WG21 June 2023 Hybrid meeting
Record of Discussion

ISO/IEC JTC1 SC22 WG21 P2931— 2023-28-06
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Chair: John Spicer

12-17 June 2023, Varna, Bulgaria

1. Opening activities

John Spicer opens the meeting at 09:03 AM GMT+3

1.1 Opening comments, welcome from host (INCITS C++)

Vassil Vassilev welcomes the group and presents information about food options, social events during the meeting, and organizational contacts.

A word from the sponsors
Vassil Keremidchiev from Chaos welcomes the group.
Stanimir Lukanov from VMware welcomes the group.

Thank you to the sponsors and meeting organizers.

1.2 Meeting guidelines

John Spicer presents.

Please speak into the microphone so people participating over Zoom can hear. Please introduce yourself when speaking.

Meetings are not public, we want everyone to be able to speak freely. Please refrain from live tweeting, blogging, taking photos of other people's screens or recording the meetings. You're allowed to take screenshots of presentations for your personal use.

Agenda is on the wiki.

Every participant is responsible for understanding and abiding by the following:

> The INCITS Antitrust Guidelines (INCITS C++)
> The INCITS Patent Policy (INCITS C++)
> The ISO Code of Conduct

The INCITS Code of Conduct (INCITS C++)
The IEC Code of Conduct
The WG21 Practices and Procedures, and Code of Conduct

John Spicer presents the slides. They are also linked in the agenda.

If you have any questions or concerns about CoC issues, please approach a committee officer or a NB representative and bring it to their attention.

1.3 Membership, voting rights, and procedures for the meeting

John Spicer presents voting rights.

If you are representing an organization that is considering formally joining INCITS/C++, or your organization is already a member and you wish to change your voting status, please inform Barry Hedquist, Nevin Liber or me (John Spicer).

On Saturday we take WG21 plenary polls. Rules are the same for US and other NBs. Every person registered in the global directory gets one vote. If you have questions about your voting status, please contact one of the officers.
Everyone can vote in subgroups. Please see best practice for voting.

Nevin Liber presents. Please sign the attendance list. It has been emailed to the reflector, it is available on the Mattermost, and it can be found on the wiki.

Jonathan Caves : Do we need a google account to access it?
Nevin Liber : you should be able to just click on the link.

John Spicer : please speak into the microphone so people on Zoom can hear you.
Nina Ranns : please introduce yourself before speaking.

Nevin Liber : if you need to upload papers to the paper system, but don't have a log in, let me know. The next official mailing will be on July 15th.

John Spicer presents voting procedures during the plenary.

1.4 INCITS/C++ Social Media Information (Linkedin, Twitter, Facebook)

Click here for the INCITS social media landing page.

1.5 Introductions

New members introduce themselves.
John Spicer welcomes new members.

Herb Sutter presents. As of now, we have 18 national bodies represented at the meeting. From the chat, I see that we expect one or two more to join during the week.

1.6 Agenda review and approval (INCITS/C++ motion, WG21 poll)

John Spicer presents the agenda.

The primary goals of this meeting will be work on C++26 features.
Additional, lower-priority goal includes subgroup work that may target versions after C++26.

INCITS/C++ business.

WG21 motion to approve the meeting agenda.
The motion is unanimously approved by WG21.

1.7 Editor's reports, approval of working drafts

Document	Editor's report
C++ 26 Working Draft	N4951
Library Fundamentals V3	N4949

WG21 motion to approve the above.
The motion is unanimously approved by WG21.

1.8 Approval of the minutes of the previous meetings (INCITS C++ motion, WG21 poll)

Meeting	Minutes
WG21 Issaquah	N4943
INCITS C++ Issaquah	pl22.16-2023-00012

WG21 pre-Varna administrative telecon	N4955

INCITS/C++ business.

WG21 motion to approve the above.
The motion is unanimously approved by WG21.

