

OcNOS®

Cell Site Router

Overview

The service provider mobile and wireline network of the future will not just need to provide exponentially higher bandwidth at lower operating costs but will also have to be capable of enabling new applications such as pervasive mobile broadband, IoT/sensor networks, autonomous vehicles and smart consumer wireless devices. Mobile network operators are actively seeking cost-effective cell site gateway solutions to accommodate the mass rollout of 5G services to meet this mobile traffic demands. Disaggregated, open network solutions benefit operators as they build out 5G infrastructure by reducing costs, expanding the vendor ecosystem and leveraging automation so they are more agile in introducing new services.

The evolution to next-generation 5G networks introduces architectural changes in the radio access network (RAN) and mobile core that will have significant implications for how operators design and provision transport capacity and services. The mobile transport network will need

to meet the higher capacity and lower latency demands of 5G, as well as flexibly adapt to diverse traffic flows, to support a growing variety of use cases, from augmented reality to factory automation. A key concept that will enable next generation transport networks is disaggregation, whereby networking software is separated from the switching or routing hardware and partitioned into functional components that can be more efficiently operated. Programmability, automation, and agility with better control of their networks are immediate benefits of disaggregation for operators, besides potential cost savings as well.

OcNOS-SP-CSR Disaggregated Cell Site Gateway System

IP Infusion's OcNOS-SP-CSR is a complete carrier class, Cell Site Router (CSR) solution, aligning with the Telecom Infra Project's (TIP) Disaggregated Cell Site Gateway1 (DCSG) technical specification. The technical specification provides detailed requirements for CSR device that operators can deploy in current and future generations of wireless transport networks.

Cell Site Router

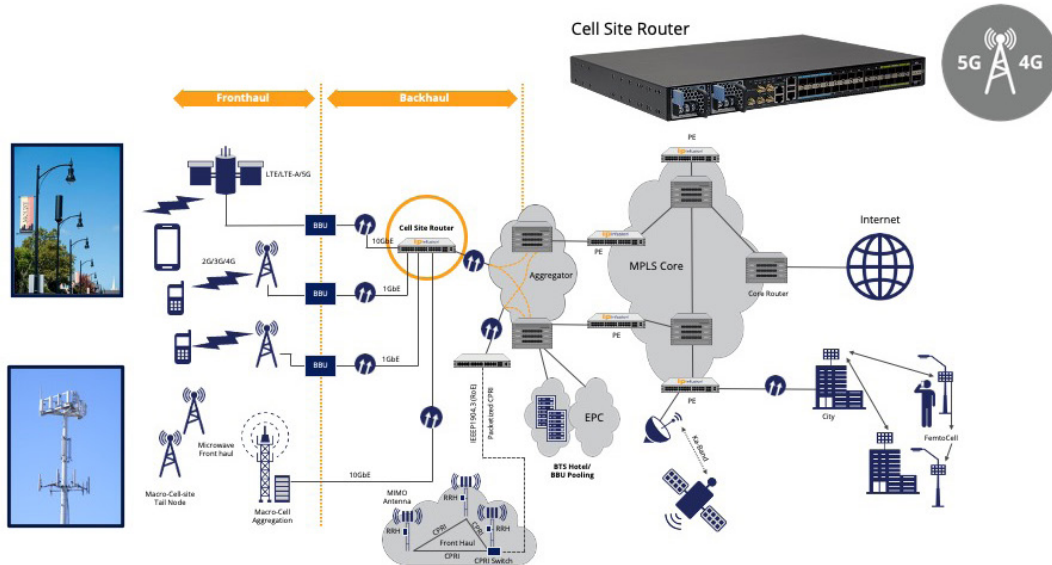


Figure 1: SP Edge: Cell Site Router

The OcNOS-SP-CSR solution is a smart converged integrated access platform which enables service providers to deliver next-level business and entertainment experiences and it comprises of the following core components:

[The TIP DCSG specification falls under the TIP Open Optical & Packet Transport project:](#)

