Sebastien Gareau

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Sebastien is a Systems Architect in the WaveLogic Technologies team, working on the latest coherent modem products.

His background is in ASIC/FPGA digital design and architecture, and has been at Ciena for 16 years.

He represents Ciena in various public forums such as ITU-T Question 11, OpenROADM and OIF Optical track, and has various editorship roles in these forums.

ITU Workshop on “Evolution of Optical Networks for IMT2030 and Beyond”

Charles K. Kao Auditorium, Hong Kong Science and Technology Park (HKSTP)

20 November 2024, 15:00 - 18:00

B800G and other thoughts

Sebastien Gareau

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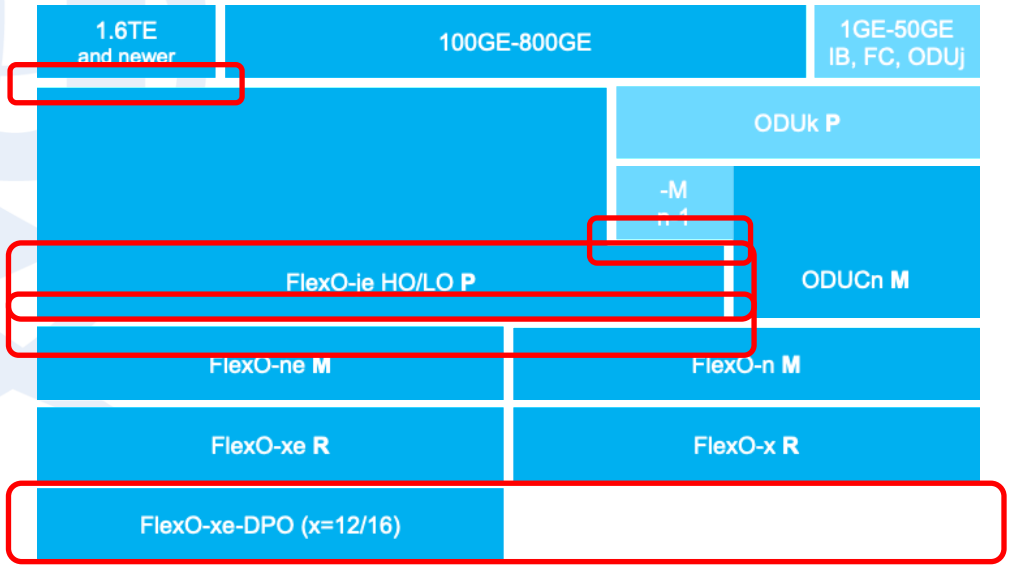
B800G Asks/Requirements

- Increase capacity/reach of interfaces by increasing aggregate baud
  - E.g. 1.6T and 1.2T aligning to OIF 1600ZR+ and 1200ZR+
- LO/HO container to aggregate and optimize muxponding
- LO/HO container to optimize OTN switching
- Optimize the interoperable interface bit rate
- ZR+ Reach expectations in OIF 1000km, beyond current scope of ITU

Note: ITU is calling it B1T, but we have not excluded the need for a new 800G longer reach interface at this early stage

Proposed B800G Architecture

- Focus on FlexO-xe/ZR+ Ethernet optimized multi-vendor interoperable interfaces
- Full rate FlexO-x and Ethernet optimized FlexO-xe supported by bookend single-vendor interfaces (common elements in G.709.1)
  - FlexO-x-DPO OTN multi-vendor interoperable interfaces no longer needed
- FlexO-ne Ethernet GMP mapping procedure to include 1.6TE client
  - ODUflex BMP mapping in G.709 no longer needed
- FlexO-je optional and switchable path layer and define OH
  - Name still in discussion (e.g. B1T ODU, FlexO-npe, …)
- FlexO-je to FlexO-n mapping procedure
- FlexO-je to FlexO-ne adaptation procedure
- Legacy ODUk and ODUCn services can be mapped to FlexO-n
  - No compromises in capacity
- Legacy ODUk and ODUCn services can be mapped to FlexO-ne
  - Compromise in capacity



