



IEEE P802.3ba

40 GbE and
100 GbE

Standards Update

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NANOG 44

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Recent Developments

- Defined architectures and nomenclature (100GBASE-ER4, etc)
- Adopted baseline proposals for all objectives
- Finished Draft 1.0
- On schedule: the 40 GbE and 100 GbE standards will be delivered together in June 2010
- Crystal ball says there is already demand for other PMDs outside the scope of 802.3ba (100 GbE serial, etc)
 - Standard defines a flexible architecture that enables many implementations as technology changes
 - Expect MSAs

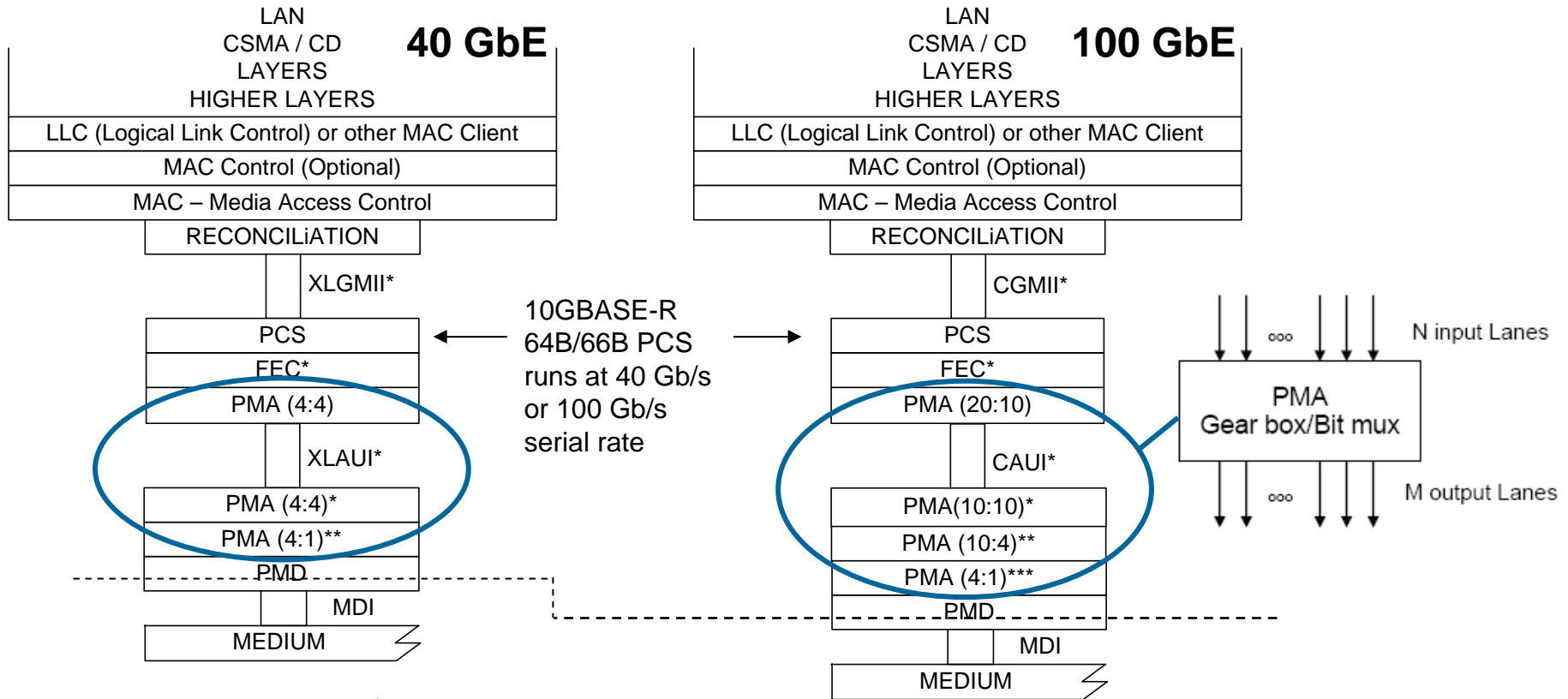
Draft 1.0 is Here!

- Significant milestone, captures all objectives but not technically complete yet (292 pages long)
- Draft 2.0 will technically complete for WG ballot
- Gives people an idea of the technology and solutions for them to scope out implementation
- Technical specifications could still be modified and clarified as people start to implement
 - Looks good on paper but stuff will come up
 - Crossing Is and dotting Ts
- Careful balance between marketing timing and standards process/technical compliance

Summary of Reach Objectives and Physical Layer Specifications

Reach	40 GbE	100 GbE	Solution
1m Backplane	40GBASE-KR4	x	4 x 10 Gb/s (reuse 10GBASE-KR)
10m Copper Cable	40GBASE-CR4	100GBASE-CR10	n x 10 Gb/s (reuse 10GBASE-KR)
100m OM3 MMF	40GBASE-SR4	100GBASE-SR10	n x 10 Gb/s
10km SMF	40GBASE-LR4	100GBASE-LR4	4 x 10 Gb/s and 4 x 25 Gb/s
40km SMF	x	100GBASE-ER4	4 x 25 Gb/s

Overview of Architecture



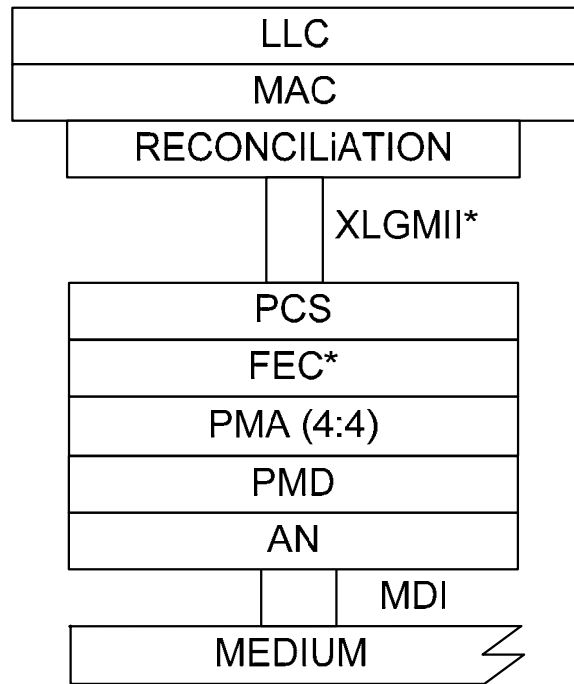
MDI - Medium Dependant Interface
 PCS - Physical Coding Sublayer
 PHY - Physical Layer Device
 PMA - Physical Medium Attachment
 PMD - Physical Medium Dependent
 CGMII - 100 Gigabit Media Independent Interface
 XLGMII - 40 Gigabit Media Independent Interface
 CAUI - 100 Gigabit Attachment Unit Interface
 XLAUI - 40 Gigabit Attachment Unit Interface

