Project documentation for 802.3df – timeline considerations

IEEE 802.3 Beyond 400 Gb/s Ethernet Study Group
Sep 2021 Electronic Session

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02 Sept 2021 Electronic Meeting

Where do we stand today?

- Very large set of project objectives (31) adopted
  - 26 Physical Layer & Interface Specifications
- Remaining Study Group tasks:
  - Complete and adopt for WG approval:
    - CSD responses. (draft reviewed – 08/19/21)
    - PAR (draft reviewed – 08/19/21)
  - Submission requirement deadlines
    - 802 – 10/5/21
    - NesCom – 10/18/21
  - Oct 28 – Overview presentation to 802.3
- 802.3 WG and 802 EC approval - Nov 2021 Plenary
- IEEE SA Std Board approval – Dec SASB Series (Dec 6 – 8)
- Anticipated first Task Force meeting - Jan 2022
  - This is when the technical work towards adopting baselines begins

Adopted Physical Layer Objectives Landscape (as of 8/26/21)

Ethernet Rate	Assumed Signaling Rate	AUI	BP	Cu Cable	MMF 50m	MMF 100m	SMF 500m	SMF 2km	SMF 10km	SMF 40km
200 Gb/s	200 Gb/s	Over 1 lane		Over 1 pair			Over 1 Pair	Over 1 Pair		
400 Gb/s	200 Gb/s	Over 2 lanes		Over 2 pairs			Over 2 Pair			
800 Gb/s	100 Gb/s	Over 8 lanes	Over 8 lanes	Over 8 pairs	Over 8 pairs	Over 8 pairs	Over 8 pairs	Over 8 pairs		
	200 Gb/s	Over 4 lanes		Over 4 pairs			Over 4 pairs	1) Over 4 pairs 2) Over 4 λ's		
	TBD								Over single SMF in each direction	Over single SMF in each direction
1.6 Tb/s	100 Gb/s	Over 16 lanes								
	200 Gb/s	Over 8 lanes		Over 8 pairs			Over 8 pairs	Over 8 pairs		

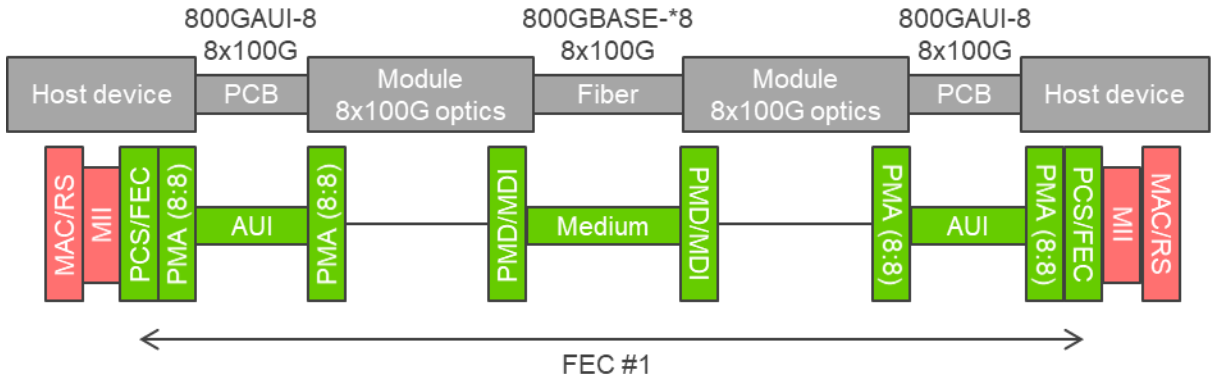
Technical Challenges

- Our immediate technical challenges
  - Co-existence of 100 Gb/s and 200 Gb/s Signaling
  - FEC Architecture (see slide #5)
  - Compatibility of modulation schemes between copper / optical signaling

