

# Trends in Open Optical Networks and the evolution of Embedded Optics

UKNOF45, 2020-01-15

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smartoptics

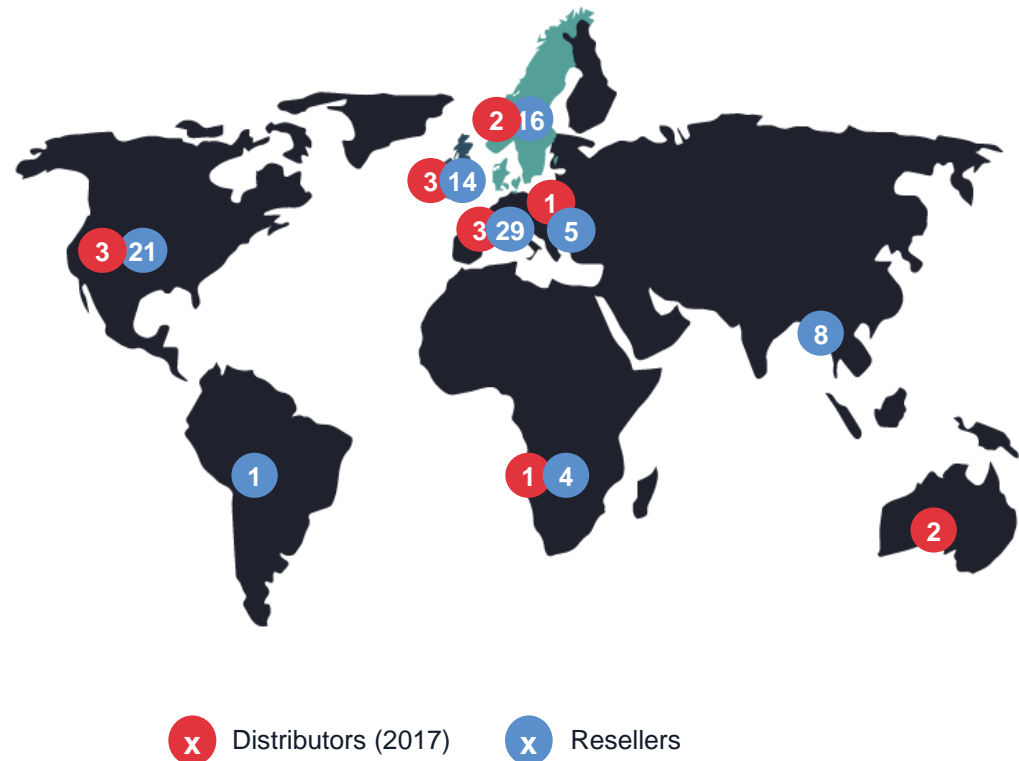


# A profitable and growing company with global reach

## Smartoptics at a glance

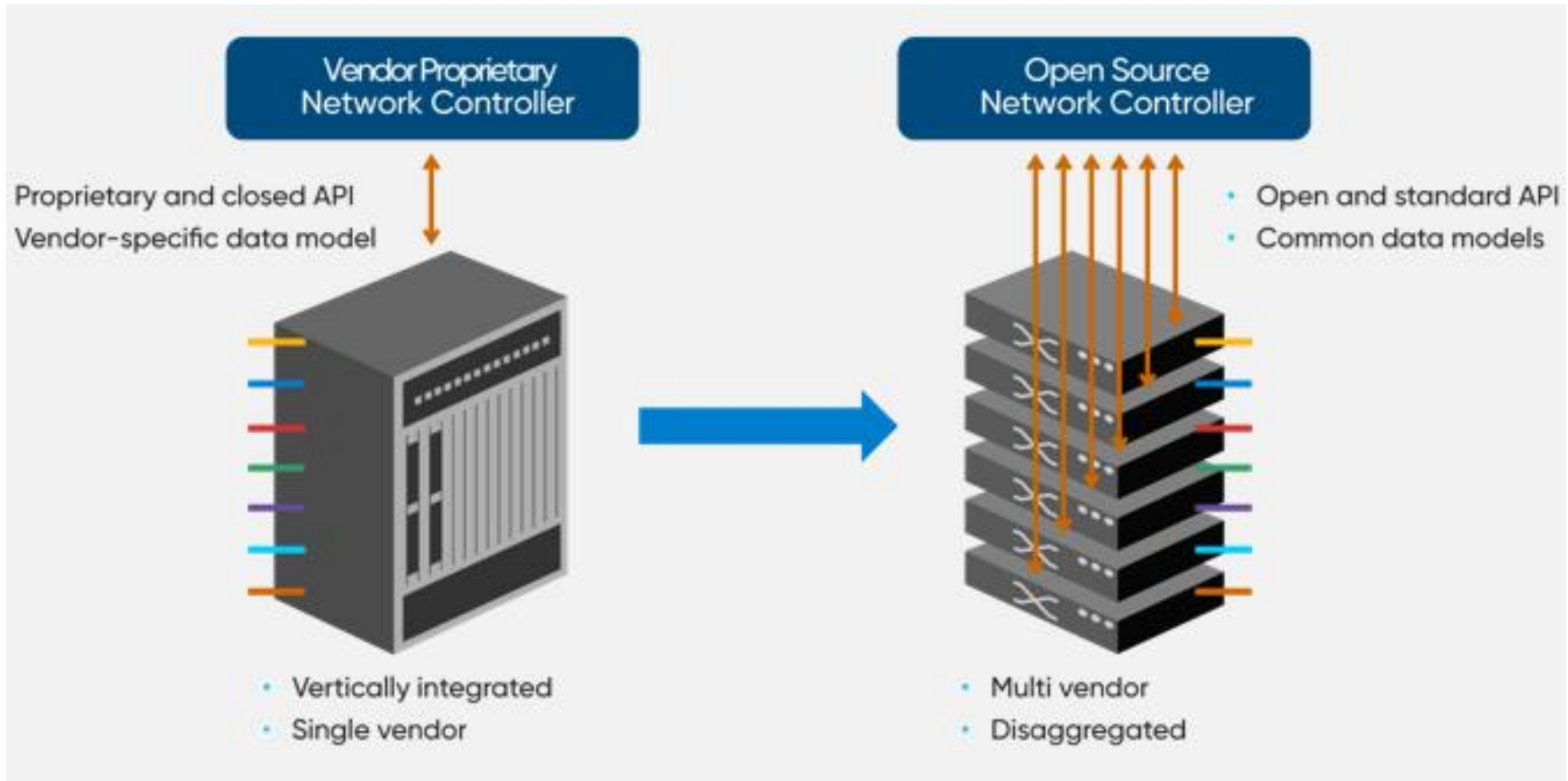
<b>Founded</b>	2006
<b>Ownership</b>	Stable ownership - Ignis A/S 2011 Profits reinvested
<b>Revenues</b>	USD 27M 2019
<b>CEO</b>	Magnus Grenfeldt
