

# Agenda and General Information

IEEE 802.3 EPON Protocol over Coax  
(EPoC) PHY Study Group

Howard Frazier  
Broadcom  
San Diego, CA  
17-July-2012

# Agenda

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- Appointment of recording secretary
- Welcome and introductions
- Approve agenda
- Approve minutes from May
- Goals for this meeting
- Reflector and web
- Ground rules
- IEEE
  - Structure
  - Bylaws and Rules
  - Call for Patents
  - IEEE Standards Process
- Liaisons and communications
- Recap of last meeting
  - Objectives
  - 5 Criteria responses
  - PAR
- Presentations
- Motions and closing business
- Future meetings

# 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

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- Hear presentations on requirements, architecture, technical feasibility
- Respond to any comments that are submitted against our PAR and 5 Criteria responses
  - Comments shall be submitted by 5:00 pm Tuesday
  - We shall respond by 5:00 pm Wednesday

# Reflector and Web

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- To subscribe to the EPoC Study Group 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-epoc <yourfirstname> <yourlastname>

*end*

- Send EPoC Study Group reflector messages to:

[stds-802-3-epoc@listserv.ieee.org](mailto:stds-802-3-epoc@listserv.ieee.org)

- Study Group web page URL:

<http://www.ieee802.org/3/epoc/>

- New “Tools” page:

<http://www.ieee802.org/3/epoc/public/tools>

# Task Force Private Area

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- Not yet established
- Will be once we have a draft, or other material requiring password protection
- 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.

