

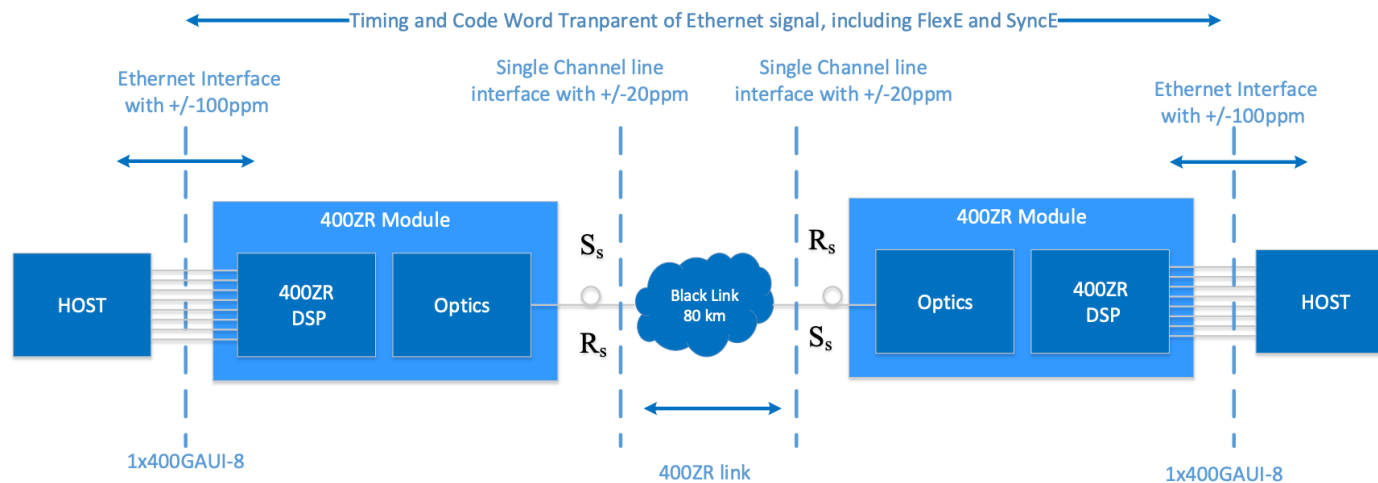


400ZR, 800ZR, Multi-Span Coherent Pluggables Interoperability Demo ECOC 2024

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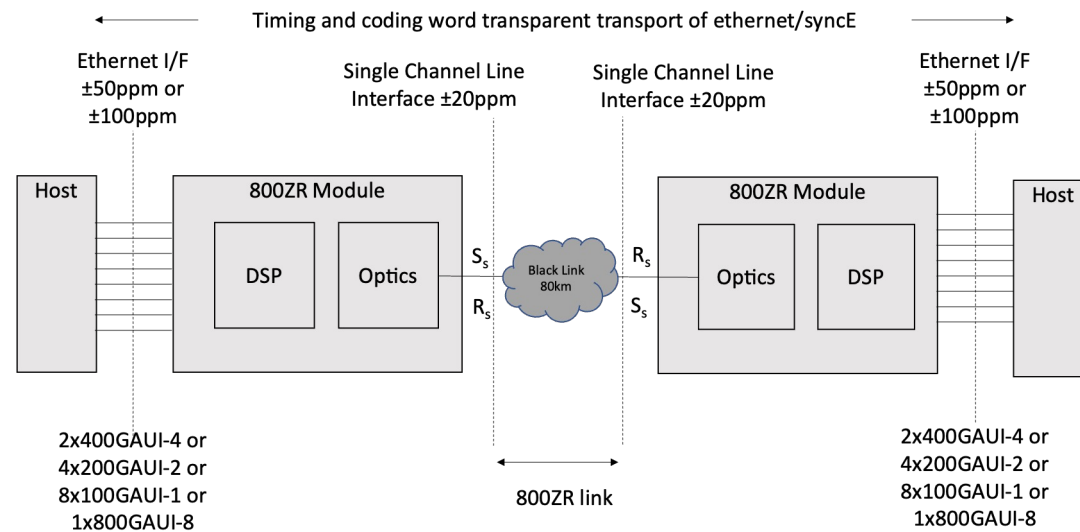
What is 400ZR?

