IEEE P802.3ba

40 GbE and 100 GbE Standards Update

Greg Hankins

<ghankins@force10networks.com>

RIPE 56 – EIX WG

Per IEEE-SA Standards Board Operations Manual, January 2005

At lectures, symposia, seminars, or educational courses, an individual presenting information on IEEE standards shall make it clear that his or her views should be considered the personal views of that individual rather than the formal position, explanation, or interpretation of the IEEE.

Higher Speed Study Group became the P802.3ba Task Force!

- Major compromises were worked out before, and during the July 2007 Plenary
  - Voted to adopt both 40 Gb/s and 100 Gb/s rates
  - Submitted PAR and 5 Criteria which were approved by the 802.3 Working Group
  - Approved by 802 EC, NESCOM and Standards Board in December

Higher Speed Ethernet

802.3ba – The Next Generation of Ethernet

- The Higher Speed Study Group has become the IEEE P802.3ba Task Force
- The Task Force will produce one amendment to the IEEE 802.3 specification
- The 40 GbE and 100 GbE standards will be delivered together in June 2010
  - Proposed solutions use existing 10 GbE, copper and optical technology

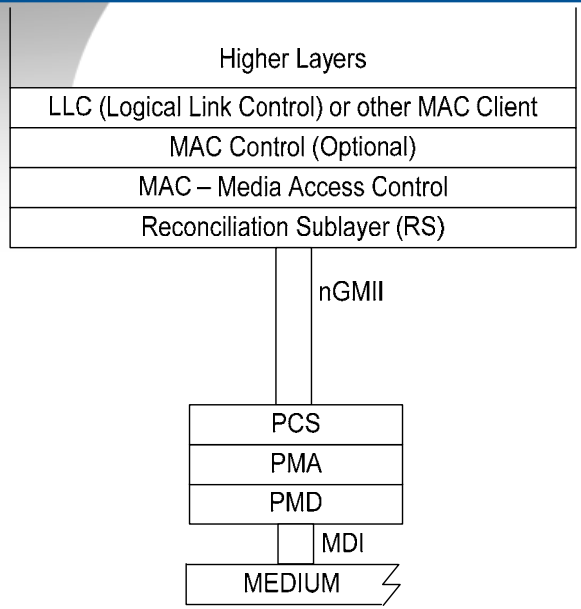
Summary of Adopted Objectives – July 2007 Plenary

Common Objectives
Support full-duplex operation only
Preserve the 802.3 / Ethernet frame format utilizing the 802.3 MAC
Preserve minimum and maximum FrameSize of current 802.3 standard
Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface
Provide appropriate support for OTN

Summary of Adopted Objectives – March 2008 Plenary

	40 GbE	100 GbE	Potential Solution Space
Architecture	✓		Interest to Create a Common Architecture
Interfaces	✓		Interest to Reuse 10 Gb/s Serial Technology
Physical Layer Specifications			
1m Backplane	✓	✗	Reuse 10GBASE-KR
10m Copper Cable	✓	✓	Reuse 10GBASE-KR
100m OM3 MMF	✓	✓	“n” x 10 Gb/s
10km SMF	NEW ✓	✗	4 x 10 Gb/s
10km SMF	✗	✓	4 x 25 Gb/s
40km SMF	✗	✓	4 x 25 Gb/s

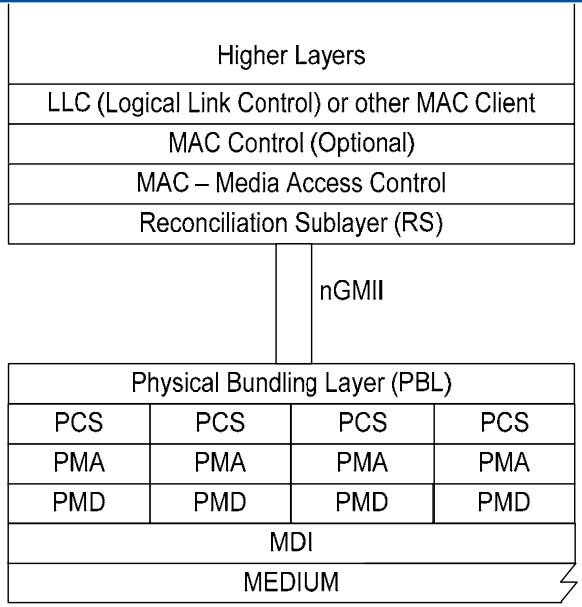
Architecture Options Discussion



Option #1 – "MLD"

Multi-Lane Distribution

66 bit blocks lane striped



Option #2 – "PBL"

Physical Bundling Layer

66 bit blocks encoded

- Is a solution "n" lanes by "m" Gb/s (multiple λs)?
- Is a solution "n" instances of PHY by "m" Gb/s PHY?
- http://grouper.ieee.org/groups/802/3/ba/public/jan08/green_01_0108.pdf
- MLD has the most support and fits into the proposed architecture