# 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

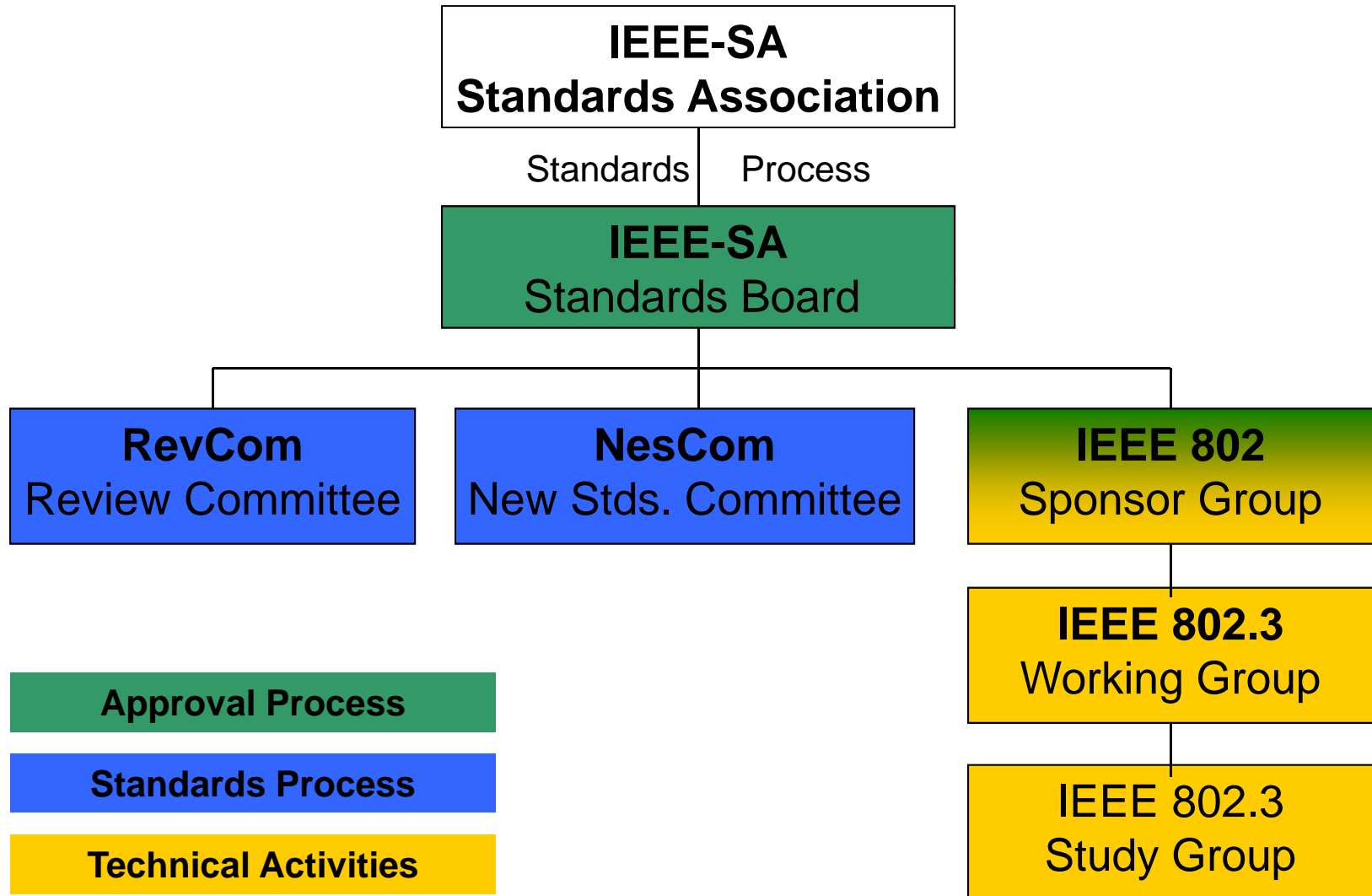
# Attendance

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- Tutorial Material on IMAT attendance tool
  - [https://mentor.ieee.org/etools\\_documentation/bp/IMAT](https://mentor.ieee.org/etools_documentation/bp/IMAT)
- IMAT attendance tool URL
  - <http://imat.ieee.org>
- Make sure that you log your attendance every day!
- Seek assistance if you have difficulty with this tool!



# IEEE Structure



# Important Bylaws and Rules

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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)

# 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

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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

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- 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

