ipinfusion OcNOS

SOLUTION BRIEF
OcNOS SP & DC

Converging Optical and IP: 400G ZR/ZR+ with OcNOS

IP Infusion Routers and Switches for Coherent IPoDWDM Transport

Why Choose IP Infusion for 400G IPoDWDM?

No External Transponders
Deploy 400G transport directly from routers and switches—no need for standalone optical gear.

Maximize Transport Reach
Enable metro, regional, and long-haul connectivity up to ~2,000 km using ZR/ZR+ optics.

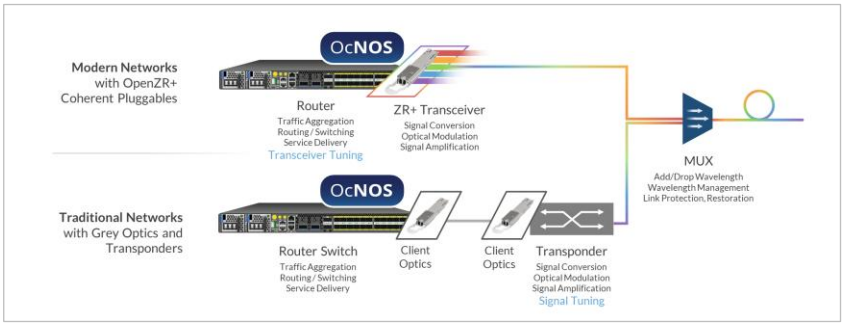
Integrated Optics Management
Monitor and tune ZR/ZR+ transceivers through OcNOS using CMIS, OpenConfig, and Streaming Telemetry.

Simplified Licensing
Perpetual, all-inclusive OcNOS licensing—no add-on or subscription fees.

Carrier-Grade Routing & Switching Stack
Access one of the industry's most mature and feature-rich NOS platforms.

No Vendor Lock-in
Choose from a wide range of qualified ZR/ZR+ optics and whitebox hardware. Mix and match to meet your cost, density, and operational requirements.

400G ZR and ZR+ coherent pluggable optics are redefining transport network design by eliminating the need for external transponders. With OcNOS, network operating system, IP Infusion enables seamless integration of these optics into whitebox routers and switches, delivering significant **savings in power, space, and cost**—all while enhancing operational simplicity and scalability.



Modern networks with Open ZR/ZR+ Pluggables vs traditional networks with optical transponders

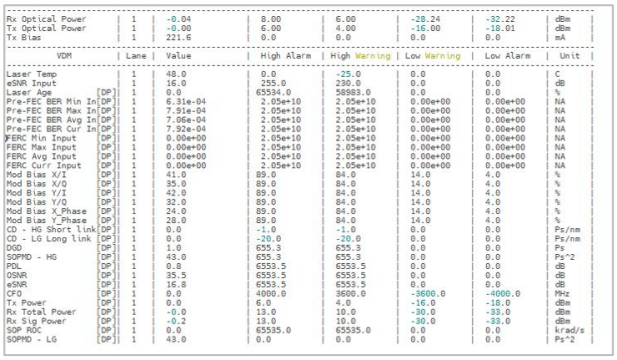
End-to-End Coherent Optics Management

Open ZR and ZR+ has reduced the need for using optical transponders on distances under 2,000 kilometers. However, transponders carried several key features that are now transferred to ZR/ZR+ coherent pluggables (signal conversion, optical modulation, signal amplification), and host routers and switches (transceiver tuning).

OcNOS provides full support for 400G ZR and ZR+ pluggable optics, including:

- **Tuning and Monitoring** via **CMIS** and **OpenConfig**
- Laser & frequency grid tuning
- O/P Power
- Modulation & FEC (Via Applications)
- Monitoring
- Alarms
- Diagnostics (Loopback & PRBS)
- User Thresholds

Thanks to OpenConfig and data models added to recent OcNOS 6.6 release, Open ZR and ZR+ transceiver monitoring and tuning has become a simple and intuitive process.



