ADVA™
Optical Networking

Coherent communications - Quo vadis?

Jörg-Peter Elbers

ECOC Market Focus

Service and content provider optical transmission

Coherent communications has come a long way …

Turning Point

From:
- Amplified DWDM
- Spectrally efficient
- Dispersion compensation

To:
- Unamplified grey
- Fiber-rich
- Dispersion not an issue

… and is conquering new territory.

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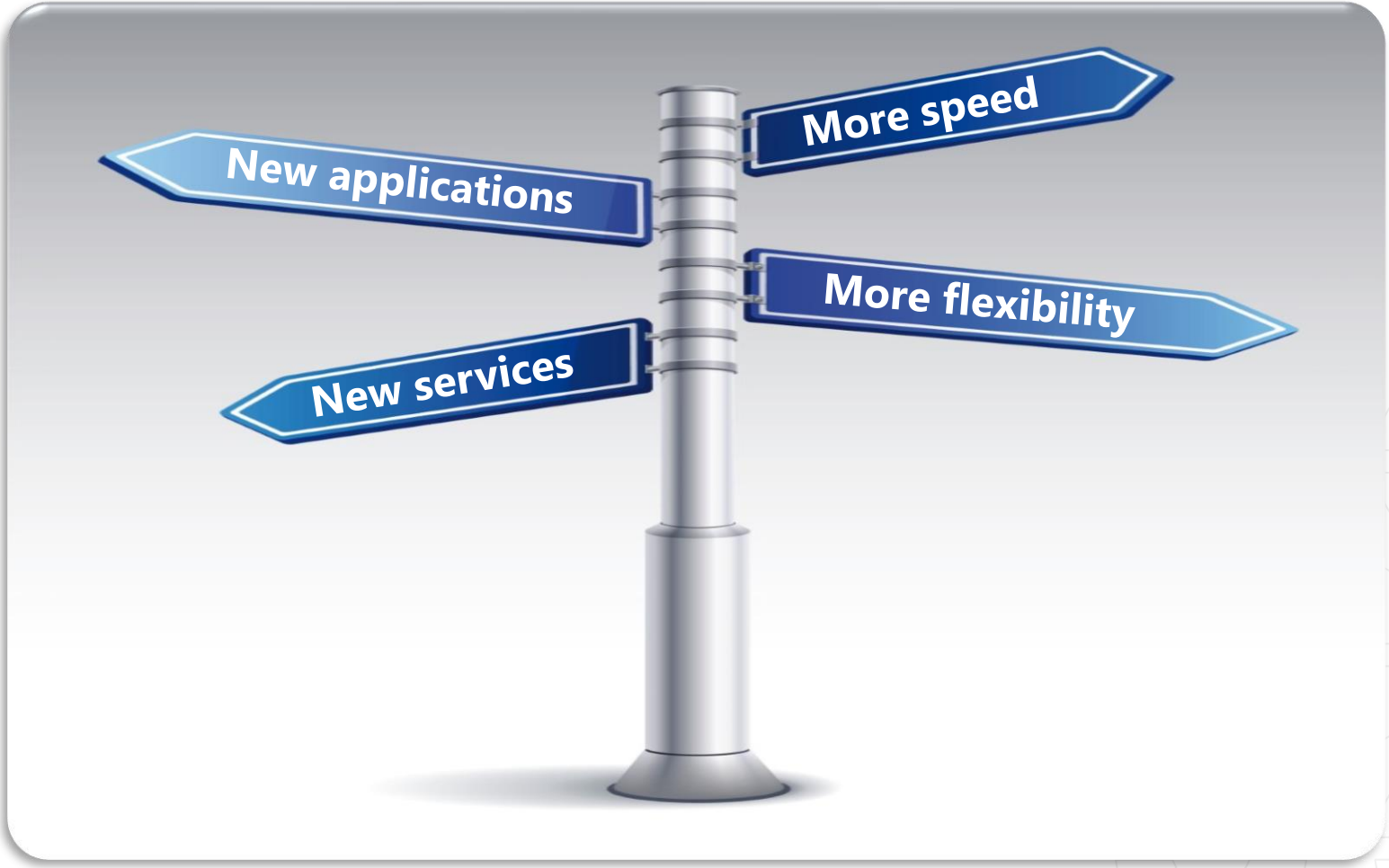

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More speed.