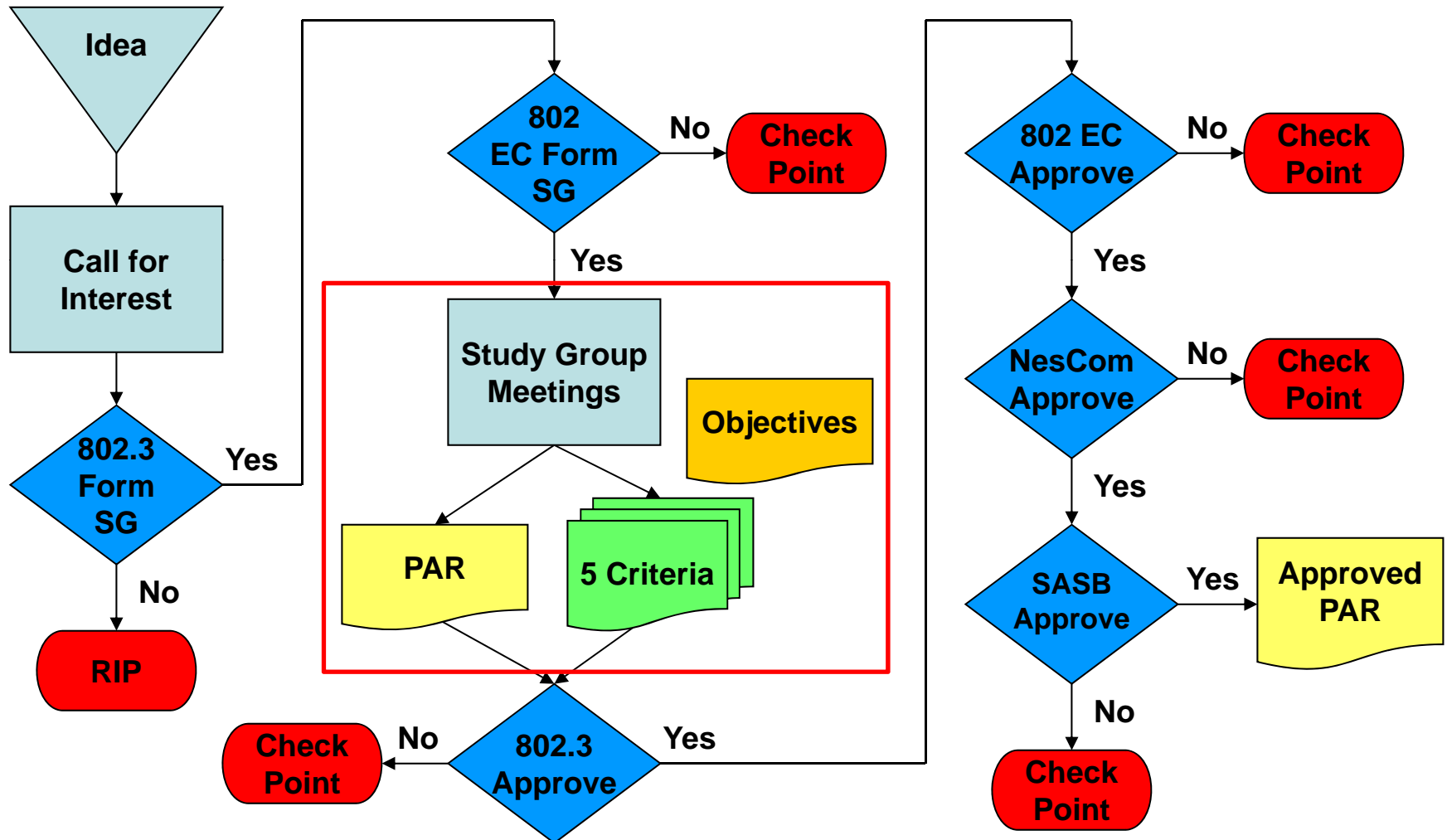
# Other Guidelines for IEEE WG Meetings

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- **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.

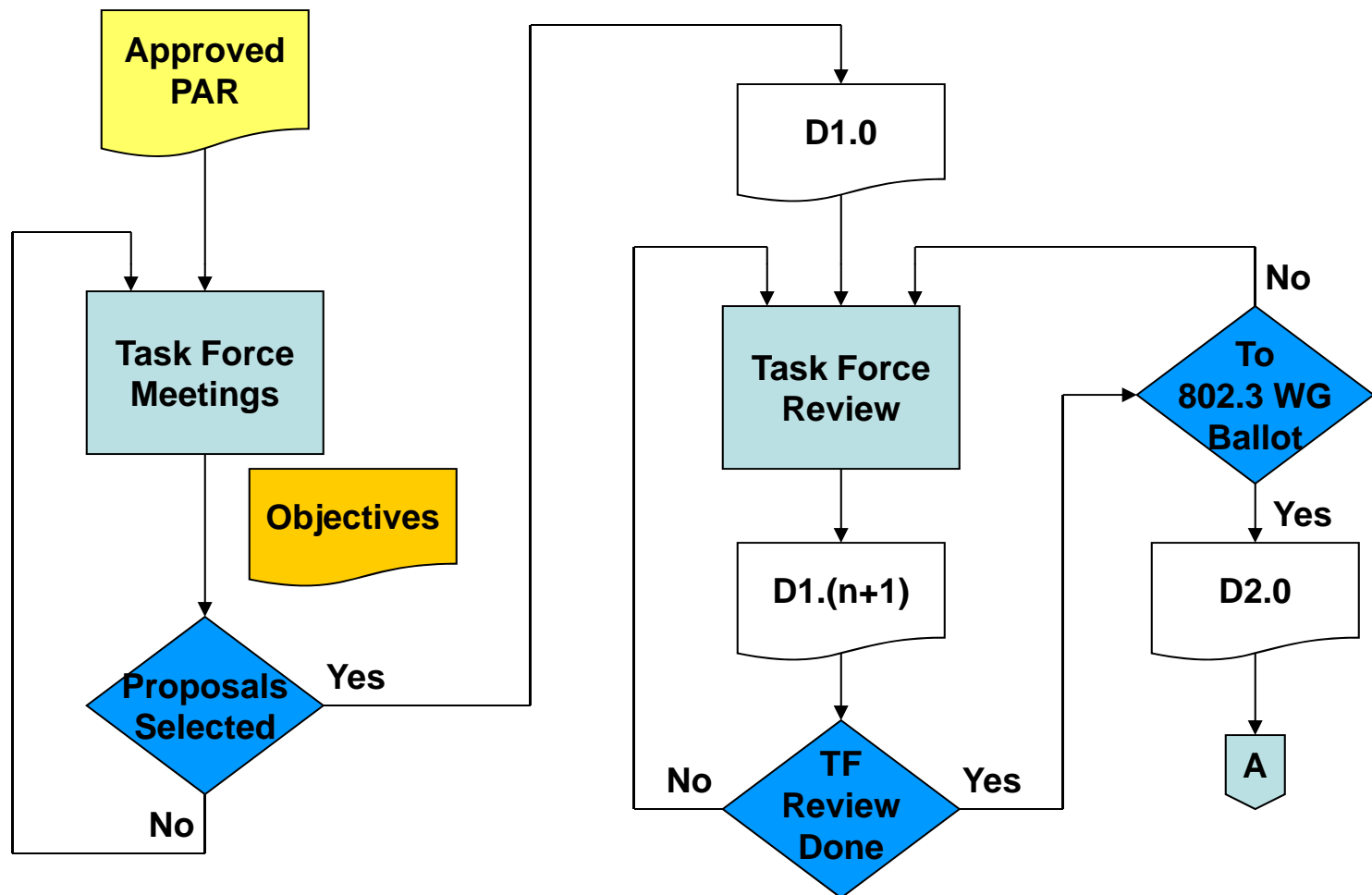
# Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase



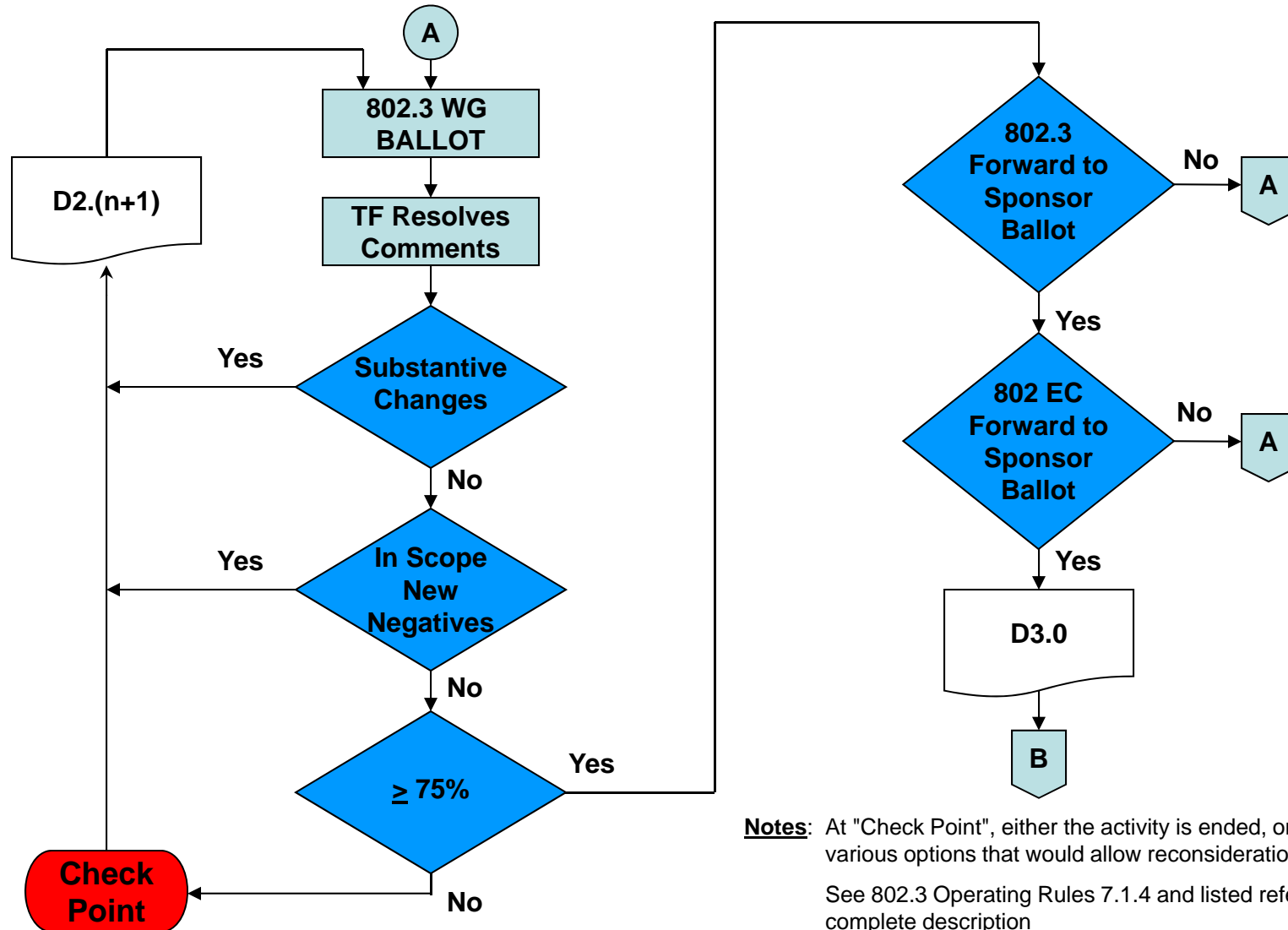
Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.



