



# Higher Speed Ethernet Update

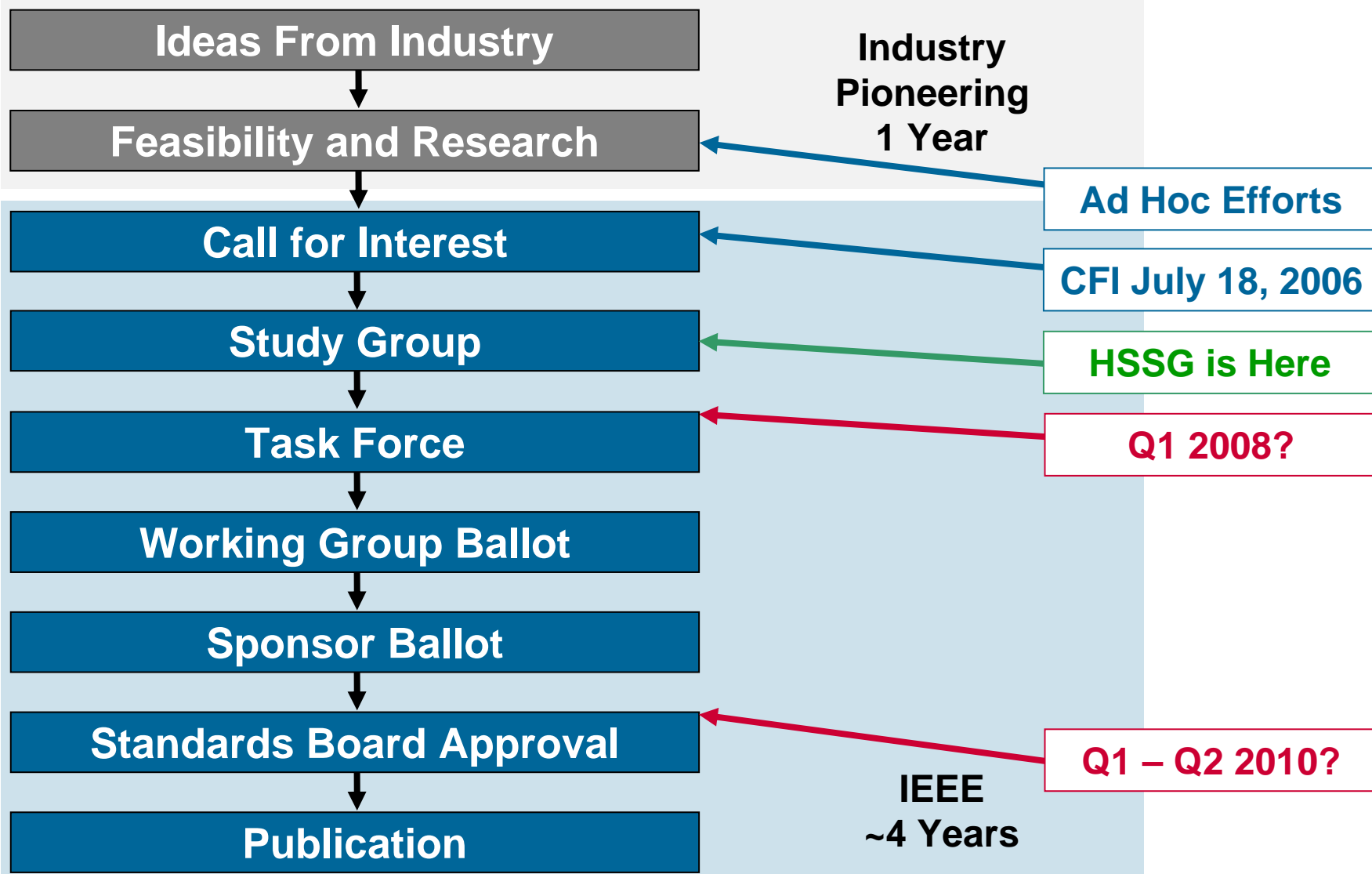
***Greg Hankins***

***<ghankins@force10networks.com>***

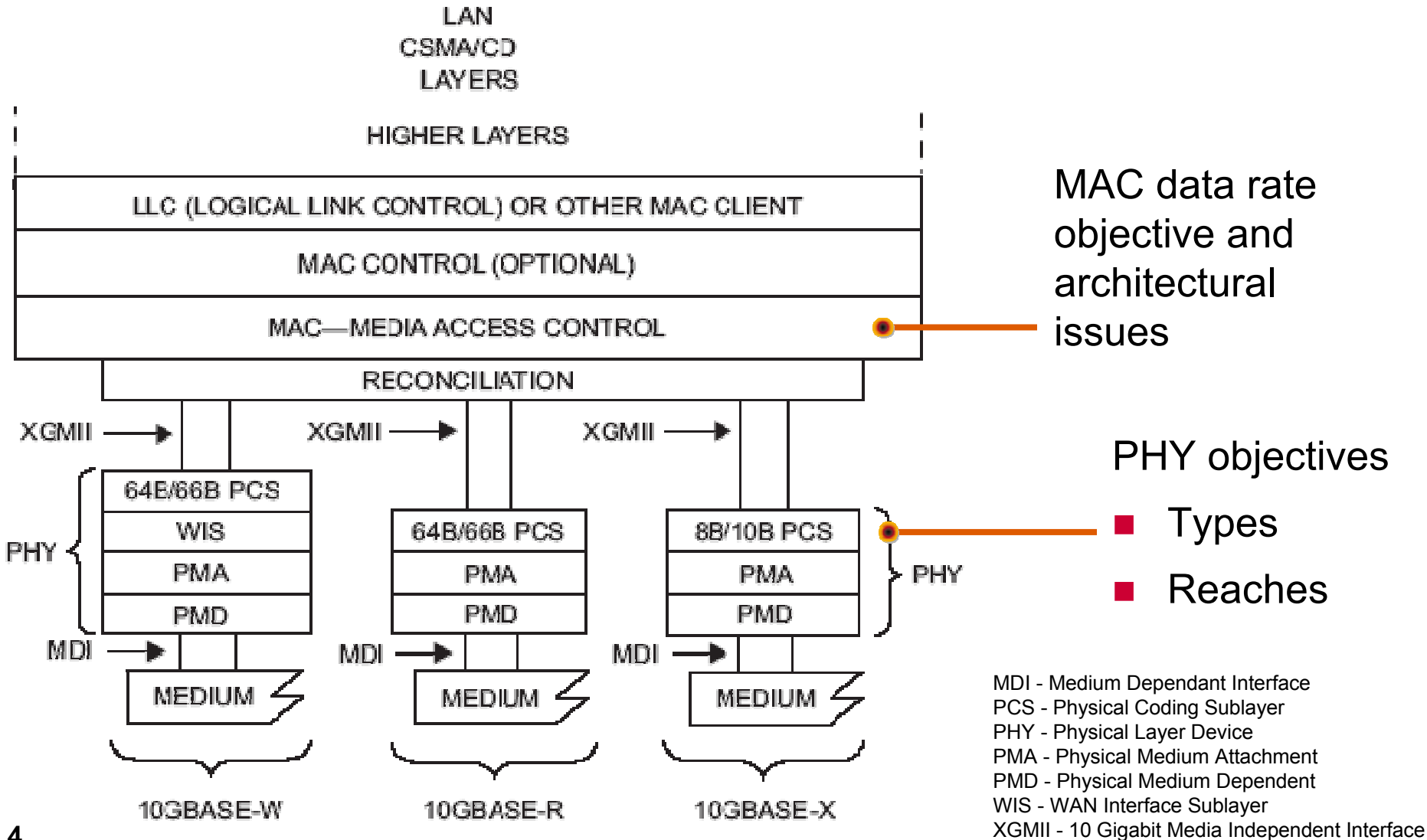
***NANOG 40***

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.

# Birth of an IEEE Standard: It Takes About 5 Years



# What Exactly is the HSSG Studying?



# Next Step: Becoming a Task Force

- Write a Project Authorization Request (PAR)
  - PAR A working draft is ready for 100 GbE
- Answer the “5 Criteria” for PAR A
  - Broad Market Potential: ✓
  - Compatibility: ✓
  - Distinct Identity: ✓
  - Technical Feasibility: ✓
  - Economic Feasibility: ✓

# HSSG Objectives Included in PAR A

Objective	Date Added	Votes (Yes / No / Abstain)
Support full-duplex operation only	11/16/06	All 73 / 0 / 4
Preserve the 802.3 / Ethernet frame format at the MAC Client service interface	11/16/06	All 76 / 0 / 6
Preserve minimum and maximum FrameSize of current 802.3 Std	11/16/06	All 74 / 0 / 4
Support a speed of 100 Gb/s at the MAC/PLS interface	11/16/06	All 67 / 9 / 14 802.3 26 / 6 / 11
Support at least 10km on SMF	11/16/06	All 86 / 0 / 4 802.3 40 / 0 / 4
Support at least 100 meters on OM3 MMF	11/16/06	All 61 / 3 / 27 802.3 33 / 2 / 13
Support a BER better than or equal to $10^{-12}$ at the MAC/PLS service interface	1/19/07	All 68 / 0 / 4
Support at least 40km on SMF	1/19/07	All 38 / 10 / 32 802.3 12 / 6 / 16
To support at least 10m over a copper cable assembly	4/19/07	All 51 / 0 / 15 802.3 23 / 0 / 7

