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# Information technology — Programming languages — C#

*Technologies de l'information — Langages de programmation — C#*

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# Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 23270 was prepared by Ecma (as Ecma-334) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC. This second edition cancels and replaces the first edition (ISO/IEC 23270:2003), which has been technically revised.

# Introduction

This International Standard is based on a submission from Hewlett-Packard, Intel and Microsoft, that described a language called C#, which was developed within Microsoft. The principal inventors of this language were Anders Hejlsberg, Scott Wiltamuth and Peter Golde. The first widely distributed implementation of C# was released by Microsoft in July 2000, as part of its .NET Framework initiative.

Ecma Technical Committee 39 (TC39) Task Group 2 (TG2) was formed in September 2000, to produce a standard for C#. Another Task Group, TG3, was also formed at that time to produce a standard for a library and execution environment called Common Language Infrastructure (CLI). (CLI is based on a subset of the .NET Framework.) Although Microsoft's implementation of C# relies on CLI for library and runtime support, other implementations of C# need not, provided they support an alternate way of getting at the minimum CLI features required by this C# standard (see Annex D).

As the definition of C# evolved, the goals used in its design were as follows:

- C# is intended to be a simple, modern, general-purpose, object-oriented programming language.
- The language and implementations thereof should provide support for software engineering principles such as strong type checking, array bounds checking, detection of attempts to use uninitialized variables, and automatic garbage collection. Software robustness, durability and programmer productivity are important.
- The language is intended for use in developing software components suitable for deployment in distributed environments.
- Source code portability is very important, as is programmer portability, especially for those programmers already familiar with C and C++.
- Support for internationalization is very important.
- C# is intended to be suitable for writing applications for both hosted and embedded systems, ranging from the very large that use sophisticated operating systems, down to the very small having dedicated functions.
- Although C# applications are intended to be economical with regard to memory and processing power requirements, the language was not intended to compete directly on performance and size with C or assembly language.

The following companies and organizations have participated in the development of this International Standard, and their contributions are gratefully acknowledged: ActiveState, Borland, CSK Corp., Hewlett-Packard, IBM, Intel, IT University of Copenhagen, Jaggersoft (UK), Microsoft, Mountain View Compiler, Monash University (AUS), Netscape, Novell, Pixo, Plum Hall, Sun, and the University of Canterbury (NZ).

The development of this version of the International Standard started in January 2003.

# Information technology — Programming languages — C#

# 1. Scope

This International Standard specifies the form and establishes the interpretation of programs written in the C# programming language. It specifies

- The representation of C# programs;
- The syntax and constraints of the C# language;
- The semantic rules for interpreting C# programs;
- The restrictions and limits imposed by a conforming implementation of C#.

This International Standard does not specify

- The mechanism by which C# programs are transformed for use by a data-processing system;
- The mechanism by which C# applications are invoked for use by a data-processing system;
- The mechanism by which input data are transformed for use by a C# application;
- The mechanism by which output data are transformed after being produced by a C# application;
- The size or complexity of a program and its data that will exceed the capacity of any specific data-processing system or the capacity of a particular processor;
- All minimal requirements of a data-processing system that is capable of supporting a conforming implementation.

 

# 2. Conformance

Conformance is of interest to the following audiences:

- Those designing, implementing, or maintaining C# implementations.
- Governmental or commercial entities wishing to procure C# implementations.
- Testing organizations wishing to provide a C# conformance test suite.
- Programmers wishing to port code from one C# implementation to another.
- Educators wishing to teach Standard C#.
- Authors wanting to write about Standard C#.

As such, conformance is most important, and the bulk of this International Standard is aimed at specifying the characteristics that make C# implementations and C# programs conforming ones.

The text in this International Standard that specifies requirements is considered ***normative***. All other text in this specification is ***informative***; that is, for information purposes only. Unless stated otherwise, all text is normative. Normative text is further broken into ***required*** and ***conditional*** categories. ***Conditionally normative*** text specifies a feature and its requirements where the feature is optional. However, if that feature is provided, its syntax and semantics must be exactly as specified.

Undefined behavior is indicated in this International Standard only by the words ‘‘undefined behavior.’’

A ***strictly conforming program*** shall use only those features of the language specified in this International Standard as being required. (This means that a strictly conforming program cannot use any conditionally normative feature.) It shall not produce output dependent on any unspecified, undefined or implementation-defined behavior.

A ***conforming implementation*** of C# must accept any strictly conforming program.

A conforming implementation of C# must provide and support all the types, values, objects, properties, methods, and program syntax and semantics described in the normative (but not the conditionally normative) parts in this International Standard.

A conforming implementation of C# shall interpret characters in conformance with the Unicode Standard Version 4.0 and ISO/IEC 10646-1. Conforming implementations must accept Unicode source files encoded with the UTF-8 encoding form.

A conforming implementation of C# shall not successfully translate source containing a `#error` preprocessing directive unless it is part of a group skipped by conditional compilation.

A conforming implementation of C# shall produce at least one diagnostic message if the source program violates any rule of syntax or any negative requirement (defined as a “shall” or “shall not” or “error” or “warning” requirement), unless that requirement is marked with the words “no diagnostic is required”.

A conforming implementation of C# is permitted to provide additional types, values, objects, properties and methods beyond those described in this International Standard, provided they do not alter the behavior of any strictly conforming program. Conforming implementations are required to diagnose programs that use extensions that are ill formed according to this International Standard. Having done so, however; they can compile and execute such programs. (The ability to have extensions implies that a conforming implementation reserves no identifiers other than those explicitly reserved in this International Standard.)

A conforming implementation of C# shall be accompanied by a document that defines all implementation-defined characteristics and all extensions.

A conforming implementation of C# shall support the class library documented in Annex D. This library is included by reference in this International Standard.

A ***conforming program*** is one that is acceptable to a conforming implementation. (Such a program is permitted to contain extensions or conditionally normative features.)

# 3. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 31.11:1992, *Quantities and units — Part 11: Mathematical signs and symbols for use in the physical sciences and technology*.

ISO/IEC 2382.1:1993, *Information technology — Vocabulary — Part 1: Fundamental terms*.

ISO/IEC 10646 (all parts), *Information technology — Universal Multiple-Octet Coded Character Set (UCS)*.

ISO/IEC 23271:2005, *Common Language Infrastructure (CLI), Partition IV: Base Class Library (BCL), Extended Numerics Library, and Extended Array Library.*

IEC 60559:1989, *Binary floating-point arithmetic for microprocessor systems* (previously designated IEC 559:1989). (This standard is widely known by its U.S. national designation, ANSI/IEEE Standard 754-1985, *IEEE Standard for Binary Floating-Point Arithmetic*.)

*The Unicode Standard, Version 4.0*, The Unicode Consortium, (Addison-Wesley, Boston, MA, 2003. ISBN 0-321-18578-1).