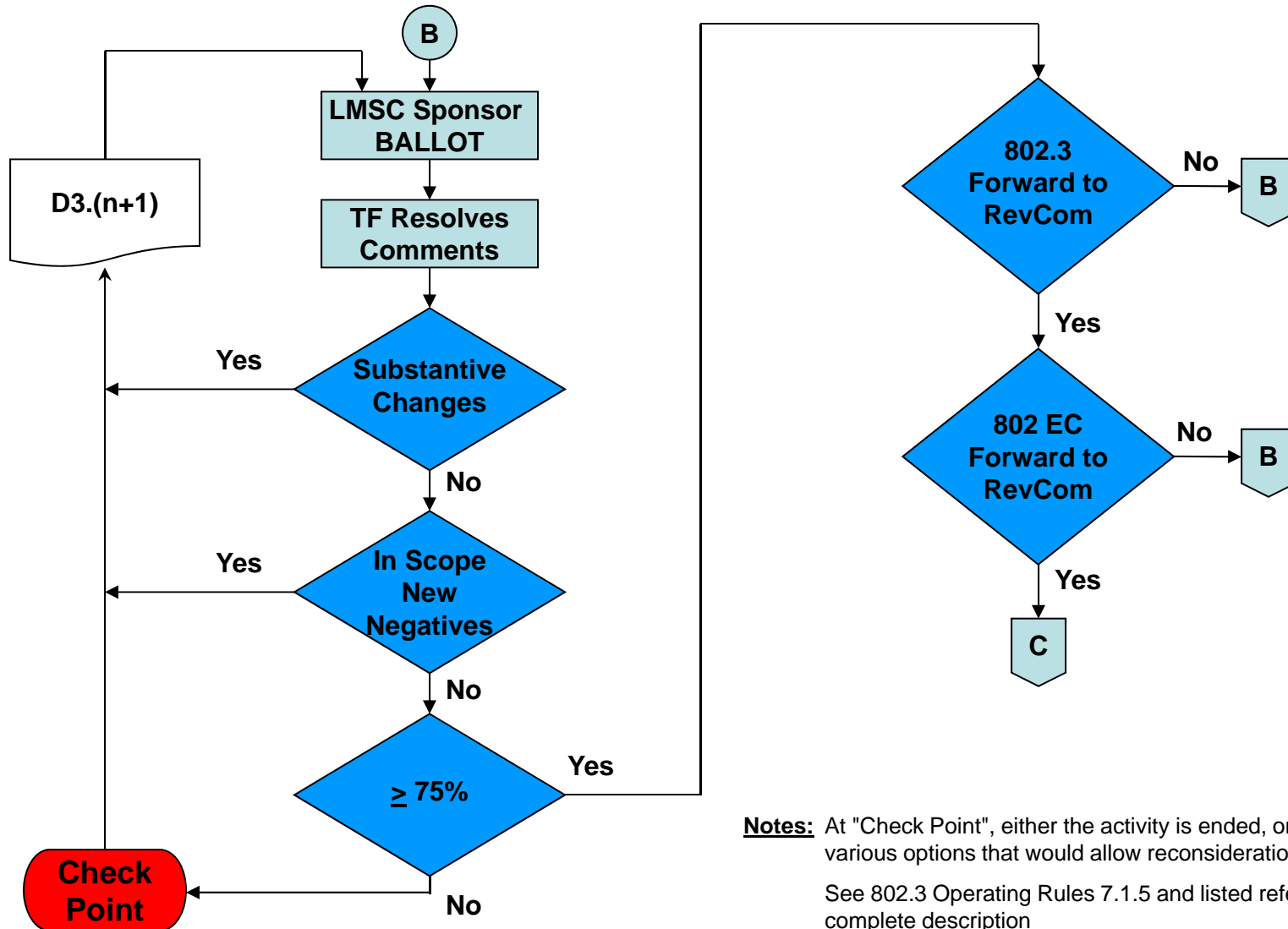
# Overview of IEEE 802.3 Standards Process (2/5) – Task Force Comment Phase



