Łukasz Łukowski

CSMO I STORDIS GmbH

European Project Lead I OCP

A-Team Ambassador I ONF

CTKTO I route2open

OPEN Compute Project

SOLUTION PROVIDER

How Open Are You?

Revolutionizing Telecoms: The Advent of **400G OpenZR+** in **Open Networking** Platforms

What do minds have in common with parachutes?

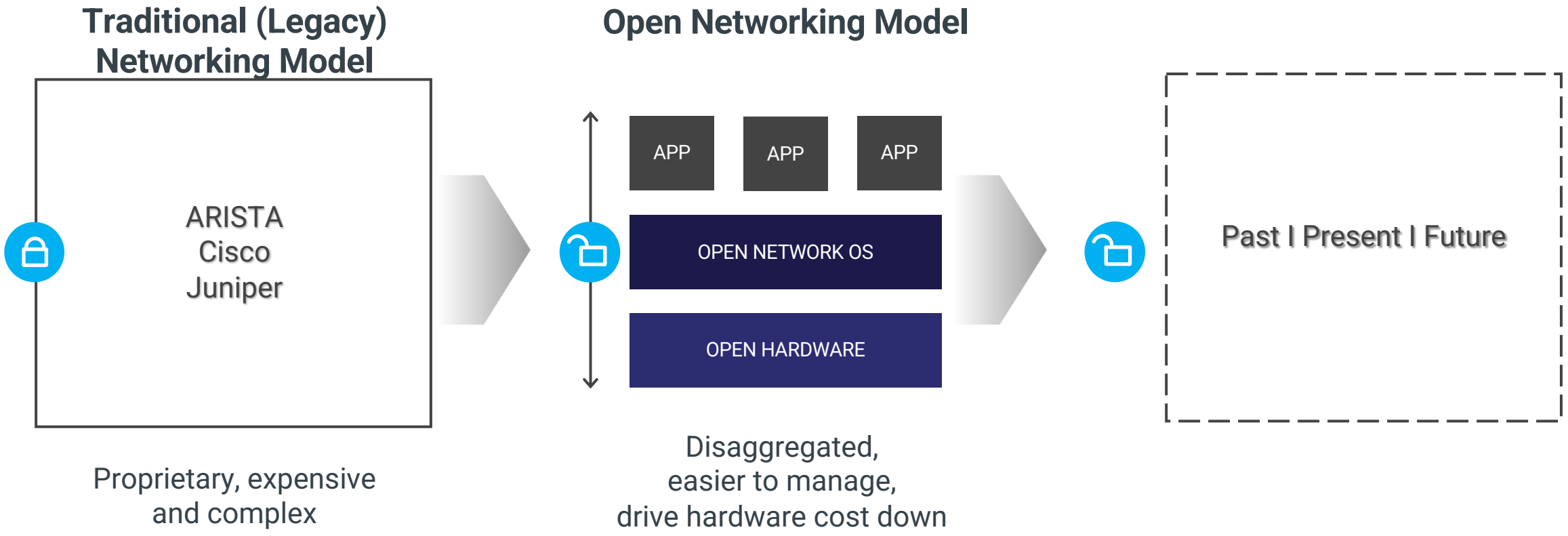
*…they work better when they are **Open ;-)***

STORDIS

The Open Networking Expert

Network Disaggregation is Key

STORDIS
The Open Networking Expert



Open Networking History: The Rise of ONIE

STORDIS
The Open Networking Expert

The Ascendance of Open Network Infrastructure

2012: **Introduction:** ONIE is introduced by Cumulus Networks, marking the beginning of a new era in open networking

2013: **Collaboration Begins:** ONIE starts collaborating with hardware vendors
Public Demonstration: The **first public demo** of ONIE takes place at the OCP MIT Workshop
OCP Incubation: The Open Compute Project (OCP) begins incubation of ONIE, recognizing its potential and importance

2014: **OCP Adoption:** ONIE is fully adopted by the Open Compute Project, solidifying its place in the open networking ecosystem

2015: **Broadening Horizons:** ONIE is now supported on over **40 hardware platforms** by more than **12 vendors**, showcasing its versatility and widespread acceptance

Present: **Massive Growth:** ONIE supports a staggering **500+ hardware platforms across 20+ vendors**, a testament to its success and pivotal role in Open Networking

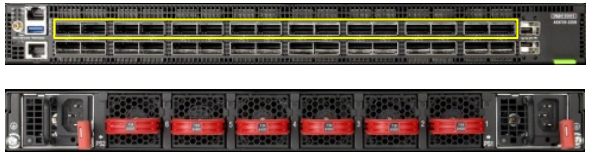
OPEN ACCEPTED™
OPEN INSPIRED™

Pioneering 400G: Open Networking Switches with OpenZR+ Support

STORDIS
The Open Networking Expert

Edge-corE NETWORKS

Trident 4 X11



DCS240 I AS9726-32DB
32x400G QSFP-DD
16xZR+ Support

Tomahawk4 OPEN ACCEPTED

DCS500 I AS7816-64X
64x400G QSFP-DD
16xZR+ Support

NEW

Tomahawk 5

DCS560 I AS9817-64D / -64O
64x800G QSFP-DD800 / OSFP800
with ZR+ Support!

