cisco Connect

GO BEYOND

#CiscoConnect

Connectivité à l’Ère de l’IA:

Performance et Efficacité Énergétique du Cloud, au DC à l'Edge.

Rony Honein
Specialist – Routing, Optics, Optical
Session ID

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Cisco Webex App

https://ciscolive.ciscoevents.com/ciscolivebot/#BRKXXX-xxxx

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How

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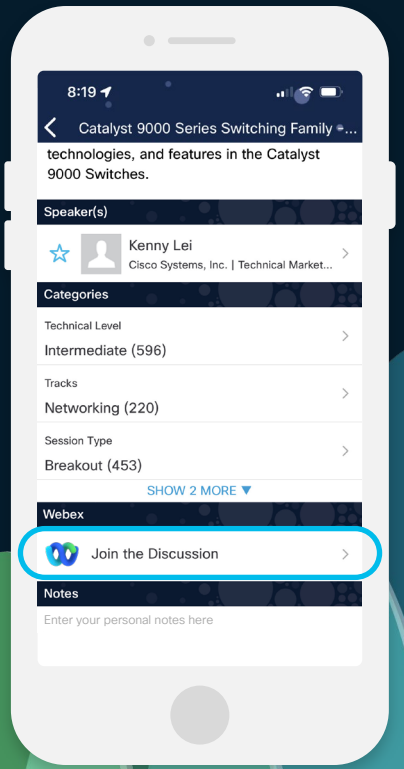
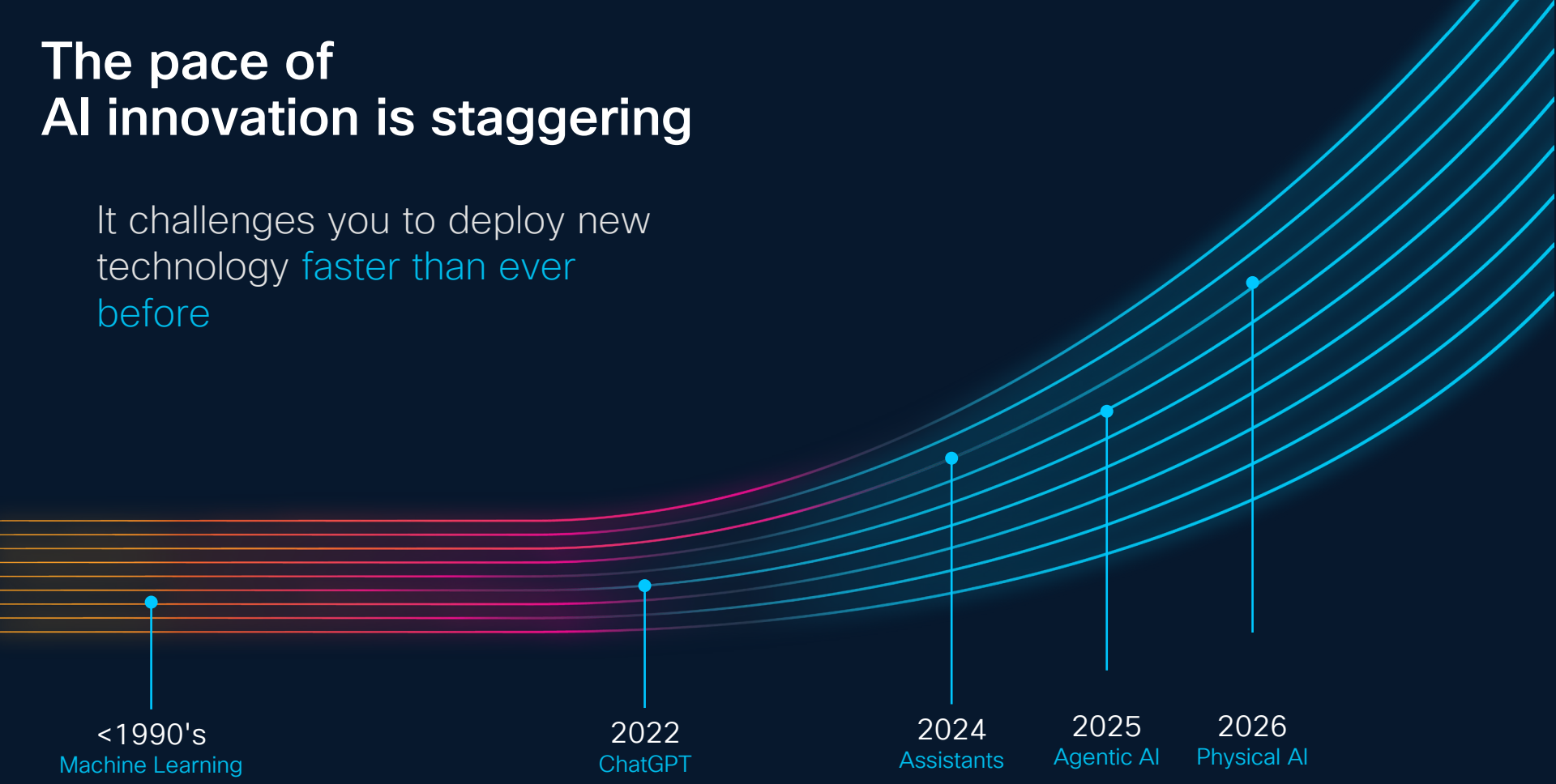


Agenda

- Impact de l’IA sur les réseaux
- Dans le Datacenter
- Entre les Datacenters (DCI)
- Sur les Réseaux WAN Privés

The pace of AI innovation is staggering

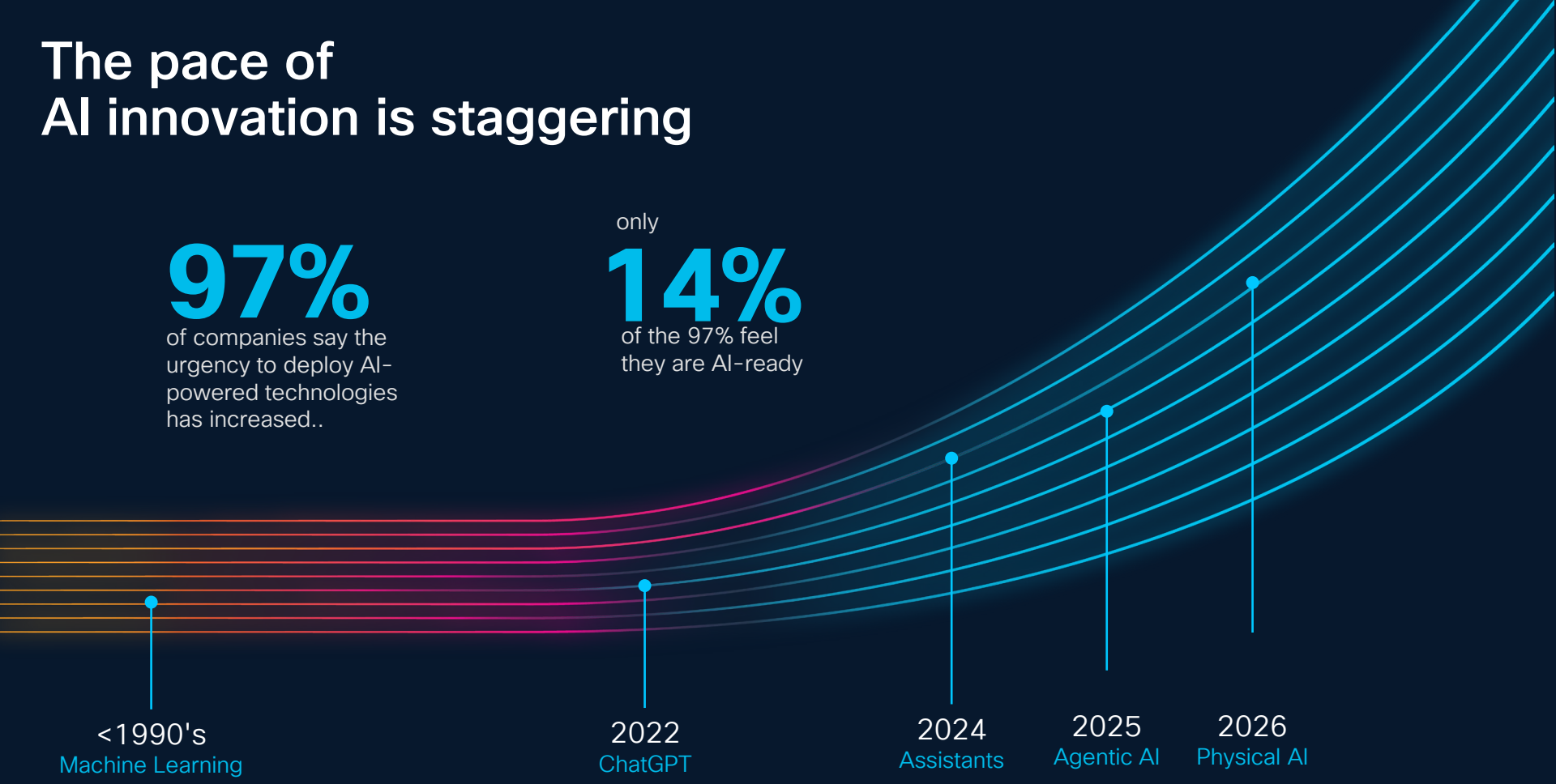
It challenges you to deploy new technology faster than ever before



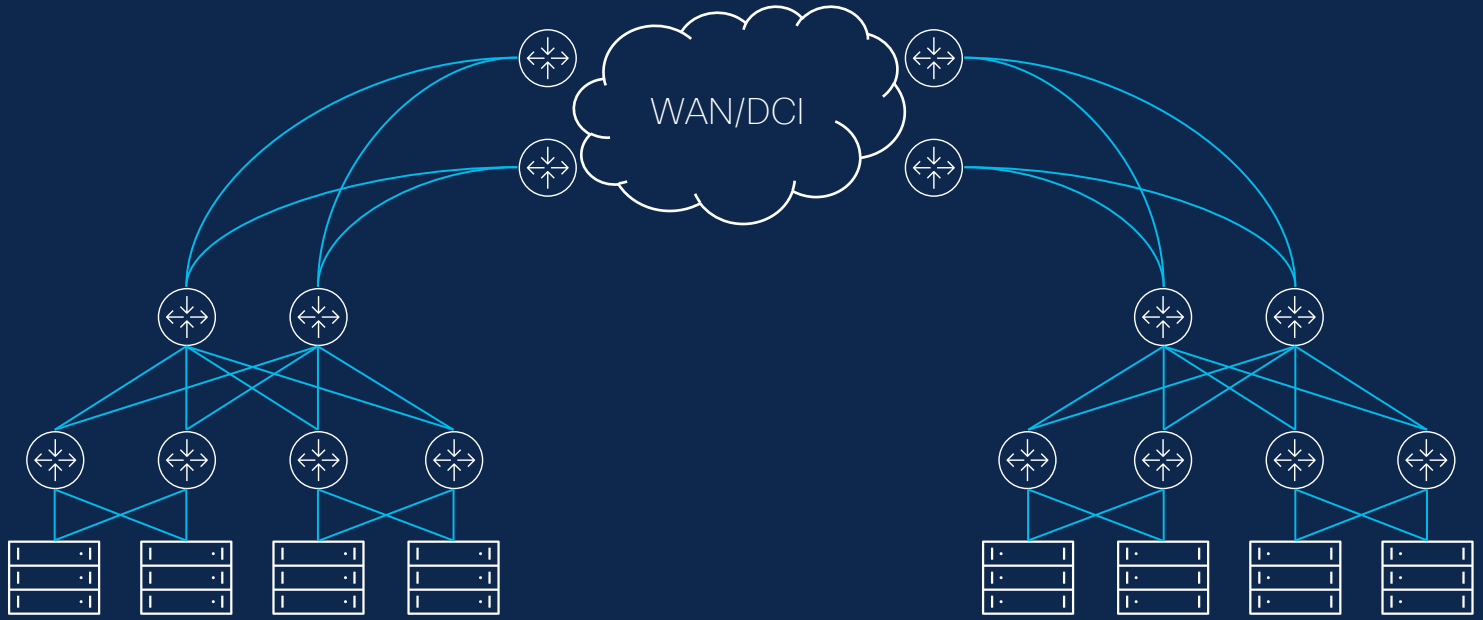
The pace of AI innovation is staggering

97%
of companies say the urgency to deploy AI-powered technologies has increased..

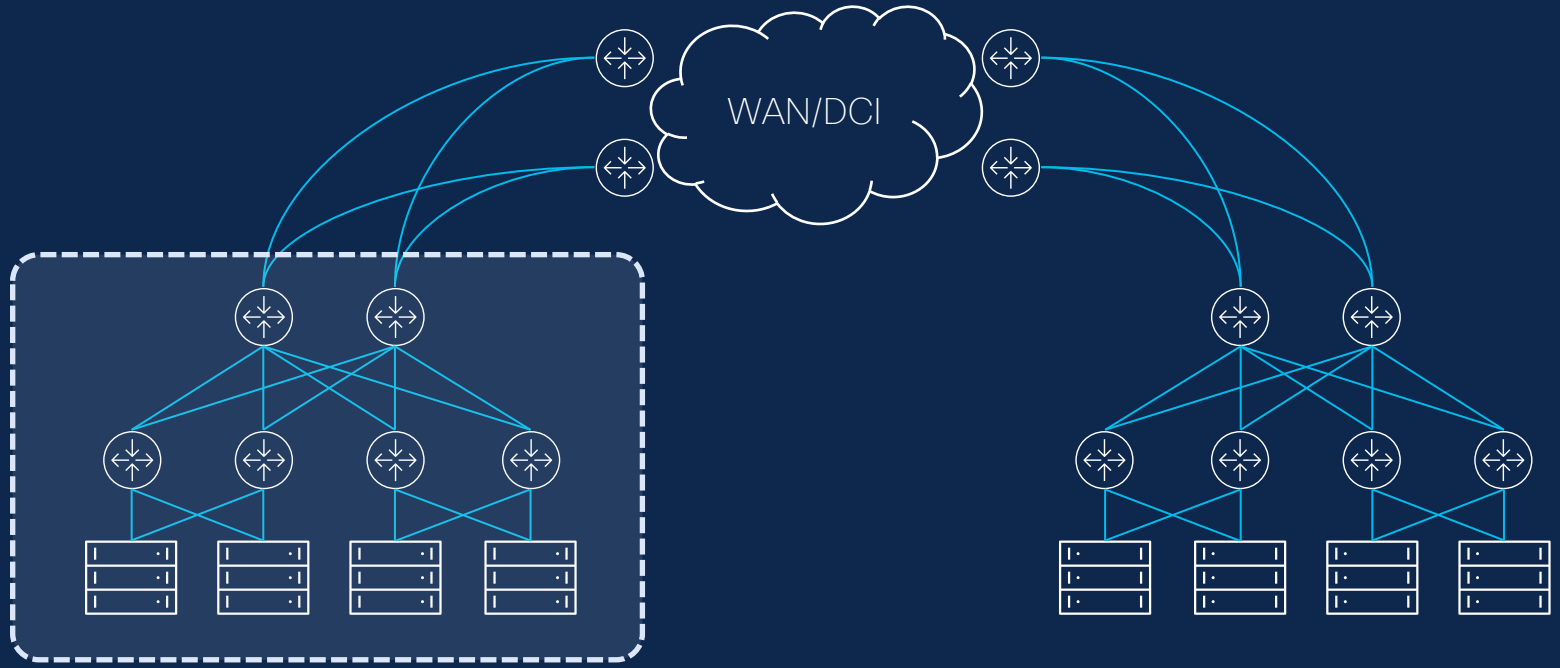
only
14%
of the 97% feel they are AI-ready



Point de Départ



Dans le Datacenter



Building Blocks

Cloud
Protected

AI READY INFRASTRUCTURE

Nexus 9000

Data Center Networking

Hyperfabric

Cloud managed
Network fabric

Unified Computing System

Cloud managed
compute fabric

AI FULL STACK SYSTEMS

AI Pod

Validated hardware and
software AI system

Hyperfabric AI

Cloud managed
integrated AI System

Secure AI Factory

Secure and integrated AI
full stack system

Digital
Resilience

Les Challenges Posés aux Réseaux

Training requirements

Inference requirements

General requirements

High bandwidth:

Movement of massive datasets across the network demands high bandwidth networks.