<b>Certifications</b>	Brocade, Cisco, ISO9000, ISO 14000
<b>Products</b>	Open optical networking solutions Optical devices - transceivers
<b>Locations</b>	
Norway	Operations, sales
Sweden	R&D, production, sales, management
UK	Sales
Germany	Sales
US	Sales, operations

## Geographical footprint



# Disaggregation

# What is Disaggregation?



Source: ODTN

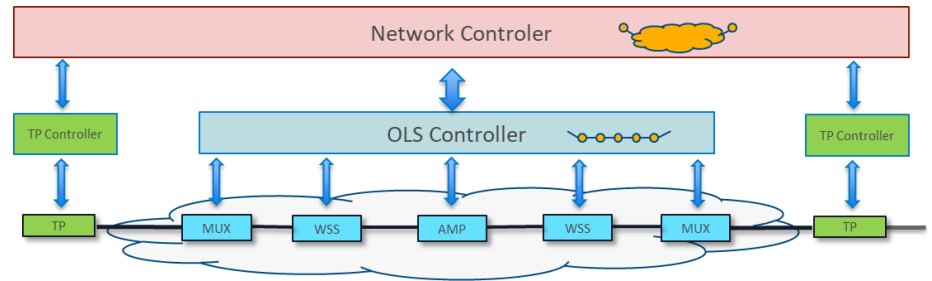
# Why is network disaggregation a strong trend?

