ALCATEL-LUCENT
OMNISWITCH 9900 SERIES
MODULAR LAN CHASSIS

The Alcatel-Lucent OmniSwitch® 9900 series Modular LAN chassis platform is a high-capacity, high-performance modular Ethernet LAN switch that is field-proven in enterprise, service provider and data center environments. As the OmniSwitch 9900 series runs on the Alcatel-Lucent Operating System (AOS), a state-of-the-art programmable operating system designed for Software-Defined Networking (SDN), it delivers uninterrupted network uptime with non-stop Layer-2 and Layer-3 forwarding.

The OmniSwitch 9900 is a high density, multi Terabit modular platform. The platform can linearly scale switching capacity with virtual chassis technology providing tens of Terabit of aggregate switching capacity. In particular its modular design provides investment protection allowing for scaling out in the future with inline upgrades offering high density 25G/40G/50G/100G interfaces.

The OmniSwitch 9900 series is ideally suited for enterprise core, aggregation and edge environments. Its resilient platform architecture providing control plane and data plane redundancy together with unparalleled scalability helps meet demanding resiliency and throughput requirements for evolving enterprises of all sizes.
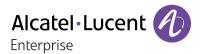
The OmniSwitch 9900 series offers a broad range of modules supporting 1 GigE, 10 GigE and 40 GigE ports in an 11-RU chassis form factor, and it offers highest 1 GigE/10GigE port density in its class. The platform is also ready to support 100 GigE.

The OmniSwitch 9900 offers the highest density of Power over Ethernet (PoE) in its class, scaling up to 10800 W of inline PoE power. The gigabit PoE line card supports 8 ports of HPoE (75 W) and 40 ports of 802.3at PoE (30 W). All PoE-enabled ports are IEEE 802.3af/at compliant.

The OmniSwitch 9900 leverages an energy-efficient model with leading low power consumption, making it an efficient and versatile switch.

The Alcatel-Lucent Enterprise Intelligent Fabric technology is also enabled on the OmniSwitch 9900 Modular LAN chassis. The technology brings true network flexibility ensuring business agility. It not only delivers a resilient, high-capacity infrastructure, but it also delivers automated deployment and self-healing network capabilities to reduce overhead in IT operations. The technology platform is built upon standard IEEE protocols and key innovations such as Shortest Path Bridging (802.1aq/SPB-M) for bridged and routed services, Multiple VLAN Registration Protocol (MVRP), dynamic Virtual Network Profiles (vNP), 802.3ad/802.1AX (LACP) and Auto-Fabric for automatic protocol and topology discovery.

Alcatel·Lucent
Enterprise

BENEFITS

- Modules provide very low latency for high-performance server clusters and core connectivity over QSFP+, SFP+, DAC or CAT 5/6.

- Outstanding performance when supporting real-time voice, data, storage and video applications for converged scalable networks

- Modular slots offer versatility in terms of 40 GigE QSFP+, 10 GigE SFP+, 10 G Base-T and 10/100/1000 Base-T ports.

- Each port is capable of operating as 40 GigE or 4x10 GigE.

- Hardware resiliency maximizes uptime for converged mission-critical networks.

- Software virtualization, the Chassis Management Module (CMM) control plane and data plane management are virtualized and execute as virtual machines, enabling high availability during upgrades and/or during unexpected network failures.

- The OmniSwitch 9900 virtual chassis* further increases system redundancy, resiliency and high availability while simplifying deployment, operations and management of the network.

- Embedded SDN integration to control virtual network profiles and policy management

- Built-in dynamic and automated policy enforcement

- Policy enforcement engine fully open for external control through RESTful northbound APIs for automation and integration of innovative applications

- Native Cloud Multi-Tenancy

- Out-of-the-box flexible fabric architecture designed to automate and simplify the end-to-end deployment of campus, data center, and cloud-based services

- Prevents human mistakes by automating standardized and replicable configurations

- Prevents host address explosion and flooding with built-in SLA service support at low capital and operating costs, and based on interoperable proven standards

- Optimizes/simplifies Layer-2 and Layer-3 network designs and reduces administration overhead while increasing network capacity with resilient multipath active-active dual homing multi-chassis support

- Out-of-the-box Auto-Provisioning to simplify installation and service provisioning

- With its advanced PoE capabilities and high density of PoE ports, the OmniSwitch 9900 is ideal for converged campus deployments, as it offers deployment

flexibility, simplifies the wiring and reduces the time to deploy edge devices such as VoIP phones, surveillance cameras, 802.11ac access points, and emerging devices that require more than 30 W, such as video displays, a small network switch or a thin virtual desktop infrastructure (VDI) client.

- Unified Access and application-fluent networks provide simplified network architecture with automated controls and enhanced security for both wired and wireless users. Offers enhanced management and security for reduced operational complexity costs.

- User network profiles add intelligence to the network to automatically adapt as users move around the corporation without compromising the security

- With its advanced capabilities, the OmniSwitch 9900 brings enhanced performance when supporting real-time voice, data and video applications.

- Provides consistent and secure user experience when applications and services are accessed from wired or wireless end devices

- Offers flexible deployment options and enables the network for BYOD deployments and zero-touch guest management

- Supports dynamic change of authentication (CoA) and enforces traffic remediation or restriction for non-compliant devices

- Provides control and increased security over corporate data/applications for the mixed personal and corporate environment for improved visibility and control for IT

- Opens the door for fast deployment of new network services that meet employees' needs to continuously adopt new applications that support the business

- The support of SDN reassures customers that their investment helps them prepare for the future and enables interoperability with third-party solutions.

FEATURES

- Wire-rate non-blocking switching and routing performance for Ethernet at 40 GigE, 10 GigE and 10/100/1000 Base-T speeds.

- High port density in 11-RU.
  - Up to 288 10/100/1000 Base-T triple speed ports
  - Up to 248 SFP+ ports. Capable of 1 GigE/10 GigE
  - Up to 248 10 G Base-T ports. Capable of 1 GigE/10 GigE
  - Up to 4 QSFP+ ports

- Resilient hardware system and highly available virtualized software architecture

- Up to two switches can be connected using virtual chassis* technology to create a single chassis-like entity with up to 480 10 GigE ports and 480 GigE ports

- Integral operating system advanced functions: Quality of Service (QoS), access control lists (ACLs), Layer-2/Layer-3 switching, virtual LAN (VLAN) stacking and IPv6

- Intelligent policy control through OpenFlow 1.3.1/1.0

- Hardware virtual routing and forwarding (VRF) support for VRF-lite and IPVPN

- Scalable network virtualization architecture with guaranteed Service Level Agreement (SLA) delivery over standard Ethernet fabric: Auto-Fabric IP routing for routed backbone and access provisioning, Shortest Path Bridging (SPB) for bridging and routed services, Edge Virtual Bridging (EVB), Multiple VLAN Registration Protocol (MVRP) and dynamic Virtual Network Profiles (vNP)

- Zero-touch provisioning and network automation with out-of-the-box plug-and-play Auto-Fabric for automatic protocol and topology discovery. Protocol auto-discovery and self-provisioning works with any Ethernet device that supports standard IEEE protocols such as 802.1aq (Shortest Path Bridging Media Access Control, SPBM), 802.1ak (MVRP), 802.3ad/802.1AX (Link Aggregation Control Protocol, LACP). Auto-Fabric operation extends to IP routing protocol provisioning and IP onboarding.

- On PoE-enabled network interface modules:
  - IEEE 802.3af and 802.3at compliant PoE of 30 W per port on all ports
  - Up to 75 W of PoE (High Power-over-Ethernet, HPoE) per port on first eight ports
  - Capacity to deliver 1800 W of PoE power

- Advanced Unified Access features providing application fluency in converged campus networks:
  - Integrated policy with dynamic User Network Profiles (UNP)
  - Extensive security features for network access control (NAC), policy enforcement and attack containment
  - Session Initiation Protocol (SIP) fluency to provision and monitor QoS treatment of SIP flows
  - AirGroup™ Network Services for Bonjour® speaking devices

- Enables deployment of comprehensive and secure bring-your-own-device (BYOD) services in enterprise networks:
  - ¬ Advanced guest management capabilities
  - ¬ Device onboarding and automated IEEE 802.1x provisioning
  - ¬ Device posture/health check and fingerprinting
  - ¬ Application management
- The OmniSwitch 9900 is SDN-ready:
  - ¬ Comprehensive northbound RESTful API to the entire AOS feature set.
  - ¬ API offers access to all AOS command line interface (CLI) commands and management information base (MIB) structures
  - ¬ AOS-embedded scripting capabilities supporting Python® and Bash programming
  - ¬ OpenFlow™ 1.0/1.3
  - ¬ OpenStack® neutron plugin

OmniSwitch 9900 chassis and interface modules

The OmniSwitch 9900 family offers high-performance and very low latency Layer-2/Layer-3 switching. The chassis has a 11-RU form factor with four power supply bays and fan trays for front-to-back airflow. Available interfaces vary from 40 GigE, 1/10 GigE, 1/10GBase-T and 10/100/1000Base-T. The chassis management module has built-in 2x 40 GbE ports; each port can also be used as 4x 1/10 GbE with splitter cables.
The OmniSwitch 9900 supports 1+1 redundant and hot-swappable power supplies. The power supply units are internal but removable to allow for easier maintenance and replacement. The OmniSwitch 9900 power supplies provide both system power and PoE power. The platform supports power load-sharing for PoE between the power supplies providing up to 10800 W of PoE per switch. There is no interruption of service when a new power supply is installed or an existing one replaced. The OmniSwitch 9900 allows for maximum flexibility and investment protection as customers migrate from 1 GigE and 10 GigE to 40 GigE and beyond.

DETAILED PRODUCT FEATURES

Simplified manageability
- Fully programmable RESTful web services interface with XML and JavaScript Object Notation (JSON) support. API enables access to CLI and individual MIB objects
- Intuitive CLI in a scriptable Bash environment through console, Telnet or Secure Shell (SSH) v2 over IPv4/IPv6
- Built-in Python engine enables automation, providing programmatic access of network events with scripted controlled actions
- Powerful WebView Graphical Web Interface through HTTP and HTTPS over IPv4/IPv6
- Full configuration and reporting using Simple Network Management Protocol (SNMP) v1/2/3 to facilitate third-party network management over IPv4/IPv6
- File upload using USB, TFTP, FTP, SFTP or SCP using IPv4/IPv6
- Multiple microcode image support with fallback recovery
- Local (on the flash) and remote server logging (Syslog): event and command logging
- Loopback IP address support for management per service
- Management Virtual Routing and Forwarding (VRF) support
- Dynamic Host Configuration Protocol (DHCP) relay for IPv4/IPv6
- IEEE 802.1AB Link Layer Discovery Protocol (LLDP) with Media Endpoint Discovery (MED) extensions
- Network Time Protocol (NTP)
- DHCPv4 and DHCPv6 server managed by Alcatel-Lucent VitalQIP® Domain Name System (DNS)/DHCP IP Address Management
- Access to the AOS console using Bluetooth® provides wireless management access to the OmniSwitch 9900, eliminating the use of console cables

Monitoring and troubleshooting
- Policy and port-based mirroring (many to many)
- Remote port mirroring
- sFlow v5 and Remote Network Monitoring (RMON)
- Dying gasp support through SNMP and syslog messages
- IP tools: ping and trace route
  Unidirectional Link Detection (UDLD)
- Digital Diagnostic Monitoring (DDM)

Resiliency and high availability
- Unified management, control and fabric-mesh virtual chassis* technology
- 1+1 redundant supervisor manager
- Virtual chassis In-Service Software Upgrade (ISSU)*
- Smart continuous switching technology
- ITU-T G.8032/Y1344 2010: Ethernet Ring Protection

- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP), IEEE 802.1D Spanning Tree Protocol (STP) and IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
- Per-VLAN spanning tree (PVST+) and 1x1 STP mode
- IEEE 802.3ad/802.1AX Link Aggregation Control Protocol (LACP) and static link aggregation (LAG) groups across modules
- Virtual Router Redundancy Protocol (VRRP) with tracking capabilities
- IEEE protocol auto-discovery
- Bidirectional Forwarding Detection (BFD)
- Redundant and hot-swappable power supplies
- Hot-swappable fan trays
- Built-in CPU protection against malicious attacks
- Split virtual chassis protection*: Auto-detection and recovery of virtual chassis splitting due to Virtual Fabric Link (VFL) failures
- Broadcast and multicast storm control to avoid degradation in overall system performance

Software Defined Networking (SDN)
- Programmable AOS RESTful API
- Fully programmable OpenFlow 1.3.1* and 1.0* agent for control of native OpenFlow and hybrid ports
- OpenStack networking plug-in*

Advanced security
Network control
- LGS CodeGuardian solution is enabled on OmniSwitch® 9900, hardening it at both the software source code and binary executable levels to enhance overall network security.
- CodeGuardian protects networks from intrinsic vulnerabilities, code exploits, embedded malware, and potential back doors that could compromise mission-critical operations.
- CodeGuardian is a proactive, defense-in-depth approach toward network security that continuously defines and implements value-add capabilities to address both current and future threats. For additional information on CodeGuardian visit http://enterprise.alcatel-lucent.com

Access control
- AOS Access Guardian framework for comprehensive user-policy-based NAC
- Autosensing IEEE 802.1X multi-client, multi-VLAN support

- Media Access Control (MAC)-based authentication for non-IEEE 802.1X hosts
- Web-based authentication (captive portal): a customizable web portal residing on the switch
- User Network Profile (UNP) simplifies NAC by dynamically providing pre-defined policy configuration to authenticated clients: VLAN, ACL, bandwidth
- Secure Shell (SSH) with public key infrastructure (PKI) support
- Terminal Access Controller Access-Control System Plus (TACACS+) client
- Centralized Remote Access Dial-In User Service (RADIUS) and Lightweight Directory Access Protocol (LDAP) administrator authentication
- Centralized RADIUS for device authentication and network access control authorization
- Learned Port Security (LPS) or MAC address lockdown
- ACLs; flow-based filtering in hardware (Layer 1 to Layer 4)
- DHCP Snooping, DHCP IP and Address Resolution Protocol (ARP) spoof protection
- ARP poisoning detection
- IP source filtering as a protective and effective mechanism against ARP attacks
- LLDP Security mechanism for rogue device detection and restriction
- BYOD provides on-boarding of guest, IT/non-IT issued and silent devices. Restriction or remediation of traffic from non-compliant devices. Uses RADIUS CoA to dynamically enforce User Network Profiles based on authentication, profiling, posture check of devices. (with Aruba ClearPass)

Quality of Service (QoS)
- Priority queues: Eight hardware-based queues per port
- Traffic prioritization: Flow-based QoS
- Flow-based traffic policing and bandwidth management
- 32-bit IPv4/128-bit IPv6 non-contiguous mask classification
- Egress traffic shaping
- DiffServ architecture
- Congestion avoidance: IEEE 802.3x Flow Control (FC)*
- SIP detection, session monitoring and tracking
- Provides real-time conversation quality information contained in the SIP packets concerning packet loss, delay, jitter, mean opinion score (MOS), R-Factor in real time
- SIP profile for QoS, priority tuning for end-to-end processing
- Multicast DNS Relay: Bonjour protocol support for wired AirGroup

- LLDP network polices for dynamic designation of VLAN-ID and Layer-2/ Layer-3 priority for IP phones
- Auto-QoS for switch management traffic as well as traffic from IP phones

IPv4 routing
- Multiple Virtual Routing and Forwarding (VRF)
- Static routing with route labeling
- Routing Information Protocol (RIP) v1 and v2
- Open Shortest Path First (OSPF) v2 with graceful restart
- Intermediate System to Intermediate System (IS-IS) with graceful restart
- Border Gateway Protocol (BGP) v4 with graceful restart
- Generic Routing Encapsulation (GRE) and IP/IP tunneling
- Virtual Router Redundancy Protocol (VRRPv2)
- DHCP relay, including generic User Datagram Protocol (UDP) relay
- Address Resolution Protocol (ARP)
- Policy-based routing and server load balancing
- DHCPv4 server
- IP router port
- Export/Import IPv4 routes across VRFs

IPv6 routing
- Multiple Virtual Routing and Forwarding (VRF)
- Internet Control Message Protocol version 6 (ICMPv6)
- Static routing
- Routing Information Protocol Next Generation (RIPng)
- Open Shortest Path First (OSPF) v3 with graceful restart
- Intermediate System to Intermediate System (IS-IS) with graceful restart
- Multi-Topology IS-IS
- BGP v4 multiprotocol extensions for IPv6 routing (multiprotocol Border Gateway Protocol, MP-BGP)
- Graceful restart extensions for OSPF and BGP
- Virtual Router Redundancy Protocol (VRRPv3)
- Neighbor Discovery Protocol (NDP)
- Policy-based routing and server load balancing
- DHCPv6 server
- Export/Import IPv6 routes across VRFs

IPv4/IPv6 multicast
- Internet Group Management Protocol (IGMP) v1/v2/v3 snooping

- Protocol Independent Multicast – Sparse-Mode (PIM-SM), Source Specific Multicast (PIM-SSM),
- Protocol Independent Multicast – Dense-Mode (PIM-DM), Bidirectional Protocol Independent Multicast (PIM-BiDir)
- Distance Vector Multicast Routing Protocol (DVMRP)
- Multicast Listener Discovery (MLD) v1/v2 snooping
- PIM to DVMRP gateway support
- (S,G) and (*,G) forwarding

Advanced Layer-2 services
- Up to 4094 IEEE 802.1Q VLANs
- Ethernet services support using IEEE 802.1ad Provider Bridges (also known as Q-in-Q or VLAN stacking)
- Fabric virtualization services IEEE 802.1aq Shortest Path Bridging (SPB-M)
  - ¬ Ethernet Virtual Connection (EVC) support for transparent LAN services such as E-LAN, E-Line and E-Tree
  - ¬ Multipoint Ethernet VPN (EVPN) over I-SID service virtualization or Q-in-Q tunnels
  - ¬ Ethernet network-to-network interface (NNI) and user network interface (UNI)
  - ¬ Service Access Point (SAP) profile identification
  - ¬ Service VLAN (SVLAN) and Customer VLAN (CVLAN) support
  - ¬ VLAN translation and mapping including CVLAN to SVLAN
  - ¬ C-tag to S-tag priority mapping
- DHCP Option 82: Configurable relay agent information
- Multicast VLAN Registration Protocol (MVRP)
- High-availability VLAN (HA-VLAN) for Layer-2 clusters such as Microsoft® Network Load Balancing (MS-NLB) and active-active firewall clusters
- Jumbo frame support up to 9216 bytes
- Bridge Protocol Data Unit (BPDU) blocking
- Spanning Tree Protocol (STP) Root Guard prevents edge devices from becoming STP root nodes
- MAC-Forced Forwarding support according to RFC 4562
- Private VLAN feature for user traffic segregation*
- TR-101 Point-to-Point Protocol over Ethernet (PPPoE) Intermediate Agent allowing for the PPPoE network access method
- TACACS+ client allows for authentication authorization and accounting (AAA) with a remote TACACS+ server

PoE

- Dynamic PoE allocation delivers only the power needed by the attached device up to the total power budget for most efficient power consumption
- PoE models support Alcatel-Lucent IP phones and WLAN access points, as well as any IEEE 802.3af-compliant end device
- Configurable per-port PoE priority and max power for power allocation
- Negotiation for Additional PoE Power using LLDP Power-via-MDI TLV

TECHNICAL SPECIFICATIONS

Product specifications and measurements

System LEDs

- Chassis Backlight (OS9900): active Blue
- CMM Backlight (OS99-CMM): active Blue
- 40G: active Green
- PRI: Primary active Green/ Secondary active Yellow
- VC: active Blue
- FAB: active Green
- PS: active Green
- TEMP: active Green
- CMM USB Type A: active Green link/ activity
- CMM EMP: active Green link/activity
- PWR Save: active Green (reserved for future use)

Per-port LEDs

- CMM 40G Uplink Mode: First LED active Green link/activity
- CMM 40G VFL Mode: First LED active Blue link/activity
- CMM 10G Uplink Mode: All LEDs active Yellow link/activity
- CMM 10G VFL Mode: All LEDs active Blue link/activity
- 1G: active Green link/activity
- 1G PoE enabled: active Yellow link/activity
- 10G: active Green link/activity

COMPLIANCE AND CERTIFICATIONS

EMI/EMC - Commercial

- FCC 47 CFR Part 15 Class A
- ICES-003 Class A
- CE marking for European countries (Class A)
- EMC Directive 89/336/EEC
- EN55022:1998:2006 Class A
- EN55024:1998:A1: 2001+A2:2003
- EN61000-3-2
- EN61000-3-3
- EN61000-4-2
- EN61000-4-3

- EN61000-4-4
- EN61000-4-5
- EN61000-4-6
- EN61000-4-8
- EN61000-4-11
- CISPR22:1997 (Class A)
- VCCI (Class A)
- AS/NZS 3548 (Class A)
- IEEE 802.3 Hi-Pot requirement and 1.5 kV surge on data port for copper interfaces

Safety agency certifications

- US UL 60950
- IEC 60950-1:2001; all national deviations
- EN 60950-1: 2001; all deviations
- CAN/CSA-C22.2 No. 60950-1-03
- AS/NZ TS-001 and 60950:2000, Australia
- UL-AR, Argentina
- UL-GS Mark, Germany
- GOST, Russian Federation
- EN 60825-1 Laser
- EN 60825-2 Laser
- CDRH Laser

SUPPORTED STANDARDS

IEEE standards

- IEEE 802.1D STP
- IEEE 802.1p CoS
- IEEE 802.1Q VLANs
- IEEE 802.1ad Provider Bridges Q-in-Q/ VLAN stacking
- IEEE 802.1ak Multiple VLAN Registration Protocol (MVRP)
- IEEE 802.1aq Shortest Path Bridging (SPB)
- IEEE 802.1s MSTP
- IEEE 802.1w RSTP
- IEEE 802.1X Port-based Network Access Control (PNAC).
- IEEE 802.3x Flow Control
- IEEE 802.3i 10Base-T
- IEEE 802.3u Fast Ethernet
- IEEE 802.3z 1 GigE
- IEEE 802.3ab 1 GBase-T
- IEEE 802.3af Power over Ethernet
- IEEE 802.3at PoE Plus
- IEEE 802.3ac VLAN Tagging
- IEEE 802.3ad/802.1AX Link Aggregation
- IEEE 802.3ae 10 GigE
- IEEE 802.3an 10 GBase-T
- IEEE 802.3az Energy Efficient Ethernet (EEE)
- IEEE 802.3ba 40 GigE

ITU-T recommendations

- ITU-T G.8032/Y.1344 2010: Ethernet Ring Protection (ERPv2)

ANSI recommendations

- ANSI TIA-1057 LLDP-MED Support

IETF RFCs

IPv4

- RFC 2003 IP/IP Tunneling
- RFC 2784 GRE Tunneling
- RFC 2131 Dynamic Host Configuration Protocol (DHCPv4)

OSPF

- RFC 1765 OSPF Database Overflow
- RFC 1850/2328 OSPF v2 and MIB
- RFC 2154 OSPF MD5 Signature
- RFC 2370/3630 OSPF Opaque LSA
- RFC 3101 OSPF NSSA Option
- RFC 3623 OSPF Graceful Restart
- RFC 2740 OSPFv3 for IPv6

RIP

- RFC 1058 RIP v1
- RFC 1722/1723/2453/1724 RIP v2 and MIB
- RFC 1812/2644 IPv4 Router Requirements
- RFC 2080 RIPng for IPv6

BGP

- RFC 1269/1657/4273 BGP v3 and v4 MIB
- RFC 1403/1745 BGP/OSPF Interaction
- RFC 1771-1774/2842/2918/3392/4271 BGP v4
- RFC 1965 BGP AS Confederations
- RFC 1966 BGP Route Reflection
- RFC 1997/1998/4360 BGP Communities Attribute
- RFC 2042/5396 BGP New Attribute
- RFC 2385 BGP MD5 Signature
- RFC 2439 BGP Route Flap Damping
- RFC 2545 BGP-4 Multiprotocol Extensions for IPv6 Routing
- RFC 2858/4760 Multiprotocol Extensions for BGP-4
- RFC 3065 BGP AS Confederations
- RFC 4456 BGP Route Reflection
- RFC 4486 Subcodes for BGP Cease Notification
- RFC 4724 Graceful Restart for BGP
- RFC 5492/5668/6793 BGP 4-Octet ASN
- RFC 3392/5492 Capabilities Advertisement with BGP-4
- RFC 5396/5668/6793 BGP 4-Octet ASN and Textual Representation of ASN

IS-IS

- RFC 1142/1195/3719/3787/5308 IS-IS v4
- RFC 2763/2966/3567/3373 Adjacencies and route management
- RFC 5120 M-ISIS: Multi Topology IS-IS

- RFC 5306 Graceful Restart
- RFC 5309/draft-ietf-isis-igp-p2p-over-lan Point to point over LAN
- RFC 6329 IS-IS Extensions Supporting IEEE 802.1aq SPB

IP Multicast
- RFC 1075 DVMRP
- RFC 2365 Multicast
- • RFC 2710/3019/3810/MLD v2 for IPv6
- RFC 2715 PIM and DVMRP interoperability
- RFC 2933 IGMP MIB
- RFC 3376 IGMPv3 (includes IGMP v2/v1)
- RFC 3569 Source-Specific Multicast (SSM)
- RFC 3973 Protocol Independent Multicast-Dense Mode (PIM-DM)
- RFC 4087 IP Tunnel MIB
- RFC 4541 Considerations for IGMP and MLD Snooping Switches
- • RFC 2362/4601/5059 PIM-SM
- RFC 5015 BiDIR PIM
- RFC 5060 Protocol Independent Multicast MIB
- RFC 5240 PIM Bootstrap Router MIB
- RFC 5132 Multicast Routing MIB

IPv6
- RFC 1981 Path MTU Discovery
- RFC 2460 IPv6 Specification
- RFC 2464 IPv6 over Ethernet
- RFC 2465 MIB for IPv6: Textual Conventions (TC) and General Group
- RFC 2466 MIB for IPv6: ICMPv6 Group
- RFC 2711 Router Alert Option
- RFC 3056 6to4 Tunnels
- RFC 3315 Dynamic Host Configuration Protocol for IPv6 (DHCPv6)
- RFC 3484 Default Address Selection
- RFC 3493/2553 Basic Socket API
- RFC 3542/2292 Advanced Sockets API
- RFC 3587/2374 Global Unicast Address Format
- RFC 3595 TC for IPv6 Flow Label
- RFC 3596/1886 DNS for IPv6
- RFC 4007 Scoped Address
- RFC 4022/2452 MIB for IPv6 TCP
- RFC 4113/2454 MIB for IPv6 UDP
- RFC 4193 Unique Local Addresses
- RFC 4213/2893 Transition Mechanisms
- RFC 4291/3513/2373 Addressing Architecture (uni/any/multicast)
- RFC 4301/2401 Security Architecture
- RFC 4302/2402 IP Authentication Header
- RFC 4303/2406 IP Encapsulating Security Payload (ESP)

- RFC 4308 Cryptographic Suites for IPsec
- RFC 4443/2463 ICMPv6
- RFC 4861/2461 Neighbor Discovery
- RFC 4862/2462 Stateless Address Auto-configuration
- RFC 5095 Deprecation of Type 0 Routing Headers in IPv6

Manageability
- RFC 854/855 Telnet and Telnet options
- RFC 959/2640 FTP
- RFC 1350 TFTP Protocol
- RFC 1155/2578-2580 SMI v1 and SMI v2
- RFC 1157/2271 SNMP
- RFC 1212/2737 MIB and MIB-II
- RFC 1213/2011-2013 SNMP v2 MIB
- RFC 1215 Convention for SNMP Traps
- RFC 1573/2233/2863 Private Interface MIB
- RFC 1643/2665 Ethernet MIB
- RFC 1867 Form-based File Upload in HTML
- RFC 1901-1908/3416-3418 SNMP v2c
- RFC 2096 IP MIB
- RFC 2131 DHCP Server/Client
- RFC 2388 Returning Values from Forms: multipart/form-data
- RFC 2396 Uniform Resource Identifiers (URI): Generic Syntax
- RFC 2570-2576/3410-3415/3584 SNMP v3
- RFC 2616 /2854 HTTP and HTML
- RFC 2667 IP Tunneling MIB
- RFC 2668/3636 IEEE 802.3 MAU MIB
- RFC 2674 VLAN MIB
- RFC 3023 XML Media Types
- RFC 3414 User-based Security Model
- RFC 4122 A Universally Unique IDentifier (UUID) URN Namespace
- RFC 4234 Augmented BNF for Syntax Specifications: ABNF
- RFC 4251 Secure Shell Protocol Architecture
- RFC 4252 Secure Shell (SSH) Authentication Protocol
- RFC 4627 JavaScript Object Notation (JSON)
- RFC 6585 Additional HTTP Status Codes

Security
- RFC 1321 MD5
- RFC 2104 HMAC Message Authentication
- RFC 2138/2865/2868/3575 /2618 RADIUS Authentication and Client MIB
- RFC 2139/2866/2867/2620 RADIUS Accounting and Client MIB

- RFC 2228 FTP Security Extensions
- RFC 2284 PPP EAP
- RFC 2869/2869bis RADIUS Extension
- RFC 4301 Security Architecture for IP
- RFC 1826/1827/4303/4305 Encapsulating Payload (ESP) and crypto algorithms

QoS
- RFC 896 Congestion Control*
- RFC 1122 Internet Hosts
- RFC 2474/2475/2597/3168/3246 DiffServ
- RFC 3635 Pause Control*
- RFC 2697 srTCM*
- RFC 2698 trTCM*

Others
- RFC 791/894/1024/1349 IP and IP/Ethernet
- RFC 792 ICMP
- RFC 768 UDP
- RFC 793/1156 TCP/IP and MIB
- RFC 826 ARP
- RFC 919/922 Broadcasting Internet Datagram
- RFC 925/1027 Multi-LAN ARP/Proxy ARP
- RFC 950 Subnetting
- RFC 951 BOOTP
- RFC 1151 RDP
- RFC 1191 Path MTU Discovery
- RFC 1256 ICMP Router Discovery
- RFC 1305/2030 NTP v3 and Simple NTP
- RFC 1493 Bridge MIB
- RFC 1518/1519 CIDR
- RFC 1541/1542/2131/3396/3442 DHCP
- RFC 1757/2819 RMON and MIB
- RFC 2131/3046 DHCP/BootP Relay
- RFC 2132 DHCP Options
- RFC 2251 LDAP v3
- RFC 2338/3768/2787 VRRP and MIB
- RFC 3021 Using 31-bit Prefixes
- RFC 3060 Policy Core
- RFC 3176 sFlow
- IETF draft "IP/IPVPN services with IEEE 802.1aq SPB networks"
- RFC 4562 MAC-Forced Forwarding

Software Defined Networking (SDN)
- OpenFlow Switch Specification, Version 1.3.1*
- OpenFlow Switch Specification, Version 1.0.0*

*Feature capabilities will be supported in future AOS release.

CHASSIS MODEL

OMNISWITCH 9907	
Number of modular slots	11 (Front accessible 7 slots + Rear accessible 4 slots)
Management module slots (CMM)	2
Network interface slots (NI)	6 (Slot 2 is universal; accommodates CMM or NI, limited to 160 Gb/s aggregate switching capacity)
Fabric module slots (CFM)	4 (Bays marked CFM 3 and CFM 4 inactive; reserved for future use)
Fan tray slots	3
Current switching capacity per CMM (b/s / pps)	160 Gb/s Aggregate / 128 Mpps
Current switching capacity per 1 G NI (b/s / pps)	96 Gb/s Aggregate / 77 Mpps
Current switching capacity per 10 G NI (b/s / pps)	960 Gb/s Aggregate / 767 Mpps
Power supply (AC/DC) slots	4
Height (19-in. and 23-in. rack mount)	11U
Dimensions (HxWxD)	49.02 x 44.2 x 58.42 cm (19.3 x 17.4 x 23 in)
Weight (RCB)	32.83 kg (72.24 lb)
ENVIRONMENT	
Operating temperature	0°C to 45°C (32°F to 113°F)
Storage temperature	-20°C to 70°C (-4°F to 158°F)
Operating humidity	10% to 90% (non-condensing)
Storage humidity	10% to 95% (non condensing)
Max operating altitude	4000m/13,000 feet

