Pushing Nx 400G Further

16-Oct-2023

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Filipe Correia, Ribbon Communications

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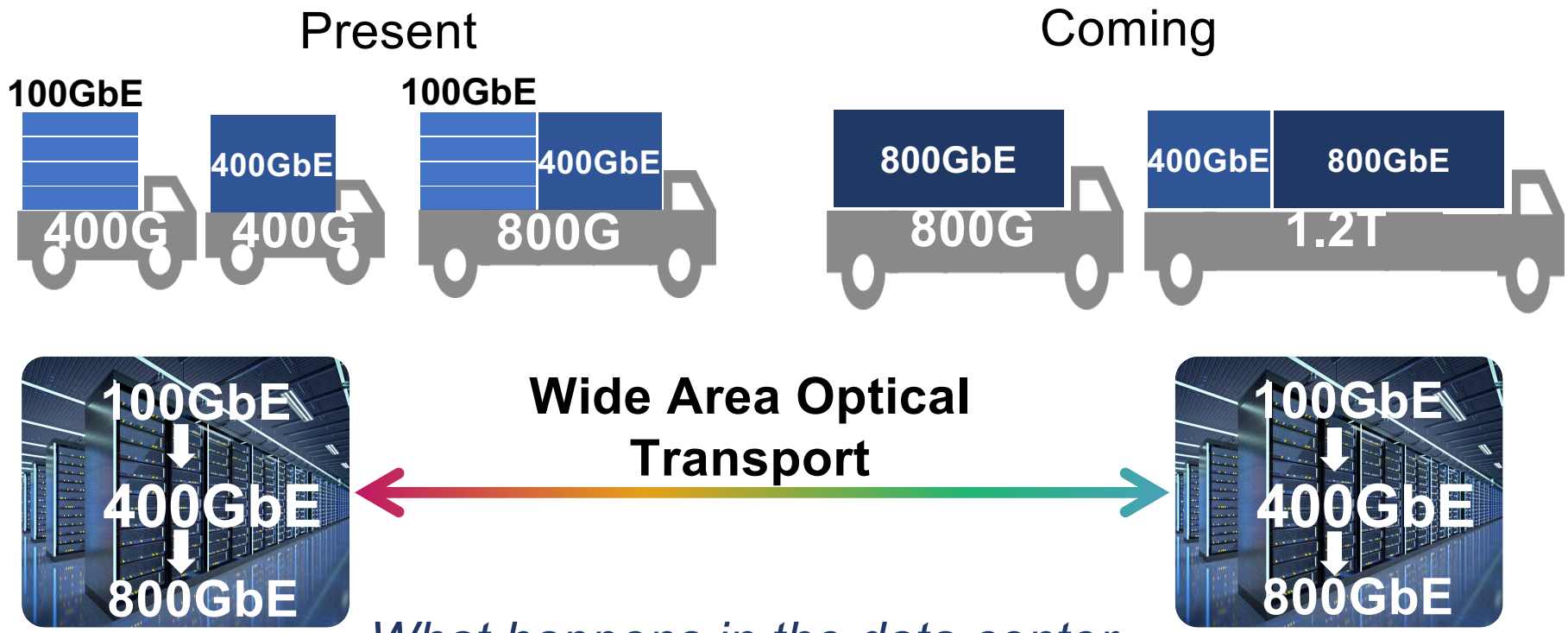
Data Center Evolution Driving N x 400G Lanes



