

# Agenda and General Information

IEEE P802.3bs 400GbE Task Force

John D'Ambrosia, Dell  
San Antonio, TX, USA  
IEEE 802 Nov 2014 Plenary

# Agenda

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- Appointment of Recording Secretary
- Welcome and Introductions
- Approve Agenda
- Approve Sept 2014 Interim Minutes
- Goals for this meeting
- Reflector and Web
- Patent Policy
- Ground Rules
- IEEE
  - Structure
  - Bylaws and Rules
  - Guidelines for IEEE-SA Meetings
  - IEEE Standards Process
- Project Documentation
- Liaisons & Communications
- Ad Hoc Reports
- Technical Presentations
- Motions and Closing Business
- Future Meetings
- Future Ad Hoc Calls

# Task Force Decorum

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- Photography or recording by permission only (2010 SASB Op Manual 5.3.3.4)
- Cell phone ringers off
- Press (i.e., anyone reporting publicly on this meeting) are to announce their presence (5.3.3.5)
- Wear your badges at all times in meeting areas
  - Help the hotel security staff improve the general security of the meeting rooms
  - **PCs HAVE BEEN STOLEN** at previous meetings
  - **DO NOT** assume that meeting areas are secure
- Please observe proper decorum in meetings

# Goals for the meeting week

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- Hear Technical Proposals and supporting presentations
- Identify Steps Moving Forward
- Address Multiple Technical Key Issues
  - Architecture
  - FEC
  - Electrical Interface: 8x50
  - MMF PMD
  - SMF PMDs
    - # of wavelengths and effective rate per lambda
    - Modulation schemes
    - Commonality between PMDs?

# Reflector and Web

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

[ListServ@ieee.org](mailto: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](mailto:STDS-802-3-400G@listserv.ieee.org)

- Task Force web page URL:

<http://www.ieee802.org/3/bs/index.html>

- Ad hoc area URL:

<http://www.ieee802.org/3/bs/public/adhoc/index.shtml>

# Private Area

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- URL: <http://www.ieee802.org/3/bs/private/index.html>
  - Username: xxxxxx
  - Password: xxxxxx
- Write it down...
- Note - The draft, and any other content, is posted for your review only, and neither the content nor access information should be copied or redistributed to others in violation of document copyrights.

# Instructions for the WG Chair

The IEEE-SA strongly recommends that at each WG meeting the chair or a designee:

- Show slides #1 through #4 of this presentation
- Advise the WG attendees that:
  - The IEEE's patent policy is described in Clause 6 of the *IEEE-SA Standards Board Bylaws*;
  - Early identification of patent claims which may be essential for the use of standards under development is strongly encouraged;
  - There may be Essential Patent Claims of which the IEEE is not aware. Additionally, neither the IEEE, the WG, nor the WG chair can ensure the accuracy or completeness of any assurance or whether any such assurance is, in fact, of a Patent Claim that is essential for the use of the standard under development.
- Instruct the WG Secretary to record in the minutes of the relevant WG meeting:
  - That the foregoing information was provided and that slides 1 through 4 (and this slide 0, if applicable) were shown;
  - That the chair or designee provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or the holder of patent claim(s)/patent application claim(s) of which the participant is personally aware and that may be essential for the use of that standard
  - Any responses that were given, specifically the patent claim(s)/patent application claim(s) and/or the holder of the patent claim(s)/patent application claim(s) that were identified (if any) and by whom.
- The WG Chair shall ensure that a request is made to any identified holders of potential essential patent claim(s) to complete and submit a Letter of Assurance.
- It is recommended that the WG chair review the guidance in *IEEE-SA Standards Board Operations Manual* 6.3.5 and in FAQs 12 and 12a on inclusion of potential Essential Patent Claims by incorporation or by reference.

Note: **WG** includes Working Groups, Task Groups, and other standards-developing committees with a PAR approved by the IEEE-SA Standards Board.



# Participants, Patents, and Duty to Inform

All participants in this meeting have certain obligations under the IEEE-SA Patent Policy.

- Participants [Note: Quoted text excerpted from IEEE-SA Standards Board Bylaws subclause 6.2]:
  - “Shall inform the IEEE (or cause the IEEE to be informed)” of the identity of each “holder of any potential Essential Patent Claims of which they are personally aware” if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents
    - “Personal awareness” means that the participant “is personally aware that the holder may have a potential Essential Patent Claim,” even if the participant is not personally aware of the specific patents or patent claims
  - “Should inform the IEEE (or cause the IEEE to be informed)” of the identity of “any other holders of such potential Essential Patent Claims” (that is, third parties that are not affiliated with the participant, with the participant’s employer, or with anyone else that the participant is from or otherwise represents)
- The above does not apply if the patent claim is already the subject of an Accepted Letter of Assurance that applies to the proposed standard(s) under consideration by this group
- Early identification of holders of potential Essential Patent Claims is strongly encouraged
- No duty to perform a patent search



# Patent Related Links

All participants should be familiar with their obligations under the IEEE-SA Policies & Procedures for standards development.

Patent Policy is stated in these sources:

IEEE-SA Standards Boards Bylaws

*<http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6>*

IEEE-SA Standards Board Operations Manual

*<http://standards.ieee.org/develop/policies/opman/sect6.html#6.3>*

Material about the patent policy is available at

*<http://standards.ieee.org/about/sasb/patcom/materials.html>*

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at [patcom@ieee.org](mailto:patcom@ieee.org) or visit <http://standards.ieee.org/about/sasb/patcom/index.html>

This slide set is available at  
<https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.ppt>

# Call for Potentially Essential Patents

- If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance:
  - Either speak up now or
  - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible or
  - Cause an LOA to be submitted

# Other Guidelines for IEEE WG Meetings

- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
  - **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
  - **Don't discuss specific license rates, terms, or conditions.**
    - Relative costs, including licensing costs of essential patent claims, of different technical approaches may be discussed in standards development meetings.
      - Technical considerations remain primary focus
  - **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
  - **Don't discuss the status or substance of ongoing or threatened litigation.**
  - **Don't be silent if inappropriate topics are discussed ... do formally object.**

