

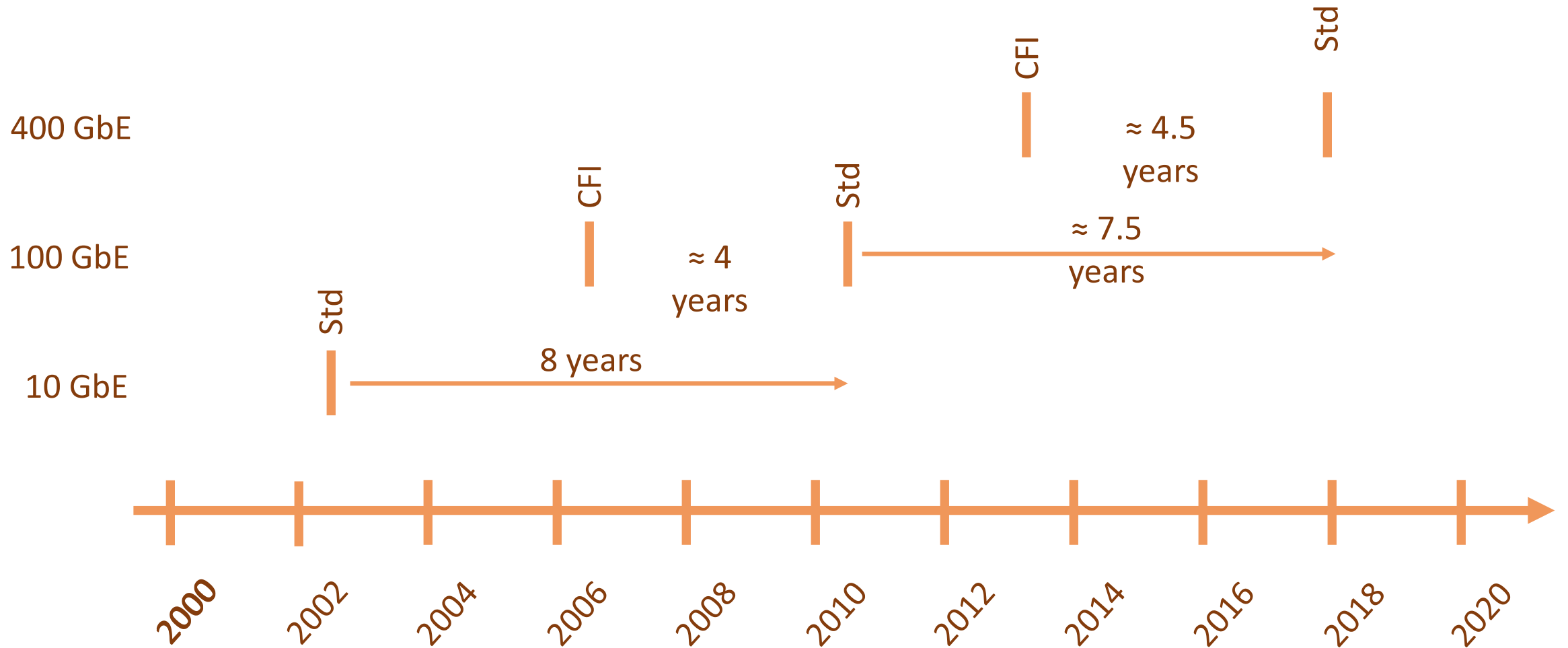
# Industry Consensus Beyond 400 GbE?

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Futurewei, U.S. Subsidiary of Huawei  
IEEE 802 Nov 2019 Plenary  
Kona, HI, USA

# Introduction – Recent Events

- 800 Gb/s has been an industry discussion topic –
  - ECOC
    - [Ethernet Alliance Press Release](#) – “Ethernet Alliance ECOC 2019 Demo Points to the 800GbE Future “
    - [“Market Focus” Topics](#)
      - “Leveraging 400 GbE to enable 800G”
      - “Design Considerations for 400G and 800G board mount optics”
      - “Polymer modulators with >50GHz performance for power consumption reduction at 400, 800, and 1600 Gbaud aggregated data rates”
      - “Beyond 400G – the challenge of testing the link, transmission and services”
  - New MSAs
    - 800G Pluggable MSA
      - Sept 5, 2019
      - [Press Release](#) (Chinese), [Lightwave Article](#)
      - “... target optical 8x100G and 4x200G based on PAM4 modulation for applications of 100 m, 500 m, and 2 km.”
    - QSFP-DD800 MSA Group –
      - Sept 19, 2019
      - [Press Release](#)
      - “.... Collaborate to increase pluggable transceiver speeds to 800 Gbps”
        - Dense 100 GbE or dense 400 GbE interfaces