“Provide appropriate support for OTN”

- The ITU-T and IEEE will work together to specify mappings for 40 GbE and 100 GbE into OTN
  - Several people attend both the IEEE and ITU-T meetings
  - Liaison established
- Define transparent mapping of 40 GbE into existing ODU3 with transcoding
- Define new ODU4 tier for 100 GbE
  - Transparent transport of 100 GbE over new wave
  - Multiplexed tributaries
    - ODU3-3v, 3 bonded waves of 40 Gb/s
    - ODU2-11v, 11 bonded waves of 10 Gb/s
  - TBD based on optical transmission feasibility

Physical Layer Specifications: Copper Objectives

- 40 Gb/s over 1m backplane
  - Proposals to reuse 10GBASE-KR and adopt for 40GBASE-KR4
- 40 Gb/s and 100 Gb/s over 10m copper cable assembly
  - Proposal to reuse 10GBASE-KR for 40 GbE (4 x 10.3125 Gb/s) and 100 GbE objectives (10 x 10.3125 Gb/s)
- Define media characteristics
  - Twinaxial cable
  - QSFP or CX4 connectors

Physical Layer Specifications: Optical Objectives for 100m OM3 MMF

- Options under consideration
  - 850nm MMF parallel fiber
    - Used on proprietary links since 2000 and InfiniBand SDR since 2002
    - Generated the most interest
  - 850nm MMF CWDM over duplex fiber
    - Considered during 10 GbE and shipping in high definition video applications today
  - 850nm combination parallel and CWDM
    - Possibility to reduce cabling cost and total cost of ownership (TCO)
- Discussion to extend reach beyond 100m for OM3 fiber
- Discussion for even further reach extension using OM4 fiber

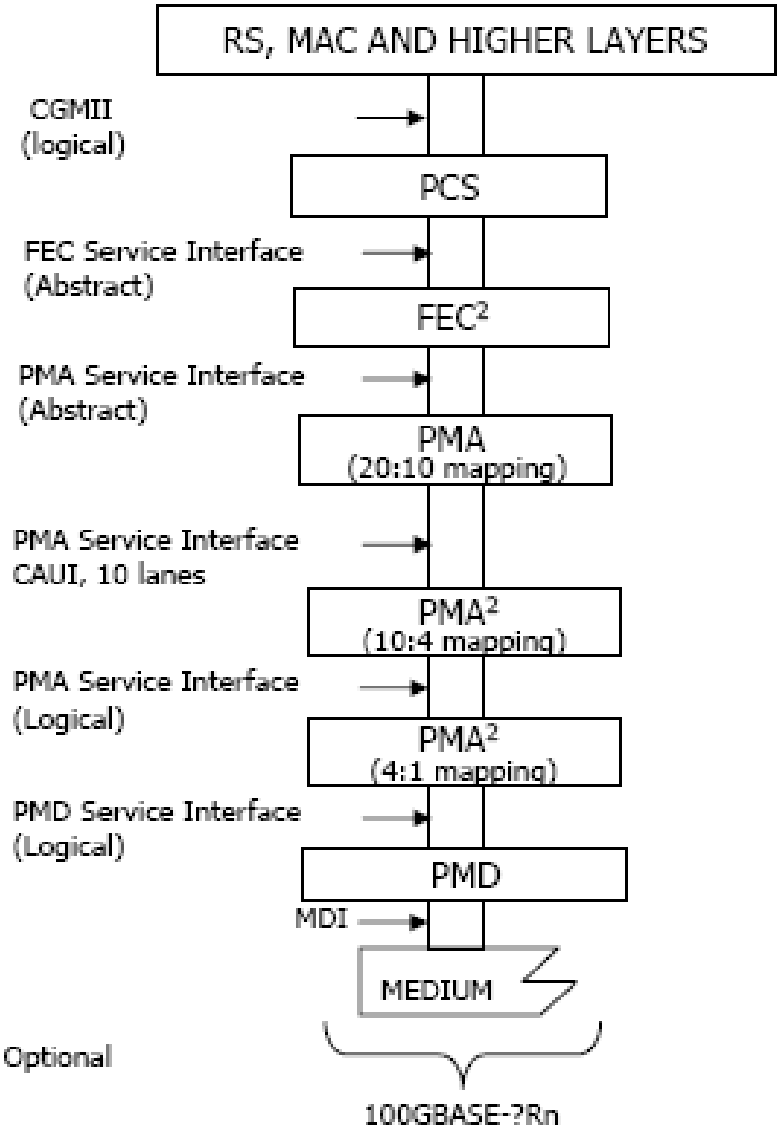
Physical Layer Specifications: Optical Objectives for SMF