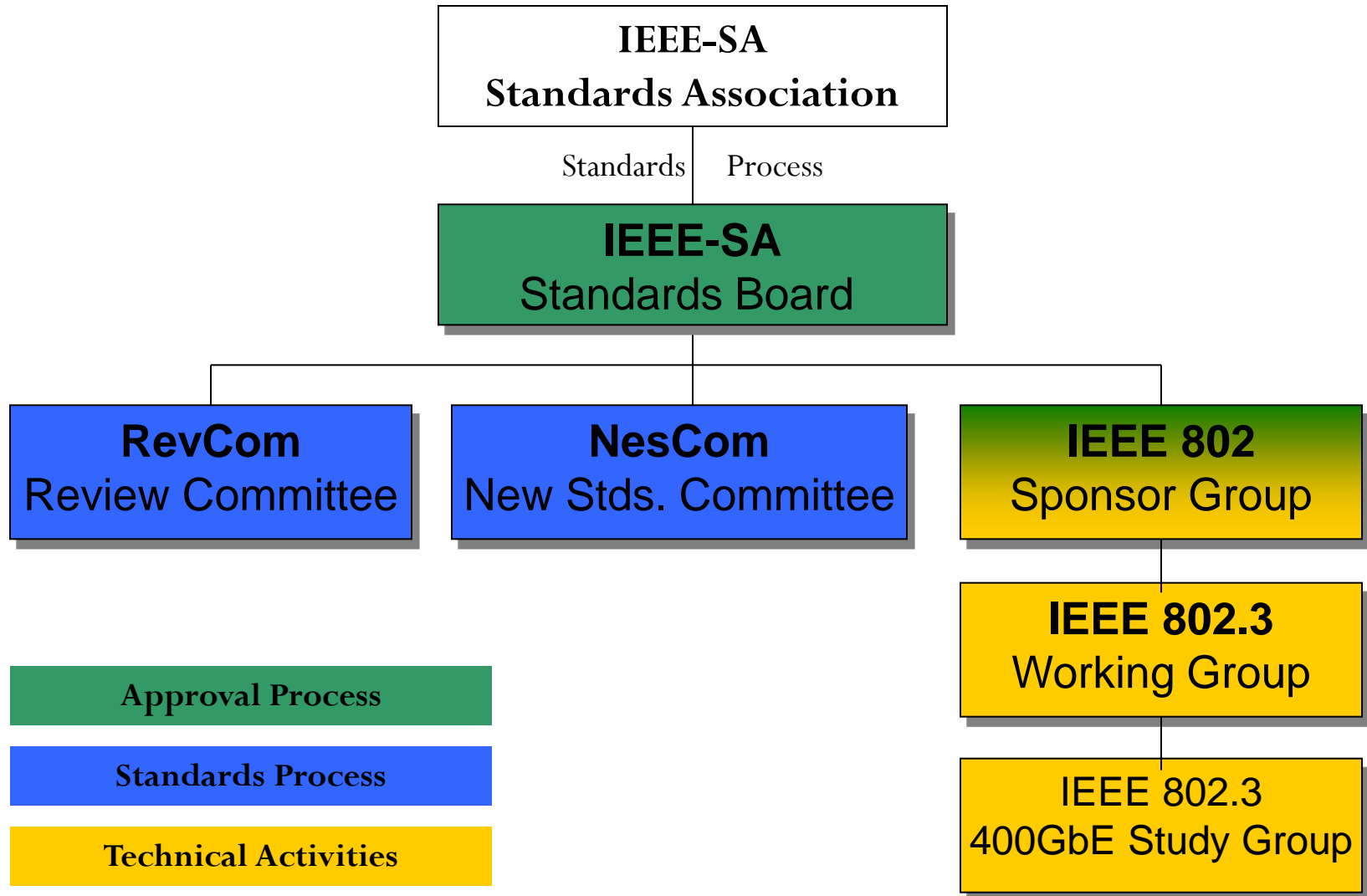
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See *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and “Promoting Competition and Innovation: What You Need to Know about the IEEE Standards Association's Antitrust and Competition Policy” for more details.

# Ground Rules

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- Based upon IEEE 802.3 Rules
  - Foundation based upon Robert's Rules of Order
  - Anyone in the room may speak
  - Anyone in the room may vote
- **RESPECT**... give it, get it
- NO product pitches
- NO corporate pitches
- NO prices!!!
  - This includes costs, ASPs, etc. no matter what the currency
- NO restrictive notices

