Minutes

IEEE P802.3 100 Gb/s Electrical Lane Study Group

Interim Meeting

March 7-8, 2018

Rosemont, IL, USA

Prepared by Kent Lusted

Table of Contents

IEEE P802.3 100 Gb/s Electrical Lane Study Group – March 7, 2018

Prepared by Kent Lusted

IEEE P802.3 100 Gb/s Electrical Lane Study Group meeting convened at ~10:00 a.m., by Beth Kochuparambil, IEEE 802.3 100GEL Study Group Chair.

Mrs. Kochuparambil welcomed attendees.

Introductions were made.

Chair reviewed agenda in
http://www.ieee802.org/3/100GEL/public/18_03/agenda_100GEL_01c_0318.pdf

Motion #1:
Move to approve the agenda:

- Moved by: Thananya Baldwin
- Second by: Tom Palkert
- Passed by voice without opposition

Motion #2:
Move to approve the January 2018 meeting minutes

- Moved by: Nathan Tracy
- Second by: Mike Dudek
- Passed by voice without opposition

Chair reminded participants to observe meeting decorum. Called for members of the press. No one indicated. Photography and recording are not permitted.

Chair reviewed the ground rules for the meeting.

Chair reviewed the IEEE structure.

Chair reviewed the Bylaws and Rules slides in
http://www.ieee802.org/3/100GEL/public/18_03/agenda_100GEL_01c_0318.pdf

Chair asked if there was anyone unfamiliar with the Bylaws or Rules. No one responded.

Chair reviewed the participant requirements. No one responded.

Reviewed the reflector and web information for the Study Group in the agenda deck.

Chair reviewed the attendance procedures. Chair reminded participants to sign into the IEEE Meeting Attendance Tool and sign the attendance book.

Chair provided a summary of the study group status.

Chair reviewed the IEEE 802.3 Standards Process.

Chair provided a status of the Study Group. The PAR and CSD were pre-submitted to the IEEE 802 EC in February. Feedback was received and will be reviewed later.

Chair reviewed the adopted objectives. (see: http://www.ieee802.org/3/100GEL/P802_3ck_Objectives_2018jan.pdf) Chair noted that several objectives have TBDs that need to be resolved before going to Working Group.

Chair reviewed the study group ad hocs that occurred since the January meeting. The ad hoc material is located at: http://www.ieee802.org/3/100GEL/public/adhoc/index.html Chair noted that the ad hoc calls will resume on March 21, 2018 at 9:00 a.m. Pacific.

Goals for the meeting:

- Review technical presentations
- Complete TBDs in objectives
- Consider feedback on pre-submitted CSD and PAR.
- Update CSD and PAR.

Chair noted that a liaison was received in January. (http://www.ieee802.org/3/minutes/jan18/incoming/OIF_to_IEEE_802d3_112G_Jan_2018.pdf) In January, the Study Group decided to defer the response to this Plenary meeting. A response was being prepared for review and approval by the Study Group.

Chair reviewed the meeting and presentation schedule. Chair noted that there has been much discussion on copper cable reaches and building consensus on the backplane TBD items. The goal is to get approvals at this plenary in order to become a Task Force in May. If there is insufficient consensus, the Task Force will be delayed until November.

Chair reviewed the future ad hoc meeting plans and the future meeting dates. Anyone interested in hosting a meeting should contact the Chair or Steve Carlson.

There was a question about late presentations. Chair noted that 3 presentations were received late (Rob Stone, Chris Diminico, Ramin Farjadrad). Chair asked if there was objection to hearing these presentations. No one responded.

Chair asked participants to review the 4 presentations scheduled for Thursday (Tom Palkert, Andy Zambell, Chris Diminico, Ramin Farjadrad) in advance of the discussion on objectives.

Presentation #1:
"Evolution of Cu Cabling", Ali Ghiasi
See: http://www.ieee802.org/3/100GEL/public/18_03/ghiasi_100GEL_02_0318.pdf

- Discussed the broad market potential of copper cables in the different markets.
- Discussed the PCB reaches needed on a circuit board and its impact on the cable reach.
- Discussed the switch radix implication on PCB host route length.
- There were several comments on the different cable reaches.

Chair reminded participants to sign into the IEEE Meeting Attendance Tool.

