

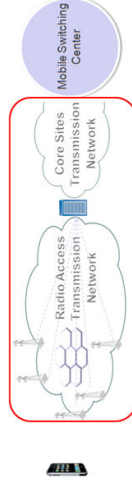
# MRV Packet Optical Solution for Mobile Backhaul – Application brief



OptiSwitch® - Mobile Backhaul packet solution

## What is Mobile Backhaul?

Mobile Backhaul is a new term that includes a spectrum of networks and network technologies, including the Radio Access Network (RAN) and Core Networks. The role of the Backhaul network is to provide end-to-end transport of voice and data traffic between cell site and its mobile switching center.



## Mobile Backhaul Challenges

Mobile Operators face an evolution from Circuit-based to Packet-based Mobile NGN services. The challenges of new High-Speed packet access (HSPA) networks fostered by subscriber growth and increased usage of mobile data.

Migration from legacy TDM to NGN cellular network involves significant challenges for network operators. The compelling economics of Ethernet create massive pressure to move away from E1/T1 TDM transport to packet-based transport for wireless backhaul. However, the migration to Ethernet-based transport requires careful planning on packet data offload and synchronization requirements that enable the real-time and mobility services.

## MRV Solution enables

- Migration from TDM to packet network
- Circuit Emulation Services
- Timing Synchronization – SyncE and PTP 1588
- Traffic mapping to Ethernet Virtual Circuits
- Traffic Management – Hierarchical QoS
- Bandwidth scalability over any infrastructure
  - Fiber optics up to 10GE
  - G.SHDSL.bis bonded copper up to 22.8Mbps
- Security and line integrity
- Ring-based sub 50ms protection
- Per Service end-to-end OAM at nano-sec precision
- Point & Click service Pro-Vision®

## MRV Optiswitch® Mobile Backhaul Solution

**Cell Site Demarcation**

- OS904
- OS906

**TDM Circuit Emulation**

- OS910-M

**Clock Synchronization**

- Bonded Copper G.SHDSL

**Carrier Ethernet Aggregation**

- OS9124-410G

**Access Ring Aggregation**

- OS912

- Migration from TDM to packet network
  - Fiber and Bonded Copper
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  - Per Service end-to-end OAM

- Traffic mapping to Ethernet Virtual Circuits
- Traffic Management – Hierarchical QoS
- Bandwidth scalability
- Security and line integrity

- ✓ Packet-Data offload services for 3G UMTS / HSPA and 4G LTE/WiMAX mobile networks
- ✓ Voice Circuit Emulation Services
- ✓ Clock synchronization services
- ✓ Flexibility in network design
- ✓ Fast service activation
- ✓ Cost effective solution

# Solution Elements and Features Highlights

| Mobile Backhaul Service / Application                                            |  | OptiSwitch Elements                               | NMS & Provisioning                                           |
|----------------------------------------------------------------------------------|--|---------------------------------------------------|--------------------------------------------------------------|
| Packet-Data offload services for 3G UMTS / HSPA and 4G LTE/WiMAX mobile networks |  | OS904, OS906, OS912, OS912A-410G                  | MRV Pro-Vision® or 3 <sup>rd</sup> party NMS / OSS platforms |
| Voice Circuit Emulation Services                                                 |  | OS910-M, OS912A-410G, EM9-CES-4E1/T1, EM9-CES-OC3 |                                                              |
| Clock synchronization services                                                   |  | OS904-MBH Series                                  |                                                              |

## Mobile Backhaul specification compliance

- MEF-22 implementation agreement
- MPLS forum framework 20.0.0
- MEF Services**
  - UNI type 1 and Type 2
  - External-NNI & Internal-NNI
  - EPL, E-Line, E-Tree & E-LAN – MEF9
  - EPL, E-Line, E-Tree & E-LAN Traffic Mgmt. – MEF14
  - 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 O-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 (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

## Standard Operation, Administration & Maintenance

- End-to-end Service OAM IEEE802.1ag
  - Connectivity Fault Management per service MEP/MIP
  - In-service EVC loopsbacks, Linktrace & continuity check
- End-to-end Performance Measurement ITU-T Y.1731
  - Jitter, Latency & Loss per service at nano-sec accuracy
- End-to-end IP SLA measurement
  - Jitter, Latency & Loss per service at nano-sec
- 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
- Bi-directional link integrity (fault: reflection)

## 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 on Ethernet
- 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

## Security

- Wire-speed ACLs on L2-3-4 headers
  - 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 82
- ACL for management sessions from NOC
- VACM – View-based Access Control Model

## 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\*

## Multicast and IP Services

- DHCP server/client/relay for remote auto-configuration
- Wire speed multicast replication
- IGMP v1, v2 snooping , proxy and fast leave
- 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, CSFP

## Fiber Optic Interfaces

- 100FX/1000FX/2000FX
- 10GBase LAN/WAN PHY
- Short/Long Haul, Multi-rate, BX (single strand Fiber) & WDM

## Copper Bonding interfaces (OS904-DSL)

- IEEE802.3ah EFM 2Base-TL
- ITU-T G.991.2 Annex F/G
- TC-PAM32 line coding & ETSI 101524

## Circuit Emulation Services (OS910-M / OS912A-410G)

- CESoPSN, SAToP and MEF CESoETH

## Timing Synchronization (MBH Series)

- 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