

# IEEE802.3 Liaison Report

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# IEEE 802.3 Task Forces, Study Groups, CFIs of interest to T11

- P802.3ck 100 Gb/s per Lane Electrical Task Force
- P802.3cm Next Generation 400 Gb/s Ethernet over Multimode Fiber Task Force
- P802.3cn 50 Gb/s, 200 Gb/s, and 400 Gb/s over single-mode fiber Task Force
- P802.3ct 100 Gb/s and 200 Gb/s Ethernet over DWDM systems Task Force
- P802.3cu 100 Gb/s per lane optical PHYs for 2km and 10km for 100 GbE and 400 GbE Task Force
- CFI approved: 100 Gb/s per Wavelength Short Reach PHYs

# P802.3ck 100 Gb/s per lane Electrical Task Force

- 9<sup>th</sup> Task Force meeting 11-13 September 2019, Indianapolis, IN
  - Meeting Materials: [http://ieee802.org/3/ck/public/19\\_09/index.html](http://ieee802.org/3/ck/public/19_09/index.html)
  - Meeting Minutes: [http://grouper.ieee.org/groups/802/3/ch/public/sep19/Unconfirmed\\_minutes\\_3ch\\_0919.pdf](http://grouper.ieee.org/groups/802/3/ch/public/sep19/Unconfirmed_minutes_3ch_0919.pdf)
  - Adopted a baseline for the chip-to-chip interface
- 10<sup>th</sup> Task Force meeting 11-15 November 2019
  - Meeting Materials: [http://www.ieee802.org/3/ck/public/19\\_11/index.html](http://www.ieee802.org/3/ck/public/19_11/index.html)
  - Adopted baselines: <http://www.ieee802.org/3/ck/public/baselines/index.html>
  - Meeting Minutes:
    - [http://www.ieee802.org/3/ck/public/19\\_11/minutes\\_3ck\\_1119\\_unconfirmed.pdf](http://www.ieee802.org/3/ck/public/19_11/minutes_3ck_1119_unconfirmed.pdf)
  - Ad hoc call info: <http://www.ieee802.org/3/ck/public/adhoc/index.html>
- Adopted baselines for:
  - Optional interleaved FEC
  - C2M reference receiver
  - Floating tap weight range and implementation method
  - Cable assembly host and channel insertion loss
  - Note: Did not adopt parameters for mated test fixtures

# P802.3ck 100 Gb/s per lane Electrical Task Force

## Adopted Objectives (1 of 2)

- Support a MAC data rate of 100 Gb/s, 200 Gb/s, and 400 Gb/s
  - 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 the existing bit error ratios (BERs) at the MAC/PLS service interface (or the frame loss ratio equivalent) for 100 Gb/s, 200 Gb/s, and 400 Gb/s Ethernet
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- Define a single-lane 100 Gb/s Attachment Unit interface (AUI) for chip-to-module applications, compatible with PMDs based on 100 Gb/s per lane optical signaling
  - Define a single-lane 100 Gb/s Attachment Unit Interface (AUI) for chip-to-chip applications
  - Define a single-lane 100 Gb/s PHY for operation over electrical backplanes supporting an insertion loss  $\leq 28$  dB at 26.56 GHz.
  - Define a single-lane 100 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 2m

# P802.3ck 100 Gb/s per lane Electrical Task Force

## Adopted Objectives (2 of 2)

- Define a two-lane 200 Gb/s Attachment Unit interface (AUI) for chip-to-module applications, compatible with PMDs based on 100 Gb/s per lane optical signaling
  - Define a two-lane 200 Gb/s Attachment Unit Interface (AUI) for chip-to-chip applications
  - Define a two-lane 200 Gb/s PHY for operation over electrical backplanes supporting an insertion loss  $\leq 28$  dB at 26.56 GHz.
  - Define a two-lane 200 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 2m
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- Define a four-lane 400 Gb/s Attachment Unit interface (AUI) for chip-to-module applications, compatible with PMDs based on 100 Gb/s per lane optical signaling
  - Define a four-lane 400 Gb/s Attachment Unit Interface (AUI) for chip-to-chip applications
  - Define a four-lane 400 Gb/s PHY for operation over electrical backplanes supporting an insertion loss  $\leq 28$  dB at 26.56 GHz.
  - Define a four-lane 400 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 2m