All: All people in the room, 802.3: Registered 802.3 voters

# More Objectives: 40 Gb/s?

- Growth in belief for Broad Market Potential for 40 Gb/s server applications
  - March Plenary (Y / N / A): 23 / 32 / 36
  - April Interim (Y / N / A): 24 / 24 / 26
  - May Interim (Y / N / A): 46 / 4 / 19
- Positioned as a server interconnect technology because
  - Servers do not need 100 GbE today
  - Aligns with 16 x PCIe2 bus speed
  - 100m MMF, copper and backplane reaches
- Presented by individuals from Intel, Sun, IBM, and Broadcom and Brocade
  - Little end user support

# May Interim Meeting - Geneva (Last Week)

- Political debate preventing consensus building
- Straw poll results show there is consensus and clear understanding on:
  - 100 GbE core and aggregation needs
  - 40 GbE server needs
- Vocal minority has stopped the group from reaching consensus
- Rejected offers of compromise
  - PAR A (100 GbE) and PAR B (40 GbE)
  - One Task Force (split into two if/when appropriate)



# May Interim Meeting Motions - Failed

- Adopt the objectives for 40 Gb/s operation shown below:
  - Support a speed of ~40 Gb/s at the MAC/PLS service interface while ensuring compatibility with OTN infrastructure
  - Define a family of physical layers for 40 Gb/s operation
    - Support at least 100m on OM3 MMF
    - Support at least 10m over a copper cable assembly
    - Support at least 1m over a backplane
  - Technical Motion (>75% required)
  - Results: All 41 / 17 / 10  
802.3 28 / 8 / 4

# May Interim Meeting Motions - Failed

- Move the HSSG request 802.3 working group approval of the PAR A objectives contained in agenda\_01\_0507 slide 21.
  - Technical motion (>75% required)
  - Results: All 34 / 20 / 5  
802.3 18 / 11 / 6

# May Interim Meeting Motions - Passed

- The Higher Speed Study Group recommends the IEEE 802.3 WG form a 40G Study Group to evaluate definition of approximately 40Gb/s MAC data rate and related PHY capability to IEEE Std 802.3
  - Procedural motion (>50% required)
  - Results: All 33 / 22 / 7  
802.3 16 / 15 / 5

# What's Next?

## July Meeting Agenda

- This meeting is key to reaching consensus and compromises in order to move forward
- HSSG must request extension for life after the July meeting
- Venturing into uncharted territory
  - There has never been a request for a 4<sup>th</sup> SG extension
- Compromise to move forward will require work on two efforts
  - May or may not share common aspects
  - Need to consider impact on component vendors, system vendors and end users

# Impact of 40 GbE on HSSG and 100 GbE

- Delayed 100 GbE by two months already and some more delay is anticipated
  - HSSG is in deadlock
  - Time needed to accommodate possible 40 GbE objective
    - This also includes figuring out co-existence of the two speeds
    - Increased scope and change for slippage
- Expected that 40 GbE and 100 GbE standards would be available at about the same times
- Options
  - Let HSSG voters decide on a single rate
  - Compromise and allow market to decide
  - 40 Gb/s MSA outside of IEEE
  - HSSG ends and start new CFIs

# IEEE 802.3 HSSG Reflector and Web Page

- To subscribe to the HSSG reflector, send mail to <[ListServ@ieee.org](mailto:ListServ@ieee.org)> with the following in the body of the message:

subscribe stds-802-3-hssg <your first name> <your last name>

end

(≈ 500 people have subscribed to the list)

- HSSG web page has links to all presentations:

<http://grouper.ieee.org/groups/802/3/hssg/index.html>

# Future HSSG Meetings

- July 2007 IEEE 802 Plenary
  - July 16 – 19
  - Hyatt Regency
  - San Francisco, CA, USA
- September 2007 Interim
  - September 11 – 13
  - Seoul, Korea

# End User Participation

- Participation by end users has never been this high in the IEEE before
  - Presentations at meetings given by individuals from: AMS-IX, Comcast, DT, EDS, Equinix, Google, LBNL, NTT America, NYSE, Sprint, Time Warner, T-Systems, Yahoo!
  - Over 30 individuals contributing and supporting presentations
  - Thanks for your support
- You need to voice your opinion NOW!
  - Talk to your vendors
  - Express your needs on 40 GbE and 100 GbE





