

Data Storage

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WHAT'S COVERED

When data enters a computer it is immediately routed and stored in memory. If the data needs to be kept for future use, it must be saved to a storage device. Numerous options for storage are available for computers, each with their own set of advantages and disadvantages. In this tutorial, we will take a look at computer memory, the various storage options, and the capacities for each storage option.

Our discussion breaks down as follows:

1. How Data is Stored

In a computer, data sent to and read from the hard disk is initially read by the hard disk controller. The **hard disk controller** gives the processor access to read, write, and modify data on the hard disk, CD-ROM, flash drive, and any other storage device. If the operating system needs to read or write data to a storage device, it examines the storage device to determine where to read from (file location) or where to write to. After a read/write location is obtained, the hard disk controller tells the drive to read or write.

All data stored on a hard disk is done magnetically. If the computer needs to read data from the hard disk, it reads magnetic polarities from the hard disk. One side of the polarity is 0 (off) and the other side is 1 (on). The computer reads the 0 or 1 as binary data. Each 0 or 1 is referred to as a **bit** (a contraction of binary digit). This means that the computer reads data from its storage location as a binary number. For the computer to write information to the hard disk, the magnetic polarities are aligned with the hard disk's read/write head. The read/write head then writes 0s and 1s that can be read by the computer at a later time. This means that the computer writes information to the hard disk as a binary number.



TERMS TO KNOW

Hard Disk Controller

A hard disk component that enables the CPU to access, modify, read, and write data to and from the hard disk, CD-ROM, and any other drive.

Bit

A contraction of "binary digit" — a digit containing either a 0 or 1.

2. Bits and Bytes

As mentioned above, a bit is a unit of digital data, containing a single value of either a 0 or a 1. Digital information can be very large, and thus can result in incredibly lengthy strings of 0s and 1s. A string of eight bits is known as a byte. So a **byte** is also a unit of digital information, and it contains eight bits.

 TERM TO KNOW

Byte
A unit of digital data, containing a string of eight binary units (0s or 1s).

3. Units of Measurement for Storage

Similar to RAM, storage space is measured in bytes. As the capacities of digital devices grew, new terms were developed to identify the capacities of processors, memory, and disk storage space. Prefixes were applied to the word byte to represent different orders of magnitude. Since these are digital specifications, the prefixes were originally meant to represent multiples of 1024 (which is two raised to the 10th power), but have more recently been rounded to mean multiples of 1000. The table below shows various storage sizes, how they are related to bytes, and an example of media with an approximate storage size.

Prefix	Represents	Example	Storage Device	Value Contained
B	Byte	Byte = Eight Bits		1 Character; e.g. the letter “t” is 1 byte
KB	Kilobyte	1 KB = 1,000 Bytes		Two or three paragraphs of text
MB	Megabyte	1 MB = 1 Million Bytes	Floppy Disk	One-minute MP3 file One digital picture (four megapixel) Four books (200 pages each)
GB	Gigabyte	1 GB = 1 Billion Bytes	DVD-R Blu Ray Disc Hard Disk USB Flash Drive	One 650MB CD of data 256 MP3 songs 340 digital pictures 600 web pages 4,470 books (200 pages each)
TB	Terabyte	1 TB = 1 Trillion Bytes	Hard Disk	1600 CDs of data 230 DVDs 40 Blu-Ray Discs 262,100 MP3 songs 349,500 digital pictures 655,300 web pages 4,500,000 books (200 pages each)

4. Common Storage Media

Various storage media have their own storage capacity limitations.

Storage Media	Description
Hard Drive/Hard	Most of today’s personal computers use a hard disk for long-term data storage.

Disk	Maximum capacity is currently around 2TB.
Solid-State Drives	The solid-state drive (SSD) performs the same function as a hard disk: long-term storage. Maximum capacity is currently around 1 TB.
Flash Drives	The USB flash drive serves as a portable and removable storage solution. Maximum capacity is currently around 256GB.
Optical Disc (CD/DVD-ROM)	An optical disc is another form of portable and removable storage. Maximum capacity is currently 900MB for CDs and 50GB for DVDs.



TERMS TO KNOW

Hard Disk

The location for long-term data storage when the computer is turned off, and where data is retrieved from when the computer is turned on.

Solid-State Drive (SSD)

Form of data storage that uses flash memory; all data is stored on a microchip.

Flash Drive

Form of data storage that attaches to the USB connector on PCs.

Optical Disc

A form of removable storage media that stores data on the surface of the disc.



SUMMARY

As data is generated by a computer, there must be sufficient **space** in which to **store** it. Various types of **storage media** are available, each with their own **storage capacities**, pros, and cons.

Source: Derived from Chapter 2 of “Information Systems for Business and Beyond” by David T. Bourgeois. Some sections removed for brevity.

<https://www.saylor.org/site/textbooks/Information%20Systems%20for%20Business%20and%20Beyond/Textbook.htm>



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