

Programming In C, C

C (programming language)

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C is a general-purpose programming language. It was created in the 1970s by Dennis Ritchie and remains widely used and influential. By design, C gives the programmer relatively direct access to the features of the typical CPU architecture, customized for the target instruction set. It has been and continues to be used to implement operating systems (especially kernels), device drivers, and protocol stacks, but its use in application software has been decreasing. C is used on computers that range from the largest supercomputers to the smallest microcontrollers and embedded systems.

A successor to the programming language B, C was originally developed at Bell Labs by Ritchie between 1972 and 1973 to construct utilities running on Unix. It was applied to re-implementing the kernel of the Unix operating system. During the 1980s, C gradually gained popularity. It has become one of the most widely used programming languages, with C compilers available for practically all modern computer architectures and operating systems. The book *The C Programming Language*, co-authored by the original language designer, served for many years as the de facto standard for the language. C has been standardized since 1989 by the American National Standards Institute (ANSI) and, subsequently, jointly by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC).

C is an imperative procedural language, supporting structured programming, lexical variable scope, and recursion, with a static type system. It was designed to be compiled to provide low-level access to memory and language constructs that map efficiently to machine instructions, all with minimal runtime support. Despite its low-level capabilities, the language was designed to encourage cross-platform programming. A standards-compliant C program written with portability in mind can be compiled for a wide variety of computer platforms and operating systems with few changes to its source code.

Although neither C nor its standard library provide some popular features found in other languages, it is flexible enough to support them. For example, object orientation and garbage collection are provided by external libraries GLib Object System and Boehm garbage collector, respectively.

Since 2000, C has consistently ranked among the top four languages in the TIOBE index, a measure of the popularity of programming languages.

C Sharp (programming language)

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C# (see SHARP) is a general-purpose high-level programming language supporting multiple paradigms. C# encompasses static typing, strong typing, lexically scoped, imperative, declarative, functional, generic, object-oriented (class-based), and component-oriented programming disciplines.

The principal inventors of the C# programming language were Anders Hejlsberg, Scott Wiltamuth, and Peter Golde from Microsoft. It was first widely distributed in July 2000 and was later approved as an international standard by Ecma (ECMA-334) in 2002 and ISO/IEC (ISO/IEC 23270 and 20619) in 2003. Microsoft introduced C# along with .NET Framework and Microsoft Visual Studio, both of which are technically

speaking, closed-source. At the time, Microsoft had no open-source products. Four years later, in 2004, a free and open-source project called Microsoft Mono began, providing a cross-platform compiler and runtime environment for the C# programming language. A decade later, Microsoft released Visual Studio Code (code editor), Roslyn (compiler), and the unified .NET platform (software framework), all of which support C# and are free, open-source, and cross-platform. Mono also joined Microsoft but was not merged into .NET.

As of January 2025, the most recent stable version of the language is C# 13.0, which was released in 2024 in .NET 9.0

Operators in C and C++

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When not overloaded, for the operators &&, ||, and , (the comma operator), there is a sequence point after the evaluation of the first operand.

Most of the operators available in C and C++ are also available in other C-family languages such as C#, D, Java, Perl, and PHP with the same precedence, associativity, and semantics.

Many operators specified by a sequence of symbols are commonly referred to by a name that consists of the name of each symbol. For example, += and -= are often called "plus equal(s)" and "minus equal(s)", instead of the more verbose "assignment by addition" and "assignment by subtraction".

The C Programming Language

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The C Programming Language (sometimes termed K&R, after its authors' initials) is a computer programming book written by Brian Kernighan and Dennis Ritchie, the latter of whom originally designed and implemented the C programming language, as well as co-designed the Unix operating system with which development of the language was closely intertwined. The book was central to the development and popularization of C and is still widely read and used today. Because the book was co-authored by the original language designer, and because the first edition of the book served for many years as the de facto standard for the language, the book was regarded by many to be the authoritative reference on C.

