



GCSE Computer Science Knowledge Organiser

SLR 1.5 Systems Software:

The Purpose of the System Software and User Interfaces

There are two types of systems software:

- Operating system: Provides a platform for running programs.
- Utility software: Helps maintain the computer system.

What is an Operating System?

- Operating systems manage computer hardware, users and the resources used by software
- They are responsible for managing:
 - The user interface
 - Memory management
 - Multitasking
 - Peripheral management and drivers
 - User management
 - File management

Key Terminology	BCS Definition
System software	“Software that manages the computer. Usually supplied with the computer.”
Operating system	“Specialised software that communicates with computer hardware to allow other programs to run. The most common operating systems are Windows, Linux, Unix, MacOS and iOS.”
Utility software	“A program that performs a specific task relating to the operation of the computer – e.g., backup, virus scan, compression, defragmentation.”
User interface	“Allows a user to interact with a computer – e.g., input devices and software.”

The Four Types of User Interfaces

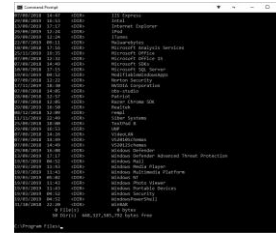
Graphical user interface (GUI)

- Windows, icons, menus, pointers (WIMP)
- Visual
- Interactive
- Intuitive
- Optimised for mouse and touch gesture input



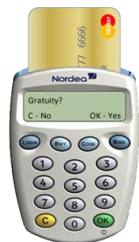
Command Line

- Text-based
- Less resource-intensive than a GUI
- More commands than a GUI
- Highly efficient
- Best suited for advanced users
- Used to automate processes with scripts



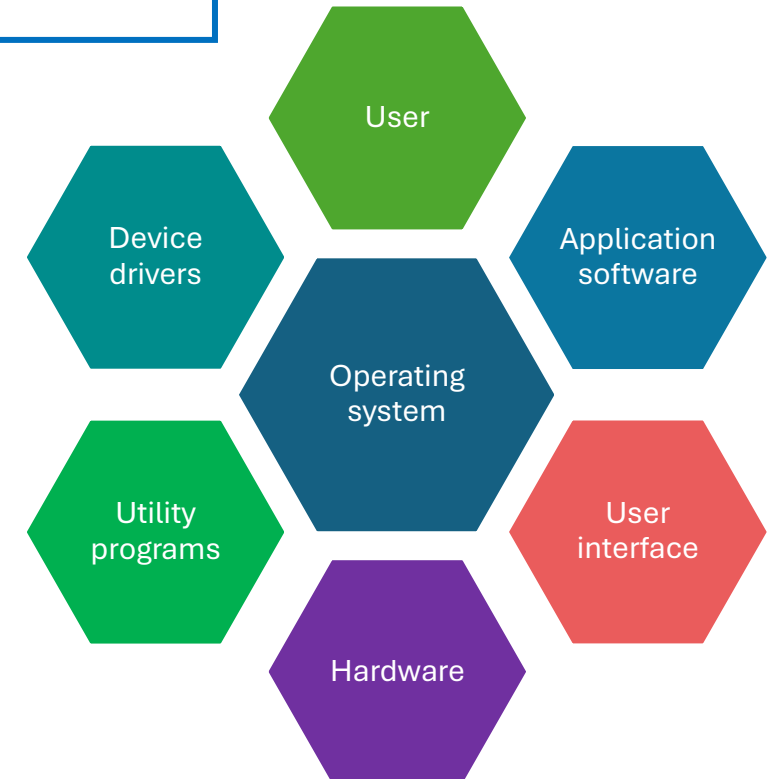
Menu

- Successive menus presented to the user.
- Single options chosen at each stage.
- Often with buttons on a keypad.



Natural Language

- Responds to questions in spoken language.
- Not always reliable but improving all the time.





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SLR 1.5 Systems Software: Operating Systems

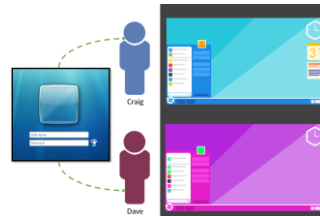
Multitasking

- Multitasking is when you have more than one program open and running at the same time.
- The processor allocates a small amount of time to each process and cycles between them.
- As this happens so quickly, it appears as if multiple programs are executing simultaneously.
- This process allows more than one program to be held in memory at the same time, as well as any data being shared between them (e.g., copy and paste).
- For example, you can listen to music on your PC at the same time as using a word processor.



User Management

- Allows multiple users to log into one computer.
- The operating system retains settings for each user such as icons or desktop backgrounds.
- Each user may have different access rights to files and programs.
- A client-server network may impose a fixed or roaming profile for a user and manage login requests to the network.