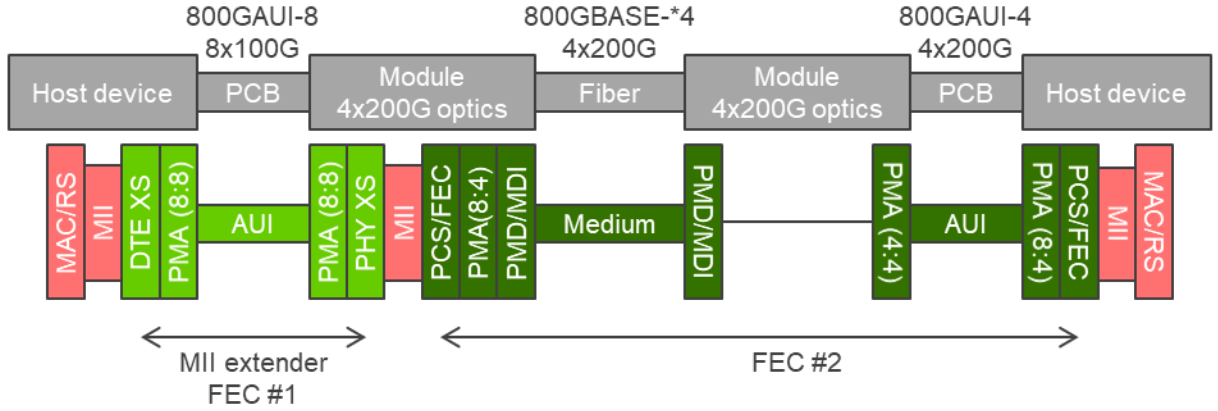
- A breadth of physical layer specifications
  - For 800 Gb/s Ethernet - Leverage 100 Gb/s signaling from:
    - 802.3cu – 500m / 2km SMF objectives
    - 802.3ck – AUI, backplane, copper cable objectives
    - 802.3db – MMF objectives
  - For 200 Gb/s, 400 Gb/s, 800 Gb/s, and 1.6 Tb/s –
    - Develop 200 Gb/s signaling and apply to all respective medium and interface objectives
  - For 800 Gb/s Ethernet 10km and 40km objectives
    - Other Signaling?

From dambrosia_b400g_01_210301: Example link scenarios for 800GE (apply similarly to 1.6TE)

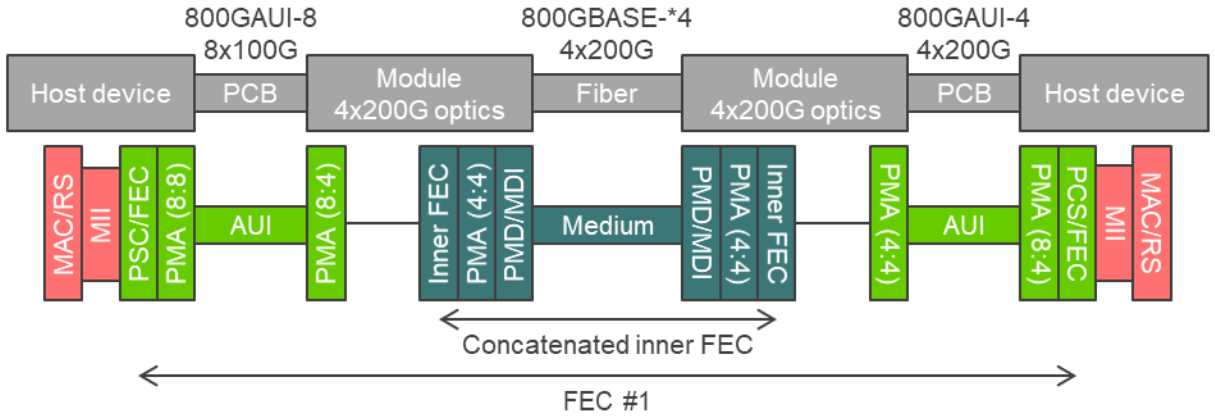
Example a: Single end-to-end FEC.



