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INFORMATION AND COMMUNICATION TECHNOLOGIE

TUTORIAL

FOR STUDENTS OF TECHNICAL SPECIALTIES

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The manual is intended to prepare for lectures and practical exercises, to perform independent work on the discipline " Information and Communication Technologies ", as well as for the independent study of the discipline. The manual contains the necessary theoretical material throughout the course, examples of solving typical problems, as well as tasks for independent decisions.

For teachers and students of universities.

CONTENT

INTRODUCTION

The manual "Information and Communication Technologies" includes 3 sections, the topics of which are connected with modern information technologies and telecommunications. The issues of standardization of software, the design of modern telecommunication systems, PC hardware, technologies of portal solutions, the basics of computer graphics and mobile information technologies are considered. The manual is intended for the system of advanced training of faculty members and may be useful for students studying in the specialties 070400, 070300, 071900, etc.

Goals and Objectives:

Goals of the Course "Information and Communication Technologies" are training of the highly qualified specialists owning skills of application of the modern information technologies in the sphere of professional area.

Objectives of the Course:

- to give an idea of use of application program packages;

- to give an idea of architecture of computing systems, operating systems, and networks;

- to inform of the main concepts of development network and web applications, with bases of information security;

- explain the principles of information communication technologies and w-learning;

- learn to carry independent creative search;

- study possibilities of the modern information technologies and tendencies of their development.

Position of the course in the educational program:

The Course "Information and Communication Technologies" is a mandatorycourse and the part of the General Education.

After studying the subjects students acquire the following competencies:

Cultural:

- The ability to learn to acquire new knowledge in the field of mathematics, natural and socio-economic sciences and the ability to use them in a professional activity

- The ability to use innovation

- The ability to use information and communication technology

Professional:

- Communicate, adapt, and present information properly in its context (audience, media) in ICT environments and for a peer audience.

- Appropriateness and adequacy of information and information sources for a specific purpose (including determining authority, bias, and timelines of materials).

1 MODULE. INTRODUCTION TO ICT

1.1 ICT role in key sectors of development of society. Standards in the field of ICT

IT (Information Technology)

The term Information Technology refers to an entire field that uses computers, networking, software, and other equipment to manage information electronically in a digital form. Consider an IT department in an organization. They are equipped with computers, database Management Systems, servers, and security mechanisms for storing, processing, retrieving, and protecting information available with the organization. You might have heard about the professionals working in such department of a company like system administrators, database administrators, programmers, IT managers, network engineers. If it is a business organization, they all work together to provide services such as providing information, providing tools to improve the productivity, automating the business processes, and providing means for connect with customers. Therefore, in the modern world, IT is an essential part of all of business operations.

ICT (Information and Communication Technology)

The term Information and Communication Technology can be considered as an extended version of the term IT as it involves a „C" that represents the communication of data by electronic means, usually over some distance. Here, communication refers to the media broadcasting technologies, audio/video processing and transmission and telephony. Recently, the term ICT has been used to refer to the integrating telephone and audio/ visual networks with computer networks. This integration has provided large savings of costs due to the elimination of telephone networks. Simply, ICT can be seen as the integration of information technology with communication technology.

In contrast with IT according to the *Wikipedia*, Information and Communications Technology or (ICT), is often used as an extended synonym for information technology (IT). But it is a more specific term that 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 more inclined and widely used in the educational sector. Some have simplified ICT as using audiovisual equipment for learning at school and the use of networks that help transmit information across schools.

IT was limited only to the textual mode of transmission of information with ease and fast. But the information not only in textual form but in audio, video or any other media is also to be transmitted to the users. Thus, the ICT = IT + Other media. It has opened new avenues, like, Online learning, e-learning, Virtual University, e-coaching, e-education, e-journal, etc. Third Generation Mobiles are also part of ICT. Mobile is being used in imparting information fast and cost effective. It provides e-mail facility also. One can access it anywhere. It will be cost effective. The ICT brings more rich material in the classrooms and libraries for the teachers and students. It has provided opportunity for the learner to use maximum senses to get the information. It has broken the monotony and provided variety in the teaching – learning situation.

As already mentioned above, by the technology of communication we process trans-

fer digital data from one device to another. These technologies related to the communications are usually complex. Though you are not going to study about them in this material, there are some aspects of digital communication that you need to study such as the types of networks and the mechanism of getting connected with the internet. These topics are discussed within this course material in coming sessions.

CS (Computer Science)

In addition to the terms IT and ICT described above, you might have heard another terminology "Computer Science" which also sounds similar to the above two. Computer Science is the mother of all computational disciplines (Computer Engineering, Information Technology/Information Science, Software Engineering, ICT, etc). In simple words, Computer Science is all about computers. In contrast with IT, CS is the science of computing with in depth knowledge of working principles of computers whereas information technology is the science designed to make best use of information systems to make work easier in business environments. According to the *Wikipedia*, CS is the scientific and practical approach to computation and its applications. A computer scientist specializes in the theory of computation and the design of computational systems. So, a computer scientist is obviously thorough in Physics, Mathematics, electrical engineering, and forms of languages. CS is a field related to research work and thus it"s evolving with the innovations of the research outcomes.

Now you may have some idea that the ones who can afford to be in touch with the information and communication technology can be updated with evolving knowledge while the ones who fail or have less chances may remain in the pre-knowledge stage.

Objectives of the course unit

It is clear that you require some skills ranging from basic to advanced, that are needed to be able to work with computer based information systems. Simply, you will require the capability of using computers and computer software in order to deal with information and communication technologies.

Therefore, the fundamental objective of this course unit is to be able to:
- Convert
- Store
- Protect
- Process
- Transmit/communicate and
- Retrieve

Information by using computers and its software. So, now you can understand that the computer skills are necessary and highly related to ICT.

Imagine that you have followed this course unit. Let us take very simple examples to brief the above six terms related to information to understand the necessary computer skills for ICT.

You can sing a song and record your voice using a microphone and save it in your computer as a digital file which you can open and play later. Here the voice input has been *converted* into a digital media file and *stored* it in your computer for future reference. You may *save (store)* it in a CD and give it to your friend to listen.

Imagine that you have very confidential documents saved in a folder of your com-

puter. In order to avoid others accessing those documents you may *lock (protect)* the folder accessibility by applying a password on the folder. Simply, when someone tries to open that folder, the computer will ask for a password which is only known to you.

If you are working in the salary division of your company you may use a simple computer program which gives the monthly salary of employees when the data such as basic salary, salary advance taken, allowances to be given, no. of overtime hours worked, and the rate of monthly salary increment are entered into the computer. Here the data given has been *processed* into the monthly salary which is important information.

- The salary particulars of all employees of Matara branch of your company may be processed at the Colombo Head office and the salary file may be sent to Matara branch through the company intranet (a network built among the branches of your company). Otherwise the salary file may be e-mailed to the branch manager at Matara. Here, using either ways, the required salary file is *transmitted /communicated* through a computer network.

You may be asked by your manager to give a list of employees who work in the Sales division who have exceeded a total of 250 OT hours during the last six months. It will be just a matter of calling (*retrieving*) the existing data saved in the central database to generate the report in the required format.

What next in the course unit

From the next session onwards, you will get familiar with computers and will acquire the necessary skills step by step. You will able to get the skills related to some of the key applications of ICT such as text editors, spreadsheets, databases, and presentations. This *ICT Skills* course is planned to do more, than teaching basic computer literacy skills on current packages. It provides a combination of theoretical knowledge and practical skills that together comprise a mental framework that will enable the student to get familiar and learn new IT packages as they change, to solve new IT problems and use additional package features that are not explicitly taught in this course. However, the course has a strong practical focus with the intention of enabling students to use ICT"s as tools for productivity and problem solving in your lives which is the aim and objective of this course unit. So it is a must to do practicals based on the content of this material to achieve the above aims and objectives.

What is a Computer?

A computer is a general purpose device which can be programmed to carry out a finite set of arithmetic or logical operations. Since a sequence of operations can be readily changed, the computer can solve more than one kind of problem.

A computer is, at its most basic, a machine which can take instructions, and perform computations based on those instructions.

A computer is an electronic device which is capable of receiving the inputs (data from the user), storing it for a desired period of time, manipulating it according to the set of instructions (called program) and producing the output to the user in desired form. It performs a variety of operations in accordance to the set of instructions.

The above three descriptions are some standard definitions extracted from different information resources available in the World Wide Web, including Wikipedia, the largest free encyclopedia. Meanwhile, a computer can be defined as follows in terms of basic us-

age of the computer which is more readable for a layman.

A computer is an electronic device that manipulates information, or "data". It has the ability to store, retrieve, and process data. You can use a computer to type documents, send email, and browse the internet. You can also use it to handle spreadsheets, accounting, database management, presentations, games, and more.

When reading the above definitions you may find some common behaviors of computers such as;

-   It is a man-made machine
-   It accepts instructions of a human given in a sequential manner
-   As per the given instructions, it performs some calculations and does changes for the information fed by human
-   Releases or produces an output that is useful to the user

Since the computer is a man-made digital electronic device, it has a physical structure with several parts like the monitor, processor, mouse, and key board which are tangible. These are called Hardware. The sets of instructions which are also called computer programs installed in the computer are called Software. These softwares tell the hardware what to do and how to do to accomplish some tasks expected by the user to get done by the computer. The web browsers like Mozilla Fire Fox, Computer games, and Word processors like Microsoft Word are some examples for Software. You will learn more about these computer hardware and software in coming sessions of this course material.

Questions for self-test.
1.Declarative and procedural knowledge.
2.Three types of information processes.
3.The role of the senses in the perception of information.
4.What is the shape information?
5.What determines the information content of messages received by the man?
6.Unit of measurement information.

1.2Introduction to computer systems. Architecture of computer systems

What is Computer Hardware?

You are already aware that a computer system is made up of several different components. Those that can be seen and touched are referred to as the Computer Hardware (or simply „hardware"). In other words, the physical equipments that are involved in the function of the computer are called its hardware. The computer hardware is typically divided into four main categories:

Processing Devices, Memory Devices, Input/, Output Devices, and Storage Devices.
Processing Devices
The Central Processing Unit (CPU)
The Central Processing Unit is an electronic device which runs computer programs: a set of sequential instructions. It is also called as the Computer Processor or the brain of the computer. According to the above Figure 3.2, you can see that there are two major components namely the Control Unit (CU) and the Arithmetic and Logic Unit (ALU). The

CU is the circuitry that controls the flow of data through the processor, and coordinates the activities of the other units within it. In a way, it is the "brain within the brain", as it controls what happens inside the processor, which in turn controls the rest of the PC. The ALU is a digital circuit that performs arithmetic and logical operations. The ALU is a fundamental building block of the central processing unit of a computer, and even the simplest microprocessors contain one, for purposes such as maintaining timers. The processors found inside modern CPUs have very powerful and very complex ALUs; a single component may contain a number of ALUs.

We consider the CPU as the processing device of the computer. You are aware that the CPU contains Control Unit (CU) and an Arithmetic and Logic Unit (ALU). These two components work together to perform the processing operations. On a PC, the CPU usually is contained on a single chip and sometimes is called Microprocessor. In addition to the CU and ALU, a microprocessor usually contains the registers and system clock.

The Control Unit (CU)

As you know, a computer program or set of instructions must be stored in memory for a computer to process data. The CPU uses its CU to execute these instructions. Further, the CU directs and coordinates most of the operations of the computer. The speed at which the processorcarries out its operations is measured in megahertz (MHz). The higher the number of MHz the faster the computer can process information. The Intel i7, Athlon, Celron, and Duron, Ultra Spark are some examples for the brands of processors available in the market.

The Arithmetic and Logic Unit (ALU)

ALU performs the arithmetic, comparison, and logical operations. Arithmetic operations include addition (+), subtraction (-), multiplication (*) and division (/). Comparison operations include comparing one data item to another to determine if the first item is greater than (>), equal (=), or less than (<) to the second item. Logical operations work with conditions such as AND, OR, NOT.

Memory Devices

Computer Memory

A character is stored in the computer as a group of 0s and 1s, called a Byte. The size of the memory is measured by the number of bites available. The following equalities give the measuring units of the memory.

8 Bits	= 1	Byte
1024 Bytes	= 1	Kilobyte (1KB)
1024KB	= 1 Megabyte (1MB)	
1024 MB	= 1 Gigabyte (1 GB)	
1024 GB	= 1	Terabyte (1 TB)

While performing a processing operation, a processor needs a place to temporarily store instructions to be executed and the data to be used with those instructions. The data and the instructions needed by the CPU are temporarily stored in the Memory. Therefore the memory acts as the internal storage of a computer. The programs that are stored in external storages are loaded into the memory before they start running. The memory of a

computer may be either volatile or non-volatile. If the data will be lost as soon as the power is turned off the computer, then this type of memory is said to be Volatile. Such memory needs a continuous steady power/electricity to remain its content.

Random Access Memory (RAM)

The Random Access Memory (RAM) is a volatile form of a computer memory. This small memory is capable of memorizing temporarily. It can be read and written. That is, you can both write data into RAM and read data from RAM. Together with the CPU, RAM determines the computer's speed. A computer with a large RAM and a CPU can actually run faster than a computer with a powerful CPU but with a low RAM.

Read Only Memory (ROM)

As RAM is volatile, the computers need a non-volatile memory to read larger programs. This is known as the Read Only Memory (ROM). The programs which are needed to start up your computer (Ex: to boot the computer) are stored in ROM.

Cache

Most of today"s computers improve their processing times by using cache (pronounced cash).

Memory cache, also called a cache store or RAM cache, helps speed the processes of the computer by storing frequently used instructions and data thus reducing the access time of data. When the processor needs an instruction or data, it first searches in the cache.

Input Devices

A computer executes instructions and processes data into information and stores the information for future use. Input devices are used to enter instructions and data into the computer.

What is Input?

Input is any data or instructions you enter to the memory of a computer. Once input is in memory, the CPU can access it and process the input into output. There are four types of input namely: data, programs, commands, and user responses.

Data

Data is a collection of unorganized facts that can include words, numbers, pictures, sounds, and videos. A computer manipulates and processes data into information, which is useful.

Program

A program is a series of instructions that tells a computer how to perform the tasks necessary to process data into information. Programs are kept on storage media such as a floppy disk (not used now), hard disk, CD-ROM, or DVD-ROM. Programs respond to commands issued by the user.

Command

A Command is an instruction given to a computer program. Commands can be issued by typing keywords or pressing special keys on the keyboard. A keyword is a specific word, phrase, or code that a program understands as an instruction. Some keyboards include keys that send a command to a program when you press them. Instead of requiring you to remember keywords or special keys, many programs allow you to issue commands by selecting menu choices or graphical objects. For examples, programs that are menu driven provide menus as a means of providing commands. Today, most programs have a

graphical user interface (GUI) that uses icons, buttons, and other graphical objects to issue commands. However, GUI is the most user friendly way to issue commands

Input Devices

An Input Device is any hardware component that allows you to enter data, programs, commands, and user responses into a computer. Some of the commonly used input devices are listed below.

- Keyboard
- Pointing devices
- Mouse
- Trackball
- Joystick
- Touchpad
- Light Pen
- Scanners
- Voice input systems
- Web Cam
- Bar code readers

Keyboard

The keyboard is the main input device for most computers. It is a text based input device that allows the user to input alphanumeric characters and some other special characters. The keyboard is consisting of a set of keys mounted on a board. Each key or button acts as an electronic switch corresponding to a symbol. However, to produce some symbols requires pressing and holding several keys simultaneously or in sequence; other keys do not produce any symbol, but instead affect the operation of the computer or the keyboard itself.

Mouse

The mouse functions as a pointing device by detecting two-dimensional motion relative to its supporting surface. Physically, a mouse consists of a small case, held under one of the user's hands, with one or more buttons. It sometimes features other elements, such as "wheels", which allow the user to perform various system-dependent operations, or extra buttons or features can add more control or dimensional input. The mouse's motion typically translates into the motion of a pointer on a display, which allows for fine control of a Graphical User Interface. Furthermore, a mouse is an input device that allows the user to "point and click" or "drag and drop". Common functions are pointing (moving the cursor or arrow on the screen by sliding the mouse on the mouse pad), clicking (using the left and right buttons) and scrolling (hold down the left button while moving the mouse).

Scanner

A scanner is a light-sensing input device that reads printed text and graphics and then translates the pattern of light and dark colors into a digital signal that the computer can store and manipulate. The resulting image can be of different qualities depending on the resolution of the scanner. The Flat-bed scanner is the most popular scanner which is similar to a photo copy machine except that it creates a file (softcopy) of the document instead of a paper copy (hardcopy). The file that contains the scanned object can be stored on an external storage device, displayed on the screen, printed, faxed, sent via e-mail, or

included in another document.

Bar code reader

A bar code reader uses laser beams to read bar codes. Most items in shops, special in super markets in Sri Lanka have a bar code printed or affixed on them. The Bar code is a trip of vertical bars of varying widths that creates a unique reference for the particular item. Groups of bars represent individual digits and most bar codes are made up of 12-13 digits. The last number is a check digit and it is used to verify that the number has been scanned in correctly. The computer applies a set of calculations to the individual digits and the answer should equal to the last check digit. Bar code reader uses a visible red light to scan the bar code and it is interpreted through a decoder. The reference is matched with the stock list in the computer system to find the appropriate price. Sometimes, numbers are printed below the vertical stripes which are to be used in cases the bar code reader fails to read the code

Architecture and components of computer systems

Output Devices   What is output? Output is data that has been processed into a useful form called information. A computer processes input into output. Computers generate several types of output, depending on the hardware and software being used and the requirements of the user. You may choose to display or view this output on a monitor, print it on a paper using a printer, or listen to it through speakers or a headset. Accordingly the four common types of output are text, graphics, audio, and video. A brief description on each of output type is given below.

Text

Text consists of characters that are used to create words, sentences and paragraphs. A character can be a letter, number, punctuation mark, or any other symbol that requires one bite of computer storage space.

Graphics

Graphics are digital representations of non-text information such as drawings, charts, pictures and photographs. Graphics also can be animated, giving them the illusion of motion. Animations are created by displaying a series of still images in rapid sequence.

Many of today"s software programs support graphics. For example, you can include a photograph in a word processing document or create a chart of data in a spreadsheet program. Some software packages are specifically designed to edit graphics.

Audio

Audio is Music, speech, or any other sound. You might have learnt at school that sound waves, such as the human voice or music are analog. To store such sounds, a computer converts the sounds from a continuous analog signal into a digital format. Most output devices require that the computer converts the digital format back into analog signals.

Video

Video consists of images that are played back at speeds that give the appearance of full motion. Video often is captured with a video input device such as video camera or VCR. Most video signals are analog; however, most of the modern video devices record the video images digitally.

A video capture card converts an analog video signal into a digital signal that a computer can understand. The digital signal then is stored on the computer"s hard disk.

Some output devices accept the digital signal, while others require that the computer converts the digital signals back into analog signals.

Output Devices

An output device is any computer component capable of conveying information to a user. Some commonly used output devices are listed below.

- Display devices
  - Cathode Ray Tube (CRT) monitors
  - Liquid Crystal Display (LCD) monitors / Flat-panel displays
  - LED Monitors
  - Gas plasma monitors
- Printers
  - Impact printers
  - Daisy Wheel and Dot Matrix printers
  - Non-Impact Printers
  - Ink Jet printers
  - Thermal Dye Transfer printers
  - Laser printers
- Plotters
- Audio Devices
  - Speakers
  - Headphones

You have already learnt about some of the above devices together with some images in the previous session. Therefore, let us look at some general facts about these categories of output devices.

Monitor

The monitor displays the output to the user visually. Therefore it is also called the Visual Display Unit (VDU) or simply the screen. The monitor looks like a television, but they often have higher resolutions than a normal television. Similar to televisions, the sizes of monitors are varying and often expressed in diagonally measured distance in inches. The technology used with monitors is expanding rapidly and there are two major types of monitors that differ in the technology of visualizing the output to the user. They are Cathode Ray Tube (CRT) monitors, Liquid Crystal Display (LCD) and Light Emitting Displays (LED).

The CRT monitor has more lines of dots per inch, higher the lines more amount of the resolution. It creates the picture by number of rows or lines of the small tiny dots. For an instance the resolution of 1024 x 768 will be sharper than 800 x 600 resolutions.

The LCD consists of two sheets of polarizing material with a liquid crystal solution between them. When an electric current passed through the liquid crystal solution, crystals align so that light cannot pass through them. It is like a shutter either allows light to pass through or blocking the light.

The LED is the latest marketing innovation of display units. It looks similar to LCD and it is also a flat panel display. LED means Light Emitting Diode and relates to the way the display is illuminated. LED monitors still use the same Liquid Crystals as the previous LCD displays. The way the backlight works however with the LED's will lead to a number

of improvements in the display.

Though CRT monitors are much cheaper than LCDs and LEDs, the CRTs consume more power than others

Printer

A computer printer produces a hard copy (permanent human-readable text and/or graphics) of documents stored in electronic form, usually on physical/tangible print media such as paper or transparencies. Many printers are primarily used as local computer peripherals, and are connected by a printer cable to a computer which serves as a document source. Some printers, commonly known as network printers can serve as a hardcopy device to be shared and used by any user among a group of users connected to the network. Individual printers are often designed to support both local and network connected users at the same time. There are several types of printers categorized based on the applied technology of printing text/graphics on the paper.