UL/DL symmetry

1

Non-Blocking Lossless:

Network inconsistencies can affect the accuracy and training time of AI models

2

Congestion management:

Detect potential congestion and redistribute network traffic accordingly

3

Low latency:

Real-time AI applications require extremely low latency

4

Visibility:

Comprehensive visibility tools for real-time monitoring, issue detection, and troubleshooting

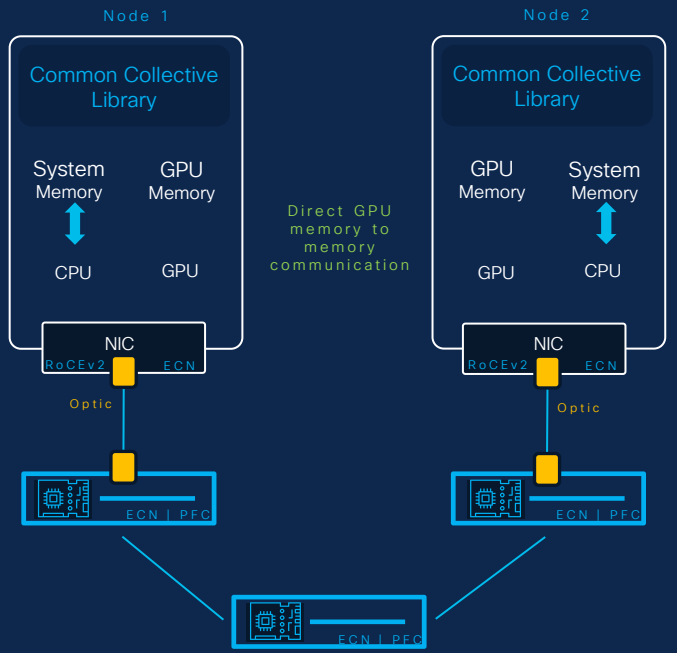
5

Security:

Tampered data is useless. Protect data in transit. Secure network components and paths.

6

AI Networking Dans le Datacenter



Lossless Ethernet Fabric

- RDMA over converged Ethernet (RoCEv2)
- Common Collective Library (CCL)
- Data Center Quantized Congestion Notification (DCQCN)

Custom Silicon

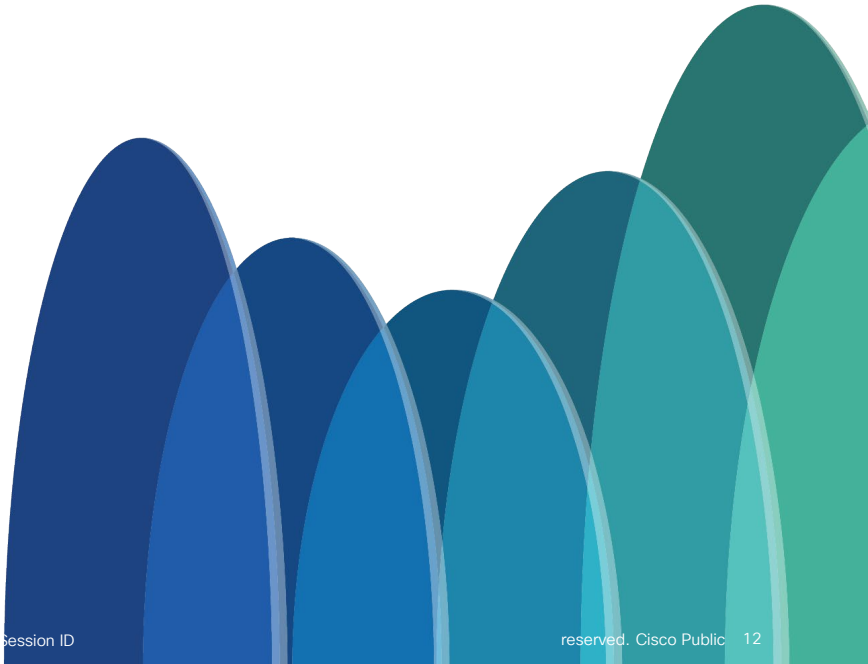
- Enhanced network utilization with telemetry
- Programmable SerDes for optimal AI performance
- Visibility and insights into energy consumption

Custom Optics

- Multivendor qualification and compliance
- Low failure rates with full TAC support
- Data Center Intconnect with coherent optics

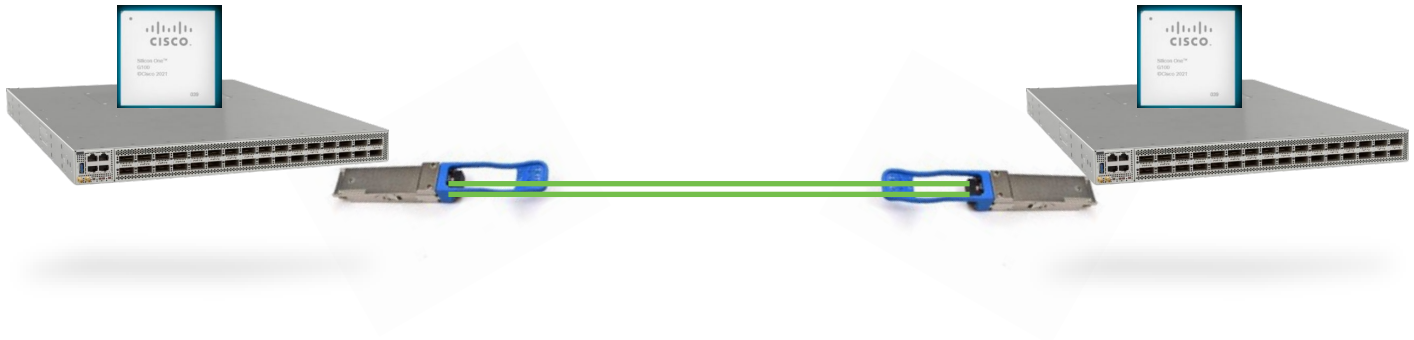
“xPUs determine the network bandwidth.”

x = Central, Graphics, Network, Data, Tensor, Vision, Neural…



The Function of Pluggable Optics

- The only function of Optics is to extend the interfaces from one xPU/ASIC in a Server/AI-POD/Switch/Router to another
- Therefore, it is the xPU/ASIC roadmaps which primarily matter, and the role of optics is to keep up – without causing too many issues



Relentless ASIC Advancement

Cisco Nexus

32 ports of 800G in 1RU

Switching Capacity

640G · 1.28T · 3.2T · 6.4T · 12.8T · 25.6T · 51.2T · 102.4T · 204.8T

← 204.8T is 16x the bandwidth of 12.8T

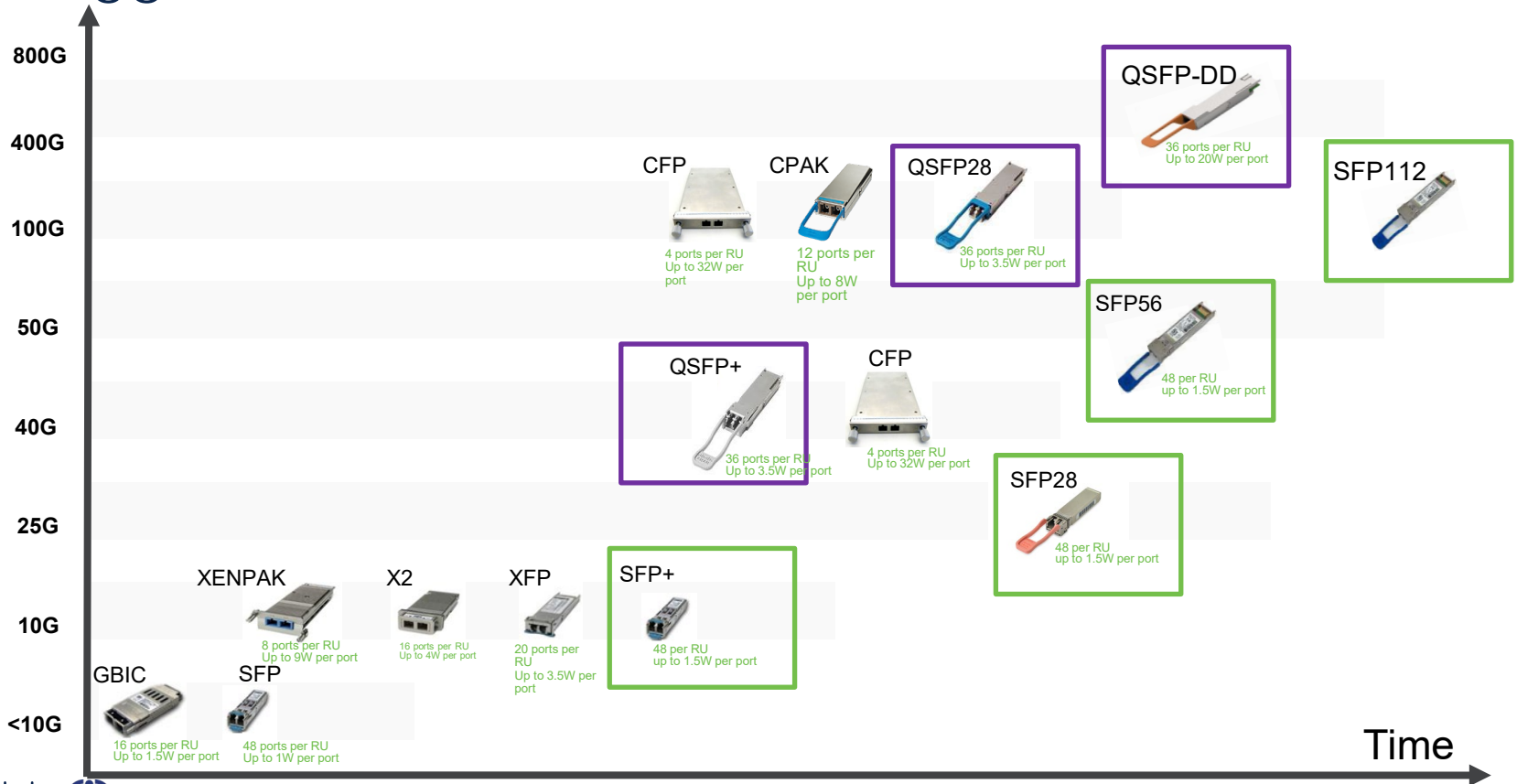
320x increase in switching bandwidth over 16 years

Cisco One ASICs

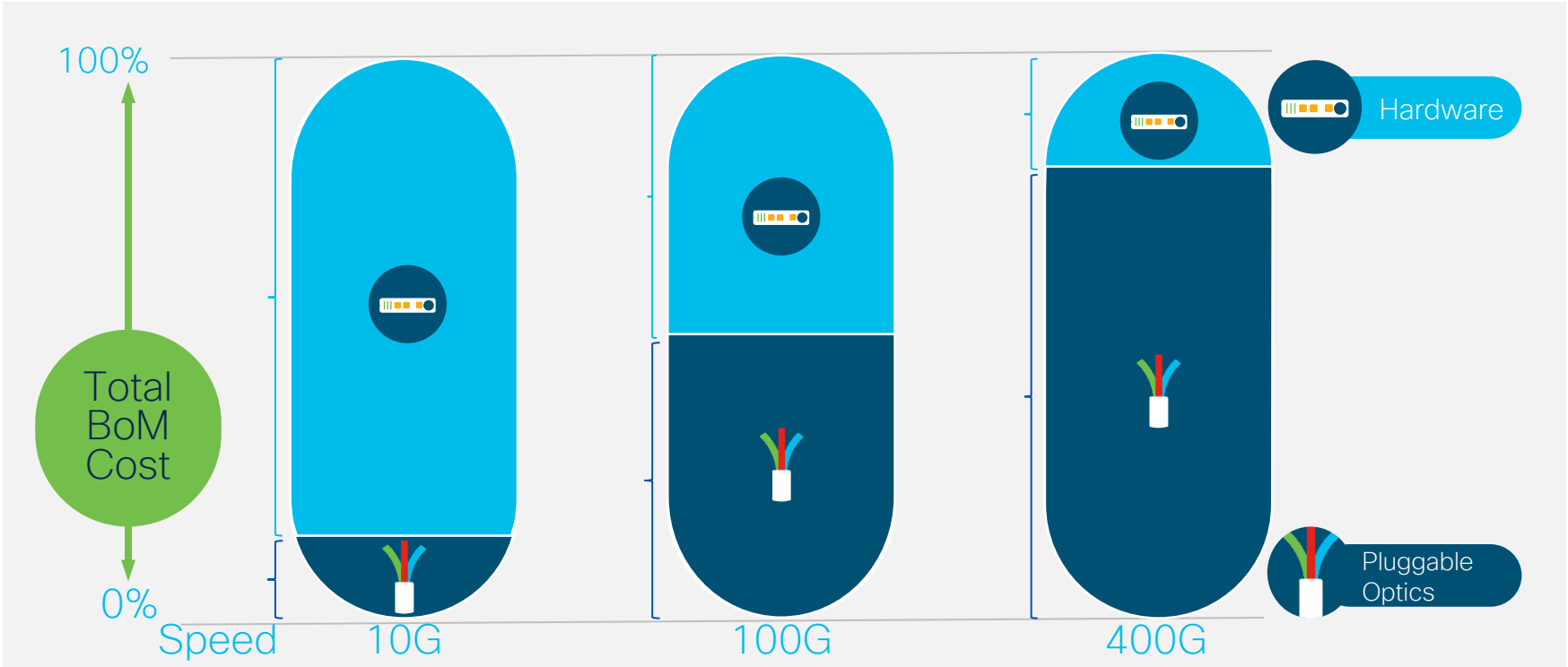
Year	2010	2012	2014	2016	2018	2020	2022	~2024 ?	~2026 ?	in 16 years ...
ASIC # SerDes	64	128		256		512			1024	16x
Serdes Gbps	10G NRZ		25G NRZ		50G PAM4		100G PAM4	200G PAM4		20x
Optics/Port	QSFP+		QSFP28		QSFP-DD56		QSFP-DD800	QSFP-DD1600		5 pkgs
Port Gbps	40G		100G		400G		800G	1.6T		40x
Ports/Router	16	32		64	32	64	64	64	128	

ASIC density continues to redefine how products are built.
Gates & GHz. SerDes & Interconnect. Optics & wavelengths.