2. Liaison reports, and WG21 study group reports (see pre-meeting WG21 telecon minutes)

No discussion.

3. WG progress reports (Core, Evolution, Library, Library Evolution; see pre-meeting WG21 telecon minutes)

No discussion.

4. New business requiring action by the committee

No discussion

5. Organize working groups and study groups, establish working procedures

Jens Maurer presents.
Thank you to those who brought audio setup gear and all the volunteers who helped set it up.
This helps the virtual attendance.

Jens Maurer presents the time schedule.
Jens presents the subgroup room assignment.
Jens presents the evening sessions.

John Spicer : heroic effort from Jens in organizing these meetings. Thank you.

6. Subgroup sessions

John Spicer presents. The subgroup chairs must arrange for any proposals to be written up in the form of a motion, and made available by 8:00 PM Friday on the straw polls page together with associated papers. Groups are encouraged to make those papers and polls available as soon as possible during the week so people can have time to review them.

Jens Maurer : on the core wiki page, there is a link to the core poll staging area. It will be moved to the main poll page on Friday. Same for library. Respective chairs will make an effort to update the staging area.

John Spicer Presents. There is general information on the main Varna wiki page that will be useful to new members, including information about the communication channels we use.

If you have questions or concerns regarding polls/papers, we want to know as soon as possible. Raise them with subgroup chairs, national body, on the reflector or through the authors.

7. Review of the meeting

Subgroup status and progress reports. Presentation and discussion of proposals to be considered for consensus adoption by full WG21.

SG1: Concurrency (Giroux)

No report.

SG2: Modules (Stone)

Currently dormant.

SG4: Networking (Snyder)

SG4 has no open papers and has not met since Issaquah.

SG5: Transactional memory (Boehm/Maurer)

Currently dormant.

SG6: Numerics (Kretz/Lippincott/McFarlane)

SG6 met for one session to look at P2746R2 "Deprecate and Replace Fenv Rounding Modes" and P2901R0 "Extending linear algebra support to batched operations". P2746R2 will come back after receiving feedback. P2901R0 was acknowledged by SG6 and forwarded as having no SG6 relevant issues that need work.

SG7: Compile-time programming (Dusikova/Vandevoorde)

SG7 met and had only one paper D2911R0 "Python Bindings with Value-Based Reflection" which was a study / usage report of implementation of current status quo.

SG9: Ranges (Levi/Carter)

The Ranges Study Group had a hybrid meeting on Monday. We had a productive meeting in which we reviewed:

P2846R0: size_hint: Eagerly reserving memory for not-quite-sized lazy ranges
P2728R4: Unicode in the Library, Part 1: UTF Transcoding
P2542R2: `views::concat`
The first paper (P2846R0) was forwarded to LEWG for C++26, with a design question (whether or not optimization should be mandatory), and with a name change recommendation. The third paper had all the fixes and tests previously requested by SG9 and was forwarded to LEWG (P2542R2: views::concat) The second paper (P2728R4) got feedback from the group but will require more work, and will be discussed in SG9's future meetings. A few additional "Ranges" papers are in the queue of LEWG and will be seen there in the next few weeks.

Thank you to all our participants, and special thanks to the ones who had to overcome the time zone challenges.

SG10: Feature test (Revzin/Wakely)

No report

SG12: Undefined and unspecified behavior (Ballman/Wakely)

Currently dormant.

SG14: Games & low latency (Wong)

SG14 did not meet but will continue monthly meetings rotating between Games, Low Latency, Embedded. Recently, we have been working through a paper by Patrice Roy collected from the games domain.

SG19: Machine Learning (Wong/Reverdy)

SG19 did not meet but will continue rotating between Statistics, Graph, and Matrix. There are now 2 Statistics papers and we anticipate Graph will be voted out soon.

SG15: Tooling (Spencer/Boeckel)

No report.

SG18: LEWG Incubator (Baker/Liber)

SG18 did not meet in Varna.