400G

Low Latency

24W Max ZR/ZR+

AI ML

L4 Load Balancing

Empowered by: ipinfusion

Next-Gen Connectivity: Access & Aggregation Routers Leveraging 400G OpenZR+

STORDIS
The Open Networking Expert

Edge-corE NETWORKS

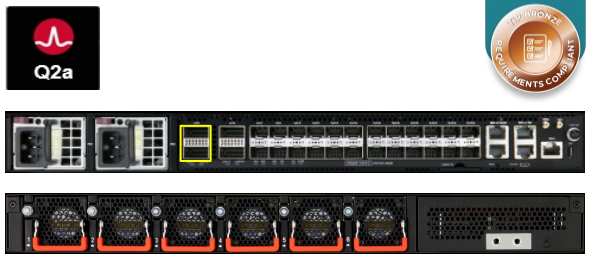
OcNOS IP Infusion: Supports over 50+ hardware platforms spanning 7 diverse vendors!

Carrier Grade Reliability

Low Latency

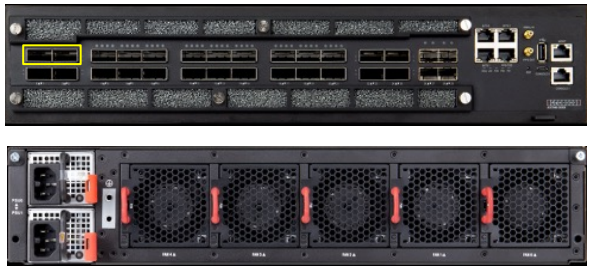
24W Max ZR/ZR+

Q2a



CSR440 I AS7535-28XB
24x25G SFP28, 2x100G QSFP28,
2x400G QSDP-DD with ZR+ Support

Q2c



AGR400 I AS7946-30XB
22x100G QSFP28, 4x25G SFP28,
4x400G QSDP-DD
2xZR+ Support

Empowered by: ipinfusion

Edgecore's OcNOS with OpenZR+

STORDIS
The Open Networking Expert

- **No Need for Traditional Transponders**: Direct embedding in switches and routers for streamlined operations.
- **Extended Reach with Amplifiers**: Achieve distances up to 2,000 km with the use of amplifiers.
- **Efficient Power Consumption**: Optimized for performance without compromising energy use.
- **Standards-Driven:** Comprehensive support for CMIS 5.1, ensuring compatibility and flexibility.
- **Advanced Configurations:** Application code-based configurations ranging from payload rates, FEC, modulation, and more.
- **In-depth Monitoring:** Detailed diagnostics from module temperature, SNR, Tx/Rx Optical Power, to laser specifications.

Empowered by: ipinfusion™

Edgecore's OcNOS with OpenZR+

STORDIS
The Open Networking Expert

```
WU10-24#show qsfp-dd 0 advertisement laser


Port Number                      : 0
Supported Grids                  : 6.25 GHz, 12.5 GHz, 25 GHz, 50 GHz, 100 GHz, 75 GHz
   6.25 GHz Channels             : Low=191.300 THz, High=196.100 THz, Total=768
   12.5 GHz Channels             : Low=191.300 THz, High=196.100 THz, Total=384
   25 GHz Channels               : Low=191.300 THz, High=196.100 THz, Total=192
   50 GHz Channels               : Low=191.300 THz, High=196.100 THz, Total=96
   100 GHz Channels              : Low=191.300 THz, High=196.100 THz, Total=48
   75 GHz Channels               : Low=191.300 THz, High=196.100 THz, Total=64
Fine Tuning Support              : Yes
   Fine Tuning Resolution        : 0.100 GHz
   Fine Tuning Low Offset        : -6.250 GHz
   Fine Tuning High Offset       : 6.250 GHz
Output Power Programmable Per Lane : Yes
   Min Output Power Programmable : -6.00 dBm
   Max Output Power Programmable : 1.00 dBm
```

```
WU10-24#show qsfp-dd 0 advertisement applications


Port Number                      : 0
> Application 1:
    | Host |
        Interface                : 400GAUI-8 C2M
        Application BR           : 425.00
        Lane Count               : 8
        Lane Sig BR              : 26.5625
        Modulation Format        : PAM4
        Bits Per Unit Intvl      : 2.000000
        Lane Assigned            : Lane-1
    | Media |
        Interface                : ZR400-OFEC-16QAM
        Application BR           : 481.108374
        Lane Count               : 1
        Lane Sig BR              : 60.1385468
        Modulation Format        : DP-16QAM
        Bits Per Unit Intvl      : 8.000000
        Lane Assigned            : Lane-1
```