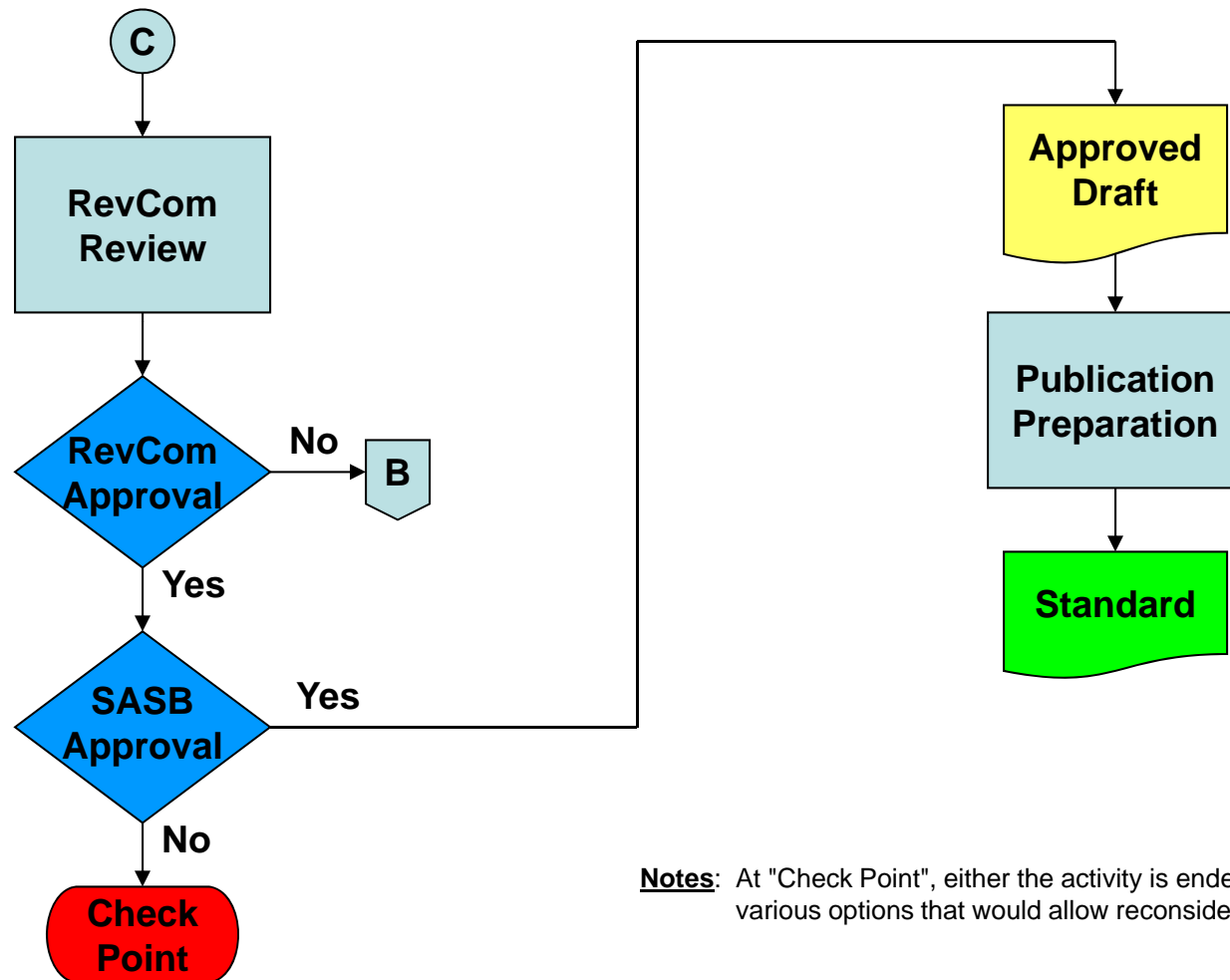
# Overview of IEEE 802.3 Standards Process (3/5) – Working Group Ballot Phase



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



# 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.

# Liaisons and Communications

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- None received

# Recap of last meeting

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- 56 attendees
- Heard 20 presentations
- Adopted 9 objectives
- Adopted text of 5 Criteria responses
- Adopted text of Project Authorization Request
- Responded to a letter from Chinese interests

# Draft Objectives (1/3)

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- **Specify a PHY to support subscriber access networks capable of supporting burst mode and continuous mode operation using the EPON protocol and operating on point-to-multipoint RF distribution plants comprised of either amplified or passive coaxial media.**
- **Maintain compatibility with 1G-EPON and 10G-EPON, as currently defined in IEEE Std. 802.3 with minimal augmentation to MPCP and/or OAM if needed to support the new PHY.**
- **Define required plant configurations and conditions within an overall coaxial network operating model.**

# Draft Objectives (2/3)

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- **Provide a physical layer specification that is capable of:**
  - **A baseline data rate of 1 Gb/s at the MAC/PLS service interface when transmitting in 120 MHz, or less, of assigned spectrum under defined baseline plant conditions;**
  - **A data rate lower than the baseline data rate when transmitting in less than 120 MHz of assigned spectrum or under poorer than defined plant conditions;**
  - **A data rate higher than the 1Gb/s baseline data rate and up to 10 Gb/s when transmitting in assigned spectrum and in channel conditions that permit.**
- **PHY to support symmetric and asymmetric data rate operation.**



# Draft Objectives (3/3)

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- **PHY to support symmetric and asymmetric spectrum assignment for bidirectional transmission.**
- **PHY to support independent configuration of upstream and downstream transmission operating parameters.**
- **PHY to operate in the cable spectrum assigned for its operation without causing harmful interference to any signals or services carried in the remainder of the cable spectrum.**
- **PHY to have:**
  - a downstream frame error ratio better than  $10^{-6}$  at the MAC/PLS service interface;
  - an upstream frame error ratio better than  $5 \times 10^{-5}$  at the MAC/PLS service interface.