	10km	40km
40 GbE	CWDM	N/A
100 GbE	CWDM LAN WDM	LAN WDM

- Proposals under consideration for 100 GbE
  - Option #1 - ITU G.694.1 widely spaced DWDM grid for LAN applications (LAN WDM)
  - Option #2 - ITU G.694.2 CWDM grid for LAN applications (CWDM)
  - For > 10km: disagreement between which grid option
  - For > 40km: consensus around LAN WDM grid
- Key area to be resolved next week

Other Questions to be Answered

- Architecture, block diagrams, interfaces and terminology for 40 Gb/s and 100 Gb/s
- Management (Clause 30, 45, Annex 30A, SNMP MIBs)
- Define test procedures

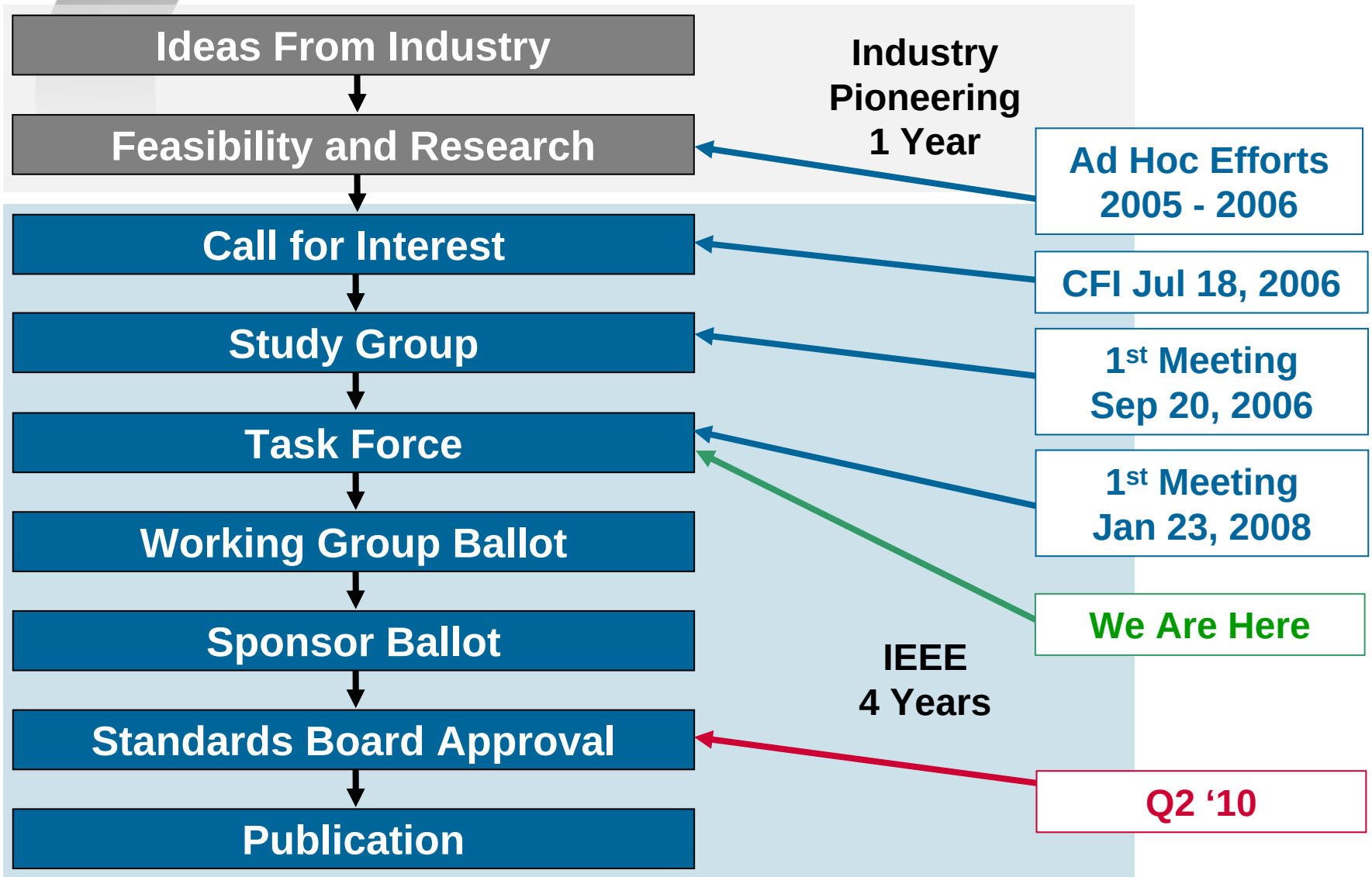


Note: 2. Optional

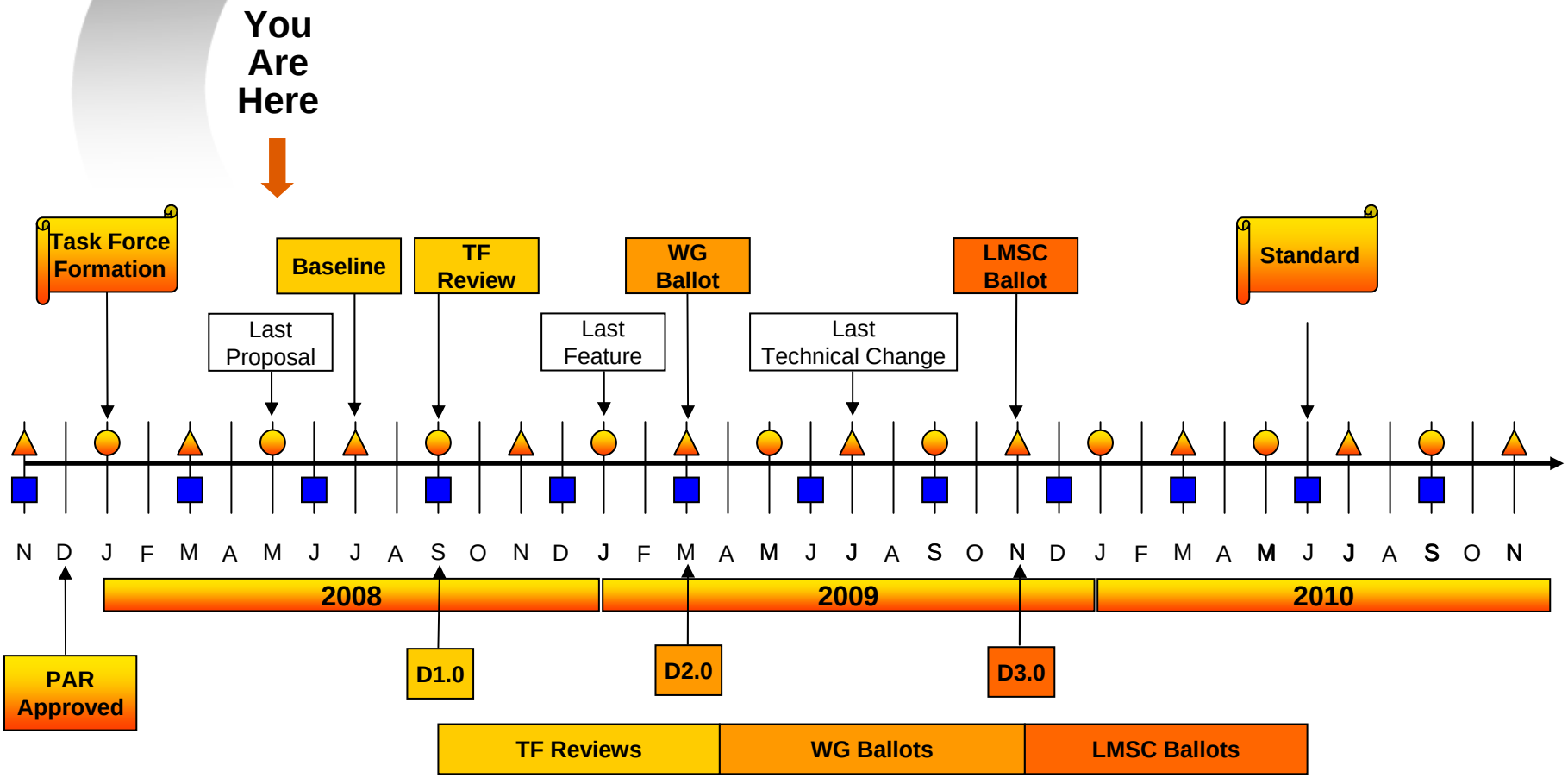
Project Comparison

	802.3ae 10 GbE	802.3ak 10GBASE-CX4	802.3an 10GBASE-T	802.3aq 10GBASE-LRM	802.3ap 10GBASE-KR	802.3ba 40 GbE and 100 GbE
Date	Jun 2002	Feb 2004	Jun 2006	Sep 2006	Mar 2007	Jun 2010
MMF	✓			✓		✓ (40 / 100)
10km SMF	✓					✓ (40 / 100)
40km SMF	✓					✓ (100)
80km SMF	✓ (not specified in 802.3ae)					
Copper Cable		✓	✓			✓ (40 / 100)
Backplane					✓	✓ (40)

Where are we now?



