INTRODUCTION TO COMPUTER SOFTWARE

Class: Comp. Sc & ICT A/L   **By:** DZEUGANG PLACIDE

Computer hardware is only as effective as the instructions we give it, and those instructions are contained in software. Software not only directs the computer to manage its internal resources, but also enables the user to tailor a computer system to provide specific business value. This chapter aims to:

- Define software and state the main difference between hardware and software
- Distinguish the main differences between application software and system software
- Classify the different type of application software by categories with examples in each category

Table of Contents

I. INTRODUCTION TO SOFTWARE

I.1 Definition of software

Software, by definition, is the collection of computer programs, procedures and documentation that performs different tasks on a computer system. It actually tells the computer what to do and how to do it. Software may enter the computer through one of following three ways.

(i) I may be build into the computer circuit in the form of firmware.
(ii) It may be loaded into the computer from a secondary storage device such as CD-ROM or hard disk drives
(iii) It is also be typed into the computer with the aid of the keyboard and programming tools

I.2 Relation between hardware and software

Software refers to the computer programs that are loaded into a computer system, and hardware refers to all the visible devices, which are assembled together to build a computer system. The blending of software and hardware gives life to a computer system. Even though hardware is the physical part of a computer, it is nothing unless it has software to control it. Hardware and software then share a special relationship. If hardware is the 'heart' of a computer system, software is its 'soul'. Both are complimentary to each other. Hardware is of no use without software and software cannot be used without hardware.

I.3 Qualities of a good software

Some of the most essential attributes of good software include

(a) **Usability:** This is the ease and convenience with which software can be used by human being. This is affected by technologies such as the Human-Computer Interface
(b) **Efficiency**: This is the degree with which software fufills its purposes without waste of resources
(c) **Portability**: It is the ease with which software can be used in other computer systems different from the currents one.
(d) **Reusability:** This is the ease with which software can be reused to design other software.
(e) **Maintainability:** this is the ease with which modifications can be made to satisfy new requirements or to correct deficiencies. Well designed software should be flexible enough to accommodate future changes that will be needed as new requirements come to light.
(f) **Security:** This is the with which software is able to protect its data against unauthorized access and to withstand malicious interference on its operations

(g) Reliability: This is the frequency and extends to which software fails to perform its functions under normal operating circumstances.

(h) Understandability: It is the ease with which software can be understood by computer users.

(i) Completeness: This is the characteristic whereby, the software possesses all of its parts, each of them being fully developed.

(j) Correctness: This is the degree with which software meet its specified requirements.

(k) Robustness: This is the degree with which software resist to users manipulations errors

(l) ...

I.4 Ways of acquiring computer software

Software can enter the computer through different channels. Some of the common ways of acquiring computer software include:

(i) Buying the computer: when you buy a new computer from the shop, you are usually supplied with some software for free, from the computer manufacturer

(ii) Buying the software from a shop:

(iii) Downloading the software from a website for free (freeware) or after paying some money to the vendor

(iv) Ordering from the vendor either by email, fax or postal letter. Here you also need to pay for the product before it is sent to you.

(v) Copying from other people's machines: This is what most Cameroonians do and it is what referred to as software piracy. Software piracy is illegal and therefore punishable by law

II.   CLASSIFICATION OF SOFTWARE

Computer software can be organized into categories based on common function, task, or field of use. We can then categorize software in different ways.

II.1 Classification of software based on task

Based on the kind of task they perform, software can be divided into two major groups: **System software** and **application software.** The diagram below gives a simplified hierarchical organization of the main parts of software in a general-purpose computer. At the highest level of this hierarchy lies the application software, whose services are carried out by the underlying system software. The devices of the system software are then executed by the underlying hardware components
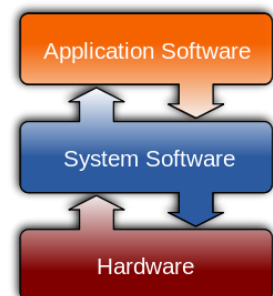
Computers operate by executing software programs. This involves passing the instructions from the application software, through the system software to the hardware that ultimately

receive the instruction as machine code. Each instruction causes the computer to carry out an operation such as data transmission, data processing, data storage or data control.