Impact Printers

Any impact printer forms characters and graphics on a piece of paper by striking a mechanism against in an ink ribbon that physically contacts the papers. Because of the striking activity, impact printers generally are noisy.

Many impact printers do not provide letter-quality print. Letter-Quality (LQ) output is a quality of print acceptable for business letters. Many impact printers produce near letter-quality (NLQ)

print, which is slightly less clear than LQ. NLQ impact printers are used for jobs that require only NLQ, such as printing of mailing labels, envelopes, or invoices.

Impact printers are also ideal for printing multipart forms because they easily can print through many layers of paper. Finally, impact printers are used in many factories and retail counters as they can survive in dusty environments, vibrations, and extreme temperatures.

Storage refers to the media on which data, instructions, and information are kept, as well as the devices that record and retrieve these items. In this section we will discuss about the storage media and storage devices.

Memory versus Storage

It is important to understand the difference between the memory what we discussed under section 3.3 and the Storage. Memory holds data and instructions temporarily while they are being processed by the CPU. Storage, also called Secondary, Auxiliary storage, or Mass storage, holds items such as data, instruction, and information for future use.

Think of storage as a filing cabinet used to hold file folders, and memory as the top of your desk. When you need to work with a file, you remove it from the filing cabinet (storage) and place it on your desk (memory). When you are finished with the file, you return it to the filing cabinet.

Storage

Storage is non-volatile which means that items in storage remains even when power is removed from the computer. A storage medium is the physical material on which the items are kept. One commonly used storage medium is a disk, which is round, flat piece of plastic or metal with a magnetic coating on which items can be written. A storage device is the mechanism used to record and retrieve items to and from a storage medium.

Storage devices can function as source of input and output. For example, each time a storage device transfers data, instructions, and information from a storage medium into memory (a process called Reading); it functions as an input source. When a storage device transfers these items from memory to a storage medium (a process called Writing), it functions as an output source.

The speed of a storage device is defined by its access time, which is the minimum time it takes the device to locate a single item on the disk. Compared to memory, storage devices are slow. The access time of memory devices are measured in milliseconds.

Hard disk drives are used to store operating systems, software and working data.

Hard Disk

Hard Disk drive which is often referred to as Hard Disk or Hard Drive is a device to store and retrieve data in a computer. The hard drive can store important system files like the operating system, program files and other data. Though HDDs were originally designed to be used with computers nowadays the applications for HDDs have expanded beyond computers to include digital video recorders, digital audio players, personal digital assistants, digital cameras and video game consoles. HDD is a non-volatile storage device that stores digitally encoded data. It is an electromagnetically charged surface or set of disks that record data in concentric circles known as tracks. HDDs record data by magnetizing ferromagnetic material directionally, to represent either a 0 or a 1 binary digit. They read the data back by detecting the magnetization of the material. A typical HDD design consists of a spindle which holds one or more flat circular disks called platters, onto which the data is recorded. The platters are made from a non-magnetic material, usually aluminum alloy or glass, and are coated with a thin layer of magnetic material.

Portable Hard Disks

Portable hard disk is an interesting and useful device because you can carry data about all over the place and transfer information, programs, pictures, etc. between computers. Modern portable hard disks have a massive capacity like 500GB.

Optical backing storage media such as CDs and DVDs

- CDs tend to be used for large files (but smaller than 1 GB) which are too big for a floppy disc to hold such as music and general animation.

- DVDs are used to hold very large files (several GBs) such as movie films. Both CDs and DVDs are portable i.e. they can be transported from one computer to another. Both can be used to store computer data.

- CD R/DVD R uses which require a single „burning" of data, e.g. CDs - recording of music downloads from the Internet, recording of music from MP3 format, recording of data for archiving or backup purposes. DVDs – recording of film movies and television programs.

- CD RW/DVD RW uses when require the updating of information and ability to record over old data. Not suitable for music recording but is very useful for keeping generations of files. DVDs have between five and ten times the capacity of CDs.

The System Unit

With reference to Figure 2.3 above, the System Unit of the computer is the box-like casing which contains the major electronic components that are responsible for the main functions of the computer. It should be mentioned here that many people use to refer to

this as the CPU incorrectly. This erroneous reference may be due to CPU: *The brain of the commuter* being that significant. However, the electronic devices such as CPU, memory, hard disk drive are located inside the System Unit. In addition to the above parts, Motherboard, Floppy Disk Drive, Power Supply unit, and CD-ROM Drive are the other major components that you can find within the system unit. A brief description of each above component is given next.

Motherboard

The motherboard is sometimes called the system board, planner board or main board. It is the main circuit board of a computer. The motherboard contains several connectors for attaching additional boards. Usually, the motherboard contains the CPU, BIOS, memory, mass storage interfaces, serial/parallel ports, expansion slots, and all the controllers required to control standard peripheral devices, such as the display screen, keyboard, and disk drive.All of the basic circuitry and components required for a computer to function are onboard the motherboard or are connected with a cable. The most important component on a motherboard is the chipset. It often consists of two components or chips known as the Northbridge and Southbridge, though they may also be integrated into a single component. These chips determine, to an extent, the features and capabilities of the motherboard.

Power Supply Unit

Power Supply Unit (PSU) is another very important unit found in the system unit. Usually we connect the power code of the computer to the domestic mains supply. Therefore, PSU converts Alternating Current (AC) from mains supply to Direct Current (DC) with the required different voltages needed to power different components of the computer. Power supplies have a certain power output specified in Watts, a standard power supply would typically be able to deliver around 350 Watts. The more components like HDD, CD/DVD drives, and cooling fans, are connected to your computer the greater the power required fro m the power supply. All of the basic circuitry and components required for a computer to function are onboard the motherboard or are connected with a cable. The most important component on a motherboard is the chipset. It often consists of two components or chips known as the Northbridge and Southbridge, though they may also be integrated into a single component. These chips determine, to an extent, the features and capabilities of the motherboard.

CD-ROM Drive

Most probably, you might have seen the Compact Disks (CDs) which are commonly used as a storage media. The CD-ROM drive is a high capacity optical data storage device with a removable disk, it writes data onto or reads data from a storage medium.

A CD-ROM drive may be connected to the computer via an IDE (ATA), SCSI, S-ATA, Firewire, or USB interface or a proprietary interface

Questions for self-test.
1.What is the alphabet, alphabet power?
2.What is the weight of the information symbol in the alphabet?
3.How to measure the volume of information text with the alphabetical view.
4.Speed of information flow and bandwidth.
5.Determination of the number system.

1.3 Software. Operating systems.

Software

Software is, unlike hardware, intangible part of the computer. It consists of a sequence of commands, written according to strict rules. Programs are written by programmers, in various programming languages.

Software types:

Operating system is a program which manages computer hardware. First computers did not have operating systems; they had programs that were directly loaded into the computer (e.g. punchcards). Today, computers have an operating system which loads into the computer's memory during its startup. Computer functions are based on its operating system. Within operating system, drivers (responsible for the functioning of a computer) and various utility programs (responsible for the functionality of a computer) are installed. The most famous operating systems are:

- Linux (Debian, Ubuntu, Fedora, Knoppix,...) - open source software
- Microsoft Windows (XP, Vista, 7,...) - proprietary software
- Mac OS X (Cheetah, Panther, Snow Leopard,...) - proprietary software

Application Software (Utility programs) are all programs that users use to perform different tasks or for problem solving. Users, according to his/her needs, install the appropriate utility software. Computer functions and tasks that computers can perform are defined by the installed utility software. Utility software can often cost more than computer hardware unless the software is open source.

Common utility softwares are:

Text processing software is used for creating and forming text documents and nowadays, they can contain images, charts and tables. Examples of such programs are OpenOffice.org Writer (open source software) and MicrosoftWord (proprietary software).

Spreadsheet calculations software is used for performing various calculations and presentation of results in charts. Examples of such programs are OpenOffice.org Calc Writer (open source software) and MicrosoftExcel (proprietary software).

Software for presentations is used to create professional presentations that consist of slides with graphical and textual elements. Such a presentation can afterwards be displayed as a "slide show" by using a projector. Examples of such programs are OpenOffice.org Impress (open source software) and MicrosoftPowerPoint (proprietary software). Software for creating and managing database helps to manage a collection of structured data. Examples of such programs are OpenOffice.org Base (open source software) and MicrosoftAccess (proprietary software).

Common utility software installed on a computer:
- office programs - OpenOffice.org, Microsoft Office
- antivirus programs – Avira, Sophos, Kaspersky, Antivir etc.
- Internet browser: Mozilla Firefox, Microsoft Internet Explorer, Opera, Safari etc.
- programs for image editing: Adobe Photoshop, Canvas, CorelDraw, Draw etc.

Basic concepts of OS

Programs to facilitate easier computer accessibility

We can access accessibility options:

Start menu, All Programs , Accessories, ☐Ease of Access

Magnifier is used to enhance a part of the screen.

On-Screen Keyboard – text is entered using a mouse to click on the on-screen keyboard.

Narrator is commonly used by users with visual impairment - it can read text displayed on monitor, it tells current cursor position, and describes certain events, like warning and error messages generated by OS.

Windows Speech Recognition enables speech recognition, i.e. recognizes spoken word, transfers it to text and enters it into a document; therefore it enables you to dictate a text to a computer, to browse the web using your voice etc.

An operating system is an integral part of virtually every computer system. It fundamentally affects how you can use your computer.

Can you run two programs at the same time? Can you connect your computer to a network? Does your computer run dependably? Does it have a touchscreen? To answer questions like these, it is helpful to have a clear idea about what an operating system is and what it does. Section A provides an overview of operating system basics. operating system tasks .

What is an operating system? An operating system (abbreviated OS) is a type of system software that acts as the master controller for all activities that take place within a computer system. It is one of the factors that determines your computer's compatibility and platform. Most computers are sold with a preinstalled operating system, such as Microsoft Windows or Mac OS . A third operating system called Linux is customarily used for high-end workstations and servers, but can also be installed on personal computers. Tablet computers and smartphones use operating systems such as Windows RT, iOS, and Android.

How do operating systems manage processor resources?

Every cycle of a computer's microprocessor is a resource for accomplishing tasks. Many activities—called processes—compete for the attention of your computer's microprocessor. Commands are arriving from programs you're using, while input is arriving from the keyboard, mouse, and other devices. At the same time, data is being sent to the display device or printer, and Web pages could be arriving from your Internet connection. To manage all these competing processes, your computer's operating system must ensure that each process receives its share of microprocessor cycles. You can check the processes that are being executed by the microprocessor if you suspect that a program did not close properly or that malware is working behind the scenes

How do operating systems handle so many processes? During a typical computing session, your computer might run an average of 50 processes. Ideally, the operating system should be able to help the microprocessor switch seamlessly from one process to another. Depending on the capabilities of the operating system and computer hardware,

processes can be managed by multitasking, multithreading, and multiprocessing. Multitasking provides process and memory management services that allow two or more tasks, jobs, or programs to run simultaneously. Most of today's popular operating systems offer multitasking services. Within a single program, multithreading allows multiple parts, or threads, to run simultaneously. For example, one thread for a spreadsheet program

might be waiting for input from the user while other threads perform a long calculation in the background. Multithreading can speed up performance on single- or multiple-processor computers. Many new computers include multi-core processors or multiple processors. An operating system's multiprocessing capability supports a division of labor among all the processing units. The Windows operating system displays a list of processes when you hold down the Ctrl, Shift, and Esc keys. On the Mac, look for the Activity Monitor in the Utilities folder listed under Applications. Most processes are legitimate programs that run in the background to carry out tasks for the operating system, device drivers, and applications. Occasionallya bot or worm launches rogue processes. If you want to know if a process is legitimate, you can google it. Use your interactive eBook to find out how to access information about the processes on your computer.

How does an operating system manage memory? A microprocessor works with data and executes instructions stored in RAM— ne of your computer's most important resources. Sometimes an application requests memory but never releases it—a condition called a memory leak. Memory "leaks" away into this application's reserved area, eventually preventing other programs from accessing enough memory to function properly. Those programs can crash, and the operating system might display error messages, such as "General Protection Fault" or "Program Not Responding." Your computer can sometimes recover from a memory leak if you access Task Manager (PCs) or Activity Monitor (Macs) to close the corrupted program.

How does the OS keep track of storage resources? Behind the scenes, an operating system acts as a filing clerk that stores and retrieves files from your computer's hard drive and other storage devices. It remembers the names and locations of all your files and keeps track of empty spaces where new files can be stored. Later in the chapter, you'll explore file storage in more depth and learn how the operating system affects the way you create, name, save, and retrieve files.

Why does the operating system get involved with peripheral devices? Every device connected to a computer is regarded as an input or output resource. Your computer's operating system communicates with device driver software so that data can travel smoothly between the computer and peripheral resources. If a peripheral about what to do—usually it displays an on-screen message to warn you of the problem. Your computer's operating system ensures that input and output proceed in an orderly manner, using buffers to collect and hold data while the computer is busy with other tasks. By using a keyboard buffer, for example, your computer never misses one of your keystrokes, regardless of how fast you type or what else is happening in your computer at the same time.

Are different operating systems needed for different computing tasks? One operating system might be better suited to some computing tasks than others. To provide clues to their strengths and weaknesses, operating systems are informally categorized and characterized using one or more of the following terms: A single-user operating system deals with one set of input devices— those that can be controlled by one user at a time. Operating systems for tablet computers and smartphones fit into this category. DOS is an example of a single-user operating system designed for desktop computers. A multiuser operating system allows a single, centralized computer to deal with simultaneous input, output, and processing requests from many users. One of its most difficult responsibilities is to

schedule all the processing requests that a centralized computer must perform. A server operating system provides tools for managing distributed networks, e-mail servers, and Web hosting sites. Mac OS X Server, Windows Server 2012, and Linux are examples of server operating systems. Server operating systems typically route data and programs to each user's local computer where the actual processing takes place. They might also provide multiuser capabilities.

A desktop operating system is designed for a desktop or laptop personal computer. The computer you use at home, at school, or at work is most likely configured with a desktop operating system, such as Microsoft Windows or Mac OS. These operating systems are designed to accommodate one user at a time, but also provide networking capability. Today's desktop operating systems invariably provide multitasking capabilities so that users can run more than one application at a time.

A mobile operating system is designed for devices such as smartphones and tablet computers. Mobile OSs support touchscreens, but tend to limit multitasking and user access to local storage devices. Operating systems for handheld and desktop devices provide many similar services, such as scheduling processor resources, managing memory, loading programs, managing input and output, and establishing the user interface. But because handheld devices tend to be used for less sophisticated tasks, their operating systems are somewhat simpler and significantly smaller.

- What is the boot process? The sequence of events that occurs between the time that you turn on a computer and the time that it is ready for you to issue commands is referred to as the boot process, or booting your computer. Your computer's small bootstrap program is built into special ROM circuitry housed in the computer's system unit. When you turn on a computer, the ROM circuitry receives power and begins the boot process by executing the bootstrap program. Six major events happen during the boot process:

- Power up. When you turn on the power switch, the power light is illuminated,and power is distributed to the computer circuitry.

- Start boot program. The microprocessor begins to execute the bootstrapprogram that is stored in ROM.

- Power-on self-test. The computer performs diagnostic tests of severalcrucial system components.

- Identify peripheral devices. The computer identifies any peripheraldevices that are connected and checks their settings.

- Load operating system. If necessary, the operating system is copiedfrom the hard disk to RAM.

- Check configuration and customization. The microprocessor readsconfiguration data and executes any customized startup routines specified by the user.

Questions for self-test.
1. Alphabet with positional. from.; base positional Julian
2. The detailed presentation of numbers in a positional Julian
3. What is the shape information?
4. What information (what data) running on the computer?
5. What are the devices is the computer?
6. The principle of program control.

1.4 Human-computer interaction.

Definition of User Interface

In computer science and human-computer interaction, the user interface (of a computer program) refers to the graphical, textual and auditory information the program presents to the user. The user employs several control sequences (such as keystrokes with the computer keyboard, movements of the computer mouse, or selections with the touchscreen) to control the program.

There exist several types of user interfaces. We here give you just two examples:

- Command-Line Interface (CLI): The user provides the input by typing a command string with the computer keyboard and the system provides output by printing text on the computer monitor .

- A GUI is an interface built around visual (graphical) things:

- Windows are regions of the screen used to display information

- Icons are small pictures that are used to represent folders, software, etc.

- Menus are lists of options the user can select from

- A pointer is an arrow that can be moved around the screen and is used to select things

Windows XP is an example of an operating system with a GUI.

GUIs are quite **easy to use** due to the visual nature of the interface – the user has lots of visual clues as to what things do.

However, to display all of the nice graphics required by a GUI takes a lot of computing power so quite a **powerful** computer is needed.

Graphical User Interface (GUI): The use of pictures rather than just words to represent the input and output of a program. Input is accepted via devices such as keyboard and mouse.

Many years ago when computers were **not very powerful** they could not display the colourful graphics required for a GUI. The only interface available to most computer uses was the 'command line'.

The user would see nothing but a black screen. They would have to **type a command** to make anything happen.

e.g. To copy a text file called NOTES from a floppy disc to the hard drive the user would have to type:

> COPY A:\NOTES.TXT C:\

The user would have to learn a whole set of strange commands so that they could make use of the computer system. Plus it was not very interesting look at – no visual clues to tell you what to do next.

This meant computers used to be quite **difficult to use**, so this type of interface is only really suitable for **expert users**.

The system that **people** use to **interact** with a **computer** (to give it commands, to see the results of those commands, etc.) is known as the **user interface**.

Graphical user interface

In computer science, a graphical user interface (GUI /guːiː/), is a type of user interface that allows users to interact with electronic devices through graphical icons and visual

indicators such as secondary notation, instead of text-based user interfaces, typed command labels or text navigation. GUIs were introduced in reaction to the perceived steep learning curve of command-line interfaces (CLIs),[1][2][3] which require commands to be typed on a computer keyboard.

The actions in a GUI are usually performed through direct manipulation of the graphical elements.[4] Beyond computers, GUIs are used in many handheld mobile devices such as MP3 players, portable media players, gaming devices, smartphones and smaller household, office and industrial equipment. The term *GUI* tends not to be applied to other lower-display resolution types of interfaces, such as video games (where *head-up display* (HUD)[5] is preferred), or not restricted to flat screens, like volumetric displays[6] because the term is restricted to the scope of two-dimensional display screens able to describe generic information, in the tradition of the computer science research at the Xerox Palo Alto Research Center (PARC).

Post-WIMP interfaces

Smaller mobile devices such as personal digital assistants (PDAs) and smartphones typically use the WIMP elements with different unifying metaphors, due to constraints in space and available input devices. Applications for which WIMP is not well suited may use newer interaction techniques, collectively termed *post-WIMP* user interfaces.[10]

As of 2011, some touchscreen-based operating systems such as Apple's iOS (iPhone) and Android use the class of GUIs named post-WIMP. These support styles of interaction using more than one finger in contact with a display, which allows actions such as pinching and rotating, which are unsupported by one pointer and mouse.[11]

Human interface devices, for the efficient interaction with a GUI include a computer keyboard, especially used together with keyboard shortcuts, pointing devices for the cursor (or rather pointer) control: mouse, pointing stick, touchpad, trackball, joystick, virtual keyboards, and head-up displays (translucent information devices at the eye level).

There are also actions performed by programs that affect the GUI. For example, there are components like inotify or D-Bus to facilitate communication between computer programs.

Operating system command-line interfaces

Operating system (OS) command line interfaces are usually distinct programs supplied with the operating system.

A program that implements such a text interface is often called a command-line interpreter, command processor or shell.

Examples of command-line interpreters include DEC's DIGITAL Command Language (DCL) in OpenVMS and RSX-11, the various Unix shells (sh, ksh, csh, tcsh, bash, etc.), the historical CP/M CCP, and MS-DOS/IBM-DOS/DR-DOS's COMMAND.COM, as well as the OS/2 and the Windows CMD.EXE programs, the latter groups being based heavily on DEC's RSX-11 and RSTS CLIs. Under most operating systems, it is possible to replace the default shell program with alternatives; examples include 4DOS for DOS, 4OS2 for OS/2, and 4NT or Take Command for Windows.

Although the term 'shell' is often used to describe a command-line interpreter, strictly speaking a 'shell' can be any program that constitutes the user-interface, including fully graphically oriented ones. For example, the default Windows GUI is a shell program

named EXPLORER.EXE, as defined in the SHELL=EXPLORER.EXE line in the WIN.INI configuration file. These programs are shells, but not CLIs.

Application command-line interfaces

Application programs (as opposed to operating systems) may also have command line interfaces.

An application program may support none, any, or all of these three major types of command line interface mechanisms:

Parameters: Most operating systems support a means to pass additional information to a program when it is launched. When a program is launched from an OS command line shell, additional text provided along with the program name is passed to the launched program.

Interactive command line sessions: After launch, a program may provide an operator with an independent means to enter commands in the form of text.

OS inter-process communication: Most operating systems support means of inter-process communication (for example; standard streams or named pipes). Command lines from client processes may be redirected to a CLI program by one of these methods.

CLI software

Some applications support only a CLI, presenting a CLI prompt to the user and acting upon command lines as they are entered. Some examples of CLI-only applications are:DEBUG, Diskpart, Ed, Edlin, Fdisk, Ping

Hybrid software

Some computer programs support both a CLI and a GUI. In some cases, a GUI is simply a wrapper around a separate CLI executable file. In other cases, a program may provide a CLI as an optional alternative to its GUI. CLIs and GUIs often support different functionality. For example, all features of MATLAB, a numerical analysis computer program, are available via the CLI, whereas the MATLAB GUI exposes only a subset of features.