# Looking Back at 3 Last New Higher Speed Efforts



# Here We are in 2019

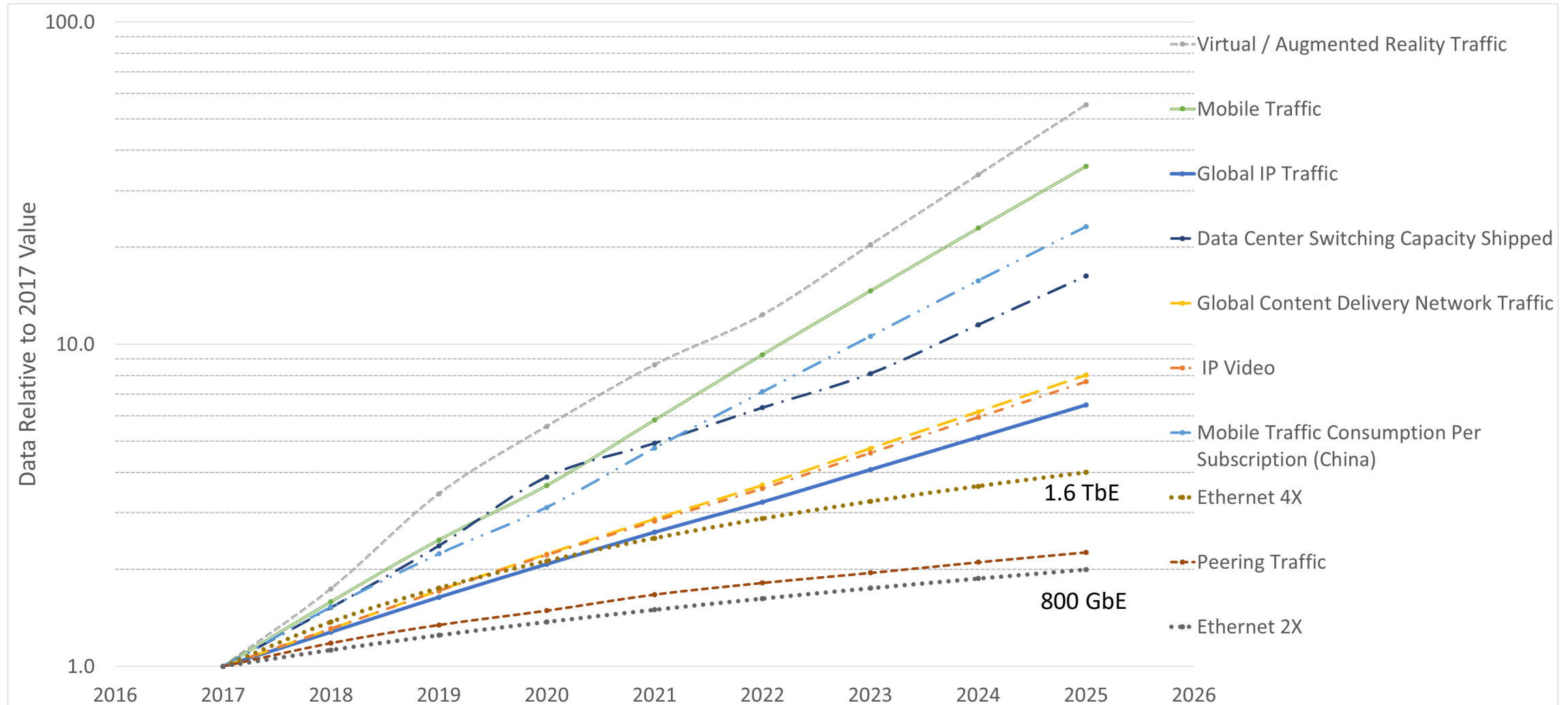
- Assumptions:

- 7 to 8 years between new “higher speed” standards
- 4 to 5 years to develop new “higher speed” standard (from CFI)
  - The bigger the technical hurdle, i.e. developing new signaling, the longer the project

