

WG21 2026-06 Brno Hybrid Meeting Minutes

ISO/IEC JTC1 SC22 WG21 N5053 — 2026-07-05

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Chair: Nina Ranns

08-13 June 2026

Brno, Czechia

1. Opening and introductions

Nina Ranns opens the meeting at 9:03 UTC+2.

1.1. Opening comments, welcome from host

Nina Ranns welcomes the group.

Welcome from the host.

Thank you to the host.

Thank you to the sponsors.

1.2. Meeting guidelines

Nina Ranns presents.

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

- [The ISO Code of Conduct](#)
- [The IEC Code of Conduct](#)
- [The WG21 Practices and Procedures, and Code of Conduct](#)

Documents are on the wiki. Please get familiar with them. They also include a description of the process we follow.

You are expected to abide by the rules of the code of conduct of your respective NB.

Should you at any point find yourselves overwhelmed or needing advice on an uncomfortable situation, do not hesitate to approach a WG21 officer: Guy Davidson, Jeff Garland, Braden Ganetsky, or Nina Ranns. If you can't find them, send them an email and they will be in touch.

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. You can quote aggregate polls and decisions after the meeting.

We have a wiki that contains meeting specific information. Please do not edit the wiki unless you have been explicitly instructed to do so. If you are attending for the first time, please see the page for new committee members.

We also have a github tracker. Please do not update github issues unless you have been explicitly instructed to do so by the relevant chair. Contact Nina Ranns if you need access to the github.

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

Please wear your name badges so everyone knows who is who.

The attendance sheet is live. You can find it on wiki, mattermost, and posted to the reflector. If you have registered, it's pre-populated with your information. Please mark your attendance. If you have any issues, let Nevin Liber know.

For plenary polls, you have to be in the ISO global directory to vote. One person, one vote. In working groups and study groups everyone can vote. Please refer to the best practices in the WG21 document - e.g. do not vote unless you are familiar with the issue.

Nina Ranns explains voting procedure for remote and in person attendance.

Agenda is on the wiki.

1.3. Introductions

Introduction of the WG21 officers.
Introduction of admin support roles.
Introduction of the subgroup chairs.
First time attendees introduce themselves.

1.4. Agenda review and approval

Nina Ranns presents the agenda and timings for the week.

The primary goals of this meeting will be:

- Work on C++29 features

Additional, lower-priority goals include:

- See also P1000R7

Motion to approve the meeting agenda.

No objections.

Approved.

1.5. Editor's reports, approval/adoption of working drafts

Document	Editor's Report	Prospective WD
C++26 Working Draft	N5047	N5046

Motion to approve the documents above.

No objections.

Approved.

1.6. Approval of the minutes of the previous meetings

Meeting	Minutes
WG21 Croydon	N5040
WG21 pre-Brno administrative telecon	N5049

Motion to approve the documents above.

No objections.

Approved.

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 new business.

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

Jens Maurer presents room assignments. There will be no evening sessions.

Jens Maurer presents local amenities.

Room assignments are on the wiki page. Any questions or issues with remote attending setup, please find Jens Maurer.

6. Subgroup sessions

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. Groups are encouraged to make polls available as soon as possible during the week so people can have time to review them. Please keep informed so you can raise any issues or concerns early.

If you have any questions or issues, please bring them up to attention as soon as possible. On reflector, mattermost, or one of the subgroup chairs.

7. Review of the meeting

Reminder: Make sure you have marked the attendance sheet, if you have not already done so.

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

ABI Group (Vandevoorde/Merril)

ABI group has received no queries since Croydon.

Admin (Liber)

There were 199 attendees representing 29 NBs: 113 in person and 88 virtually.

The next few mailing dates are:

Wednesday, July 15th, 2026 (post-Brno mailing)

Friday, August 14th, 2026

Tuesday, September 22nd, 2026

Monday, October 19th, 2026 (pre-Búzios mailing)

SG1: Concurrency (Arutyunyan/Brito)

SG1 was scheduled to meet for 4 days, but only met for 3 days due to an author not showing up or giving notice.

We had our regular topics: atomics, senders and receivers, concurrency and synchronization, and parallelism. There were more parallelism-related papers in the schedule initially.

We had several memorable moments.