Types of interfaces: command line interface, text interface, graphic interface.

software determines the tasks a digital device can help you accomplish. Some software helps you create documents, while other software helps you block viruses or fine-tune computer performance. Section A helps you categorize application software, utilities, and device drivers.

Software Categories

What is software? the instructions that tell a computer how to carry out a task are referred to as a computer program. These programs form the software that prepares a computer to do a specific task, such as document production, photo editing, virus protection, file management, or Web browsing.

How is software categorized? The two main categories are system software and application software. Operating systems, which are covered in the next chapter, are classified as system software. Device drivers, utilities, and programming languages are also system software. Application software categories include music, graphics, mapping, finance, and entertainment. Application software is designed to help people accomplish real-world tasks, whereas system software is designed for computer- centric tasks. For example, you would use application software to edit a photo, write a term paper, or play a game, but you

would use system software to diagnose a problem with your hard disk drive or Internet connection. Music software offers many ways to work with music, sound effects, andnarration from your desktop, laptop, or handheld computer.

What do I need to work with video on my digital devices?

The most popular video software plays movies on your computer or handheld device. As with digital music, the source of videos is usually an online store such as iTunes or Netflix, or a video sharing site such as YouTube.

Another popular video application is video editing software.

What can video editing software do? Video editing software provides a set of tools for creating video productions from raw footage. Professional versions are used by video production studios, whereas simpler, consumer-level software is designed for the casual user. The popularity of video editing can be attributed to consumer-level video editing software, such as Windows Movie Maker and Apple iMovie, included with many new computers. Consumer-level video editing software provides a set of tools for video production tasks, such as these:

Video editing software helps you import a series of video clips from a camera or other video source,arrange the clips in the order of your choice, add transitions between clips, and add an audio track. Preview your video to see how the clips, transitions, and soundtrack all work together.

Can it produce discs for DVD players? After producing a video that plays on your computer, you might want to transfer it to a DVD that you can use in a standard DVD or Blu-ray player connected to a television or projector. DVD authoring software offers tools for creating DVDs with Hollywood-style menus. You can obtain this software as a standalone product or in a collection of video editing tools. Despite an impressive array of features, video editing software is relatively easy to use. graphics software

What kind of software do I need to work with drawings, photos, and other pictures? In computer lingo, the term graphics refers to any picture, drawing, sketch, photograph, image, or icon that appears on your computer screen. Graphics software is designed to help you create, manipulate, and print graphics. Some graphics software products specialize in a particular type of graphic, while others allow you to work with multiple graphics formats. If you are really interested in working with graphics, you will undoubtedly end up using more than one graphics software product. The graphics captured by digital cameras and smartphones can be best edited using paint or photo editing software (Figure 3-5). To create graphics from scratch, you can use drawing software, 3-D graphics software, or CAD software.

Paint software (sometimes called a raster graphics editor) provides a set of electronic pens, brushes, and paints for painting images on the screen. A simple program called Microsoft Paint is included with Windows. More sophisticated paint software products are also available. Many graphic artists, Web page designers, and illustrators use paint software as their primary computer-based graphics tool. Photo editing software, such as Adobe Photoshop, includes features specially designed to fix poor-quality photos by modifying contrast and brightness, cropping out unwanted objects, and removing red eye. Photos can also be edited using paint software, but photo editing software commonly offers tools and wizards that simplify common photo editing tasks. Drawing software provides a set of

lines, shapes, and colors that can be assembled into diagrams, corporate logos, and schematics. The drawings created with tools such as Adobe Illustrator, CorelDRAW. 3-D graphics software provides a set of tools for creating wireframes that represent three-dimensional objects. A wireframe acts much like the framework for a pop-up tent. Just as you would construct the framework for the tent and then cover it with a nylon tent cover, 3-D graphics software can cover a wireframe object with surface texture and color to create a graphic of a 3-D object CAD software (computer-aided design software) is a special type of 3-D graphics software designed for architects and engineers who use computers to create blueprints and product specifications. AutoCAD is one of the best-selling professional CAD products. TurboCAD is a low-cost favorite. Scaled-down versions of professional CAD software provide simplified tools for homeowners who want to redesign their kitchens.

Utility Software

What is utility software? A type of system software called utility software is designed to help you monitor and configure settings for your digital gear, its operating system, or application software. Like all system software, utilities focus on computer-centric tasks such as blocking viruses or diagnosing hard disk errors, rather than real-world tasks such as document production or accounting. A set of basic utilities is included with your device's operating system. Your iPhone utilities are accessed from the Settings icon.

What is a device driver? A device driver is software that helps a peripheral device establish communication with a computer. This type of system software is used by printers, monitors, graphics cards, sound cards, network cards, modems, storage devices, mice, and scanners. Once installed, a device driver automatically starts when it is needed. Device drivers usually run in the background, without opening a window on the screen. Suppose you connect a new printer to your computer. You might also have to install a printer driver or select a preinstalled driver. After the device driver is installed, it runs in the background to send data to the printer whenever you initiate a print job. The printer driver signals you only if it runs into a problem, such as if the printer is not connected or it runs out of paper. Word processing software has replaced typewriters for producing many types of documents, including reports, letters, memos, papers, and book manuscripts. Word processing packages, such as Microsoft Word, iWork Pages, and LibreOffice Writer, give you the ability to create, spell-check, edit, and format a document on the screen before you commit it to paper. Spreadsheet software, such as Microsoft Excel, iWork Numbers, Google Docs Spreadsheets, or LibreOffice Calc, provides tools to create electronic spreadsheets. It is similar to a smart piece of paper that automatically adds up columns of numbers written on it. You can make other calculations, too, based on simple equations that you create or more complex, built-in formulas. As an added bonus, spreadsheet software can turn your data into colorful graphs. It also includes special data-handling features that allow you to sort data, search for data that meets specific criteria, and print reports.

What is a database? The term *database* has evolved from a specialized technical term into a part of our everyday vocabulary. In the context of modern usage, a database is simply a collection of data that is stored on one or more computers. A database can contain any sort of data, such as a university's student records, a library's card catalog, a store's inventory, an individual's address book, or a utility company's customers. Data-

bases can be stored on personal computers, network servers, Web servers, mainframes, and even handheld computers.

1.5Database systems.

Databases are an essential aspect of modern life.

Most businesses could not function without them, and they are the backbone of popular Internet services such as iTunes, Facebook, Classmates, and eBay. Section A begins the chapter with an overview of databases and the many ways they are used today.

Database Basics

What is a database? In the broadest definition, a database is a collection of information. Today, most databases are stored as computer files. A database can be a simple personal list, such as your address book, or it can be a massive list, such as New York City telephone numbers.

Databases can even incorporate several lists. For example, the database for an e-commerce site, such as Amazon.com, includes inventory lists and customer lists.

How is database information used? The tasks associated with creating, maintaining, and accessing the information in databases are referred to as data management, file management, or database management. Databases can be used in a variety of ways, from a simple tool for collecting and tracking data, to a comprehensive source for making decisions and predicting future trends. Update data. One of the primary database management activities is keeping data up to date by entering current addresses, inventory quantities, and so on. As with collecting data, updates can be made manuallyor electronically. Data entry errors can result in database inaccuracies, which are not always easy to correct. Horror stories about data entry errors abound, including individuals—very much alive—whose records were mistakenly marked "deceased" and victims of identity theft who had trouble restoring their credit ratings. Organizations that maintain databases should be held accountable for data accuracy.

Organize and output data. The data in a typical database is stored in no particular order. New data is appended to the end of the file because it is too cumbersome to insert it in, say, alphabetical order, then rearrange all the records that come after it. Reports created with this jumble of raw data would not be particularly useful. To make data into a more suitable report, it can be organized in a variety of ways. It can be alphabetized, placed in numeric order, grouped, and subtotaled. Database output is easy to organize and reorganize without actually rearranging the physical data on the disk. A database can be configured so that a librarian can extract a list of patrons with overdue books organized

by date, while at the same time a student can look for a list of books written by Elizabeth Peters. The same database can be configured to print envelopes for a library fundraiser in order by ZIP code to take advantage of cost-saving bulk mail rates.

Distribute data. Databases, combined with mail merge and other computerized technologies, offer efficient ways to distribute information to customers, employees, the press, government agencies, and other companies. Your monthly electric bill is generated from the power company's database. That recall notice you receive about the braking system in your six-month-old car, your monthly bank statement, and your classschedule for next semester all are generated from databases. Spammers, junk mailers, and telemarketers pay only a fraction of a penny for each name on a mailing list or call list. Millions of records can be easily copied, sent over the Internet, and stored on an external hard drive, a USB flash drive, or a DVD. The legal system has yet to iron out details regarding database ownership and under what conditions it is allowable to share database data.

Find data. Databases make it easy to locate information. You can use a library online public access catalog (OPAC) to find books. A pharmacist can check a pharmaceutical database for drug interactions before filling a prescription. A computer technician can check a manufacturer's database to find the part number for replacing your computer's fried hard drive. Analyze data. Databases include certain facts as raw data, such as names, addresses, bank balances, prices, and inventory quantities. Analyzing this data using statistics and other interpretive tools can produce information that is not readily apparent from simply looking at raw data. For example, a nationwide chain of bookstores issues discount cards and tracks books purchased using each card. An analysis of sales data shows that customers who purchase self-help books typically purchase other similar books within six months. Nowhere in the database does it explicitly state "self-help book purchasers tend to buy additional self-help books." This conclusion is new information that can be gleaned from the raw data. Techniques for data analysis include data mining and OLAP.

What is data mining? Data mining refers to computer algorithms that analyze information to discover previously unknown and potentially useful information, including relationships and patterns. The data accessed by data mining and other analysis techniques is often stored in a data warehouse, which is a repository for data from more than one database. Data from operational databases—those used for daily transactions—is transferred to a data warehouse where it can be combined with data from other databases to enhance the data set. Data mining can reveal relationships that might not be expected or anticipated. For example, an analysis of over 10 million policies and accident claims in the Farmers Insurance Group database revealed that married baby boomers who owned a full-size car or minivan in addition to a sports car tended to make far fewer insurance claims than younger, unmarried sports car owners. As a result of the data analysis, lower insurance rates were offered to sports car owners who fit the low-risk profile. What is predictive analytics? Predictive analytics refers to abranch of data mining that analyzes current and historical data to predict future trends. It makes use of statistical algorithms, neural networks, and optimization research to discover patterns in data. For example, researchers might use predictive analytics to predict customer behavior, unmask terrorists, forecast storm paths, or determine genetic susceptibility to certain diseases. Like data mining, predictive analytics processes data autonomously, rather than under the direction of an operator who speci-

fies what to look for. Data mining and predictive analytics are sometimes criticized for finding relationships, patterns, and trends when none actually exist. The misuse of data mining is sometimes called data dredging or data fishing.

What is OLAP? OLAP (online analytical processing) is a data analysis technique that allows decision makers to quickly get answers to complex queries that encompass multiple factors, such as locations, revenue, time periods, and employee status. Unlike data mining and predictive analytics, OLAP is an interactive process that allows decision makers to devise unique queries, enter them, and get an immediate response.

What is big data? The term *big data* seems oddly non-technical, but it has a specific meaning in the world of databases. Big data refers to huge collections of data that are difficult to process, analyze, and manage using conventional database tools. An example of big data is the one million transactions generated by Walmart sales registers every hour, which are stored in databases measured in petabytes, not gigabytes or terabytes. Other examples of big data include user profiles stored on social network sites, records of Google searches, medical records, astronomical data, and military surveillance data.

Mining big data and performing analytics require specialized tools, but the resulting information can lead to breakthroughs in scientific research, medicine, energy, and astronomy. Privacy advocates are concerned.

Database Models

What is the underlying structure of a database? Computer databases evolved from manual filing systems. A filing cabinet full of folders and papers would be classified as an unstructured file because every document has a unique structure and contains different kinds of data. In a box of unstructured documents, you could find old receipts, photos, product brochures, and handwritten letters. The electronic equivalent to this jumble of information might be the collection of documents and graphics stored at a Web site. In contrast to a collection of dissimilar information, library card catalogs and

Rolodexes would be classified as structured files. A structured file uses a uniform format to store data for each person or thing in the file. The focus of this chapter is on databases that are constructed with structured files because they constitute the majority of databases used in business, e-commerce,and government activities.

Structured files can be used in different ways to build databases. The underlyingstructure of a database is referred to as a database model. Some of these models are becoming obsolete, whereas other models are just beginning to develop a track record. Understanding the characteristics of each model will help you determine which type of database is right for your needs, and understand why certain types of databases are popularly deployed for various business and organizational applications.

What's the simplest way to store data? The simplest model for storing data is a flat file that consists of a single, two-dimensional table of data elements. Each row in the table is a record, and each column of the table is a field A field contains the smallest unit of meaningful information, so you might call it the basic building block for a structured file or database. Each field has a unique field name that describes its contents. For example, in an iTunes playlist, the field called Name holds the name of a song, the Time field holds the song length, the Artist field holds the name of the performer, the Album field holds the name of the album that the song came from, and the Genre field holds the type of song. A

field can be variable length or fixed length. A variable-length field is like an accordion—it expands to fit the data you enter, up to some maximum number of characters. A fixed-length field contains a predetermined number of characters (bytes). The data you enter in a fixed-length field cannot exceed the allocated field length. Moreover, if the data you enter is shorter than the allocated length, blank spaces are automatically added to fill the field. The fields in Figure 11-7 are fixed length. The underscores indicate the number of characters allocated for each field.

In the world of databases, a record refers to a collection of data fields. You're already familiar with several types of records, such as student records, medical records, and dental records. Each record stores data about one entity—a person, place, thing, or event. For example, a data record stored in an iTunes playlist contains fields of data pertaining to a digital music track. The template for a record is referred to as a record type. It contains field names, but no data. Creating record types is part of the design process that lets database designers specify the information needed to complete each record. A record type, similar to a blank form, is usually shown without any data in the fields.

How are flat files used? Flat files are the foundation for simple databases, such as an e-mail address book, an iTunes playlist, or the addresses for a mail merge. Spreadsheets are also modeled on flat files.

With a flat file, you can search for, update, group, and organize records. Each record in a flat file, however, is an independent entity and no relationships can be established between records. For example, you can't set up links between all of The Beatles' songs in your iTunes playlist. If you are listening to "A Hard Day's Night," you can't automatically link to The Beatles' next most popular top ten song.

Why would a database need to keep track of relationships? Let's use a fictional music store called Vintage Music Shop as an example. The store sells vinyl record albums from a Web site and on eBay. Jason, the manager, uses a database to keep track of his inventory and customers. In database jargon, a relationship is an association between data that's stored in different record types. Relationships are important because there are associations among the real-life things that database records represent. For Jason's business, there are several important relationships. The relationship between customers and the goods they purchase helps Jason create invoices. The relationship between an album and the song tracks it contains helps Jason pinpoint specific music requested by customers. An important aspect of the relationship between record types is cardinality.

Cardinality refers to the number of associations that can exist between two record types. For example, a Vintage Music Shop customer can place more than one order. The reverse is not true, however. A particular order cannot be placed jointly by two customers. When one record is related to many records, the relationship is referred to as a one-to-many relationship.

What's the advantage of a relational database? In a relational database, each table is essentially independent, but tables can be joined for a particular task as required. Relationships can be added, changed, or deleted on demand, making this database model very flexible. The relational database model's flexibility is a major factor in its use for the majority of databases that handle everyday query and reporting needs of businesses, government

agencies, and organizations. It is also the database model supported by many consumer-level database products, such as Microsoft Access.

What's a dimensional database? A dimensional database organizes relationships over three or more dimensions. In the context of databases, a dimension is simply a layer based on a data element, such as a product, place, or customer, that can be used to categorize data.

Dimensional databases can have any number of dimensions; but when there are more than seven dimensions, the models become difficult to work with.

Questions for self-test.
1.Basic information about the organization of files
2.The size of the symbol alphabet of the computer; memory footprint symbol.
3.What is the encoding table; what code symbol?
4.lexicographical order (sequential coding principle).
5.What is a hypertext?
6.The structure of the text file.

1.6 Data analysis. Data management

Data analysis. Data management.

Analysis of data is a process of inspecting, cleaning, transforming, and modeling datawith the goal of discovering usefulinformation, suggesting conclusions, and supporting decision-making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains.

Data mining is a particular data analysis technique that focuses on modeling and knowledge discovery for predictive rather than purely descriptive purposes. Business intelligencecovers data analysis that relies heavily on aggregation, focusing on business information. In statistical applications, some people divide data analysis into descriptive statistics, exploratory data analysis(EDA), and confirmatory data analysis(CDA). EDA focuses on discovering new features in the data and CDA on confirming or falsifying existing hypotheses. Predictive analyticsfocuses on application of statistical models for predictive forecasting or classification, while text analyticsapplies statistical, linguistic, and structural techniques to extract and classify information from textual sources, a species of unstructured data. All are varieties of data analysis.

Data integration is a precursor to data analysis, and data analysis is closely linked to data visualizationand data dissemination. The term *data analysis* is sometimes used as a synonym for data modeling.

Database management systems

What kinds of tools are specifically designed for creating and manipulating databases? The term DBMS (database management system) refers to software that is designed to manage data stored in a database. Each DBMS specializes in one database model, butsome DBMS software offers versatility by dealing with a variety of modelsand data.
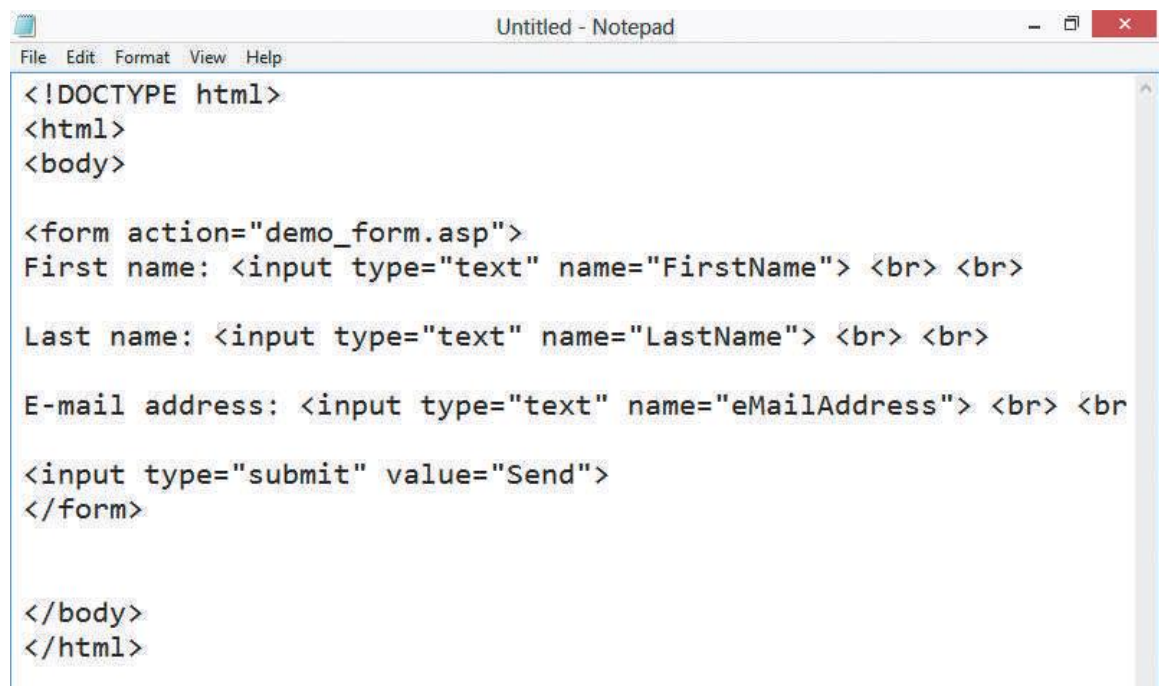
- XML DBMS: Optimized for handling data that exists in XML format. (You'll learn more about XML later in the chapter.)

- ODBMS (object database management system): Optimized for the object database model, allowing you to store and manipulate data classes, attributes, and methods.

- RDBMS (relational database management system): Allows you to create, update, and administer a relational database. Most of today's popular RDBMS software also provides the capability to handle object classes and XML data, making it unnecessary to purchase a separate ODBMS or XML DBMS. Which DBMS should I use for my projects? Today most database projects are implemented with a relational database management system. The RDBMS package you choose, however, depends on the scope of your project, the number of people who will simultaneously access the database, and the expected volume of records, queries, and updates. Entry-level RDBMS software, such as Microsoft Access, is a good fit for small businesses and individuals whose data can't be efficiently handled as a flat file spreadsheet. Do DBMSs support network access to databases? If an entry-level DBMS is located on a network, it is possible for multiple users to access the database at the same time. Database client software allows any remote computer or network workstation to access data in a database. An entry-level DBMS that resides on a network server might be able to handle many simultaneous searches. However, these DBMSs are limited in their ability to deal with problems that arise when multiple users attempt to update the same record at the same time.

