

# CLOUD AND SERVICE PROVIDER WAN TRANSPORT WITH OCNOS

## WHY OCNOS DELIVERS FOR CLOUD AND SERVICE PROVIDER WAN TRANSPORT

- **Unified NOS Across All Segments:** Provides one consistent software image and operational model from Access to Core.
- **Best-in-Class Protocol Stack:** Offers comprehensive support for foundational and advanced overlay technologies crucial for modern services.
- **Modular SKUs and Licensing:** Available in flexible SKUs allowing providers to acquire only the necessary without unnecessary cost or software bloat.
- **Hardware Agnostic Platform:** Runs on a wide variety of open network hardware platforms from multiple vendors.
- **Lower Total Cost of Ownership (TCO):** Achieved by perpetual licensing, lower support cost, and competitive open hardware pricing.

As Cloud, 5G, AI/ML, and IoT demand unprecedented scale, performance, and agility from transport networks, service providers face rising complexity, spiraling costs, and slower time-to-market. Traditional, vertically integrated routers with disparate operating systems can no longer meet the agility, operational efficiency, and scale required to stay competitive.

OcNOS by IP Infusion delivers a unified, carrier-grade network operating system (NOS) specifically designed for disaggregated WAN deployments—spanning access to core, metro, DCI, and peering. By enabling deployment on open whitebox hardware with a consistent software stack, this approach dramatically slashes Total Cost of Ownership (TCO) by avoiding vendor lock-in, boosts operational efficiency through unified management, accelerates innovation via modern feature sets and programmable interfaces, and shortens lead times by decoupling software from hardware supply constraints.

## The Challenge: Legacy WANs Can't Keep Up with Modern Demands

Legacy networks are fundamentally fragmented, built on disparate operating systems across different network roles—one vendor's OS for access, another for aggregation, yet another for the core. This monolithic and vendor-locked approach results in significant drawbacks:

- **High operational overhead:** Requires maintaining expertise across multiple vendor CLI syntaxes, tools, and training paths.
- **Limited flexibility and slow service delivery:** Rigid systems make it difficult to adapt to new requirements or provision services quickly.
- **Vendor lock-in:** Restricts hardware choices, limits negotiation power, and slows down feature adoption.

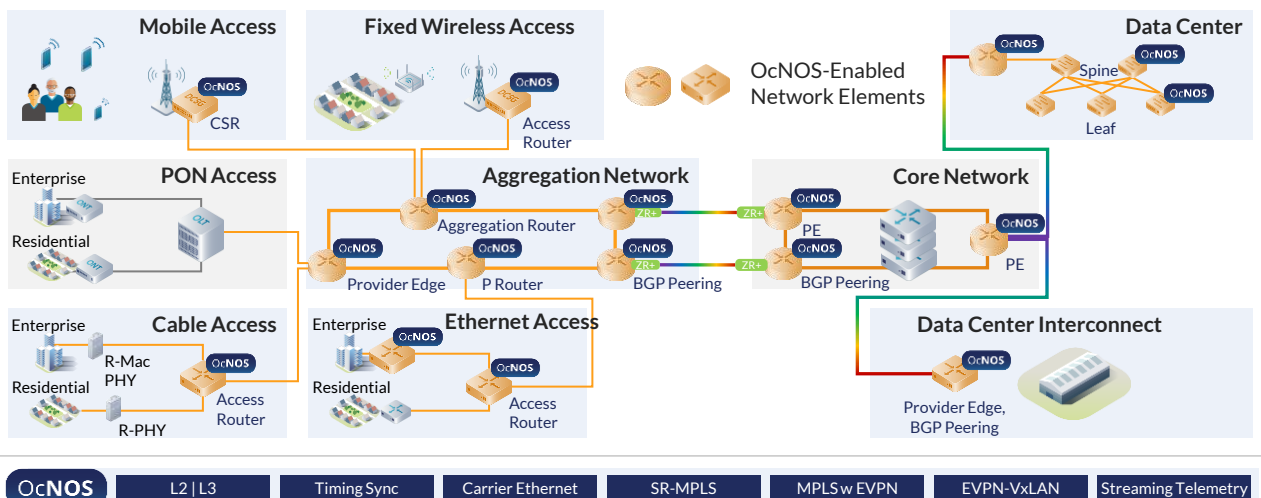
Emerging demands from transformative technologies only worsen the problem, pushing the limits of traditional infrastructure:

