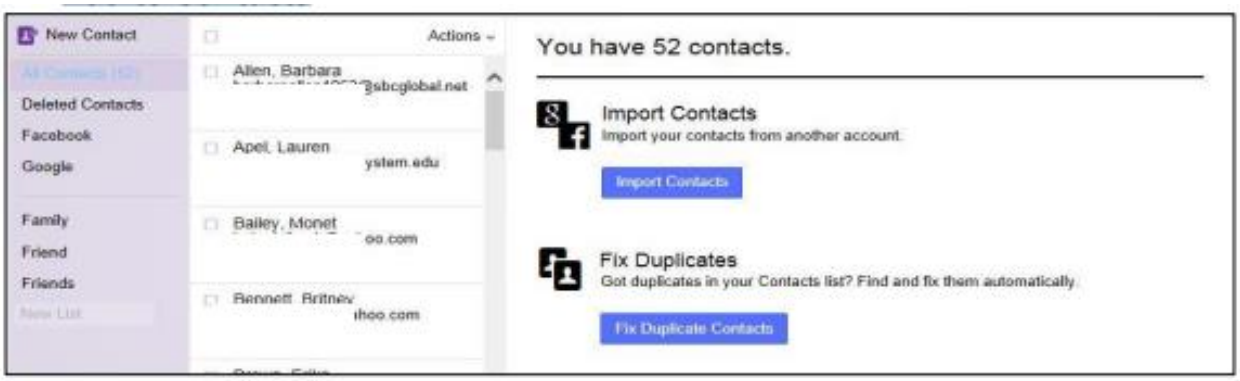



Figure 9.8 Ataching contacts

II. Email Hints & Tips

- Emoticons – you can add emotion icons to your email messages when words just won't suffice ☺

- In the viewing pane when you hover over an email you have options to search, delete, or mark as starred on that email.
- If you have important emails you want to be able to find easily, click the star icon next to them so that later you can view just your starred (important) emails using the View option in the Action box
- Empty your Trash and Spam boxes regularly. If an email goes to your spam box that is not spam you can checkmark it as not spam so it will go to your inbox in the future and vice versa.
- Any email that has a paperclip symbol to the far right means it has an attachment.
- Customize your inbox and your account settings by changing the background theme, setting up your account preferences, creating a signature, programming email filters, and a lot more.
- When you click on options in the action box you will see keyboard shortcuts next to some items that you can use instead of your mouse.
- When you hover over folders in the navigation box, a tip will pop up telling you how many emails are in that folder. Whenever you have new emails the folder will be bold and display how many new emails there are.

# UNIT10
# CLOUD AND MOBILE TECHNOLOGIES

## 10.1 Principles of cloud computing

***Cloud computing*** is an information technology (IT) paradigm that enables ubiquitous access to shared pools of configurable system resources and higher-level services that can be rapidly provisioned with minimal management effort, often over the Internet. Cloud computing relies on sharing of resources to achieve coherence and economy of scale, similar to a utility.

Third-party clouds enable organizations to focus on their core businesses instead of expending resources on computer infrastructure and maintenance. Advocates note that cloud computing allows companies to avoid or minimize up-front IT infrastructure costs. Proponents also claim that cloud computing allows enterprises to get their applications up and running faster, with improved manageability and less maintenance, and that it enables IT teams to more rapidly adjust resources to meet fluctuating and unpredictable business demand. These platforms hide the complexity and details of the underlying infrastructure from users and applications by providing very simple graphical interface or API (Applications Programming Interface).

Cloud computing boasts several attractive benefits for businesses and end users. Five of the main benefits of cloud computing are:

- Self-service provisioning: End users can spin up compute resources for almost any type of workload on demand. This eliminates the traditional need for IT administrators to provision and manage compute resources.
- Elasticity: Companies can scale up as computing needs increase and scale down again as demands decrease. This eliminates the need for massive investments in local infrastructure, which may or may not remain active.
- Pay per use: Compute resources are measured at a granular level, enabling users to pay only for the resources and workloads they use.
- Workload resilience: Cloud service providers often implement redundant resources to ensure resilient storage and to keep users'

important workloads running -- often across multiple global regions.

- Migration flexibility: Organizations can move certain workloads to or from the cloud -- or to different cloud platforms -- as desired or automatically for better cost savings or to use new services as they emerge.

**Cloud Computing Delivery Models**

Good industry agreement on three major layered models:

- Software-as-a-Service (SaaS) Clouds, where an application environment is provided
- Platform-as-a-Service (PaaS) Clouds, where an application development platform is provided
- Infrastructure-as-a-Service (IaaS), where infrastructure capabilities such as storage or a bare operating system are provided.

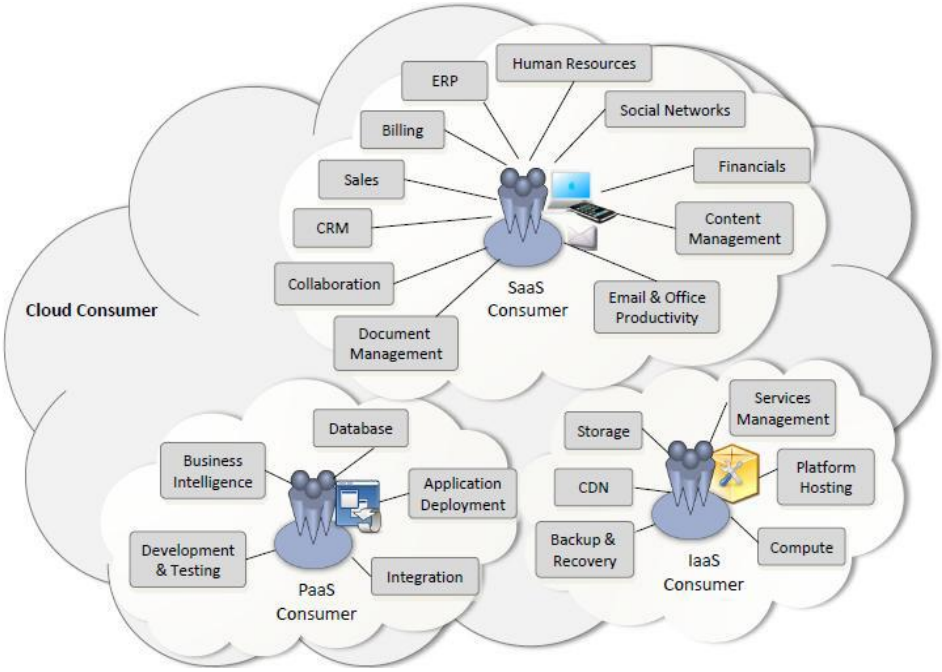



Figure 10.1 Major layered models

**Deployment models**

Within each model there is the dimension of ownership:

- Public cloud – the infrastructure intended for free use by the general public. A public cloud can be owned, managed and operated by commercial, scientific and government organizations (or some combination thereof). A public cloud

exists physically in the jurisdiction of the owner-provider of services.

- Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party, and hosted either internally or externally.
- Community cloud shares infrastructure between several organizations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party, and either hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the cost savings potential of cloud computing are realized.
- Hybrid cloud is a composition of two or more clouds (private, community or public) that remain distinct entities but are bound together, offering the benefits of multiple deployment models. Hybrid cloud can also mean the ability to connect collocation, managed and/or dedicated services with cloud resources.

**Leading Cloud Companies**

The biggest cloud computing services — Amazon, Microsoft and Google — all offer excellent products at affordable prices with strong backup, security and service options.

**Amazon Web Services**

Amazon's cloud offering is called Amazon Web Services (AWS) and it was the first of the major players to offer cloud services to the public in 2006. It makes up about 9 percent of Amazon's sales.

Because of its scalability and the billing options that come along with such scalability, AWS is used by small businesses and huge enterprises alike. Large corporations like Netflix, Expedia and Adobe all use AWS because it offers a dependable and secure solution. AWS is the biggest of the cloud providers, and draws on a huge infrastructure and a wealth of experience.

**Microsoft Azure**

Microsoft has put huge emphasis on the cloud and its revenue from Azure – its cloud business – has grown by 100 percent in the last year. This growth is in part because people in the business environment are already familiar with Office 365 and its applications.

Azure is used by about 80 percent of Fortune 500 companies including 3M and Boeing. 3M uses Azure to facilitate better ways to

track assets. Boeing uses the cloud to predict aircraft maintenance and optimize fuel use. Other large companies like BMW and Heineken utilize Azure to promote and reach consumers via social marketing campaigns.

Though small businesses use Azure's services on a much smaller scale, the services are attractive to small businesses for the same reasons as they are attractive to large companies.

**Google Cloud Platform**

As the world's undisputed leader in Internet search, Google has undeniable expertise in running data centers. After Amazon launched its cloud computing service in 2006, Google put that data center expertise to work by launching a cloud service of its own. Soon it became known as one of the "big three" public cloud vendors, along with AWS and Microsoft.

While its larger competitors tout their broad portfolios of services, Google has a narrower focus and specializes in meeting the needs of developers. Through its Web search and advertising businesses, the company has become particularly adept at handling big data, and it has transferred those capabilities to its cloud computing business as well, developing a solid reputation for prowess in analytics, artificial intelligence and machine learning.

## 10.2 Main terms and concepts of mobile technologies

MCC refers to an infrastructure where both the data storage and data processing happen outside of the mobile device.

Mobile cloud applications move the computing power and data storage away from the mobile devices and into powerful and centralized computing platforms located in clouds, which are then accessed over the wireless connection based on a thin native client.

*MOBILE CLOUD COMPUTING = MOBILE COMPUTING + CLOUD COMPUTING*

Mobile cloud computing (MCC) at its simplest, refers to an infrastructure where both the data storage and data processing happen outside of the mobile device.

Mobile cloud applications move the computing power and data storage away from the mobile devices and into powerful and

centralized computing platforms located in clouds, which are then accessed over the wireless connection based on a thin native client.

**Bridging the gap between mobile and cloud**

- Embedded mobile platforms and technologies for mobile clouds
- Innovative mobile middleware, platforms and client technologies
- Smart sensor platforms and Urban (crowd) sensing
- Emergent barcode/RFID/NFC-based mobile technologies
- Mobile cloud data centers and storage/persistency technologies
- Mobile cloud networking, communication, and tunneling
- Energy-saving wireless communication technologies.

**Why Mobile Cloud Computing:**

- Mobile devices face many resource challenges (battery life, storage, bandwidth etc.)
- Cloud computing offers advantages to users by allowing them to use infrastructure, platforms and software by cloud providers at low cost and elastically in an on-demand fashion.
- Mobile cloud computing provides mobile users with data storage and processing services in clouds, obviating the need to have a powerful device configuration (e.g. CPU speed, memory capacity etc), as all resource-intensive computing can be performed in the cloud.

**MCC Popularity:**

- According to a recent study by ABI Research, more than 240 million business will use cloud services through mobile devices by 2015.
- That traction will push the revenue of mobile cloud computing to $5.2 billion.
- Mobile cloud computing is a highly promising trend for the future of mobile computing.

**MCC Architecture**

- Mobile devices are connected to the mobile networks via base stations that establish and control the connections and functional interfaces between the networks and mobile devices.
- Mobile users' requests and information are transmitted to the central processors that are connected to servers providing mobile network services.
- The subscribers' requests are delivered to a cloud through the Internet.

– In the cloud, cloud controllers process the requests to provide mobile users with the corresponding cloud services.

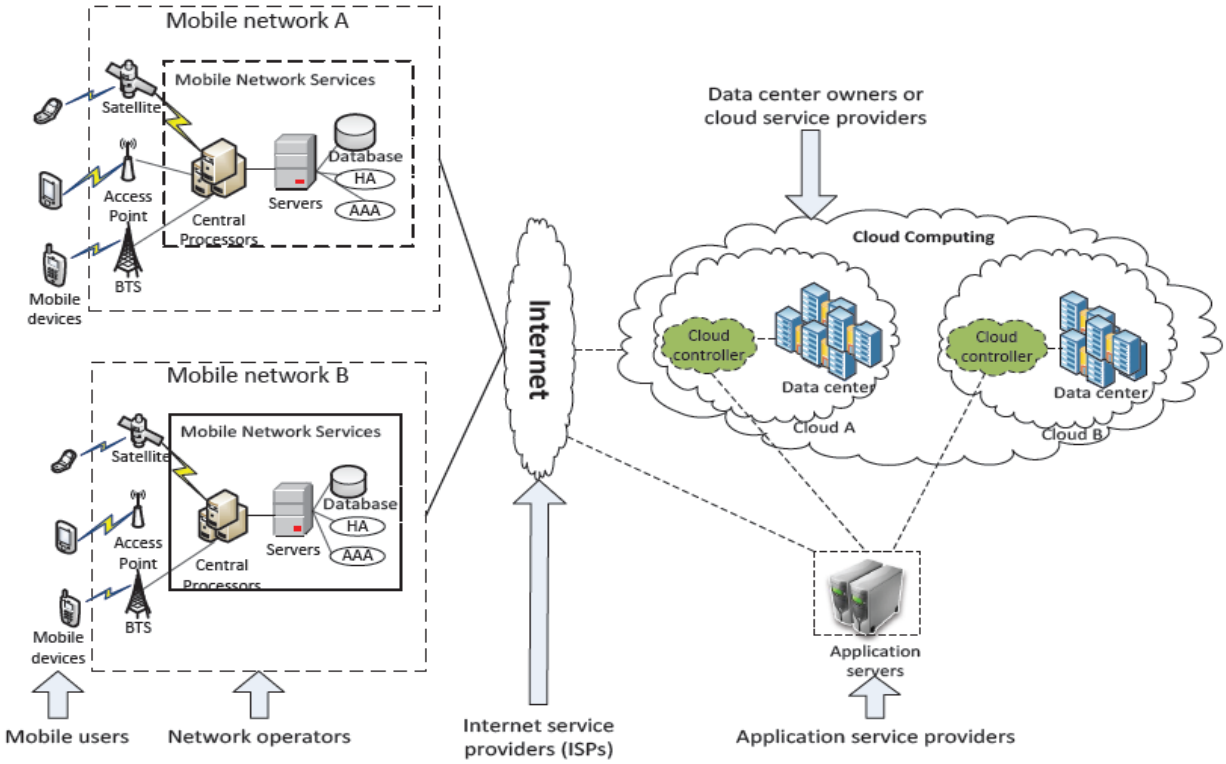



Figure 10.2 Architectures of mcc

**Advantages of MCC**

• Extending battery lifetime:

– Computation offloading migrates large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds).

– Remote application execution can save energy significantly.

– Many mobile applications take advantages from task migration and remote processing.

• Improving data storage capacity and processing power:

– MCC enables mobile users to store/access large data on the cloud.

– MCC helps reduce the running cost for computation intensive applications.

– Mobile applications are not constrained by storage capacity on the devices because their data now is stored on the cloud.

• Improving reliability and availability:

– Keeping data and application in the clouds reduces the chance of lost on the mobile devices.

– MCC can be designed as a comprehensive data security model for both service providers and users:

• Protect copyrighted digital contents in clouds.

• Provide security services such as virus scanning, malicious code detection, authentication for mobile users.

– With data and services in the clouds, then are always(almost) available even when the users are moving.

• Dynamic provisioning:

– Dynamic on-demand provisioning of resources on a fine-grained, self-service basis

– No need for advanced reservation

• Scalability:

– Mobile applications can be performed and scaled to meet the unpredictable user demands

– Service providers can easily add and expand a service

• Multi-tenancy:

– Service providers can share the resources and costs to support a variety of applications and large no. of users.

• Ease of Integration:

– Multiple services from different providers can be integrated easily through the cloud and the Internet to meet the users' demands.

**Control questions:**

1. What is a *cloud computing*?
2. Why do we call it this way?
3. What makes up a *cloud computing* system?
4. What are some of the applications of *cloud computing*?
5. What accounts for *data backup*?
6. Are there any potential problems about *cloud computing*?

***Exercise 10.1***

Work with Google Drive. In Google Drive, you can store absolutely any files: photos, videos, presentations, PDF files and even Microsoft Office documents. By default, all files in Drive are available to you only. To allow other users to view, comment, or edit the files and folders you have selected, simply send them an invitation.

1. Go to drive.google.com
2. Create your account (fill in the form fields Figure 10.3).

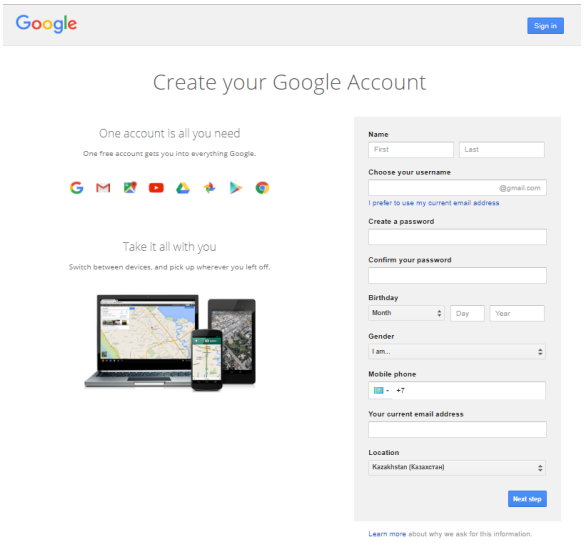



Figure 10.3 Creating account

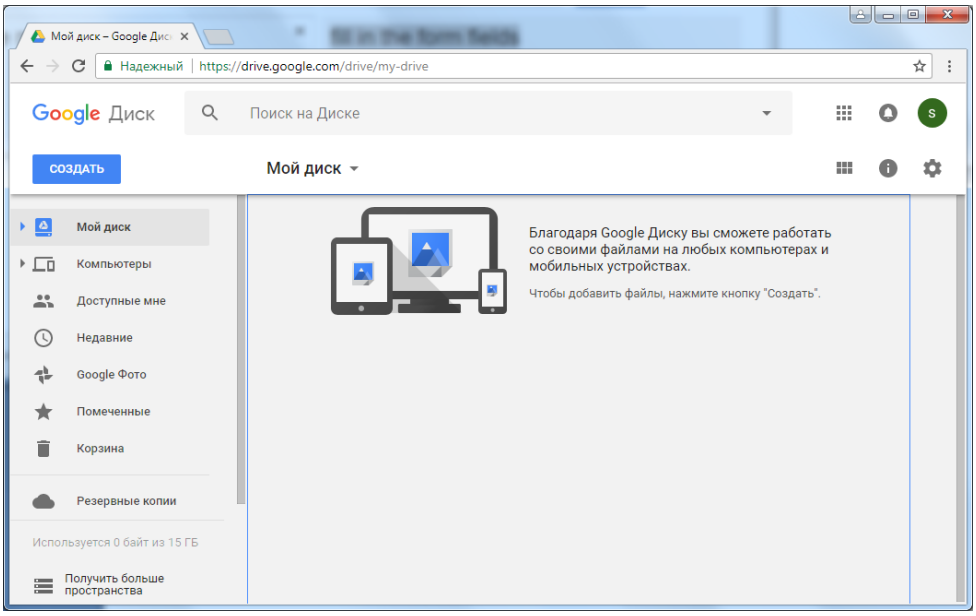



Figure 10.4 Google drive

***Exercise 10.2***

**Upload & view files.** You can upload items to Google Drive, view and edit them, and share them with others. Google Drive supports the following file types: Documentation; Images; Audio; Video.