Open Fabric™

Cloud Connect™

30GBaud	60GBaud	Next gen - 120GBaud
200Gb/s per carrier	600Gb/s per carrier	1.2Tb/s+ per carrier
QPSK – 16QAM	QPSK – 64QAM	QPSK – 64QAM+
N x 10G aggregation	N x 100G aggregation	N x 400G aggregation

Industry-leading 600Gb/s per optical carrier today.

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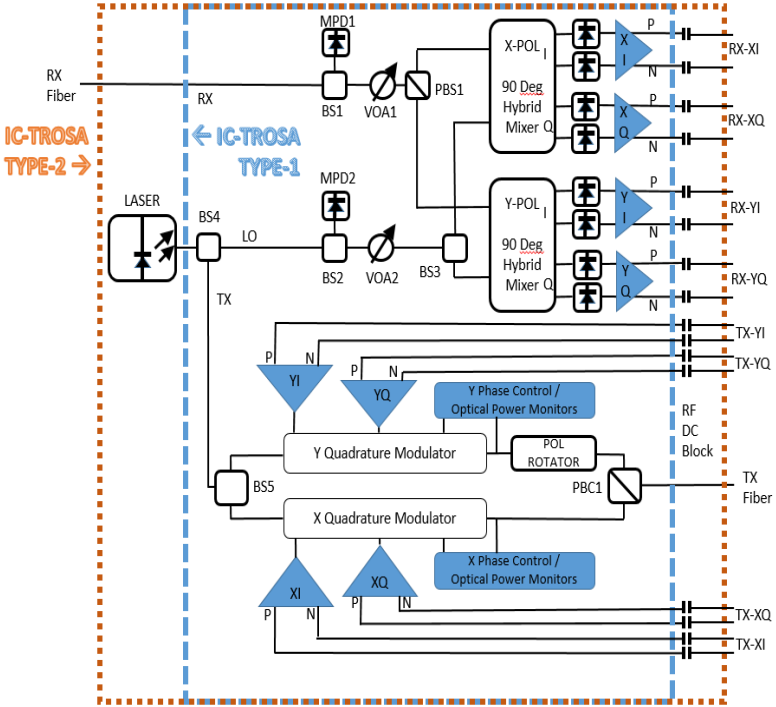
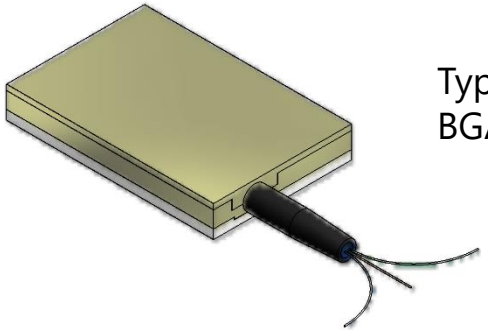
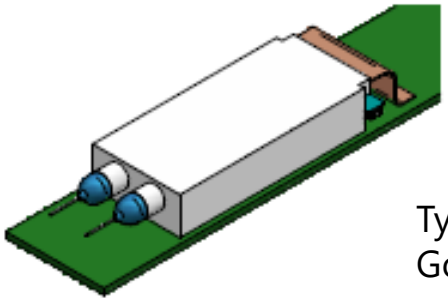
IC-TROSA for optical engines





Type 1
BGA package



Type 2
Gold-box package

[adapted from: OIF2017.195.11]

Tighter integration is key enabler.

