

u3a Computing Group

Alan Hopwood, 3 November 2022

Agenda



Welcome

Current News, Issues and Questions

Topic List

Solid State Drives

Files and Folders

AOB and Follow up

Current News, Issues and Questions

Anything to discuss?

Topic List

Insert the topic using cloud storage (iCloud, OneDrive, Googledrive, Dropbox)?

Topic	votes
Communications within the home	4
Which apps are great	3
Solid State drives	3
Thunderbird email vs alternatives	2
Android - laptop integrations (connectivity)	2
How to select data on a tablet for later use	1
Unicode	
Computer alternatives e.g. Chromebook	

Probably make this “all about email clients”

Presentation

Solid State Drives

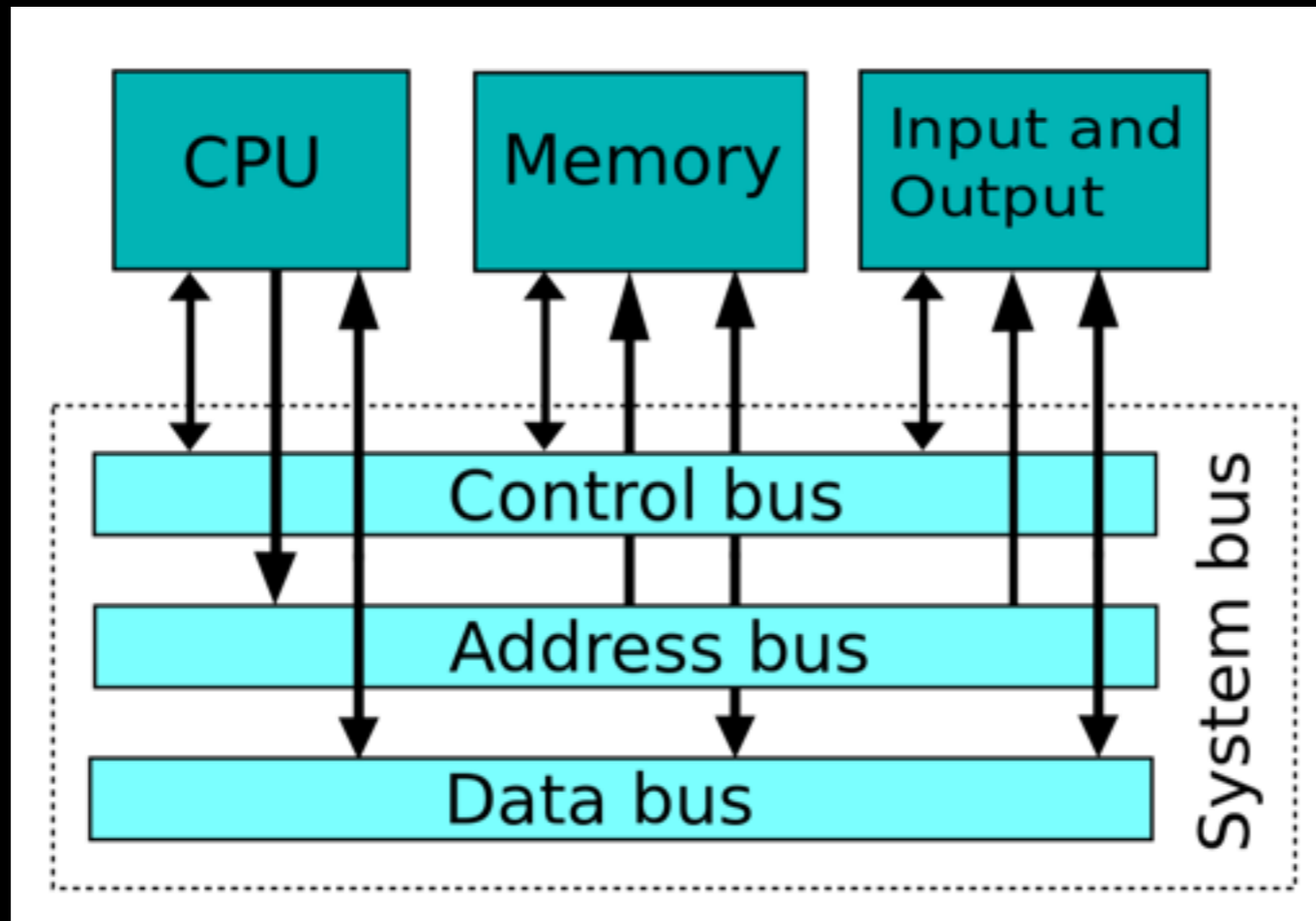
Presentation Agenda

Solid State Drives

- The (disk) drive in the computer system
- Memory types
- Traditional magnetic disks
- SSD performance
- Comparisons
- SSD in use
- Buying considerations