- 400ZR is an interoperable, cost-effective, 400Gb/s interface based on single-carrier coherent DP-16QAM modulation, low power DSP supporting absolute (Non-Differential) phase encoding/decoding, and a Concatenated FEC (C-FEC) with a post-FEC error floor $<1.0E-15$. >80 km. Form-factor agnostic.



What is 800ZR?

- 800ZR is an interoperable, cost-effective, 800Gb/s interface based on single-carrier coherent DP-16QAM modulation, low power DSP supporting non-differential phase encoding/decoding, and OFEC with a post-FEC error floor $<1.0E-15$. >80 km. Form-factor agnostic.



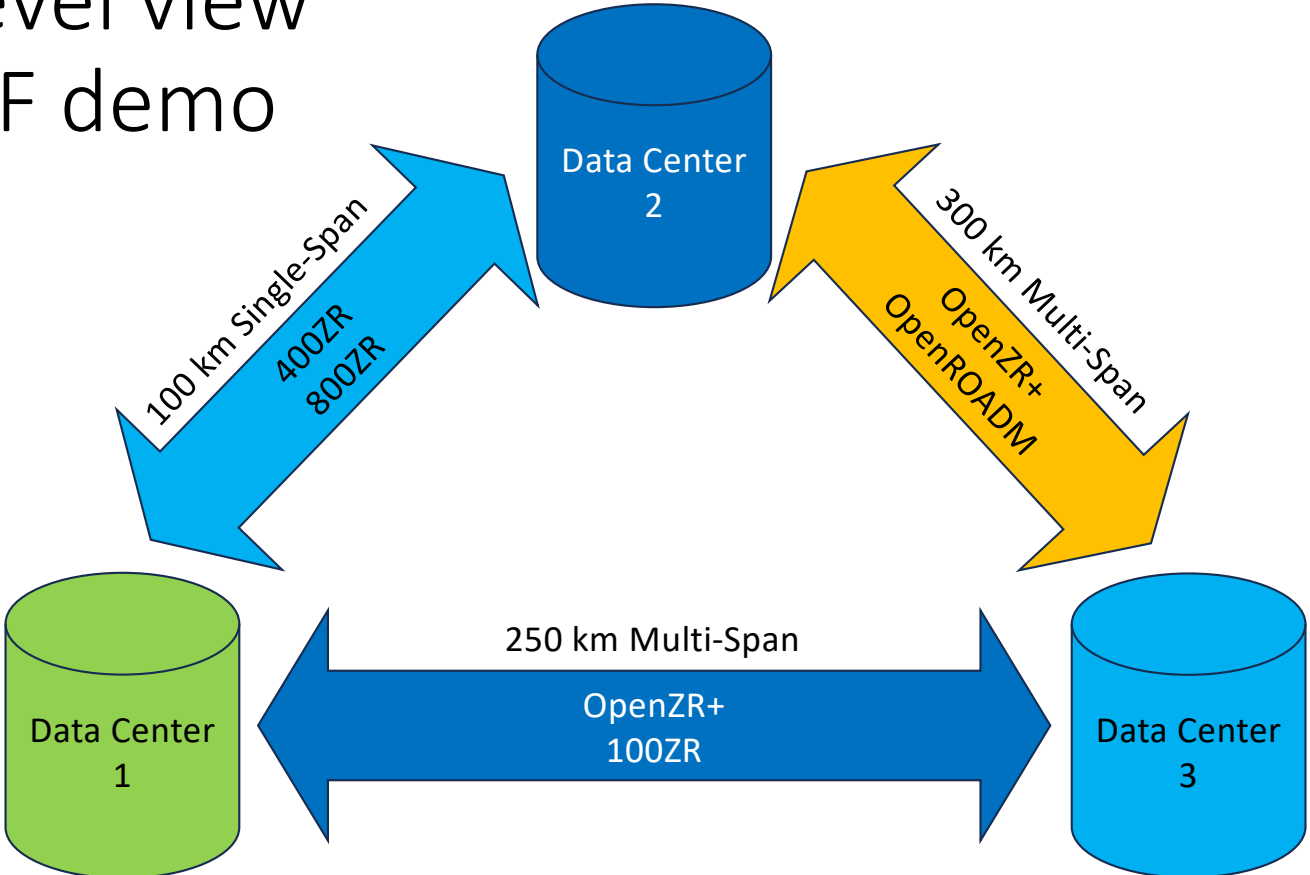
What is 400ZR+?

