

Datasheet

# OptiSwitch® 940 Series - 10GE Carrier Ethernet Access & 1<sup>ST</sup> Mile Aggregation



OS940 and OS940-M

## Overview

MRV's OptiSwitch® 940 is a 1RU small form-factor Carrier-Ethernet access and mini-aggregation device for 1<sup>st</sup> mile GigE and 10GE NGN networks.

The OS940M is its equivalent 2U and ETSI depth (250mm) model that includes a multi-services slot for hosting MRV's Circuit Emulation Services (CES) and WDM modules.

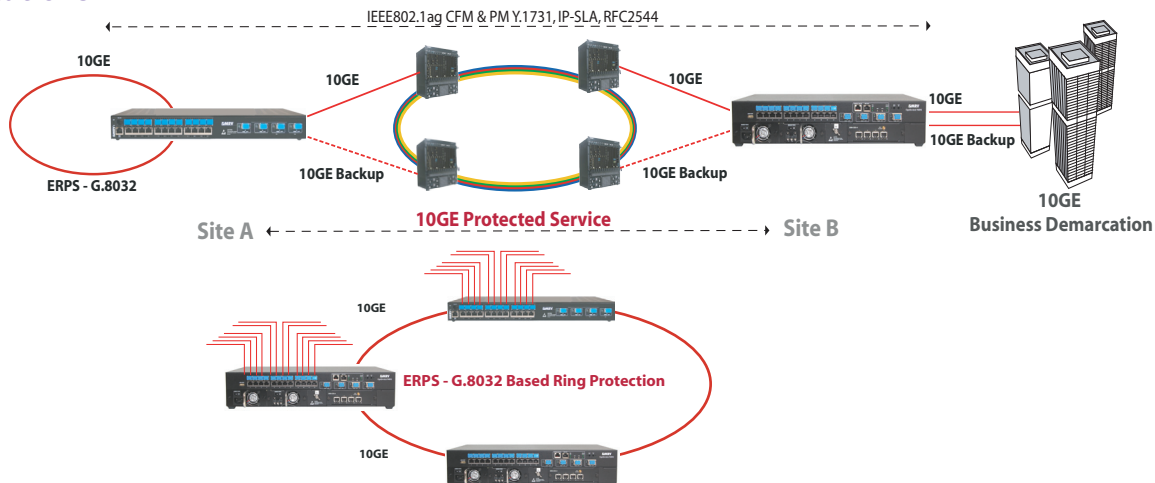
As part of the OS900 series both devices provide carriers with industry best CAPEX and OPEX savings and for extra OPEX cuts they also are designed to meet the "Green Ethernet" standard for low power consumption.

OptiSwitch 940 and 940M present service providers with a full suite of carrier-grade Ethernet services along with high-availability, enhanced quality of service, security, and Operations, Administration & Maintenance (OAM) support. The uniqueness of a full suite of Carrier-Ethernet tools enables flexible service awareness and rigid SLAs for converged Triple Play, Business, and Mobile backhaul services.

The OptiSwitch 940 and 940M Metro Ethernet solutions meet IEEE, ITU, IETF standards, and MEF specifications, and, offer complete control for simplifying deployment and management, while providing full interoperability and guaranteed Service Level Agreements (SLAs).

The devices also support the enhanced IP/MPLS suite, which includes all standard IPv4 IGP and EGP protocols and MPLS LER & LSR functionalities.