The Core Computer System

Solid State Drives

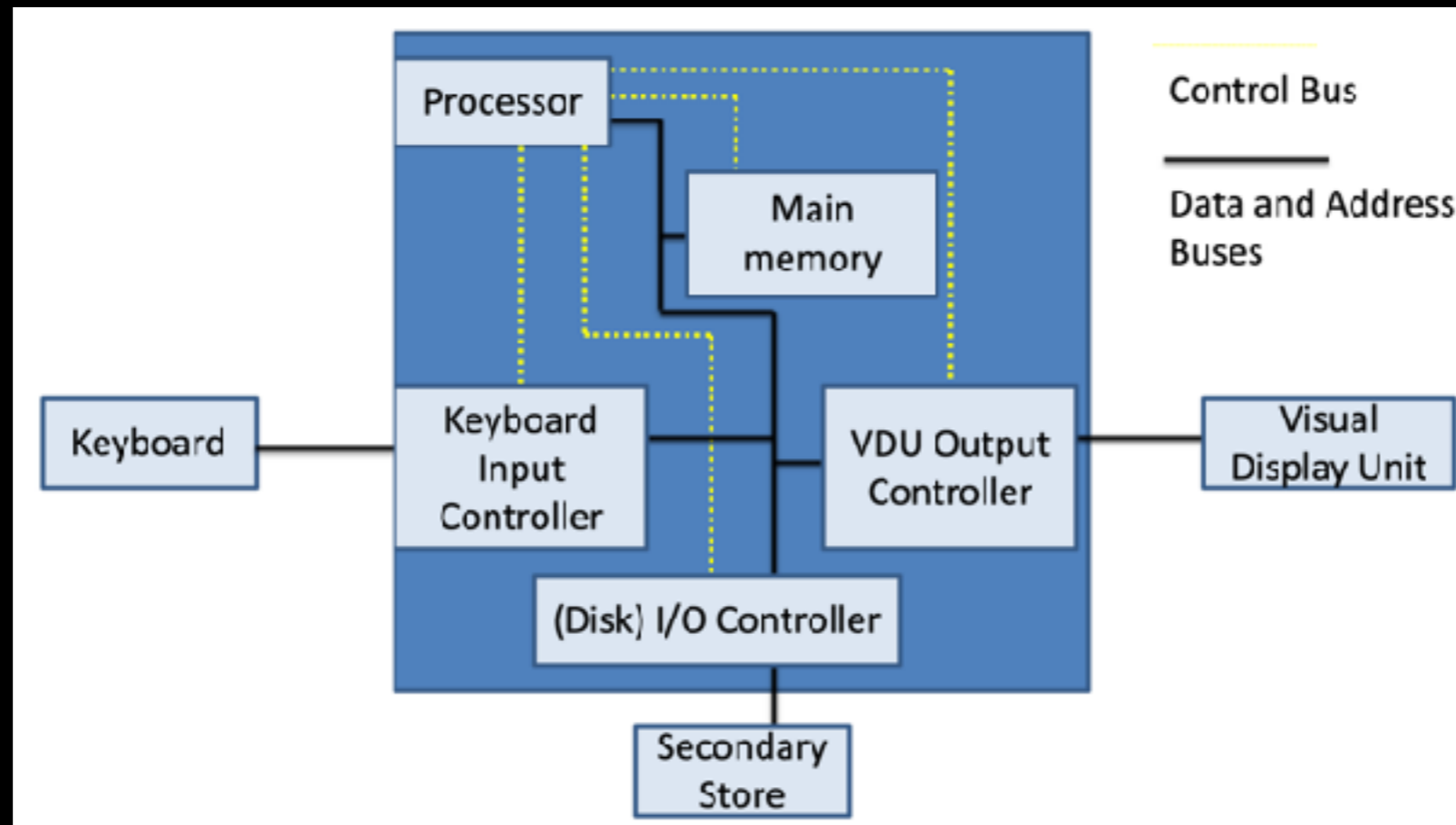


- In the core of a computer, the CPU has high speed access to main memory

Full computer system

Solid State Drives

- The disk drive is the secondary store



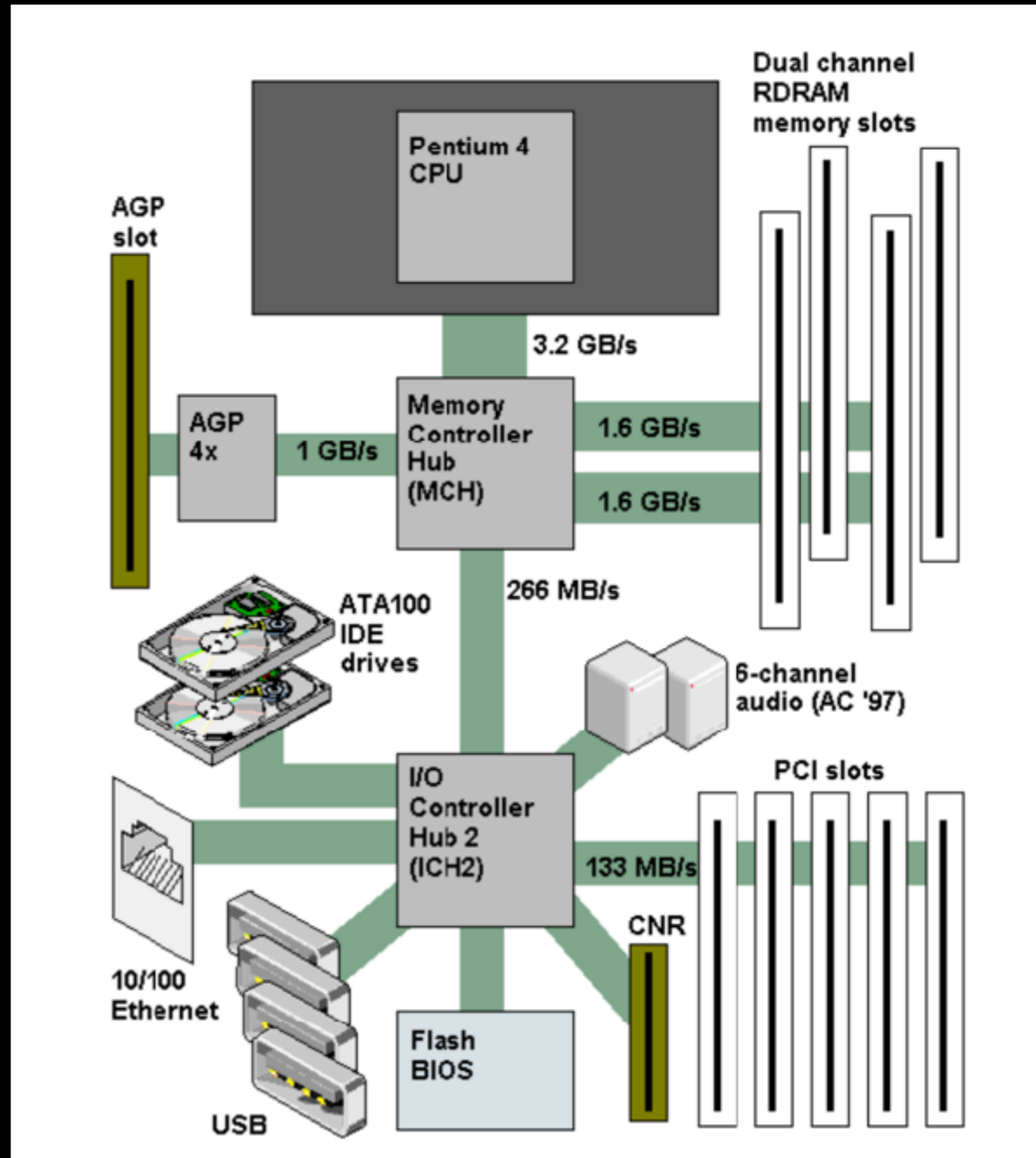
- To use data from a disk drive it is transferred into main memory through the i/o controller

Computer Constraints

Solid State Drives

- Limit of hardware / OS on address size. Windows 10 x86 is limited to 4GB while disk sizes exceed 750GB.
- Data transfer rates with the computer cover a range.
- USB - no longer universal. Various connectors & speeds
 - 12MBps
 - 60MBps
 - To 1GBps

(bps = bits per second
Bps = bytes per second)



Type of Memory

Solid State Drives

Volatile

- RAM: Random Access Memory - very fast but volatile, info disappears if powered off

Non-volatile

- ROM: Read only memory - data etched in during production
- EPROM: erasable programmable read-only memory - needs uv to erase data.
- EEPROM: electrically erasable programmable read-only memory

- External Memory = Hard Drive
- New varieties of non-volatile memory - flash memory, (usb sticks etc.)

The numbers

Solid State Drives

- 1 alphabetic character takes up 8 bits (01101011) or 1 byte (typically)
- A number takes up takes up 32 bits or 4 bytes (typically)
- 1 Byte = 8 bits
- 1 Kilobyte = 1,000 Bytes
- 1 Megabyte = 1,000 Kilobytes
- 1 Gigabyte = 1,000 Megabytes
- 1 Terabyte = 1,000 Gigabytes

The last year the Encyclopaedia Britannica was printed was 2010. That final edition consists of 32 volumes, weighs nearly 130 pounds, and contains approximately 50 million words and 300 million characters. It requires roughly one gigabyte (GB) of disk space to store the entire text of that final volume.