- **5G:** Demands highly accurate timing (SyncE/PTP), ultra-low latency, and scalable interfaces (10/25/100/400GbE) close to the edge.
- **AI/ML:** Requires infrastructure capable of moving vast datasets efficiently (driving 400GbE/800GbE) and generating detailed, real-time network telemetry for operational intelligence.
- **Edge/Cloud:** Changes traffic flow patterns (more East-West between DCs, more North-South between users and cloud/edge), necessitating flexible VPN tunnels (VXLAN/EVPN) for seamless connectivity and scalable routing.
- **IoT:** Explodes endpoint counts exponentially, increasing traffic volume and requiring highly scalable, secure access and aggregation points.

## The Solution: An OcNOS-Powered Disaggregated WAN Transport

With OcNOS, you get one unified, carrier-grade NOS that runs across diverse open whitebox hardware platforms deployed from Access to Core, Metro, DCI, and Peering. This fundamental shift delivers tangible benefits for service providers:

- **Consistent Operations Across All Segments:** A single OS means a unified CLI, consistent telemetry, fewer tools, simplified training, and streamlined troubleshooting across the entire network footprint.
- **Lower Total Cost of Ownership (TCO):** Achieved by perpetual licensing, lower support cost, and competitive open hardware pricing, avoiding vendor lock-in, and reducing operational expenses through standardization.
- **Faster Innovation & Feature Adoption:** Modern feature sets (like SR-MPLS, EVPN-VXLAN, 400G ZR+) are available on open hardware more rapidly, and programmable interfaces enable agile service creation and network evolution.
- **Shorter Lead Times and Supply Chain Resilience:** Decoupling software from hardware supply constraints offers greater flexibility in sourcing and deploying network capacity.



IP Infusion OcNOS Use Case Coverage

## Modern VPN Tunneling Technologies Offered with OcNOS

Service providers need flexible and scalable VPN tunneling technologies to deliver diverse services and segment their network. OcNOS provides comprehensive support for key technologies, including traditional MPLS, Segment Routing, and EVPN, each with distinct characteristics and use cases:

| Attribute           | Traditional MPLS  | SR-MPLS   | EVPN-MPLS   | EVPN-VXLAN   | EVPN-SR  |
|---------------------|---|---|---|--|--|
| Underlay            | IP  | MPLS  | MPLS  | IP (VXLAN)   | SR-MPLS  |
| Overlay             | MPLS (L3VPN, L2VPN)   | MPLS (L3VPN, L2VPN)   | EVPN  | EVPN   | EVPN   |
| Primary Use Cases   | L3VPN, L2VPN (VPLS, VPWS), Traffic Engineering  | L3VPN, L2VPN, Traffic Engineering, Service Chaining   | L2VPN (ELAN, ETREE, EVPN VPWS), L3VPN integration   | Data Center Interconnect (DCI), L2/L3 overlay over IP fabric   | L2/L3 VPNs over SR-MPLS fabric   |
| Key Characteristics | Relies on LDP/RSVP for label distribution; stateful per tunnel; established over decades. | Based on source routing; uses MPLS labels for SIDs; leverages IGP (OSPF/IS-IS) for prefix/adj SID distribution; stateless from transit nodes. | Unifies L2/L3 VPNs; uses BGP EVPN AFI/SAFI; leverages MPLS tunnels for transport; provides active-active multihoming. | Unifies L2/L3 VPNs; uses BGP EVPN AFI/SAFI; leverages VXLAN tunnels for transport; ideal for IP-centric networks (e.g., data centers). | Combines the benefits of EVPN's control plane with SR-MPLS transport; uses BGP EVPN AFI/SAFI over SR-MPLS tunnels. |
| Benefits            | Mature, widely deployed, robust TE capabilities (with RSVP).                              | Simplified control plane (no LDP/RSVP in core), improved scalability, easier TE.  | Unified control plane for L2/L3, simplifies DC/WAN interconnect, active-active multihoming.                           | Seamless L2/L3 extension over IP, integrates well with cloud environment, active-active multihoming.                                   | Unified L2/L3 control plane, leverages SR-MPLS benefits (TE), active-active multihoming.                           |

Table. VPN Tunneling Technologies Offered with OcNOS

OcNOS supports all these tunneling technologies, providing service providers with the flexibility to choose the best fit for their specific network architecture, service requirements, and transition strategy.