# Broad Market Potential

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## **I. Broad sets of applicability**

## **II. Multiple vendors and numerous users**

## **III. Balanced costs (LAN versus attached stations)**

- Given the success of DOCSIS-based services, service providers are looking for cost-effective, high performance means to provide higher data capacity, addressing their CapEx and OpEx, growing market competition and future-proofing their existing coaxial plant, while expanding service portfolios for business and residential customers.
- Service providers have seen unabated growth in both offered capacity and consumption of broadband IP services over the course of 15 years for residential, and recently, business services
- The proposed project would result in a new PHY with the widest possible applicability
- Interest and support from a worldwide array of operators, system vendors, optical and RF component manufacturers, and silicon suppliers has already been demonstrated at CFI and SG stages
- The proposed project will result in the use of the existing EPON architecture by extending its capabilities to support point-to-multipoint RF distribution plants comprised of either amplified or passive coaxial media.
- This approach will allow the project to optimize the cost balance between the network infrastructure components and attached stations in the cable network.

# Compatibility

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**IEEE 802 defines a family of standards. All standards should be in conformance with the IEEE 802.1 Architecture, Management, and Interworking documents as follows: IEEE 802. Overview and Architecture, IEEE 802.1D, IEEE 802.1Q, and parts of IEEE 802.1F. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1.**

**Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.**

## **I. Compatibility with IEEE Std 802.3**

### **II. Conformance with the IEEE Std 802.3 MAC**

### **III. Managed object definitions compatible with SNMP**

- As an amendment to current IEEE Std 802.3, the proposed project will remain in conformance with the IEEE 802 Overview and Architecture, as well as the bridging standards IEEE Std 802.1D and IEEE Std 802.1Q.
- Moreover, the proposed project will build on 1G-EPON and 10G-EPON architecture, extending coverage of Multi Point Control Protocol (MPCP) to amplified and passive coaxial media.
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC, as defined in Annex 4A.
- EPoC will reuse the MAC Control and OAM as defined in the current IEEE Std 802.3 for EPON, with minimal augmentation if necessary, while developing new PHY specifications.
- The project will include a protocol independent specification of managed objects with SNMP management capability to be provided in the future by an amendment or revision to IEEE Std 802.3.1.

# Distinct Identity

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**I. Substantially different from other IEEE 802 standards**

**II. One unique solution per problem (not two solutions to a problem)**

**III. Easy for the document reader to select the relevant specification**

**IV. Substantially different from other IEEE 802.3 specifications/solutions.**

- There is no existing 802 standard or approved project appropriate for operation up to 10 Gb/s over point-to-multipoint active and passive coax plants in symmetric and asymmetric configurations.
- The proposed project is an evolutionary extension of the coverage of Multi Point Control Protocol (MPCP) and OAM, specified for IEEE Std 802.3 EPON, onto coax medium.
- The solution will include a PHY specification.
- The proposed amendment to the existing IEEE Std 802.3 will be formatted as a set of new clauses and changes to existing clauses, making it easy for the document reader to select the relevant specification.

# Technical Feasibility

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## **I. Demonstrated System Feasibility**

## **II. Proven Technology**

## **III. Confidence in reliability**

- Widely deployed data transport technology in the form of DOCSIS & Digital Video services demonstrates the capacity of coaxial networks to support multi-gigabit/second data rates over existing infrastructure when sufficient spectrum is allocated.
- Wideband communication techniques can provide necessary granularity and flexibility of bandwidth assignment in upstream and downstream.
- Millions of successfully deployed and operating 1G-EPON & 10G-EPON devices clearly demonstrate the reliability factor of MAC and PHY layers standardized by 802.3.
- Millions of Cable Modems deployed and operating demonstrate the reliability of high speed data over access cable plants.

