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Project: Programming Language C++, SG19 Machine Learning
Reply to: Michael Wong <fraggamuffin@gmail.com>

SG19: Machine Learning virtual Meeting Minutes to 2024/06/13-2024/10/10

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Minutes for 2024/06/13 SG19 Conference Call

On Wed, Jun 12, 2024 at 12:27 AM Michael Wong <fraggamuffin_at_[hidden]> wrote:

> Hi, this SG19 meeting will focus on Graph Michael Wong is inviting
> you to a scheduled Zoom meeting.
>
> Topic: SG19 monthly
> Time: 2nd Thursdays 02:00 PM Eastern Time (US and Canada)
> Every month on the Second Thu,
>
>
> Join from PC, Mac, Linux, iOS or Android:
>
> https://iso.zoom.us/j/93084591725?pwd=K3QxZjJlcnljaE13ZWU5cTlLNkx0Zz09
> Password: 035530
>
> Or iPhone one-tap :
> US: +13017158592,,93084591725# or +13126266799,,93084591725#
> Or Telephone:
> Dial(for higher quality, dial a number based on your current location):
> US: +1 301 715 8592 or +1 312 626 6799 or +1 346 248 7799 or +1
> 408 638 0968 or +1 646 876 9923 or +1 669 900 6833 or +1 253 215 8782

> or 877 853 5247 (Toll Free)
> Meeting ID: 930 8459 1725
> Password: 035530
> International numbers available: https://iso.zoom.us/u/agewu4X97
>
> Or Skype for Business (Lync):
> https://iso.zoom.us/skype/93084591725
>
> Agenda:
>
> 1. Opening and introductions
>
> The ISO Code of conduct:
> https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100397.pdf
>
> IEC Code of Conduct:
>
> https://www.iec.ch/basecamp/iec-code-conduct-technical-work
>
> ISO patent policy.
>
>
>
https://isotc.iso.org/livelink/livelink/fetch/2000/2122/3770791/Common_Policy.htm?nodeid=6344764&vernum=-2
>
> The WG21 Practices and Procedures and Code of Conduct:
>
> https://isocpp.org/std/standing-documents/sd-4-wg21-practices-and-procedures
>
> 1.1 Roll call of participants
>
Phil, Boguslaw, Guy, Oliver, Richard, Michael, ANdrew, Jens, Scott

>
>
> 1.2 Adopt agenda
>
> 1.3 Approve minutes from previous meeting, and approve publishing
> previously approved minutes to ISOCPP.org

>
> 1.4 Action items from previous meetings
>
> 2. Main issues (125 min)
>
> 2.1 General logistics
>
> Meeting plan, focus on one paper per meeting but does not preclude other
> paper
> updates.
>
> 2024 planning
> C++23 and C++26 status
> CPPCON 2024
>

Schedule for Graph to go out
June 24: St. Louis
July 11
Aug 15
Sept 12: exit vote
Sept 15-20 CPPCON meeting
 OCt 10: exit vote, last chance
Nov 14: Not possible

2024-11-18 to 23: Wrocław, Poland
<https://isocpp.org/files/papers/N4974.pdf>; Nokia
else
2025-02-10 to 15: Hagenberg, Austria
<https://isocpp.org/files/papers/N4979.pdf>; University of Applied
Sciences, Upper Austria

>
> * Jan 11, 2024 02:00 PM ET: Graph DONE
> * Feb 8, 2024 02:00 PM ET: Graph DONE
> * Mar 14, 2024 02:00 PM ET: Cancelled due to Tokyo 3-18-23
> * Apr 11, 2024 02:00 PM ET: Stats/Graph DONE
> * May 9, 2024 02:00 PM ET: Graph DONE
> * June 13, 2024 02:00 PM ET: Graph; St.louis 6-24-29
> * July 11, 2024 02:00 PM ET: Stats
> * Aug 15, 2024 02:00 PM ET: Graph

> * Sep 12, 2024 02:00 PM ET: CPPCON Sept 15-20 so canceled
> * Oct 10, 2024 02:00 PM ET: Stats
> * Nov 14, 2024 02:00 PM ET: Cancelled Wroclaw F2F
> * Dec 12, 2024 02:00 PM ET: Graph
>
>
> ISO meeting status
>
> future C++ Std meetings
>
> 2.2 Paper reviews
>
SG6 feedback pre-St.Louis 2024:
Matthias Kretz
11:41 AM (2 hours ago)
to Phil, me, Lisa
Hi Phil,

sorry for picking this back up only now. But I reviewed P3131 and P3130 again
and still don't see anything *in the papers* that requires review by SG6.

You mention CSR in P3131, but if I understand correctly, the paper only uses it as an implementation detail, not as a library facility exposed to C++ users. There may well be topics that warrant discussion in SG6, but I don't see them written up. If there are topics/questions related to your papers that
you want to raise in SG6, please put them in the paper(s). I find it especially helpful if you paper points out the feedback you need and the challenges that you believe need to be reviewed.

So for now I continue to believe that there is nothing for SG6 to review. And
I don't mean the topic in general — I mean the specific papers.

I hope this helps,
  Matthias

On Dienstag, 19. März 2024 23:38:33 MESZ Phil Ratzloff wrote:
> compressed_graph (P3131) is an extended version of a CSR matrix. The purpose

> of the discussion is to see if this would be valuable in the context of
> numerics/mathematics. If so, someone would need to take that on and own it
> in collaboration with our effort.
>
> How it is presented would also need to be different than what I've done to
> date.
>
> compressed_graph extends the typical CSR matrix by supporting optional
> values for rows and the compressed_graph object itself. The API for the
> graph is defined as a set of functions that apply to all graphs, defined
in
> P3130.
>
> I took this approach to minimize the public interface of compressed_graph,
> as I know containers can take a long time to get through the Committee.
>
> If it were to be used for math-oriented features, I imagine there might
need
> to be member functions added, as well as mathematical algorithms that use
> it.

>
> Review BSI Graph feedback:
> As Oliver (Rosten) said "The basic premise is important, and it would be
> fantastic to have support for graphs in the standard."
>
> The main items identified were:
> Oliver:
> - This paper is long and incomplete, it has lots of details which I think
> to be irrelevant, however things that are definitely relevant are missing
> from the paper - for example definition of graph - since people have
> different ideas. We need to add a mathematical perspective to the paper.
>
> - The structure of the paper completely changed in the new revision, so now
> it’s hard to understand what and why they have done
>
> - Another missing part is discussion of graph invariants
>
> Tom (Deakin): There’s a big missing part in “Prior art” part, GraphBLAS (
> https://graphblas.org) eminently.

