Agenda, Study Group Status and Work

IEEE 802.3 100 Gb/s Wavelength Short Reach PHYs Study Group

Robert Lingle, Jr
Study Group Chair
OFS

Telephonic Interim Meeting, May 13, 2020

Meeting

- Attendance
  - The WebEx tool does not record attendance
  - Please indicate your name and employer/affiliation in an e-mail to the ad hoc recording secretary: Mabud Choudhury (mchoudhury@ofsoptics.com).
- Webex
  - Please mute your lines if you are not speaking
    - *6 to mute/unmute or click on mute button in the WebEx window
  - Noisy, unmuted lines will be muted by the WebEx organizer
    - *6 to unmute if this happens to you
- Calendar invitation for WebEx was sent to the Reflector
  - https://listserv.ieee.org/cgi-bin/wa?A2=ind20&L=STDS-802-3-100GSR&O=D&P=7450

Agenda

- Meeting Attendance and Webex
- Approve Agenda
- Approve minutes of the Geneva Interim and 4/23 Ad Hoc meetings
- 100GSR Study Group ad hoc communications
- IEEE Patent Policy reminder:
  - https://mentor.ieee.org/myproject/Public/mytools/mob/preparslides.pdf
- IEEE SA Copyright Policy reminder:
  - https://standards.ieee.org/ipr/index.html
- IEEE Participation Requirements reminder:
  - https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/Participant-Behavior-Individual-Method.pdf
- SG Status
- May 20th 100GSR SG telephonic interim
- Future Meetings
- Straw Polls
- Late Registration
- Motions

Approve January 23-24 & April 23 Minutes

- Any modifications, additions, deletions or corrections?
- Move to approve meeting minutes, previously posted, for January 23-24 IEEE 100GSR Study Group Interim face to face meeting:
  - unapproved_meeting_minutes_100GSR_01_0120.pdf
- Move to approve meeting minutes, previously posted, for April 23, 2020 IEEE 100GSR Study Group Ad Hoc Webex meeting
  - unapproved_minutes_100GSR_adhoc_01_042320.pdf

100GSR Study Group ad hoc communications

- The SG web page:
  - http://www.ieee802.org/3/100GSR/index.html
- SG ad hoc schedule and WebEx information:
  - http://www.ieee802.org/3/100GSR/public/adhoc/
- SG ad hoc presentations:
  - http://www.ieee802.org/3/100GSR/public/adhoc/presentations/index.html
- All e-mail communications are via the SG reflector
  - archive and subscription links are here:
    https://listserv.ieee.org/cgi-bin/wa?A0=STDS-802-3-100GSR
    http://www.ieee802.org/3/100GSR/reflector.html

IEEE Patent, SA Copyright, Participation Policies & Requirements

- IEEE Patent Policy reminder:
  - https://mentor.ieee.org/myproject/Public/mytools/mob/preparslides.pdf
- IEEE SA Copyright Policy reminder:
  - https://standards.ieee.org/ipr/index.html
- IEEE Participation Requirements reminder:
  - https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/Participant-Behavior-Individual-Method.pdf

Guidelines for IEEE-SA Meetings

- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
  - **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
  - **Don't discuss specific license rates, terms, or conditions.**
    - Relative costs of different technical approaches that include relative costs of patent licensing terms may be discussed in standards development meetings.
      - **Technical considerations remain the primary focus**
  - **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
  - **Don't discuss the status or substance of ongoing or threatened litigation.**
  - **Don't be silent if inappropriate topics are discussed … do formally object.**

For more details, see *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and *Antitrust and Competition Policy: What You Need to Know* at http://standards.ieee.org/develop/policies/antitrust.pdf

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at patcom@ieee.org

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At the beginning of each standards development meeting the chair or a designee is to:

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- Advise the standards development group participants that:
- IEEE SA's copyright policy is described in Clause 7 of the IEEE SA Standards Board Bylaws and Clause 6.1 of the IEEE SA Standards Board Operations Manual;
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- That the foregoing information was provided and that the copyright slides were shown (or provided beforehand).

