Defining the "Beyond 400 Gb/s Ethernet" Project

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

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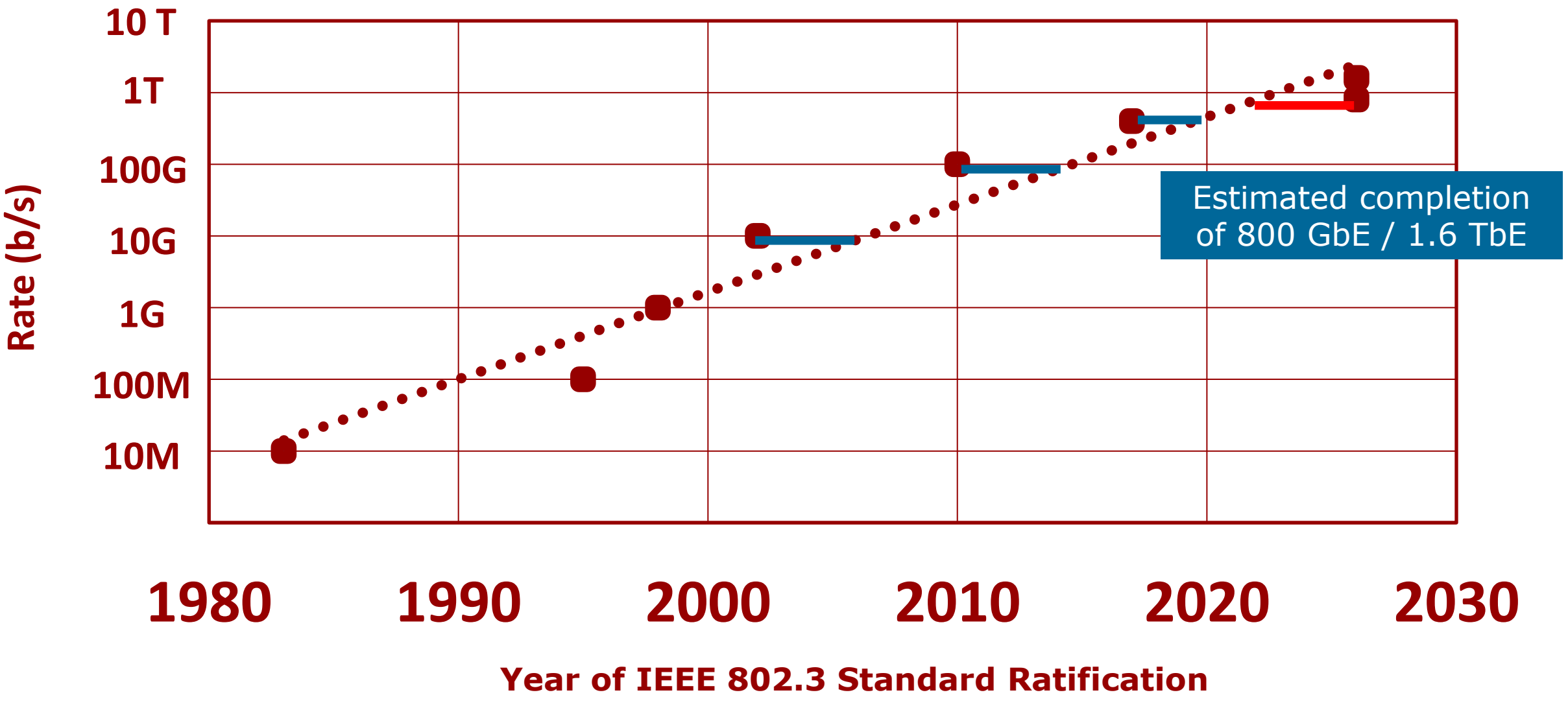
01 Mar 2021 Electronic Meeting