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



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

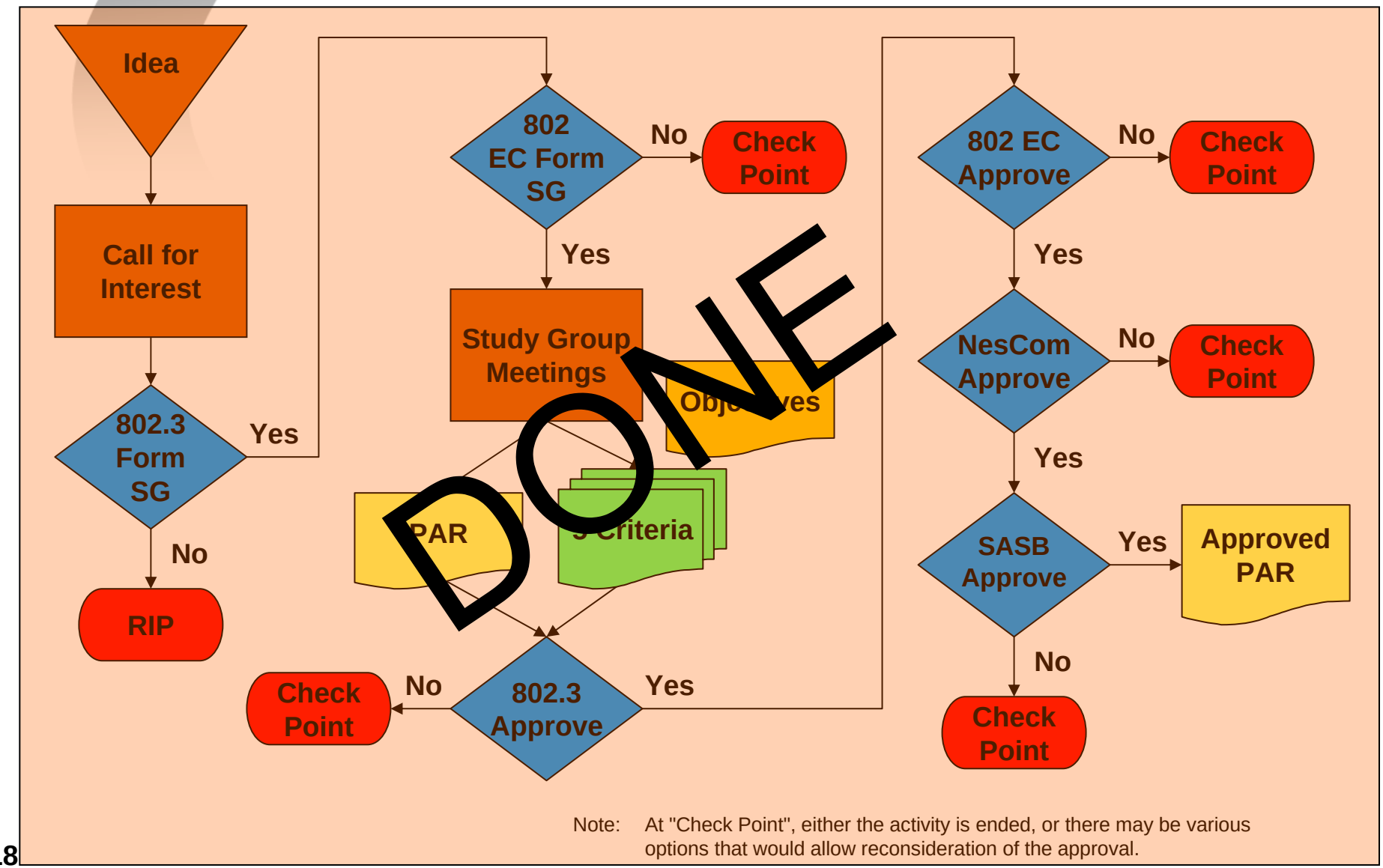
Future Meetings for 2008

- January Interim
  - January 23 – 25, Portland
  - *Task Force formation*
  - *Begin hearing technical proposals*
- March Plenary
  - March 18 – 20, Orlando
- May Interim
  - May 12 – 16, Munich, Germany
  - *Last new technical proposal*
- July Plenary
  - July 13 – 18, Denver
  - *Start making baseline choices*
- September Interim
  - Week of September 15, ChengDu or ShenZhen, China
  - *Finish baseline choices*
- After September Interim
  - *Generate Draft 1.0*
  - *Begin Task Force review*
- November Plenary
  - November 9 – 14, Dallas