- A lot of time talking about atomics specifically on 2 topics:
 - Atomics compatibility with C, where the next steps are likely to go to SG22 to see what can be done on the C language side and also to investigate what can be done on C++ standard side to clarify unobvious things.
 - Atomics and their lifetimes, where we had a fruitful discussion, which should help authors to make progress with his paper, but more work needs to be done before coming back to SG1.
- First try senders and receivers related papers. They were forwarded to the next groups in the papers pipeline as R0. Even though those papers were relatively small, it's still worth noting.

- “Bounced” concurrent queues, which were sent back to SG1 by LWG for formal wording review. We reviewed it and sent it back to LEWG to reconsider the design, because there are different positions in SG1, LEWG, and LWG, which all make sense. We need to figure out how to resolve this to help this paper to make progress.
- “Ultra” unanimous consent on asynchronous synchronization primitives. All votes were strongly in favor.

SG4: Networking (Snyder/Ažman)

SG4 originally had a session scheduled in order to discuss the overall ideas & direction of the networking effort summarised in P4100, but this was cancelled due to the authors deciding to defer this to a later meeting.

SG6: Numerics (Kretz/Lippincott)

SG6 met for two full days on Tuesday and Thursday. Our group was, again, relatively large (with some dependency on what other groups were doing, of course). We processed two LWG issues and reviewed 10 papers. Of these we finished one issue, agreed on a direction for the other; we forwarded 3 papers, and the other 7 papers received good feedback for another round in SG6.

Notable topics:

- "Quantities and units" continues to make good progress.
- There's continuing interest in saying more (a.k.a something) about floating-point behavior. Notably, we have started to make concrete plans for what an Annex for 60559 behavior could look like.

SG7: Compile-time programming (Dusíková/Snyder)

SG7 did not meet.

SG9: Ranges (Müller/Laine)

SG9 met in Brno on Monday afternoon, Wednesday the entire day, and one bonus session on Thursday afternoon. We saw 14 papers, 9 new papers and 3 revisions of papers we've already seen and one LWG issue. We ran out of time to discuss two papers, and one paper was deferred at the author's request.

We forwarded 8 papers, including UTF transcoding and endian conversion views, a view for doing a transform | join in a more efficient way, and a concept for statically sized ranges (which addresses 7+ LWG issues!). We also looked at multi-dimensional index based for_each, the first SG9 paper that does not deal with iterator ranges but multi-dimensional index ranges.

SG10: Feature test (Revzin/Wakely)

SG10 did not meet.

SG14: Low latency (Wong)

SG14 did not meet. We continue to meet monthly online. The next call will be in the 2nd week of July. We continue to focus on ultra low latency, and some amount of coroutines, networking, and games. Some people have expressed interest in discussing hardware acceleration in ultra low latency, including Solarflare, io_uring, and kernel bypass. These topics are welcome in SG14.

SG15: Tooling (Spencer/Boeckel)

SG15 did not meet. We plan to meet at the next meeting.

SG16: Unicode (Downey/Bindels)

The new chair team for SG16, Steve Downey and Peter Bindels, have begun regular telecons for the study group. The group has met twice since Croydon and picked up review of P2728: Unicode in the Library, Part 1: UTF Transcoding, the base paper for Unicode in C++29. SG 16 did not meet in Brno, as the expertise of the regular attendees is needed in other groups. We are restarting telecons every 2 weeks, and will meet in telecons until the next meeting.

SG17: EWG incubator (Keane/Touton)

SG17 did not meet.

SG18: LEWG incubator (Baker/Liber)

We met for 1.5 afternoon sessions (Thursday and Friday), and maintained our record of always ending on time, and finished just before the break on Friday.

We covered all five of the papers on our agenda:

P4210R0 copy_on_write: A Vocabulary Type for Lazily- Copied Values - forwarded P4210R1 to LEWG.

P4148R1 protocol: Structural Subtyping for C++ - voted strongly in favor of seeing this again, next time along with P3086 Proxy: A Pointer-Semantics-Based Polymorphism Library and a comparison of the two approaches.

P3832R2 Timed lock algorithms for multiple lockables - forward P3832R3 to SG1/LEWG (LEWGI has finished reviewing it).

P3833R2 `std::multi_lock` - forwarded P3833R3 to LEWG.

P2906R2 Structured bindings for `std::extents` - forwarded to LEWG.

We plan to have monthly telecons between now and the next meeting.

SG19: Machine learning (Wong/Ratzloff)

SG19 did not meet. We continue our monthly calls, working on statistics and graph algorithms. There is a call for us to work on AI tooling, and how to use AI to develop C++. This is a timely topic, and we must define the bounds carefully.