- Consistent with previous Ethernet rates, extension to 40 Gb/s and 100 Gb/s data rates
- Same frame format
- No changes to the MAC
- New interface definitions

“Provide appropriate support for OTN”

- No WIS (WAN Interface Sublayer) like we have for 10 GbE
- Define transparent mapping of 40 GbE into existing ODU3
 - Transcoding to be specified by the ITU-T SG15
 - Coordination between ITU-T SG15 and IEEE on control block types
- Define new ODU4 tier for 100 GbE
- Link fault signaling for 802.3ba Ethernet over OTN is feasible

40GBASE-KR4: 1m Backplane

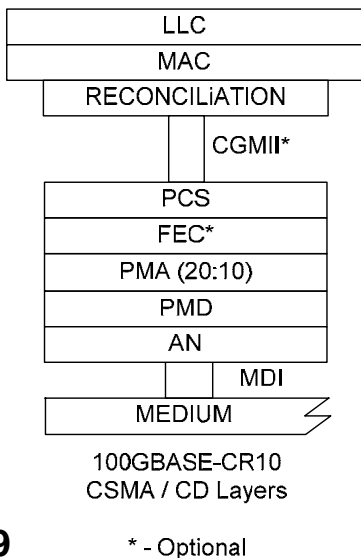
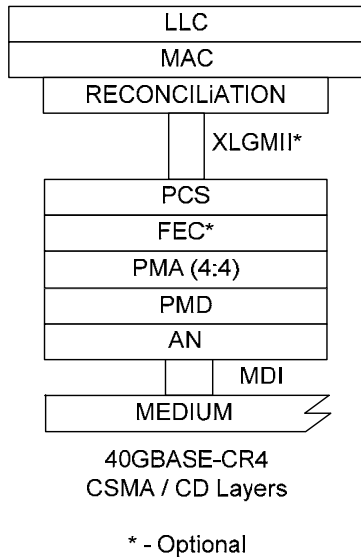


40GBASE-KR4
CSMA / CD Layers

* - Optional

- 1 Gigabit to 40 Gigabit Ethernet solution for backplanes
- Reuses 10GBASE-KR
 - 4 x 10 Gb/s
 - Same Tx / Rx electrical characteristics and testing
- Auto-negotiation
 - Speed
 - Capabilities (FEC, pause ability)
- Influence of EEE (Energy Efficient Ethernet) pending

