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Programming languages — C++

Langages de programmation — C++



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces*.

This fifth edition cancels and replaces the fourth edition (ISO/IEC 14882:2014), which has been technically revised.

The main changes compared to the previous edition are as follows:

- expression evaluation order is specified in more cases
- removal of trigraphs
- adjustments to value categories resulting in copy elision being mandatory
- additional character and floating point literal syntaxes
- lambda expressions extended to permit capture of `*this` and use in constant expressions
- initializer statements for `if` and `switch` statements
- addition of `constexpr` if statements
- range-based `for` statement generalized to support heterogeneous `begin` and `end` types
- addition of structured bindings
- addition of inline variables
- list initialization extended to support enumerations and aggregates with base classes
- message in `static_assert` is now optional
- addition of nested namespace definition syntax

- extended support for attributes
- exception specifications are now part of function types
- template argument deduction is now supported for class templates
- addition of fold expressions
- pack expansion can be performed on using declarations
- permitted forms of template parameters and template arguments have been generalized
- dynamic allocation is supported for over-aligned types
- preprocessor can detect presence of header files with `__has_include`
- new utility functions, types, and templates in the standard library, including
 - an `any` type
 - an `optional` class template
 - a `variant` class template
 - a `clamp` function
 - a `std::byte` type
 - a `not_fn` function
 - a `void_t` alias template
 - `conjunction`, `disjunction`, and `negation` templates
 - an `invoke` function, and `is_invocable` and `invoke_result` type traits
 - an `is_swappable` type trait
- extended constant expression evaluation support in the standard library
- elementary conversion functions between strings and numeric types added
- constructors for `pair` and `tuple` are conditionally-explicit
- `shared_ptr` of array types now supported
- additional algorithms for managing uninitialized memory
- addition of polymorphic memory resources
- addition of substring search facilities providing the Boyer-Moore and Boyer-Moore-Horspool search algorithms
- addition of variable templates for type traits
- addition of a non-owning string view template
- ability to splice elements between containers for maps and sets
- better support for element insertion in unique-key maps
- support for incomplete types in containers
- addition of parallel algorithms
- addition of `sample` algorithm
- addition of mathematical special functions, and `gcd`, `lcm`, and three-argument `hypot` functions
- addition of support for operations on file systems
- addition of shared mutexes and variadic lock guards
- removal of deprecated features