IEEE 802.3 Next Generation EPON Study Group

Plenary Closing Report

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Study Group information

Study Group charter

Form an 802.3 Study Group to develop Project Authorization Request (PAR), Criteria for Standards Development (CSD) and Objectives for Next Generation EPON

Study Group web and reflector information

Reflector information: http://www.ieee802.org/3/NGEPONSG/reflector.html

Home page: http://www.ieee802.org/3/NGEPONSG/index.html

Progress this Week

- ~35 attendees
- ~14 presentations
- Resolved 4 comments on PAR and Objectives
  - PAR and Objectives were updated accordingly
  - CSD did not change

802.3ca Amended PAR

- Purpose statement was deleted
- Scope statement updated to satisfy comments:

The scope of this project is to amend IEEE Std 802.3 to add physical layer specifications and management parameters for **symmetric and/or asymmetric** operation at 25 Gb/s**, 50 Gb/s,** and 100 Gb/s MAC data rate**s** on point-to-multipoint passive optical networks **with distance and split ratios consistent with those defined in IEEE Std 802.3-2015.**

- Original PAR passed with Y/N/A = 25/0/0
- Modified PAR passed with Y/N/A = 21/0/0

802.3ca Amended Objectives

- Purpose statement was deleted
- Scope statement updated to satisfy comments:

Provide specifications for physical layers operating over a single SMF strand and supporting **symmetric and/or asymmetric** ~~the~~ MAC data rate**s** of:

25 Gb/s in downstream and **less than or equal to** 25 Gb/s in upstream

50 Gb/s in downstream and less than or equal to 50 Gb/s in upstream

100 Gb/s in downstream and **less than or equal to** 100 Gb/s in upstream. ~~This physical layer specification shall accommodate flexible configuration to support operation at reduced MAC data rates.~~

- Original Objectives passed with Y/N/A = 24/0/0
- Modified Objectives passed with Y/N/A = 18/0/6

Updated Documentation

- PAR

  http://www.ieee802.org/3/NGEPONSG/documents/P802_3ca_PAR_111115.pdf

- CSD

  http://www.ieee802.org/3/NGEPONSG/documents/100gepon_CSD.pdf

- Objectives

  http://www.ieee802.org/3/NGEPONSG/documents/100gepon_objectives_111115.pdf

802.3ca Adopted Objectives

- Support subscriber access networks using point to multipoint topologies on optical fiber
- Provide specifications for physical layers operating over a single SMF strand and supporting symmetric and/or asymmetric the MAC data rates of:
  - 25 Gb/s in downstream and less than or equal to 25 Gb/s in upstream
  - 50 Gb/s in downstream and less than or equal to 50 Gb/s in upstream
  - 100 Gb/s in downstream and less than or equal to 100 Gb/s in upstream
- PHY(s) to have a BER better than or equal to 10-12 at the MAC/PLS service interface (or the frame loss ratio equivalent)
- Support coexistence with 10G-EPON
  - Optical power budgets to accommodate channel insertion losses equivalent to those supported by the 10G-EPON standard
  - Wavelength allocation allowing concurrent operation with 10G-EPON PHYs

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON objectives, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Glen Kramer
- 802.3 voters (Y/N/A):

802.3ca PAR

- **2.1 Title:** Approved Draft Standard for Ethernet Amendment: Physical Layer Specifications and Management Parameters for 25 Gb/s and 100 Gb/s Passive Optical Networks

- **5.2.b. Scope of the project:** The scope of this project is to amend IEEE Std 802.3 to add physical layer specifications and management

  parameters for symmetric and/or asymmetric operation at 25 Gb/s, 50 Gb/s, and 100 Gb/s MAC data rates on point-to-multipoint

  passive optical networks with distance and split ratios consistent with those defined in IEEE Std 802.3-2015.

- **5.5 Need for the Project:** The project is applicable to business and residential access environments. The project is needed to enable access

  network operators to provide advanced bandwidth-intensive services while reducing footprint of network equipment, simplifying service

  upgrades, reducing network upgrade cost, and reducing fiber deployment costs.