40GBASE-CR4 and 100GBASE-CR10: 10m Copper Cable

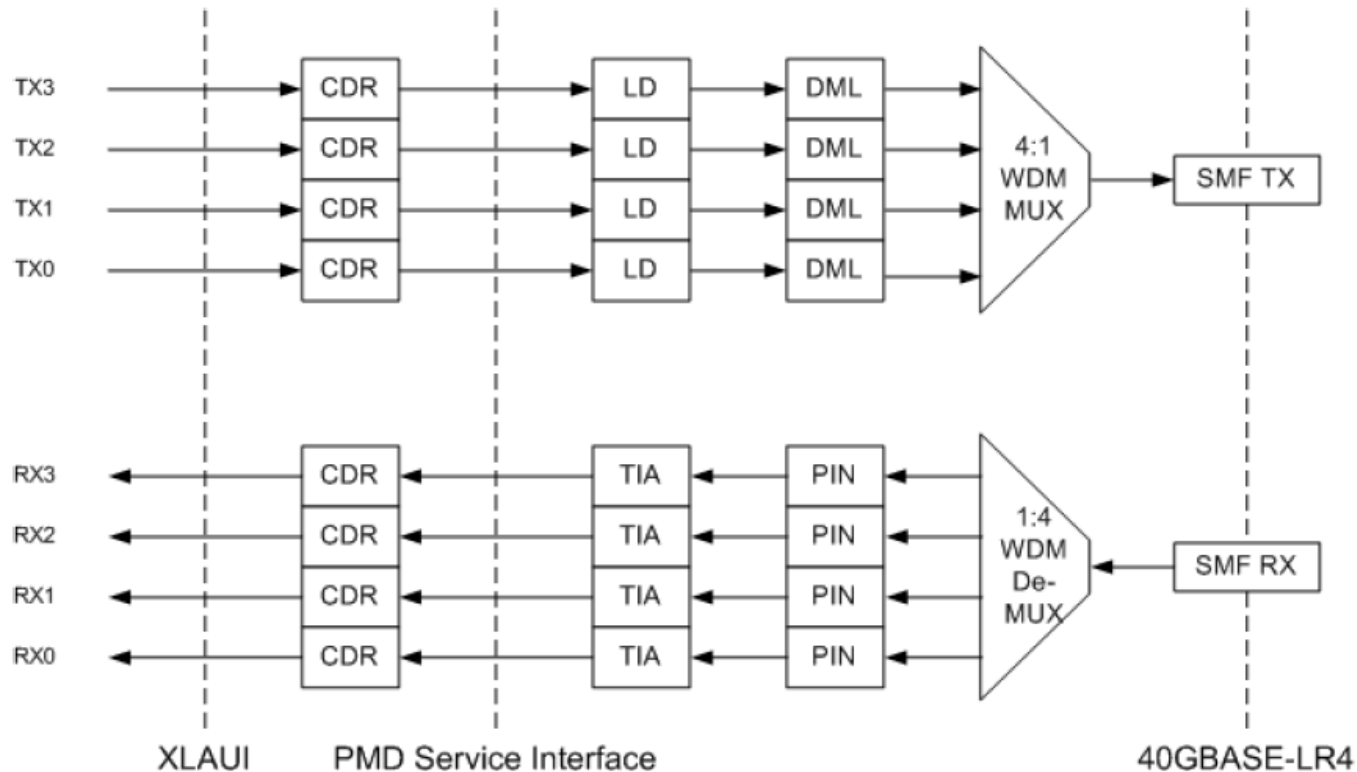


- Reuses 10GBASE-KR
 - 40GBASE-CR4: 4 x 10 Gb/s
 - 100GBASE-CR10: 10 x 10 Gb/s
- Cable parameters based on 10GBASE-CX4
- Auto-negotiation
 - Speed
 - Capabilities (FEC, pause ability)
- 4 x MDI
 - QSFP: enables common form factor for fiber and copper
- 10 x MDI
 - SFF-8092: enables common form factor for fiber and copper

40GBASE-SR4 and 100GBASE-SR10: 100m OM3 MMF

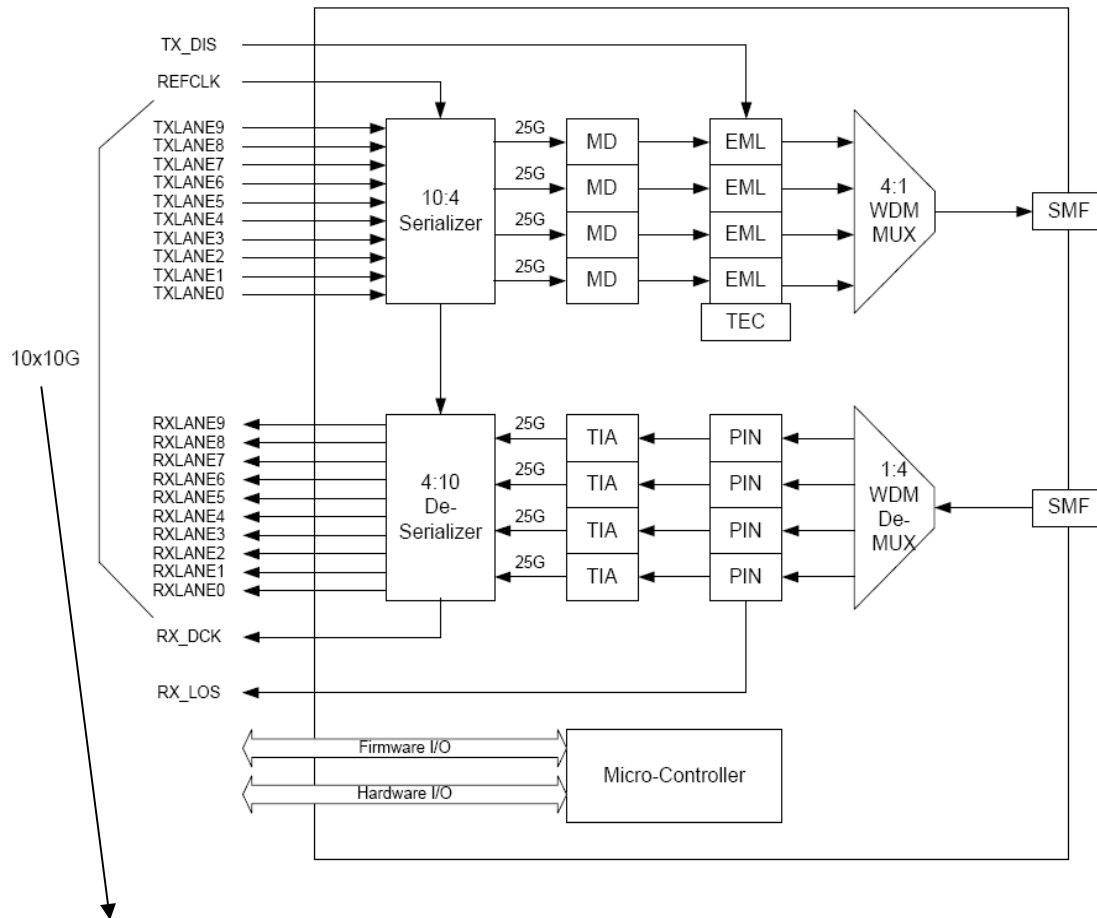
- 40GBASE-SR4
 - 4 Tx / 4 Rx parallel lanes over 4 + 4 OM3 parallel fibers connected to a high density SFF
- 100GBASE-SR10
 - 10 Tx / 4 Rx parallel lanes over 10 + 10 OM3 parallel fibers connected to a high density SFF
- Interest in going beyond 100m
 - How far can the adopted proposal really go?

40GBASE-LR4: 10km SMF



- Uses ITU G.694.2 CWDM grid for LAN applications (CWDM) specification
- Wavelengths 1270nm, 1290nm, 1310nm and 1330nm