Pluggable Form factors



Economic Trends Driving Architectural Shifts



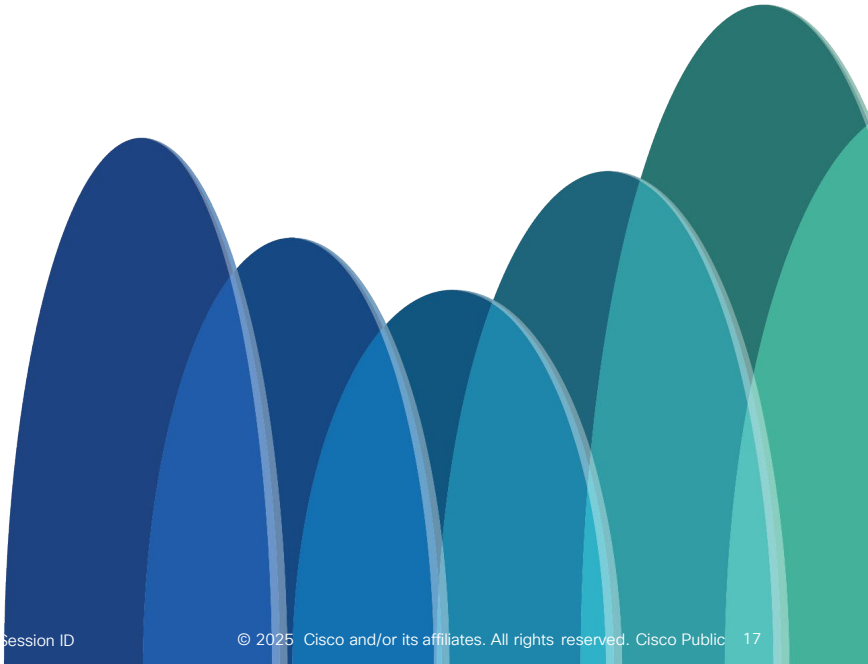
WHY? Host port costs are decreasing FASTER than optics technologies.
Optics complexity increases with speed.

Diversity & Compatibility

SMF or MMF

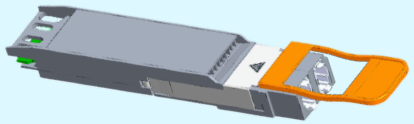
Power Consumption

Quality & Price



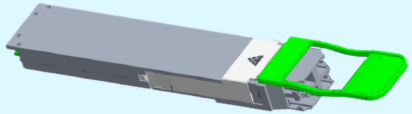
Pluggable form factors – a wealth of options

OSFP



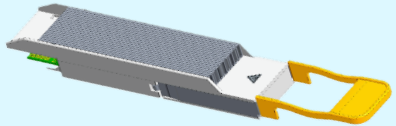
400G/800G/1.6T

OSFP-RHS



400G/800G/1.6T

OSFP-XD

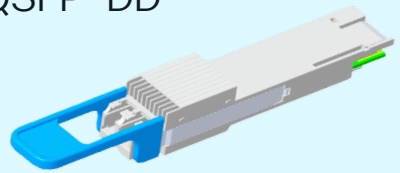


1.6T

Switches

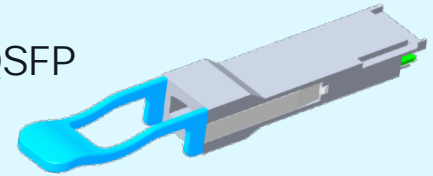
NIC

QSFP-DD



400G/800G/1.6T

QSFP



100G/200G/400G
QSFP28, QSFP56, QSFP112

Port compatibility

Everything within the square is compatible with each other

Nvidia Ports Support Many Interfaces

- Many Nvidia NICs have QSFP112 ports
- MCX715105AS-WEAT (ConnectX-7)
  - Single QSFP112 port
  - Nvidia Datasheet says it supports the following:
    - 200GAUI-2 C2M, 200GAUI-4 C2M, 200GBASE-CR4, 100GAUI-2 C2M, 100GAUI-1 C2M, 100GBASE-CR4, 100GBASE-CR2, 100GBASE-CR1, 50GAUI-2 C2M, 50GAUI-1 C2M, 50GBASE-CR, 50GBASE-R2 , 40GBASE-CR4, 40GBASE-R2, 25GBASE-R, 10GBASE-R, 10GBASE-CX4, 1000BASE-CX, CAUI-4 C2M, 25GAUI C2M, XLAUI C2M , XLPPI, SFI
- Check TMG's Compatibility Matrix for Cisco PIDs supported on Nvidia NICs
  - Optics Compatibility Matrix
  - Type in Nvidia to see the cards PIDs and NICs that TMG has certified!

Single-Port QSFP112 Adapter Cards
OPNs: MCX715105AS-WEAT

Interconnecting Cisco N9K to Nvidia ConnectX-7

1 x 400G NIC

Nexus 9332D-GX2B	
Port Type	QSFP56-DD
Port Speed	400G
SERDES	56G PAM4

QDD-400G-DR4-S

QSFP-400G-DR4

Nvidia ConnectX-7, BF-3 (B3140H)	
Port Type	QSFP112
Port Speed	1 x 400G
SERDES	112G PAM4

QDD-400G-DR4-S (Switch)	
SMF	IEEE 400GBASE-DR4
Cable	MPO-12 (APC)
Form Factor	QDD
Alternative Options	
(a) QDD-400G-SR8-S	100M – (MM)
(b) QDD-2X100-SR4-S	100M – (MM)
(c) QDD-2Q200-CU3M	3M Cable
(d) QDD-4ZQ100-CUxM	1, 2, 2.5 ,3m Cable

QSFP-400G-DR4 (NIC)	
SMF	IEEE 400GBASE-DR4
Cable	MPO-12 (APC)
Form Factor	QSFP112
Alternative Options	
(a) 2x QSFP-200G-SR4-S	100m (2 NICs) – (MM)
(b) 2x QSFP-100G-SR4-S	100m. (2 NICs) – (MM)
(c) QSFP-2Q200-CU3M	3M Cable (2 NICs)
(d) QDD-4ZQ100-CUxM	1, 2, 2.5 ,3m (4 NICs) Cable

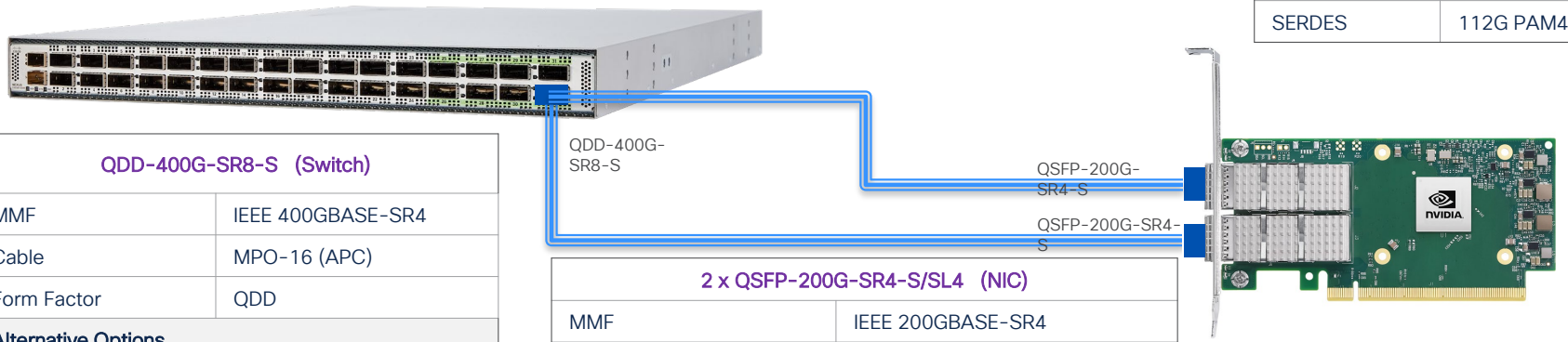
* Roadmap

Interconnecting Cisco N9K to Nvidia ConnectX-7

2 x 200G NIC

Nexus 9332D-GX2B	
Port Type	QSFP56-DD
Port Speed	400G
SERDES	56G PAM4

Nvidia ConnectX-7, BF-3 (B3220H)	
Port Type	QSFP112
Port Speed	2 x 200G
SERDES	112G PAM4



QDD-400G-SR8-S (Switch)	
MMF	IEEE 400GBASE-SR4
Cable	MPO-16 (APC)
Form Factor	QDD
Alternative Options	
(a) QDD-2X100-SR4-S	QDD - (MM)
(b) QDD-2Q200-CU3M	3M Cable, QDD to QSFP56
(c) QDD-4ZQ100-CUxM	1, 2, 2.5 ,3m, QDD to QSFP28

2 x QSFP-200G-SR4-S/SL4 (NIC)	
MMF	IEEE 200GBASE-SR4
Cable	2 x MPO-12 (UPC)
Form Factor	QSFP56
Alternative Options	
(a) 2x QSFP-100G-SR4-S	QSFP28 - (MM)
(b) QDD-2Q200-CU3M	3M Cable, QDD to QSFP56
(c) QDD-4ZQ100-CUxM	1, 2, 2.5 ,3m, QDD to QSFP28 (2 NICs)

Interconnecting Cisco 8000 to Nvidia ConnectX-7

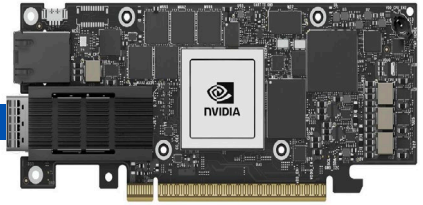
800G to 2 x 400G

Cisco 8111-32EH	
Port Type	QSFP-DD800
Port Speed	800G
SERDES	112G PAM4

QDD-8x100G-FR

Nvidia ConnectX-7, BF-3 (B3140H)	
Port Type	QSFP112
Port Speed	1 x 400G
SERDES	112G PAM4

QSFP-400G-DR4-2



QSFP-400G-DR4-2

QDD-8X100G-FR (Switch)	
SMF	**IEEE 400GBASE-DR4-2
MPO-12 (APC)	2km
Roadmap	
* (a) QDD-800G-VR8	(50m)
* (b) QDD-800G-DR8	(500m)

* Roadmap

** DR4-2 = FR4

* 2 x QSFP-400G-DR4-2 (NIC)	
SMF	**IEEE 400GBASE-DR4-2
MPO-12 (APC)	2km
Roadmap	
* (a) 2 x QSFP-400G-VR4. (QSFP112)	50m (2 NICs)
(b) 2 x QSFP-400G-DR4 (QSFP112)	500m (2 NICs)

Interconnecting Cisco 8000 to Nvidia ConnectX-7

800G to 4 x 200G

Cisco 8111-32EH	
Port Type	QSFP-DD800
Port Speed	800G
SERDES	112G PAM4

Nvidia ConnectX-7, BF-3 (B3220)	
Port Type	QSFP112
Port Speed	2 x 200G
SERDES	112G PAM4

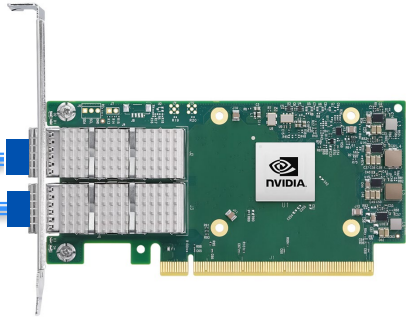
QDD-8x100G-FR

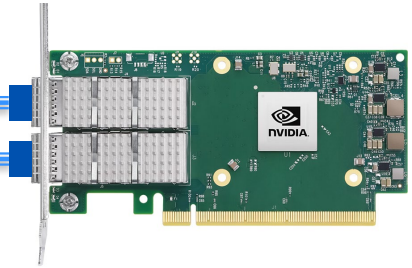
QSFP-400G-DR4-2

QSFP-400G-DR4-2

QSFP-400G-DR4-2

QSFP-400G-DR4-2





QDD-8X100G-FR (Switch)	
SMF	IEEE 400GBASE-DR4-2
MPO-12 (APC)	2km
Roadmap	
* (a) QDD-800G-VR8	(50m) - (MM)
* (b) QDD-800G-DR8	(500m) – (SM)

* Roadmap
** DR4-2 = FR4

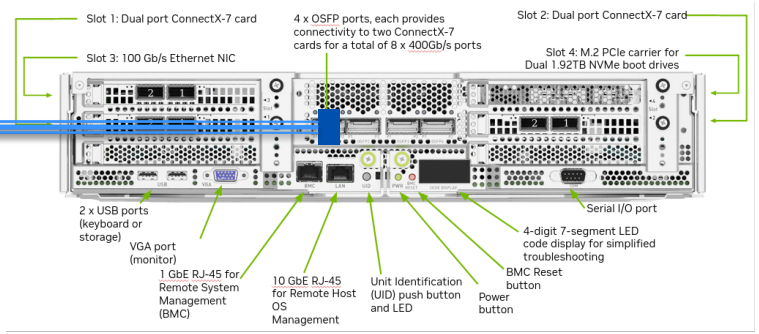
* 4 x QSFP-400G-DR4-2 (2 NIC)	
SMF	**IEEE 400GBASE-DR4-2
MPO-12 (APC)	2km
Roadmap	
* (a) 4 x QSFP-400G-VR4. (QSFP112)	50m (2 NICs)
* (b) 4 x QSFP-400G-DR4 (QSFP112)	500m (2 NICs)

Interconnecting Cisco N9K to Nvidia ConnectX-7 (DGX)

Nexus 9332D-GX2B	
Port Type	QSFP56-DD
Port Speed	400G
SERDES	56G PAM4

2 x QDD-400G-DR4-S	
SMF	IEEE 400GBASE-DR4
MPO-12 (APC)	500m
4 waves 1310 nm	G.652

Nvidia ConnectX-7 in DGX H100	
Port Type	Twin port OSFPs
Port Speed	2 x 400G
SERDES	112G PAM4



DR8, 2 x 400G Twin-port OSFP	
SMF	IEEE 400GBASE-DR4
2x MPO-12 (APC)	100m
4 waves 1310 nm	G.652

Interconnecting Cisco N9K to Nvidia ConnectX-6

Nexus 9332D-GX2B	
Port Type	QSFP56-DD
Port Speed	400G
SERDES	56G PAM4

Nvidia ConnectX-6	
Port Type	QSFP56
Port Speed	1 x 200G
SERDES	56G PAM4

QSFP-200G-SR4

QDD-400G-SR8-S

QSFP-200G-SR4

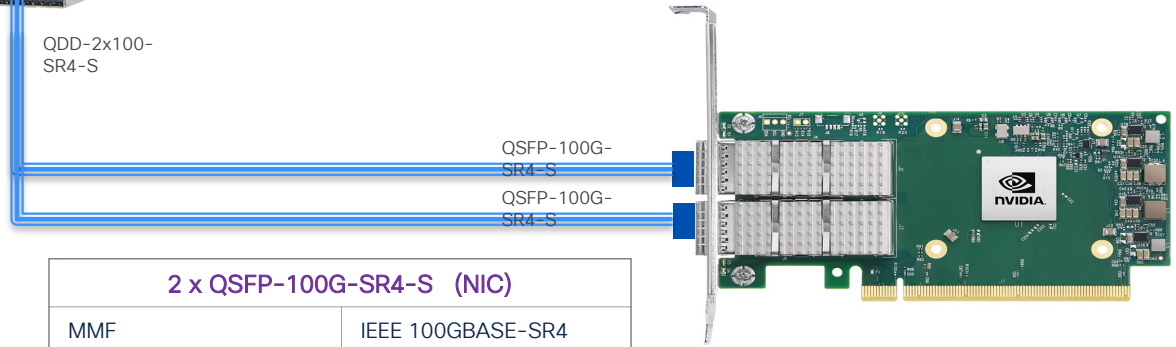
QDD-400G-SR8-S (Switch)	
MMF	IEEE 400GBASE-SR8
MPO-16 (APC)	100m
Alternative	
(a) QSFP-200G-SR4-S	100m
(b) QSFP-2Q200-CU3M	3m
(c) QSFP-200G-CU3M	3m
(d) QDD-4ZQ100-CUxM	1, 2, 2.5 3m

2 x QSFP-200G-SR4 - (NIC)	
MMF	IEEE 200GBASE-SR4
MPO-12	100m
Alternative	
(a) QSFP-200G-SR4-S	100m
(b) QSFP-2Q200-CU3M	3m
(c) QSFP-200G-CU3M	3m
(d) QDD-4ZQ100-CUxM	1, 2, 2.5 3m

