ETHERNET ACCESS SOLUTIONS

Datasheet

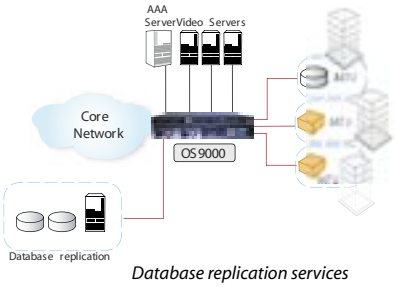
OptiSwitch 9000 Metro Ethernet Series

Overview

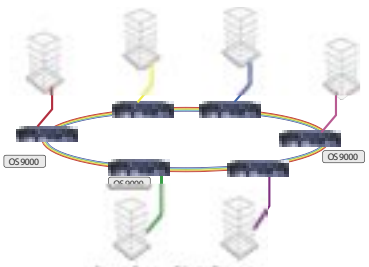
The OptiSwitch® 9000 series is an intelligent, versatile, and powerful carrier-class/metro Ethernet platform with a comprehensive traffic management suite. Distributive software and hardware architecture along with the incorporation of cutting-edge technology enable it to meet current and future needs. Robust and highly flexible, it can readily be applied to provide Ethernet IP multimedia services, intelligent Layer 2 switching, and advanced QoS to enable metro-optimized Service Level Agreements.
Product offering:

- Metro Ethernet E-Line and E-LAN services
- Multi-field classification of packets at Layers 2, 3, and 4
- QoS compliance to latest IETF standards
- Advanced routing engine with IGP and EGP protocols
- High availability protocols at Layers 2 and 3
- Robust Master-OS™ software for current and future services

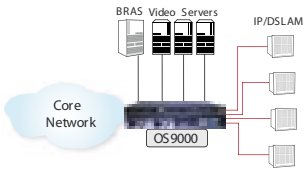
The OptiSwitch® 9000 series is designed as a high-end optical aggregation switching platform for telecommunications applications and is suited for next generation inter-converged IP and Ethernet networks.
The product line is targeted for providers' Central Offices, street cabinets, and Multi-Tenant Units (MTUs) and is the ideal solution for deployments especially where utilization of minimal rack space is critical.



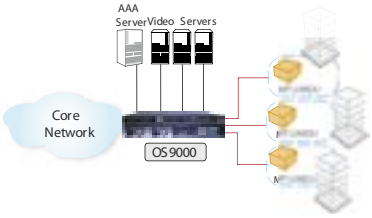
Database replication services



Wavelength and inteligent muxing



IP DSLAM optical aggregation



Multimedia aggregation services

Features

Hardware

- Small form factor (2U high) – ideal for small and medium Point-of-Presence installations
- Efficient rack space-saving form factor with front facing ports and power supplies
- Aggregation flavors :
  - 24 GigE SFP ports + 4GigE Dual PHY
  - 24 FX SFP + 4 GigE Dual PHY
  - 24 GigE copper + 12 GigE Dual PHY SFPs
- Hot-swappable SFP optics support SX, LX, ZX and xWDM
- MS-9000 multi-service slot for optional Optical Add-Drop and wavelength Multiplexing
  - Wavelength services (physical separation) between dispersed MTU sites
- AC and/or DC redundant (1+1) hot-swappable load sharing power supplies
- Environmental monitoring with built-in temperature sensing
- Optical performance monitoring via SFPs
- Support for jumbo frames up to 9K bytes
- Designed to meet NEBS/ETSI

Software

- IP Service Delivery
  - Complete routing set of IGP and EGP protocols
  - Virtual Router Redundancy Protocol (VRRP)
  - Software based NAT, PAT, and SNAT (Internal IP header translation)
- IP Multicast Services
  - IGMP v1/v2/v3
  - Multicast router functionality PIM SM
- Intelligent Layer 2 switching - Provider bridges concept
  - Customer VLAN and Service VLAN (VLAN and CoS preservation)
  - Multicast, Broadcast service control, delivery, and filtering
  - Layer 2 control protocols (discard and tunnel) processing
  - Ethernet OAM (Ethernet Operation, Administration, and Management)
  - Fault tolerance and Loop protection
- Multiple Instance Spanning Tree Protocol (802.1s)
- Link Aggregation (802.3ad)
- Classification and Marking
  - VLAN priority/IP Type of Service/MPLS EXP
- Class-aware bandwidth profiles
  - Per Inbound Interface service
  - Per VLAN/subscriber service
  - Per Class (CoS ID) service
  - Layer 3 and/or Layer 4 packet headers
- Statistics per subscriber
  - Statistics used by subscriber/VLAN service or per application class
  - Counters per physical port per CoS
  - Counters per queue
- Security ACLs (Access control and Layer 2 filtering)
  - Enhanced secure management
  - IP auto-configuration services (DHCP server, client, and relay)
- Security logs/traps

Applications

- Service Demarcation – Fiber-To-The-Neighborhood (FTTN)
- IP DSLAM Gigabit Ethernet Optical Aggregation
- Intelligent Service Multiplexing
- Multiple Ethernet Services on single UNI
- Ethernet Virtual Circuit to provider network
- Bandwidth-on-demand provisioning per class/subscriber (rate limit & shaping)
- Point-to-point and multi-point Layer 2 services for business subscribers
  - E-Line services
  - E-LAN services

System Architecture

OptiSwitch® 9000 series is a high-performance system with non-blocking hardware and software architecture engineered for deployment in new demanding Ethernet network environments to support the provider's value-added services offering. The platform offers a unique combination of features and optical interfaces that enable easy and flexible field configurations while making it ideal for maintenance and inventory.

Back-to-back installation in Telco racks

The OptiSwitch® 9000 series' 12-inch deep design enables the installation of two systems, back-to-back in standard 19-inch Telco racks. This feature enables doubling the 'port-per-rack' density.

Front facing system configuration

This feature eliminates the need to dismount the system for maintenance or installation of new hardware following initial installation.

Fiber guard/protection tray

The front fiber tray is indented in relation to the power supplies to allow additional space for connectors and cabling to be conveniently connected to the rack. This indentation is ideal for installations of high-density fiber optic cables, where connector space is critical for connector integrity.

Optical SFP interfaces

SFP interfaces provide unmatched deployment flexibility to enable versatile multimode, singlemode, and single fiber connections, or even shared physical fiber CWDM or DWDM connections – simply by means of the use of a specific SFP. In addition, the OptiSwitch® 9000 series offers the optional MuliService optical WDM module (MS9-OADM8) for Add/Drop and aggregation from its optical interfaces to a single outgoing fiber.
Such a function offers better fiber utilization and physical services separation with dedicated Gigabit rate for premium services for businesses that are geographically dispersed.

SFP Optical Performance Monitoring (OPM)

The OptiSwitch® 9000 series supports the SFP digital diagnostics standard, providing a powerful Optical Performance Monitoring(OPM) tool for accessing a number of real-time SFP operating parameters. The information provided by the digital diagnostics, along with alarm and warning thresholds, enables a network administrator to identify potential problems in optical transmission and take preemptive action before any service outage actually occurs.

OptiSwitch® 9000 Quality of Service

Carriers can offer different types of traffic/services carried into IP/Ethernet networks with better control in order to reduce the load from their core networks, using the following features:

- Layer 2-4 packet classification using QoS access control entries
- CoS mapping between layers (802.1p, IP ToS or EXP MPLS)
- Traffic management using ingress policing and egress traffic shaping
- Bandwidth enforcement per flow: single /dual rate tree-color marking
- Congestion management – Scheduling of flows to interfaces
- Congestion avoidance – WRED and RED

The OptiSwitch® 9000 series enables a value-added network infrastructure, with end-to-end QoS. The OptiSwitch® 9000 advanced ASIC design supports full CoS and QoS including classification, rate limiting, shaping, weighted round-robin scheduling, and strict priority for lower delay, low jitter and guaranteed throughput in real-time applications, including voice over IP, video-on-demand, and IP TV services. The network burst-control enforced by RED (Random Early Detection) and WRED (class based RED) congestion-avoidance mechanisms are able to monitor network traffic load, and discard packets at a stage sensed as a congestion threshold. The result of the drop is that the client side will detect the dropped traffic and will slow down transmission. For network convergence applications that have a clear boundary between customer's and carrier's network,s Layer 3 (IP ToS) and Layer 2 CoS (802.1p) can be mapped/marked to preserve priorities or map them into predefined profiles set by the carrier.

Security

The OptiSwitch® 9000 series offers advanced security capabilities that can provide protection against malicious attacks while enabling Authentication, Authorization and Accounting (AAA). The internal security engine can administer vast Access Lists and advanced features such as port security, and set of Layer 2-4 network traffic security policies.