# Economic Feasibility

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## **I. Known cost factors, reliable data**

## **II. Reasonable cost for performance**

## **III. Consideration of installation costs**

- The cost factors for EPON components and systems are well known and there is a broad and healthy industry ecosystem associated with these technologies.
- EPoC components are expected to be similar to those used in EPON, and CNU's developed for RF networks should have comparable cost structure as EPON ONU's
- The proposed project might introduce new cost factors which can be quantified and accounted for during the course of the project.
- EPON has been established as an attractive access technology in terms of cost/performance.
- This project is intended to bring these benefits to RF distribution plants comprised of either amplified or passive coaxial media.
- EPoC is expected to follow the same cost/performance trend line, established for all major Ethernet technologies developed by 802.3 in the past.
- Installation, maintenance and operations costs for the new technology are expected to be similar to those of DOCSIS equipment.
  - OLT installation costs should be comparable to the DOCSIS CMTS
  - CNU installation costs should be comparable to the cable modem
  - New optical-to-RF equipment installation costs should be comparable to other hybrid fiber-coax amplifier or node installation costs

# Draft PAR (IEEE P802.3bn)

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- [http://www.ieee802.org/3/epoc/P802\\_3bn\\_PAR\\_170512.pdf](http://www.ieee802.org/3/epoc/P802_3bn_PAR_170512.pdf)

# Presentations - Tuesday

Tuesday, July 17			Duration	Start time
Howard Frazier	Broadcom	Agenda and General Information	0:45	9:00 AM
Marek Hajduczenia	ZTE	EPoC Draft Structure	0:20	9:45 AM
Marek Hajduczenia	ZTE	Data rate adaptation	0:30	10:05 AM
Break			0:15	10:35 AM
Rick Li	Cortina Systems	MPCP extension for EPoC	0:30	10:50 AM
Rick Li	Cortina Systems	Concurrent Upstream Transmission from Multiple CNU's in Single EPoC Coax Segment	0:30	11:20 AM
Jim Chen	Huawei	An example of designing a Coax Convergence Layer in EPoC	0:20	11:50 AM
Lunch			1:00	12:10 PM
Eugene Dai	Cox	Delay analysis of Ethernet Passive Optical Network over Coax	0:20	1:10 PM
Eugene Dai	Cox	EPON over Coax System reference Models	0:20	1:30 PM
Eugene Dai	Cox	Duplexing Methods for Ethernet Passive Optical Network over Coax – FDD or TDD?	0:20	1:50 PM
Jorge Salinger, Hesham ElBakoury, David Barr, Nicola Varanese, Christian Pietsch, Juan Montojo	Comcast, Huawei, Entropic, Qualcomm	Feasibility of TDD in EPoC	1:30	2:10 PM
Break			0:15	3:40 PM
Xiao-Jun Gao	Jiangsu Cable	The status of bidirectional network transformation in China MSOs	0:30	3:55 PM
Mark Laubach	Broadcom	Evaluation Criteria Beyond Objectives	0:30	4:25 PM
Mark Laubach	Broadcom	Comments on Channel models	0:30	4:55 PM
Leo Montreuil	Broadcom	Examination of Spectral Limitations in HFC plants	0:30	5:25 PM
Break for the day				5:55 PM



# Presentations - Wednesday

Wednesday, July 18			Duration	Start time
Avi Kliger	Broadcom	FDD vs. TDD Comparison	0:30	9:00 AM
Ed Boyd	Broadcom	EPoC Delay	0:30	9:30 AM
Yong Yao	Technical Working Committee, China Radio & TV Association	Consideration on EPoC architecture	0:20	10:00 AM
Break			0:15	10:20 AM
Yong Yao	Technical Working Committee, China Radio & TV Association	Feasibility of TDD & China Market Demand on EPoC	0:20	10:35 AM
Marek Hajduczenia	ZTE	Energy Management in EPoC	0:20	10:55 AM
Howard Frazier	Broadcom	Review of comments submitted on our documents	0:45	11:15 AM
Lunch			1:00	12:00 PM
Respond to comments submitted on our documents			2:30	1:00 PM
Break			0:15	3:30 PM
Any other business			2:00	3:45 PM
Future meetings			0:15	5:45 PM
Adjourn				6:00 PM

# Future Meetings

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- See: <http://www.ieee802.org/3/interims/index.html>
- September 2012 Interim
  - ITU-T
  - Geneva, CH
  - September 24-28
- November, 2012 Plenary
  - Grand Hyatt San Antonio
  - San Antonio, Texas USA
  - November 11-16
- If anyone is interested in hosting a meeting, you must contact me or Steve Carlson

# Future Meetings

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I will attend the September interim \_16\_

I probably will attend the September interim \_19\_

I probably will not attend the September interim \_11\_

I will not attend the September interim \_0\_

I will attend an October interim \_12\_\_

I probably will attend an October interim \_14\_\_

I probably will not attend an October interim \_16\_\_

I will not attend an October interim \_4\_\_

I will attend the November plenary \_32\_\_

I probably will attend the November plenary \_8\_\_

I probably will not attend the November plenary \_3\_\_

I will not attend the November plenary \_0\_

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# Thank You!