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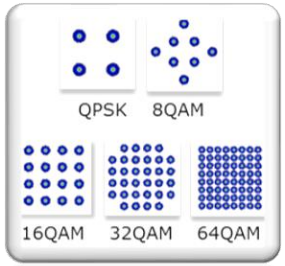
More flexibility.



Client side	Line side	Automation and ZTP
10-400G port speeds	Flexible symbol rate	Open systems & APIs
QSFP & MicroMux™	Adaptive modulation	Streaming telemetry
FlexE & OTN	Constellation shaping	NI-based optimization

ZTP: Zero-touch provisioning
NI: Network intelligence

Managing complexity and driving efficiency.

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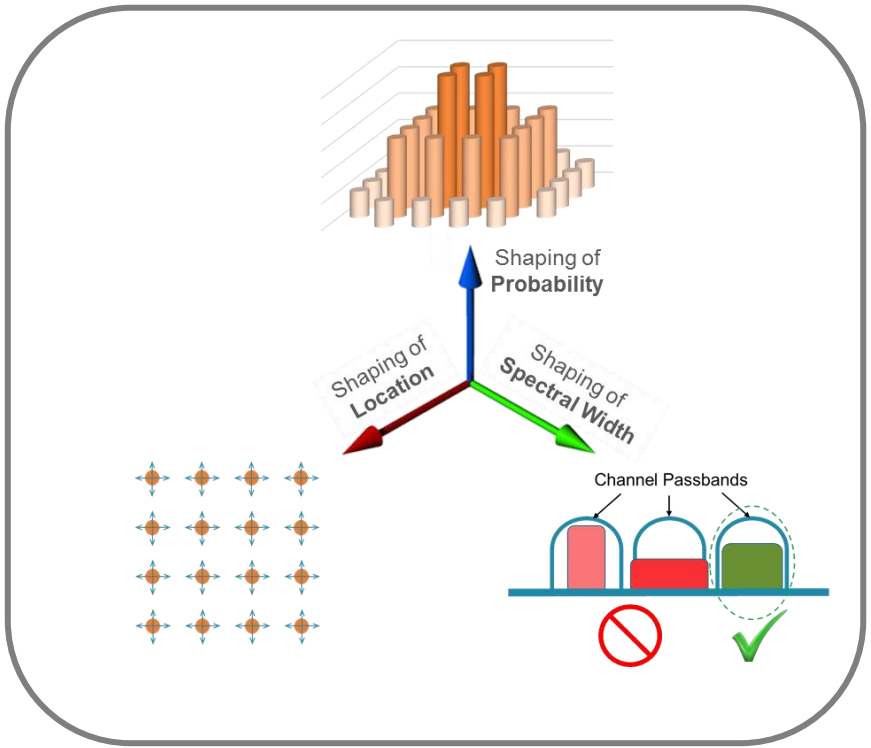
Shaping of coherent signals



- Optimization of performance
- Flexible capacity adjustment
- Best spectrum exploitation

Optimising network efficiency.

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New applications.

OIF

CableLabs®

IEEE

400G-ZR	Coherent Optics	Beyond 10km PHY
DWDM DCI	Remote PHY backhaul	Access & aggregation
60GBd - 16QAM - <15W	N x 100/200G (trunk)	50/100/200/400G
Pluggable module	Middle Mile Mux	Grey interfaces (initially)

Pushing coherent technology deeper into the network.