- 400ZR+ is a generic term for “more capable than 400ZR” and is not standardized across the ecosystem.
- OpenZR+ MSA is the product of an MSA designed to address extended reaches, including flexible Ethernet rates and modulation types. High Tx output power (0 dBm) added in v3.0 (9/2023).
- OpenROADM is the product of the Open ROADM MSA and supports both Ethernet and OTN traffic. Since it is similar, we’ve included it in our demo.

What is 100ZR?

- 100ZR is an interoperable, cost-effective, 100Gb/s interface based on single-carrier coherent DP-QPSK modulation, low power DSP supporting Staircase FEC per IEEE Std. 802.3-2022 100GBASE-ZR or ITU-T G.709.2, and a reach of up to 80km (unamplified) and 300k (amplified). Line side specifications are aligned with IEEE Std. 802.3-2022 & ITU-T G.698.2. Form-factor agnostic.

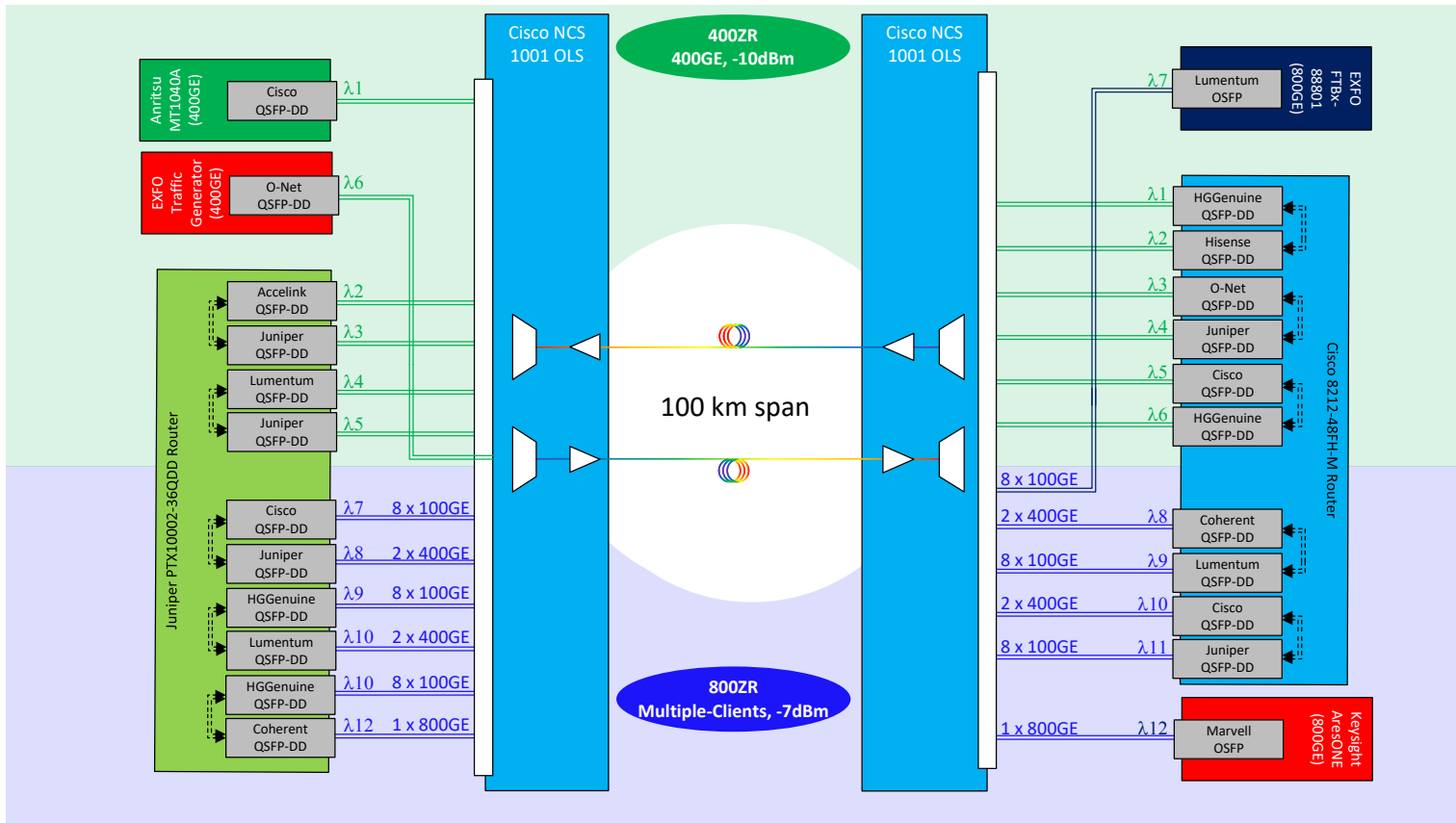
Top-level view of OIF demo



Single-Span Interoperability Demo