# P802.3cm – Next generation 400 Gb/s MMF PHYs

## Task Force

- 9<sup>th</sup> Task Force meeting 9 September 2019, Indianapolis, IN
  - Meeting Materials: <http://www.ieee802.org/3/cm/public/September19/>
  - Meeting Minutes: [http://www.ieee802.org/3/cm/public/September19/approved\\_meeting\\_minutes\\_3cm\\_01\\_0919.pdf](http://www.ieee802.org/3/cm/public/September19/approved_meeting_minutes_3cm_01_0919.pdf)
- 10<sup>th</sup> Task Force meeting 13 November 2019, Waikoloa Village, HI
  - Meeting Materials: <http://www.ieee802.org/3/cm/public/November19/>
  - Meeting Minutes: [http://www.ieee802.org/3/cm/public/November19/unapproved\\_meeting\\_minutes\\_3cm\\_01\\_1119.pdf](http://www.ieee802.org/3/cm/public/November19/unapproved_meeting_minutes_3cm_01_1119.pdf)
- Resolved 35 comments against Draft 3.0 in September interim and agreed to produce Draft 3.1 for Standards Association 1<sup>st</sup> recirculation ballot
- Resolved 1 comment against Standards Association 1st recirculation ballot Draft 3.1 in November plenary.
- Task Force and 802.3 Working Group approved to submit IEEE P802.3cm Draft 3.1 to RevCom for approval
- RevCom review scheduled for IEEE SASB meeting January 2020
- Standard specifies 400GBASE-SR8 and 400GBASE-SR4.2

# P802.3cm – Next generation 400 Gb/s MMF PHYs

## Task Force – Adopted Objectives (1 of 2)

1. Support full-duplex operation only
2. Preserve the Ethernet frame format utilizing the Ethernet MAC
3. Preserve the minimum and Maximum FrameSize of the current Ethernet standard
4. Provide appropriate support for OTN
5. Specify optional Energy Efficient Ethernet (EEE) capability
6. Support a BER of better than or equal to  $10^{-13}$  at the MAC/PLS service interface (or the frame loss ratio equivalent)
7. Support a MAC data rate of 400 Gb/s

# P802.3cm – Next generation 400 Gb/s MMF PHYs

## Task Force - Adopted Objectives (2 of 2)

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



# P802.3cn 50 Gb/s, 200 Gb/s, and 400 Gb/s Ethernet over Single-Mode Fiber Task Force

- 6<sup>th</sup> Task Force meeting (contingent interim teleconference) 20 August 2019
  - Meeting Materials: [http://www.ieee802.org/3/cn/public/tf\\_interim/19\\_0820/index.html](http://www.ieee802.org/3/cn/public/tf_interim/19_0820/index.html)
  - Meeting Minutes: [http://www.ieee802.org/3/cn/public/tf\\_interim/19\\_0820/minutes\\_3cn\\_190820\\_unapproved.pdf](http://www.ieee802.org/3/cn/public/tf_interim/19_0820/minutes_3cn_190820_unapproved.pdf)
- 7<sup>th</sup> Task Force meeting 10-11 September 2019, Indianapolis, IN
  - Meeting Materials: [http://www.ieee802.org/3/ct/public/19\\_09/index.html](http://www.ieee802.org/3/ct/public/19_09/index.html)
  - Meeting Minutes: [http://www.ieee802.org/3/ct/public/19\\_09/minutes\\_3cnct\\_01\\_0919\\_unapproved.pdf](http://www.ieee802.org/3/ct/public/19_09/minutes_3cnct_01_0919_unapproved.pdf)
- 8<sup>th</sup> Task Force meeting (contingent interim teleconference) 24 September 2019
  - Meeting Materials: [http://www.ieee802.org/3/cn/public/tf\\_interim/19\\_0924/index.html](http://www.ieee802.org/3/cn/public/tf_interim/19_0924/index.html)
  - Meeting Minutes: [http://www.ieee802.org/3/cn/public/tf\\_interim/19\\_0924/minutes\\_3cn\\_190924\\_unapproved.pdf](http://www.ieee802.org/3/cn/public/tf_interim/19_0924/minutes_3cn_190924_unapproved.pdf)
- Resolved 37 comments against Draft 3.0 from initial Standards Association ballot in August contingent interim teleconference meeting and agreed to produce Draft 3.1 for Standards Association ballot recirculation
- Resolved 2 comments against Draft 3.1 from Standards Association ballot recirculation. The 802.3 Working Group agreed at the September interim to forward this to RevCom for approval
- 11 comments received and resolved against P802.3cn D3.0 public review, which closed 18 September 2019. Approved by IEEE 802 EC for submission to RevCom 1 October 2019