Traditional Hard Drive

Solid State Drives

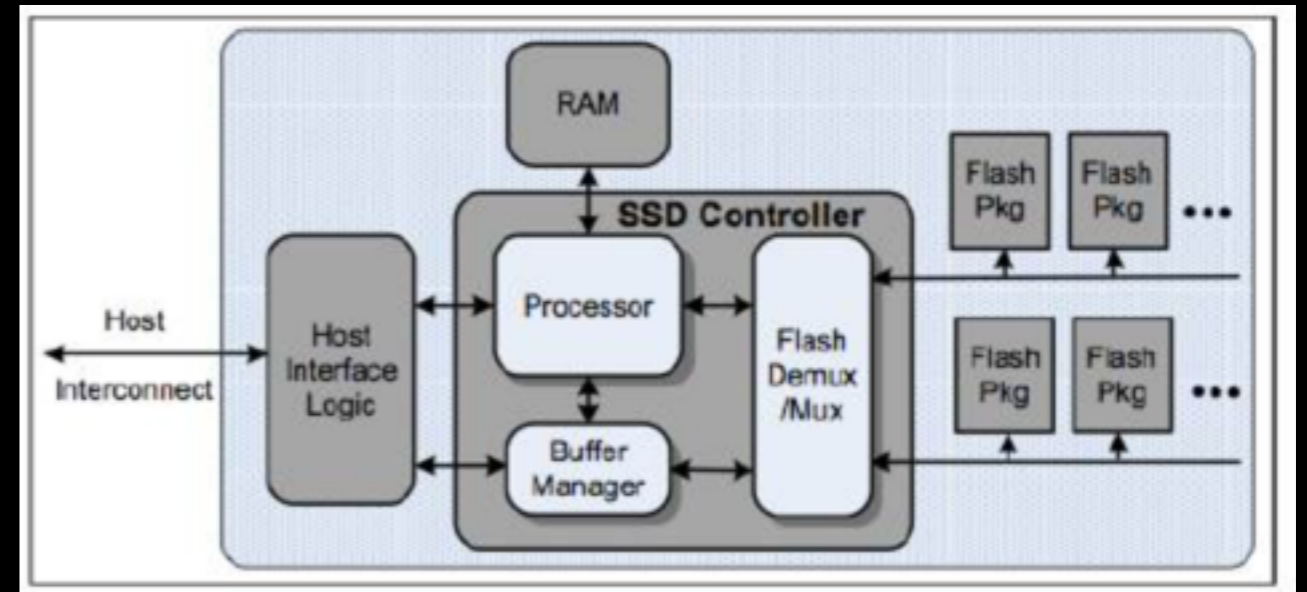
- Typical Hard Drive - 750 gigabytes
- magnetic disc
- read/write heads on arm hover over the disc



SDD

Solid State Drives

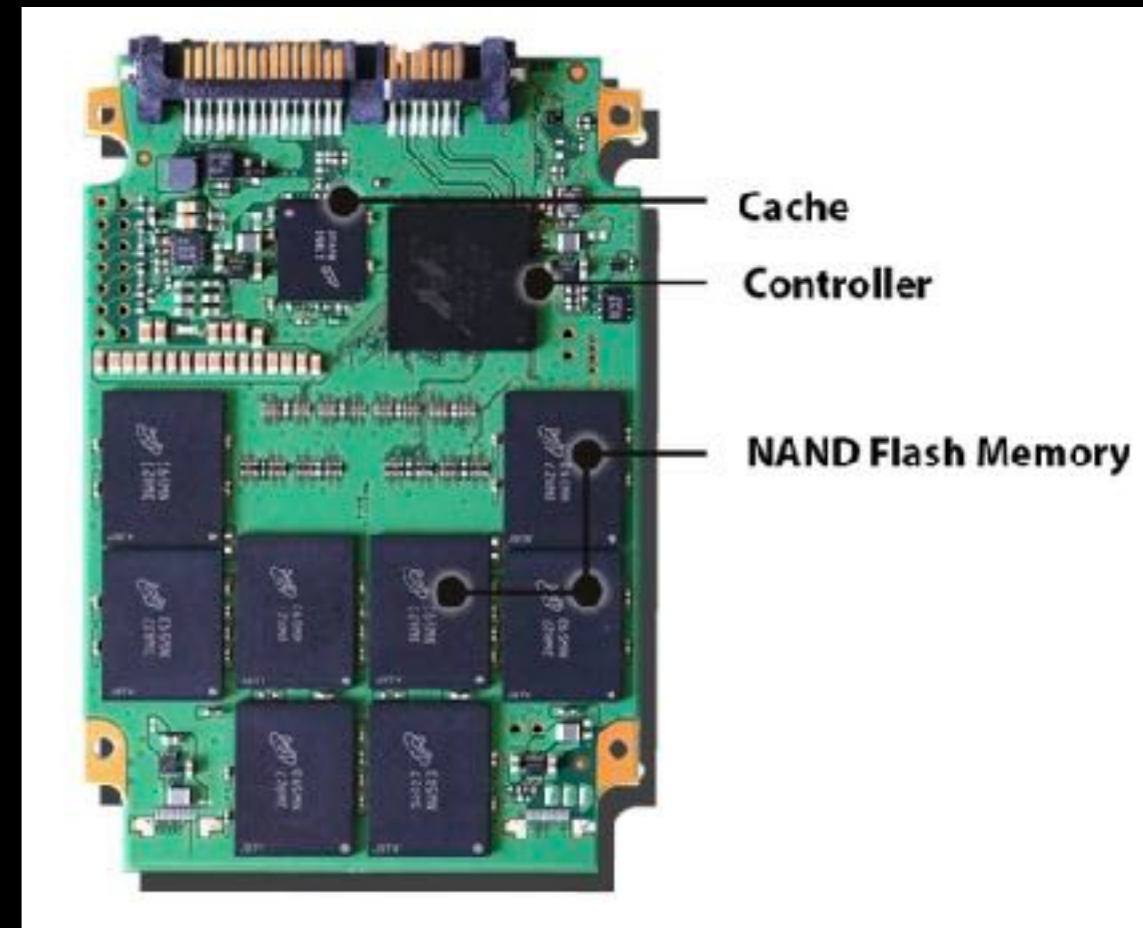
- No moving parts, but...
- Need a processor to manage the write, read and erase processes
- Example: cannot erase individual cells because neighbours will be impacted. Need to move retained data and erase page at a time.



