Business Plan and Convener's Report: ISO/IEC JTC1/SC22/WG21 (C++)

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1. MANAGEMENT SUMMARY

1.1. JTC1/SC22/WG21 STATEMENT OF SCOPE

Development and maintenance of ISO/IEC Standards, Technical Specifications, and Technical Reports related to the programming language C++.

1.2. PROJECT REPORT

1.2.1. COMPLETED PROJECTS

JTC1.22.14882 - Programming Language C++ - This project was delivered by the publishing of ISO/IEC 14882:1998, :2003, :2011, :2014, and :2017.

JTC1.22.18015:2006 Information Technology - Programming Languages Technical Report on C++ Performance (Technical Report Type 3) -- Confirmed in 2013 systematic review

JTC1.22.18822:2014: C++ Extensions for File System

JTC1.22.19216: C++ Extensions for Networking

JTC1.22.19217:2015: C++ Extensions for Concepts

JTC1.22.19568:2015: C++ Extensions for Library Fundamentals

JTC1.22.19568:2017: C++ Extensions for Library Fundamentals, 2nd edition

JTC1.22.19570:2015: C++ Extensions for Parallelism

JTC1.22.19570:2018: C++ Extensions for Parallelism, 2nd edition

JTC1.22.19571:2015: C++ Extensions for Concurrency

JTC1.22.19768:2007 Information Technology - Programming Languages Technical Report of Type 2 on C++ Library Extensions (based on ISO/IEC 14882) -- Confirmed in 2013 systematic review

JTC1.22.19841:2015: C++ Extensions for Transactional Memory

JTC1.22.21425: C++ Extensions for Ranges

JTC1.22.21544: C++ Extensions for Modules

JTC1.22.22277: C++ Extensions for Coroutines

JTC1.22.24733 Information Technology - Programming Languages Technical Report of Type 2 on Extensions for the programming language C++ to support decimal floating point arithmetic

JTC1.22.29124 Programming Language C++ - International Standard on Special Math Functions

1.2.2. PROJECTS UNDERWAY

See isocpp.org/std/status for a summary of projects underway, including contemplated upcoming ballots.

JTC1.22.14882 - Work is now underway on the next revision, which is targeted for publication in 2020.

JTC1.22.19568:2017: C++ Extensions for Library Fundamentals, 3rd edition - Work is now underway on the next revision, which is targeted for publication in 2021.

JTC1.22.23619: C++ Extensions for Reflection - Pending publication. Targeted for publication in 2020.

1.2.3. CANCELLED PROJECTS

None this period.

1.2.4. COOPERATION and COMPETITION

Where appropriate, WG21 has established liaisons with other SC22 and SC22 liaison organizations' working groups. There is no direct competition with any other current SC22 working group. Occasional overlap with SC22/WG14 (C) is coordinated with regular WG21 liaison.

2. PERIOD REVIEW

2.1. MARKET REQUIREMENTS

ISO C++ remains a widely-used foundation technology, well-received in the marketplace.

Although C++ has long been a consistently popular language, since 2011 in particular it has enjoyed a renewed cycle of growth and investment in tools and platform support across the industry. This was driven primarily by the C++11 standard's completion at the same time as the industry saw a resurgence of interest in performance-efficient, hardware-efficient, and especially power-efficient systems programming capability for mobile devices, cloud data centers, high-performance financial systems, vector and GPGPU computing (via nonstandard extensions to C++ that we are now investigating standardizing), and other major growth sectors and environments.

This new cycle of industry investment in C++ includes, but is not limited to, investment in:

1. tools, such as the advent of a new major C++ implementation in the Clang compiler and other major new products actively competing to fully implement the latest ISO C++ standard;
2. organization, with the establishment of the Standard C++ Foundation trade association in 2012 (see isocpp.org/about);
3. standardization participation, so that meeting attendance is has been growing rapidly (252 experts in February 2020) organized into over 20 active subgroups -- this includes 16 active domain-specific subgroups (e.g., transactional memory, graphics, gaming) that were established since 2012 and have drawn domain experts who did not previously participate in C++ standardization; and
4. faster and more predictable standardization output, with regular releases of the standard every three years along with many concurrent Technical Specifications (13 completed and published from 2014 to 2018).

2.2. ACHIEVEMENTS

Achievements in the past year include the following.

JTC1.22.19570: C++ Extensions for Parallelism, 2nd edition

JTC1.22.23619: C++ Extensions for Reflection - technical work complete, pending publication.