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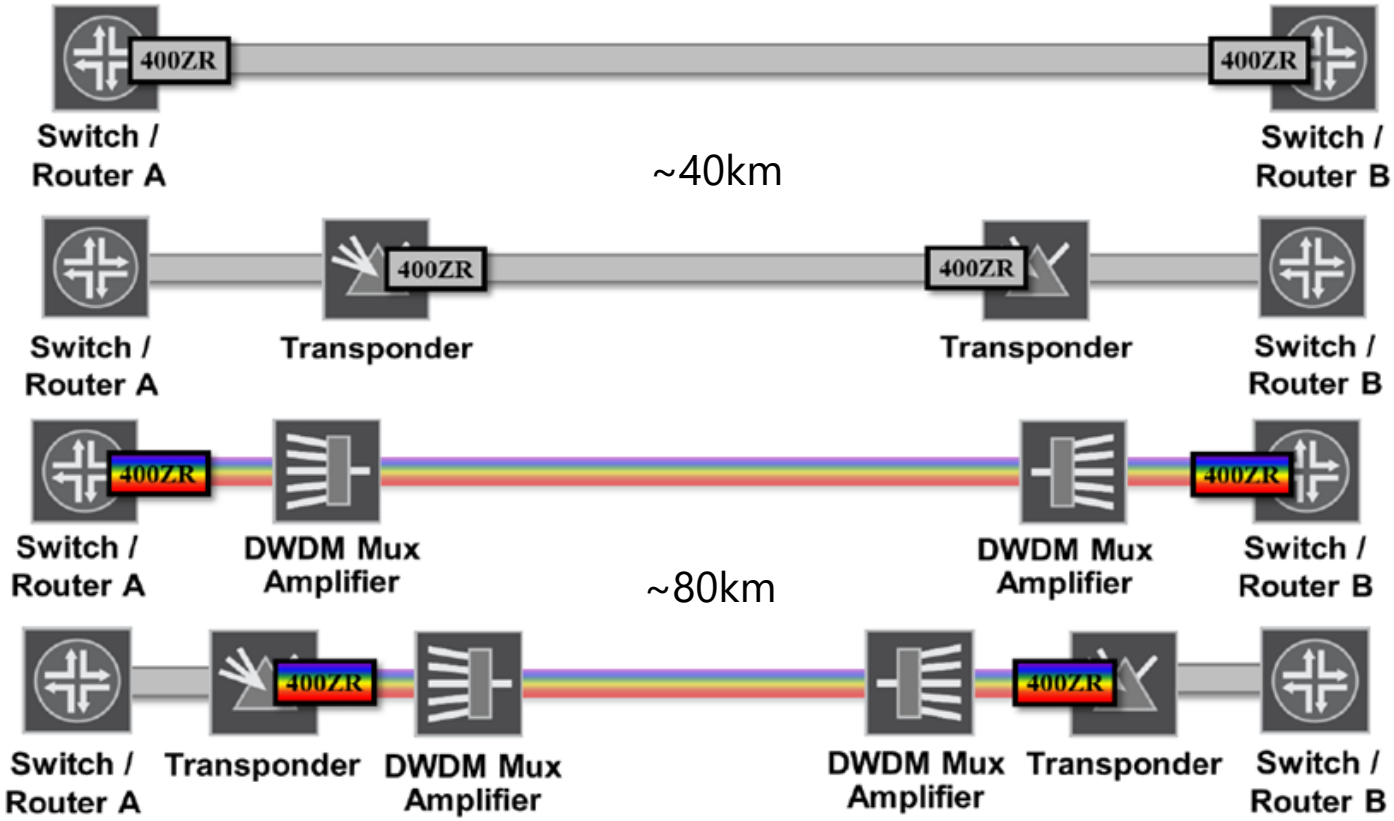
ADVA™ Optical Networking

400G-ZR Data center interconnect



[adapted from: OIF-400GZR-09. Draft]

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Beyond 10km Ethernet for access

	Lanes	500m	2km	10km	20km	40km	Up to 80km
1000BASE-	1		LX	LX10 / LH		EX	ZX
10GBASE-	1			LR		ER	ZR
25GBASE-	1			LR		ER	
40GBASE-	4	PSM4		LR4		ER4	
	1		FR				
50GBASE-	1		FR	LR			
100GBASE-	10		10X10				
	4	PSM4	CWDM4 / CLR4	LR4 / WDM4-10	WDM4-20	ER4 / WDM4-40	
	<4	DR					
200GBASE-	4		FR4	LR4			
400GBASE-	8		FR8	LR8			
	4	DR4					
	1						