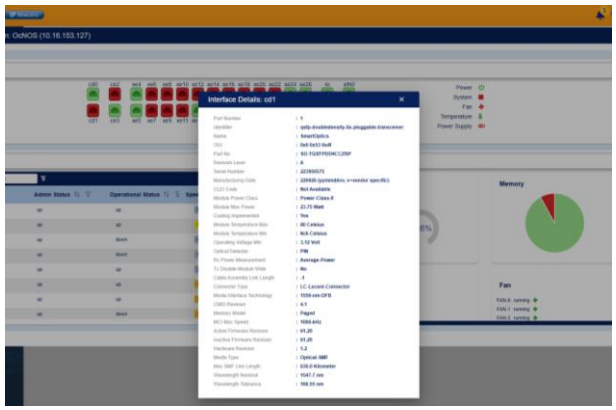
Rx Optical Power	1	-0.04	8.00	6.00	-28.24	-32.22	dBm
Tx Optical Power	1	-0.00	6.00	4.00	-16.00	-18.01	dBm
Tx Bias	1	221.6	0.0	0.0	0.0	0.0	mA

VDM	Lane	Value	High Alarm	High Warning	Low Warning	Low Alarm	Unit
Laser Temp	1	48.0	0.0	-25.0	0.0	0.0	C
eSNR Input	1	16.0	255.0	230.0	0.0	0.0	dB
Laser Age [DP]	1	0.0	65534.0	58983.0	0.0	0.0	%
Pre-FEC BER Min In [DP]	1	6.31e-04	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
Pre-FEC BER Max In [DP]	1	7.91e-04	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
Pre-FEC BER Avg In [DP]	1	7.06e-04	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
Pre-FEC BER Cur In [DP]	1	7.92e-04	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
FERC Min Input [DP]	1	0.00e+00	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
FERC Max Input [DP]	1	0.00e+00	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
FERC Avg Input [DP]	1	0.00e+00	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
FERC Curr Input [DP]	1	0.00e+00	2.05e+10	2.05e+10	0.00e+00	0.00e+00	NA
Mod Bias X/I [DP]	1	41.0	89.0	84.0	14.0	4.0	%
Mod Bias X/Q [DP]	1	35.0	89.0	84.0	14.0	4.0	%
Mod Bias Y/I [DP]	1	42.0	89.0	84.0	14.0	4.0	%
Mod Bias Y/Q [DP]	1	32.0	89.0	84.0	14.0	4.0	%
Mod Bias X_Phase [DP]	1	24.0	89.0	84.0	14.0	4.0	%
Mod Bias Y_Phase [DP]	1	28.0	89.0	84.0	14.0	4.0	%
CD - HG Short link [DP]	1	0.0	-1.0	-1.0	0.0	0.0	Ps/nm
CD - LG Long link [DP]	1	0.0	-20.0	-20.0	0.0	0.0	Ps/nm
DGD [DP]	1	1.0	655.3	655.3	0.0	0.0	Ps
SOPMD - HG [DP]	1	43.0	655.3	655.3	0.0	0.0	Ps^2
PDL [DP]	1	0.8	6553.5	6553.5	0.0	0.0	dB
OSNR [DP]	1	35.5	6553.5	6553.5	0.0	0.0	dB
eSNR [DP]	1	16.8	6553.5	6553.5	0.0	0.0	dB
CFO [DP]	1	0.0	4000.0	3600.0	-3600.0	-4000.0	MHz
Tx Power [DP]	1	0.0	6.0	4.0	-16.0	-18.0	dBm
Rx Total Power [DP]	1	-0.0	13.0	10.0	-30.0	-33.0	dBm
Rx Sig Power [DP]	1	-0.2	13.0	10.0	-30.0	-33.0	dBm
SOP ROC [DP]	1	0.0	65535.0	65535.0	0.0	0.0	krad/s
SOPMD - LG [DP]	1	43.0	0.0	0.0	0.0	0.0	Ps^2

Monitoring of Open ZR/ZR+ transceivers with OcNOS

Centralized Management for ZR/ZR+ Transceivers with IP Infusion EMS, IP Maestro

IP Infusion offers an innovative element management system (EMS), IP Maestro, for network monitoring and management. Based on OpenConfig and Netconf, IP Maestro brings the power of centralized management to the user via a web-based graphical user interface, and allows real-time monitoring of the ZR and ZR+ transceiver status.



400G QSFP-DD OpenZR+ transceiver management with IP Infusion IP Maestro

Qualified Open ZR/ZR+ Optics

OcNOS can offer native support for 12 Open ZR/ZR+ coherent transceivers, providing a true freedom in ZR/ZR+ optics selection. All optics are validated for CMIS and OpenConfig compatibility and support tuning and telemetry.