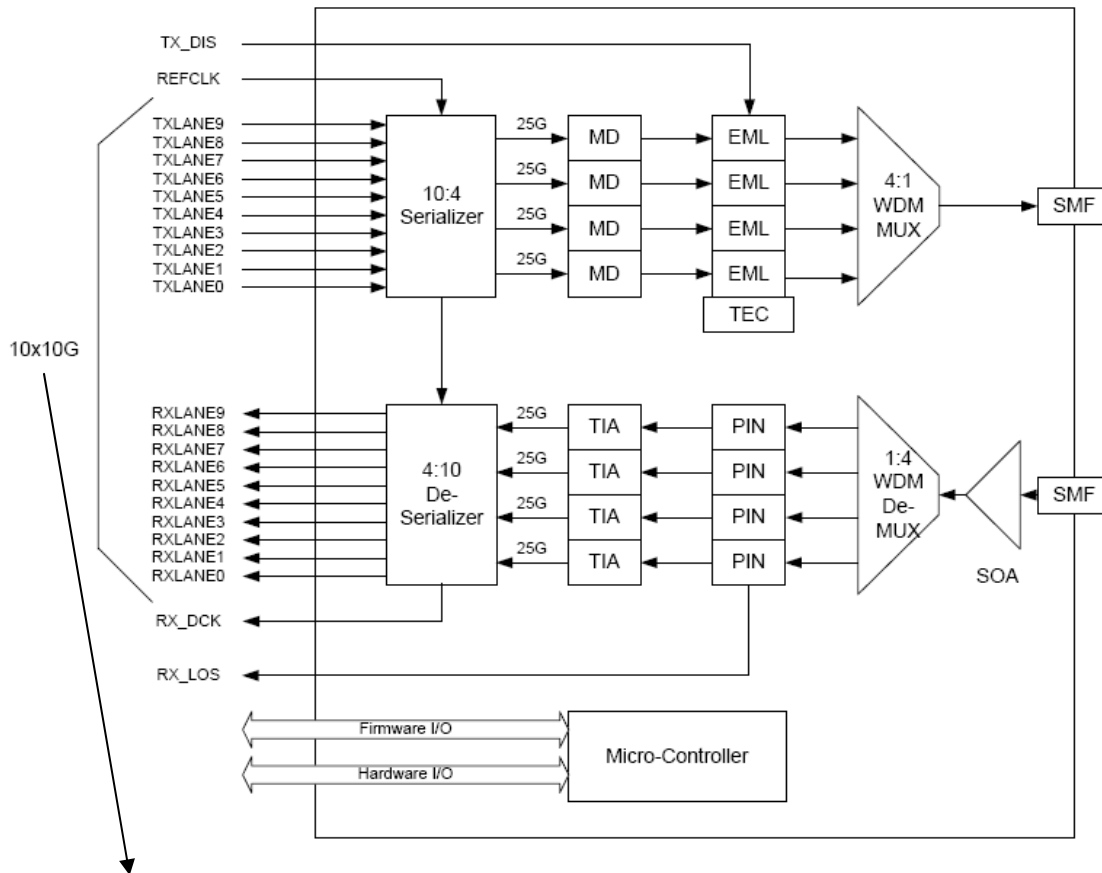
100GBASE-LR4: 10km SMF



- Uses ITU G.694.1 widely spaced DWDM grid for LAN applications (LAN WDM) specification
- Wavelengths 1295nm, 1300nm, 1305nm, and 1310nm
- Same grid as 40km

Development of 25 Gb/s electrical signaling will drive 2nd generation

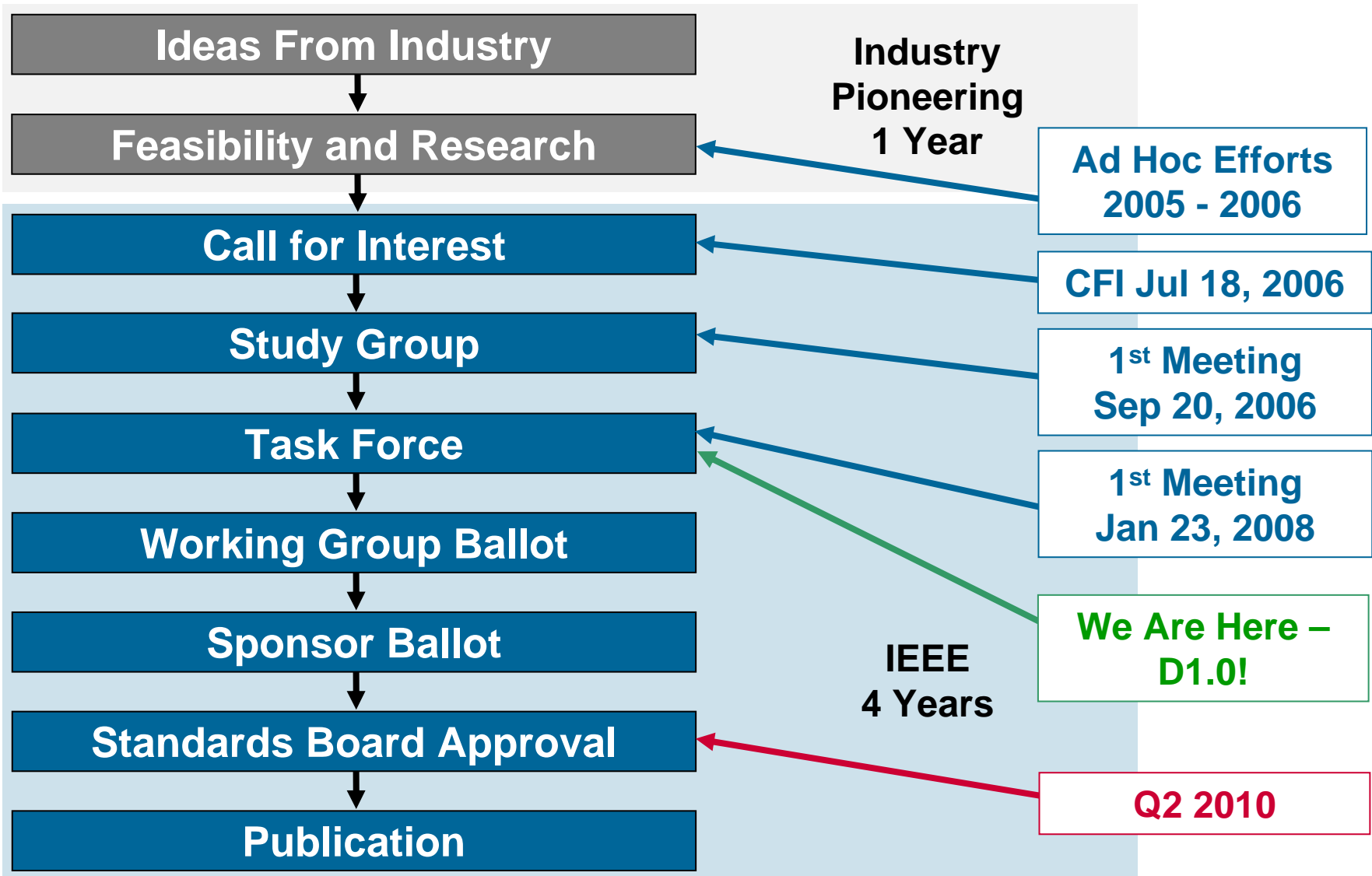
100GBASE-ER4: 40km SMF



- Uses ITU G.694.1 widely spaced DWDM grid for LAN applications (LAN WDM) specification
- Wavelengths 1295nm, 1300nm, 1305nm, and 1310nm
- Same grid as 10km