**Drag files into Google Drive**

1. Open or create a folder.
2. To upload files and folders, drag them into the Google Drive folder.

**Use the Backup & Sync**

1. To download and install application Backup and Sync on your computer, click **Download Backup and Sync.**
2. Read the Terms of Service and click **Agree and download**.
3. After it's downloaded, open **installbackupandsync.exe**.
4. If you see a window asking if you want to allow the program to make changes on your computer, click **Yes**.
5. If you're asked to restart your computer, do it now.
6. Start **Backup and Sync**.
7. Sign in with your Google Account username and password.
8. Choose your sync settings and click **Next**.
9. On your computer, you'll see a folder called "Google Drive."
10. Drag files or folders into that folder. They will upload to Drive and you will see them on drive.google.com.

***Exercise 10.3***

Convert documents into Google formats

If you want to upload files like Microsoft Word documents, you can change a setting to convert files.

**Note**: You can only change Google Drive settings from your computer.

1. Using a computer, go to drive.google.com/drive/settings.
2. Next to "Convert Uploads," check the box.

***Exercise 10.4***

Upload files with the same name

If you upload a file with the same name, Google Drive will upload the file as a revision of the file already in Google Drive.

To keep both files:

1. On your computer, go to drive.google.com.
2. Upload a file.
3. Click **Keep as separate file**.

***Exercise 10.5***

You can share the files and folders that you store in Google Drive with anyone. When you share from Google Drive, you can control whether people can edit, comment on, or only view the file.

Note: To edit Microsoft Office files with others, you'll need to convert them to Google Docs, Sheets, or Slides.

Step 1: Find the file you want to share

1. On a computer, go to drive.google.com.
2. Click the file you want to share or hold **Shift** and select two or more files.
3. At the top right, click Share

Step 2: Choose who to share with & how they can use your file Share with specific people

1. Under "People," enter the email address you want to share with.

**Note:** If you share with an email address that isn't a Google Account, they'll only be able to view the file.

2. To choose what someone can do with your file, click the Down arrow .
3. If you don't want to send an email people, turn off "Notify people."
4. Click **Send**.

Step 3: Limit how a file is shared

When you share a file with someone, you can choose what they can do with it.

- View: People can view, but can't change or share the file with others.
- Comment: People can make comments and suggestions, but can't change or share the file with others.
- Edit: People can make changes, accept or reject suggestions, and share the file with others.

## UNIT 11
## MULTIMEDIA TECHNOLOGIES

What is Multimedia?

- ***Multi***: more than one.
- ***Medium*** (singular): middle, intermediary, mean.
- ***Media*** (plural): means for conveying information.
  - Media in the press, newspaper, radio and TV context – mass media
  - Media in communications: cables, satellite, network – transmission media
  - Media in computer storage: floppy, CD, DVD, HD, USB – storage media
  - Media in HCI (human-computer interaction) context: text, image, audio, video, CG – interaction media
- ***Multimedia***: refers to various information forms text, image, audio, video, graphics, and animation in a variety of application environments.

Multimedia …: product, application, technology, platform, board, device, network computer, system, classroom, school …

Word "multimedia" is widely used to mean many different things.

Computing: Computer-based technologies and applications → What computers? → Various forms of computers/devices!

In terms of computing, four fundamental multimedia attributes:

- Digitized: All media including audio/video are represented in digital format;
- Distributed: The information conveyed is remote, either pre-produced and stored or produced in realtime, distributed over networks;
- Interactive: It is possible to affect the information received, and send own information, in a non-trivial way beyond start, stop, fast forward;
- Integrated: The media are treated in a uniform way, presented in an orchestrated way, but are possible to manipulate independently.

Definition of Multimedia is computer-based techniques of text, images, audio, video, graphics, animation, and any other medium

where every type of information can be represented, processed, stored, transmitted, produced and presented digitally.

A Classification of Multimedia:

- Text - ASCII/Unicode, HTML, Postscript, PDF
- Audio – Sound, music, speech, structured audio (e.g. MIDI)
- Still Image - Facsimile, photo, scanned image
- Video (Moving Images) – Movie, a sequence of pictures
- Graphics – Computer produced image
- Animation – A sequence of graphics images
- Discrete Media (DM, Static): text, image, graphics
- Continuous Media (CM, Dynamic): audio, video, animation
- Captured vs Synthesized media
- Standalone vs Networked media

Multimedia imposes new requirements on all parts of the system architecture:

- Representation - digitization and coding (compressing)
- Storage - database, larger volumes and new access patterns
- Processing - OS, scheduling, indexing, searching
- Understanding - speech/object recognition, content analysis
- Production - more complex authoring and user interface software
- Presentation - user perception, user friendly in HCI (Human Computer Interface)
- Protection – media encryption, copyright, privacy
- Distribution - media delivery and broadcast
- Communication - media transmission over network/internet, session control

## 11. 1 Representing text

All data inside a computer is transmitted as a series of electrical signals that are either ***on*** or ***off***. Therefore, in order for a computer to be able to process any kind of data, including text, images and sound, they must be converted into ***binary*** form. If the data is not converted into binary – a series of 1s and 0s – the computer will simply not understand it or be able to process it.

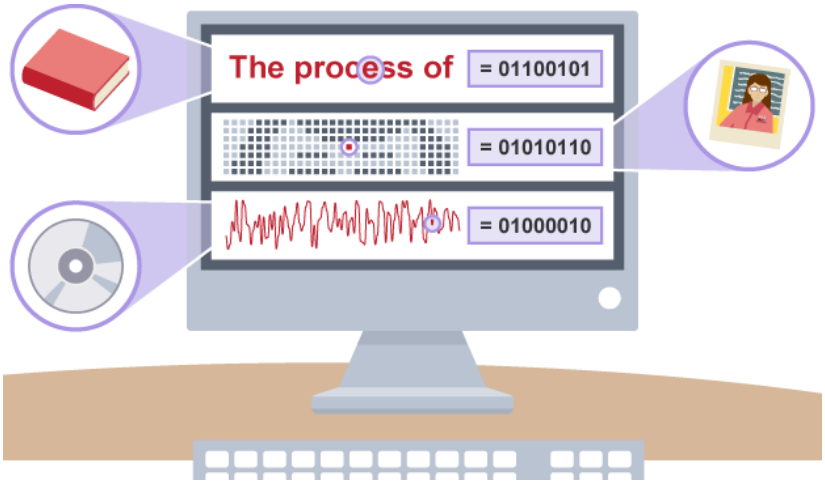



Figure 11.1 Representing text

When any key on a keyboard is pressed, it needs to be converted into a binary number so that it can be processed by the computer and the typed character can appear on the screen.

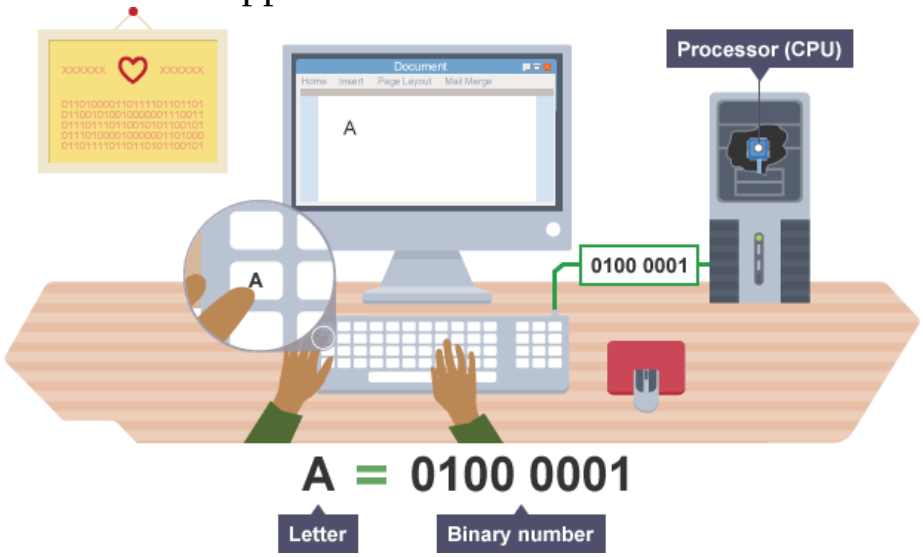



Figure 11.2 Representing text

A code where each number represents a character can be used to convert text into binary. One code we can use for this is called ***ASCII***. The ASCII code takes each character on the keyboard and assigns it a binary number. For example:

- the letter ‘a’ has the binary number 0110 0001 (this is the denary number 97)
- the letter ‘b’ has the binary number 0110 0010 (this is the denary number 98)
- the letter ‘c’ has the binary number 0110 0011 (this is the denary number 99)

Text characters start at ***denary*** number 0 in the ASCII code, but this covers special characters including punctuation, the return key and control characters as well as the number keys, capital letters and lower case letters.

ASCII code can only store 128 characters, which is enough for most words in English but not enough for other languages. If you want to use accents in European languages or larger alphabets such as Cyrillic (the Russian alphabet) and Chinese Mandarin then more characters are needed. Therefore another code, called **Unicode**, was created. This meant that computers could be used by people using different languages.

## 11.2 Representing images

Images also need to be converted into ***binary*** in order for a computer to process them so that they can be seen on our screen. Digital images are made up of ***pixels***. Each pixel in an image is made up of binary numbers.

If we say that 1 is black (or on) and 0 is white (or off), then a simple black and white picture can be created using binary.

To create the picture, a grid can be set out and the squares coloured (1 – black and 0 – white). But before the grid can be created, the size of the grid needs be known. This data is called ***metadata*** and computers need metadata to know the size of an image. If the metadata for the image to be created is 10x10, this means the picture will be 10 pixels across and 10 pixels down.

This example shows an image created in this way:

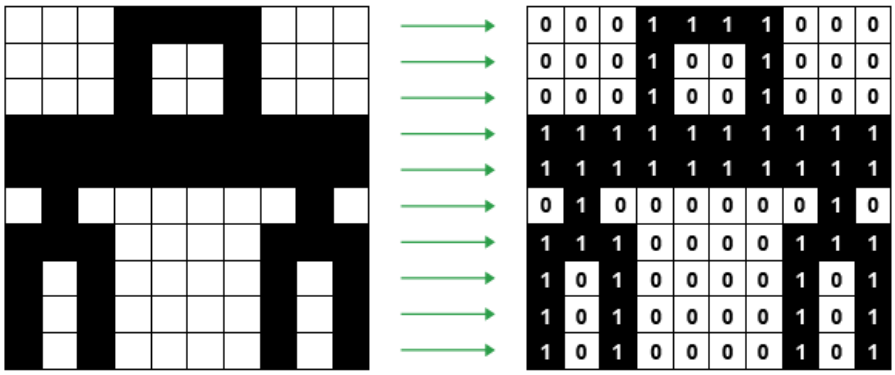



Figure 11.3 Adding color

The system described so far is fine for black and white images, but most images need to use colors as well. Instead of using just 0 and 1, using four possible numbers will allow an image to use four colors. In binary this can be represented using two ***bits*** per pixel:

- 00 – white
- 01 – blue
- 10 – green
- 11 – red

While this is still not a very large range of colors, adding another binary digit will double the number of colors that are available:

- 1 bit per pixel (0 or 1): two possible colors
- 2 bits per pixel (00 to 11): four possible colors
- 3 bits per pixel (000 to 111): eight possible colors
- 4 bits per pixel (0000 – 1111): 16 possible colors
- …
- 16 bits per pixel (0000 0000 0000 0000 – 1111 1111 1111 1111): over 65 000 possible colors

The number of bits used to store each pixel is called the ***color depth***. Images with more colors need more pixels to store each available color. This means that images that use lots of colours are stored in larger files.

***Image quality*** is affected by the ***resolution*** of the image. The resolution of an image is a way of describing how tightly packed the pixels are.

In a low-resolution image, the pixels are larger so fewer are needed to fill the space. This results in images that look blocky or ***pixelated***. An image with a high resolution has more pixels, so it looks a lot better when you zoom in or stretch it. The downside of having more pixels is that the file size will be bigger.

## 11.3Representing sound

Sound needs to be converted into ***binary*** for computers to be able to process it. To do this, sound is captured - usually by a microphone - and then converted into a ***digital*** signal.

An ***analogue*** to digital converter will sample a sound wave at regular time intervals. For example, a sound wave like this can be sampled at each time sample point:

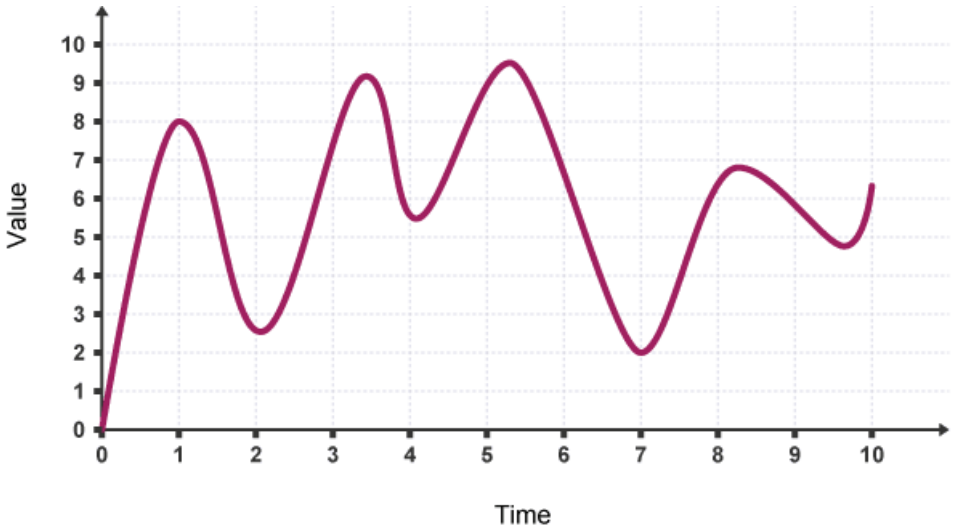



Figure 11.4 Analogue sound

The samples can then be converted to binary. They will be recorded to the nearest whole number.

Table 11.1 Binary sound

| **Time sample** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Denary** | 8 | 3 | 7 | 6 | 9 | 7 | 2 | 6 | 6 | 6 |
| **Binary** | 1000 | 0011 | 0111 | 0110 | 1001 | 0111 | 0010 | 0100 | 0110 | 0110 |

If the time samples are then plotted back onto the same graph, it can be seen that the sound wave now looks different. This is because sampling does not take into account what the sound wave is doing in between each time sample.

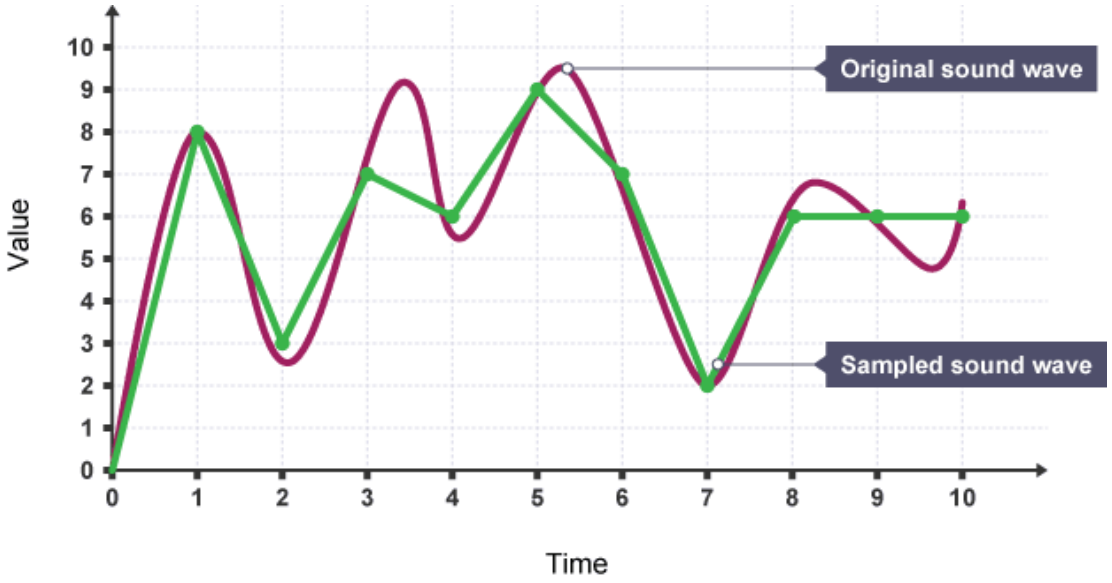



Figure 11.5 Sound waves

This means that the sound loses quality as data has been lost between the time samples. The way to increase the quality and store the sound at a quality closer to the original, is to have more time samples that are closer together. This way, more detail about the sound can be collected, so when it's converted to digital and back to analogue again it does not lose as much quality.

The frequency at which samples are taken is called the **sample rate**, and is measured in Hertz (Hz). 1 Hz is one sample per second. Most CD-quality audio is sampled at 44 100 or 48 000 KHz.

**Control questions**:

1. What is digital information?
2. What is Multimedia?
3. How computer displays text information?
4. How computer plays audio and video?
5. What do you know about digital images?

***Exercise 11.1***

1. Add a Table slide with two columns and seven rows.
2. Edit the table slide to resemble the one opposite.
3. Remove the borders
4. Save the presentation.