## **40 GbE vs. 100 GbE**

**Perspective of a System  
Vendor Supporting 100 GbE**

# Impact of 40 GbE on System Vendors

- Board design is a lengthy and expensive process
  - FPGA: 6 – 12 months
    - \$2.5M – \$5M development costs
  - ASIC: 9 – 18 months
    - \$7.5M – \$10M development costs
- System design issues (chassis, backplane, fabric, line cards)
  - Cost and performance design is driven by maximum capacity
    - Boards and connectors
    - Components
    - Power and thermal management

# Impact of 40 GbE on System Vendors

- We have to stop work on 100 GbE or work on it in parallel
  - Everyone has limited resources and this is specialized stuff
  - Supporting more speeds costs more
  - Delays 100 GbE
  - We'd rather put effort into 100 GbE and deliver a faster speed in about the same time
- Component vendors face similar constraints
  - Impacts components available to us to build stuff for you

# Impact of 40 GbE on System Vendors

- Dual-rate line cards cost everyone more too
  - Port density on card edge is based on maximum capacity
  - Doesn't allow port count of lower capacity modules to be maximized
  - Cost optimization for lower rate cards is constrained
  - Reducing optics cost doesn't significantly reduce port cost
  - You pay for a 100 GbE line card and run it at a lower speed
  - Assumes there is some auto-negotiation of speeds
  - Multiple flavors of modules to support

# Impact of 40 GbE on the Market

- Will make both technologies more expensive because of volume and market split
- Confusion in the market about mass adoption
  - Delay buying to see who wins and what turns out to be cheaper
- More combinations of interfaces
  - 40 GbE, 100 GbE interfaces and optics
  - Higher CapEx and OpEx costs
- Cost of 40 GbE and 100 GbE
  - CapEx and OpEx costs
  - Relative cost to each other

