

# The New Penguin Dictionary of Computing

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C# contains many features aimed at creating more secure and stable programs including hierarchical namespaces to control overriding of methods, STRUCTURED EXCEPTION HANDLING, restrictions on the use of POINTERS and TYPE CASTS and automatic array BOUNDS CHECKING. Pseudo-code compiled from a C# program runs within a runtime system (see COMMON LANGUAGE RUNTIME) that imposes all these safety features and is therefore called MANAGED CODE, though it can also make outside calls to code within traditional, unmanaged DYNAMIC-LINKED LIBRARIES. C# is intended to eventually replace VISUAL BASIC as the programming language for Microsoft's web development systems.

**C1 security** The lowest of the levels of computer security defined in the US Government's ORANGE BOOK, which requires that users should log on to the system, but permits groups of users to share the same password. See also C2 SECURITY.

**C2 security** A medium level of computer security as defined in the US Government's ORANGE BOOK, which requires that users should log on to a system with individual passwords, and that an audit record of who has logged in be maintained. See also C1 SECURITY.

**CA** Abbreviation of COMPUTER ASSOCIATES.

**cable 1** A multi-core wire terminated with multi-pin plugs used to connect a piece of PERIPHERAL equipment to a computer.

**2** Shorthand for 'cable television'.

**cable modem** A MODEM that allows computer DATA TRANSFERS and Internet access via cable TV connections. Cable TV services employ COAXIAL CABLING, so a cable modem can operate at much a higher maximum speed than a telephone modem, typically between 0.5 and 20 megabits per second. However, cable TV systems support only downstream traffic (i.e. from TV station to the home) so require a telephone modem to be used in parallel to carry upstream traffic. Also cable TV lines are shared by many households, so the BANDWIDTH achieved in practice may be highly variable and far below the maximum.

**cable TV** A communication technology that transmits television signals into the home

over a local area network of optical or coaxial cable, rather than via radio-frequency broadcast or satellite transmission. Its significance for computing is that this relatively high-speed network may also be used for Internet access and other data transmissions by installing a CABLE MODEM.

**cabling** The physical conductors used to carry data around a NETWORK. The term is applied to both metal wire that conducts electrical signals and to OPTICAL FIBRE that conducts light signals, since the engineering problems of running either sort around a building are related. See also various cable types such as TWISTED-PAIR, UTP, COAXIAL CABLE, THICK ETHERNET and THIN ETHERNET.

**cache** A small region of fast MEMORY interposed between a data processing device and a larger slower memory to hold copies of the most frequently or recently used data so that they may be accessed more quickly. The same principle is at work in a library when someone takes several books they are consulting from the main shelves and places them on their desktop for easier access.

Caches are universally employed between the CPUs of modern computers and their main memory, reflecting the fact that the speed of processors has been enhanced far more rapidly than the speed of memory: a cache helps to bridge this growing discrepancy. Indeed the latest generations of PENTIUM and other processors employ two (or even three) levels of cacheing. A small, typically 32 to 64 kilobyte, cache on the chip itself acts as a cache for a larger off-chip cache which may be many megabytes in size, and which in turn caches the main memory accesses. (See more under L1 CACHE and L2 CACHE.)

The mechanics of deciding precisely how to arrange the data within a cache, how much to read at a time, and how to ensure consistency between the cache contents and main memory constitute a complex area of engineering: see more under CACHE LINE, CACHE HIT, CACHE COHERENCY, ASSOCIATIVE CACHE, DIRECT MAPPED CACHE, SET-ASSOCIATIVE CACHE, FULLY ASSOCIATIVE CACHE, UNIFIED CACHE, HARVARD ARCHITECTURE.

Caches may be employed in many other forms of communication, for example to



again more quickly, and between a computer's CPU and disk drives of various kinds (where the speed discrepancy is even greater than with memory): see for example **DISK CACHE**, **WRITE-THROUGH CACHE**, **WRITE-BACK CACHE**.

**cacheable** Capable of, or allowed to be, stored in a **CACHE**. Many operating systems permit certain regions of memory to be declared as **NONCACHEABLE**, particularly those used for I/O by **MEMORY-MAPPED peripherals**.

**cache coherency** A problem intrinsically associated with **SHARED-MEMORY MULTIPROCESSOR** computer systems. When multiple processors access the same memory, it is possible for a data item that currently resides in one processor's **CACHE** to be updated in main memory by a different processor, leaving the first processor unaware that it holds stale, out-of-date, data. To avoid this situation it is necessary to maintain cache coherency, and the most popular method is to implement the **MESI PROTOCOL**.

**cache controller** AN **INTEGRATED CIRCUIT** that controls access to the **BUS** connecting a computer's CPU core to its **CACHE** memory, performing several functions that include locating a requested address in the cache, storing the **TAGS** for an **ASSOCIATIVE CACHE** and sorting memory accesses into line-order to economize on bus bandwidth.

All modern **MICROPROCESSORS** incorporate an on-chip or **LEVEL 1 CACHE** whose controller is part of the on-chip circuitry. However, some recent designs (for instance the **POWERPC G3** and **G4**) also integrate a controller for an external or **LEVEL 2 CACHE** onto the chip, provided with its own bus to enable access to the L2 cache faster than the system bus would permit. Intel's **PENTIUM** family of CPUs employ an external L2 cache controller that is integrated instead into the **SYSTEM CHIP SET**. See also **CACHE COHERENCY**, **BACKSIDE BUS**, **MESI PROTOCOL**, **BUS SNOOPING**.

**cache hit** A request by a computer's processor to read or write a data item that finds its target in the processor's **CACHE** and therefore does not have to reach out over the bus to external memory to access it. Since the purpose of a cache is to keep traffic local to the processor

and reduce the traffic to external memory, a high ratio of cache hits to **CACHE MISSES** is a good thing.

**cache line** The unit of data that is stored within a processor **CACHE**. For example each line might be 64 bytes long, so that whenever a single byte in main memory is accessed, its surrounding 64 bytes are fetched into the cache too. See also **ASSOCIATIVE CACHE**, **TAG**.

**cache memory** A region of memory (whether on-chip, or external in the form of **RAM chips**) that is dedicated to use as a **CACHE**.

**cache miss** A request by a computer's processor to read or write a data item that does not find its target in the processor's **CACHE** and therefore must continue through into main memory to access the item. See also **CACHE HIT**.

**CACM** Abbreviation of **COMMUNICATIONS OF THE ACM**.

**CAD** Abbreviation of **COMPUTER AIDED DESIGN**.

**CAD/CAM** (Computer Aided Design/Computer Aided Manufacturing) The use of computers to assist in the complete manufacturing cycle of a product, from design to final delivery. The term implies a degree of integration between the design software, a parts database, ordering and stock control software for parts from outside suppliers, and software that controls the manufacturing process itself, so that information flows from one stage to the next. See more under **COMPUTER AIDED DESIGN**, **COMPUTER AIDED MANUFACTURING**, **JUST-IN-TIME**.

**CADD** Abbreviation of **COMPUTER AIDED DESIGN AND DRAFTING**.

**caddy** A shallow removable plastic tray with a hinged lid used by early **CD-ROM** drives: a disk was loaded into the caddy and the caddy inserted into the drive. Most modern drives use instead a retractable, lidless tray.

**CAE** Abbreviation of **COMPUTER AIDED ENGINEERING**.

**CAI** Abbreviation of **COMPUTER AIDED INSTRUCTION**.

**Cairo** The internal codename given by Microsoft to its unified, 32-bit **OBJECT-ORIENTED**