SG16: Unicode (Honermann/Brett)

SG16 did not meet this week, but intends to continue its twice monthly telecon cadence for the foreseeable future. We continue to have no shortage of work ahead of us.

SG17: EWG Incubator (Keane/TBD)

Saw 6 papers over 2 afternoons

- P2889R0 Distributed Arrays
    - Motivated, but needs work
- P2893R0 Variadic Friends
    - Forwarded to EWG
- P2785R1 Relocating PRValues
    - No Consensus, but author encouraged to discuss with other relocatable authors
- Provided feedback without vote to 3 other papers:
    - P2665R0 Allow calling overload sets containing T, const T&
    - P2666R0 Last use optimization
    - P2668R0 Role based parameter passing

SG20: Education (van Winkel)

SG20 met in Varna on Wednesday, there were 7 attendees (tough competition from SG23 - safety & Security). We had a good discussion of how to move forward with our teaching guidelines, how to get more contributions, and how we can improve on the presentation of the document. We also developed ideas around our advising function towards WG21 in general, which we will work out in the coming months.

SG21: Contracts (Spicer/Doumler)

SG21 met for 1.5 days in Varna (Tue AM, Thu all day). We are working on a Contracts MVP proposal that can be forwarded to EWG/LEWG for C++26. We discussed three papers:

• P2877R0 "Contract Build Modes, Semantics, and Implementation Strategies" by Joshua Berne and Tom Honermann
• P2811R6 "Contract-violation handlers" by Joshua Berne
• P2853R0 "Proposal of std::contract_violation" by Andrew Tomazos

We had consensus on the first two papers, and consensus against the third. As a consequence, we removed the notion of build modes from the Contracts MVP. Every contract annotation now has one of the following three semantics: ignore, observe, enforce, and it is implementation-defined which one you get. Further, we now have a consensus design for contract-violation handling.

Between now and Kona our main focus will be on syntax. We will also look at papers dealing with various other aspects of the design that are still missing from the Contracts MVP (for example, how should contracts behave during constant evaluation? how should they interact with lambdas? etc.)

SG22: C/C++ Liason (TBD)

Did not meet. SG22 usually meets via telecon to allow WG14 members to attend, but that hasn't happened for a while. Applications for the SG22 chair are warmly accepted.

SG23: Safety/Security (Orr/Craig)

We met for half a day and had three subjects for discussion:

P2771R1 towards memory safety in C++
Following the presentation we took a poll which had consensus against further work in this direction.

P2878R1 Reference checking
Following the presentation we took a poll which had consensus against further work in this direction.

Presentation on further work on profiles
Bjarne gave an update on the profiles approach and asked for volunteers to assist with further work.
No polls were taken.

ABI Group (Vandevoorde)

No report.

Admin (Liber)

If you haven't marked the attendance sheet, please do so now.

Admin did not meet this week. The next mailing is scheduled for July 15th.

Evolution (Bastien)

This week, EWG saw all issues and papers which had a presenter (in person or online), and were not marked as needing revision. This amounts to 3 issues, and 30 papers being discussed, at the end of which we have 98 papers needing revision. Some of the papers

marked as needing revision have been in this status for a while, the chair will follow up with authors to ensure papers either make forward progress or terminate.

EWG also hosted an open discussion regarding the Lakos rule (P2861, P2834, P2831, P2837), now that we've shared views we expect to host a joint session of EWG/LEWG/SG21 in Kona. We will attempt to determine group policies such as those for noexcept in this session.