SG20: Education (van Winkel/Sattler)

SG20 met in Brno on Thursday morning.

Our session opened with a status update on our teaching guideline development. Currently, 17 new teaching topics are in active development, and approximately 15 new topics have been scoped out for people to work on. This was followed by our standard open forum on C++ teaching experiences. Discussion primarily centered on structuring introductory courses for novice students (e.g., don't start with C and progress towards C++ but start with C++ directly) and effectively integrating AI tools into curricula to maximize educational value. SG20 then reviewed the Units paper (P3045) and provided feedback to the author. SG20 wants to explicitly thank the author for incorporating a well-structured, comprehensive teaching section into the proposal. Subsequently, we discussed preliminary improvements for reflection-based code injection, focusing on syntax that ensures reflection remains accessible to non-expert developers. Finally, we concluded with a brief status update on ongoing initiatives aimed at improving the overall C++ onboarding experience for newcomers.

SG22: C/C++ liaison (Doumler/Schultke/Meneide)

SG22 did not meet. We will continue to meet in telecons and see papers. We have a new chair and assistant chair, Timur Doumler and Jan Schultke, respectively.

Report from WG14: They have met twice this year, virtually. They will have 2 in-person meetings this year, in Ottawa and Búzios. The Búzios meeting will be co-located with us. They published a schedule for C2y in N3827. They have a new floating point chair. Robert Seacord has been nominated as the US candidate for the convenor for a second term.

SG23: Safety and Security (Orr/Butler)

SG23 met for most of a day on Friday. We looked at three papers:

P4186R0 A Plan For Profiles by Peter Bindels

We polled in favour of keeping a separation between specifically profiles work and other papers on undefined behaviour. We also agreed to take ownership of a primary document for the profiles design and wording.

P4049R0 Relaxing and extending std::copy from Giuseppe D'Angelo

We support the direction of this paper, removing UB from some algorithms in the library. We had consensus for the option "B" in the paper, which categorises some usages as erroneous behaviour, but did not have consensus for recommending a specific extension.

An update to P4222R0 An initialization profile from Bjarne Stroustrup

The author gave an update on his paper describing an initialization profile. We support him doing more work on this paper. The author was also asking for additional assistance from WG21 for this effort, such as with review comments or work on implementations.

Evolution (Keane/Dusíková/Snyder)

EWG Met for 3 days in Brno, during which we:

Discussed 33 papers/issues:

3 outright rejected, 3 were discussion/presentation ONLY, and 12 were forwarded to other rooms. The remaining are expected to be seen again.

Of those, a whole day (plus a few extra papers) were dedicated to the Contracts feature. We approved of a 'Plan' by the Contracts authors on how they'd like to move forward with their extensions to the existing feature.

Additionally, we forwarded Contracts on Virtual Functions and User Defined Contract Diagnostic Messages, and encouraged more work on Postcondition captures and Contract assertion properties.

We also participated in a very productive and informative joint session with LEWG on the topic of `_BitInt`.

We will be hosting telecons to deal with P3100.

Library Evolution (Levi/Fracassi/Weis)

LEWG have met during the full week in Brno, with a joint session with EWG on Friday. We've reviewed 49 papers & issues.

Summary:

- Forwarded to LWG (C++29) - 16
- Issues:
 - Resolution approved - 2
 - Closed as NAD / needs paper - 7
- No consensus - 2
- Reviewed, needs-revision / implementation needed / more feedback needed - 15
- Reviewed, info - 3
- Design-approved, needs-revision - 2
- Sent back to SG1/CWG - 2

Papers' status:

- P4206R0 — Revert string support in `std::constant_wrapper` — Forwarded to LWG (C++29, DR C++26)
- LWG1488 — Improve interoperability between the C++0x and C1x threads APIs — Closed as NAD
- LWG4515 — format: a and A should insert the 0x or 0X prefix — Needs-paper
- P3395R5 — Fix encoding issues and add a formatter for `std::error_code` — Forwarded to LWG (C++29)
- LWG4156 — `error_category` messages have unspecified encoding — Resolved by P3395R5
- P3793R1 — Better shifting — Forwarded to LWG (C++29)
- P3724R4 — Integer division — Forwarded to LWG (C++29)
- LWG2884 — Relational operators for containers should `sfinae` — Closed as NAD
- LWG2885 — Relational operators of optional/variant inconsistent — Closed as NAD
- LWG3486 — `is_constructible<T[], T...>` may be misleading in C++20 — Needs-paper
- LWG4250 — swap overloads for indirect/polymorphic only found by ADL — Closed as NAD
- LWG2973 — `inplace_merge` complexity prohibits optimizations — Resolution approved
- P1339R1 — Disallowing friending of names in namespace `std` — Needs-author
- LWG2883 — `string_view` parameters instead of `char const*/string const&` — Needs-author
- P3002R1 — Policies for Using Allocators in New Library Classes — Reviewed, needs-revision
- P2127R0 — Making C++ Software Allocator Aware — Reviewed, Info (P3002)
- P3005R0 — Memorializing Principled-Design Policies for WG21 — Reviewed
- P3155R1 — `noexcept` policy for SD-9 (The Lakos Rule) — Reviewed, needs-revision
- P3085R3 — `noexcept` policy for SD-9 (throws nothing) — Brief review, pending LEWG
- P4254R0 — Throwing Violation Handlers Are Post Hoc Library Design — No consensus
- P4257R0 — Marking wide contract non-throwing functions `noexcept` — Brief review, pending LEWG
- P4227R0 — What's in a `cstring_view`? — No consensus
- P4220R0 — Design goals for `zstring_view` — Reviewed, Info
- P3655R5 — `cstring_view` — Reviewed, needs-revision
- LWG4572 — Key ordering requirements of associative containers — Design voted, needs-wording

- P2929R4 — `chunked_invoke` — Forwarded to LWG (C++29)
- P3772R1 — `std::simd` overloads for bit permutations — Forwarded to LWG (C++29)
- P3642R5 — Carry-less product: `std::clmul` — Forwarded to LWG (C++29)
- P4139R2 — Better Name for Better Lookups in P3091 — Forwarded to LWG (C++29)
- P3094R6 — `std::basic_fixed_string` — Reviewed, needs-revision
- P4189R0 — `get()`ing the pointer from `optional<T&>` — Forwarded to LWG (C++29)
- P3125R5 — `constexpr` pointer tagging — Forwarded to LWG (C++29)
- P3771R0 — `constexpr` mutex, locks, and condition variable — Implementation needed
- P1040R10 — `std::embed` and `#depend` — Design approved, needs-revision
- P3669R3 — Non-Blocking Support for `std::execution` — Forwarded to LWG (C++29)
- P3427R4 — Hazard Pointer Synchronous Reclamation — Forwarded to LWG (C++29)
- P3148R1 — Formatting of chrono Time Values — Reviewed, needs-revision
- LWG4560 — Precision specification in duration formatter — Needs-paper
- P2945R1 — Additional format specifiers for `time_point` — Reviewed, needs-revision
- P3242R2 — Copy and fill for `mdspan` — Forwarded to LWG (C++29)
- P3117R1 — Extending Conditionally Borrowed — Design approved, needs-wording
- P3220R2 — `views::take_before` — Forwarded to LWG (C++29)
- P3666R4 — Bit-precise integers — Design approved, needs revision
- LWG3417 — Missing volatile atomic deprecations — Sent back to SG1
- LWG1459 — Overlapping evaluations are allowed — Sent back to SG1/CWG
- P3413R0 — A more flexible `optional::value_or` (else!) — Reviewed, needs-revision
- P3411R6 — `any_view` — Forwarded to LWG (C++29)
- P3049R1 — `node_handles` for lists — Forwarded to LWG (C++29)
- P2964R4 — Allowing user-defined types in `std::simd` — Reviewed, pending LEWG

LEWG will continue to conduct telecons until November's meeting in Búzios, starting on July 7th. In Búzios we will take votes on policies discussed during the Brno meeting.

Thank you to all the paper authors and participants for the great feedback, and to the SG chairs for great collaboration.

Special thanks to our minute takers: Bronek Kozicki, Eddie Nolan, Elias Kosunen, Nicolas Morales, Guy Davidson, Nathan Myers, Andreas Weis, and to all who assisted!

Core (Maurer/Merrill/Yaghmour)

- CWG has more straw polls than LWG
- Huge thanks to the scribes, 4/5 of which goes to Jason and 1/5 to Roger
- Wordings of future papers should have changes to UB/IFNDR annexes
- P3367 `constexpr` coroutines not on the list (LWG approval outstanding)
- Polls 17 and 18 were amended to mark them as DRs

CWG polls

1. Accept as Defect Reports and apply the proposed resolutions of all issues in P4271R0 (Core Language Working Group "ready" Issues for the June, 2026 meeting) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

2. Apply the changes in P3596R3 (Undefined Behavior and IFNDR Annexes) to the C++ Working Paper.

No discussion.

