IEEE 802.3 100 Gb/s per Lane Electrical Interfaces and Electrical PHYs (100GEL) Study Group Closing Report

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IEEE 802.3 100 Gb/s per Lane Electrical Interfaces and Electrical PHYs Study Group information

Study Group Organization

Beth Kochuparambil, Study Group Chair

Kent Lusted, Recording Secretary

Study Group charter

Develop a PAR and CSD responses for “100Gb/s per Lane for Electrical Interfaces and Electrical PHYs”

Study Group Web Page

http://www.ieee802.org/3/100GEL/reflector.html

Study Group Reflector

http://www.ieee802.org/3/100GEL/index.html

Activities This Week

- 93 attendees met over the span of Wednesday and Thursday morning
- Heard presentations on technical feasibility and broad market potential
- Reviewed feedback and created a new draft of our PAR and CSD
- Refined project documentation

Pre-submitted documents:

http://www.ieee802.org/3/100GEL/P802_3ck_Objectives_2018jan.pdf

https://mentor.ieee.org/802-ec/dcn/18/ec-18-0016-01-00EC-ieee-p802-3ck-draft-csd.pdf

https://mentor.ieee.org/802-ec/dcn/18/ec-18-0015-01-00EC-ieee-p802-3ck-draft-par.pdf

Current Documents:

http://www.ieee802.org/3/100GEL/P802_3ck_Objectives_2018mar.pdf

https://mentor.ieee.org/802-ec/dcn/18/ec-18-0015-02-00EC-ieee-p802-3ck-draft-par.pdf

https://mentor.ieee.org/802-ec/dcn/18/ec-18-0016-02-00EC-ieee-p802-3ck-draft-csd.pdf

Summary of Study Group Motions

January Motions	Foundational Objectives	Y: 50	N: 0	A: 4
	100 Gb/s Chip-to-Module AUI	Y: 54	N: 0	A: 1
	100 Gb/s Chip-to-Chip AUI	Y: 43	N: 1	A: 10
	100 Gb/s Backplane/Cu Cable w/ TBDs	Y: 40	N: 0	A: 13
	Pre-submitted CSD	Y: 47	N: 0	A: 1
	Pre-submitted PAR	Y: 42	N: 0	A: 0
	200 Gb/s & 400 Gb/s Objectives w/ TBDs	Y: 30	N: 0	A: 1
March Motions	Updated PAR	Y: 45	N: 0	A: 0
	Updated CSD	Y: 46	N: 0	A: 0
	Completing Backplane TBDs	Y: 46	N: 0	A: 6
	Completing Copper Cable TBDs	Y: 52	N: 0	A: 8

Adopted Objectives (1 of 4)

Support a MAC data rate of 100 Gb/s, 200 Gb/s and 400 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 the existing bit error ratios (BERs) at the MAC/PLS service interface (or the frame loss ratio equivalent) for 100 Gb/s, 200 Gb/s and 400 Gb/s Ethernet

Adopted Objectives (2 of 4)

Define a single-lane 100 Gb/s Attachment Unit interface (AUI) for chip-to-module applications, compatible with PMDs based on 100 Gb/s per lane optical signaling

Define a single-lane 100 Gb/s Attachment Unit Interface (AUI) for chip-to-chip applications

Define a single-lane 100 Gb/s PHY for operation over electrical backplanes supporting an insertion loss ≤ 28 dB at 25.56 GHz.

Define a single-lane 100 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 2 m.

Adopted Objectives (3 of 4)

Define a two-lane 200 Gb/s Attachment Unit interface (AUI) for chip-to-module applications, compatible with PMDs based on 100 Gb/s per lane optical signaling.

Define a two-lane 200 Gb/s Attachment Unit Interface (AUI) for chip-to-chip applications.

Define a two-lane 200 Gb/s PHY for operation over electrical backplanes supporting an insertion loss ≤ 28 dB at 26.56 GHz.

Define a two-lane 200 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 2 m.

Adopted Objectives (4 of 4)

Define a four-lane 400 Gb/s Attachment Unit interface (AUI) for chip-to-module applications, compatible with PMDs based on 100 Gb/s per lane optical signaling.

Define a four-lane 400 Gb/s Attachment Unit Interface (AUI) for chip-to-chip applications.

Define a four-lane 400 Gb/s PHY for operation over electrical backplanes supporting an insertion loss ≤ 28 dB at 26.56 GHz.

Define a four-lane 400 Gb/s PHY for operation over twin-axial copper cables with lengths up to at least 2 m.

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3ck 100GEL objectives, as per slides 5-8 of 0318_100G_elec_close_report.pdf

M: B. Kochuparambil
S: K. Lusted
(Technical ≥ 75%)
Passes with voice without opposition

P802.3ck PAR

2.1 Title: Standard for Ethernet: Physical Layer Specifications and Management Parameters for 100 Gb/s, 200 Gb/s, and 400 Gb/s electrical interfaces based on100 Gb/s signaling.

5.2.b. Scope of the project: This project is to specify additions to and appropriate modifications of IEEE Std 802.3 to add Physical Layer specifications and Management Parameters for 100 Gb/s, 200 Gb/s, and 400 Gb/s electrical interfaces based on 100 Gb/s signaling.

5.5 Need for the Project: The continual growth of bandwidth demand has driven evolution of higher Ethernet speeds, most recently with 100 Gb/s, 200 Gb/s and 400 Gb/s Ethernet. To meet this growth, ongoing advancement in SERDES technology to higher rates of operation enables the opportunity to develop higher density or lower cost electrical interfaces using 100 Gb/s signaling.

