

# 100GbE CSD Response Ad hoc: *100 GbE additions*

# Current Status

- At March plenary meeting, adopted objectives for 200 GbE / 40 km & 100 GbE / 80km
- Draft CSD responses in relation to 50 GbE / 40 km objective were presented:
  - [http://www.ieee802.org/3/B10K/project\\_docs/csd\\_draft\\_0118\\_notapproved.pdf](http://www.ieee802.org/3/B10K/project_docs/csd_draft_0118_notapproved.pdf)
- Updated work on CSD response to include 200 GbE/40km objective were presented:
  - [http://www.ieee802.org/3/B10K/public/adhoc/18\\_0403/lewis\\_b10k\\_02\\_180403.pdf](http://www.ieee802.org/3/B10K/public/adhoc/18_0403/lewis_b10k_02_180403.pdf)
- Following slides are marked up with proposed changes for 200 GbE / 40 km already discussed and updated with proposed changes for 100 GbE / 80km .
  - Green text is new (for 100 GbE or general topics)
  - Grey text is possible text if other (anticipated) objectives are added
  - Red text is previous text that is proposed to be deleted
  - Some responses combined with previous responses to improve readability – generally in green text too

# IEEE 802.3 Criteria for Standards Development (CSD)

The IEEE 802 Criteria for Standards Development (CSD) are defined in Clause 14 of the IEEE 802 LAN/MAN Standards Committee (LMSC) Operations Manual. The criteria include project process requirements (“Managed Objects”) and 5 Criteria (5C) requirements. The 5C are supplemented by subclause 7.2 ‘Five Criteria’ of the ‘Operating Rules of IEEE Project 802 Working Group 802.3, CSMA/CD LANs’.

The following are the CSD Responses in relation to the IEEE  
P802.3~~xx~~ PAR

Items required by the IEEE 802 CSD are shown in Black text and supplementary items required by IEEE 802.3 are shown in **blue** text.

# Managed Objects

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Describe the plan for developing a definition of managed objects. The plan shall specify one of the following:

- a) The definitions will be part of this project.
  - b) The definitions will be part of a different project and provide the plan for that project or anticipated future project.
  - c) The definitions will not be developed and explain why such definitions are not needed.
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- The definition of protocol independent managed objects will be part of this project.
  - In addition, it is expected that the protocol-specific definition of managed objects will be added in a future amendment to an IEEE 802.3 Standard for Management.

– No Changes ---

# Coexistence

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A WG proposing a wireless project shall demonstrate coexistence through the preparation of a Coexistence Assurance (CA) document unless it is not applicable.

- a) Will the WG create a CA document as part of the WG balloting process as described in Clause 13?
- b) If not, explain why the CA document is not applicable

- A CA document is not applicable because the proposed project is not a wireless project.

No Changes ---

# Broad Market Potential

Each proposed IEEE 802 LMSC standard shall have broad market potential. At a minimum, address the following areas:

- a) Broad sets of applicability.
- b) Multiple vendors and numerous users.

Grey text– based on anticipated presentations

- *Ethernet is being adopted in new application areas that require longer transmission distances than currently specified by the IEEE 802.3 Ethernet standard for 50GbE, 100GbE, 200GbE, and 400GbE. Mobile backhaul, Cable / MSO, and Data Center Interconnect are all looking to deploy an optical Ethernet infrastructure based on physical solution ranges of 40 km to 80 km.*
  - Optical solutions targeting 40 km will address the bandwidth requirements of the access layers of mobile backhaul networks, in particular in China, as forecasted bandwidth data indicates demand fueled by consumer video *in excess of* other world regions.
  - *Optical solutions targeting 80km will address the bandwidth growth and reach requirements of Cable/MSO distribution networks, mobile backhaul networks and data center interconnect networks where reaches in excess of 40km are required, or where fiber availability drives the need multiple Ethernet interfaces on a single fiber.*
- This project will provide upgrade paths for existing application areas that need greater bandwidth at the reaches specified. Existing solutions that currently do not have an upgrade path are:
  - 40km applications migrating from 25 GbE to 50 GbE or 100 GbE to 200 /400 GbE
  - 80km applications migrating from 10 GbE
- *Two calls-for-interest for “Beyond 10km Optical PHYs” (50G/200G/400G and then separately 100G) had 103 & 124 participants respectively. In each CFI, approximately 60 individuals affiliated with at least 39 companies indicated that they would support the standardization process. It is anticipated that there will be sufficient participation to effectively complete the standardization process including individuals from end-users, equipment manufacturers and component suppliers.*

# Compatibility

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 WG prior to submitting a PAR to the Sponsor.