More Technical Specifications/Reports are expected to be started in the coming year (concurrency 2nd edition, tooling). Much of the content in these and the published TSes are likely candidates for inclusion in the next planned revision of IS 14882 in 2023.

2.3. RESOURCES

WG21 has grown considerably over the past three years, which reflects the continued growth and investment in C++ across the industry as noted in 2.1.

WG21 meets three times per year in co-located technical sessions with the US committee PL22.16. WG21 regularly has experts from 13 national bodies present at meetings, with 20 countries participating in all by attending these meetings or by being involved in the technical discussions that take place over the committee email lists. WG21 has been monitoring the cross-language standards activities, and made use of the ISO/IEC JTC1/SC22 guidelines on extended characters.

Liaisons:

- SC22/WG14 - C
    - Michael Wong (Codeplay, UK)
    - Tom Plum (Plum Hall, USA)

3. FOCUS NEXT WORK PERIOD

3.1. DELIVERABLES

WG21 is working on the next revision of JTC.22.14882 (IS C++) and progressing other projects as noted in 1.2.2.

3.2. STRATEGIES

WG21 members have been meeting in parallel subgroups and coordinating work between meetings via e-mail lists, teleconferences, and wiki. WG21 is working on revisions to the central IS JTC1.22.14882 on a regular three-year cadence. In addition, WG21 is parallelizing its work products by producing many work items first as Technical Specifications, which enables each independent work item to progress at its own speed and with less friction, and enables more experimental work to progress outside the main standard until it is more mature while still providing a reference for commercial implementations. When ready, these TS's can then be considered adopted (in whole or in part, and with changes) into the ISO C++ standard.

As of this writing, WG21 has 16 active domain-specific subgroups, focusing on incubating proposals in specific areas, and which meet between WG21 face-to-face meetings via telecon and/or their own face-to-face meetings. These domain-specific groups have directly led to increased participation by leading experts in those domains who had not previously participated in WG21. For a current list of subgroups, see isocpp.org/std/the-committee.

3.3. RISKS

The COVID-19 pandemic has disrupted all WG21 meetings. We have been making increased use virtual meetings instead.

The major financial risk is that without an explicit meeting ban from ISO or INCITS, our meeting hosts cannot actually cancel meetings without financial penalty.

Details follow:

(1) Face-to-face ISO meetings (and all technical conferences) will be last to resume.

Realistically, our face-to-face meetings will be the very last of all things to resume: We know sports/theatres/concerts with normal audiences will be among the last to resume, and our ISO meetings will be after those because compared to those our ISO meetings are equally dense for seating, equally non-essential, and strictly worse because our meetings require people from countries all over the world to fly together, mingle, and fly back home again (unlike sports/theatres/concerts where audiences are usually local or at least domestic). So, we will be last.

I cannot imagine being able to hold a WG21 face-to-face meeting until at least:

(1) a large majority of the SC22 P-member nations have

(2) open and free travel among each other (with no quarantine requirement on either entry or return, because that would add weeks to the trip which is infeasible) and

(3) each resumed domestic sports/theatres/concerts with fully normal audiences.

Until then, a face-to-face WG21 meeting is impossible. Unfortunately, achieving that seems unlikely in the next year -- the only three paths I know are either an effective testing+tracing plan (which is not going sufficiently well so far in some of our P-member countries), or an effective cure available at scale, or else an effective vaccine is deployed at scale (= mass produced + also mass willingness to take it + has taken effect so that R0 measured in the field is stably well below 1.0).

(2) Physical meeting venues have very large cancellation fees unless the meeting becomes impossible due to an organizational ban.

Here are data points I know about from the cancelled WG21 meetings, which have delegates from 13 SC22 nations...

The key to hosts being able to cancel meetings based on "force majeure" (to avoid a large financial penalty) is whether it is "impossible" to hold the meeting (using the words from one of the venues we are currently negotiating with). Without a clear meeting ban of some sort by the host country or by a governing authority such as ISO or INCITS, our planned venues have been typically resisting

admitting that holding the meeting is "impossible" and so will treat a cancellation as the choice of the host and therefore subject to penalty.

Our first cancelled meeting was the planned June 1-6 meeting in Bulgaria, where a combination of the initial ISO ban through May 31 plus Bulgaria's national travel ban and lockdown enabled our WG21 host for Bulgaria on June 1-6 to cancel without penalties.