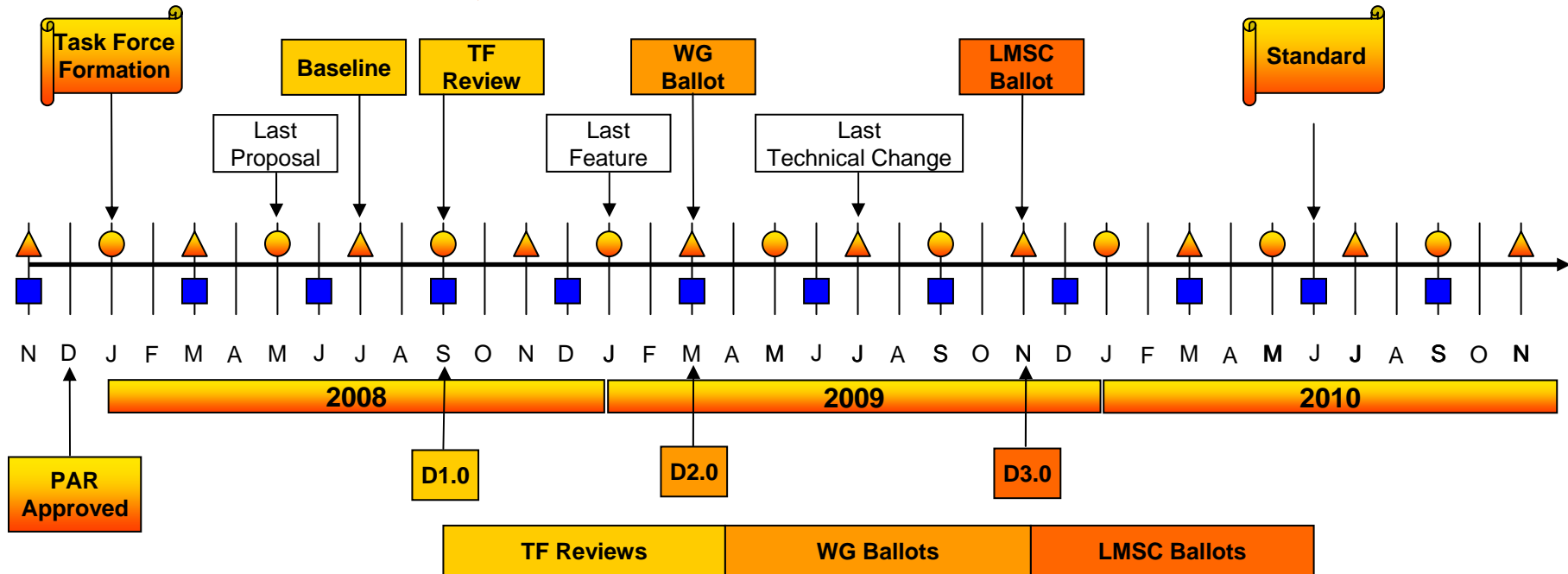
Development of 25 Gb/s electrical signaling will drive 2nd generation

Where are we now after ~3 years?



IEEE P802.3ba Task Force Timeline – March 2008 Plenary

You
Are
Here



Legend

- ▲ IEEE 802 Plenary
- IEEE 802.3 Interim
- IEEE-SA Standards Board

Future Meetings for 2008 and 2009

- September 2008 Interim
 - September 15 – 19, Seoul
 - Review Draft 0.9
 - Resolve 40 GbE 10km SMF objective
- After September Interim
 - Generate Draft 1.0
 - Begin Task Force review
- November 2008 Plenary
 - November 9 – 14, Dallas
 - Draft 1.0 comment resolution, work towards Draft 2.0
- January 2009 Interim
 - January 12 – 16, New Orleans
- March 2009 Plenary
 - March 8 – 13, Vancouver