Objection in the room.

In favour: 54 in room + 22 online = 76

Opposed: 0 in room + 0 online = 0

Abstain: 2 in room + 6 online = 8

Approved.

3. Apply the changes in P2287R6 (Designated-initializers for Base Classes) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

4. Accept as a Defect Report and apply the changes in P3899R3 (Clarify the behavior of floating-point overflow) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

5. Apply the changes in P3668R4 (Defaulting Postfix Increment and Decrement Operations) to the C++ Working Paper.

Discussion in the room.

Question: How hard did we try to get rid of the weirdness in the declaration? Now we have a situation where we can avoid the other definition, but we need that int parameter that isn't real. Did we try this with a single declaration that causes the other declaration and definition to be emitted?

Answer:

- Person 1: We forwarded this paper in Croydon. It is long enough ago that we would need to go back and check the minutes.
- Person 2: We discussed it in EWG in Sofia. The paper mentions a design alternative of a rewrite rule wherein we implicitly generate the postfix through one declaration of the prefix. We decided against it. This was discussed.

Objection in the room.

In favour: 47 in room + 17 online = 64

Opposed: 1 in room + 1 online = 2

Abstain: 10 in room + 8 online = 18

Approved.

6. Apply the changes in P2953R5 (Adding restrictions to defaulted assignment operator functions) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

7. Accept as a Defect Report and apply the changes in P2434R5 (Nondeterministic pointer provenance) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

8. Accept as a Defect Report and apply the changes in P3347R6 (Invalid Pointer Operations) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

9. Accept as a Defect Report and apply the changes in P3658R1 (Adjust identifier following new Unicode recommendations) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

10. Accept as a Defect Report and apply the changes in P3950R1 (return_value & return_void Are Not Mutually Exclusive) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

11. Accept as a Defect Report and apply the changes in P3733R1 (More named universal character escapes) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

12. Accept as a Defect Report and apply the changes in P3847R1 (Lexical order for lambdas) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

13. Accept as a Defect Report and apply the changes in P2243R0 (Language linkage for templates) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

14. Apply the changes in P3424R2 (Deallocation Functions with Throwing Exception Specification Are Ill-formed) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

15. Apply the changes in P3822R2 (Conditional noexcept specifiers in compound requirements) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

16. Apply the changes in P3097R3 (Contracts for C++: Virtual functions) to the C++ Working Paper.

Discussion in the room.

- Person 1: There were various concerns why this facility was pulled out of C++26. Those concerns remain unaddressed. I would like to request that this motion be postponed by one meeting so that response papers can be rewritten and considered before adoption into the working draft.
- Person 2: These objections were discussed in EWG over the last few meetings. When we pulled it out of the C++26 WD, we were promised that the alternatives would be in a paper within a few weeks. Those papers did not materialize, approximately 8 months since that promise was made. It is up to the CWG chair on whether to pull it, but we have waited already. Unsure if one more cycle changes that.
- Person 3: Yes this has been discussed over multiple meetings over the last more-than-one year, and it would be inappropriate to pull this poll.

Objection in the room.

In favour: 42 in room + 13 online = 55

Opposed: 4 in room + 6 online = 10

Abstain: 16 in room + 7 online = 23

Approved.

17. Accept as a Defect Report and Apply the changes in P4101R1 (Consteval-only Values for C++26) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

18. Accept as a Defect Report and Apply the changes in P2414R12 (Pointer lifetime-end zap proposed solutions) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

19. Apply the changes in P3670R4 (Pack Indexing for Template Names) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

20. Apply the changes in P3540R3 (#embed offset parameter) to the C++ Working Paper.

No discussion.

No objection to unanimous consent.

Approved.

Library (Wakely/Garland/Kühl/St. Amour/Trott)

LWG met all week and had an interesting and productive week. Without the pressure of processing NB ballot comments we were able to spend several sessions processing library issues, and closing a few dozen (out of around 600 open issues).

We processed a number of papers that have been in progress for several years, having missed the C++26 (or even C++23) train. We also processed some more recent papers that had been approved by LEWG more recently, but with C++29 as the shipping vehicle. Most of what we reviewed is on the polls today, but there are some papers that need revisions and will be seen again.

