

# WG21 2021-06 Virtual Meeting Minutes of Meeting

ISO/IEC JTC1 SC22 WG21 N4891 — 2021-06-13

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Chair: John Spicer

Monday 2021-06-07  
08:00 N.Am. Pacific Time

## 1. Opening activities

John Spicer opens the meeting at 08:05 AM N.Am. Pacific Time

### 1.1 Opening comments (PL22.16)

John Spicer presents.

Thank you to everyone for your continuing efforts in these challenging times.

### 1.2 Meeting guidelines

John Spicer presents.

Meetings are not public, but are open to visitors. Please refrain from live tweeting, blogging, taking photos or videos.

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

[The INCITS Antitrust Guidelines \(PL22.16\)](#)

[The INCITS Patent Policy \(PL22.16\)](#)

[The ISO Code of Conduct](#)

[The INCITS Code of Conduct \(PL22.16\)](#)

[The IEC Code of Conduct](#)

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

John Spicer presents the meeting guidelines. We expect everyone to be familiar with these rules. These apply to the plenary and to all the subgroup meetings  
John Spicer presents the Antitrust guidelines.

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. If you have any technical issues or concerns, please bring them up as soon as possible.

### **1.3 The ISO Code of Conduct**

ISO requires that, through 2020, committees provide an opportunity to discuss the code of conduct.

John Spicer presents ISO CoC slides.

Please report any CoC violation to @conduct even if you also report it to the subgroup chair.

### **1.4 Membership, voting rights, and procedures for the meeting (PL22.16)**

John Spicer presents voting rights.

If you are representing an organization that is considering formally joining PL22.16, or your organization is already a member and you wish to change your voting status, please inform an officer.

Hal Finkel presents. When registering for the call, please make sure you use the name that is registered in the global directory.

John Spicer presents how to vote using the telecon client.

### **1.5 Introductions**

Officers introduce themselves.

New members introduce themselves.

John Spicer welcomes new members.

### **1.6 Agenda review and approval (PL22.16 motion, WG21 poll)**

John Spicer presents.

The meeting goals described above are derived from the schedule adopted in 2020 and described in: [P1000R4](#)

The primary goal of this meeting will be to provide any necessary status updates and conduct straw polls proposed for working draft changes.

John Spicer presents the agenda.

PL22/16 motion to approve the meeting agenda

Aaron Ballman Moves

Nevin Liber seconds.

The motion is unanimously approved by PL22/16.

WG21 motion to approve the meeting agenda, with the changes to the agenda as discussed.

The motion is unanimously approved by WG21.

### 1.7 Editor's reports, approval of working drafts

Document	Editor's report	Prospective WD
C++23 Standard	<a href="#">N4886</a>	<a href="#">N4885</a>

WG21 motion to approve the working drafts.

The motion is unanimously approved by WG21.

### 1.8 Approval of the minutes of the previous meetings (PL22.16 motion, WG21 poll)

Meeting	Minutes
WG21 February Virtual	<a href="#">N4884</a>
PL22.16 February Virtual	<a href="#">pl22.16-2021-00002</a>
WG21 pre-June Virtual administrative telecon	<a href="#">N4890</a>

PL22/16 motion to approve the minutes.

Mike Miller moves.

Hubert Tong seconds

The motion is unanimously approved by PL22/16.

WG21 motion to approve the minutes.

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**

Aaron Ballman presents an update on the C committee on going work.

All of this is covered in P2391R0:

##### **C23 Major Features :**

Attributes (N2335, N2554) (is compatible with C++ syntax and semantics)

TS 18661 integration (N2314, N2341, N2359, N2401) (ISO 60559:2011/IEEE

754-2008 compatible with an eye towards the future; adds new floating-point types and a pile of new functions)

##### **Other Features of Interest :**

Fixed about 15 defect reports

Lifting from POSIX (N2349, N2353) (adds memccpy, strdup, and strndup)

Thread-safe time conversion functions (N2417)

Removed support for K&R C-style identifier list definitions (N2432)

##### **C23 Features for C++ Compatibility :**

Harmonizing static\_assert with C++ (N2265)

Querying attribute support (N2553)

nodiscard attribute (N2267, N2448)

maybe\_unused attribute (N2270)

deprecated attribute (N2334)

fallthrough attribute (N2408)

Two's complement sign representation (N2412)

u8 character prefix (N2418)

\_Bool definitions for true and false (N2393)

Allowing unnamed parameters in function definitions (N2480)

Binary literals (N2549)

Allow duplicate attributes (N2557)

Remove mixed wide string literal concatenation (N2594)

digit separators (N2626)