>
> Some other things to add:
>
> 1. The electrical circuit example needs more explanation, and I think this
> will highlight some deep issues around representing things which are
> seemingly trivially graphs, as graphs in practice. In what sense is a
> bog-standard resistor directed? I assume the reason that the graph is
> directed is because current has a sign and in an undirected graph it
> becomes ambiguous which way the current is flowing (also you may want
> components like diodes). But the directed representation also has issues:
> "can current flow from 'Vdd' to 'n0'?" should be immediately answerable
> from the properties of Vdd and its edges. There are other ways to represent
> an electrical circuit. One is as a directed graph but with incident edges
> recorded - but iiuc, this is excluded from the latest version of the paper.
> Alternatively, one could have a mathematical object, the name of which I
> actually don't know: it looks like an undirected graph, but where each
> partial edge has additional, unique, end-point data, as well as the common
> weight. Things like this are the reason why I think we need a broader group
> to look at this proposal (i.e. beyond SG19) and if we possibly can we
> should involve someone from the mathematics community. Otherwise there's a
> real danger we end up missing important insights.
>
> 2. My comment about the structure of the paper changing was a reference to
> previous comparisons with boost::graph. I'm sure these were in an earlier
> version, or am I misremembering? Either way, it would be very helpful to
> have a proper discussion of e.g. the move away from visitors.
>
> 3. Re. the definition of a graph, there needs to be a proper discussion
> about whether the paper's definition of graph is what some authors call a
> multigraph and whether it does/does not include loops. These things are
> mentioned, in passing, when introducing algorithms, but terminology needs
> to be properly established.
>
> 4. I think we're trying to do too much in one go in this paper. I think a
> great first step would be to build on mdspan and try to standardize (or at
> least understand) what might reasonably be called an unstructured span.
> This could be represented as a vector of vectors or as a vector with some
> auxiliary storage indicating where the partitions fall. The point is that
> an unstructured span, with the right invariants, is an adjacency list. If
> we can understand unstructured span and its desirable api, I think this
> will be incredibly valuable guidance for what a standardized graph

> container might look like.
>
> 5. IIUC, this paper excludes pure connectivity graphs. These are incredibly
> helpful and, if I've understood correctly that they are not supported,
> would be a major omission. Another good reason, imo, to start with
> unstructured span!
>
> 6. I'm not convinced by the load api. We don't have a load api for vector
> etc. Moreover, would it not be preferable to have appropriate constructors?
>
>
> 2.2.1: ML topics
>
> 2.2.1.1 Graph Proposal Phil Ratsloff et al
>
> D3127 terminology
Andrew presenting
pg 3: terminology can we claw back
4: rarely a distinction between graph and graph terminology
8: OR: add multiple edges (pair of nodes connected by 2 or more edges)
Figure 3 mentions instagram
This is an R1: should add a table of what is delta with R0
10: JM: partition graph: V should add vn1-1 looks wrong, so its 2 level of subscripting so need to fix the latex
11: typo
12: OR: represent currents, flow networks, circuits, deserves mention of direction of current or if it is positive or negative; library needs to support it because it is difficult; not scope creep, but fundamental; representing them is subtle
JM: disagree, can do route finding without flow network, is enough
AL+OR: need to work through examples to get the building blocks
JM: different dimension of design, flow network is not a good example to explain these terms, use something else; do the flow network in another paper
OR: disagree, the necessity of these terms is revealed by this paper; how to categorize a structure for flow network
AL: we call it multigraph for flow network, not structural, cant enforce at compile time
OR: direct representation vs adjacency lists should be separate, not conflated; section 10. should not have adjacency list
JM: dont introduce arc now

OR: Pure connectivity has no representation; OK
AL: will remove circuit

Appendix:
OR: data to graph do we need this at all
AL: like to avoid the property map dependency; JM: not sure what the abstraction layer is for Djkstra
PR: current abstraction is a concept of property on a graph, edge, vertex, so tuple is property on the edge, inside algo there are multiple values, caller to Djkstra knows which graph and provides a function to extract the correct distance
AL: add a djkstra example

OR: start with vertex, list of edges, tuple of properties
what is the property referring to?
AL: property represents circuit element, the current, the conductance, that is associated with the edge
PR: to make this compile, need a second argument on the vector
AL: yes I see
JM: vertex needs a template argument
OR dont like direct representation, it will be templated on vertex and edge weight, vertex should not know edge weight; its not the cleanest design
AL: template on edge type? OK
JM: should this be super generic graph data structure
PR:P3131 has a definition for compressed graph
JM: template on edge and vertex wright and everyhting else is impl detail
PR: can reduce internal size of graph
OR: cover vector of vector
AL: should pass that into Djkstra
PR: now you can
OR: adjacency lists is unstructured, but there are large patches that are structured, use template param to optimize these structures through customization
PR: depends on who is creating the data structure; have range of ranges and how you represent that range is upto you
impl is in P3131 and it is a CSR but there could be additional
PR: how customizable should it be; want to have 1 thats good, then more can come later
JM: containers are complex to get through LEWG; how detail should the spec be, or impl leeway
it should support all the algorithms in the paper but not arbitrary

PR: design to adapt existing containers
I am just providing are constructors, everything else use public interface
P303 are all CPO public fns, gives back a range
your own graph datastructure can override the CPOs

What about negative edges, cycles, DAG

https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2024/p3126r1.pdf
contains the list of issues at bottom

Agree on a graph DS but does not preclude other algo; needs to be trimmed down

another paper needed: Comparison of BGL with our Graph

> Latest paper:
>
> Here's a link to the paper (different than the previous paper reviewed).
> There are some additional updates I'm planning on making before the
> meeting.
>
>
>
https://docs.google.com/document/d/1OpH-xxRri7tJTtJJIZTYmSHkkrZJkdBwm9zJ7LqolfQ/edit?usp=sharing
>
>
>
>
> P1709R3:
>
>
https://docs.google.com/document/d/1kLHhbSTX7j0tPeTYECQFSNx3R35Mu3xO5_dyYdRy4dM/edit?usp=sharing
>
>

>
https://docs.google.com/document/d/1QkfDzGyfNQKs86y053M0YHOLP6frzhTJqzg1Ug_vkkE/edit?usp=sharing
>
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>
>
> <
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
> *>*
>
> Array copy semantics:
> array copy-semantics paper P1997 "Relaxing Restrictions on Arrays",
> https://wg21.link/p1997
>
> Stats feedback:
>
> P1708:
Added ISO references

OR: Erroneous instead of unspecified as another alternative is more specific and less ambiguous

> P2376R0
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p2376r0.pdf>
> Comments
> on Simple Statistical Functions (p1708r4): Contracts, Exceptions and
> Special cases Johan Lundberg
>
> 2.2.1.2 Reinforcement Learning Larry Lewis Jorge Silva
>
> Reinforcement Learning proposal:
>
> 2.2.1.3 Differential Calculus:
>
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_