Interconnecting Cisco N9K to Nvidia ConnectX-6

Nexus 9332D-GX2B	
Port Type	QSFP56-DD
Port Speed	400G
SERDES	56G PAM4

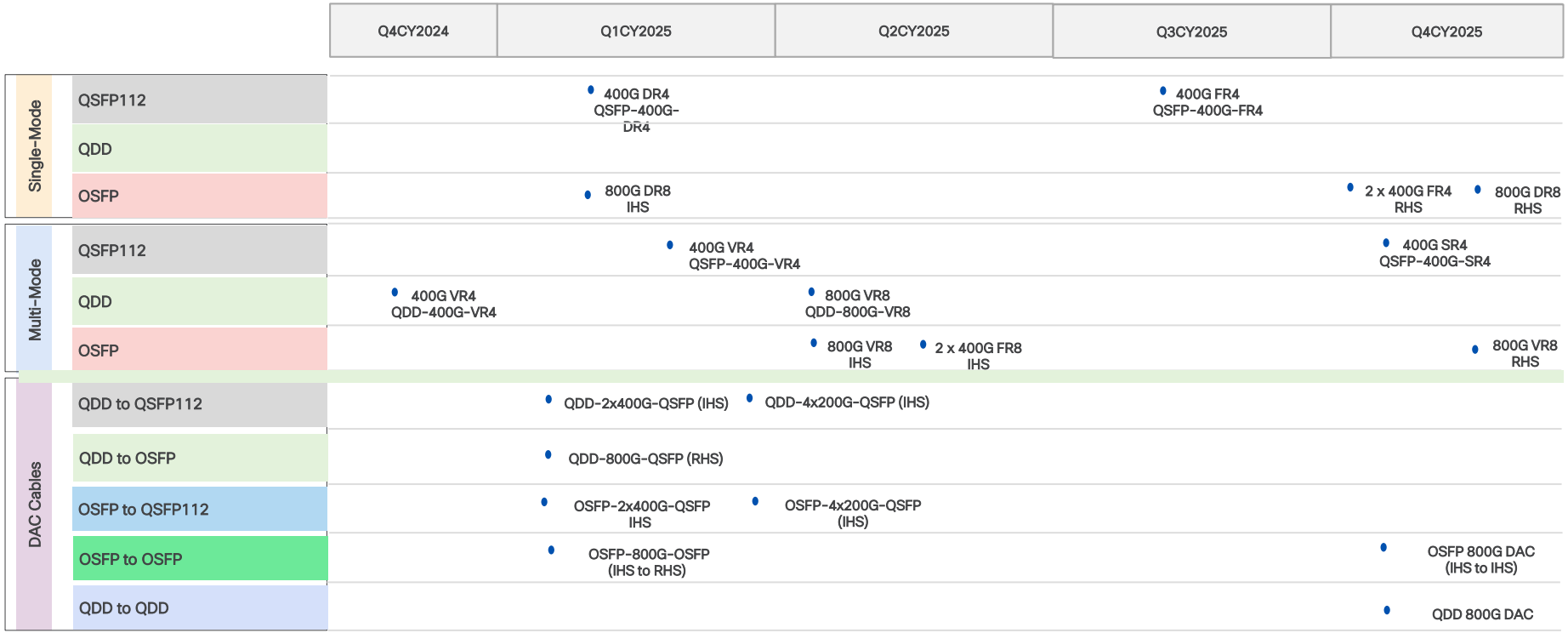
Nvidia ConnectX-6	
Port Type	QSFP56
Port Speed	2 x 100G
SERDES	56G PAM4



QDD-2x100-SR4-S (Switch)	
MMF	IEEE 100GBASE-SR4
MPO-24 (APC)	100m
Alternative	
(a) QDD-4ZQ100-CUxM	1, 2, 2.5 3m

2 x QSFP-100G-SR4-S (NIC)	
MMF	IEEE 100GBASE-SR4
MPO-12 (UPC)	100m
Alternative	
(a) QDD-4ZQ100-CUxM	1, 2, 2.5 3m

Optics for AI Roadmap Summary



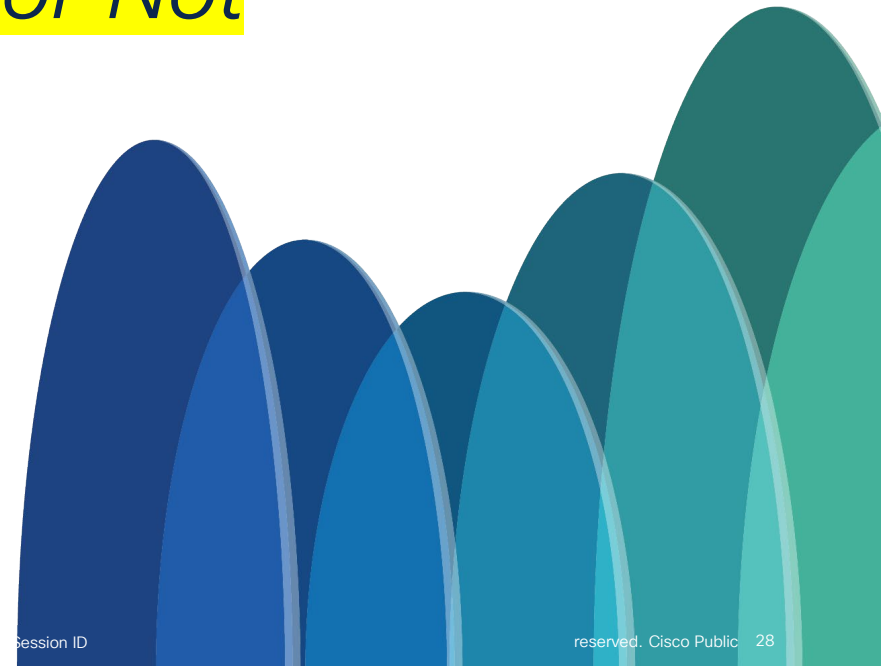
IHS – Integrated Heat Sink supported on the switch only
RHS – Riding Heat Sink supported on the NIC only

Diversity & Compatibility

SMF or MMF; Breakout or Not

Power Consumption

Quality & Price



400G QSFPDD 500m, 2km, 10km

4x100G Breakout

Single-Mode Fiber

9-micron core

PID: QDD-400G-DR4-S=

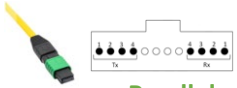
RS-FEC, IEEE 802.3 Clause 119, RS(544,514)

Speed: 400G
Reach: 500m
Type: QSFP-DD
Power: 12W
Temp: 0 – 70 C

Member of Bundle: QDD-4Q-500M-BND-4Q-500M-=

400GBASE DR4

Fiber: SMF
Connector: MPO-12 (APC)
Optimized: G.652



Parallel

400GAUI-8/CEI-56G- VSR-PAM4

4 Waves (nm): 1310
Xmt Power: -2.9 to +4
Rcv Power: -5.9 to +4 dBm

IEEE 400GBASE-DR4

Breakout Capable

400GE, 4x100GE

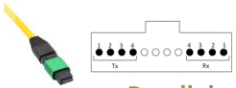
PID: QDD-4X100G-FR-S=

Speed: 400G
Reach: 2km
Type: QSFP-DD
Power: 12W
Temp: 0 – 70 C

Member of Bundle: QDD-4Q-2KM-BND-4Q-2KM-=

4x 100GBASE FR

Fiber: SMF
Connector: MPO-12 (APC)
Optimized: G.652



Parallel

400GAUI-8/CEI-56G- VSR-PAM4

4 Waves (nm): 1310
Xmt Power: -3.1 to +4
Rcv Power: -7.1 to +4 dBm

4x IEEE 100GBASE-FR1

Breakout Capable

4x100GE

PID: QDD-4X100G-LR-S=

Speed: 400G
Reach: 10km
Type: QSFP-DD
Power: 12W
Temp: 0 – 70 C

Member of Bundle: QDD-4Q-10KM-

4x 100GBASE LR

Fiber: SMF
Connector: MPO-12 (APC)
Optimized: G.652

Parallel

400GAUI-8/CEI-56G- VSR-PAM4

4 Waves (nm): 1310
Xmt Power: -1.9 to +4.8
Rcv Power: -8.2 to +4.8 dBm

4x IEEE 100GBASE-LR1

Breakout Capable

4x100GE

400G QSFPDD 100m

Multi-Mode Fiber

50-micron core

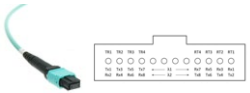
PID: **QDD-400G-SR4.2-BD=**

RS-FEC, IEEE 802.3 Clause 119, RS(544,514)

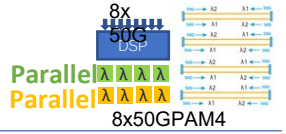
Speed: 400G
Reach: 100m
Type: QSFP-DD
Power: 3.5W
Temp: 0 – 70 C

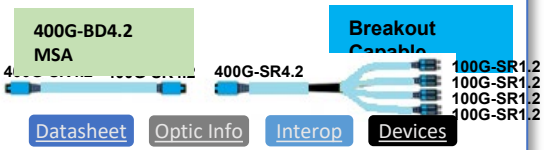
400GBASE SR4.2 BiDi

Fiber: MMF
Connector: MPO-12 (UPC)
Optimized: OM3, **OM4**/OM5



8 Waves (nm): 855, 908
Xmt Power: -2.9 to +4
Rcv Power: -7.9 to +4 dBm





400GE, 4x100GE

Lead Time (days): Future

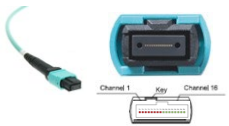
PID: **QDD-400G-SR8=**

RS-FEC, IEEE 802.3 Clause 119, RS(544,514)

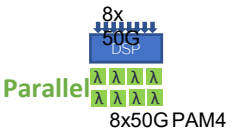
Speed: 400G
Reach: 100m
Type: QSFP-DD
Power: 10W
Temp: 0 – 70 C

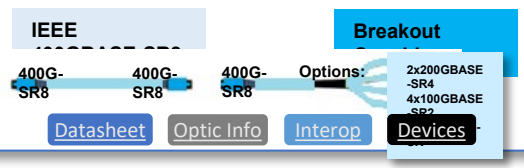
400GBASE SR8

Fiber: MMF
Connector: MPO-16 (UPC)
Optimized: OM3, **OM4**/OM5



8 Waves (nm): 850
Xmt Power: -6 to +4
Rcv Power: -7.9 to +4 dBm





400GE, 2x200GE, 4x100GE, 8x50GE

800G QSFPDD800 2km

8x100G, 2x400G Breakout

Single-Mode Fiber

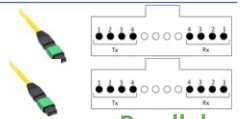
9-micron core

PID: **QDD-8X100G-FR=**

Speed: **8x100G**
Reach: **2km**
Type: **QSFP-DD800**
Power: **17W**
Temp: **0 – 70 C**

8x 100GBASE FR

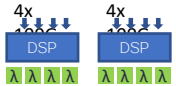
Fiber: **SMF**
Connector: Dual **MPO-12 (APC)**
Optimized: **G.652**



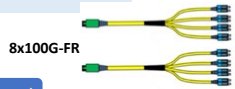
Parallel

100GAUI-1/400GAUI-4 Annex 120G

4 Waves (nm): **1310**
Xmt Power: **-3.1 to +4**
Rcv Power: **-7.1 to +4 dBm**



8x IEEE 100GBASE-FR1



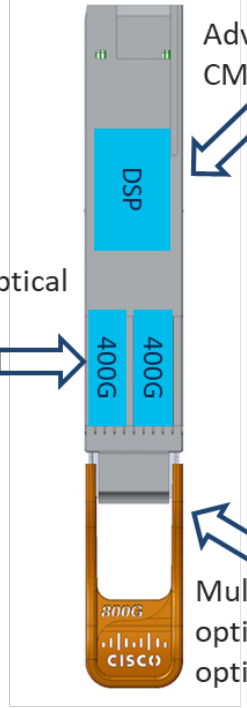
Breakout Capable

100G-FR 100G-FR
100G-FR 100G-FR
100G-FR 100G-FR
100G-FR 100G-FR

Datasheet

8x100GE

8x 100Gb/s from ASIC



Advanced CMOS node

Advanced optical integration (especially SiPhotonics)

Multiple dense optical connector options

PID: **QDD-2X400G-FR4=**

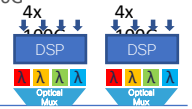
Speed: **2x400G**
Reach: **2km**
Type: **QSFP-DD800**
Power: **17W**
Temp: **0 – 70 C**

2x 400GBASE FR4

Fiber: **SMF**
Connector: **Dual Duplex LC (UPC)**
Optimized: **G.652**

400GAUI-4 Annex 120G

4 Waves (nm): **1270,1290,1310,1330**
Xmt Power: **-3.2 to +3.5**
Rcv Power: **-7.3 to +3.5 dBm**



2x IEEE 400GBASE-FR4

Breakout Capable

400G-FR4
400G-FR4

Datasheet

2x400GE

Diversity & Compatibility

SMF or MMF ; Breakout or Not

Power Consumption

Quality & Price

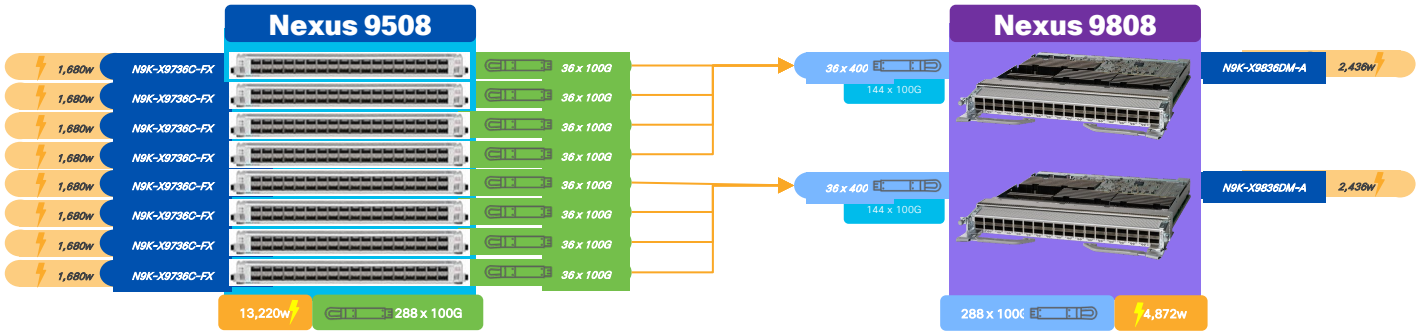
GLC-LH-SMD=

QDD-2X400G-FR4=

800 W

17 W

From 100G to 400G : Modular Nexus Platform



36 ports (100G) x 8 linecards = 288 ports (100G)

13,220w

36 ports (400G) x 2 linecards = 288 ports (100G)

4,872w

Optics and Ports
75% ⬇

Linecards Power
63% ⬇
(Based on Max. Power)

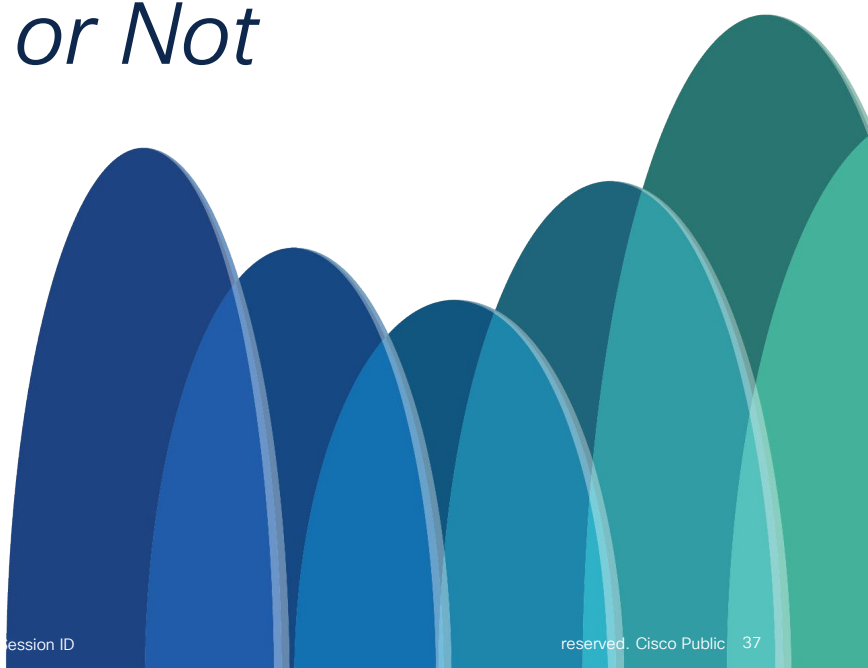
“The higher we go in speed, the lower is the cost, space, and power consumed per Gbit of data.”