### **Additional (unadopted) Features :**

Pointer provenance and correcting the C memory and object models  
(Memory Object Model study group)  
lambdas (N2736, N2737, N2738)  
nullptr (N2692)  
type inference (N2735)  
typeof (N2685)  
bit-precise integer types (N2709)  
\_\_has\_include (N2673)  
integer-safe arithmetic (N2683)  
defer and panic (N2589)  
#embed (N2592)

## **5. Discussion and Straw Polls**

### **5.1 CWG Polls**

**1. Accept as Defect Reports all issues in [P2386R0](#) (Core Language Working Group "ready" Issues for the June, 2021 meeting) and apply the proposed resolutions to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**2. Apply the changes in [P1938R3](#) (if **consteval**) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**3. Apply the changes in [P2186R2](#) (Removing Garbage Collection Support) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**4. Accept [P1949R7](#) (C++ Identifier Syntax using Unicode Standard Annex 31) as a Defect Report and apply the changes therein to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**5. Accept [P2156R1](#) (Allow Duplicate Attributes) as a Defect Report and apply the changes therein to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**6. Apply the changes in [P1401R5](#) (Narrowing contextual conversions to `bool`) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**7. Apply the changes in [P2223R2](#) (Trimming whitespaces before line splicing) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**8. Apply the changes in [P1847R4](#) (Make declaration order layout mandated) to the C++ working paper.**

There are objections in the room  
Herb Sutter reminds of the voting procedure.

In favour : 52  
Opposed : 2  
Abstain : 14

Motion passes.

**9. Apply the changes in [P2201R1](#) (Mixed string literal concatenation) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

## 5.2 LWG Polls

### Concurrency TS

**1. Apply the changes in [P1122R4](#) (Proposed Wording for Concurrent Data Structures: Read-Copy-Update (RCU)) to the Concurrency TS working paper.**

No objection to unanimous consent.

Motion passes.

**2. Apply the changes in [P1121R3](#) (Hazard Pointers: Proposed Interface and Wording for Concurrency TS 2) to the Concurrency TS working paper.**

No objection to unanimous consent.

Motion passes.

### Issues

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**3. Apply the changes for all Tentatively Ready issues in [P2385R0](#) (C++ Standard Library Issues to be moved in Virtual Plenary, June 2021) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

### C++23

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**4. Apply the changes in [P1132R7](#) (out\_ptr - a scalable output pointer abstraction) to the C++ working paper.**

Objections in the room.

In favour : 36

Opposed : 4

Abstain: 29

Motion passes.

**5. Apply the changes in [P1328R1](#) (Making `std::type_info::operator==` constexpr) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**6. Apply the changes in [P0448R4](#) (A `stringstream` replacement using `span` as buffer) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**7. Apply the changes in [P1425R4](#) (Iterators pair constructors for `stack` and `queue`) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**8. Apply the changes in [P1518R2](#) (Stop overconstraining allocators in container deduction guides) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**9. Apply the changes in [P0401R6](#) (Providing size feedback in the `Allocator` interface) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**10. Apply the changes in [P1659R3](#) (`starts_with` and `ends_with`) to the C++ working paper.**

No objection to unanimous consent.



Motion passes.

**11. Apply the changes in [P1951R1](#) (Default Arguments for `pair`'s Forwarding Constructor) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**12. Apply the changes in [P1989R2](#) (Range constructor for `std::string_view` 2: Constrain Harder) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**13. Apply the changes in [P2136R3](#) (`invoke_r`) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

**14. Apply the changes in [P2166R1](#) (A Proposal to Prohibit `std::basic_string` and `std::basic_string_view` construction from `nullptr`) to the C++ working paper.**

No objection to unanimous consent.

Motion passes.

## **C++20 and C++23**

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**15. Apply the changes in [P2231R1](#) (Missing `constexpr` in `std::optional` and `std::variant`) to the C++ working paper, as a defect report for C++20.**

No objection to unanimous consent.

Motion passes.

**16. Apply the changes in [P2216R3](#) (`std::format` improvements) to the C++ working paper, as a defect report for C++20.**

There are objections in the room.

In favour : 45

Opposed : 1

Abstain : 15

Motion passes.

**17. Apply the changes in [P2281R1](#) (Clarifying range adaptor objects) to the C++ working paper. This resolves LWG issues 3509 and 3510.**

No objection to unanimous consent.

Motion passes.

**18. Apply the changes in [P2328R1](#) (`join_view` should join all views of ranges) to the C++ working paper, as a defect report for C++20.**

No objection to unanimous consent.

Motion passes.