## WAN Architecture Breakdown and OcNOS Placement

OcNOS provides a unified software stack capable of running on devices across all key segments of the Cloud and Service Provider WAN:

### Access Network: Subscriber and Cell Site Ingress

- **Role:** Aggregate residential, enterprise, and 5G traffic. First point of aggregation and policy enforcement.
- **Devices:** Access Routers (AR), Cell Site Routers (CSR).
- **Speeds:** 1G/10G/25G access, 10G/25G/100G/400G uplinks.
- **Key Needs OcNOS Addresses:** Precise Timing (SyncE/PTP boundary/transparent clock) for 5G, scalable L2/L3 protocols, QoS, Security, and operational consistency with the rest of the network.

### Aggregation Network: Scaling Ingress Traffic

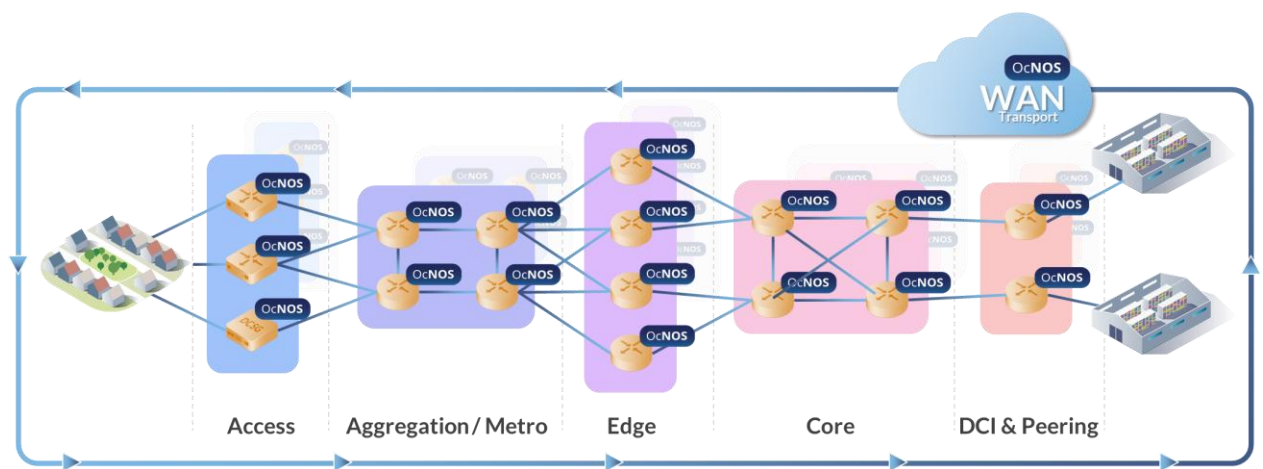
## Modern WAN Transport Requirements

- **Extreme Interface Scale & Capacity:** High-density support for 100GbE, 400GbE, and higher, including cost-effective pluggable optics like 400G ZR/ZR+ for DCI.
- **Advanced VPN Tunneling Support:** Comprehensive implementation of VXLAN, EVPN, MPLS, and Segment Routing (SR-MPLS, SRv6, EVPN-SR) for agile service delivery and network segmentation.
- **High Resilience & Fast Convergence:** Robust Layer 2 and Layer 3 protection mechanisms and rapid fault detection (sub-50ms). Including support for MLAG or EVPN Multihoming as alternatives for active-active redundancy.
- **Service Agility:** Full support for delivering diverse Layer 2/Layer 3 VPNs, Carrier Ethernet services (E-LINE, E-LAN, E-TREE), and multicast applications.
- **Precise Timing:** Carrier-grade implementation of SyncE and PTP (including Telecom Profiles G.8275.1/2, Boundary and Transparent clocks) essential for 5G.
- **Advanced Quality of Service (QoS):** Granular traffic classification, marking, policing, shaping, and hierarchical queuing for strict SLA enforcement.
- **Enhanced Operational Efficiency:** Support for automation via open APIs (NETCONF/RESTCONF, OpenConfig YANG), real-time streaming telemetry (gNMI), ZTP, and centralized management platforms.
- **Broad Open Hardware Compatibility:** Ability to run on a wide ecosystem of disaggregated platforms from multiple vendors.

