

40Gb/s Ethernet Single-mode Fibre PMD Study Group Proposed 5-Criteria Responses

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Black text: IEEE 802 criteria
Blue text: IEEE 802.3 criteria

Broad Market Potential

a) Broad sets of applicability.

b) Multiple vendors and numerous users.

c) Balanced costs (LAN versus attached stations).

- There is a significant and growing deployment of 40G serial interfaces in carrier networks and in access to carrier networks. Quantitative presentations have been made to the 802.3 40Gb/s Ethernet Single-mode Fibre PMD Study Group indicating significant market opportunity.
- A growing share of the traffic in carrier networks is comprised of Ethernet and Ethernet services. Alternative technologies such as 40G POS (packet over SONET) are deployed in today's networks due to the lack of a serial Ethernet 40G interface
- 88 participants attended the 40Gb/s Ethernet Single-mode Fibre Call for Interest. 40 people from 34 companies indicated they would participate in the project. 61 indicated this is the right time to start, with nobody opposed. This level of commitment indicates that a standard will be supported by multiple vendors.
- The target market for the 40Gb/s SMF PMD is carrier networks, for which volumes may be more modest than those for lower speed or data center targeted PMDs. This does not imply a reduction in the need or value of the 40 Gb/s SMF PMD to address the stated applications. Overall costs are minimized through reductions in operational expense (including network design, installation and maintenance) by enabling common modules to be used for 40GE/OC-768/STM-256/OTU3. Carrier SMF is comparable to data center SMF market.

Compatibility

- **IEEE 802 defines a family of standards. All standards should be in conformance with the IEEE 802.1 Architecture, Management, and Interworking documents as follows: IEEE 802. Overview and Architecture, IEEE 802.1D, IEEE 802.1Q, and parts of IEEE 802.1F. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1.**
- **Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.**
- **Compatibility with IEEE Std 802.3**
- **Conformance with the IEEE Std 802.3 MAC**
- **Managed object definitions compatible with SNMP**
- As an amendment to IEEE Std 802.3 as amended by the IEEE P802.3ba 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 80 introduced by P802.3ba.
- As an amendment to IEEE 802.3, the proposed project will follow the existing format and structure of IEEE 802.3 MIB definitions by providing a protocol-independent specification of managed objects. The MDIO interface is expected to be a strict subset of what is specified in 802.3ba for 40GBASE-LR4.
- Utilizing the same MAC, PCS, and PMA as 40GBASE-LR4, the new PMD maintains the same relationship to IEEE Std 802.3 as 802.3ba 40 Gb/s PMDs. Using the same PCS as 802.3ba 40Gb/s PMDs allows the same ITU-T G.709 mapping into OPU3 to be used.
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
- 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 the yet-to-be-approved IEEE P802.3.1.

Distinct Identity

- a) **Substantially different from other IEEE 802 standards.**
 - b) **One unique solution per problem (not two solutions to a problem).**
 - c) **Easy for the document reader to select the relevant specification.**
 - d) **Substantially different from other IEEE 802.3 specifications/solutions.**
- The proposed amendment is an upgrade path for IEEE 802.3 users, based on the IEEE 802.3 MAC.
 - There are IEEE 802.3 users who currently use a single device to provide 10GbE/OTU2/STM-64/OC-192 optical interfaces. This proposed amendment would be the only 40Gb/s Ethernet standard that provides optical specifications that are compatible with existing carrier 40Gb/s client interfaces (e.g., OTU3/STM-256/OC-768/40G POS) and would provide an upgrade path for these users to 40Gb/s.
 - The proposed amendment to the existing IEEE 802.3 standard will be formatted as a new clause, making it easy for the reader to select the relevant specification.

Technical Feasibility

- a) Demonstrated system feasibility.**
- b) Proven technology, reasonable testing.**
- c) Confidence in reliability.**

- The operation of an IEEE 802.3 MAC at 40Gb/s has been established by IEEE P802.3ba.
- The principle of building 40G optical PMDs has been proven both technically and operationally feasible by the deployment of ITU-T/SONET-based OTU3/STM-256/OC-768 optical transport interfaces in carrier networks.
- The technology to be utilized in the proposed project will rely on the work of previous IEEE 802.3 standards and activities as well as ITU-T Recommendations. The proposed 40G PMD is expected to leverage and extend available 40GBASE-R and ITU-T G.693 40G VSR technologies. It is recognized that these relevant technologies have advanced since the inception of work on related standards.
- The reliability of Ethernet components and systems in the target environments can be projected with a high degree of confidence based on existing 40G deployment experience.

Economic Feasibility

- a) Known cost factors, reliable data.**
- b) Reasonable cost for performance.**
- c) Consideration of installation costs.**

- The cost factors for Ethernet components and systems are well known. The proposed project will reduce cost for carrier applications, enable Ethernet services transition and increase global Ethernet footprint & penetration. For carrier applications a 40G Single Mode Fiber PMD would enable a single module type which minimizes Operating Expense (OpEx) by allowing configuration of the same module for different services. This also provides backwards compatibility with deployed technology in carrier networks.
- For carrier applications the preferred carrier approach would be to utilize a 40G Serial PMD & deploy multi-protocol 40GE/OC-768/STM-256/OTU3 modules to provide the best balance of performance and cost:
 - provide backwards compatibility with deployed technology.
 - minimize OpEx costs due to simplified deployment.
 - leverage combined volumes to achieve lower Capital Expense (CapEx) for serial modules.
- In consideration of installation costs, the project is expected to use the proven and familiar medium of single mode fiber. A 40G Serial PMD would enable a single multi-protocol 40G module for carrier applications – this would simplify and reduce installation cost.
- Network design, installation and maintenance costs are reduced by preserving carrier network architecture, management, and software. A single module reduces cost as there is no need to individually support and maintain multiple modules to cover the required protocols.