Both FlexO-xe and FlexO-x can be supported by bookend single-vendor

Proposed New B800G G.709.x Work Items

- New FlexO-16e-RS in G.709.5
- New FlexO-12e-DPO and FlexO-16e-DPO in G.709.6 or G.709.b1t
- New FlexO-16e-MFI and FlexO-16-MFI in G.sup58

- Extend Ethernet GMP mapping procedure to include 1.6TE client in G.709.1

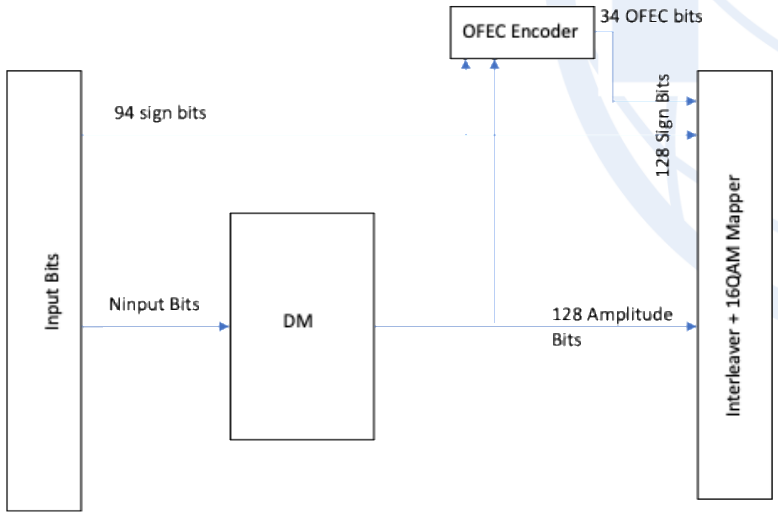
- New FlexO-je optional path layer and define OH in G.709.1
- New FlexO-je to FlexO-n mapping procedure in G.709.1

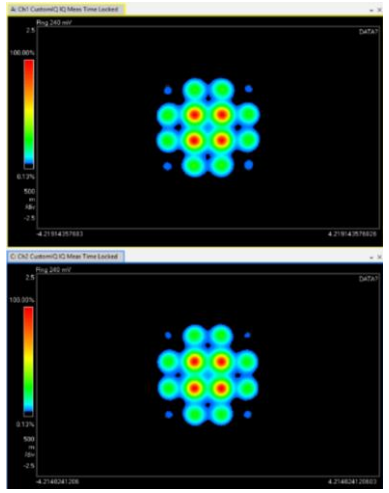
- New ODUCn-1 or ODUCn-M mapping procedure in G.709.1

- *Note: ITU members can alternatively decide to create new Recommendations*

B800G/ZR+ Interoperable PCS

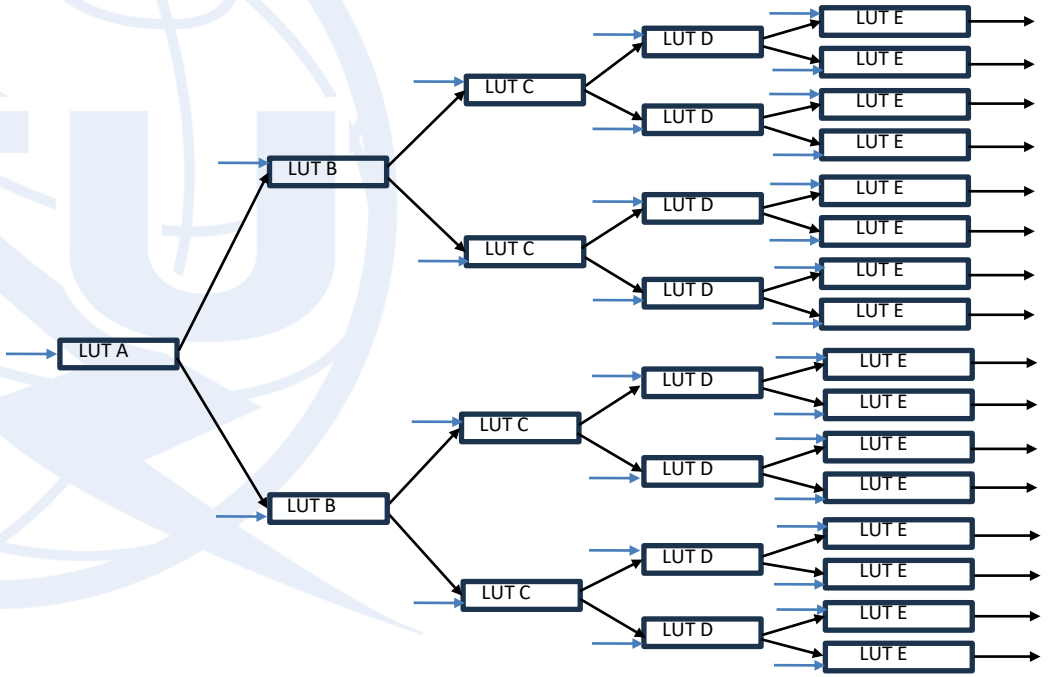
- ITU has not adopted interoperable probabilistic shaping in B400G
  - Likely needed for B800G, alignment with OIF that has target reach of 1000km
- Amplitude shaping can be applied to OFEC