E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
>
> 2.2.1.4: Stats paper
>
> P2681R0
> <https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p2681r0.pdf>
> More
> Stats Functions Richard Dosselmann, Michael Wong
> Current github
>
> https://github.com/cplusplus/papers/issues/475
>
> https://github.com/cplusplus/papers/issues/979
>
> Stats review Richard Dosselman et al
>
> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p1708r4.pdf
>
> Feedback from Johan Lundberg and Oleksandr Korval
>
> https://isocpp.org/files/papers/D2376R0.pdf
>
> P1708R3: Math proposal for Machine Learning: 3rd review
>
> PXXXX: combinatorics: 1st Review
>
> *> std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2
> <http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2>*
> *> above is the stats paper that was reviewed in Prague*
> *> http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19
> <http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19>*
> *>*
> *> Review Jolanta Polish feedback.*
> *> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>*
>
>
> 2.2.1.4: Matrix paper
>
> 2.2.3 any other proposal for reviews?
>

> 2.3 Other Papers and proposals
>
> P1416R1: SG19 - Linear Algebra for Data Science and Machine Learning
>
>
https://docs.google.com/document/d/1IKUNiUhBgRURW-UkspK7fAAyIhfXuMxjk7xKikK4Yp8/edit#heading=h.tj9hitg7dbtr
>
> P1415: Machine Learning Layered list
>
>
https://docs.google.com/document/d/1elNFdIXWoetbxjO1OKol_Wj8fyi4Z4hogfj5tLVSj64/edit#heading=h.tj9hitg7dbtr
>
> 2.2.2 SG14 Linear Algebra progress:
> Different layers of proposal
>
>
https://docs.google.com/document/d/1poXfr7mUPovJC9ZQ5SDVM_1Nb6oYAXlK_d0ljdUAtSQ/edit
>
> 2.5 Future F2F meetings:
>
> 2.6 future C++ Standard meetings:
> https://isocpp.org/std/meetings-and-participation/upcoming-meetings
>
> None
>
> 3. Any other business
>
> New reflector
>
> http://lists.isocpp.org/mailman/listinfo.cgi/sg19
>
> Old Reflector
> https://groups.google.com/a/isocpp.org/forum/#!newtopic/sg19
> <https://groups.google.com/a/isocpp.org/forum/?fromgroups=#!forum/sg14>
>
> Code and proposal Staging area
>
> 4. Review

>
> 4.1 Review and approve resolutions and issues [e.g., changes to SG's
> working draft]
>
> 4.2 Review action items (5 min)
>
> 5. Closing process
>
> 5.1 Establish next agenda
>
>
> 5.2 Future meeting
> * Jan 11, 2024 02:00 PM ET: Graph DONE
> * Feb 8, 2024 02:00 PM ET: Graph DONE
> * Mar 14, 2024 02:00 PM ET: Cancelled due to Tokyo 3-18-23
> * Apr 11, 2024 02:00 PM ET: Stats/Graph DONE
> * May 9, 2024 02:00 PM ET: Graph DONE
> * June 13, 2024 02:00 PM ET: Graph; St.louis 6-24-29
> * July 11, 2024 02:00 PM ET: Stats
> * Aug 15, 2024 02:00 PM ET: Graph
> * Sep 12, 2024 02:00 PM ET: CPPCON Sept 15-20 so cancelled
> * Oct 10, 2024 02:00 PM ET: Stats
> * Nov 14, 2024 02:00 PM ET: Cancelled Wroclaw F2F
> * Dec 12, 2024 02:00 PM ET: Graph
>

Minutes for 2024/07/11 SG19 Conference Call

Notes:
On Wed, Jul 10, 2024 at 12:24 PM Phil Ratzloff <Phil.Ratzloff_at_[hidden]>
wrote:

> Sounds good. Thanks!
>
>
>
>
>
> *From:* SG19 <sg19-bounces_at_[hidden]> *On Behalf Of *Michael Wong
> via SG19
> *Sent:* Wednesday, July 10, 2024 11:25 AM
> *To:* Oliver Rosten <oliver.rosten_at_[hidden]>
> *Cc:* Michael Wong <fraggamuffin_at_[hidden]>; sg19_at_[hidden]
> *Subject:* Re: [isocpp-sg19] SG19 July 2024 Monthly call
>
>
>
> *EXTERNAL*
>
> Hi Oliver, thank you for staying with us during Covid. Understood, Get
> well soon.
>
>
>
> I received various replies from a few people and it seems we can meet at
> 3:15 ET instead of 2 pm ET (this will alllow Andrew, and Richard to join)
> mostly to talk about Richards's Stats updates and how to get consensus. If
> that is OK, I will still hold a meeting to start at 3:15 ET. Cheers.
>
>
>
> On Wed, Jul 10, 2024 at 3:33 AM Oliver Rosten <
> oliver.rosten_at_[hidden]> wrote:
>
> I'm still not fully recovered from the latest covid variant, so will be
> skipping this one.
>
>
>
> O.
>
>
>
> On Tue, 9 Jul 2024 at 23:22, Michael Wong via SG19 <sg19_at_[hidden]>
> wrote:

>
> I am also happy to cancel the meeting if we don't have enough progress
> report. Cheers.
>
>
>
> On Tue, Jul 9, 2024 at 6:19 PM Michael Wong <fraggamuffin_at_[hidden]>
> wrote:
>
> Hi, this SG19 meeting will focus on Graph and stats
>
> I know we just met 2 weeks ago so there may not be a lot of progress yet,
> in which case this will be just a short recap/planning meeting.
>
>
>
> Michael Wong is inviting you to a scheduled Zoom meeting.
>
> Topic: SG19 monthly
> Time: 2nd Thursdays 02:00 PM Eastern Time (US and Canada)
> Every month on the Second Thu,
>
>
> Join from PC, Mac, Linux, iOS or Android:
>
> https://iso.zoom.us/j/93084591725?pwd=K3QxZjJlcnljaE13ZWU5cTlLNkx0Zz09
>
<https://protect.checkpoint.com/v2/___https://iso.zoom.us/j/93084591725?pwd=K3QxZjJlcnljaE13ZWU5cTlLNkx0Zz09___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1NDkyOmI5ZGNlYzUzMzg3MzJiZWU0ZDhiMDgwYzY4NTY3MzI2ZGIzZjQ3ZGRhM2Y5ZDE3NjBlMzU1NWQ2ZDM0OTk4ZTY6aDpUOk4>
> Password: 035530
>
> Or iPhone one-tap :
> US: +13017158592,,93084591725# or +13126266799,,93084591725#
> Or Telephone:
> Dial(for higher quality, dial a number based on your current location):
> US: +1 301 715 8592 or +1 312 626 6799 or +1 346 248 7799 or +1
> 408 638 0968 or +1 646 876 9923 or +1 669 900 6833 or +1 253 215 8782
> or 877 853 5247 (Toll Free)
> Meeting ID: 930 8459 1725
> Password: 035530
> International numbers available: https://iso.zoom.us/u/agewu4X97
>
<https://protect.checkpoint.com/v2/___https://iso.zoom.us/u/agewu4X97___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpkNjk0OmRmY2M4OGNjOTNlY2U4NzA0YTZiOGMxOGE0MWVmNzQyZDIzYTM4NzYzZmM5MjA0NmEzMjE3MmRlZTZkN2RjN2U6aDpUOk4>
>
> Or Skype for Business (Lync):
> https://iso.zoom.us/skype/93084591725

