

**ENT-AN1190**

**Application Note**

**Hardware-Based Up MEP OAM Support  
with ViSAA™**



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## Revision History

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The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

### **1.1 Revision 1.0**

Revision 1.0 was the first publication of this document.



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# Contents

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- Revision History..... 3
  - 1.1 Revision 1.0..... 3
- 2 Hardware-Based Up MEP OAM Support with ViSAA™ ..... 6
  - 2.1 Up MEP OAM ..... 6
  - 2.2 Up MEP Support Using ViSAA ..... 6
  - 2.3 Up MEPs and Down MEPs..... 7
  - 2.4 The Lesser Alternatives ..... 8

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## Figures

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|   |   |
|---|---|
| Figure 1 Metro Ethernet Forum Ethernet Virtual Connection Service ..... | 6 |
| Figure 2 Up and Down MEPs.....  | 7 |

## 2 Hardware-Based Up MEP OAM Support with ViSAA™

Microsemi's Service Aware Architecture (ViSAA) technology is advantageous as it supports Up MEP OAM in hardware, enabling service providers to monitor connection health and performance. Up MEP OAM enhances the profitability of Carrier Ethernet services by providing remote monitoring of faults and precise service performance right up to the customer UNI interface.

The enhancements are as follows:

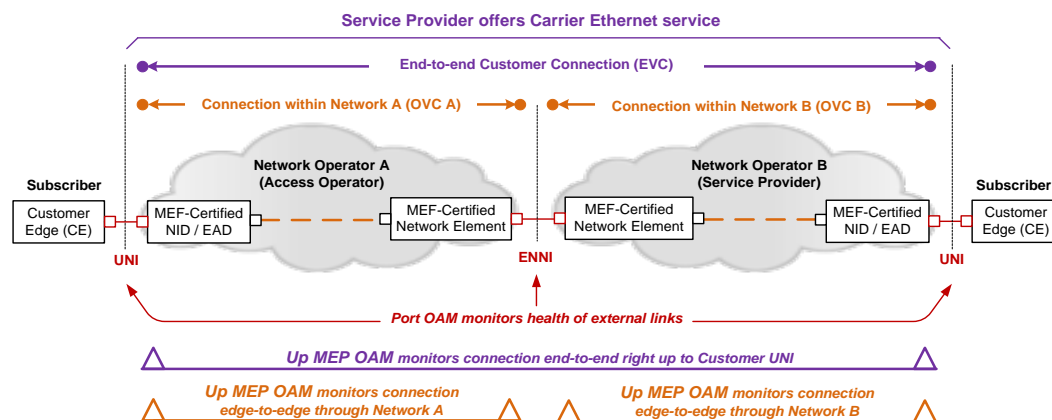
- Dramatically improves ability to detect and localize faults, reducing truck rolls and operational expenses, and enabling Carrier-class service availability.
- Supports delivery of highly profitable, low loss and delay services for the enterprise, finance, and mobile backhaul markets.

### 2.1 Up MEP OAM

With Up MEP OAM technology, it is possible to monitor connection health and performance end-to-end, while simultaneously monitoring through each operator's network. Up MEP enables increasing the scale and reach of Carrier Ethernet service offerings in a collaborative, multiple network service environment.

The following illustration shows a Metro Ethernet Forum (MEF) Ethernet virtual connection (EVC) service, where the service provider subcontracts with an access operator to reach off-net customer locations.

**Figure 1 Metro Ethernet Forum Ethernet Virtual Connection Service**



Two layers of Up MEP OAM are supported simultaneously to enable monitoring the service end-to-end including the off-net access portion. Each network operator independently monitors service over their own network. This dedicated OAM Up MEP functionality is used by each network operator to precisely measure loss, delay, delay variation, and availability right up to the edge of each network, as well as end-to-end as seen by the subscriber.

### 2.2 Up MEP Support Using ViSAA

ViSAA Ethernet switches from Microsemi (Serval™, LynX™, and Jaguar™), include Up MEP technology in the hardware to enable the use of Ethernet OAM protocols to monitor each service

sold to a subscriber. This verifies performance and Quality of Service (QoS) according to the agreed upon service level agreement (SLA).