Is it possible to access a database over the Web? The Web allows access to many databases. When you shop at an online store, for example, the photos, descriptions, and prices you see are pulled from the merchant's database and displayed as Web pages. More direct database access is offered by online public access catalogs, such as the one offered by the U.S. Library of Congress. A database also provides the foundation for online access to course registration systems, yellow pages, real estate listings, movie reviews, flight schedules, and other information. The Web provides both opportunities and challenges for accessing the information in a database. Obviously, with its global reach, the Web provides an opportunity for many people to gain access to data from multiple locations. Web access is constrained, however, by the stateless nature of HTTP and the necessity to provide access by using a browser as client software. Providing access to databases over the Web requires some tricks. It does not, however, require special databases or special DBMSs.

What's the simplest way to provide Web access to a database?

A technique called static Web publishing is a simple way to display the data in a database by converting a database report into an HTML document, which can be displayed as a Web page by a browser. Static publishing provides extremely limited access to a database because it creates a Web page that essentially displays a snapshot of your data at the time the report was generated. Data on the Web page cannot be manipulated, except to be searched in a rudimentary way by the Find feature of your Web browser. The advantages of static publishing include security and simplicity. Yourdata remains secure because you have not provided direct access to your database, so unauthorized users cannot change your data. What if I want to provide access to current data? Each time regular customers access the Vintage Music Shop site, they see Web pages tailored to their music prefer-

ences. Country music fans, for example, see descriptions of Nashville classics and a list of discount albums by their favorite artists. Obviously, these pages cannot be the result of static publishing. They are created by a dynamic Web publishing process that generates customized Web pages as needed, or "on the fly." Dynamic Web publishing relies on a program or script, referred to as a server-side program, that resides on a Web server and acts as an intermediary between your browser and a DBMS. In the Vintage Music Shop example, a server-side program reads a cookie from the customer's computer to find the unique number assigned to thecustomer. The server-side program then uses the customer number to generate a query, which is sent to the database server software. This software accesses the database to locate the customer's music preferences and favorite artists. The server-side program then asks the database server software to locate all the specials that apply to this customer's preferences. A list of applicable albums, descriptions, and prices is sent back to the Web server, where it is formulated as an HTML document and sent to the browser. Is it possible to add to and update database records over the Web? In several situations, such as making an e-commerce purchase or registering for a social networking site, it is important for people to use a browser to add or update records in a database. For example, the process of ordering merchandise at Vintage Music Shop creates a new order record, changes the InStock field in the Albums table, and creates acustomer record for first-time customers. These dynamic database updates require an architecture similar to that used for dynamic Web publishing, plus the use of HTML forms.


```
<!DOCTYPE html>
<html>
<body>

<form action="demo_form.asp">
First name: <input type="text" name="FirstName"> <br> <br>

Last name: <input type="text" name="LastName"> <br> <br>

E-mail address: <input type="text" name="eMailAddress"> <br> <br

<input type="submit" value="Send">
</form>


</body>
</html>
```

Figure 1.1. Interface of HTML file

XML

How does XML relate to the Web and databases? XML is a markup language that allows field tags, data, and tables to be incorporated into a Web document. It was developed in response to several deficiencies that became apparent as HTML gained wide-

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spread use. For example, suppose you are interested in speeches given by Martin Luther King, Jr. Entering his name in a search engine produces thousands of entries, including MLK biographies, streets and schools named after the famous civil rights leader, historic locations relating to the civil rights movement, and so on. Wouldn't it be nice if King's speeches were stored in HTML documents that identified their content as speeches and their author as Martin Luther King, Jr.? XML provides tags that can be embedded in an XML document to put data in context. How is XML used today? One of XML's most positive contributions to data management is the potential to add context to the information contained in a widely diverse pool of documents on the Web. Although it is easy to see how XML tags might make the free-form documents currently on the Web much easier to manage, today XML is more often used for structured data.

XML can be used to specify a standard structure of fields and records, such as SportsML and Chemical Markup Language, for storing data that can be accessed from a browser. Using this standard structure, data entered into an XML document can be identified by field names. Figure 11-29 provides an example of an XML document that contains data similar to that in Vintage Music Shop's Albums table.

Questions for self-test.
1.What is a text document?
2.The main elements of the medium WP.
3.The main parameters of the text format.
4.How do database designers use normalization to reduce data redundancy?
5.What is SQL?
6.How safe is the data in a database?

MODULE 2. NETWORK TECHNOLOGIES

2.1 Networks and telecommunications.

Types of networks.

Computer network is comprised of at least two, connected, by wire or wireless, computers that can exchange data i.e. communicate. There are many reasons for connecting computers into a network, and some of them are:
- exchange of data between users that have network access,
- access to shared devices, such as network printers, network disks, etc.,
- enables user communication and socializing, etc.

Internet is the most famous and most widespread network with nearly2 billion users and the number of users is still growing.

TYPES OF NETWORKS

Types of networks according to their size:
- LAN (Local Area Network) - a network that covers a relatively small geographical area- it connects computers within a firm or household by wire,
- WLAN(Wireless Local Area Network) - a network that covers a relatively small geographical area - it connects computers within a firm or household wirelessly,
- WAN (Wide Area Network)- a network that covers a relatively large geographical area - it connects a greater number of computers and local networks.

Terms: client / server

Relationship client - server is defined in the following manner: client sends requests and server responds to those requests. We can use Internet as the best known example. User's computer, connected to the Internet, sends requests to a certain web page (by entering page address into the Internet browser Address bar), and the server responds. Web page is loaded into the user's computer Internet browser as a result of server response. From this example, we can see that communication between client and server depends on connection speed (bandwidth). Since bandwidth is limited, the amount of data that can flow through network is limited too. Today, for instance, while purchasing access to mobile Internet, you will notice a limited amount of data that can be transferred within a package, i.e. amount of transferred data is what is charged. The reason for that is limited bandwidth of mobile networks, and since companies that are offering mobile Internet access do not want networks to be congested, they de-stimulate their users by charging amounts of money related to the amount of transferred data. That was the case with ADSL Internet access. Today, once Internet providers have developed communication infrastructure, they do not need to de-stimulate users by charging based on the amount of transferred data, therefore they are offering so called "flat rate" access) charging only based on the access speed. That is why you will, while listening or reading news about communication technologies, have the opportunity to hear how important it is to develop communication infrastructure.

Types of networks according to their architecture:
- client-server - all clients are connected to the server,
- P2P (peer to peer) - all computers are clients and servers at the same time.

INTERNET, INTRANET, EXTRANET

Internet ("network of all networks") is a global system comprised of interconnected computers and computer networks, which communicate by means of using TCP/IP protocols. Although, in its beginnings, it emerged from the need for simple data exchange, today it affects all domains of society. For example:

- Economy: Internet banking (paying bills, transferring funds, access to account, access to credit debt, etc.), electronic trading (stocks, various goods, intellectual services, etc), etc.
- Socializing: social networks, forums...
- Information: news portals, blogs etc.
- Healthcare: diagnosing disease, medical examinations (for people living on an island or in other remote places, some examinations, that require a specialist, can be done remotely), making appointments for medical examinations, the exchange of medical data between hospitals and institutes, surgery and remote surgery monitoring
- Education: online universities with webinars (web + seminar), websites with tutorials, expert advice, Ideas Worth Spreading @ www.TED.com , etc.

Internet really does have many applications and a huge social impact. Perhaps the most important trait is information exchange, because information exchange among people enables collaboration, collaboration of like-minded people leads to ideas and actions in real life, and coordinated actions of people results in social change.

Intranet is a private network of an organization to which only authorized employees have access (login and password).

Extranet is part of Intranet, to which independent collaborators have access.

DATA FLOW/ TRANSFER

Download is a term that implies taking a copy of digital data from a network computer on a local computer, and upload means placing digital content on a network computer. For example, when you saved a copy of this manual from the web sitehttp://www.itdesk.info to your computer, you have downloaded digital data, that is, the manual. Likewise, when we finished writing this manual, we have placed it (uploaded) it on the network computer (our Internet server).

Bitrate represents speed at which data is transferred through a modem (network). It is measured in bit/s (bit per second). bit/s is/are a measurement unit for speed of digital data flow through the network. The number of bits transferred in one second tells us how many bits can be transferred through a network in one second.

1,000 bit/s rate = 1 kbit/s (one kilobit or one thousand bits per second)

1,000,000 bit/s rate = 1 Mbit/s (one megabit or one million bits per second)

1,000,000,000 bit/s rate = 1 Gbit/s (one gigabit or one billion bits per second)

(source used: http://en.wikipedia.org/wiki/Bit_rate#Prefixes)

Speed of data flow can be expressed in bytes per second. Since one byte has eight bits, such is the relation between bit/s and Bp/s, i.e. bits per second and bytes per second.

Ways to connect to the Internet:

Dial-up Internet access method uses a modem (56k) and a telephone line.

Broadband is characterized by a high-speed data transfer, permanent access to the Internet, and thus the risk of unauthorized access to the network or your personal computer.

Connection methods:

- Mobile-connecting by using a mobile network (GPRS, EDGE, UMTS, HSPA)

- Satellite-commonly used in parts of the world where there is no proper infrastructure and there is no other way of accessing the Internet

- Wireless (Wi-Fi) - data is transferred between computers by using radio frequencies (2,4 GHz) and the corresponding antennaes

- Cable - connecting to the Internet through television cable network using a cable modem

Broadband is characterized by a high-speed data transfer, permanent access to the Internet, and thus the risk of unauthorized access to the network or your personal computer. In the beginning of broadband Internet access, due to underdeveloped communication infrastructure, Internet providers charged based on the data traffic but not time spent on the Internet (unlike dial-up Internet access). Today, in large cities, telecommunications infrastructure is developed, therefore Internet providers do not charge money based on the time spent on the Internet or the amount of transferred data but they do charge by access speed.

Wire and wireless network technologies

ICT IN EVERYDAY LIFE

The acronym ICT (Information and Communication Technology) includes all technical means that are used for handling information and facilitating communication, including computers, network hardware, communication lines and all the necessary software. In other words, ICT is comprised of information technology, telephony, electronic media, and all types of process and transfer of audio and video signals, and all control and managing functions based on network technologies.

INTERNETSERVICES

E-commerce is a form of trade that allows customers to browse and purchase products online.

E-banking allows users to have control over their accounts (view balances and transactions), transactions from one account to another, credit payment, shopping vouchers for mobile phones etc. The benefits are saving time (which would otherwise be spent waiting in lines), lower service fees, and access from anywhere, anytime.

E-government-use of information technology to provide better public access to government information (www.vlada.hr-GovernmentToCitizens, G2C), therefore providing citizens with their human right to information.

E-LEARNING

E-learning consists of all forms of learning and/or knowledge transfer that are based on electronic technologies. This term will mostly be used to describe learning and/or dissemination of knowledge without direct teacher-student contact, while using ICT technology.

Advantages of e-learning greatly coincide with learning from books, with a difference that the books come only in text and graphic form on paper, while e-learning materials have multimedia features, and the ability to remotely monitor lectures in realtime. To illustrate, physicians can observe medical procedures that are currently taking place in an-

other hospital; students can attend classes that are currently taking place at another university.

Some of the advantages for students:
- adaptive time, place and pace of learning
- access and availability of education
- unlimited repetition of lectures
- reduced cost of education
- multimedia environment(video, audio, text)
- Some of the benefits for teachers and educational institutions:
- reduced costs of conducting teaching (reduced travel costs and accommodation, reduced or eliminated costs for classrooms, etc.)
- much larger education user base
- once created, e-education allows educational staff to invest a much shorter time commitment to implement the respective education.

TELEWORKING

Some of the factors that determine teleworking are: quality of IT infrastructure, good computer literacy, type of work that can be done from any place with a computer equipped with necessary programs, employees with a professional attitude towards work, organization of work adapted to this operation mode, etc.

Some advantages of teleworking:
- reduced utility costs and employees transportation reimbursement
- reduced time for traveling to and from work
- adapting working conditions to personal habits-flexibility
- possibility of working in the convenience of a person's home (or other places that are not an office),
- lower stress level, provided there is a good organization and coordination , i.e. the flow of information between employees is unconstrained
- an excellent solution for people with disabilities or longterm illness, parents, or those who enjoy traveling

Some disadvantages of teleworking:
- physical isolation - lack of direct social contact with colleagues
- not suitable for everyone - requires a certain dose of self-control and motivation
- less opportunity for advancement due to lack of traditional vertical hierarchy in the company, however horizontal hierarchy is created, where no one is above anyone, but everyone has their own duties and obligations
- less emphasis on teamwork in the traditional sense, since tasks are done independently, physically isolated from others. It requires a heightened focus, due to lack of physical contact among team members, and emphasizes teamwork in terms of communication, information exchange. Each team member depends on others to perform their tasks. For example, a programmer from Australia works in a team with developers from Croatia, Ireland and America, on a software development for a company from Asia. In most cases a coordinator travels and his/her function is coordination among the parent company, client and programmers. Coordinators, whether by visit or otherwise, have client's demands, organizes teams of programmers, distributes tasks and reports to company headquarters.

Each programmer is assigned his own programming task and they are all responsible for the program's functionality overall. They must coordinate in order to achieve full program functionality.

It is evident that they can work in a team, regardless of the place of work, provided that they have excellent communication and exchange of information, good organization and professional attitude towards work.

E-MAIL, IM, VOIP, RSS, BLOG, PODCAST

E-mail is the transmission of text messages via Internet. Using attachment, users can exchange files like images, multimedia, documents, etc. E-mail addresses consist of a username, @ sign ("at") and a domain name, e.g. mark.marich@ITdesk.info, where "mark.marich" is the username and "ITdesk.info" is the domain name.

IM (Instant Messaging) service is used for instant message exchange and real time communication. Besides textual communication and video conferencing, they allow file transfer as well. Some of the popular IM services are: WindowsLiveMessenger, Skype, and GoogleTalk.

VoIP (Voice over Internet Protocol) is a term for technology that enables digitalization and transfer of sound (and multimedia sessions) over the Internet. Therefore, it enables sound communication much like the telephone call. In short, VoIP protocol enables audio/video communication between users.

RSS (Really Simple Syndication) is a set of web formats, used by web pages that are being constantly updated, considering that by using RSS, new information, articles, etc. can be published. RSS enables us to, with use of appropriate software, read new titles and access news summaries. Users can, with appropriate software, obtain news from various portals and receive information without the need to visit all of them independently, while publishers can distribute news easily to end-users who are monitoring their RSS feeds/channel.

Blog (web log) is a form of Internet media in which users can re-post or write their opinion on any topic. It can be personal (a form of Internet diary), thematic, or in the form of journals. Blogs are popular because end-users do not need to have advanced computer knowledge, or knowledge of webpage creation, in order to be present on the Internet and write about various topics, i.e. state their opinion. Blogging has greatly facilitated the exchange of interests, ideas, opinions, and contributed to realization of human right to free expression. Some use blogs to share their art, personal aesthetic, or to collect virtual clippings from websites online.

Entries published on blogs are called posts, which may allow a space below for visitors to leave their comments. Besides text, it is possible to exchange multimedia files, such as photos or videos. In order to share your texts, pictures, video clips, etc., it is necessary to create a personal account on websites that offer this type of service. In case you simply wish to browse the content, it is not necessary to open a personal account.

Podcast (POD - Personal On Demand+ Broadcast) is a digital file containing audio or video content. It is distributed over the Internet using RSS technology.

VIRTUAL COMMUNITIES

The term "virtual community" encompasses a group of people who communicate via social networks, forums, IM service, blogs. We call it a community, since they are a

collection of people who participate in a group of their interests, thus forming a virtual community, because it does not involve physical contact, but is carried out by means of ICT technologies.

Social Networks are free online services that provide users with various forms of presentation and communication. Some of the more popular social networks are: MySpace, Facebook, Twitter, Google+.

Forum is a service that allows users to exchange opinions. It can be compared to bulletin boards on which participants leave their messages, while others leave their comments. Examples of forums are: Reddit, TED Conversations.

MMO (Massive Multiplayer Online) are network games, played by a large number of players via the Internet. One of the sub-genres of MMO is a MMORPG (Massive Multiplayer Online Role-Playing Game), and its most popular representative is a game called 'World of Warcraft'.

Chatroom is a webpage or part of a webpage which allows a real-time information exchange. Unlike the instant messaging writing software, it does not require computer installation, only a web browser and Internet connection.

The most popular service for video clip sharing is YouTube.

Picture or photograph exchange services– Photobucket, Flickr, lolcats etc.

One of the main features of the Internet is information flow. That is why information is valuable, and today companies are looking for ways to obtain information via the Internet. For instance, Google does not charge for the use of the search engine, however every time you enter something into a search engine, you inform the search engine what you want to know, what your interests are. Using this information, Google will display ads that might be of interest to you, and will gain revenue through advertising.

Another example is online community. In online communities you open a user account and fill it out with more or less personal information. You will often have the opportunity to read that someone got fired for leaving negative comments on sites, such as Twitter, about their boss or a company they work for. Another characteristic of the Internet is that once you publish some information, it is extremely difficult, if not impossible, to remove it. For that reason it is necessary to be careful when leaving personal data on social networks. One should avoid sharing information regarding date and place of birth, home address, phone number, planned vacation, and use security settings to restrict access to your user profile. Also, be careful with the terms of use agreement to which you agree when you open an account, because that very agreement defines how the company - owner of the some social network, can handle the information that you released on their social networks.

Also, it is also necessary to bear in mind that, when communicating with someone over the Internet, you do not really know who that person really is. It is very easy to impersonate someone, and that fact further accentuates the need for caution when giving any personal information.

Parents must particularly be careful, because children are easily deceived. How to protect children on the Internet is a special issue of great importance, which is why we paid special attention to it on our page http://www.itdesk.info/en/child-safety-internet/.

Questions for self-test.
1.How does the Internet work?
2.What is TCP/IP?
3.What are the differences between static IP addresses, dynamic IP addresses, private IP addresses, and domain names?
4.Can I find the actual speed of my Internet connection?
5.What is the best type of Internet service?
6.Is there a difference between portable Internet access and mobile Internet access?

2.2 Cybersafety

Security risks of information and their classification

Safety is the state of being "safe" (from French sauf), the condition of being protected from harm or other non-desirable outcomes. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk.

Meanings

"After Whiskey Driving Risky." Safety roadsign in Ladakh, India

There are two slightly different meanings of safety. For example, home safety may indicate a building's ability to protect against external harm events (such as weather, home invasion, etc.), or may indicate that its internal installations (such as appliances, stairs, etc.) are safe (not dangerous or harmful) for its inhabitants.

Discussions of safety often include mention of related terms. Security is such a term. With time the definitions between these two have often become interchanged, equated, and frequently appear juxtaposed in the same sentence. Readers unfortunately are left to conclude whether they comprise a redundancy. This confuses the uniqueness that should be reserved for each by itself. When seen as unique, as we intend here, each term will assume its rightful place in influencing and being influenced by the other.

Safety is the condition of a "steady state" of an organization or place doing what it is supposed to do. "What it is supposed to do" is defined in terms of public codes and standards, associated architectural and engineering designs, corporate vision and mission statements, and operational plans and personnel policies. For any organization, place, or function, large or small, safety is a normative concept. It complies with situation-specific definitions of what is expected and acceptable.

Using this definition, protection from a home's external threats and protection from its internal structural and equipment failures (see Meanings, above) are not two types of safety but rather two aspects of a home's steady state.

In the world of everyday affairs, not all goes as planned. Some entity's steady state is challenged. This is where security science, which is of more recent date, enters. Drawing from the definition of safety, then:

Security is the process or means, physical or human, of delaying, preventing, and otherwise protecting against external or internal, defects, dangers, loss, criminals, and other individuals or actions that threaten, hinder or destroy an organization's "steady state," and deprive it of its intended purpose for being.

Using this generic definition of safety it is possible to specify the elements of a security program.

Types of safety

It is important to distinguish between products that meet standards, that are safe, and those that merely feel safe. The highway safety community uses these terms:

Normative safety

Normative safety is achieved when a product or design meets applicable standards and practices for design and construction or manufacture, regardless of the product's actual safety history.

Substantive safety

Substantive or objective safety occurs when the real-world safety history is favorable, whether or not standards are met.

Perceived safety

Perceived or subjective safety refers to the users' level of comfort and perception of risk, without consideration of standards or safety history. For example, traffic signals are perceived as safe, yet under some circumstances, they can increase traffic crashes at an intersection. Traffic roundabouts have a generally favorable safety record[2] yet often make drivers nervous.

Low perceived safety can have costs. For example, after the 9/11/2001 attacks, many people chose to drive rather than fly, despite the fact that, even counting terrorist attacks, flying is safer than driving. Perceived risk discourages people from walking and bicycling for transportation, enjoyment or exercise, even though the health benefits outweigh the risk of injury.

Security

Also called social safety or public safety, security addresses the risk of harm due to intentional criminal acts such as assault, burglary or vandalism.

Because of the moral issues involved, security is of higher importance to many people than substantive safety. For example, a death due to murder is considered worse than a death in a car crash, even though in many countries, traffic deaths are more common than homicides.

Risks and responses

Safety is generally interpreted as implying a real and significant impact on risk of death, injury or damage to property. In response to perceived risks many interventions may be proposed with engineering responses and regulation being two of the most common.

Probably the most common individual response to perceived safety issues is insurance, which compensates for or provides restitution in the case of damage or loss.

Malicious applications.

Web safety, or online safety or Internet Safety, is the knowledge of maximizing the user's personal safety and security risks to private information and property associated with using the internet, and the self-protection from computer crime in general.