>
<https://protect.checkpoint.com/v2/___https://iso.zoom.us/skype/93084591725___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo4MGEzOmU4YWM1MDQ5MDc3OGQ2YTc5YzNjOGMzZDhiZWYxNWM1ZTFmMzMwZGU5YjQ1OTQ0OWVmYzgwOTM2OTVhZTNmNjk6aDpUOk4>
>
> Agenda:
>
> 1. Opening and introductions
>
> The ISO Code of conduct:
> https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100397.pdf
>
<https://protect.checkpoint.com/v2/___https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100397.pdf___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo4MWMyOjBlZmNkYWY3ODdkOWZhNzY2MjAyYTJmYjhhM2YwYzJhOTdlOGI4YWVhNzliZjUzODlkZDI5NTg0ZTc1N2RkNTI6aDpUOk4>
>
> IEC Code of Conduct:
>
> https://www.iec.ch/basecamp/iec-code-conduct-technical-work
>
<https://protect.checkpoint.com/v2/___https://www.iec.ch/basecamp/iec-code-conduct-technical-work___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjoxYTdiOmVkYmJmZDllNDcxMGZhNzlmZTViNzExNDM1YWJmZDJhY2U5NTRkNGE2YmZiMzljNmRhZWVlYmExNzEwYmU5ODA6aDpUOk4>
>
> ISO patent policy.
>
>
>
https://isotc.iso.org/livelink/livelink/fetch/2000/2122/3770791/Common_Policy.htm?nodeid=6344764&vernum=-2
>
<https://protect.checkpoint.com/v2/___https://isotc.iso.org/livelink/livelink/fetch/2000/2122/3770791/Common_Policy.htm?nodeid=6344764&vernum=-2___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpjOGNhOmUxZTU1ODAxNDg3YzQ3OGUwYWEzMDFjY2M3MjExNzMzYmE3NGYzZTUwNzg5OTc3NGU2OGQ3Zjk3YjljNDRiNjY6aDpUOk4>
>
> The WG21 Practices and Procedures and Code of Conduct:
>
> https://isocpp.org/std/standing-documents/sd-4-wg21-practices-and-procedures
>
<https://protect.checkpoint.com/v2/___https://isocpp.org/std/standing-documents/sd-4-wg21-practices-and-procedures___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1NGIyOmE1OWNiNDMwZGIzNzZmYjBiOTBjYWYxMmJmYTI4MjQyYmM5ZGU4ZGNlM2Q0ODExMGMxM2JkMDhkMjI5Yjk0YmQ6aDpUOk4>
>
> 1.1 Roll call of participants
>
> Phil, MIchael. Richard, Pete

an informal meeting to review stats update as there was not enough Quorum with the changed times.
No graph update as this is too close to the STL F2F

> 1.2 Adopt agenda
>
> 1.3 Approve minutes from previous meeting, and approve publishing
> previously approved minutes to ISOCPP.org
>
> 1.4 Action items from previous meetings
>
> 2. Main issues (125 min)
>
> 2.1 General logistics
>
> Meeting plan, focus on one paper per meeting but does not preclude other
> paper
> updates.
>
> 2024 planning
> C++23 and C++26 status
> CPPCON 2024
>
>
> * Jan 11, 2024 02:00 PM ET: Graph DONE
> * Feb 8, 2024 02:00 PM ET: Graph DONE
> * Mar 14, 2024 02:00 PM ET: Cancelled due to Tokyo 3-18-23
> * Apr 11, 2024 02:00 PM ET: Stats/Graph DONE
> * May 9, 2024 02:00 PM ET: Graph DONE
> * June 13, 2024 02:00 PM ET: Graph; St.louis 6-24-29 DONE
> * July 11, 2024 02:00 PM ET: Stats/ Graphs
> * Aug 15, 2024 02:00 PM ET: Graph
> * Sep 12, 2024 02:00 PM ET: CPPCON Sept 15-20 so canceled
> * Oct 10, 2024 02:00 PM ET: Stats
> * Nov 14, 2024 02:00 PM ET: Cancelled Wroclaw F2F
> * Dec 12, 2024 02:00 PM ET: Graph
>
>
> ISO meeting status
>
> future C++ Std meetings
>
> 2.2 Paper reviews
> Review BSI Graph feedback:
> As Oliver (Rosten) said "The basic premise is important, and it would be
> fantastic to have support for graphs in the standard."
>
> The main items identified were:
> Oliver:
> - This paper is long and incomplete, it has lots of details which I think

> to be irrelevant, however things that are definitely relevant are missing
> from the paper - for example definition of graph - since people have
> different ideas. We need to add a mathematical perspective to the paper.
>
> - The structure of the paper completely changed in the new revision, so now
> it’s hard to understand what and why they have done
>
> - Another missing part is discussion of graph invariants
>
> Tom (Deakin): There’s a big missing part in “Prior art” part, GraphBLAS (
> https://graphblas.org
>
<https://protect.checkpoint.com/v2/___https://graphblas.org/___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpmMDY0OjY4MDc0MmRlMmMyYTZhMThmM2E5MDcxNmMxY2FjNzFjNDdhNmZjMzc5MGRiMGU2NzYwYjE1ODk5ZmVhNzQzZjM6aDpUOk4>)
> eminently.
>
> Some other things to add:
>
> 1. The electrical circuit example needs more explanation, and I think this
> will highlight some deep issues around representing things which are
> seemingly trivially graphs, as graphs in practice. In what sense is a
> bog-standard resistor directed? I assume the reason that the graph is
> directed is because current has a sign and in an undirected graph it
> becomes ambiguous which way the current is flowing (also you may want
> components like diodes). But the directed representation also has issues:
> "can current flow from 'Vdd' to 'n0'?" should be immediately answerable
> from the properties of Vdd and its edges. There are other ways to represent
> an electrical circuit. One is as a directed graph but with incident edges
> recorded - but iiuc, this is excluded from the latest version of the paper.
> Alternatively, one could have a mathematical object, the name of which I
> actually don't know: it looks like an undirected graph, but where each
> partial edge has additional, unique, end-point data, as well as the common
> weight. Things like this are the reason why I think we need a broader group
> to look at this proposal (i.e. beyond SG19) and if we possibly can we
> should involve someone from the mathematics community. Otherwise there's a
> real danger we end up missing important insights.
>
> 2. My comment about the structure of the paper changing was a reference to
> previous comparisons with boost::graph. I'm sure these were in an earlier
> version, or am I misremembering? Either way, it would be very helpful to
> have a proper discussion of e.g. the move away from visitors.
>
> 3. Re. the definition of a graph, there needs to be a proper discussion
> about whether the paper's definition of graph is what some authors call a
> multigraph and whether it does/does not include loops. These things are
> mentioned, in passing, when introducing algorithms, but terminology needs
> to be properly established.
>
> 4. I think we're trying to do too much in one go in this paper. I think a
> great first step would be to build on mdspan and try to standardize (or at

