

Case Study: FEC architectures for 800 GbE

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Goals of the Talk

- Several different FEC schemes have been presented during the B400G Study Group
- This presentation will :
 - Review the FEC schemes presented
 - Study them in the context of several deployment scenarios, as the PMD and AUI technology transitions from 100G/lane to 200G/lane
 - Tease out key attributes of the different FEC schemes that could be important as we define the overall FEC architecture strategy for the project
- Get people thinking about complexity and consideration of support for multiple implementations

Intent of the presentation

- What *is NOT* the intent
 - It is not the intent to recommend one FEC scheme over another
 - It is not the intent to propose a FEC baseline
- What *is* the intent
 - Focus on the FEC Architecture - has to support all the PHYs in 802.3df
 - Should enable as many implementation options as possible
 - Develop a framework for discussing FEC options without going into merits of one or other
 - Initiate discussion on a common language for the group to discuss Architectural questions

Approach

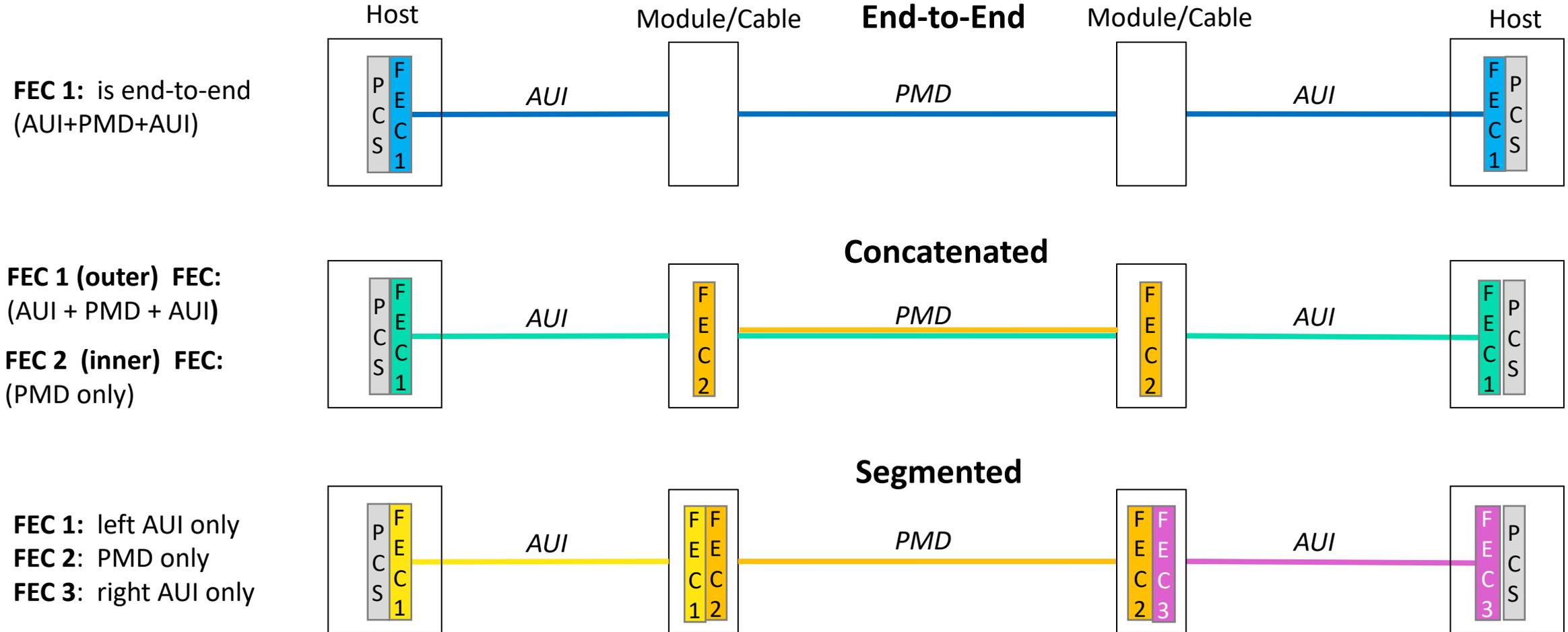
- Evaluate different FEC schemes using 800GbE as a case study
 - Future work -- include other MAC Speeds (1.6TbE, 200GE and 400GE)
- Use an implementation example consisting of a host with a single C2M AUI and a pluggable Optical / Copper cable PMD
- Consider 3 FEC schemes:
 - Segmented
 - Concatenated
 - End-to-End
- Compare each FEC scheme in the context of several deployment scenarios, as technology migrates from 100G/lane to 200G/lane
- Not considered in this presentation (yet)
 - Hosts with two AUIs (i.e. C2C and C2M)
 - Special AUIs (e.g. for CPO, etc)
 - Other.....