As the number of internet users continues to grow worldwide, internet safety is a growing concern for both children and adults. Common concerns regarding safety on the internet include: malicious users (spam, phishing, cyberbullying, Cyberstalking etc.), web-

sites and software (malware, computer viruses, etc.) and various types of obscene or offensive content. Several crimes can be committed on the Internet such as stalking, identity theft and more.

Most social networking and chat sites have a page about safety. Numerous groups, governments and organizations have expressed concerns about the safety of children using the Internet. Safer Internet Day is celebrated worldwide in February to raise awareness about internet safety. In the UK the Get Safe Online campaign has received sponsorship from government agency Serious Organized Crime Agency (SOCA) and major Internet companies such as Microsoft and eBay.

Information security

Sensitive information such as personal information and identity, passwords are often associated with personal property (for example, bank accounts) and privacy and may present security concerns if leaked. Unauthorized access and usage of private information may result in consequence such as identity theft, as well as theft of property. Common causes of information security breaches include:

Phishing

Phishing is a type of scam where the scammers disguise as a trustworthy source in attempt to obtain private information such as passwords, and credit card information, etc. through the internet. Phishing often occurs through emails and instant messaging and may contain links to websites that direct the user to enter their private information. These fake websites are often designed to look identical to their legitimate counterparts to avoid suspicion from the user.

Internet scams

Internet scams are schemes that deceive the user in various ways in attempt to take advantage of them. Internet scams often aim to cheat the victim of personal property directly rather than personal information through false promises, confidence tricks and more.

Malware

Malware, particularly spyware, is malicious software disguised as legitimate software designed to collect and transmit private information, such as passwords, without the user's consent or knowledge. They are often distributed through e-mail, software and files from unofficial locations. Malware is one of the most prevalent security concerns as often it is impossible to determine whether a file is infected, despite the source of the file.

Cyberstalking

Cyberstalking is the use of the Internet or other electronic means to stalk or harass an individual, a group of individuals, or an organization. It may include the making of false accusations or statements of fact (as in defamation), monitoring, making threats, identity theft, damage to data or equipment, the solicitation of minors for sex, or gathering information that may be used to harass. According to a study conducted by Baum et al. (2009), the rate of assault through electronic means such as e-mail or instant messaging was over one in four out of all stalking victims in the study.

Questions for self-test.
1. Safety is … ?
2. Types of safety?
3. Normative safety is … ?

4.Web safety is … ?
5.Information security is … ?
6.Malwares are … ?

2.3Internet technologies.

World Wide Web

A technical definition of the World Wide Web is : all the resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP).

A broader definition comes from the organization that Web inventor Tim Berners-Lee helped found, the World Wide Web Consortium (W3C).

The World Wide Web is the universe of network-accessible information, an embodiment of human knowledge.

In simple terms, The World Wide Web is a way of exchanging information between computers on the Internet, tying them together into a vast collection of interactive multimedia resources.

Internet and Web is not the same thing: Web uses internet to pass over the information.
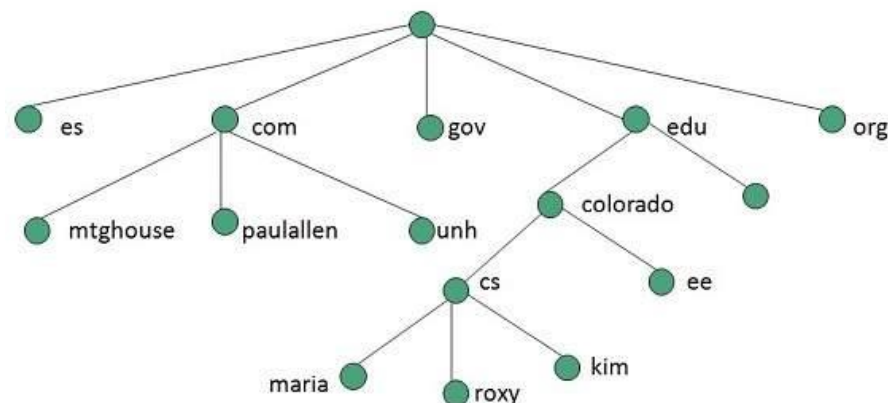
Figure 2.1.WWW Architecture

WWW architecture is divided into several layers as shown in the following diagram:
Data Interchange

Resource Description Framework (RDF) framework helps in defining core representation of data for web. RDF represents data about resource in graph form.
Taxonomies

RDF Schema (RDFS) allows more standardized description of taxonomies and other ontological constructs.
Ontologies

Web Ontology Language (OWL) offers more constructs over RDFS. It comes in following three versions:

OWL Lite for taxonomies and simple constraints.

OWL DL for full description logic support.
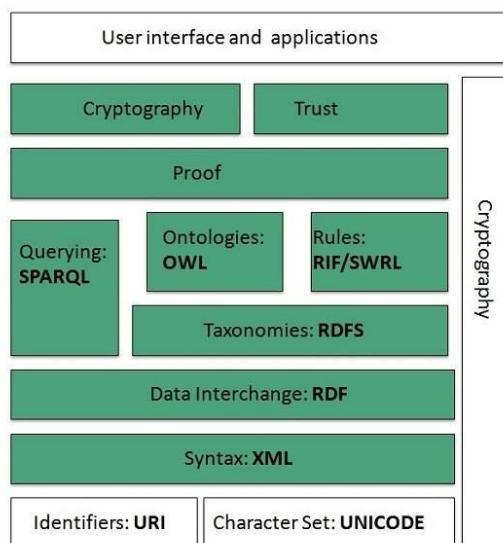OWL for more syntactic freedom of RDF

Figure 2.2.Identifiers and Character Set

Uniform Resource Identifier (URI) is used to uniquely identify resources on the web and UNICODE makes it possible to built web pages that can be read and write in human languages.

Syntax

XML (Extensible Markup Language) helps to define common syntax in semantic web.

Rules

RIF and SWRL offers rules beyond the constructs that are available from RDFs and OWL. Simple Protocol and RDF Query Language (SPARQL) is SQL like language used for querying RDF data and OWL Ontologies.

Proof

All semantic and rules that are executed at layers below Proof and their result will be used to prove deductions.

Cryptography

Cryptography means such as digital signature for verification of the origin of sources is used.

User Interface and Applications

On the top of layer User interface and Applications layer is built for user interaction.

WWW Operation

WWW works on client- server approach. Following steps explains how the web works:

User enters the URL (say, http://www.tutorialspoint.com) of the web page in the address bar of web browser.

Then browser requests the Domain Name Server for the IP address corresponding to www.tutorialspoint.com.

After receiving IP address, browser sends the request for web page to the web server using HTTP protocol which specifies the way the browser and web server communicates.

Then web server receives request using HTTP protocol and checks its search for the requested web page. If found it returns it back to the web browser and close the HTTP connection.

Now the web browser receives the web page, It interprets it and display the contents of web page in web browser's window.

WWW Future

There had been a rapid development in field of web. It has its impact in almost every area such as education, research, technology, commerce, marketing etc. So the future of web is almost unpredictable.

Apart from huge development in field of WWW, there are also some technical issues that W3 consortium has to cope up with.

User Interface

Work on higher quality presentation of 3-D information is under deveopment. The W3 Consortium is also looking forward to enhance the web to full fill requirements of global communities which would include all regional languages and writing systems.

Technology

Work on privacy and security is under way. This would include hiding information, accounting, access control, integrity and risk management.

Architecture

There has been huge growth in field of web which may lead to overload the internet and degrade its performance. Hence more better protocol are required to be developed.

Web Browsers

web Browser is an application software that allows us to view and explore information on the web. User can request for any web page by just entering a URL into address bar.

Web browser can show text, audio, video, animation and more. It is the responsibility of a web browser to interpret text and commands contained in the web page.

Earlier the web browsers were text-based while now a days graphical-based or voice-based web browsers are also available. Following are the most common web browser available today:

Browser	Vendor
Internet Explorer	Microsoft
Google Chrome	Google
Mozilla Firefox	Mozilla
Netscape Navigator	Netscape Communications Corp.
Opera	Opera Software
Safari	Apple
Sea Monkey	Mozilla Foundation
K-meleon	K-meleon

Architecture

There are a lot of web browser available in the market. All of them interpret and display information on the screen however their capabilities and structure varies depending upon implementation. But the most basic component that all web browser must exhibit are listed below:

Controller/Dispatcher

Interpreter

Client Programs

Controller works as a control unit in CPU. It takes input from the keyboard or mouse, interpret it and make other services to work on the basis of input it receives.

Interpreter receives the information from the controller and execute the instruction line by line. Some interpreter are mandatory while some are optional For example, HTML interpreter program is mandatory and java interpreter is optional.

- Client Program describes the specific protocol that will be used to access a particular service. Following are the client programs tat are commonly used:
- HTTP
- SMTP
- FTP
- NNTP
- POP
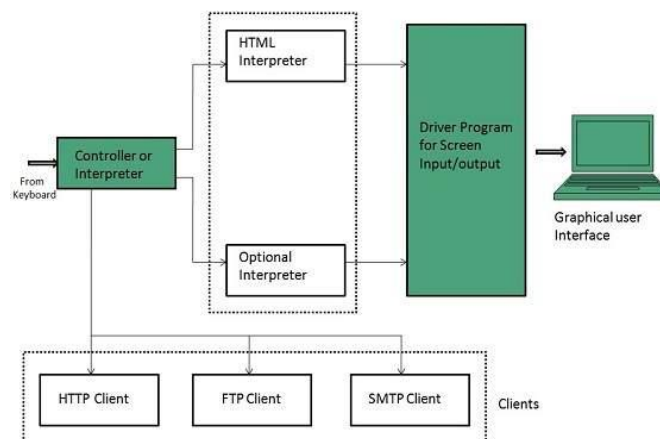
Figure2.3. Web Server

Web server is a computer where the web content is stored. Basically web server is used to host the web sites but there exists other web servers also such as gaming, storage, FTP, email etc.

Web site is collection of web pages whileweb server is a software that respond to the request for web resources.

Web Server Working

Web server respond to the client request in either of the following two ways:

- Sending the file to the client associated with the requested URL.
- Generating response by invoking a script and communicating with database

Key Points

- When client sends request for a web page, the web server search for the requested page if requested page is found then it will send it to client with an HTTP response.

- If the requested web page is not found, web server will the send an HTTP response:Error 404 Not found.

- If client has requested for some other resources then the web server will contact to the application server and data store to construct the HTTP response.

Architecture

Web Server Architecture follows the following two approaches:

Concurrent Approach

Single-Process-Event-Driven Approach.

Concurrent Approach

Concurrent approach allows the web server to handle multiple client requests at the same time. It can be achieved by following methods:

- Multi-process
- Multi-threaded
- Hybrid method.

Multi-processing

In this a single process (parent process) initiates several single-threaded child processes and distribute incoming requests to these child processes. Each of the child processes are responsible for handling single request.

It is the responsibility of parent process to monitor the load and decide if processes should be killed or forked.

Multi-threaded

Unlike Multi-process, it creates multiple single-threaded process.

Hybrid

It is combination of above two approaches. In this approach multiple process are created and each process initiates multiple threads. Each of the threads handles one connection. Using multiple threads in single process results in less load on system resources.

Examples

Following table describes the most leading web servers available today:

Proxy Server

Proxy server is an intermediary server between client and the interner. Proxy servers offers the following basic functionalities:

- Firewall and network data filtering.
- Network connection sharing
- Data caching

Proxy servers allow to hide, conceal and make your network id anonymous by hiding your IP address.

Purpose of Proxy Servers

Following are the reasons to use proxy servers:

Monitoring and Filtering

Improving performance

Translation

Accessing services anonymously

Security

Type of Proxies

Following table briefly describes the type of proxies:

Forward Proxies

In this the client requests its internal network server to forward to the internet.
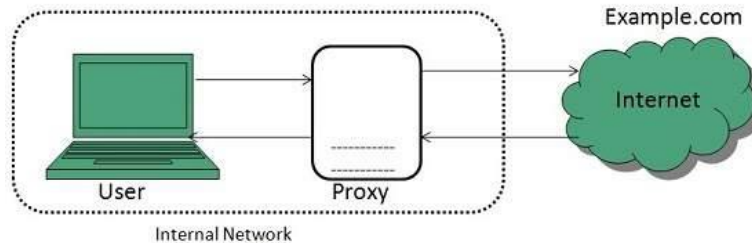
Figure 2.4.Open Proxies

Open Proxies helps the clients to conceal their IP address while browsing the web.

Reverse Proxies

In this the requests are forwarded to one or more proxy servers and the response from the proxy server is retrieved as if it came directly from the original Server.
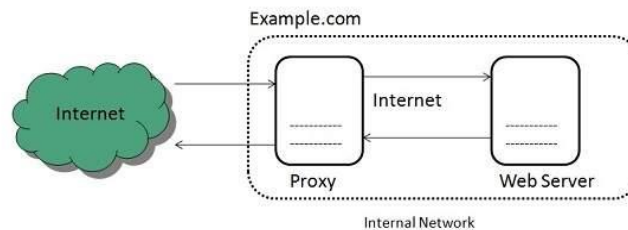
Figure 2.5. Proxy user interface

This module controls and manages the user interface and provides an easy to use graphical interface, window and a menu to the end user. This menu offers the following functionalities:

- Start proxy
- Stop proxy
- Exit
- Blocking URL
- Blocking client
- Manage log
- Manage cache
- Modify configuration

Proxy server listener

It is the port where new request from the client browser is listened. This module also performs blocking of clients from the list given by the user.

Connection Manager

It contains the main functionality of the proxy server. It performs the following functions:

- It contains the main functionality of the proxy server. It performs the following functions:
- Read request from header of the client.
- Parse the URL and determine whether the URL is blocked or not.
- Generate connection to the web server.
- Read the reply from the web server.
- If no copy of page is found in the cache then download the page from web server else will check its last modified date from the reply header and accordingly will read from the cache or server from the web.
- Then it will also check whether caching is allowed or not and accordingly will cache the page.

Cache Manager

This module is responsible for storing, deleting, clearing and searching of web pages in the cache.

Log Manager

This module is responsible for viewing, clearing and updating the logs.

Configuration

This module helps to create configuration settings which in turn let other modules to perform desired configurations such as caching.

Search Engine Components

Generally there are three basic components of a search engine as listed below:

Web Crawler

Database

Search Interfaces

Web crawler

It is also known as spider or bots. It is a software component that traverses the web to gather information.

Database

All the information on the web is stored in database. It consists of huge web resources.

Search Interfaces

This component is an interface between user and the database. It helps the user to search through the database.

Search Engine Working

Web crawler, database and the search interface are the major component of a search engine that actually makes search engine to work. Search engines make use of Boolean expression AND, OR, NOT to restrict and widen the results of a search. Following are the steps that are performed by the search engine:

- The search engine looks for the keyword in the index for predefined database instead of going directly to the web to search for the keyword.

- It then uses software to search for the information in the database. This software component is known as web crawler.

- Once web crawler finds the pages, the search engine then shows the relevant web pages as a result. These retrieved web pages generally include title of page, size of text portion, first several sentences etc.

These search criteria may vary from one search engine to the other. The retrieved information is ranked according to various factors such as frequency of keywords, relevancy of information, links etc.

Questions for self-test.
1.What is Social Networking?
2.What a phishing email may contain?
3.What is Internet Collaboration?

2.4 Cloud and mobile technologies

Nowadays, the IT industry is revolving around the build-out and adoption of a new platform, characterized by mobility, cloud-based application and service delivery, and value-generating overlays of social business and pervasive analytics. The paper explores the convergence of mobile, cloud, and social, as well as the effects for the enterprise and the emergence of the new enterprise application platforms. In the beginning we set the stage, while showing the ex-pansion of the mobile, cloud, and social in the business information system, as they were found in the literature. We then look over the IT trends, especially the consumerization of IT, as reasons and basis for the information systems embracing of mobile. Afterwards, we present a mobility roadmap for the enterprise and illustrate the re-configuration of the enterprise ap-plication platform.

There are seven phases in a mobile IT pro-ject:

a. Alignment of the project with the enter-prise mobility strategy. An enterprise must have a long term mobility strategic vision, coupled with a short to mid-term tactical approach meant to link the rapid technology changes with the business goals and the users' requirements.

b. User workflow analysis. Like any other application development, a good process analysis is placed in the beginning and it targets the identification of requirements. Users play an important role, as in every requirements specification phase of a pro-ject.

c. Mobile platform selection. There are two types of platforms to be selected: Mobile Enterprise Application Platform (MEAP) and Mobile Device Management Plat-form (MDMP). They must provide tools for managing the applications, users and devices, on one side and instruments for building integrated mobile applications with the operational workflows across the enterprise, on the other side. It is a difficult phase because there are many available products, offering different ca-pabilities. Many of them are offering an integrated development studio which ac-celerates the mobile application devel-opment (used effectively in phase 6). Even if at the moment only the MDM platform is necessary, it is recommenda-ble to select the MEAP, as they should match.

d. *Device and operating system selection*. This is another problematical phase, due to the diversity of options and the em-ployees' pressure to use their own mobile devices. From the technical point of view, the first choice seems to be the most popular devices and OSs but this is more appropriate when developing for individual consumers. For enterprise ap-plications, technical criteria should be analyzed, as well as users' related issues.

The purpose is to ensure a proper man-agement of the devices (staging, monitor-ing, malfunctioning, etc.) in correlation with their lifecycle. The ideal would be to have a de-vice-agnostic mobile applica-tion, which is compatible with most oper-ating systems and may also work on dif-ferent types of devices, including note-books, tablet PCs or smartphones .

e. *Back-end integration*. It is an essential phase in the economy of the project. A project might fail if the back-end integra-tion doesn't work. The most common used plat-form is EAI (Enterprise Applica-tion Integration) which is a middleware layer in the en-terprise information archi-tecture. This middleware layer aggregates data from the back-end (ERP) system and intelligently distributes in the appropriate format to the mobile de-vices. Having the greater than before number of mobile ap-plications, a new middleware layer is re-sponsible for back-end integration: the MEAP.

f. *Mobile application development*. Lots of mobile apps are developed, but so many of them are poorly designed and fail to deliver functionality. A good mobile ap-plication is highly usable, has a proper and accepted way to access information, has a well-designed user interface, and is responsive. The three basic requirements are: user-friendliness, re-sponse time and switch between applications, look and feel. Ideally, whether the mobile devices are company-owned or employee-owned, mobile applications should be written once and deployed to many devices via a mobile cloud model (BaaS).

g. *Mobile application deployment*. If the development phase produced a user-friendly and usable application, the de-ployment will succeed. This phase also includes a change management process. The accomplishment of this phase is sub-stantially dependa-ble on the end-users, which should be involved from the early phases because they may contribute to the development process and the training programs.

Mobileservices. Standards of mobile technologies.

We believe that the proliferation of smart de-vices and mobile cloud apps in the en-terprise is driving the constant reconsideration of the *enterprise mobility strategy*. Based on the strategy, evaluation is performed and then the solution turns out, following the well-known sequence "develop – integrate – deploy – manage" (presented earlier with the sev-en phases) in a cloud-based environment

As many reports indicate, mobile develop-ment faces many challenges:
- connectivity to back-end systems and da-ta;
- device diversity and multiple platforms;
- high users' expectations;
- integration with existing development processes.

A reliable mobile enterprise applications pro-ject has in our opinion two weak spots: inte-gration and security. The first because there's more than just one type of integration in-volved: one is the connection of new mobile app with the existing systems (integration capabilities between various mobile technol-ogies) and the other concerns the correlation

with the existing business processes that it will replace, impact, or improve. Security is perhaps the Achilles' heel, mainly because mobile devices are more exposed to malware and they enable new forms of attack. Ongo-ing efforts in achieving security are reported.

Conclusions

The notorious IT market research company IDC considers that the organizations should shift to "the third platform", which assembles mobility, big data, cloud computing and social media and our research conclusion cor-roborates with this report. Moreover, IDC predicts that by 2020, likely 60% of IT spending will be on cloud, social, mobility and big data technologies, with "third-platform" revenue projected to grow by 12% each year for the next seven years. By com-parison, second platform spending - referring to cli-ent/server technologies - is only grow-ing by about 1% year over year, according to the same source.

On the other hand, surveys among IT manag-ers show a reluctance to move the business workflows to mobile devices – considering key applications such as ERP, CRM, and HR. Moreover, enterprise applications still aren't moving to the cloud. The applica-tions that are mostly likely to move are those that are already safely in the cloud: email, mobile apps, collaboration and data backup.

Questions for self-test.
1.Main terms and concepts of mobile technologies.
2.Mobile services. Standards of mobile technologies.
3.Software LAN
4.Principles of cloud computing.
5.Technologies of virtualization.
6.Web service in the Cloud.

2.5 Multimedia technologies

The term "media" from English can be translated as "many edium "(from multi - And many media

Currently, multimedia technology are rapidly growing area of information technolo-gy. In this direction

actively works a significant number of large and small firms, technical universities and studios (notably IBM, Apple, Motorola, Philips, Sony, Intel and etc.). Fields of appli-cation are extremely iverse: interactive training and information systems, CAD and oth-ers.

The maincharacteristicfeatures these technologies
They are:

- Association multicomponent information medium (text, sound, graphics, photos, video) in a uniform digital representation;

- providing reliable (no distortion when copying) and large - durable storage (ten years warranty period of storage)amounts of information;

- ease of processing of the information (from the routine to the creative operations).