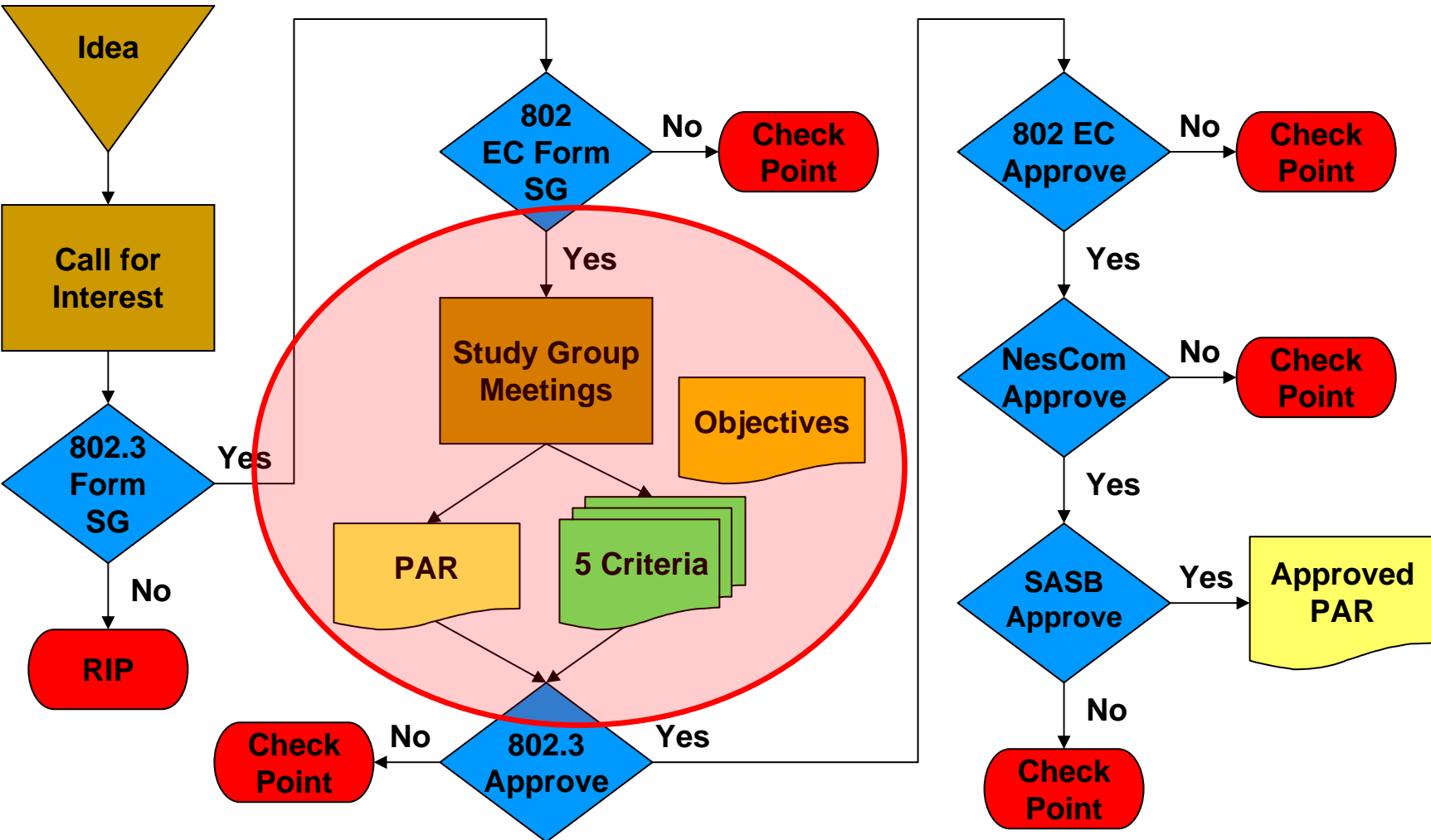
# Impact of 40 GbE on the Market

- 40 GbE would need to be
  - (Much?) cheaper than 4 x 10 GbE LAG (and DWDM)
    - 10 GbE XFPs are cheap and high volume
    - 40 Gbps optics are really expensive and low volume
  - (Much?) cheaper than 100 GbE
  - Available (much?) sooner than 100 GbE
    - Unlikely that someone would build a 40 GbE and 100 GbE line card
    - Feasible to build a line card that uses LAG internally over a 40 Gbps optic, but at what cost?

**Thank You**

**FORCE**  TM

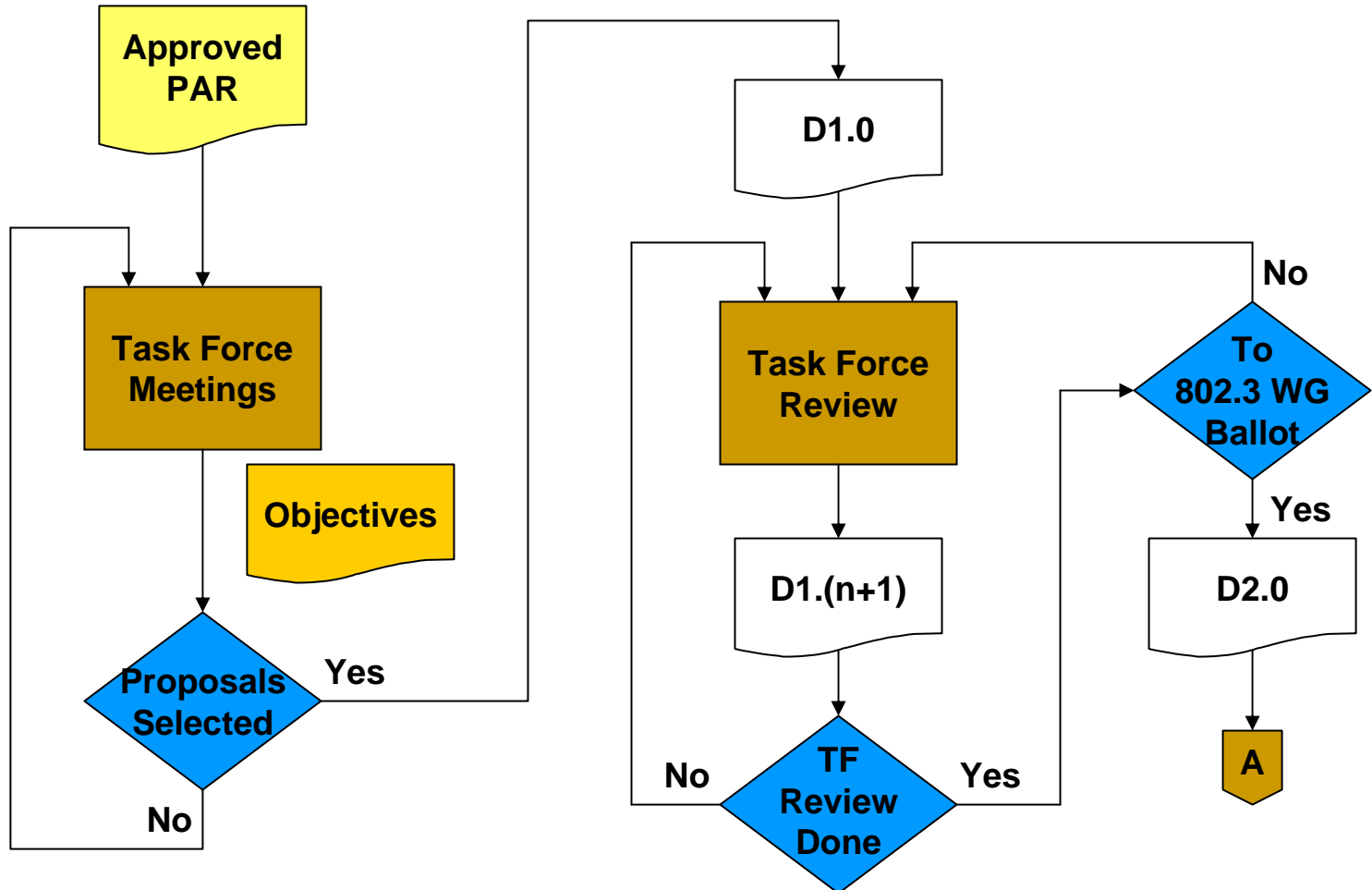
# Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase



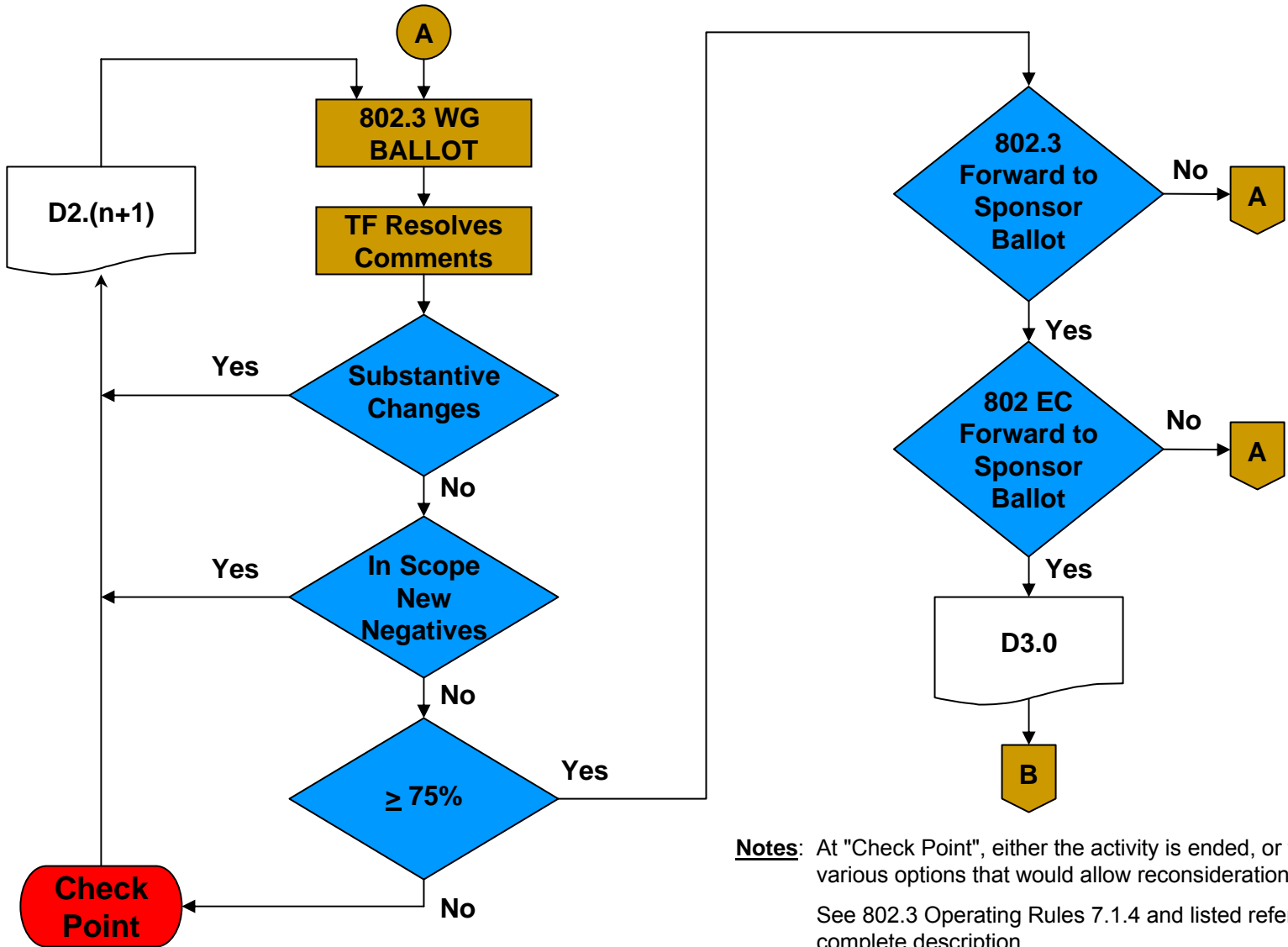
Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.



