

## Datasheet

# OptiSwitch® 904-MBH

## Mobile Backhaul Timing and Synchronization over Ethernet Solution



### Overview

The OS904-MBH is a compact Carrier Ethernet purpose-built cell-site Demarcation device that enables high-quality timing synchronization over packet switched networks.

High-quality timing synchronization is extremely important in 2G GSM, 2.5G GPRS, 3G UMTS and 4G LTE/WiMAX mobile networks for a successful call signal hand-off between cellular base stations.

The OS904-MBH allows operators a migration to packet-switched networks without the loss of traditional TDM-quality synchronization to cellular base stations. The solution functions as an Ethernet Equipment Clock (EEC) and combines the two leading technologies existing for packet-switched networks synchronization: Physical layer Synchronization over Ethernet (SyncE) and Precision time Protocol (PTP -1588v2). By integrating both timing technologies, the OS904-MBH enables timing-gateway functionality between Synchronous and Asynchronous physical layer networks. Such flexibility enables end-to-end synchronization with maximum investment protection of the existing network infrastructure.

As part of the OptiSwitch®900 series, the OS904-MBH model offers Carrier Ethernet features that enable end-to-end visibility and Service Level Assurance at each Mobile backhaul cell site.

Timing synchronization over packet is reinforced with enhanced traffic management/mapping to enable ATM-like QoS settings to transport PTP real-time protocol. All topologies based on MEF-defined connectivity services are supported, to facilitate migration path from E-Tree centralized 2G, 2.5G, 3G to 4G E-LAN multipoint mobile networks.

All timing synchronization and connectivity services can be monitored remotely via comprehensive end-to-end Ethernet OAM tools according to IEEE802.1ag CFM, ITU-T.Y.1731 PM at a precision of nano seconds and RF2544 wire speed throughput analysis.

### Product highlights

- Same platform to enable timing synchronized Carrier Ethernet E-Line, E-LAN, E-Tree, EPL services
- MEF 9, 14 & 21 certified
- End-to-end Service OAM to monitor SLA
  - End-to-end Performance Measurements ITU-T.Y.1731
  - End-to-end IP SLA measurements
  - Jitter, Latency & Loss per service at nano-sec
  - RFC2544 internal tester up to wire speed throughput measurements
  - EFM Link OAM IEEE802.3ah
- Mobile Backhaul specification compliance
  - MEF-22 Implementation Agreement
- MRV Pro-Vision® point-and-click NMS
- All UNI/E-NNI interfaces support precision timing
  - Synchronous Ethernet ITU-T G.8621
  - Packet Precision Protocol IEEE1588v2
- Timing-Gateway between synchronous and asynchronous physical layer networks
- Hitless switching between clock reference in TDM timed mode, and automatic switchover to PTP if all available clocks fail
- Multiple Input / Output synchronization signals including T1/E1, PPS & telecom standard frequencies

### Physical Layer Synchronous Ethernet features

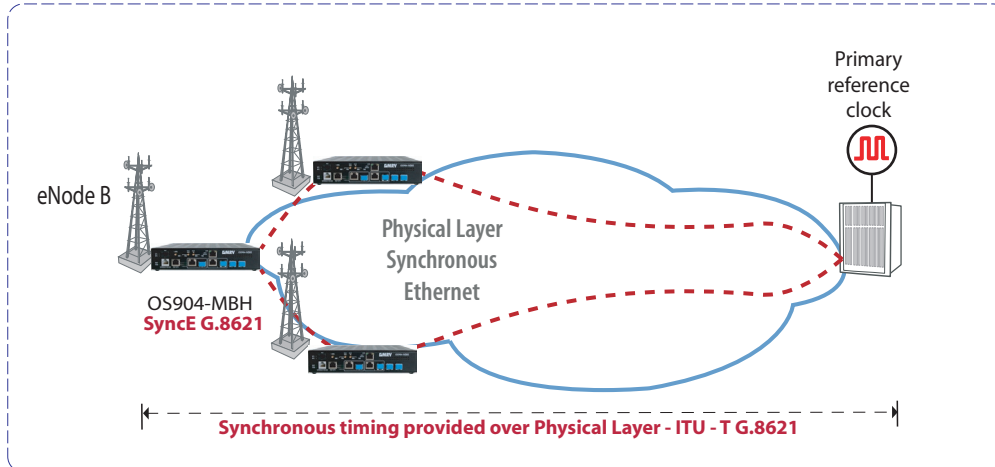
- Compliant to ITU-T standards
- G.8261 – Timing & synchronization aspects of packet networks
- G.8262 – Timing characteristics of Eth' equipment slave clock
- G.8264 – SSM (Synchronization Status Message)
- G.736, G.742, G.813, G.823, G.824
- Input clocks priority can be set manually or switchover can occur according to SSM value
- Phase transient protection and phase build-out on locked-to reference and on reference switching
- Precision holdover accuracy based on internal Stratum-3 OCXO