B800G/ZR+ Interoperable PCS

- OpenROADM adopted a simple scheme for B400G
  - LUT based, with N=11
  - Option for ITU B800G
  - 260Gbaud FlexO-16e/ZR+
- OIF proposals for 1200ZR+/1600ZR+
  - Ciena proposal, fixed tree, N=128
  - Option for ITU B800G
  - Tradeoff performance and baud
  - 250-260Gbaud FlexO-16e/ZR+
  - OIF requirement of 13.7dB RSNR

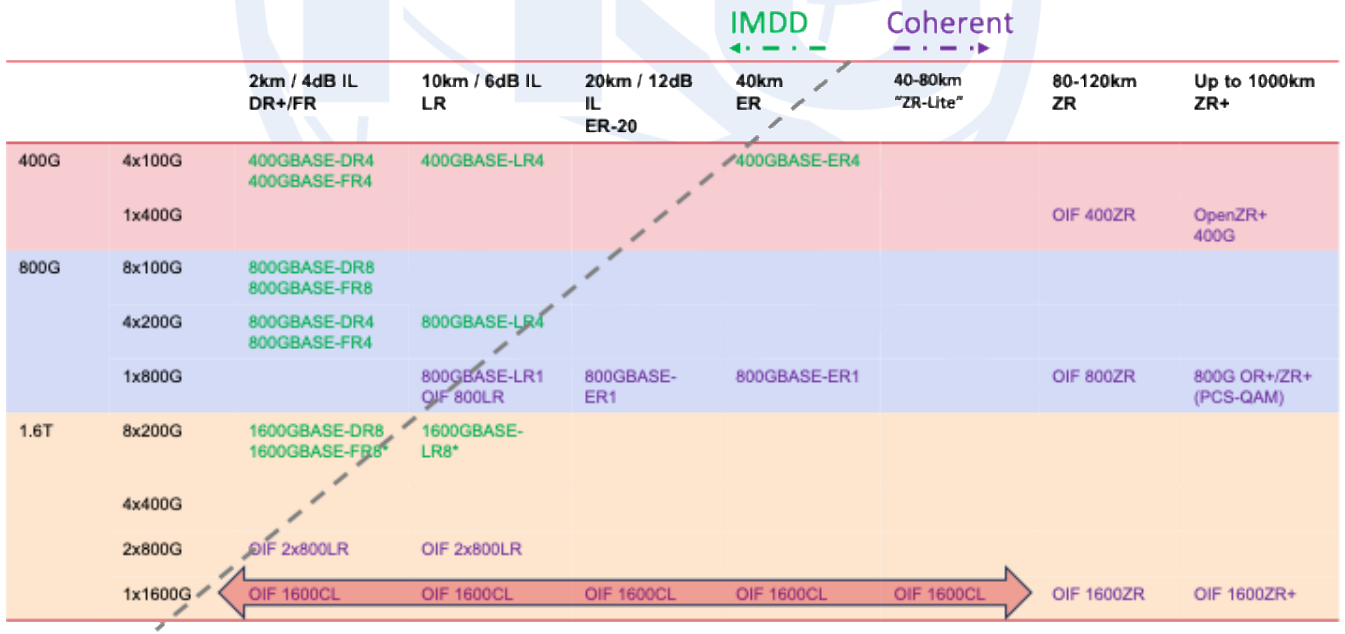