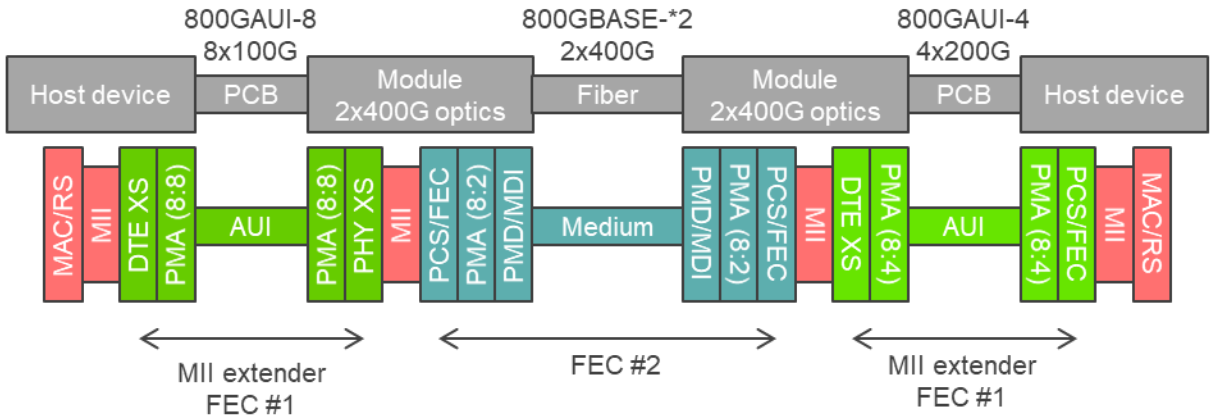
Example b: FEC #1 for 100GPL and FEC #2 for 200GPL



Example c: FEC #1 for end-to-end link with concatenated inner FEC for optical



Example d: FEC #1 electrical and segmented FEC #3 for optical



Source: Matt Brown, Huawei Technologies Canada

Reconciling the work ahead & schedule

Summary

- This project could be large. Potential activities include:
  - Developing 2 new speeds – 800 GbE / 1.6 TbE, including
    - Develop AUI's based on 100 Gb/s and 200 Gb/s electrical signaling? For both rates?
    - Develop physical layer optical specifications on 100 Gb/s or 200 Gb/s or both? For both rates?
    - Other?
  - Revisit existing Ethernet rates (200 GbE or 400 GbE)
    - Based on 200 Gb/s electrical – new AUIs for both rates?
    - Based on 200 Gb/s optical – new physical layer specifications for both rates
- Recommendation –
  - Develop a single PAR for this project to start
    - The future task force will be responsible for ensuring that everything works together
    - The future task force can consider / request splitting future project, as appropriate, based on timeline schedules

Source: dambrosia_b400g_01_210301
Highlighting is new

Summary from 03/21 still stands:

- Large number of objectives
- Task Force is responsible for ensuring consistency and interoperability for all

- Therefore, some common foundational items need to be worked out first (e.g. PCS/FEC architecture) before each Physical Layer spec can be built upon it.

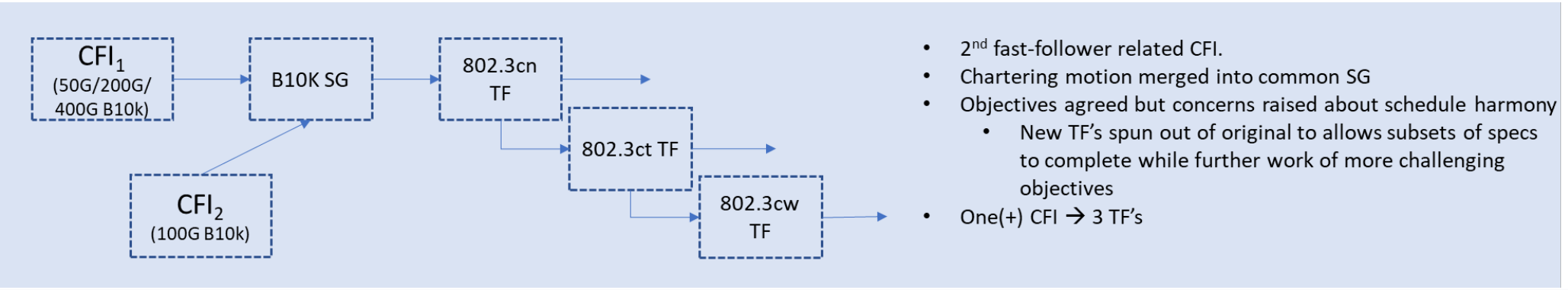
- In authors' opinions, it is very likely that projects will need to be split out from initial PAR.