> least understand) what might reasonably be called an unstructured span.
> This could be represented as a vector of vectors or as a vector with some
> auxiliary storage indicating where the partitions fall. The point is that
> an unstructured span, with the right invariants, is an adjacency list. If
> we can understand unstructured span and its desirable api, I think this
> will be incredibly valuable guidance for what a standardized graph
> container might look like.
>
> 5. IIUC, this paper excludes pure connectivity graphs. These are incredibly
> helpful and, if I've understood correctly that they are not supported,
> would be a major omission. Another good reason, imo, to start with
> unstructured span!
>
> 6. I'm not convinced by the load api. We don't have a load api for vector
> etc. Moreover, would it not be preferable to have appropriate constructors?
>
>
> 2.2.1: ML topics
>
> 2.2.1.1 Graph Proposal Phil Ratsloff et al
>
> Latest paper:
>
> Here's a link to the paper (different than the previous paper reviewed).
> There are some additional updates I'm planning on making before the
> meeting.
>
>
>
https://docs.google.com/document/d/1OpH-xxRri7tJTtJJIZTYmSHkkrZJkdBwm9zJ7LqolfQ/edit?usp=sharing
>
<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/1OpH-xxRri7tJTtJJIZTYmSHkkrZJkdBwm9zJ7LqolfQ/edit?usp=sharing___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjphODc1OjEzYjcxYTg3NzMyNmY2MDkxMWIzOGMwY2NkMGU2MDdhOWU4MWNmY2IwMmIwYjMxMzY4ZmQ2N2I3YjI3N2U3MTU6aDpUOk4>
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> P1709R3:
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https://docs.google.com/document/d/1kLHhbSTX7j0tPeTYECQFSNx3R35Mu3xO5_dyYdRy4dM/edit?usp=sharing
>
<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/1kLHhbSTX7j0tPeTYECQFSNx3R35Mu3xO5_dyYdRy4dM/edit?usp=sharing___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo2MzYyOjRkNjJkMzhjY2U2YTIyYTQ1OGRkNmRkMTI2YWM5MGFmZGVhMWZiNTE4Zjg4NjJjM2M2MTgzNzc1MmVhMjRlYWM6aDpUOk4>
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<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/1QkfDzGyfNQKs86y053M0YHOLP6frzhTJqzg1Ug_vkkE/edit?usp=sharing___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjphZjQ4OjBiZWViODc4ZTE0ZGEyYjk2ZWEwMGI3MDVmN2Y5NmIyNmQ0MWI0ZTI1YjRlNWZiYmUyNjM3ZmJiZDY1MDk2ZGM6aDpUOk4>
>
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
>
<https://protect.checkpoint.com/v2/___http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpiNjRlOjdkNmRjZTAzMjM0ZDVhNGUyOTRiZDE0NGZiZjZiNDA0MmE1YjJjN2RjY2U3YWQxMDc4ZmYyOTkyYmI5NjJlMDE6aDpUOk4>
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<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd%23heading=h.9ogkehmdmtel___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo5NWVmOjllNTdlZTlmYzQ5NmI2Nzg0NTRmZWVmNmJkY2JjZjBlYTgxMzhiNzNiYzAyMWRmODgxMTI2MTE3ZWRmMThjNTI6aDpUOk4>
> *>*
>
> Array copy semantics:
> array copy-semantics paper P1997 "Relaxing Restrictions on Arrays",
> https://wg21.link/p1997
>
<https://protect.checkpoint.com/v2/___https://wg21.link/p1997___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpmNmRhOjM5NDYzYjZlY2MyOGUxMWI5NzVlMDg3NWU2Yjg0NjMwZmI4MDE2ZDJiMjE2MjcyZGRkNTRlNmE0NWY2YzVmODU6aDpUOk4>
>
> Stats feedback:
>
> P2376R0
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p2376r0.pdf
>
<https://protect.checkpoint.com/v2/___http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p2376r0.pdf___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1MjQ2OmJjMzIzMjg4NjM0OWEwY2IzOWQ1NGZmOTBkYWQ2NWMxZGJjODkwMDkyNzIzOTdjNTc4M2UyMzZlNDdhMDczMGM6aDpUOk4>
> >
> Comments
> on Simple Statistical Functions (p1708r4): Contracts, Exceptions and

> Special cases Johan Lundberg
>
>
Richard reviewed the changes he made to Graph based on STL feedback.
accepted feedback from STL that weighted variance is not stabilized yet
then may be not standardized
so offered various intermediate options.

>
> 2.2.1.2 Reinforcement Learning Larry Lewis Jorge Silva
>
> Reinforcement Learning proposal:
>
> 2.2.1.3 Differential Calculus:
>
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
>
<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd%23heading=h.9ogkehmdmtel___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjphMGI5Ojk2NTY5OGY1YTQzNjBkNmE1NWMyZTcxZDAwMzA4MDRmNzk2MmI3MTkwZWZlY2M4MGU3N2FmOGIwMmEzODk5ZjU6aDpUOk4>
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> 2.2.1.4
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<https://protect.checkpoint.com/v2/___http://2.2.1.4___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo2MzdiOmNiNDRlM2NhNDViN2UzZGI3YjQwOGYzYzc4NjZhNzllMDliMTFjZWNlZmZjNGJlMzM4ZGE0NzRhNTk4ZjViNGU6aDpUOk4>:
> Stats paper
>
> P2681R0
> <https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p2681r0.pdf
>
<https://protect.checkpoint.com/v2/___https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p2681r0.pdf___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpiZThhOjk2ZjNlN2M5ZGM0MzE0YWM0NmYzMzI4NmVkZjQ5MDUzOGRhYjc5NzUxNmUyNGY3YTI5OTc1ODUwMjIzZjE5OGU6aDpUOk4>>
> More
> Stats Functions Richard Dosselmann, Michael Wong
> Current github
>
> https://github.com/cplusplus/papers/issues/475
>
> https://github.com/cplusplus/papers/issues/979
>
> Stats review Richard Dosselman et al
>
> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p1708r4.pdf