Coherent-Lite

- OIF has an active project for 800LR
- OIF started project 1600CL
- Based on KP4+BCH2 concat FEC
- Low latency/power, purpose built

Coherent-Lite

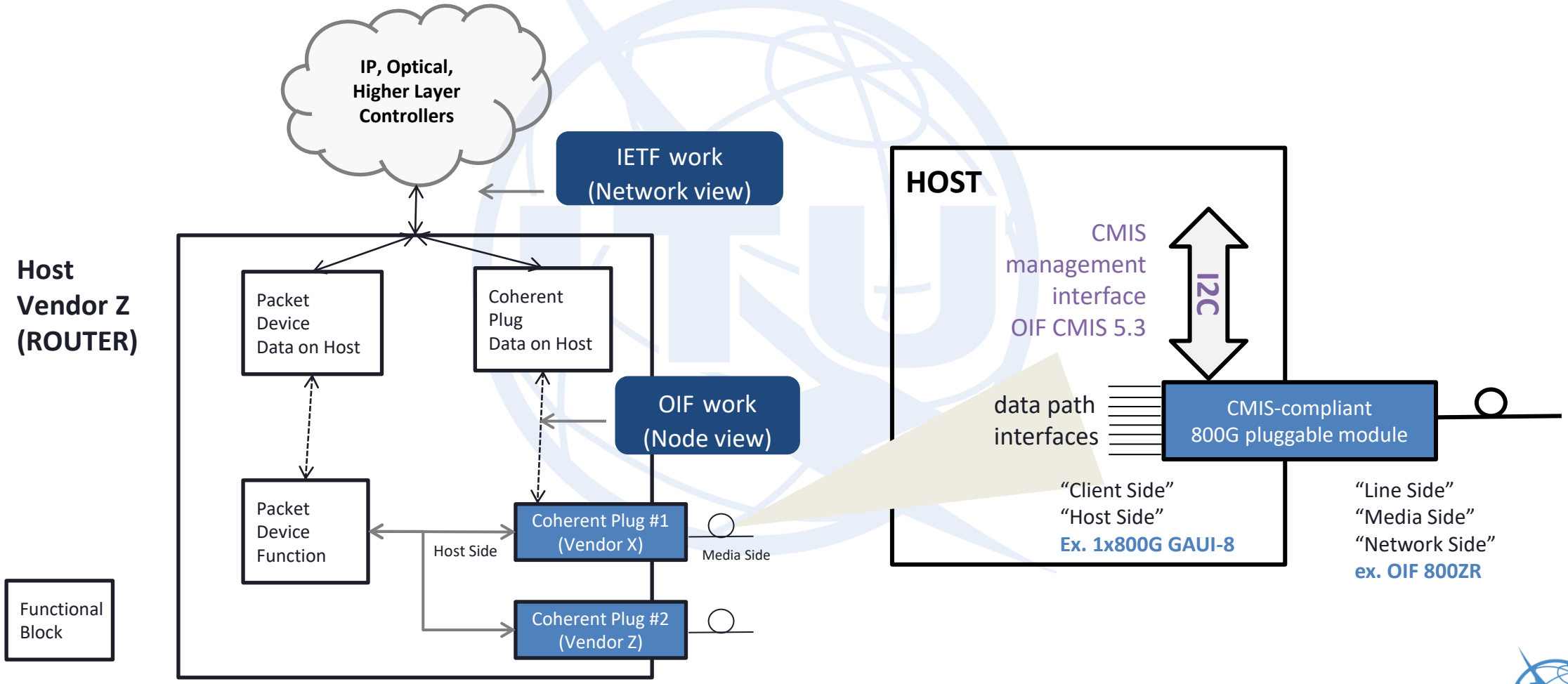
- Should this be in scope of ITU for FlexO-x and FlexO-xe?
- OTN handoff applications for FlexO-x-RS don’t have a lot of traction
- CL can address various applications