"Splitting the PAR" is a known process in 802

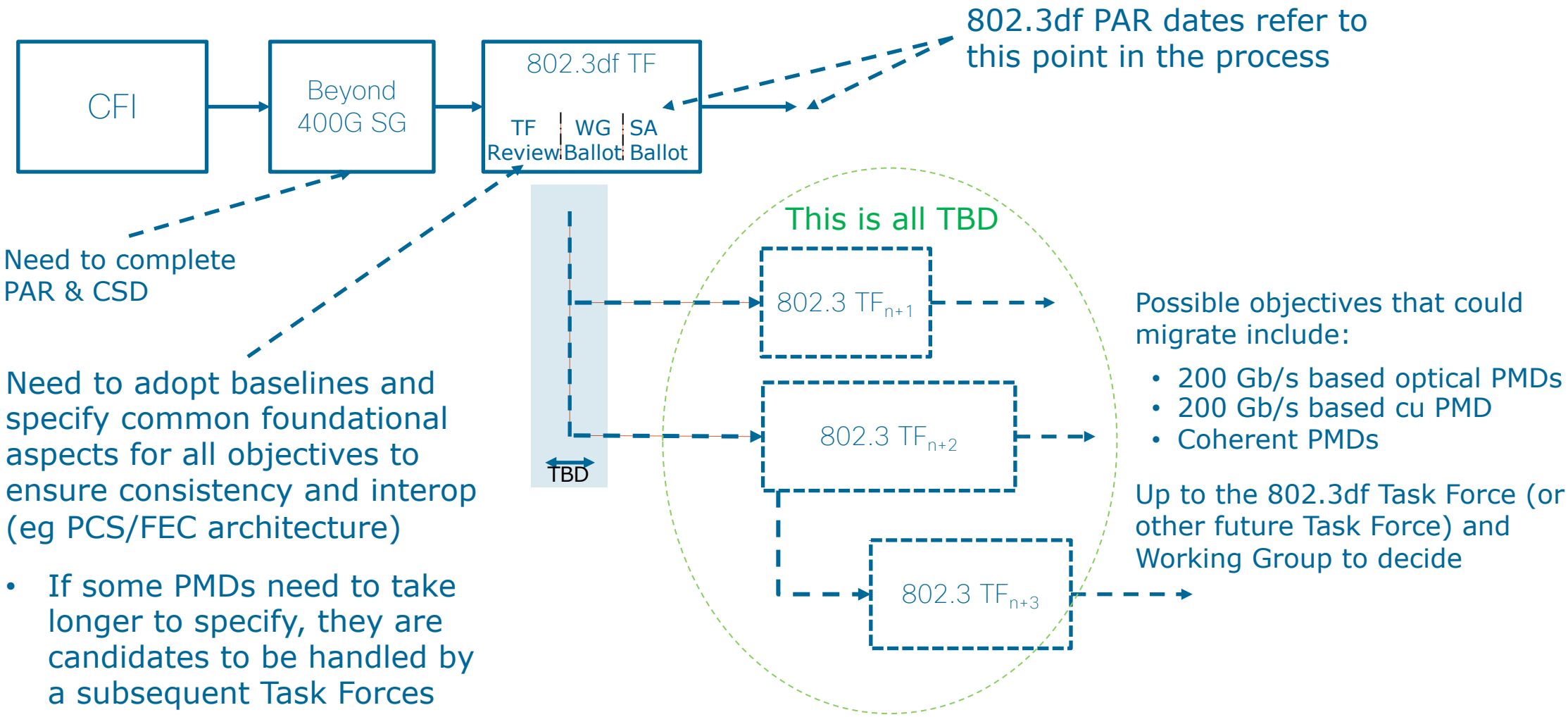
- PER IEEE 802 Operations Manual, Section 9.2 IEEE 802 LMSC approval

  At the discretion of the IEEE 802 LMSC Chair, PARs for ordinary items (e.g., Maintenance PARs) and PAR changes essential to the orderly conduct of business (e.g., division of existing work items or name changes to harmonize with equivalent ISO JTC-1 work items) may be placed on the IEEE 802 LMSC agenda if delivered to IEEE 802 LMSC members 48 hours in advance