Up MEP implementation in silicon, results in uncompromising functionality with no limitations to overcome, no workarounds to implement, and no equipment performance and scalability issues to contend with.

The following features are supported by Microsemi Carrier Ethernet switches.

- Per EVC on-demand Ethernet loopback.
- Per EVC frame delay and frame delay variation measurements.
  - One-way delay measurements (DM).
  - Two-way delay measurements (DM).
- Per EVC frame loss measurements.
  - Single-ended and dual-ended loss measurements (LM).
- Injection of OAM-CCM, OAM-LBM, OAM-TST, OAM-LMM, and OAM-DMM frames. Automatic hardware-generated OAM-LBR, OAM-LMR, and OAM-DMR frames.

## 2.3 Up MEPs and Down MEPs

As a connection traverses a network element (NE), it passes through an ingress port and an egress port. It is possible for OAM to be initiated and terminated on either port, and also in either direction.

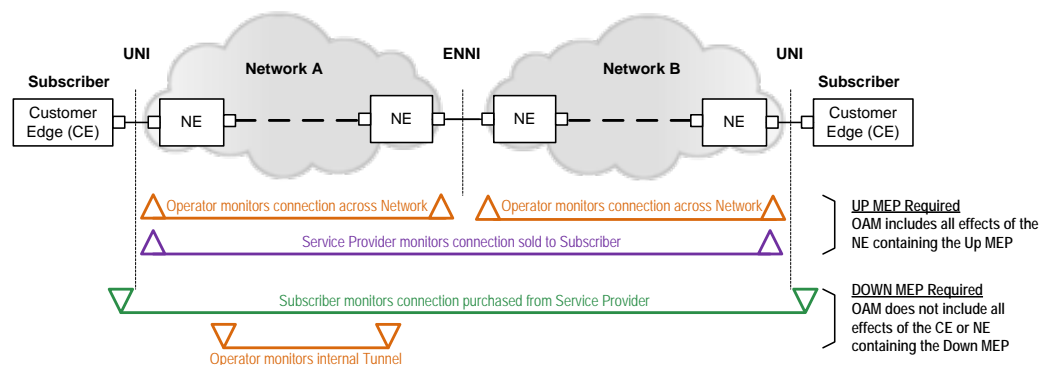
It is critical to understand whether OAM health monitoring and performance measurements include internal NE effects (Up MEP) or do not include internal NE effects (Down MEP). The NE's significant impact on loss, delay, delay variation, and availability must be included in service provider applications.

Up MEP OAM truly monitors health and performance edge-to-edge over a network domain, including all effects of the two NEs at each end.

Down MEP OAM monitors health and performance, not including all effects of the two NEs at each end.

The following illustration shows Up and Down MEPs.

**Figure 2 Up and Down MEPs**



Up MEPs are applicable when monitoring connections across a service provider or operator network. Down MEPs are applicable when monitoring internal tunnels within a network, or when monitoring connections from the subscriber location.

## 2.4 The Lesser Alternatives

Other switch vendors do not embed Up MEP in their silicon. When Up MEP is not embedded in the silicon, OAM measurements are unreliable because the OAM frames do not share fate with the service frames they monitor. It is impossible to support multiple levels of Up MEPs and provide hardware-accurate loss measurements at each level. The lesser alternatives are typically as follows:

- Up MEP OAM loopback is done in software only. This is not scalable and fails to fully reflect conditions right up to the network edge.
- Up MEP OAM loopback is done on a dedicated loop port. This scales better than all-software, but it does not provide monitoring at the true Up MEP location, leading to the following consequences:
  - Loss measurements may go wrong.
  - Delay measurements are inaccurate with service frames and OAM scheduled independently in separate egress queues.

Microsemi's Up MEP support with ViSAA technology is superior to other vendor's solutions thereby enabling service providers improved performance OAM and more profitable services.