Closing Report

IEEE 802.3
400 Gb/s Ethernet Study Group

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Beijing, China
IEEE 802 Mar 2014 Plenary

Reflector and Web

- To subscribe to the 400G reflector, send an email to:

  ListServ@ieee.org

  with the following in the body of the message (do not include "<>"):

  subscribe stds-802-3-400G <yourfirstname> <yourlastname>

  end

- Send 400G reflector messages to:

  STDS-802-3-400G@listserv.ieee.org

- Task Force web page URL:

  http://www.ieee802.org/3/400GSG/index.html

- Ad hoc area URL:

  http://www.ieee802.org/3/400GSG/public/adhoc/index.shtml

This Week

- ≈ 50 Attendees
- Review of project documentation by other WGs
  - 0 Comment received
- TIA TR-42 to IEEE 802.3 regarding single-mode connection return loss liaison considered
- Motion to extend Study Group passed by voice vote without objection

Project Documentation

- PAR- http://www.ieee802.org/3/400GSG/project_docs/PAR_400_14_0121.pdf
- CSD - http://www.ieee802.org/3/400GSG/project_docs/CSD_400_14_0121.pdf
- Objectives - http://www.ieee802.org/3/400GSG/project_docs/Objectives_13_1114.pdf

Adopted Objectives

- Support a MAC data rate of 400 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) ***
- Support full-duplex operation only *
- Preserve the Ethernet frame format utilizing the Ethernet MAC *
- Preserve minimum and maximum FrameSize of current Ethernet standard *
- Provide appropriate support for OTN *
- Specify optional Energy Efficient Ethernet (EEE) capability for 400 Gb/s PHYs *
- Support optional 400 Gb/s Attachment Unit Interfaces for chip-to-chip and chip-to-module applications **
- Provide physical layer specifications which support link distances of:
  - At least 100 m over MMF ***
  - At least 500 m over SMF ***
  - At least 2 km over SMF ***
  - At least 10 km over SMF ***

* Adopted by SG July 2013. Not approved by IEEE 802.3 WG

** Adopted by SG Sept 2013. Not approved by IEEE 802.3 WG

***** **Adopted by SG Nov 2013. Not approved by IEEE 802.3WG**

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet objectives, as per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Pete Anslow

- 802.3 Voters (Y/N/A): approved by voice vote without opposition
- Motion passes

PAR - Title

Standard for Ethernet Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 400 Gb/s Operation

PAR - Scope

Define Ethernet Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 400 Gb/s.

PAR - Need

The project is necessary to provide solutions for aggregation & high-bandwidth interconnect in these key application areas: cloud-scale data centers, internet exchanges, co-location services, wireless infrastructure, service provider and operator networks, and video distribution infrastructure.

PAR - Stakeholders

Stakeholders identified to date include but are not limited to users and producers of systems and components for internet exchanges, co-location providers, service providers and network operators, cloud-scale data centers and multiple system operators (MSOs).

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet PAR, per PAR_400_14_0121.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Pete Anslow

- 802.3 Voters (Y/N/A): 85 0 0
- Motion Passes

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.

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet CSD “Managed Objects” per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D’Ambrosia
- Second: Howard Frazier

- 802.3 Voters (Y/N/A): 92 0 1
- Motion Passes

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, aggregation & high-bandwidth interconnect in these key application areas: cloud-scale data centers, internet exchanges, co-location services, wireless infrastructure, service provider and operator networks, and video distribution infrastructure.
- 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.

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet Broad Market Potential Criterion per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: David Ofelt

- 802.3 Voters (Y/N/A): 88 0 1
- Motion Passes

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 IEEE Std 802.3 amendments, 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 Std 802.3 MAC protocol, this proposed amendment will maintain maximum compatibility with the installed base of Ethernet nodes.

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet Compatibility Criterion per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Hugh Barrass

- 802.3 Voters (Y/N/A): 87 0 1
- Motion passes

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 400 Gb/s MAC rate, providing an upgrade path for IEEE 802.3 users, from lower speeds such as 40 Gb/s and 100 Gb/s.
- There are no existing standards, or projects developing standards, addressing the specification of 400 Gb/s Ethernet.

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet Distinct Identity Criterion per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Hugh Barrass

- 802.3 Voters (Y/N/A): 83 0 0
- Motion Passes

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.

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet Technical Feasibility Criterion, per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Steve Trowbridge

- 802.3 Voters (Y/N/A): 79 0 3
- Motion Passes

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 between PMD complexity and the number of fibers in order to maintain a reasonable balance between these two costs.
- 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 single-mode and multimode optical fiber cabling technology.
- Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.
- In consideration of operational costs associated with power consumption, the project will examine alternatives that trade off PMD complexity, power, and implementation constraints. The project has adopted an objective to support Energy Efficient Ethernet, which will help reduce operational costs and environmental footprint.

WG Motion

- Move that 802.3 approve the IEEE P802.3bs 400Gb/s Ethernet Economic Feasibility Criterion, per 0314_400g_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Steve Trowbridge

- 802.3 Voters (Y/N/A): 83 0 5
- Motion passes

WG Motion

- Move that IEEE 802.3 Working Group extends the 400 Gb/s Ethernet Study Group.

- M: D’Ambrosia on behalf of the SG
- (> 50%)
- Results (y/n/a): 82 0 2
- Motion passes

WG Motion

- Move that IEEE 802.3 approve the text in
  - IEEE_802d3_to_TR_42_0314.pdf

  with editorial license granted to the Chair (or his appointed agent), as a liaison communication from the IEEE 802.3 Working Group to TIA TR-42.
- M: John D'Ambrosia
- S: Steve Trowbridge
- Technical (>= 75%)
- Results All (y/n/a) : approved by voice without opposition

Future Meetings

- See: http://www.ieee802.org/3/interims/index.html
- May 2014 Interim (hosted by Ethernet Alliance)
  - Week of May 12
  - Sheraton Norfolk Waterside Hotel, Norfolk, VA, USA
- July 2014 Plenary
  - Week of July 13
  - Manchester Grand Hyatt, San Diego, CA, USA
- Sept 2014 Interim (hosted by Ericsson)
  - Week of September 8
  - Brookstreet Hotel, Ottawa, Canada
- Nov 2014 Plenary
  - Week of November 2
  - Grand Hyatt San Antonio, San Antonio, TX, USA
- Anyone interested in hosting a meeting or webex contact me.

Moving Forward

- If approved by 802.3 / 802 EC, then moves to IEEE-SA Standards Board Meeting (week of 3/24).
  - Anticipated approval date – 3/27.
- If approved by IEEE-SA Standards Board:
  - A new 400GbE Task Force web page will be set up.
  - A link to the new Task Force web page will be provided on the Study Group web page

Thank You!