Unusually for LWG, we had some polls where the room was split, requiring the chair to actually determine consensus. In our room the vote is invariably close to unanimous,

because by the time we've done a thorough review and updated the wording, everybody is usually on the same page and satisfied with the changes being proposed..

We must thank everybody who helped out in LWG this week. Especially our scribes (with Dietmar doing the majority of scribing work as usual) and the vice chairs (Jeff, Dietmar, Christian and Bryan) who kept everything running smoothly while the chair tried to stay on top of updating the issues list and straw polls. Thanks also to the LWG regulars who identified countless problems that needed to be addressed in proposals, provided new wording, and generally kept things moving in the right direction.

LWG will not be meeting for a zombie session after plenary. We will resume telecons in 2 or 3 weeks, to be announced on the reflector and updated on the WG21 calendar.

LWG polls

1. Apply the changes in P4258R0 (C++ Standard Library Ready Issues to be moved in Brno, Jun. 2026) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

2. Apply the changes in P3319R6 (Add an iota object for simd (and more)) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

3. Apply the changes in P3798R1 (The unexpected in std::expected) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

4. Apply the changes in P3052R2 (view_interface::at()) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

5. Apply the changes in P4206R0 (Revert string support in std::constant_wrapper) to the C++ working paper.

Discussion in the room

- Person 1: Does the wording of the paper include an annex C entry? And the same question for poll 7.
- Person 2: No it does not. We can add one, and proposals that do that are welcome.
- Person 3: This can likely be done as a defect report.

No objection to unanimous consent.

Approved.

6. Apply the changes in P3395R6 (Fix encoding issues and add a formatter for `std::error_code`) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

7. Apply the changes in P3505R4 (Fix the default floating-point representation in `std::format`) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

8. Apply the changes in P3154R3 (Deprecating signed character types in iostreams) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

9. Apply the changes in P3428R4 (Hazard Pointer Batches) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

10. Apply the changes in P3248R5 (Require `[u]intptr_t`) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

11. Apply the changes in P3793R2 (Better shifting) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

12. Apply the changes in P3242R4 (Copy and fill for mdspan) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

13. Apply the changes in P3692R4 (How to Avoid OOTA Without Really Trying) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

14. Apply the changes in P3104R6 (Bit permutations) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

15. Apply the changes in P3772R2 (std::simd overloads for bit permutations) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

16. Apply the changes in P3091R6 (Better Lookups for map, unordered_map, and flat_map) to the C++ working paper.

No discussion.

No objection to unanimous consent.

Approved.

17. Apply the changes in P3125R6 (constexpr pointer tagging) to the C++ working paper.

No discussion.

Objection in the room.

In favour: 43 in room + 13 online = 56

Opposed: 3 in room + 1 online = 4

Abstain: 16 in room + 11 online = 27

Approved.

18. Apply the changes in P2019R9 (Thread attributes) to the C++ working paper.

No discussion.

Objection in the room.

In favour: 46 in room + 12 online = 58
Opposed: 1 in room + 0 online = 1
Abstain: 10 in room + 15 online = 25
Approved.

19. Apply the changes in P3785R1 (Library Wording Changes for Defaulted Postfix Increment and Decrement Operations) to the C++ working paper.

No discussion.
No objection to unanimous consent.
Approved.

Direction Group (Vandevoorde)

At the last meeting, we shipped C++26 and already community feedback seems quite positive: It's definitely regarded as a "major release" for C++.

Major releases often come with major followup work: We've worked hard to make that C++26 deadline, but maybe had to drop some parts of proposals that would make them "whole". Or maybe towards the end we ran into an issue that couldn't be addressed in time? Or maybe there are pre-C++26 items that need closure, like UTF-8 support?

In any case, the direction group believes that the C++29 standardization cycle would be a good one to prioritize completing all that work, and also give implementers time to catch up.

However, there is one item that deserves higher priority still: Improving C++'s story with respect to safety and security. So we encourage group chairs to push reviewing proposals in that category to the front of the queue. Examples include P4233 — an additional library hardening proposal from Apple — and P3589, which is the profiles framework proposal from Microsoft. Bjarne also has some initial profile proposals for that framework, including P4222 dealing with uninitialized objects.

We've updated P5000 to express that suggested direction: For individuals who haven't read it yet, we encourage them to do so.