# IEEE Structure

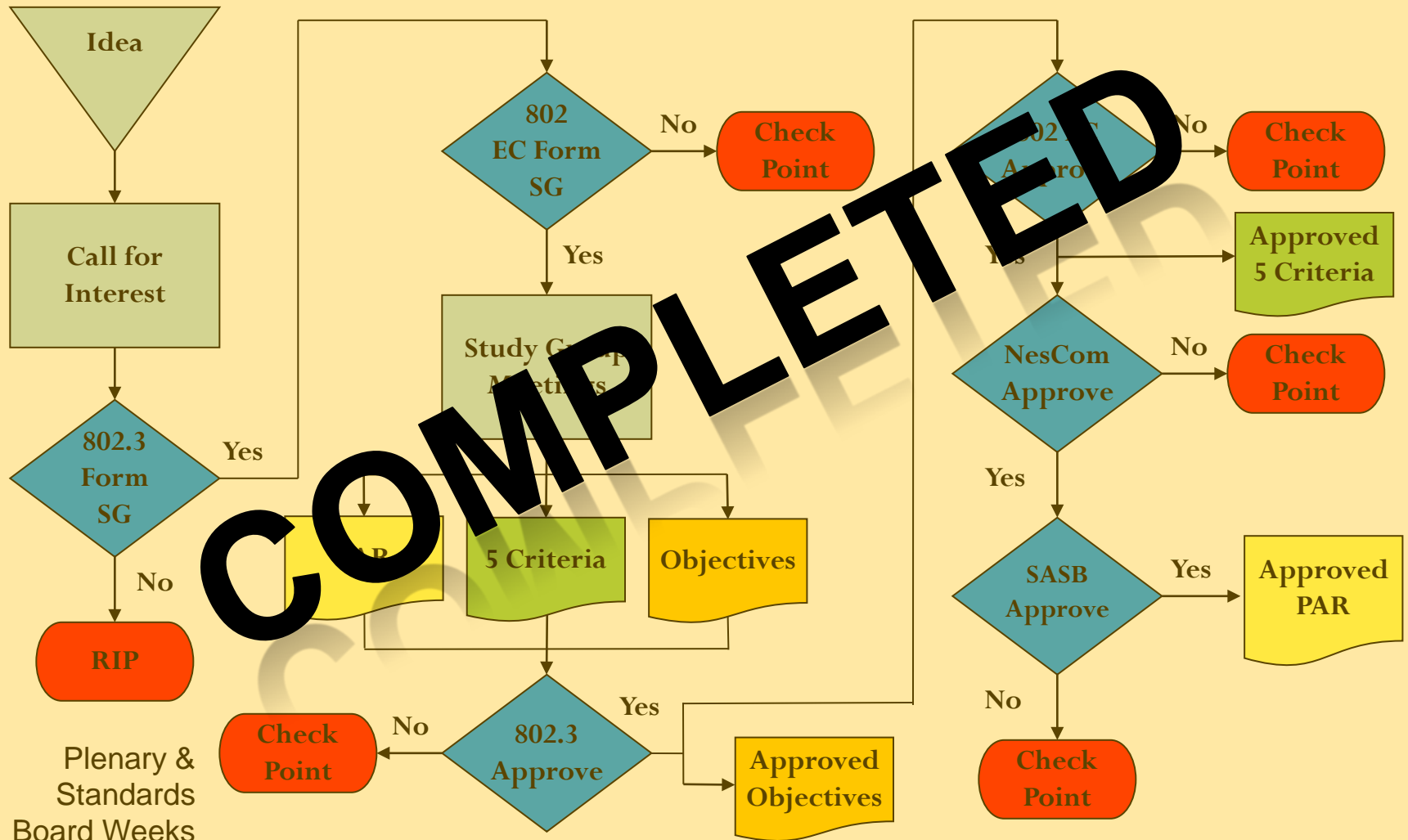


# Important Bylaws, Rules, & References

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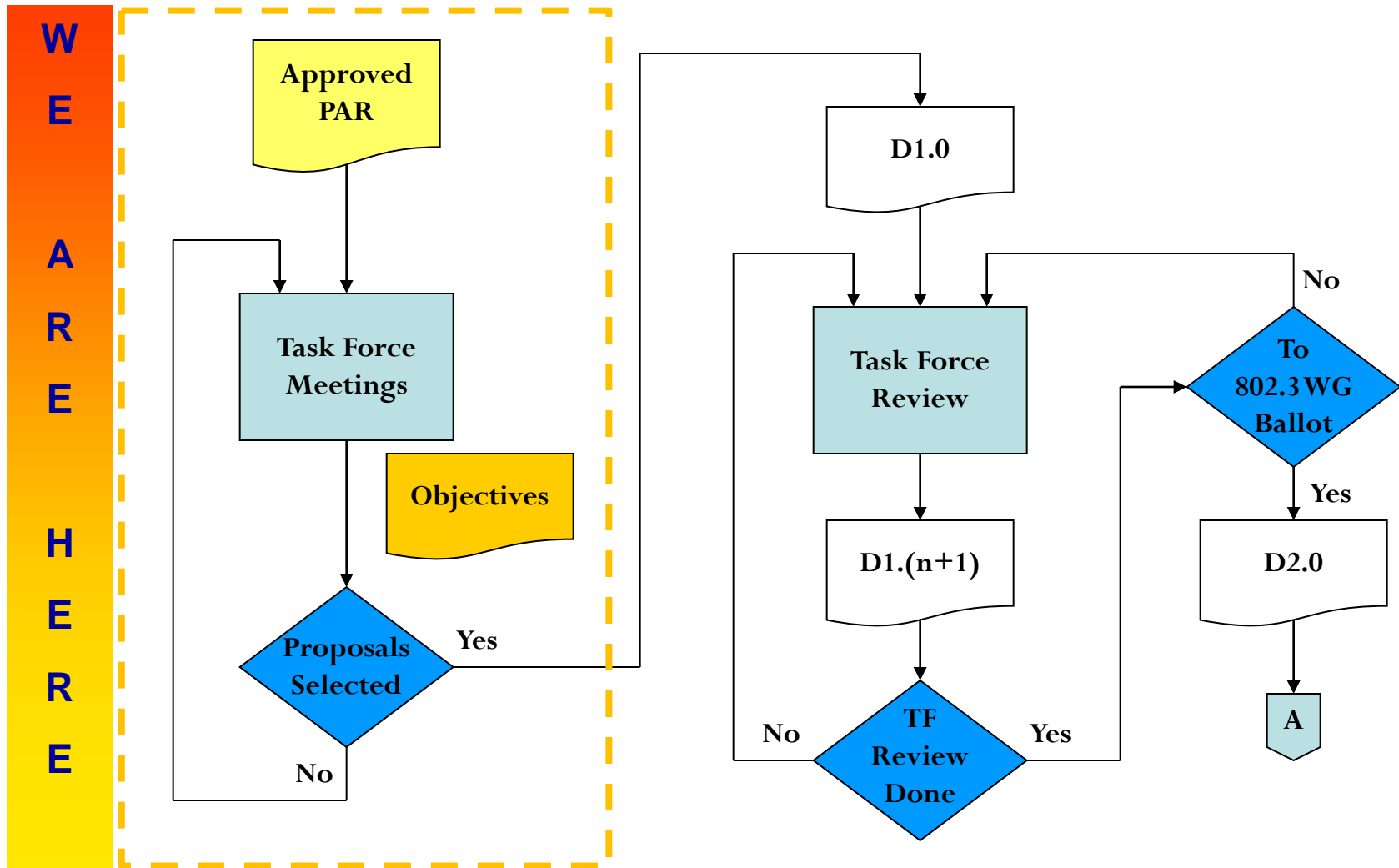
- **IEEE-SA Operations Manual**  
<http://standards.ieee.org/sa/sa-om.pdf>
- **IEEE-SA Standards Board Bylaws**  
<http://standards.ieee.org/guides/bylaws/sb-bylaws.pdf>
- **IEEE-SA Standards Board Operations Manual**  
<http://standards.ieee.org/guides/opman/sb-om.pdf>
- **IEEE 802 LAN/MAN Standards Committee (LMSC) Policies and Procedures**  
<http://standards.ieee.org/about/sasb/audcom/pnp/LMSC.pdf>
- **IEEE 802 LAN/MAN Standards Committee (LMSC) Operations Manual**  
[http://www.ieee802.org/PNP/2010-07/IEEE\\_802\\_LMSC\\_OM\\_approved\\_100716.pdf](http://www.ieee802.org/PNP/2010-07/IEEE_802_LMSC_OM_approved_100716.pdf)
- **IEEE 802 LAN/MAN Standards Committee (LMSC) Working Group (WG) Policies and Procedures**  
[http://www.ieee802.org/PNP/2010-07/IEEE\\_802\\_LMSC\\_WG\\_PandP\\_approved\\_100716.pdf](http://www.ieee802.org/PNP/2010-07/IEEE_802_LMSC_WG_PandP_approved_100716.pdf)
- **IEEE 802.3 Working Group Operating Rules**  
[http://ieee802.org/3/rules/P802\\_3\\_rules.pdf](http://ieee802.org/3/rules/P802_3_rules.pdf)
- **“Promoting Competition and Innovation: What You Need to Know about the IEEE Standards Association's Antitrust and Competition Policy”**  
<http://standards.ieee.org/develop/policies/antitrust.pdf>

# Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase



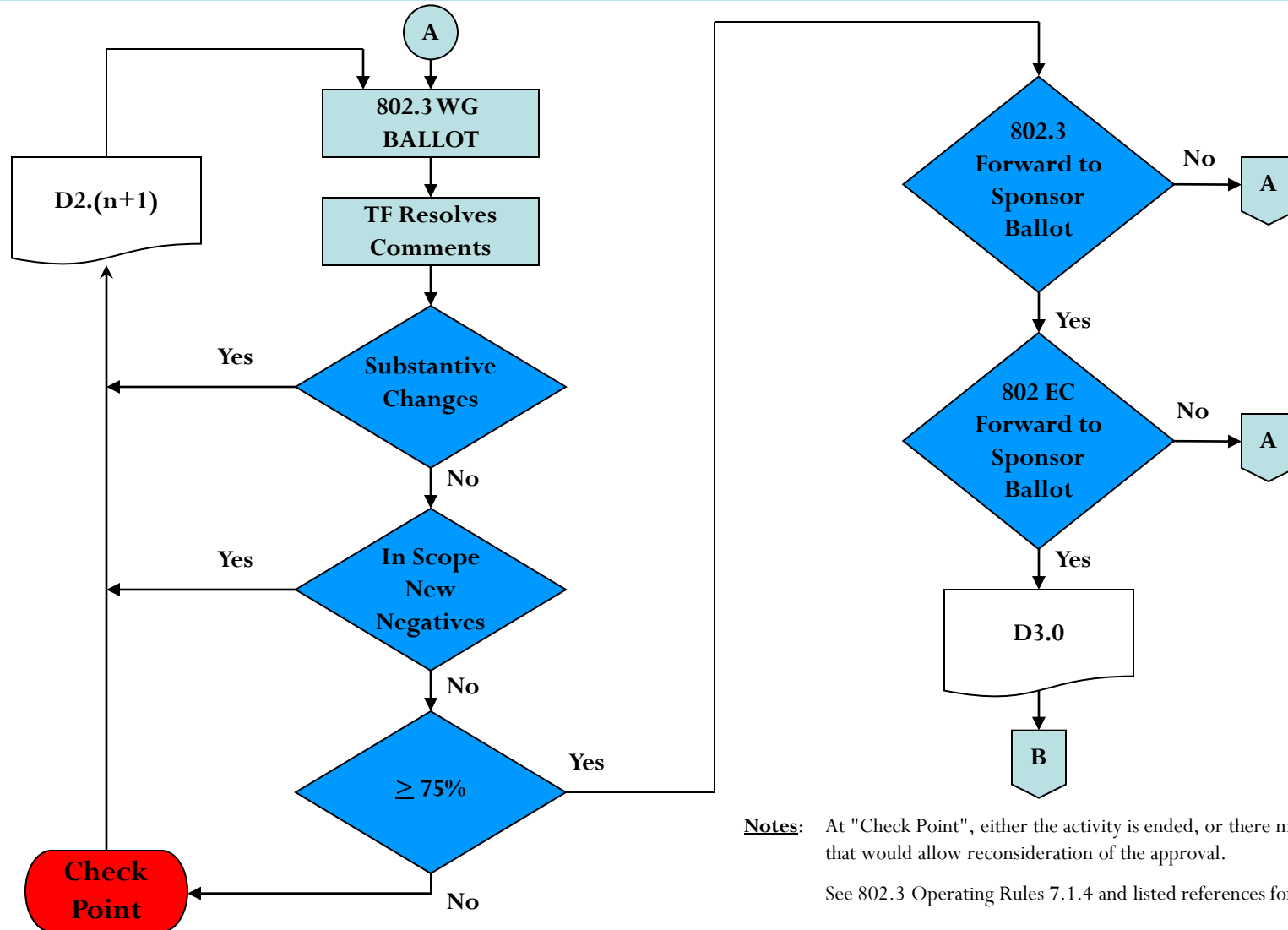
Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