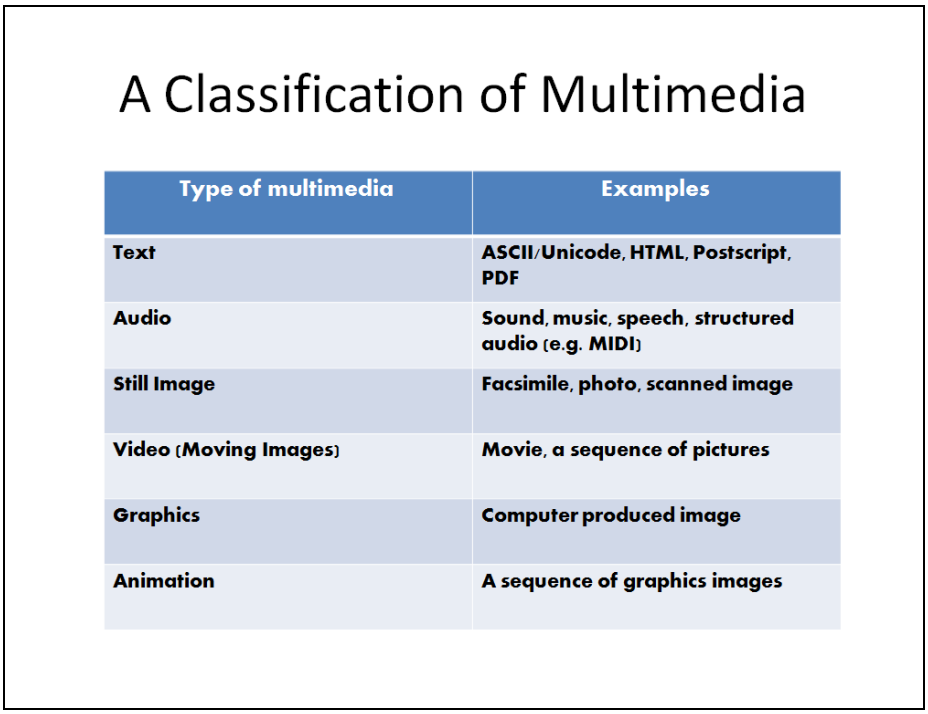



Figure 11.7 Slide 2

***Exercise 11.2***

1. On a new slide add an organisation chart using the content layout for WK Sauda Inc. consisting of a CEO (Saule Akimova), her assistant (Zhansaya Muratova), three managers (Irina Pugacheva - Creative Director, Zhanna Ixebaeva - Sales and Dinara Tlekkabylova - IT).
2. Fill the Managers' boxes with yellow, the PA with green, and the CEO with grey.
3. Apply different font styles for the different individuals.
4. Save the presentation.

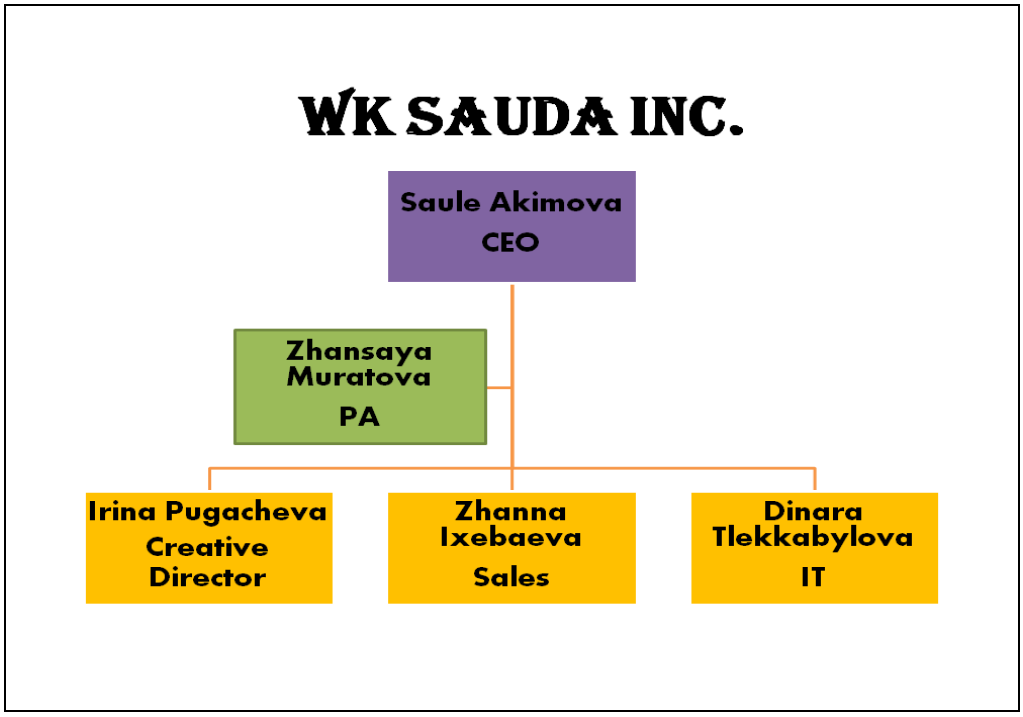



Figure 11.6 Slide 1

***Exercise 11.3***

Using the content layout, create a chart on a new slide to depict the following data. The data records the number of people in the audiences of three different presentations who were asleep after 10, 20, 30 and 40 minutes. (One presentation contained text-only slides, the second contained graphics, and the third contained animation effects).

| | A | B | C | D |
|---|---|---|---|---|
| 1 | | Text only | Graphics | Animation |
| 2 | 10 mins | 1 | 0 | 0 |
| 3 | 20 mins | 3 | 2 | 1 |
| 4 | 30 mins | 8 | 5 | 3 |
| 5 | 40 mins | 12 | 9 | 5 |

Figure 11.8 The data records the number of people in the audiences

The resulting chart should look something like the following:

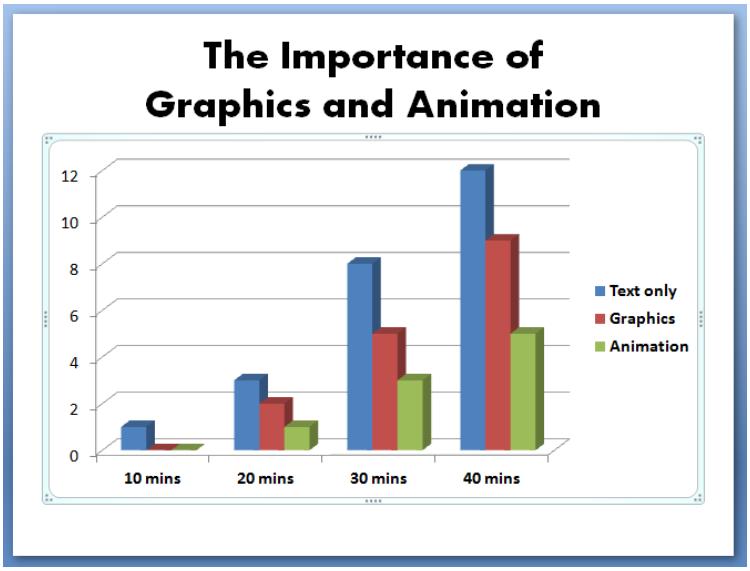



Figure 11.9 The resulting chart

***Exercise 11.4***

Use the Drawing tools to create the picture shown.

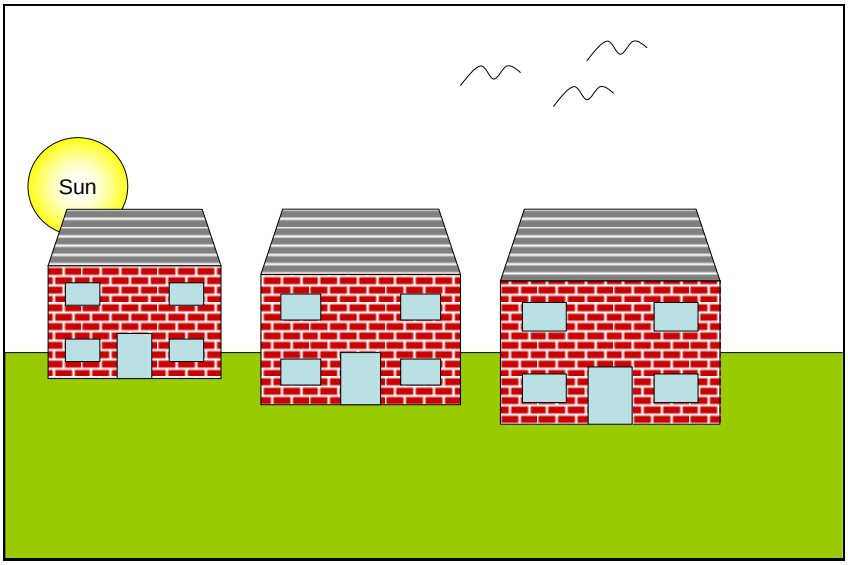



Figure 11.10 Slide with the house picture

***Exercise 11.5***

1. Go to the slide with the house picture which you created in the previous exercise.
2. Take a copy of the slide.
3. On the copied slide, use animation as follows:

Table 11.2 Animation effects

| Object | Effect | Start | Direction | Speed |
|---|---|---|---|---|
| Grass | Entrance = Appear | On click | | |
| Smallest house | Entrance = Box | Start after previous | Out | Very fast |
| Middle house | Entrance= Diamond | Start after previous | Across | Fast |
| Largest house Brickwork only | Entrance= Checkerboard | Start after previous | Across | Medium |
| Windows and Door (ctrl to select all 5) | Entrance = Box | Start after previous | In | Fast |
| Roof | Entrance = Wedge | Start after previous | - | Medium |
| Birds | Entrance = Bounce | Start after previous<br>Start **with** previous<br>Start after previous | - | Medium |
| Sun | Entrance= Pinwheel | | - | Medium |

4. Now run the slide in slide show view to have a look at these animation effects.
5. Save the presentation.

***Exercise 11.6***

1. On slide 2 running along the top of the slide is text that you are going to make into hyperlinks to the corresponding slides.

*2.* Create the appropriate hyperlinks by selecting the text not the text box. Right click over the text and choose hyperlink. *(Note: the TOC text should link to slide 3, the Act text to slide 4 for activists and so on.)*

3. Copy and paste the links bar to the other slides in the presentation.

4. Run the presentation in slide show view to make sure that all the links work.

**UNIT 12**
**SMART TECHNOLOGY**

## 12.1 What is Smart Technology?

The technologies (includes physical and logical applications in all formats) that are capable to adapt automatically and modify behavior to fit environment, senses things with technology sensors, this providing data to analyze and infer from, drawing conclusions from rules. It also is capable of learning that is using experience to improve performance, anticipating, thinking and reasoning about what to do next, with the ability to self-generate and self-sustain.

Technologies that allow sensors, databases, and wireless access to collaboratively sense, adapt, and provide for users within the environment. Such smart technologies are currently found in housing designs for elderly and educational environments similar to sensors and information feeds within museums.

Simply put – smart technology goes one step further than the average ‘on and off’ mechanics of electronics.

***Smart Technology*** has interactive qualities which often grant the user remote control via the internet.

A great example of Smart Technology is the Nest thermostat. It learns your preferences from usage and is able to react accordingly.

Figure 12.1 Nest Thermostat, Smart phone, Smart TV, Glasses-Free 3D

Home automation allows lights, entertainment and heating to be controlled through smart phones from any location.

These are all developments that go one step further than the basic mechanics of ‘on’ and ‘off’.

***Smart phones*** go one step further than making phone calls and sending multi-media messages, they allow you to access the internet via apps or a web browser – creating a device which is closer to a computer than a phone.

The iphone was the first of its kind, but now virtually every new phone has 'smart phone' features allowing people to be online at any time almost anywhere.

***Smart TV's*** are TV's which are connected to the internet via wi-fi or broadband and allow the user to access content online.

Apps, web browsers and your home file network can be accessed – expanding the capabilities of your TV from one way receiver, to interactive user interface.

The evolution of flatscreen HDTVs went from: LCD, to LED, and now OLED.

Short for Organic Light Emitting Diodes, this new technology allows HDTVs to become even thinner; and it can be controlled on a per-pixel basis.

It also **uses a very low amount of energy, greatly reduces motion blur, and offers brilliant colors**. As with Ultra HD, these sets will start at around $10,000.

When televisions reached the "Full HD" 1080p resolution, many claimed that there would never be a need for higher resolutions.

Originally known as ***4K resolution***, the new standard is officially named "Ultra HD" and is meant for TVs larger than 40 inches. Currently these at least $10,000, but will become affordable within a couple of years.

Companies are now moving toward producing ***glasses-free 3D*** television sets. Autostereoscopic displays have been used in smartphones and gaming handhelds, this is the first time that this technology comes to the big screen and the living room.

Although already a few years old, the Kinect for Xbox 360 is still an amazing piece of technology. Now primed for this type of controller, companies are looking to directly add ***gesture controls*** to TV sets. Rather than reaching for the remote to change the channel, now you can simply wave your hand.

Electronics companies are working to further integrate technology into home appliances. These ***"smart" appliances*** of the future will allow for **better control and automation**. The appliances will be able

to communicate with each other and can be controlled remotely using apps.

Many different companies, including Google, are experimenting with eyewear computing. It appears that at least one ***hands-free display*** is on the way in 2012, and more will follow soon afterward. These displays use a type of **heads-up display in either the corner of your vision or overlaid over your whole vision**. It won't be long before this technology moves from the pages of science fiction to reality.

If you haven't seen it in person before, ***3D printing*** is really awesome. A machine creates a plastic model using a tiny nozzle and melted plastic. Previously, these ***3D printers*** cost thousands of dollars, but now the cost is finally going down. The machines are also **safer, smaller, and easier to use**. It won't be long before nearly everyone can afford to print off little plastic pieces with the click of a button.

## 12.2 Artificial Intelligence

According to the father of Artificial Intelligence, John McCarthy, it is *"The science and engineering of making intelligent machines, especially intelligent computer programs".*

Artificial Intelligence is a way of **making a computer, a computer-controlled robot, or a software think intelligently**, in the similar manner the intelligent humans think.

AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

While exploiting the power of the computer systems, the curiosity of human, lead him to wonder, *"Can a machine think and behave like humans do?"*

Thus, the development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

Goals of AI:

- To Create ***Expert Systems*** − The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.

- To Implement ***Human Intelligence in Machines*** − Creating systems that understand, think, learn, and behave like humans.

Artificial intelligence is a science and technology based on disciplines such as Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering. A major thrust of AI is in the development of computer functions associated with human intelligence, such as reasoning, learning, and problem solving.

Out of the following areas, one or multiple areas can contribute to build an intelligent system.

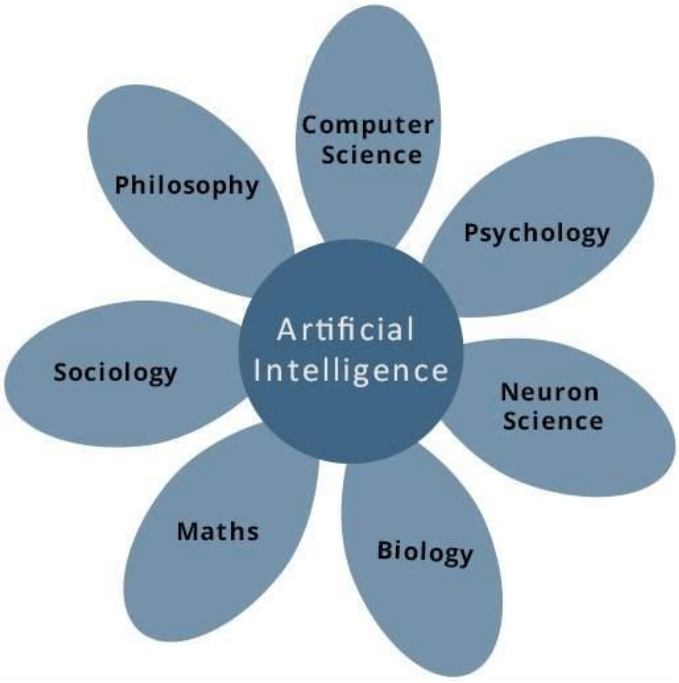



Figure 12.2 Artificial intelligence

Applications of AI:

**Gaming** − AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions based on heuristic knowledge.

**Natural Language Processing** − It is possible to interact with the computer that understands natural language spoken by humans.

**Expert Systems** − There are some applications which integrate machine, software, and special information to impart reasoning and advising. They provide explanation and advice to the users.

**Vision Systems** − These systems understand, interpret, and comprehend visual input on the computer. For example,

- A spying aeroplane takes photographs, which are used to figure out spatial information or map of the areas.

- Doctors use clinical expert system to diagnose the patient.
- Police use computer software that can recognize the face of criminal with the stored portrait made by forensic artist.

**Speech Recognition** − Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talks to it. It can handle different accents, slang words, noise in the background, change in human's noise due to cold, etc.

**Handwriting Recognition** − The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

**Intelligent Robots** − Robots are able to perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bump, and pressure. They have efficient processors, multiple sensors and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to the new environment.

While studying artificially intelligence, you need to know what intelligence is.

The ability of a system to calculate, reason, perceive relationships and analogies, learn from experience, store and retrieve information from memory, solve problems, comprehend complex ideas, use natural language fluently, classify, generalize, and adapt new situations.

As described by Howard Gardner, an American developmental psychologist, the Intelligence comes in multifold.

Types of Intelligence:

- Linguistic intelligence
- Musical intelligence
- Logical-mathematical intelligence
- Spatial intelligence
- Bodily-Kinesthetic intelligence
- Intra-personal intelligence
- Interpersonal intelligence

You can say a machine or a system is ***artificially intelligent*** when it is equipped with at least one and at most all intelligences in it.

The intelligence is intangible. It is composed of −

- Reasoning
- Learning
- Problem Solving
- Perception
- Linguistic Intelligence

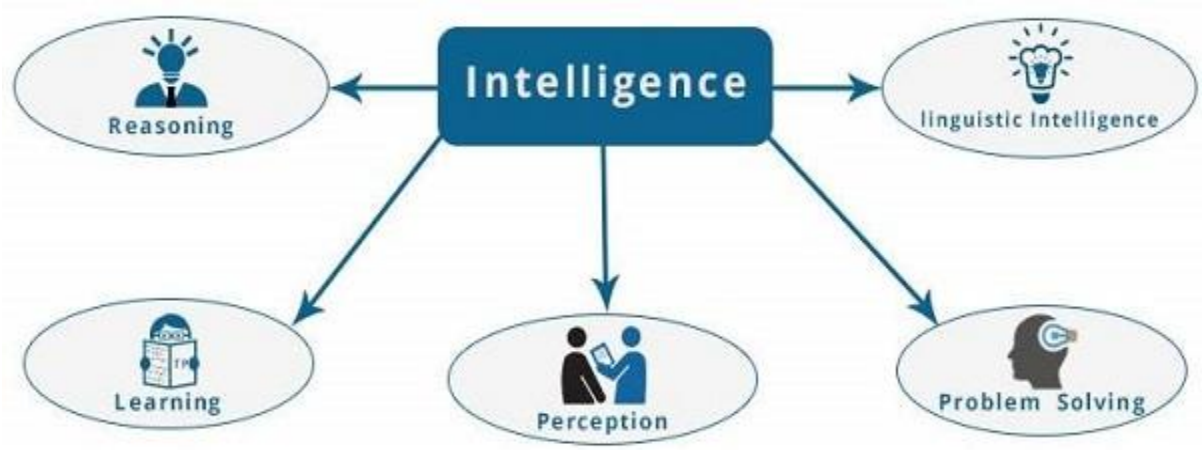



Figure 12.3 Intelligence compose

***Reasoning*** − It is the set of processes that enables us to provide basis for judgement, making decisions, and prediction. There are broadly two types – ***Inductive*** and ***Deductive.***

***Learning*** − It is the activity of gaining knowledge or skill by studying, practising, being taught, or experiencing something. Learning enhances the awareness of the subjects of the study.