- **Role:** High-density traffic collection, grooming, and timing aggregation.
- **Devices:** Aggregation Routers (AGGR). High port count devices.
- **Speeds:** 10/25/100G downlinks, 100/400G uplinks.
- **Key Needs OcNOS Addresses:** High-density interfaces, PTP boundary clock capabilities, MLAG/redundancy for resilience, robust QoS, and unified management.

#### Metro Network: High-Speed Regional Transport

- **Role:** High-bandwidth transport and interconnection within a metro region, linking aggregation points to regional data centers, PoPs, and peering. Devices in this layer can function as Provider (P) routers, primarily performing label switching, or Provider Edge (PE) routers, terminating VPN tunnels and connecting to customer or aggregation networks.
- **Devices:** High-capacity Routers (P and PE roles).
- **Speeds:** Predominantly 100G, 400G.
- **Key Needs OcNOS Addresses:** Scalable L3 routing (OSPF/IS-IS, BGP), VPN Tunnel support (EVPN, SR, MPLS L2/L3 VPN) for agile services, Carrier Ethernet features (OAM, ERPS), and high interface density.



IP Infusion OcNOS – Consistent NOS across various whitebox hardware and across various network segments.

#### Core Network: Backbone Connectivity

- **Role:** High-capacity, resilient, and low-latency transport over long distances, handling massive traffic volumes. Core routers typically function as Provider (P) devices, focused on high-speed label swapping (MPLS or SR) and forwarding without maintaining per-customer VPN state.
- **Devices:** High-end Core Routers (primarily P routers) optimized for forwarding performance.
- **Speeds:** 100G, 400G, moving towards 800G.
- **Key Needs OcNOS Addresses:** Extreme scalability, fast convergence, high resilience (L3 protection), advanced BGP features, and high-speed interface support.

#### Data Center Interconnect (DCI): Multi-DC Fabric Extension

- **Role:** Extend data center networks (often Layer 2 via VXLAN/EVPN) or provide high-speed Layer 3 connectivity between DC locations. Crucial for Cloud/Edge strategies and AI/ML data mobility.
- **Devices:** Dedicated DCI Routers or high-end Switches/Routers with DCI-specific features.
- **Speeds:** Very high bandwidth required, commonly 100G, 400G, and higher.
- **Key Needs OcNOS Addresses:** VXLAN/EVPN support for seamless Layer 2/Layer 3 extension, SR-MPLS support for traffic engineering, and native support for **400G ZR/ZR+** coherent optics, which dramatically simplifies and lowers the cost of DCI by enabling direct router-to-router connectivity over metro distances without external DWDM systems.

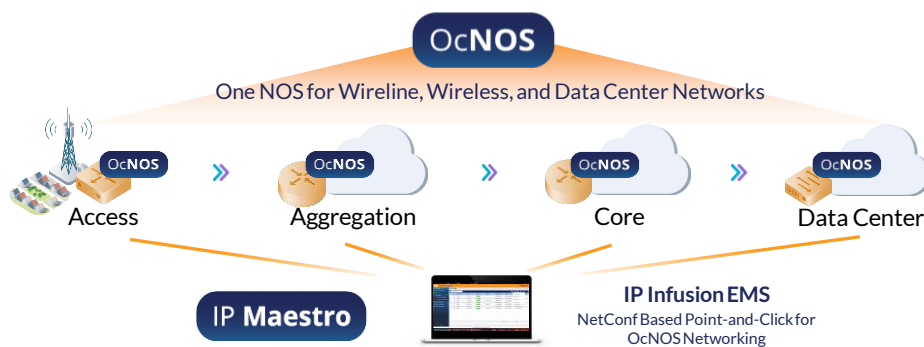
## Peering Points: Internet & Partner Interconnect

- **Role:** Interconnecting with other networks (internet exchanges, other service providers, large content providers) to exchange traffic.
- **Devices:** Provider Edge Routers (PE routers) or dedicated Peering Routers.
- **Speeds:** High capacity, often 100G and 400G.
- **Key Needs OcNOS Addresses:** Robust and scalable BGP capabilities to handle large routing tables and complex policies, high-speed interface support, and essential security features.

