

## Bit and Byte

In the binary system, numbers are represented using only the binary digits 0 and 1. The composite word "binary digit" is abbreviated as "bit". In a digital computer, a bit is the minimal amount of information that can be processed.

A group of eight contiguous bits in the computer is called a "byte". Usually, computers process and transfer several bits simultaneously. The first popular microprocessors worked with 8 bits at a time; now microprocessors can handle up to 64 bits simultaneously. In the latter case, we would say that the word-length of the processor is 64 bits or 8 bytes.

The word byte was coined by the IBM engineer Werner Buchholz in 1956, who wanted to have a term to represent a subset of a word that could not be confused with bit. Afterwards, some computer manufacturers used the term byte to denote a 7-bit or even 9-bit unit of information (necessary to store one character), but eventually only the connotation in which a byte refers to eight bits of information survived. The IBM 360 series of computers, started in 1964, was the first 32-bit architecture with byte addressing.

When referring to large sets of bits and bytes, the abbreviations K (Kilo), M (Mega), G (Giga), T (Tera) are used. They correspond to  $1024$ ,  $1024^2$  (around a million),  $1024^3$  (around a billion) and  $1024^4$  (around a million-million) units.

The capacity of memory chips is measured in bits (denoted as "b"). A 64-Kb memory chip, for example, can store up to  $64 \times 1024$  bits. The capacity of secondary storage media, like floppies, hard disks or CD-ROMs, is measured in bytes. Therefore we speak of our 1 MB (Megabyte) floppy disk and our 3 GB (Gigabyte) hard disk. The transmission speed of networks is measured in bits per second. The classic Ethernet, for example, is a 10 Mb/s network.

There is another word which programmers sometimes use: a "nibble" (pronounced nihb-uhl) refers to 4 bits of information, that is, half a byte. A nibble is a convenient unit of information, since it can be used to pack an hexadecimal digit. In telecommunications, a nibble is sometimes called a quadbit.

### References

See IEEE Annals

Raúl Rojas