Diversity & Compatibility

SMF or MMF ; Breakout or Not

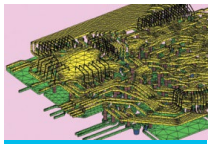
Power Consumption

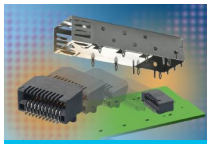
Quality & Price



Cisco System Level Optics Qualification


Optical


Electrical


Mechanical

Design Verification Testing


Regulatory


Reliability

Compliance Testing

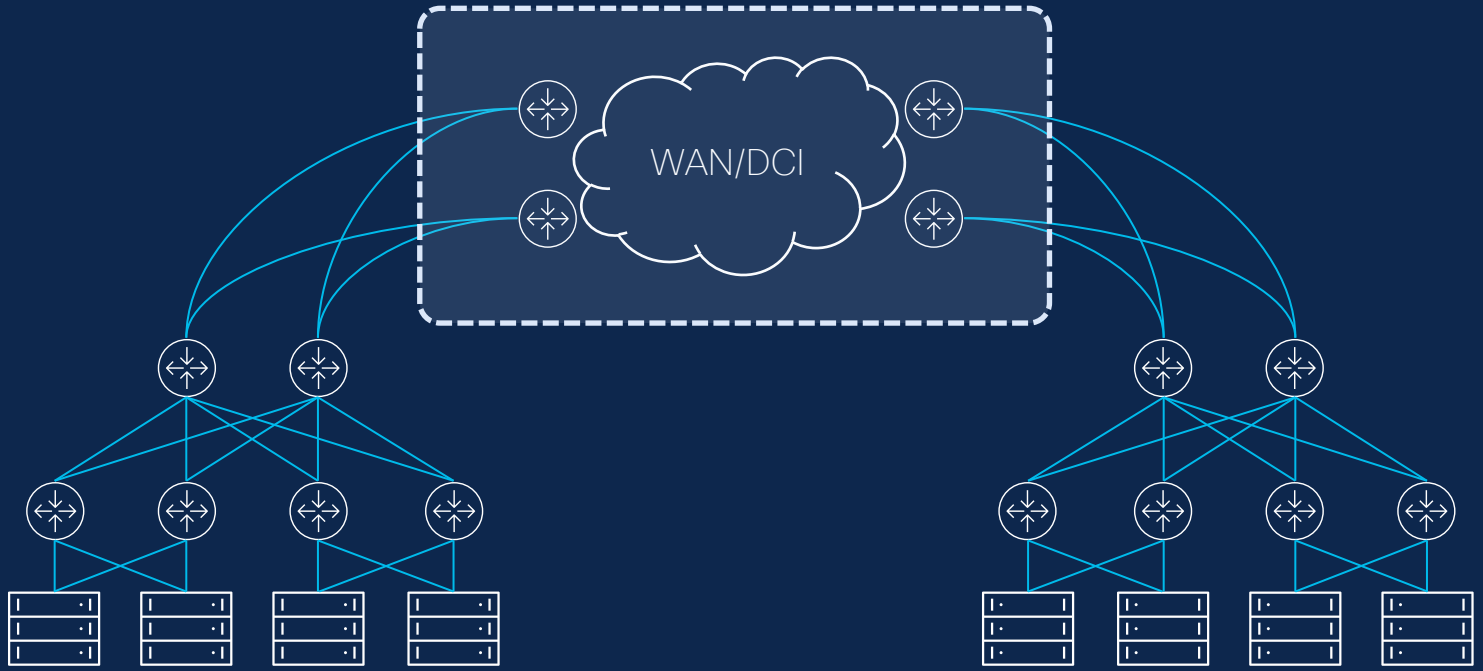

Software Integration

Multi-vendor Interop

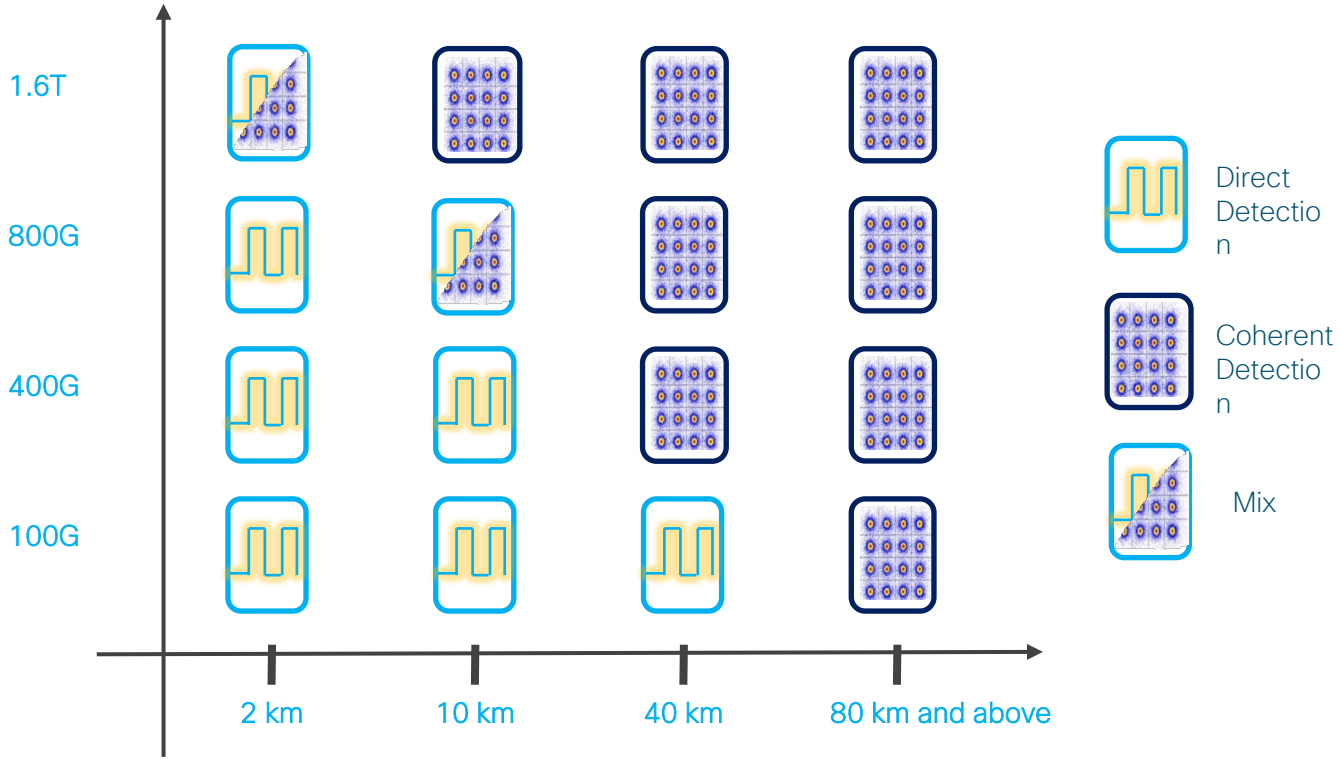
Cisco sets the most stringent standards and employs the most rigorous qualification testing in the industry

Pays dividends in low failure rates:
<100ppm field return rate

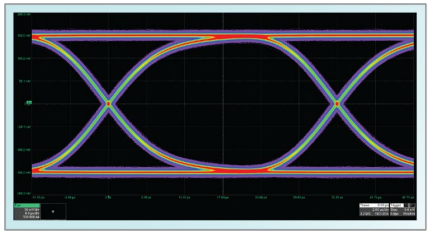
Entre les Datacenters



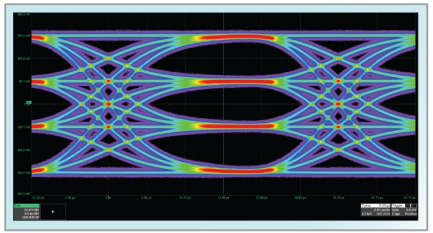
Direct vs. Coherent Detection



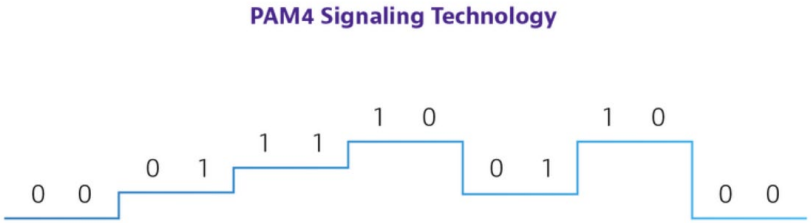
Direct vs. Coherent Detection

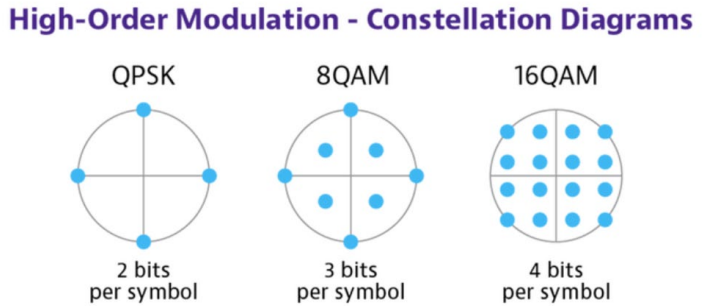


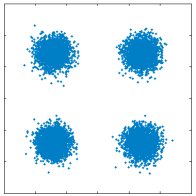
NRZ
1 bit/sec/symbol



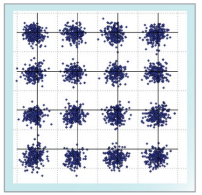
PAM4
2 bit/sec/symbol







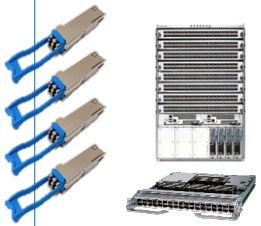
Coherent QPSK
2 bit/sec/symbol



Coherent 16-QAM
4 bit/sec/symbol

High-speed, long reach: How was it done so far ?

Previous



Router / Switch

\+

4x 100G

Gray Pluggable

\+

4x Fiber Jumpers

\+

4x 100G

Gray Pluggable

\+

Nx Muxponders

Transponder/ Muxponder

Optical Chassis

\+

Fiber Jumper

\+

ROADM – OLS Layer

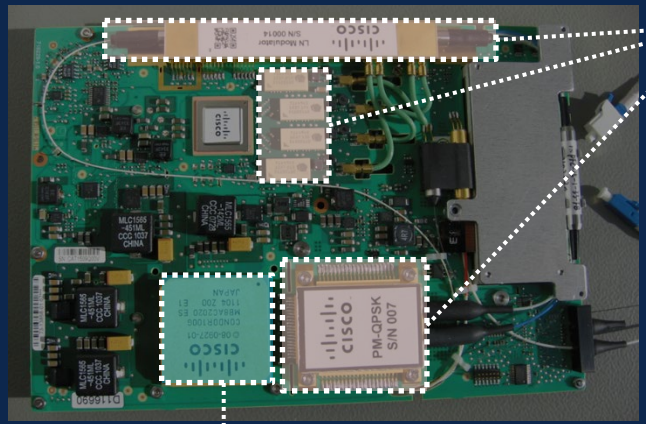
Outside Plant Fiber

Transponder Role:
Remodulate from direct to coherent detection signal

What is a DCO ?

Digital Coherent Optic

Typical 100G Coherent transponder line card for 300x300mm layouts

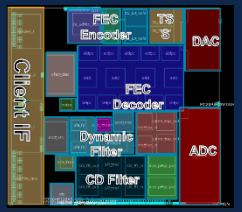


€€€

80W / 100G

Discrete Photonic Elements

Digital Signal Processor



28nm

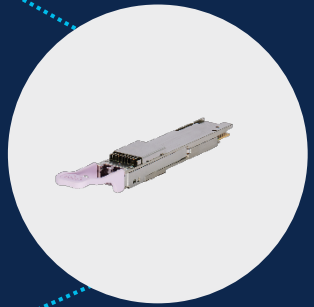
Silicon Photonics Integration Advanced Packaging Integration

Moore's Law

PIC with Multi Chip Packaging

7nm

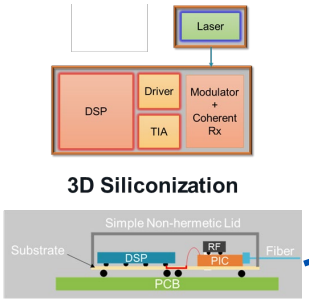
QSFP-DD 400G DCO

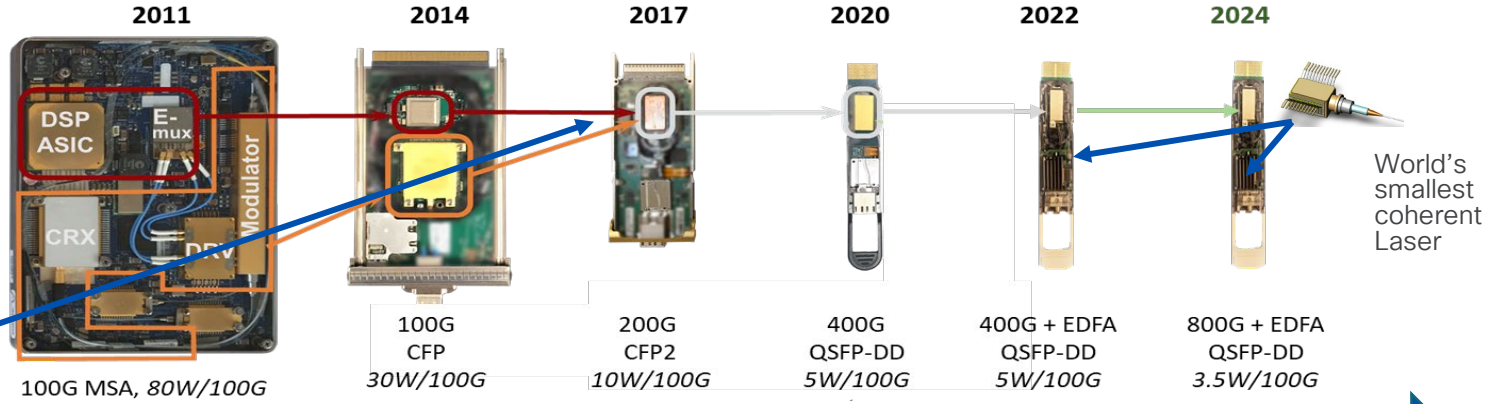


€

5W / 100G

Coherent Optics Evolution





In-House:	DSP	+ SiPh Optics	+ OE-MCM	+ ASIC	+ Laser	100% Integration
QAM:	QPSK	QPSK	16QAM	16QAM[4]		PCS
CMOS:	40nm	28nm	16nm	7nm		4/3nm
Optics:	Discrete, InP, LiNbO3	SiPh	SiPh	SiPh		SiPh

100G/400G – Swap the Transponder by a Pluggable Optic

400G DCO 120+km High Power (BRZR+)

Single-Mode Fiber

9-micron core

"Bright"