## Applications



## Key Features

- **MRV Unified Master-OS® control plane for Metro-E services**
  - Simplifies operation and management integration with OSS
- **Non-blocking hardware architecture**
  - 12 x GigE and 4 x 10GE (LAN/WAN)
    - As a mini aggregator
      - Uplink ports: 4 x 10GE XFP
      - Access ports: 12 x GigE SFP
    - As an access device
      - Uplink ports: 2 x 10GE XFP
      - Access ports: 2 x 10GE XFP + 12 x GigE SFP
- **Wide range of Optical Layer 1 and Layer 2 VPN Services**
  - EPL X-connect, E-Line, E-Tree, and E-LAN
  - Point-to-point, point-to-multipoint, and multipoint-to-multipoint
- **Flexible UNI/NNI interfaces - 100FX/1000FX and 10GE**
  - Same device for all access and tier 1 aggregation scenarios
  - Support for jumbo frames on all ports
- **Advanced traffic management with line rate performance**
  - Classification, policing, metering, per-flow marking of QoS
  - Low-latency and precise controller service rates
  - Dual-rate 3- color metering with traffic conditioners
- **Unmatched flexibility of Ethernet Virtual Circuits**
  - Selective Q-in-Q and inner/outer VLAN translation
- **Hierarchical QoS for premium SLAs**
- **End-to-end HW- based Ethernet service OAM for monitoring SLAs**
  - Standards compliance – IEEE802.1ah, IEEE802.1ag, ITU-T Y.1731, IETF RFC2544, and MEF 17 IA
  - Simplifies, monitors and troubleshoots services/applications
  - Promptly reveals service impacting problems
- **Protection mechanism**
  - Packet rings, mesh, 1:1 (LOS), and n+1 (LAG)
  - 50ms network operation recovery based on MSTP (802.1s) and ERPS (G.8032) standards
- **IP/MPLS**
  - Supports all IGP and EGP protocols: RIP/ OSPF/IS-IS/BGP
  - Supports label distribution protocols: LDP/CR-LDP/RSVP-TE
  - Supports LER and LSR functionalities
- **Multicasting service for IP-TV Triple Play**
- **Compact 1RU form factor for space saving**
- **Green Ethernet Standard support for low power consumption**
- **Pluggable protected 1:1 power supplies**
- **Excellent price/performance for fast ROI**
- **Service module in the OS940M**

### Features and Solution Benefits

OptiSwitch 940 and OptiSwitch 940M are high-performance systems with non-blocking hardware and software architecture engineered for deployment in new and demanding packet-optical network environments. As the devices incorporate both 4x10GE ports and 12 tri-mode GE ports, in a fixed, non chassis shape, structure they provide carriers with outstanding CAPEX and OPEX savings.

To add to these savings, the devices support standard Green Ethernet architecture and enable customers to minimize power consumption. Since the devices supports all industry standard OAM functionalities and have an internal hardware-based traffic generator, they enable the provider to save on expensive testing equipment required to monitor SLAs with 3<sup>rd</sup> party carriers.

In addition, the new state-of-the-art platform supports various technologies that enable the provider the utmost flexibility in network design and the capability to use it for multiple purposes, such as, an elaborated L2 suite for Metro Ethernet and Mobile Backhaul , full wire speed and full protocol suite for IP and MPLS networks (including MPLS LER and LSR functionalities)

### Multi-purpose Service Interfaces

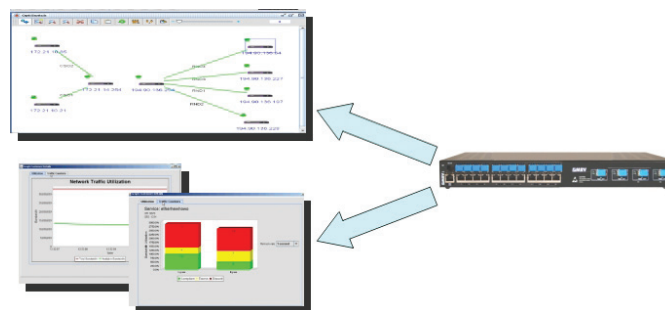
The platform offers a unique combination of features and optical interfaces that enable easy and flexible field configurations while making it ideal for maintenance and inventory. As a small device, it helps providers save on rack space and, along with very low power consumption, it leads to a substantial decrease in power consumption and overall operational maintenance cost.