Empowered by: ipinfusion™

400G ZR+ Distance Comparisons

(Unamplified vs Amplified)

Vendor	Launch Power	Rx Sensitivity (400G)	Optical Budget	Unamplified Distances		Amplified Distances	
				Standard Fiber (0.5dB/km)	Low-Loss Fiber (0.25dB/km)	Standard Fiber (0.5dB/km)	Low-Loss Fiber (0.25dB/km)
Vendor A	-9dBm	-21dBm	12dB	24 Kms	48 Kms	112 Kms	224 Kms
Vendor B	-9dBm	-19dBm	10dB	20 Kms	40 Kms	108 Kms	216 Kms
Vendor C	0dBm Bright	-21dBm	21dB	42 Kms	84 Kms	130 Kms	260 Kms
Vendor D	-6dBm	-12dBm	6dB	12 Kms	24 Kms	100 Kms	200 Kms
Vendor E	>0dBm Bright	-23dBm	24dB	48 Kms	96 Kms	136 Kms	272 Kms

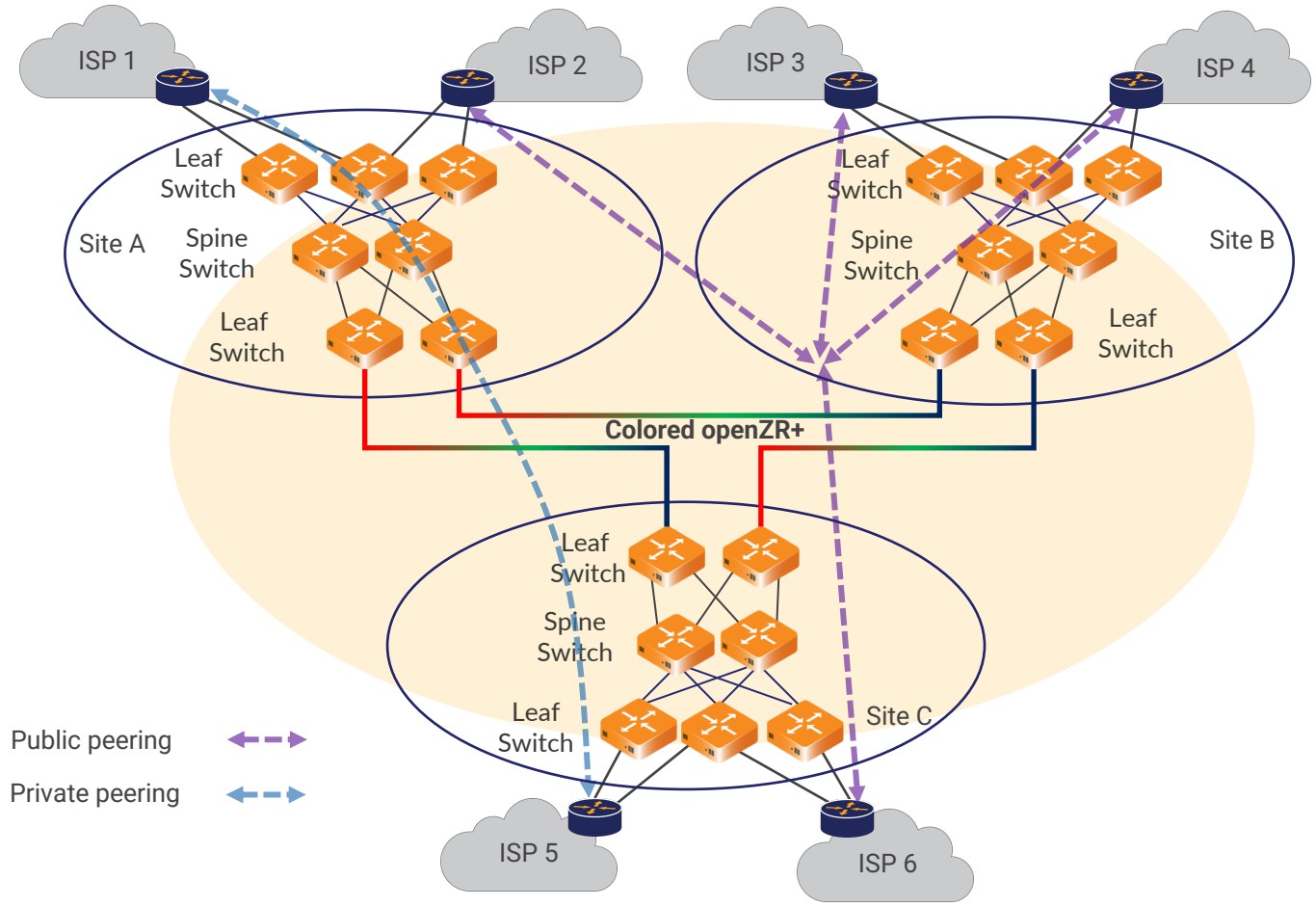
Legend:

- ***Unamplified Distances***: *Distances achievable without the use of amplifiers.*
- ***Amplified Distances***: *Distances achievable with the use of amplifiers providing a gain of 22dB on both sites (A and B).*
- *Fiber loss values for standard and low-loss fibers are given as 0.5 dB/km and 0.25 dB/km, respectively.*
- *Real-world performance might vary based on various factors.*

IXP in a Metro with 400G OpenZR+

OcNOS Data Center EVPN VxLAN fabric

STORDIS
The Open Networking Expert



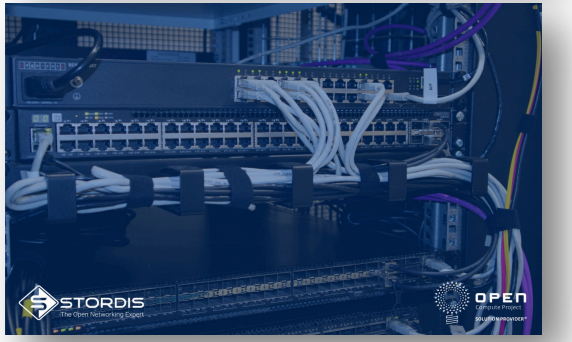
Are You Ready to Open Up?

Engage, Educate, and Elevate with STORDIS

- **Discover at OCP Experience Centers:** Located in Stuttgart, Germany and Leszno, Poland. Advanced labs showcasing 1G to 400G solutions. Test environments for vSONiC, NOS variants, and P4 switches. Witness the evolution of open networking.
- **ScaleUp OCP Experience Center:** Situated in Berlin, Germany. Features the latest OCP servers, Open Racks, Power Solutions, and **Open Networking Hardware from Edgecore Networks**. Real-world data center for hardware testing and POC executions. Workshops, tours, and remote testing available. Conference room with video conferencing for 12 attendees.

OCP
Experience Center
Berlin, DE

- www.**route2open.com Academy** Explore our free courses and enrich your understanding. Also available on the **OCP Marketplace**



Are You Ready to Open Up?

Engage, Educate, and Elevate with STORDIS

- **Open Networking Mobile Lab:** A self-contained demo of a fully disaggregated ethernet fabric. Open "leaf and spine" architecture. Perfect for Datacenter, IXP, ISP, or Enterprise services. Contains Edgecore Networks OCP Accepted™ switches. Optimal for testing and POCs.
  - https://www.opencompute.org/telecom-edge/19/open-networking-mobile-lab

Are You Ready to Open Up?

Passion, Innovation, Trust and Loyalty

STORDIS
The Open Networking Expert

Disaggregated Open Network Expert

We are the Solutions Provider and Knowledge Source for Open Networking Technologies in Europe

Technical Expertise

Switching, Routing, Monitoring, Development, Linux

Innovation and Service

Consulting on Architecture Design, Solution Design, Deployment and Installation, Quality Assurance and Maintenance

route2open Training Services

Innovative Technologies require innovate ways of Training. We developed a Web Training platform to provide Knowledge.

Support and Helpdesk

We want to make sure the best level of Resilience is met and provide 24x7 Support and Helpdesk Services to our Customers

Long Term Partnership

Partnership is the Key to success. We do our business based on trust, loyalty and the commitment to deliver innovations

STORDIS
The Open Networking Expert

OPEN Compute Project
SOLUTION PROVIDER®

route2open

The Open Networking Expert, A Trusted Team,
Passionate to Deliver Innovation

*"**Freedom** is nothing else but a chance to be better"*
Albert Camus

*"Your journey to **openness** has just begun. Let's explore Together"*
Lukasz Lukowski

www.stordis.com I www.route2open.com