We are starting on C++26, and already a few language feature papers were voted into C++26 this week:

- P2621R2 UB? In My Lexer?
- P1854R4 Making non-encodable string literals ill-formed
- P2361R6 Unevaluated strings
- P2558R2 Add @, $, and ` to the basic character set
- P2738R1 constexpr cast from void*: towards constexpr type-erasure
- P2552R3 On the ignorability of standard attributes
- P2752R3 Static storage for braced initializers
- P2741R3 user-generated static_assert messages
- P2169R4 A nice placeholder with no name

The 9 EWG papers which had no presenters this week are:

- P2893 Variadic Friends
- P2784 Not halting the program after detected contract violation
- P2633 thread_local_inherit: Enhancing thread-local storage
- P2624 Make operations on bools more portable
- P2607 Let alignas specify minimum alignment
- P2355 Postfix fold expressions
- P2191 Modules: ADL & GMFs do not play together well (anymore)
- P1046 Automatically Generate More Operators
- P1203 modular main()

The chair will see if presenters can be found for the next meeting.

After the week's activities, we are left with these issues and papers which are now ready to be seen:

- CWG2726 Alternative tokens appearing as attribute-tokens
- CWG1699 Does befriending a class befriend its friends?
- CWG2669 Lifetime extension for aggregate initialization
- P2865 Remove Deprecated Array Comparisons from C++26
- P2795 Correct and incorrect code, and "erroneous behaviour"
- P0342 pessimize_hint
- P2662 Pack Indexing

They will be seen in Kona.

Given the light open workload, EWG will not host any telecons between now and Kona.

Library Evolution (Adelstein Lelbach/Fracassi/Craig)

At 2023-06 Varna

We planned to focus on big papers at F2F meetings, and we delivered.

Advanced to Library:

- P1928R4 SIMD
- P0876R13 Fibers
- P0843R6 inplace_vector

Progression on:

- P0447R22 hive
- P0260R5 Concurrent Queues
- P1030R5 path_view
- P2781R2 constexpr_v

For hive paper, we need to refine the wording. Anyone who has interest in hive, please reach out to me and the author to get involved. If you feel it may not belong in the standard library, we would encourage you to prepare a paper with the objections so we can discuss it.

Future Plans

Focus on fixes on telecons
Ranges (P2836)
Deprecation (P2863)

Focus on big papers at F2F meetings

- mdspan (P1684)
- Unicode (P2728, P2729)
- SIMD (P2664, P2663, P2876)
- Policy (P1656, P2148)

Core (Maurer)

We reviewed all the papers that were in our queue. A lot of them are on the straw polls, including some that we have already approved in earlier meetings, but couldn't move because we were busy with C++23.
We forwarded a number of papers with questions to EWG. When we notice issues in papers we alert EWG to decide if the situation is intentional or not.

Thank you to the minute takers.

Regarding P2620 (Improve the wording for Universal Character Names in identifiers), during review, we noticed a few changes in behavior and the author has expressed that he does not want to pursue that paper any more.

We faced some obstacles; when there were audio troubles in another room, CWG was without a chair. We need an assistant chair in core. Please send applications to me or Herb.

Poll 9, P2752, permits implementations to store the backing array of std:initializer_list in static storage, as opposed to on the stack, in certain restricted circumstances. That is possible visible in terms of optimisation potential

With P2169, you can use an _ when declaring variables or structured bindings if you do not intend to refer to that thing afterwards. There was a lot of effort in making it backwards compatible.

Paper in poll 10 will let you generate a compile time message if your static_assert fails.

We also looked at some issues. We plan to have teleconferences.

CWG polls

1. Accept as a Defect Report and apply the proposed resolution of all issues except issues 2518, 2521, 2659, 2674, 2678, and 2691 in P2796R0 (Core Language Working Group "ready" Issues for the February, 2023 meeting) to the C++ Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

1. Accept as Defect Reports and apply the proposed resolutions of all issues in P2922R0 (Core Language Working Group "ready" Issues for the June, 2023 meeting) to the C++ Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

2. Accept as a Defect Report and apply the changes in P2621R2 (UB? In my Lexer?) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

3. Accept as a Defect Report and apply the changes in P1854R4 (Making non-encodable string literals ill-formed) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

