

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-300 Disaggregated Cell Site Gateway System

IP Infusion's OcNOS-SP-CSR-300 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.

SP Edge: Cell Site Router

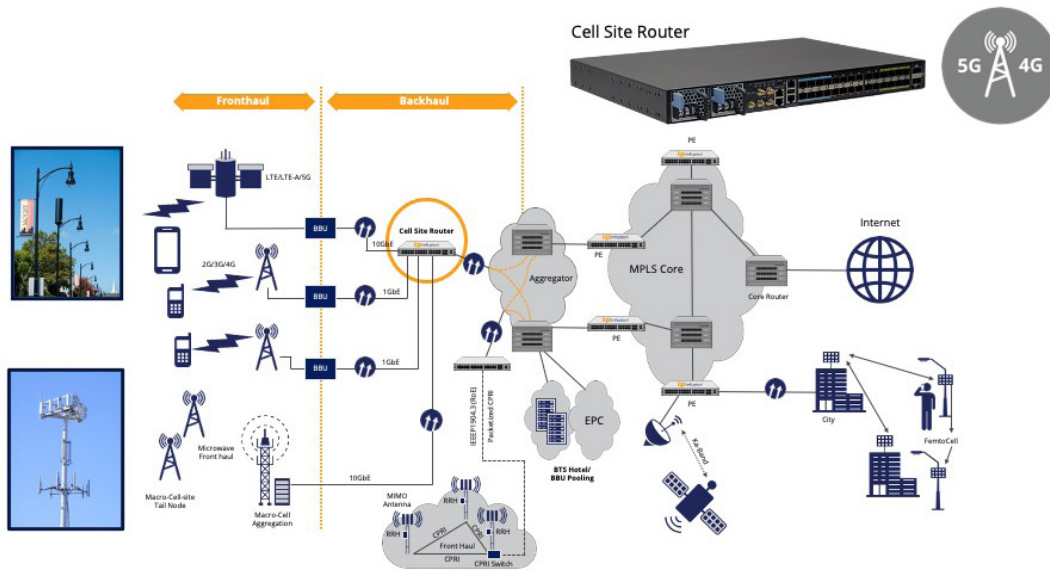


Figure 1: SP Edge: Cell Site Router

The OcNOS-SP-CSR-300 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-300: ODM CSR Hardware Specification