- Faster Innovation – Independent HW & SW design cycles
- Cost saving – Competing vendor -> lower Capex & lower opex
- Best in class functions – Cherry-pick suppliers/technologies
- Flexibility - Limited vendor lock-in
- Simplicity – Control & integration with one SDN system

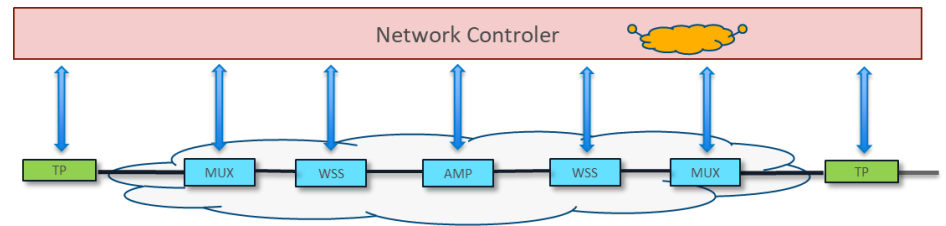


# Types of disaggregation

- Separation of hardware functions



- Separation hardware and controller

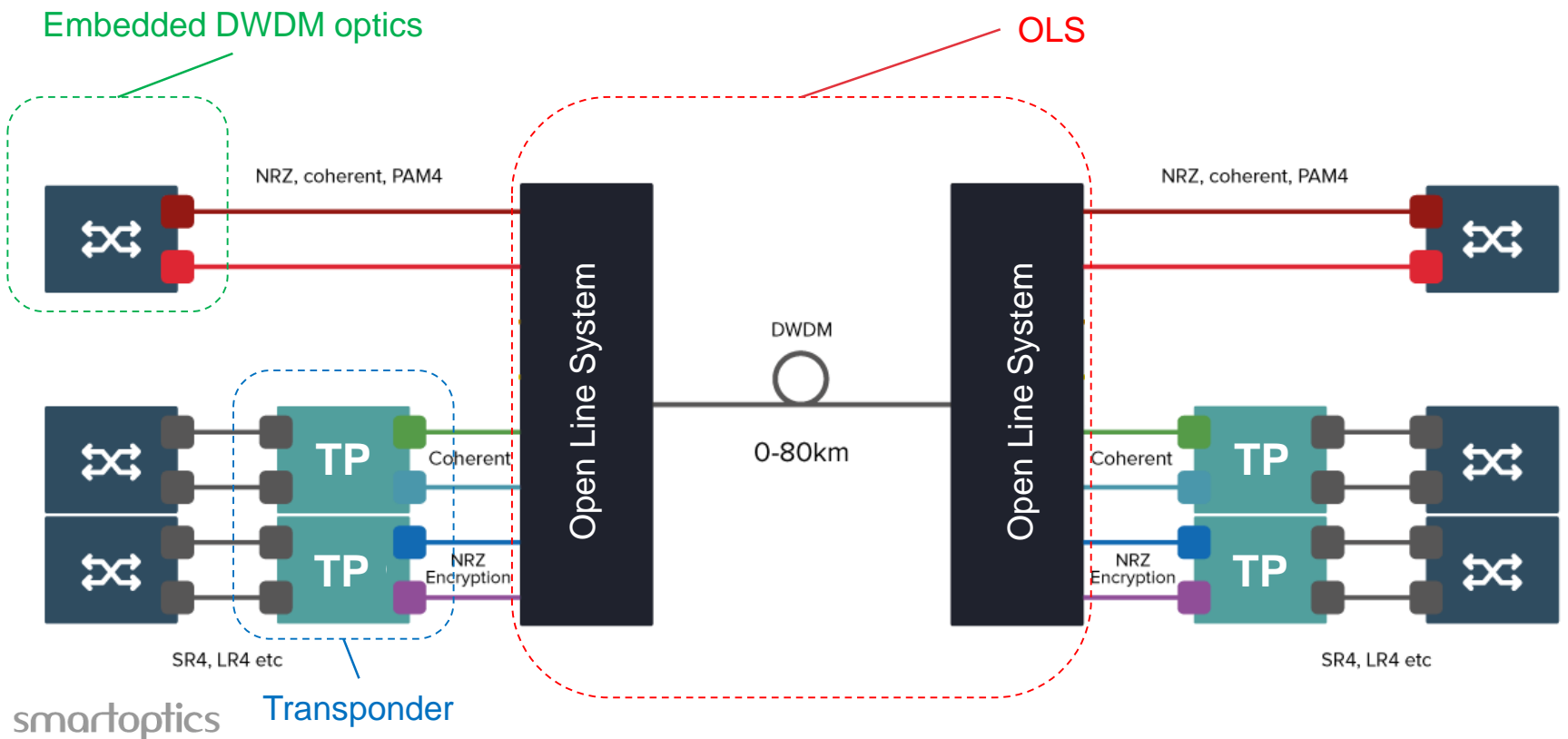


- Separation of hardware and OS



# Typical disaggregation deployments for DCI

Controlled by a self developed "Open" Network controller