For the Closet Geeks

Solid State Drives

- Almost all types of SSDs use NAND flash memory.
- Flash refers to a non-volatile solid state memory that retains data even when the power source is removed
- A cell is programmed and erased by applying a voltage to send electrons through an insulator and back.
- The location of those electrons determine when current will flow, determining the data stored in that cell (the 1s and 0s)
- Sending electrons through the insulator and back, causes the insulator to wear and limits life.



SSD Speeds

Solid State Drives

SLC, MLC, TLC are types of SDD

	SLC	MLC	TLC	HDD	RAM
P/E cycles	100k	10k	5k	*	*
Bits per cell	1	2	3	*	*
Seek latency (μ s)	*	*	*	9000	*
Read latency (μ s)	25	50	100	2000-7000	0.04-0.1
Write latency (μ s)	250	900	1500	2000-7000	0.04-0.1
Erase latency (μ s)	1500	3000	5000	*	*

Speed in real Use

Solid State Drives

“To demonstrate the difference in speed between an HDD and a basic SSD, we upgraded a 6-year-old gaming PC. We replaced its HDD with a SATA SSD and performed a series of tests.

The results after switching to SSD storage are astounding:”

- Boot time
 - Before: 79 seconds
 - After: 17 seconds
- Gaming loading time (GTA V)
 - Before: 133 seconds
 - After: 25 seconds