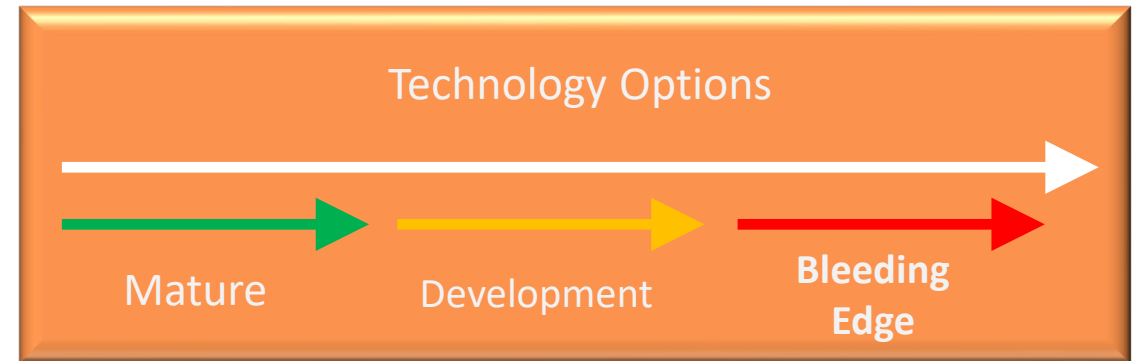
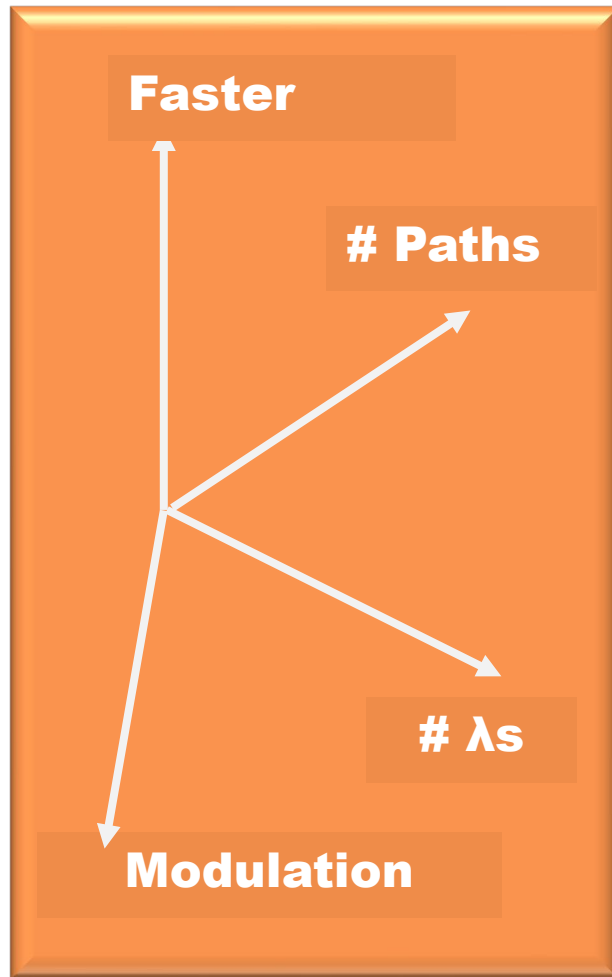
- Doing the Math

- New standard from 2018: 2025 to 2026
- Next CFI: As early as 2020 to 2021

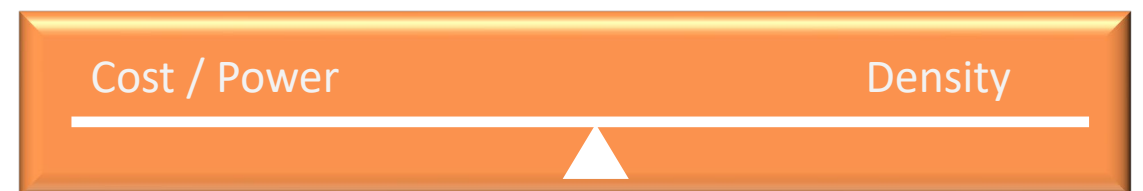
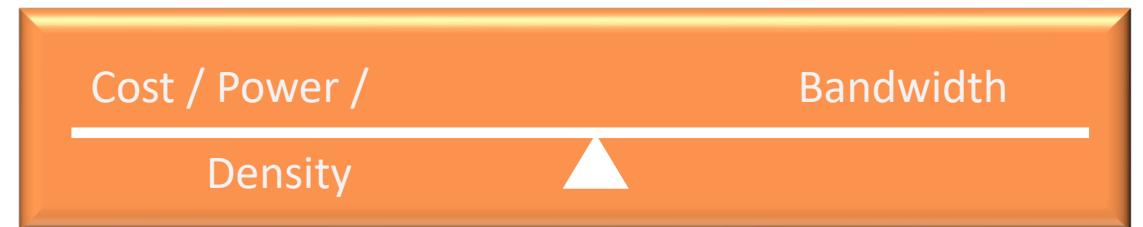
# BWA2 Forecast to 2025(pending approval)