The ability of learning is possessed by humans, some animals, and AI-enabled systems. Learning is categorized as −

- Auditory Learning
- Episodic Learning
- Motor Learning
- Observational Learning
- Perceptual Learning
- Relational Learning
- Spatial Learning
- Stimulus-Response Learning

***Problem Solving*** − It is the process in which one perceives and tries to arrive at a desired solution from a present situation by taking some path, which is blocked by known or unknown hurdles.

Problem solving also includes ***decision making***, which is the process of selecting the best suitable alternative out of multiple alternatives to reach the desired goal are available.

***Perception*** − It is the process of acquiring, interpreting, selecting, and organizing sensory information.

Perception presumes ***sensing***. In humans, perception is aided by sensory organs. In the domain of AI, perception mechanism puts the data acquired by the sensors together in a meaningful manner.

***Linguistic Intelligence*** − It is one's ability to use, comprehend, speak, and write the verbal and written language. It is important in interpersonal communication.

Difference between Human and Machine Intelligence:

- Humans perceive by patterns whereas the machines perceive by set of rules and data.
- Humans store and recall information by patterns, machines do it by searching algorithms. For example, the number 40404040 is easy to remember, store, and recall as its pattern is simple.
- Humans can figure out the complete object even if some part of it is missing or distorted; whereas the machines cannot do it correctly.

Real Life Applications of AI Research Areas:

- Expert Systems: Flight-tracking systems, Clinical systems.
- Natural Language Processing: Google Now feature, speech recognition, Automatic voice output.
- Neural Networks: Pattern recognition systems such as face recognition, character recognition, handwriting recognition.
- Robotics: Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, carving, etc.
- Fuzzy Logic Systems: Consumer electronics, automobiles, etc.

**Control questions:**

1. How can smart technology be described?
2. What devices work with it?
3. What is smart technology programming software used for?
4. What is meant by smart technology?
5. What does the label "smart" mean regarding technology?

6. How are schools using smart technologies to enhance learning?
7. What is the future of smart technology?
8. How is technology used for a smart home?
9. Is there a smart pen with an API for developers?
10. What is smart technology characterized for?
11. What are the existing Artificial Intelligence System?
12. What is meant by the concept of Artificial Intelligence System?

***Exercise 12.1***

1. You will make a kahoot. What is kahoot? Kahoot is a game-based classroom response system.
2. Open your browser. Go to https://create.kahoot.it, and log in to your account or sign up.
3. Pick a game type:

Click "New K!" in the top navigation bar and pick a game type. You can choose from:

- Quiz - a competitive multiple choice question game
- Jumble - a competitive sorting game where you have to place answers in correct order
- Survey - a multiple choice game to gather opinions (no points)
- Discussion - a one question survey

4. Choose from Quiz.
5. Add details and settings

Figure 12.4 Quiz

6. After click Ok, go and click onto Add question.

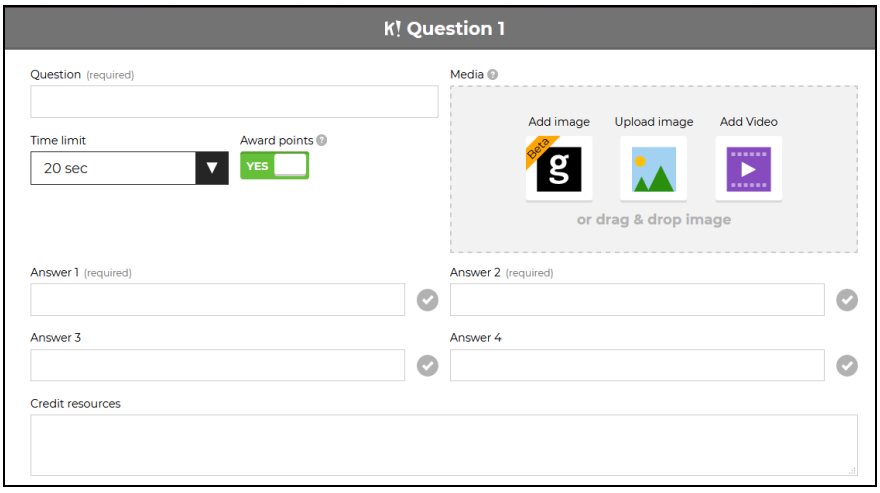



Figure 12.5 Setup questions and answers

7. Set up questions and answers (Figure 12.8).
8. Adjust time limits and turn points on or off.
9. Add an image or YouTube video to the questions if your question consists media (image or video).
10. On quizzes, you must mark at least one answer correct. Setting more than one answer as correct will allow any correct answer to award points. Players cannot submit more than one answer per question. To switch on true answers click on the button.
11. Click **Next** and add new questions.
12. **Save** and Publish.
13. Click on the **Play it** and choose **Team mode** and **Start**.

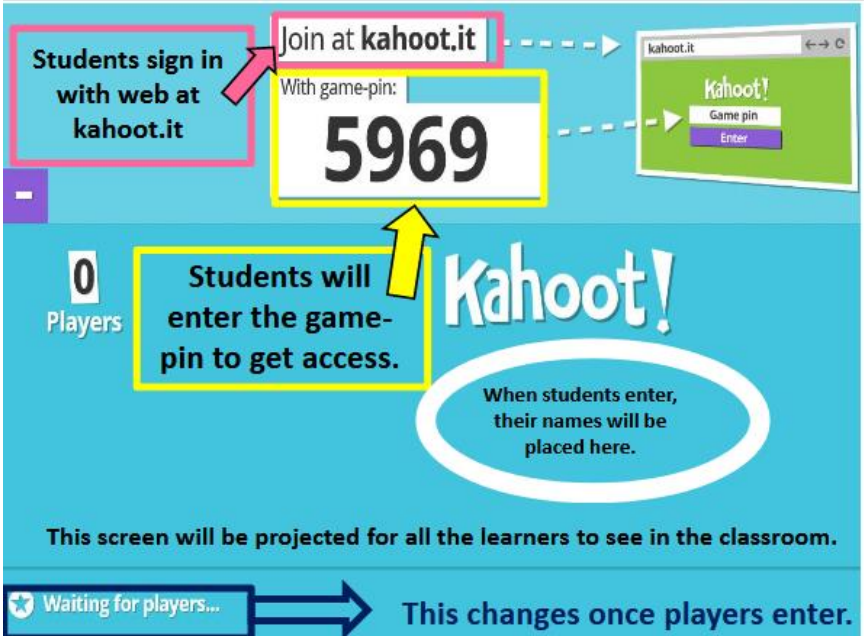



Figure 12.6 Join at kahoot.it

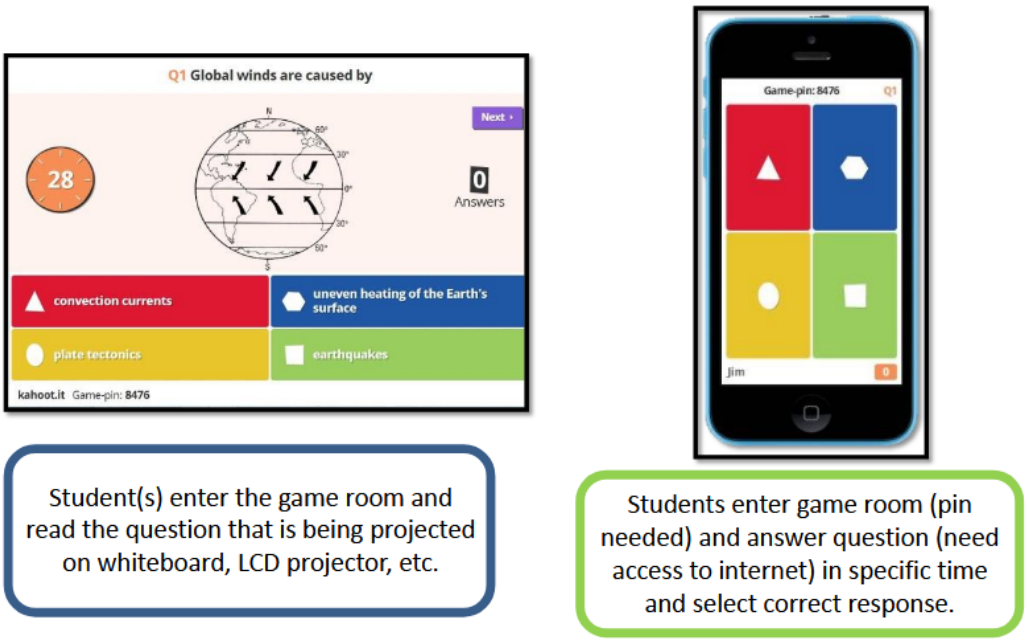



Figure 12.7 How it works

***Exercise 12.2***

QR Codes are 2-dimensional, which results in them having a square filled with data. Besides data, there are certain identifiers helping the code being read correctly. The most common QR Code type is model 2, which is broken down in the following information identifiers:

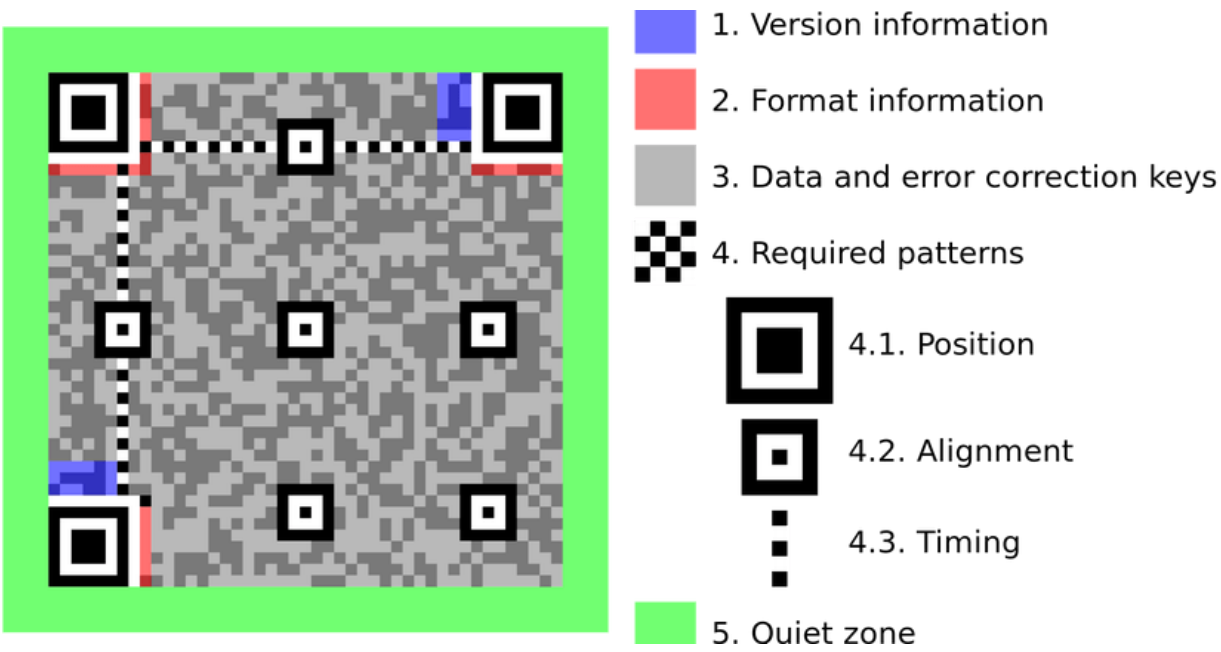



Figure 12.8 QR Code information

***Version*** and ***format*** information are important for the scanning device to know what kind of data to expect. Meanwhile, the ***data*** can be slightly smeared or missing and still be readable. This depends on the error correction level being used when writing the code.

And did you know that you can rotate QR Codes however you like? Upside down will still work! This is a courtesy of the position patterns (squares with dots in the middle) that allow the code to be read from any direction in 360 degrees.

Meanwhile, the ***alignment*** patterns are used to assist in navigation of larger codes and the ***timing*** patterns are used to determine the size of modules. The ***quiet zone*** requires a margin of at least 4-module worth.

1. Download to your mobile device application QR Code Reader from Play Market.
2. Load the browser on your computer and go to http://e-portal.wksu.kz.
3. Scan QR Code of Schedule for mobile devices.
4. Choose Browse website.

***Exercise 12.3***

Find the picture by QR Code.

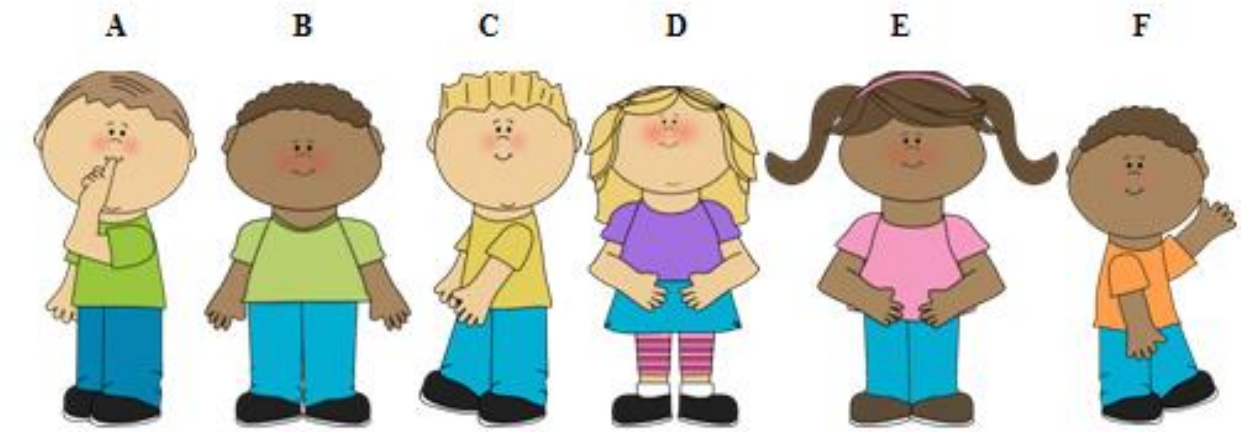
a)

b)

c)

d)

e) f)




***Exercise 12.3***

Make a QR Code

1. Select a QR code generator. To generate a QR-code for a site, business cards, advertisements or just for fun, use one of the following services: qrcoder.ru, qrcc.ru, qr-code-generator.com, qrmania.ru, creambee.ru. Choose the web site qr-code-generator.com
2. Design and link it up. Select what type of content you want your QR code to send the consumer to – choose a *Virtual business card* for this example.
3. Insert the content.
4. Check out the preview, customize as desired, then download and/or embed where needed.

**UNIT 13**

**E-TECHNOLOGY. E-BUSINESS. E-LEARNING. SOCIAL NETWORKS. E-GOV**

**E-technologies**

Electronic-technology (E-technology) covers a diverse range of IT, IS, IT/IS and ICT used with the network architecture support of the Internet, Intranet and/or Extranet to assist personal, business, organisational and institutional activities. This ranges from the basic e-technology such as e-mail, to the intermediate one, such as an integrated payroll system (e.g. ERP), to the advanced e-technology, such as e-commerce or e-business, e-learning and e-government.

**Electronic business**

E-business (electronic business) is the conduct of business processes on the Internet. These electronic business processes include buying and selling products, supplies and services; servicing customers; processing payments; managing production control; collaborating with business partners; sharing information; running automated employee services; recruiting; and more.

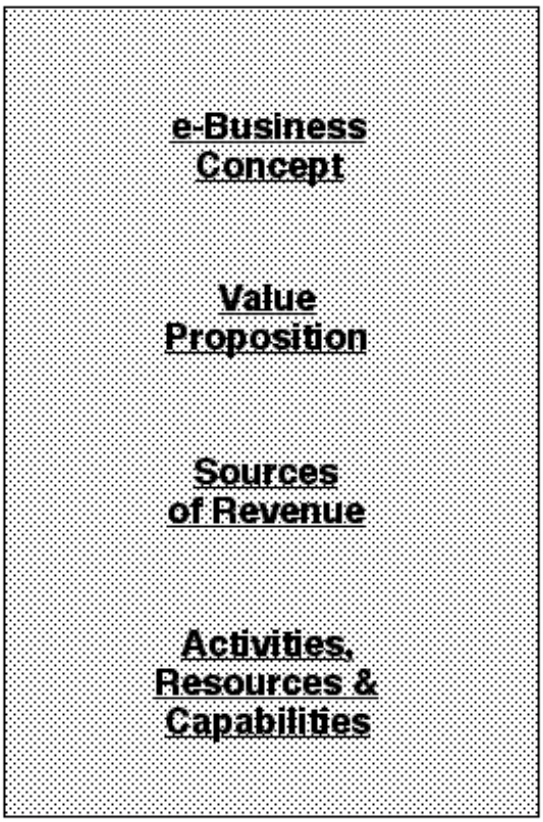



Figure 13.1 e-Business Model

**What Is A Business Model?**

The e-Business model, like any business model, describes how a company functions; how it provides a product or service, how it generates revenue, and how it will create and adapt to new markets and technologies. It has four traditional components as shown in the figure, The e-Business Model. These are the e-business concept, value proposition, sources of revenue, and the required activities, resources, and capabilities. In a successful business, all of its business model components work together in a cooperative and supportive fashion.

**E-Learning**

The e-Learning system is a large-scale governmental project included in the the National Program for Education Development in the Republic of Kazakhstan, 2011 - 2020.

The Project's primary objective is to enable all the learning process parties' equal access to the best learning resources and technologies.

***Goals:***

- substantially improve the quality of secondary education based on modernization of education contents and technologies
- developing high-quality educational services to the parties to learning process using capabilities of up-to-date telecommunication facilities and digital technologies
- ensuring equal access to educational services through implementing the new learning tools

***Benefits***

**To teachers**

Each teacher not only puts down grades in electronic gradebooks and class registers, but can also track every student's academic progress and receive the required reports.

***Provide new level of knowledge***

Making use of the e-Learning system allows a teacher's improving qualification, timely carrying out the teaching loads and automatically generating the required reports.

***Possibility of permanent communication***

The E-LEARNING system's interface is quite simple and user-friendly. Alongside with that, it is supposed to have special tools, allowing communicating with students and colleagues. To exchange opinions, to ask for advice from a more experienced teacher, to give

tutorship to an A level student and help to understand those, who do not have time - all this may be done in the E-LEARNING

***Accelerating the work and improving the students' general academic progress***

Every teacher not only puts down the marks in e-gradebooks and e-classregisters, but also can, based on analyzing the statistical data, follow each student's academic progress. Automatic generation of reports allows performing all the routine work with documents much faster. Also, thanks to E-LEARNING, a teacher may post in the system his/her own best practices, conduct testing the students.

**To administration**

Maintaining legal framework, developing reports and documentation, human resource recording, developing school schedule — all these may be automated, improved and accelerated.

***Full automation of all business processes***

The E-LEARNING system allows managing human resources, maintaining students' personal records, conducting tests and control works, managing the school and learning process, etc. Thus, administration of an education institution practically fully gets rid of extra paperwork. This enables concentrating on more important objectives - on management of teachers' staff and improvement of quality of education.

