



# IEEE 802.3

## 25 Gb/s Ethernet over a single lane for server interconnect Study Group

### Closing Plenary Report

San Antonio, Tx

Nov 3-7<sup>th</sup>, 2014

Mark Nowell, Chair

# Reflector and Web

- To subscribe to the 25Gb/s Ethernet Study Group reflector, send an email to:

**ListServ@ieee.org**

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

*subscribe stds-802-3-25G <yourfirstname> <yourlastname>*

*end*

- Send 25Gb/s Ethernet reflector messages to:

**stds-802-3-25G@listserv.ieee.org**

- Study Group web page URL:

**<http://www.ieee802.org/3/25GSG/index.html>**

# Progress this week

- 56 attendees
- 14 presentations reviewed.
- Motion to extend Study Group passed Y/N/A: 41/0/1
  
- Review of Project documentation from Other WGs
  - 802.11 WG provided feedback on response for PAR and CSD (BMP)
  - Comments reviewed and accepted. Documents modified and approved.

# 802.3by- Amended PAR

Updated Text  
Original Text

## 5.2b Scope of the Project

This amendment defines ~~Define~~ Ethernet Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 25 Gb/s for server to switch interconnections.

## 5.6 Stakeholders of the Project

~~Stakeholders identified to date include, but are not limited to,~~ Users and producers of systems and components for data centers.

### **Updated documents:**

Modified PAR document:

[http://www.ieee802.org/3/25GSG/25GE\\_PAR\\_updated\\_051114.pdf](http://www.ieee802.org/3/25GSG/25GE_PAR_updated_051114.pdf)

Study group PAR presentation used to adopt:

[http://www.ieee802.org/3/25GSG/25GE\\_PAR\\_v5.pdf](http://www.ieee802.org/3/25GSG/25GE_PAR_v5.pdf)

# 802.3by- Amended CSD - BMP

Updated Text  
Original Text

- Ethernet is widely deployed for server to switch applications in data centers. An Ethernet data rate of 25 Gb/s enables a cost effective interconnect solution enabling 25 Gb/s server solutions and intersecting the 100Gb/s networking solutions based on 25 Gb/s **serial IO SerDes** technology.
- There will be a significant market potential for 25 Gb/s Ethernet interfaces on servers that optimize the total cost of ownership while meeting the necessary IO bandwidth requirements in data centers.
- 148 participants attended the “25 Gb/s Ethernet over a single lane for server interconnect ” Call-For-Interest. 59 individuals representing at least 36 companies indicated that they would support the standardization process. 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.

## **Updated documents:**

Modified and adopted CSD document showing changes:

[http://www.ieee802.org/3/25GSG/25GE\\_CSD\\_1114\\_updated\\_adopted\\_with\\_changes.pdf](http://www.ieee802.org/3/25GSG/25GE_CSD_1114_updated_adopted_with_changes.pdf)

Modified and adopted CSD clean document

[http://www.ieee802.org/3/25GSG/25GE\\_CSD\\_1114\\_updated\\_adopted\\_clean.pdf](http://www.ieee802.org/3/25GSG/25GE_CSD_1114_updated_adopted_clean.pdf)

# Updated Project documentation

- PAR

[http://www.ieee802.org/3/25GSG/25GE\\_PAR\\_updated\\_051114.pdf](http://www.ieee802.org/3/25GSG/25GE_PAR_updated_051114.pdf)

- CSD

[http://www.ieee802.org/3/25GSG/25GE\\_CSD\\_1114\\_updated\\_adopted\\_clean.pdf](http://www.ieee802.org/3/25GSG/25GE_CSD_1114_updated_adopted_clean.pdf)

- Objectives

[http://www.ieee802.org/3/25GSG/25GE\\_Objectives\\_0914\\_adopted.pdf](http://www.ieee802.org/3/25GSG/25GE_Objectives_0914_adopted.pdf)

# Adopted Objectives

- Support a MAC data rate of 25 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 a BER of better than or equal to  $10^{-12}$  at the MAC/PLS service interface (or the frame loss ratio equivalent)
- Support optional Energy-Efficient Ethernet operation
- Define a single-lane 25 Gb/s PHY for operation over a printed circuit board backplane consistent with channels specified in IEEE Std 802.3bj-2014 Clause 93
- Define a single-lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m
- Define a single-lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 5m
- Define a single-lane 25 Gb/s PHY for operation over MMF consistent with IEEE P802.3bm Clause 95
- Provide appropriate support for OTN

# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet objectives, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 802.3 Voters (Y/N/A):



# Project Authorization Request

**2.1 Title:** Standard for Ethernet Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 25 Gb/s Operation

**5.2.b. Scope of the project:** This amendment defines Ethernet Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 25 Gb/s for server to switch interconnections.