What happens in the data center,
***goes outside** the data center*

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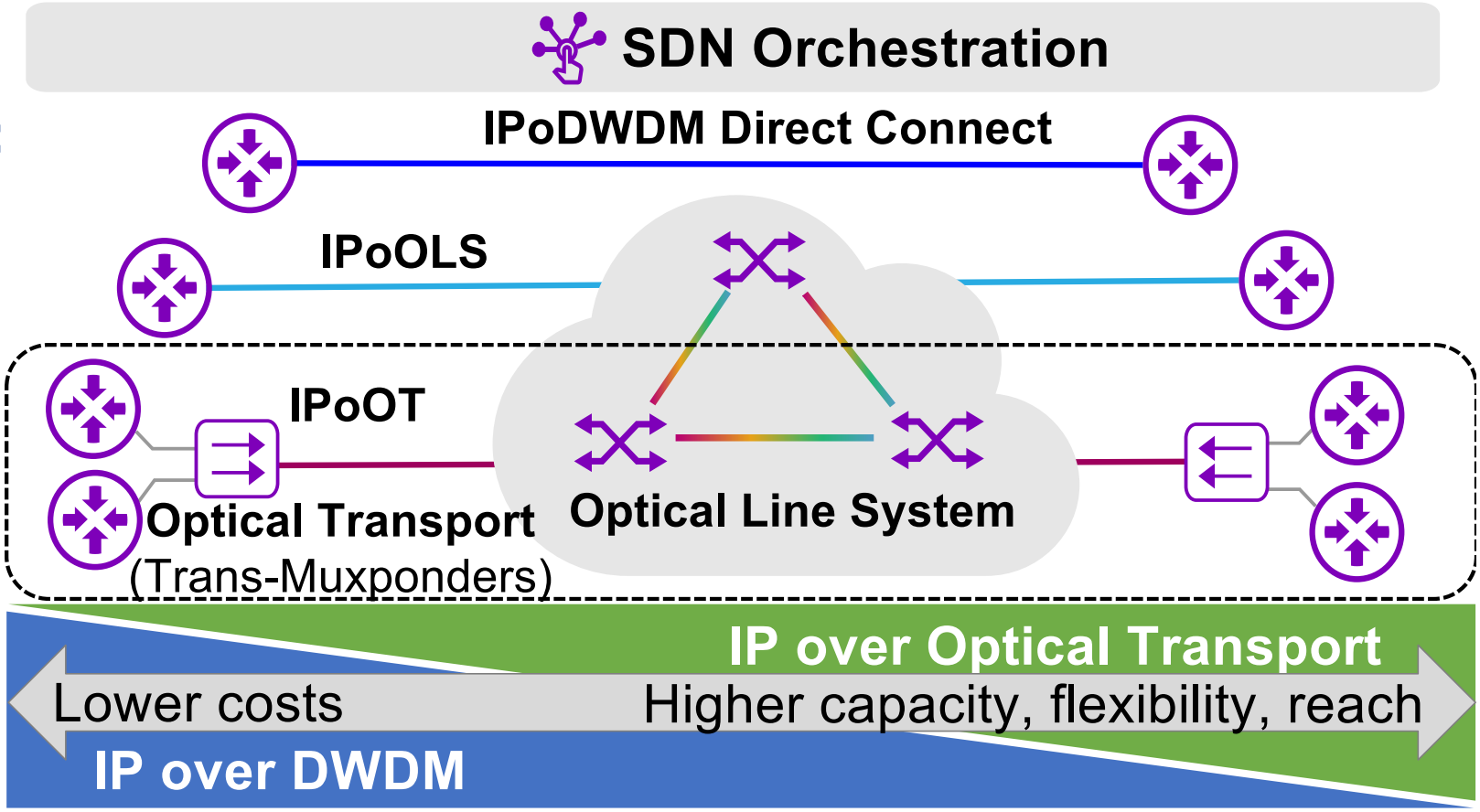
Session Focus on High Power Wide Area Optical Transport

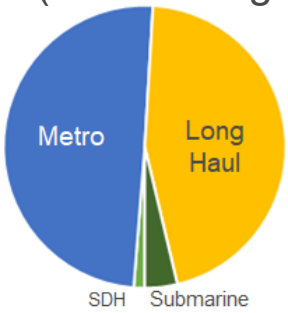
Launch power:
-10 to 0 dBm
(0.1 to 1 mW)

Launch power:
0 to 3 dBm
(1 to 2 mW)