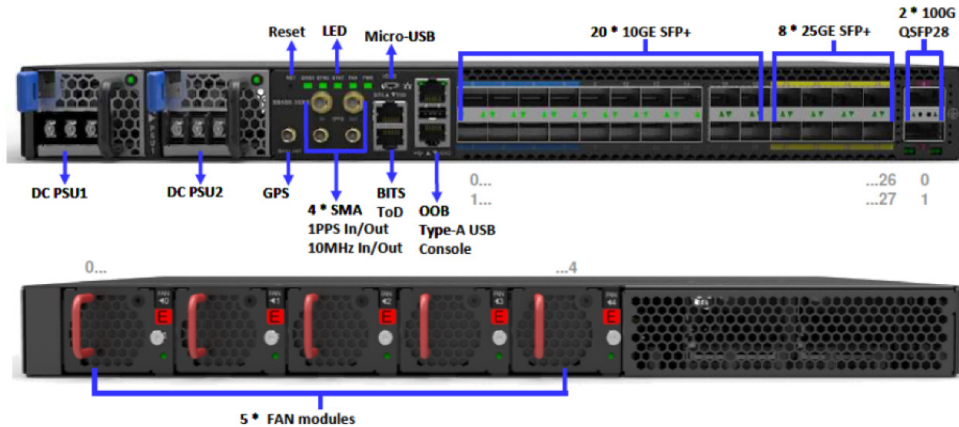


Figure 2: Qualified ODM CSR Hardware

| ODM PRODUCT IDENTIFICATION | | UFISPACE S9500-30XSZ |
|--------------------------------|---|--|
| CPU | Intel® Broadwell-DE D-1519 1.5G 4-Core | |
| Memory | DDR4 SODIMM 16GB with ECC support | |
| Storage | M.2 SSD 128 GB storage | |
| Interfaces | Total 10 GE SFP+: 20 Total 25 GE SFP28: 8 Total 100 GE QSFP28: 2 | |
| 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 | (EMC) 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 |
| Interfaces | Total 10 GE SFP+: 20 Total 25 GE SFP28: 8 Total 100 GE QSFP28: 2 | |
| Synchronization | GNSS, 1PPS, 10MHz, BITS, TOD | |
| Power Supplies, Fans & Airflow | Two hot swappable power units | AC input: 100 ~ 240V, 6 ~ 3A, 50 ~ 60Hz DC input: -36 ~ -75V, 16 ~ 8A Max power: 400 Watts |
| | Five hot swappable modular fan units | Cooling Front-to-back airflow |
| Environmental | Max. Operating Specs. | Operating temperature: -40°C to 65°C (-40°F to 149°F) Operating humidity: 5% to 85% (RH), non-condensing |
| | Max. Non-Operating Specs. | Storage temperature: -40°C to 70°C (-40°F to 158°F) Storage humidity: 5% to 85% (RH), non-condensing |

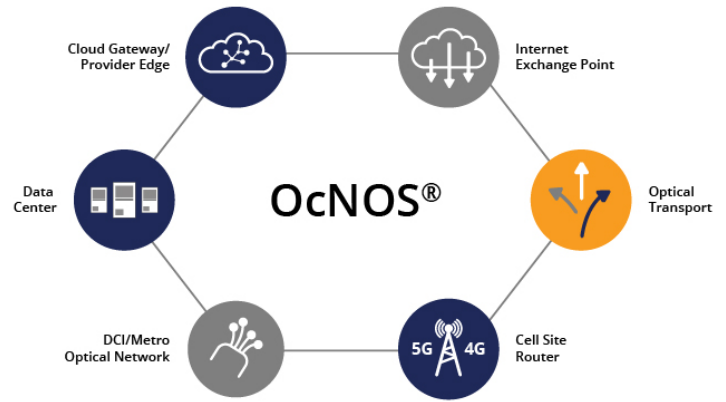
OcNOS Software

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 Software Feature Support Summary

| OCNOS FEATURE | SPECIFICATION |
|-------------------|---|
| Layer 2 Switching | Layer 2 forwarding and bridging Bridge Domains (BD) IEEE 802.1Q VLANs and Q-in-Q Ethernet Link Aggregation Group (LAG) Link Aggregation Control Protocol (LACP) 802.3ad Jumbo frames on all ports MSTP, STP, LLDP, VLAN Translation CV-LAN, S-VLAN VXLAN/EVPN |
| Layer 3 Routing | IPv4 and IPv6 unicast routing Layer 3 interfaces: physical interfaces Layer 3 interfaces: sub-interfaces Layer 3 interfaces: SVI Open Shortest Path First (OSPFv2, OSPFv3) with LFA Multiprotocol Border Gateway Protocol (MP-BGP) Equal-Cost Multipath (ECMP) Bidirectional Forwarding Detection (BFD) – Hardware offload (10ms) IS-IS, BGP/BGP+, BGP-LU, VRRP, VRRPv6 |