>
<https://protect.checkpoint.com/v2/___http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p1708r4.pdf___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpkNWI1OmU2ODAwYjVkNjNiNWRiOGVlYWYxNjA2YmM5YzQyMjcxNDA3NzRhMTFiOWFmZjQ2N2ViNTg4MDllNmYxYjY1YzA6aDpUOk4>
>
> Feedback from Johan Lundberg and Oleksandr Korval
>
> https://isocpp.org/files/papers/D2376R0.pdf
>
<https://protect.checkpoint.com/v2/___https://isocpp.org/files/papers/D2376R0.pdf___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1ZjkyOjEzNGY1MDBhMzVmMDgyZTFlZmNiOTA2MDdlN2JhNGU3N2E4OTU1NjMzZWRlYzFiNGY4ZjZlM2RkYzcwZWZhN2U6aDpUOk4>
>
> P1708R3: Math proposal for Machine Learning: 3rd review
>
> PXXXX: combinatorics: 1st Review
>
> *> std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2
>
<https://protect.checkpoint.com/v2/___http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo2MjVlOjk4MTEyZGRjN2ViZTg1YWU5ZjY4NTBiNjBlMjczNWQwNjlhMWI0ODdiNTIzYjFiZjY0OTc4Zjg0ZWMwNTg0ZGY6aDpUOk4>
> <http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2
>
<https://protect.checkpoint.com/v2/___http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1MjA1OmE1NzVmOTJjNGI1YjMzNjI2MTBjMmE1YTQ0Nzk2N2M2ZGM3MzY0NzRlYTk5ODBiOTFjZDE4YjgwMTA1YmUyZjI6aDpUOk4>
> >*
> *> above is the stats paper that was reviewed in Prague*
> *> http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19
>
<https://protect.checkpoint.com/v2/___http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1OTMzOmJhZThlMzM5MjA2ZTMwNzg3ZGIzOGRkNWYwNGZiZDhmMjBmOGM3MmQ3ZDY1OTgxZTE0NWJhMzRhMGQ0NmJkMzc6aDpUOk4>
> <http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19
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> >*
> *>*
> *> Review Jolanta Polish feedback.*
> *> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
>
<https://protect.checkpoint.com/v2/___http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r

0.html___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjozODE5OjM3ZDczYzNmMjRmYTk2ZjdiYmQwZDJhZDBhMjMzYWZmNWM3MGQ0NzMzOTUzMjRlMmVmMGJhODMzYTBiYjNlMWU6aDpUOk4>
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
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<https://protect.checkpoint.com/v2/___http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjphOWVhOjQwZjFjODI1YTBkYWY3NGY4YjVlYjg5YzRlMjkzYWEyNGYwNmU4NDBiMTk2ZTU3YzE1OGMxYWRlZTdiZDczNzg6aDpUOk4>
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> Matrix paper
>
> 2.2.3 any other proposal for reviews?
>
> 2.3 Other Papers and proposals
>
> P1416R1: SG19 - Linear Algebra for Data Science and Machine Learning
>
>
https://docs.google.com/document/d/1IKUNiUhBgRURW-UkspK7fAAyIhfXuMxjk7xKikK4Yp8/edit#heading=h.tj9hitg7dbtr
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<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/1IKUNiUhBgRURW-UkspK7fAAyIhfXuMxjk7xKikK4Yp8/edit%23heading=h.tj9hitg7dbtr___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo1ZGZlOjRmZjc1NzUyOGE0ZDkwNjVhN2I4NjJiMDdiMjZjZGExOTg3NDRlYWM2OTA4YTIyZDFjMTM3MDI3MTE5ZTY1YjM6aDpUOk4>
>
> P1415: Machine Learning Layered list
>
>
https://docs.google.com/document/d/1elNFdIXWoetbxjO1OKol_Wj8fyi4Z4hogfj5tLVSj64/edit#heading=h.tj9hitg7dbtr
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>
> 2.2.2 SG14 Linear Algebra progress:
> Different layers of proposal
>
> https://docs.google.com/document/d/1poXfr7mUPovJC9ZQ5SDVM_1Nb6oYAXlK_d0ljdUAtSQ/edit
>
<https://protect.checkpoint.com/v2/___https://docs.google.com/document/d/1poXfr7mUPovJC9ZQ5SDV

M_1Nb6oYAXlK_d0ljdUAtSQ/edit___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjpjY2MwOjM2NjQ3NWMzYjg2ODMxNGIxNzJkODI3MzEzNWYxNGVmZTNhYmE4YmE2Y2NjMjgwMjI2ZjMxMWI4ZTgyZmZmODE6aDpUOk4>
>
> 2.5 Future F2F meetings:
>
> 2.6 future C++ Standard meetings:
> https://isocpp.org/std/meetings-and-participation/upcoming-meetings
>
<https://protect.checkpoint.com/v2/___https://isocpp.org/std/meetings-and-participation/upcoming-meetings___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo3YjU2Ojc4ZjllZGM3OTcwY2JhNTllNTlhNGVkMjZkYWNiODEyNTY5MDNhODMyZDU4MmVmZGM4NzhiM2UxMzA0NGY3ZTE6aDpUOk4>
>
> None
>
> 3. Any other business
>
> New reflector
>
> http://lists.isocpp.org/mailman/listinfo.cgi/sg19
>
<https://protect.checkpoint.com/v2/___http://lists.isocpp.org/mailman/listinfo.cgi/sg19___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo5MDQ4Ojc5ZjdjNDY3MzdmOWNlMzgwNWIyOWQ5MjkzOTVhOGVjZTllZWZmNTJkMjIwMTZjOGUwMzNlODk5NGQ3MTFiNWI6aDpUOk4>
>
> Old Reflector
> https://groups.google.com/a/isocpp.org/forum/#!newtopic/sg19
>
<https://protect.checkpoint.com/v2/___https://groups.google.com/a/isocpp.org/forum/%23!newtopic/sg19___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo2ZmM2OjczODM4ZmYzZjdkMzJiNjIzZmE3ZjRmZGJmY2EyZTBmMTViZWI2YzdiNDJlNWM0ZDc1N2MzY2FhMzRjMDM0YmE6aDpUOk4>
> <https://groups.google.com/a/isocpp.org/forum/?fromgroups=#!forum/sg14
>
<https://protect.checkpoint.com/v2/___https://groups.google.com/a/isocpp.org/forum/?fromgroups=%23!forum/sg14___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6Njo3ZGM3OjcxNDFlYzFiYmVlODc3ZDliM2MxZTI4NzBhMGRkNDEzZmExNDczNTQ3YmM0ZTBmMzBkNWUwZmM3NGZmYmUzOTc6aDpUOk4>
> >
>
> Code and proposal Staging area
>
> 4. Review
>
> 4.1 Review and approve resolutions and issues [e.g., changes to SG's
> working draft]
>
> 4.2 Review action items (5 min)
>

> 5. Closing process
>
> 5.1 Establish next agenda
>
>
> 5.2 Future meeting
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> * June 13, 2024 02:00 PM ET: Graph; St.louis 6-24-29 DONE
> * July 11, 2024 02:00 PM ET: Stats
> * Aug 15, 2024 02:00 PM ET: Graph
> * Sep 12, 2024 02:00 PM ET: CPPCON Sept 15-20 so cancelled
> * Oct 10, 2024 02:00 PM ET: Stats
> * Nov 14, 2024 02:00 PM ET: Cancelled Wroclaw F2F
> * Dec 12, 2024 02:00 PM ET: Graph
>
> --
> SG19 mailing list
> SG19_at_[hidden]
> https://lists.isocpp.org/mailman/listinfo.cgi/sg19
>
<https://protect.checkpoint.com/v2/___https://lists.isocpp.org/mailman/listinfo.cgi/sg19___.YzJ1OnNhc2luc3RpdHV0ZTpjOm86ZDc5NjE0ZGZjN2I3YzE5YzU2NTVlMDA2N2JmODE4MTA6NjplZTIxOmJkMTJiZTBhMTUzODc1MDI4OTAwN2I5MzBhN2JlMGUyZDA2YzlmZDQ1Y2U4Y2Y2ZTZmYjFjZmE2OTQ2MGIzOGI6aDpU>Ok4>
>
>