Layer 2 security

- Management VLAN
- Isolation of Customer VLAN from Provider VLAN
- Layer 2 management protocols filtering and tunneling
- MAC flood protection security for partitioning and border control

Layer 2-4 profiles

- Access Lists – inspect each incoming packet and permit/deny according to predefined rules
- Rate limit for protection against denial-of-service attacks
- IP spoofing protection in ASIC – Filtering of incoming packets spoofed from an indirect network connection by an IP source

Access Control List (ACL) mechanisms

The OptiSwitch® 9000 ASIC-based technology enables a secure environment, preventing Denial of Service (DoS) attacks by using a range of layer-independent ACL together with QoS protective techniques such as rate limit for per-service based streams, source MAC address learning limit, and comprehensive IP ACL rules. Each Access list has an action rule that determines whether a packet will be forwarded or dropped in case of an unsuccessful hit. If a packet satisfies an ACL rule at any layer, various handling actions can be defined.

Statistics

The OptiSwitch® 9000 series enables the collection of extensive statistics and diagnostics to enable flexible billing, traffic planning and rapid troubleshooting. Thanks to this spectrum of statistics, service providers can better tune their network operation, in general, and bandwidth, in particular, and charge customers accordingly.
The spectrum includes:

- Statistics profiles (packets and bytes counters).
- Statistics used by subscriber/service (VLAN) or per class
- Counters per physical port per CoS
- Counters per queues

Management

The OptiSwitch® 9000 system can be managed out-of-band from a craft terminal with a Serial/RS-232 connection and inband from a TELNET/SSH or SNMP station. Using MRV's powerful SNMP management application, MegaVision®, all the devices on a network can be centrally and securely managed from a single host via a LAN or the World Wide Web. Central management by MegaVision™ allows the network managers to access their management elements via any browser console through an authentication control interface and to have complete control of an entire map of devices for configuration, performance analysis, and inventory control.

Enhanced management features

- Industry Standard Command Line Interface
- Out-of-band management – EIA-232 console
- In-band Management – Dedicated Ethernet RJ45 port
- TELNET, SSH v2, SNMPv1,v2c,v3, RMON (per-port Ethernet statistics, History, Alarms, and Events)
- Ping, Trace route, DNS lookup, TCP dump (built-in sniffer)
- Port mirroring/monitoring of ingress and egress traffic
- Management ACL for trusted connections
- Hierarchical administration policy
- RADIUS AAA for management sessions
- Statistics for accounting information
- Configuration load/save via FTP
- Remote firmware download via FTP
- NTP – Network Time Protocol
- Logging –Syslog
- Events Scheduler
  - Scheduling of execution of administrator-selected commands at times/dates
- Advanced Ethernet OA&M (discovery, continuity, and connectivity testing)
  - Virtual Cable Diagnostics (VCD™ copper TDR)
  - Optical performance management - Digital Diagnostics (SFPs MSA SFF-8472)
  - Layer 2 PING
  - Loopback
  - Service Assurance probes