# Overview of IEEE 802.3 Standards Process (2/5) – Task Force Comment Phase



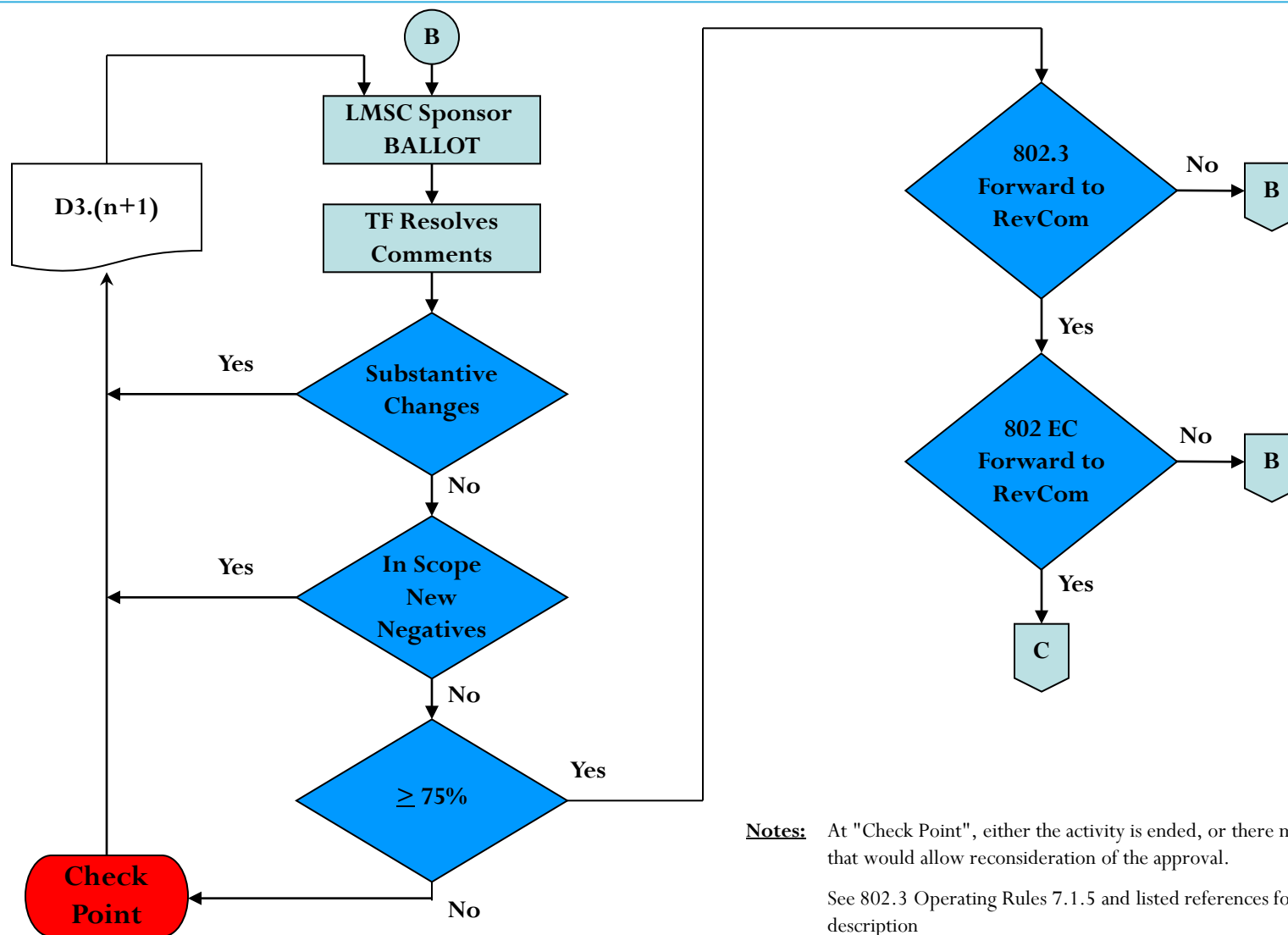


# Overview of IEEE 802.3 Standards Process (3/5) – Working Group Ballot Phase



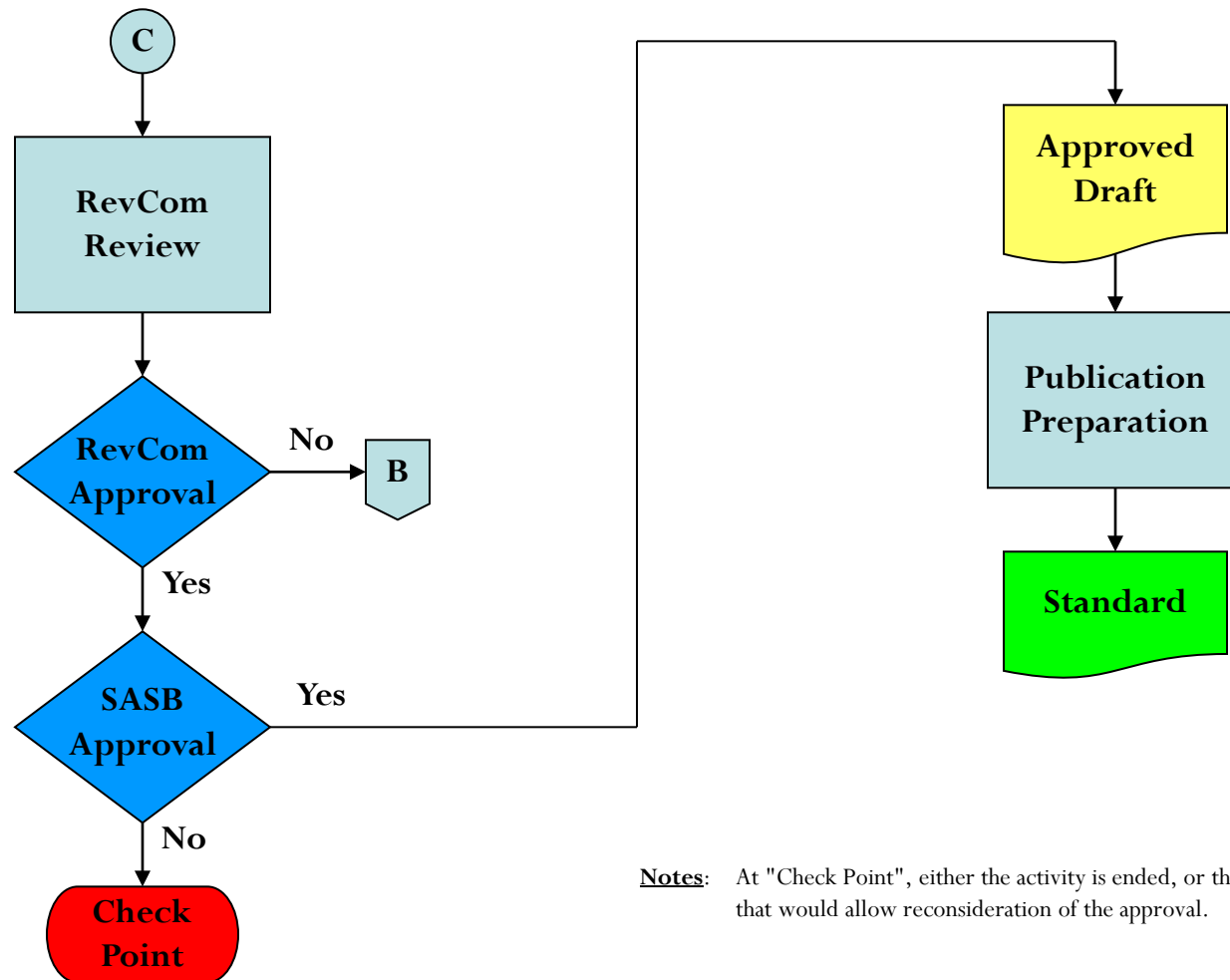
**Notes:** At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.  
See 802.3 Operating Rules 7.1.4 and listed references for complete description

