25 Gb/s Ethernet over a single lane for server interconnect Study Group: status and work

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Draft work

Draft Objectives (Foundational)

- Support a MAC data rate of 25 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 a BER of better than or equal to 10^{-12} at the MAC/PLS service interface (or the frame loss ratio equivalent)
- Support optional Energy-Efficient Ethernet operation

Draft Objectives (Strong Consensus)

Backplane
- Define a single-lane 25 Gb/s PHY for operation over a printed circuit board backplane consistent with channels specified in IEEE Std 802.3bj-2014 Clause 93

Twin-ax options
A. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m
B. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m that re-uses the host board silicon transmitter and receiver characteristics specified in IEEE Std 802.3bj-2014 Annex 92A
C. Define a single-lane 25 Gb/s PHY for operation over copper twin-axial cable consistent with the overall channel budget specified in IEEE Std 802.3bj-2014 Clause 92

Twin Ax Objective options

Twin-ax options
A. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m
B. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 5m
C. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m and up to at least 5m
D. Define a single lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, that re-uses the host ~~board~~ silicon transmitter and receiver characteristics specified in IEEE Std 802.3bj-2014 Clause 93
E. ~~Define a single-lane 25 Gb/s PHY for operation over copper twin-axial cable consistent with the overall channel budget specified in IEEE Std 802.3bj-2014 Clause 92~~

Chicago Rules
1) Option A
2) Option B
3) Option A & B
4) Option C
5) Option D

Draft Objectives (Consensus needed)

Some topics were raised in discussions during the Call-for-Interest that were outside the scope of the CFI presentation and the built consensus.

- Provide appropriate support for OTN
- Define a single-lane 25 Gb/s PHY for operation over MMF consistent with IEEE P802.3bm Clause 95

Optical ad hoc formed to explore.

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 definition of SNMP managed objects, through reference to the protocol independent managed objects provided by this project, will be added in a future amendment to, or revision of, IEEE Std 802.3.1 IEEE Standard for Management Information Base (MIB) Definitions for Ethernet.

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.**

- Ethernet is widely deployed for ~~intra-rack and inter-rack~~ server to switch applications in data centers. An Ethernet data rate of 25 Gb/s enables a cost effective interconnect solution enabling 25 Gb/s rack server solutions and intersecting the networking 100Gb/s solutions based on 25 Gb/s SerDes technology.

- There will be a significant market potential for 25 Gb/s Ethernet interfaces on servers that optimize the total cost of ownership while meeting the necessary IO bandwidth requirements in data centers.

- 148 participants attended the "25 Gb/s Ethernet over a single lane for server interconnect " Call-For-Interest. 59 individuals representing at least 36 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 representatives 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, 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 25 Gb/s operation.

- 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

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.

- The proposed amendment will be the first IEEE 802.3 standard operating at a 25 Gb/s MAC rate.
- There are no existing standards, or projects developing standards, addressing the specification of 25 Gb/s Ethernet.

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.**

- Systems based upon 25 Gb/s technology have been demonstrated and deployed in operational networks.

- The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.

- Component technology at 25Gb/s, developed for other Ethernet standard (IEEE Std 802.3bj) and project (IEEE P802.3bm), are available and in production.

- 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.

- Prior experience in the development of 25Gb/s technology for Ethernet establishes that the 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.

- A 25 Gb/s Ethernet interface will maintain a favorable cost balance for server to switch applications.

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