Stakeholders for the Standard: Users and producers of systems and components for servers, network storage, networking systems, data

centers, high performance computing, and telecommunications carriers.

8.1 Additional Explanatory Notes: Item 5.2: IEEE Std 802.3 is IEEE Standard for Ethernet

Item 5.5: SERDES expands to serializer and deserializer circuit

https://mentor.ieee.org/802-ec/dcn/18/ec-18-0015-02-00EC-ieee-p802-3ck-draft-par.pdf

P802.3ck PAR (change bar)

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5.2.b. Scope of the project: This project is to specify additions to and appropriate modifications of IEEE Std 802.3 to add Physical Layer specifications and Management Parameters for 100 Gb/s, 200 Gb/s, and 400 Gb/s electrical interfaces based on 100 Gb/s signaling.

5.5 Need for the Project: The continual growth of bandwidth demand has driven evolution of higher Ethernet speeds, most recently with 100 Gb/s, 200 Gb/s and 400 Gb/s Ethernet. To meet this growth, ongoing advancement in SERDES technology to higher rates of operation enables the opportunity to develop higher density or lower cost electrical interfaces using 100 Gb/s signaling. ~~IEEE Std 802.3 and its proposed or existing amendments do not currently define electrical solutions based on 100 Gb/s signaling.~~

Stakeholders for the Standard: ~~Stakeholders identified to date include, but are not limited to~~: Users and producers of systems and components for servers, network storage, networking systems, data centers, high performance computing, and telecommunications carriers.

8.1 Additional Explanatory Notes: Item 5.~~5~~2: IEEE Std 802.3 is IEEE Standard for Ethernet

Item 5.5: SERDES expands to serializer and deserializer circuit

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3ck 100GEL PAR, in https://mentor.ieee.org/802-ec/dcn/18/ec-18-0015-02-00EC-ieee-p802-3ck-draft-par.pdf

M: B. Kochuparambil
S: K. Lusted
(Technical ≥ 75%)
Y: 85 N: 0 A: 0

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 project ~~will~~ includes a protocol independent specification of managed objects. ~~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.

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 electrical signaling data rate to 100 Gb/s provides cost effective 100 Gb/s, 200 Gb/s and 400 Gb/s Ethernet solutions that are required to maintain pace with new demands.

These target markets offer significant market potential for 100 Gb/s, 200 Gb/s and 400 Gb/s Ethernet electrical PHYs and interfaces that optimize the total cost of ownership.

143 participants attended the “100 Gb/s per Lane Electrical Interfaces and PHYs” Call-For-Interest. 137 participants voted in favor of forming the Study Group. At least 80 participants affiliated with at least 45 companies indicated that they would support the standardization process. Study Group participation is consistent with these numbers.

There is sufficient participation to effectively complete the standardization process including participants 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 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.

As was the case in previous IEEE Std 802.3 amendments, new electrical PHYs and interfaces will be defined for 100 Gb/s, 200 Gb/s, and 400 Gb/s operation.

The project will include a protocol independent specification of managed objects. 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.

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 are no existing standards or projects addressing the specification of 100 Gb/s, 200 Gb/s, or 400 Gb/s Ethernet electrical PHYs or electrical interfaces based on 100 Gb/s signaling.

~~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 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.

Individuals affiliated with component vendors have presented data on the feasibility of the necessary components for 100 Gb/s electrical signaling for various internal system applications and 2 m copper cable. Proposals, which either leverage existing technologies or employ new technologies, have been provided.

Component technology based on 100 Gb/s electrical signaling rates is either under development or has been demonstrated.

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

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.

Electrical PHYs and interfaces based on 100 Gb/s electrical signaling can enable higher bandwidth switches, reducing the overall data center costs compared to those employing 50 Gb/s technology.

A 100 Gb/s, 200 Gb/s or 400 Gb/s Ethernet link based on 100 Gb/s electrical signaling will maintain favorable cost for server-to-switch and switch-to-switch applications.

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.

In consideration of operational costs, the project is expected to maintain the current or better level of operational costs.

Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.

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

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3ck 100GEL CSD “Managed Objects”, “Coexistence”, “Broad Market Potential”, “Compatibility”, “Distinct Identity”, “Technical Feasibility”, and “Economic Feasibility” responses, in https://mentor.ieee.org/802-ec/dcn/18/ec-18-0016-02-00EC-ieee-p802-3ck-draft-csd.pdf

M: K. Lusted
S: B. Kochuparambil
(Technical ≥ 75%)
Y: 75 N: 0 A: 1

WG Motion

Move that the IEEE 802.3 Working Group request the re-chartering of the 100GEL Study Group.

M: B. Kochuparambil on behalf of the study group
(> 50%)
Y: 78 N: 0 A: 0

WG Motion

Move that the IEEE 802.3 Working Group approve: IEEE_802d3_to_OIF_112G_0318_draft.pdf with editorial license granted to the Chair (or his appointed agent) as liaison communications from the IEEE 802.3 Working Group to OIF.

M: K. Lusted
S: B. Kochuparambil

(Technical ≥ 75%)

Passed with voice without opposition

Next Steps

Continue ad hoc conference calls

- Next call is scheduled for March 21st

If PAR is approved, the Task Force would have its first meeting at 802.3 May Interim (Pittsburgh, PA, USA week of May 21st)

Otherwise will meet as a study group

Questions?

Thank you!