Longer Reach Opportunity

Lane width Opportunity

Black Text — IEEE Standard
Red Text — In Standardization
Blue Text — Non-IEEE standard but complies to IEEE electrical interfaces

Addressed in Beyond 10km Study Group

[adapted from: Draft 1.3 – 100GbE Beyond 10km Optical PHYs CFI Consensus Presentation]

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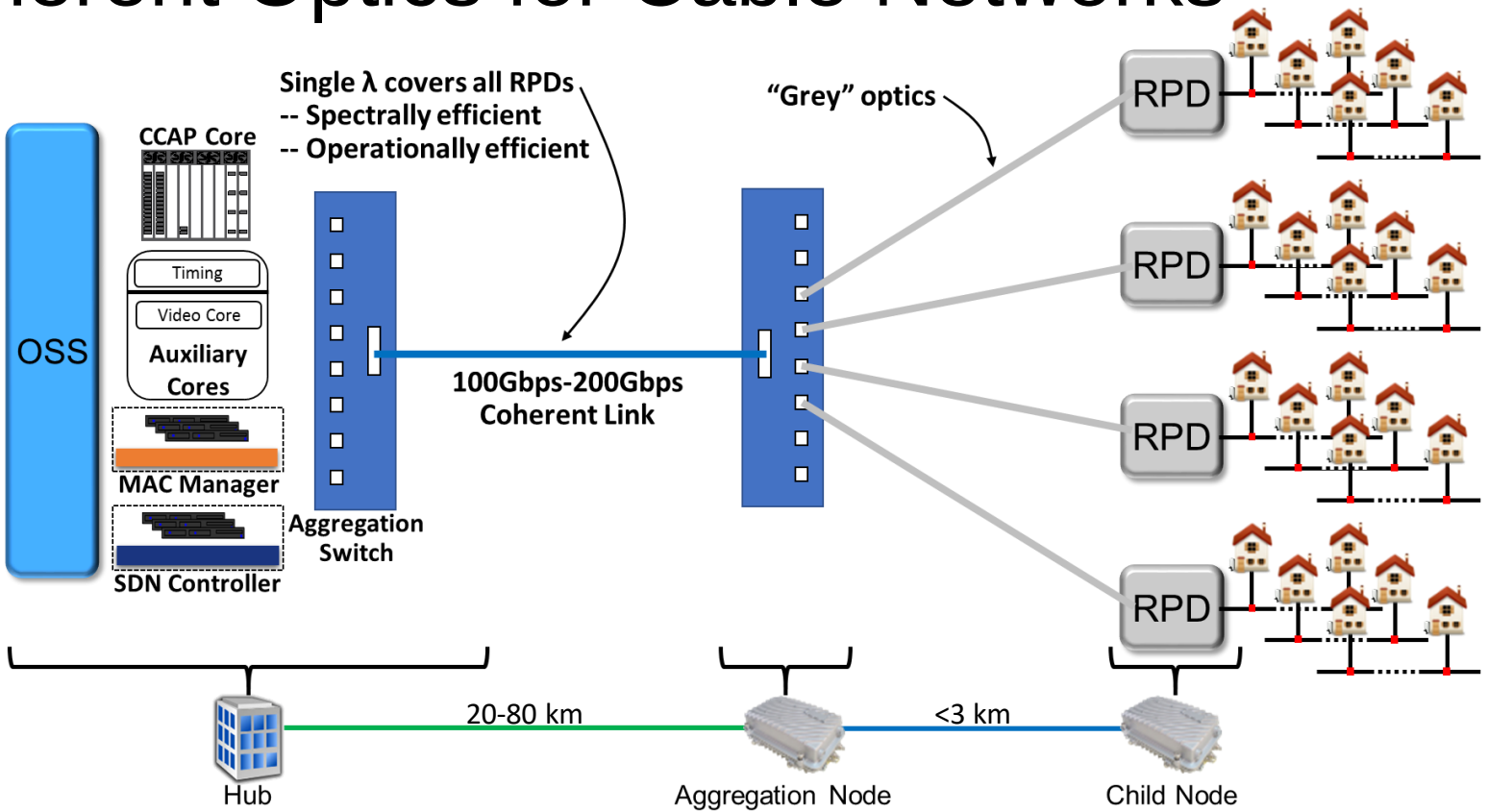
Coherent Optics for Cable Networks



