OptiSwitch® 900 Series - Carrier Ethernet Service Demarcation Devices

OS904

OS906

OS912

OS900

Product Highlights

- ○ **Carrier Ethernet service demarcation**
  - - MEF EPL, E-Line E-Tree & E-LAN services
  - - MEF 9, MEF14 & MEF21 certified
  - - Provider bridging or MPLS L2 VPN services
- ○ **Carrier-grade resiliency - sub 50ms recovery time**
- ○ **Hierarchical QoS for premium SLAs**
- ○ **End-to-end Service OAM to monitor SLAs**
- ○ **Multi-purpose interfaces at lower TCO**
  - - All ports can serve as UNI / E-NNI
- ○ **IPv6 future-proof (hardware enabled)**
- ○ **Unified Master-OS™ control plane in all models**
- ○ **MRV Pro-Vision® point-and- click software**
  - - End-to-end Service ProVisioning and Operation, Administration & Maintenance
- ○ **Temperature hardend models**

Applications

- ○ Business Ethernet Services
- ○ Mobile Backhaul Services
- ○ WAN Ethernet E-NNI Services

The OptiSwitch® 900 series is a compact carrier-class Ethernet Demarcation service unit. The OS900 enables premium manageable Ethernet services with extensive traffic management and end-to-end control for Service level conformance.

The OS900 series functions as a demarcation device at the customer premises and is owned by the service provider. It provides a carrier-to-customer User-Network Interface (UNI) that separates the carrier's WAN from the customer's LAN. The OS900 enables bandwidth limiting, security and monitoring of customer and network interfaces with clear visibility of LAN and WAN segments.

For inter-provider demarcation points, the OS900 serves as a demarcation device at the carrier-to-carrier on-net locations, and provides Network- Network interfaces (NNI) that separate two different service provider networks. In such an application, the OS900 Series enables Ethernet service delivery over multiple carrier transport networks with end-to-end visibility and control.
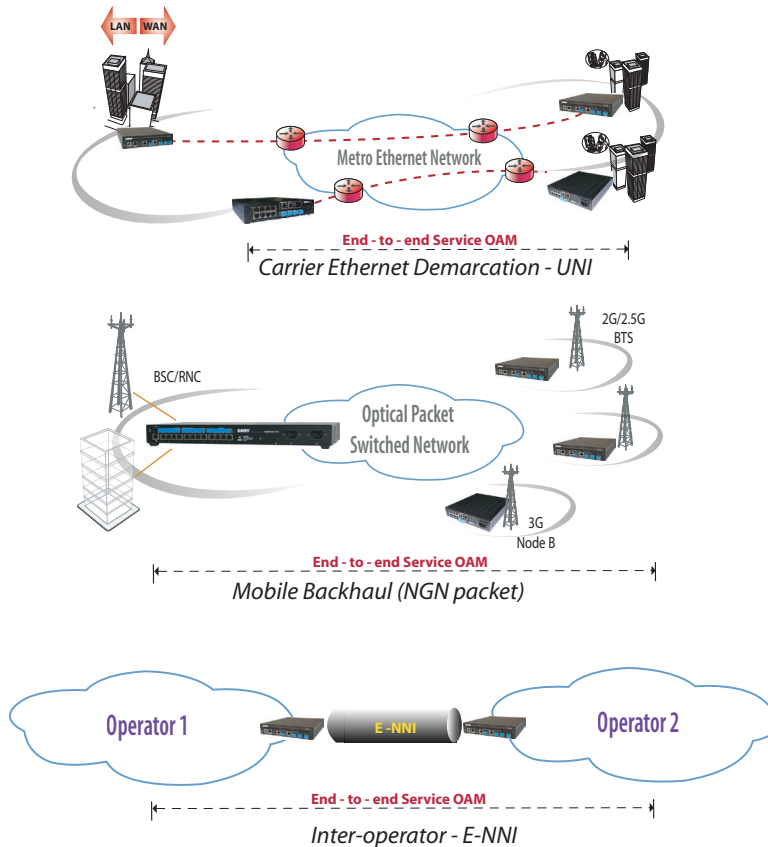The OS904 demarcation model has hardened versions for use in extreme temperature conditions (see technical specifications on the last page)

Carrier Ethernet Demarcation - UNI

Mobile Backhaul (NGN packet)

Inter-operator - E-NNI

Architecture

With its design based on state-of-the-art wire-speed technology, the OS900 series offers a futureproof solution for ILECs, IXCs, MSOs or green-field service providers to meet various business subscriber SLAs. A single OS900, serving as a demarcation device, can facilitate provisioning of revenue generating new value-added services thanks to its wide spectrum of service features.