More Information is Here

- <http://grouper.ieee.org/groups/802/3/ba/>

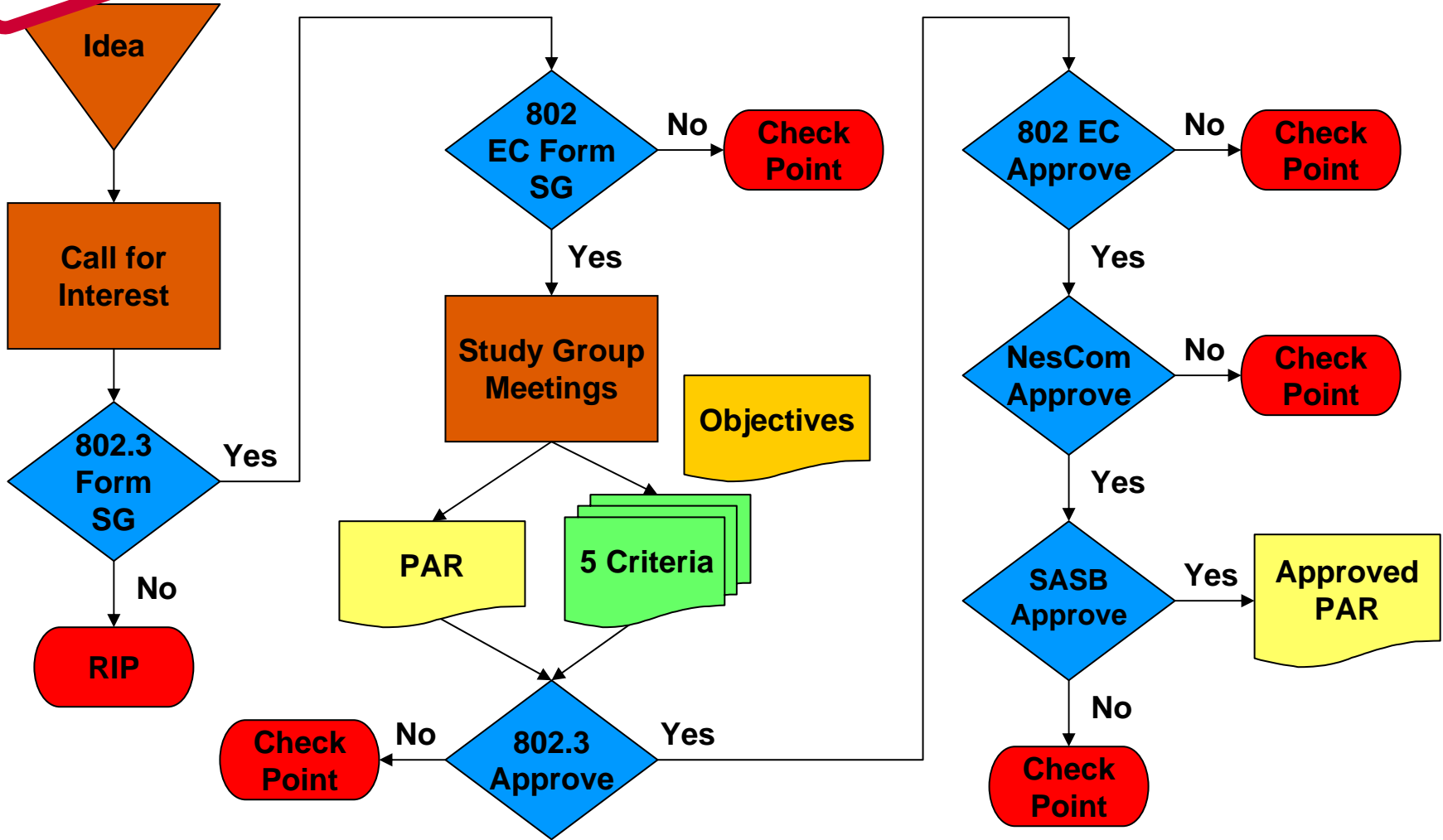
803.3ba Nomenclature Suffix Summary

Speed	Medium		Coding Scheme	Lanes	
	Copper	Optical		Copper	Optical
40G = 40Gb/s	K = Backplane	S = Short Reach (100m)	R = 64B/66B Block Coding	n = 4 or 10	n = Number of Lanes or Wavelengths
100G = 100Gb/s	C = Cable Assembly	L = Long Reach (10km) E = Extended Long Reach (40km)			
				n=1 is not required as serial is implied	

Example: 100GBASE-ER4

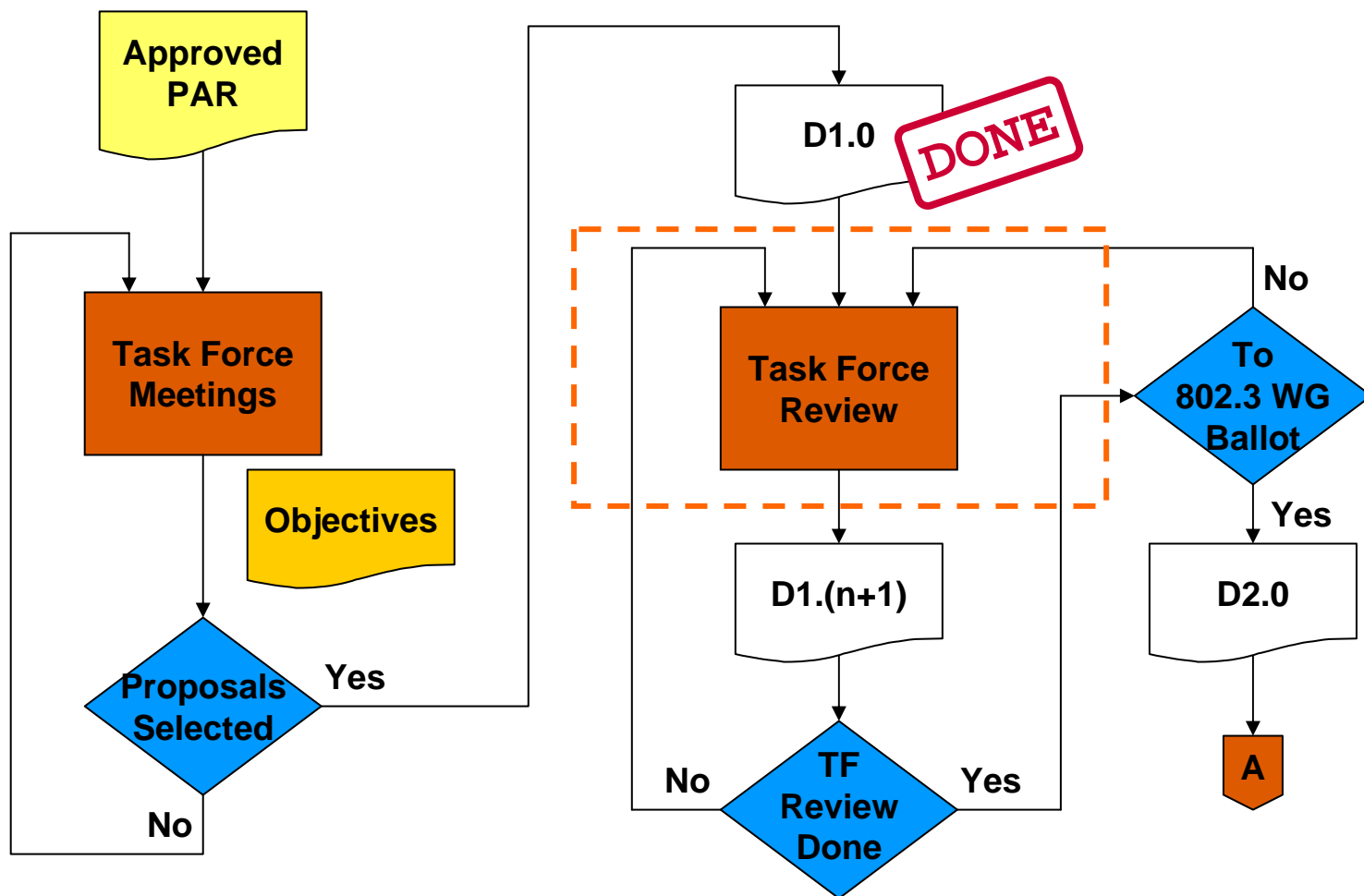
Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase

DONE



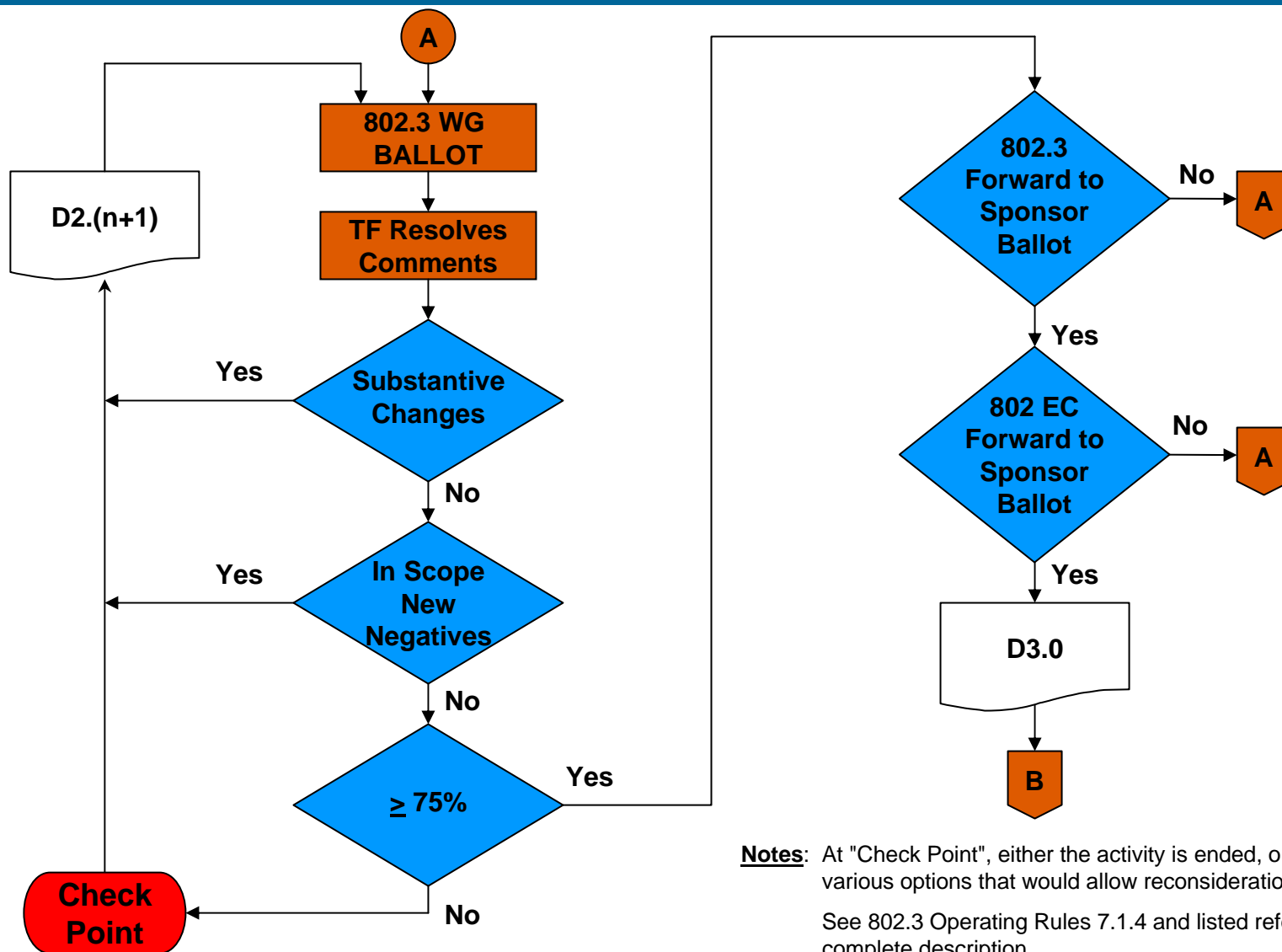
Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