		Host	Module		freq. (THz)	Cisco OLS	Host	Module	
400ZR									
		Anritsu	Cisco QSFP-DD	>	194.45	OLS 1	Cisco 1	HGGenuine QSFP-DD	}
	{	Juniper 1	Accelink QSFP-DD	<	194.30	OLS 1	Cisco 1	Hisense QSFP-DD	
		Juniper 1	Juniper QSFP-DD	>	194.15	OLS 1	Cisco 1	O-Net QSFP-DD	}
	{	Juniper 1	Lumentum QSFP-DD	<	194.00	OLS 1	Cisco 1	Juniper QSFP-DD	
		Juniper 1	Juniper QSFP-DD	>	193.85	OLS 1	Cisco 1	Cisco QSFP-DD	}
		EXFO	O-Net QSFP-DD	<	193.70	OLS 1	Cisco 1	HGGenuine QSFP-DD	
800ZR									
8 x 100	{	Juniper 1	Cisco QSFP-DD*	<	192.80	OLS 1	EXFO	Lumentum OSFP	}
2 x 400		Juniper 1	Juniper QSFP-DD	>	192.65	OLS 1	Cisco 1	Coherent QSFP-DD	
8 x 100	{	Juniper 1	HGGenuine QSFP-DD	<	192.50	OLS 1	Cisco 1	Lumentum QSFP-DD	
2 x 400		Juniper 1	Lumentum QSFP-DD	>	192.35	OLS 1	Cisco 1	Cisco QSFP-DD*	
8 x 100	{	Juniper 1	HGGenuine QSFP-DD	<	192.20	OLS 1	Cisco 1	Juniper QSFP-DD	
1 x 800		Juniper 1	Coherent QSFP-DD	>	192.05	OLS 1	Keysight	Marvell OSFP	