**5.5 Need for the Project:** There is a need for greater than 10 Gb/s Ethernet connectivity for server to switch connections. The availability of 25 Gb/s signaling technologies enables interconnect solutions for server to switch applications to be developed which are lower cost than existing 40 Gb/s Ethernet solutions.

**5.6 Stakeholders for the Standard:** Users and producers of systems and components for data centers.

# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet PAR, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 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’.

The following are the CSD Responses in relation to the IEEE P802.3by 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

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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.

# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Managed Objects”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 802.3 Voters (Y/N/A):

# Coexistence

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**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 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Coexistence”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 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.**
- Ethernet is widely deployed for server to switch applications in data centers. An Ethernet data rate of 25 Gb/s enables a cost effective interconnect solution enabling 25 Gb/s server solutions and intersecting the 100Gb/s networking solutions based on 25 Gb/s serial IO technology.
  - There will be a significant market potential for 25 Gb/s Ethernet interfaces on servers that optimize the total cost of ownership while meeting the necessary IO bandwidth requirements in data centers.
  - 148 participants attended the “25 Gb/s Ethernet over a single lane for server interconnect ” Call-For-Interest. 59 individuals representing at least 36 companies indicated that they would support the standardization process. 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.



# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Broad Market Potential”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 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, this 25 Gb/s amendment will define new physical layers.
  - As an amendment to IEEE Std 802.3, the proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
  - By using the existing IEEE Std 802.3 MAC protocol, the proposed amendment will maintain 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.

# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Compatibility”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 802.3 Voters (Y/N/A):

# Distinct Identity

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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 25 Gb/s MAC rate.
- There are no existing standards, or projects developing standards, addressing the specification of 25 Gb/s Ethernet.

# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Distinct Identity”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 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.**
- Systems based upon 25 Gb/s technology have been 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.
  - Component technology at 25 Gb/s, developed for both IEEE P802.3bj and IEEE P802.3bm, are available and in production.
  - The reliability of components for 25 Gb/s Ethernet has been established in the target environments with a high degree of confidence.

# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Technical Feasibility”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 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.**
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- The cost factors for Ethernet components and systems are well known.
  - Prior experience in the development of 25 Gb/s technology for Ethernet establishes that the 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 25 Gb/s Ethernet interface will maintain a favorable cost balance between the server and the switch.
  - Energy Efficient Ethernet will reduce the operational costs and the environmental footprint.



# WG Motion

- Move that 802.3 approve the IEEE P802.3by 25 Gb/s Ethernet CSD “Economic Feasibility”, as per 1114\_25g\_close\_report.pdf
- Technical( $\geq 75\%$ )
- Moved by: Mark Nowell
- Second: Matt Brown
- 802.3 Voters (Y/N/A):

# WG Motion

- Move that IEEE 802.3 Working Group extends the 25 Gb/s Ethernet Study Group.
- Procedural ( $\geq 50\%$ )
- M: Mark Nowell on behalf of the SG
- 802.3 Voters (Y/N/A):

# Future Plans

- If approved by 802.3 / 802 EC, then moves to IEEE-SA Standards Board Meeting (week of 12/9).
- If approved by IEEE-SA Standards Board:
  - A new 25 Gb/s 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
- On-going ad hoc meetings to continue (Wed @ 8 am PT)
- Future meetings in-line with planned interim and plenary meetings
  - <http://www.ieee802.org/3/interims/index.html>
  - Potential for a future extra interim meeting has been raised if it is seen as an opportunity to accelerate project schedule.

# 25 Gb/s Ethernet Project Organization

- Chair: Mark Nowell, Cisco
- Recording Secretary: Kent Lusted, Intel
- Editor: Matt Brown, APM
- Ad hoc chairs:
  - Optical: Jonathan King, Finisar
  - Architecture, Matt Brown, APM



# Thank you