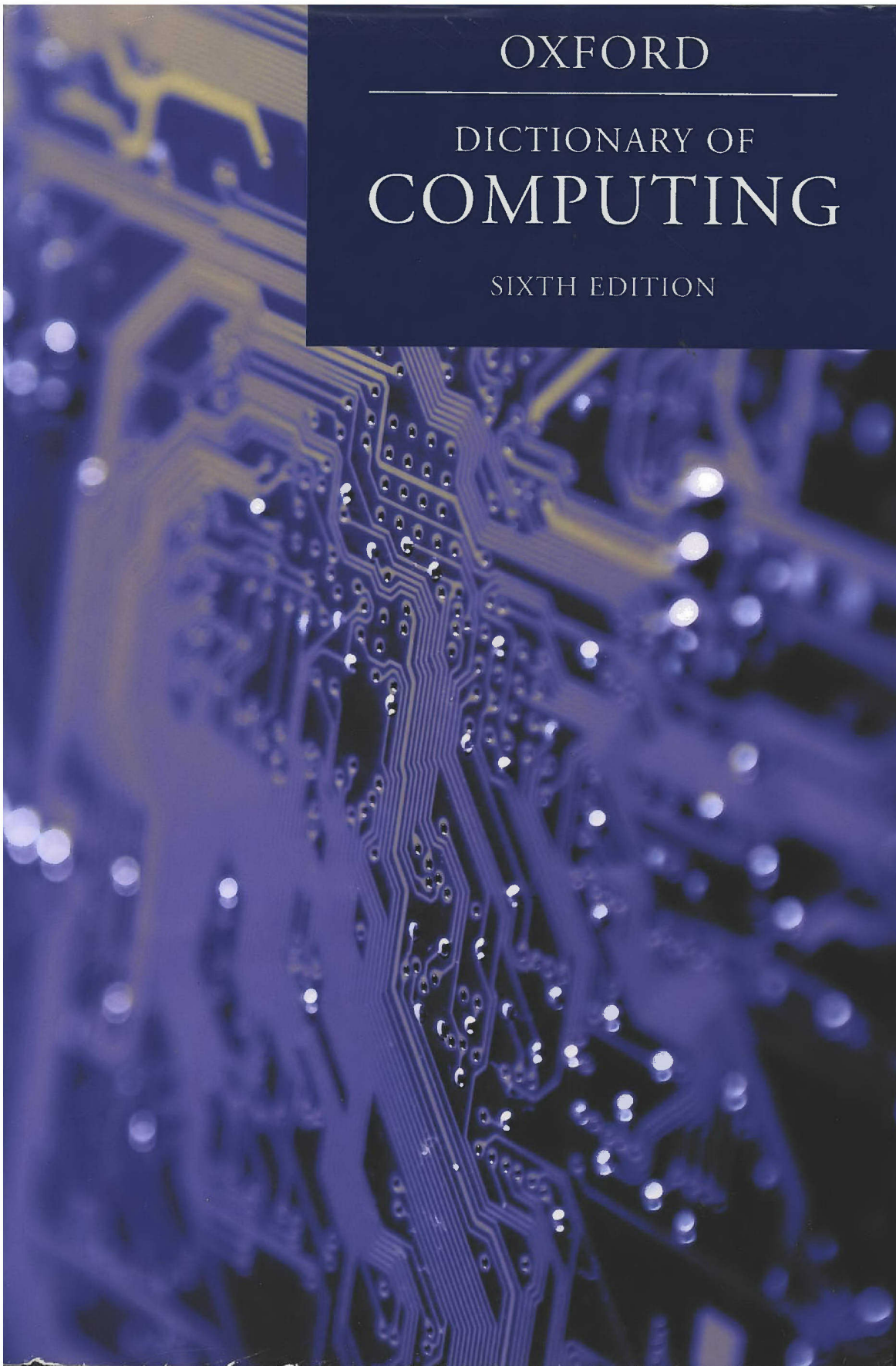




A Dictionary of
Computing

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referring to the internal storage of a computer that can be directly addressed by operating instructions. *See* MAIN MEMORY, CACHE, SEMICONDUCTOR MEMORY, MEMORY HIERARCHY, MEMORY MANAGEMENT.

memory card An *add-in card containing memory chips either directly mounted on the card or arranged in *SIMMS that plug into sockets on the card.

memory compaction (block compaction)

Any of several methods used to relocate information blocks in main memory in order to maximize the available free space in the memory. *See also* STORAGE ALLOCATION.

memory cycle 1. The complete sequence of events for a unit of memory to go from a quiescent state through a read and/or write phase and back to a quiescent state. 2. The minimum length of time that is required between successive accesses (read or write) to a memory. *See also* CYCLE.

memory data register (MDR) A *register used for holding information (either program words or data words) that is in the process of being transferred from the memory to the central processor, or vice versa.

memory dump A representation, which can be read by a person, of the contents at some time of some part of the main memory of a computer system. A variety of representation formats might be employed, but typically these would all be relatively low-level – e.g. purely numeric or assembler-code format. A memory dump is normally taken for *postmortem purposes.

memory element A device that stores one item of information: if it has q stable states it is said to be * q -ary, and if $q = 2$ it is said to be binary. It is usually implemented electronically, sometimes with the assistance of the magnetic, optical, or acoustic properties of a storage medium. In practice, most memory elements are binary. In fast computer circuitry, the *flip-flop is the most common type of memory element.

Memory elements are employed specifically in computer memories and generally in *sequential circuits. A memory element is any smallest part of such a system that possesses more than one stable state. For example, a binary *shift register contains four flip-flops and has 16 states, but each of its four memory elements has only two states; a

similar ternary shift register would have 81 states, but would still consist of four memory elements, each having three states.

memory fill An aid to program debugging in which every location in the memory is filled with a predetermined character before being overwritten by the incoming program.

memory guard A form of hardware *interlock used in some systems to control access to memory that is currently involved in a peripheral transfer. At the time of initiating the transfer the channel sets an indication that the buffer area is associated with the transfer; this indication is cleared by the channel on completion of the transfer. Any attempt to access the buffer area (other than by the channel) will suspend the process attempting to access the buffer until the transfer has been completed.

memory hierarchy For physically different kinds of *memory there are significant differences in the time to read or write the contents of a particular *location in memory, the amount of information that is read or written on a given occasion, the total volume of information that can be stored, and the unit costs of storing a given amount of information. To optimize its use and to achieve greater efficiency and economy, memory is organized in a hierarchy with the highest performance and in general the most expensive devices at the top, and with progressively lower performance and less costly devices in succeeding layers. The contents of a typical memory hierarchy, and the way in which data moves between adjacent layers, might be organized as follows.

1. **Register** – A single word held in each *register of the *processor; typically a word contains 4 bytes. This is sometimes not thought of as part of the hierarchy.

2. **Cache** – Groups of words within the *cache; typically a single group in the cache will hold 64 words (say 256 bytes), and there will be, say, 1024 such groups, giving a total cache of 256 Kbytes. Single words pass between the cache and registers within the processor. All transfers into and out of the cache are controlled entirely by hardware.

3. **Main memory** – Words within the main (*random-access) memory. On a very high performance system, groups of words corresponding to a group within the cache are transferred between the cache and the main memory in a single cycle of main memory.