

Storage units

Digital systems store information as binary digits. Each binary digit has two possible values: on or off, one or zero. Digital systems reduce all information—text, sound, image, or any other type of data—to a series of binary digits.

A binary digit is called a *bit* (binary digit). The bit is the smallest unit of data in any digital system. A single bit on its own is only enough information to store two possible states—for example, whether an element of an image is to be white or black. To allow us to deal with more possible states, bits are linked up in larger units.

The most common of these units is called the *byte*, which is made up of eight bits. Each byte represents one of 256 possible values, since 2 (states per bit) times 8 (bits per byte) equals 256.



One byte is also used to represent a single character of text. The Latin alphabet of 26 letters (including upper and lower case), numerals, punctuation and special symbols, along with a number of invisible characters called “control codes” comprise about 200 commonly-used characters.

One byte can also be used to store a single element, or pixel, of a grayscale image. Each pixel can be assigned one of 256 possible values, in this case, shades of grey.

To store information such as pieces of text, images, or sounds takes many bytes. 1000 bytes makes up a kilobyte (abbreviated KB, or K). One KB is equal to about half a page of typed text (1000 characters, including spaces.)

Note: You will often see a kilobyte defined as 1024 bytes (2 raised to the power of 10) and all the other units defined as 1024 times a big as the preceding unit, rather than 1000 times as big. 1024 bytes is now officially called a kibibyte, although, confusingly, many sources still refer to 1024 bytes as a kilobyte. Mebibyte, gibibyte and tebibyte are the larger units in this standard.

When using computers for such things as imaging or animation, a kilobyte is too small a unit to conveniently describe the huge amounts of data required. Larger chunks of data are usually measured in megabytes (abbreviated MB, or meg). A megabyte is equal to 1000 kilobytes. A single, low resolution colour image (about 4x5 inches) would be more than 1 megabyte of data.

Even larger chunks of data are measured in gigabytes (GB, or gig). A gigabyte is equal to 1000 megabytes. A music CD contains two-thirds of a gigabyte of digital data. One gigabyte is the amount of capacity needed to store about 8 minutes of HD video, the type created by most digital video cameras. A terabyte (TB) is equal to 1000 gigabytes. The

entire theatrical release print of a Hollywood movie is equal to about one terabyte of image data.

Remember that both short-term memory (RAM) and long-term storage is measured using the same units: bits, bytes, and their multiples.

COMMON STORAGE MEDIA

Optical media - CD, DVD and Blu-ray,

Optical media disks are becoming increasingly rare. CD-R technology can store approximately 700MB on a disk. DVDs look like CDs but can store much greater amounts of information—up to 8.5GB for dual layer DVDs. A newest standard, Blu-ray, can store 25-50 GB. Optical drives are still sometimes found on desktop Windows PCs. Optical drives may be read-only (you can not change the information on the disk) or writable (in which you can, but usually only once).

Hard drives and SSDs

Available in a variety of capacities, hard drives may be internal (permanently mounted in the computer) or removable (portable). Current hard drive capacities range from 128 GB to over 16TB. Some hard drives use magnetic spinning disks (HDDs), but virtually all portable computers (and many desktops) now use solid state drives (SSD) which are smaller and more power efficient, but much more expensive than HDDs. Phones and tablets all use SSDs, although the original iPod used tiny spinning discs.

Memory cards and flash drives

Digital cameras and other small devices often use removable memory cards, often based on a special type of memory chip called flash memory, which can store information without electrical power. It is far more expensive than other types of storage, and generally only used in small, lightweight devices running on battery power. Some laptops use flash memory instead of a hard drive.

A large range of incompatible formats exist, but SD (Secure Digital) cards are by far the most common.

Flash drives are flash memory chips encased in a protective shell with a USB connector. They are useful for transporting files from one computer to another.