Minutes for 2024/10/10 SG19 Conference Call

Summary of current active papers:
P3126-3131: waiting for 2 papers , and identifiers; Aiming for May 2025.
P1708 : LEwg/SG6 needs to look again
P1709 : SG19
Richard presented a revised paper, emphasizing the need to include it in the next mailing for Poland. The group discussed the importance of feedback incorporation and the status of various papers, including the background paper and benchmarking progress. They also explored the integration of machine learning frameworks like Pytorch into C++, highlighting the need for a realistic timeline and potential collaboration with AI Alliance members. The conversation concluded with a focus on improving C++ for machine learning and the importance of engaging more participants.

Action Items

- [ ] Richard to send the revised version of paper 1708 to the mailing list and email SG6 to see if they want to look at it again.
- [ ] Phil to make a recommendation to close the graph library paper 1709
- [ ] Scott to connect with David Edelson from the AI Alliance to discuss the paper on AI frameworks and acceleration technologies.

Outline

- Richard confirms the major change in the paper, which includes providing source implementation.
- Discussion on the paper number and the need to send the paper to SG6 for review.

- Michael mentions the need to join the OEWG mailing list to contribute to discussions.

Discussion on Graph Algorithms and Identifiers

- Phil discusses the use of libraries and the implications of exceptions versus error codes in graph algorithms.
- introduces the concept of identifiers to replace vertex and edge references, simplifying the design.
- explains the benefits of using identifiers, including reducing the number of views and simplifying the interface.
- discuss the potential impact of this change on the design and the need for further review.

- discuss the timeline for paper progress and the need to aim for May 2025 for review.
- mentions the need for more engagement from other participants to meet the timeline.
- suggests setting a realistic goal and adjusting the timeline if

necessary.
- expresses readiness to travel and attend meetings, emphasizing the need for progress.

AI Alliance and Machine Learning Frameworks

- Michael introduces the AI Alliance and discusses a paper on various AI frameworks.
- Scott expresses interest in the paper and mentions the use of multiple frameworks in their lab.
- Michael explains the goal of showcasing C++'s capabilities in machine learning and the potential for future papers.
- Scott suggests sharing the paper with their lab to identify gaps in the technology.

- Michael presents a high-level view of the machine learning ecosystem, including frameworks, model optimizations, and inference engines.
- Scott discusses the lab's focus on advanced computing and the use of various frameworks.
- Michael expresses interest in inviting more people and larger groups to contribute to the machine learning effort.
- Scott suggests focusing on pytorch as a key framework due to its widespread use.

- discuss the potential of FPGA for machine learning and the challenges in the current toolchain.
- mentions the low utilization of FPGA for edge deployment and the need for different packing schemes.
- acknowledges the missing FPGA component in the diagram and plans to address it in future discussions.
- highlights the research nature of the FPGA toolchain and the need for maturity in the software.

- plans to bring the machine learning discussion back to the next few meetings.
- Scott agrees to advertise the opportunity within their division and identify potential contributors.
- a final question about wording in the paper, and provides guidance on including GitHub information

On Tue, Oct 8, 2024 at 4:11 PM Michael Wong <fraggamuffin_at_[hidden]> wrote:

> Hi, this SG19 meeting will focus on stats and graphs. I know we just met
> 2 weeks ago so there may not be a lot of progress yet,
> in which case this will be just a short recap/planning meeting.

>
> Michael Wong is inviting you to a scheduled Zoom meeting.
>
> Topic: SG19 monthly
> Time: 2nd Thursdays 02:00 PM Eastern Time (US and Canada)
> Every month on the Second Thu,
>
>
> Join from PC, Mac, Linux, iOS or Android:
>
> https://iso.zoom.us/j/93084591725?pwd=K3QxZjJlcnljaE13ZWU5cTlLNkx0Zz09
> Password: 035530
>
> Or iPhone one-tap :
> US: +13017158592,,93084591725# or +13126266799,,93084591725#
> Or Telephone:
> Dial(for higher quality, dial a number based on your current location):
> US: +1 301 715 8592 or +1 312 626 6799 or +1 346 248 7799 or +1
> 408 638 0968 or +1 646 876 9923 or +1 669 900 6833 or +1 253 215 8782
> or 877 853 5247 (Toll Free)
> Meeting ID: 930 8459 1725
> Password: 035530
> International numbers available: https://iso.zoom.us/u/agewu4X97
>
> Or Skype for Business (Lync):
> https://iso.zoom.us/skype/93084591725
>
> Agenda:
>
> 1. Opening and introductions
>
> The ISO Code of conduct:
> https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100397.pdf
>
> IEC Code of Conduct:
>
> https://www.iec.ch/basecamp/iec-code-conduct-technical-work
>
> ISO patent policy.
>
>
>
https://isotc.iso.org/livelink/livelink/fetch/2000/2122/3770791/Common_Policy.htm?nodeid=6344764&vernum=-2
>
> The WG21 Practices and Procedures and Code of Conduct:
>
> https://isocpp.org/std/standing-documents/sd-4-wg21-practices-and-procedures
>
> 1.1 Roll call of participants
>

Scott M, Phil R, Richard D, Boguslaw C.

>
>
> 1.2 Adopt agenda
>
> 1.3 Approve minutes from previous meeting, and approve publishing
> previously approved minutes to ISOCPP.org
>
> 1.4 Action items from previous meetings
>
> 2. Main issues (125 min)
>
> 2.1 General logistics
>
> Meeting plan, focus on one paper per meeting but does not preclude other
> paper
> updates.
>
> 2024 planning
> C++23 and C++26 status
> CPPCON 2024
>
>
> * Jan 11, 2024 02:00 PM ET: Graph DONE
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> * Mar 14, 2024 02:00 PM ET: Cancelled due to Tokyo 3-18-23
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> * June 13, 2024 02:00 PM ET: Graph; St.louis 6-24-29 DONE
> * July 11, 2024 02:00 PM ET: Stats/ Graphs DONE
> * Aug 15, 2024 02:00 PM ET: Graph DONE
> * Sep 12, 2024 02:00 PM ET: CPPCON Sept 15-20 so canceled DONE
> * Oct 10, 2024 02:00 PM ET: Stats
> * Nov 14, 2024 02:00 PM ET: Cancelled Wroclaw F2F
> * Dec 12, 2024 02:00 PM ET: Graph
>
>
> ISO meeting status
>
> future C++ Std meetings
>
> 2.2 Paper reviews
> Review BSI Graph feedback:
> As Oliver (Rosten) said "The basic premise is important, and it would be
> fantastic to have support for graphs in the standard."
>
> The main items identified were:
> Oliver:
> - This paper is long and incomplete, it has lots of details which I think
> to be irrelevant, however things that are definitely relevant are missing

