IEEE 802 Mar 2024

IEEE 802.3 Ethernet WG
Closing Plenary
14 Mar 2024

IEEE P802.3dj
200 Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s
Ethernet Task Force
Closing Report

IEEE P802.3dj Task Force Project information

- **Organization**
  - **John D'Ambrosia, Chair, IEEE P802.3dj Task Force**
  - **Mark Nowell, Vice-Chair, IEEE P802.3dj Task Force; Chair, Optics Track**
  - **Kent Lusted, Secretary, Chair, Electrical Track**
  - **Matt Brown, IEEE P802.3dj Chief Editor**
  - **Gary Nicholl, Chair, Architecture and Logic Track**
- **Task force web and reflector information:**
  - **Home page: https://www.ieee802.org/3/dj/index.html**
  - **Reflector Info - https://www.ieee802.org/3/dj/reflector.html**
    - **TF Reflector: stds-802-3-b400g@listserv@ieee.org**
    - **Logic Reflector: stds-802-3-b400g-logic@listserv@ieee.org**
    - **Optical Reflector: stds-802-3-b400g-optx@listserv@ieee.org**
    - **Electrical Reflector: stds-802-3-b400g-elec@listserv@ieee.org**
- **Project Documentation –**
  - **PAR : https://www.ieee802.org/3/dj/projdoc/P802d3dj_PAR.pdf**
  - **CSD: https://mentor.ieee.org/802-ec/dcn/22/ec-22-0256-00-ACSD-p802-3dj.pdf**
  - **Objectives: https://www.ieee802.org/3/dj/projdoc/objectives_P802d3dj_240314.pdf**
  - **Adopted Timeline: https://www.ieee802.org/3/dj/projdoc/timeline_3dj_231128.pdf**

Activities This Week

- Heard 31 technical presentations
  - Mar 2024 Webpage - https://www.ieee802.org/3/dj/public/24_03/index.html
- Progress!!!! - Key Decisions (Architectural, Copper, Optical) made!
  - See slides below
- Reviewed project timeline status
  - Detailed schedule analysis indicates that timeline needs to be reviewed to address size of project
- Generated liaisons - motion to follow
  - Response to MOPA – PTP
  - Responses to OIF – 1) P802.3dj Coherent PHYs; 2) Energy Efficient Interfaces
  - Response to ITU- G.652 Fiber
- Chartered "COM" ad hoc - to assist in the development of COM
- Generating D1.0 and initiating Task Force Review!

Highlights of this week's motions/polls

See: latest version of "Motions & Straw Polls" here.

Motions

- Adopted logic and optics baselines for ER1-20 (20km objective)
- Adopted amendment to 20/40km logic baseline
- Adopted amendments to 40 km optics baseline
- Adopted MDI for 400GBASE-DR2 & 400GBASE-DR2-2 PMDs
- Adopted a chip-to-chip DER_0 target
- Adopted MDI naming for CR-based PMDs
- Adopted key aspects for electrical Link Training including a multi-segment approach
- Adopted CRU bandwidth for FECi-based PHYs

Straw Polls - Task force support was shown for:

- Proposed editorial approach to Variable and MDIO references
- Developing baseline proposals for Optical Auto-negotiation (OAN)
- Developing baseline proposals for Optical Link Training (OLT)
- Support for investigating an open source approach for COM model

802.3 WG APPROVAL:
NEW SMF 20 km OBJECTIVE

Justification Slide

P802.3dj Task Force adopted a new objective @ Jan 2024 Interim:

- Define a physical layer specification that supports 800 Gb/s operation over a single SMF in each direction with lengths up to at least 20 km

Task Force justification:

- The Task Force has had numerous contributions to satisfy various use cases for coherent interfaces for 800 GbE.
  - Intra-datacenter up to 10 km – optimized for latency and power
  - Telecom (access, mobile) 10 & 40 km – interop between reaches and maximizing investment leverage are important
- Since there was an overlap @ 10km between applications, it was proposed to create a new objective at 20km which enabled optimized solutions to be developed for both use-cases.
  - The traditional telecom Ethernet users maintain two solution options (20km and 40km) with the new 20km objective enabling:
    - Support of shorter 10+ km interfaces with link margin to overcome the typical variability of fiber, connectors, and splices.
    - Lower cost and lower power implementations that could be unamplified (vs. the amplified 40km reach)
    - Interop / Flexibility of deployment and leverage of common components for economy of scale
- The proposal was broadly supported across network operaters and equipment/component manufacturers

IEEE P802.3dj Objectives Update (1 of 2)