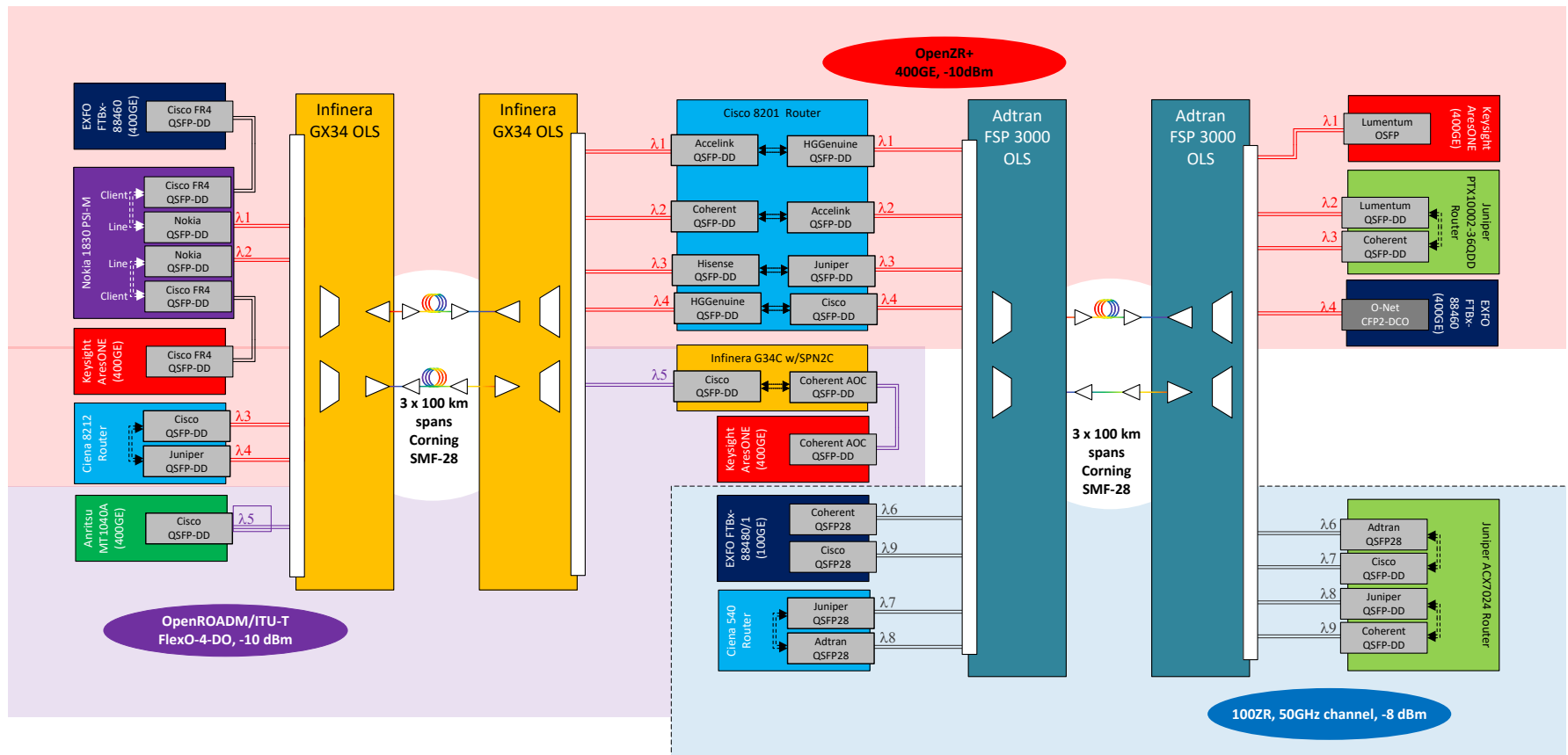
Single-Span



Multi-Span Interoperability Demo

	Host	Module	freq. (THz)	Infinera OLS	Host	Module	freq. (THz)	Adtran OLS	Host	Module
OpenZR+ 400GE										
	EXFO	Nokia FR4 QSFP-DD								
	Nokia Client	Nokia FR4 QSFP-DD								
	Nokia Line	Nokia QSFP-DD	> 193.850	OLS 2	Cisco 2	Accelink QSFP-DD				
					Cisco 2	HGGenuine QSFP-DD	> 193.850	OLS 3	Keysight	Lumentum OSFP
	Keysight	Cisco FR4 QSFP-DD								
	Nokia Client	Cisco FR4 QSFP-DD								
	Nokia Line	Nokia QSFP-DD	> 193.775	OLS 2	Cisco 2	Coherent QSFP-DD				
					Cisco 2	Accelink QSFP-DD	> 193.775	OLS 3	Juniper 1	Lumentum QSFP-DD
					Cisco 2	Juniper QSFP-DD	< 193.700	OLS 3	Juniper 1	Coherent QSFP-DD
	Cisco 1	Cisco QSFP-DD	< 193.700	OLS 2	Cisco 2	Hisense QSFP-DD				
	Cisco 1	Juniper QSFP-DD	> 193.625	OLS 2	Cisco 2	HGGenuine QSFP-DD				
					Cisco 2	Cisco QSFP-DD	> 193.625	OLS 3	EXFO	O-Net CFP2-DCO
400GE over OpenROADM										
	Anritsu	Cisco QSFP-DD	> 193.550	OLS 2	Infinera Line	Cisco QSFP-DD				
					Infinera Client	Coherent AOC QSFP-DD				
					Keysight	Coherent AOC QSFP-DD				
100ZR										
	EXFO	Coherent QSFP28	> 193.550	OLS 3	Juniper 2	Adtran QSFP28				
	Cisco 3	Juniper QSFP28	< 193.500	OLS 3	Juniper 2	Cisco QSFP28				
	Cisco 3	Adtran QSFP28	> 193.450	OLS 3	Juniper 2	Juniper QSFP28				
	EXFO	Cisco QSFP28	< 193.400	OLS 3	Juniper 2	Coherent QSFP28				