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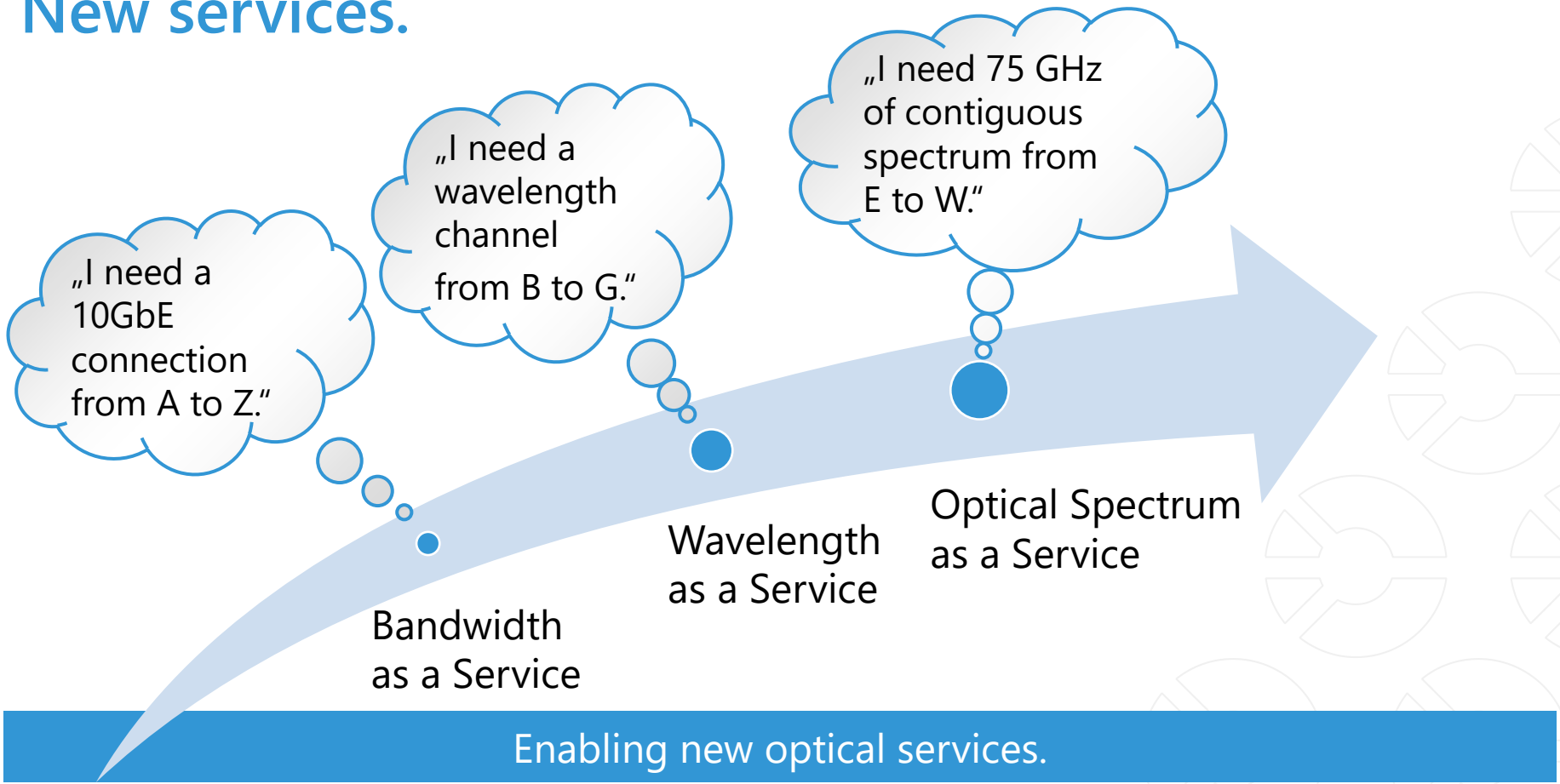
New services.