# P802.3cn 50 Gb/s, 200 Gb/s, and 400 Gb/s Ethernet over Single-Mode Fiber Task Force

## Adopted Objectives – 1/2

- Support full-duplex operation only
- Preserve the Ethernet frame format utilizing the Ethernet MAC
- Preserve minimum and maximum FrameSize of current Ethernet standard
- Provide appropriate support for OTN

### *50 Gb/s Ethernet*

- Support a MAC data rate of 50 Gb/s
- Support a BER of better than or equal to  $10^{-12}$  at the MAC/PLS service interface (or the frame loss ratio equivalent) for 50 Gb/s
- Provide a physical layer specification which supports 50 Gb/s operation over at least 40km of SMF

### *200 Gb/s Ethernet*

- Support a MAC data rate of 200 Gb/s
- 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
- Provide a physical layer specification supporting 200 Gb/s operation over four wavelengths capable of at least 40km of SMF

# P802.3cn 50 Gb/s, 200 Gb/s, and 400 Gb/s Ethernet over Single-Mode Fiber Task Force

## Adopted Objectives – 2/2

### *400 Gb/s Ethernet*

- Support a MAC data rate of 400 Gb/s
- Support a BER of better than or equal to  $10^{-13}$  at the MAC/PLS service interface (or the frame loss ratio equivalent) for 400 Gb/s
- Provide a physical layer specification supporting 400 Gb/s operation over eight wavelengths capable of at least 40 km of SMF

# P802.3ct 100 Gb/s and 400 Gb/s over DWDM systems

## Task Force

- 4th Task Force meeting 10-11 September 2019, Indianapolis, IN
  - Meeting Materials: [http://ieee802.org/3/ct/public/19\\_09/index.html](http://ieee802.org/3/ct/public/19_09/index.html)
  - Meeting Minutes: [http://ieee802.org/3/ct/public/19\\_09/minutes\\_3cnct\\_01\\_0919\\_unapproved.pdf](http://ieee802.org/3/ct/public/19_09/minutes_3cnct_01_0919_unapproved.pdf)
- 5th Task Force meeting 13-14 November 2019, Waikoloa Village, HI
  - Meeting Materials: [http://www.ieee802.org/3/ct/public/19\\_11/index.html](http://www.ieee802.org/3/ct/public/19_11/index.html)
  - Meeting Minutes: [http://www.ieee802.org/3/ct/public/19\\_11/minutes\\_3ct\\_01a\\_1119\\_unapproved.pdf](http://www.ieee802.org/3/ct/public/19_11/minutes_3ct_01a_1119_unapproved.pdf)
- The Task Force agreed to split into two projects, with 100GBASE-ZR remaining in P802.3ct and 400GBASE-ZR moving to new P802.3cw. This is still pending 802.3, EC, and NesCom approval. This split is to allow the efforts to proceed on separate timelines
- The P802.3ct Task Force adopted Draft 1.0 (with 100GBASE-ZR-related content only) for the beginning of formal Task Force review
- Resolved 59 comments submitted against Draft 1.0 (100 GbE objective only) and instructed the editor to produce Draft 1.1 for continued Task Force review
- Pending approval of modified P802.3ct and new P802.3cw PARs

# P802.3ct 100 Gb/s ~~and 400 Gb/s~~ Ethernet over DWDM systems Task Force Adopted Objectives

## *400 Gb/s Ethernet*

- Support full-duplex operation only
- Preserve the Ethernet frame format utilizing the Ethernet MAC
- Preserve minimum and maximum FrameSize of current Ethernet standard
- Provide appropriate support for OTN

## *100 Gb/s Ethernet*

- Support a MAC data rate of 100 Gb/s
- 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
- Provide a physical layer specification supporting 100 Gb/s operation on a single wavelength capable of at least 80 km over a DWDM system

## ~~*400 Gb/s Ethernet*~~

- ~~• Support a MAC data rate of 400 Gb/s~~
- ~~• Support a BER of better than or equal to  $10^{-13}$  at the MAC/PLS service interface (or the frame loss ratio equivalent) for 400 Gb/s~~
- ~~• Provide a physical layer specification supporting 400 Gb/s operation on a single wavelength capable of at least 80 km over a DWDM system~~

