PD ISO/IEC TS 21425:2017

BSI Standards Publication

Programming languages — C++ Extensions for ranges

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee IST/5, Programming languages, their environments and system software interfaces.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2018

ISBN 978 0 580 52141 6

ICS 35.060

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2018.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/IEC TS 21425:2017

TECHNICAL SPECIFICATION

ISO/IEC TS 21425

First edition
2017-11

Programming languages — C++ Extensions for ranges

Langages de programmation — Extensions C++ pour les «ranges»

Reference number
ISO/IEC TS 21425:2017(E)

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Foreword

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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*.

TECHNICAL SPECIFICATION **ISO/IEC TS 21425:2017(E)**

Programming languages — C++ Extensions for ranges

1 Scope [intro.scope]

1 This document describes extensions to the C++ Programming Language (2) that permit operations on ranges of data. These extensions include changes and additions to the existing library facilities as well as the extension of one core language facility. In particular, changes and extensions to the Standard Library include:

(1.1) — The formulation of the foundational and iterator concept requirements using the syntax of the Concepts TS (2).

(1.2) — Analogues of the Standard Library algorithms specified in terms of the new concepts.

(1.3) — The loosening of the algorithm constraints to permit the use of *sentinels* to denote the end of a range and corresponding changes to algorithm return types where necessary.

(1.4) — The addition of new concepts describing *range* and *view* abstractions; that is, objects with a begin iterator and an end sentinel.

(1.5) — New algorithm overloads that take range objects.

(1.6) — Support of *callable objects* (as opposed to *function objects*) passed as arguments to the algorithms.

(1.7) — The addition of optional *projection* arguments to the algorithms to permit on-the-fly data transformations.

(1.8) — Analogues of the iterator primitives and new primitives in support of the addition of sentinels to the library.

(1.9) — Constrained analogues of the standard iterator adaptors and stream iterators that satisfy the new iterator concepts.

(1.10) — New iterator adaptors (`counted_iterator` and `common_iterator`) and sentinels (`unreachable`).

2 Changes to the core language include:

(2.1) — the extension of the range-based `for` statement to support the new iterator range requirements (10.4).

3 This document does not specify constrained analogues of other parts of the Standard Library (e.g., the numeric algorithms), nor does it add range support to all the places that could benefit from it (e.g., the containers).

4 This document does not specify any new range views, actions, or facade or adaptor utilities; all are left as future work.

2 Normative references [intro.refs]

1 The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

(1.1) — ISO/IEC 14882:2014, *Programming Languages - C++*

(1.2) — ISO/IEC TS 19217:2015, *Programming Languages - C++ Extensions for Concepts*

ISO/IEC 14882:2014 is herein called the *C++ Standard* and ISO/IEC TS 19217:2015 is called the *Concepts TS*.

3 Terms and definitions [intro.defs]

For the purposes of this document, the terms and definitions given in ISO/IEC 14882:2014, ISO/IEC TS 19217:2015, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp