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OcNOS™
Product Overview

OcNOS™ is a networking solution built with traditional networking components along with components to transition to the new disruptive networking technologies. OcNOS supports disaggregation of network hardware and software to reduce CAPEX and OPEX.

OcNOS allows for investment protection by maintaining the operational and interop requirements for deployments with traditional networking gear.

OcNOS heavily borrows from the popular ZebOS® line of products, it takes advantage of a rich feature density and robustness that has built up over the years. 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 exposes Netconf, REST APIs besides custom CLI generation capability. All of this allows an OcNOS system to be configured, managed and controlled by the Network Management System for scaled topologies and in more than one way.

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.

Availability

- **Device and protocol level redundancy:** OcNOS provides standards based redundancy protocols like VRRP, BFD, Multi-chassis LAG, UDLD and graceful restart mechanisms. These provide a guaranteed network level redundancy.
- **Easy upgrades:** The modularity of OcNOS allows for individual process/protocol level upgrades and restarts without disturbing the running system. OcNOS supports software update with minimal service disruption.
- **Process survivability:** OcNOS has a built-in process heartbeat monitoring and restart feature in a 1U format. This leads to minimal downtime and unavailability at critical deployments.

Serviceability

- **Troubleshooting and diagnostics:** OcNOS supports event and process logging both local and remote, using standard mechanisms like syslog and traps. It also supports several system level diagnostics for health monitoring. These can provide useful data for troubleshooting and diagnostics.
- Traffic Monitoring: OcNOS can monitor traffic using standard port mirroring techniques. It can also do sample based traffic monitoring using widely implemented sFlow protocol.

Features and Benefits

- **Common software for multiple deployments and hardware:** OcNOS is designed using several inbuilt abstraction layers. These abstraction layers allow the software to run over multiple control plane CPU and forwarding chipset hardware. The system calls are also well abstracted allowing to switch across operating systems if required. It has been integrated with verified with multiple commodity hardware, which again allows for easier transition.

- **Interoperation and ease of use:** The OcNOS solution is built using standards based definitions, as well as has popular vendor specific extensions. The operation and management is provided using CLI, SNMP and Netconf. This allows the OcNOS-based network node to be easy to operate and interoperate with another vendor node.

- **Modular software design:** OcNOS software design is highly modular with multiple processes handling individual key protocols. The processes are managed and contained by a process handler framework, which also monitors the processes, restarts and maintains event logging for them. OcNOS can be built and packaged with minimal software features, reducing CapEx and device footprint.

- **Support for disruptive networking technologies**: OcNOS supports technologies required for bandwidth scaling at data centers and interconnects. It has a centralized transaction based modelling layer which allows for multiple management interfaces, this, in turn, allows for a central service level provisioning and chaining across multiple devices. It supports technologies required for SDN and NFV.

- System Configuration and Management: OcNOS provides well known mechanisms for device control such as boot parameters, password recovery.

Manageability

- Programmable and Flexible Management Layer: OcNOS has an internal transaction based management layer with open programmable upper layer. This allows it be programmed using NetConf, SNMP, HTTP traditional CLI mechanism.

- Simple Network Management Protocol (SNMP): OcNOS complies with SNMPv1, v2c, and v3.

A comprehensive collection of MIBs is supported.

- **Configuration verification and rollback:** With OcNOS, the system operator can verify the consistency of a configuration and the availability of necessary hardware resources prior to committing the configuration. A device can thus be preconfigured and the verified configuration applied at a later time. Configurations also include checkpoints to allow operators to roll back to a known good configuration as needed.

- **Role-based access control (RBAC):** With RBAC, OcNOS enables administrators to limit access to switch operations by assigning roles to users. Administrators can customize access and restrict it to the users who require it. The authentication and authorization is supported using both RADIUS and TACACS+.

Traffic Routing, Forwarding, and Management

- **Ethernet switching:** The solution supports the complete feature set required to run it as pure Layer2 or Layer2-3 switch. This feature set includes IEEE 802.1D-2004, Rapid Spanning Tree Protocol (RSTP), Multiple Spanning Tree Protocol (MSTP) IEEE 802.1w and 802.1s, RPVST, QinQ, IEEE 802.3ad link aggregation, Multi-Chassis Link Aggregation, IEEE 802.1AB Link Layer Discovery Protocol (LLDP), PVLAN, UDLD, BPDU Guard, Loop guard, Switched VLAN Interface support, EVB and DCB support.

- **Data center features:** OcNOS supports multiple standards based multi-path

Ethernet technologies for the data center. They are TRILL and Multi-chassis Link Aggregation Group. Apart from these it also supports Data Center Bridging (DCB), QCN, ETS and PFC for true unified Ethernet backplane. These technologies are well supported by the related integrated hardware, resulting in line rate performance. For Layer-3 based data center deployments, OcNOS has BGP, OSPF support with a very large ECMP fan out.