Foreword

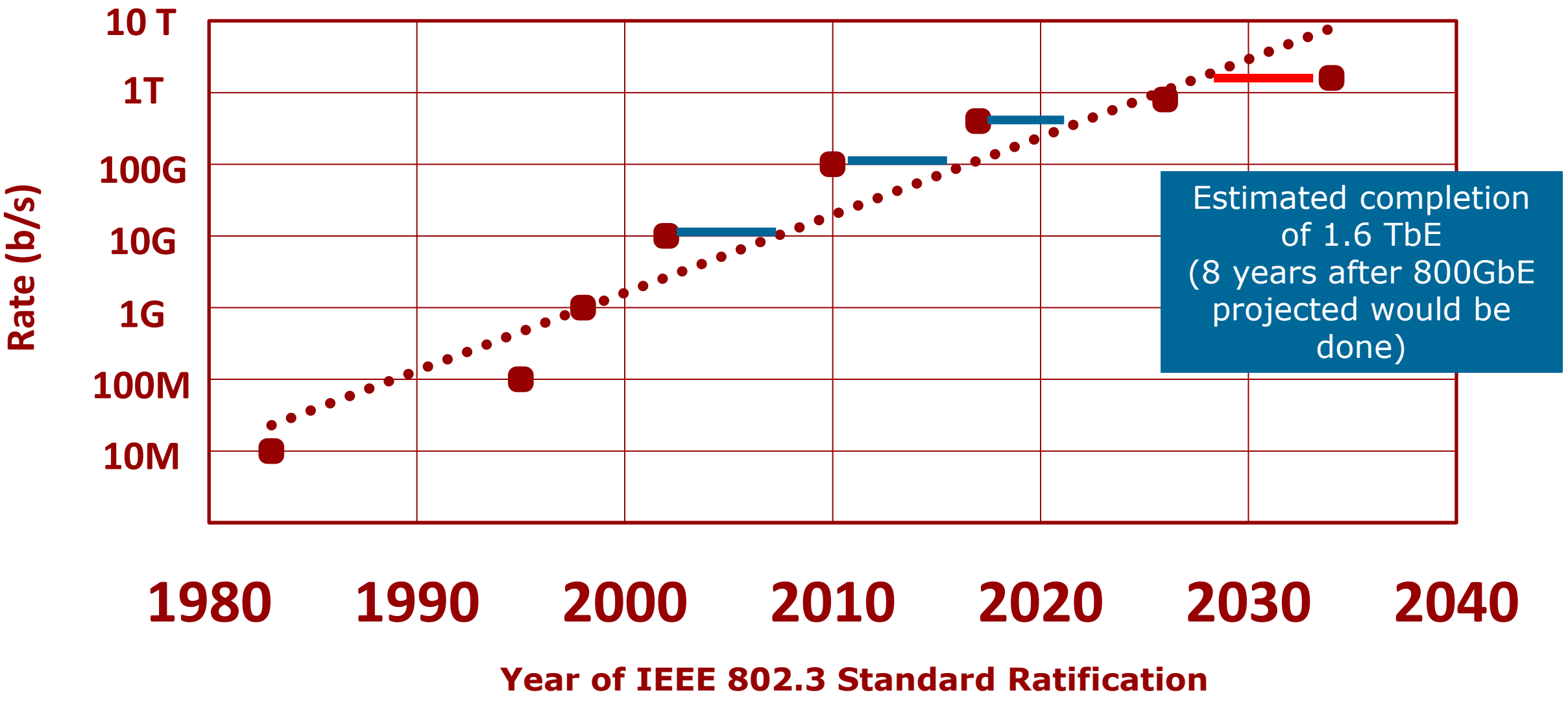
- **My responsibility as chair:**
  - **to produce a draft standard, recommended practice, or guideline in a reasonable amount of time for review and approval by the WG.**

- **Nothing in this presentation should be interpreted as an endorsement by its mention.**