- Multi-vendor CSR hardware platform: An Open Compute Project (OCP)2 and TIP DCSG Compliant ODM smart integrated access device platform supporting 300Gbps capacity.
- OcNOS full-featured network OS for White Box. Its features include advanced capabilities, such as extensive switching and routing protocol support, MPLS (Multiprotocol Label Switching), and SDN (software defined networking). OcNOS features hybrid, centralized or distribute network support; scalable, modular high-performance network; and a robust data plane built on merchant silicon.
- IP Infusion Advanced Network Services: Comprehensive network design, installation, commissioning, monitoring and technical support services.

Key CSR ODM Hardware Highlights

- Extremely compact, low-power design
- Flexible form factors for both CO and outdoor deployments
- Highly integrated design: 1-100G interfaces, rich set of QoS capabilities, flexible management options, and integrated timing in a single box
- Versatile licensing scheme to enable a range of commercial objectives
- 1 RU small form factor ODM hardware with depth <300mm
- Front-to-back airflow
- Low power consumption, minimum <100W, typical <200W, maximum 250W
- Low latency forwarding
- Precise frequency and phase/time synchronization using the latest industry standards
- Excellent manageability

OcNOS-SP-CSR: ODM CSR Hardware Specification

ODM PRODUCT IDENTIFICATION	EC AS7316-26XB	
Switch Silicon	Broadcom Qumran-AX BCM88470	
CPU Modules	Processor: Intel Broadwell-DE D-1519 1.5G 4C Memory: DDR4 SO-DIMM 2x 8GB SDRAM with ECC support SSD: 128 GB	
Ports	Switch Ports: 16 x SFP+ (each supporting 10 GbE or 1 GbE) 8 x SFP28 (each supporting 10 GbE or 25 GbE) 2 x 100G QSFP28 (each supporting 1 x 40/100 GbE or 4 x 10/25 GbE or 2 x 50 GbE) Management Ports on Front Panel: 1 x RJ-45 serial console 1 x RJ-45 1000BASE-T management Ethernet port (MGMT) 1 x USB Type A storage port Clocking and Timing ports: 1 x 1PPS Input port 1 x 1PPS Output port 1 x 10MHz Input port 1 x 10MHz Output port 1 x Time of day (ToD) RJ-45 port 1 x Building-Integrated Timing System port (BITS) GPS Antenna: 1 x GPS antenna port	
Performance	High performance packet processor : Switching Capacity: 300 Gbps full-duplex Packet Throughput: 300 Mpps processing rate	
Regulatory Compliance	Safety UL (CAN/CSA 22.2 No 60950-1 & UL60950-1) CB (IEC/EN60950-1) CCC (GB4943.1-2011) BSMI (CNS14336-1)	Electromagnetic Compatibility CE Mark EN55032 Class A EN55024 (Immunity) for Information Technology Equipment EN 61000-3-3 EN 61000-3-2 FCC Title 47, Part 15, Subpart B Class A VCCI Class A CNS 13438 (BSMI) CCC (GB9254-2008)
Power	48 VDC Power Supply: 400W PSU 36-75VDC input Front-to-back airflow Supports load-sharing function	AC Power Supply: 400W PSU 100-240V AC input Front-to-back airflow Supports load-sharing function Power Consumption: Approx. 230 W (Max), 170 W (Typical)
OcNOS SKU	OCNOS-SP-CSR	