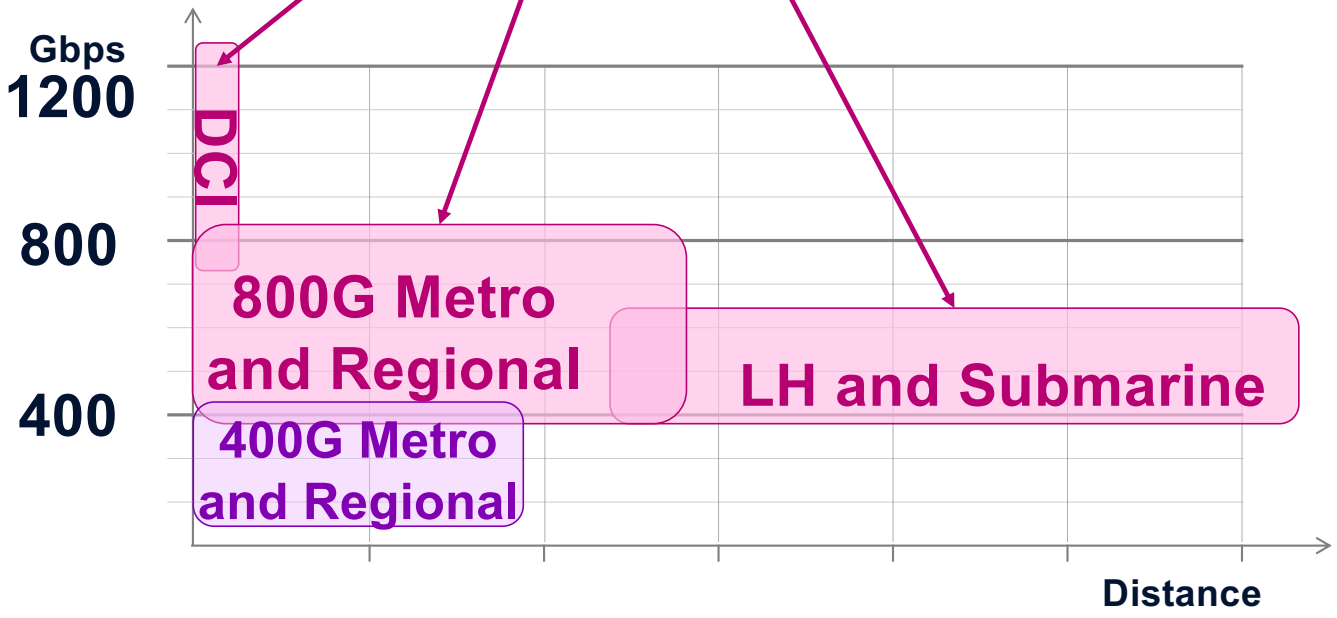
Two Types of Optical Transport Optimizations for 0+ dBm Launch Power

$16B Global DWDM/OTN Market
(Source: Cignal AI)



Capacity-Reach (Performance) Optimized

Uses proprietary transceiver modules that ***maximize*** channel capacity for any given distance