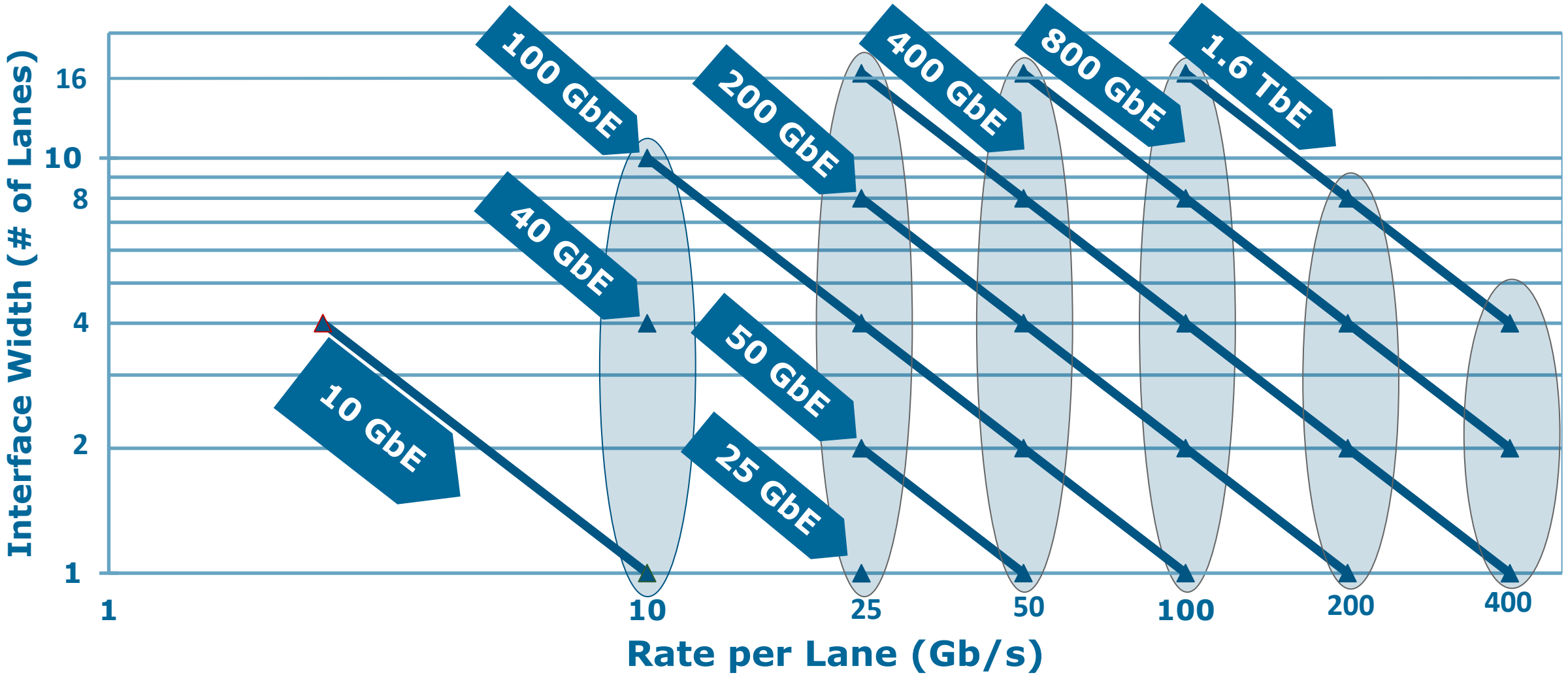
Scenario 1 – Develop 800 GbE & 1.6 TbE at same time



Scenario 2 – Develop 800 GbE / 1.6 TbE in separate "Next Speed" Projects



The Relationship Between Ethernet & Signaling Rates



Review 2/18 SG Straw Polls

- Straw Poll #1- I am interested in objectives targeting:

800 Gb/s:	12	(17%)
1.6 Tb/s:	2	(3%)
Both:	43	(61%)
Need more information:	8	(11%)
Abstain:	5	(7%)

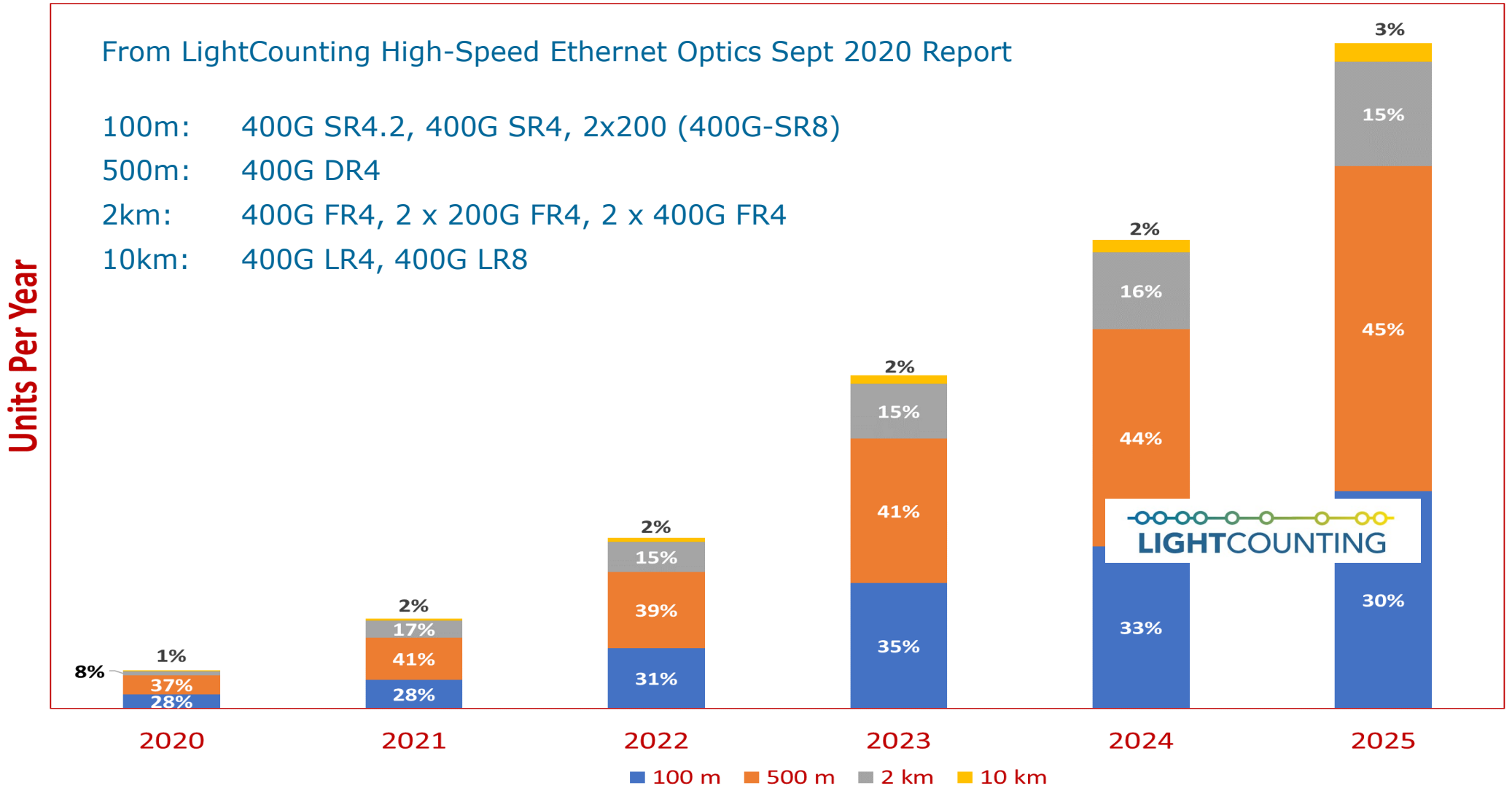
- Straw Poll #2- I am interested in development of higher speed electrical interfaces targeting “Beyond 400 GbE” based on:

100 Gb/s per lane:	6	(9%)
200 Gb/s per lane:	12	(17%)
Both	38	(55%)
Need more information:	9	(13%)
Abstain:	4	(6%)

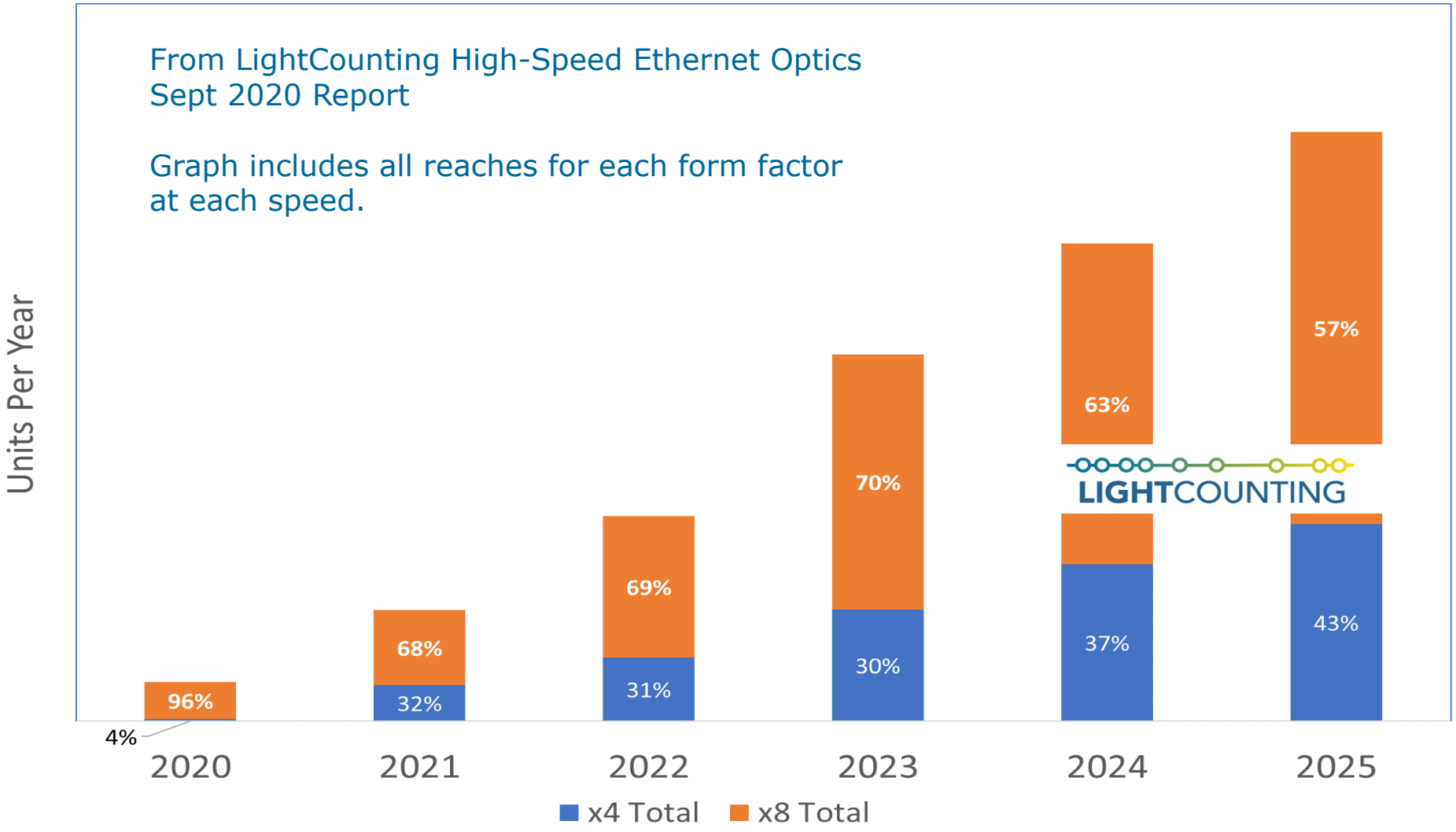
- Straw Poll #3 - I am interested in development of optical solutions targeting “Beyond 400 GbE” with optical signaling per lane based on:

100 Gb/s:	3	(5%)
200 Gb/s:	19	(33%)
800 Gb/s:	4	(7%)
Need more information:	28	(49%)
Abstain:	3	(5%)

Forecast – Transceiver Modules Targeting 200 GbE or 400 GbE



Comparison of Form Factor Adoption (200GbE / 400GbE / 800GbE)