Achieved technological basis is based on the use of new standard optical media DVD (Digital Versalite / Video Disk), having a capacity of the order of units and tens of gigabytes and replaces allprevious: CD-ROM, Video-CD, CD-audio. Using the DVD allowed implement the concept of homogeneity of digital information. One the device replaces the music player, VCR, CD-ROM, floppy drive, Slider and others. In terms of presentation DVD optical media

It brings it to the level of virtual reality. Multicomponent media environment should be divided intothree groups: Audio dubbing, video, text information. Audio dubbing can include speech, music, effects (such as noise sounds, thunder, creaking, etc., united symbol WAVE (wave). the principalproblem with this group is the multi-media information capacity. To record one minute higher WAVE-sound Quality requires about 10 MB of memory, so the standard volume CD (640 MB) allows you to record up to an hour WAVE. For solutions this problem using compression techniques sound information. Another trend is the use of multi-media sound (Odnogolosyj and polyphonic music, until the orchestra, sound effects) MIDI (Musical Instrument Digitale Interface). In this case the sounds of musical instruments, the sound effects are synthesized software-controlled electronic synthesizers. Correction and digital recording MIDI-sounds by means of music editors (software sequencers). The main advantage of MIDI a small amount of memory required - 1 minute MIDI-sound takes inaverage of 10 KB. Visuals compared with Audio dubbing is characterized by large number of elements. There are static and dynamic visuals. Static video includes graphics (designs, interiors,surface character in graphics mode) and photo (photos and scanned images). Dynamic video is a sequence static elements (frames). three sample groups can be distinguished: normal video (life video) - a sequence of photos (about 24 frames per second); kvazivideo - sparse sequence of pictures (6-12frames per second); animation - a sequence of animated images. The first problem in the implementation of video sequences – resolution screen capability and number of colors. There are three areas:

- VGA standard gives 640 480 pixels (dots) on the screenwith 16 colors or 320 200 pixels with 256 colors;

- SVGA standard (512 KB video memory, 8 bits / pixel) gives640 480 pixels with 256 colors;

- 24-bit graphics cards (video memory 2 MB 24-bit / pixel)allow the use of 16 million colors.

The second problem - the amount of memory. For still images onefull screen requires the following amounts of memory:

mode 640 480, 16 colors - 150 kB;

mode 320 200, 256 colors - 62.5 kB;

mode 640 480, 256 colors - 300 KB.

Such significant amounts when implementing audio and video sequencesdefine high demands on the storage medium, and video memorydata rate.

When placing text information on the CD-ROM nodifficulties and limitations due to the large volume of informationoptical disk.

The main directions of use of multimedia technologies:

- electronic publications for the purposes of education, etc.;

- in telecommunications with the spectrum of the possible applications of view custom shows and select the desired book to participate in multimedia conferences. Such developments have been calledInformation Highway;

- multimedia information systems ("multimediaKiosks ") issued by user request visual information.

From the standpoint of technical equipment on the market are represented as fully equipped multimedia computers, and separate components and subsystems (Multimedia Upgrade Kit) includingSound card, CD-ROM drives, joysticks, microphones, Acustic systems.

For personal computers IBM PC class approved MPC special standard that defines the minimum configuration hardware for reproduction of multimedia products. For optical drives CD-ROM developed by an international standard (ISO 9660).

Multimedia - the simultaneous use of different forms of reporting and processing it in a single container object.

For example, in one aspect, the container can contain text, auditory, graphic and video information as well as, possibly, the method interaction with her. The term multimedia also often It used to refer to media, allowing you to store large amounts of data and provide quick access to enough it (the first carriers of this type were CD ROM). In this case media, the term means that the computer can use such carriers and provide information to the user through every possible types of data, such as audio, video, animation, graphics and other in addition to the traditional methods of reporting, such as text.

History of Multimedia term In 1965, the term "multi-media" was used to describe Exploding Plastic.

Inevitable - The show will combine the live rock music,cinema, experimental lighting effects and unconventional art. ATFor forty years, the term acquired a different meaning. At the end 1970s, the term refers to the presentation composed of images obtained from multiple projectors synchronized with the soundtrack. In the 1990s, the term has acquired a modern us value.

Classification of multimedia

Multimedia can be classified into two main groups:
- Linear. The analogue representation is linear fashion
- cinema. Man looking through the document, not in any way may affect its output.
- Nonlinear. The non-linear way of presenting information
- It allows a person to participate in the output information, interacting in any way by means of the display of multimedia data.
- Human involvement in this process is also called interactivity.
- The non-linear way of presenting multimedia data is sometimes
- "Hypermedia" referred to by the term.

As an example, linear and nonlinear representation method the information can be seen a situation like holding presentation. If the presentation was recorded on film and shown audience, the method of providing information may be named linear as browsing this presentation have not ability to influence the speaker. In the case of a live presentation the audience has the opportunity to interact with the speaker (for example, ask questions), that allows it to deviate from the presentation of the theme,explaining some of the terms,

or to further illuminating controversial part report. Thus, the live presentation can be represented as non-linear (interactive) way of presenting information.. Structural Components of the multimedia:Text, Audio, Computer graphics, Video

Questions for self-test.
1.The composition of the computer devices to display images.
2.The structure of the pixel color display.
3.What is a raster screen resolution?
4.Give an example of a nonlinear and comment on multimedia.
5.Describe the advantages and disadvantages of vector graphics.
6.For what purpose uses interlaced scanning and why Currently?

MODULE 3. SMART TECHNOLOGIES

3.1 Technology Smart.

From the large amounts of data to the Big Data.

Usually, the discussion centered around the Big Data Storage (and the analysis based on such repositories), the volume is much larger than just a few terabytes.

In particular, some data warehouse can grow to thousands of terabytes, ie, up to a petabyte (1000 terabytes petabytes = 1).

Outside petabytes, data acquisition can be measured in exabytes, for example, in the manufacturing sector worldwide in 2010 is estimated to have accumulated a total of 2 exabytes of new information (Manyika et al., 2011).

There are sectors where the data is collected and accumulate very rapidly.

For example, in the industrial sector, such as power plants, a continuous stream of data is generated sometimes for tens of thousands of options every minute or every second.

In addition, over the past few years, introduced the so-called "smart grid" technologies that allow utilities to measure the power consumption of individual families every minute or every second.

For such applications in which data must be stored for years, the accumulated data are classified as Extremely Big Data.

There is a growing number of applications and Big Data among commercial and government sectors, where the amount of data in storage, may be hundreds of terabytes or petabytes.

Modern technologies allow to "keep track" of people and their behavior in various ways. For example, when we use the Internet, make purchases at online stores or large networks of stores, such as Walmart (according to Wikipedia, Walmart data warehouse is estimated at over 2 petabytes), or move enabled mobile phones - we leave a trace of our activities that It leads to the accumulation of new information.

Various methods of communication, ranging from simple phone calls to social networks to download information through sites such as Facebook (according to Wikipedia, the exchange of information each month is 30 billion. Units), or sharing videos on sites such as YouTube (Youtube says he load 24 hours of video every minute; see Wikipedia), daily generate a huge amount of new data..

Similarly, modern medical techniques generate large amounts of data relating to the medical assistance (images, video, real-time monitoring).

Thus, the amounts of data classification can be represented as:
- Large data sets from 1000 megabytes (1 gigabyte) to hundreds of gigabytes
- Huge data sets: from 1,000 gigabytes (1terabayt) to several terabytes
- Big Data: from a few terabytes to hundreds of terabytes
- Extremely Big Data: from 1,000 to 10,000 terabytes = 1 to 10 petabytes
- Problems associated with Big Data

There are three types of problems associated with Big Data:
1. Storage and Management

The amount of data in the hundreds of terabytes or petabytes does not allow to easily store and manage with traditional relational databases.

2. Unstructured Information

Most of the data is unstructured Big Data. Those. how to organize text, video, images, etc.?

3. Analysis of Big Data

How to analyze unstructured information? As on the basis of Big Data to make simple reports, build and deploy predictive models of in-depth?

Storage and management of Big Data

Big Data is generally stored and organized in a distributed file system.

In general, information is stored in multiple (sometimes thousands) hard drives on standard computers.

So-called "card» (map) keeps track of where (on which computer and / or disk) stores the particular piece of information.

To provide fault tolerance and reliability, each piece of information is usually stored several times, for example - three times.

For example, suppose that you have collected the individual transaction in a large retail chain stores. Details of each transaction will be stored on different servers and hard drives, and "map» (map) index, where it stores information about the relevant transaction.

Using standard hardware and open source software for the management of distributed file system (eg, Hadoop), relatively easy to implement a reliable data warehouse to petabyte scale.

Unstructured information

Much of the information collected in a distributed file system consists of unstructured data such as text, images, photos or video.

It has its advantages and disadvantages.

The advantage is that the ability to store large data allows you to store "data", without worrying about how much of the data relevant for analysis and decision making.

The downside is that in such cases, to extract useful information requires subsequent processing of huge amounts of data.

Although some of these operations can be simple (for example, simple calculations, etc.), while others require more complex algorithms, which must be specifically designed to work effectively in the distributed file system.

One top manager once told StatSoft that he "spent a fortune on IT and data storage, but still began to get money," because I do not think about how best to use these data to improve core operations.

Thus, while the amount of data may increase exponentially, the ability to retrieve information and act on basis of this information will be limited and asymptotically reach the limit.

It is important that the methods and procedures for the construction, model updates, and to automate decision making process have been developed along with the data storage system to ensure that such systems are useful and advantageous for the company.

Analysis of Big Data

This is really a big problem with the analysis of unstructured data Big Data: how to analyze them to good use. On this issue it is written much smaller than on the data storage and management technologies Big Data.

There are a number of issues that should be considered.

Map-Reduce

When analyzing hundreds of terabytes or petabytes of data, it is not possible to extract the data in any other place for the analysis (eg, STATISTICA Enterprise Analysis Server).

The process of transferring data channels on a single server or server (for parallel processing) take too long and require too much traffic.

Instead, analytic calculations to be performed physically close to the location where data is stored.

Map-Reduce algorithm is a model for distributed computing. Its working principle is as follows: there is a distribution of the input data on the working units (individual nodes) distributed file system for the pretreatment (map-step) and then the convolution of (union) already pre-processed data (reduce-step).

Thus, for example, to calculate the total sum, the algorithm will calculate subtotals parallel in each of the nodes distributed file system, and then sum the intermediate values.

On the Internet a huge amount of available information on how you can perform various calculations using the model map-reduce, including for predictive analytics.

Simple statistics, Business Intelligence (BI)

To compile simple BI reports, there are many products with open source, allowing to calculate sums, averages, proportions, etc. using a map-reduce.

Thus, to obtain accurate counts and other simple statistics for reporting is very easy.

Predictive modeling, in-depth statistics

At first glance it may seem that the construction of predictive models in a distributed file system more complicated, but it is not so. Consider the preliminary stages of data analysis.

Data preparation. Some time ago, StatSoft has held a series of large and successful projects with very large data sets that describe the per-minute performance of the power plant process. The purpose of the analysis was to increase the efficiency of power plants and lowering emissions (Electric Power Research Institute, 2009).

It is important that, despite the fact that the datasets can be very large, the information contained in them, has a substantially smaller dimension.

For example, while data is collected every second or every minute, many of the parameters (temperature and gas ovens, flows damper position, etc.) are stable over long time intervals. In other words, the data is recorded every second, are basically repeats the same information.

Thus, there should be "smart" aggregation of data, getting to simulate and optimize the data that contains only the necessary information about the dynamic changes affecting the efficiency of the power plant and the amount of emissions.

Classification of texts and data preprocessing. Let us illustrate again how large data sets can contain far less useful information.

For example, StatSoft participated in projects related to the analysis of texts (text mining) of tweets, reflecting how passengers and airlines are satisfied with their services.

Despite the fact that it was removed hourly and daily large number of relevant tweets sentiment expressed in them are fairly simple and monotonous. Most of the reports - complaints and short messages from one sentence about the "bad experience." In addition, the number and the "power" of these attitudes are relatively stable over time and in specific issues (eg, lost luggage, bad food, cancellation of flights).

Thus, the reduction of the actual tweets up soon (evaluation) mood, using the methods text mining (eg, implemented in STATISTICA Text Miner), results in a much smaller amount of data, which can then be easily compared with existing structured data (actual ticket sales or information about the frequent flyer). The analysis allows to divide customers into groups and study their specific complaints.

There are many tools for aggregation of such data (for example, but rather a) in a distributed file system that allows you to easily carry out the analytical process.

Building models

Often the objective is to quickly build a precise model for the data stored in the distributed file system.

There are map-reduce implementation of various algorithms data mining / predictive analytics, suitable for large-scale parallel processing of data in a distributed file system (which can be supported by a StatSoft STATISTICA platform).

However, because of the fact that you have processed a very large amount of data, if you are confident that the final model is really more accurate?

In fact, probably more convenient to construct a model for small data segments in a distributed file system.

According to a recent Forrester report: "Two plus two is equal to 3.9 - it is usually good enough» (Hopkins & Evelson, 2011).

Statistical and mathematical precision is that the linear regression model, including, for example, 10 predictors based on properly done probabilistic sample of 100,000 observations, will be as accurate as the model based on observations of 100 million.

In probability sampling, each element has a set of specific, predetermined probability of being selected. Moreover, for each element of the aggregate probability of falling into the same sample.

In contrast, some vendors in Big Data, often for advertising, claimed that "all the data to be processed."

In fact, the accuracy of the model depends on the sample quality (each observation in the population should have a known probability of selection) and its size is related to the complexity of the model. The population size is irrelevant.

For this reason, for example, a sample consisting of only a few thousand votes, can afford to build a very accurate predictions of the actual election results.

So, the real value of Big Data in distributed file systems is not to build a predictive model based on all the data; the accuracy of the models will be higher.

More significant is the use of the entire volume of data for segmentation and clustering, which will effectively build a large number of models for small clusters.

For example, it can be expected that the models based on the general segmentation (20-30 years) will be less accurate than a large number of models based on more detailed segmentation (eg, 20-21 year old students living in the dormitory, and students on the faculty of business).

Thus, one way to obtain the benefits Big Data is to use the available information to construct a large number of models for a large number of segments and then build an appropriate model predictions.

In the extreme case, every single "person" in the large customer data warehouse can have its own model to predict future purchases.

This means that the analytical platform (eg, STATISTICA Enterprise), supporting the data warehouse must be able to manage hundreds or even thousands of models and be able to re-adjust them when necessary.

Sampling, data reduction, data selection using a map-reduce. What this means for analyzing Big Data?

There are effective (map-reduce) algorithms for obtaining samples, available for the distributed file system in which Big Data become suitable for building predictive models.

For many purposes it is a very convenient way, for example, the deployment of STATISTICA Enterprise and Data Mining Platform over data interface to a distributed file system operations data preparation / aggregation and / or a probability sample, using algorithms of map-reduce (and message-driven platform Enterprise).

In addition, you can also build a detailed sampling (eg, based on microsegmentation specific groups of customers) and to provide STATISTICA data to build models for specific segments.

STATISTICA Integration with open-source tools. The unique advantage of STATISTICA Enterprise and Data Mining platform that is specifically designed as an enterprise platform with standard interfaces for scripting and data.

This means that not only StatSoft tools and open-source tools, and specialized analytics algorithms using map-reduce, can be easily integrated into the STATISTICA platform, managed through it as a separate unit in the working environment.

For example, R platform, often used by analysts to perform specialized calculations, easily interacts with STATISTICA. R scripts for many years, can be made of STATISTICA environment.

Methods of analysis of Big Data emerge and evolve very quickly. It is important that analytical platform for distributed file system could easily use new methods of preparation and aggregation of data, sampling and stratification.

Implementation of specialized procedures for map-reduce. In addition to the easy integration with open-source and other tools and platforms, it is equally important that the analytic STATISTICA platform provides a flexible adjustment of the working environment analyst for specific tasks based on a distributed file system, and Big Data.

Appear and develop various methods of analysis and use of Big Data, and there is currently no "traditional" methods of prediction, the standard approaches, which would have been well documented.

However, this situation can change rather quickly, as all of the major database vendors and BI tools (Microsoft, Oracle, Teradata, and others) promptly provide interfaces and tools for accessing and processing data.

Anyway, STATISTICA Enterprise platform provides you with the ability to customize specific analytical approaches based on the data in the distributed file system, and supports non-standard interfaces and tools.

Big Data Storage not always results in benefits

Storing vast amounts of data describing some easily observable events, does not always lead to a profitable understanding of reality.

This applies equally to the analysis of stocks, twitter channel, medical data, CRM data, or monitoring complex for diagnostic equipment maintenance.

For example, a reliable list of potential buyers of goods, along with demographic information and information on the net value of the goods can be much more valuable to providers than a massive repository of data about clicks on various websites of online shops.

When monitoring of power plants, we have learned, [and demonstrated cm. Electric Power Research Institute (EPRI), 2009], that the treatment of attention precisely on certain pieces of information on the changes that occur in certain parameters (or combinations thereof), more informative for subsequent submission to, than thousands of parameter monitoring data streams per second.

Questions for self-test.
1. Examples of computer intellectual systems.
2. What is an expert system?
3. Why use expert systems?
4. Internet of things.
5. Big data. Technology Block Chain.
6. Artificial intelligence. Use of Smart-services.

3.2 E-technologies. Electronic business. Electronic training. Electronic government.

Internet-technologies in business.
In the recent past, the main Internet usage mode is the e-mail mode. E-mail - it is absolutely necessary means of communication, but it is not sufficient in a number of important cases (for example, when you need to quickly search for information on servers connected to the network): the exchange of information is too long. In such cases, the Internet connection in the On-Line mode. Until recently, such a connection cost the users are significantly more expensive than connecting to the e-mail mode (uses more telecommunication resources). Now on a global scale there is an abrupt transition to the new telecommunication technologies, accompanied by a sharp increase in bandwidth channels and the same sharp decline in the value of their use. This has already led to the fact that in the US On-Line mode is now the main mode of Internet usage. Naturally, it attracts business

When you use Internet in On-Line mode, potentially available many software service means providing connection to a remote terminal mode server (Telnet), swapping

files (Ftp), search of necessary information resources, and so on. D. Especially important is the fact that the potential of any user connected to the Internet in the On-Line mode, and has a so-called IP-address can create your own WWW-server, filling it with relevant information. This offers great opportunities for business (advertising, catalogs and price lists of goods and services, the possibility of remote orders, and so on. D.).

Many commercial organizations previously little-used Internet-technologies because of the almost complete absence of information security during transmission over the network. For this reason, many large companies, branches of which are located in different parts of the globe, still support their own corporate wide area networks with guaranteed safety. Of course, such networks are far more costly than the Internet. Currently, funds began to appear, providing safety information, and using the Internet.

For example, Sun Microsystems has announced the release of SunScreen product, based on the use of cryptographic methods at the level of transmission of message fragments. On the basis of applying SunScreen company can create a virtual subnet within the secure corporate Internet. The main problem are legal restrictions on the use of cryptographic techniques, established by national governments. However, open for business prospects are so tempting that the international community, the government will be forced to take a positive decision agreed.

At the present stage of development of electronic business there are two main areas of Internet usage in business (it is Internet technology for business) and business in Internet-space [Kuznetsov Internet business and online business. www.citforum.ru/internet/].

The first approach (Internet business) is used almost from the very moment of the birth of Internet. Any company needs information support of their business processes and information interaction in online mode with the external environment: the branches in other cities and countries, customers, suppliers - reliable and inexpensive desirable. Those companies that were the first to use e-mail and teleconferencing, for some time to gain a competitive advantage - developed technologies allow almost instantaneous exchange of high-quality multimedia information. Companies began to acquire data marts (sites), and multi-companies and corporations - information portals (Enterprise Information Portal - EIP), which very quickly became not only represent the "face" of the company in business, but also become one of the most powerful business management tools.

The information portal is a "multi-level system the totality of the various information resources and services organization that integrates different data sources and individual functional systems, with a single entry point and unified rules for the submission and processing of information."

From a technological point of view, the portal is an application server that can run the default "portal" components and ensures reliability and scalability of the system, and takes over issues of control of access rights.

In terms of imaging is showing part of an information system, which provides authorized users a single personalized access to internal and external information resources and business applications.

In terms of implementation of the main activities of this new concept of the organization of workplaces of employees with access to all the information needed to perform their assigned functions.

In terms of management of the organization - an integrated distributed information management system and the system of information support of the entire organization. The portal is built on Web-based, it is based on the core work of providing all the services and the integration of data and applications. Custom functions are implemented by means of specialized software modules - portlets.

Development and effective use of the Web-portal opens new possibilities for the use of Internet-technologies in business, allowing you to:
- quickly locate and develop information resources of the organization;
- faster access to information on the subject portal - anytime, anywhere in the location and to any interested user;
- improve information of persons involved in the preparation of decision-making;
- form a "club of friends of the organization" - to interest potential customers and clients with quality products and services, discounts and bonuses to accumulate additional financial resources due to the attractive investment projects and increased use of information resources of the organization a wide range of external users;
- optimize the advertising budget and IT expenses of the organization (through the organization for collective use Web-services);
- integration of information resources of the organization with resource providers, business, global information resources and partners;
- improve the quality of process management, information security and the activities of the organization as a whole.

Here are some of the benefits of the Internet for business.

Low costs. The use of Internet-technologies for small and medium-sized companies significantly reduces the cost of creating, and the main thing - to operate its own distributed enterprise network.