ODM PRODUCT IDENTIFICATION	UFISPACE S9500-30XS	
Switch Silicon	Broadcom Qumran-AX BCM88470	
CPU Modules	Processor: Intel® Broadwell-DE D-1519 1.5G 4-Core Memory: DDR4 SODIMM 2x8GB with ECC support SSD: 128 GB	
Ports	Total 10 GE SFP+: 20 Total 25 GE SFP28: 8 Total 100 GE QSFP28: 2 1 RJ45 + Micro USB console/management ports 1 1000 Base-T Ethernet port for Out-of-Band management 1 USB 2.0 Type-A general purpose port GNSS, 1PPS, 10M, ToD, and BITS timing ports	
Performance	Packet Throughput 300 Mpps Packet Switching Capacity 300 Gbps	
Regulatory Compliance	Safety NEBS Level3 UL 62368-1 IEC/EN 60950-1 IEC/EN 62368-1 BSMI CNS 14336-1	Electromagnetic Compatibility NEBS Level 3 FCC Part 15, Subpart B, Class A EN55032, Class A EN300 386 EN55024 EN301 489-1 EN301 489-19 EN303413 BSMI (CNS 13438), Class A
Power	AC input: 100 ~ 240V, 6 ~ 3A, 50 ~ 60Hz DC input: -36 ~ -75V, 16 ~ 8A Max power: 400 Watts	
OcNOS SKU	OCNOS-SP-CSR	

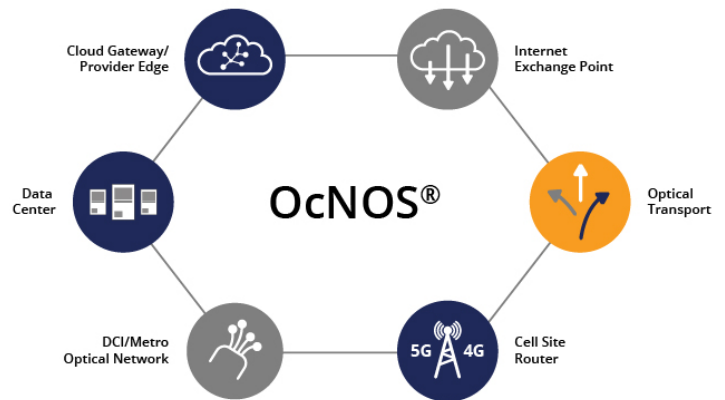
OcNOS Software

OcNOS is a robust, programmable and innovative operating system, featuring a single software image that runs across the entire portfolio of Open Compute platforms from leading network device vendors. This guarantees consistent operations, workflow automation and high availability, while significantly reducing operational expenses.

OcNOS borrows heavily from the popular ZebOS line of products, which provides a rich feature density and robustness that has been built up over the years and validated in thousands of diverse customer networks. OcNOS provides industry standard CLI, supports all standard MIBs and other standard operation and management tools. Its integrated centralized management and provisioning layer allows for transaction-based configuration and device feature modelling. The management layer has support for Netconf, REST APIs besides custom CLI generation capability. This allows an OcNOS system to be

configured, managed and controlled by Network Management System for scaled topologies and in multiple ways.

OcNOS is a modular, multi-tasking network operating system, with tight integration capabilities on commodity hardware. This design allows for scaled and performance critical deployments. The niche coupling with merchant silicon utilizes key hardware capabilities for better performance and feature set.