Optical SFP interfaces

SFP interfaces provide unmatched deployment flexibility to enable versatile optical extensions from short-haul to long-haul singlemode, single fiber, or CWDM/DWDM connections – simply with the appropriate SFP.

For service providers who build next-generation optical networks, the consolidation of xWDM services with intelligent traffic forwarding on the same platform offers significant cost savings in capital expenditures.

The integration of CWDM and DWDM SFPs eliminates the need for a transponder on the network, and offers better fiber optimization along with physical services separation with dedicated Gigabit rate for premium optical services with the same concept of legacy "leased-line" services

VPN Services & Protection

Compliant to MEF Ethernet Virtual Circuit (EVC), the OS900 offers 3 types of VPN services:
1. Layer 1 Optical VPN – a cross-connect mode without MAC address learning
2. Layer 2 VPN – VLAN-based tunneling Q-in-Q stacking, swapping or mapping services
3. Layer 2.5 VPN – a label-based MPLS VC for direct connection into MPLS domains or H-VPLS MTU-s

All the above VPN services can be fully protected using port redundancy, dual-homing, and/or ring topology with a recovery time of less than 50 ms.

In addition to L2 VPN, the OS900 can offer integrated IP router services to save on costs of an external router and provides a single demarcation platform for managed L2 VPN and IP services.

Traffic Management

The OS900 enables a value-added network infrastructure, with end-to-end per flow QoS.

It supports full CoS and QoS (MEF 14 model) including classification of flows, rate limiting, shaping, WFQ scheduling, and strict priority for lower delay/jitter and guaranteed throughput in real-time applications. In addition, it enables dynamic/adaptive buffer pools to prevent bursty traffic starvation and ensure effectiveness of queuing resources.

For network convergence applications that have a clear boundary between customer's and carrier's networks, CoS layers (802.1p, IP ToS & MPLS EXP bits) can be mapped/marked to preserve priorities or mapped into predefined protection profiles preconfigured by the provider.

Hierarchical QoS – CoS-Aware Rate Limit

Defining premium SLAs is a key requirement for service differentiation.

The OS900 enables traffic management based on innovative CoS-aware rate limit to dynamically reuse bandwidth profiles. Dynamic QoS is an important feature that allows sharing of defined rate limited flows controlled by an aggregate profile applied to a user network interface or an EVC. In the new service offering, the consolidated real-time, high-priority and best effort data require different rates and marked class of service. Dynamic QoS helps to share/borrow the bandwidth that was allocated for real-time or high priority applications at a time when these services are not active. Such an offering contributes to a more efficient way of provisioning bandwidth at the access/demarcation of the network without complex configuration sets at the aggregation layer.

Denial of Service (DoS) Protection

The OS900 incorporates multilayer DoS protection at the hardware architecture on the CPU control plane and data-switching plane. to protect service and the device functionality from hostile traffic without causing degradation of service performance or affecting the forwarding database or CPU availability. Multiple traffic types can be policed or discarded starting from the frame level such as broadcast, multicast and going up to IP/TCP/UDP layers.

End-to-end Service ProVisioning and Operation, Administration & Maintenance

MRV's Pro-Vision® software enables complete easy-to-use GUI tools to provision and activate management of MEF services. Network monitoring is supported by real-time sampling and historical performance reporting for customer SLA. The system is carrier-grade UNIX-based supporting full FCAPS industry standards to ensure simplified interoperability with existing Operation Support Systems (OSSs) and 3rd party Network Management Systems (NMSs) through northbound protocols, such as CORBA, SNMP, TL1, HTTP and XML.

End-to-end OAM - IEEE802.1ag , ITU-T Y.1731, IP-SLA & RFC2544

The OS900 Series incorporates connectivity, discovery and fault management along performance statistics of delay, jitter and frame loss for demarcation and intermediate points of service.   OS900 series offers hardware-based SLA measurment tools at nano-second accuracy.