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- The IEEE SA Copyright Policy is described in the IEEE SA Standards Board Bylaws and IEEE SA Standards Board Operations Manual
  - IEEE SA Copyright Policy, see
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    https://standards.ieee.org/about/policies/bylaws/sect6-7.html#7
    Clause 6.1 of the IEEE SA Standards Board Operations Manual
    https://standards.ieee.org/about/policies/opman/sect6.html
- IEEE SA Copyright Permission
  - https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/permissionltrs.zip
- IEEE SA Copyright FAQs
  - http://standards.ieee.org/faqs/copyrights.html/
- IEEE SA Best Practices for IEEE Standards Development
  - http://standards.ieee.org/develop/policies/best_practices_for_ieee_standards_development_051215.pdf
- Distribution of Draft Standards (see 6.1.3 of the SASB Operations Manual)
  - https://standards.ieee.org/about/policies/opman/sect6.html

Participant behavior in IEEE-SA activities is guided by the IEEE Codes of Ethics & Conduct

- All participants in IEEE-SA activities are expected to adhere to the core principles underlying the:
  - IEEE Code of Ethics
  - IEEE Code of Conduct
- The core principles of the IEEE Codes of Ethics & Conduct are to:
  - *Uphold the highest standards of integrity, responsible behavior, and ethical and professional conduct*
  - *Treat people fairly and with respect, to not engage in harassment, discrimination, or retaliation, and to protect people's privacy.*
  - *Avoid injuring others, their property, reputation, or employment by false or malicious action*
- The most recent versions of these Codes are available at http://www.ieee.org/about/corporate/governance

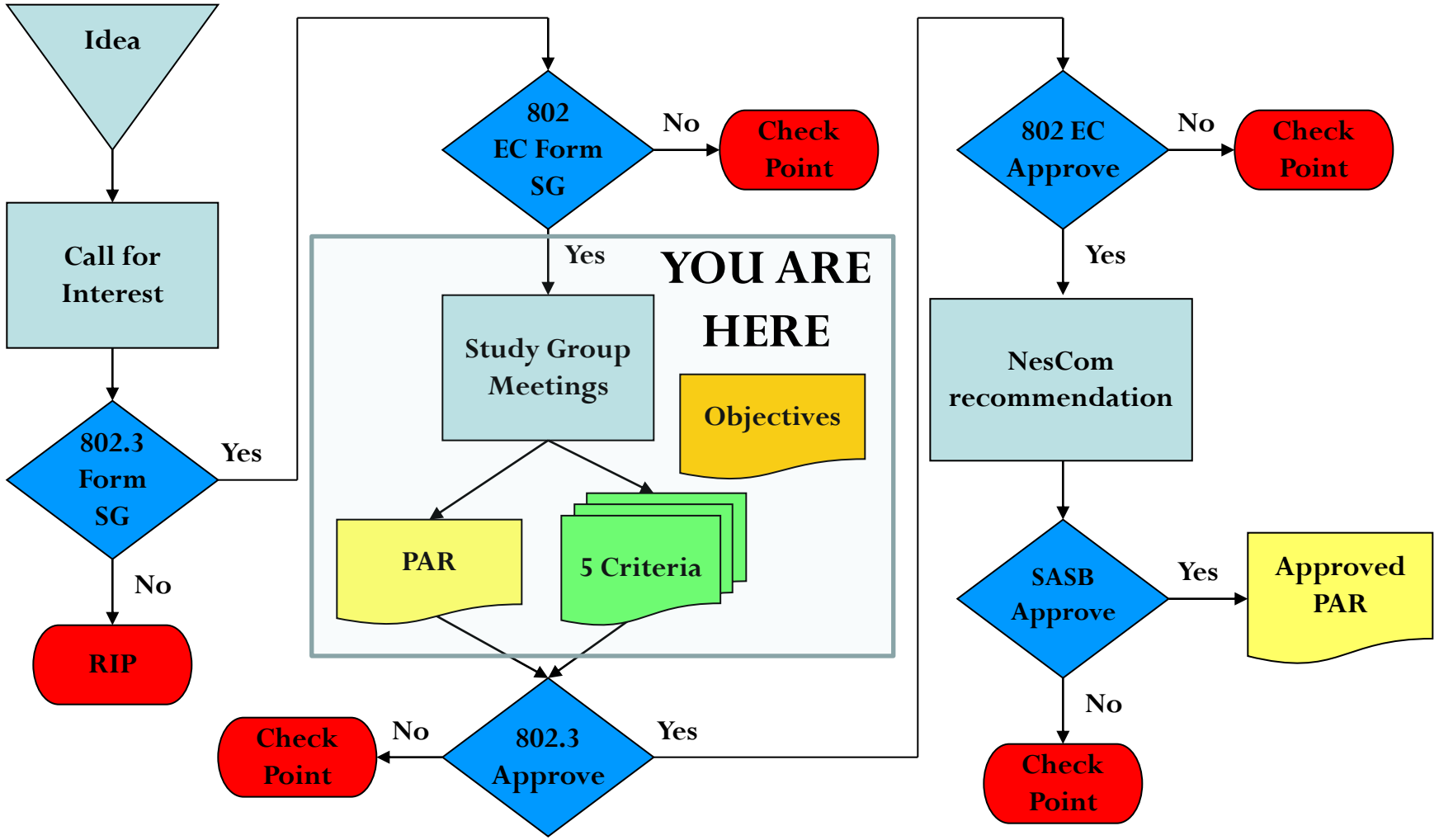
Participants in the IEEE-SA "*individual process*" shall act independently of others, including employers