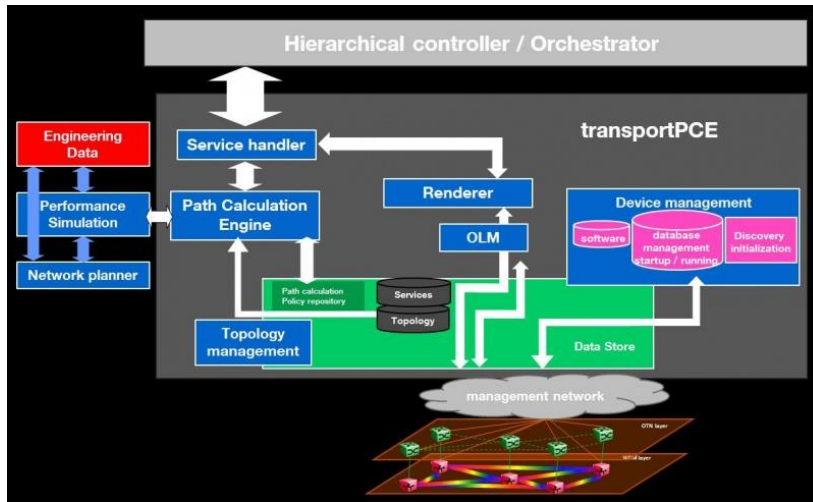
# Industry Initiatives for disaggregation and open networks

## OpenRoadm



- Mainly focused on ROADM networks
- Strict specification of HW features and capability's
- Consortium consist of both vendors and operators

### TransportPCE



Source: <https://wiki.opendaylight.org/view/TransportPCE:Main>

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## Telecom Infra Project

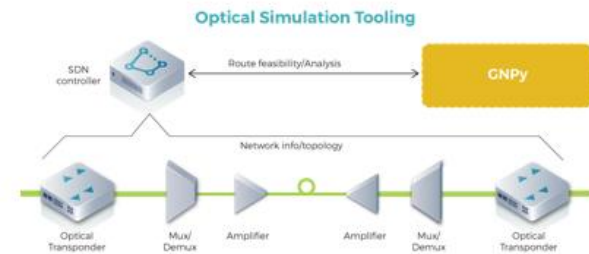


- Focus on Open Optical & Packet Transport
- Consist of several project groups, example of technologies