This is our first meeting dedicated to what we hope will become C++29... three years is not that long... So we are wishing all best wishes for solid progress.

8. Closing activities

8.1. Issues delayed until today

Thank you to everyone who has scribed this week.

8.2. Mailings

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

2026-07-15: Wednesday, July 15th, 2026

2026-08-14: Friday, August 14th, 2026

2026-09-22: Tuesday, September 22nd, 2026

2026-10-19: Monday, October 19th, 2026

8.3. Plans for the future

No discussion.

8.4. Next and following meetings

Thank you to the sponsors of this meeting and the people who made it run smoothly.

The upcoming meetings are:

- [2026-11-16 to 21: Búzios, Rio De Janeiro, Brazil](#); C++ Alliance
- 2027-03-21 to 27: Istanbul, Türkiye; Matriks
 - The N-paper with information is forthcoming
- 2027-summer: (tentative) Sofia, Bulgaria
- 2027-autumn: (tentative) Budapest, Hungary
- 2028-winter: Kona, HI, USA
- 2028-summer: (tentative) Madrid
- 2028-autumn: (tentative) Crete

9. Adjournment

Meeting adjourned at 10:01 UTC+2.

10. Attendance

Name (199)	National Body (29)
Adams, Michael	SCC
Akkaoui, Mohamed Ayoub	UNMZ
Alday, Juan	ANSI
Arutyunyan, Ruslan	ANSI
Bagdonas, Ignas	BSI
Baker, Billy	ANSI
Balog, Pal	ANSI
Banglawala, Neelofer	BSI
Bentley, Matthew	ANSI
Berge', Agustin	UNI
Berne, Joshua	ANSI
Beyls, Kristof	BSI
Bi, Brian	ANSI
Bindels, Peter	NEN
Birbacher, Frank	ANSI
Boeckel, Ben	ANSI
Boehm, Hans	ANSI
Bonaventura, Xavier	DIN
Borland, Matt	ANSI
Bott, Harold	ANSI
Brindle, Tristan	BSI
Brito Gadeschi, Gonzalo	ANSI
Brown, Walter E.	SII
Butler, Matthew	ANSI
Büttner, Sebastian	ANSI
ÇAĞRI, Murat Can	TSE
Cardoso de Souza Rodrigues, Guilherme	ASI
Cassagnes, Aurelien	ANSI
Caves, Jonathan	ANSI
Childers, Wyatt	ANSI
Chochlik, Matus	UNMS SR
Coe, Jonathan Brian	BSI
Craig, Philip	BSI
Cranmer, Joshua	ANSI
D'Angelo, Giuseppe	ANSI
Davidson, Guy	BSI
Dionne, Louis	SCC
Douglas, Robert	ANSI

Doumler, Timur	BSI
Downey, Steve	ANSI
Dusikova, Hana	UNMZ
Ebenkamp, Alli	ANSI
Egan, Jake	SCC
Engert, Daniela	DIN
Falco, Vincent	ANSI
Fertig, Andreas	DIN
Fracassi, Fabio	DIN
Ganetsky, Braden	SCC
García Sánchez, José Daniel	UNE
Garg, Lakshay	ANSI
Garland, Jeff	ANSI
Genovese, Walter	ANSI
Gill, Mungo	NSAI
Goodspeed, Nathaniel	ANSI
Gordon, Fraser	SCC
Gordon, Molly	ANSI
Gruber, Bernhard	ANSI
Gustafsson, Bengt	SIS
Halpern, Pablo	ANSI
Hannon, Daniel	NSAI
Hava, Michael Florian	ASI
Haynes, Graham	BSI
Herring, Davis	ANSI
Hoemmen, Mark	ANSI
Honermann, Tom	ANSI
Hrenka, Peter	DIN
Hunt, Oliver	ANSI
HUSSONG, Charles	JISC
Izvekov, Matheus	ABNT
Izvekov, Matheus	ANSI
JABOT, Corentin	AFNOR
Jelinek, Jakub	ANSI
Josuttis, Nicolai	DIN
Kamiński, Tomasz	PKN
Karampour, Maryam	SCC
Kawulak, Robert	PKN
Keane, Erich	ANSI
Khyzha, Artem	BSI
Kilpeläinen, Mikael	SFS