Presentation #2:
"Criteria for 100Gbps Copper Cable Solution", Joel Goergen
See: http://www.ieee802.org/3/100GEL/public/18_03/goergen_100GEL_01_0318.pdf

- Actives cables would not change the routed minimum length between end points. However, it could extend the reach.
- Discussed the impact of cable management on airflow inside the rack. It was noted that the Cisco NCS-4016 chassis guide is an example reference specification for cable management and routing.
- Discussed the amount of power that can be handled in a rack.
- Discussed that cloud scale data centers deploy racks differently from enterprise.

Presentation #3:
"Channel Simulations for 100G Direct Attach cable (Copper) Analysis", Nathan Tracy
See: http://www.ieee802.org/3/100GEL/public/18_03/tracy_100GEL_01a_0318.pdf

- Updated version '01a' with additional supporters
- Ed Cady requested to be added as a supporter.
- Discussed that the performance of other connectors beside the OSFP, such as QSFP, could be equivalent.
- The presentation did not include the impact of temperature variation; nominal only.
- This analysis did not take into account stacked connectors or press-fit connector. At 400G, the primarily use is belly-belly connector.
- Discussed the possibility of shifting the host loss budget to different ends.

Presentation #4:
"ToR Switch Architectures and Implications for 100G Electrical Lane Interfaces", Rob Stone
See: http://www.ieee802.org/3/100GEL/public/18_03/stone_100GEL_01_0318.pdf

- Discussed the possibility of shifting the host loss budget to different ends of the link.
- Discussed the switch desire to match server link at lower speed with higher speed uplink. The switch ASIC is pin limited and forced to higher speed I/O, unlike the constraint on the server end.
- The power rack limit assumption may change in the future to allow more servers per rack.

Chair summarized that there does not appear to be opposition to the copper cables. She asked if the summary was incorrect. No one indicated opposition.

Break for lunch at ~12:15 p.m. Resume at ~1:15 p.m.

Chair reviewed and summarized the PAR and CSD feedback received from the other IEEE 802 Working Groups. Chair reviewed the proposed changes to the PAR and CSD based on the feedback received. Chair highlighted the requested change to the PAR that needs further discussion with David Law, IEEE 802.3 Working Group chair. Chair asked if there was opposition to aligning to the PAR scope text that will be proposed by David Law later in the day. No one objected. The proposed markup will be posted to the website for offline review and will be revisited later on Wednesday. Chair noted that an updated PAR and CSD must be sent back to the EC by the end of Wednesday.

Presentation #5:
"Backplane and Copper Cabling Objectives - Wording and Technical Decisions", George Zimmerman
See: http://www.ieee802.org/3/100GEL/public/18_03/zimmerman_100GEL_01a_0318.pdf

- Updated version '01a' with additional supporters
- Discussed changing the backplane objective from insertion loss based to physical reach based.
- There were questions about mapping insertion loss to physical reach for a backplane.

Chair asked George Zimmerman to prepare a straw poll on the backplane objective form change for consideration, if desired.

Presentation #6:
"100G Passive Copper Cable Link Budget Analysis", Tom Palkert
See: http://www.ieee802.org/3/100GEL/public/18_03/palkert_100GEL_01a_0318.pdf

- Updated version '01a' with additional supporters
- Discussed the challenges of crosstalk in the connector and the impact to reach feasibility.
- The variation of the bypass cable assembly loss is lower than that of PCB traces.
- There was a request for relative cost comparison between the PCB materials and the bypass cable assembly.

Presentation #7:
“100GEL C2M Channel Estimate”, Jane Lim
See: http://www.ieee802.org/3/100GEL/public/18_03/lim_100GEL_01b_0318.pdf

- Updated version ‘01b’ with additional supporters
- Discussed the desire to support copper cables and optical modules on the same switch port.
- The power savings of an optical module receiver on a short channel have not been shared at this time.
- Slide 5 data is at a high temperature corner, measured data.

Chair reminded participants to sign into the IEEE Meeting Attendance Tool and the attendance book.

Break at ~3:05 p.m. Resumed at ~3:20 p.m.

Presentation #8:
“Architectural Consideration for System Based on 100 Gb/s/Lane Signaling”, Ali Ghiasi
See: http://www.ieee802.org/3/100GEL/public/18_03/ghiasi_100GEL_01a_0318.pdf

- Updated version ‘01a’ with technical changes and additional content. Chair asked if there was opposition to hearing the slide. No one responded.
- There would be an issue with switch-to-switch connections using passive copper cables and an asymmetric host budget.
- A backplane loss budget proposal was not included in the presentation.