***Help in analysis of the school work as a whole***

The school's level depends on students' academic progress and attendance, as well as the possibility of implementing more interesting and useful novelties, general development of school with teachers, and assessment of activity of administration and teaching staff. In the E-LEARNING, the education institution's administration may monitor students' academic progress and attendance, control teachers' work, and improve school's interaction with students' parents and management bodies.

**To students**

In e-Learning , there are absolutely all the modules and systems needed for reaching success in learning.

***Receiving the lessons schedule and hometasks***

If a student got sick and cannot attend school, then all hometasks may be done at home. So, children are not behind the school program and can go on lessons without fear of getting lower marks or misunderstanding of something. Also, teachers may leave advices to

children, give links to necessary electronic study materials, electronic version of a lesson. However, IT achievements rescue not only in single cases. In case of quarantine, cancellation of lessons, all students can view helpful information in the E-LEARNING system and communicate with teachers, class master and each other without wasting time. It's simple, easy, modern!

***Access to e-books, necessary education resources***

It is not always comfortable to bear a dozen heavy books. Especially, textbooks that have outlived themselves morally and physically. Today, there is enough many permanently updated and actual content on all subjects. Advanced teachers work out own programs, own methodical manuals, helping to reach big results, assimilate more knowledge. Necessary information for studying is constantly downloaded and updated in the E-LEARNING. Always at hand, always available!

***Viewing marks in electronic gradebook and in class register***

Motivation is the best friend. Students can view their achievements in electronic class register, get a grade in electronic gradebook. Moreover, all information is confidential: no one of class mates will be able to see the grade for control work, but to communicate with each other and discuss successes— you are welcome! Convenience of information viewing on academic progress is reaffirmed by possibility of statistics viewing per week, month and even year.

***Online attendance possibility of additional lessons and consulting with the teachers***

Timely academic performance often hastens a teacher and prevents a student from keeping pace with the rest of students. Being behind as to knowledge of this or that discipline hinders not only a student's academic progress, but also his/her psychological state According to statistics, a child suffers when getting an unsatisfactory grade, retires into its shell, ceases understanding and estimating the advantages given by study. That is why the capability of each student's communication with teachers is designed in E-LEARNING system, as well as ability to obtain additional knowledge, ask questions and get answers, for instance, when doing homework. Additional classes do not take extra time for going to school and for the need to stay in school after classes. All quickly, all online!

**To parents**

Promptly receiving reliable information on their child's academic progress and attendance.

***Observe children's grades and success***

The E-LEARNING system allows parents to find out about each child's academic progress without leaving home and diverting from work.

***Operative and efficient interaction with school administration and teachers***

Thanks to e-Learning system, parents have an opportunity to communicate with teachers, get to know the innovations in education system, to participate more actively in the life of school and their children. Now, every parent may ask questions directly, make suggestions and consult teachers regarding children bringing up and education. The E-LEARNING includes sending out SMS and direct communication with the teacher in question.

***Viewing the grades and other helpful information concerning learning***

Does a child attend all school lessons? At what disciplines it is worth working more intensively? Each parent may control all this for the sake of son's/daughter's future success. In the E-LEARNING, there is a capability of getting remote access to viewing the grades in all disciplines. Now it is much harder to hide a grade book or tear out a page with unsatisfactory grade. This is a formal information which can only be viewed by parents upon getting the respective login and password for sign on to the system. Parents may also monitor children's staying in school. The System helps mothers, fathers and grandmothers cease worrying and be unalarmed about children's attending classes.

***Public services.*** Parents can obtain the automated public services, such as "Documents submission for enrollment to the schools" and "Documents submission for free meals to some categories of pupils at secondary schools".

**To management bodies**

Capability of promptly receiving statistical reports on the education sphere's status. Capability of generating analytical samples and considering the dynamics of the industry development in multiple aspects. Corporate portal operation.

***Assess the situation in education***

Information that comes to National Education Database (NEDB) can be analyzed for further modernization of the industry.

***Quick receipt of reports, statistical data***

How to optimize the work? How to carry out activity faster and more transparently? Collection and processing of data in E-LEARNING run automatically. Similarly, it is possible to create various reports, to keep records, to provide the ready information to other ministries and bodies of the Republic of Kazakhstan.

***Dissemination of orders and a comprehensive communication***

How to develop actual study programs taking into account the needs of students? How to control and improve the performance in the organization? With E-LEARNING, workers at all levels of education sphere can exchange information, can send the obtained statistics to the Ministry of Education's Situation Center, and vice versa. Contact with regions and each separate education organization: thanks to e-Learning system, the work of management bodies is improved, even though they are geographically distant from each other.

**Project components**

***Managing an education organization***

The System maintains electronic recording of personal data files of both staffs and students. It allows drawing up the HR documents and automatically generates the reports on an education organization's activities.

***Full automation of all business processes***

The E-LEARNING system allows managing human resources, maintaining students' personal records, conducting tests and control works, managing the school and learning process, etc. Thus, administration of an education institution practically fully gets rid of extra paperwork. This enables concentrating on more important objectives - on management of teachers' staff and improvement of quality of education.

***Help in analysis of the school work as a whole***

The school's level depends on students' academic progress and attendance, as well as the possibility of implementing more interesting and useful novelties, general development of school with teachers, and assessment of activity of administration and teaching staff. In the E-LEARNING, the education institution's administration may monitor students' academic progress and attendance, control teachers' work,

and improve school's interaction with students' parents and management bodies.

***Learning management.*** The System allows maintaining the electronic log of grades, generating calendar-thematic plans, and it also automatically informs parents of students' academic progress and attendance.

***Provide new level of knowledge.*** Making use of the e-Learning system allows a teacher's improving qualification, timely carrying out the teaching loads and automatically generating the required reports.

***Possibility of permanent communication***

The E-LEARNING system's interface is quite simple and user-friendly. Alongside with that, it is supposed to have special tools, allowing communicating with students and colleagues. To exchange opinions, to ask for advice from a more experienced teacher, to give tutorship to an A level student and help to understand those, who do not have time - all this may be done in the E-LEARNING.

***Accelerating the work and improving the students' general academic progress***

Every teacher not only puts down the marks in e-gradebooks and e-classregisters, but also can, based on analyzing the statistical data, follow each student's academic progress. Automatic generation of reports allows performing all the routine work with documents much faster. Also, thanks to E-LEARNING, a teacher may post in the system his/her own best practices, conduct testing the students.

***E-Library*** contains digital educational resources, legal framework database, and bank of test and measurement materials.

***Testing system*** provides teachers with capability of drawing up, assigning and checking a variety of tests.

***National Educational Database.*** This is a single centralized repository of data on education organizations' equipment, personnel and enrolment. NEDB contains information required for industry's planning and development.

***Webinars.*** This is a site to hold events in a variety of formats: from presentations and speeches to multiple real-time training programs, i.e. lectures, workshops or master classes via Internet.

***Classroom Management System*** allows teachers' managing a computer classroom, communicating and interacting with students using all the classroom's multimedia.

***Developing learning materials.*** Using various software and tools, it is possible to generate and edit digital educational resources, interactive demonstrations, simulations, games and classes.

***Education organizations' portals.*** Integrate all services into a single network making possible online communication and information sharing among students, teachers, and education management bodies.

***MES RK corporate portal*** is intended for automation of major corporate processes in MES RK activities, and for creation of the single base for internal documentation.

***The administering system.*** Integrates all the e-Learning subsystems and administers them, ensures security and recognizes users in the system. Through this subsystem, notices are sent out as well.

**Infrastructure**

***Internet.*** To enable equal access to educational resources and technologies, the broadband Internet access was provided to each education organization with the speed of 4 to 10 Mbps.

***Wireless local area network*** allows education organizations at all levels to implement a wide range of applications covering all buildings of a school without cost-intensive laying additional cables.

***All-in-one PCs in classrooms.*** For working in the e-Learning system and conducting classes, all-in-one PCs are installed in each classroom for teachers.

***Personal computers in libraries.*** To provide students and teachers access to digital educational resources, personal computers are installed in libraries.

***Computer classroom.*** As part of the project, each education organization is provided with an additional computer classroom containing 5 to 15 new modification PCs.

***Mobile classroom.*** To enlarge the project capabilities, each education organization is provided a mobile computer class containing 5 to 15 up-to-date laptops.

***Multimedia and peripherals.*** These are the tools for demonstration of digital educational resources and broadcasting the video-classes. All parties to the project are equipped with interactive whiteboard and projectors.

***Server hardware*** includes the central node's server farm and regional nodes' server farms, as well as proxy servers of education

organizations that enable the system's uninterrupted operation and data storage.

**Electronic government**

What does electronic government mean and its purposes?

Just try to image a society close in your perspective to the ideal one. Sound, with good job, good level of life, favorable living environment – the list can be continued endlessly and according to personal priorities be completed with necessary additional aspects.

But essential part of that society is the state itself. State takes care of the citizens. State provides opportunities for the best way of fulfillment of each citizen. State that guarantees integrity and compliance with law. State oriented to needs and demands of citizens. State with easy, apprehensible and available interaction – a state for people**.**

Development of information communicational technologies in Kazakhstan may guarantee the implementation of as minimum two last statements. The concept of "electronic government" has been developed for comfort, clear without obstacles communication between the state and the people.

"***Electronic government***" was created for more effective, transparent and accessible work of government agencies.

Formerly each state agency had been acting separately and had weak contacts with the rest and at the same time citizens had to rush different instances to obtain necessary certificates and references, verifications and other loads of documents. All this made the process of obtainment of only one service unbearable with endless visits to numerous agencies. Today it is all over owing to the projects of the "electronic government".

Electronic government is the integrated mechanism of interaction between the state and citizens, state agencies with each other, ensuring consistency with the help of informational technologies. This mechanism reduced queues to state agencies and simplified acceptance of certificates, references, permits and many other documents and services.

In other words "electronic government" it is when for obtainment of license you need only Individual identification number (IIN) (other necessary data is taken by automatic requests), it is when you can pay for utility services and fines online, it is when for getting a certificate at «State-owned corporation «Government for citizens» NJSC you

may only need your ID card, it is when you may independently register your business and get the certificate at the "electronic government" web-portal within 10-15 minutes, it is whet you may get info about the turn of your kidthe waiting list to the kindergarten at any time of the day and night, or get statement of residence on cell phone and hundreds more of such "when".

**Development of the electronic government in the Republic of Kazakhstan**

The idea of creation of the electronic government belongs to the President of the country and was announced almost 9 years ago. During this period passed four global stages of establishment and development of the electronic government. Each stage assisted in interaction processes between each Kazakhstani citizen with the state.

The first stage – ***informational***. At that particular time was launched electronic government web-portal filled with information. It provided information about state agencies, their work and services which they deliver to citizens. In addition regulatory legal acts were also posted for information.

At this stage each Kazakhstani citizen could get necessary information – the list of necessary documents, the sizes of state duties, contact information of state agency. Starting from the first state reduced necessity in visits to different institutions owing to provided information in full volume.

The second stage is ***interactive***. It was marked with the start of electronic services provision. The users of the web-portal had got an opportunity to send requests to different state agencies just staying at home without any losses of time. Introduction of interactive services at the electronic government web-portal seriously saved time for the paperwork. At this stage were launched informational systems, state data bases, electronic licensing and gateway of the electronic government.

The third stage of the electronic government development is a ***transactional*** one. At this stage citizens got an opportunity to pay for state taxes and fees, fines and utility services. If earlier citizens needed to go to banks not the services can be paid and obtained online.

For entrepreneurs transactional stage presented a truly valuable gift – Government procurement. The benefits are obvious - increased transparency and openness of competitions, tenders.

The fourth stage of the electronic government is ***transformational***, it is the current stage of the development. The main aim now is provision of services to citizens with maximum efficiency. For the achievement of this target interactive and transaction services were combined within complex services which are demanded by the citizens of Kazakhstan. From the beginning of the year citizens may register legal entity within just 15 minutes, accept ID card, passport or driver's license. Significance of socially important services will be highlighted, that is why all of them have been transformed into electronic format.

**Control questions:**

1. What does the " E-government " ?
2. Why use the portal "Electronic government" ?
3. What methods has in e-learning?
4. What is E-technology?
5. What is the E - business model?
6. What social networks do you use?

***Exercise 13.1***

**e- Business. e-Learning**

1. List the URLs of all the commercial and non-commercial websites and find out their domain names, servers and protocols.
2. Name all the websites related to e-commerce.
3. Create your e-group on a social networking site and share your opinions and views on environment.
4. Name all the personal types of blogging sites.
5. List all the popular search engines in the market.
6. Write the names of all the newsgroups that you can join on internet.
7. Make a list of IP addresses of a few of your favourite sites using any search engine of your choice.
8. Make a collage depicting all the logos of web browsers and list their comparative features.
9. Identify the category of these sites and complete the table.

Table 13.1 Category of sites

| Website | Category |
|---|---|
| www.olx | |
| www.facebook.com | |
| www.halykbank.com | |
| www.irctc.co.in | |
| www.merriam-webster.com | |

***Exercise 13.2***

1. Make a list of different email addresses that you or your friends use and identify different Host names.

2. Search Internet for different e-learning programs that are available. List down the benefits derived by you. Which e-learning program is used by your university and find out the information derived by them.

3. Identify the local TV programs that are using Video conferencing. Can you make a list of advantages while watching the program? Also list what were the disadvantages of video conferencing that you notice.

4. Make a reservation of a ticket online and make a list of all the steps needed.

5. List all social media sites you are using. Identify what benefits you feel by their use. Also identify the restrictions these websites put on you as a user.

6. Create an account in facebook. How can you use the gaming facility on the facebook.

***Exercise 13.3***

**Infrastructure electronic government**

The study of the basic functions of a single portal of public services www.egov.kz

