

**Primary storage** is fast; however, it has some disadvantages. **RAM** is **volatile** (has to be constantly powered) and **ROM** cannot store anything new as it is **read only**.

**Secondary storage** is a **non-volatile** form of memory. Different storage devices have a number of different characteristics.

- **Technology** – magnetic; optical; solid state
- **Capacity** – the amount of storage space for data
- **Speed or data rate** – how much data can be transferred per second
- **Portability** – how easy it is to be transported
- **Durability** – how robust it is
- **Reliability** – how long will it work without failing

Devices such as **CD drives** and **DVD drives** require **CDs** and **DVDs** that are removable from the device. These are known as **storage media**.

Storage device	Description	Data
<b>Magnetic hard disk drive</b>	One or more <b>platters</b> (rotating disks) are coated with a magnetic material. A <b>drive head</b> connected to an <b>actuator</b> moves to the location of the data as required. The platter is rigid which is why they are called <i>hard</i> disks.	Technology: Magnetic Capacity: 200GB~2TB Data rate: 50-150MB/s + seek time Portability: Somewhat if in a case Durability: Reasonable if in a case Reliability: Can suddenly fail; mechanical parts
<b>CD-ROM; CD-R; CD-RW; CD-RAM</b>	<b>Compact discs (CDs)</b> originally were read only ( <b>CD audio; CD-ROM; CD-R</b> ). CD-Rs were blank and could be written to once. <b>CD-RW</b> and <b>CD-RAM</b> could be written to more often; however, data rates were slow. CDs have a reflective layer encased in two rigid plastic layers. A laser beam is reflected by the disk.	Technology: Optical Capacity: 650MB~700MB Data rate: 120KB/s~4MB/s Portability: Very portable Durability: Can be scratched Reliability: 20 years if looked after; very short if scratched
<b>DVD – Digital versatile disc</b>	<b>DVDs</b> use a laser with a shorter wavelength. They can also have two layers on each side of the disk.	Technology: Optical Capacity: 4.7GB per layer Data rate: 1MB/s~30MB/s
<b>Flash memory</b>	<b>Flash memory</b> is used in portable devices, <b>SD cards</b> , <b>USB flash drives</b> and increasingly as solid state drives. They are more expensive than hard disks but reliable and portable. They tend to have good reliability as there are no moving parts.	Technology: Solid state Capacity: 256MB~4TB Data rate: 100MB/s~600MB/s Portability: Very portable Durability: Very durable Reliability: No moving parts; limit to number of writes before fails

**Cloud storage** is a method of storing data at a **remote location**. Magnetic hard discs or solid state storage will be fitted into **servers** anywhere in the world. The data may be stored at multiple **redundant** locations (**replicated**) so that it can be accessed faster if it is closer to the user and so that there are instantly accessible **backups** should one location fail. The term *cloud storage* does not tell us if the data is backed up or replicated, nor does it tell us where in the world it is located. It only tells us that the data is stored remotely and accessed via a **network**, usually the Internet.