| | |
|--|--|
| <p>MPLS</p> | <p>Label Distribution Protocol (LDP) Resource Reservation Protocol (RSVP) RSVP-TE MPLS DiffServ, MPLS OAM Layer 2 VPN (VPWS and VPLS). VPWS/VPLS ethernet mapping Layer 3 VPN 6vPE, 6PE Seamless MPLS (LU and LDP DoD)</p> |
| <p>Quality of Service (QoS)</p> | <p>Class-based 3-level Hierarchical QoS Policing, Shaping, Rate Limiting Multi-level priority queuing Classification on ACL, DSCP, IP Precedence, RTO, 802.1P, VLAN Remarking Weighted Random Early Detection (WRED) Deep packet buffer WRR/WFQ/SP Scheduling per Queue</p> |
| <p>Timing</p> | <p>Integrated GNSS receiver, 1PPS, 10M, ToD, and BITS timing ports IEEE 1588-2008 PTP T-GM, T-BC, T-TSC G.8271.1 (T-BC) G.8273.2 Class B/C , G8275.1 SYNCE G.8262, Eth IEEE 1588v2</p> |
| <p>Carrier Ethernet</p> | <p>Connectivity Fault Management (CFM) Continuity check (multicast CCM) Fault Reporting (RDI, Mac, CCM Cross Connect, Error CCM) Ethernet Ring Protection (ERPS) ITU-T Y.1564 Ethernet Service Activation Test MEF 3.0 Compliant, E-Line, E-LAN, EPL, EVPL</p> |
| <p>Security</p> | <p>Control-plane and management plane protection Authentication, and Authorization (AAA) Terminal Access Controller Access-Control System Plus (TACACS+) Secure Shell (SSH) Layer 3 ingress/egress ACLs for IPv4, IPv6 Ingress ACL, Layer 2 Ingress ACL Storm Control, DHCP Snooping, Flow Control</p> |
| <p>Multicast</p> | <p>Protocol Independent Multicast (PIM) PIM-Sparse Mode (PIM-SM) Bootstrap Router BSR PIM-Dense Mode (PIM-DM) Multicast Source Discovery (MSDP) (Roadmap) IGMP v1, v2, v3 IGMP and MLD Snooping</p> |
| <p>Manageability</p> | <p>CLI, Syslog, SNMP MIB, sFlow NTP, DHCP, DHCP-Relay Zero-Touch Provisioning (ZTP) with ONIE boot loader Ansible Management VRF</p> |

OcNOS-SP-CSR-300 Solution SKUs for Ordering

| 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. |
| OcNOS-SP-CSR-300-S9500-30XS | OcNOS Open Compute Network Operating System MPLS image for CSR and Fixed Wireless Backhaul plus Ufispac S9500-30XS hardware platform bundle SKU. |
| OcNOS-MS-1Y OcNOS-MS-3Y OcNOS-MS-5Y | 1, 3, 5 Year Maintenance and Support with Upgrades – Includes Technical support resources, software updates & upgrades, email and phone support, 16x5 access to Support web site including case management system. “Upgrade” means a version change for the licensed software with substantial improvements, enhancements and bug fixes. Calculated as % of List Price of the SKU times the number of years of support. (Not included in bundle, must be ordered separately including for renewals) |
| OcNOS-MS-1Y-Premium OcNOS-MS-3Y-Premium OcNOS-MS-5Y-Premium | 1, 3, 5 Year Premium Maintenance and Support with Upgrades – Includes 24x7 Technical support resources, software updates and upgrades, email and phone support, access to Support web site including case management system. “Upgrade” means a version change for the licensed software with substantial improvements, enhancements and bug fixes. Calculated as % of List Price of the SKU times the number of years of support. (Not included in bundle, must be ordered separately including for renewals) |

IP Infusion Advanced Network Services

IP Infusion offers a wide range of network services to help accelerate your success in deploying and optimizing the IP Infusion OcNOS-SP-CSR-300. These innovative IP Infusion Advanced Network Services offerings are delivered through a unique combination of people, processes, tools, and global system integration partners, and they are focused on helping you increase operating efficiency and improve your network operation. IP Infusion Advanced Network Services uses an architecture-led approach to help you align your data center infrastructure with your business goals and achieve long-term value.

IP Infusion Advanced Network Services helps you resolve mission-critical problems with direct access at any time to IP Infusion network experts and award-winning resources. Spanning the entire network lifecycle, IP Infusion Advanced Network Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

Warranty

The OcNOS-SP-CSR-300 solution has a 1-year limited hardware warranty with option to purchase rapid equipment replacement.

ABOUT IP INFUSION

IP Infusion, the 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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