

Utility software

1. Utilities

A 'utility' application has a specific job to do regarding the computer's operation and performance. They are not essential to running the computer, however they are useful tools that the operating system and the user can use for a specific task.

Utility applications include:-

- **Security** - Encryption software, Firewall, Anti-virus, Anti-malware.
Read more about security utilities in the [network security](#) section.
- **Performance** - Hard disk defragmentation, task manager monitor
- **Improve storage efficiency** - data compression applications
- **Backup** - system backup and file backup utilities
- **System information and diagnosis** - ensuring that the rest of the computer continues to work as well as possible.

Many utilities come ready-loaded with the operating system in order allow the system to be optimised. Others can be purchased or are sometimes available for free as open source software.

This section will cover these topics.

Utility software

2. Encryption utilities

Encryption scrambles data in such a way that only a person (or computer) with the correct software key can read it.



Much of the data that we send via the internet is encrypted by software already built into the browser. Pages displaying "HTTPS" in their URL show that data can be sent safely and securely without having to take any additional measures.

But not all data is sent - some of it is just stored. Many organisations need to ensure that data they store is secure and cannot be accessed or viewed by unauthorised people. For example, under the Data Protection Act, all personal data about customers and staff must be stored in a secure manner.

An encryption utility can be used to secure data. The file is selected, a password created and the encryption utility encrypts the data within that file. In order to decrypt the data, the correct password must be entered before it will be unencrypted and presented to you in its original format.

Utility software

3. Defragmentation utility

Files are stored on secondary storage devices such as a hard disk.

On a hard disk, memory is divided into chunks called 'sectors'.

When a file needs to be stored, the operating system looks for free sectors on the disk. However, these sectors are rarely sequential (i.e. next to one another), instead they are usually scattered in different places across the hard disk.



If a file is broken up ("fragmented") across too many separate memory sectors, it becomes difficult for the hard disk to access all of the pieces of a file in a timely manner. This can make the computer appear to be running slowly.

To prevent this, defragmentation utilities juggle the contents of memory sectors around to keep files together as much as possible. This ensures that the computer runs quickly and efficiently.

Utility software

4. Defragmentation

If you want to know how defragmentation utilities work, here is an example of defragmentation in action.


Imagine that we have three files, A, B and C. At the moment they are stored on the hard disk something like this (the empty squares represent free sectors):

A	B	C		A	C	B		C	A
C	A		A		B	A			C

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The defragmentation utility will aim to rearrange the files so that all parts are stored adjacent to one another rather than being scattered throughout the hard disk.

It will start off by trying to get all of the parts of file A next to one another. It does this by moving the first part of file B into a free segment:



A	B	C		A	C	B		C	A
C	A		A		B	A			C

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Once moved, the segment next to the first portion of file A becomes free:

A		C	B	A	C	B		C	A
C	A		A		B	A			C

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It then looks for the next portion of file A on the hard disk and moves it into the newly freed up segment:



A		C	B	A	C	B		C	A
C	A		A		B	A			C


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Here you can see that two parts of file A are now stored next to one another:

A	A	C	B		C	B		C	A
C	A		A		B	A			C

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It then takes the first part of file C and moves it into another free segment:



A	A	C	B		C	B		C	A
C	A		A		B	A			C

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It continues this process working through all of the file A segments and then beginning the same process with file B and finally with file C until the hard disk looks something like this:

A	A	A	A	A	A	B	B	B	
C	C	C	C	C					

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By rearranging the files so that they are stored sequentially the utility makes reading and writing of files to the hard disk, much faster and more efficient.

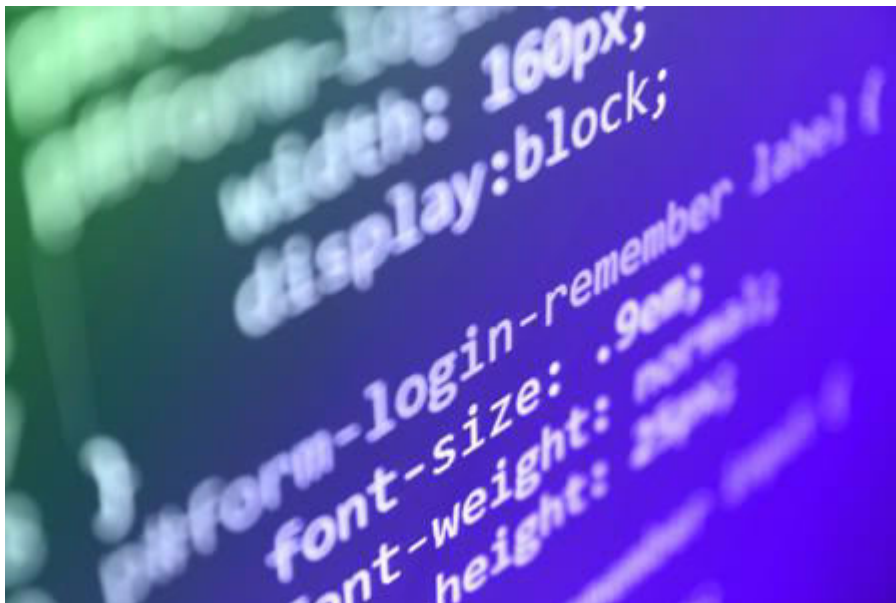
Utility software

5. Compression utility

A compression utility makes a file smaller in size.

This is good because:-

- less storage space is needed
- it is faster to download and upload the file
- better performance is achieved when streaming audio or video files



There are two types of compression

Lossy compression

This method removes redundant or unnecessary data from the file i.e. some data is lost.

The MP3 file format uses lossy compression to make music and sound files smaller. It does this by discarding some sounds in the original data that you are not likely to hear such as very high / low pitch sound or its too quiet. There is a loss in quality but it is normally hardly noticeable and it does offer impressive compression - a 3 minute song stored as an MP3 file is about 4 Megabytes whilst the same song in uncompressed format is about 100 Megabytes.

The JPEG file format that stores images also uses lossy compression.

Lossless compression

Lossless compression does not remove any information from the file, instead it looks for patterns within the data that allows it to be stored more efficiently. Lossless compression is used for data files such as text documents. A very popular lossless compression method is the ZIP file format.

The amount of compression depends on the data itself - a highly regular data set with lots of patterns in it will be highly compressed whilst a completely random data set cannot be compressed as it has no pattern within it.

Utility software

6. Summary

- Utility software performs tasks related to the performance and operation of the computer itself.
- Such tasks include **security, performance, storage efficiency, and data backups.**
- Encryption is the scrambling of data such that a key is required in order to read it.
- Encryption over the internet is often carried out by a utility built into the web browser.
- Stored data can be encrypted too.
- Memory sectors containing file data do not have to be physically next to one another.

- However, performance is improved when file data is kept relatively close together. This is done using a defragmentation utility.
- Files can be reduced in size using a compression utility.
- There are different types of compression: lossless and lossy.