More Information is Here

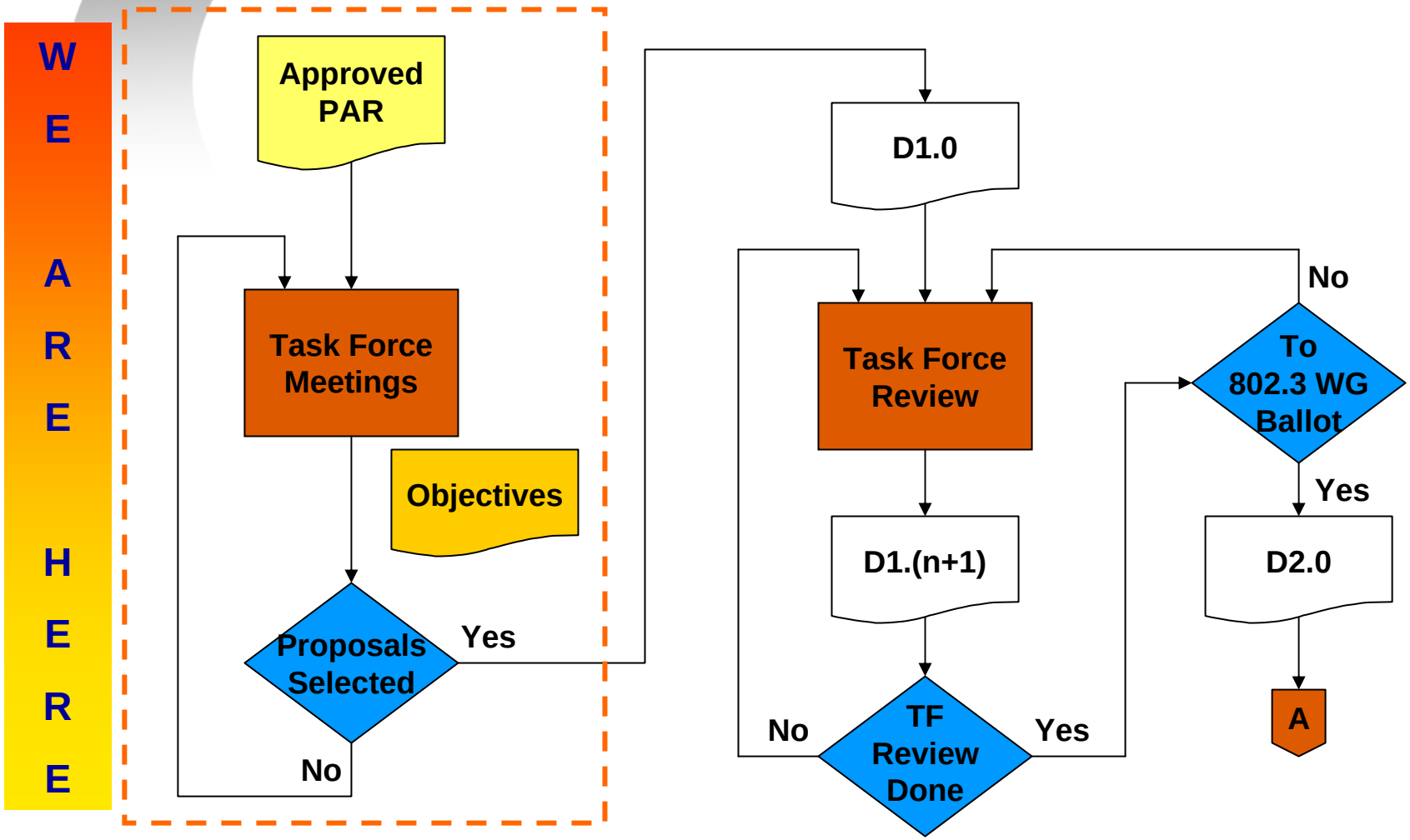
- http://grouper.ieee.org/groups/802/3/ba/