Reliability 1

Solid State Drives

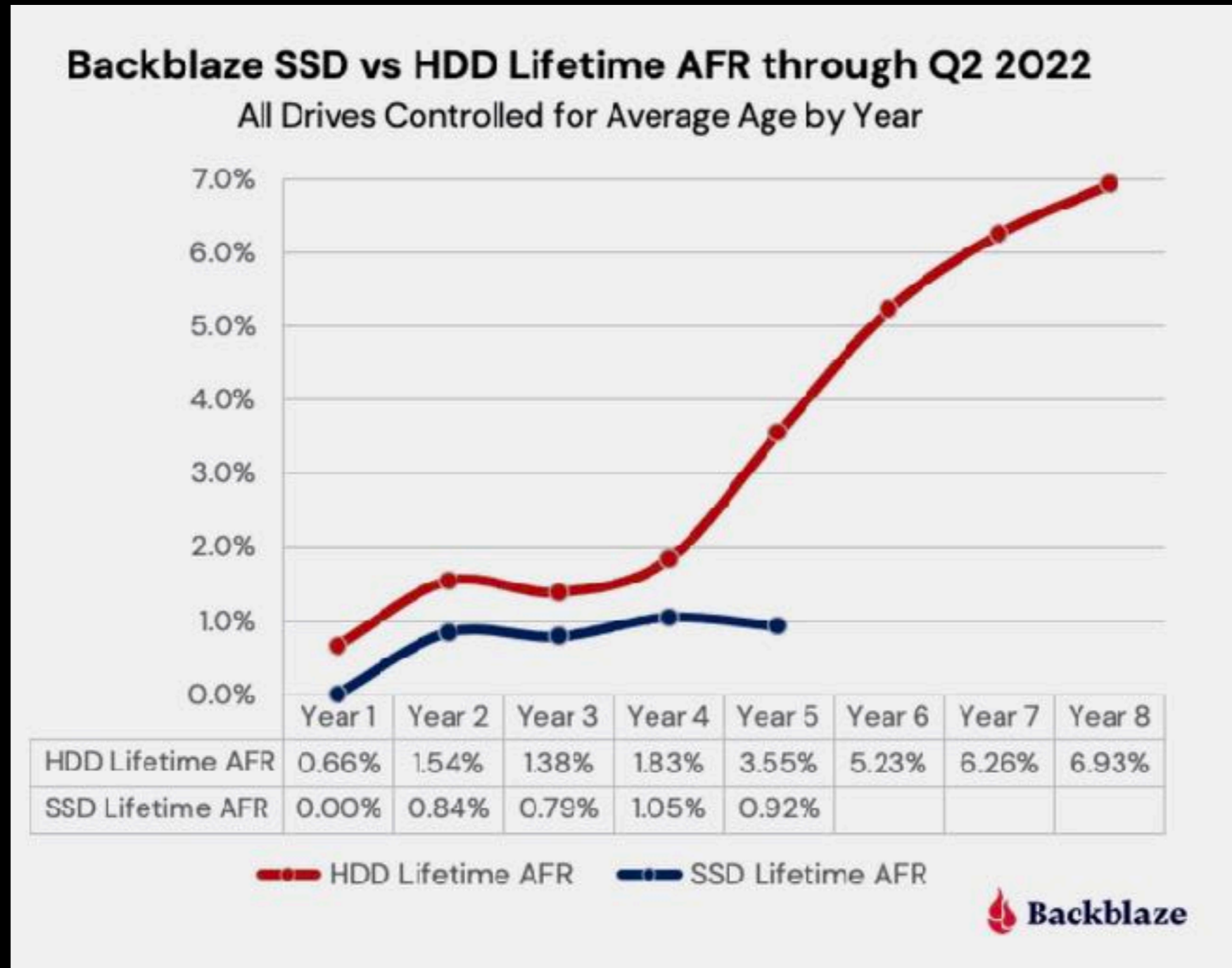
Considerations are different to HDDs

- Programmed and Erased Cycles: between 500 to 100,000 P/E cycles
- TBW- Terabytes written is the total amount of data that can be written to an SSD before it is likely to fail: Current warranties specify between 150 to 2,400 TBW
- MTBF (mean time between failures) - typically 1.5 million hours compared to 300,000 for an HDD

There are different performance and reliability criteria depending on whether the SSD will be used in a home desktop computer, a data center, or an exploration vehicle on Mars.

Reliability 2

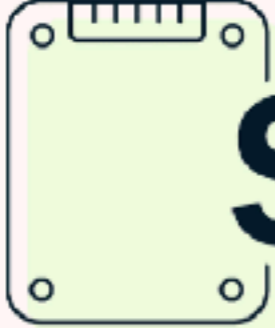

Solid State Drives



- Comparison of Average Failure Rate **HDD** to **SSD**

Comparison Overview

Solid State Drives

 SSD	vs	 HDD	
faster	✓	✗	slower
shorter lifespan	✗	✓	longer lifespan ?
more expensive	✗	✓	cheaper
non-mechanical (flash)	✓	✗	mechanical (moving parts)
shock-resistant	✓	✗	fragile
best for storing operating systems, gaming apps, and frequently used files			best for storing extra data, such as movies, photos, and documents

Buying an SSD

Solid State Drives

- If replacing an internal drive, shape & connection must be compatible

SSD form factors



Buying an external SSD is straight forward

(From Computer Active Magazine)

Solid State Drives

PNY EliteX-Pro
0.5 to 4TB

1TB = £115
2TB = £212

Speeds up to 1.6
Gbps

USB-C & USB 3.0

REVIEWS

PNY EliteX-Pro 1TB

SOLID-STATE DRIVE | £115 from Amazon
www.snipca.com/43557

Up to speed

Many laptops are still a little light in the storage department. 256GB is about the minimum we'd recommend as your main drive for installing Windows on, though you'd still find SSDs as small as 128GB in the cheapest laptops until recently. If you're saddled with insufficient storage, an external drive is a sensible option.

This particular model is a 1TB portable SSD that connects to a laptop via a USB-C or standard USB port. It doesn't support the fastest Thunderbolt standards, so it's worth looking for a model that does if you have a Thunderbolt-compatible port (look for the lightning bolt symbol on the port). For anyone else this is a nippy, affordable storage solution.

It comes in four capacities (500GB, 1TB, 2TB and 4TB), but the 1TB version we've reviewed here costs £115, which is good value for money, even though the £212 2TB model offers the best value in terms of cost per gigabyte.