OS900 demarcation series is a standard-compliant and interoperable OAM solution that enables:
1. End-to-end Connectivity Fault Management per IEEE802.1ag
2. End-to-end Performance Measurement per ITU Y.1731
3. IP SLA with HW-based time stamping (IP-VPN measurements)
4. RFC2544 Layer 2 and 3 testing up to 1Gbps rate


Ethernet Loopbacks

The OS900 Series offers remote loopback functionality on a physical interface or a specific VLAN that traverses UNI and E-NNI interfaces. The loopback function allows for remote troubleshooting of services from NOC or any other manageable location without going to the customer's premises. Loopback functionality is hardware controlled to provide performance monitoring and SLA verification in wire-speed.

Copper TDR

The OS900 incorporates copper TDR that can identify problems with CAT5 copper cables on a customer's site such as opens, shorts, polarity mismatch, and impedance mismatch.

Optical Performance Level Monitoring (Digital Diagnostics)

The OS900 Series supports the SFP Digital Diagnostics standard (as per SFF-8472). Being a powerful OPM tool, it provides access to a number of real-time SFP operating parameters such as optical TX/RX power, voltage, and temperature, as well as component information such as vendor code, serial number and wavelength. The information provided by Digital Diagnostics, together 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.

MRV
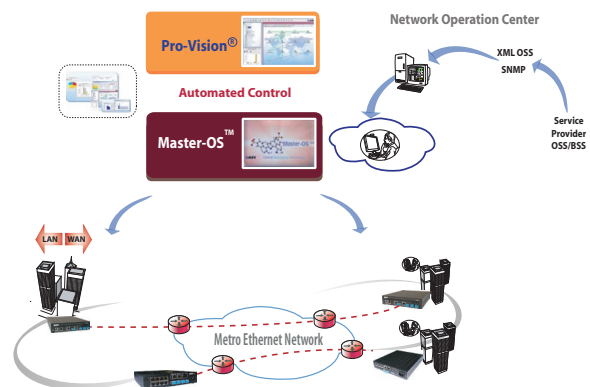
Per-service Performance Monitoring
The OS900 offers real-time and historical reporting on various service performance metrics, including port/VPN-EVC utilization, transmission errors, and QoS threshold exceptions.
Each service can be tracked for statistical information to help in base lining and troubleshooting traversing services. This capability enables users to verify service guarantees and increase network reliability by validating network performance. Performance monitoring uses pro-active monitoring to regulate traffic in a continuous, reliable, and predictable manner so as to enable measurement of network performance and health.

Link Fault Reflection/Propagation
The Link Reflection/Propagation mechanism provides notification on the integrity of a link from the network interface to the user interface even if the link extends through several OS900s.
Ethernet OAM CFM packets in native Ethernet services or PW-status TLVs in MPLS-based services can be used as vehicles of the mechanism.

Sniffer/Analyzer VLAN
The OS900 incorporates a powerful tool called Sniffer VLAN. This feature enables the operator to configure a dedicated sniffer VLAN for traffic analysis from a remote surveillance center. Sniffing on the OS900 can be set per specific customers' VLAN, per L2-3-4 fields or per learn table MAC address. The remote service monitoring conforms with interception processes based on requirements of Law Enforcement Monitoring.

Services Specifications

MEF Services
• UNI Type 1 and Type 2 - MEF21
• External-NNI & Internal-NNI
• EPL, E-Line, E-Tree & E-LAN – MEF9
• EPL, E-Line, E-Tree & E-LAN Traffic Mgt. – MEF14
• UNI Type 2 Link OAM - MEF21
• OAM Implementation Agreement (IA) – MEF17
• All interfaces can be configured as UNI / E-NNI

Packet Switching Services
• IEEE802.1Q and IEEE802.1ad provider bridges
    - 4K active VLANs / EVCs
    - Selective Q-in-Q stacking per ACL criteria
    - Customer VLAN switching over Service VLAN tunnel
    - Inner classification on double tagged frames
    - Configurable Ethertype values per port, VLAN
    - Private VLAN
    - 16,000 MAC addresses learn table
    - Jumbo Frame support up to 16,000 bytes
• Transparent cross-connect mode (no MAC learning)
    - Per System, per port or per EVC non-learning mode
• Learning table limit per VLAN/port
• Layer 2 control protocols tunneling / filtering
• UNI protected ports / Layer 1 filtering