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

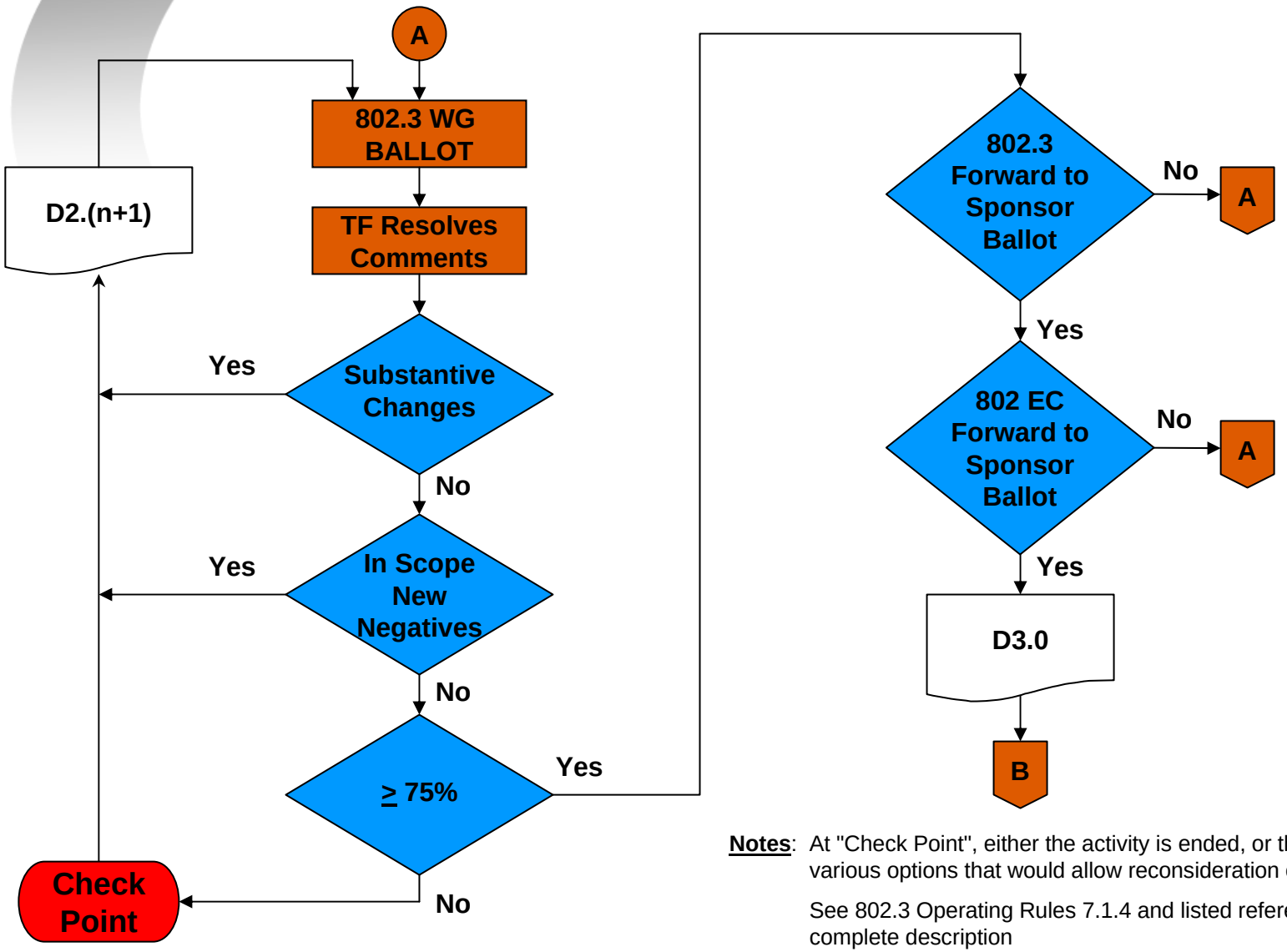


Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

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



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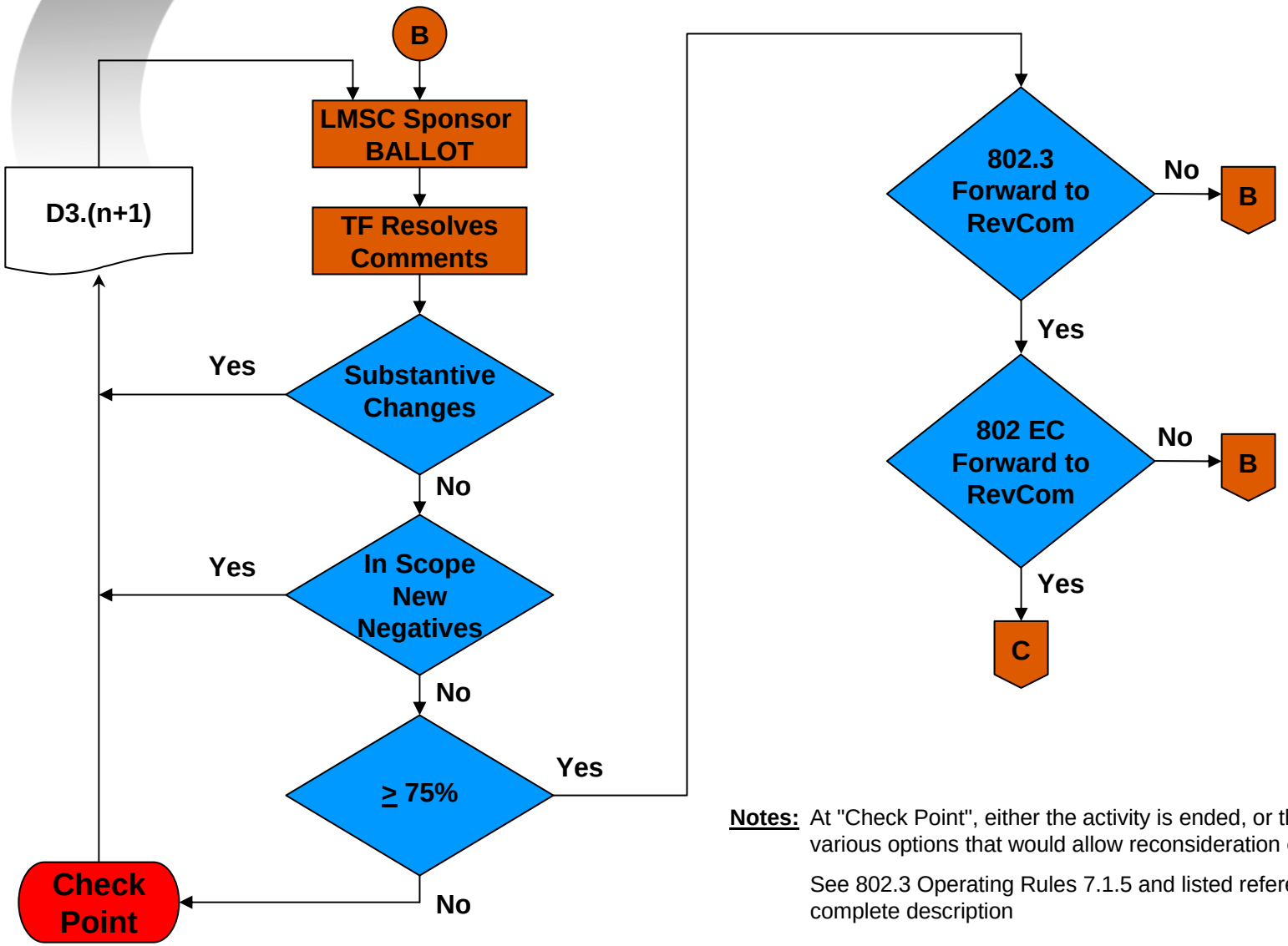
See 802.3 Operating Rules 7.1.4 and listed references for complete description