Interface Protocol	No. of Ports	Interface Type	IDs of Ports
10GE LAN / WAN (OC-192)	4	XFP	13 to 16
Tri-mode built-in RJ45/100/1000BaseT or 100/1000FX SFP ports	12	SFP	1 to 12
Multi-service slot for OS940M	<b>WDM &amp; CES Services</b>		
	ITU-T G.694.1 Standard (DWDM) ITU-T G.694.2 Standard (CWDM) OADMs, MUX/DEMUX E1/T1 CES STM-1/OC3 CES		

- All Interfaces can be configured as UNI/NNI to enable access-to-edge and intra-network services
- Hot Swappable XFP and SFP pluggable optics ensure a wide range of operating distances, cost, and performance
- Tri-mode built-in RJ45 electrical interfaces and optical SFP ports
- XFP ports support short-haul to long-haul operating distances
- SFP ports support short-haul to long-haul operating distances, single strand, and CWDM and DWDM optics
- 10GE interfaces software configurable for 10GE LAN or WAN OC192/STM64 protocol
- All SFP and XFP interfaces enabled for remote Optical Level monitoring and alarm thresholds
- All RJ45 electrical interfaces enabled for remote copper-TDR cable diagnostics
- All SFP and XFP ports have SyncE support for mobile backhaul clock synchronization\*

### End-to-end Service ProVisioning and OAM

MRV's Pro-Vision® application provides a complete suite of easy-to-use GUI tools for provisioning and activation management of bonded copper and fiber services. Network monitoring is supported by real-time sampling and historical performance reporting for customer SLA. The system has carrier-grade UNIX-based software that supports 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 service provisioning and activation across network infrastructure\*

## Service Specifications

### MEF Services

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

### Packet Switching Services

- 100 Gbps (Full-duplex) non-blocking wire-speed architecture
- Configurable jumbo frames per port/EVC
- Packet buffer management
- 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
  - Private VLAN
- Transparent cross-connect mode
  - Per System, per port, or per EVC non-learning mode
- Learning table limit per VLAN/port
- Layer 2 tunneling of control protocols
- UNI protected port/Layer 1 filtering

### Packet ring and Link protection Services

- Sub 50 ms network recovery for ring and dual-homed topologies
- MSTP per IEEE 802.1s
- ERPS (ring-based network protection) per ITU-T G.8032/Y.1344
- 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
- Hardware-based CFM (OAM) messages for fault detection and link fallback
- Bi-directional Link Fault Reflection
- Link flap protection and damping
- Un-idirectional Link Detection

### Multicast and IP Services

- Wire-speed multicast replication
- IGMP v1,v2 snooping , proxy, and fast leave
- Wire-speed IPv4 / packet forwarding routing
  - RIP, OSPF, IS-IS, BGP4, VRRP
  - DHCP server/client/relay
- Multicast routing PIM-SM\*
- Multicast VLAN registration (MVR)\*

### Layer 2.5 Services

- Ethernet over MPLS pseudowire with Traffic Engineering
- H-VPLS dual-homed spoke MTU-s (LER)
  - LDP, CR-LDP, RSVP-TE, OSPF-TE, ISIS-TE, CSPF
- MPLS LSR functionality
- MPLS OAM (MPLS PING / MPLS Traceroute)

### Availability

- Pluggable 1:1 Hot-swappable dual redundant power
  - AC and/or DC
- Ambient temperature sensor for alerting
- Dual image & rollback processes
- Modular control plane - Master-OS™

### Traffic Management

- Inbound & outbound traffic management per flow/EVC
- Dual-rate 3-color rate limit per flow or aggregate for flows
  - Granular CIR/EIR rates up to 10Gbps
- Classification by L2, and/or L3, and/or L4 criteria
  - Physical port, MAC, Ethertype, double VLAN tags, IP/TCP/UDP
- IEEE 802.1p (PCP), DiffServ
- Marking/remarking profiles for layers
  - IEEE802.1p, DSCP, and MPLS EXP
- 8 hardware Service Level queues per port
- Hierarchical QoS based on inner queues
- Per flow SLA metrics
- Counters per UNI, CoS, EVC, control protocols
  - 4K counters

### Security

- Wire-speed ACLs on L2, L3, and L4 headers
  - Up to 3K rules
  - Ingress and Egress ACLs
  - Multiple actions in single ACL
- CPU Denial-of-Service protection
- MAC filters and MAC limit per port/per VLAN
- UNI Broadcast/Multicast/Unicast rate control
- Flood limit of OAM frames
- DHCP Relay Agent Information Option 82 per RFC 3046
- ACL for management sessions from NOC
- VACM – View-based Access Control Model
- IEEE 802.1X security for port authentication