OptiSwitch 9000 - Technical Specifications

Standard Sertified	UL-1950; CSA-22.2 No.950; FCC part 15 Class A;CE-89/336/EEC,73/23/EEC Designed to meet NEBS/ETSI
Environment	Operating Temp. : 0˚ to 40˚C / 32˚ to 104˚F
Humidity	95% maximum , non-condensing
Diagnostic LEDs	Power, Power RST, Temperature, FAN, Management, PS1 & PS2 Online / Active / Alarm Ports: Link, activity
Mounting	19-Inch Rack Mount ELARS-310C standard
Networking Standards Compatibility	IEEE 802.3z Gigabit Ethernet IEEE 802.3ab Gigabit Etehrnet Copper IEEE 802.3u Fast Ethernet IEEE 802.3 Ethernet IEEE 802.1q VLAN Tagging IEEE 802.1p Priority Queuing IEEE 802.1d Bridge/Spanning Tree IEEE 802.1w Rapid Spanning Tree IEEE 802.1s MSTP IEEE 802.1ad Draft Provider Bridges IEEE 802.3ad Link Aggregation IEEE 802.3x Flow Control RFC 2236 IGMP v2 RFC 2475 An Architecture for DiffServ RFC 2597 Assured Fw PHB Group RFC 768 UDP RFC 791 IP RFC 792 ICMP RFC 2131 DHCP server/relay RFC 793 TCP RFC 826 ARP RFC 1812 IP Router RFC 2338 VRRP RFC 1519 CIDR RFC 1058,2453, 2082 RIP v1,2 MD5 RFC 2328 OSPF interoperable with RFC 1583 RFC 1587 OSPF-NSSA RFC 1765 OSPF-DB Overflow RFC 2370 OSPF-Opaque LSA RFC 1771, 1772, 2439 BGP route flap RFC 3065 BGP-AS confederations RFC 2796,1966 BGP route reflection RFC 2842 BGP capabilities advertisement RFC 1997 BGP communities attribute RFC 2858 Multiprotocol BGP ISO-10589 IS-TO-IS RFC1195 OSI IS-IS for routing TCP/IP RFC2973 IS-IS Mesh Groups RFC 2918 BGP route refresh RFC 3031 MPLS Framework RFC 3032 MPLS label encoding RFC 3036 MPLS LDP RFC 3212 CR-LDP RFC 3037 LDP Applicability RFC 3209 RSVP-TE RFC 2702 Require ments for traffic engineering over MPLS RFC 3210 Applicability statement for extensions to RSVP for LSP tunnels Draft MARTINI -L2 circuit - trans - MPLS - 08 Draft MARTINI -L2 circuit - encap - MPLS - 04 RFC 854 Telnet RFC 783 TFTP RFC 959 FTP RFC 2865 RADIUS Authentication RFC 2866 RADIUS Accounting RFC 1591 DNS client RFC 1157 SNMP v1,2 RFC 2571,2572, 2573,2574,2575 SNMP v3 RFC 2863 IF.MIB RFC 1213 MIB II RFC 1284 Etherlike MIB RFC 1757 RMON 4 groups RFC 1724 RIP MIB RFC 1850 OSPF MIB RFC 1657 BGP MIB RFC 2787 VRRP
Physical Dimensions	Height: 2 U Size (W x D x H): 442x362.13x68.80 mm 17.5x14.25x2.6 Inch Weight: 7 Kg/15.4 lbs
Power (AC/DC)	AC Line Frequency 50-60 Hz DC Input Voltage Options -48VCD (-36VCD to 72VCD)
BTU (min/max) per hour	240 / 375
MTBF	175,915 HRS.@25˚C /77˚F
Chassis Power Consumption	Min. 150W Max. 180W

9000 Series Order Information

Product	Description
OS9000 Models	
OS9024-4C	OptiSwitch® 9000 Series multi-layer platform with 24 unpopulated 1000BaseX SFPs and 4 10/100/1000Base-T Combo (dual PHY) ports (Power supplies should be ordered separately)
OS9024FX-4GC	OptiSwitch® 9000 Series multi-layer platform with 24 unpopulated 100BaseX SFPs and 4 1000BaseX Combo (dual PHY) ports (Power supplies should be ordered separately)
OS9024-12C	OptiSwitch® 9000 Series multi-layer platform with 24 1000Base-T and 12 unpopulated 1000BaseX SFP Combo (dual PHY) ports (Power supplies should be ordered separately)
Pluggable Power Supplies	
EM9005-PS/AC	AC power supply for the OptiSwitch® 9000 Series (90-240V AC)
EM9005-PS/DC	DC power supply for the OptiSwitch® 9000 Series (-48V DC)
CWDM service modules	
MS9OADMxxyyzzww	4 CWDM wavelengths* OADM module for OS9000
MS9OADM3xxyyzz	3 CWDM wavelengths* OADM module for OS9000
MS9OADM2xxyy	2 CWDM wavelengths* OADM module for OS9000
MS9OADM1xx	1 CWDM wavelengths* OADM module for OS9000
MS9-Mux/Demux	8 wavelengths CWDM Multiplexer/Demultiplexer module for OS9000
Accessories	
MS9000-Blank	Blank panel for multi-service slot
MS9000-FG	Fiber guard tray for OS9000
Software Upgrade Packages **	
SW-UPG-9SL3	Enhanced IP software upgrade package for OptiSwitch® 9000 series (Master-OS™: OSPF, IS-IS, BGP4,ECMP, PIM-SM)
SW-UPG-9MPLS	Enhanced MPLS software upgrade package for OptiSwitch® 9000 series (Master-OS™: MPLS VC)

* xx,yy,zz,ww represents the two middle digits of the wavelength
** Denotes future release

Wavelength							
31 = 1310nm	33 = 1330nm	35 = 1350nm	37 = 1370nm	39 = 1390nm	41 = 1410nm	43 = 1430nm	45 = 1450nm
47 = 1470nm	49 = 1490nm	51 = 1510nm	53 = 1530nm	55 = 1550nm	57 = 1570nm	59 = 1590nm	61 = 1610nm