

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) raised to the 8th power (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. 1024 bytes (2 raised to the 10th power) makes up a kilobyte (abbreviated KB, or K). One K is equal to about half a page of typed text (1024 characters, including spaces.)

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 1024 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 1024 megabytes. A music CD contains two-thirds of a gigabyte of digital data. One gigabyte is the amount of capacity needed to store about 5 minutes of DV video, the type created by most digital video cameras. A terabyte (TB) is equal to 1024 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 disks: CD, DVD, Blu-ray

Optical disks use lasers to read data from a plastic disk; most optical disk formats have a writable variant that allows data to be stored on optical disks.

A compact disk (CD) stores 650 MB. A writable version, CD-R, allows data to be written to the disk (only once).

DVDs look like CDs but can store much greater amounts of information—up to 8.5 GB.

The newest type of optical disk, Blu-ray, can store 25-50 GB. Blu-ray disks use similar technology to DVD but pack more information into the same area, and are mostly used for high definition (HD) movies. Blu-ray drives never became common on computers.

Hard drive

Available in a variety of capacities, hard drives are usually fixed—that is, they cannot be removed from the computer in everyday use. Current hard drive capacities range from 500 GB to 6TB.

Portable hard drives can also be mounted in a protective case, and connected to computers via USB.

Memory cards and flash drives

Digital cameras, cellphones, digital music players and other small devices often use removable memory cards 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.

A large range of incompatible formats exist, but the most common are SD (Secure Digital) cards. Typical sizes are 8-64 GB

Flash drives are flash memory chips encased in a protective shell. They are useful for transporting files from one computer to another. Typical sizes are 2-64 GB, but much larger ones are available.

Some laptops use a variant of flash memory (called SSD, or *solid state drives*) instead of a hard drive. This saves weight and reduces power consumption, but are much more expensive than regular hard drives.