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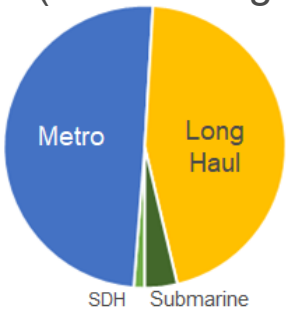
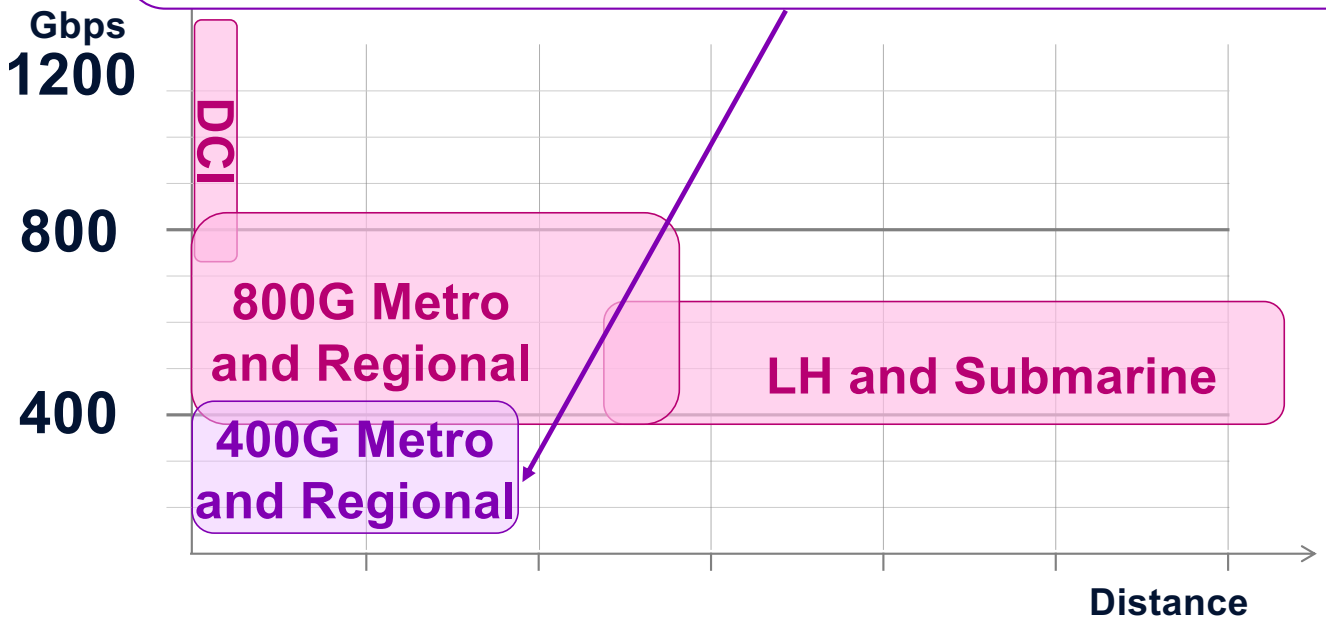
Two Types of Optical Transport Optimizations for 0+ dBm Launch Power (cont.)

$16B Global DWDM/OTN Market
(Source: Cignal AI)



Cost-Power Optimized

Multi-vendor interoperable pluggable transceivers with ***strong enough performance*** for most metro-regional applications