**19. Apply the changes in [P2325R3](#) (Views should not be required to be default constructible) to the C++ working paper, as a defect report for C++20.**

No objection to unanimous consent.

Motion passes.

**20. Apply the changes in [P2210R2](#) (Superior String Splitting) to the C++ working paper, as a defect report for C++20.**

No objection to unanimous consent.

Motion passes.

**21. Apply the changes in [P2367R0](#) (Remove misuses of list-initialization from Clause 24) to the C++ working paper, as a defect report for C++20.**

No objection to unanimous consent.

Motion passes.

### 5.3 WG21 Polls

**1. Direct the project editor for the Concurrency Technical Specification V2 to produce an initial working paper based on [P1122R4](#) and [P1121R3](#).**

No objection to unanimous consent.

Motion passes.

**2. Direct the Convener to request a New Work item for a Technical Specification for C++ Concurrency V2 based on [P1122R4](#) and [P1121R3](#) as an indication of its content.**

No objection to unanimous consent.

Motion passes.

## 6. Closing activities

### 6.1 Other business

### 6.2 PL22.16 motions, if any

John Spicer reminds of voting rights for PL22.16

#### 6.2.1 Systematic Review - TS 19216:2018, C++ Extensions for Networking

**Motion: Per PL22.16-2021-00007, PL22.16 APPROVES to Confirm TS19216:2018, C++ Extensions for Networking.**

Jonathan Wakely moves.

Bryce Adelstein Leibach seconds.

In favour : 30

Opposed : 0

Abstain : 4  
Total voting members : 40

Motion approved.

### **6.2.2 Systematic Review - TS 21544:2018, C++ Extensions for Modules**

**Motion: Per PL22.16-2021-00010-0001, PL22.16 APPROVES to Withdraw TS 21544, C++ Extensions for Modules.**

Barry Hedquist moves  
Bronck Kozicki seconds

In favour : 32  
Opposed : 0  
Abstain : 3  
Total voting members : 40

Motion approved.

## **7 Plans for the future (PL22.16)**

### **7.1 Next and following meetings**

Herb Sutter presents.

(virtual) 2021-10-04: Zoom virtual plenary meeting

2022-02-07 to 12: Portland, OR, USA; Intel

2022-07: New York, NY, USA; Bloomberg

2022-11-07 to 12: Kona, HI, USA: Standard C++ Foundation

### **7.2 Mailings**

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

2021-06-15: Post-Summer

2021-09-15: Pre-Autumn

## **8. Adjournment (PL22.16 motion)**

Jonathan Wakely moves  
Bryce Adelstein Lelbach seconds

John Spicer adjourned the meeting at 09:20 AM N.Am. Pacific Time

## 9. Attendance

<b>Name</b>	<b>Company</b>	<b>Country</b>
Aaron Ballman	Intel Corporation	US
Adam Lach	Bloomberg	
Alicia Klinvex	Naval Nuclear Laboratory	
Alisdair Meredith	Bloomberg	US
Andreas Weis		Germany
Antony Polukhin		Russia
Barry Hedquist	Perennial	US
Barry Revzin	Jump Trading LLC	US
Ben Boeckel		
Billy Baker	FlightSafety International	US
Bjarne Stroustrup	Morgan Stanley	US
Bronek Kozicki		UK
Bruno Cardoso Lopes	Facebook	US
Bryan St Amour		Canada
Bryce Adelstein Lelbach	NVidia Corporation	US
Casey Carter	Microsoft Corporation	US
Chandler Carruth	Google	US
Christian Trott	Sandia National Laboratories	US
Christof Meerwald		Austria
Christopher Di Bella		UK
Corentin Jabot		France

<b>Damien Lebrun-Grandie</b>	Oak Ridge National Laboratory	US
<b>Daniel Katz</b>		
<b>Daniela Engert</b>		
<b>David Olsen</b>	NVidia Corporation	US
<b>David Sankel</b>	Bloomberg	US
<b>Davide Di Gennaro</b>		Italy
<b>Detlef Vollmann</b>		Switzerland
<b>Dietmar Kühl</b>	Bloomberg	US
<b>Ellen Herrick</b>		
<b>Eric Niebler</b>	Facebook	US
<b>Erich Keane</b>	Intel Corporation	US
<b>Espen Harlinn</b>		Norway
<b>Fabio Fracassi</b>		Germany
<b>Florian Sattler</b>		
<b>Frank Birbacher</b>		UK
<b>Gabriel Dos Reis</b>	Microsoft Corporation	France
<b>Glen Fernandes</b>	The C Plus Plus Alliance Inc	US
<b>Graham Lopez</b>	NVidia Corporation	US
<b>Guy Davidson</b>		UK
<b>Hal Finkel</b>	United States Dept of Energy	US
<b>Hana Dusíková</b>		Czech Republic
<b>Hans Boehm</b>	Google	US
<b>Hartmut Kaiser</b>	Louisiana State University	US
<b>Herb Sutter</b>	Microsoft Corporation	US
<b>Howard Hinnant</b>	Ripple Labs	US
<b>Hubert Tong</b>	IBM Corporation	Canada