### Precision Time Protocol features

- Compliant to IEEE1588v2 – Telecom Profile
- PTP IEEE1588v2 Slave mode function
- Hardware time-stamping, network noise suppression, network re-route accommodation and holdover
- Alignment to PTP Grandmaster and generate time of day signals as well as clock signals
- Dynamic adaptation to network delay variations
  - Network loading change tolerant

## Applications

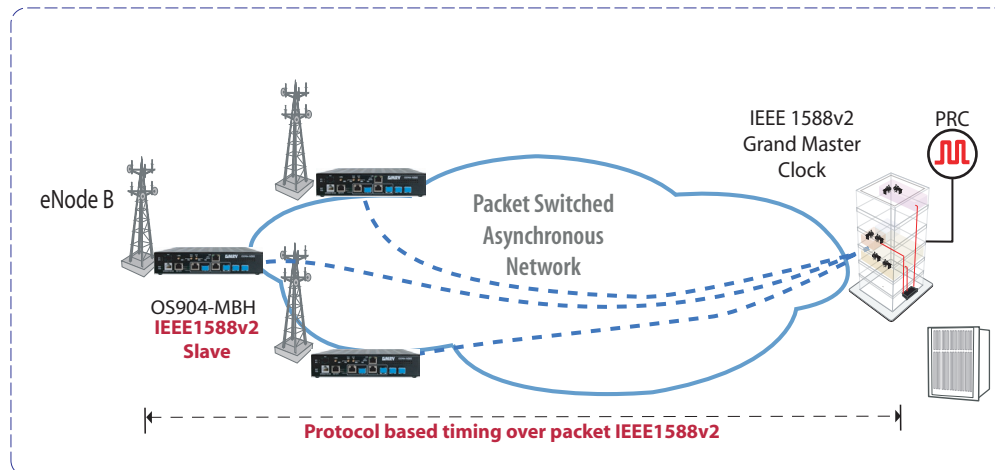
### OS904-MBH cell site Demarcation device - Synchronous Ethernet – Physical Layer Solution