- a) Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q?
- b) If the answer to a) is “no”, supply the response from the IEEE 802.1 WG.
- c) **Compatibility with IEEE Std 802.3**
- d) **Conformance with the IEEE Std 802.3 MAC**
- e) **Managed object definitions compatible with SNMP**

- As an amendment to IEEE Std 802.3 as amended by the IEEE P802.3cd project, the proposed project will remain in conformance with the IEEE 802 Overview and Architecture, the bridging standards IEEE Std 802.1D and IEEE Std 802.1Q and Clause 131 introduced by IEEE P802.3cd.
- The proposed amendment will conform to the 50 Gb/s and 200 Gb/s Media Independent Interfaces and maintain appropriate support for OTN as specified by IEEE Std 802.3.
  - Note - Text below part of bullet above and editing not completed
    - The new 50 Gb/s *and 200 Gb/s* PHYs will be compatible with IEEE Std 802.3. The new PHYs will be compatible at the respective MII.
    - utilize ~~50GBASE-R~~ *existing* MAC rates, and may leverage the ~~50GBASE-R~~ *existing* PCS and PMA sublayers and applicable FEC. *They* will maintain the same relationship to IEEE Std 802.3 as other 50 Gb/s and 200 Gb/s PHYs.
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
- As an amendment to IEEE Std 802.3 as amended by the IEEE P802.3cd project, the proposed project will follow the existing format and structure of the IEEE 802.3 Management Information.

## Compatibility with 802.3 response...

- Post-Jan F2F (leveraged 802.3cc response):
  - The new 50 Gb/s PMD will utilize the 50GBASE-R MAC, and may leverage the 50GBASE-R PCS and PMA. It will maintain the same relationship to IEEE Std 802.3 as other IEEE P802.3cd 50 Gb/s PMDs.
- Post 4/2 Ad hoc ( )
  - The proposed amendment will conform to the 50 Gb/s and 200 Gb/s Media Independent Interfaces and maintain appropriate support for OTN as specified by IEEE Std 802.3.
  - Note - Text below part of bullet above and editing not completed
    - The new 50 Gb/s *and 200 Gb/s* PHYs will be compatible with IEEE Std 802.3. The new PHYs will be compatible at the respective MII.
    - utilize ~~50GBASE-R~~ *existing* MAC rates, and may leverage the ~~50GBASE-R~~ *existing* PCS and PMA sublayers and applicable FEC. *They* will maintain the same relationship to IEEE Std 802.3 as other 50 Gb/s and 200 Gb/s PHYs.
- Proposed (leveraging .3bs, .3by & .3cd approach):
  - As was the case in previous IEEE Std 802.3 amendments, new physical layers will be defined for 50 Gb/s, 100 Gb/s and 200 Gb/s operation (400G).

# Compatibility

Each proposed IEEE 802 LMSC standard should be in conformance with IEEE Std 802, IEEE 802.1AC, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 WG prior to submitting a PAR to the Sponsor.

- a) Will the proposed standard comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q?
- b) If the answer to a) is “no”, supply the response from the IEEE 802.1 WG.
- c) **Compatibility with IEEE Std 802.3**
- d) **Conformance with the IEEE Std 802.3 MAC**
- e) **Managed object definitions compatible with SNMP**

Alternative version –  
consistent with .3cd  
response

- As an amendment to IEEE Std 802.3 as amended by the IEEE P802.3cd project, the proposed project shall comply with IEEE Std 802, IEEE Std 802.1AC and IEEE Std 802.1Q.
- As was the case in previous IEEE Std 802.3 amendments, new physical layers will be defined for 50 Gb/s, 100 Gb/s and 200 Gb/s operation (400G).
- As an amendment to IEEE Std 802.3, the proposed project will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
- By utilizing the existing IEEE Std 802.3 MAC protocol, this proposed amendment will maintain maximum compatibility with the installed base of Ethernet nodes.
- The project will include a protocol independent specification of managed objects with SNMP management capability to be provided in the future by an amendment to or revision of IEEE Std 802.3.1.

# Distinct Identity

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Each proposed IEEE 802 LMSC standard shall provide evidence of a distinct identity. Identify standards and standards projects with similar scopes and for each one describe why the proposed project is substantially different.

