

Bitsize notes: Storage

(The text shown here was taken from:

<https://www.bbc.co.uk/bitesize/guides/zhmmtv4/revision/1>)

Storage

Computer users need to be able to store programs and data when the power is switched off. Secondary storage is used to hold data and programs on physical devices when the computer is not in use. This can be used to:

- **store** data **indefinitely** and to
- **transfer** data between computers.

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Secondary storage

Computers use main memory, such as random-access memory (RAM) and cache, to hold data that is being processed. However, main memory is volatile - it loses its contents when the computer is switched off. General purpose computers, such as desktop computers and tablets, need to be able to store programs and data for later use.

Secondary storage is needed to keep programs and data indefinitely.

Secondary storage is **non-volatile, long-term storage**. It is used to keep programs and data indefinitely. Without secondary storage, all programs and data would be lost the moment the computer is switched off.

There are many forms of secondary storage and each type of secondary storage device has its own characteristics. Because all devices are different, some are more suited to certain applications than others.

For example, a **hard disk** drive has:

- a **high capacity** and
- **reasonable access speed**,
- making it suitable for **everyday storage** of programs and data.

A **USB memory stick** is:

- smaller in capacity,
- but extremely fast and portable

making it suitable for transferring files between computers.

Not all computers require secondary storage. **Embedded computers**, such as those found in a digital watch or central heating system, do not need to store data when the power is turned off. The instructions needed to run them are stored in read only memory (**ROM**) and any user data is held in **RAM**.

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Common types of secondary storage

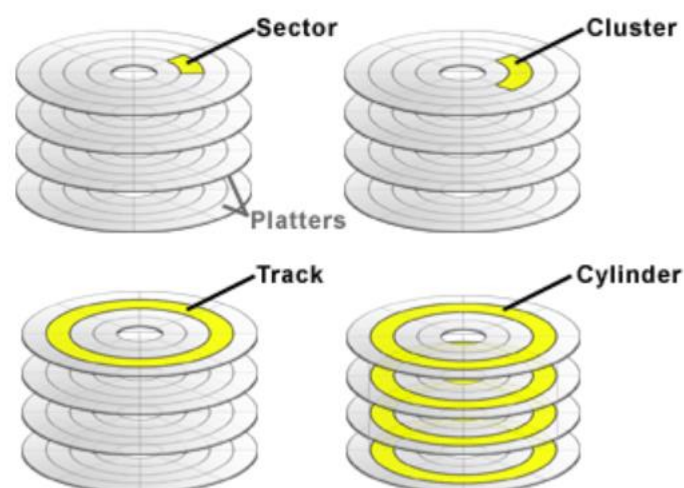
Secondary storage devices are generally separated into three types:

- **magnetic storage devices**, such as hard disk drives
- **optical storage devices** such as CD, DVD and Blu-ray discs
- **solid state devices** such as solid-state drives (SSD) and USB memory sticks

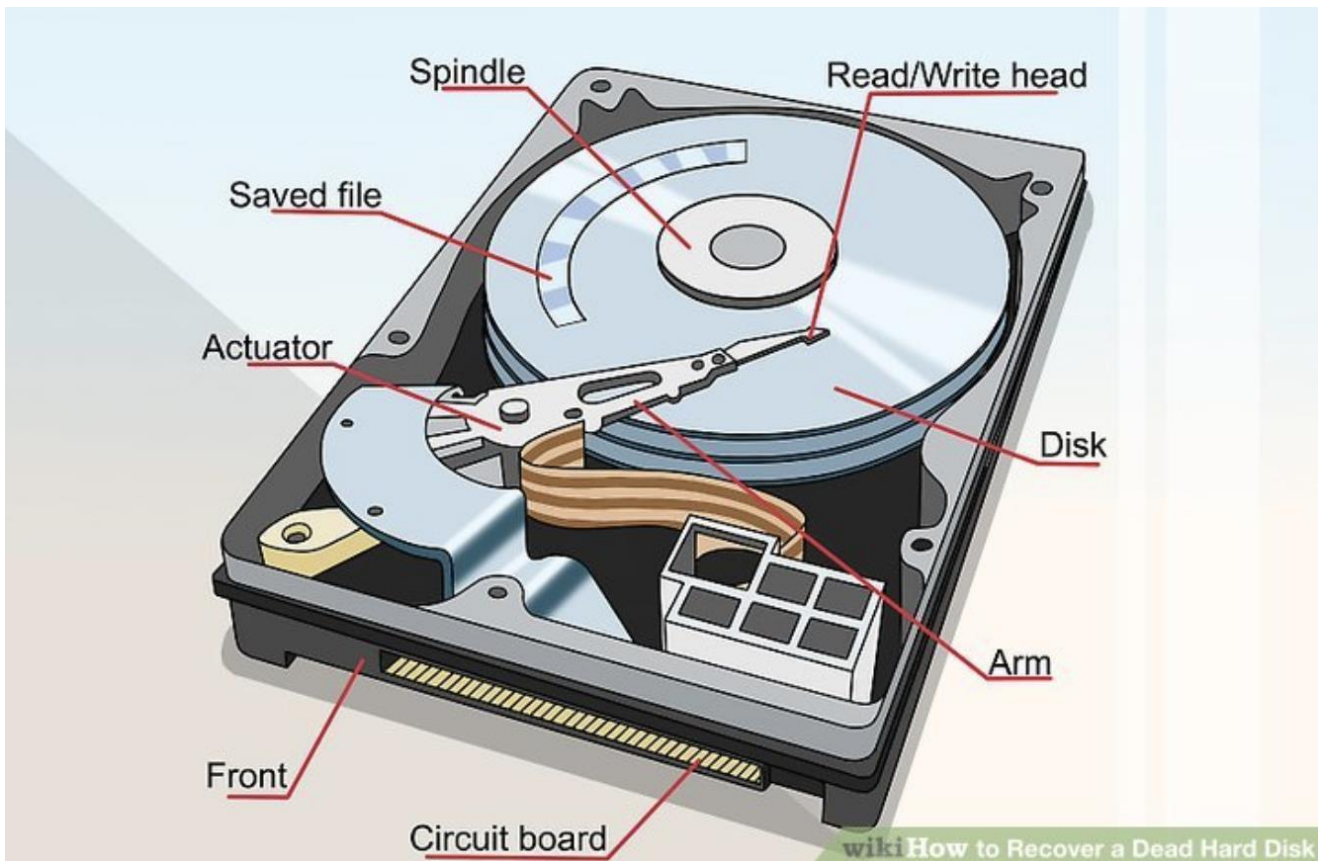
Data is stored in binary form on secondary storage devices.