Koeppe, Thomas	ANSI
Kosunen, Elias	SFS
Kozicki, Bronek	BSI
Kretz, Matthias	DIN
Krzemieniski, Andrzej	PKN
Kuhl, Dietmar	ANSI
Lakos, John	ANSI
Lapkowski, Christopher	ANSI
Larson, Brad	ANSI
Lauko, Henrich	UNMZ
Leahy, Robert	SCC
Lebrun-Grandie, Damien	ANSI
Leroy, Robin	UNICODE
Levi, Inbal	ANSI
Levi, Inbal	SII
Li, Yihe	ANSI
Liao, Tian	SAC
Liber, Nevin	ANSI
Lippincott, Lisa	ANSI
López Gómez, Javier	UNE
Luchkin, Viacheslav	ANSI
Lyngmo, Ted	SIS
Machutova, Jana	UNMZ
Majumder, Abhilash	ANSI
Maness, Wesley	ANSI
Martin, Adam	ANSI
Matt, Cummins	ANSI
Maurer, Jens	ANSI
McDougall, Ryan	ANSI
McKenney, Paul	ANSI
McMonagle, John	BSI
Meerwald, Christof	ASI
Mejstrik, Thomas	ASI
Meneide, JeanHeyd	NEN
Meredith, Alisdair	ANSI
Merrill, Jason	ANSI
Michael, Maged	ANSI
Morales, Nicolas	ANSI
Moschovakos, Paris	SNV
Müller, Jonathan	DIN
Murzin, Sergei	ANSI

Myers, Nathan	ANSI
Nathan Baggs	BSI
Nolan, Edward	ANSI
Orr, Roger	BSI
Owen, Nathan	ANSI
Pashov, Vasil	BDS
Peacock, Antony	BSI
Pelliccioni, Fernando	ANSI
Persson, Jonas	SIS
Petersen, Ian	SCC
Polukhin, Anton	GOST R
Pusz, Mateusz	PKN
Ranns, Nina Dinka	BSI
Revzin, Barry	ANSI
Rivera Morell, René Ferdinand	ANSI
Ronkainen, Jari	SFS
Rosten, Oliver	BSI
Roy, Patrice	SCC
Ryan, Christopher	ANSI
Sandoe, Iain	BSI
Satle, Ankur	BIS
Sattler, Florian	ANSI
Schultke, Jan	ANSI
Serebrennikov, Vladislav	ANSI
Simerda, Pavel	UNMZ
Snyder, Jeff	BSI
Song, Tim	ANSI
Spencer, Michael	ANSI
Spicer, John	ANSI
St. Amour, Bryan	SCC
Starosz, Sebastian	PKN
Stroustrup, Bjarne	ANSI
Sutter, Herb	ANSI
Taylor, Matthew	BSI
TEODORESCU, Lucian Radu	ASRO
Thomas, Alexsandro	ABNT
Tong, Hubert	SCC
Towner, Daniel	ANSI
Trott, Christian	ANSI
Van Eerd, Tony	SCC
Vandevoorde, Daveed	ANSI

Varlamov, Konstantin	ANSI
Vasama, Lauri	SFS
Veigas Ramírez, Santiago	UNE
Vollmann, Detlef	SNV
Voutilainen, Ville	SFS
Wakely, Jonathan	ANSI
Walker, Kelly	ANSI
Wang, Yihan	ANSI
Waterloo, Jarrad	ANSI
Weis, Andreas	ANSI
Williams, Anthony	BSI
Wippich, Matthias	ANSI
Wood, Tobias	BSI
Xie, Hui	BSI
xu, chuanqi	SAC
Yacobi, Tal	ANSI
Yaghmour, Shafik	ANSI
Yuan, Zhihao	ANSI
YUKHYMENKO, VALENTYN	ANSI
Zimmermann, Philipp	ANSI
Zissu, Andrei	ANSI
Zverovich, Victor	ANSI
Arnold, Anthony	SA
Bauman, Jon	ANSI
Chris Blume	ANSI
Császár Mátyás	MSZT
Daniel Pfeifer	SNV
Jan Koniarik	UNMZ
Jan Mrázek	UNMZ
Jan Wilmans	NEN
Jan Zatyko	UNMZ
Klaus Triendl	CYS
Lukáš Korenčík	UNMZ
Marcos Bracco	IRAM
Matěj Plch	UNMZ
Miklós Kozák	MSZT
Tibor Mikeš	UNMZ
Václav Chvíla	UNMZ
Vladimír Štill	UNMZ
Zoltán Porkoláb	MSZT