OCR GCSE Computer Science

Your notes

Operating Systems & Utility Software

Contents

The Purpose & Functionality of Operating Systems

Your notes

What is an operating system?

- An operating system (**OS**) is software that **provides an interface between the user and the hardware** in a computer system
- An operating system **hides the complexities of the hardware** from the user, for example:
  - A user does not need to know 'where' on secondary storage data is kept, just that it is saved for when they want it again
- An operating systems main functions can be divided in to five key area:
  - **Provide a user interface**
  - **Memory management & multitasking**
  - **Peripheral management & device drivers**
  - **User management**
  - **File management**

User Interface

What is a user interface?

- A user interface is **how the user interacts with the operating system**
- Examples of user interfaces include:
  - **Command Line Interface (CLI)**
  - **Graphical User Interface (GUI)**
  - **Menu**
  - **Natural language (NLI)**

Your notes

What is a command line interface?

- A Command Line Interface (**CLI**) requires users to interact with the operating system using **text based commands**
- CLIs are more commonly used by **advanced users**
- Examples of CLIs are MSDOS (Microsoft Disk Operating System) and Raspbian (for Raspberry Pi)

What is a graphical user interface?

- A Graphical User Interface (**GUI**) requires users to interact with the operating system using **visual elements** such as windows, icons, menus & pointers (**WIMP**)
- GUIs are **optimised for mouse and touch gesture input**
- Examples of GUIs are Windows, Android and MAC OS

What is a menu interface?

- A menu interface is **successive menus** presented to a user with a **single option at each stage**
- Often performed with **buttons** or a **keypad**
- Examples include
  - **Chip and pin machines**
  - **Vending machines**
  - **Entertainment streaming services**

What is a natural language interface?

- A natural language interface (**NLI**) uses the spoken word to respond to spoken or textual inputs from a user
- Examples include
  - **Virtual assistants** - Amazon Alexa, Google Assistant, Siri
  - **Search engines**
  - **Smart home devices**


Your notes

Advantages and disadvantages of user interfaces

Interface	Advantages	Disadvantages
Command line (**CLI**)	▪ Uses less system resources ▪ Useful for automation of tasks ▪ Commands are often faster to type than navigating menus	▪ Requires users to remember commands ▪ Typing errors are common ▪ Less intuitive than GUI
Graphical (**GUI**)	▪ Intuitive and user-friendly ▪ Requires no previous knowledge to use ▪ Information is visual, making it easier to understand	▪ Uses more system resources ▪ Can be slower to find and execute commands ▪ Can be frustrating when doing repetitive tasks
Menu	▪ Simplicity ▪ Efficiency	▪ Limited flexibility ▪ Accessibility issues
Natural language (**NLI**)	▪ Can be used by people with disabilities ▪ Intuitive	▪ Not always reliable ▪ Privacy concerns

Memory Management & Multitasking

What is memory management?

- Memory management is a process carried out by the operating system **allocating main memory (RAM) between different programs** that are **open at the same time**

- The OS is responsible for **copying programs and data from secondary to primary storage** as it is needed
- **Programs and data require different amounts of RAM** to operate efficiently and the OS manages this process
- **RAM is allocated** based on **priority and fairness**, for example, system applications (essential) may have a higher priority than user applications
- The OS **dynamically manages the memory**, adjusting allocation as needed to maintain optimal system performance
- Memory management makes **multitasking** possible


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What is multitasking?

- Multitasking is a process made possible by the OS **simultaneously managing system resources** (memory, CPU etc) to give a user the **perception of being able to use multiple programs at the same time**
- The OS **splits tasks and allocates system resources** based on a priority
- The CPU can only **execute one instruction at a time**, it can execute billions of them in one second.
- This makes it **appear that multiple programs are running at the same time**

Peripheral Management & Device Drivers

What is peripheral management?

- Peripheral management is a process carried out by the operating system **managing the way peripherals (hardware) interact with software**
- The OS **allocates system resources** to peripherals to ensure **efficient operation**
- Peripheral management makes **plug-and-play** (PnP) functionality possible, **automatically detecting and configuring new peripherals** without the need for manually installing device drivers or power cycling the system

What is a device driver?

- A device driver is **a piece of software used to control a piece of hardware**
- Peripherals **require device drivers** in order to be used by the operating system
- The OS has **generic device drivers built in** which makes **basic compatibilit**y possible and enables **plug-and-play** (PnP)
- In order for hardware to be used to its **maximum capacity**, often **a separate device driver must be downloaded** from the manufacturer

- Device drivers are **OS specific** and are **regularly updated**

Examiner Tips and Tricks

There are 5 main functions of the operating system. Try to think about the OS as a manager of the computer, talking to the hardware & software and managing what they can and can't do. The keyword is **MANAGEMENT**! memory management, file management, peripheral management, user management


Your notes

User Management

What is user management?

- User management is a process carried out by the operating system enabling different users to log onto a computer
- The OS is able to maintain settings for individual users, such as desktop backgrounds, icons and colour schemes
- A system administrator is able to allocate different **access rights** for different users on a network

File Management

What is file management?

