50 Gb/s Ethernet over a single lane And Next Generation 100 Gb/s and 200 Gb/s Ethernet and 200 Gb/s Ethernet Single Mode Fiber Study Groups Closing Report

Mark Nowell

Cisco

Macau, China

Mar 14th-18th

IEEE 50G/NGOATH & 200GE SMF Study Groups Project information

Task Force Organization

Mark Nowell, Cisco, Study Group(s) Chair

Kent Lusted, Intel, Study Group(s) Recording Secretary

Kent Lusted, Intel, Study Group(s) Ad hoc

Study Group web and reflector information

Reflector information: http://www.ieee802.org/3/50G/reflector.html

Home pages:

http://www.ieee802.org/3/50G/index.html

http://www.ieee802.org/3/NGOATH/index.html

IEEE 50G/NGOATH & 200G SMF Study Groups Progress this week

114 attendees

19 technical contribution were made

16 Motions and 1 Straw Poll

Key Highlights

- Motions to Extend Study Groups
- Adopted refined objectives for 50 Gb/s, 100 Gb/s and 200 Gb/s Ethernet twinaxial and PCB backplane media
- Adopted objective for 200 Gb/s PHY for 500m four-lane parallel SMF
- Refined an objective for 100 Gb/s 100m MMF to align language to be consistent with other adopted objectives “2-fiber” -> “2-lane”
- Responded to 802 feedback on PAR and CSD and modified the PAR scope for both the P802.3cd PAR and the P802.3bs PAR modification

Review of Project Documentation from other WGs

Feedback request to add reach and media to Sec 5.2b Project Scope in PAR modification for P802.3bs and PAR for P802.3cd

P802.3bs changes

Old

Define Ethernet Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 200 Gb/s and 400 Gb/s.

Newly adopted (Y:89 N:0 A:2 3/16/16)

Define Ethernet Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 200 Gb/s over single-mode fiber and 400 Gb/s over optical physical media.

http://www.ieee802.org/3/50G/public/Mar16/P802_3bs_PAR_160316.pdf

Review of Project Documentation from other WGs

P802.3cd changes

Old

Define Ethernet Media Access Control (MAC) parameters, Physical Layer specifications, and management parameters, as needed, for the transfer of Ethernet format frames at 50 Gb/s, 100 Gb/s, and 200 Gb/s.

Newly adopted (Y: 90 N:0 A:2 3/16/16)

Define Ethernet Media Access Control (MAC) parameters, Physical Layer specifications, and management parameters for the transfer of Ethernet format frames at 50 Gb/s over copper and optical media. Define additional Physical Layer specifications and management parameters at 100 Gb/s, over copper and optical media. Define additional Physical Layer specifications and management parameters at 200 Gb/s over copper and multimode fiber physical media.

http://www.ieee802.org/3/50G/public/Mar16/P802_3cd_PAR_160316.pdf

Updated Project Documentation

50G/NGOATH Ethernet SG

Objectives

http://www.ieee802.org/3/50G/public/Mar16/objectives_50G_NGOATH_01_0316.pdf

CSD

http://www.ieee802.org/3/50G/public/CSD_50G_NGOATH_01_0116.pdf

PAR

http://www.ieee802.org/3/50G/public/Mar16/P802_3cd_PAR_160316.pdf

200 GbE SMF SG

Objectives

http://www.ieee802.org/3/50G/public/Mar16/objectives_50G_NGOATH_01_0316.pdf

P802.3bs CSD modifications

http://www.ieee802.org/3/50G/public/NGAOTH_802d3bs_CSD_modification_0116.pdf

P802.3bs PAR modifications

http://www.ieee802.org/3/50G/public/Mar16/P802_3bs_PAR_160316.pdf

Adopted Objectives of Joint SG (1 of 3)

- 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

Adopted Objectives of Joint SG (2 of 3)

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

Adopted Objectives of Joint SG (3 of 3)

Define four-lane 200 Gb/s PHYs for operation over

- copper twin-axial cables with lengths up to at least 3 m.
- printed circuit board backplane with a total channel insertion loss of <= 30 dB at 13.28125 GHz.