- **IP routing:** OcNOS supports a wide range of IPv4 and v6 services and routing protocols. Notably;
  - Open Shortest Path First (OSPF) Protocol Versions 2 (IPv4) and 3 (IPv6)
  - Intermediate System-to-Intermediate System (IS-IS) Protocol for IPv4
  - Border Gateway Protocol (BGP) for IPv4 and IPv6

- **Routing Information Protocol Version 2 (RIPv2)** The implementations of these protocols are fully compliant with the latest standards, providing modern enhancements and parameters such as 4-byte autonomous system numbers (ASNs), NSF graceful restart (NSF-GR) is supported by all unicast protocols. All protocols support all interface types, including Ethernet interfaces, switched virtual interfaces (SVIs) and subinterfaces, PortChannels, tunnel interfaces, and loopback interfaces. The great variety of routing protocols and functions is complemented by a broad collection of IP services, including the following:
  - VRF-lite and MPLS VPNs as described in RFCs 2547 and 4364
  - Dynamic Host Configuration Protocol (DHCP) Helper
  - Unicast Reverse Path Forwarding (uRPF) for IPv4 and IPv6
  - Virtual Router Redundancy Protocol (VRRP) for IPv4
  - Unicast graceful restart for OSPFv2, OSPFv3, LDP & BGP
  - Unicast graceful restart for OSPFv3 in IPv6

- **IP Multicast:** OcNOS provides a feature rich in multicast. The OcNOS implementation lays the foundation for the future development of a comprehensive portfolio of multicast-enabled network functions.

In a way similar to its support for the unicast routing protocols, OcNOS includes implementations of the following multicast protocols and functions:

- Protocol-Independent Multicast Version 2 (PIMv2)
- Source-Specific Multicast (SSM) for IPv4 and IPv6
- PIM Sparse Mode (Any-Source Multicast [ASM] for IPv4 and IPv6)
- Anycast Rendezvous Point (Anycast-RP)
- RP-Discovery using bootstrap router (BSR): Auto-RP and static
- Internet Group Management Protocol (IGMP) Versions 1, 2, and 3 router role
- IGMPv2 host mode
- IGMP snooping
- Multicast Source Discovery Protocol (MSDP) (for IPv4 only)
- IGMP group-specific queries to router ports only
- Debug filters for IGMP snooping

Quality of service (QoS): OcNOS supports numerous QoS mechanisms, including classification, marking, queuing, policing, and scheduling. Hierachical and Modular QoS is supported.

- **Multiprotocol Label Switching (MPLS):** OcNOS supports a comprehensive set of MPLS features including label switching, Layer 3 VPNs, MPLS Traffic Engineering with Fast Reroute (FRR), Multicast VPNs for IPv4.).

Network Security

- Network security features:
  - Authentication, authorization, and accounting (AAA) and TACACS+
  - Secure Shell (SSH) Protocol Version 2
  - SNMPv3 support
  - Port security
  - IEEE 802.1x authentication and RADIUS support
  - Policies based on basic and extended ACLs

Features on OcNOS release

The tables below list the software features in OCNOS available release. Note, the below mentioned features are only indicative and the detail feature list may vary.

Security Features

Description
Secure interface login and password
RADIUS/TACACS+
SSH v1,v2
Storm Control, port error disable and auto-recovery
Control plane DOS protection

QoS Features

Description
L2 and L3 Modular and Hierarchical QOS
Rate Limiting - 1/2/3 rate coloring, policing, marking
Shaping per queue, per port
802.1p remarking
Classification based on interface, MAC address, Ethertype, 802.1p, VLAN
Trust IEEE 802.1p feature

Management Features

Description
CLI based both in & out of band support
SNMP v1, v2, v3 support
Netconf support
VRF isolation for management & operation protocols
Ansible support for Data Center configurations

MPLS Features

Description
MPLS Architecture
Label Distribution Protocol
RSVP protocol
RSVP with IETF Integrated Services
RSVP-TE Extension to RSVP for LSP Tunnels
MPLS Support of Differentiated Services and DS-TE
Fast Reroute Extensions to RSVP for LSP Tunnels
Pseudowire Setup and Maintenance using Label Distribution Protocol
Static Pseudowire Setup and Maintenance
Virtual Private LAN Service (VPLS) Using Label Distribution Protocol (LDP) Signaling
Pseudowire Preferential Forwarding Status Bit
Virtual Private LAN Service (VPLS) Using BGP for signaling and auto-discovery
BGP MPLS IPv4 VPN
OAM for MPLS Networks
VRF Lite
MLAG support at VPLS edge

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About IP Infusion

IP Infusion, the leader in disaggregated networking solutions, delivers the best network OS for white box and network virtualization. IP Infusion offers network operating systems for both physical and virtual networks to carriers, service providers and enterprises to achieve the disaggregated networking model. With the OcNOS™ and VirNOS™ network operating systems, IP Infusion offers a single, unified physical and virtual software solution to deploy new services quickly at reduced cost and with greater flexibility. Over 300 customers worldwide, including major networking equipment manufacturers, use IP Infusion's respected ZebOS platform to build networks to address the evolving needs of cloud, carrier and mobile networking. 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.

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 (2) 3153-5224

India (Bangalore), +91 (80) 6728 7000
China (Shanghai), +86 186 1658-6466
EMEA (Stockholm), +46 8 566 300 00

IP Infusion
An ACCESS Company
(408) 400-3000
www.ipinfusion.com
3965 Freedom Circle, Suite 200
Santa Clara, CA 95054