C++

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C++ is a high-level, general-purpose programming language created by Danish computer scientist Bjarne Stroustrup. First released in 1985 as an extension of the C programming language, adding object-oriented (OOP) features, it has since expanded significantly over time adding more OOP and other features; as of 1997/C++98 standardization, C++ has added functional features, in addition to facilities for low-level memory manipulation for systems like microcomputers or to make operating systems like Linux or Windows, and even later came features like generic programming (through the use of templates). C++ is usually implemented as a compiled language, and many vendors provide C++ compilers, including the Free

Software Foundation, LLVM, Microsoft, Intel, Embarcadero, Oracle, and IBM.

C++ was designed with systems programming and embedded, resource-constrained software and large systems in mind, with performance, efficiency, and flexibility of use as its design highlights. C++ has also been found useful in many other contexts, with key strengths being software infrastructure and resource-constrained applications, including desktop applications, video games, servers (e.g., e-commerce, web search, or databases), and performance-critical applications (e.g., telephone switches or space probes).

C++ is standardized by the International Organization for Standardization (ISO), with the latest standard version ratified and published by ISO in October 2024 as ISO/IEC 14882:2024 (informally known as C++23). The C++ programming language was initially standardized in 1998 as ISO/IEC 14882:1998, which was then amended by the C++03, C++11, C++14, C++17, and C++20 standards. The current C++23 standard supersedes these with new features and an enlarged standard library. Before the initial standardization in 1998, C++ was developed by Stroustrup at Bell Labs since 1979 as an extension of the C language; he wanted an efficient and flexible language similar to C that also provided high-level features for program organization. Since 2012, C++ has been on a three-year release schedule with C++26 as the next planned standard.

Despite its widespread adoption, some notable programmers have criticized the C++ language, including Linus Torvalds, Richard Stallman, Joshua Bloch, Ken Thompson, and Donald Knuth.

ANSI C

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ANSI C, ISO C, and Standard C are successive standards for the C programming language published by the American National Standards Institute (ANSI) and ISO/IEC JTC 1/SC 22/WG 14 of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Historically, the names referred specifically to the original and best-supported version of the standard (known as C89 or C90). Software developers writing in C are encouraged to conform to the standards, as doing so helps portability between compilers.

Objective-C

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Objective-C is a high-level general-purpose, object-oriented programming language that adds Smalltalk-style message passing (messaging) to the C programming language. Originally developed by Brad Cox and Tom Love in the early 1980s, it was selected by NeXT for its NeXTSTEP operating system. Due to Apple macOS's direct lineage from NeXTSTEP, Objective-C was the standard language used, supported, and promoted by Apple for developing macOS and iOS applications (via their respective application programming interfaces (APIs), Cocoa and Cocoa Touch) from 1997, when Apple purchased NeXT, until the introduction of the Swift language in 2014.

Objective-C programs developed for non-Apple operating systems or that are not dependent on Apple's APIs may also be compiled for any platform supported by GNU Compiler Collection (GCC) or LLVM/Clang.

Objective-C source code 'messaging/implementation' program files usually have .m filename extensions, while Objective-C 'header/interface' files have .h extensions, the same as C header files. Objective-C++ files are denoted with a .mm filename extension.

C--

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C-- (pronounced C minus minus) is a C-like programming language, designed to be generated mainly by compilers for high-level languages rather than written by human programmers. It was created by functional programming researchers Simon Peyton Jones and Norman Ramsey. Unlike many other intermediate languages, it is represented in plain ASCII text, not bytecode or another binary format.

There are two main branches:

C--, the original branch, with the final version 2.0 released in May 2005

Cmm, the fork actively used as the intermediate representation (IR) in the Glasgow Haskell Compiler (GHC)

The C++ Programming Language

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C*

2–16. C User Guide, Thinking Machines Corporation, 1991 C* Programming Manual, Thinking Machines Corporation, 1993. The Art of Parallel Programming (2nd*

C* (or C-star) is a data-parallel superset of ANSI C with synchronous semantics.

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