Fiber ring and Link protection Services
• Sub 50ms recovery in ring and dual–homed topologies
• ITU-T G.8032 / Y.1344 Ethernet Ring Protection Switching
• IEEE MSTP IEEE802.1s
• Link Aggregation (LAG n+1) – static and LACP
    - Load balancing based on L2-3-4 headers
• Link level 1:1 Loss of Signal (LOS) protection
• CFM (OAM) messages for fault detection and link fallback
• Bi-directional Link Fault Reflection
• Link flap protection and damping
• Unidirectional Link Detection

Traffic Management
• Inbound & Outbound traffic management per flow/EVC
• In-service circuit parameters value changes (hitless ACL)
• Rate limit per flow or aggregate
    - Granular CIR/EIR rates up to 1Gbps
• Classification by L2-3-4 criteria and combinations
    - Physical port, MAC, Ethertype,
        double tagged VLAN, IP/TCP/UDP
• IEEE 802.1p (VPT), DiffServ (IPv4 & IPv6 TC)
• Marking/remarking profiles between layers
    - 802.1p, DSCP & MPLS EXP
• 8 hardware queues per port & configurable SL
• Per flow SLA metrics
    - per UNI, CoS, EVC, control protocols

Layer 2.5 Services (optional Master-OS™ SW)
• Ethernet over MPLS pseudowire with Traffic Engineering
• H-VPLS dual-homed spoke MTU-s (LER)
    - LDP, RSVP-TE, OSPF-TE, ISIS-TE, CSPF

Security
• Wire-speed ACLs on L2-3-4 headers
    - Up to 1K rules
    - Ingress and Egress ACLs
    - Multiple actions in single ACL
• MAC filters and MAC limit per port/per VLAN
• UNI Broadcast/Multicast/Unicast rate control
• Flood limit of OAM frames
• ARP rate control
• DHCP Options
• ACL for management sessions from NOC
• VACM – View-based Access Control Model
• IEEE802.1x security for port authentication

Management & Diagnostics Tools
• Industry Standard CLI
• Out-of-band management – EIA-232 console
• Out-of-band Ethernet management – Dedicated ETH port
• Telnet, SSH v2, SNMPv3, RMON (4 groups)
• Port mirroring - ingress & egress traffic to analyzer port / VLAN
• Remote service/flow mirroring per ACL – Sniffer VLAN
• Ping, Trace route, DNS lookup, TCP dump (built-in sniffer)
• Management ACL for trusted connections (Telnet/SSH/SNMP)
• Hierarchical Administration policy
• RADIUS / TACACS+ AAA for management sessions
• Configuration load/save with FTP or Secure Copy (SCP)
• NTP – Network Time Protocol
• Internal and Remote Syslog
• Scripting tool for macro configurations & maintenance
• Scheduler for automated execcution (single, several, or periodic) of preset administrator commands
• IPv6 management*

Standard OAM
• End-to-end Service OAM IEEE802.1ag
    - Connectivity Fault Management per service MEP/MIP
    - In-service EVC loopbacks, Linktrace & continuity check
• End-to-end Performance Measurement ITU-T Y.1731
• End-to-end IP SLA measurement
    - Jitter, Latency & Loss per service with nano-sec accuracy
• RFC2544 internal tester up to wire-speed throughput measurements
• EFM Link OAM IEEE802.3ah
    - discovery, port-loopback and dying gasp
• Optical signal level monitoring (SFP SFF-8472)
• Copper cable diagnostics TDR on RJ45 ETH ports
• Remote failure notification / reflection
    - Enables bi-directional link integrity (fault reflection)

Multicast and IP Services
• DHCP server/client/relay for remote auto-configuration
• Wire-speed multicast replication
• IGMP v1,v2 snooping , proxy and fast leave
• Multicast VLAN Registration (MVR) protocol
• Multicast routing PIM-SM
• Wire-speed IPv4 and IPv6* packet routing
    - RIP, OSPF, IS-IS, BGP-4, VRRP