4. Apply the changes in P2361R6 (Unevaluated strings) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

5. Apply the changes in P2558R2 (Add @, $, and ` to the basic character set) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

6. Apply the changes in P2738R1 (constexpr cast from void*: towards constexpr type-erasure) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

7. Accept as a Defect Report and apply the changes in P2915R0 (Proposed resolution for CWG1223) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

8. Accept as a Defect Report and apply the changes in P2552R3 (On the ignorability of standard attributes) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

9. Accept as a Defect Report and apply the changes in P2752R3 (Static storage for braced initializers) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

10. Apply the changes in P2741R3 (User-generated static_assert messages) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.
Motion passes.

11. Apply the changes in P2169R4 (A nice placeholder with no name) to the C++26 Working Paper.

No discussion.
No objection to unanimous consent.

Motion passes.

Library (Wakely)

We met all week. We worked through our queue of papers. We got rid of our backlog and would like to keep it gone.
Thank you to Dietmar for scribing
Most polls were reviewed before this meeting, but were waiting for a C++26 WP. Almost everything we saw at this meeting is in the polls. Some papers needed more work or came in too late on Friday.
Larger papers we saw this week include execution, and submdspan. Thank you to the authors and reviewers for their patience.
Submdspan is done and is in the polls today. It is extending the work done for mdspan in C++23.
We will continue the review of std::execution (P2300).
There were some questions raised about atomic min max paper (P0493) and its handling of floating point numbers and particular values. My recommendation is that we fix those issues later if we need to.

LWG polls

1. Apply the changes for all Tentatively Ready issues in P2910R0 (C++ Standard Library Issues to be moved in Varna, Jun. 2023) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

2. Apply the changes in P2497R0 (Testing for success or failure of <charconv> functions) to the C++ working paper.

Jonathan Wakely : this was supposed to be voted on in Issaquah, but it was missed from the poll page.

No objection to unanimous consent.
Motion passes.

3. Apply the changes in P2592R3 (Hashing support for std::chrono value classes) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

4. Apply the changes in P2587R3 (to_string or not to_string) to the C++ working paper.

No discussion.

No objection to unanimous consent.
Motion passes.

5. Apply the changes in P2562R1 (constexpr Stable Sorting) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

6. Apply the changes in P2545R4 (Read-Copy Update (RCU)) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

7. Apply the changes in P2530R3 (Hazard Pointers for C++26) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

8. Apply the changes in P2538R1 (ADL-proof std::projected) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

9. Apply the changes in P2495R3 (Interfacing stringstreams with string_view) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

10. Apply the changes in P2510R3 (Formatting pointers) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

11. Apply the changes in P2198R7 (Freestanding Feature-Test Macros and Implementation-Defined Extensions) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

12. Apply the changes in P2338R4 (Freestanding Library: Character primitives and the C library) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

13. Apply the changes in P2013R5 (Freestanding Language: Optional ::operator new) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

~~**14. Apply the changes in P0493R4 (Atomic maximum/minimum) to the C++ working paper.**~~

JF : as discussed on the reflector, there are issues with floating point min and max when it comes to handling NaN and -0/+0. We haven't considered this in the discussions. We think the poll should be rejected for now and we should come back with the paper after these issues have been considered.

John Spicer : has this been considered in LWG ?
Jonathan Wakely : no.
Herb Sutter : Jonathan, are you happy recalling this poll ?
Jonathan Wakely : yes.

Poll has been recalled.

15. Apply the changes in P2363R5 (Extending associative containers with the remaining heterogeneous overloads) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

16. Apply the changes in P1901R2 (Enabling the Use of weak_ptr as Keys in Unordered Associative Containers) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

17. Apply the changes in P1885R12 (Naming Text Encodings to Demystify Them) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

18. Apply the changes in P0792R14 (function_ref: a type-erased callable reference) to the C++ working paper.

No discussion.

Objections in the room.