VENDOR	SKU	TYPE	FORM FACTOR	INTERFACE (G)	REACH
Fujitsu	IPI-FU-FIM38900/130	ZR	QSFP-DD	400	120km
Fujitsu	IPI-FU-FIM38950/130	ZR+	QSFP-DD	400	1000km
Ciena	IPI-CI-176-3530-901	ZR	QSFP-DD	400	120km
SmartOptics	IPI-SO-TQSFP-DD-4CCZRP	ZR+	QSFP-DD	400	480km
SmartOptics	IPI-SO-TQD013-TUNC-SO*	ZR+	QSFP-DD	400	480km
Hisense Broadband	IPI-HBLCQ638BS-PC+	ZR+	QSFP-DD	400	480km
Ciena	IPI-CI-176-3580-900	ZR+	QSFP-DD	400	480km
Coherent Corp	IPI-CO-FTCD3323R1PCL*	ZR+	QSFP-DD	400	480km
NEC	IPI-NE-OD-QD337SCLS00N	ZR+	QSFP-DD	400	600km
Ciena	IPI-CI-176-3360-900*	ZR+	QSFP-DD	400	1000km
Ciena	IPI-CI-176-3370-900*	ZR+	QSFP-DD	400	1800km
Ciena	IPI-CI-176-3590-900	ZR+	QSFP-DD	400	900km

* High Tx Power Output Transceiver

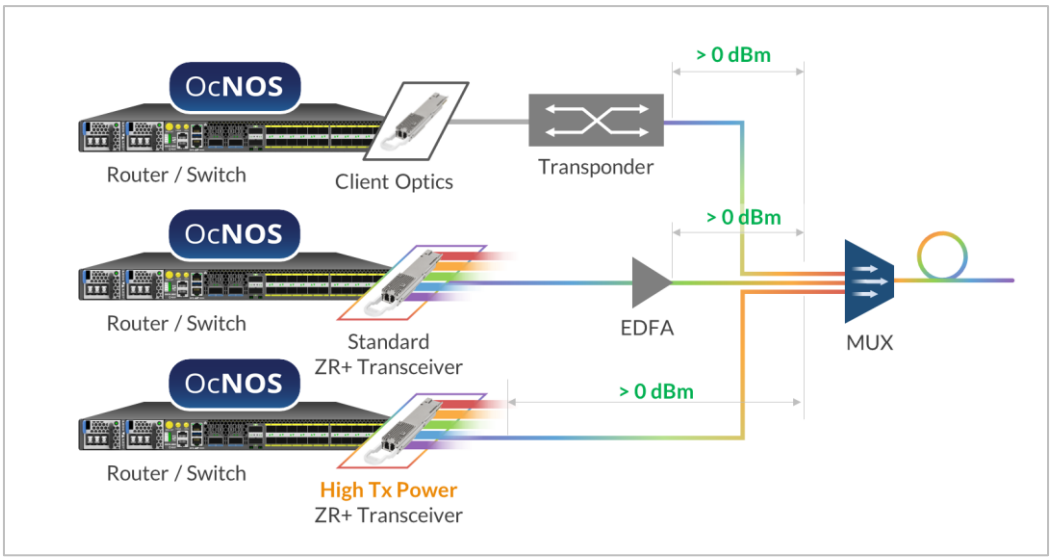
400G QSFP-DD Open ZR/ZR+ transceivers qualified with OcNOS

Low vs. High-Power ZR+ Transceivers

As you could notice in the table above, 400G ZR+ transceivers come in low and high-power variants. Low-power 400G ZR/ZR+ optics are typically suited for unamplified links up to 30 km. With optical amplification,

low-power ZR+ modules can support distances up to 900 km.

For longer spans or more complex optical paths, such as links exceeding 30 km, or networks with multiple ROADMs or higher insertion loss, high-power ZR+ optics are a better fit. These modules support up to 80 km without amplification and can reach nearly 2,000 km with amplification, providing greater link margin and reducing the need for intermediate amplifiers.