* Future software release

Specifications	Services and Interfaces	OS904	OS906	OS912
	MEF Services and Certifications	EPL, E-Line, E-LAN, E-Tree; MEF 9, 14, 21	EPL, E-Line, E-LAN, E-Tree; MEF 9, 14, 21	EPL, E-Line, E-LAN, E-Tree; MEF 9, 14, 21
	Non-blocking architecture wire-speed forwarding	+	+	+
	All ports can serve as UNI / E-NNI	+	+	+
	10/100/1000Base-T or 100/1000Base-FX SFP	2	6	12
	100/1000Base-FX SFP	2		
	Hot Swappable SFP Optics	Short/Long Haul, Multi-rate, BX & WDM	Short/Long Haul, Multi-rate, BX & WDM	Short/Long Haul, Multi-rate, BX & WDM
	Power Supply A=AC, D=DC, Dual-Redundancy=2	A, D	A, D, 2A, 2D	2A, 2D

Technical Specifications

Standards compliance	This equipment is designed to comply with the following standards: IEC 60950-1:2005 (2nd Edition) and EN 60950-1; UL60950-1:2nd Edition; CSA C22.2 No.60950-1:2nd Edition; FCC Part 15 Class B; 2004/108/EC; 2006/95/EC. Class I laser products. Internal lasers comply with IEC 60 825-1:1993 + A1:1997 + A2:2001/EN60825-1:1994 + A1:1996 + A2:2001
Environment	Operating Temp: 0˚- 50˚C (32˚ - 122˚F) Storage Temp: -25˚ - 70˚C (-13˚ - 158˚F) - ETSI EN300-019 class 3.1 Temperature -hardened models: "E" for -10˚C to +65˚C (14˚ - 149˚F), "EXT" for -40˚C to 65 ˚C (-40˚ - 149˚F)
Humidity	85% maximum , non-condensing

MTBF

AC		DC	
OS904/AC-1:	283,000 Hrs @ 25˚C/77˚F	OS904/DC-1:	459,892 Hrs @ 25˚C/77˚F
OS904E/AC-1:	39,070 Hrs @ 65˚C/149˚F	OS904E/DC-1:	105,549 Hrs @ 65˚C/149˚F
OS904EXT/AC-1:	14,073 Hrs @ 65˚C/149˚F	OS904EXT/DC-1:	81,255 Hrs @ 65˚C/149˚F
OS904EXT/AC-1N:	14,073 Hrs @ 65˚C/149˚F	OS904/DC-1N:	505,083 Hrs @ 25˚C/77˚F
OS906/AC-1:	161,021 Hrs @ 25˚C/77˚F	OS906/DC-1:	386,477 Hrs @ 25˚C/77˚F
OS906/AC-2:	237,510 Hrs @ 25˚C/77˚F	OS906/DC-2:	407,513 Hrs @ 25˚C/77˚F
OS912-AC-2 :	252,266Hrs @ 25˚C/77˚F	OS912-DC-2:	311,756 Hrs @ 25˚C/77˚F

Performance	Non-blocking wire speed on all ports

Power Specifications

AC	DC
OS904/AC-1: 115V - 0.16A, 230V -0.08A (15W) - max.	OS904/DC-1: -48/60V 0.5A (15W) - max.
	OS904/DC-1N: -24/60V 1.0A (15W) - max.
OS904E/AC-1: 115V - 0.16A, 230V -0.08A (15W) - max.	OS904E/DC-1: -48/60V 0.5A (15W) - max.
OS904EXT/AC-1 & AC-1N : 220V +0.5A & 110V +1A 15W	OS904EXT/DC-1: -48/60V 3.5A (125W)- max
OS906/AC-1: 100V - 0.26A, 240V -0.13A (30W) - max.	OS906/DC-1: -48/60 V 0.8A (30W) - max.
OS906/AC-2: 115V - 0.30A, 230V -0.15A (36W) - max.	OS906/DC-2: -48/60 V 1.0A (36W) - max.
OS912-AC-2: 115V - 0.48A, 230V -0.24A (49W) - max.	OS912-DC-2: -48/60V 1.5A (49W) - max.