OcNOS-SP Software Feature Support Summary

OcNOS-SP FEATURE	TECHNICAL SPECIFICATIONS – NOS SOFTWARE FEATURES
Layer 2 Switching	Virtual LANs with Port-based VLANs, Routed VLAN interface, Port based VLAN interface, Private VLAN, Ingress and egress VLAN translation for C-VLAN and S-VLAN at PNP, Cvlan translation at CEP, Q-in-Q, L2PT, STP, Multiple Spanning, Tree Protocol (MSTP), Rapid Spanning Tree (RSTP), LLDP v2, Link Aggregation Control Protocol (LACP), Static link aggregation group, MC-LAG Active/Standby support as attachment circuit for VPWS Pseudowire Redundancy, BPDU Protect, Root Guard, MAC Learning Disable, Static MAC Address Assignment, Port based authentication with Radius server
Layer 3 Routing	Ethernet ARP, Path MTU for IPv4 & IPv6, Transmission of IP Datagrams over Ethernet, Congestion Control in IP/TCP Networks, IP Broadcast, IP Broadcast in the Presence of Subnets, IP Subnetting, Classless Inter-Domain Routing (CIDR), Requirements for IP Version 4 Routers, Route Redistribution across RIP, OSPF and BGP, VLAN Routing, URPF, BGP, RIP, OSPF, ISIS, BFD, VRRP
MPLS	MPLS Architecture, MPLS Label Stack Encoding, Time To Live (TTL) Processing in Multi-Protocol Label Switching (MPLS) Networks, MPLS Diffserv, Multiprotocol Label Switching (MPLS) Label Switching Router (LSR) Management Information Base (MIB), Multiprotocol Label Switching (MPLS) Forwarding Equivalence Class to Next Hop Label Forwarding Entry (FEC-To-NHLFE) Management Information Base (MIB), Label Distribution Protocol (LDP), Resource Reservation Protocol (RSVP), Layer 2 VPN (VPWS and VPLS), Layer 3 VPN, MPLS OAM, MPLS PW and LSP Traffic Statistics
Carrier Ethernet	Connectivity Fault Management (CFM) MD, MA, MIP, Down MEP, Continuity check (multicast CCM), Ping (unicast), Link trace, Fault reporting (RDI, Mac Status defect, CCM Cross Connect Defect, Error CCM Defect), CFM over L2 Bridge with xSTP, CCM over VPWS, Frame Delay and inter frame delay variation measurement using DMM and DMR over L2 Bridge, Frame Delay and inter frame delay variation measurement using DMM and DMR over VPWS Frame Loss Measurement using LMM/LMR and SLM/SLR over VPWS Ethernet Ring Protection Switching (ERPS) ERPS over CFM on Provider/Customer domain, Sub-ring support (Multiple ring and ladder topologies), Support of multiple ERP Instances on single ring

OcNOS-SP FEATURE	TECHNICAL SPECIFICATIONS – NOS SOFTWARE FEATURES (CONT'D)
VxLAN with EVPN	EVPN for VXLAN, EVPN Multihoming for VXLAN, VxLAN QoS
Multicast Features	PIM, IGMP
Quality of Service (QoS)	DiffServ Field in IPv4/IPv6 Headers, Assign matching traffic flow to a specific queue, 1/2/3 Level queuing hierarchy, L2 and L3 QoS, Rate Limiting - 1/2/3 rate coloring, policing and marking, Shaping per queue, per port, Multiple hardware queues per port, WRR/WFQ/SP Scheduling Per Queue, WRED, 802.1p remarking, Classification based on interface, ACL, DSCP, IP precedence, RTP, 802.1p, and VLAN, Trust IEEE 802.1p/DSCP, Remarking of bridged packets, Police Rate (SRTCM/TRTCM), Minimum and Maximum Bandwidth Per Queue, Service Queuing (Mapping services to specific vlans and shaping each vlan based traffic)
Management	Role based CLI management and access, CLI access via console, telnet and SSH, Authentication using tacacs+/radius client, Extended ping and traceroute, SNMP v1, v2, and v3, sFlow, DHCP client, DHCP relay, NTP, syslog, File Upload/Download using FTP/TFTP/SFTP/SCP, Management VRF, Ansible, Yang, NETCONF, Patch Upgrade Mechanism with & without ONIE
Security	Secure interface login and password, SSH v1, v2, Storm control, Flow control, DHCP Snooping, IP Source Guard Access Control Lists (ACLs) based on: Source IP address, Destination IP address, TCP/UDP source port, TCP/UDP destination port, IP protocol type, Source MAC address, Destination MAC address, Ethertype TCP Flags, Protocol type, IP fragment flags, DSCP, CoS, IP precedence, Rule prioritization and Re sequence, On-fly modification
Hardware-Specific Features	Switched port analyzer (SPAN), Remote switched port analyzer (RSPAN), Unified Forwarding Table (UFT), Dynamic load balancing (RTAG7 hash), Port Breakout, TCAM space monitoring
Chassis Monitoring	Temperature monitor, Fan control, Power Monitoring, CPU load monitoring, Board information (EEPROM), Fan and PSU FRU information, Hardware MIB and Traps
Digital Diagnostics Monitoring	Temperature monitor, Power Monitoring (Power, Current, Voltage), Hardware MIB and Traps
Timing and Synchronization	SyncE, ESMC, G.8271.1 (T-BC), G.8273.2, G.8275.1
Subinterface	L3 termination of IPv4 and IPv6 packets