> from the paper - for example definition of graph - since people have
> different ideas. We need to add a mathematical perspective to the paper.
>
> - The structure of the paper completely changed in the new revision, so now
> it’s hard to understand what and why they have done
>
> - Another missing part is discussion of graph invariants
>
> Tom (Deakin): There’s a big missing part in “Prior art” part, GraphBLAS (
> https://graphblas.org) eminently.
>
> Some other things to add:
>
> 1. The electrical circuit example needs more explanation, and I think this
> will highlight some deep issues around representing things which are
> seemingly trivially graphs, as graphs in practice. In what sense is a
> bog-standard resistor directed? I assume the reason that the graph is
> directed is because current has a sign and in an undirected graph it
> becomes ambiguous which way the current is flowing (also you may want
> components like diodes). But the directed representation also has issues:
> "can current flow from 'Vdd' to 'n0'?" should be immediately answerable
> from the properties of Vdd and its edges. There are other ways to represent
> an electrical circuit. One is as a directed graph but with incident edges
> recorded - but iiuc, this is excluded from the latest version of the paper.
> Alternatively, one could have a mathematical object, the name of which I
> actually don't know: it looks like an undirected graph, but where each
> partial edge has additional, unique, end-point data, as well as the common
> weight. Things like this are the reason why I think we need a broader group
> to look at this proposal (i.e. beyond SG19) and if we possibly can we
> should involve someone from the mathematics community. Otherwise there's a
> real danger we end up missing important insights.
>
> 2. My comment about the structure of the paper changing was a reference to
> previous comparisons with boost::graph. I'm sure these were in an earlier
> version, or am I misremembering? Either way, it would be very helpful to
> have a proper discussion of e.g. the move away from visitors.
>
> 3. Re. the definition of a graph, there needs to be a proper discussion
> about whether the paper's definition of graph is what some authors call a
> multigraph and whether it does/does not include loops. These things are
> mentioned, in passing, when introducing algorithms, but terminology needs
> to be properly established.
>
> 4. I think we're trying to do too much in one go in this paper. I think a
> great first step would be to build on mdspan and try to standardize (or at
> least understand) what might reasonably be called an unstructured span.
> This could be represented as a vector of vectors or as a vector with some
> auxiliary storage indicating where the partitions fall. The point is that
> an unstructured span, with the right invariants, is an adjacency list. If
> we can understand unstructured span and its desirable api, I think this
> will be incredibly valuable guidance for what a standardized graph

> container might look like.
>
> 5. IIUC, this paper excludes pure connectivity graphs. These are incredibly
> helpful and, if I've understood correctly that they are not supported,
> would be a major omission. Another good reason, imo, to start with
> unstructured span!
>
> 6. I'm not convinced by the load api. We don't have a load api for vector
> etc. Moreover, would it not be preferable to have appropriate constructors?
>
>
> 2.2.1: ML topics
>
> 2.2.1.1 Graph Proposal Phil Ratsloff et al
>
> Latest paper:
>
> Here's a link to the paper (different than the previous paper reviewed).
> There are some additional updates I'm planning on making before the
> meeting.
>
>
>
https://docs.google.com/document/d/1OpH-xxRri7tJTtJJIZTYmSHkkrZJkdBwm9zJ7LqolfQ/edit?usp=sharing
>
>
>
>
> P1709R3:
>
>
https://docs.google.com/document/d/1kLHhbSTX7j0tPeTYECQFSNx3R35Mu3xO5_dyYdRy4dM/edit?usp=sharing
>
>
>
https://docs.google.com/document/d/1QkfDzGyfNQKs86y053M0YHOLP6frzhTJqzg1Ug_vkkE/edit?usp=sharing
>
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>
>
> <
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
> *>*
>
> Array copy semantics:
> array copy-semantics paper P1997 "Relaxing Restrictions on Arrays",

> https://wg21.link/p1997
>
> Stats feedback:
>
> P2376R0
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p2376r0.pdf>
> Comments
> on Simple Statistical Functions (p1708r4): Contracts, Exceptions and
> Special cases Johan Lundberg
>
> 2.2.1.2 Reinforcement Learning Larry Lewis Jorge Silva
>
> Reinforcement Learning proposal:
>
> 2.2.1.3 Differential Calculus:
>
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
>
> 2.2.1.4: Stats paper
>
> P2681R0
> <https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p2681r0.pdf>
> More
> Stats Functions Richard Dosselmann, Michael Wong
> Current github
>
> https://github.com/cplusplus/papers/issues/475
>
> https://github.com/cplusplus/papers/issues/979
>
> Stats review Richard Dosselman et al
>
> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p1708r4.pdf
>
> Feedback from Johan Lundberg and Oleksandr Korval
>
> https://isocpp.org/files/papers/D2376R0.pdf
>
> P1708R3: Math proposal for Machine Learning: 3rd review
>
> PXXXX: combinatorics: 1st Review
>
> *> std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2
> <http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2>*
> *> above is the stats paper that was reviewed in Prague*
> *> http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19
> <http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19>*
> *>*

> *> Review Jolanta Polish feedback.*
> *> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>*
>
>
> 2.2.1.4: Matrix paper
>
> 2.2.3 any other proposal for reviews?
>
> 2.3 Other Papers and proposals
>
> P1416R1: SG19 - Linear Algebra for Data Science and Machine Learning
>
>
https://docs.google.com/document/d/1IKUNiUhBgRURW-UkspK7fAAyIhfXuMxjk7xKikK4Yp8/edit#heading=h.tj9hitg7dbtr
>
> P1415: Machine Learning Layered list
>
>
https://docs.google.com/document/d/1elNFdIXWoetbxjO1OKol_Wj8fyi4Z4hogfj5tLVSj64/edit#heading=h.tj9hitg7dbtr
>
> 2.2.2 SG14 Linear Algebra progress:
> Different layers of proposal
>
> https://docs.google.com/document/d/1poXfr7mUPovJC9ZQ5SDVM_1Nb6oYAXIK_d0ljdUAtSQ/edit
>
> 2.5 Future F2F meetings:
>
> 2.6 future C++ Standard meetings:
> https://isocpp.org/std/meetings-and-participation/upcoming-meetings
>
> None
>
> 3. Any other business
>
> New reflector
>
> http://lists.isocpp.org/mailman/listinfo.cgi/sg19
>
> Old Reflector
> https://groups.google.com/a/isocpp.org/forum/#!newtopic/sg19
> <https://groups.google.com/a/isocpp.org/forum/?fromgroups=#!forum/sg14>
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