Presentation #9:
“Using Chiplets to Lower Package Loss”, Brian Holden
See: http://www.ieee802.org/3/100GEL/public/18_03/holden_100GEL_01a_0318.pdf

- On slide 2, there was a suggestion that the FPGA could be larger than the SoC core.
- Chiplets located near the edge of a package may need a stiffener.

Presentation #10:
“Updated Host Backplane Feasibility & Models”, Howard Heck
See: http://www.ieee802.org/3/100GEL/public/18_03/heck_100GEL_01b_0318.pdf

- Updated version 01b with typo fix. Kent asked if there was objection to hearing the updated version. No one responded.
- There was a request for additional information on the package materials.
- Single ended signals in server packages limit changes to the package dielectric thickness.

Presentation #11:
"112 Gbps BR and COM Investigation", Mike Li
See: http://www.ieee802.org/3/100GEL/public/18_03/li_100GEL_01_0318.pdf

- Clarifying questions were asked and answered.

Kent Lusted reviewed the updated proposed PAR and CSD responses. He reviewed and compared the redline version and the no-change bar version with participants. See http://www.ieee802.org/3/100GEL/public/18_03/P802_3ck_PAR_ECresponse.pdf and http://www.ieee802.org/3/100GEL/public/18_03/P802_3ck_CSD_ECresponse.pdf . There were questions and discussion but no changes were made.

Motion #3:
Move to:

- Adopt the IEEE P802.3ck PAR in P802_3ck_PAR_ECresponse.pdf

M: Mike Li
S: Brian Holden
Technical (>=75%)
Results: Y: 45 N: 0 A: 0
Motion passes!

Motion #4:
Move to:

- Adopt CSD responses for "Managed Objects", "Coexistence", "Broad Market Potential", "Compatibility", "Distinct Identity", "Technical Feasibility", and "Economic Feasibility" responses, as per P802_3ck_CSD_ECresponse.pdf

M: Ed Sayre
S: Tom Palkert
Technical (>=75%)
Results: Y: 46. N:0. A:0
Motion passes!

Kent Lusted previewed a few straw polls submitted by George Zimmerman that were related to the backplane objective. He announced the intent to hold the straw polls on Thursday morning. There was much discussion. Kent Lusted encouraged participants to discuss the straw polls at the social event.

Presentation #12:

“Technical Feasibility of 100Gb/s per lane SerDes for Backplanes”, Toshiaki Sakai
See: http://www.ieee802.org/3/100GEL/public/18_03/sakai_100GEL_01_0318.pdf

- Clarifying questions were asked and answered.

Chair reviewed the plans for Thursday; respond to liaison, and straw polls and motions to close the TBDs in the objectives and prepare for Working Group. Chair confirmed the start time of 8:00 a.m. on Thursday. Chair encouraged participants to work offline to build consensus.

Chair noted that there was a proposed liaison letter response posted to the website for consideration on Thursday.

Break for the day at ~5:45 p.m.

IEEE P802.3 100 Gb/s Electrical Lane Study Group – March 8, 2018

Prepared by Kent Lusted,

Meeting convened at ~8:10 a.m. by Beth Kochuparambil, IEEE 100 Gb/s Electrical Lane Study Group Chair.

Chair outlined the plans for the day: review presentations, hold straw polls and motions, and closing business. The goal was to resolve the TBD items in the adopted objectives. Chair asked participants to consider straw polls for the Study Group.

Chair displayed the proposed liaison response to the OIF. (See: http://www.ieee802.org/3/100GEL/public/18_03/IEEE_802d3_to_OIF_112G_0318_draft.docx) There was discussion. Changes were made to the document and saved as http://www.ieee802.org/3/100GEL/public/18_03/IEEE_802d3_to_OIF_112G_0318_draftV2.docx .

Motion #5
Move that:

- the Task Force approve the text in IEEE_802d3_to_OIF_112G_0318_draftV2.docx with editorial license granted to the Chair (or his appointed agent) as a liaison to OIF

M: Mike Dudek
S: Brian Holden
Procedural (>50%)
Results: passes by voice without opposition

Attendance Straw Polls
I will attend the IEEE 100GEL meetings at the May interim in Pittsburgh, PA, USA (week of May 21, 2018)
Y: 38 , M: 8
I will attend the IEEE 100GEL meetings at the July plenary in San Diego, CA, USA (week of July 8, 2018)
Y: 36, M: 14

Straw Poll #1
I prefer an objective of the form:

A: “Define a single-lane 100 Gb/s PHY for operation over electrical backplanes supporting up to at least TBD cm.”
B: “Define a single-lane 100 Gb/s PHY for operation over electrical backplanes supporting connection from end to end of at least a 4RU rack-mounted chassis”
C: “Define a single-lane 100 Gb/s PHY for operation over electrical backplanes supporting an insertion loss ≤ TBD dB at 26.6 GHz.”
D: “Define a single-lane 100 Gb/s PHY for operation over electrical backplanes consistent with an insertion loss ≤ TBD dB at 26.6 GHz.” - with the understanding that this does not define the frequencies over which the channel is to be specified.