		2km / 4dB IL DR+/FR	10km / 6dB IL LR	20km / 12dB IL ER-20	40km ER	40-80km “ZR-Lite”	80-120km ZR	Up to 1000km ZR+
400G	4x100G	400GBASE-DR4 400GBASE-FR4	400GBASE-LR4		400GBASE-ER4			
	1x400G						OIF 400ZR	OpenZR+ 400G
800G	8x100G	800GBASE-DR8 800GBASE-FR8						
	4x200G	800GBASE-DR4 800GBASE-FR4	800GBASE-LR4					
	1x800G		800GBASE-LR1 OIF 800LR	800GBASE-ER1	800GBASE-ER1		OIF 800ZR	800G OR+/ZR+ (PCS-QAM)
1.6T	8x200G	1600GBASE-DR8 1600GBASE-FR8*	1600GBASE-LR8*					
	4x400G							
	2x800G	OIF 2x800LR	OIF 2x800LR					
	1x1600G	OIF 1600CL	OIF 1600CL	OIF 1600CL	OIF 1600CL	OIF 1600CL	OIF 1600ZR	OIF 1600ZR+

*Not adopted in 802.3

Network Management Coherent Plugs



1.6T is Here!

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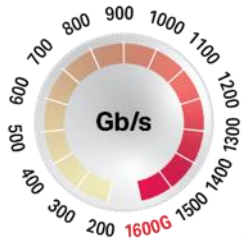
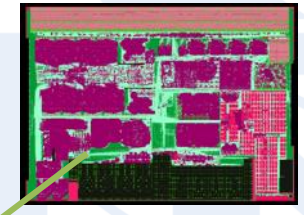
WaveLogic 6 Extreme
1.6Tb/s, 200Gbaud, 3nm CMOS



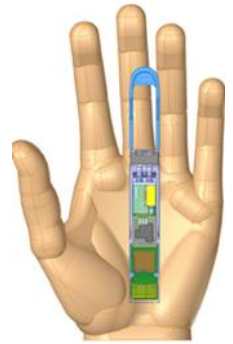
1st 3nm coherent DSP ASIC

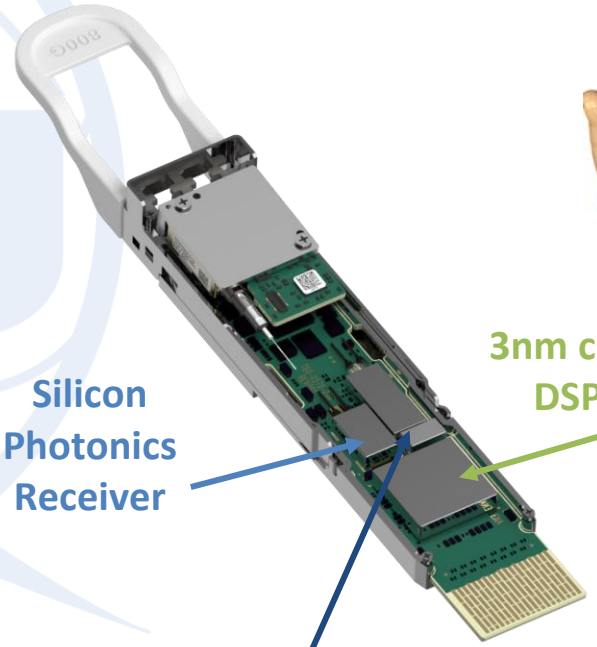


1st 200GBaud Receiver

1st 200GBaud Coherent Driver Modulator (CDM)

WaveLogic 6 Nano
800G, 141GBd, 3nm CMOS
1.6T, 2x800LR , 3nm CMOS





3nm coherent DSP ASIC

Silicon Photonics Receiver

Silicon Photonics-based Modulator with integrated SOA

Thank you !