NETWORK INTERFACE CHARACTERISTICS

MODEL NUMBERS	CPU	MEMORY	PORT COUNT	INTERFACE TYPE
OS99-CMM	Intel® Rangeley Quad core, 1.7 GHz, 64-bit	16 GB SDRAM, 2 GB eUSB Flash*, 32 Mb packet buffer	6	USB Type-A, EMP** RJ-45, Console RJ-45/ micro-USB, QSFP+
OS9907-CFM	N/A	N/A	0	N/A
OS99-GNI-48	Intel Rangeley Dual core, 1.7 GHz, 64-bit	8 GB SDRAM, 32 Mb packet buffer	48	10/100/1000Base-T
OS99-GNI-P48	Intel Rangeley Dual core, 1.7 GHz, 64-bit	8 GB SDRAM, 32 Mb packet buffer	48	10/100/1000Base-T PoE
OS99-XNI-48	Intel Rangeley Dual core, 1.7 GHz, 64-bit	8 GB SDRAM, 192 Mb packet buffer	48	1/10 GigE Base-T
OS99-XNI-U48	Intel Rangeley Dual core, 1.7 GHz, 64-bit	8 GB SDRAM, 192 Mb packet buffer	48	1/10 GigE SFP+

*eUSB Flash for storing switch configuration, monitoring logs and AOS images etc.
**EMP (Ethernet Management Port) for out-of-band management

POWER SUPPLIES

MODEL NUMBERS	MAX WITH 1 PSU	INPUT VOLTAGE/ CURRENT	MAX OUTPUT POWER/CURRENT	DIMENSION (HXWXD)	WEIGHT
OS99-PS-A	3K Watts	100 V AC (13.8A) to 240 V AC (16.5 A)	1200 W/21.4 A 3000 W/53.5 A	1.63 in x 4 in x 17.2 in	4.8 lb (2.18 kg)
OS99-PS-D	2.5K Watts	-40 V DC to -72 V DC	2500 W/44.6 A	1.63 in x 4 in x 17.2 in	4.6 lb (2.1 kg)

The OmniSwitch 9900 platform is capable of supporting MACsec, IEEE 1588 PTP transparent clock, Multiprotocol Label Switching (MPLS), Virtual Extensible LAN (VXLAN) and IEEE Data Center Bridging (DCB) for lossless Ethernet. The software to support these features is a future availability.

ORDERING INFORMATION

Chassis and power supply

MODEL NUMBER	DESCRIPTION
OS9907-CHAS	OS9900 11-slot chassis with 7 front accessible CMM/NI slots and 4 rear accessible fabric slots. Includes 3 x fan trays - 5 dedicated slots for any OS9900 network interfaces modules, 1 dedicated slot for CMM (management module), 1 hybrid slot for either CMM OR network interface module, 4 dedicated slots for CFMs (switch fabric module), 4 power supply bays.
OS9907-CB-A-XX	OS9907 base bundle with AC power and SSL (DES, 3DES, RC2, RC4). Base bundle includes 1 x OS9907 Chassis with 3 x Fan Trays, 1 x OS99-CMM management module, 1 x OS9907-CFM fabric module, 1 x OS99-PS-A power supply, and fully featured AOS software w/ advanced IP routing SW (IPv4/IPv6). XX country specific power cord designator.
OS9907-CB-D	OS9907 base bundle with DC power and SSL (DES, 3DES, RC2, RC4). Base bundle includes 1 x OS9900 Chassis with 3 x Fan Trays, 1 x OS99-CMM management module, 1 x OS9907-CFM fabric module, 1 x OS99-PS-D power supply, and fully featured AOS software w/ advanced IP routing SW (IPv4/IPv6).
OS9907-RCB-A-XX	OS9907 redundant bundle with AC power and SSL (DES, 3DES, RC2, RC4). Redundant bundle includes 1 x OS9900 Chassis with 3 x Fan Trays, 2 x OS99-CMM management module, 2 x OS9907-CFM fabric module, 2 x OS99-PS-A power supplies, and fully featured AOS software w/ advanced IP routing SW (IPv4/IPv6). XX country specific power cord designator.
OS9907-RCB-D	OS9907 redundant bundle with DC power and SSL (DES, 3DES, RC2, RC4). Redundant bundle includes 1 x OS9900 Chassis with 3 x Fan Trays, 2 x OS99-CMM management module, 2 x OS9907-CFM fabric module, 2 x OS99-PS-D power supplies, and fully featured AOS software w/ advanced IP routing SW (IPv4/IPv6).
OS9907-FAN-TRAY	OS9907 Fan Tray. Spare.
OS99-PS-A-XX	OS9900 series AC power supply. Provides up to 3KW of power, auto-ranging 110VAC-240VAC. XX country specific power cord designator.

Management and switching fabric modules

MODEL NUMBER	DESCRIPTION
OS99-CMM	OS9900 Chassis Management Module w/SSL (DES, 3DES, RC2, RC4). The OS99-CMM includes a processor module, 2x 40G QSFP ports and AOS software w/ advanced IP routing SW (IPv4/IPv6).
OS9907-CFM	OS9900 Chassis Fabric Module. OS9907-CFM provides inter switch fabric.