Observations

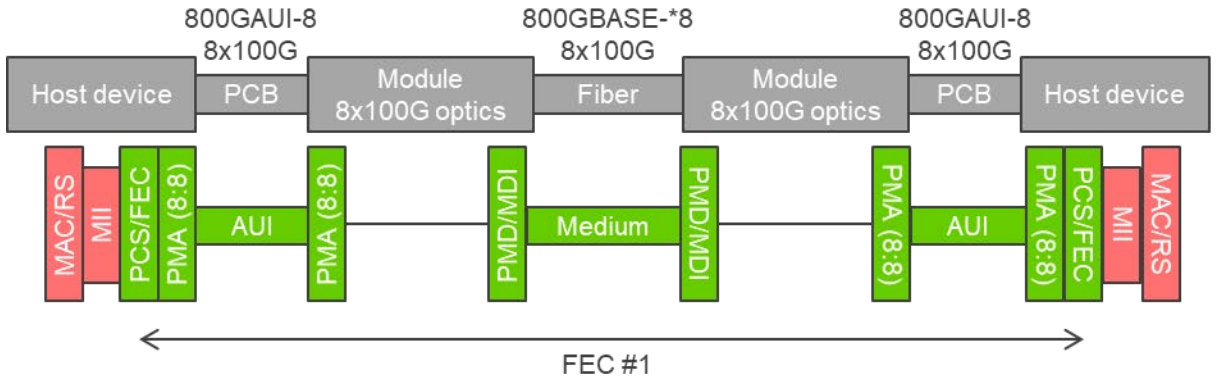
- IMO, Study Group has expressed strong interest in:
  - Objectives Targeting 800 GbE and 1.6 TbE
  - Electrical interfaces targeting Beyond 400 GbE based on 100 Gb/s and 200 Gb/s per lane
- Market data indicates
  - Modules for parallel fiber solutions (both MMF and SMF) make up ≥70% of shipments of targeting 400 GbE (2022 – 2025)
  - 2km (FR) module shipments were ≈15% of shipments
  - X8 modules > than 57% of modules shipping each year (20-25) targeting 200 GbE / 400 GbE / 800 GbE
  - Prior data (boujelbene_b400g_01_210211) also noted x1 /x2 / x4 / x8 ports
- Other trends that need to be considered?

Consider this hypothetical partial list of potential key objectives

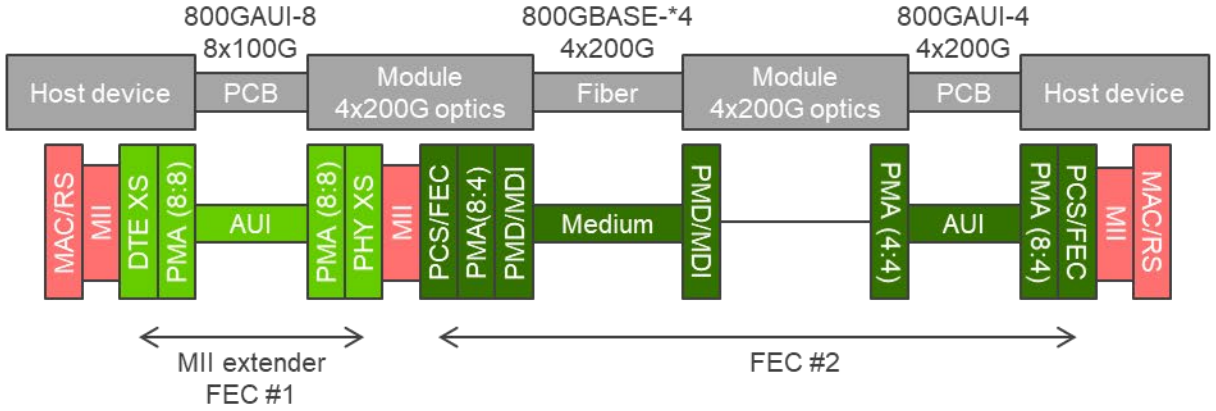
- **Ethernet Data Rates**
  - **Support a MAC data rate of 800 Gb/s**
  - **Support a MAC data rate of 1.6 Tb/s**
- **Electrical Interfaces (AUI) to support Beyond 400 Gb/s Ethernet**
  - **Based on 100 Gb/s signaling**
  - **Based on 200 Gb/s signaling**
- **Physical Layer Specifications to support Beyond 400 Gb/s Ethernet**
  - **Parallel Single mode fiber**
  - **Parallel MMF (leveraging 100 Gb/s per fiber more likely in this project)**
  - **Duplex SMF up to at least 2km**
  - **Other?**
- **Revisit 200 GbE and 400 GbE physical layer specifications based on higher speed specifications based on 200 Gb/s signaling?**