Difference between client optics, low and high-power ZR+ transceivers

Qualified Whitebox Ecosystem

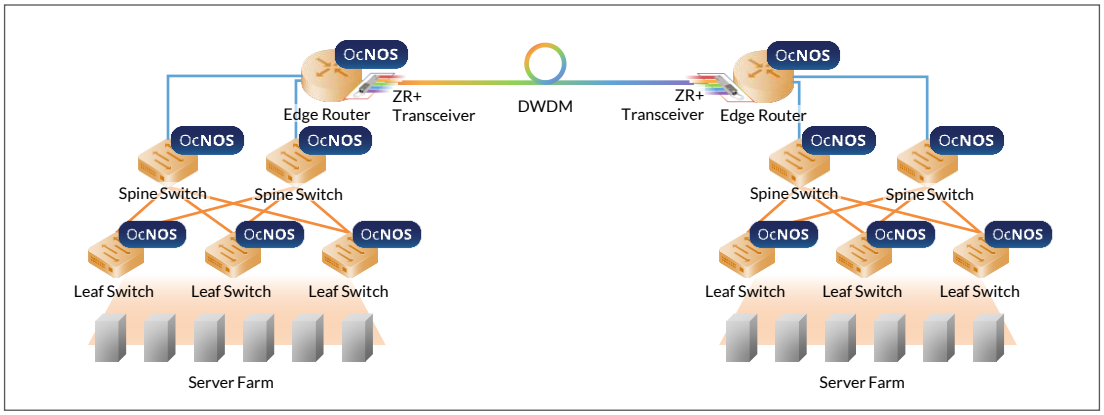
OcNOS supports a wide range of whitebox routers and switches with 400G ports capable of housing ZR/ZR+ optics.

P/N	Max ZR+ Ports	OcNOS SKU	25GE SFP28	100GE QSFP28	100GE QSFP-DD	400GE QSFP-DD	Capacity	Chipset	Form Factor	Type
S9510-28DC	2	SP-PLUS	24	2		2	800 Gbps	Q2A	1RU	Open Router/ L3 Switch
AS7535-28XB	2	SP-PLUS	24	2		2	800 Gbps	Q2A	1RU	
AS7946-30XB	2	SP-PLUS	4	8	4	4	2.4 Tbps	Q2C	2RU	
S9600-28DX	4	SP-PLUS	4	24		4	2.4 Tbps	Q2C	2RU	
S9600-56DX	8	SP-PLUS	4	48		8	4.8 Tbps	Dual Q2C	2RU	
S9610-36D	24	SP-PLUS				36	14.4 Tbps	J2C+	2RU	
S9300-32D	8	DC-PLUS				32	12.8 Tbps	TD4	1RU	Open DC Switch
AS9726-32DB	16	DC-PLUS				32	12.8 Tbps	TD4	1RU	
AS9736-64D	16	DC-PLUS				64	25.6 Tbps	TH4	2RU	

400G QSFP-DD OpenZR+ compatible OcNOS switches and routers

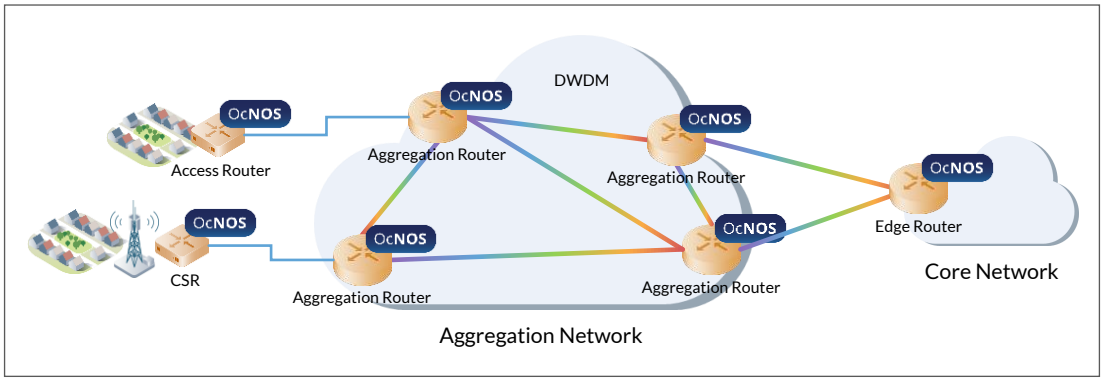
Use Cases for IPoDWDM with OcNOS

- **Data Center and AI Cluster Interconnect.** IP Infusion enables flexible DCI architectures using either data center switches or carrier-grade routers, depending on the required feature set. For environments where basic switching and Layer 3 functionality are sufficient, 400G Open ZR/ZR+ transceivers can be directly deployed in OcNOS data center switches. For more advanced use cases—such as MPLS or advanced traffic engineering—ZR/ZR+ optics can be integrated into OcNOS routers, providing robust scalability and control.