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



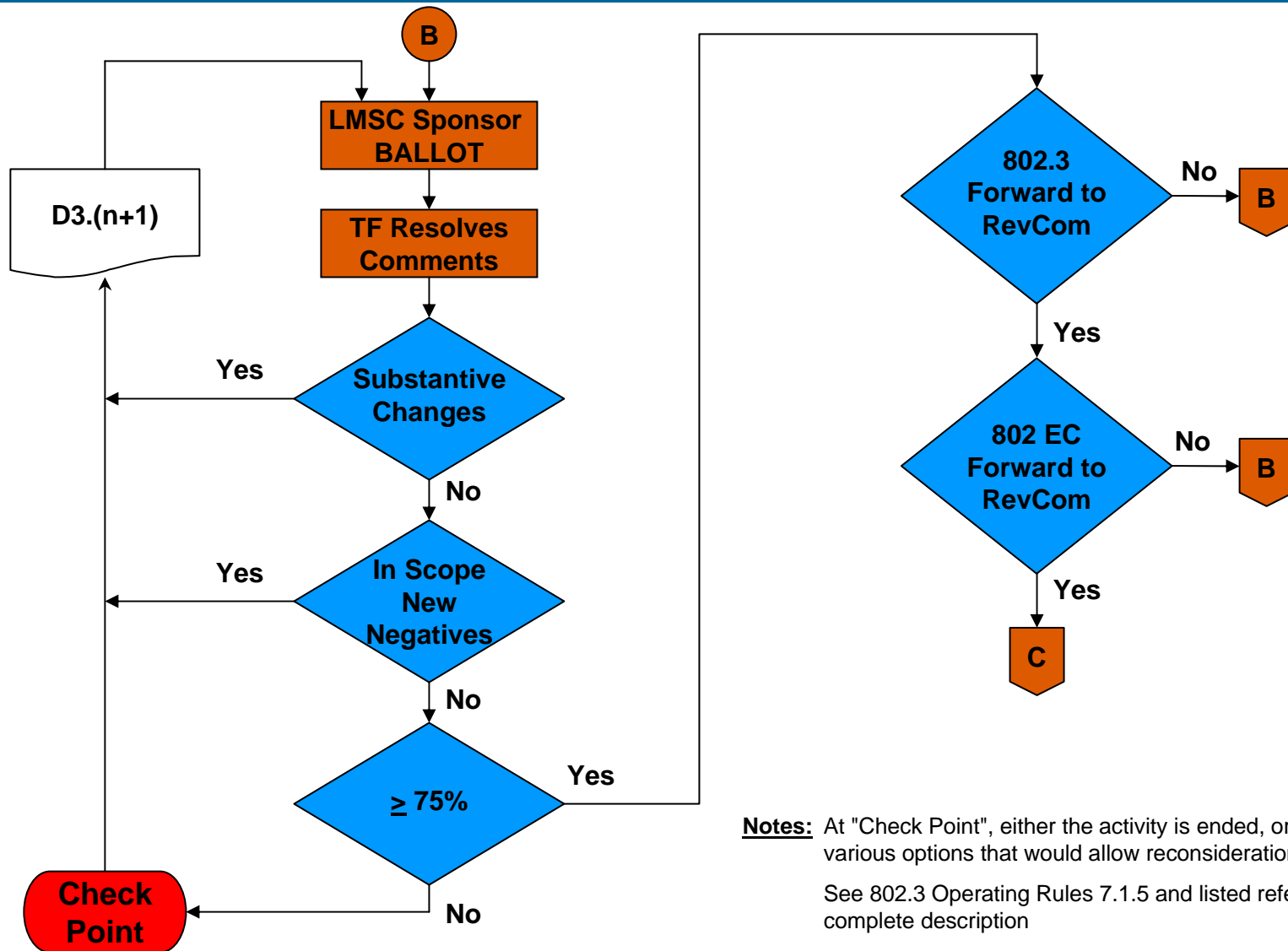
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Overview of IEEE 802.3 Standards Process (3/5) - Working Group Ballot Phase



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

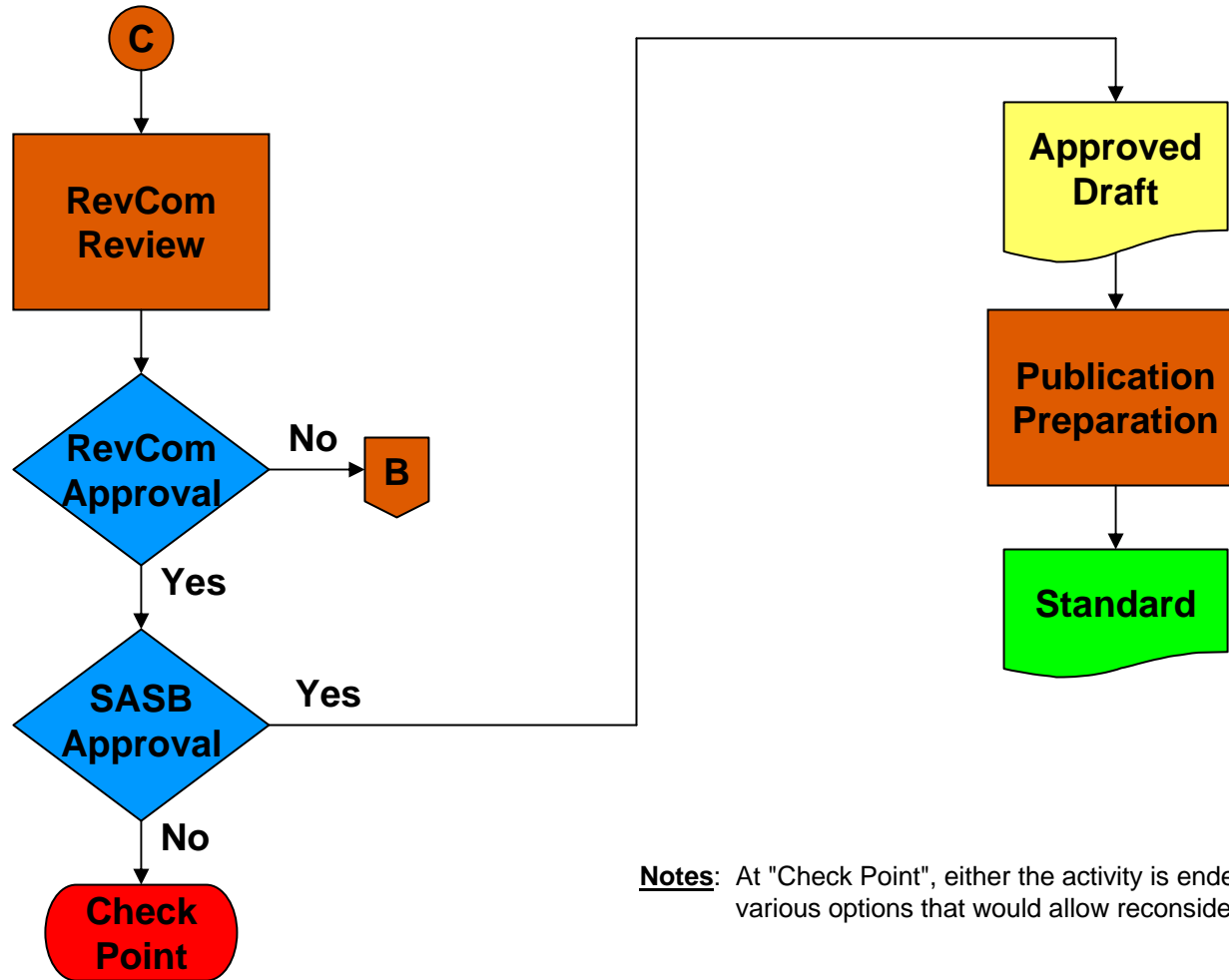
Overview of IEEE 802.3 Standards Process (4/5)- Sponsor Ballot Phase



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.

Thank You

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