OcNOS-SP-CSR Solution Ordering Guide

SKU	DESCRIPTION
OcNOS-SP-CSR	Open Compute Network Operating System MPLS image for Cell Site Routing and Fixed Wireless Backhaul with Layer 2, /L3 switching and Routing Support for (OSPF, IS-IS, BGP), IP/MPLS support, Ring/Linear Protection Switching ,ITU/IETF/IEEE OAM, with perpetual use license (1 license). Applicable for Service Provider Customers with carrier aggregation switching platforms with ports speeds between 10Gbps -100 Gbps. Please refer Data Sheet and Hardware Compatibility Matrix for supported platforms and detailed feature set descriptions.

Maintenance & Support

SKU	MAINTENANCE & SUPPORT
OcNOS-MS-1Y	1-year Maintenance & Support with Upgrades - Includes Technical support resources, software updates & upgrades, email and phone support, access to Support web site including case management system. Access to technical support team 24 x 7 for Severity 1 issues, normal business hours for all other issues. "Upgrade" means a version change for the licensed software with substantial improvements, enhancements and bug fixes.
OcNOS-MS-3Y	3-year Maintenance & Support with Upgrades - Includes Technical support resources, software updates & upgrades, email and phone support, access to Support web site including case management system. Access to technical support team 24 x 7 for Severity 1 issues, normal business hours for all other issues. "Upgrade" means a version change for the licensed software with substantial improvements, enhancements and bug fixes.
OcNOS-MS-5Y	5-year Maintenance & Support with Upgrades - Includes Technical support resources, software updates & upgrades, email and phone support, access to Support web site including case management system. Access to technical support team 24 x 7 for Severity 1 issues, normal business hours for all other issues. "Upgrade" means a version change for the licensed software with substantial improvements, enhancements and bug fixes.
OcNOS-MS-1Y-Premium	1-year Maintenance & Support with Upgrades - Includes Technical support resources, software updates & upgrades, email and phone support, access to Support web site including case management system. Access to technical support team 24 x 7 for all issues. "Upgrade" means a version change for the licensed software with substantial improvements, enhancements and bug fixes.
OcNOS-MS-3Y-Premium	3-year Maintenance & Support with Upgrades - Includes Technical support resources, software updates & upgrades, email and phone support, access to Support web site including case management system. Access to technical support team 24 x 7 for all issues. "Upgrade" means a version change for the licensed software with substantial improvements, enhancements and bug fixes.
OcNOS-MS-5Y-Premium	5-year Maintenance & Support with Upgrades - Includes Technical support resources, software updates & upgrades, email and phone support, access to Support web site including case management system. Access to technical support team 24 x 7 for all 1 issues. "Upgrade" means a version change for the licensed software with substantial improvements, enhancements and bug fixes.

More Information

For more information about the OcNOS Service Provider solution, contact your IP Infusion sales representative.

ABOUT IP INFUSION

IP Infusion, a leader in disaggregated networking solutions, delivers enterprise and carrier-grade software solutions allowing network operators to reduce network costs, increase flexibility, and to deploy new features and services quickly. 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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Phone | +1 877-MYZEBOS
Email | sales@ipinfusion.com
Web | www.ipinfusion.com

U.S. (Santa Clara) | +1 408-400-1912
Japan (Tokyo) | +81 03-5259-3771
Korea (Seoul) | +82 10 2733 3016

India (Bangalore) | +91 (80) 6728 7000
China (Shanghai) | +86-186 1658 6466
EMEA | +49 (208) 8290 6464