In favour : 59 (40 in person + 19 online)
Opposed : 1 (1 in person + 0 online)
Abstain : 29 (22 in person + 7 online)

Consensus.
Passes.

19 Apply the changes in P2874R2 (Mandating Annex D) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

20 Apply the changes in P2757R3 (Type checking format args) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

21 Apply the changes in P2637R3 (Member visit) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

22 Apply the changes in P2641R4 (Checking if a union alternative is active) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

23 Apply the changes in P1759R6 (Native handles and file streams) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

24 Apply the changes in P2697R1 (Interfacing bitset with string_view) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

25 Apply the changes in P1383R2 (More constexpr for cmath and complex) to the C++ working paper.

Jonathan Wakely : we forgot to bump the relevant feature test macro. I considered revising the poll to ask the editor to bump the macro, but we didn't discuss it in the group. It can be fixed with an issue. It doesn't need to stop the feature.

No discussion.
Objections in the room.

In favour : 62 (42 in person + 20 online)
Opposed : 2 (2 in person + 0 online)
Abstain : 21 (13 in person + 8 online)

Consensus.
Passes.

26 Apply the changes in P2734R0 (Adding the new 2022 SI prefixes) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

27 Apply the changes in P2548R6 (copyable_function) to the C++ working paper.

No discussion.
Objections in the room.

In favour : 50 (32 in person + 18 online)
Opposed : 3 (3 in person + 0 online)
Abstain : 31 (21 in person + 10 online)

Consensus.
Passes.

28 Apply the changes in P2714R1 (Bind front and back to NTTP callables) to the C++ working paper.

No discussion.
Objections in the room.

In favour : 29 (20 in person + 7 online)
Opposed : 1 (1 in person + 0 online)
Abstain : 39 (27 in person + 12 online)

Consensus.
Passes.

29 Apply the changes in P2630R4 (submdspan) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Motion passes.

Direction Group (Stroustrup)

DG didn't meet in Varna. Continues biweekly meetings.

WG21 polls

1 Approve P1000R5 as the schedule for C++26.

Herb Sutter ; Same poll as what we took in Prague for C++23, updated for C++26. It adds 3 years to the schedule we had for C++23.

Peter Brett : do we expect for iso to publish C++23 in 2023?
Herb : maybe. Whatever date they put on it, it is C++23 in the marketplace. I am optimistic they will finish it by the end of the year.

No objection to unanimous consent.
Motion passes.

8. Closing activities

8.1 Issues delayed until today

No discussion.

8.2 Mailings

Note: These are the closest regular mailings and not special pre/post meeting mailings.

2023-07-15: Post-Varna
2024-10-15: Pre-Kona

9. INCITS/C++ Agenda Items

9.1 INCITS C++ Motions, if any

INCITS/C++ business.

[Note : during the INCITS motion, a comment was made about the possible need for a resolution meeting for “no” votes. After the plenary, John Spicer clarified that resolution meetings are never required for votes taken at a meeting, only those by letter ballot.]

9.1.3 Plans for the future (INCITS C++)

No discussion.

9.1.4 Next and following meetings

Herb Sutter : thank you to the host. This was the first pandemic meeting delayed, and then delayed again. It is great that it happened and thank you for the efforts in making it happen.
John Spicer : thank you to the host, it was a beautiful meeting.

Mark Zeren presents slides about the organization of the meeting and the people involved in making it happen.
Mark Zeren : Thank you very much for coming and we hope you enjoyed your stay.

Herb presents.

2023-11-6/11: Kona, HI, USA (N4936)

2024-03-18/23: Tokyo, Japan (N4946)

This meeting is hosted by Woven by Toyota. There is an updated invitation paper coming.