1. To obtain government services and information , open the browser in the site «http://egov.kz/»

2. To work with the portal to get the " electronic digital signature (EDS ) . " For this purpose

3. Create a personal account on the site.

4. Register for the e-government website: www.egov.kz.:

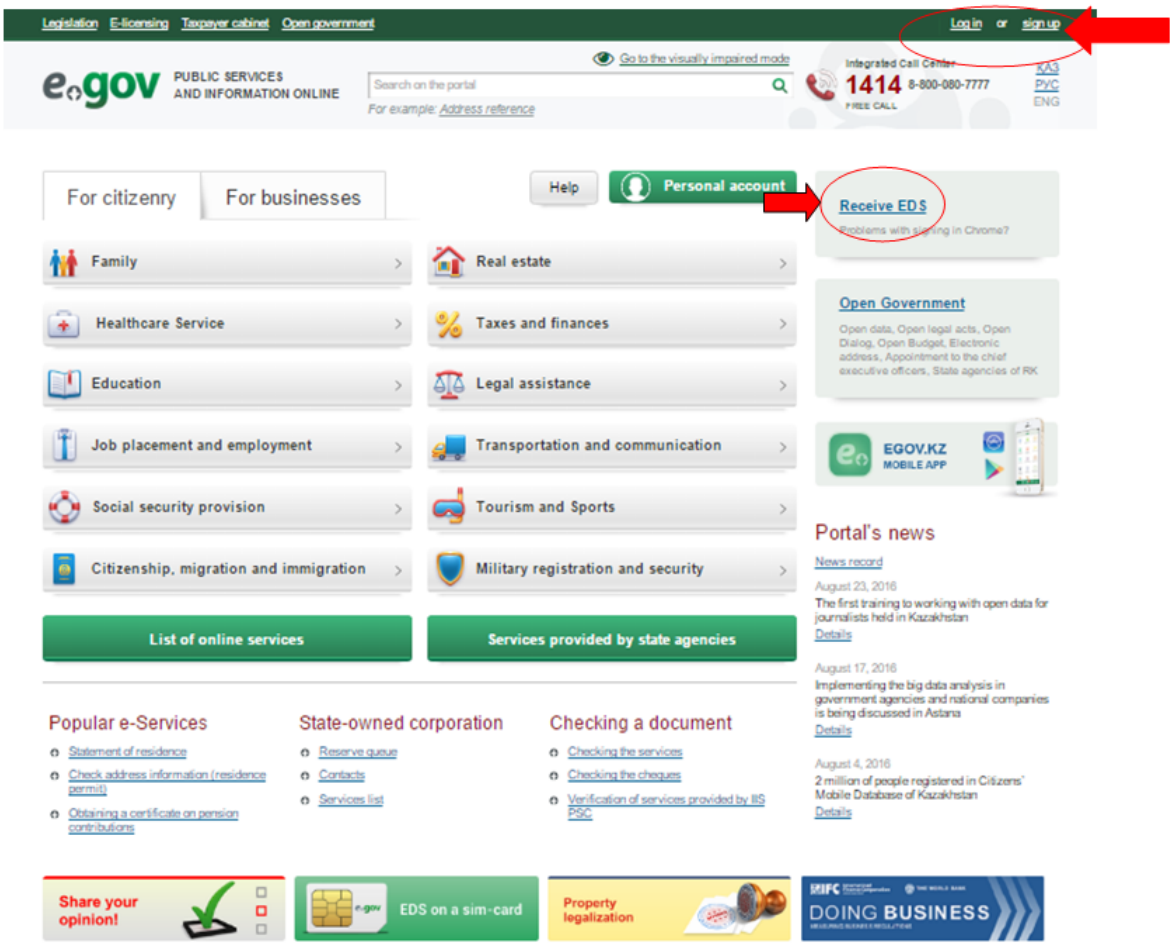



Figure 13.2 (a) egov.kz

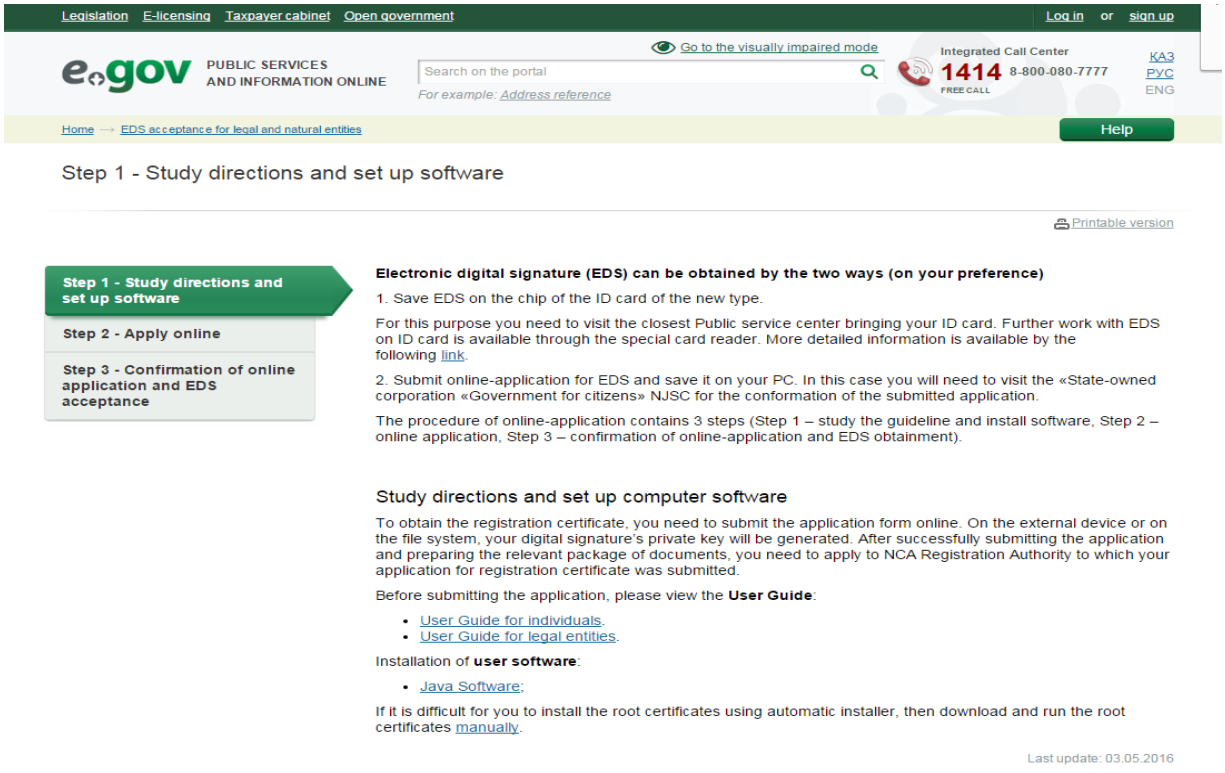



Figure 13.2 (b) egov.kz

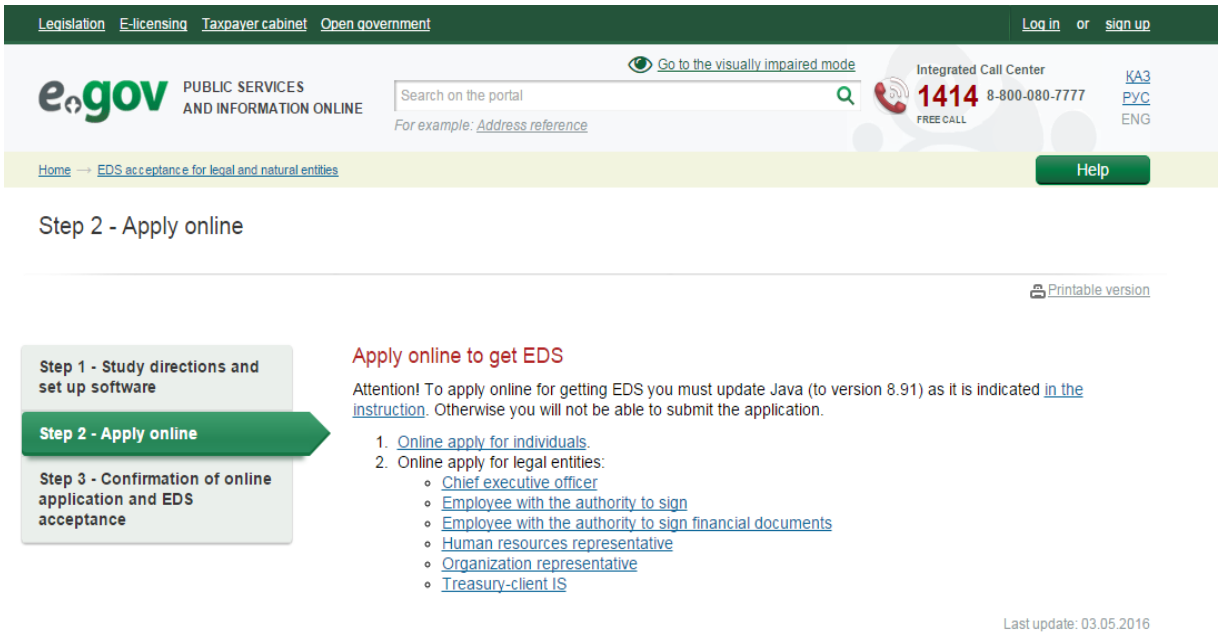



Figure 13.2 (c) egov.kz

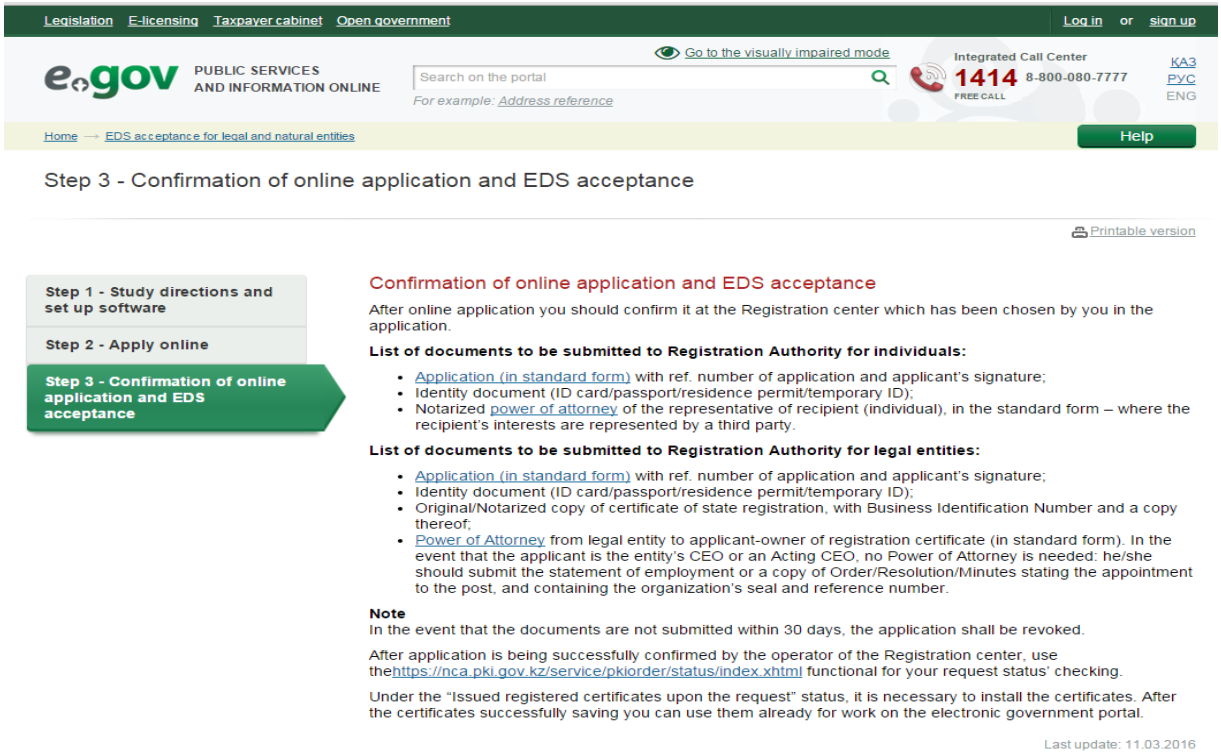



Figure 13.2 (d) egov.kz

5. After the digital signature will get the ability to send requests for any documentation. Go through the portal and sign up for your personal account (Figure 13.2)

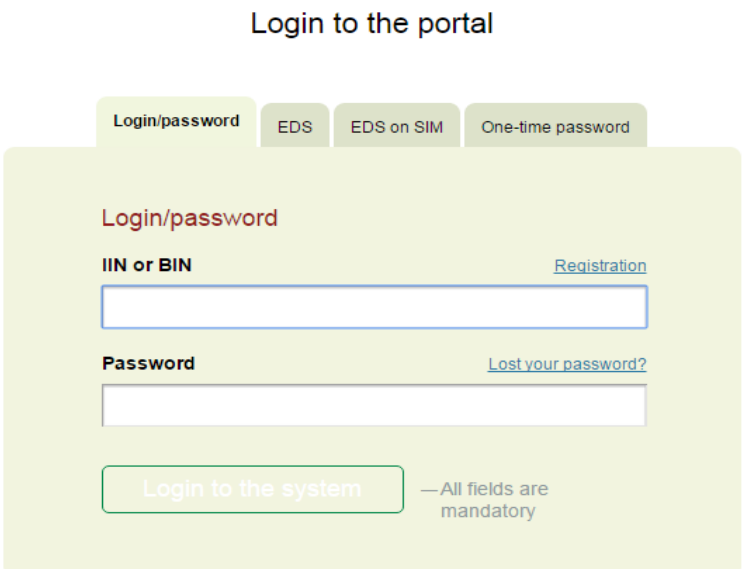



Figure 13.2 (e) egov.kz

***Exercise 13.3***

With the help of instructions and videos on the site egov.kz, perform the following task

1. Getting help address
2. Check the address data ( data on registration )
3. Getting Help of pension contributions

## UNIT 14
## INFORMATION TECHNOLOGIES IN THE PROFESSIONAL SPHERE. INDUSTRIAL ICT

### 14.1 The software for the solution of tasks of the specialized professional sphere

***Application package*** – a set of programs designed to meet the challenges of a certain class (functional subsystem, business application)method-oriented.

- the following types of PPP:
- general purpose (universal);
- problem-oriented,
- global networks;
- organization (administration) computing process whole.

***IFR general purpose*** – versatile software designed to automate the development and operation of the user's functional tasks and information systems as a By this RFP class includes:

- text editor (word processor) and graphics,
- spreadsheets,
- database management systems (DBMS);
- integrated
- packages; Case-technology;
- the shell of expert systems and artificial intelligence systems changes.

RFP for creating and text documents, graphics, and illustrations, called the editor.

***Text editors*** designed to handle text and perform mainly the following functions:

- record the text file;
- insert, delete, replace characters, lines, text fragments,
- spell checking,
- formatted text, different fonts,
- text alignment
- preparation tables of contents, splitting the text on the page;
- search and replace words and expressions,
- the inclusion in the text of simple illustrations;
- text printing

The most widely used text editor Microsoft word, word Perfect (currently owned by the company Corel), chiWriter, Multi-Edit And other used.

Graphic editors are for processing graphic documents, including diagrams, illustrations, drawings and tables. Allowed to control the size and font of figures, moving figures and letters, the formation of any image. Among the most famous image editors can be called packages Corel DRAW, Adobe PhotoShop and Adobe Illustrator.

Publishing systems combine the possibilities of text and graphic editors have developed capabilities for formatting strips with graphic materials and then printed. These systems are targeted for use in publishing and typesetting systems are called. Because these systems can be called PageMaker products from Adobe and Ventura Publisher of Corel Corporation.

***Spreadsheets*.** Spreadsheet called RFP for processing tables.

The data in the table is stored in the cells located at the intersection of rows and columns. The cells can be stored numbers, formulas and character data. Formula values are set dependent on the contents of one cell to other cells. Changing the contents of a cell resulting in a change of values in the dependent cells.

The most popular PPP of this class are products such as Microsoft Excel, Lotus 1-2-3, Quattro Pro, and others.

***Database Management Systems***. To create a database inside the machine information support uses special IFR – database management system – ***Database.*** **A** set of specially data organized sets stored on disk adding, database management includes data entry, their correction and manipulation of data, that is, delete, retrieve, update, etc. Developed database applications to ensure the independence, working with them on the specific organization of information in databases. Depending on how these organizations are distinguished: network, hierarchical, distributed, relational database management system from the available database the most widely used Microsoft Access, Microsoft FoxPro, Paradox (corporation Borland), and the Oracle database company, Informix, Sybase, Modern etc.

## 14.2 Modern IT trends in the professional sphere: medicine, power, etc.

Computers have long been used in medicine. Many modern diagnostic methods based on computer technology. Such methods are surveys, as ultrasound or computed tomography, generally unthinkable without a computer. But in a more "old" methods of examination and diagnostic computers are invading more and more actively. Cardiogram and blood tests, the study of the fundus and dental health ... - It's hard to find an area of medicine in which computers have not been applied to more and more to.

Active, but only diagnostic use of computers in medicine is not limited. They are increasingly beginning to be used in the treatment of various diseases. Starting from the construction of the optimal treatment plan and to manage the various medical facilities during procedures.

The information economy has changed many aspects of economic reality, in particular, and the function of money, that of a universal equivalent effort gradually turned into a means of calculation. Virtual banks and payment systems -. The fruit of development of information technologies in economics and business information technology applied to the processing, sorting and aggregating data for the organization of interaction of actors and computer technology, to meet the information needs for operational communications, etc.

It is understood investment decision in the development of information technologies, as well as other management decisions should take into account economic feasibility. But it turns out that this very convenient to calculate the benefit in using all of the same information technologies. There are models of counting the total economic impact, which allows to take into account, among other things, additional benefits of the introduction of information technologies, scalability and flexibility of the systems, as well as potential risks.

## 14.3 Use of search engines and electronic resources in the professional purposes.

***The search engine*** (Eng. engine) – search it is a computer system designed to for search information. One of the most well-known applications of search engines – web services to search for text or graphic information in the World WideWeb. There are also systems that can search for files on the FTP-server, goods in online stores, information in the Use net newsgroups.

To search for information using a search engine user formulates a search request. The search engine's job is to search for the user to find documents that contain any specified keywords, or words, in any way related to the keyword. In this case the search engine generates a search result page. Such a search listing may comprise various types of results, such as web pages, images, audio files. Some search engines also extract information from the appropriate database and web directory.

The search engine is better than more documents that are to relevant the user's request, it will return. Search results may become less relevant due to the nature of algorithms or due to human error. Most popular search engine in the world is Google.

According to the methods of research and service shared by four types of search Systems using crawlers, systems controlled by a person, the hybrid system and the meta-system. The search system architecture typically includes:

- crawler that collects information from Internet sites or from other documents,
- indexer, provides a quick search on the stored information, and
- the search engine - a graphical interface for the user

**High-level architecture of the standard crawler**

Main components of a search: engine crawler, indexer, search engine.

As a rule, the system works in stages. First, the crawler receives the content, then the indexer generates a searchable index, and finally, the search engine provides the functionality to search for the indexed data. To update the search engine indexing of the loop is executed again.

Search engines work by storing information about many web pages, which they receive from HTML pages. Crawler or "crawler"(eng. -Crawler)a program that automatically runs through all the links found on the page, and makes them stand out. Crawler based on references or on the basis of a predetermined list of addresses, searches for new documents, not yet well-known search engine. The site owner can exclude certain page using a robots.txt, using which you can prevent the indexing of files, pages or the site directory.

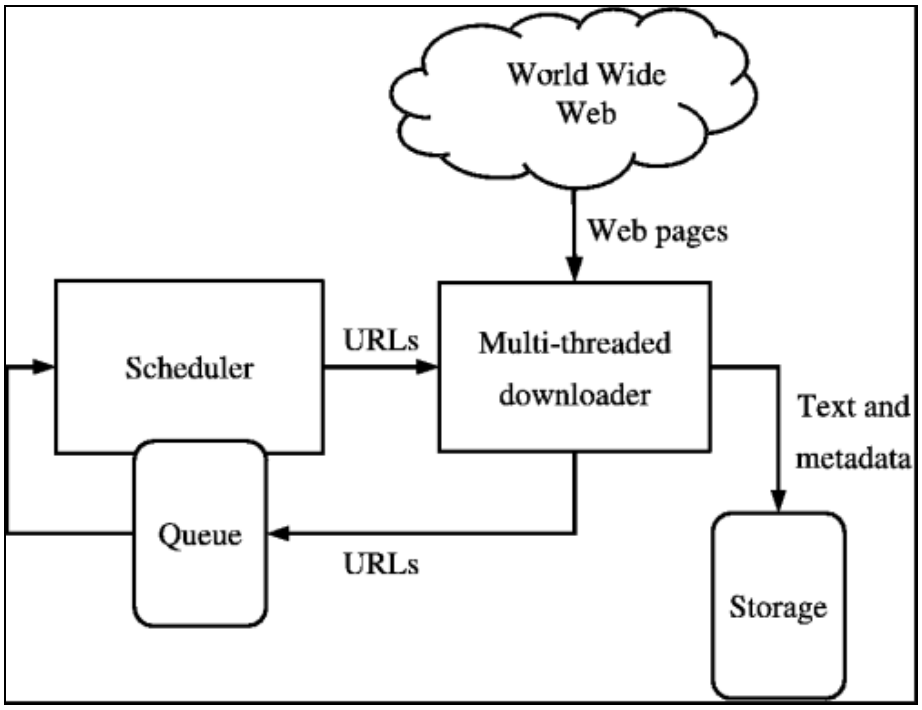



Figure 14.1 Search engine structure

Searcher operates to output files received from the indexer. The search engine receives user requests, processes them using the index and returns search results

## 14. 4 Safety issues in industrial information and communication technologies

Vision of information security of the Republic of Kazakhstan Information Security Concept of the Republic of (Hereinafter - the Concept) is designed to ensure that the interests of society and state in the information sphere. recently updated issue of equal participation of

the Republic of Kazakhstan in the international exchange of information and processes in the international regulation of information security. The need to defend the national interest requires an increase in the activity of state bodies in the framework of existing international organizations introduction. Thus, the current state of information security is characterized by the following threats:

1) the imperfection of information security system and dysfunction of critical facilities information;

2) low level of production, the and the use of modern information and communication technology that does not meet the objective needs of and society,

3) depending on the Republic of Kazakhstan on import of information technologies, informatization and protection of information, the use of which may cause damage to the national interests of the country;

4) the rise of information warfare between the world's leading centers of power, preparation and conduct of foreign states struggle in the information space;

5) non-constructive policy of foreign countries in the field of global information monitoring, dissemination of information and the new information technologies;

6) the development of information manipulation technologies;

7) the possibility of destructive information impact on the public consciousness and public institutions, the applicator damage to the country's national interests;

8) dissemination of false or deliberately distorted information that could harm the national interests of the Republic of Kazakhstan;

9) openness and vulnerability of the national information space from external influence;

10) lack of effectiveness of information support of public policies;

11) a weak protection and low competitiveness national information space;

12) non-compliance of national content quality of the objective requirements of Kazakhstan's society and world level;

13) increase in crime, including transnational crime, as well as extremist and terrorist activities, using information and communication technologies;

14) attempts unauthorized access to information resources Republic of Kazakhstan, resulting in damage to its national interests;

15) activities of foreign intelligence and special services, as well as foreign political and economic structures, aimed against the interests of the Republic of Kazakhstan;

16) violations of secrecy when working with information constituting state secrets of the Republic of Kazakhstan, as well as willful misconduct and unintentional errors and irregularities in the handling of information of restricted access;

17) lack of legal regulation of information sphere system;

18) natural disasters and catastrophes;

19) unlawful actions of state structures, leading to a violation of the legitimate rights and interests of individuals and legal entities, the state in the field of information.