PID: **DP04QSDD-HE0=**

O-FEC

Speed: 100-400G

Reach: unamplified 85km, amplified 1300+km

Type: QSFP-DD56

Power: 22.5W

Temp: 15 – 75 C

Application: Transponder Replacement

400GBASE ZRH "Bright"

Fiber: SMF

Connector: Duplex LC (UPC)

Optimized: G.652/G.653/G.655

1 Wave (nm): **1530-1565 C-Band Tunable**

Xmt Power: **-9 to +1**

Rcv Power: **-32 to +13 dBm**

OIF ZR

Open ZR+

Datasheet | Optic Info | Interop | Devices

DWDM Specs: **DP04QSDD-HE0=**

Modulation Baud	TX dBm	RX dBm	OSNR dB	CD ps/nm
16-QAM 400G 60Gbd	+1 to -9	-21 to -12	22.5	+/- 13,000 +/-52,000
8-QAM 300G 60Gbd	+1 to -9	-23 to -15	19.5	+/- 50,000 +/- 100,000
16-QAM 200G 30Gbd	+1 to -9	-25 to -15	19.3	+/- 30,000 +/- 85,000
8-QAM 200G 40Gbd	+1 to -9	-28 to -16	17.2	+/- 50,000 +/- 100,000
QPSK 200G 60Gbd	+1 to -9	-29 to -18	14.8	+/- 50,000 +/- 100,000
QPSK 100G 30Gbd	+1 to -9	-32 to -20	11.5	+/- 80,000 +/- 160,000

RON capable

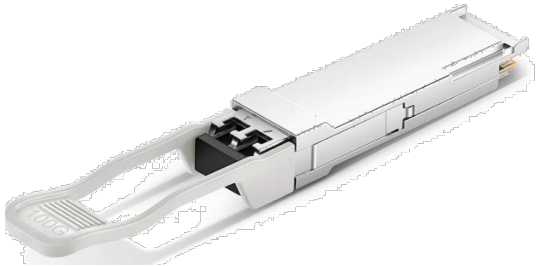
DWDM: 100G,200G,300G,400G

Client: 100GE,2x100GE,200GE,3x100GE,4x100GE,400GE

- **PID Decoder** **DP04QSDD-HE0=**

DP	DCO Pluggable
04	400G = 04x100G
QSDD	Form Factor
H	High Tx Power
E	Ethernet only clients
=	Spare

Cisco QSFP28 ZR Coherent

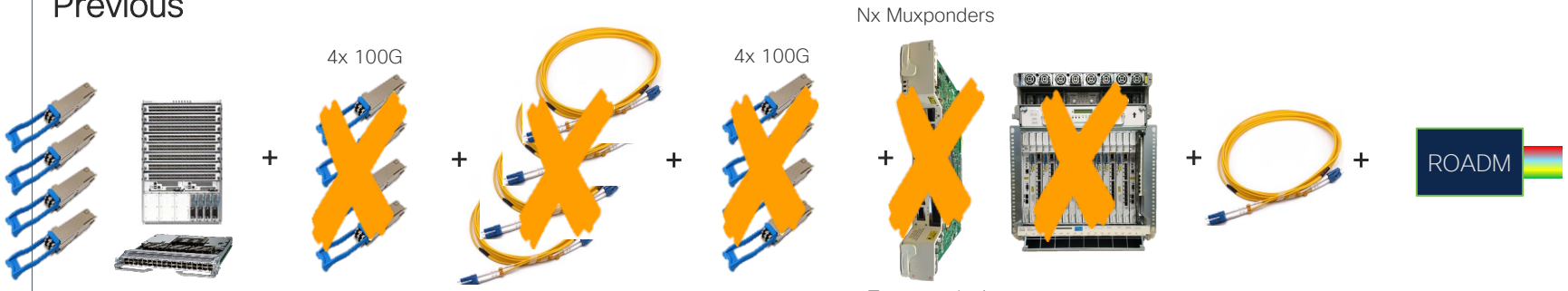


- Target Optical spec
  - Tx Power -8dBm
  - Min Rx Power -30dBm

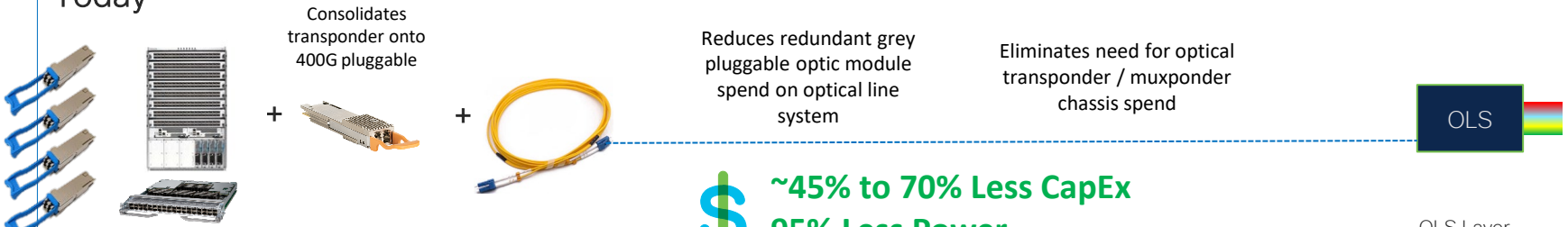
- QSFP28 form factor
  - Compatible with legacy QSFP28 router ports
  - 100G Staircase FEC
  - 80km dark fiber, 300km DWDM amplified
  - C-band tunable
  - PTP class C support
  - CMIS 5.2
- Two different versions
  - C-temp: 5.5W max
  - I-temp: 6W max

High-speed, long reach: How was it done so far ?

Previous

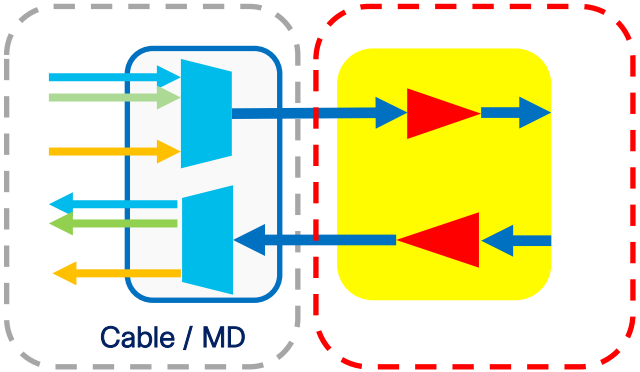


Today



~45% to 70% Less CapEx
95% Less Power
100% Less TXP/MXP Rack Space

Using QDD-OLS for Amplification



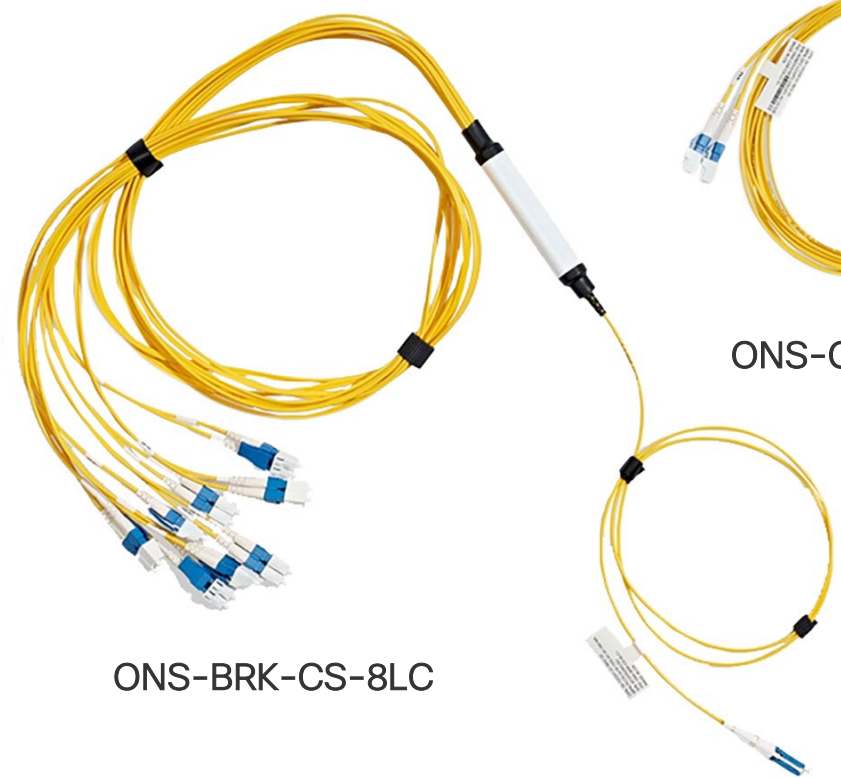
The solution contains:

1. A QDD pluggable w/ 2 amplifiers, one for each direction, ingress (pre) and egress (bst).
2. One of the A/D mechanisms to choose from:
    1. An FLD-4 passive A/D module to handle 4 ch into fiber duct.
    2. A 1x8 cable does the Mux (coupling) and Demux (splitting) of 8 ch into fiber duct.
    3. A 1x16 cable does the Mux (coupling) and Demux (splitting) of 16 ch into fiber duct.
    4. An MD-32 passive M/D to handle 32 Ch's into the fiber duct

Together they form an N-channel Optical Line System (OLS), the QDD-OLS
N = 4 or 8 or 16 or 32 channel solution.

QSFP-DD Open Line System (OLS) Pluggable, 8x optical mux and 1x cable

ONS-QDD-OLS

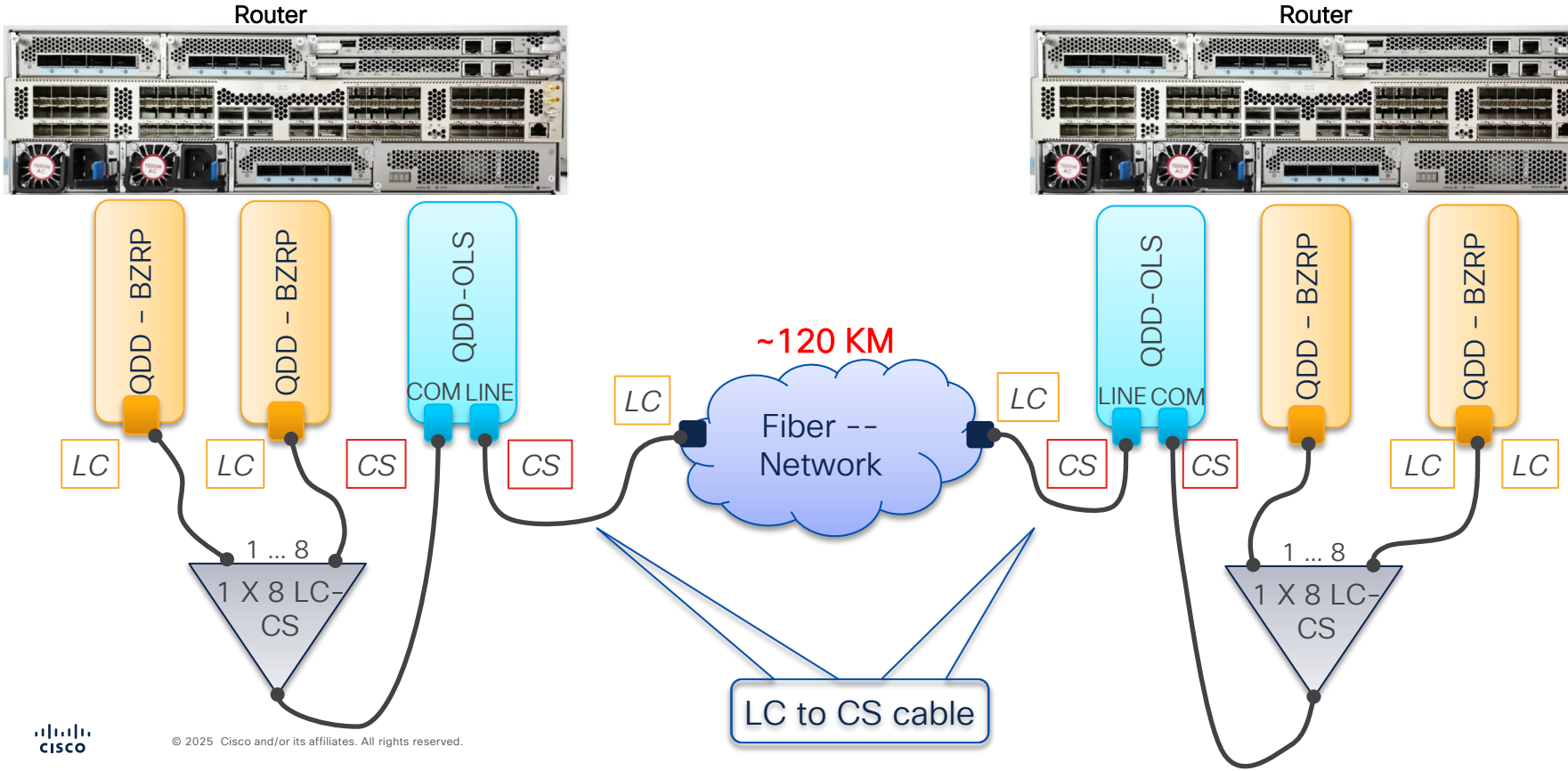


ONS-BRK-CS-8LC

ONS-CAB-CS-LC-5

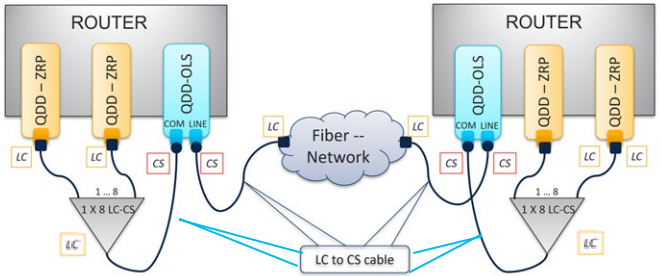
QDD OLS Example

2 x 400G QDD waves

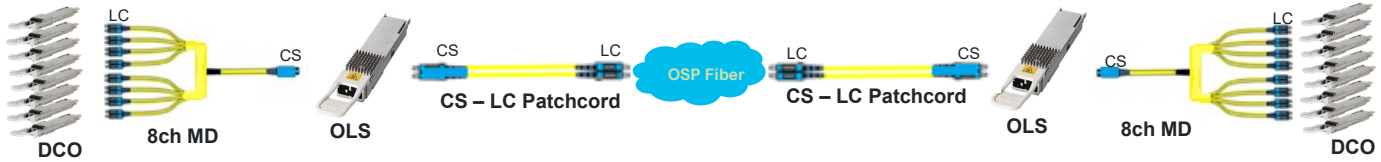


OLS Cable Connectivity

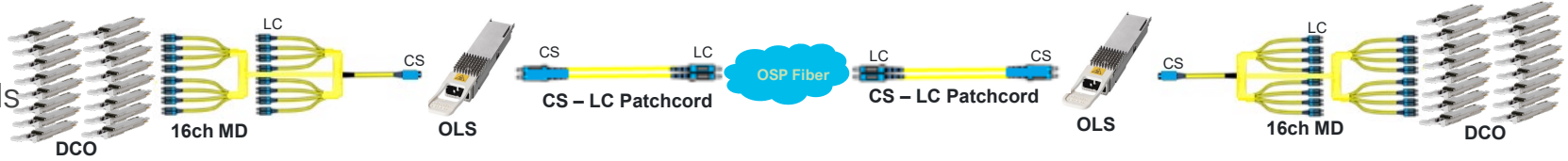
An example: an end-to-end QDD OLS system



8 Channels



16 Channels



Coherent Product Roadmap

Calendar Years
Sample dates

2024 | 2025 | 2026 | 2027 | 2028

MSA Pluggables

Power-optimized

400G(60GB+)
- Lower-power 400ZR/ZR+

800G (120GB+)
- 800ZR/ZR+
- 400G ULH (C&L)