Openness. Network technologies are completely open, because they are based on a standardized and accessible to every user protocols and formats. A large number of application developers package supports technologies in an open environment. In this regard, the specialized software market are many products, which provides good availability and selection.

Stability. There are two critical factors to the success of those or other technologies on the market - reliability and scalability. Internet / Intranet-technologies today are proven and reliable, as these technologies are developing over a long period and are used by millions of people around the world. For example, Netscape's servers record up to 40 million hits per day.

Access to the widest possible audience. By creating a "virtual storefront" in the World Wide Web, a commercial enterprise has access to any interested user and can interact directly with potential buyers, providing the ability to fully implement the principle of "anywhere, anytime".

Lower marketing costs and support. Significantly reduced the traditional advertising costs, as the company can post it on its website in any reasonable quantities. Electronic distribution and finding the right information is much cheaper than traditional paper media. At the same time the speed of propagation is incomparably higher. Electronic information can be constantly updated, and automatically. All possible spread of WWW pro-

vides access to almost any corner of the Earth, which, combined with e-commerce technology opens the door to previously inaccessible markets.

Effective enforcement of the companies with distributed production. Many companies have branches and offices in other areas and other countries where there is an excess of either cheap labor or other resources. Information systems, including Internet tools allow for efficient management of branched networks in the online mode of production and marketing.

Cost presentation for corporate and confidential information. Intranet Intra-space been successfully used as a centralized repository of documents, which are constantly working employees of the company or its management considers it necessary to introduce them. Intranet saves time, eliminates the need for manufacturing and distribution of printed documents. Every employee can access vast amounts of data, regardless of where he is and what platform it uses.

The pace of development of the Internet is extremely high. More and more businesses are using Internet / Intranet- technology. In the private sector more and more subscribers are connected to the Internet using a high-speed connection technology such as cable modems, XDSL line and IDSL, hybrid satellite systems.

The second approach (Business in the Internet) is based on the understanding that the modern Internet is the established information virtual space that is accessible to any internet user at any time, anywhere on Earth. Any Internet full client can automatically become part of the virtual world by creating and giving other users a new particle information (Fig. 4.3).

The latest concepts and Internet tools are used extensively in solving the classic business questions: "What to do?", "Where to take this money," "Who's Who?", "Who has to buy and who to sell it?", "How to do it, to derive maximum benefit? ". Very important prospects using the Internet banking, to conduct marketing in the provision of services in sales, advertising, market research analytical, communication with suppliers and customers. Special article - monitoring the activities of competitors and protection of their vital information. To do this, of course, particularly important means of improving the security of information on the web.

The interactive nature of the interactions on the Internet allows us to provide a virtual (but at the same time, it is really affordable) services:.. Network libraries, video libraries, conferences, shops, etc. The possibility of interactivity allows users, without leaving the office or at home, to make purchases on the Internet shop, pay for services, play the stock market, get an education, to raise the cultural level.

At present, we formed two concepts - e-business and e-commerce, which, for all resemblance have significant differences.

E-business (e-Business) is the implementation and automation of business processes, as well as improving the efficiency of the company due to the widespread use of the achievements in the field of Web-based technologies. In this business the focus moves to the maximum use of the advantages of internal and external communications in the global information networks.

The electronic business four layers can be distinguished: Internet- infrastructure, Internet-services, information brokers, e-commerce. Infrastructure is realized telecommuni-

cations companies and software vendors, computer and network equipment. Services provided by Internet service providers, providing a transaction network, and the owners of the communication channels. middleman services infrastructure includes services, consulting and service companies to ensure the creation of Web-pages and manage all of your content (Content Management System - CMS), search engines, databases, and multimedia applications. Each participant of this layer is to actively contribute to the implementation of e-commerce.

Electronic commerce (e-Commerce) is an important part of e-business. This kind of business in which the interaction (transactions) between the parties to commercial transactions take place using information technology (electronic payment, digital signature, and so forth.) Or through the of Internet.

Questions for self-test.
1.What is a translation? What is a translator?
2.List the advantages and disadvantages of using the Internet / Intranet-technologies in business today.
3.On the basis of what technologies are implemented search engines?
4.How organized Internet space?
5.In what areas are used Intranet technology?
6.What is Hypertext Markup Language documents?

3.3Information technologies in the professional sphere. Industrial ICT.

Information technology (IT) are the most important part of the process of using information resources of society. To date, IT went through several evolutionary stages, the change of which is determined primarily technical progress, the advent of new technological means of data retrieval and processing. The most recent phase, often called new, is characterized by a change in direction with the development of IT hardware to create a strategic advantage in biznese.

There are several options the IT development of the classification with the use of computers, which are determined by various qualitative characteristics of division into stages. The main purpose of IT is becoming the satisfaction of corporate and personal information needs. Here are a few such classifications.

The challenges on the way of information society

The current stage of development of modern information technology, which began in the early 90's, characterized by the creation of large ICs, local, regional and global networks. Problems of this stage are very numerous. The most important of them are:
- development agreements and the establishment of standards, protocols for computer research and telecommunications;
- the need for the development of distributed IP;
- providing access to strategic information;
- organization of the protection and security of corporate information.

Objectives and information processing data processing tasks at the present stage consists in the creation of IT to address the strategic objectives and the implementation of information control systems (EMIS) and support business decisions (ISPPR).

The advantages of using computer technology

The advantages of using computer technologies at the present stage are associated with the advent of personal computers. The approach to the creation of IP - focus shifted towards the individual user to support its decisions. This user is interested in the ongoing development, to establish contact with the developer, there is a mutual understanding of both teams. At this stage, used as a centralized data processing, typical of the first stage, and decentralized, based on the solution of local problems and working with local databases on the user's workplace.

The advantages of using computer technologies at the present stage are related to the role that they play in the business, and are based on the achievements of telecommunications technology and distributed information processing. EC are intended to not only increase the efficiency of data processing and help managers and the creation of highly efficient production. Applied IT should help the company to survive in the competition and gain an advantage.

The main instrumental technological means of the present stage of development of IT become "Internet / Intranet (latest)" technology. Widely used in various fields of science, technology and business distributed systems, global, regional and local computer networks. Developed e-commerce. In connection with the transition to microprocessor base undergo a significant change in the technical means of communication, means of domestic, cultural and other purposes.

System approach to business informatization

Economic benefits associated with the widespread use of information technologies in enterprises, are constantly growing, and it is unclear how long their leadership will underestimate this important strategic resource. Recently top management has become more attentive to IT. It was from him should come the decisive initiatives to change the situation in this area.

The process of transition from an industrial society to an information by the saturation of the political, economic and social activity of modern information technology called informatization. Information in enterprise management system includes:

- creation of legal, economic, technological, social conditions in order that the necessary solutions to management problems information was available as soon as possible, at any point, any potential user;

- the creation of hardware and software, telecommunications systems, ensuring the formation of information resources and access to them, including the storage, processing, conversion and transfer of information and knowledge;

- ensure priority development of structures for the production and reproduction of information and knowledge;

- development and implementation of organizational and methodological foundations and successive programs, targeted and effective introduction of information technologies in the organization's management system.

The concept of an information system

In computer science, the term "system" is widespread and has many meanings. Most often it is used to refer to a set of hardware and software: the system can be called the computer's hardware, the system may also be considered as a variety of programs to address specific applications, procedures, system documentation and calculations management.

Under the system, understand the object that is seen and at the same time as a whole and as a collection of heterogeneous elements, united in order to achieve their goals. Systems differ in the composition and on the main objectives. Table. 3.1 are examples of systems consisting of different elements and aimed at the realization of different purposes

It is necessary to understand the difference between computers and information systems. Computers equipped with specialized software, are the technical facilities and tools for information systems. The information system is unthinkable without defining its mission, objectives, architecture, infrastructure, configuration, telecommunication facilities and personnel interacting with computers. Therefore repeat above determination was carried out.

Information system - a set of interrelated concepts, methods, technologies, hardware and software used for the collection, processing, storage and delivery of information to the consumer in order to achieve this goal. The modern understanding of information system involves the use of the computer as the main technical tool for searching and processing information.

The information system is determined by the following properties:

- Any IP can be analyzed, built and managed on the basis of general principles of complex systems;

- when the IP building is necessary to use a systematic approach;

- IP is a dynamic and evolving system;

- EC should be seen as an information processing system composed of computer and telecommunication devices, implemented on the basis of modern technologies;

- IC production output is the information on which decisions are made or produced by the automatic execution of routine operations;

- human involvement depends on the complexity of the system, types and data sets, the degree of formalization of tasks.

In large organizations, along with a personal computer, a mainframe (Mainframe) may be part of the technical basis of the information system. In addition, the technical implementation of the information system itself will not mean anything if you do not take into account the role of man, the end-user, for which the information is produced and without which it is impossible to obtain and submit.

Questions for self-test.
1.The basic data types used in Pascal.
2.The structure of the program in Pascal.
3.Identification of constants and variables.
4.Information technologies in the professional sphere. Industrial ICT.
5.The software for the solution of tasks of the specialized professional sphere.
6.Modern IT trends in the professional sphere: medicine, power, etc.

3.4Prospects of development of ICT.

In the traditional approach to the organization when specific functions are included in the deal, one after another, as in a relay race, high efficiency attainable. Responsiveness to external change requires constant cooperation between the various specialized departments and services. Constantly communicating and sharing information, they can act quickly and consistently at the same time in different directions.

Changing the style of doing business in the modern company

The information can appear in one place, at one time, information may appear to be in demand anywhere, anytime - when you need a distributed database and data storage, search engines, search technology specified data

The complex job of assessing the situation can only perform the work of experts, experts can perform specialist generalist Expert Systems

It is necessary to choose between centralization and decentralization can simultaneously benefit from a combination of the two forms of organization and management of production distributed group work, telecommunications and networks

All decisions are made by only the top leaders and senior managers Decision-making becomes part of each employee responsible for your area of work means support enterprise solutions, access to databases and repositories of knowledge, knowledge of the system

To search, retrieval, analysis, storage and transmission of information required specially equipped facilities professionals can send and receive information from the place where they are Internet / Intranet technology, fiber-optic and satellite communications systems, mobile systems

The best contact with the customer - the personal touch The best contact with a potential buyer - an effective study of the peculiarities of the buyer online interaction, database, survey systems and identify preferences

In order to find an entity, you need to know where it is Being itself tell you where they are Search Engine Mobile agent systems

Laid out the plans are not revised or reviewed under the pressure of force majeure plans are reviewed, and adjusted quickly, as necessary and appropriate customer requirements Expert systems, flexible planning and risk management system, high-performance computers

IT architectural asceticism state can be characterized by the following provisions:

- the presence of a large number of software and hardware systems and platform for the effective management and maintenance of production, industrial operating databases and repositories of knowledge large volume, containing information on all areas of society;

- availability of technologies for online access of any user to the information and resources - technical basis for this are open (Free) and corporate information search system (Information Retrieval Systems - IRS) government and commercial communications, global (Global Network Systems), national (NNS) and regional (RNS) information and computer networks; international agreements, standards and communication protocols;

- enhancements to the functionality of IT capabilities, providing a distributed job databases and data warehouses with data varied structure and content, multiob- docu-

ments, hypermedia; creation of local integrated and problem-oriented ICs for different purposes on the basis of high-end servers and local area networks;

- including user specific interfaces in the IP to communicate with expert systems (Expert System - ES), decision support systems (Decision Support System - DSS), performance support systems (Executive Support System - ESS), machine translation systems (Translating Computer System - TCS) and other techniques and tools.

It is also possible to identify five major trends in IT development:

Globalization. Companies are using IT to conduct business in the global market, anywhere, instantly get detailed information. There is a software internationalization and market an information product. Getting benefits through continuous distribution costs of information on a wider geographical region is becoming an essential element of the strategy.

Convergence. Blurs the distinction between industrial products and services, product information and their means of production, their professional and domestic use. The transmission and reception of digital, audio and video signals are combined in some devices and systems.

The increasing complexity of information products and services. The information product in the form of hardware and software, databases and data warehouses, maintenance services and expert support tends to constant development and complexity. At the same time, the interface of the IT for all the complexity of tasks consistently simplified, making it more comfortable and user interactive communication system.

Interoperability (Interoperability). Problems of optimal communication between computer information systems between the system and users, problems of processing and data transfer and the formation of the required information acquired the status of leading technological problems. Modern software and hardware and communication protocols allow us to solve them in an increasingly full.

The elimination of intermediaries (Disintermediation). The development of the ability to interact uniquely leads to a simplification of the delivery of the information product to the consumer. It becomes unnecessary chain of intermediaries, if it is possible to place orders and receive the required directly using IT.

With respect to the business, this means the following:

- implementation of a distributed data processing when the workplace sufficient resources to receive and analyze information;
- creation of advanced communication systems when jobs are combined for the fastest messaging;
- elimination of interference in the system integration of the organization - environment, direct access to global information flows;
- creation and development of electronic orders and trading systems;
- support for social networks.

The above changes in the requirements for interest groups in the field of IT and information company culture due to the dynamics of enterprise development and the environment and lead to functional changes in the management system. Key aspects of the development and its impact on the role of IT in enterprise management are listed below.

From data processing - knowledge management

For a long time there is no need to consider IT only as a data processing means. With the help of these technologies is necessary to retrieve the information for the user's needs, and arising in this connection, the problem of "information overload" demands of modern high-speed screening tools, further processing and updating information. Thus it is necessary to consider the issue of commercially viable and user-friendly interface, as well as the interaction of shared knowledge between organizational units and partners in cooperation.

The rapid integration of networks of local systems with regional and even internationalized structures leads to the abandonment of the classical working fields of computer science and a wide fundraising telecommunications. Organizational and this leads to a "blurring" the boundaries of enterprise information. It becomes increasingly difficult to determine where it begins and where it ends.

Creation and maintenance of an appropriate communication infrastructure for such "virtual enterprises" refer to the problems of information management in the same way as the classical function of providing the production process or the development of IT-based products and services. The point in this is not only in the processing of information, but also the rational allocation and use of knowledge. Knowledge should be profitable and, if possible, today!

In addition, workers and enterprise managers should take into account at a professional level all the new and important aspects of IT. An example is the question of the technological and economic significance of Internet / Intranet technology. It is the information technology service responsible for creating a platform on which it will be possible corporate management including quality training (including psychological) of staff.

Questions for self-test.
1. What is the difference between compilation and interpretation?
2. Development of necessary infrastructure of electronic payments and logistics.
3. Prospects of development of E-technologies.
4. Prospects of development in the sphere of the IT market: development of the free software.
5. Forming of an ecosystem of IT of entrepreneurship and support small startup of the companies
6. Programs of acceleration and incubation.

GUIDELINES FOR THE LABORATORY WORKS

Laboratory work # 1

Theme: Computation of metrics of productivity of computer system: speed, efficiency, energy expenses, Amdahl's law, CPU time.

Goals of lab work: The goal of the work is measurement system performance and its evaluation: definition, measurement and benchmarks.

List of aids, appliances, devices: Personal Computer, Microsoft Windows operating system, MS Office, Multimedia applications, peripheral devices.

Summary of the content:

Computer Performance
In these notes we introduce the notion of *computer performance* (the terms computer performance and system performance are largely interchangeable) and discuss how it may be measured. In particular, we demonstrate that computer performance is neither easy to define, nor is it easy to measure. *Computer performance* is now a major component of courses in computer architecture and all computer science students and computing professionals should have a working knowledge of this topic.

The chip architecture
Different families of chips (e.g., ARM or Intel iCore or AMD) have different architectures or instruction sets. Consequently, they execute code in different ways using different numbers of registers, different instruction types and different addressing modes. Some architectures might favour arithmetic processing operations whereas other might favour graphical operations. You cannot easily compare chips with different architectures.

The chip micro architecture
The micro architecture of a chip (also called its organization) is its structure (implementation) and defines the way in which the architecture (instruction set) is implemented in silicon at the level of buses, registers and functional units. Over the years, Intel's IA32 architecture has remained largely constant, whereas great advances have been made in its micro architecture leading to much faster processors

Number of cores
Until the early 2000s, most CPUs had a single processing element. Many processors are now described as *multicore* devices; for example, Intel's Core i7 processor has four processing units (CPUs) on the same chip. Multicore chips have several CPUs on a single chip that are connected by buses. Moreover, each individual processor normally has its own cache memory. Most multicore processors are said to be *homogeneous* with all processors being identical. Some multicore chips are *heterogeneous* with different types of processor; each of which is optimized for a specific task. Graphics processors found in high-performance video display cards may have over 5,000 processors on a chip.

The performance of multicore processors is strongly dependent on the type of program being executed because some software can take advantage of parallel processing, whereas other software cannot be parallelized. Consequently, you may have a chip with four CPUs, but only one or two of them is actually in use for most of the time.

Cache memory

Cache memory holds frequently used data and instructions and is far faster than external (i.e., off the chip) main DRAM memory. The quantity of cache memory and its structure has a great impact on system performance. Cache memory is necessary because, over the years, the performance of DRAM has increased more slowly than the performance of CPUs. Consequently, there is a bottleneck between processors and memory which cache memory helps to alleviate.

Main memory

The main memory is composed of DRAM chips. These have gradually been improved over the years; for example, DRAM architectures have changed from DDR to DDR4 (in 2014).

Secondary storage

Secondary storage, hard drives and now SSDs (solid state disks) hold data not currently in main memory. Hard drives are very slow compared to main store and can reduce the performance of a computer if frequent access to secondary memory is necessary. Newer solid state disks use semiconductor memory to store data and are far faster than hard disks.

General

Many other factors determine performance; for example buses that distribute information between memory, the CPU and peripherals, chip sets that connect processors to buses and handle input/output transactions.

Software

The performance of a computer system depends on it software as well as its hardware. Processors execute machine code. Compilers translate high-level code into machine code. Consequently, a good compiler may be able to generate much faster code than a poor compiler. It is dangerous comparing machines that have used different compilers because you might be comparing compiler efficiency rather than machine performance.

Forms of laboratory work:
Experiment, research, application of technical aids, tasks.

Procedure of the laboratory work

1. The Familiarization with purpose of the laboratory work;
2. The Familiarization with short theoretical material;
3. Performing the individual task;
4. The writing of the report about performing the laboratory work;
5. Defense the report of the laboratory work.

1. Start your computer.

2. Go to the "Control Panel" and open "Performance Information and Tools" app.

3. Click on the "Rate the computer" and find out the index performance.

Use the link "Adjust visual effects" for improved performance.

To change other settings, click on the link "Additional tools" and start the necessary application.

Tasks for individual work

Turn on the computer and fill in the following table.

parameter	value
Processor frequency:	
Number of processor cores:	
The capacity of the cache memory of the processor:	
The frequency of RAM:	
RAM capacity:	
Hard Drive Capacity:	

Requirements to the report

- in the report student must specify the theme, goals and objectives of the current laboratory work;

- the report must contain the content summary and perform individual tasks of the work;

- student must specify the results of the work;

- report includes answers to questions if they are applicable.

Assessment

- oral questioning;

- presentation of the report on the laboratory work

- demonstration of a software on PC

Bibliography

[2, 4, 5, 9, 11, 13, 16]

Laboratory work # 2

Theme: Determination of properties of an operating system. Operation with files and directories.

Goals of lab work: The purpose of the lab is to introduce the concept of the operating system and the practical skills of work on the files.

List of aids, appliances, devices: Personal Computer, Microsoft Windows operating system, MS Office, Multimedia applications, peripheral devices.

Summary of the content:

An operating system (OS) is system software that manages computer hardware and software resources and provides common services for computer programs. All computer programs, excluding firmware, require an operating system to function.

Time-sharing operating systems schedule tasks for efficient use of the system and may also include accounting software for cost allocation of processor time, mass storage, printing, and other resources.

For hardware functions such as input and output and memory allocation, the operating system acts as an intermediary between programs and the computer hardware, although the application code is usually executed directly by the hardware and frequently makes system calls to an OS function or is interrupted by it. Operating systems are found on many devices that contain a computer – from cellular phones and video game consoles to web servers and supercomputers.

The dominant desktop operating system is Microsoft Windows with a market share of around 82%. OS X by Apple Inc. is in second place (9.8%), and Linux is in third position (1.5%). In the mobile (smartphone and tablet combined) sector, according to third quarter 2016 data, Android by Google is dominant with 87.5 percent and a growth rate 10.3 percent per year, followed by iOS by Apple with 12.1 percent and a per year decrease in market share of 5.2 percent, while other operating systems amount to just 0.3 percent. Linux is dominant in the server and supercomputing sectors. Other specialized classes of operating systems, such as embedded and real-time systems, exist for many applications.

Windows is Microsoft's flagship operating system, the de facto standard for home and business computers.

The GUI-based OS was introduced in1985 and has been released in many versions since then, as described below.

Microsoft got its start with the partnership of Bill Gates and Paul Allen in 1975. Gates and Allen co-developed Xenix (a version of Unix) and also collaborated on a BASIC interpreter for the Altair 8800. The company was incorporated in 1981.

In a computer, a file system (sometimes written filesystem) is the way in which files are named and where they are placed logically for storage and retrieval.

For example, DOS, Windows, OS/2, Macintosh and Unix-based operating systems (OSes) all have file systems in which files are placed somewhere in a hierarchical (tree) structure. A file is placed in a directory (folder in Windows) or subdirectory at the desired place in the tree structure.

Forms of laboratory work:
Experiment, research, application of technical aids, tasks.