Define 200 Gb/s PHYs for operation over MMF with lengths up to at least 100 m

Provide physical layer specifications which support 200 Gb/s operation over:

- At least 2 km of SMF
- At least 10 km of SMF
- At least 500 m of 4-lane parallel SMF

Note: Objectives in red have been proposed to be handled by the P802.3bs Task Force (400 Gb/s Ethernet).

200 Gb/s Ethernet Single-Mode Study Group
(Modifications to P802.3bs)
Section

SG adopted Objectives for P802.3bs

- Provide physical layer specifications which support 200 Gb/s operation over:
  - At least 2 km of SMF
  - At least 10 km of SMF
  - At least 500 m of 4-lane parallel SMF

P802.3bs Objectives (if SG additions are adopted)

- Support a MAC data rate of 200 Gb/s
- 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
- Provide physical layer specifications which support 200 Gb/s operation over:
  - At least 500 m of 4-lane parallel SMF
  - At least 2 km of SMF
  - At least 10 km of SMF
- Provide physical layer specifications which support 400 Gb/s operation over:
  - At least 100 m of MMF
  - At least 500 m of SMF
  - At least 2 km of SMF
  - At least 10 km of SMF
- Specify optional Energy Efficient Ethernet (EEE) capability
- Support optional Attachment Unit Interfaces for chip-to-chip and chip-to-module applications

WG Motion

Move that 802.3 approve the IEEE P802.3bs objectives, as per slide 12 of 0316_50_100_200_close_report.pdf

M: Mark Nowell

S: Kent Lusted

Passes by voice vote without opposition

Proposed P802.3bs CSD Modifications

http://www.ieee802.org/3/50G/public/Mar16/NGAOTH_802d3bs_CSD_modification_0116.pdf

Adopted Y: 89 N: 0 A: 2 1/21/16

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.

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 200 Gb/s and** 400 Gb/s Ethernet will address **the growing diverse bandwidth requirements and cost considerations for 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 **200 Gb/s and** 400 Gb/s Ethernet.

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 **200 Gb/s and** 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.

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 **defining operation at 200 Gb/s and** 400 Gb/s MAC rate**s**, 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 **200 Gb/s over single-mode fiber and** 400 Gb/s Ethernet.

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.

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. **Possible use of common technologies that support both 200 Gb/s and 400 Gb/s Ethernet would allow economies of scale to reduce cost.**
- 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 the IEEE 802.3 Working Group approve the IEEE P802.3bs 400 Gb/s Ethernet CSD Modifications "Managed Objects", "Broad Market Potential", "Compatibility", "Distinct Identity", "Technical Feasibility", and "Economic Feasibility" responses, as per 0316_50_100_200_close_report.pdf

M: Mark Nowell

S: Kent Lusted

Y: 82 N: 1 A: 1

P802.3bs PAR Modifications

Modified Sections

2.1 Title: Standard for Ethernet Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for 200 Gb/s and 400 Gb/s Operation

5.2.b. Scope of the project: Define Ethernet Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 200 Gb/s over single-mode fiber and 400 Gb/s over optical physical media.

http://www.ieee802.org/3/50G/public/Mar16/P802_3bs_PAR_160316.pdf

WG Motion

Move that the IEEE 802.3 Working Group approve the IEEE P802.3bs 400Gb/s Ethernet PAR modifications, in http://www.ieee802.org/3/50G/public/Mar16/P802_3bs_PAR_160316.pdf

M: Mark Nowell

S: Kent Lusted

Y: 84 N: 2 A: 0

WG Motion

Move that the IEEE 802.3 Working Group request the extension of the 200 Gb/s Ethernet Single-Mode Fiber Study Group.