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

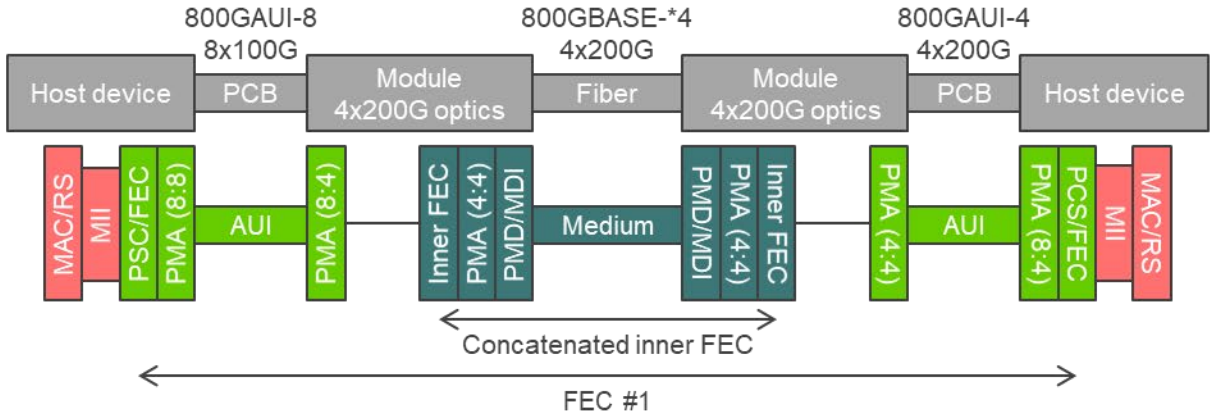
Example a: Single end-to-end FEC.



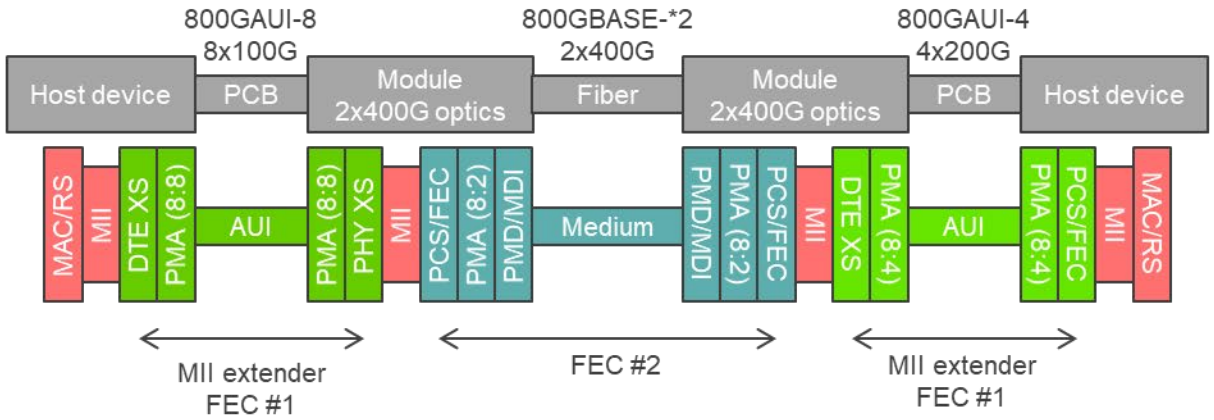
Example b: FEC #1 for 100GPL and FEC #2 for 200GPL



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

Key Observations

- Multiple potential solutions possible would need to be analyzed for Ethernet rate(s) chosen
- Architecture will need to ensure coexistence and interoperability between 100 Gb/s and 200 Gb/s based electrical interfaces.
- Architecture may need to address
  - multiple FEC schemes
  - flexibility for future physical layer specifications
- Potential to create new electrical interfaces and physical layer specifications for 200 GbE and 400 GbE, based on work at higher speeds

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