II.1.1 System software

System software is a type of computer software that controls the operation of the computer and provides facilities that extend the general capabilities of the machine. This provides the basic functions for computer usage and helps to run the computer hardware and system. It includes a combination of the following:

1) *Operating system*

An operating system is a group of computer programs that coordinates all the activities among computer hardware devices. This is the most important type of system software in a computer. A user can't run an application program on the computer except it is self booting without the Operating System. Operating systems are contained in almost all devices including mobile phones. (to be extended in the next chapter)

Functions of an operating system

An operating system executes many functions to operate computer system efficiently. Among them, four essential functions are the followings.

- **Resource Management:** An operating system manages a collection of computer hardware resources by using a variety of programs. It manages computer system resources, including its CPU, primary memory, *virtual memory*, secondary storage devices, input/output peripherals, and other devices. For example, most operating systems now are plug and play which means a device such as a printer will automatically be detected and configured without any user intervention.

- **Task Management:** The function of the operating system that controls the running of many tasks. It manages one program or many programs within a computer system simultaneously. That is, this function of operating system manages the completion of users' tasks. A task management program in an operating system provides each task and interrupts the CPU operations to manage tasks efficiently. Task management may involve a *multitasking* capability.

- **File management:** This is a function that manages data files. An operating system contains file management programs that provide the ability to create, delete, enter, change, ask, and access of files of data. The operating system keeps track of where files are located on the hard drive through the type of file system. The type two main types of file system most used are *File Allocation table* (**FAT**) or *New Technology File system* (**NTFS**).

- **User Interface:** It is a function of an operating system that allows users to interact with a computer. The two main types of user interfaces are: *command line* and a *graphical user interface* (GUI). With a command line interface, the user interacts

with the operating system by typing commands to perform specific tasks. An example of a command line interface is **DOS** (disk operating system). With a graphical user interface, the user interacts with the operating system by using a mouse to access windows, **icons**, and **menus**. An example of a graphical user interface is Windows Vista or Windows 7.

Examples of popular modern operating systems include ***Android, BSD, iOS, Linux (ubuntu, Knoppix, Dreamlinux, …) OS X, QNX, Microsoft Windows****(Windows 95, 2000, Vista, 7, 8, …)****, Windows Phone***, and ***IBM z/OS***. All these, except Windows, Windows Phone and z/OS, share roots in UNIX.

2) *Utility program*

This is system software designed to help analyse, configure, optimise or maintain a computer. A single piece will be called a utility or tool. Some Well-known utility software include :

➢ **Antivirus programs:** They are used to detect and eliminate computer viruses and related malicious software. Some examples are: avast, AVG, Avira, BitDefender, Norton

➢ **Backup programs:** They help to make copies of all information valuable to a computer or information system and store it safe. The information can be restored in the event of disk failure or other accidents that will lead to data loss.

➢ **Data Recovery**: As the name implies, data recovery programs are used to recover data. Since disk drives or other hardware may fail, these utilities are essential to recover data in such a scenario.

➢ **Data Compression programs:** They make the data more compact, reducing the space occupied by the data.

➢ **Disk management program :** These are program involving formatting and arranging disk files in an orderly manner.

➢ **Memory management software** : It handles locations in RAM where data put their current data. It can move certain memory-resident items out of the way so as to increase the memory space.

➢ **The Server:** In the context of client-Server architecture, a server is a computer program running to serve the requests of other programs – "the clients". The clients may run on the same systems or through networks.

3) *Programming software*

*I*t is the type of software that is used for creating other software. Another name for programming software is Integrated Development Environment (IDE). An IDE normally consist of a source code editor, a translator (compiler or interpreter) and a debugger.

- **Editor:** It is a programming tool that is used for creating and modifying application programs. It helps the computer user to enter, search, delete, replace, copy and insert text or sections of a text in a desired position.

