

Day 3	Storage Devices + Types of Memory + Measuring Memory + Computer Performance	11-10-2015 12-10-2015
--------------	---	--

Storage Devices

Storage capacity uses several terms to define the increasing amounts of data that can be stored.

1 bit	The amount of storage space needed to hold either 1 or 0 in memory (binary numbering). This is the smallest unit of computer memory.
1 byte	Equal to 8 bits, this is the amount of storage space needed to hold one character.
1 kilobyte (k)	1024 bytes.
1 Megabyte (Mb)	1024 k bytes
1 Gigabyte (Gb)	1024 M bytes
1 Terabyte (Tb)	1024 G bytes

Examples of Storage Devices



Examples of Storage Devices (continued)

1. Information is saved to the **Hard Disk Drive (HDD)** and remains there ready to be retrieved at some future date. Applications software packages or programs are also stored on the hard disk.



- **HDD** can contain many Gigabytes of information, and the capacity of the HDD supplied as standard with a PC is rising continuously and quickly. A PC will usually be sold with a single HDD as an internal component; however, it is possible to purchase additional HDDs to increase storage capacity.

Examples of Storage Devices (continued)

- The average multimedia PC currently (2014) on sale will have an internal HDD of at least 8TB. A supplementary HDD can be added as an internal or external unit, the external drive unit being significantly more expensive. Cost increases with capacity. As of March 2015, available capacities for external hard disk drives range from 500 Gb to 10Tb.
- The access time of a HDD is measured in milliseconds (msec). This is the time required by a hard drive to search for, identify and process data saved on the disk. In general, larger capacity hard drives tend to have faster access times than smaller ones. Also; the larger and faster the drive, the higher the cost.

Examples of Storage Devices (continued)

2. A **Floppy Disk Drive (FDD)** uses floppy disks (portable diskettes) to store information in a similar way to a hard drive. The most common type of floppy disk is the 3½”, which can store 1.44Mb of data. Information can be saved on to a floppy disk to create a backup (a second copy) of important files in case the original is damaged or deleted, or carried from one computer to another, to copy or open information on a different machine.



- Floppy disks are a cheap and simple form of removable storage media.

Examples of Storage Devices (continued)

3. **C**ompact **D**isks (**CD**-ROM) have been used for some years as storage devices for computer software, as Read Only Memory.
- CD-ROMs were originally able to store 650Mb of information (approximately 75 min of music).
 - CD-ROMs are typically used to store data which does not need frequent updating, e.g. computer programs, clipart, graphics files, complete libraries of reference material, etc.
 - Compact Disks may be CD-R (Recordable) and CD-RW (Rewriteable). The difference being that CD-R disks can only have data saved to them once, so that data becomes permanently burnt, while CD-RW disks allow us to remove old data and store new data.



Examples of Storage Devices (continued)

4. Already **Digital Versatile** (or **Video**) **Disk (DVD)** are basically specialist drives and disks with a storage capacity of approx. 4-5 Gb, which can used to store audio, video or computer program data.



5. **Flash Drive** is a storage module made of flash memory chips. Flash disks have no mechanical platters or access arms, but the term “disk” is used because the data are accessed as if they were on a hard drive. The disk storage structure is emulated. Its capacity reach 1Tb at 2015.



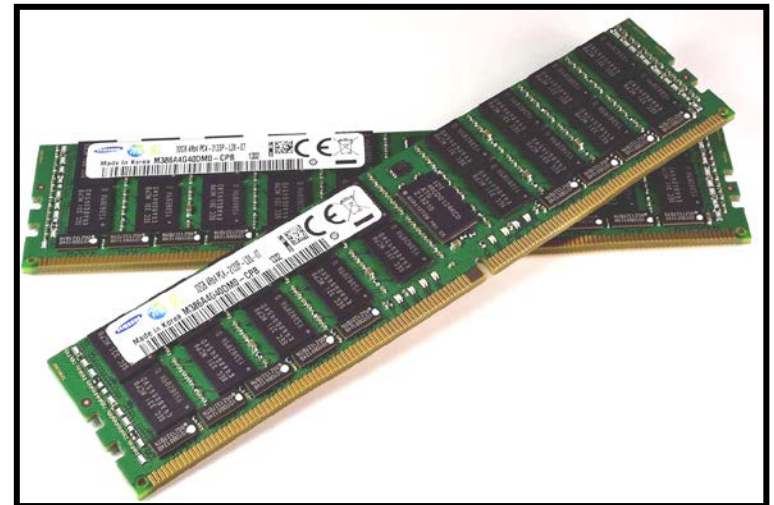
Examples of Storage Devices (continued)

6. **PC Cards** is I/O device that fits into a personal computer, usually a notebook or laptop computer. Probably the most common use of a PC Card is the telecommunications modem for notebook computers. Its capacity reach 200Gb at 2015.