### Management & Diagnostics Tools

- Link Layer Discovery Protocol (LLDP), 802.1ab
- Industry Standard CLI
- Out-of-band management via EIA-232 console port
- Out-of-band Ethernet management port
- TELNET, SSH v2, SNMPv3, RMON (4 groups)
- Port mirroring - ingress & egress traffic to analyzer port
- Remote service/flow mirroring per ACL Sniffer VLAN
- Built-in sniffer
- Hierarchical Administration policy
- RADIUS and TACACS+ AAA
- Configuration load/save with FTP or Secure Copy (SCP)
- Network Time Protocol
- Internal / Remote Syslog
- Scripting tool for macro configurations & maintenance
- Scheduler for automated execution (single, several, or periodic) of preset administrator commands
- IPv6 management \*
- Supported by MRV's EMS/NMS (MegaVision/ProVision)
- USB interface to simplify and enable rapid software upgrades\*

### Standard OAM

- End-to-end Service OAM IEEE 802.1ag
  - Connectivity Fault Management per service MEP/MIP
  - In-service EVC loopbacks , Linktrace & continuity check
- End-to-end Performance Measurement ITU-T Y.1731
- SOAM - PM design
- End-to-end IP SLA measurement
  - Jitter, Latency, and Loss per service with nanosecond accuracy
- RFC2544 internal tester with wire speed throughput measurements
- EFM Link OAM (segment-based CO-to-CE) IEEE802.3ah
  - Discovery, port-loopback, remote failure indication, dying gasp
- Optical signal level monitoring (SFP SFF-8472)
- Copper cable diagnostics TDR on RJ45 ports
- Bi-directional Link Integrity (LIN)
  - Remote failure notification/reflection

\* Future Software release

**Technical Specifications**

	OS940	OS940-M		
<b>Standards compliance</b>	IEC 60950 - 1:2005 (2 <sup>nd</sup> Edition); EN 60950-1:2006; UL 60950-1:2007 (2 <sup>nd</sup> Edition); CSA-C22.2 No.60950-1-07 (2 <sup>nd</sup> Edition); FCC Part 15, Class A; EMC Directive 2004/108/EC, Low Voltage Directive 2006/95/EC, RoHS.			
<b>Operating Temperature</b>	Operating Temp: 0 to 50 °C (32 to 122 °F) Storage Temp: -40 to +70 °C (-40 to 158 °F)			
<b>Humidity (max.)</b>	85% (non-condensing)			
<b>Performance</b>	Non-blocking 100Gbps (full-duplex) architecture Fullwire speed packet forwarding on all ports at 95M pps			
<b>Physical dimensions WxDxH</b>	443.0 x 297.9 x 43.8 mm (17.44 x 11.73 x 1.72 inch)	444 x 250 x 88.10 mm (17.48 x 9.84 x 3.468 inch)		
<b>Weight</b>	3.05 kg (6.72 lb)	4.6 kg (10.14 lb)		
<b>MTBF</b>	324583 hr @ 25°C/77°F	264836 hr @ 25°C/77°F		
<b>Power Specifications</b>	AC Input Voltage Line frequency 50 to 60Hz	DC Input Voltage	Power consumption (W)	
			Min.	Max.
	<b>OS940</b>	90 to 240 VAC	-36 to 72VDC	33W
<b>OS940-M</b>	90 to 240 VAC	-36 to 72VDC	70W	100W