Our second cancelled meeting is the November 2020 meeting in New York, where the U.S. INCITS ban (currently through December 31 2020) makes it clear it's impossible to hold the meeting (which, among other things, would have been at a U.S. location hosted by INCITS, as well as that our WG meetings are co-located with INCITS meetings), and this enabled the host to avoid a six-figure penalty.

However, for our next WG21 meeting scheduled for February 2021, we already know that we will not be able to hold it (in the middle of flu season) but the venue has informed us that they will not accept a cancellation based on force majeure because it is not yet clearly "impossible" to hold the meeting, and if the host cancelled now it would be viewed as a voluntary cancellation and the host would be charged approximately 4 times the cost of actually holding the meeting because of penalties (because most of the hotel's revenue comes from the guest rooms which are paid for by each participant, not by the host... unless the host cancels).

Right now, it would help WG21's February 2021 host financially to have any of ISO, JTC 1, INCITS, or SC 22 say that face-to-face meetings are banned through at least March 2021, because then they could actually start realistic planning with the venue to reschedule the meeting.

3.4. OPPORTUNITIES

Nothing new to report.

3.5. WORK PROGRAM PRIORITIES

WG21 intends to continue working on new language and/or library extensions with a view to publishing multiple TSes and then another new JTC1.22.14882 IS in 2020.

4. OTHER ITEMS

4.1. POSSIBLE ACTION REQUESTS AT FORTHCOMING PLENARY

None.

4.2 PROJECT EDITORS

The following individuals have been appointed project editors and backups.

Currently active projects:

- JTC1.22.14882, Programming Language C++:
  - Richard Smith (editor)
  - Jonathan Wakely (backup)
  - Dawn Perchik (backup)
  - Thomas Köppe (backup)
- JTC1.22.19568: Library Fundamentals
  - Thomas Köppe (editor)
  - Jeffrey Yasskin (backup)
- JTC1.22.23619: Reflection
  - David Sankel (editor)

Complete projects:

- JTC1.22.14882:1998 and :2003, Programming Language C++:
  - Andrew Koenig (editor)
  - Tom Plum (backup)
- JTC1.22.14882:2011, Programming Language C++:
  - Pete Becker (editor)
  - Lawrence Crowl (backup)
  - Tom Plum (former backup, until 2006)
- JTC1.22.14882:2014, Programming Language C++:
  - Stefanus Du Toit (editor)
  - Lawrence Crowl (backup)
- JTC1.22.18015, Technical Report on C++ Performance
  - Lois Goldthwaite (editor)
  - Detlef Vollmann (backup)
  - Martin O'Riordan (former editor, until 2003)
- JTC1.22.18822: File System Library
  - Beman Dawes (editor)
  - Stefanus Du Toit (backup)
- JTC1.22.19217: Concepts
  - Andrew Sutton (editor)
- JTC1.22.19570: Parallelism
  - Jared Hoberock (editor)
- JTC1.22.19768, Technical Report on C++ Library Extensions
  - Matt Austern (editor)
  - Pete Becker (backup)
- JTC1.22.21544: Modules
  - Gabriel Dos Reis (editor)
- JTC1.22.24733, Technical Report on Extensions to Support Decimal Floating Point Arithmetic
  - Robert Klarer (editor)
  - Pete Becker (backup)
- JTC1.22.29124 Programming Language C++ - Special Math Functions
  - Walter Brown (editor)

    - Pete Becker (backup)
- JTC1.22.19216: Networking
    - Jonathan Wakely (editor)
- JTC1.22.19571: Concurrency
    - Michael Wong (editor)
- JTC1.22.21425: Ranges
    - Casey Carter (editor)

Cancelled projects:

- JTC1.22.19569: Arrays
    - Lawrence Crowl (editor)
- JTC1.22.24737, Technical Report on C++ Library Extensions
    - Matt Austern (editor)
    - Pete Becker (backup)

4.3. ELECTRONIC DOCUMENT DISTRIBUTION

WG21 has conducted much of its detailed technical discussion using the email lists provided by the Standard C++ Foundation via isocpp.org.

WG21 uses a secure wiki maintained by Edison Design Group. This secure wiki is used for quick exchange of documents during and between meetings.

WG21 is now providing all the appropriate committee documents electronically, eliminating the need for paper mailings.

4.4. RECENT MEETINGS

See isocpp.org/std/meetings-and-participation/upcoming-meetings for a list of recent and future meetings.