

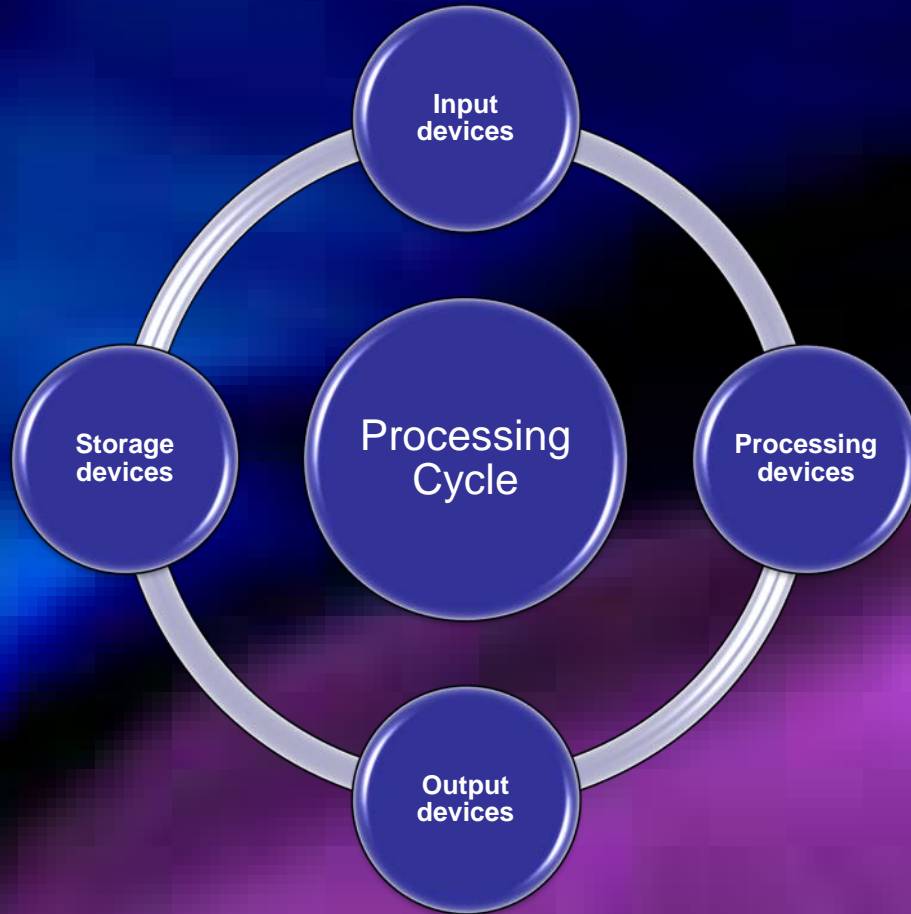


# Storage devices

or "Secondary Storage"

# The personal computer system uses the following hardware device types -

- Input devices
- Processing devices
- Output devices
- Storage devices



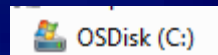
**to complete the processing cycle**

# Drives .... What are they?

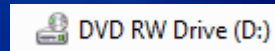
- Personal Computers have drives (or storage devices).
- A disk drive is a storage device that allows a permanent copy of current digital data as well as permanent storage of the programs required to manage that data.

# What are drives called?

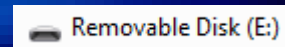
- Hard disk drive C: = HDD



- DVD or CD Rom drive

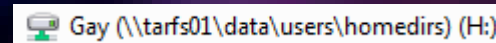


- Removable disk drive

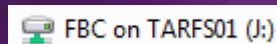


*These drives might  
NOT be D and E on  
your machine!*

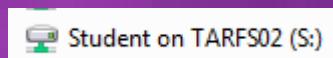
- Home drive at EIT H: = personal storage area on EIT's server  
TARFS01



- Network drive at EIT J: = shared storage area on the server  
named TARFS01



- Network drive at EIT S: = shared storage area on the server  
TARFS02



# What is a HARD DISK DRIVE?

- Hard Drives give computers the ability to remember things when the power goes out – they are non volatile
- In everyday use, the terms "hard disk," "hard disk drive," and "hard drive" are all used interchangeably, because the disk and the drive mechanism are a single unit.

– PERMANENT STORAGE OF  
DATA & PROGRAMS



# HDD

- Hard drives use a set of rotating, magnetically coated disks called platters to store data or programs
- Storage of data or programs is organised in sectors (pie-shaped wedges) and tracks (concentric circles). This process is called formatting a drive.
- The whole hard drive unit is sealed to prevent airborne contaminants (eg dust, smoke) from entering
- Light on system unit shows disk is being accessed
- Connected by a cable to the motherboard
- Hard disks are very reliable, but they do fail, and usually at the most inconvenient moment. Backups are VERY IMPORTANT!