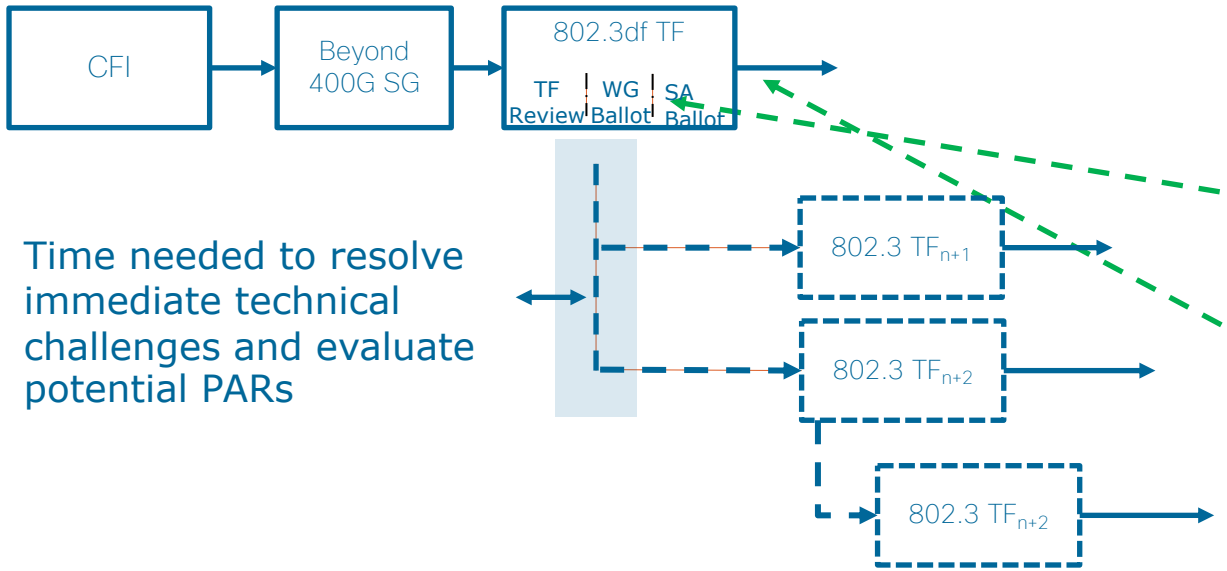
- Most recent example: IEEE Beyond 10km Study Group
  - Initial PAR – 802.3cn - Physical Layers and Management Parameters for 50 Gigabit per second (Gb/s), 100 Gb/s, 200 Gb/s, and 400 Gb/s Operation over Single-Mode Fiber and DWDM (dense wavelength division multiplexing) systems.
  - 802.3cn PAR split (Feb 2019)
    - 802.3cn (PAR Modification) - Physical Layers and Management Parameters for 50 Gb/s, 200 Gb/s, and 400 Gb/s Operation over Single-Mode Fiber
    - 802.3ct (New PAR) - Physical Layers and Management Parameters for 100 Gb/s and 400 Gb/s Operation over DWDM (dense wavelength division multiplexing) systems
  - 802.3ct PAR split (Feb 2020)
    - 802.3ct (PAR Modification) - Physical Layers and Management Parameters for 100 Gb/s Operation over DWDM (dense wavelength division multiplexing) systems
    - 802.3cw (New PAR) - Physical Layers and Management Parameters for 400 Gb/s Operation over DWDM (dense wavelength division multiplexing) systems