**Aims and objectives**

The aim of the Concept is creation of a national information security system that guarantees the protection of the national interests of the Republic of Kazakhstan in the field of information to achieve this goal it is necessary to solve the following set of tasks:

1) the development of information security management system that enables ensure security of the country's national information infrastructure, and a single national information space;

7) 2016, the level of maintenance to eliminate downtime of information systems for information security will be reduced to 20 minutes;

8) will be provided by the production of the domestic computer hardware, accessories, peripherals and software

9) increase the level of innovative activity of industrial enterprises;

10) legal framework governing the information sector will be improved, including through international cooperation;

11) will improve the system of staffing in the field of information security and the protection of state secrets.

**Control questions:**

1. What is the software for the solution of tasks of the specialized professional sphere?
2. Safety issues in industrial information and communication technologies

3. What is the modern IT trends in the professional sphere?
4. What are the differences between using of search engines and electronic resources in the professional purposes?

***Exercise 14.1***

**Design E-book cover pages / Magazine front/ books front/back page using cover page option in Insert Menu.**

This practice is an advance. But try to find the books, magazine cover pages. And try to make similar in MS-Word. Imagine if you're the designer, how you will design the same content or front page.

***Exercise 14.2***

**Try to create similar Header & Footer that you're seeing in the Book**

This is the most important option and thousands of students find it difficult to use header and footer. It's easier to learn header and footer one time but if you're not practicing it in various ways or the things such as books header and footer, it's tough for you to explain it to others.

***Exercise 14.3***

**Create Business Cards using Shapes, text, and colors.**

People use Adobe Photoshop, Corel Draw and websites to create business cards nowadays automatically and manually. You can also use that. But it's about mastering in MS Word options and skills. When you create and design anything in Microsoft word. Your basic computers skills become strong. That helps you in future when you start working on Computer or MS-office or MS-Word. Also, basic computer skills are very important before doing any degree course in IT. So, Design the business cards similarly you're seeing in the below sample picture.

***Exercise 14.4***

**Create and Design Admission/Enquiry Forms etc. See a sample in the image below.**

To create this kind of form, you need to use shapes, text boxes, colors, formatting options, table, and horizontal lines in MS word. This is very good exercise to practice because it will give you the idea

how to use such options practically on various official documents that we use in our daily official life.

Post Applied for: Post Number:

## Harlow Council Job Application Form

Closing Date: Interview Date:

It is important that you read the guidance notes before completing this application form. Please complete this form fully using black ink or type. C.V.s are not accepted. Applications received after the closing date will not normally be considered.

**THE INFORMATION YOU SUPPLY ON THIS FORM WILL BE TREATED IN CONFIDENCE.**

### Section 1 Personal details

Last Name: First Name:

Address:

Postcode:

Home Telephone Nº: National Insurance Nº: Letters Numbers Letter

Daytime Telephone Nº:

Mobile Telephone Nº:

E-mail address:

Can we contact you at work? Yes No

Are you free to remain and take up employment in the UK with no current immigration restrictions? Yes No

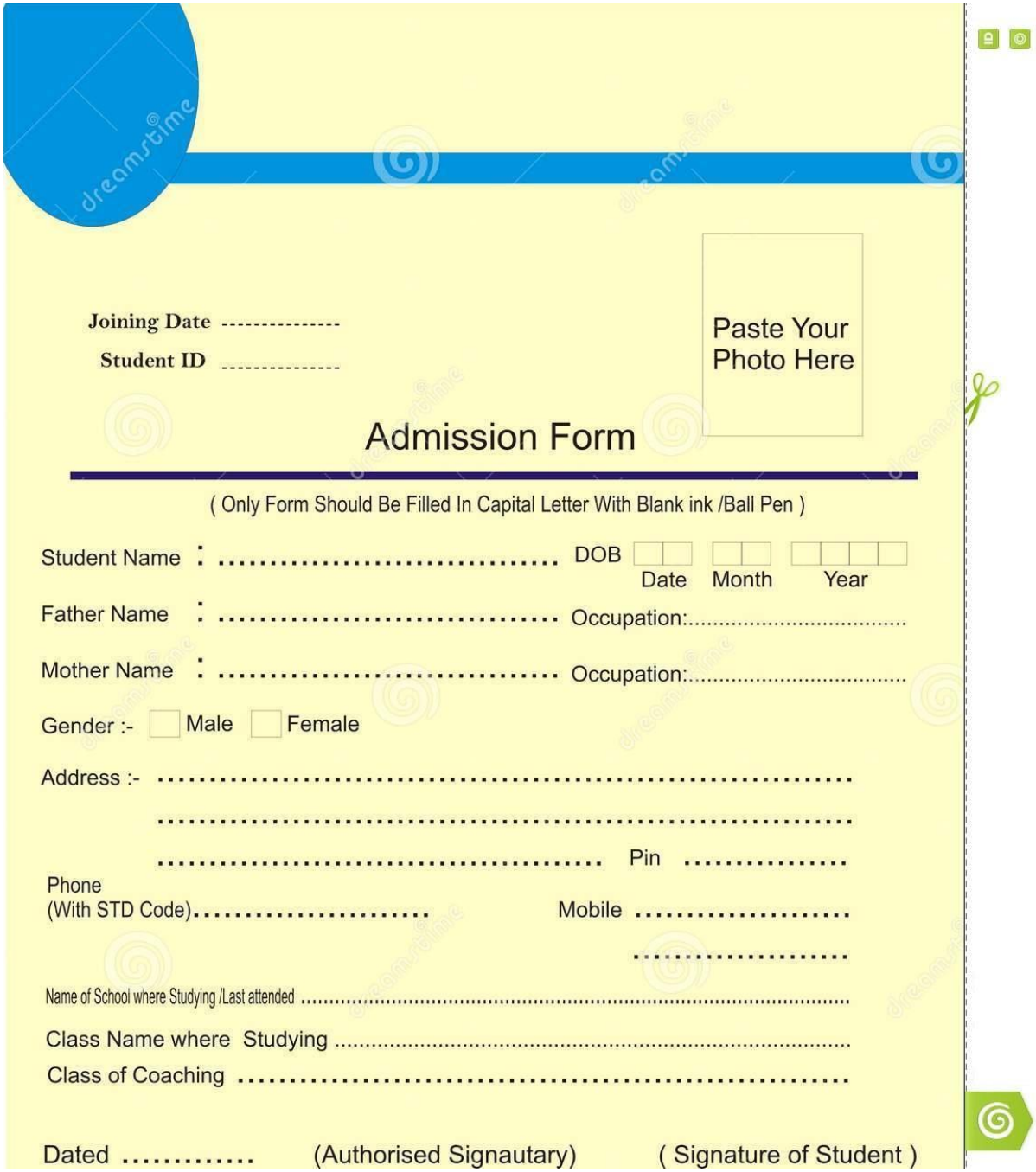
Job Share Details
Are you applying on a job share basis? Yes No

Driving Licence – if relevant to post applied for.
Do you hold a full, clean driving licence valid in the UK? Yes No

**If you are successful you will be required to provide relevant evidence of the above details prior to your appointment.**

Harlow

Figure 14.2 Job Application Form



Joining Date ----------

Student ID ----------

Paste Your Photo Here

Admission Form

( Only Form Should Be Filled In Capital Letter With Blank ink /Ball Pen )

Student Name : ..... DOB Date Month Year

Father Name : ..... Occupation:.....

Mother Name : ..... Occupation:.....

Gender :- Male Female

Address :- .....

.....

..... Pin .....

Phone
(With STD Code)..... Mobile .....

.....

Name of School where Studying /Last attended .....

Class Name where Studying .....

Class of Coaching .....

Dated ..... (Authorised Signautary) ( Signature of Student )

Figure 14.3 Admission Form

***Exercise 14.5***

**Use smart art and create organization charts**

Smart Art is my one of the favorite option in Microsoft Word. Smart art used to draw diagrams which are used to showcase the content visually that will be easy to understand and manage. Such as

you’re seeing below smart art image Hierarchy Diagram that is used to create organizational chart or structure of Telecom company. This is the best method to understand and teach about certain things to students, teachers, parents and companies. You will see such organizational charts in companies office and government head offices.

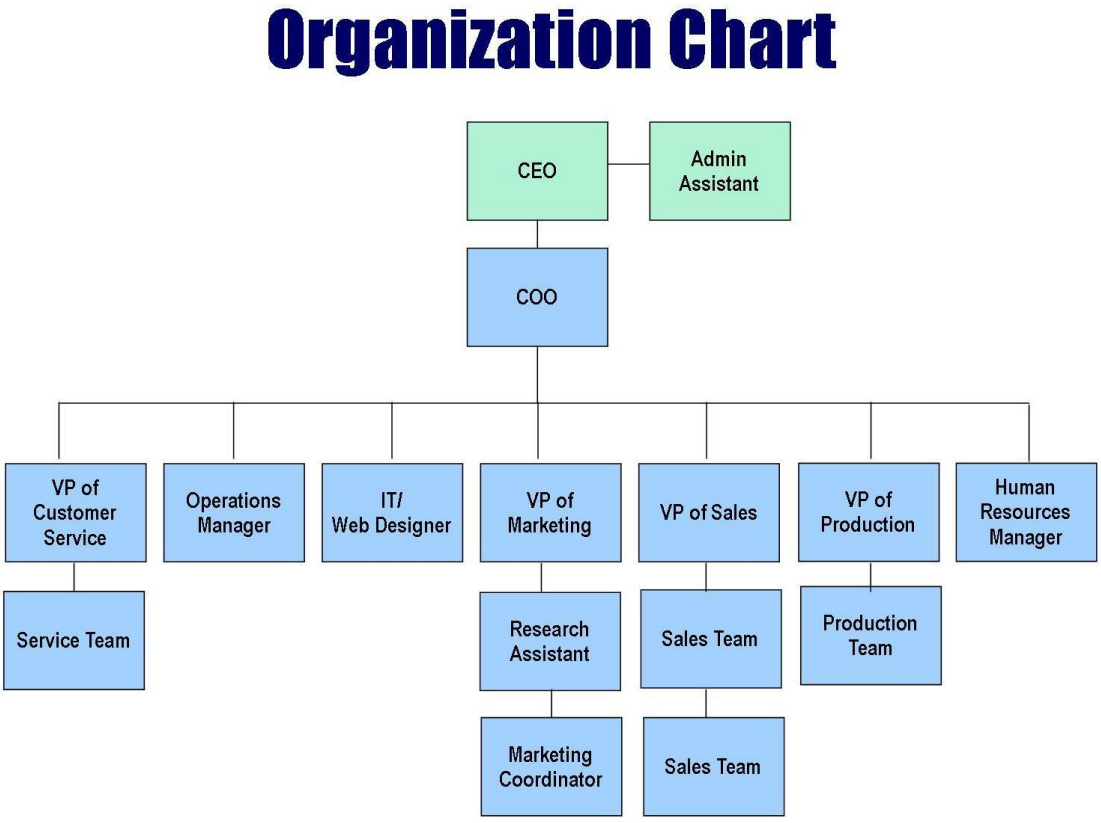



Figure 14.4 Chart

***Exercise 14.6***

**Get the newspaper and see the text based advertisement and Design that advertisement in Microsoft Word.**

Design and create text or image-based advertisement that you saw in the newspaper. Designing such advertisement will be a very beneficial role for Microsoft Word students or people learning Advanced Microsoft word skills. Advertisement designs contain high-quality images, text, and layout. And these designs are created by experts. When students practice on experts material and create similar or better than that. I think that movement is great for learners and teachers. So, try to create as many as you like. It will make you master in MS word. And I think doing exercise after completing the class topic is the best way to learn MS-Word.

Figure 14.5 Newspaper examples

***Exercise 14.7***

**Make books content page or index page**

This is another idea in which you need to create index or content page of the book. In this process you will learn about first line indent, hanging indent and the perfect use of ruler bar in Microsoft Word. And also about page number, a hyperlink (if it is eBook). You can discuss this article with your computer teachers, to allow us or provide us similar things to practice on.

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Figure 14.6 Contents

## UNIT 15
## PROSPECTS OF DEVELOPMENT OF ICT

**Prospects of development in the sphere of the IT market**: development of the free software. Forming of an ecosystem of IT of entrepreneurship and support small startup of the companies.

The free software (SPO, eng. free software also software libre or libre software), free software software, where users have rights ("freedom") on its installation, start-up, free use, study, dissemination and change (improvement) and distribution of copies and results of any changes. If the software has the exclusive rights, the freedom, are declared using the free license.

As a free (freeware) and free software, SPO can be used to obtain and usually free (but the distributor can charge for the obtaining of his copies, delivery channels, media CD-ROMs or additional services). However, freeware is usually distributed as executables without source code is proprietary, and to be free (free software), recipients must be available in source code from which you can create executable files together with the appropriate licenses. Due to the fact that the word "sale" and called the original sale, and distribution of copies for the money, and paid licensing (usually proprietary conditions), some still believe free software is a subset of the free.

Often distinguish between free and open source software (open source) – although the availability of source code for the SPO is required and many open programs are both free. The choice of the name is often associated with the language and purpose of vacancy or openness.

The free software movement began in 1983 when Richard Stallman formed the idea of having freedom to use the software (eng. software freedom) users. In 1985 Stallman founded the free software Foundation to provide organizational structure to promote their ideas.

The business model of the SPO, as a rule, based on the principle of empowerment – for example, new objects of application, training, integration, configuration or certification. At the same time, some business models which work with proprietary software that is not compatible with free software, especially those that force users to pay for the license to legally use a software product.

**Programs of acceleration and incubation**

Accelerator – a company the business of which is to help other companies (residents of the accelerator).

Accelerators offer residents a structured program that helps the team to hone the business model to get the necessary contacts and increase sales. The program lasts from 3 months to half a year. The accelerator typically is a coworking space, where resident companies can be during acceleration.

The business model accelerator

Accelerators make the receipt of shares in the company and the subsequent sale of this stake, so often work in conjunction with the venture Fund (the Fund makes investments, the accelerator educational program, networking, and infrastructure).

For example, the accelerator received a share in the amount of 10% of the project N. a Project N went through the acceleration program, has grown to become a significant player in the market. Google decided to buy the startup for $10 million In this case, the accelerator receives 10% of the purchase amount is $1 million.

Program incubation – assistance in the development, promotion and financing for established small innovative or entrepreneurial companies.

To obtain resident status for the incubation program small businesses must meet the requirements:

- be registered as a legal entity or individual entrepreneur
- period of activity of a small business entity with the state registration till the moment of submission of the application should not exceed one year

not carry out the following activities:

- financial, insurance services
- retail and wholesale trade
- building
- medical services
- catering
- real estate transactions
- production of excisable goods
- production and sale of minerals
- gambling.

During the implementation of the incubation program provided office space or workplace, and end up consulting services on business issues.

**Development of necessary infrastructure of electronic payments and logistics**

E-logistics is the management and optimization of information flows that arise in the supply chain management of products from producer to consumer. The review considers the main components of e-logistics: the international system of commodity numbering codes, electronic data interchange (EDI), global data synchronization network (GDSN), the role of international and local product catalogues.

"E-logistics" – a study of current trends in development of logistics management e-logistics and the mastery of techniques and approaches in designing and managing the supply chain using modern information, communication and computer technology (ICT).

Examines theoretical and applied aspects of electronic logistics as part of overall concept of supply chain management with the use of active learning methods (discussion problems, case studies and group work

Payment system – a set of procedures enabling the transfer of funds.

It is generally understood that through payment systems money is transferred. If we approach translation from a legal point of view, in most cases there is a transfer of debt: means that the payment system should one of the customers, it becomes must to another client.

Payment systems are a substitute for cash transactions in the implementation of domestic and international payments and is one of the basic services provided by banks and other specialized financial institutions. The biggest service of this kind is the system SWIFT – society for worldwide interbank financial telecommunication, an international interbank transfer system information and make payments.

Advanced forms of payment systems are the financial procedures carried out via ATMs, payment kiosks, POS terminals, and cards with a stored cash value transaction in the foreign exchange markets, futures, derivatives and options.

Electronic payment systems are a sub-set of payment systems that ensure the implementation of electronic transfer of payments through the payment network or the chips.

In an average day through the payment system of Kazakhstan is of 119.3 thousand transactions in the amount of 753,8 billion tenge.

The largest payment systems are WebMoney – system of instant payments, Yandex. Money, Qiwi payment service, payment terminals (indoor and outdoor).

WebMoney is a universal tool for calculations in the Network, the whole financial relationships, which today are used by millions of people around the world. Kazakhstan takes the 4th place in the number of registrations and probably other indicators too. Kazakhstan is ahead of only Russia, Ukraine and Belarus.

Yandex.Money is the largest electronic payment system in Runet, which offers simple secure methods of payment for goods and services. Are the offices of Alliance Bank and branch transfer system CONTACT, as well as terminals Quickpay. Most Kazakhstanis pay via Yandex. Money online game, entertainment, extra opportunities in social networks and online advertising.

Qiwi payment service designed to pay for everyday services from mobile communications and utilities to Bank loans.

The peculiarity of Qiwi service is that payments can be made in cash in the network of QIWI payment terminals and via the Internet service and the app for mobile devices. In fact, the user can make a payment from your account in the system being in a convenient place and in convenient time.

At the moment, with the help of the payment system in Kazakhstan will be possible to replenish the account in favor of the 157 companies-providers such as utilities, Internet, cellular communication, IP-telephony, various products through catalogs, including the services of the three thousand companies that are connected to QIWI-wallet.

Also on the territory of Kazakhstan has a QIWI-purse in two languages.

Payment terminal – a hardware-software complex providing reception of payments from individuals in self-service mode. For a payment terminal is characterized by a high degree of autonomy in its work.

Using terminal you can pay for mobile communication, utility services, Internet service providers, repay loans, replenish the Bank account.

Kazakhstan companies providing services in the field of payment terminals: Quickpay, Taulink of Asia Terminal ComepayCyberPlat, TelePay.

Quickpay — the company was founded in 2003. The company started its activity as a software developer. For the first time in Russia the company developed software for touch-screen payment terminals on the operating system "Linux". In 2007, the company entered the market of Kazakhstan.

Taulinkcompany started its activity in the Republic of Kazakhstan in 2006 by the commercial launch of the first business decisions within the international telecommunications exhibition KITEL-2006. System for accepting payments TAULINK represented in more than 8 200 sales and service outlets in 507 settlements of Kazakhstan.

"Asia Terminal" company exists on the market since 2006. Under the brand "Asia Terminal" has been known since 2008. Is the production of a full (closed) cycle – from design and cutting to sales, software and service.

Comepay (Kampey) – the company was founded in 2006, operates in the market under the registered brand name "Comepay" and is one of the leading companies of the Russian Federation for reception of instant payments.

Organized more than 2000 service providers – from utilities companies to leading domestic banks that are connected to more than 38 000 points of payment and more than 25 000 payment terminals.

"CyberPlat-Kazakhstan" company was founded on 15 September 2005. The first payment was made in April 2006. Currently, the network of points of reception of payments on the territory of Kazakhstan has more than 3,100 outlets, which carry out reception of payments in favor of mobile operators and Internet service through the payment system CyberPlat.