- The IEEE-SA Standards Board Bylaws require that "*participants in the IEEE standards development individual process shall act based on their qualifications and experience*"
- This means participants:
  - **Shall act & vote** based on their personal & independent opinions derived from their expertise, knowledge, and qualifications
  - **Shall not act or vote** based on any obligation to or any direction from any other person or organization, including an employer or client, regardless of any external commitments, agreements, contracts, or orders
  - **Shall not direct** the actions or votes of other participants or retaliate against other participants for fulfilling their responsibility to act & vote based on their personal & independently developed opinions
- By participating in standards activities using the "*individual process*", you are deemed to accept these requirements; if you are unable to satisfy these requirements then you shall immediately cease any participation

IEEE-SA standards activities shall allow the fair & equitable consideration of all viewpoints

- The IEEE-SA Standards Board Bylaws (clause 5.2.1.3) specifies that "*the standards development process shall not be dominated by any single interest category, individual, or organization*"
  - This means no participant may exercise *"authority, leadership, or influence by reason of superior leverage, strength, or representation to the exclusion of fair and equitable consideration of other viewpoints"* or "*to hinder the progress of the standards development activity*"
- This rule applies equally to those participating in a standards development project and to that project's leadership group
- Any person who reasonably suspects that dominance is occurring in a standards development project is encouraged to bring the issue to the attention of the Standards Committee or the project's IEEE-SA Program Manager

Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase



Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

The Study Group

- Normal function is to draft a complete PAR and Five Criteria
- Provide a plenary week tutorial to the LMSC.
- Gain approval at the IEEE 802.3 WG, IEEE 802 EC, IEEE-SA NesCom and IEEE-SA Standards Board.
- SG only exists for 6 months
  - Extensions can be requested
  - Voted on by IEEE 802.3
  - Ratified by IEEE 802 EC
- Development of Objectives helps set the goals for the Task Force
  - The 802.3 WG has used objectives since approximately 1996 with IEEE P802.3z
- Consensus required to move forward

- Not a goal – choosing a solution.

Draft PAR, CSD, Objectives

IEEE 802.3 100 Gb/s Wavelength Short Reach PHYs Study Group

The IEEE 802 LMSC Executive Committee has chartered a Study Group under the IEEE 802.3 Ethernet Working Group to develop a Project Authorization Request (PAR) and Criteria for Standards Development (CSD) responses for "Lower cost, short reach, optical PHYs using 100 Gb/s wavelengths".

- Draft project documents
  - PAR (Approved by Study Group - Jan 2020)
  - Criteria for Standards Development (Approved by Study Group - Jan 2020)
  - Objectives (Approved by Study Group - Jan 2020)

- Draft project documents. Adopted by SG, January 2020:
  - PAR
  - Criteria for Standards Development
  - Objectives

Objectives

1. Support a MAC data rate of 100 Gb/s, 200 Gb/s and 400 Gb/s
2. Support full-duplex operation only
3. Preserve the Ethernet frame format utilizing the Ethernet MAC
4. Preserve minimum and maximum FrameSize of current IEEE 802.3 standard
5. Provide appropriate support for OTN
6. Support a BER of better than or equal to 10^-12 at the MAC/PLS service interface (or the frame loss ratio equivalent) for 100 Gb/s operation
7. Support a BER of better than or equal to 10^-13 at the MAC/PLS service interface (or the frame loss ratio equivalent) for 200 Gb/s and 400 Gb/s operation

Objectives

8. Define a physical layer specification that supports 100 Gb/s operation over 1 pair of MMF with lengths up to at least 50 m
9. Define a physical layer specification that supports 200 Gb/s operation over 2 pairs of MMF with lengths up to at least 50 m
10. Define a physical layer specification that supports 400 Gb/s operation over 4 pairs of MMF with lengths up to at least 50 m

Ad Hoc Report (1 of 8)