# Overview of IEEE 802.3 Standards Process (4/5)- Sponsor Ballot Phase



**Notes:** At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.  
See 802.3 Operating Rules 7.1.5 and listed references for complete description

# Overview of IEEE 802.3 Standards Process (5/5) – Final Approvals / Standard Release



**Notes:** At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

# Project Documentation

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- **PAR -**

[http://www.ieee802.org/3/bs/PAR\\_P802.3bs\\_14\\_0612.pdf](http://www.ieee802.org/3/bs/PAR_P802.3bs_14_0612.pdf)

- **CSD -**

[http://www.ieee802.org/3/bs/CSD\\_400\\_14\\_0121.pdf](http://www.ieee802.org/3/bs/CSD_400_14_0121.pdf)

- **Objectives -**

[http://www.ieee802.org/3/bs/Objectives\\_14\\_0320.pdf](http://www.ieee802.org/3/bs/Objectives_14_0320.pdf)

- **Timeline -**

[http://www.ieee802.org/3/bs/timeline\\_3bs\\_0514.pdf](http://www.ieee802.org/3/bs/timeline_3bs_0514.pdf)

# Project 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

# Liaisons and Communications

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- OIF – Progress on OIF CEI-56G Projects
  - [http://www.ieee802.org/3/bs/public/14\\_11/OIF\\_Liaison\\_CEI56G\\_Progress\\_28Oct14.pdf](http://www.ieee802.org/3/bs/public/14_11/OIF_Liaison_CEI56G_Progress_28Oct14.pdf)
- CDFP MSA
  - [http://www.ieee802.org/3/bs/public/14\\_11/41031\\_Letter\\_to\\_IEEE.pdf](http://www.ieee802.org/3/bs/public/14_11/41031_Letter_to_IEEE.pdf)

# Ad Hoc

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- Webpage: Ad Hoc
  - <http://www.ieee802.org/3/bs/public/adhoc/index.shtml>
- Ad Hoc
  - Logic, Chair – Mark Gustlin
  - Use Case, Chair – Gary Nicholl
  - SMF, Chair – Pete Anslow
  - MMF, Chair – Jonathan King
  - Electrical Interface, Co-chair – Joel Goergen,  
Co-chair – Vasu Parthasarathy