#### SyncE timing solution enables

Frequency	✓
Phase	–
Time of Day	–

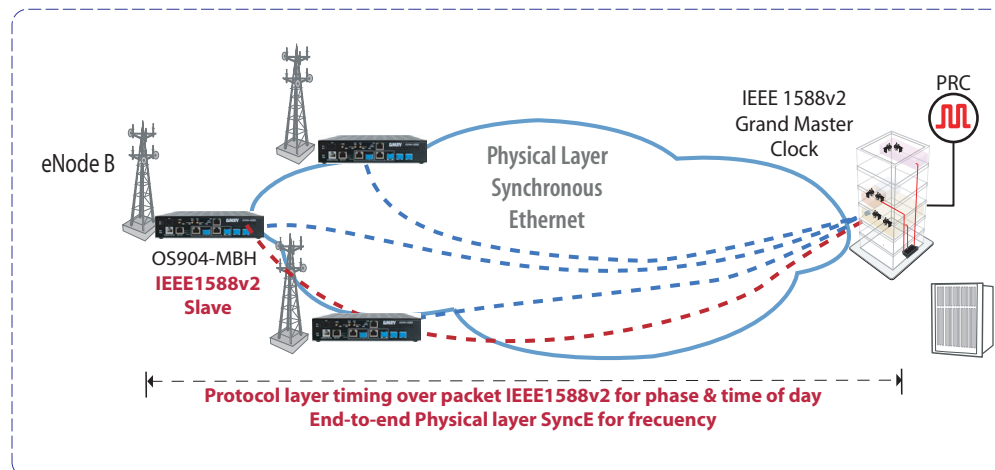
### OS904-MBH cell site Demarcation device – Packet-based timing – PTP Protocol Solution



#### PTP timing solution enables

Frequency	✓
Phase	✓
Time of Day	✓

### OS904-MBH cell site Demarcation device – Combined timing – SyncE + PTP Solution



#### SyncE + PTP timing solution enables

Frequency	SyncE
Phase	IEEE1588
Time of Day	IEEE1588

## Services Specifications

### Timing Synchronization

- ITU-T G.8261, G.8262, G.8264
- ITU-T G.736, G.742, G.813, G.823, G.824
- IEEE1588v2 – Telecom Profile
- PTP IEEE1588v2 Slave mode function

### 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 Mgm. – MEF14
- OAM Implementation Agreement (IA) – MEF17
- Mobile backhaul MEF 22 specification compliant
- 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
- 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
- IEEE MSTP IEEE802.1s
- ITU-T G.8032 / Y.1344 Ethernet Ring Protection Switching
- 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 changes (hitless ACL)
- Rate limit per flow or aggregate
  - Granular CIR/EIR rates up to GigE
- Classification by any L2-3-4 criteria and mix
  - 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

### Availability

- Oval image & rollback processes
- Modular control plane - Master- OS™

### 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 Option 60 & 82
- ACL for management sessions from NOC
- VACM – View-based Access Control Model
- IEEE 802.1X 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 via FTP, Secure Copy (SCP)
- NTP – Network Time Protocol
- Internal / Remote Syslog
- Scripting tool for macro configurations & maintenance
- Action scheduler for automated rules (time/day/cycle)
- IPv6 management\*
- Supported by MRV EMS/NMS ( MegaVision/ProVision)

### Standard Operation, Administration & Maintenance

- 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 at nano-sec accuracy
- RFC2544 internal tester for wire speed throughput measurement
- 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 / IPv6\* packet routing
  - RIP, OSPF, IS-IS, BGP-4, VRRP

### Layer 2.5 Services (optional Master-OS™ SW)

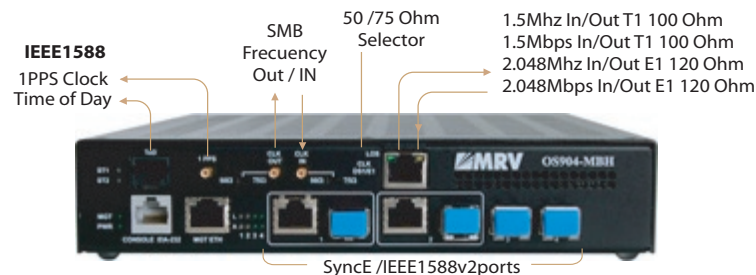
- Ethernet over MPLS pseudowire with Traffic Engineering
- H-VPLS dual-homed spoke MTU-s (LER)
  - LDP, RSVP-TE, OSPF-TE, ISIS-TE, CSPF
- MPLS OAM (MPLS Ping/MPLS Trace route)

