

Systems Software

What is a TRANSLATOR and why is it required?

A piece of software that translates high level or low level languages into machine code.

What is MACHINE CODE?

The computer's own language, containing only 1's and 0's.

What is a HIGH LEVEL LANGUAGE?

Programming languages written in everyday language like English, with instructions telling the computer what to do, e.g. PRINT "Hello" in Visual Basic.

Errors can be quite easily found and fixed because the language looks like everyday language.

Systems Software

What is a LOW LEVEL LANGUAGE?

Programming language written in a language like machine code.

Much harder to understand than a high level language.

Easy to make mistakes and hard to find them to fix.

What is a SPECIAL PURPOSE LANGUAGE?

A language which performs one specific task, e.g. for controlling a robot.

Allows specific tasks to be programmed easily, e.g. by having commands used to, say, move a robotic arm up and down, and gloves linked to the computer.

Systems Software

What does a COMPILER do?

- Translates high level language into machine code in one operation.
- Compiled version of code can be saved, making it quick to use as the code does not have to be translated every time the program is run, unless any changes are made.
- Error messages can be unhelpful making them hard to find and fix.

What does a INTERPRETER do?

- Translates high level language into machine code one line at a time.
- Slower than compiled language as program is interpreted every time the program is run, even if no changes are made.
- Errors are reported as they happen meaning they can be fixed on the spot.
- Error messages are often helpful making them easy to spot and fix.

Operating Systems

What is the OPERATING SYSTEM?

The program that controls how the computer works.

What functions does the operating system do?

- Manages the computer's memory.
- Manages the filing system (backing storage devices, e.g. hard disc).
- Checks the input devices like the keyboard.
- Controls the security of the computer.
- Provides an HCI for the user.

Operating Systems

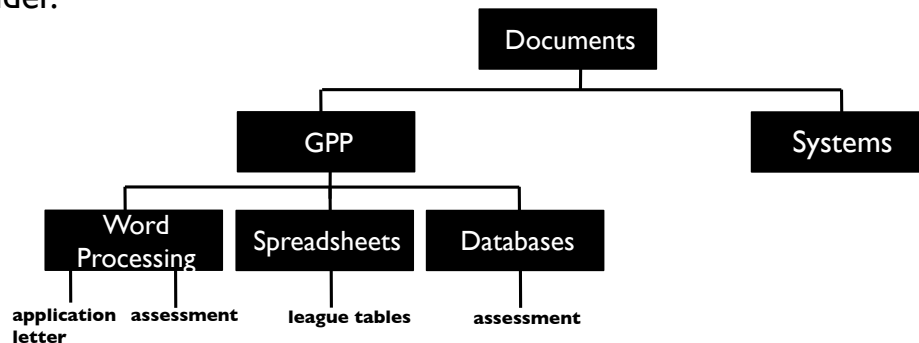
What is a Hierarchical Filing System?

Where files are stored in folders (or directories), which can in turn contain further folders and files.

What advantages does a hierarchical filing system have?

Easy to organise files sensibly, with similar files stored in one folder.

Duplicate file names can be used as long as they are in a separate folder.



Operating Systems

How does interactive system with background processing work?

Interactive job is priority task and takes control of the CPU, e.g. a user typing a word processing document.

When there is a gap in this process, (say, waiting for a key to be pressed) a background task is processed, e.g. printing a document.

When priority task requires processor again, background task is suspended until there is another gap.

Remember, there will be many gaps as the CPU can do many thousands (or millions) of tasks in one second.

What is a DEVICE DRIVER?

Software allowing the computer to operate a connected piece of hardware.

E.g. A printer driver converts word processing codes for operations such as bold into printer codes, so that a document prints out exactly as it looks on the screen.

Low Level Machine

How is the **PROCESSOR** structured?

There are 3 main parts:

CONTROL UNIT

- Makes sure program instructions are carried out in the right order.

ARITHMETIC AND LOGIC UNIT (ALU)

- Carries out the calculations and performs the logical operations.

REGISTERS

- Temporary memory locations within the processor.
- Store programs and data that are actively being processed.

Low Level Machine

How can numbers, letters, pictures etc represented in the computer?

- The computer is a 2 state device, which only works with the binary values 1 and 0.
- All text, numbers etc. must be broken into this state before the computer can work with them.

How do bits, bytes, kilobytes, megabtes, gigabytes and terabytes work?

- A bit (binary digit) is either a 1 or a 0.
- No character such as a letter or number can be represented in just one bit.
- A byte is a series of 8 bits.
- Single characters can be stored using one byte.

Low Level Machine

How do bits, bytes, kilobytes, megabytes, gigabytes and terabytes work?

- A kilobyte is 2^{10} bytes = 1024 bytes
- A megabyte is 2^{10} kilobytes = 1024 kilobytes
- A gigabyte is 2^{10} megabytes = 1024 megabytes
- A terabyte is 2^{10} gigabytes = 1024 gigabytes
- Therefore, a gigabyte = $1024 * 1024 * 1024 * 1024 * 8 = 879609302016$ bits.

What is a CHARACTER SET?

- The complete list of different characters represented in a computer system.
- ASCII (American Standard Code for Information Interchange) is the most common.

Low Level Machine

How is text stored inside the computer?

- Each character is given a special 8 bit code, called an ASCII character.
- E.g. the letter a has the ASCII value 97 in decimal, which is 0110 0001 (Note that A has a different value, 65).

What problems occur in storing numbers as ASCII values?

Cannot be used in calculations.

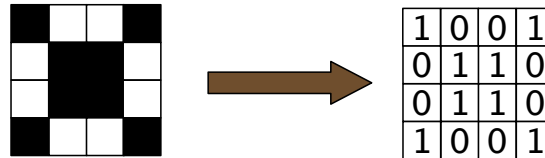
Low Level Machine

How are graphics stored in the computer?

Computer screen is made up of many pixels, with the value 0 or 1.

This basically translates to 1 or 0 for black and white.

A simple graphical representation is shown.



- ☑ This screen would have 16 bits (2 bytes).
- ☑ It would take 2 bytes to store any picture on this screen, but the range and quality of picture is very limited.
- ☑ A greater number of (smaller) screen pixels would be required.
- ☑ This would increase the resolution, but also storage size for each picture.

Low Level Machine

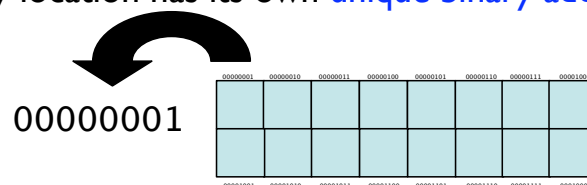
What are CONTROL CHARACTERS?

Special ASCII characters that do not appear on screen in the normal way.

E.g. the return key, new page key etc.

How can the CPU access a particular location in memory?

Each memory location has its own **unique binary address**.



What is the WORD size?

The number of bits that can be processed in one complete operation.

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