**Order Info**

OS940-M	Intelligent 10GE mini aggregator with 12GE tri-mode ( 100FX-100FX SFP or RJ45 10/100/1000Base-T) 4x10 Gbps (LAN/WAN) ports. Power Supplies compatible to those used for OS9000 devices.
OS940	Intelligent 10GE services demarcation platform with 12GE tri-mode ( 100FX-100FX SFP or RJ45 10/100/1000Base-T) 4x10 Gbps (LAN/WAN) ports. Power Supplies are to be ordered explicitly by the customer.
<b>Hot-swappable power supplies for OS940 series</b>	
EM940-PS/AC	AC power supply for the OptiSwitch 940 (90-240V AC) - not suited for OS940-M
EM940-PS/DC	DC power supply for the OptiSwitch 940 (-48V DC nominal) - not suited for OS940-M
EM940-PS/DC-1N	DC power supply for the OptiSwitch 940 (-24V DC nominal) - not suited for OS940-M
EM9005-PS/AC	AC power supply for the OptiSwitch 940M ((90-240V AC)
EM9005-PS/DC	DC power supply for the OptiSwitch 940M (-24V DC nominal)
<b>Circuit Emulation Services (CES) Line-Cards</b>	
EM9-CES-4E1c	4 port E1 Circuit Emulation Service module with high-precision clock
EM9-CES-4T1c	4 port T1 Circuit Emulation Service module with high-precision clock
EM9-CES-OC3	1 port OC-3/STM -1 - 1:1 protected - Circuit Emulation Service aggregation module. Only compatible with OS910M and OS9124-410G
<b>OS940 - CWDM fiber optimization modules</b>	
O9ADCxx	1 CWDM wavelength DF OADM module for OS940M
O9ADCxxyy	2 CWDM wavelengths DF OADM module for OS940M
O9ADCxxyyzz	3 CWDM wavelengths DF OADM module for OS940M
O9ADCxxyyzzww	4 CWDM wavelengths DF OADM module for OS940M
O9ADCDxx	1 CWDM wavelength DF Dual Sided OADM module for OS940M
O9ADCDxxyy	2 CWDM wavelengths DF Dual Sided OADM module for OS940M
O9ADCDxxyyzz	3 CWDM wavelengths DF Dual Sided OADM module for OS940M
O9ADCDxxyyzzww	4 CWDM wavelengths DF Dual Sided OADM module for OS940M
O9ADCDSxx	1 CWDM wavelength SF Dual Sided OADM module for OS940M
O9ADCDSxxyy	2 CWDM wavelengths SF Dual Sided OADM module for OS940M
O9ADCDSxxyyzz	3 CWDM wavelengths SF Dual Sided OADM module for OS940M
O9ADCDSxxyyzzww	4 CWDM wavelengths SF Dual Sided OADM module for OS940M
O9-Mux/Demux8	8 wavelengths CWDM Multiplexer/Demultiplexer module for OS940M
<b>OS940 - DWDM fiber optimization modules</b>	
O9ADDxx	1 DWDM wavelength DF Dual Sided OADM module for OS940M
O9ADDxxyy	2 DWDM wavelengths DF OADM module for OS940M
O9ADDxxyyzz	3 DWDM wavelengths DF OADM module for OS940M
O9ADDxxyyzzww	4 DWDM wavelengths DF OADM module for OS940M
O9ADDDxx	1 DWDM wavelength DF Dual Sided OADM module for OS940M
O9ADDDxxyy	2 DWDM wavelengths DF Dual Sided OADM module for OS940M
O9ADDDxxyyzz	3 DWDM wavelengths DF Dual Sided OADM module for OS940M
O9ADDDxxyyzzww	4 DWDM wavelengths DF Dual Sided OADM module for OS940M
O9ADDDSxx	1 DWDM wavelength SF Dual Sided OADM module for OS940M
O9ADDDSxxyy	2 DWDM wavelengths SF Dual Sided OADM module for OS940M
O9ADDDSxxyyzz	3 DWDM wavelengths SF Dual Sided OADM module for OS940M
O9ADDDSxxyyzzww	4 DWDM wavelengths SF Dual Sided OADM module for OS940M
O9-Mux/Demux8DB	8 wavelengths DWDM Multiplexer/Demultiplexer (ch#43 to ch#57) module for OS940M
O9-Mux/Demux8DR	8 wavelengths DWDM Multiplexer/Demultiplexer (ch#21 to ch#35) module for OS940M
<b>Master-OST™ - MPLS Software Upgrade Package for OS940</b>	
SW-UPG-94xMPLS **	Enhanced software upgrade package for OptiSwitch® 940 (Master-OS: MPLS LER /LSR VC - LDP, RSVP-TE, CR-LDP, OSPF-TE, ISIS-TE, CSPF)

\* For ordering codes of SFP/XFP Pluggable optics, please visit MRV's web site at [www.mrv.com](http://www.mrv.com)