

# Storage

## Introduction

In everyday computer use, we need a way to write data, rewrite data, store data when the computer is switched off and retrieve data the next time we switch our computer back on. We have already looked at system/primary memory:

- RAM allows us to write data and store it...but the data is lost when it is switched off (volatile).
- ROM allows us to store data when it has no power (non-volatile)...but we cannot write to it.

We therefore need another device/medium by which we can re-write data when we want AND store the data when the computer has no power. This is where SECONDARY STORAGE comes in!

## Storage Technologies:

### Magnetic storage

Magnetic storage uses different patterns of magnetisation in a magnetisable material to store data (tape/hard disk). Magnetised points on a pattern represents '1' and demagnetised points represent '0'



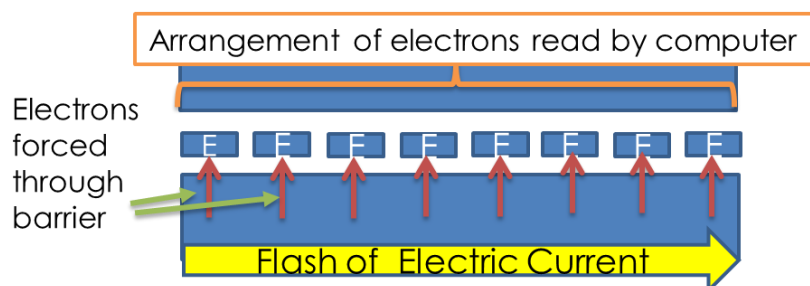
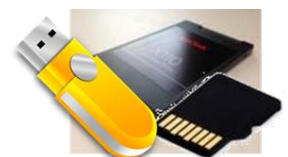
### Optical storage

Optical storage consists of 'marks' arranged in patterns. When writing to optical media the laser burns 'pits' into the shiny surface (land). When reading optical media a light (laser) is shined on its surface. When it hits land the beam reflects (0) but when it hits the pits, it doesn't (1).



### Solid State Storage (Flash)

They work by sending a large electric current to force electrons through a barrier and trapping them in position. The flash of the electric current used to achieve this gives us the name for this type of memory. The different arrangement of electrons gives us data.



## Magnetic Storage Performance



Hard Disk  
(Hard Drive)

<b>Use</b>	Desktop computers to store large files, programs and operating systems
<b>Capacity</b>	750GB – 3TB (3000GB) (Large)
<b>Speed</b>	High read/write speeds
<b>Portability</b>	Heavy / poor portability (even external are clunky!)
<b>Durability</b>	Dropping this device could cause damage, especially to the 'read head'
<b>Reliability</b>	Can be used again and again but does have a limited life (a good few years)
<b>Cost</b>	Low cost (quite cheap)



Magnetic  
Tape

<b>Use</b>	Backing up vast amount of data
<b>Capacity</b>	1 – 5TB (Very Large)
<b>Speed</b>	High write speeds BUT Slow read speeds
<b>Portability</b>	Fairly small and light (but reading device is not because if the data you need is at the end of the tape you have to read/play the tape from the start – which takes time (known as serial access))
<b>Durability</b>	Fairly durable.
<b>Reliability</b>	Can be used again and again.
<b>Cost</b>	Cheap

## Optical Storage



CD-ROM

<b>Use</b>	Storage of small media files and documents
<b>Capacity</b>	650MB (Small)
<b>Speed</b>	Moderate read/write speeds
<b>Portability</b>	Very portable and light
<b>Durability</b>	Fair durability, can survive the odd knock but scratches can damage the data.
<b>Reliability</b>	CD-Rs are write once but can be read over and over. (CD-RW can be reused)
<b>Cost</b>	Very cheap

BLU-RAY



DVD-ROM

<b>Use</b>	Storage of larger media files and documents
<b>Capacity</b>	4.37GB (DVD) 25GB (Standard Blu-Ray) (Small)
<b>Speed</b>	Moderate read/write speeds
<b>Portability</b>	Very portable and light
<b>Durability</b>	Fair durability, can survive the odd knock but scratches can damage the data.
<b>Reliability</b>	DVD-Rs are write once but can be read over and over.
<b>Cost</b>	Very cheap

## Solid State / Flash Storage



Solid State Drive

<b>Use</b>	Desktop computers, laptops and tablets to store large files, programs and operating systems
<b>Capacity</b>	64GB – 480GB (Moderate)
<b>Speed</b>	Super Fast (Read/Write)
<b>Portability</b>	Very portable (small and lightweight)
<b>Durability</b>	No moving parts so can survive knocks and scrapes
<b>Reliability</b>	Can be re-used many times (up to 100,000 times)
<b>Cost</b>	Very Expensive (per Gb)