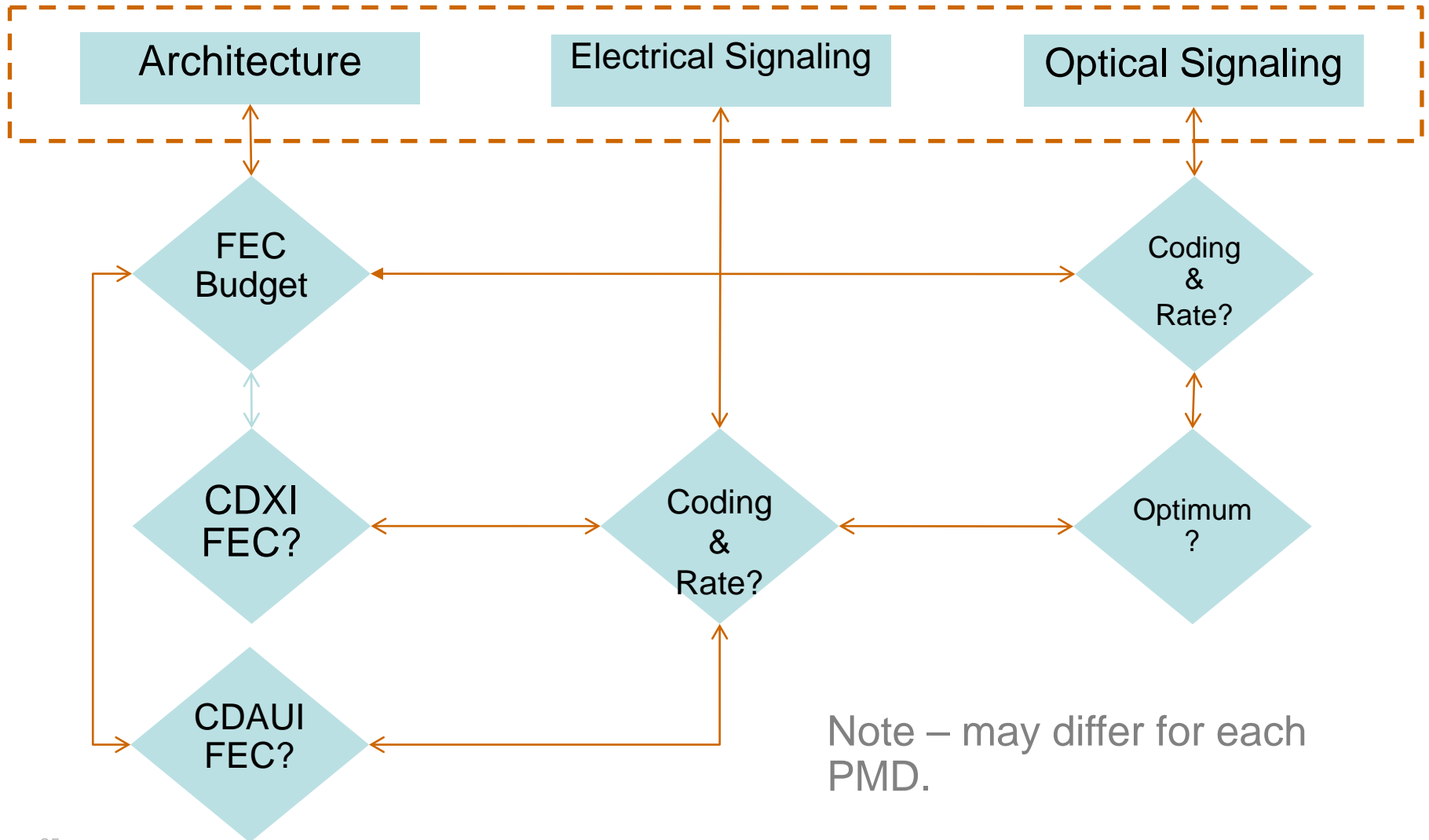
# Ad Hoc Reports

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- Logic, Chair – Mark Gustlin
  - [http://www.ieee802.org/3/bs/public/14\\_11/gustlin\\_3bs\\_01\\_1114.pdf](http://www.ieee802.org/3/bs/public/14_11/gustlin_3bs_01_1114.pdf)
- SMF, Chair – Pete Anslow
  - [http://www.ieee802.org/3/bs/public/14\\_11/anslow\\_3bs\\_01\\_1114.pdf](http://www.ieee802.org/3/bs/public/14_11/anslow_3bs_01_1114.pdf)
- MMF, Chair – Jonathan King
  - [http://www.ieee802.org/3/bs/public/14\\_11/king\\_3bs\\_01\\_1114.pdf](http://www.ieee802.org/3/bs/public/14_11/king_3bs_01_1114.pdf)
- Electrical Interface, Co-chair – Joel Goergen, Co-chair – Vasu Parthasarathy
  - [http://www.ieee802.org/3/bs/public/14\\_11/goergen\\_3bs\\_04\\_1114.pdf](http://www.ieee802.org/3/bs/public/14_11/goergen_3bs_04_1114.pdf)



# Interrelations Between Technical Decisions



# Tuesday

All times listed are subject to change.  
Revisions presented will be noted in minutes

Time	Presenter	Affiliation	Title	File Name
8:00 AM	John D'Ambrosia	Dell	Agenda and General Information	agenda_3bs_01_1114
8:30 AM	Pete Anslow	Ciena	FEC performance on multi-part links	anslow_3bs_02_1114
8:50 AM	Jonathan King	Finisar	400G MMF 100m reach baseline proposal	king_3bs_02_1114
9:10 AM	Chris Cole	Finisar	400Gb/s 2km & 10km duplex SMF NRZ PMD Nominal Specifications	cole_3bs_01_1114
9:25 AM	Chris Cole	Finisar	400Gb/s 2km & 10km duplex SMF PAM-4 PMD Nominal Specifications	cole_3bs_02_1114
9:40 AM	Chris Cole	Finisar	400Gb/s 500m PSM4 NRZ PMD Nominal Specifications	cole_3bs_03_1114
9:55 AM	Break			
10:10 AM	Chris Cole	Finisar	400Gb/s 500m PSM4 PAM-4 PMD Nominal Specifications	cole_3bs_04_1114
10:25 AM	Mizuki Shirao	Mitsubishi	Proposal of 50G NRZ specification for 400GbE 10km	shirao_3bs_01_1114
10:50 AM	Mizuki Shirao	Mitsubishi	Proposal of 8 x 50G NRZ specification for 400GbE 2km PMD	shirao_3bs_02_1114
11:15 AM	David Lewis	JDSU	Proposal for 400GE Optical PMDs for SMF Objectives based on 4 x 100G DMT	lewis_3bs_01_1114
11:40 AM	Tomoo Takahara	Fujitsu	400 GbE draft proposal for 10km based on 4 x 100G DMT	takahara_3bs_01_1114
12:00 PM	Lunch			

# Tuesday

All times listed are subject to change.  
Revisions presented will be noted in minutes

12:00 PM	Lunch			
1:00 PM	Brian Welch	Luxtera	A proposal for the 500m objective using 100 Gbps per lane Signaling	welch_3bs_01_1114
1:25 PM	Beck Mason	JDSU	Proposal for 400GE Optical PMD for 2km SMF Objective based on 4 x 100G PAM4	mason_3bs_01_1114
1:50 PM	Riu Hirai	Hitachi	Baseline for 400GE 2km and 10km SMF PMD	hirai_3bs_02_1114
2:15 PM	Peter Stassar	Huawei	Further information on PAM4 error performance and power budget considerations	stassar_3bs_01_1114
2:35 PM	Alan Tipper	Semtech	56GBaud PAM4 Error Floor Analysis	tipper_3bs_01_1114
2:55 PM	Break			
3:15 PM	Winston Way	NeoPhotonics	Error Floor Investigation for both 56 and 112Gb/s PAM4 Signals	way_3bs_01_1114
3:35 PM	Yoshiaki Sone	NTT	Improving the Performance of Advanced Modulation Scheme	sone_3bs_01_1114
3:55 PM	Riu Hirai	Hitachi	Supplementary Information on Nyquist-PAM4	hirai_3bs_01_1114
4:15 PM	Matt Traverso	Cisco	Analytic Estimation of MPI Penalty with supporting experimental measurements	traverso_3bs_01_1114
4:35 PM	Will Bliss	Broadcom	Does PAM-4 or NRZ require an intra-Baud clipping penalty?	bliss_3bs_01_1114
4:55 PM	Yangjing Wen	Huawei	Demonstration of Optical 56Gbps NRZ for 400GbE PMD Using 56Gbps SerDes	wen_3bs_01_1114
5:15 PM	Yangjing Wen	Huawei	Experimental Demonstration of 56Gbps NRZ for 400GbE 2km and 10km PMD Using 28Gbps Optical Transmitter and Rx EQ	wen_3bs_02_1114
5:30 PM	Break for Day			

# Wednesday

All times listed are subject to change.  
Revisions presented will be noted in minutes