- February 13, 2020 (16 attendees)
  - "100G VCSELs with 30 m OM3 or 50 m OM4 Links" Parsons (CommScope)
    - 100G VCSELs with 30 m OM3 is essentially equivalent to 50 m OM4 links
    - ToR elimination. Economic feasibility of short reach optical PMDs is based on a more complex calculation than simply comparing the relative costs of fiber links to copper links

Ad Hoc Report (2 of 8)

- March 26, 2020 (37 attendees)
  - "Objectives for 100 Gb/s shorter-reach PMDs" Lewis (Lumentum)
    - Add an objective for intra-rack and active cable applications
      - 100 Gb/s operation over 1 pair of MMF with lengths of up to at least 20 m
      - 940 nm VCSELs to potentially leverage volume and lower cost of 3D sensing (3DS), while factoring that a 50 Gbd PAM4 VCSEL is a different device design
    - Consider adding an interoperability objective between the 20 m and 50 m PMDs

Ad Hoc Report (3 of 8)

- April 9, 2020 (39 attendees)
  - "200G-DR2 Broad Market Potential" Welch (Cisco)
    - Relative Market Sizes (≤ 2km) for 100G, 200G, 400G
    - Potential 200G-DR2 Applications:
      - TOR Uplinks
      - Server Uplinks

Ad Hoc Report (4 of 8)

- April 9, 2020 (continued):
  - "100Gbps MMF Objectives" Swanson (Corning)
    - Two distinct market needs for the 100G Short Reach MMF SG:
      - Interconnects between switches
        - based on supporting the maximum link length MMF 100G switch-to-switch interconnect, 100 m desirable with cost less than 100G-DR
      - Interconnects between switches and servers
        - based on supporting minimum cost MMF 100G switch-to-server interconnects, cost competitive with AOC and copper. 20 m reach

Ad Hoc Report (5 of 8)

- April 23, 2020 (44 attendees)
  - "Technical feasibility of 100 Gb/s over >100m MMF using VCSELs with reduced spectral width" Ledentsov (VI Systems)
    - Technical feasibility of 100 Gb/s over >100 m MMF using SM VCSELs/VCSELs with reduced spectral width
    - Objective of 100G data transmission over at least 100m of MMF using 850nm VCSEL with a reduced spectral width
    - Decide on the maximum OM4 and OM5 MMF transmission distance in Task Force

Ad Hoc Report (6 of 8)

- April 23, 2020 (continued)
  - "In-row server applications" Young (CommScope)
    - End User distance requirements for in-row MOR (T1) to servers - 30m minimum (no end user feedback for <30m)
    - Longer distances would support additional applications
    - Several trends combine to favor longer reach for server-attachment ≥ 50 m
      - High radix switching replacing TOR switches - lower capex, opex and latency
    - OSA reference: technically feasible objectives for 100GbE at 70m simulated

Ad Hoc Report (7 of 8)

- May 7, 2020 (39 attendees)
  - "Exploring the Feasibility of Longer Reach" Bhatt (II-VI)
    - Strawman link budget as well as the results of a modeling exercise based on a comprehensive set of link impairments and parameters
      - To support a reach greater than 50 meters, Equalization and RIN are big levers worth exercising
      - Improvements in VCSEL bandwidth and spectral width help, but with diminishing marginal benefits
      - Penalties for 30 meters on OM3 and 50 meters on OM4 are comparable
      - We must add margin, and we must support target specs with measurements
      - Supporting a reach greater than ~70 meters will require improvement in component specs beyond what was presented today
      - Tradeoffs!

Ad Hoc Report (8 of 8)

- May 7, 2020 (continued)
  - "Proposals for two PMDs for 100G lambda" Castro (Panduit)
    - MMF-VCSEL channel requirements for two PMD options: Switch-to-Switch and Switch-to-Server – to best address market needs
      - switch-to-server 30m
        - Option 1, current option, 30m using OM3 (50m using OM4)
        - Option 2 provide relaxed VCSEL tolerances:
          - ≤ 20m OM3, (aligned to lowest cost considerations)
          - ≤ 30m using OM4
      - switch-to-switch interconnections for ≥ 80m
    - RIN is a critical parameter based on model
    - Based on link model simulations

Possibilities for handling proposals for alternate objectives

- The draft objectives must still be approved by the WG
- Alternate MMF objectives have been suggested since Geneva
  - A longer reach than 50m for switch-switch links
  - A shorter reach for potentially lower cost for server attachment
- Options
  - 75% consensus required to change existing draft objectives in SG
  - Our process does allow us to modify objectives in TF, provided they are within the scope of the PAR, with approval of both the TF and the WG.
  - There is precedent for a SG to adopt specific objectives plus one or more “Consider” or “Research” objectives, e.g. IEEE P802.3af and P802.3at. Some WG members may dislike this approach, but it has been done.