M: Mark Nowell

S: Kent Lusted

Y: 88 N: 0 A: 1

P802.3cd Section
(50 Gb/s Ethernet over a single lane And Next Generation 100 Gb/s and 200 Gb/s Ethernet)

P802.3cd Objectives (1 of 3)

- 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

P802.3cd Objectives (2 of 3)

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

P802.3cd Objectives (3 of 3)

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

http://www.ieee802.org/3/50G/public/Mar16/objectives_50G_NGOATH_01_0316.pdf

WG Motion

Move that 802.3 approve the IEEE P802.3cd objectives, as per 0316_50_100_200_close_report.pdf

M: Mark Nowell

S: Kent Lusted

Passes by voice vote without opposition

P802.3cd CSD

http://www.ieee802.org/3/50G/public/Mar16/CSD_50G_NGOATH_01_0116.pdf

Adopted Y: 47 N: 0 A: 1 1/21/16

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.

c) Balanced Costs (LAN versus attached stations) [Removed from IEEE 802 5 Criteria Nov 2012]

- 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 50 Gb/s 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 (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 50 Gb/s, 100 Gb/s and 200G 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 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. [Removed from IEEE 802 CSD Nov 2013]

- 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 50 Gb/s 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 Ethernet would allow economies of scale to reduce cost for all implementations.
- Experience in the development of 50 Gb/s technology 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 50 Gb/s, 100 Gb/s and 200 Gb/s Ethernet interface will maintain a favorable cost balance for server-to-switch and 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 "Managed Objects", "Coexistence", "Broad Market Potential", "Compatibility", "Distinct Identity", "Technical Feasibility", and "Economic Feasibility" responses, as per 0316_50_100_200_close_report.pdf

M: Mark Nowell

S: Kent Lusted

Y: 80 N: 1 A: 0

P802.3cd PAR

2.1 Title: Standard for Ethernet Amendment: Media Access Control Parameters for 50 Gb/s and Physical Layers and Management Parameters for 50 Gb/s, 100 Gb/s, and 200 Gb/s Operation

5.2.b. Scope of the project: Define Ethernet Media Access Control (MAC) parameters, Physical Layer specifications, and management parameters for the transfer of Ethernet format frames at 50 Gb/s over copper and optical media. Define additional Physical Layer specifications and management parameters at 100 Gb/s over copper and optical media. Define additional Physical Layer specifications and management parameters at 200 Gb/s over copper and multimode fiber physical media.

5.5 Need for the Project: Rapid growth of server, network, and internet traffic is driving the need for higher data rates, higher density and lower cost solutions. Advances in 50 Gb/s signaling technologies can be leveraged to create optimized solutions based on single instance or multiple instances in parallel. IEEE Std 802.3 does not currently define 50 Gb/s Ethernet rates nor define 100 Gb/s or 200 Gb/s Ethernet solutions based on these new technologies**.**

5.6 Stakeholders for the Standard: Users and producers of systems and components for servers, networking systems, high performance computing, and data centers.

http://www.ieee802.org/3/50G/public/Mar16/P802_3cd_PAR_160316.pdf

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" PAR, in http://www.ieee802.org/3/50G/public/Mar16/P802_3cd_PAR_160316.pdf

M: Mark Nowell

S: Kent Lusted

Y: 84 N:0 A:0

WG Motion

Move that the IEEE 802.3 Working Group request the extension of the 50 Gb/s Ethernet over a single lane and Next Generation 100 Gb/s and 200 Gb/s Ethernet Study Group.

M: Mark Nowell

S: Kent Lusted

Y: 82 N: 0 A: 0

Future Meetings & Ad hocs

Ad-hoc meeting plans

- Single on-going weekly meetings, all topics (will cycle) – agendas will be published. 2 hr duration.
- Joint with P802.3by Task Force

See: http://www.ieee802.org/meeting/index.html

May 2016 Interim

- Week of May 23rd, 2016 – Whistler, B.C., Canada

July 2016 Plenary

- Week of July 24th, 2016 – San Diego, CA

Anyone interested in hosting a interim meeting contact me or the IEEE 802.3 Executive Secretary Steve Carlson.

Questions?

Thank you!