- File management is a process carried out by the operating system **creating, organising, manipulating and accessing files and folders on a computer system**
- The OS **manages where data is stored** in both **primary and secondary storage**
- File management gives the user the ability to:
  - **Create files/folders**
  - **Name files/folders**
  - **Rename files/folders**
  - **Copy files/folders**
  - **Move files/folders**
  - **Delete files/folders**
- The OS allows users to control who can access, modify and delete files/folders (**permissions**)

- The OS provides a **search facility** to find specific files based on various criteria


Your notes

Worked Example

Ella uses her computer to create artwork for a magazine

Ella makes use of system software.

One type of system software is the operating system.

Identify and describe **two functions** of an operating system **[6]**

How to answer this question

- Break down the 6 marks, 1 mark each for identifying a function of the operating system. For each function you need to make 2 points about how they work

Answer

- Memory management
  - Allocates memory to programs currently in use
  - Gets data from RAM
  - Stores data in RAM
- File management
  - Creating/editing/renaming files
  - Creating/editing/renaming folders
  - Movement of files/folders

The Purpose & Functionality of Utility Software

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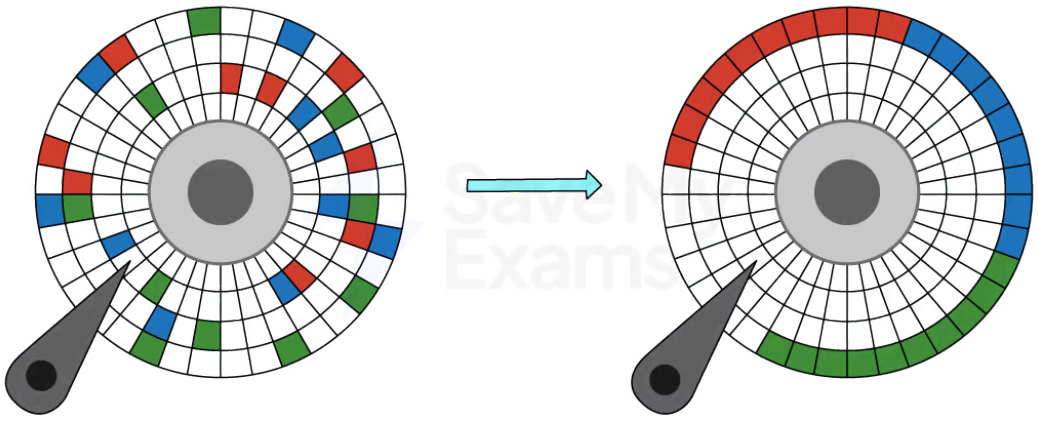
Utility Software

What is utility software?

- Utility software is software designed to help **maintain**, **enhance** and **troubleshoot/repair** a computer system
- Utility software is designed to **perform a limited number of tasks**
- Utility software **interacts with the computers hardware**, for example, secondary storage devices
- Some utility software comes **installed with the operating system**
- Examples of utility software and their function are:

Defragmentation (maintain)

- Defragmentation software **groups fragmented files back together** in order to **improve access speed**
- As programs and data are added to a new hard disk drive, it is added in order, **over time as files are deleted this leaves gaps**
- As programs and data are added over time, **these gaps get filled and data becomes fragmented**
- Defragmentation can only used on **magnetic storage**



Examiner Tips and Tricks

If the concept of defragmentation still seems a little difficult then hopefully this analogy will help

- In a tidy bedroom you can find your things faster because they are in the right place (in order)
- Over time you move things, forget to put them back and/or add new things
- The time taken to find your things increases, until...
- You tidy your room and finding things becomes quicker again (defragmentation!)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Compression (enhance)

- Compression **reduces the amount of secondary storage** required by performing an algorithm on the original data
- **Lossy compression** physically **removes data** from the original data to reduce its size, **the original file can not be re-created**
- **Lossless compression** uses mathematics to **order data** more efficiently reducing its size, **the original files can be re-created as no data is lost**

Encryption (enhance)

- Encryption is the process of **scrambling data using an algorithm** from plain-text into cipher-text in order to make it unreadable to users without the **master key**
- Encryption software **enhances the security** of the computer system and **keeps data safe**

Task manager (troubleshoot/repair)

- Task manager is software that is built into the operating system to allow users to **monitor system resources** in order to help **troubleshoot potential problems**
- Task manager gives system information such as:
  - **Processes**
  - **Performance**
  - **App history**
  - **Start-up apps**
  - **Users**
  - **Services**

Worked Example

A hotel has a computer-based booking system which is running slowly. A technician has said that the hard disk drive is fragmented. The technician has suggested using utility software to defragment the drive.

Explain how the hotel's hard disk could have become fragmented **[4]**

How to answer this question

- The keyword is 'how', do not just explain what fragmented means in general, you must give examples of how it could have become fragmented in the hotel. What does a hotel use a computer for?

Answer

- Booking have been saved onto the system and then deleted once completed **[1]**
- New bookings are created **[1]** which may need more space than the completed ones left behind **[1]**
- The booking files are split up **[1]**


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