8:30 AM	John D'Ambrosia	Dell	Opening Comments	
8:40 AM	Toshiki Tanaka	Fujitsu	Technical discussion on 400GbE PMD for SMF Objectives	tanaka_3bs_01_1114
9:00 AM	Mark Gustlin	Xilinx	400GbE Architecture Baseline Proposal	gustlin_3bs_02_1114
9:25 AM	Gary Nicholl	Cisco	FEC Architecture	dambrosia_3bs_01_1114
9:45 AM	Adam Healey	Avago	CDAUI-8 chip-to-module and chip-to-chip interfaces using PAM4 modulation	healey_3bs_01_1114
10:05 AM	Break			
10:25 AM	Mark Gustlin	Xilinx	400G PCS Options	gustlin_3bs_02_1114
10:45 AM	Joel Goergen	Cisco	50Gb/s Modulation Proposal	goergen_3bs_03_1114
11:10 AM	Mike Li	Altera	Draft Baseline Proposal for CDAUI-8 Chip-to-Chip (c2c)	li_3bs_01_1114
11:35 AM	Dave Brown	Semtech	Draft Baseline Proposal for CDAUI-8 Chip-to-Module (c2m)	brown_3bs_01_1114
12:00 PM	Lunch			

# Wednesday

All times listed are subject to change.  
Revisions presented will be noted in minutes

1:00 PM	Joel Goergen	Cisco	Spanning SERDES Across Reaches - Finding the Best Modulation Approach	goergen_3bs_01_1114
1:25 PM	Joel Goergen	Cisco	Proposal for LPPI	goergen_3bs_02_1114
1:50 PM	Vivek Telang	Broadcom	50G PAM4 Serdes Performance on a Medium Reach Chip-to-Chip Channel	valliappan_3bs_01_1114
2:10 PM	Haoli Qian	Credo Semiconductor	56G NRZ Channel Measurement Data	qian_3bs_01_1114
2:30 PM	Mike Dudek	Qlogic	56G chip to module channels	dudek_3bs_01_1114
2:50 PM	Break			
3:10 PM	Dave Brown	Semtech	NRZ vs PAM-4 Re-Timer Power Comparison for 56Gb/s C2M and C2EO Electrical Channels	brown_3bs_02_1114
3:30 PM	Martin Langhammer	Altera	FEC Cores - Areas and Models	langhammer_3bs_01_1114
3:50 PM	Martin Langhammer	Altera	FEC Considerations for 400GE and Beyond	langhammer_3bs_02_1114
4:10 PM	Xinyuan Wang	Huawei	Some Consideration of Stronger FEC in 400GbE	wang_x_3bs_01_1114
4:30 PM	Tongtong Wang	Huawei	FEC Performance of FOM Bitmux in Different User Cases	wang_3bs_01_1114
4:50 PM	Vasu Partsarathy	Broadcom	FEC Codes for 400 Gbps 802.3bs	parthasarathy_3bs_01_1114
5:10 PM	Hideki Isono	Fujitsu Optical Components	Production feasibility study on 400GbE PMD for SMF objectives.	isono_3bs_01_1114
5:30 PM	Rang-Chen (Ryan) Yu	Oplink	Economics of 4x100G PAM4 v.s. 8x50G	yu_3bs_01_1114
6:00 PM	Break for day			

# Thursday

All times listed are subject to change.  
Revisions presented will be noted in minutes

8:30 AM	John D'Ambrosia	Dell	Opening Comments	
8:40 AM	Chris Cole	Finisar	50Gb/s per lane Specification Considerations	cole_3bs_05_1114
9:00 AM	Discussion, Strawpolls, Motions			
10:00 AM	Break			
10:20 AM	Discussion, Strawpolls, Motions			
11:30 AM	Closing Business			
12:00 PM	Adjourn			

\*\* Pending Time Availability left from Presentations and needed Time For Discussion, Strawpolls, & Motions

	Ali Ghiasi **	Ghiasi Quantum LLC	Path towrd 400 GbE PMD consensus	ghiasi_3bs_01_1114
	Tom Palkert **	Molex	Description of breakout and MDI requirements for data center 400G	palkert_3bs_01_1114

# Meeting Map

	Mon	Tues	Wed	Thur	Fri
8:00	SEC	802.3bs	802.3bs	All - Motions & Closing Business	
8:30					
9:00					
9:30					
10:00					
10:30					
11:00	802.0 Plenary				
11:30					
12:00	Lunch	Lunch	Lunch	Lunch	
12:30					
13:00	802.3 Plenary	802.3bs	802.3bs	802.3 Plenary	SEC
13:30					
14:00					
14:30					
15:00					
15:30					
16:00					
16:30					
17:00					
17:30	Dinner	Dinner	Dinner		
18:00					
18:30	Tutorial #1	Tutorial #1	Social		
19:00					
19:30					
20:00		Tutorial #2			
20:30					
21:00					
21:30					

# Future Meetings

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- See: <http://www.ieee802.org/3/interims/index.html>
- Jan 2015 Interim
  - Week of Jan 12
  - Hyatt Regency, Atlanta, GA, USA
  - Hosted by IEEE 802
- Mar 2015 Plenary
  - Week of Mar 8
  - Estrel Hotel and Convention Center, Berlin, Germany
- May 2015 Interim
  - Week of May 18, 2015
  - Omni William Penn Hotel, Pittsburgh, PA, USA
  - Hosted by Ethernet Alliance
- July 2015 Plenary
  - Week of July 12
  - Hilton Waikoloa Village
- Sept 2015 Interim
  - Week of Sept 14
  - Hyatt Regency Coconut Point, Bonita Springs, FL
  - Hosted by NEC
- Anyone interested in hosting a meeting or webex contact me.



# Future Ad Hoc Calls (Tentative)

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- Nov 18 Tuesday SMF 7:30am to 9am PST
- Nov 20 Thursday Electrical 7:30am to 9am PST
- Dec 2 Tuesday Logic 8:00am PST
- Dec 4 Thursday Electrical 7:30am to 9am PST
- Dec 9 Tuesday SMF 7:30am to 9am PST
- Dec 16 Tuesday Logic 8:00am PST
- Dec 18 Thursday Electrical 7:30am to 9am PST
- Jan 2 Friday Electrical 7:30am to 9am PST

Note –Dates / times listed  
are subject to change.

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# Thank You!