Network interface cards

MODEL NUMBER	DESCRIPTION
GIGABIT MODULES	
OS99-GNI-48	OS9900 Gigabit network interface card offers 48 wirerate RJ-45 10/100/1000M Base-T ports. This Enhanced network interface card is MPLS, MACSEC ready, and provides large table support for L2, L3, and ACL policies.
OS99-GNI-P48	OS9900 Gigabit network interface card offers 48 wirerate RJ-45 10/100/1000M Base-T ports with PoE. This Enhanced network interface card is MPLS, MACSEC ready, and provides large table support for L2, L3, and ACL policies.
10 GIGABIT MODULES	
OS99-XNI-48	OS9900 10 Gigabit network interface card offers 48 wirerate RJ-45 10GBase-T ports. This Enhanced network interface card is MPLS, MACSEC ready, and provides large table support for L2, L3, and ACL policies.
OS99-XNI-U48	OS9900 10 Gigabit network interface card offers 48 wirerate unpopulated SFP+ 1/10 GbE ports. This Enhanced network interface card is MPLS, MACSEC ready, and provides large table support for L2, L3, and ACL policies.
SOFTWARE LICENSE	
OS99-SW-A	Advanced Software for support of SPB, Auto-Fabric on OS9900. One license required per chassis.
GE TRANSCEIVERS	
SFP-GIG-T	1000Base-T Gigabit Ethernet Transceiver (SFP MSA). SFP works at 1000 Mb/s speed and full-duplex mode.
SFP-GIG-SX	1000Base-SX Gigabit Ethernet optical transceiver (SFP MSA).
SFP-GIG-LX	1000Base-LX Gigabit Ethernet optical transceiver (SFP MSA).
SFP-GIG-LH40	1000Base-LH Gigabit Ethernet optical transceiver (SFP MSA). Typical reach of 40 km on 9/125 µm SMF.
SFP-GIG-LH70	1000Base-LH Gigabit Ethernet optical transceiver (SFP MSA). Typical reach of 70 km on 9/125 µm SMF.
10 GE SFP+ TRANSCEIVERS	
SFP-10G-SR	10 Gigabit optical transceiver (SFP+). Supports multimode fiber over 850 nm wavelength (nominal) with an LC connector. Typical reach of 300 m
SFP-10G-LR	10 Gigabit optical transceiver (SFP+). Supports monomode fiber over 1310 nm wavelength (nominal) with an LC connector. Typical reach of 10 km
SFP-10G-ER	10 Gigabit optical transceiver (SFP+). Supports monomode fiber over 1550 nm wavelength (nominal) with an LC connector. Typical reach of 40 km
SFP-10G-ZR	10 Gigabit optical transceiver (SFP+). Supports data transmission at 1550nm over up to 80km single mode fiber. LC connector type.
SFP-10G-LRM	10 Gigabit optical transceiver (SFP+). Supports multimode fiber over 1310 nm wavelength (nominal) with an LC connector. Typical reach of 220 m on FDDI-grade (62.5µm)
SFP-10G-GIG-SR	Dual-speed SFP+ optical transceiver. Supports multimode fiber over 850nm wavelength (nominal) with an LC connector. Supports 1000BaseSX and 10GBASE-SR
SFP-10G-24DWD80	10 Gigabit DWDM optical transceiver (SFP+ MSA), 1558.17 nm/Channel 24 (100GHz ITU Grid), 80 km, LC Connector.
10 GE SFP+ DIRECT ATTACHED CABLES	
SFP-10G-C1M	10 Gigabit direct attached copper cable (1 m, SFP+).
SFP-10G-C3M	10 Gigabit direct attached copper cable (3 m, SFP+).
SFP-10G-C7M	10 Gigabit direct attached copper cable (7 m, SFP+).

40 GE QSFP+ TRANSCEIVERS	
QSFP-40G-SR	Four channel 40 Gigabit optical transceiver (QSFP+). Supports link lengths of 100 m and 150 m, respectively, on OM3 and OM4 multimode fiber cables.
QSFP-40G-LR	Four channel 40 Gigabit optical transceiver (QSFP+). Supports single mode fiber over 1310nm wavelength. Typical reach 10 km
QSFP-4X10G-SR	40 Gigabit to 4 x 10 Gigabit Multifiber Push-On (MPO) fiber splitter transceiver
40 GE QSFP+ DIRECT ATTACHED CABLES	
QSFP-40G-C1M	40 Gigabit direct attached copper cable (1 m, QSFP+).
QSFP-40G-C3M	40 Gigabit direct attached copper cable (3 m, QSFP+).
QSFP-40G-C7M	40 Gigabit direct attached copper cable (7 m, QSFP+).
QSFP-4X10G-C1M	40 Gigabit to 4 x 10 Gigabit direct attached copper splitter cable (1m, QSFP+)
QSFP-4X10G-C3M	40 Gigabit to 4 x 10 Gigabit direct attached copper splitter cable (3m, QSFP+)
QSFP-4X10G-C5M	40 Gigabit to 4 x 10 Gigabit direct attached copper splitter cable (5m, QSFP+)

Please replace the "-xx" in the part number with the country-specific power cord (for example, OS9907-RCB-A-US comes with a power cord for the US, -UK for the United Kingdom). We offer 11 different power cord options. See the price list for the official power cord options offered.

WARRANTY

Limited warranty to the original owner of one year on hardware and 90 days on software.

SERVICE AND SUPPORT

For more information about our Professional services, Support services, and Managed services, please go to http://enterprise.alcatel-lucent.com/?services=EnterpriseServices&page=directory

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