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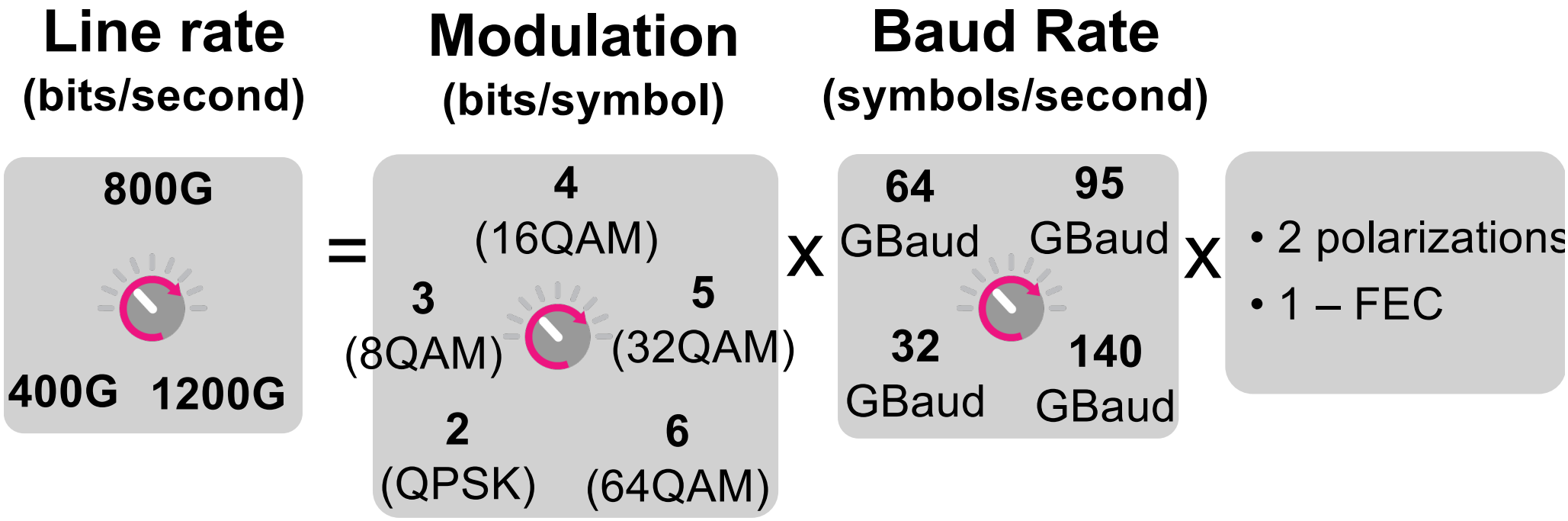
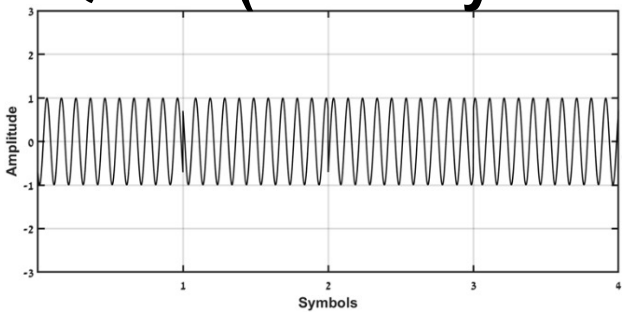
Baud Rate Key to Practical N x 400 Lanes

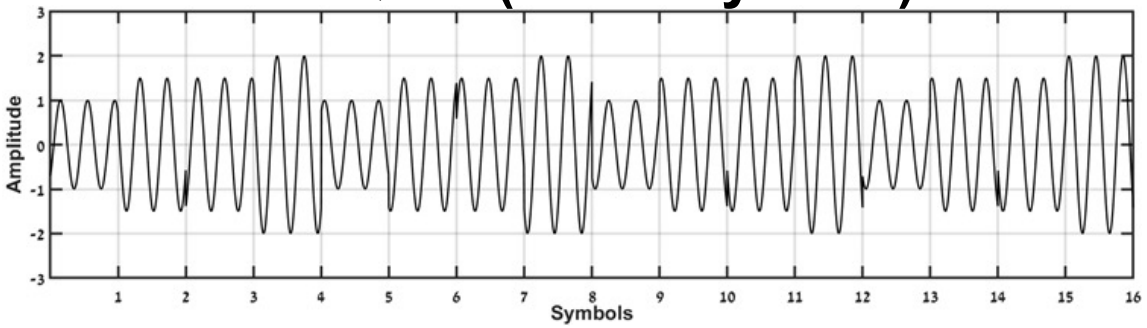


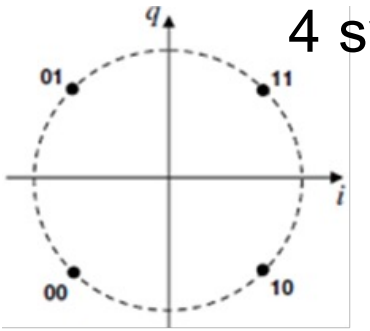
QPSK and 16QAM Modulation

QPSK (2 bits/symbol)

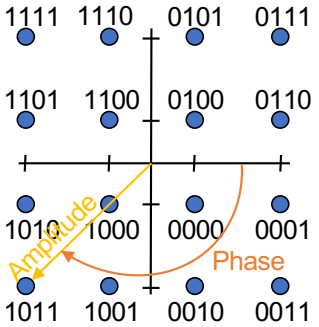


16QAM (4 bits/symbol)