- **5.6 Stakeholders for the Standard:** The stakeholders include access network operators, system suppliers, component suppliers, and

  subscribers.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON PAR, in http://www.ieee802.org/3/NGEPONSG/documents/P802_3ca_PAR_111115.pdf with the following change in **2.1 Title**:

  insert “, 50 Gb/s, “ after “25 Gb/s”.

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Glen Kramer
- 802.3 voters (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'.

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 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.

The Management Information Base (MIB) for NG-EPON will maintain compatibility with the current 802.3.1 MIB.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Managed Objects” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Kevin Noll
- 802.3 voters (Y/N/A):

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.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Coexistence” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Kevin Noll
- 802.3 voters (Y/N/A):

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.

Access network bandwidth usage increases on average 50% year over year due to a continual increase in the number of subscribers, connected devices per subscriber, and higher data capacity requirements per connected device. In addition, the demand for higher peak speed is increasing at an even faster pace and is expected to continue. The definition of NG-EPON will address requirements for high-capacity interconnect in the Ethernet access network.

There has been wide attendance and participation in the NG-EPON ad hoc and the Study Group by end users, equipment manufacturers, and component suppliers. It is anticipated that there will be a robust NG-EPON ecosystem of vendors and users of this standard.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Broad Market Potential” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Marek Hajduczenia
- 802.3 voters (Y/N/A):

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 EPON physical layers will be defined.

As an amendment to IEEE Std 802.3, the proposed project will conform to the simplified full-duplex MAC defined in Annex 4A in IEEE Std 802.3.

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

See managed objects for SNMP compatibility

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Compatibility” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Alan Brown
- 802.3 voters (Y/N/A):

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 is no existing IEEE 802 LMSC standard or an approved project appropriate for fiber access using point-to-multipoint topology at a MAC data rate of at least 25 Gb/s.

The proposed project is an upgrade for users of Ethernet Passive Optical Networks specified in IEEE Std 802.3 to a MAC data rate of at least 25 Gb/s.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Distinct Identity” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Duane Remein
- 802.3 voters (Y/N/A):

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.

Presentations made to IEEE 802.3 Industry Connections NG-EPON ad hoc and to the NG-EPON Study Group illustrate the technical feasibility of a point-to-multipoint PHY operating at a rate of at least 25 Gb/s.

This project reuses the Ethernet point-to-multipoint technology that proved to be stable and reliable. The project will extend point-to-multipoint PHY technology to support MAC data rates of 25 Gb/s and up to 100 Gb/s.

Contributions received from PHY vendors, component vendors, system vendors, and service providers suggest that 10 Gb/s point-to-multipoint and 25 Gb/s point-to-point technologies are mature, which provides a high level of confidence in the reliability of future 25 Gb/s and 100 Gb/s EPON systems.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Technical Feasibility” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Marek Hajduczenia
- 802.3 voters (Y/N/A):

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.

Interfaces of at least 25Gb/s utilizing advanced modulation techniques are expected to exhibit a similar cost balance as 10G-EPON and 1G-EPON for EPON Optical Line Terminal ports versus attached stations.

The cost factors for Ethernet components and systems are well known.

The installation costs of cable plant and maintenance costs are similar to that of existing EPON technologies.

Point-to-multipoint topology is optimal for access networks, providing a cost-efficient subscriber architecture as compared to point-to-point topology. Coupled with a higher capacity of the Optical Line Terminal equipment, reduction of trunk fiber count, and lower maintenance and repair costs, the introduction of NG-EPON will result in the further reduction of infrastructure cost and cost-to-performance ratio.

WG Motion

- Move that the IEEE 802.3 Working Group approve the IEEE P802.3ca 100G-EPON CSD “Economic Feasibility” response, as per 1115_ngepon_close_report.pdf

- Technical (>=75%)

- Moved by: Curtis Knittle
- Seconded: Duane Remein
- 802.3 voters (Y/N/A):

WG Motion

- Move that the IEEE 802.3 Working Group request the extension of the NG-EPON Study Group

- Procedural (>=50%)

- Moved by: Curtis Knittle on behalf of the SG
- 802.3 voters (Y/N/A):

Questions?

Thank you!