Procedure of the laboratory work

1. The Familiarization with purpose of the laboratory work;
2. The Familiarization with short theoretical material;
3. Performing the individual task;
4. The writing of the report about performing the laboratory work;
5. Defense the report of the laboratory work.
6. Start the operating system Windows.
7. On your desktop create a new folder.
8. Include a folder several files of different types.
9. Change the file properties (hidden, archive, read-only).
10. Make a folder hidden.
11. Open the page "Folder Options ..." and check the box to hide folders.

Tasks for individual work
1. Start the Windows operating system
2. On your desktop create a new folder.
3. Include a folder several files of different types.
4. Back up this folder using the "Winrar" program.
5. Set the password for the archive.
6. Create a file of type SFX.

Requirements to the report
- in the report student must specify the theme, goals and objectives of the current laboratory work;
- the report must contain the content summary and perform individual tasks of the work;
- student must specify the results of the work;
- report includes answers to questions if they are applicable.

Assessment
- oral questioning;
- presentation of the report on the laboratory work
- demonstration of a software on PC

Bibliography
[4, 5, 9, 11, 13, 13]

Laboratory work # 3

Theme: Development of database structure, creation of tables and requests.

Goals of lab work: Familiarization with the basics of the database, the practical use of the database and obtaining skills for a database.

List of aids, appliances, devices: Personal Computer, Microsoft Windows operating system, MS Office, Multimedia applications, peripheral devices.

Summary of the content:

Microsoft Access is a database management system (DBMS) 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.

When you create a database, Access offers you *Tables, Queries, Forms, Reports, Macros,* and *Modules*. Here's a quick overview of what these are and when to use them.

Tables. All data is stored in tables. When you create a new table, Access asks you define fields (column headings), giving each a unique name, and telling Access the data type. Use the "Text" type for most data, including numbers that don't need to be added e.g. phone numbers or postal codes. Using Wizards, Access will walk you through the process of creating common tables such as lists of names and addresses. Once you have defined a table's structure, you can enter data. Each new row that you add to the table is called a record. To define relationships between tables:

- in Access 2007 or later: Database Tools | Relationships,
- in Access 95 — 2003: Tools | Relationships,
- in Access 1 — 2: Edit | Relationships.

Queries. Use a query to find or operate on the data in your tables. With a query, you can display the records that match certain criteria (e.g. all the members called "Barry"), sort the data as you please (e.g. by Surname), and even combine data from different tables. You can edit the data displayed in a query (in most cases), and the data in the underlying table will change. Special queries can also be defined to make wholesale changes to your data, e.g. delete all members whose subscriptions are 2 years overdue, or set a "State" field to "WA" wherever postcode begins with 6.

Forms. These are screens for displaying data from and inputting data into your tables. The basic form has an appearance similar to an index card: it shows only one record at a time, with a different field on each line. If you want to control how the records are sorted, define a query first, and then create a form based on the query. If you have defined a one-to-many relationship between two tables, use the "Subform" Wizard to create a form which contains another form. The subform will then display only the records matching the one on the main form.

Reports. If forms are for input, then reports are for output. Anything you plan to print deserves a report, whether it is a list of names and addresses, a financial summary for a period, or a set of mailing labels. Again the Access Wizards walk you through the process of defining reports.

Pages (Access 2000 - 2003). Use pages to enter or display data via Internet. Pages are stored as HTML files, with data read from and written to the database. Michael

Kaplan has published a free utility to convert Access forms and reports into Data Access Pages. (Pages were deprecated in Access 2007.)

Macros. An Access Macro is a script for doing some job. For example, to create a button which opens a report, you could use a macro which fires off the "OpenReport" action. Macros can also be used to set one field based on the value of another (the "SetValue" action), to validate that certain conditions are met before a record saved (the "CancelEvent" action) etc.

Modules. This is where you write your own functions and programs if you want to. Everything that can be done in a macro can also be done in a module, but you don't get the Macro interface that prompts you what is needed for each action. Modules are far more powerful, and are essential if you plan to write code for a multi-user environment, since macros cannot include error handling. Most serious Access users start out with macros to get a feel for things, but end up using modules almost exclusively. On the other hand, if your needs are simple, you may never need to delve into the depths of Access modules.

Forms of laboratory work:
Experiment, research, application of technical aids, tasks.

Procedure of the laboratory work

1. The Familiarization with purpose of the laboratory work;
2. The Familiarization with short theoretical material;
3. Performing the individual task;
4. The writing of the report about performing the laboratory work;
5. Defense the report of the laboratory work.

1. Start MS Access program.
2. Create a table using constructor of tables.
3. Structure of the table shown below.
4. Fill the table a few records.
5. Use the Query Designer to create a request for a sample of people whose names begin with the letter A.
6. Create a form using the Form Wizard.
7. Create a report using the Report Wizard.

MyTable	
Имя поля	Тип данных
nCode	Числовой
sFullName	Текстовый
dBirthDate	Дата/время
sAddress	Текстовый
sPhone	Текстовый

Figure 1. The structure of the table 'My Table'

Figure 2. Sample of the filling of the table

Tasks for individual work
1. Start MS Access program.
2. Create a new table "Examination results".
3. Fill the table a few records.
4. Create a query that lists all students.
5. Create a query that shows a list of all students failing an exam.
6. Create a query that calculates the amount of the scholarship for the best students.
7. Create a form using the Form Wizard.
8. Create a report using the Report Wizard.

Requirements to the report
- in the report student must specify the theme, goals and objectives of the current laboratory work;
- the report must contain the content summary and perform individual tasks of the work;
- student must specify the results of the work;
- report includes answers to questions if they are applicable.

Assessment
- oral questioning;
- presentation of the report on the laboratory work
- demonstration of a software on PC

Bibliography
Main
[3, 4, 7, 9, 11, 13]

Laboratory work # 4

Theme: Design and creation of the presentations of lecture material, scientific reports, etc.

Goals of lab work: Consideration of the basic functionality PowerPoint programs provide practical skills to create the presentation and their application in the educational process.

List of aids, appliances, devices: Personal Computer, Microsoft Windows operating system, MS Office, Multimedia applications, peripheral devices.

Summary of the content:

Microsoft PowerPoint is a slide show presentation program currently developed by Microsoft, for use on both Microsoft and Apple Macintosh operating systems. PowerPoint, initially named "Presenter", was created by Forethought Inc.. Microsoft's version of PowerPoint was officially launched on May 22, 1990, as a part of the Microsoft Office suite. PowerPoint is useful for helping develop the slide-based presentation format and is currently one of the most commonly used slide-based presentation programs available. Microsoft has also released the PowerPoint mobile application for use on Apple and Android mobile operating systems.

Operation

PowerPoint presentations consist of a number of individual pages or "slides". The "slide" analogy is a reference to the slide projector. Slides may contain text, graphics, sound, movies, and other objects, which may be arranged freely. The presentation can be printed, displayed live on a computer, or navigated through at the command of the presenter. For larger audiences the computer display is often a video projector. Slides can also form the basis of webcasts.

PowerPoint provides three types of movements:

Entrance, emphasis, and exit of elements on a slide itself are controlled by what PowerPoint calls Custom Animations.

Transitions, on the other hand, there are movements between slides. These can be animated in a variety of ways.

Custom animation can be used to create small story boards by animating pictures to enter, exit or move.

PowerPoint provides numerous features that offer flexibility and the ability to create a professional presentation. One of the features provides the ability to create a presentation that includes music which plays throughout the entire presentation or sound effects for particular slides. In addition to the ability to add sound files, the presentation can be designed to run, like a movie, on its own. PowerPoint allows the user to record the slide show with narration and a pointer. The user may customize slide shows to show the slides in a different order than originally designed and to have slides appear multiple times. Microsoft also offers the ability to broadcast the presentation to specific users via a link and Windows Live.

Forms of laboratory work:
Experiment, research, application of technical aids, tasks.

Procedure of the laboratory work

1. The Familiarization with purpose of the laboratory work;
2. The Familiarization with short theoretical material;
3. Performing the individual task;
4. The writing of the report about performing the laboratory work;
5. Defense the report of the laboratory work.

1. Start PowerPoint.
2. Create a new slides (about 10 slides).
3. Lay the material on "Miras University".
4. Add the transition effects for the slideshow.
5. Add effects to slide elements (for text, objects, drawings).
6. Add the music file to the slides (preferably hymn of RK)
7. Create visualization file. (* .pps)

Tasks for individual work
1. Start PowerPoint.
2. Create a new slides (about 10 slides).
3. Lay the materials on the topic "My mother."
4. Add the transition effects for the slideshow.
5. Add effects to slide elements (for text, objects, drawings).
6. Add the music file to the slides.
7. Create visualization file.

Requirements to the report
- in the report student must specify the theme, goals and objectives of the current laboratory work;
- the report must contain the content summary and perform individual tasks of the work;
- student must specify the results of the work;
- report includes answers to questions if they are applicable.

Assessment
- oral questioning;
- presentation of the report on the laboratory work
- demonstration of a software on PC

Bibliography
[4, 8, 9, 10, 13, 15]

Laboratory work # 5

Theme: Processing of numerical information, editing formulas and creation of charts in plate editors.

Goals of lab work: The aim is to get acquainted with the basics of the spreadsheet, spreadsheet Excel and the practical application of spreadsheets.

List of aids, appliances, devices: Personal Computer, Microsoft Windows operating system, MS Office, Multimedia applications, peripheral devices.

Summary of the content:

Brief Introduction to Excel

Excel is the spreadsheet program created by Microsoft. Although you can use any spreadsheet program for analyzing data, the instructions given here are specific for Excel and you must use Excel for the three Excel quizzes. NOTE: Microsoft also makes a less powerful spreadsheet program as part of Microsoft Works or some similar title. Some of the features that we will use in these exercises are not found in MS Works, so you will not be able to complete all the exercises using MS Works.

Excel is, in its most basic form, a very fancy calculator. The information given in this quick tutorial is meant to give a working knowledge of how to use Excel. There are usually several different ways to perform the same function in Excel, this tutorial will usually just give one way. If you need more information on how to use Excel, there are many web sites dedicated to using Excel, a simple 'google' search will find many of them. In addition, accessing the HELP menu from within the program can also be useful!

The Interface:

The first figure shows the typical Excel sheet with the important parts of the programs interface labeled. Please become familiar with these.
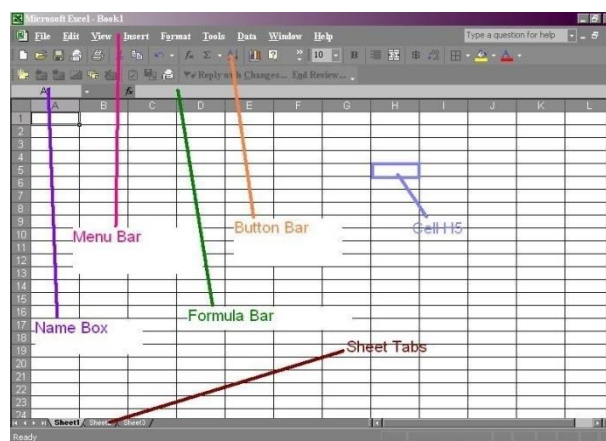

Figure 1. The interface excel program

Inserting Data and Formulas

To insert data, you simply use your mouse to select a cell and then simply type. Start the Excel program. Select the cellA1(that is the cell in column A, row 1) by using

your mouse and clicking the left mouse button (this is the 'normal" mouse button). Note that the name of the cell is displayed in theName Box. By default, the name of the cell is its address with reference to the row/column although you can name a cell anything you want using theInsert/Namemenu item..

WARNING NOTE: In many instances, you will be using numbers with units (like meters, or grams). When using Excel, never mix numbers with letters in a cell. If you do, Excel assumes that you are inserting text and not inserting numbers. For example, if the units for the numbers you inserted in the previous example are grams, do not type 34 g(or34 grams) in a single cell - Excel will not recognize this as a number. Simply type34.You can use a label on the column to indicate the units. You will learn later how to insert a label.

That should have been easy - now lets do some calculations.

Forms of laboratory work:
Experiment, research, application of technical aids, tasks.

Procedure of the laboratory work

1. The Familiarization with purpose of the laboratory work;
2. The Familiarization with short theoretical material;
3. Performing the individual task;
4. The writing of the report about performing the laboratory work;
5. Defense the report of the laboratory work.

1. Start the MS Excel.
2. Fill in the table that you see in Figure 1.
3. Use the formula to calculate the average.
4. Draw a table border.
5. Change the fill color of the table header.
6. Create a chart on the students' progress.

ФИО	Матем	Физика	Информатика	Средный
Асанова К	5	5	5	
Беккелдиев Р	4	3	2	
Валиев И	5	5	5	
Галымжан Д	3	5	4	
Данияр г	4	3	4	

Figure 2. Sample table for filling

ФИО	Матем	Физика	Информатика	Средный
Асанова К	5,00	5,00	5,00	5,00
Беккелдиев Р	4,00	3,00	2,00	3,00
Валиев И	5,00	5,00	5,00	5,00
Галымжан Д	3,00	5,00	4,00	4,00
Данияр г	4,00	3,00	4,00	3,67
Показатели	4,20	4,20	4,00	4,13

Figure 3. Sample of formatted table

Tasks for individual work
1. Start the MS Excel.
2. Fill in the table that you see in Figure 1.
3. Use the formula to calculate the average.
4. Draw a table border.
5. Change the fill color of the table header.
6. Create a chart on the students' progress.
   1.

№	Продукты	Объем (кг)	Цена (тг)	НДС (%)	Сумма (тг)
1	Картофель	8	120	12	1075,2
2	Помидор	4	480	12	2150,4
3	Лук	3	90	12	302,4
Итоги		15	230		3528

Figure 4. Sample of formatted table

Requirements to the report
- in the report student must specify the theme, goals and objectives of the current laboratory work;
- the report must contain the content summary and perform individual tasks of the work;
- student must specify the results of the work;
- report includes answers to questions if they are applicable.
Assessment
- oral questioning;
- presentation of the report on the laboratory work
- demonstration of a software on PC

Bibliography
[6, 8, 9, 10, 13, 17]

Laboratory work # 6

Theme: Creation of video files with use of programs: Hyper Cam, Adobe Premiere Pro, Windows Movie Maker, etc.

Goals of lab work: Introduction to multimedia programs, introduction to the basics of video editing, practical skills of working with MS Moviemaker.

List of aids, appliances, devices: Personal Computer, Microsoft Windows operating system, MS Office, Multimedia applications, peripheral devices.

Summary of the content:

Windows Movie Maker

Windows Movie Maker (codenamed Sundance, formerly known as Windows Live Movie Maker in Windows 7) is video editing software by Microsoft. It is a part of Windows Essentials software suite and offers the ability to create and edit videos as well as to publish them on OneDrive, Facebook, Vimeo, YouTube, and Flickr. Movie Maker was officially discontinued without a replacement on January 10, 2017.

History

Initial releases

The first release of Windows Movie Maker was included with Windows ME in 2000.

Version 1.1 was included in Windows XP a year later, and included support for creating DV AVI and WMV 8 files. Version 2.0 was released as a free update in November 2002, and added a number of new features. Version 2.1, a minor update, is included in Windows XP Service Pack 2. The Movie Maker in Windows XP Media Center Edition 2005 had more transitions and support for DVD burning.

Movie Maker 2009 supported both Windows Vista and Windows 7. As the previous version of Windows Movie Maker was no longer included with the operating system, the only way to obtain Movie Maker on Windows 7 and later was through the Windows Live Essentials suite, although some manufacturers pre-installed the application on new PCs.

An updated version, Windows Live Movie Maker 2011, was released on August 17, 2010, adding features such as webcam capture, support for high-definition video, the ability to upload videos directly to SkyDrive and Facebook, and the ability to add media files stored on network shares to projects.

Features MoviMaker
- Get videos from a digital camera;
- Create a slide show of the images;
- Crop video or bonding;
- Imposition of a track;
- Add titles and captions;
- Create transitions between video fragments;
- Add simple effects;

- The conclusion of the project in WMV or AVI format with adjustable quality.

Forms of laboratory work:
Experiment, research, application of technical aids, tasks.
Procedure of the laboratory work

1. The Familiarization with purpose of the laboratory work;
2. The Familiarization with short theoretical material;
3. Performing the individual task;
4. The writing of the report about performing the laboratory work;
5. Defense the report of the laboratory work.

First create a folder in your user area (My Documents) and name it 'video editing. Copy and Paste the unedited video footage that you have already taken into this new folder. Begin by opening Movie Maker from the Start Menu. From the task pane on the left under number 1 choose import video. Browse to your new folder and select the video clip you just copied.

Now save the project with sensible name in the folder you created.
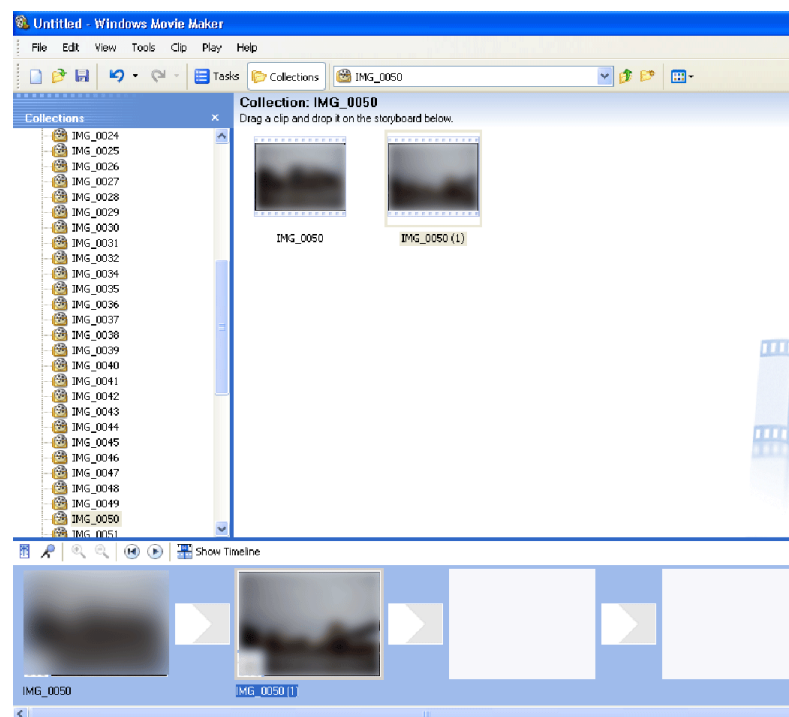

Figure 1. Main page of the program "Windows Movie Maker"

Choose the storyboard view from the View Menu or from the bottom of the window. Drag the clips from the window to the larger slots on the storyboard at the bottom. You may want to leave some clips out if they are too long or pointless.

Once all of the clips you want to use are on the timeline you will need to split some clips in order to delete some of the clip that may be too long or may jump from one scene

to another. To split a clip change to Timeline View and place the play head at the point you want to split the clip.

Tasks for individual work
1. Create a video file on the theme "My University". Use pictures and video of your university.
2. Create a video file on "My homeland - Kazakhstan"

Requirements to the report
- in the report student must specify the theme, goals and objectives of the current laboratory work;
- student must specify the results of the work;
- report includes answers to questions if they are applicable.

Assessment
- oral questioning;
- presentation of the report on the laboratory work
- demonstration of a software on PC

Bibliography
[4, 8, 9, 10, 13, 17]

TASKS FOR INDEPENDENT WORK OF STUDENTS

Module 1. Introduction to ICT

List of Themes for IS of US
1. Data representation in computer systems.
2. Classification of operating systems.
3. Types of interfaces: command line interface, text interface, graphic interface.
4. Perspectives of development of interfaces.
5. Fundamentals of SQL.
6. Processing of large volumes of data.
7. Technologies of connection to the Internet.
Task: abstract, essay, glossary, report, presentation.
Form of control: job protection

Module 2. Network technologies

List of Themes for IS of US
1. Measures and means of information protection.
2. Web service in the Cloud.
3. Instruments of development of multimedia applications.
4. Formats of implementation of the electronic government in developed countries.
5. Programs of acceleration and incubation.
6. Evolution of operating systems.
7. Classification of desktop applications.
Task: abstract, essay, glossary, report, presentation.
Form of control: job protection

Module 3. Smart technologies

List of Themes for IS of US
1. Visualization of data.
2. Telecommunication technologies.
3. Standards and specifications in information security field.
4. Main terms and concepts of mobile technologies.
5. Use of Smart-services.
6. Safety issues in industrial information and communication technologies.
7. Prospects of development of E-technologies.
Task: abstract, essay, glossary, report, presentation.
Form of control: job protection

TASKS FOR INDEPENDENT WORK OF STUDENTS WITH A TEACHER

Module 1. Introduction to ICT

1. Standards in the field of ICT
2. Data representation in computer systems.
3. Classification of desktop applications.
4. Physical and mental characteristics of the user
5. Design and development of databases.

Module 2. Network technologies

1. Methods and stages of Data mining. Tasks Data mining.
2. Telecommunication technologies.
3. The acts of the Republic of Kazakhstan governing legal relations in the sphere of information security.
4. Basic concepts Internet.
5. Main terms and concepts of mobile technologies.

Module 3. Smart technologies

1. Basic technologies for compression of information.
2. Use of multimedia technologies for planning, descriptions of business processes and their visualization.
3. Use of Smart-services.
4. Formats of implementation of the electronic government in developed countries.
5. Modern IT trends in the professional sphere: medicine, power, etc.

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