4 symbols



16 symbols

Long Haul Applications

Metro Applications

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Target Modulations

Scheme	Symbols	Bits per Symbol	Typical Distance	Application
QPSK (4QAM)	**4**	**2**	**5000 Km**	**Unlimited Long Haul**
8QAM	8	3	3000 Km	Regional
16QAM	**16**	**4**	**1500 Km**	**Metro-Regional**
32QAM	32	5	400 Km	Limited metro
64QAM	64	6	120 Km	Short haul

Minimum Required Baud Rates

	Metro-Regional – 16QAM (4 bits/symbol)	Unlimited Long Haul – QPSK (2 bits/symbol)
400G line rate	**> 62.5 Gbaud**	**> 125 Gbaud**
800G line rate	**>125 Gbaud**	**> 250 Gbaud**

$$\textbf{Baud Rate (symbols/sec)} \geq \text{Line Rate (bits/sec)} \Big/ \left[\text{Modulation (bits/symbol)} \times \text{2 Polarizations} \times \text{1- (15\% to 27\% FEC OH)}\right]$$

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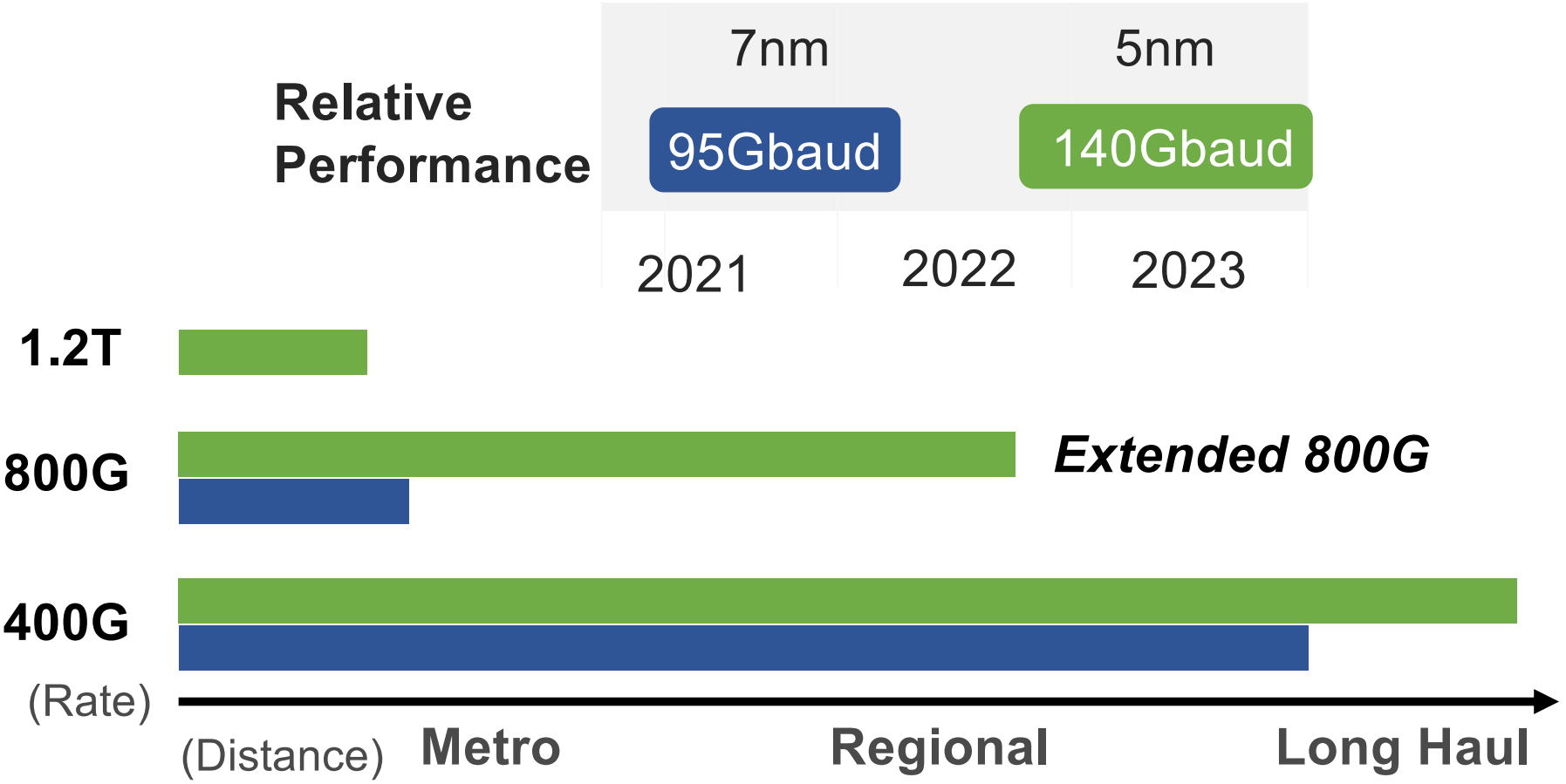
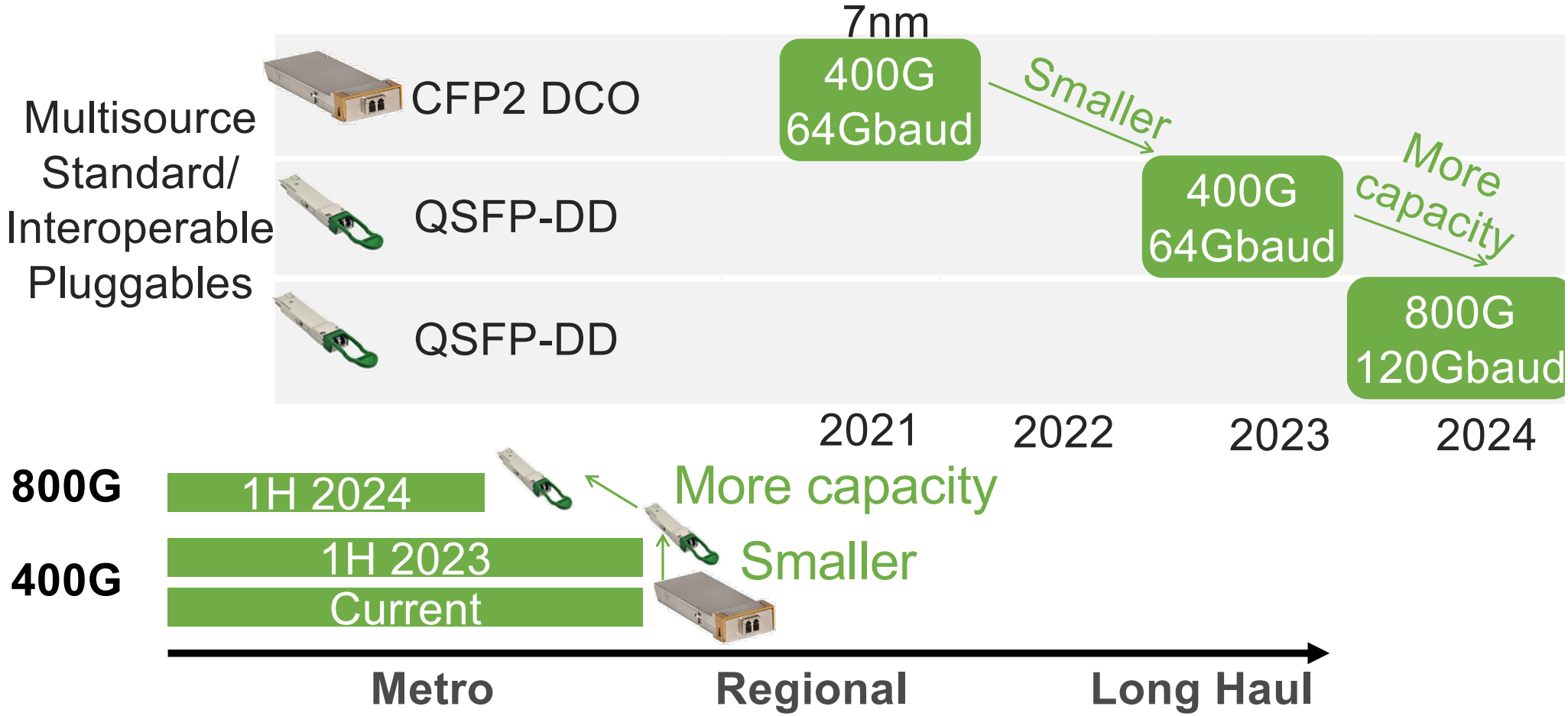
So, what can we achieve in the foreseeable future with proprietary and multi-vendor technologies?