TelePay – the company exists since 2004. The system used the latest in telecommunications and banking technology.

Recently introduced payment system Wooppay is more than just an electronic wallet. This is an indispensable tool in addressing any daily concerns, leisure, shopping or travel planning. This – Multibank system. This means that you can choose which of the banks-partners

of the system. The money credited to your purse, lie in the chosen Bank and their electronic rights are in your wallet that provides 100% security for your money.

Director of marketing Wooppay Dmitry Prihozhan in an interview CabMarket – about the history of the origin of the company and plans for the future.

There are also disadvantages: in Karaganda hard to find someone who is not in Wooppay. So, if you want to gather a great company and not to talk about work, you need to try hard, because each second in Karaganda in any way associated with our company.

So far we have implemented only a small part of what you planned, but every day we are working on new services, add features and remove bugs. Every week on the website filled with changes and services become more convenient. Anyone interested — sign up, enjoy and stay tuned. And on all issues, you can contact our customer service Department.

**Prospects of development of E-technologies**

The decree of the President of the Republic of Kazakhstan dated 1 February 2010 № 922 "Strategic plan of development of Kazakhstan till 2020" (The state program "Information Kazakhstan - 2020")

The purpose of the Program: creation of conditions for transition to Basic information society.

Program objectives:

1) the Development of it

2) ensure the availability of information and communication infrastructure

3) automation of the activities of state bodies and e-services

4) open government

5) the Development of domestic information space.

Target indicators:

1) the share of the ICT sector in GDP in 2020 - 4 %

2) quantity updated standard curricula of it professions in accordance with professional standards: technical and vocational UNIVERSITY in 2020 – 6

3) the level of digital literacy in 2020 - 80 %

4) density of Internet users per 100 inhabitants in 2020 - 75 %

5) the coverage of digital terrestrial television of Kazakhstan's population in 2020 – 95%

6) the coverage of the state radio channels in the FM band "Kazakh radio" and "Shalkar", in 2020 - 95%

7) the effectiveness ratio of use of information technologies, which developed the target architecture (ROA-return on IT assets) to the year 2020 – 30

8) the level of Kazakhstan's development index of "e-government" in 2020 - among the first 25 countries

9) index the e-participation of the Republic of Kazakhstan in 2020 - among the first 20 countries

10) the number of available local media in Kazakhstan to 2020 – 2280

11) the proportion of the population satisfying the basic information needs at the expense of the domestic media (according to sociological research), in 2020 – 53%.

**E-Commerce**

E-Commerce or Electronics Commerce is a methodology of modern business, which addresses the requirements of business organizations. It can be broadly defined as the process of buying or selling of goods or services using an electronic medium such as the Internet. This tutorial takes adopts a simple and practical approach to explain the governing principles of e-commerce.

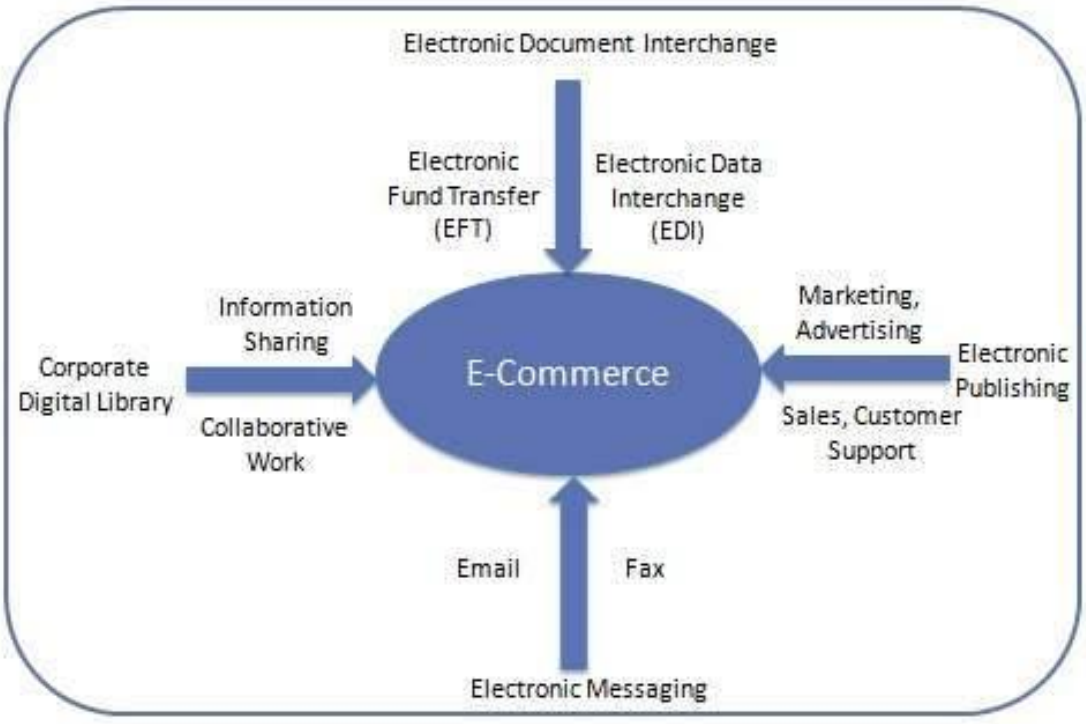


Figure 15.1 Electronic Document Interchange

E-Commerce or Electronics Commerce is a methodology of modern business, which addresses the need of business organizations, vendors and customers to reduce cost and improve the quality of goods and services while increasing the speed of delivery. Ecommerce refers to the paperless exchange of business information using the following ways −

- ElectronicDataExchange (EDI)
- ElectronicMail (e-mail)
- ElectronicBulletinBoards
- ElectronicFundTransfer (EFT)
- OtherNetwork-based technologies

E-Commerce provides the following features −

- ***Non-Cash Payment*** − E-Commerce enables the use of credit cards, debit cards, smart cards, electronic fund transfer via bank's website, and other modes of electronics payment.
- ***24x7 Service availability*** − E-commerce automates the business of enterprises and the way they provide services to their customers. Itisavailableanytime, anywhere.
- ***Advertising / Marketing*** − E-commerce increases the reach of advertising of products and services of businesses. Ithelpsinbettermarketingmanagementofproducts/services.
- ***Improved Sales*** − Using e-commerce, orders for the products can be generated anytime, anywhere without any human intervention. Itgives a bigboosttoexistingsalesvolumes.
- ***Support*** − E-commerce provides various ways to provide pre-sales and post-sales assistance to provide better services to customers.
- ***Inventory Management*** − E-commerce automates inventory management. Reports get generated instantly when required. Product inventory management becomes very efficient and easy to maintain.
- ***Communication improvement*** − E-commerce provides ways for faster, efficient, reliable communication with customers and partners.

Figure 15.2 E-Commerce

**Table 15.1 Traditional Commerce v/s E-Commerce**

| № | Traditional Commerce | E-Commerce |
|---|---|---|
| 1 | Heavy dependency on information exchange from person to person. | Information sharing is made easy via electronic communication channels making little dependency on person to person information exchange. |
| 2 | Communication/ transaction are done in synchronous way. Manual intervention is required for each communication or transaction. | Communication or transaction can be done in asynchronous way. Electronics system automatically handles when to pass communication to required person or do the transactions. |
| 3 | It is difficult to establish and maintain standard practices in traditional commerce. | A uniform strategy can be easily established and maintain in e-commerce. |
| 4 | Communications of business depends upon individual skills. | In e-Commerce or Electronic Market, there is no human intervention. |
| 5 | Unavailability of a uniform platform as traditional commerce depends heavily on personal communication. | E-Commerce website provides user a platform where al l information is available at one place. |
| 6 | No uniform platform for information sharing as it depends heavily on personal communication. | E-Commerce provides a universal platform to support commercial / business activities across the globe. |

E-commerce sites use electronic payment, where electronic payment refers to paperless monetary transactions. Electronic payment has revolutionized the business processing by reducing the paperwork, transaction costs, and labor cost. Being user friendly and less time-consuming than manual processing,it helps business organization to expand its market reach/expansion. Listed below are some of the modes of electronic payments −

- CreditCard
- DebitCard
- SmartCard
- E-Money
- ElectronicFundTransfer (EFT)

CreditCard

Payment using credit card is one of most common mode of electronic payment. Credit card is small plastic card with a unique number attached with an account. It has also a magnetic strip embedded in it which is used to read credit card via card readers. When a customer purchases a product via credit card, credit card issuer bank pays on behalf of the customer and customer has a certain time period after which he/she can pay the credit card bill. It is usually credit card monthly payment cycle. Following are the actors in the credit card system.

- **The cardholder** − Customer
- **The merchant** − seller of product who can accept credit card payments.
- **The card issuer bank** − card holder's bank
- **The acquirer bank** − the merchant's bank
- **The card brand** − for example , visa or Mastercard.

**Debit Card**

Debit card, like credit card, is a small plastic card with a unique number mapped with the bank account number. It is required to have a bank account before getting a debit card from the bank. The major difference between a debit card and a credit card is that in case of payment through debit card, the amount gets deducted from the card's bank account immediately and there should be sufficient balance in the bank account for the transaction to get completed; whereas in case of a credit card transaction, there is no such compulsion.

Debit cards free the customer to carry cash and cheques. Even merchants accept a debit card readily. Having a restriction on the

amount that can be withdrawn in a day using a debit card helps the customer to keep a check on his/her spending.

**Smart Card**

Smart card is again similar to a credit card or a debit card in appearance, but it has a small microprocessor chip embedded in it. It has the capacity to store a customer's work-related and/or personal information. Smart cards are also used to store money and the amount gets deducted after every transaction.

Smart cards can only be accessed using a PIN that every customer is assigned with. Smart cards are secure, as they store information in encrypted format and are less expensive/provides faster processing. Mondex and Visa Cash cards are examples of smart cards.

**E-Money**

E-Money transactions refer to situation where payment is done over the network and the amount gets transferred from one financial body to another financial body without any involvement of a middleman. E-money transactions are faster, convenient, and saves a lot of time.

Online payments done via credit cards, debit cards, or smart cards are examples of emoney transactions. Another popular example is e-cash. In case of e-cash, both customer and merchant have to sign up with the bank or company issuing e-cash.

**Electronic Fund Transfer**

It is a very popular electronic payment method to transfer money from one bank account to another bank account. Accounts can be in the same bank or different banks. Fund transfer can be done using ATM (Automated Teller Machine) or using a computer.

Nowadays, internet-based EFT is getting popular. In this case, a customer uses the website provided by the bank, logs in to the bank's website and registers another bank account. He/she then places a request to transfer certain amount to that account. Customer's bank transfers the amount to other account if it is in the same bank, otherwise the transfer request is forwarded to an ACH (Automated Clearing House) to transfer the amount to other account and the amount is deducted from the customer's account. Once the amount is transferred to other account, the customer is notified of the fund transfer by the bank.

## E-Commerce - Security Systems

Security is an essential part of any transaction that takes place over the internet. Customers will lose his/her faith in e-business if its security is compromised. Following are the essential requirements for safe e-payments/transactions −

- ***Confidentiality*** − Information should not be accessible to an unauthorized person. Itshouldnotbeinterceptedduringthetransmission.
- ***Integrity*** − Information should not be altered during its transmission over the network.
- ***Availability*** − Information should be available wherever and whenever required within a time limit specified.
- ***Authenticity*** − There should be a mechanism to authenticate a user before giving him/her an access to the required information.
- ***Non-Repudiability*** − It is the protection against the denial of order or denial of payment. Once a sender sends a message, the sender should not be able to deny sending the message. Similarly, the recipient of message should not be able to deny the receipt.
- ***Encryption*** − Information should be encrypted and decrypted only by an authorized user.
- ***Auditability*** − Data should be recorded in such a way that it can be audited for integrity requirements.

### Measures to ensure Security

Major security measures are following −

- ***Encryption*** − It is a very effective and practical way to safeguard the data being transmitted over the network. Sender of the information encrypts the data using a secret code and only the specified receiver can decrypt the data using the same or a different secret code.
- ***Digital Signature*** − Digital signature ensures the authenticity of the information. A digital signature is an e-signature authenticated through encryption and password.
- ***Security Certificates*** − Security certificate is a unique digital id used to verify the identity of an individual website or user.

Security Protocols in Internet

We will discuss here some of the popular protocols used over the internet to ensure secured online transactions.

Secure Socket Layer (SSL)

It is the most commonly used protocol and is widely used across the industry. Itmeetsfollowingsecurityrequirements −

- Authentication
- Encryption
- Integrity
- Non-reputability

"https://" is to be used for HTTP urls with SSL, where as "http:/" is to be used for HTTP urls without SSL.

Secure Hypertext Transfer Protocol (SHTTP)

SHTTP extends the HTTP internet protocol with public key encryption, authentication, and digital signature over the internet. Secure HTTP supports multiple security mechanism, providing security to the end-users. SHTTP works by negotiating encryption scheme types used between the client and the server.

Secure Electronic Transaction

It is a secure protocol developed by MasterCard and Visa in collaboration. Theoretically, it is the best security protocol. It has the following components −

- **Card Holder's Digital Wallet Software** − Digital Wallet allows the card holder to make secure purchases online via point and click interface.
- **Merchant Software** − This software helps merchants to communicate with potential customers and financial institutions in a secure manner.
- **Payment Gateway Server Software** − Payment gateway provides automatic and standard payment process. Itsupportstheprocessformerchant'scertificaterequest.
- **Certificate Authority Software** − This software is used by financial institutions to issue digital certificates to card holders and merchants, and to enable them to register their account agreements for secure electronic commerce.

**Control questions:**

1. What are the differences between programs of acceleration and incubation?
2. What are prospects of development of E-technologies?
3. Are there prospects of development in the sphere of the IT market?
4. Development of necessary infrastructure of electronic payments and logistics.

***Exercise 15.1***

Group exercise:

Form groups of three or four people and create a business model for an

- online technology market
- online book retailer
- online apparel retailer.

After working out the details, submit a group report that covers the following issues:

1. Products and Services: How will you earn revenues? What services will you offer? How will you price these services? What forms of payment will you accept? Will you sell ads? If so, what kinds?
2. Appearance: What will your site look like? Will it have graphics? Sound? Video? What will your domain name be? What information will you collect from customers? What information will you provide to visitors?
3. Operations: What criteria will you use to attract customers? How will your customers visit the web site?
4. Attracting customers: How will you attract customers to the site? How will you monitor and analyze site activity?
5. Security: How will you guarantee confidentiality? How will you ensure that your site is secure?
6. Opportunities and challenges: What opportunities do e-businesses offer? What challenges do they create? How would your business model change if you decided to run it as a traditional business rather than as an e-business?

***Exercise 15.2***

Joan Watson is the owner of Joan's Gourmet Baskets, a small brick-and-mortar business that specializes in gourmet gift and picnic baskets. Joan has been keeping up with the fancy food and gourmet food trends (being a great fan of the Fancy Food Show that is held several times a year), and she thinks she should tap into this sector by creating an online business that will complement her physical business. This would make her baskets available to a wider market. She is proud of the quality of her products and the customer loyalty that she has earned through her hard work and hopes she will be able to be just as successful in the e-commerce environment.

Joan knows that she needs more information before proceeding further. She has asked you to prepare a report that answers the following questions: How will her physical business compare to her online business; that is, where will things be the same, and where will they be different? What business model should she use? What are the special challenges and obstacles she will face as she moves from traditional commerce to e-commerce? What is Web 2.0 all about and does she need to be concerned about it? She expects that you will do additional gourmet foods research to support your ideas.

***Exercise 15.3***

The Website: Buy or Build?

Unless a small business owner is technologically savvy or employs someone who is, building the company's website in-house from the ground up is not a particularly good idea. An effective website presence requires a good looking, professionally designed website.

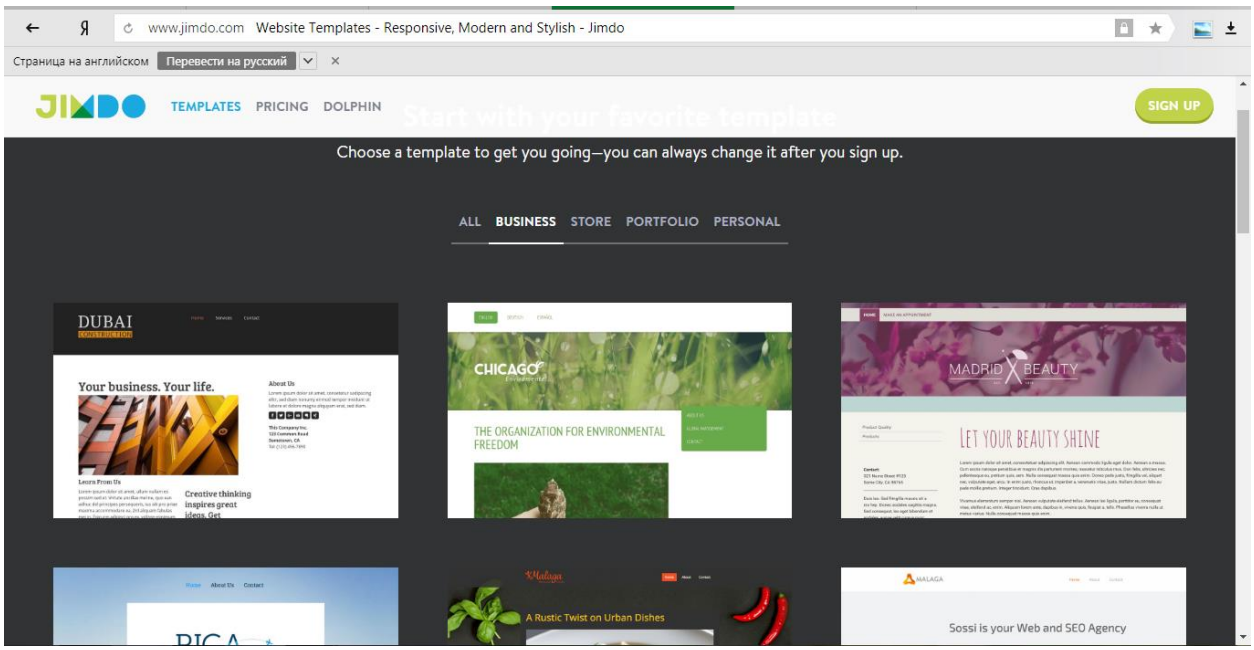


Figure 15.3 Jimdo.com

How to Create a Website with Jimdo?

Whether you're a complete newbie or already know a thing or two about websites, building your own website doesn't have to be overwhelming. This guide will help you get your first Jimdo website off the ground. We'll give you all the steps to make a website and offer tips on design, domains, and more. In this guide you will learn:

- Log in to your Jimdo website www.jimdo.com
- Choose a template for your website
- Add and rearrange content — text, photos, etc.
- Create website pages and a navigation menu
- Design your website with different settings - change fonts, colors, etc.
- Connect your website domain

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