IEEE 802.3 Beyond 10 km Optical PHYs SG -
Draft CSD Responses –
50 GbE / 40km Objective
(modified per Ad hoc discussion)

John D'Ambrosia,

Acting Chair, IEEE 802.3 Beyond 10km Optical PHYs Study Group

Futurewei, Subsidiary of Huawei

December 14, 2017

Straw Polls from Nov 2017

#2 - I believe a PAM4 approach, based on 50 Gb/s PAM4, targeting 40km would be technical feasible at
- 50 Gb/s   Yes   56   No   0   Need more info   6
- 200 Gb/s   Yes   41   No   1   Need more info   17
- 400 Gb/s   Yes   24   No   3   Need more info   34

#3 - I think there is broad market potential for a coherent solution at 50 Gb/s
- Results   40km (y/n/a) 2/41/7   80km: 3/36/9

#4 - I would support adopting the following objective
- Provide physical layer specifications which support 50 Gb/s operation over at least 40 km of SMF
- Results (y/n/a) 59/0/8)

- Based on these strawpolls it is anticipated that a motion to support the objective noted in Straw Poll #4 would pass.

- This presentation considers proposed CSD Responses to support this objective.

- Some proposed text may be applicable to other potential objectives.

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

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.**

- 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.

Coexistence

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.

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.**

- The definition of 50 Gb/s solutions targeting 40 km will address the bandwidth requirements of the access layers of mobile backhaul networks. Forecasted bandwidth data for China shows rapid growth fueled by consumer video that exceeds the demand demonstrated by other geographic regions of the world.
        Modify text to make this a leading indication as opposed to just China

- Extension of 50GbE family beyond 10 km? See LightCounting data for breakdown of 10/25 data for 40km. Enterprise Networking & Enterprise access. Single lane interface evolution. See if we can combine these two bullets. Talk with Peter Jones about enterprise.

- 103 participants attended the "Beyond 10 km Optical PHYs (50/200/400 GbE)" Call-For-Interest. 57 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.

- Utilizing the 50GBASE-R MAC, PCS, and PMA the new PMD(s) maintain the same relationship to IEEE Std 802.3 as IEEE P802.3cd 50 Gb/s PMDs.

- 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.

Distinct Identity

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.

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.**

- 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 single-mode PMD.

- 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 experience gained in the development and deployment of 25 Gb/s and 100 Gb/s solutions targeting 40 km is applicable to the development of specifications for components at 50 Gb/s targeting 40 km.
  - Component vendors have presented data on the feasibility of the necessary components for 50 Gb/s solutions targeting 40 km.

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.

- 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 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.

- Energy Efficient Ethernet will reduce the operational costs and the environmental footprint.