**Substantially different from other IEEE 802.3 specifications / solutions.**

- There is no standard or project developing a standard that supports point-to-point Ethernet over 40 km of single-mode fiber cabling at a data rate of 50 Gb/s or 200 Gb/s *or over 80km of single-mode fiber at a data rate of 100 Gb/s*

Note: if either 400 Gb/s direct or coherent objectives are added in May, just add to list as relevant

# Technical Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

- a) Demonstrated system feasibility.
  - b) Proven similar technology via testing, modeling, simulation, etc.
  - c) Confidence in reliability.
- The principle of building equipment that supports IEEE 802.3 networks operating at 50 Gb/s to 400 Gb/s Ethernet rates has been amply demonstrated by a broad set of product offerings.
  - The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.
    - The industry already has experience developing 50 Gb/s per wavelength, direct detect solutions for 50 Gb/s, 200 Gb/s and 400 Gb/s Ethernet and 100 Gb/s and 400 Gb/s coherent detection solutions for metro and long-haul networks. Subcomponents or design experience from these can be leveraged for the proposed PMDs.
    - Component vendors are currently developing 200 Gb/s and 400 Gb/s PMDs organized as 50 Gb/s per lane including: 200GBASE-DR4, 200GBASE-FR4, 200GBASE-LR4, 400GBASE-FR8, and 400GBASE-LR8. Subcomponents from these PMDs can be re-used for the proposed 50 Gb/s and 200 Gb/s single-mode PMDs.
    - The experience gained in the development and deployment of 25 Gb/s and 100 Gb/s optical solutions targeting 40 km is applicable to the development of specifications for components at 50 Gb/s per *lane wavelength* targeting 40 km. Feasibility data has been presented.
    - Component vendors have presented data on the feasibility of the necessary components for 50 Gb/s per lane solutions targeting 40 km.
    - The experience gained from the wide deployment of optical coherent detection solutions at single wavelength 100 Gb/s and higher over longer reaches than 80km provides confidence in feasibility of 80 km solutions.
  - The reliability of Ethernet components and systems has been established in the target environments with a high degree of confidence.

# Economic Feasibility

Each proposed IEEE 802 LMSC standard shall provide evidence of economic feasibility. Demonstrate, as far as can reasonably be estimated, the economic feasibility of the proposed project for its intended applications. Among the areas that may be addressed in the cost for performance analysis are the following:

- a) Balanced costs (infrastructure versus attached stations).
  - b) Known cost factors.
  - c) Consideration of installation costs.
  - d) Consideration of operational costs (e.g., **energy consumption**).
  - e) Other areas, as appropriate.
- The cost factors for Ethernet components and systems are well known.
  - Reasonable cost for the resulting performance will be achieved in this project as established by prior experience in the development of:
    - Ethernet direct detect optical specifications ranging from 50 Gb/s to 400 Gb/s based on the 50 Gb/s *per lane wavelength* PMDs
    - Optical coherent detection solutions at 100 Gb/s and above that can be optimized for the shorter 80km reaches
  - In consideration of installation costs, the project is expected to use proven and familiar media **consistent with industry deployments**.
  - **Extended reach optical solutions minimizes the need for additional equipment to achieve the target reaches which lowers overall network power consumption.**
  - Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.

Copies of older slides  
for reference

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- *Optical solutions based on 50 Gb/s per wavelength direct detect technologies targeting 40 km will address the bandwidth requirements of the access layers of mobile backhaul networks, in particular in China, as forecasted bandwidth data indicates demand fueled by consumer video in excess of other world regions.*
- *Optical solutions based on 100 Gb/s per wavelength coherent detect technologies targeting 80km will address the bandwidth growth and reach requirements of Cable/MSO distribution networks, mobile backhaul networks and data center interconnect networks where reaches in excess of 40km are required, or fiber capacity needing multiple Ethernet interfaces are required.*
- *It is also anticipated that optical solutions based on 50 Gb/s per wavelength direct detect technologies targeting 40 km will provide an upgrade path for other metropolitan networks and adjacent applications that are migrating from 25GbE today.*
- *It is also anticipated that optical solutions based on 100 Gb/s per wavelength coherent detect technologies targeting 80 km will provide an upgrade path for other metropolitan networks and adjacent applications that are migrating from 10 GbE with reaches up to 80km today.*
- *Two calls-for-interest for “Beyond 10km Optical PHYs” (50G/200G/400G and then separately 100G) had 103 & 124 participants respectively. In each CFI, approximately 60 individuals affiliated with at least 39 companies indicated that they would support the standardization process. It is anticipated that there will be sufficient participation to effectively complete the standardization process including individuals from end-users, equipment manufacturers and component suppliers.*

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- c) Consideration of installation costs.
- d) Consideration of operational costs (e.g., energy consumption).
- e) Other areas, as appropriate.

Previous version of Slide from David Lewis

- The cost factors for Ethernet components and systems are well known.
- Prior experience in the development of Ethernet direct detect optical specifications ranging from 25 Gb/s to 400 Gb/s establishes that the new specifications developed for the 50 Gb/s *per lane* PMD<sub>s</sub> by this project will entail a reasonable cost for the resulting performance.
- In consideration of installation costs, the project is expected to use proven and familiar media.
- Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.