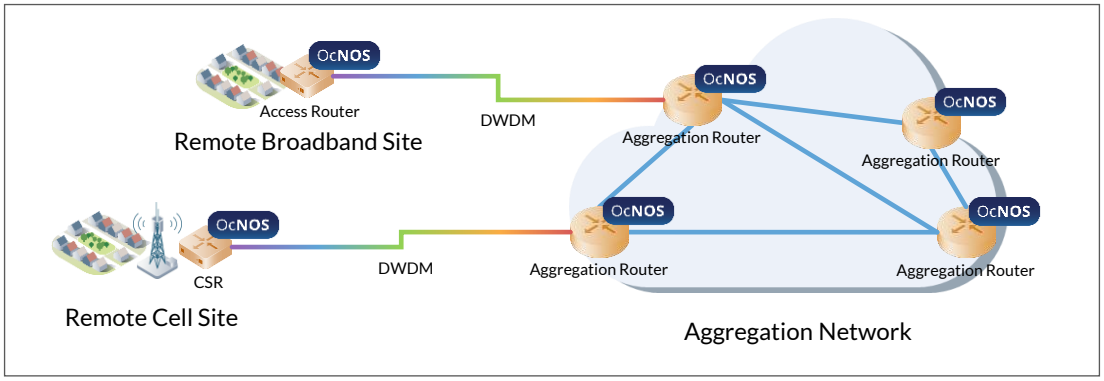
Data Center and AI Cluster Interconnect with Open ZR/ZR+

- **Aggregation Over Long-Reach Fiber** is a well-suited application for 400G Open ZR/ZR+ optics. In this scenario, router-to-router distances typically span between 20 to 300 kilometers, distances where coherent pluggable transceivers provide a more efficient and cost-effective solution compared to traditional optical transponders, offering reduced power consumption, lower complexity, and streamlined operations.



Aggregation Over Long-Reach Fiber with Open ZR/ZR+

- **Backhaul Over Long-Reach Fiber**. For mobile, broadband, or edge infrastructure, long-reach backhaul is essential to connect remote sites to core networks. IP Infusion supports efficient backhaul designs using 400G Open ZR/ZR+ optics integrated directly into whitebox routers running OcNOS. This eliminates the need for standalone optical transport systems by enabling coherent transmission over distances of 100 to 1,000+ kilometers—depending on optical budget and amplification. Combined with advanced routing features like Segment Routing, EVPN, and QoS in OcNOS, this solution delivers a high-performance, scalable, and cost-efficient alternative to traditional transport equipment.



Backhaul Over Long-Reach Fiber with Open ZR/ZR+

Summary

IP Infusion's IPoDWDM solution with 400G Open ZR/ZR+ optics brings together the best of optical and packet networking—without the complexity or cost of traditional transport systems. By integrating coherent optics into OcNOS-powered white box routers and switches, operators can scale transport capacity, reduce equipment footprint, and simplify network operations.

With support for both standard and high-power ZR+ transceivers, a broad ecosystem of validated hardware and optics, and centralized management via IP Maestro, IP Infusion provides a flexible and future-ready alternative for data center interconnect, long-reach backhaul, and next-gen infrastructure buildouts. Whether you're modernizing metro links or building long-haul capacity, OcNOS delivers the control, scalability, and openness you need.

Contact for More Information:

For more information on the OcNOS software, please contact sales@ipinfusion.com

ABOUT IP INFUSION

IP Infusion is a leading provider of open network software and solutions for carriers, service providers and data center operators. Our solutions enable network operators to disaggregate their networks to accelerate innovation, streamline operations, and reduce Total Cost of Ownership (TCO). Network OEMs may also disaggregate network devices to expedite time to market, offer comprehensive services, and achieve carrier grade robustness. IP Infusion network software platforms have a proven track record in carrier-grade open networking with over 500 customers and over 10,000 deployments. IP Infusion is headquartered in Santa Clara, Calif., and is a wholly owned and independently operated subsidiary of ACCESS CO., LTD. Additional information can be found at http://www.ipinfusion.com

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