<b>Inbal Levi</b>		Israel
<b>J. Daniel Garcia</b>	University Carlos III of Madrid	Spain
<b>Jagrut Dave</b>		
<b>Jason Merrill</b>	IBM Corporation	US
<b>JC van Winkel</b>		Netherlands
<b>Jean-Paul Rigault</b>		France
<b>Jeff Garland</b>		
<b>Jeffrey Olkin</b>		
<b>Jens Maurer</b>	Edison Design Group	US
<b>JF Bastien</b>		Canada
<b>Joe Sachs</b>	SAS Institute Inc	US
<b>John Lakos</b>	Bloomberg	US
<b>John Plaice</b>	Grammatech	US
<b>John Spicer</b>	Edison Design Group	US
<b>Jonathan Wakely</b>	IBM Corporation	US
<b>Jorge Silva</b>	SAS Institute Inc	US
<b>Joshua Berne</b>		
<b>Juan Alday</b>	GreenWireSoft	US
<b>Kelly Walker</b>	Stellar Science	US
<b>Larry Lewis</b>	SAS Institute Inc	US
<b>Loïc Joly</b>		France
<b>Louis Dionne</b>	Apple	US
<b>Maged Michael</b>	Facebook	US
<b>Marco Foco</b>		Italy
<b>Mark Hoemmen</b>	Stellar Science	US
<b>Mark Zeren</b>	VMware Inc	US
<b>Matthew Butler</b>	Laurel Lye	US
<b>Matthew Woehlke</b>		
<b>Matthias Kretz</b>		Germany

<b>Matus Chochlik</b>		Slovakia
<b>Michael Adams</b>		Canada
<b>Michael Hava</b>		Austria
<b>Michael Wong</b>		Canada
<b>Michał Dominiak</b>	NVIDIA Corporation	Poland
<b>Mike Herrick</b>	Edison Design Group	US
<b>Mingxin Wang</b>		China
<b>Nat Goodspeed</b>	Linden Research, Inc	US
<b>Nathan Sidwell</b>		
<b>Nemanja Boric</b>	Amazon Corporate LLC	US
<b>Nevin Liber</b>	Argonne National Laboratory	US
<b>Nicolai Josuttis</b>		Germany
<b>Nina Ranns</b>	Edison Design Group	UK
<b>Olivier Giroux</b>	NVIDIA Corporation	US
<b>Ozan Irsoy</b>		
<b>Pablo Halpern</b>	Halpern-Wight Inc	US
<b>Patrice Roy</b>		Canada
<b>Peter Brett</b>		UK
<b>Peter Kulczycki</b>		Austria
<b>Phil Nash</b>		UK
<b>Phil Ratzloff</b>	SAS Institute Inc	US
<b>Philip Craig</b>		UK
<b>Ran Regev</b>		Israel
<b>Richard Corden</b>	Programming Research Ltd	US
<b>Robert Douglas</b>	Aquatic Group LLC	US
<b>Robert Leahy</b>		Canada
<b>Roger Orr</b>		UK
<b>Rostislav Khlebnikov</b>		



<b>Ruslan Arutyunyan</b>	Intel Corporation	US
<b>Scott Schurr</b>	Ripple Labs	US
<b>Sebastian Büttner</b>		
<b>Sergei Murzin</b>		
<b>Sophia Poirier</b>	Apple	US
<b>Stephen Upton</b>	Programming Research Ltd	US
<b>Steve Downey</b>		
<b>Thomas Köppe</b>	Google	US
<b>Tim Song</b>	Jump Trading LLC	US
<b>Timur Doumler</b>		UK
<b>Tom Honermann</b>	Synopsys Inc	US
<b>Tomasz Kamiński</b>		
<b>Tristan Brindle</b>		UK
<b>Vassil Vassilev</b>		Bulgaria
<b>Victor Zverovich</b>		
<b>Ville Voutilainen</b>	The Qt Company	Finland
<b>Walter E Brown</b>	<Emeritus>	US
<b>Wesley Maness</b>	Schonfeld Tools LLC	US
<b>William Miller</b>	Edison Design Group	US
<b>William Seymour</b>		US
<b>Wyatt Childers</b>		