# The Path to Higher Speeds



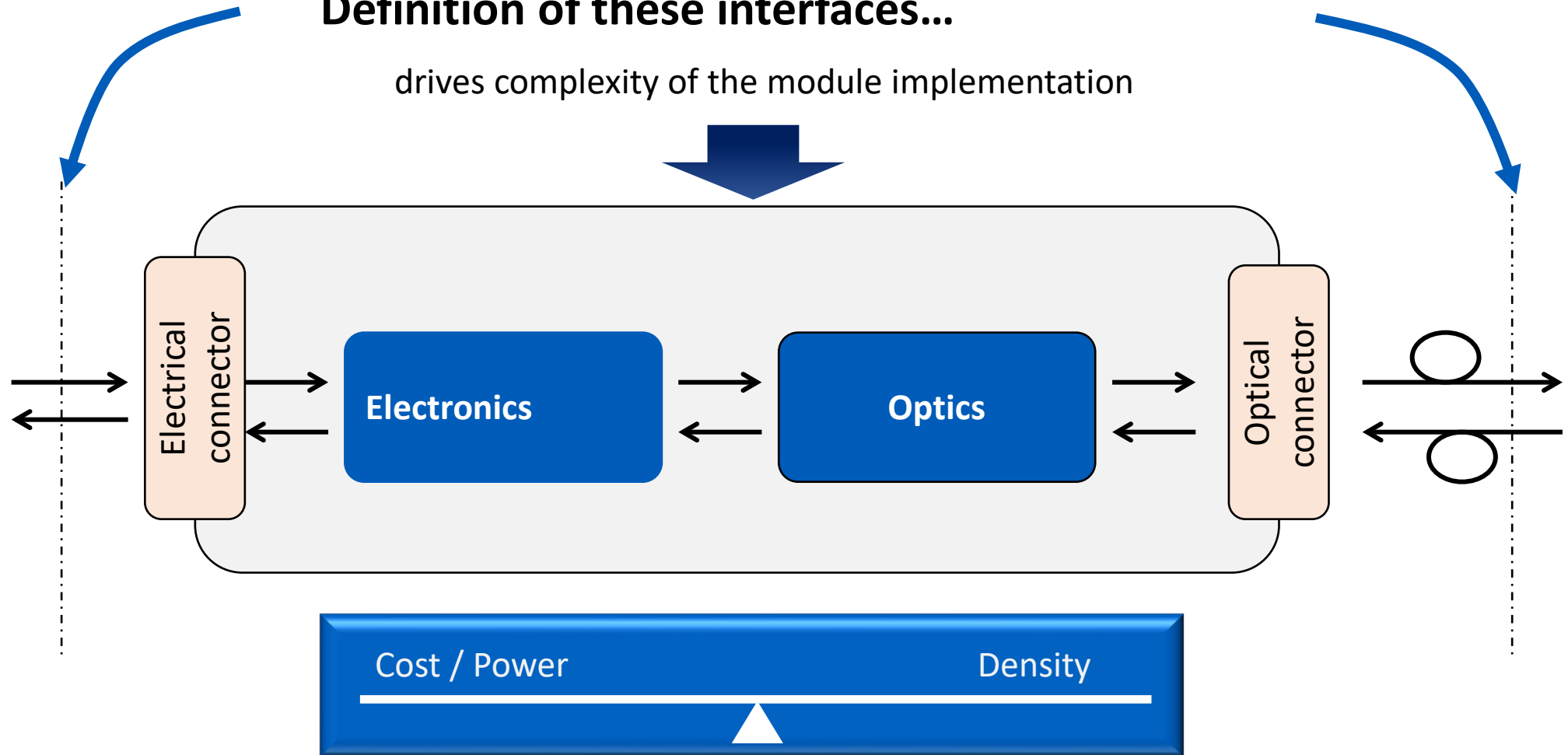
*The never-ending balancing acts!*



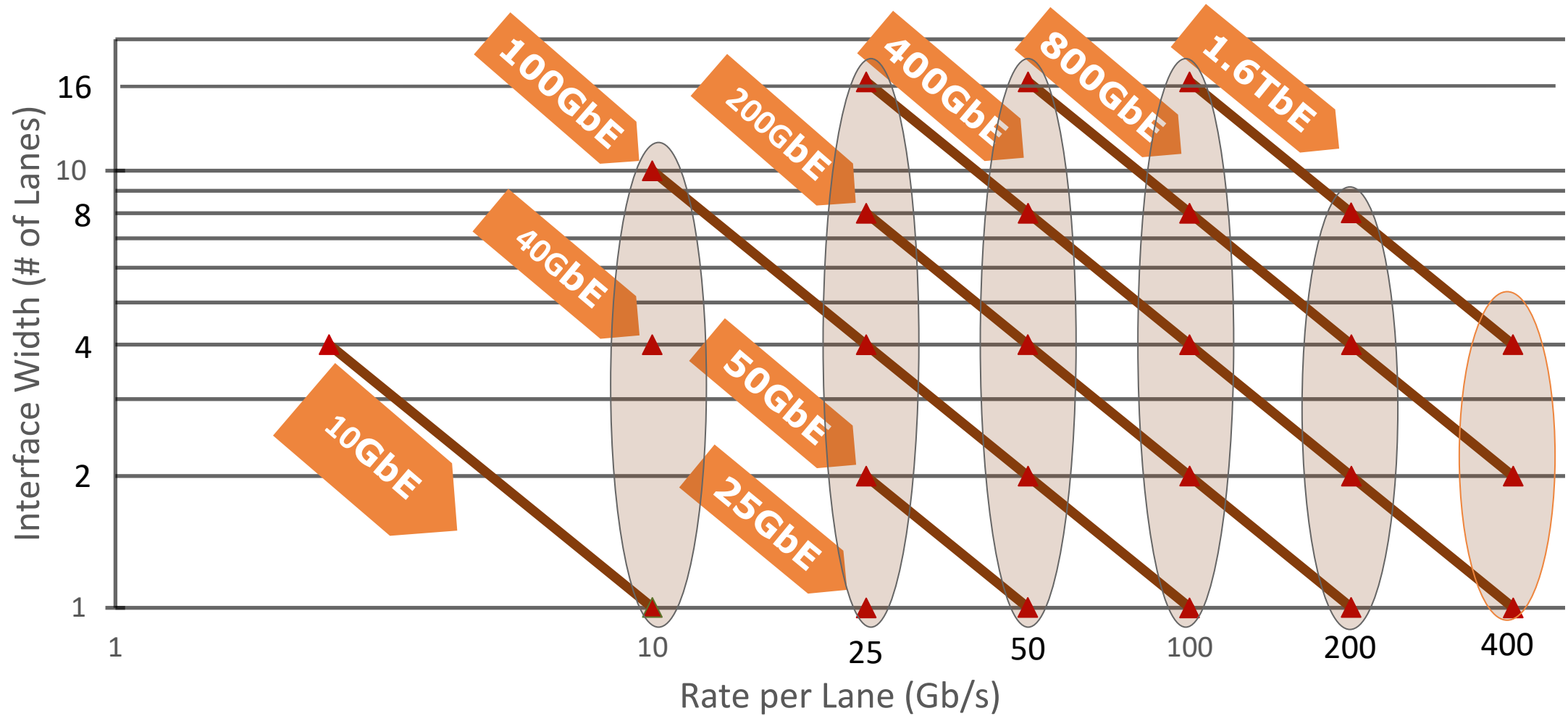
# Optical Module Implementation

## Definition of these interfaces...

drives complexity of the module implementation

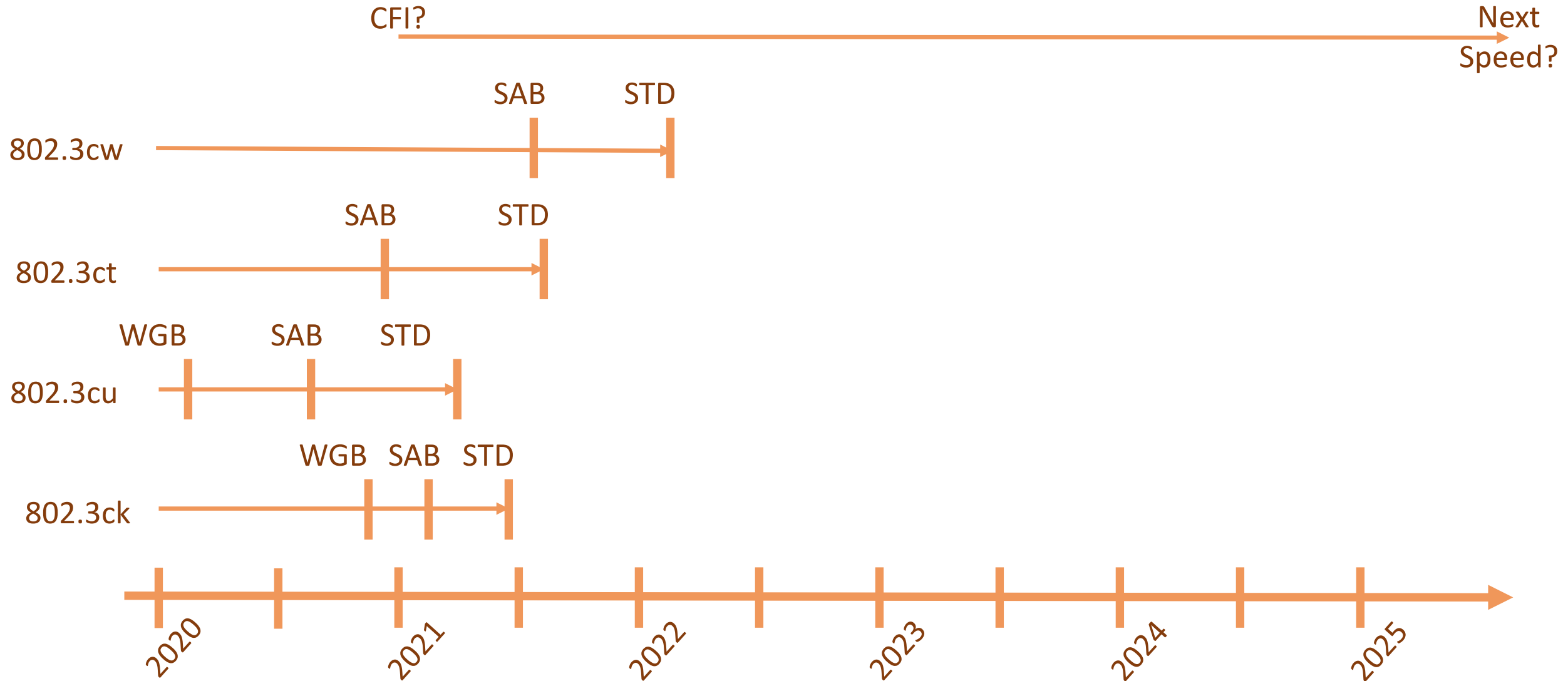


# The Basic Math of Ethernet





# Relevant 802.3 Projects Schedules



# History Review

- June 2010 – IEEE Std 802.3ba ratified
- Feb 2011 – Ethernet Bandwidth Assessment Started
- July 2012 –
  - BWA Approved / Published
  - Higher Speed Ethernet Consensus Ad hoc Formed
- Sept 2012 - Feb 2013 HSE Consensus Ad Hoc meetings
- Mar 2013 - 400 GbE Call-For-Interest

# Topics for Discussion

- Thoughts on needing new speed?
- Timing – start / completion?
- 800 GbE versus 1.6 TbE versus both? (Good question for a study group!!!!)
- Target application spaces and PHYs?
- Technology – 100 Gb/s versus 200 Gb/s signaling?
  - 100 Gb/s signaling
    - In development now
    - Impact on speed choice? 16x100G interface? Optical Mux loses impact reach?
  - 200 Gb/s signaling
    - Optics –
      - PAM4?
      - Coherent up to 400 Gb/s already being standardized / developed – building block?
    - Electrical – significant paradigm shift?
    - Technical / economic feasibility?

# Potential Next Steps

- All potential next steps are dependent on interest levels
- Option #1 - Leverage NEA for any of the following –
  - Explore market need for 800GbE / 1.6TbE / both
  - Develop consensus presentation for CFI on target speed(s)
  - Explore 200 Gb/s signaling (optical / electrical)
- Option #2 – Do nothing at this time