### Apollo



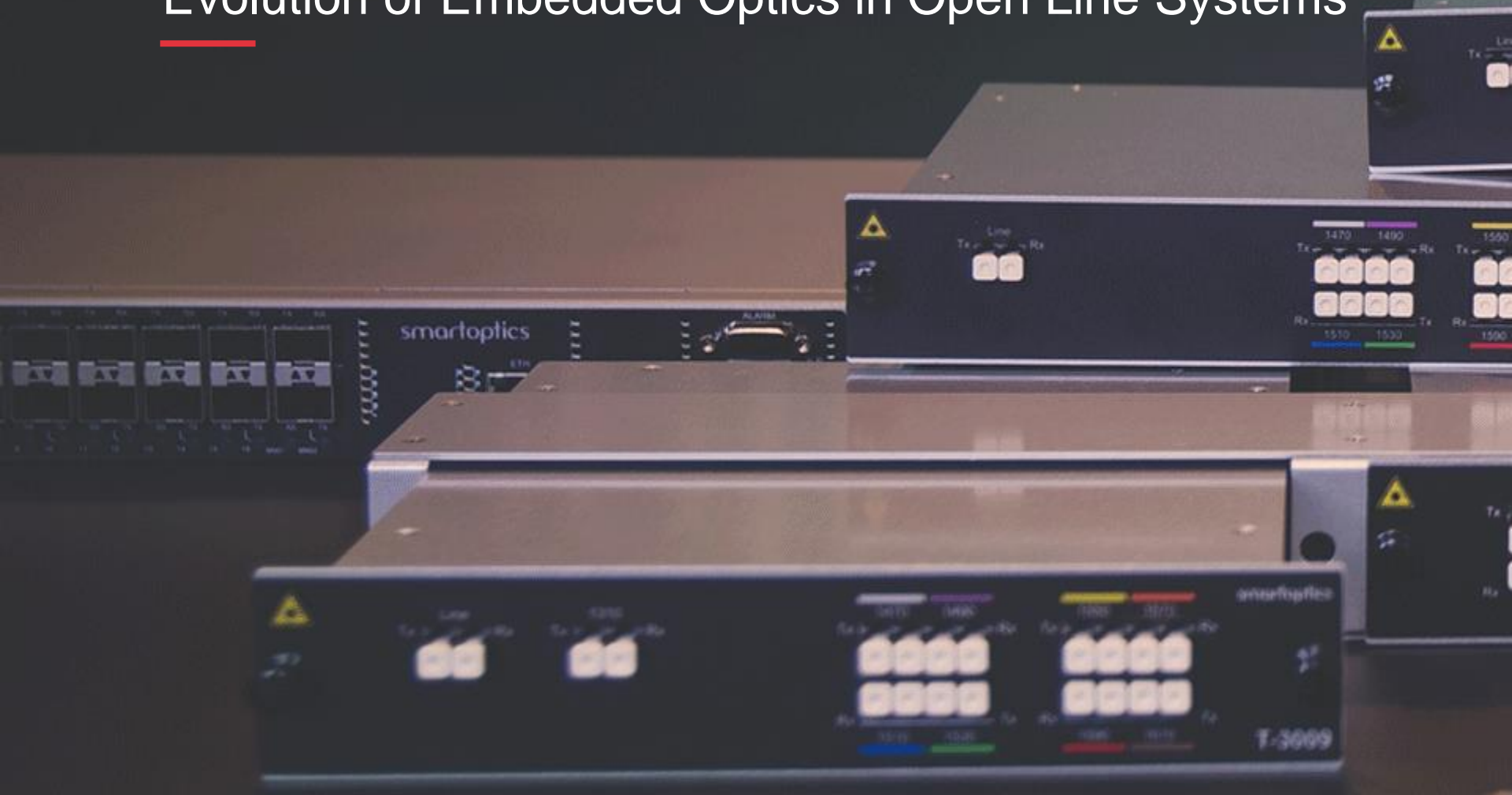
### GNPy



Source: <https://telecominfraproject.com/oopt/>



# Evolution of Embedded Optics in Open Line Systems

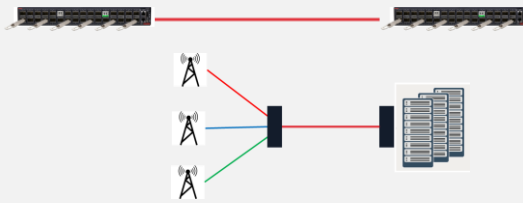


# Evolution of embedded DWDM Optics

## 25G

Form factor:  
SFP28

25GbE, eCPRI, CPRI10



## 32G

Form factor:  
SFP28

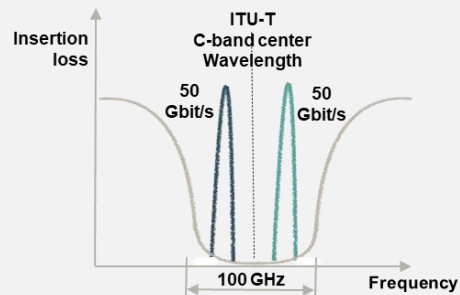
32G FC DWDM  
approved for:



## 100G PAM4

Form factor:  
QSFP28

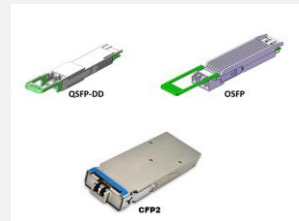
Low cost 100G DWDM



## 400ZR / 400ZR+

Form factors:  
QSFP-DD  
OSFP  
(CFP2)

400ZR standardized via



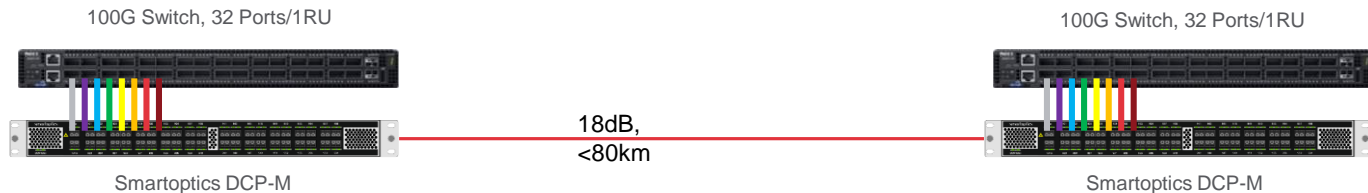
# Challenges with new high speed formats

- Low TX power  
Requires more amplification
- High OSNR requirement  
Limits the transmission distance
- Low dispersion tolerance  
Requires tuneable dispersion compensation