Physical dimensions WxDxH

OS904/AC-1	OS904/DC-1	219.6 x 265 x 43.65mm	(8.64 x 10.43 x 1.72 inch)
	OS904/DC-1N	219.6 x 265 x 43.65mm	(8.64 x 10.43 x 1.72 inch)
OS904E/AC-1	OS904E/DC-1	219.6 x 265 x 43.65mm	(8.64 x 10.43 x 1.72 inch)
OS904EXT/AC-1 & AC IN	OS904EXT/DC-1	219.6 x 265 x 43.65mm	(8.64 x 10.43 x 1.72 inch)
OS906/AC-1	OS906/DC-1	219.6 x 265 x 43.65mm	(8.64 x 10.43 x 1.72 inch)
OS906/AC-2	OS906/DC-2	443.0 x 204 x 43.65mm	(17.4 x 8.03 x 1.72 inch)
OS912-AC-2	OS912-DC-2	443.0 x 204 x 43.65mm	(17.4 x 8.03 x 1.72 inch)

Weight

AC		DC	
OS904/AC-1:	1.100kg	OS904/DC-1:	1.050kg
		OS904/DC-1N:	1.050kg
OS904E/AC-1:	1.250kg	OS904E/DC-1:	1.200kg
OS904EXT/AC-1:	2.200kg	OS904EXT/AC-1:	2.000kg
OS906/AC-1:	1.350kg	OS906/DC-1:	1.300kg
OS906/AC-2:	1.950kg	OS906/DC-2:	1.950kg
OS912/AC-2:	2.000kg	OS912/DC-2:	2.000kg

Order Info

OS900 Series

OS904/AC-1	Intelligent Ethernet Services Demarcation platform - 2 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T and 2x100FX/1000FX SFP, AC (90-240VAC) power supply. 19" bracket included.
OS904/DC-1	Intelligent Ethernet Services Demarcation platform - 2 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T and 2x100FX/1000FX SFP ports, DC (-48VDC) power supply. 19" bracket included.
OS904/DC-1N	Intelligent Ethernet Services Demarcation platform - 2 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T and 2x100FX/1000FX SFP ports, DC (-24VDC) power supply. 19" bracket included.
	For OS904 with high temperature support, add "E" or "EXT" to "OS904". Example: OS904/DC-1 (regular) OS904EXT/DC-1 (hardened). For 24VDC or 110VEC add the suffix "N"
OS906/AC-1	Intelligent Ethernet Services Demarcation platform - 6 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T, AC (90-240VAC) power supply. 19" bracket included
OS906/AC-2	Intelligent Ethernet Services Demarcation platform - 6 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T, dual redundant AC (90-240VAC) power supply. 19" bracket included
OS906/DC-1	Intelligent Ethernet Services Demarcation platform - 6 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T, DC (-48VDC) power supply. 19" bracket included
OS906/DC-2	Intelligent Ethernet Services Demarcation platform - 6 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T, dual redundant DC (-48VDC) power supply. 19" bracket included
OS912-AC-2	Intelligent Ethernet Services Demarcation platform - 12 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T ports, 19" bracket included, Dual redundant AC (90-240 VAC) power supply
OS912-DC-2	Intelligent Ethernet Services Demarcation platform - 12 Tri-mode 100FX/1000FX SFP or RJ45 10/100/1000Base-T ports, 19" bracket included, Dual redundant DC (-48 VDC) power supply

Accessories

EM900-BR-1	19" mounting brackets for a Telco rack
EM900-BR-2	23" mounting brackets for a Telco rack
EM900-BR-D	19" mounting brackets for side-by-side installation of dual OS910 - Two units in 19" rack
EM900-BR-E	19" mounting brackets for side-by-side installation of dual OS910 and LDP100 - Two units in 19" rack
EM900-BR-F	19" mounting brackets for side-by-side installation of dual OS904 and OS906 - Two units in 19" rack
EM900-WBR	Wall mounting bracket for OS900 series

MegaVision SNMP NMS / ProVision - please refer to MRV's web site

Fast Ethernet and Gigabit Ethernet fiber connectivity: For ordering codes of SFP pluggable optics, please visited our web site at mrv.com