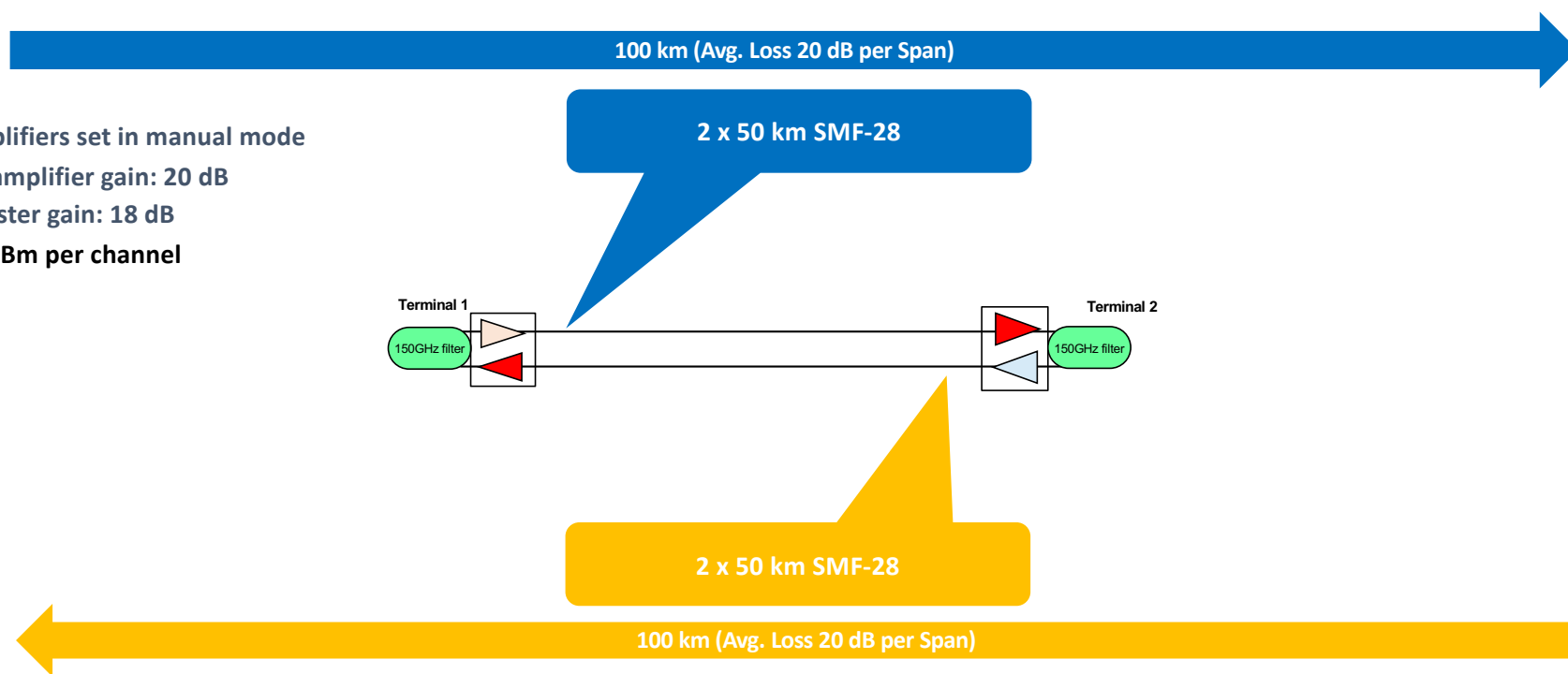
Multi-Span



Single-Span Optical Line System

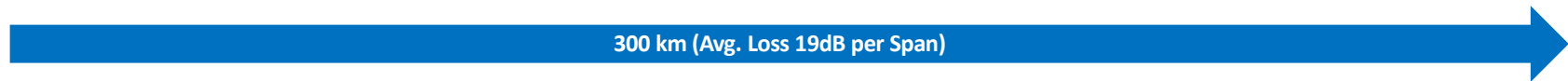
- Compact amplification modules with EDFA amplification
- 32 Channels, Fixed & Colored 150GHz Mux/Demux