Types of Memory

- **Random Access Memory (RAM)** or Main Memory is used to store information such as a text document or a software program that is currently in use by the PC. The CPU must transfer information to RAM before software can manipulate it, e.g. the operating system software must be loaded from the HDD to RAM when a computer starts up and both the necessary software and appropriate files must be loaded into RAM before processing can be performed.
- Memory chips, however, work only if there is a source of electricity, so that when the computer is switched off everything in the RAM is lost. This is known as volatile memory.



- The RAM available for PCs is currently available in modules of 128, 256 or 512 Megabytes of memory. Available capacity reaches of RAM in 2015 as 32 Gb.
- **Read Only Memory (ROM)** or Secondary Memory is chip used to store important information that the CPU needs in order to keep the PC running. Information stored within ROM can only be read by the CPU and not manipulated or changed. ROM retains this information after the power is switched off, e.g. the machine start-up software is stored here, so that when the PC is switched on again the software is immediately available to be used again and again. This type of memory is non-volatile.

Measuring Memory

Units of Computer Memory Measurements:

Bit	1 Bit = 0 or 1
byte	1 byte = 8 Bit
1 kb = 1024 b	1 kilobyte = 1024 bytes
1 Mb = 1024 kb	1 Megabyte = 1024 kbytes
1 Gb = 1024 Mb	1 Gigabyte = 1024 Megabytes
1 Tb = 1024 Gb	1 Terabyte = 1024 Gigabyte
1 Pb = 1024 Tb	1 Petabyte = 1024 Terabyte
1 Eb = 1024 Pb	1 Exabyte = 1024 Petabyte
1 Zb = 1024 Eb	1 Zettabyte = 1024 Exabyte
1 Yb = 1024 Zb	1 Yottabyte = 1024 Zettabyte
1 Bb = 1024 Yb	1 Brontobyte = 1024 Yottabyte
1 Geob = 1024 Bb	1 Geopbyte = 1024 Brontobyte

Characters are used to build up meaningful words, numbers and pictures, this collection of text, numeric and graphic information can then be saved with a given name, referred to as a file. Files can contain different amounts of data in many different forms, e.g. a memo, a report, a database containing records, a program or an image. The number of characters contained within a file will determine the amount of space or memory needed to save it. Some example file sizes are given below:

Small Memo (Microsoft Word)	15kb
10 page report with graphics	250kb
Photo Image(jpeg format)	20 - 300kb
50 page Manual with graphics	1 Mb
Microsoft Excel program	6 Mb
Computer Game	+ 600Mb

Computer Performance

- ❖ The user can judge the performance of a PC according to how quickly tasks are performed. There are a number of factors that determine the overall operating speed of a PC:
 - The clock speed of the CPU,
 - The capacity of the RAM,
 - The capacity and speed of the Hard Disk Drive,
 - The number of applications running.

- ❖ The speed of a system is determined by any component that causes a bottleneck *عنق الزجاجة* in the flow of data. A PC with the fastest available CPU (currently around Core *i7*) will not operate to its full potential if the machine only has 256Mb RAM and a small, slow hard drive. Similarly, a PC fitted with 2Gb RAM and 500Gb hard drive will not give its optimum performance if the CPU speed is 512MHz.

- ❖ The relative importance of all these factors will depend on the nature and number of the tasks being performed. A task involving thousands of complex calculations will depend heavily on CPU speed, whilst one involving huge quantities of data will be more affected by RAM size and HDD access times. Tasks involving the Internet will probably be restricted by modem speed.
- ❖ Although modern operating systems are designed to allow more than one application to be open and in use simultaneously, a large number of open applications will make enough demands on the CPU and RAM to produce a noticeable reduction in performance.
- ❖ For a PC to operate at its optimum speed the capability of all components needs to be carefully balanced.