The draft PAR for 802.3db seems sufficiently broad to allow future flexibility on MMF objectives

- 2.1 Title: Standard for Ethernet Amendment: Physical Layer Specifications and Management Parameters for 100 Gb/s, 200 Gb/s, and 400 Gb/s Operation over Optical Fiber using 100 Gb/s Signaling
- 5.2.b. Scope of the project: This project specifies additions to and appropriate modifications of IEEE Std 802.3 and adds Physical Layer specifications and management parameters for 100 Gb/s, 200 Gb/s, and 400 Gb/s Ethernet optical interfaces for server attachment and other intra-data center applications using 100 Gb/s signaling over optical fiber.
- 5.5 Need for the Project: Rapid growth of server, network, and internet traffic is driving the need for higher data rates, higher density, lower cost fiber optic solutions, including the shortest links in the data center such as server-attachment. To address these needs, advances in technology now enable the specification of 100 Gb/s, 200 Gb/s, and 400 Gb/s Physical Layer types operating over optical interconnects using 100 Gb/s signaling. IEEE Std 802.3 does not currently define operation over multimode fiber using 100 Gb/s signaling.

IEEE P802.3at adopted several “Research” objectives

Example of “Research” objectives - http://ieee802.org/3/at/objectives.html

Objective 9 was successfully updated in TF to a specific objective

Objective 11 was withdrawn in TF after further research

IEEE P802.3at DTE Power Enhancements Task Force

Objectives

Objective 9 (Updated November 2008)

~~Research potential extension of power classification to support PoEPlus modes.~~

Extend power classification to support PoEPlus modes.

Objective 10 (Updated November 2008)

~~PoE Plus will vigorously pursue supporting the operation of midspan PSEs for 1000BASE-T.~~

Support the operation of midspan PSEs for 1000BASE-T.

~~Objective 11~~ (Withdrawn May 2007)

~~Research the operations of midspan and endpoint PSEs for 10GBASE-T including providing cable heating data for evaluation by IEEE P802.3an.~~

20 May 2020 SG telephonic interims

- The IEEE 802.3 100G Short Reach SG will hold its second Interim Teleconference meeting on May 20, 2020 at 10am US Eastern Time for up to 2 hours. At this meeting, we will be able to vote on motions and conduct the business of the SG.
  - Primary goal is to review comments from the EC against our pre-submitted PAR & CSD responses out of the January Interim. The deadline for receiving comments is 14 May AOE. The WG needs to approve at meeting the following day, as I understand.
  - If the objectives were to be modified at the May 13, 2020 Telephonic Interim, then CSD responses may also need to be updated.

20 May 2020 SG telephonic interims - registration

- Registration Requirement: Because a roll call vote is required if a motion is not approved by unanimous consent, registration is required for this meeting.
- 20 May Registration Process:
  - Click on the following link 20 May 100GSR SG telephonic interim registration email
  - Or send an email to rlingle@ofsoptics.com and mchoudhury@ofsoptics.com with the subject “20 May 2020 100GSR Study Group Telephonic Interim Registration.”
  - Please provide your name, employer, and affiliation in the email.
  - Deadline: Tuesday, May 19, 2020 at 10am US Eastern Daylight Time (EDT/UTC -4), 24 hours before meeting

- Please register for 20 May interim as soon as you know you will be attending

20 May 2020 SG telephonic interim – Webex information

100GSR SG Interim Teleconference
Hosted by Seat2 802Webex

Wednesday, May 20, 2020 10:00 am | 2 hours | (UTC-04:00) Eastern Time (US & Canada)
Meeting number: 797 051 613
Password: X6ZptUN9Pp2 (96978869 from phones and video systems)
https://ieee802.my.webex.com/ieee802.my/j.php?MTID=mccb4d733a321c7e2338f424dc841cc0d

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Future Meetings

- Interim Teleconference Meetings:
  - May 20, 2020, 10 am – 12 noon EDT/UTC -4

- May 2020 face to face 802.3 Interim meeting: CANCELLED due to COVID-19 pandemic
- July 2020 face to face 802 Plenary meeting: CANCELLED due to COVID-19 pandemic
- The cancelled face to face meetings may be replaced by virtual meetings as appropriate.
  - I anticipate that the IEEE 802 EC will enact temporary rules to allow the business of July plenary to proceed

Straw Polls & Motions

- Straw Polls
- Late Registration
- Motions

Thank You!