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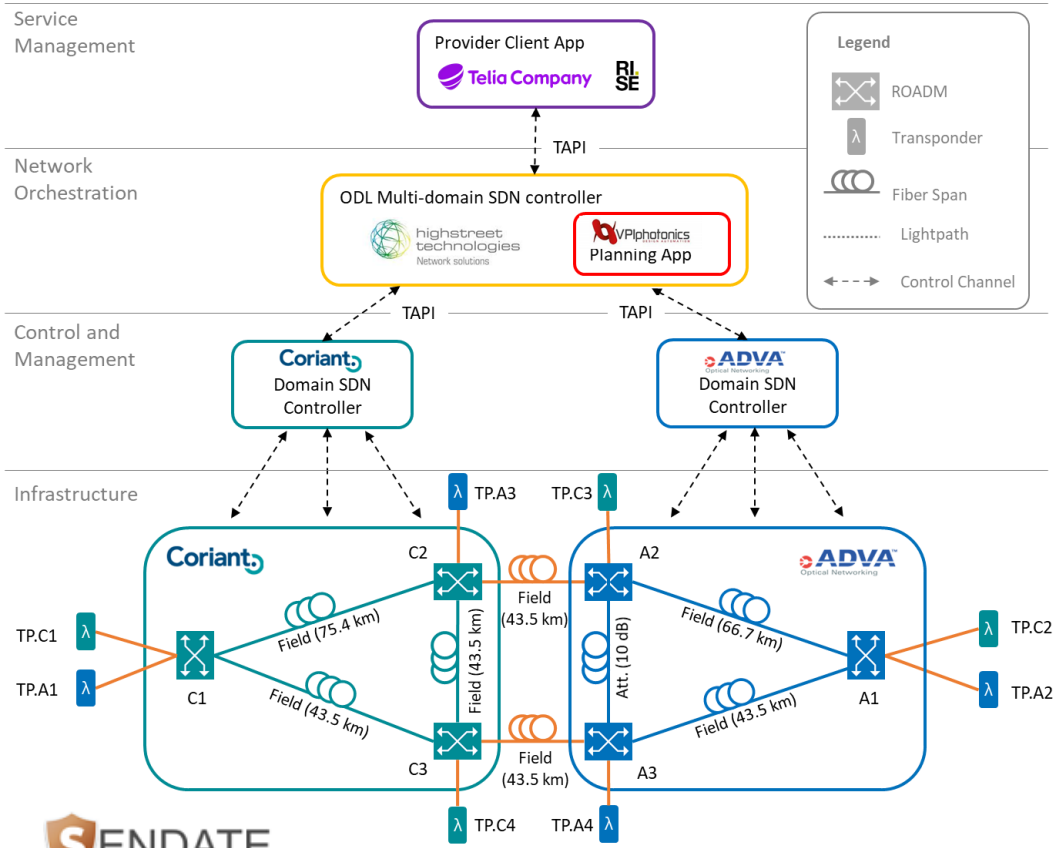
Multi-vendor optical SDN field trial (09/2018)



- 2 vendor domains
- Coherent 100G interfaces
- Transparent optical interconnect
- ONF transport API 2.0 with extensions

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Conclusion

"If all you have is a hammer, everything looks like a nail."

Abraham Maslow, 1966

Not all nails are for the coherent hammer yet, but the number keeps increasing!

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Thank you

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