In tests we saw read speeds of up to 1.69Gbps and write speeds of 1.61Gbps. This is a solid return for a non-Thunderbolt drive, and should be able to handle any job you throw at it, including running installed software.



SPECIFICATIONS

USB-C port • USB-C and USB 3.0 cables provided • 500GB, 1TB, 2TB or 4TB capacities • 11x65x58mm • 105g • Three-year warranty www.snipca.com/43557

VERDICT

A fast, portable SSD that's ideal for PCs running low on storage or that travel a lot

Nothing lasts forever

Solid State Drives

SSDs will eventually fail. There are usually advance warnings of when that's going to happen, but not the noisy disk alert. The warning signs are:

- Errors Involving Bad Blocks. System gives error message
- Files Cannot Be Read or Written. system detects the bad block
- The File System Needs Repair message.
- The Drive Becomes Read-Only

Questions & Clarifications

Solid State Drives

- Any Questions?

Computing Fundamentals

Introduction to Files & Folders


Coverage

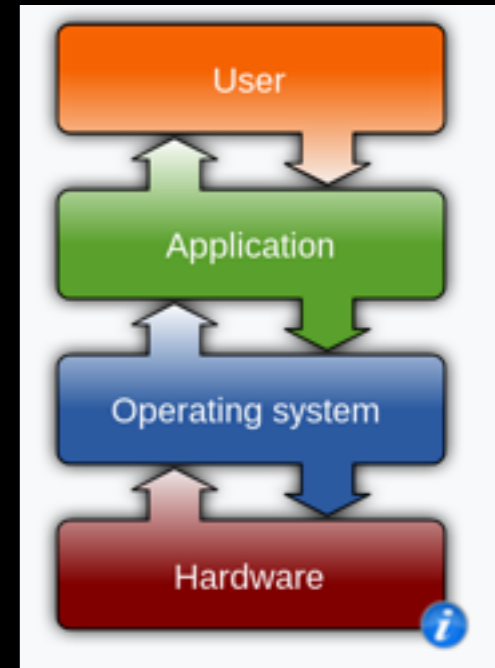
Files & Folders

- What are files for?
- File specifications
- File naming (extensions)
- File meta data
- Opening files
- Saving files
- Finding files

Introduction

Files & Folders

- All information, the data, documents and software saved on a computer are stored as individual files.
- Files are the basic unit of storage.
- Windows (and other OS's) try to help you deal with files by:
 - Displaying known file types as familiar icons 
 - Allowing files to be organised in hierarchies of folders
 - Providing a starter set of folders to hold different types of files - with folders for system files and applications as well as documents, photos, music etc.
 - Hiding files that aren't of general interest
- The actual location of files *within a type of memory* is managed by Windows and you don't need to know.



File Specifications

Files & Folders

How does the application know information in the file is organised?

- In the early days every application developer defined a specific file structure to hold the information the application needs. (E.g. MS Word with .doc files)
- Later, applications developers built in capability to open the file types used by the market leading equivalent application.
 - Microsoft files for word processing, spreadsheet and presentations are de facto standards
- Standards bodies and open software groups have defined standard file specifications to enable interchange

File (Name) Extensions

Files & Folders

- File types are commonly identified by 2-4 characters at the end of the file name after a dot. E.g. myfile.PPT
 - Picture files: .bmp .gif .jpg .png
 - Music and sound files: .mp3 .wav
 - Text and word processing documents: .doc .docx .rtf .txt .odt
 - Spreadsheet files: .xls .xlsx .**csv** .ods
 - Webpage: .htm .html
 - Template extensions: .dot .dotx .xlt .xltx .pot .potx
 - Portable Document Format: .**pdf**
- They identify the type of file for the app...and you.
- e.g. bnp vs. jpg
- Templates
- pdf usage
- Extensions now hidden and icons used

File Meta Data

Files & Folders

- Meta Data is information about the file
- File Name Extension is a form of meta data
- Some is held outside the file e.g. time last modified, size, and typically doesn't transfer with a file.
- Some is built into file structure e.g. jpg can contain "Exchangeable Image File Format"

Camera manufacturer	Canon
Camera model	Canon EOS 1200D
Author	Praveen. P
Exposure time	1/60 sec (0.0166666666666667)
F-number	f/11
ISO speed rating	200
Date and time of data generation	22:29, 22 November 2018
Lens focal length	41 mm
Show extended details	