(Chicago rules)
A: 8 B: 0 C: 46 D: 17

Chair reminded participants to sign the attendance book.

Presentation #13:
“Insertion Loss Target for 100 Gb/s per Lane Electrical PHYs”, Adam Healey
See: http://www.ieee802.org/3/100GEL/public/18_03/healey_100GEL_01_0318.pdf

- The channels analyzed included the Study Group channels in addition to other channel made available to the affiliate privately.
- Discussed the SNR required for the target frame loss ratio.
- Reviewed the assumptions in the link model for the Salz SNR calculations
- Discussed the need for changes to COM parameters to accommodate the challenges of the higher signaling rate.

Straw Poll #2:
I support replacing the frequency TBD in the backplane objectives with the value “26.56”
Yes: 42, No: 0, Abstain: 9

Straw Poll #3:
I support replacing the insertion loss TBD in the backplane objectives with the value:
A: “26”
B: “28”
C: “30”

(Chicago Rules)
A: 15 B: 27 C: 23

Break at ~10:10 a.m. Resumed at ~10:35 a.m.

Chair reminded participants to sign the attendance book.

Straw Poll #4:

I oppose replacing the insertion loss TBD in the backplane objectives with the value:

A: “28”

B: “30”

A: 6 B: 19

Motion #6:

Move to:

- Replace the insertion loss TBD with “28” and the frequency TBD with “26.56” in the 100 Gb/s, 200 Gb/s and 400 Gb/s backplane objectives

M: Joel Goergen

S: Ali Ghiasi

Technical (>=75%),

Y: 46 , N:0 , A: 6

Results: passes!

Motion #7:

Move to:

- Replace the TBD in the 100 Gb/s, 200 Gb/s and 400 Gb/s copper cable objectives with “2”

M: Joel Goergen

S: Tom Palkert

Technical (>=75%),

Y: 52 , N: 0   , A: 8

Results: passes

Motion #8

Move to

- request that the IEEE 802.3 Working Group request the extension of the IEEE 100 Gb/s per Lane Electrical Study Group

M: Jane Lim

S: Rich Mellitz

Technical (>=75%)

Y: 63 N:0 A: 1

Results: passes

Chair asked if Tom Palkert wanted to present his presentation. He declined. Chair asked Andy Zambell if he wanted to present his presentation. He declined. Chair noted that Andy Zambell has channel contributions posted to the meeting website as well. Chair asked if Chris DIminico wanted to present his presentation. He indicated that he wanted to present.

Presentation #14:
“Channel Loss Budget Considerations for 100 Gb/s per Lane Electrical Interfaces”, Chris Diminico
See: http://www.ieee802.org/3/100GEL/public/18_03/diminico_100GEL_01_0318.pdf

- Clarifying questions were asked and answered.

Presentation #15:
“Power Comparison of 106Gbps Dual-Duplex and Single-Duplex PHY Architectures”, Ramin Farjadrad
See: http://www.ieee802.org/3/100GEL/public/18_03/farjadrad_100GEL_01a_0318.pdf

- Discussed the digital/DSP power comparisons on slide 3.
- Clarifying questions were asked and answered.

Vice Chair noted that the ad hocs will resume in two weeks on a weekly cadence, starting at 9:00 a.m. Pacific on Wednesday mornings.

Vice Chair reviewed the future meeting schedule.

Motion #8:
Move to Adjourn:

- Moved by: David Ofelt
- Second by: Liav Ben-Artsi
- Passed by voice vote without opposition

Meeting ended at ~11:45 a.m.