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

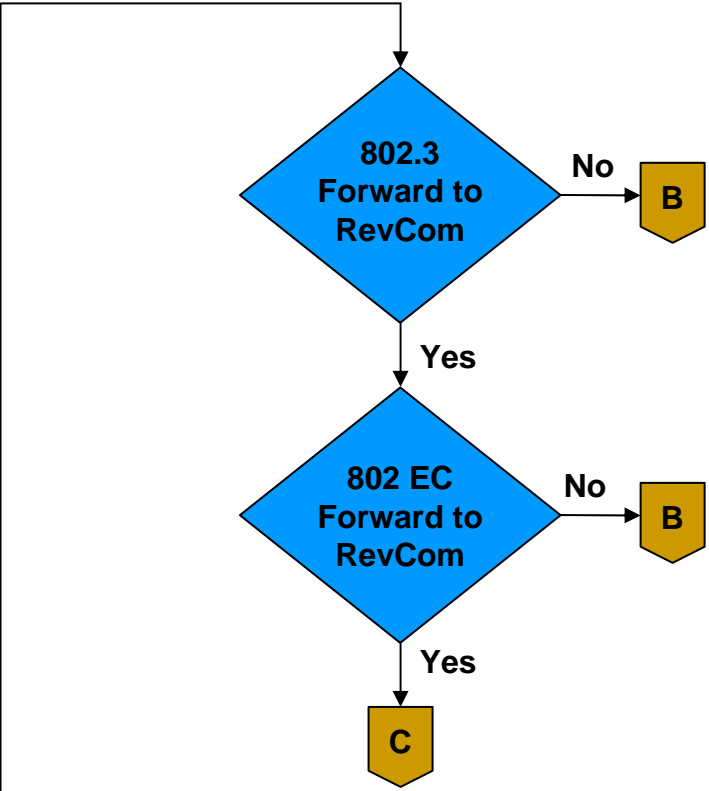
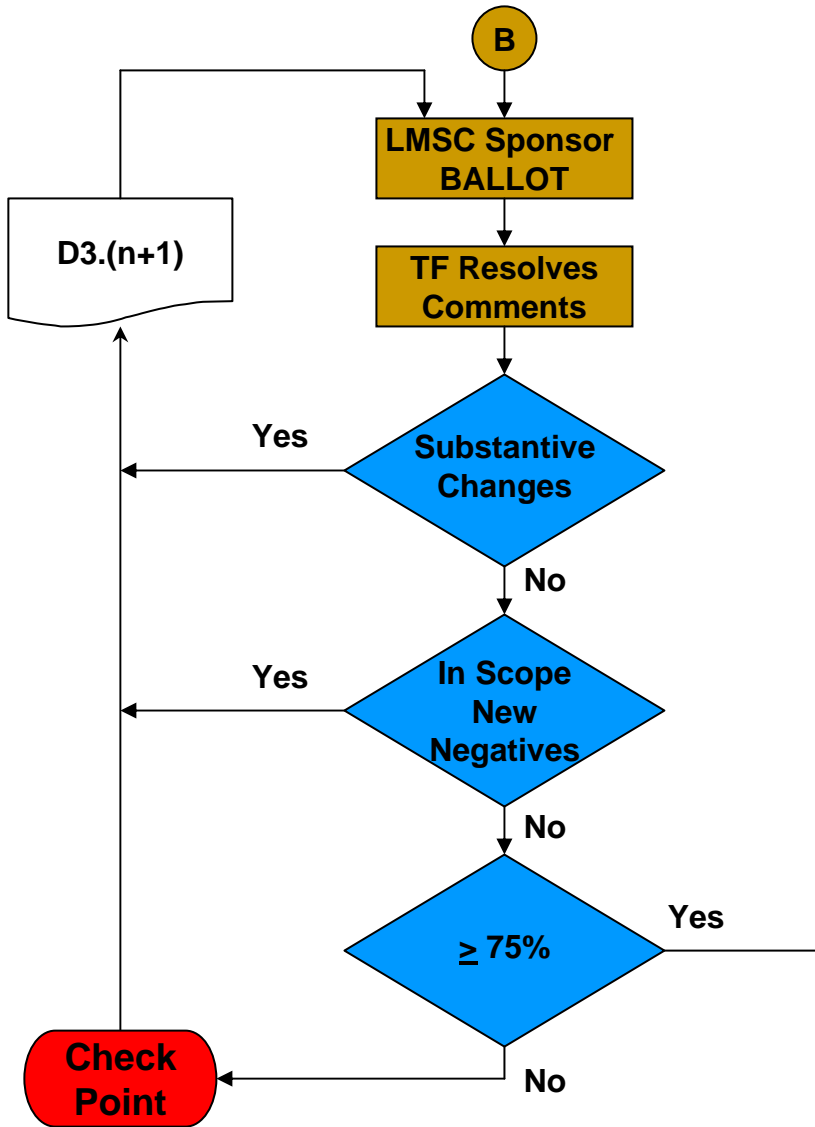