- Amplifiers set in manual mode
- Pre-amplifier gain: 20 dB
- Booster gain: 18 dB
- +1 dBm per channel



High Power, Multi-Span Optical Line System

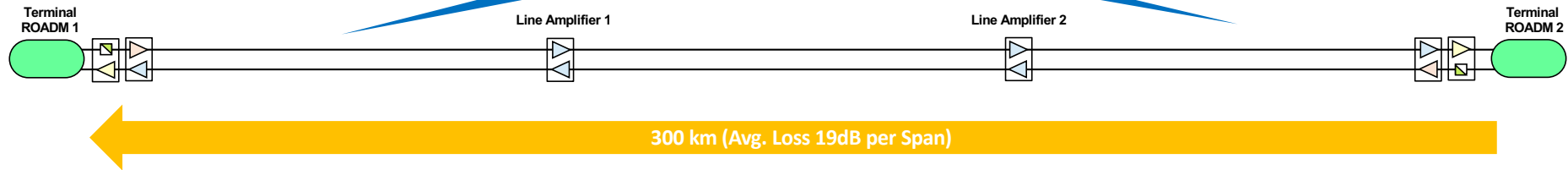
- 4RU system with Switchsponder, ROADM and EDFA amplification modules.
- OSC, and monitor ports
- Point-to-point ROADM architecture used for power equalization.



- ROADMs using Route and Select architecture
- No Span Equalization required

- Power Spectral Density: 29100nW/GHz
 - Power per Channel 3.4dBm (at 75 GHz)

6 x 50 km SMF-28 (G.657.A) Fiber



High Power, Multi-Span Optical Line System

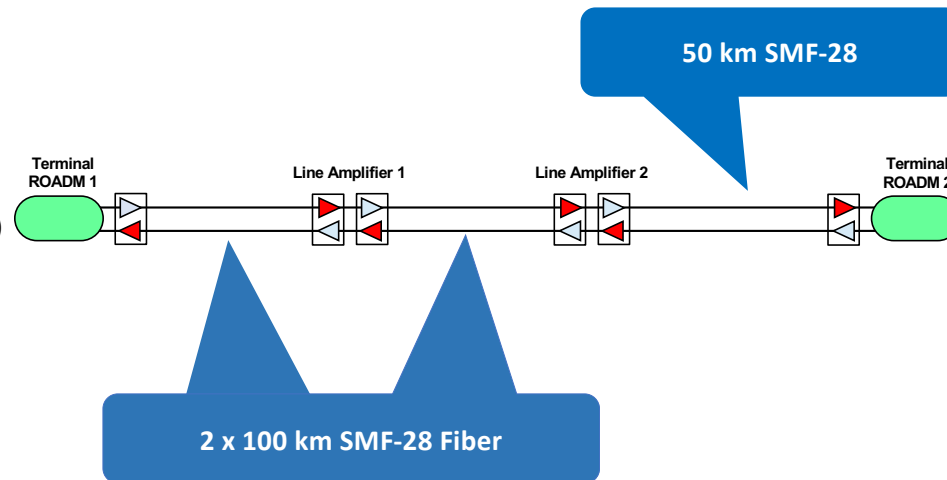
- Compact, modular architecture including EDFA amplification modules
- OSC, monitor ports and Auto-span equalization
- Multi-degree ROADMs for power equalization and scalability.



- Automatic Span Equalization Enabled

- ROADM Equalization Setpoint -35 dBm/GHz
 - -16.2 dBm per channel (400ZR+ at 75 GHz)
 - -18.0 dBm per channel (100ZR at 50 GHz)

- Booster Power Spectral Density @ -15dBm/GHz
 - Power per Channel 3.8dBm (400ZR+ at 75 GHz)
 - Power per Channel 2.0 dBm (100ZR at 50 GHz)



Adtran

Anritsu
Advancing beyond

CICT // **Accelink**

CISCO

COHERENT

EXFO

HGGenuine

Hisense Broadband
海信 宽带多媒体

Infinera®

JUNIPER
NETWORKS

KEYSIGHT

LUMENTUM

MARVELL™

NOKIA

O-Net
Technologies

SENKO®
Advanced Components