800GbE Solution Space (based on 802.3df objectives)

Ethernet MAC Speed	Signaling Rate per AUI Lane	AUI Lanes	Signaling Rate per PMD lane	Copper Cable		MMF Parallel		SMF Parallel		SMF Duplex		
				1m	2m	50m	100m	500m	2km	2km	10km	40km
800 Gb/s	100 Gb/s	8 lanes (800GAUI-8)	100 Gb/s		8 pairs	8 pairs	8 pairs	8 pairs	8 pairs			
			200 Gb/s	4 pairs			4 pairs	4 pairs	4 λ s			
			Tbd							Tbd λ s	Tbd λ s	
800 Gb/s	200 Gb/s	4 lanes (800GAUI-4)	200 Gb/s	4 pairs				4 pairs	4 pairs	4 λ s		
			Tbd								Tbd λ s	Tbd λ s

800GbE FEC architecture has to support all the above AUIs and PMDs

FEC Schemes : End-to-End, Concatenated, Segmented

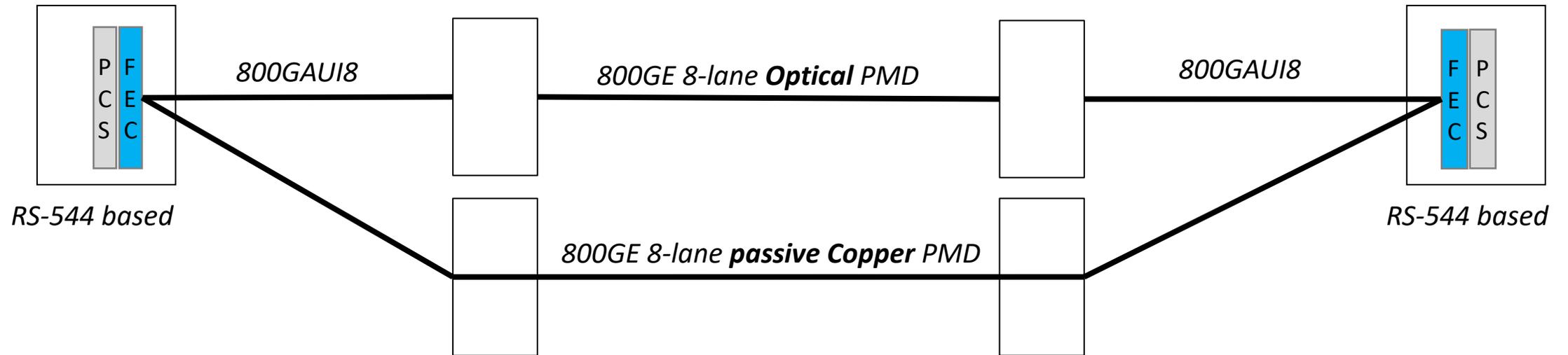


FEC Architecture Analysis Approach

- Analyze FEC schemes in context of following deployment scenarios and technology migration paths
 1. 100G/lane End-End Architecture (both host and PMD using 100G/lane)
 2. 200G/lane PMD (still using 100G/lane hosts)
 3. 200G/lane PMD (one host at 200G/lane)
 4. 200G/lane PMD (both hosts at 200G/lane)
- Potential criteria for future analysis
 - Independence of deployment scenarios and migration paths
 - AUI lane rate
 - PMD lane rate
 - Complexity (implementation and analytical)
 - Latency
 - Power