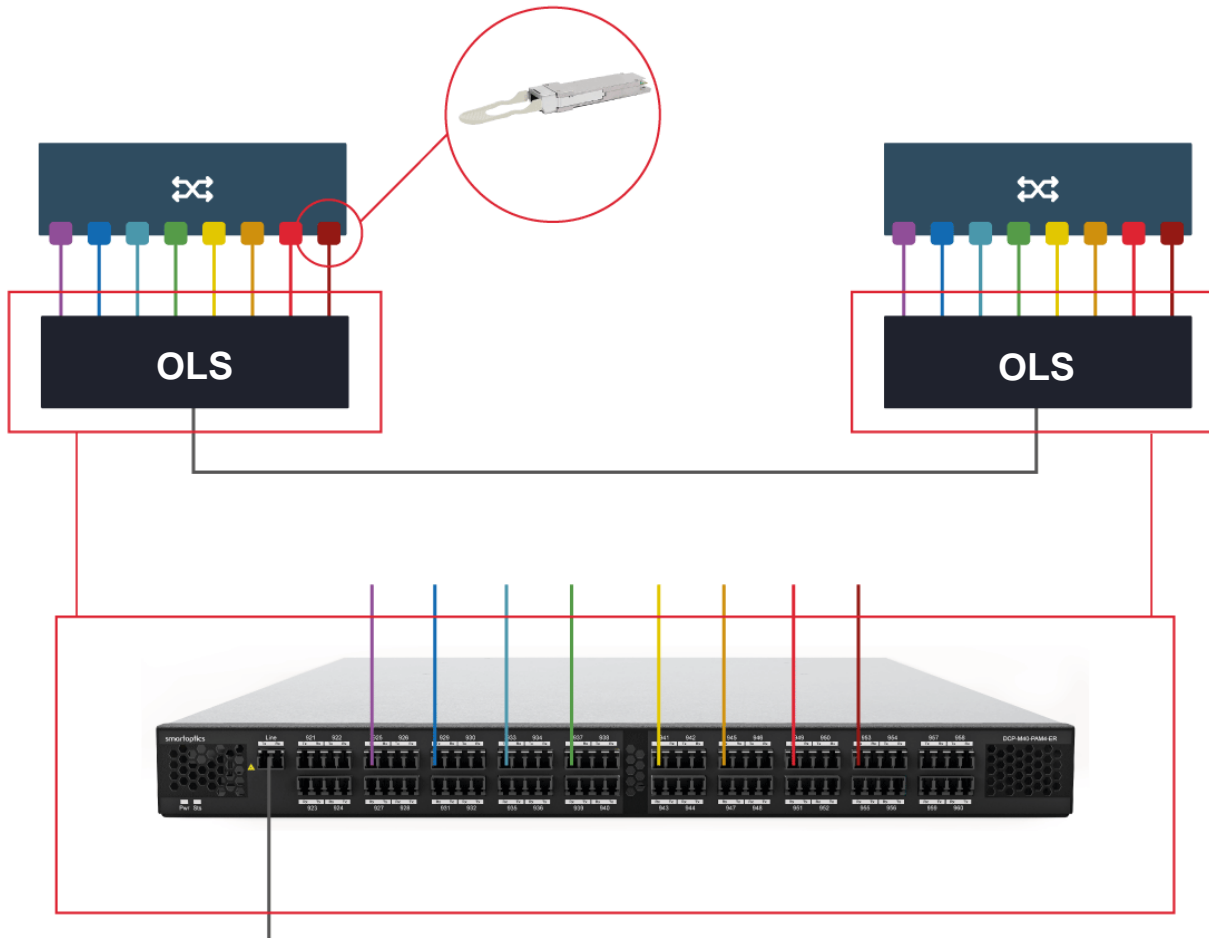


25G FC	32G FC	100G PAM4	400ZR 400ZR+
-3 dBm	-3 dBm	-11 dBm	-10 dBm
29 dB	29 dB	31 dB	26 dB (24 dB)
+170 ps/nm	+170 ps/nm	+100 ps/nm	-2400 ps/nm (-20000 ps/nm)

*Conclusion: Special line system needed to address these parameters*



# Open Line System requirements



## Generic OLS features

- ✓ Fully open approach
- ✓ Support for any service
- ✓ Support for embedded DWDM

## Desired Client control features

- ✓ Automatic protocol detection
- ✓ Automatic power level measurement
- ✓ Automatic power level regulation

## Desired Line control features

- ✓ Automatic measure of fiber length
- ✓ Automatic setting of dispersion compensation

# Thank You