# P802.3cu 100 Gb/s per lane Optical PHYs Task Force

- 3<sup>rd</sup> Task Force meeting 9 September 2019, Indianapolis, IN
  - Meeting Materials: <http://www.ieee802.org/3/cu/public/Sept19/>
  - Meeting Minutes: [http://www.ieee802.org/3/cu/public/Sept19/minutes\\_3cu\\_0919\\_unapproved.pdf](http://www.ieee802.org/3/cu/public/Sept19/minutes_3cu_0919_unapproved.pdf)
- 4<sup>th</sup> Task Force meeting 11-12 November 2019, Waikoloa Village, HI
  - Meeting Materials: <http://www.ieee802.org/3/cu/public/Nov19/>
  - Meeting Minutes: [http://www.ieee802.org/3/cu/public/Nov19/minutes\\_3cu\\_1119\\_unapproved.pdf](http://www.ieee802.org/3/cu/public/Nov19/minutes_3cu_1119_unapproved.pdf)
- Agreed to change the objective for the 10 km 4-wavelength 400G to 6 km, retaining a loss budget similar to 10 km while reducing the dispersion problem for CWDM. Adopted a CWDM-grid baseline for this objective
- Resolved 22 comments against Draft 1.0 Task Force review. Draft 1.1 to be generated and a Task Force ballot recirculation to be initiated
- Adopted updated nomenclature of 400GBASE-LR4-6
- Adopted timeline (standard target date: December 2021)

# P802.3cu 100 Gb/s per lane Optical PHYs Task Force

## Adopted objectives – Page 1/2

- Support a MAC data rate of 100 Gb/s
- Support a MAC data rate of 400 Gb/s
- 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
- Provide appropriate support for OTN
- 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
- Support a BER of better than or equal to  $10^{-13}$  at the MAC/PLS service interface (or the frame loss ratio equivalent) for 400 Gb/s operation

# P802.3cu 100 Gb/s per lane Optical PHYs (future)

## Task Force

### Adopted objectives – Page 1/2

- Define a single-wavelength 100 Gb/s PHY for operation over SMF with lengths up to at least 2 km
- Define a single-wavelength 100 Gb/s PHY for operation over SMF with lengths up to at least 10 km
- Define a four-wavelength 400 Gb/s PHY for operation over SMF with lengths up to at least 2 km
- Define a four-wavelength 400 Gb/s PHY for operation over SMF with lengths up to at least ~~10~~6 km



# Lower cost, short reach, optical PHYs using 100 Gb/s wavelengths CFI

## Page 1/3

- IEEE 802.3 Working Group opening plenary 11 November 2019 and closing plenary 14 November 2019
- CFI Presentation: [http://www.ieee802.org/3/cfi/1119\\_1/CFI\\_01\\_1119.pdf](http://www.ieee802.org/3/cfi/1119_1/CFI_01_1119.pdf)
  - Supporters: 55 supporters with 38 affiliations
- IEEE 802.3 Ethernet Working Group authorized the formation of a Study 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." (Y: 78, N: 0, A: 2)
- First Study Group meeting will be at January Interim Geneva, Switzerland

# Lower cost, short reach, optical PHYs using 100 Gb/s wavelengths CFI

## Page 2/3

- Motivation/Market Drivers:
  - Shifting from ToR to MoR/EoR architectures, requiring longer server-attachment links, sometimes including breakout
    - Possible 30 m reach to be studied
  - The first switch-to-switch links for early adopters are short in some regions
    - Possible 50 m (or greater) reaches to be studied
  - Could be SMF or MMF but I think the focus will be MMF
  - Proposed study group would look at **short reach (TBD)** MMF and/or SMF PHYs using 100G per wavelength to match emerging 100G SerDes
    - Focus will likely be 100 Gb/s VCSEL-MMF links, but SMF links are within project scope

# Lower cost, short reach, optical PHYs using 100 Gb/s wavelengths CFI

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- Technical Feasibility:
  - Goal is to re-use existing PCS/FEC/PMAAs for this project
  - Based on contribution from expert affiliated with Broadcom:
    - Link simulations suggest feasibility of a 50m OM4 link
  - Based on contribution from expert affiliated with II-VI (Finisar):
    - Simulations from models based on early characterization data show feasibility to ~50 meters

# Future Meetings

Meeting	Location	Dates
IEEE 802.3 interim	Indianapolis, IN	9-13 September 2019
IEEE 802 plenary	Waikoloa, HI	11-14 November 2019
IEEE 802.3 interim	Geneva, Switzerland	20-24 January 2020
IEEE 802 plenary	Atlanta, GA	15-20 March 2020
IEEE 802.3 interim	TBD (North America)	18-22 May 2020
IEEE 802 plenary	Montreal, QC, Canada	13-16 July 2020
IEEE 802.3 interim	TBD (North America)	21-25 September 2020
IEEE 802 plenary	Bangkok, Thailand	9-12 November 2020

Upcoming meeting details at: <http://ieee802.org/3/interims/index.html>