- **Compiler:** It is used to convert a complete program written in a high-level language (such as Pascal and C) into a program in machine language.
- **Interpreter:** A program which translates the program statements into machine language one line at a time as the program is running.
- **Assembler:** A programming tool that convert a program in assembly language into program in machine language.
- **Debugger:** It is a program that is used for locating and correcting programming errors.
- **Linker:** A linker or link Editor is a program that takes one or more objects generated by the compiler and combines them to a single executable program..
- **Loader:** Loader is a kind of system software, which is responsible for loading and relocation of the executable program in the main memory. The functions of a loader include assigning load time space for storage, that is, storage allocation and assisting a program to execute appropriately.
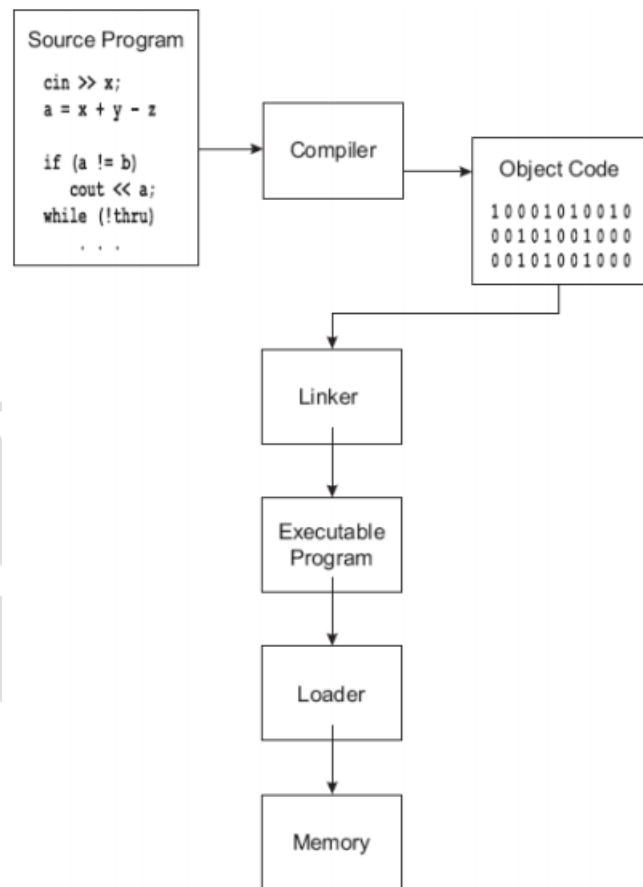
4) *Device driver*

Device drivers are computer programs that allow higher level computer programs to communicate and interact with a hardware device. All hardware devices have the devices drivers that communicate with them through the computer bus to which the hardware is connected. Drivers are hardware dependent and operating system specific. Some specific categories of device drivers are

Logical Device Drivers (LDD) which are written by the Operating System vendors
Physical Device Drivers (PDD) which are written and implemented by the hardware vendor.
To solve device driver crises, Microsoft has created the Windows Drivers Foundation (WDF) which collects and keeps all device drivers as a database.

II.1.2 Application software

Although system software has the vital job of controlling and managing the computer, it is the application software that lets you carry out the tasks for which the system was purchased. It enables the end users to accomplish certain specific tasks. Business software, databases and educational software are some forms of application software. Different word

processors, which are dedicated to specialized tasks to be performed by the user, are other examples of application software.

a) General purpose software

A general purpose application, sometimes known as 'off-the-shelf' is the sort of software that you use at home and school. Examples include word processors, spreadsheets, databases, desktop publishing packages, graphics packages etc.

This type of software tries to be a 'jack-of-all-trades'. It provides many features that the majority of users will want e.g. formatting text, creating charts, organising tables. But it does try to be' all things to all people' and so there will be a vast number of features that you may never use e.g. statistical functions, mail merge. This makes the storage size of these applications fairly large.