Device Drivers

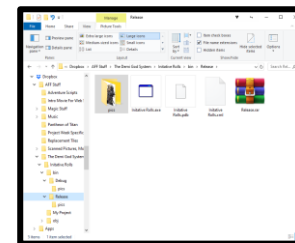
- Your computer needs to be able to output to a wide range of devices.
- A printed document should look the same regardless of the make or model of printer.
- However, the technology behind each printer is very different. To overcome this inconsistency, we use device drivers.
- Printer drivers translate the operating system instructions to print a document into a series of bespoke instructions that the printer will understand.



Key Terminology	BCS Definition
Memory management	“The process of the operating system deciding what should be in memory at any given time. Responsible for loading data and programs into and out of memory when required.”
Multitasking	“Running multiple applications simultaneously by giving each one a slice of processor time.”
Peripheral management	“The management of connected input/output devices such as a mouse, keyboard, webcam, speaker, scanner, printer, etc.”
Driver	“Translates operating system commands into hardware-specific commands – e.g., a printer driver tells the printer how to print a document.”
User management	“Allows different people to log into the same computer with a username and password. Remembers personal settings. Manages file access rights.”
File management	“Access permissions for files (read and write). Opening files in programs. Moving, deleting and renaming files. Presenting a folder structure to the user.”

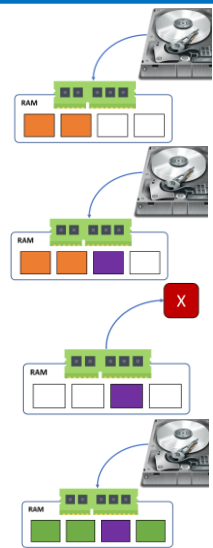
File Management

- Data is stored in files.
- An extension to the filename tells the operating system which application to load the file into.
- The operating system presents a logical structure of files in folders and allows the user to rename, delete, copy and move files.



Memory management

- The operating system handles loading programs from the hard drive into main memory (RAM).
- When a program is loaded, the operating system decides where to hold it in memory.
- Over time, as more and more programs are opened and closed, the memory becomes fragmented because programs use different amounts of memory – the operating system must keep track of these program fragments.
- When main memory (RAM) is full, the operating system will fall back to virtual memory.





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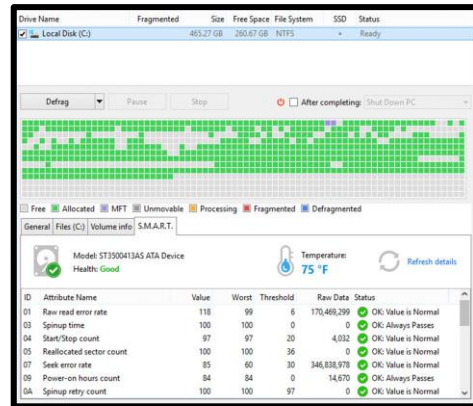
Utility Software

What is Utility Software?

- The operating system controls and manages the computer system
- Utility programs perform extra functionality and housekeeping tasks that keep computers running efficiently
- They are often packaged as part of the operating system
- Some utility programs, such as Antivirus software, are bought as stand-alone software programs

Defragmentation

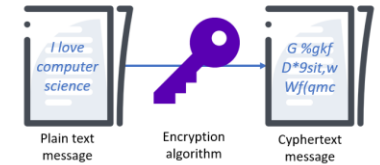
- Defragmentation utilities reorganise files on a hard disk, putting fragments of files and free space back together.
- This process reduces the movement of the read/write head across the hard disk, speeding up file access.
- Solid-state drives should not be defragmented. It is unnecessary as they have no moving parts – it also reduces their lifespan.



Key Terminology	BCS Definition
Utility software	“A program that performs a specific task relating to the operation of the computer – e.g., backup, virus scan, compression, defragmentation.”
Encryption software	“Turns plaintext data into unreadable ciphertext data using a key. Protects data from being read by hackers.”
Defragmentation software	“Files being deleted over time creates gaps on a hard disk. New files fill the gaps but may need more space than the gap provides, resulting in file fragments being spread across the disk. Defragmentation puts file fragments and free space back together in contiguous space, improving access speeds.”
Data compression software	“Reduces the size of a file so it takes up less disk space and is quicker to download over the internet. Compressed files must be extracted before they can be read.”

Encryption

- Encryption utilities use an algorithm to scramble plain text into cyphertext.
- The text can only be decrypted and made readable again with a key.
- Encryption software utilities are commonly used to:
 - Encrypt entire hard disks so that the data cannot be understood if the computer is stolen
 - Encrypt files and folders on a portable disk such as USB removable storage
 - Encrypt communication with websites
 - Encrypt data in an organisation’s database – especially sensitive data such as passwords



Data compression

- Compression utilities reduce the size of a file so it takes up less space and is quicker to download over the internet.
- Compressed files must be extracted before they can be read.
- Depending on the algorithm used, some data may be lost, reducing the quality of an image or sound (e.g., JPEG), or represented in a different way using binary, retaining the original data in a new compressed format (e.g., ZIP).
- This reduces the amount of storage space needed on a disk
- If sending the files, it reduces the amount of data that is sent
- Compression may allow attachments to be sent via email that would otherwise have been larger than a file-size limit
- More data can be stored on backup media