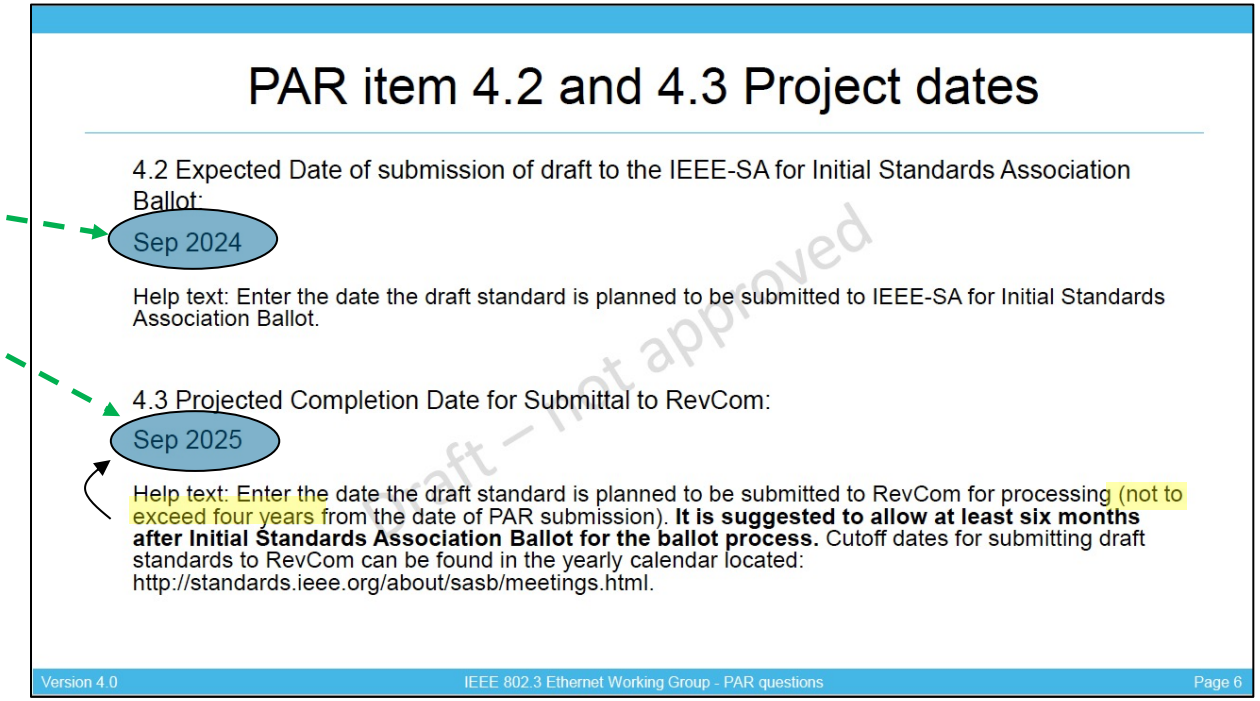
Looking closer at this potential scenario



PAR and Project Schedule



Time needed to resolve immediate technical challenges and evaluate potential PARs



PAR item 4.2 and 4.3 Project dates

4.2 Expected Date of submission of draft to the IEEE-SA for Initial Standards Association Ballot:

Sep 2024

Help text: Enter the date the draft standard is planned to be submitted to IEEE-SA for Initial Standards Association Ballot.

4.3 Projected Completion Date for Submittal to RevCom:

Sep 2025

Help text: Enter the date the draft standard is planned to be submitted to RevCom for processing (not to exceed four years from the date of PAR submission). **It is suggested to allow at least six months after Initial Standards Association Ballot for the ballot process.** Cutoff dates for submitting draft standards to RevCom can be found in the yearly calendar located: http://standards.ieee.org/about/sasb/meetings.html.

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IEEE SA Documentation does not allow an ability to capture potential nuances of the potential schedule and iterations discussed here.

dambrosia_b400g_01_210819.pdf

The PAR form documents when the 802.3df Task Force expects to submit for a) initial SA Ballot; and b) RevCom (AND there is a 4-year limit to b) per the rules).

Per this discussion, this PAR form does not capture how this project may possibly evolve.

The discussion of project objectives is an ongoing discussion between the Task Force(s) and the 802.3WG.

Summary

- This is a big project - the Study Group has adopted 31 objectives
  - 26 physical layer and electrical interface specifications
- Nothing happens until project documentation approved!
- Initial technical challenge –
  - Co-existence of 100 Gb/s and 200 Gb/s Signaling
  - FEC Architecture
  - Compatibility of modulation schemes between copper / optical signaling
- The following is anticipated as very likely by the authors:
  - 802.3df will undergo a PAR modification
  - 1 or more PARs will be split out from 802.3df
- No concerns by authors with dates (4.2 & 4.3) in proposed PAR document (dambrosia_b400g_01_210902.pdf)