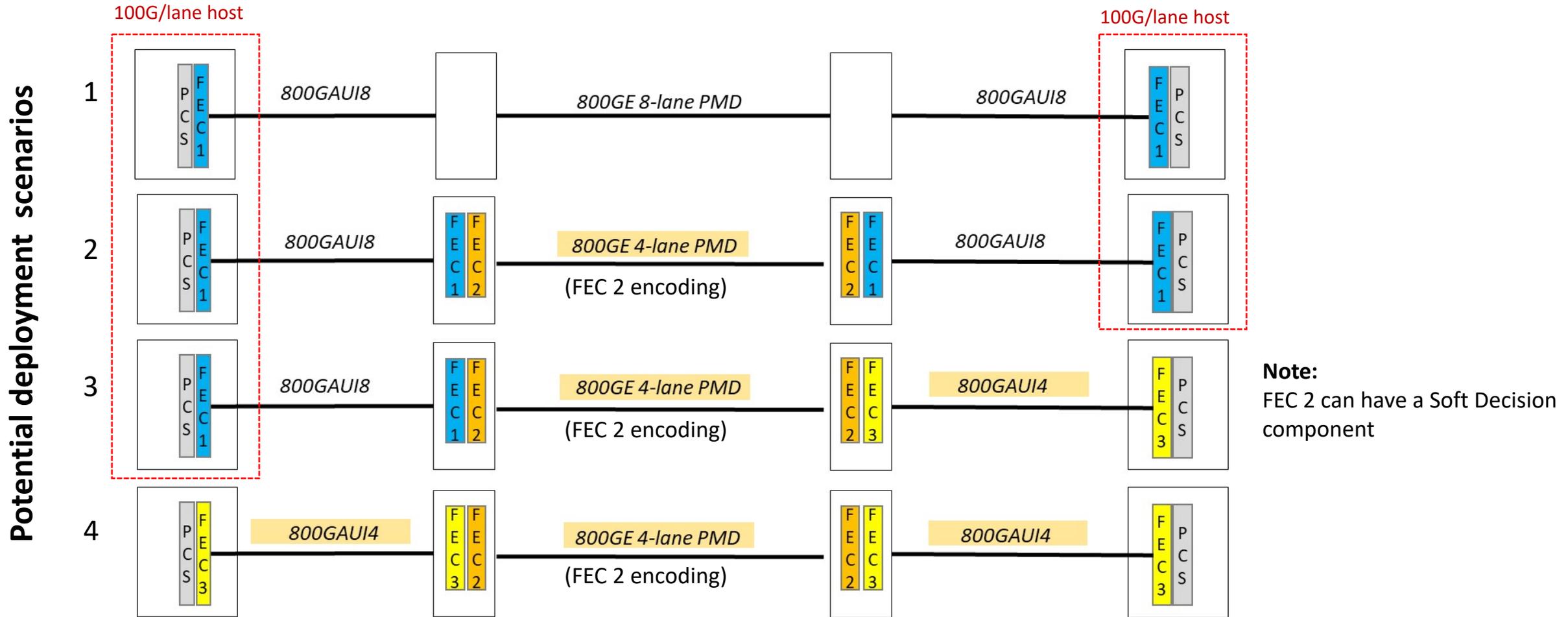
Starting Assumption - 100G/lane technology reuse

End-to-End FEC Arch. for all 100G/lane PMDs (except coherent)

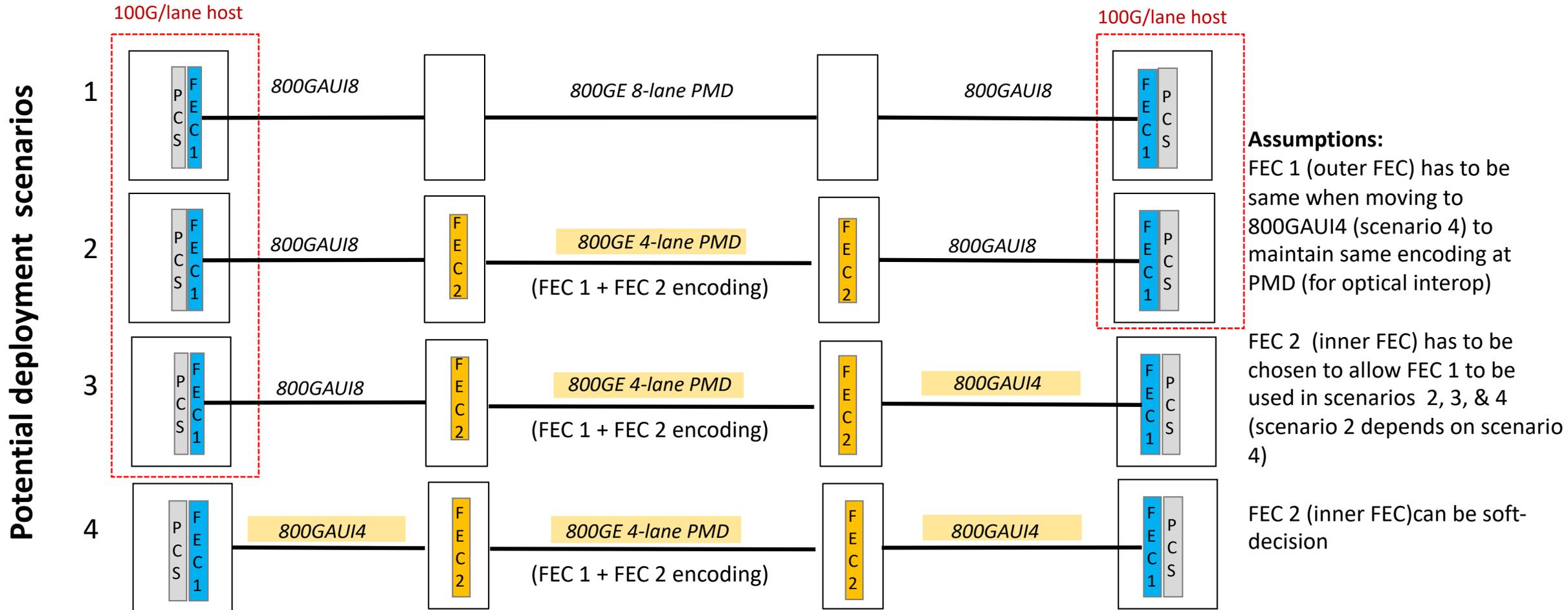


Strong desire to leverage existing 100G/lane ethernet technologies and specifications