- **Non-Rate Specific**
  - Support full-duplex operation only
  - Preserve the Ethernet frame format utilizing the Ethernet MAC
  - Preserve minimum and maximum FrameSize of current IEEE 802.3 standard
  - Support a BER of better than or equal to 10 -13 at the MAC/PLS service interface (or the frame loss ratio equivalent)
  - Provide support to enable mapping over OTN
- **200 Gb/s Related**
  - Support a MAC data rate of 200 Gb/s
  - Support optional single-lane 200 Gb/s attachment unit interfaces for chip-to-module and chip-to-chip applications
  - Define a physical layer specification that supports 200 Gb/s operation:
    - over 1 lane over electrical backplanes supporting a die-to-die insertion loss <= 40 dB at 53.125 GHz **
    - over 1 pair of copper twin-axial cables in each direction with a reach of up to at least 1.0 meter
    - over 1 pair of SMF with lengths up to at least 500 m
    - over 1 pair of SMF with lengths up to at least 2 km
- **400 Gb/s Related**
  - Support a MAC data rate of 400 Gb/s
  - Support optional two-lane 400 Gb/s attachment unit interfaces for chip-to-module and chip-to-chip applications
  - Define a physical layer specification that supports 400 Gb/s operation:
    - over 2 lanes over electrical backplanes supporting a die-to-die insertion loss <= 40 dB at 53.125 GHz **
    - over 2 pairs of copper twin-axial cables in each direction with a reach of up to at least 1.0 meter
    - over 2 pairs of SMF with lengths up to at least 500 m
    - over 2 pairs of SMF with lengths up to at least 2 km

IEEE P802.3dj Objectives Update (2 of 2)

- **800 Gb/s Related**
  - Support a MAC data rate of 800 Gb/s
  - Support optional four-lane 800 Gb/s attachment unit interfaces for chip-to-module and chip-to-chip applications
  - Define a physical layer specification that supports 800 Gb/s operation:
    - over 4 lanes over electrical backplanes supporting a die-to-die insertion loss <= 40 dB at 53.125 GHz **
    - over 4 pairs of copper twin-axial cables in each direction with a reach of up to at least 1.0 meter
    - over 4 pairs of SMF with lengths up to at least 500 m
    - over 4 pairs of SMF with lengths up to at least 2 km
    - over 4 wavelengths over a single SMF in each direction with lengths up to at least 500 m ***
    - over 4 wavelengths over a single SMF in each direction with lengths up to at least 2 km
    - over 1 wavelength over a single SMF in each direction with lengths up to at least 10 km *
    - **over a single SMF in each direction with lengths up to at least 20 km ****
    - over 4 wavelengths over a single SMF in each direction with lengths up to at least 10 km *
    - over a single SMF in each direction with lengths up to at least 40 km
- **1.6 Tb/s Related**
  - Support a MAC data rate of 1.6 Tb/s
  - Support optional sixteen-lane 1.6 Tb/s attachment unit interfaces for chip-to-module and chip-to-chip applications
  - Support optional eight-lane 1.6 Tb/s attachment unit interfaces for chip-to-module and chip-to-chip applications
  - Define a physical layer specification that supports 1.6 Tb/s operation:
    - over 8 lanes over electrical backplanes supporting a die-to-die insertion loss <= 40 dB at 53.125 GHz **
    - over 8 pairs of copper twin-axial cables in each direction with a reach of up to at least 1.0 meter
    - over 8 pairs of SMF with lengths up to at least 500 m
    - over 8 pairs of SMF with lengths up to at least 2 km

*** - Approved by IEEE 802.3 WG 16 Mar 2023**
**** - Approved by IEEE 802.3 WG 18 May 2023**
***** - Approved by IEEE 802.3 WG, 16 Nov 2023**
****** - Adopted by IEEE P802.3dj TF, 25 Jan 2024, Pending 802.3 WG Approval**

WG Motion

Motion	**Move that the IEEE 802.3 Working Group approve the addition of the following IEEE P802.3dj objective:** • Define a physical layer specification that supports 800 Gb/s operation over a single SMF in each direction with lengths up to at least 20 km
Technical (>= 75%)	
Moved by	John D'Ambrosia
Second by	Mark Nowell
Results 802.3 (y/n/a)	

Summary IEEE P802.3dj Progress @ End of Jan 2024 Interim – Logic

	AUI	Backplane	CU Cable	SMF 500m/2km	SMF 10km 4 Wavelength	SMF 10km 1 Wavelength	SMF 20km 1 Wavelength	SMF 40km
Ethernet Rate	PCS/FEC/PMA?	PCS/FEC/PMA?	PCS/FEC/PMA?	PCS/FEC/PMA?	PCS/FEC/PMA?	PCS/FEC/PMA?	PCS/FEC/PMA?	PCS/FEC/PMA?
200 Gb/s								
400 Gb/s								
800 Gb/s								
1.6 Tb/s								

Adopted baselines

Proposed Baselines

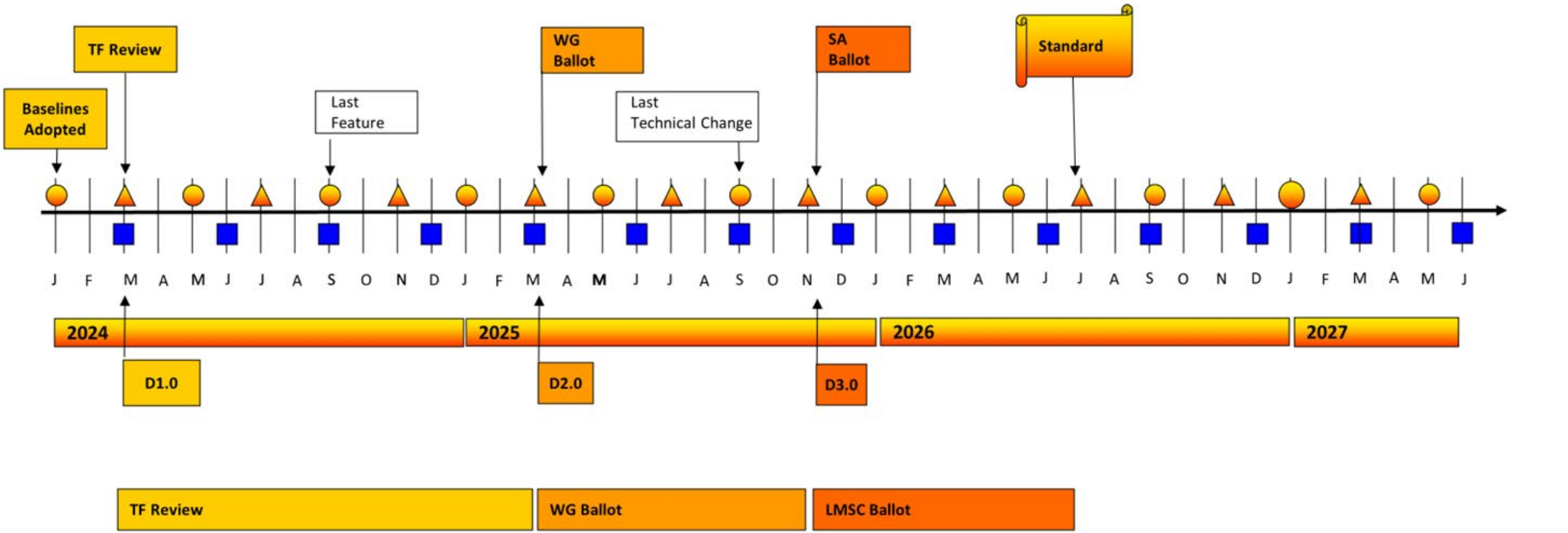
Summary IEEE P802.3dj Progress @ End of Jan 2024 Interim – PMDs (& AUIs)

Ethernet Rate	Assumed Signaling Rate	AUI	Backplane	Cu Cable	SMF 500m	SMF 2km	SMF 10km	SMF 20km	SMF 40km
200 Gb/s	200 Gb/s	200GAUI-1 C2C C2M	200GBASE-KR1	200GBASE-CR1	200GBASE-DR1	200GBASE-FR1			
400 Gb/s	200 Gb/s	400GAUI-2 C2C C2M	400GBASE-KR2	400GBASE-CR2	400GBASE-DR2	400GBASE-DR2-2			
800 Gb/s	200 Gb/s	800GAUI-4 C2C C2M	800GBASE-KR4	800GBASE-CR4	1.800GBASE-DR4 2.800GBASE over 4λ	1. 800GBASE-DR4-2 2. 800GBASE-FR4	800GBASE-LR4		
	800 Gb/s						800GBASE-LR	800GBASE-ER1-20	800GBASE-ER1
1.6 Tb/s	100 Gb/s	1.6TAUI-16 C2C C2M							
	200 Gb/s	1.6TAUI-8 C2C C2M	1.6TBASE-KR8	1.6TBASE-CR8	1.6TBASE-DR8	1.6TBASE-DR8-2			

Adopted baselines

Proposed Baselines

Adopted IEEE P802.3dj Timeline (28 Nov 2023)



OTHER MOTIONS

WG Motion

Motion	Move that the IEEE 802.3 Working Group approve: • IEEE_802d3_to_ITU_3dj_2403_draft_Redacted.pdf with editorial license granted to the Chair (or his appointed agent) as liaison communications from the IEEE 802.3 Working Group to ITU. • IEEE_802d3_to_MOPA_3dj_0224_draft_Redacted.pdf with editorial license granted to the Chair (or his appointed agent) as liaison communications from the IEEE 802.3 Working Group to MOPA. • IEEE_802d3_to_OIF_3dj_0224_draft_coherent_Redacted.pdf • IEEE_802d3_to_OIF_3dj_0224_draft_EEI_Redacted.pdf with editorial license granted to the Chair (or his appointed agent) as liaison communications from the IEEE 802.3 Working Group to MOPA, OIF, and ITU-T.
Technical (>= 75%)	
Moved by	John D'Ambrosia
Second by	Mark Nowell
Results 802.3 (y/n/a)	

THANK YOU!