Magnetic devices

Devices such as hard disk drives use magnetic fields to magnetise tiny individual sections of a **metal spinning disk**. Each tiny section represents one bit. A **magnetised section** represents a binary '1' and a **demagnetised section** represents a binary '0'. These sections are so tiny that disks can contain **terabytes** (TB) of data.



The diagram shows how data is stored in a hard disk.



As the disk is spinning, a **read/write head** moves across its surface. To write data, the head magnetises or demagnetises a section of the disk that is spinning under it. To read data, the head makes a note of whether the section is magnetised or not.

Magnetic devices are:

- fairly cheap
- high in capacity
- durable
- susceptible to damage if dropped
- vulnerable to magnetic fields (a strong magnet might erase the data the device holds)

Optical devices

Optical devices use a laser to scan the surface of a spinning disc made from metal and plastic. The disc surface is divided into tracks, with each track containing many flat areas and hollows. The flat areas are known as **lands** and the hollows as **pits**.

When the laser shines on the disc surface, land reflects the light back, whereas pits scatter the laser beam. A sensor looks for the reflected light.

Reflected light (land) represents a binary '1', and no reflection (pits) represents a binary '0'.

Optical media also come in different types:

- **ROM** media have data pre-written on them. The data cannot be overwritten. Music, films, software and games are often distributed this way.
- Read (**R**) media are blank. An optical device writes data to them by shining a laser onto the disc. The laser burns pits to represent '0's. The media can only be written to once, but read many times. Copies of data are often made using these media.
- Read/write (**RW**) media works in a similar way to R, except that the disc can be written to more than once.



Solid state devices

Most **solid state devices** use a type of **flash memory** to store data indefinitely. They tend to have **much faster access times** than other types of device and, because they have no moving parts, are **more durable**.

Since this type of memory is **expensive**, solid state devices tend to be **smaller in capacity** than other types. For example, a solid-state drive that holds 256 gigabytes (GB) might be of a similar cost to a hard disk with several terabytes of capacity.

Solid state devices require **little power**, making them ideal for **portable devices** where battery life is a big consideration. They are also portable due to their small size and durability.



Cloud storage

Storing data at a remote location online is known as **cloud storage**. When files and data are sent to the cloud, they are actually being sent to a **server** (or servers) connected to the **internet**.

Services such as Dropbox, Google Drive, Amazon Drive, OneDrive, Box and iCloud are examples of cloud storage. Files can be uploaded to a folder system and downloaded as required.

Exercise

- 1) Mention two reasons why secondary storage is used.
- 2) Consider a hard disk with a pen drive
 - a) Which of the two normally holds most data?
 - b) Which of the two is the fastest?
- 3) Say which of the following devices is magnetic, optical or solid-state.
 - a) CD
 - b) Hard disk
 - c) Pen drive
 - d) Blu-ray disc
 - e) SSD
- 4) How is a hard-disk organized to hold data?
- 5) What is the difference between the following optical devices:
 - a) CD ROM
 - b) CD-R
 - c) CD-RW
- 6) Write down the capacity of the following optical storage devices:
 - a) CD

- b) DVD
- c) Blu-ray disc
- 7) State two advantages and two disadvantages of solid-state devices.
- 8) What is cloud storage?
- 9) A shop is selling the following secondary storage devices at the price indicated. Calculate the price per megabyte of each.

Device	Capacity	Price
Hard-disk	4 TB	€170
Pen drive	128 GB	€27
SSD	2 TB	€230