Summary of Proposed Responses to CSD

IEEE 802.3
400 Gb/s Ethernet Study Group

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Introduction

- This presentation summarizes all of the responses to the CSD
  - Applications Ad Hoc > Broad Market Potential
  - Technical Feasibility Ad Hoc > Technical Feasibility
  - Economic Feasibility Ad Hoc > Economic Feasibility
  - Others (Managed Objects, Compatibility, Distinct Identity) are initial proposed responses for consideration.

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 P802.3bs PAR

Items required by the IEEE 802 CSD are shown in Black text, supplementary items required by IEEE 802.3 are shown in **Blue** text. It is expected that items shown in **Red** text will be proposed to be added to the IEEE 802.3 Operating Rules.

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.

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.
c) Balanced Costs (LAN versus attached stations) [Removed from IEEE 802 5 Criteria Nov 2012]

- Per the IEEE 802.3 Bandwidth Assessment Ad Hoc, bandwidth requirements, on average, for core networking applications are increasing by a factor of 10 every 5 years. The definition of 400 Gb/s Ethernet will address, but is not limited to, these applications: data center, internet exchanges, co-location providers, wireless back haul, service providers, and video-on-demand delivery.
- There has been wide attendance and participation in the study group by end users, equipment manufacturers and component suppliers. It is anticipated that there will be sufficient participation to effectively complete the standardization process.
- Prior experience scaling IEEE 802.3 and contributions to the study group indicates the cost distribution between routers, switches, and the infrastructure will remain acceptably balanced for 400 Gb/s Ethernet.
- Given the topologies of the networks and intended applications, early deployment will be driven by key aggregation & high-bandwidth interconnect points, such as co-location providers, wireless back haul, and service providers. Given anticipated bandwidth growth trends, deployment for data center applications will occur later.

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 (see Managed Objects)

- 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 802.3 standards, new physical layers will be defined for 400 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 802.3 MAC protocol, this proposed amendment will maintain maximum compatibility with the installed base of Ethernet nodes.

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 is an upgrade path for IEEE 802.3 users, based on the IEEE 802.3 MAC, running at 400 Gb/s.
- The established benefits of the IEEE 802.3 MAC include:
  - Deterministic, highly efficient full-duplex operation mode
  - Well-characterized and understood operating behavior
  - Broad base of expertise in suppliers and customers
  - Straightforward bridging between networks at different data rates
- The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses, making it easy for the reader to select the relevant specification.

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. [Removed from IEEE 802 CSD Nov 2013]

- The principle of scaling the IEEE 802.3 MAC to higher speeds has been well established by previous work within IEEE.
- The principle of building equipment that supports IEEE 802.3 networks operating at different Ethernet rates has been amply demonstrated by a broad set of product offerings.
- Systems with an aggregate bandwidth of greater than or equal to 400 Gb/s 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.
  - The experience gained in the development and deployment of 40 Gb/s and 100 Gb/s technology is applicable to the development of specifications for components at higher speeds. For example, parallel transmission techniques and forward error correction for high rate interfaces allow reuse of 40 Gb/s and 100 Gb/s technology and testing.
  - Component vendors have presented data on the feasibility of the necessary components for higher speed solutions. Proposals, which either leverage existing technologies or employ new technologies, have been provided.
- The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence. Presentations demonstrating this have been provided.

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.

- In consideration of balancing costs between end stations and infrastructure it is anticipated the project will examine alternatives that trade off PMD complexity for parallel media paths.
- The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
- In consideration of installation costs, the project is expected to use proven and familiar media, including optical fiber and copper cabling technology.
- Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.
- In consideration of operational costs, the project has adopted an energy efficiency objective.