JF Bastien presents the current paper.
JF Bastien : the paper says the meeting will be hosted in our office building, but that has changed. We are likely going to change the location to a place that is 12 minutes walk from the office building. I will update in the next couple of weeks. I got a request to recommend hotels. There are a lot of hotels to choose from. Mandarin oriental is expensive. Figure out what you want in a hotel. I recommend Japanese hotels.
March is the cherry blossom season. It gets busy so book a hotel and flights early.
We’re hosting a two day conference with 1 track and only 10 talks.

There are two airports in Tokyo, both are convenient. Take the high speed rail.
Most people don't need a visa, but check your own circumstances to be sure.

John Spicer : When should we book our trip ?
JF Bastien : I recommend you start looking now.

Herb Sutter presents.
Meeting after Japan is tentatively scheduled for Stockholm. I reached out to other potential hosts. If you are interested in hosting next summer, please send me an email.
In autumn 2024, we will be in Poland.
There are some tentative hosts for after that.

10. Adjournment (INCITS C++ motion)

Inbal Levi presents photos from the meeting.

INCITS/C++ motion to adjourn.

WG21 Motion to adjourn.
No objection.

Meeting adjourned at 10:16 AM GMT+3.

11. Attendance

Attendee	Affiliation
Adams, Michael	SCC
Adelstein Lelbach, Bryce	ANSI
Alday, Juan	ANSI
Amini, Parsa	ANSI
Arkipova, Olga	ANSI
Arutyunyan, Ruslan	ANSI
Ažman, Gašper	BSI
Baker, Billy	ANSI
Baker, Lewis	ANSI
Ballman, Aaron	ANSI
Balog, Pal	ANSI

Bastien, Jean-Francois	SCC
Bentley, Matthew	ANSI
Berne, Joshua	ANSI
Bi, Brian	ANSI
Birbacher, Frank	ANSI
Boehm, Hans	ANSI
Bonaventura, Xavier	DIN
Boric, Nemanja	ANSI
Boyarinov, Konstantin	ANSI
Brett, Peter	BSI
Brown, Walter E	
Butler, Matthew	ANSI
Büttner, Sebastian	ANSI
Cardoso de Souza Rodrigues, Guilherme	ASI
Catmur, Edward	BSI
Caves, Jonathan	ANSI
Childers, Wyatt	ANSI
Chorazewicz, Igor	ANSI
Corden, Richard	ANSI
Craig, Benjamin	ANSI
Craig, Philip	BSI
D'Angelo, Giuseppe	ANSI
Davidson, Guy	BSI
de Wever, Mark	ANSI
Dimitrov, Georgi	BDS

Dimov, Peter	
Dominiak, Michał	PKN
Dos Reis, Gabriel	AFNOR
Douglas, Niall	NSAI
Douglas, Robert	ANSI
Doumler, Timur	BSI
Downey, Steve	ANSI
Drewienkowski, Mateusz	
Dusikova, Hana	UNMZ
Engert, Daniela	ANSI
Erdogmus, Kaan	ANSI
Fertig, Andreas	DIN
Fevold, Jake	ANSI
Fevold, Jake	ANSI
Foco, Marco	UNI
Fracassi, Fabio	DIN
Friedman, Ronen	SII?
García Sánchez, José Daniel	UNE
Garland, Jeff	ANSI
Gill, Mungo	NSAI
Gillard, Mark	SFS
Giroux, Olivier	ANSI
Goldblatt, David	ANSI
Goodspeed, Nathaniel	ANSI
Gordon, Fraser	SCC
Gruber, Bernhard Manfred	SNV