# Overview of IEEE 802.3 Standards Process (3/5) - Working Group Ballot Phase



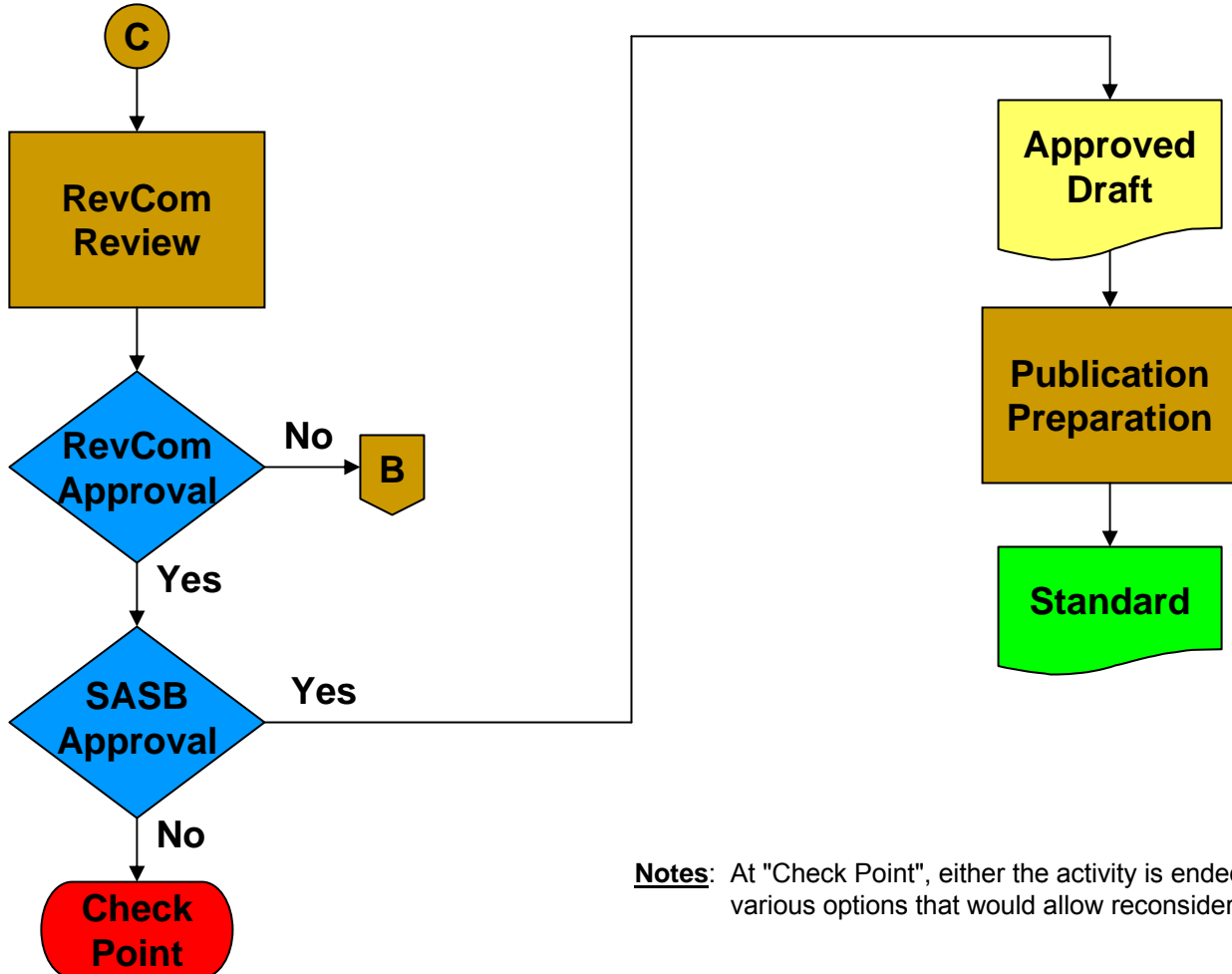
**Notes:** At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval. See 802.3 Operating Rules 7.1.4 and listed references for complete description

# 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.