100ZR QSFP28

800G (120GB+)
- 800LR/ZR-
- Encryption/OTN

1.6T (240GB+)
- 1600LR/ZR

1.6T (260GB+)
- 1600ZR+/800G ULH
- Encryption/OTN

ASICs

5nm

Jannu B0 1.2T DCI/Metro/LH

4nm

Delphi 800G LR/ER/ZR/ZR+

2nm

Olympus 1600G LR/ZR

2nm

Olympus 2 1600G ZR+/OTN

2nm

NN 2.4/1.6T DCI/Metro/LH

Multi-haul Modules

Performance-optimized

1.2T (128GB+)

C-band L-band

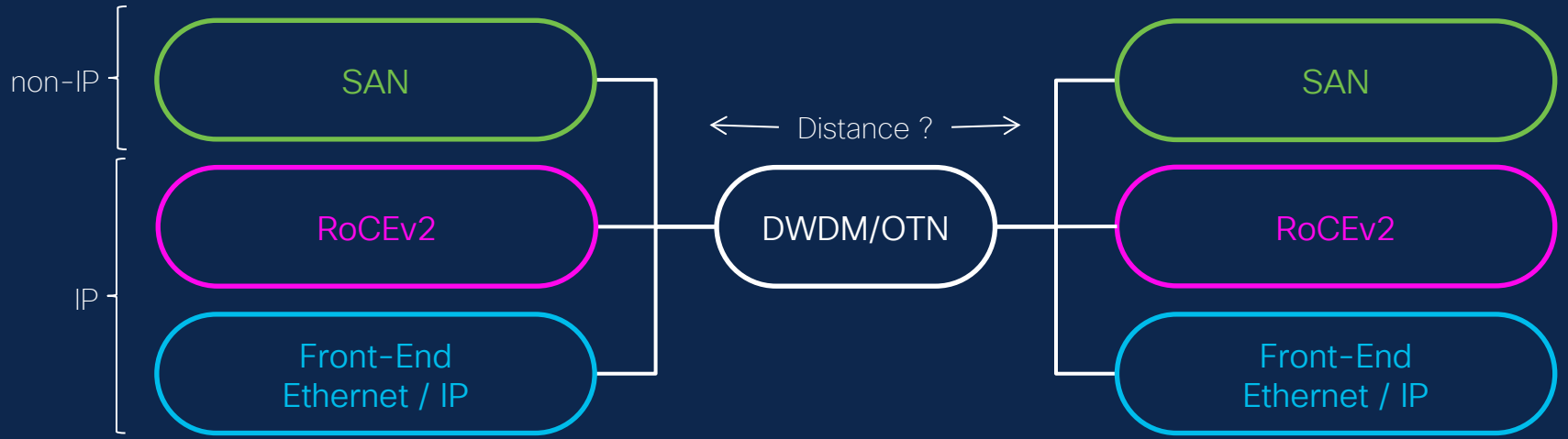
CIM8

2.4T (256GB+)