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



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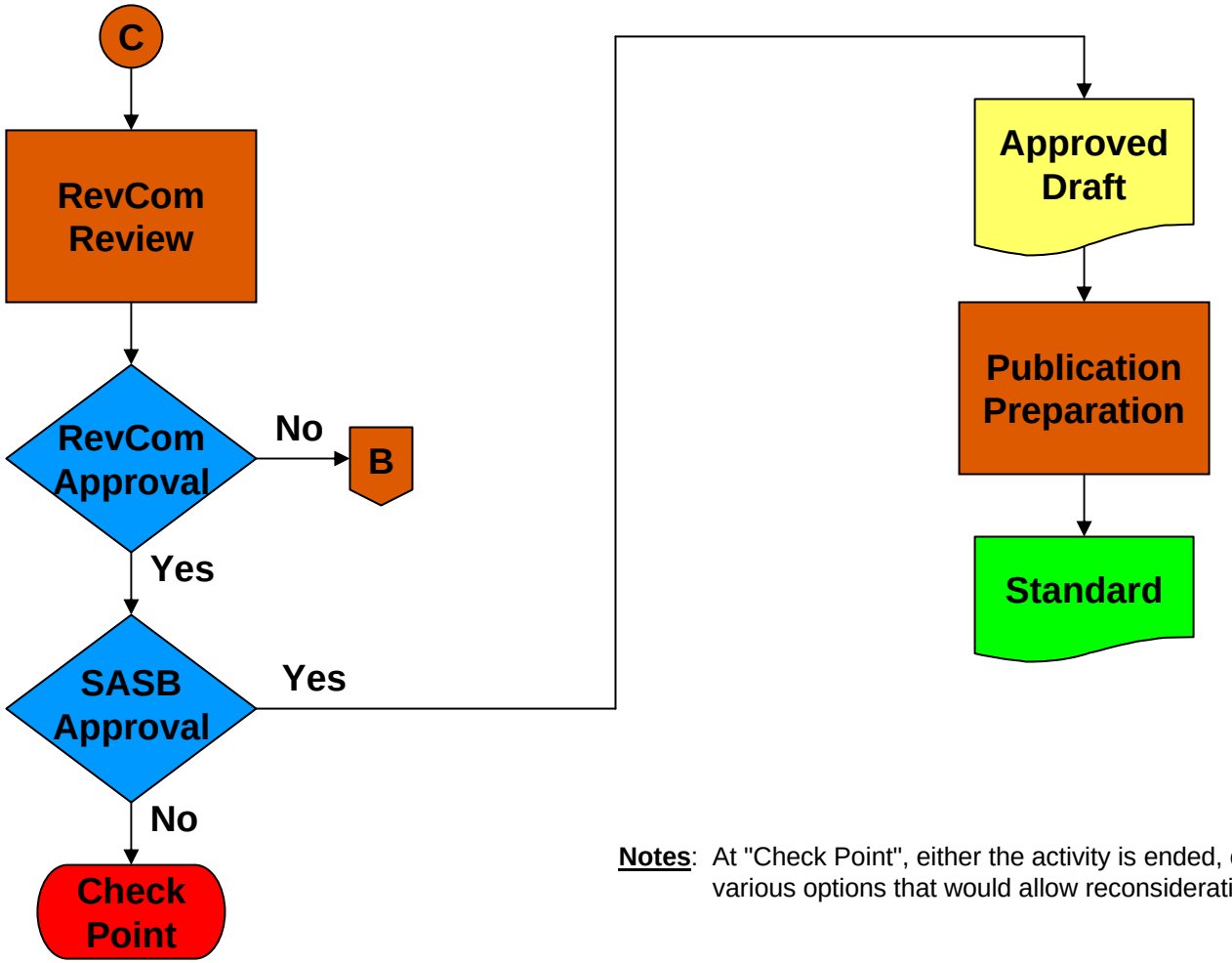
Overview of IEEE 802.3 Standards Process (5/5) - Final Approvals / Standard Release



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Thank You