There are several good reasons for using general purpose software:

- It is relatively cheap
- It is easily available from most computer shops
- It will have been thoroughly tested so there won't be any serious problems or bugs
- There will be lots of user support i.e. books, user guides, online help and discussion forums on the Internet

Examples of General Purpose Application Software:

- ✓ **Desktop Publishing Software** - Often used to create graphics for point of sale displays, promotional items, trade show exhibits, retail package designs and outdoor signs. In very simple words, it could be said that it is a page maker application.
- ✓ **Word-Processing Software** - Used for the production (including composition, editing, formatting, and possibly printing) of any sort of printable material. This software enables users to create, format, edit and print electronic documents (Letters, reports, articles, …). The most popular examples of this type of software are *MS-Word, WordPad and Word Perfect, Libreoffice writter*.
- ✓ **Spreadsheet Software** - Used for any kind of spreadsheet work including analysis, planning or modeling. This is a general purpose software with many functions. Spreadsheet software are used for creating documents to manage and organize numerical data. It is used to perform calculations on rows and columns of data *Microsoft Excel, Lotus 1-2-3* and *Apple Numbers* are some examples of spreadsheet
- ✓ **Database Database** is a structured collection of data. A computer database relies on database software to organize data and enable database users to perform database operations. Database software allows users to store and retrieve data from databases. Examples are *Oracle, MSAccess, EasyPhp*, etc.
- ✓ **Graphic package** Allow you to create pictures and edit photographs. Example software: *CorelDraw. Paint Shop Pro*.
- ✓ **Presentation Software:** The software that is used to display information in the form of a slide show is known as presentation software. This type of software includes three functions, namely, editing that allows insertion and formatting of text, methods to include graphics in the text and a functionality of executing slide shows. Microsoft

PowerPoint and *Micromedia* director are the best example of presentation softwareWeb design application

b) Specific purpose software

Function-specific software are highly specialized software that are designed to handle specific tasks. They're more limited in what they can do, but they usually perform much better than a general purpose program in a specific task.

For example, TurboTax (a tax preparation package) is a special purpose application. Sure, it adds and subtracts numbers like a spreadsheet, but you can't use it to plan your monthly budget. It does only one thing - prepare tax returns. Other examples of special purpose application software are web browsers, calculators, media players, calendar programs etc. Again, make sure that you don't use brand names!

- ✓ **Communications software**: Used to send messages and emails Example software: MS Outlook Express. MS Messenger.
- ✓ **Desktop publishing programs**: Used to combine and control graphics and text in a single document. Example software: Adobe PageMaker. MS Publisher.
- ✓ **Web browser**: Computer program that enables internet users to access, navigate, and search World Wide Web sites. It is also called browser. Ex: *Mozilla Firefox, Internet explorer, Opera, Google chrome*
- ✓ **Enterprise Software:** It deals with the needs of organization processes and data flow. Customer relationship management or the financial processes in an organization are carried out with the help of enterprise software. Ex: Sage Saari
- ✓ **Multimedia Software:** They allow users to create and play audio and video files. They are capable of playing media files. Audio converters, audio players, burners, video encoders and decoders are some forms of multimedia software. Examples of this type of software include *Real Player* and Windows *Media Player*.

c) Bespoke software

Although most organisations use general purpose software, some organisations will find that it just doesn't do exactly what they want or it doesn't work with their current systems. In this case, they might decide to have the software system they need designed and developed specifically for them. This is called 'tailor-made' or 'bespoke' software. *Bespoke application software* is tailor made for a specific user and purpose. For example a factory may require software to run a robot to make cars; however, it is the only factory making that car in the world, so the software required would have to be specially built for the task.

The main advantages are:

- the company will get the exact software/system that they need
- the software will work exactly how they want it to work
- the software will only have the features that they specifically need in their business.

The main disadvantages of this approach are:

- it takes a long time to develop such a system, between a few months to years

- it costs a great deal of money to develop such a system.
- the company may need to employ a team of people such as business analysts, programmers, testers etc
- there will be little in the way of user support and online help

Other examples might include software for the military, missile/UAV operations, software for hospitals and medical equipment, software being written inside banks and other financial institutions.

II.2 Classification of software based on source

Based on code source, we distinguish two types of software: Open Source Software and Closed Source Software.

II.2.1 Closed source software

Also called **proprietary software**, it is software with restricting on using, copying and modifying the source code as enforced by the proprietor. In other words, computer users do not have any access to the source code of the proprietary software. Well known examples of proprietary software include: *Windows, RealPlayer, Adobe Photoshop, Mac OS*, ...