Flash SD Card

<b>Use</b>	Phones, Cameras (portable devices) – great choice as no moving parts so mobile devices can function whilst on the move
<b>Capacity</b>	16GB – 64GB
<b>Speed</b>	Super Fast (Read/Write)
<b>Portability</b>	Extremely portable (small and lightweight)
<b>Durability</b>	No moving parts so can survive knocks and scrapes
<b>Reliability</b>	Can be re-used many times (up to 100,000 times)
<b>Cost</b>	Expensive (per Gb)



Flash Memory Stick

<b>Use</b>	Backing up or transferring documents, small media files from computer to computer
<b>Capacity</b>	1GB – 64GB
<b>Speed</b>	Super Fast (Read/Write)
<b>Portability</b>	Extremely portable (small and lightweight)
<b>Durability</b>	No moving parts so can survive knocks and scrapes
<b>Reliability</b>	Can be re-used many times (up to 100,000 times)
<b>Cost</b>	Expensive (per Gb)

## Network Attached Storage (NAS)



NAS Drive

<b>Use</b>	A stand alone external hard drive at the centre of a network. Plugs into the network to allow users of different computers to write or read files. Usually documents and media files.
<b>Capacity</b>	750GB – 3TB (3000GB) (Large)
<b>Speed</b>	Hard disk has high read/write speeds The network speed (transfer of data from computer to NAS) can cause slow data access speeds
<b>Portability</b>	Heavy / poor portability.
<b>Durability</b>	Dropping this device could cause damage, especially to the 'read head'
<b>Reliability</b>	Can be used again and again but does have a limited life (a good few years)
<b>Cost</b>	If Hard Disk is used then storage is cheap If SS Disk is used then storage is expensive In addition to the storage, the NAS enclosure can be very expensive depending on its features.

## Cloud Storage (online storage)

<b>Use</b>	Used to store documents and media files online. This means that you can go to another computer and access your files (providing you have internet access).
<b>Capacity</b>	Unlimited (providing you can pay for it).
<b>Speed</b>	Depends on network / bandwidth speeds Poor bandwidth can cause uploading and downloading of large files to take a long time
<b>Portability</b>	It is virtual so you don't have anything physical to move around.
<b>Durability Reliability</b>	Providing you keep up payments and the company looks after their storage devices – very durable and reliable. This is often because they back up storage devices in many places. There can be issues with the law as a company's data may be stored in a country which doesn't follow the same data protection laws. The hosting company could also be attached by hackers who could steal your data.
<b>Cost</b>	Can be expensive depending on the service – but often it is free for a few Gbs.



**Questions** (The question zone you choose must either match your target grade or be higher!)

**Question Zone 1-3**

1	2	3	4	5	6	7	8	9
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1. State the 3 different storage technologies. [3]
2. Describe how optical storage devices store data. [3]
3. What is the need for secondary storage if a computer system already has primary memory (RAM/ROM)? [3]

**Question Zone 4-6**

1	2	3	4	5	6	7	8	9
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1. What is the need for secondary storage if a computer system already has primary memory (RAM/ROM)? [3]
2. Which secondary storage technology would be most appropriate for a mobile phone? Explain your answer. [4]
3. Magnetic tape storage can store large capacities but there is a major drawback when it comes to reading data from this technology. Explain the drawback. [3]

**Question Zone 7-9**

1	2	3	4	5	6	7	8	9
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1. Magnetic tape storage can store large capacities but there is a major drawback when it comes to reading data from this technology. Explain the drawback. [3]
2. Explain which storage device is best suited to storing an operating system. [5]
3. Discuss the relative advantages and disadvantages of the 3 main storage technologies (optical, magnetic (hard disks), solid state). [5]





Stick answer sheet here

Reflections:

Score:

/

Percentage:

%

Grade:

Progress:

On / Above / Below

**What Went Well?:**

- I demonstrated a good level of understanding.
- I responded to the command words effectively.
- My answers were detailed / were written in depth.
- My work was well presented / legible.

- My answers effectively incorporated technical terminology.
- My responses were well structured / organised.
- My revision strategy was effective as I showed depth of understanding in my answers.
- My answers contained enough points / examples / explanations to achieve the marks available.

**Even Better If...:**

- My answers need to be more accurate.
- I must respond correctly to the command words.
- My answers need more detail / greater depth.
- I must take greater care over my work / write neatly.

- I must incorporate key terminology into my answers.
- I must better organise my answers to improve its clarity.
- I need to improve my revision strategy as I did not demonstrate a depth of understanding in my answers.
- My answers didn't contain enough points / examples / explanations to achieve the marks available.

**Further thoughts:**

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