Attendees

100G/lane electrical PHYs, March 2018			7-Mar-18	8-Mar-18
Last Name	First Name	Affiliation	Wednesday	Thursday
Aekins	Robert	Legrand	x	
Ahmad	Bilal	Huawei	x	x
Baca	Rich	Microsoft	x	
Balasubramonian	Venugopal	Marvell	x	x

Baldwin	Thananya	Keysight Technologies	x	
Beauregard	Francois	Belden	x	x
Ben Artsi	Liav	Marvell Semiconductor	x	x
Booth	Brad	Microsoft	x	
Braun	Ralf-Peter	Deutsche Telekom	x	
Brooks	Paul	Viavi Solutions	x	x
Brown	Matt	MACOM	x	
Butter	Adrian	Global Foundries	x	x
Cady	Ed	Luxshare	x	x
Calvin	John	VTM	x	x
Carlson	Craig	Cavium		x
Chalupsky	David	Intel	x	x
Chen	C. C. David	Applied Optoelectronics	x	
Dawe	Piers	Mellanox	x	x
Djahanshahi	Hormoz	microsemi	x	x
Dudek	Mike	Cavium	x	x
Ewen	John	Global Foundries	x	x
Farjad	Ramin	Aquantia	x	

Ghiasi	Ali	Ghiasi Quantum, Huawei	x	x
Gorshe	Steve	microsemi	x	
Grow	Bob	RMG Consulting		x
Gustlin	Mark	Xilinx	x	x
Healey	Adam	Broadcom Limited	x	x
Heck	Howard	Intel	x	x
Hegde	Raj	Broadcom	x	x
Hess	Dave	Corddata		x
Holden	Brian	Kandou Bus	x	x
Kao	Chien-Ping	Intel	x	x
Kareti	Upen Reddy	Cisco	x	x
Katz	David	Phoenix Contact		x
Kawatsu	Yasuaki	Apresia Systems	x	x
Kimber	Mark	Semtech	x	
Kipp	Scott	Brocade	x	x
Kiuchi	Hideki	JAE	x	
Kochuparambil	Beth	Cisco	x	
Lackner	Hans	QoSCom	x	
Lapak	Jeff	UNH-IOL	x	x
Law	David	HPE	x	

Lee	JuneHee	Samsung	x	x
Lewis	Jon	Dell	x	
Li	Mike	Intel	x	x
Lim	Jane	Cisco	x	x
Liu	Karen	Kaiam	x	
Liu	Zhenyu	Credo Semiconductor	x	x
Lusted	Kent	Intel	x	x
Lyubumirsky	Ilya	Inphi	x	
Malicoat	David	Senko/Aquantia	x	x
Marques	Flavio	Furukawa Electric		x
Matoglu	Erdem	Amphenol	x	x
Mazzini	Marco	Cisco	x	
McMillan	Larry	Western Digital	x	
McSorley	Greg	Amphenol	x	x
Mein	John	Dust Photonics	x	x
Mellitz	Richard	Samtec		x
Moritake	Toshiyuki	JAE	x	
Nakamoto	Edward	Spirent Communications		x
Nishimura	Takeshi	Yamaichi Electronics	x	

Nolan	John	QLogic	x	x
Nowell	Mark	Cisco	x	
Pachon	Arturo	TE	x	x
Palkert	Tom	Molex - MACOM	x	
Pepper	Gerald	Keysight Technologies	x	
Pham	Phong	US Conec	x	x
Pimpinella	Rick	Panduit Corp.	x	x
Posthuma	Carl	Nokia	x	x
Pozzebon	Dino	microsemi	x	x
Rabinovich	Rick	Keysight Technologies	x	x
Rechtman	Zvi	Mellanox	x	x
Ressl	Mike	Hitachi Cable America	x	x
Rotolo	Salvatore	ST Microelectronics	x	x
Rysin	Alexander	Mellanox	x	x
Sakai	Toshiaki	Socionext	x	x
Sayre	Edward	Samtec	x	x
Sekel	Steve	Keysight Technologies	x	x

Shen	Zuowei	Google	x	
Slavick	Jeff	Broadcom Limited	x	x
Sommers	Scott	Molex	x	
Sprague	Ted	Infinera	x	
Stone	Rob	Broadcom	x	x
Sun	Liyang	Huawei	x	
Tooyserkani	Pirooz	Cisco	x	
Tracy	Nathan	TE Connectivity	x	x
Twombly	Jeff	Credo	x	
Villarrael	Fernando	Cisco	x	
Vitali	Marco	Sicoya	x	
Walker	Clint	Intel	x	
Wang	Hui	Marvell Semiconductor	x	x
White	Martin	Cavium		x
Zambell	Andrew	Amphenol	x	x
Zhang	Kevin	IDT	x	x
Zimmerman	George	ADI, APL Group, BMW, Cisco, Commscope	x	x
Zivny	Pavel	Tektronix	x	