# How does a drive work????

- read-write head moves back & forth over the platters looking for the file to be opened
  - floats on a cushion of air from 10 to 25 millionths of an inch thick so that the heads never come into contact with the recording surface
- access arm finds the file, copy of the data is placed in RAM – time taken measured in milliseconds
- after processing data is copied back to disk using read-write head



# So what is important about HDD?

- Speed
- Capacity



# Speed ... what does speed mean?

- Speed is measured in RPM (revolutions per minute of platter rotation)
  - Typical laptop drives spin at 5400 – 7200 RPM
  - Typical desktop drives spin at 7200 RPM
  - Server based platters might spin at 15,000 RPM
- Disk rotation (speed) is a critical component of hard drive performance because it determines how quickly the read/write heads move to retrieve data (open a file, start an application, for example)
  - The faster the disk spins, the more data passes under the magnetic read/write heads that read the data, and the faster the particular piece of data will be found
  - The higher the rotation speed, the faster the data is transferred from the HDD to main memory (RAM) so that your computer can begin work



# Sequential v Random

- Sequential read/write speeds are excellent indicators of hard drive speeds when it comes to moving large files (eg computer games, videos, photo collections, music libraries), installing programs and running large programs (eg computer games, video editing software, databases).
- Random read and write speeds are measured in IOPS (Input/Output Operations Per Second) A hard drive with higher IOPS numbers is more responsive and able to multi-task better. For example, you can run a virus scan, download files, play a movie and open 20 web browser windows at the same time without hiccups.
- - See more at: <http://www.buildcomputers.net/ssd-vs-hdd.html#sthash.zEeDajAK.dpuf>

# Capacity ... what is it?

- Your primary consideration should be storage capacity
  - Hard disks range in storage capacity from a few tens of megabytes to several gigabytes of storage space, or several terabytes of storage space
    - Remember ... Hard disks are very reliable, but they do fail, and usually at the most inconvenient moment ... you don't want to lose all your data and programs! The bigger the disk, the more important a well-thought out backup strategy becomes.
  - A **megabyte** is a unit of information or computer storage equal to one million characters or bytes
  - A **gigabyte** is a unit of information or computer storage equal to one billion (meaning a thousand million) characters or bytes

# Solid State Drive

- An SSD (solid-state drive or solid-state disk) is a non-volatile storage device that stores data on solid-state flash memory. Provides the same functionality as an HDD.
- SSD is like an oversized memory stick; there are no moving parts to an **SSD**.
- SSD devices embed silicon-based memory chips as the storage media for the writing and reading of data
- Why is SSD quicker than HDD?
  - A hard disk **drive** uses a mechanical arm with a read/write head to move around and read information from the right location on a storage platter. SSD requires no mechanical movement to get information. This difference is what makes **SSD** so much faster.



SSD Top Side

SSD Bottom Side

# SDD v HDD comparison

Attribute	SSD (Solid State Drive)	HDD (Hard Disk Drive)
Power Draw / Battery Life	Less power draw, averages 2 – 3 watts, resulting in 30+ minute battery boost ✓	More power draw, averages 6 – 7 watts and therefore uses more battery
Cost	Expensive, roughly \$0.20 per gigabyte (based on buying a 1TB drive)	Only around \$0.03 per gigabyte, very cheap (buying a 4TB model) ✓
Capacity	Typically not larger than 1TB for notebook size drives; 4TB max for desktops	Typically around 500GB and 2TB maximum for notebook size drives; 10TB max for desktops ✓
Operating System Boot Time	Around 10-13 seconds average bootup time ✓	Around 30-40 seconds average bootup time
Noise	There are no moving parts and as such no sound ✓	Audible clicks and spinning can be heard
Vibration	No vibration as there are no moving parts ✓	The spinning of the platters can sometimes result in vibration
Heat Produced	Lower power draw and no moving parts so little heat is produced ✓	HDD doesn't produce much heat, but it will have a measurable amount more heat than an SSD due to moving parts and higher power draw
Failure Rate	Mean time between failure rate of 2.0 million hours ✓	Mean time between failure rate of 1.5 million hours
File Copy / Write Speed	Generally above 200 MB/s and up to 550 MB/s for cutting edge drives ✓	The range can be anywhere from 50 – 120MB / s
Encryption	Full Disk Encryption (FDE) Supported on some models ✓	Full Disk Encryption (FDE) Supported on some models ✓
File Opening Speed	Up to 30% faster than HDD ✓	Slower than SSD
Magnetism Affected?	An SSD is safe from any effects of magnetism ✓	Magnets can erase data

# What's best for you?

- An HDD might be the right choice if:
  - You need lots of storage capacity, up to 10TB
  - Don't want to spend much money
  - Don't care too much about how fast a computer boots up or opens programs - then get a hard drive (HDD).
- An SSD might be the right choice if:
  - You are willing to pay for faster performance
  - Don't mind limited storage capacity or can work around that (though consumer SSD now go up to 4TB and enterprise run as high as 60TB)

# Other hard drives

- **External hard drive**
  - Plugs into mains power
- **Portable hard drive**
  - Plugs into USB port



- Can store massive amounts of data (5 Tb) for relatively small cost

# Other storage devices



# Optical disk drive

- Hardware that can read/write to the following:
  - CDs
    - CD-R or CD-RW
  - DVDs
  - BDs (Blu-ray discs)
    - Uses a laser beam to write digitally onto the disk
- Connected by cable to the motherboard
- USB portable CD ROM drive also available if you do not have a built-in optical disk drive



# USB FLASH DRIVE

- Fast, portable, small or large storage capacity
- Allows data to be input (transferred) from one device to another

If you find one, don't plug it in to see what is on it – it may have a virus on it!!!



# Memory Cards

- Versatile memory cards that are used in several types of digital devices; including digital cameras, digital music players, digital voice recorders and many other devices that store digital information.
- Information on the memory card can be input (transferred) from one device to another using a card reader.



# End of presentation

Next steps

Go back to the workbook

You will see that there are Study Notes on the Storage devices