Opening Files

Files & Folders

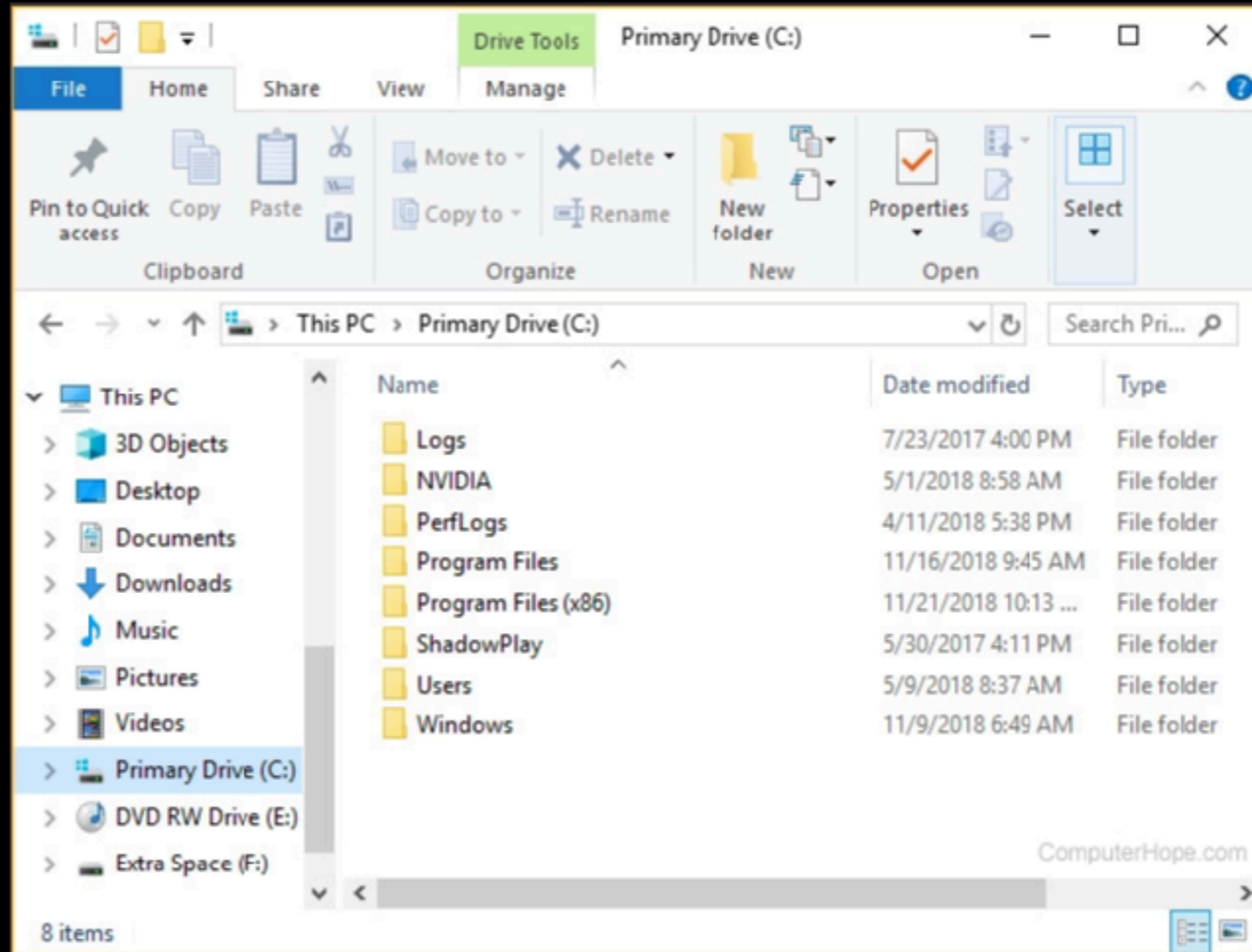
- (Obviously) can use your application to open a file
 - Only recognised file types will open
 - Normally, unrecognised files will grey out
- From File Explorer
 - Windows keeps a record of your preferred application for “known” file types
 - If it doesn't know which application to use, it will ask you to select.

File Explorer

Files & Folders



- Windows provides File Explorer as a tool to manage your file storage.
- Create a set of folders and subfolders so that you will know where to look for the file saved 3 weeks ago.
- Do story Documents in folders within documents - photos, Music etc. Folders are set up to deal with those types of files



Saving files

Files & Folders

- Applications usually set up to save files where the last file was saved. If in doubt, browse
- Your most used folder is your documents folder (in users/yourname/)
- Save as: applications often allow you to save files in older formats or standard interchange formats - useful if sending to someone with an older pc or who uses different application.
- Export: Similar to save as except there is more of a transformation going on.

Finding files

Files & Folders

- Applications will generally show the most recently used files.
- File Explorer “Home” icon shows folders - Quick Access, Favourites, Recent: to help find your most used files.
- Search: In File explorer search is very powerful.
 - Searches the area selected
 - Searches file names and content
 - hover over the result shows the file path (so that you can see where it found the result)

Questions & Clarifications

Files & Folders

- Any Questions?

AOB

- AoB: Would anyone like to raise anything?
- Meeting Follow up - notes etc.
- Meeting review: More, Less, Continue?

Thank You