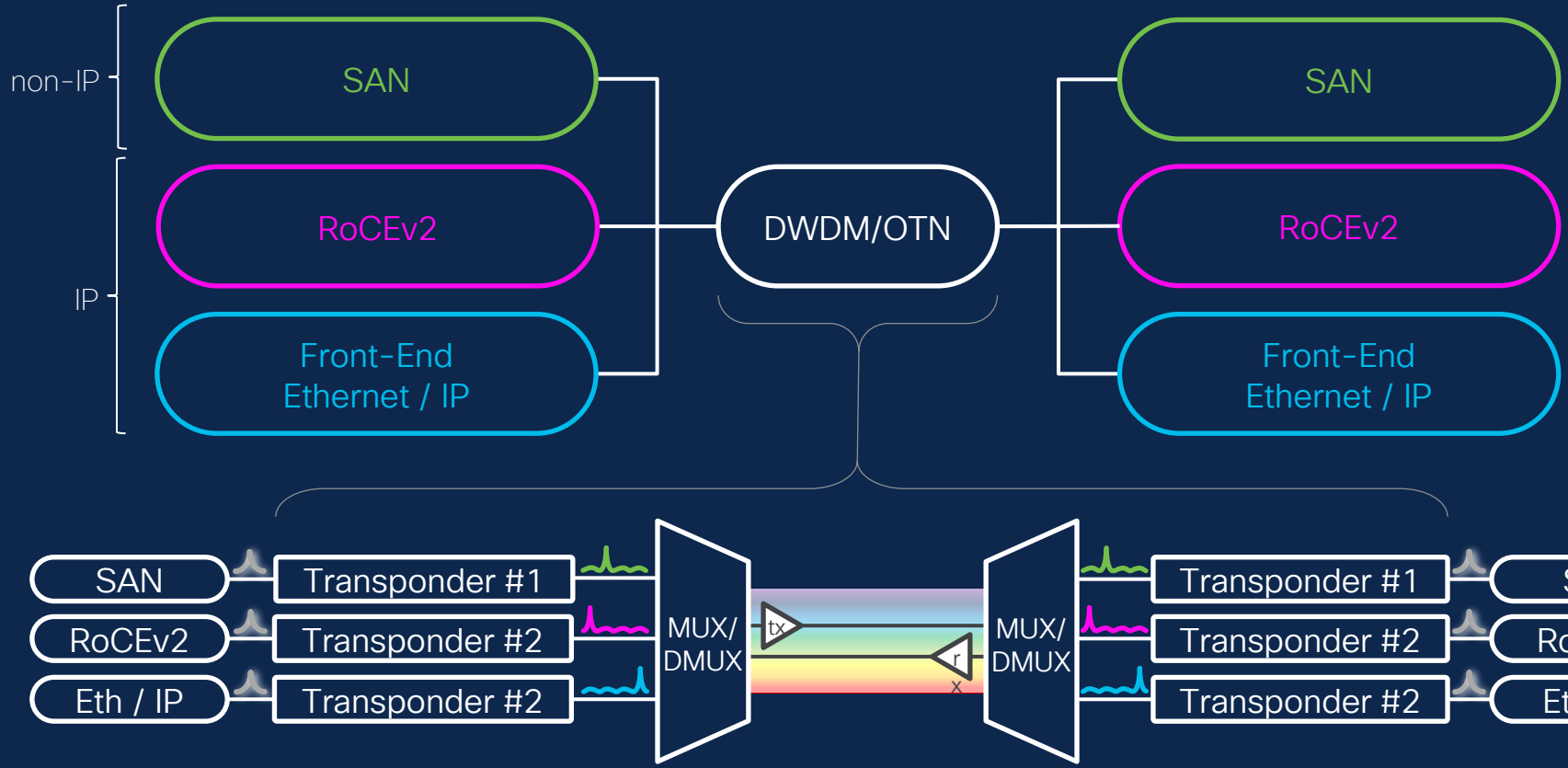
C-band L-band

CIM10

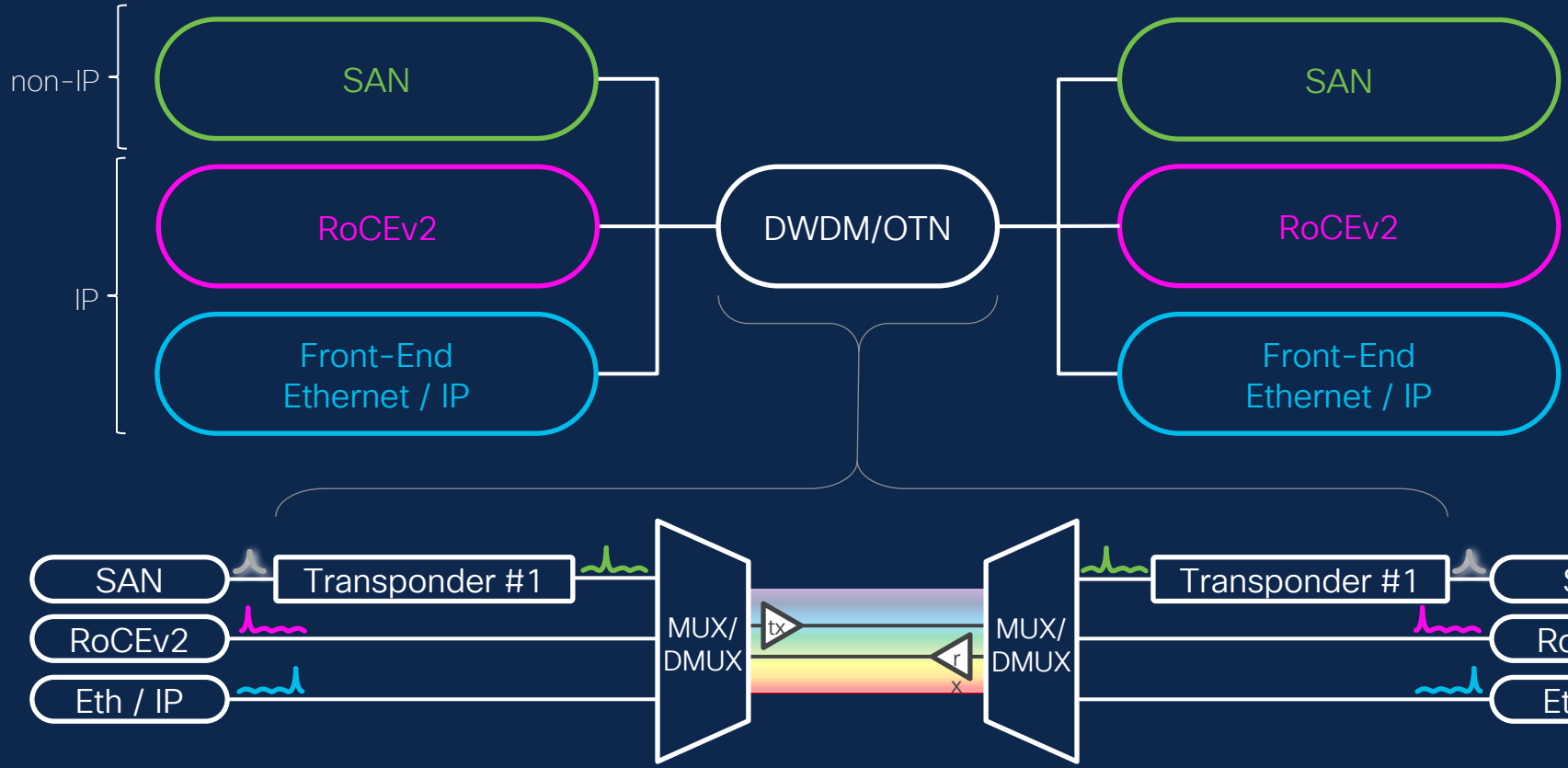
Day-0



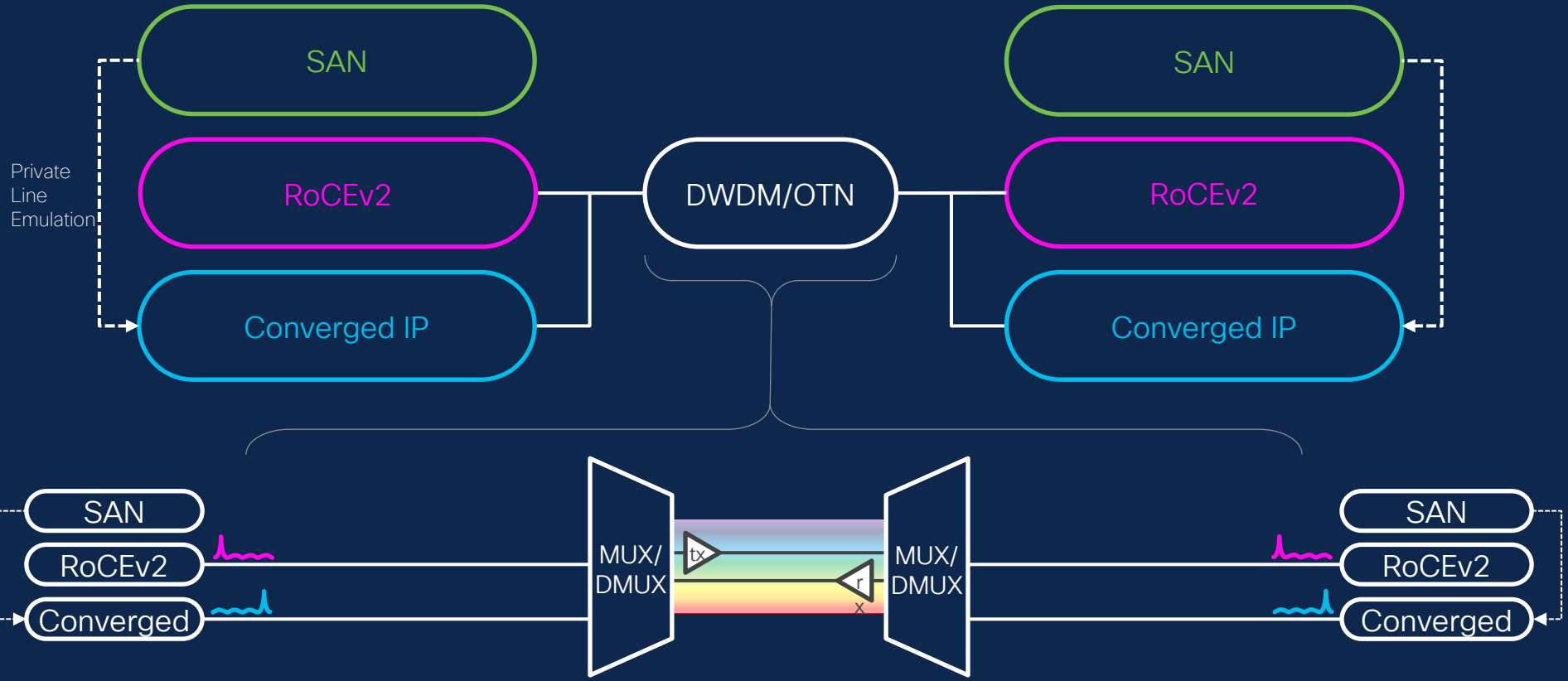
Day-0



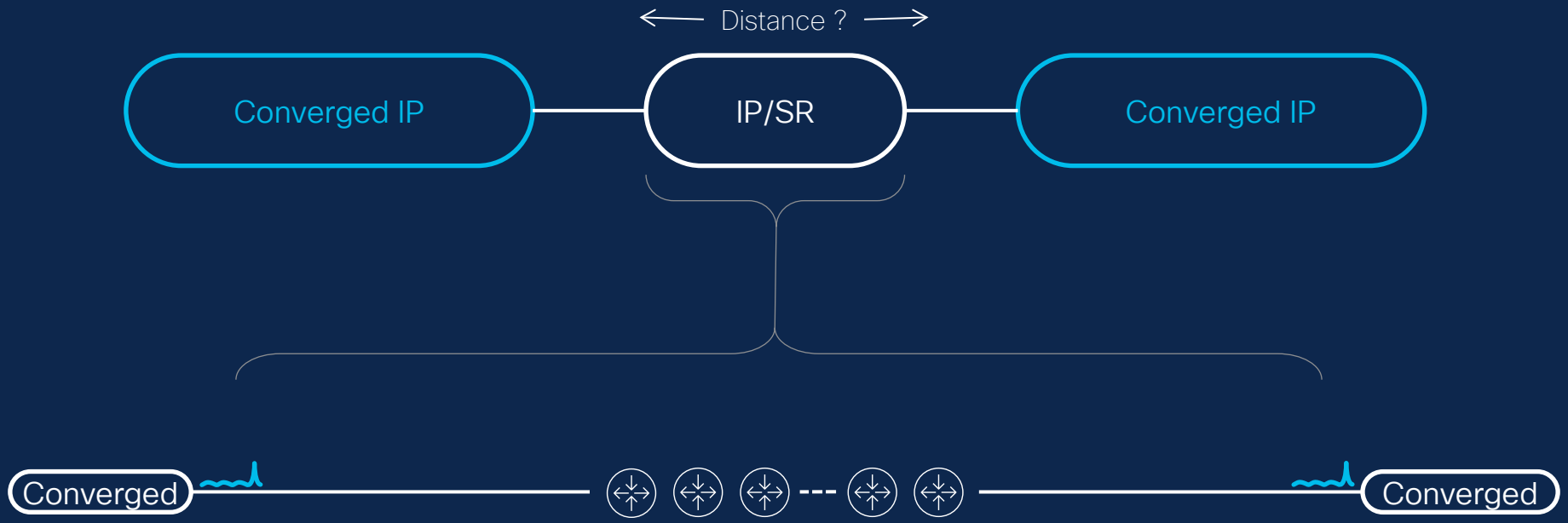
Day-1



Day-2

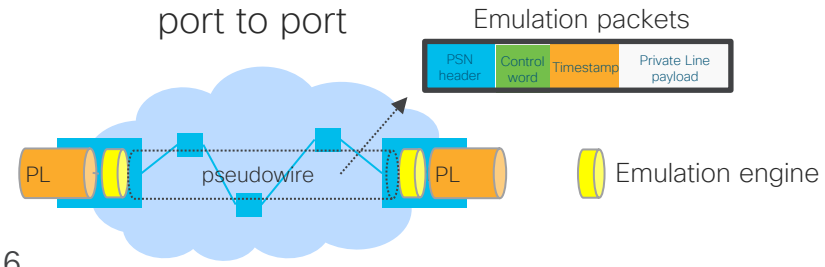


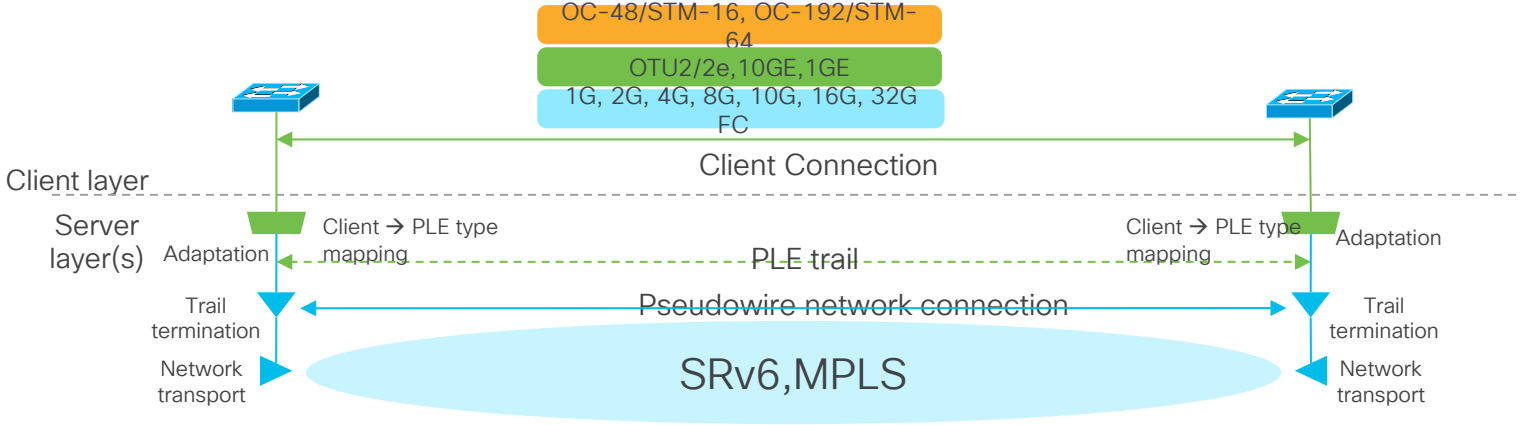
Day-3



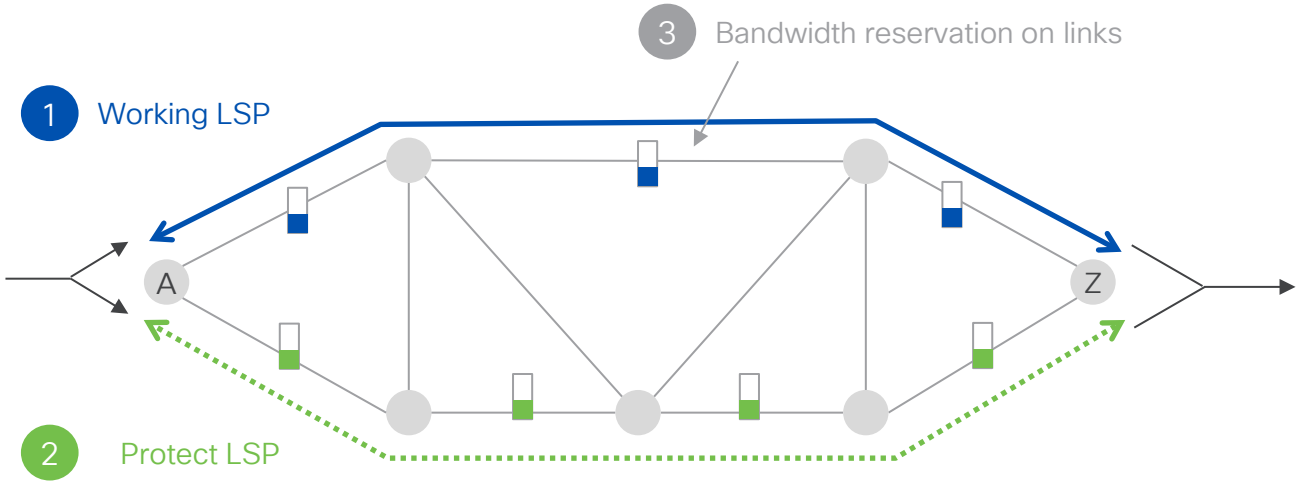
Private Line emulation definition

- Private line service over packet network.
- E2E customer interface transport
- Private line clients:
  - OTU2/2e, OC-48, OC-192, STM-64, STM-16, 10GE, 1GE, FC-1 to FC-32

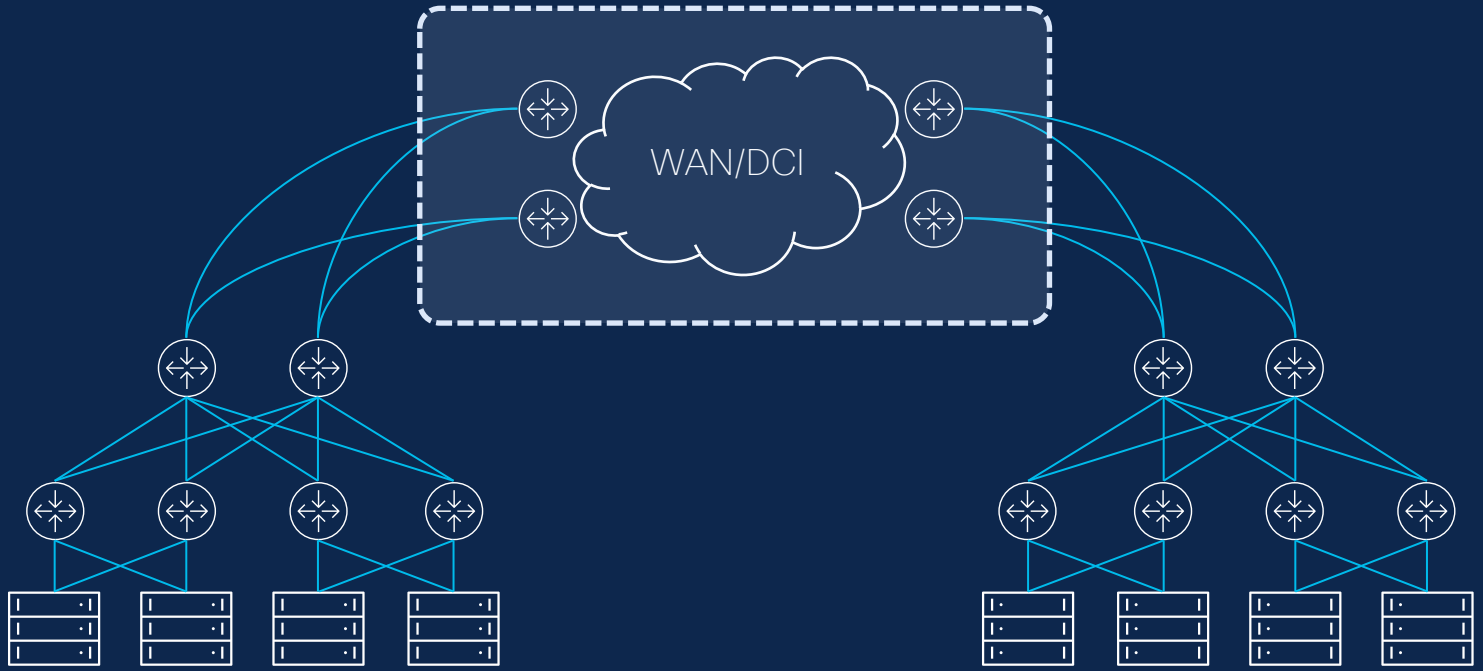




Path protected, co-routed, bi-directional LSPs



Sur les Réseaux WAN Privés



Simplified Networks

Multi-Dimensional Optimization & Convergence with programmable, secure infra. for AI & Telco workloads

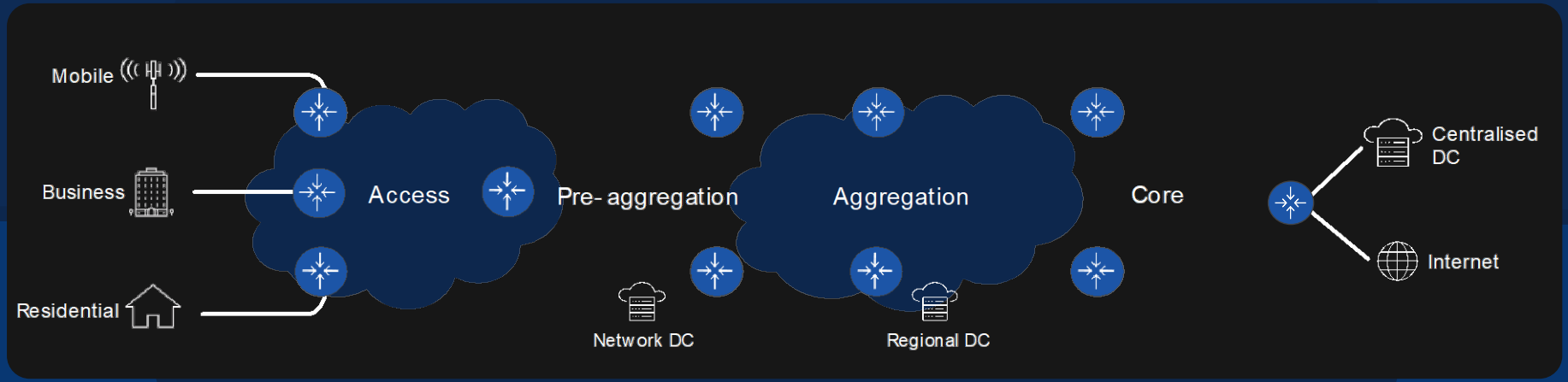
Automation & Autonomics

with Open APIs, using data & AI to deliver zero-touch & self-service operations

Data Intelligence

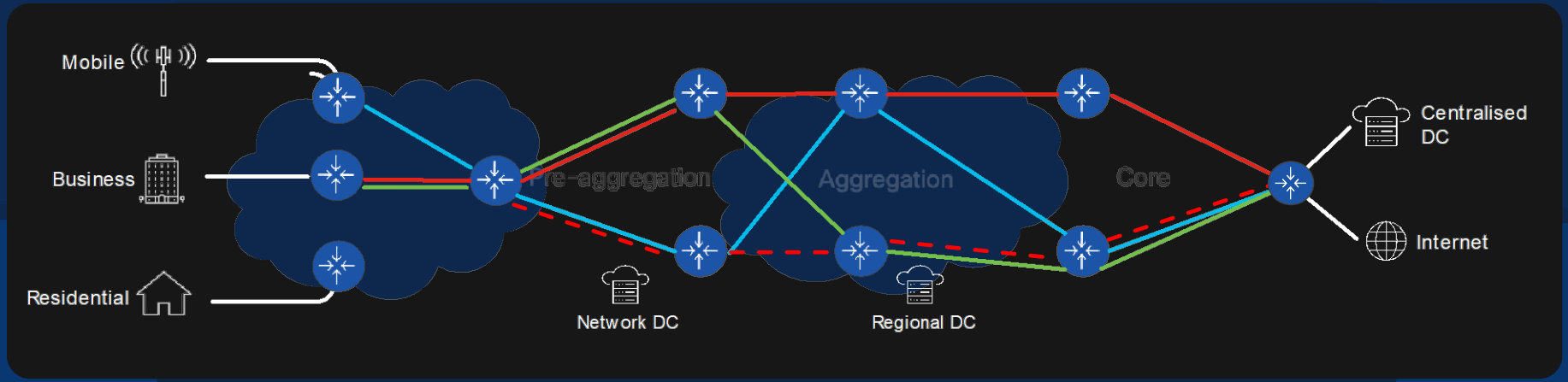
Turn data into intelligent analytics and clear insights

Network Optimization



Single network, seamless policy from user to application/cloud.

Service Convergence



Cisco Segment Routing is the Service Convergence Enabler. “Network Slices” with different characteristic – low latency, disjoint & PLE path, green path.

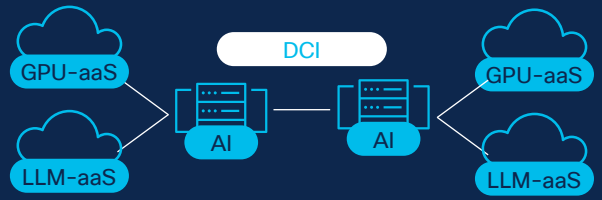
AI Traffic set to **amplify** these requirements.

Evolving AI connectivity requirements

1

DCI expansion

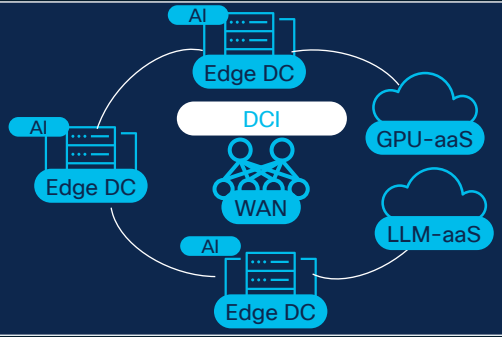
Centralised - focused mostly on AI training



2

Any-to-any DCI

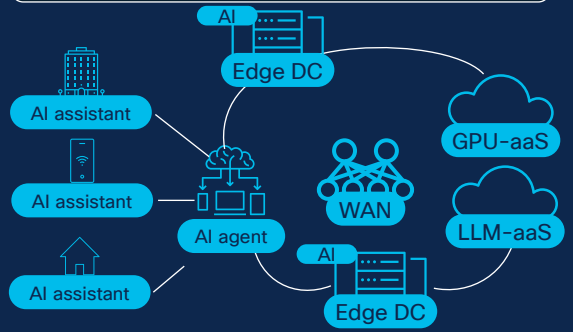
More distributed - with a growing influence of AI inference



3

Intelligent AI connectivity

Distributed and centralised - monetization of AI networking



Requirements

High-bandwidth, high-resiliency connectivity with quantum safe encryption

Higher scale, any-to-any, on-demand, high-performance, and power-efficient connectivity

Assured, SLA-driven, secure, end-to-end connectivity with full visibility and observability

Thank you

cisco Connect

GO BEYOND

#CiscoConnect