II.2.2 Open source software

It is the type of software that has no proprietary restriction attached to it, particularly the restriction about the access to the source code. In other words, open source software is designed in such a way that computer users can freely access and modify the source code to suit their individual need. It is also called non-proprietary software. E.g*. Linux, Open Office*

II.3 Classification of software based on licence

The term licence refers to a legal document or agreement giving someone permission to do and use something. A software licence comprises the permissions, rights and restriction imposed on a piece of software. Under a software licence, the Licensee is permitted to use the licence software in compliance with a specific term on the licence. Based on licence, computer software may be divided into the following:

II.3.1 Public Domain Software.GPL

The GNU General Public License (GNU GPL or simply GPL) is a free software license, originally written by Richard Stallman for the GNU project (a project to create a complete free software operating system). It has since become one of the most popular licenses for free software. The latest version of the license, version 2, was released in 1991. The GNU Lesser General Public License (LGPL), another commonly-used license, is a modified version of the GPL intended for software libraries.

The GPL grants the recipients of a computer program the following rights, or "freedoms":

✓ The freedom to run the program, for any purpose.

✓ The freedom to study how the program works, and modify it. (Access to the source code is a precondition for this)
✓ The freedom to redistribute copies.
✓ The freedom to improve the program, and release the improvements to the public. (Access to the source code is a precondition for this)

.   **II.3.2 Freeware**

This is a Copyrighted software given away for free by the author. Although it is available for free, the author retains the copyright, which means that you cannot do anything with it that is not expressly allowed by the author. Usually, the author allows people to use the software, but not sell it.

You are also free to distribute it to anyone you want, provided the distribution is an unmodified version of what you downloaded from the provider's web site. In fact they encourage you to distribute their Freeware. Freeware is provided on an "as is" basis and no technical support is usually available.

II.3.3 Shareware

This may be copyrighted software, regularly in trial version, but generally the developer allows users to make copies without an initial charge. However, if the user intends to use it beyond a brief tryout, the developer requests that the program be paid for. A marketing method for software, whereby a trial version is distributed in advance and without payment. A user tries out the program, and thus shareware has also been known as 'try before you buy', demoware, trialware and by many other names.

II.3.4 Crippleware

The shareware version of a program whose most advanced and most desirable features have been disabled with the intention of increasing users apetite for the better version. If the fee is paid, a code is acquired, which uncripple the program.

II.3.5 Nagware:

Nagware (also known as annoyware) is a type of shareware, that reminds —or nags— the user to register it by paying a fee. It usually does this by popping up a message when the user starts the program or, worse, intermittently while the user is using the application. These messages can appear as windows obscuring part of the screen or message boxes that can quickly be closed. Some nagware keeps the message up for a certain time period, forcing the user to wait to continue to use the program

II.3.6 Adware:

Advertising-supported software is any software package which automatically plays, displays, or downloads advertising material to a computer   after the software is installed on it or while the application is being used.

II.3.7 Liteware

This is the free version of a program, that does not contain those features that are attractive to frequent or heavy user.

II.3.8 Vapoware

Vaporware (or vapourware) is software or hardware which is announced by a developer well in advance of release, but which then fails to emerge, either with or without a protracted development cycle.

II.4 Other type of software

Custom Software: Software that is developed for a specific user or organization is custom software. Since it is built for a specific user, its specifications and features are in accordance with   the   user's   needs.
Off-the-Shelf Software: As opposed to custom software, off-the-shelf software is standard software bought off the shelf. It has predefined specifications that may or may not cater to any specific user's requirements. When you buy it, you agree to its license agreement.
*Tailor Made Software***:** Tailor made software is software that is made to the specifications of a client. In other words it is custom made, bespoke, or 'tailored' to address a specific need
Retail Software: While shareware is provided as a trial version to users, retail software is sold to end users.

*Firmware***:** Firmware is a combination of software (generally, system software) permanently stored in the memory (hardware). As the name suggests, it is a program or data that has been written onto the read-only memory (ROM). For example, the BIOS (which is installed inside a computer on a chip) checks different parts of the system before loading the operating system into the memory.

Liveware: People who write programs, operate and maintain the computers are collectively known as liveware, humanware or peopleware; for example, programmers, system analysts and hardware engineers.