## Why OcNOS Delivers for Cloud and Service Provider WANs

IP Infusion OcNOS is specifically architected to meet the rigorous demands of carrier-grade networks and the flexibility of open networking:

- **Unified NOS Across All Segments:** Provides one consistent software image and operational model from Access to Core. This means a **single CLI syntax**, unified telemetry data models, simplified automation scripts, fewer bugs across the network, faster engineer onboarding, and significantly easier troubleshooting compared to managing multiple vendor-specific OS platforms.
- **Best-in-Class Protocol Stack:** Offers comprehensive support for foundational Layer 2/3 protocols (OSPF, IS-IS, BGP, VRRP, MLAG) and advanced overlay technologies crucial for modern services (MPLS, Segment Routing - SR-MPLS/EVPN-SR, EVPN over MPLS/VXLAN, VXLAN). Includes full Carrier Ethernet features (E-LINE, E-LAN, E-TREE, OAM - CFM, Y.1731, Y.1564 PM) and critical protection protocols (ERPS G.8032, ELPS G.8031). OcNOS supports MEF 3.0 certification requirements for Carrier Ethernet services.
- **Precise Timing & Synchronization:** Robust implementation of SyncE and PTP Telecom Profiles (G.8275.1, G.8275.2). OcNOS devices can function as PTP Boundary Clocks or Transparent Clocks, ensuring the precise frequency and phase synchronization required by 5G base stations and other time-sensitive applications throughout the network.
- **High-Performance & 400G-Ready with DCI Optimization:** Supports high-speed interfaces (100G, 400G, potential for 800G) with features like Port Breakout for density optimization and digital diagnostic monitoring (DDM) for transceiver health monitoring. Critically, OcNOS provides native, plug-and-play support for 400G ZR/ZR+ coherent transceivers directly from router/switch ports, drastically simplifying and lowering the cost of high-bandwidth DCI deployments over metro and regional distances.



IP Infusion OcNOS and IP Maestro for WAN Transport

- **Advanced Management, Automation, and Telemetry:** Full support for standard open APIs like NETCONF/RESTCONF and OpenConfig YANG models enables powerful automation. Streaming telemetry (gNMI) provides real-time, granular network state data essential for monitoring, analytics, and AIOps integration. ZTP (Zero Touch Provisioning) automates device onboarding. Furthermore, IP Infusion IP Maestro provides a centralized platform for simplified, unified management, orchestration, and lifecycle management of the entire OcNOS-powered network.

- **Granular Quality of Service (QoS):** Extensive capabilities for detailed traffic classification, marking, policing, shaping, and sophisticated multi-level queuing hierarchies allow engineers to implement fine-grained policies to prioritize critical voice/video traffic, ensure performance for specific services (e.g., Carrier Ethernet SLAs), and manage congestion effectively.
- **Robust Security Features:** Includes essential security layers such as Access Control Lists (ACLs), Unicast Reverse Path Forwarding (URPF), secure management access (SSH, HTTPS leveraging AAA-Authentication, Authorization, Accounting), Control Plane Policing (CoPP) to protect the device itself, and robust routing security (e.g., BGP authentication).
- **Modular SKUs and Licensing:** Available in flexible SKUs (SP-IPBASE, SP-MPLS, CSR, and SP-PLUS) with perpetual licensing, OcNOS allows service providers to acquire only the necessary features for their specific deployment role without unnecessary cost or software bloat.

| OcNOS SP Service Provider | OcNOS-SP-IP-BASE | OcNOS-SP-MPLS | OcNOS-CSR | OcNOS-SP-PLUS |
|---------------------------|------------------|---------------|-----------|---------------|
| Layer 2 / Layer 3         | •                | •             | •         | •             |
| EVPN-VXLAN                | •                | •             | •         | •             |
| Carrier Ethernet          |                  | •             | •         | •             |
| MPLS                      |                  | •             | •         | •             |
| MPLS w EVPN               |                  | •             | •         | •             |
| Segment Routing           |                  | •             | •         | •             |
| Streaming Telemetry       |                  | •             | •         | •             |
| Timing Synchronization    |                  |               | •         | •             |
| 400G ZR/ZR+               |                  |               |           | •             |