<b>Technical Specifications</b>	<b>Standard compliance</b>	UL-1950; FCC part 15 Class B; 2004/108/EC, 2006/95/EC RoHS compliant
	<b>Environment</b>	Operating Temp: 0° - 50°C (32° - 122°F)
	<b>Humidity</b>	85% maximum , non-condensing
	<b>MTBF</b>	245,887 Hrs @ 25°C/77°F
	<b>Performance</b>	Non-blocking wire speed on all ports
	<b>Power Specifications</b>	100V - 0.16A, 240V -0.08A (18W) 50 - 60Hz
	<b>Physical dimensions WxDxH</b>	219.6 x 265 x 43.65mm 8.64 x 10.43 x 1.72 inch
	<b>Weight</b>	1.2kg (2.64 lb)

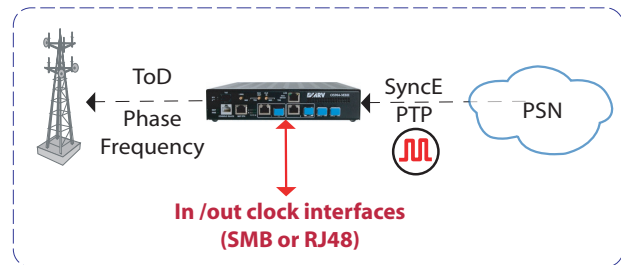
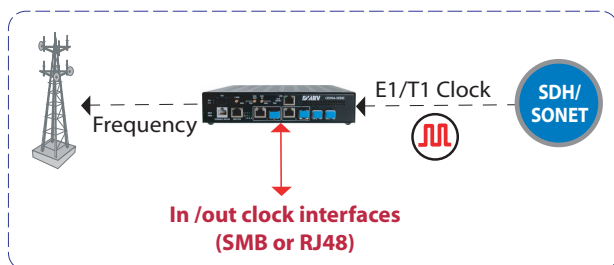
## Synchronization interfaces

The OptiSwitch®900-MBH incorporates the following synchronization inputs/output interfaces

Interface type	Interface definition	Impedance	Frecuency	Connector Type	Direction
Sync Ethernet	G-703-5	100 Ohm	1544 Kbits/s	RJ-48c	Input and Output
	G-703-9	120 Ohm	2048 Kbits/s	RJ-48c	Input and Output
	G-703-13	50 Ohm/75 Ohm	2048 KHz	SMB-48c	Input and Output
	SW configurable Frecuencies	50 Ohm/75 Ohm	1544 KHz	SMB	Input and Output
IEEE 1588 Slave/ UART	Time of Day		Range of standard frecuencies 2 KHz up to 19.44 MHz	RJ	Output
IEEE 1588 Slave/ Clocks	1PPS	50 Ohm	GPRMC (ToD encoding) over RS232	RJ	Output
	Frecuency phase aligned	50 Ohm	1 PPS	SMB	Output
SyncE and IEEE 1588v2 UNI Ethernet Interface	2 x Tri-mode RJ45 10/100/1000T or SFP (100FX / 1000FX) + 2 SFP ( 100FX/1000FX)				Input and Output



## Synchronization Clock Interface Options



<b>Order Info</b>	OS904-MBH/AC-1	Mobile Backhaul Demarcation platform - SyncE + 1588v2 slave - 2 tri-mode (RJ45 10/100/1000Base-T or 100FX/1000FX SFP) ports, 2 x 100FX/1000FX SFP ports , AC (90-240VAC) power supply
	OS904-MBH/DC-1	Mobile Backhaul Demarcation platform - SyncE + 1588v2 slave - 2 tri-mode (RJ45 10/100/1000Base-T or 100FX/1000FX SFP) ports, 2 x 100FX/1000FX SFP ports , DC (-48VDC) power supply
	OS904-MBH/DC-1N	Mobile Backhaul Demarcation platform - SyncE + 1588v2 slave - 2 tri-mode (RJ45 10/100/1000Base-T or 100FX/1000FX SFP) ports, 2 x 100FX/1000FX SFP ports , DC (24VDC) power supply
	<b>MegaVision SNMP NMS / ProVision</b> - please refer to MRV's web site	