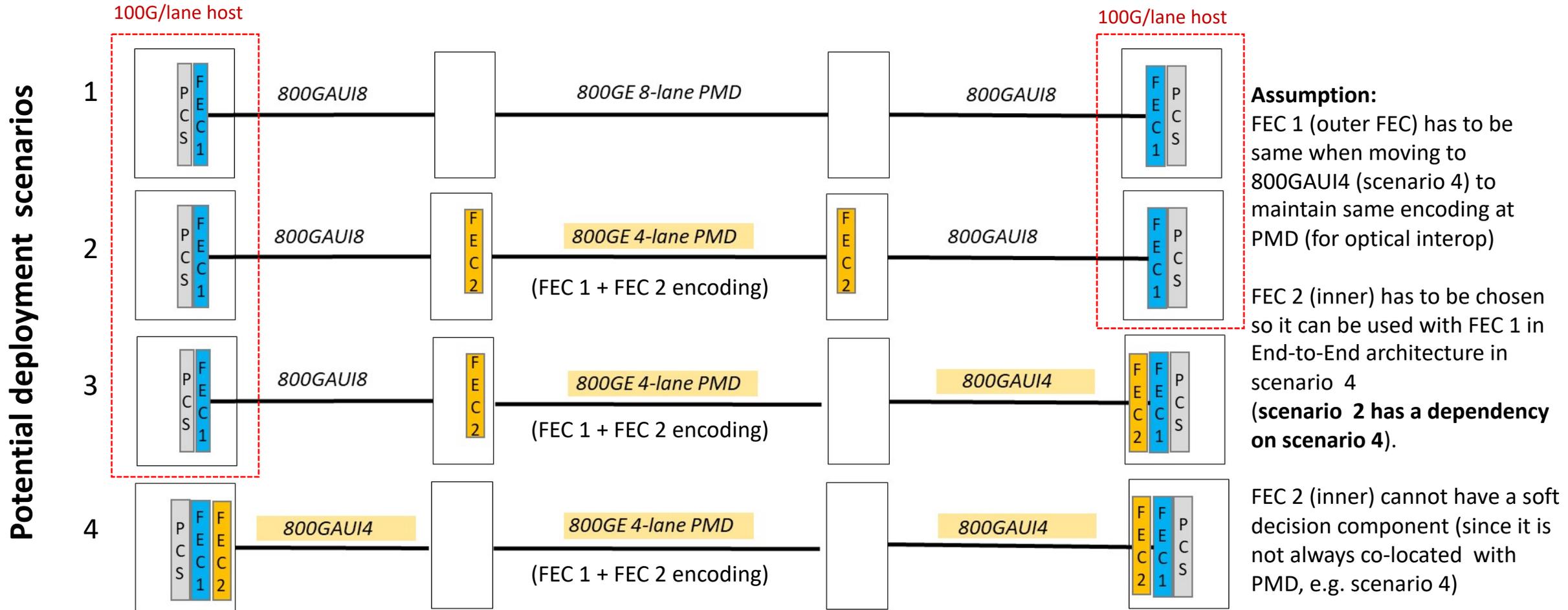
Case A : Segmented FEC architecture



Case B: Concatenated (inner FEC inside module)



Case D : Hybrid End-to-End / Concatenated



Attributes to compare features of different FEC schemes

- Recommend that a common set of attributes be used to compare features of different FEC schemes
- Following is a preliminary list of attributes
 - Independence of deployment scenarios and migration paths
 - Implementation complexity – host
 - Implementation complexity – module
 - Analytical complexity
 - PMD Lane Rate
 - AUI Lane Rate
 - Latency
 - Power
 - Others ... ?

Summary

- FEC Architecture needs to consider multiple deployment scenarios as technology migrates from 100G/lane to 200G/lane (and beyond?)
- This is not simple !
 - There are many possible implementations and deployment scenarios that may need to be considered
 - Focusing on a few specific implementations or deployment scenarios may lead us to the wrong conclusions
 - The devil is very much in the details (more so than ever before ?)
- Decisions around FEC schemes will have consequences that span multiple generations and deployment scenarios
- Recommend using a common set of attributes to compare and contrast FEC schemes
- A lot more work is required before the Task Force can coalesce around a FEC strategy !

Recommend formation of Architecture ad-hoc to study this space further

Thanks !!