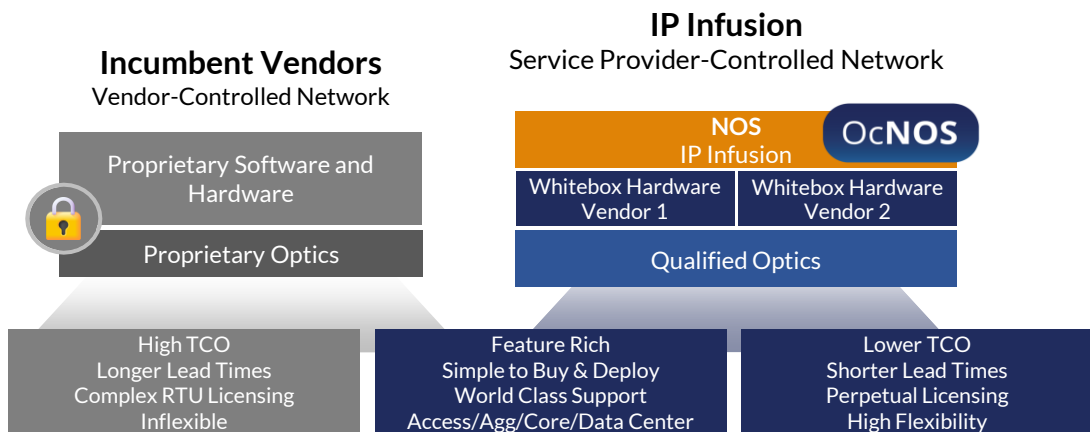
OcNOS Licensing - SKUs

- **Hardware Agnostic Platform:** Runs on a wide variety of open network hardware platforms from multiple vendors (Edgecore, UfiSpace, etc.) utilizing diverse merchant silicon ASICs (Broadcom, etc.). This provides choice, flexibility, supply chain resilience, and cost optimization at every layer of the network.

## Competitive Advantage

Unlike legacy vendors with vertically integrated, monolithic systems, OcNOS on open hardware provides service providers with a decisive advantage:

- **True Open Networking Flexibility:** Choose best-of-breed hardware and software components.
- **Shorter Lead Times:** Decoupled supply chains for hardware and software.
- **Significant CapEx and OpEx Savings:** Competitive hardware pricing and streamlined operations.
- **Faster Innovation Lifecycle:** Rapid adoption of new technologies and features on open platforms.
- **Hardware Independence and Choice:** Freedom from vendor lock-in for hardware and optics.



Comparison between vendor-locked vs IP Infusion open networking offering

## Summary

So, why does OcNOS stand out for cloud and service provider networks? It's designed from the ground up to be both robust and flexible. Imagine having one consistent software system running everywhere in your network, from the edge to the core – that's OcNOS. This means simpler operations, easier troubleshooting, and less headache for your team. It's packed with all the advanced features you need for modern services, like next-gen routing and seamless network extensions. Plus, it's ready for lightning-fast 400G connections and even simplifies costly data center links with clever optics. OcNOS helps you manage traffic precisely, keeps your network secure, and truly opens up automation with standard tools. Best of all, you only pay for the features you need, and it runs on a wide range of open hardware, giving you real choice.

This flexible, open approach gives you a powerful edge over traditional vendors who keep you locked into their systems. You get true freedom to mix and match the best hardware and software, leading to quicker deployments and big savings on both initial costs and ongoing operations. It also means you can adopt new technologies much faster, staying agile in a rapidly evolving market, and gain crucial control over your supply chain by not being tied to a single vendor.

## Contact for More Information:

For more information on the OcNOS software, please contact [sales@ipinfusion.com](mailto: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>

© 2025 IP Infusion, Inc. All rights reserved. IP Infusion is a registered trademark and the IP Infusion logo and OcNOS are trademarks of IP Infusion, Inc. All other trademarks and logos are the property of their respective owners. IP Infusion assumes no responsibility for any inaccuracies in this document. IP Infusion reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

**Phone** | +1-877-699-3267 **Email** | [sales@ipinfusion.com](mailto:sales@ipinfusion.com) **Web** | [www.ipinfusion.com](http://www.ipinfusion.com)

---