802.3cd Task Force
Updated Objectives and CSD
Working Group Report

Mark Nowell

Cisco

Fort Worth, Tx

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Background

- In May 2016, the 802.3cd Task Force adopted some new objectives around 100 Gb/s SMF PHYs
- In July 2016 meeting, baseline proposals were made to the Task Force that, if adopted, would have created issues with the currently approved CSD responses
  - Concerns raised resulted in the 802.3 working group failing to approve one of the TF's adopted objectives
- Considerable work has been done by the Task Force since July meeting resulting in an updated set of objectives for 100 Gb/s PHYs being adopted by the Task Force as well as an updated set of CSD responses.
- New 802.3cd objectives: nicholl_3cd_01a_0916.pdf – adopted by TF
- New 802.3cd CSD language: brown_3cd_02a_0916.pdf – adopted by TF

Task Force Motion 09/15/16

- Move to adopt updated
  - Objectives for 100Gb/s PHYs as outlined in nicholl_3cd_01b_0916.pdf
  - CSD response for 802.3cd as outlined in brown_3cd_02a_0916.pdf
- Y/N/A: 79:0:19

Objectives 1 of 2

- 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 optional Energy-Efficient Ethernet operation
- Provide appropriate support for OTN
- Support a MAC data rate of 50 Gb/s and 100 Gb/s
- Support a BER of better than or equal to 10^{-12} at the MAC/PLS service interface (or the frame loss ratio equivalent) for 50 Gb/s and 100 Gb/s operation
- Support a MAC data rate of 200 Gb/s
- Support a BER of better than or equal to 10^{-13} at the MAC/PLS service interface (or the frame loss ratio equivalent) for 200 Gb/s operation

Objectives 2 of 2

50 Gb/s Ethernet PHYs

- Define single-lane 50 Gb/s PHYs for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
  - SMF with lengths up to at least 2km
  - SMF with lengths up to at least 10km

100 Gb/s Ethernet PHYs

- Define a two-lane 100 Gb/s PHY for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
- Define a single lane 100 Gb/s PHY for operation over duplex SMF with lengths up to at least 500 m, consistent with IEEE P802.3bs Clause 124

200 Gb/s Ethernet PHYs

- Define four-lane 200 Gb/s PHYs for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
- Define 200 Gb/s PHYs for operation over MMF with lengths up to at least 100m

Objectives 2 of 2

Showing changes

50 Gb/s Ethernet PHYs

- Define single-lane 50 Gb/s PHYs for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
  - SMF with lengths up to at least 2km
  - SMF with lengths up to at least 10km

100 Gb/s Ethernet PHYs

- Define a two-lane 100 Gb/s PHY for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
  - ~~SMF with lengths up to at least 500m~~
- ~~Define a 100 Gb/s PHY for operation over SMF with lengths up to at least 2 km~~
- Define a single lane 100 Gb/s PHY for operation over duplex SMF with lengths up to at least 500 m, consistent with IEEE P802.3bs Clause 124

200 Gb/s Ethernet PHYs

- Define four-lane 200 Gb/s PHYs for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
- Define 200 Gb/s PHYs for operation over MMF with lengths up to at least 100m

WG Motion

Move that 802.3 approve the IEEE P802.3cd objectives, as per slides 4 & 5 in 0916_cd_report.pdf

M: Mark Nowell

S: Kent Lusted

Y: N: A:

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**cd** 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, to be included in Clause 30 of IEEE Std 802.3, will be part of this project.
- In addition it is expected that the definition of Simple Network Management Protocol (SNMP) managed objects, written using the Structure of Management Information version 2 (SMIv2), and making 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 server and switch applications in data centers. Ethernet data rates of 50 Gb/s, 100 Gb/s and 200 Gb/s enable a variety of cost effective interconnect solutions for server and switch solutions. ~~based on 50 Gb/s serial I/O technology.~~

Internet, cloud, and higher performance computing applications, along with advances in processors, server virtualization and converged networking, are driving the need for higher bandwidth switch connections e.g., in data centers, enterprises and campus networks. Increasing the signaling data rate to either 50 Gb/s or 100 Gb/s, depending on the application, provides cost effective 50 Gb/s, 100 Gb/s and 200 Gb/s Ethernet solutions that are required to maintain pace with new demands.

These target markets offer significant market potential for 50 Gb/s, 100 Gb/s and 200 Gb/s Ethernet interfaces that optimize the total cost of ownership.

134 participants attended the “50 Gb/s Ethernet Over a Single Lane and Next Generation 100 Gb/s & 200 Gb/s Ethernet” Call-For-Interest. 127 participants voted in favor of forming the “50 Gb/s over a Single Lane” Study Group and 124 participants voted in favor of forming the “Next Generation 100 Gb/s and 200 Gb/s Ethernet” Study Group. At least 102 individuals representing at least 66 companies indicated that they would support the standardization process. Study Group participation is consistent with these numbers.

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 50 Gb/s, 100 Gb/s and 200~~G~~ 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 50 Gb/s MAC rate.

While the IEEE P802.3bs project is expected to introduce 200 Gb/s, it does not address the specification of 200 Gb/s Ethernet PHYs for backplanes, twin-axial copper cables and MMF.

The proposed 100 Gb/s PHY~~(~~s~~)~~, based on ~~two 50 Gb/s electrical or optical signals~~ electrical or optical signaling rates higher than 25 Gb/s in each direction, are not currently defined in IEEE Std 802.3

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.

The principle of scaling the IEEE 802.3 MAC to different speeds has been well established by previous work within the IEEE 802.3 Working Group.

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.

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 vendors have presented data on the feasibility of the necessary components for 50 Gb/s, 100 Gb/s, and 200 Gb/s solutions. Proposals, which either leverage existing technologies or employ new technologies, have been provided.

Component technology ~~at~~for 50 Gb/s (electrical and optical) and 100 Gb/s (optical) serial rates~~,~~ are already either under development for other Ethernet projects (IEEE P802.3bs) or working implementations have been demonstrated.

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.

Possible use of common components and technologies to support 50 Gb/s, 100 Gb/s, ~~and~~ 200 Gb/s, and 400 Gb/s Ethernet would allow economies of scale to reduce cost for all implementations.

Experience in the development of higher-speed~~50 Gb/s~~ technolog~~y~~ies for Ethernet 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.

~~A~~ The 50 Gb/s, 100 Gb/s and 200 Gb/s Ethernet interfaces will maintain a favorable cost balance for the targeted server-to-switch ~~and~~or switch-to-switch applications.

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

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3cd “50 Gb/s Ethernet over a single lane
And Next Generation 100 Gb/s and 200 Gb/s Ethernet” CSD Modifications “Managed Objects”, “Coexistence”, “Broad Market Potential”, “Compatibility”, “Distinct Identity”, “Technical Feasibility”, and “Economic Feasibility” responses, as per 0916_3cd_report.pdf

M: Mark Nowell

S: Kent Lusted

Y: N: A:

Questions?

Thank you!