



The fourth Lecturer

Software system

Computer Applications

Medical device technology engineering

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Systems and Application Software

Computer Software

Computer hardware cannot work without software. Software refers to programs, which are instruction codes that direct the computer to perform some actions.

Software or programs are also used to perform certain activities or data processing for a user. In general, there are two basic types of software:

system software and application software.

System Software

System software is the set of programs designed to coordinate the activities and functions of the hardware and various programs throughout the computer system. A particular system software package is designed for a specific CPU design and class of hardware. System software includes three types of programs:

- Operating System: The combination of a particular hardware configuration and system software package is known as a computer system platform. System platforms are commonly termed as operating system (OS). Some common operating systems are DOS, Unix, Mac, and Windows platform.
- Language Translators: These are interpreters and compilers for programs such as Pascal, BASIC, COBOL, C, and C++.
- Common Utility Programs: Communication tools, disk formatter, etc.

Application Software

Application software consists of programs that help users solve particular computing problems. Application software is designed to address the need of a particular organizational activity or function.

Application software includes packaged software such as word processing, spreadsheet, database, and programming languages such as BASIC, COBOL, C, Visual Basic, and other commercial and custom software.

System software

1. Operating System

The operating system is a set of computer programs, which controls the operations of computer hardware. It also supports software development of a user by acting as an interface between the application program and the hardware.

It usually resides on a disk. After a computer system is started, or "booted up", portions of the operating system are transferred to memories as they are needed.

Popular Operating Systems:

Operating systems are needed to support the computing needs of an individual, a group of workers, and for an enterprise

- MS-DOS :Developed by Microsoft for the IBM-compatible computers in the 1980s, this Microsoft disk operating system (MS-DOS) was designed for a single user and single-task



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processing. It used commands like COPY, DELETE, RENAME, and FORMAT to perform file and disk activities

- DOS with Windows :The original Windows 3.1 was not a complete operating system, rather it was a layer written on top of the DOS operating system. Windows added a graphical user interface (GUI) to make file and disk activities simpler for the users. It also added multi-tasking capability.
- Windows 95 and 98: Windows 95 is true 32-bit, multi-tasking, and multi-threaded operating system. In a 32-bit architecture data moves in 32 bits or 4 bytes, thus increasing the speed of the computer. One can work on many documents of the same software such as word processing. There are other improvements and capabilities such maximum 255-character filename, networking, fax, e-mail, Internet connecting tools, and etc.

2. Language Translators

When computers execute programs written in high-level languages such as COBOL, FORTRAN, or C, the computer must convert these humanreadable instructions into a form that it can understand.

- Compiler: System software includes special language translators that translate high-level language into machine language.
- Source Code: The program in the high-level language before translation is called source code.
- Object Code: Compiler translates source code into a language called object code. When a computer executes a program, it really executes the object code.
- Interpreter: Some programming language such as BASIC do not use a compiler but an interpreter, which translates one statement at a time into machine code, as the computer executes the program

3. Utility Programs

System software also includes small utility programs. They are used to merge and sort sets of data, keep track of computer jobs being run, compress files, formatting disk, scan for viruses, and perform other important tasks

Application Software

As mentioned before, the primary function of application software is to apply the power of the computer to give users the ability to solve business and scientific problems.

Many different languages can be used to develop application software, each having strengths and weaknesses.

Types of Application Software

To solve a particular business requirement, a company can either develop its own software or purchase off-the-shelf software. It is also possible to modify some off-the-shelf software, to tailor it such that it satisfies business of the company.

1- Proprietary Application Software



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Software that solves a unique or specific business problem of a company is called proprietary application software. This type of software is either built in-house using programmers or it can be contracted to an outside software development company. There can not be any duplication of this type of software.

2- Off-the-Shelf Application Software

A software package is a pre-written, precoded, commercially available set of programs that eliminates the need for individuals or organizations to write their own software programs for certain functions.

Application software packages are marketed commercially. These packages perform certain functionality of a business that is required by many companies, and they are available for mainframe, minicomputers, and PCs.

Examples of standard packages are, accounting, finance, auto body shop, human resources, university registration, library catalog, payroll, physician insurance claim, fax, e-mail, tax, and so on.

3- Customized Packages

In some cases, companies modify of-the-shelf software to accommodate business requirements of the company. Software vendors must provide the opportunity to modify their software. Again modification can be done in house or contracted to an outside company.

Programming Languages

A programming language is a computer language with its own syntax and grammar. Both systems and application software are written in programming languages.

There are two types of programming languages: procedural and nonprocedural.

- Procedural Language: A procedural language tells the computer in a step-by-step fashion how to accomplish a given task.
- Non-Procedural Language: Tasks are divided into small, unrelated procedures.

There are four generations of computer languages.

1- First Generation (Machine Language)

In early years of computer revolution, programs were written in machine language, using the binary symbols 1 and 0. All numbers, characters and special symbols were represented by eight-bit codes.

This is also considered a low-level language because there is no programming scheme less sophisticated than the binary code.

Example: 00000010 00100101 00000011 == 2 + 3

2- Second Generation (Assembly Language)

Assembly language replaced binary digits with symbols such as ADD, SUB for addition and subtraction, so that programming became more understandable to humans.

Operating systems and utility programs were written in an assembly language.

- Assembler: An assembler is a special program that converts assembly language into machine-readable language (1 and 0).

3- Third Generation Languages: 3GLs (High-Level Languages)



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These languages were easier to use than assembly and machine language because they relied on natural language (such as English) and used fewer lines of code to execute an instruction.

Some high-level languages are BASIC, COBOL, FORTRAN, and C.

These languages are called high-level languages.

3GLs are machine-independent languages. That is, they are portable from one machine to another.

➤ Compiler: A special program that converts a high-level language into machine language.

4. Fourth Generation Languages:

4GLs (Very-High-Level Languages) 4GLs are less procedural and even more English-like than third-generation languages. These are user-friendly and easy to learn.

Examples are: FOCUS, SQL, HTML, and SAS.

➤ Structured Query Languages (SQL): A standardized language often used to perform database queries and manipulations.

Example: SELECT ALL FROM Employee WHERE EmpID = 1000
Employee EmpID LastName
FirstName MddleInit MonthSalary 1000 White James W \$3000
2000 Smith Mark S \$4000
Result: EmpID LastName FirstName MddleInit MonthSalary 1000 White James W \$3000

➤ Visual Programming Languages: Visual programming helps users create powerful and less error-prone applications in a shorter time span. It allows users to write special programs that in turn help users to select menus, buttons, and other graphical elements. Features of these languages include query and database abilities, and code-generation abilities.

Examples are Visual C++, C#, Visual Basic, ASP. Microsoft Visual Basic is the most popular business language used to develop client-server applications in the PC environment.

Object Oriented Languages

Languages that allow interaction of programming objects, including data elements and the actions that will be performed on them.

An object-oriented language the world is looked as a set of objects. Each object interacts with another object based on the messages it receives.

1. Encapsulation

The process of grouping items into an object.

2. Polymorphism

A process allowing the programmer to develop one routine or set of activities that will operate on multiple objects.

3. Inheritance

Property used to describe objects in a group of objects taking on characteristics of other objects in the same group or class of objects.

4. Reusable Code

The instruction code within an object that can be reused in different programs for a variety of applications.



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5. Object Oriented Languages

Small Talk, C++, C#, Java

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