Proprietary Transceiver Evolution for 0dBm Capacity-Reach Optimized Optical Transport



Multi-vendor Transceiver Evolution for 0+dBm Cost-Power Optimized Optical Transport



Industry Progress

	Metro-Regional – 16QAM (4 bits/symbol)	Unlimited Long Haul – QPSK (2 bits/symbol)
400G line rate	> 62.5 Gbaud	> 125 Gbaud
800G line rate	>125 Gbaud	> 250 Gbaud

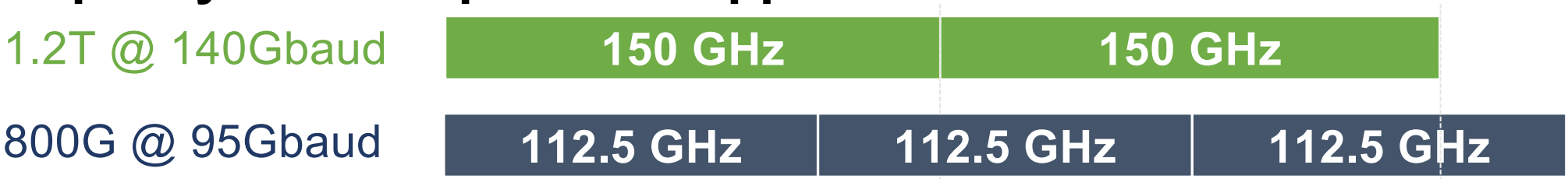
Will achieve in 2023 with solutions from several vendors

Will achieve for 400G in 2023 and for 800G in 2024

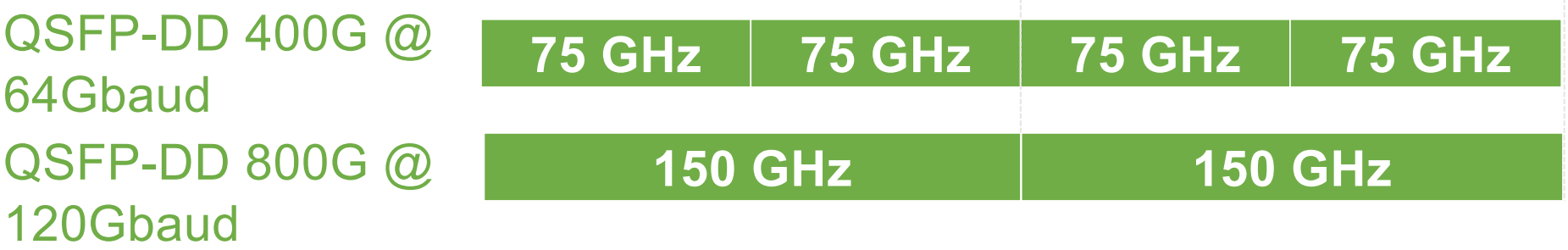
No roadmap yet by any vendor for 250Gbaud

75GHz/150GHz grid for 400GbE+ Transport

Capacity-Reach Optimized Applications



Power-Cost Optimized Applications



Heading to a rationalized grid with no wasted spectrum

Thank you

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