Gustafsson, Bengt	SIS
Hagins, Jody	ANSI
Halpern, Pablo	ANSI
Hauswedell, Hannes	IST
Hava, Michael Florian	ASI
Hoemmen, Mark	ANSI
Hollman, Daisy	ANSI
Honermann, Tom	ANSI
Hunt, Oliver	ANSI
Jabot, Corentin	AFNOR
Jaroszyńska, Magdalena	PKN
Jevnik, Joseph	ANSI
Joly, Loïc	AFNOR
Josuttis, Nicolai	DIN
KAMINISKI, Tomasz	AFNOR
Keane, Erich	ANSI
Keremidchiev, Vassil	BDS
Khlebnikov, Rostislav	ANSI
Kirkovski, Seraphime	
Koeppe, Thomas	ANSI
Kokula, Volker	
Kosunen, Elias	SFS
Kretz, Matthias	DIN
Krügler, Daniel	ANSI
Krzemienski, Andrzej	PKN
Kuhl, Dietmar	ANSI

Kulczycki, Peter	ASI
Laine, Timothy	ANSI
Lakos, John	ANSI
Lakos, John	ANSI
Leahy, Robert	ANSI
Lebrun-Grandie, Damien	ANSI
Levi, Inbal	SII
Liber, Nevin	ANSI
Lopes, Bruno	ANSI
Lukanov, Stanimir	BDS
Machutova, Jana	UNMZ
MacLean, Colin	ANSI
Maness, Wesley	ANSI
Marsman, A.	NEN
Maurer, Jens	ANSI
Meerwald, Christof	ASI
Meredith, Alisdair	ANSI
Merrill, Jason	ANSI
Mihaylov, Mihail	BDS
Miller, William	ANSI
Morales, Nicolas	ANSI
Moschovakos, Paris	SNV
Müller, Jonathan	DIN
Murzin, Sergei	ANSI
Neatu, Darius	ANSI
Neumann, Thomas	

Niebler, Eric	ANSI
Nishanov, Gor	ANSI
O'Dwyer, Arthur	ANSI
Opara, Jolanta	PKN
Orr, Roger	BSI
Owen, Nathan	ANSI
Persson, Jonas	SIS
Polukhin, Anton	GOST R
Preney, Paul	SCC
Pusz, Mateusz	ANSI
Ranns, Nina Dinka	BSI
Reverdy, Vincent	AFNOR
Revzin, Barry	ANSI
Rigault, Jean-Paul	AFNOR
Rivera Morell, René Ferdinand	ANSI
Rosten, Oliver	BSI
Roy, Patrice	SCC
Ruoso, Daniel	ANSI
Ryan, Christopher	ANSI
Sandoe, Iain	BSI
Sankel, David	ANSI
Sattler, Florian	ANSI
Schurr, Stephen	ANSI
Scogland, Thomas	ANSI
Seymour, William	ANSI
Simpson, Robert	ANSI

Sitnokov, Sasha	
Snyder, Jeff	BSI
Song, Tim	ANSI
Spencer, Michael	ANSI
Spertus, Michael	ANSI
Spicer, John	ANSI
St. Amour, Bryan	SCC
Stroustrup, Bjarne	ANSI
Sutter, Herb	ISO/IEC JTC 1/SC 22
Tenty, David	ANSI
Tomazos, Andrew	
Tong, Hubert	SCC
van Winkel, J.C.	NEN
Vandevoorde, Daveed	ANSI
Vasama, Lauri	SFS
Vasilev, Vasil	BDS
Vitek, David	ANSI
Voicu, Alexandru	ANSI
Vollmann, Detlef	SNV
Vormwald, Steven	ANSI
Voss, Michael	ANSI
Voutilainen, Ville	SFS
Vrankar, Domen	
Wakely, Jonathan	ANSI
Walker, Kelly	ANSI
Waterloo, Jarrad	ANSI

Weis, Andreas	DIN
Williams, Anthony	BSI
Williamson, Jerry	
Wong, Michael	SCC
Xie, Hui	BSI
xu, chuanqi	SAC
Yaghmour, Shafik	ANSI
Yonchev, Zamfir	
Yuan, Zhihao	ANSI
Zeren, Mark	ANSI
Zhdan, Egor	
Zielonka, Bartosz	PKN
Zissu, Andrei	SII
Zverovich, Victor	ANSI