METRObility optical systems

Simply Brilliant Optical Ethernet

Ethernet Services Provisioning Platform (ESPP)

Carrier Service Enabling Demarcation

- *Managed Multi-service Integration (Voice, Video, Data)*
- *Multi-user, Multi-Provider*
- *Secure L2/Ethernet Networking*
- *Application-aware Networking*
- *Traffic Management & Enhanced SLA Monitoring*
- *Policy-aware, Zero-touch Provisioning*
- *Multi-level OAM*

Metrobility Optical Systems' Ethernet Services Provisioning Platform (ESPP) provides a remotely managed, multi-port customer-located intelligent demarcation device to deliver managed converged services (voice, video and data) over virtual Ethernet and MPLS in a metro Ethernet network. The ESPP allows service providers to drop multiple services on separate customer interfaces. Because each service is isolated, providers can troubleshoot an individual service without impacting another.

Applications are prioritized over different traffic-engineered paths, multi-level Operations, Administration and Maintenance (OAM) is used to measure and ensure provisioned SLAs, and security controls are embedded to ensure protection against denial-of-service attacks.

Multi-Level OAM Management

The ESPP offers a rich management toolset for multi-vendor interoperability in element, network and service management to reduce operational expenses (OPEX) and scale management to large access networks.

By augmenting existing IP/SNMP-based management frameworks with the IEEE 802.3ah Operations, Administration and Maintenance (OAM) protocol and emerging MEF frameworks, the ESPP provides proactive health and status updates on network topology and application behavior.

The ESPP provides the following comprehensive and advanced, standards-based networking features:

- The **IEEE 802.3ah OAM** framework is used as a transport between the management proxy and the ESPP. As a layer-2 transport protocol, 802.3ah OAM seamlessly integrates with SNMP/MIBs, CLI, Web access, CORBA, TL1, and XML. It adapts into existing security frameworks, and prevents against the explosion of management IP addresses. Its capability for remote site management - failure indication, monitoring, loopbacks, and timely link anomaly detection – provides key feedback that is integrated by the management proxy, along with connectivity and services feedback, into the provisioning system.
- **Standards-based Management** using SNMP, Telnet/CLI, IP PING and IP Traceroute at Level 3 enables service providers to use any off-the-shelf management system to manage the ESPP as an independent network element with its own IP address.
- **AccessEthernet™** supports IEEE802.3ah OAM and Metrobility extensions.
- **AccessMPLS™** supports MPLS Ping and MPLS Traceroute for verification of LSPs.

Traffic Management

Traffic engineering addresses quality implications such as latency in time-sensitive applications such as voice and video by prioritizing it over less time-sensitive traffic like email, which can be handled on a best-effort basis.

The ESPP supports four service classes for traffic prioritization. Traffic is prioritized based on the priority bits in the Ethernet frame, and the DSCP bits in the IP frame.

With up to 4Gbps of traffic coming from the customer-facing ports to the network port, the ESPP performs scheduling and congestion control based on the priority queue for the designated traffic ensuring that lower priority packets are serviced even during periods of higher priority traffic.

End-to-end Service Level Verification

Metrobility's patent-pending Logical Services Loopback (LSL) provides end-to-end service level verification across multiple providers to support individual service level agreements. LSL extracts the source MAC address from the incoming loopback frame and modifies the incoming frame by using the extracted source address as the destination address. The source address is then reset to Metrobility's loopback unicast MAC address. LSL operates at full line rate with any frame size. Normal data frames continue to be received and transmitted while LSL is enabled.

Security

Intelligent management access controls keeps unauthorized users from accessing the provider's network. Multiple management access control options to ensure that the ESPP is impervious to denial of service attacks under all traffic conditions and traffic patterns.

The Metrobility Difference

Unprecedented flexibility and scalability in the management of Ethernet services
- IEEE 802.3ah with Metrobility extensions
- SNMP, Telnet, TFTP, and PING
- Direct and remote CLI

Troubleshooting capabilities
- Optical power monitoring
- Quality of equipment monitoring
- Quality of line monitoring

Multiple link loopbacks for link testing capability

Advanced networking
- AccessEthernet™
- AccessMPLS™

Automatic discovery and address management

Full line speed performance

Link latency and throughput testing

Bandwidth provisioning per port

Multimode, Singlemode, CWDM and Single-Strand (BWDM) SFP options up to 100km

Product Highlights

Jumbo frames up to 9k bytes

Link redundancy on network ports with Spanning Tree listener

DC input for load-shared external power supply

RADIUS support for authenticated and authorized management access

Auto-negotiation and manual selection of the duplex state of the copper interface

Advanced Virtual Ethernet Access with AccessEthernet™

Located at the customer premise, the ESPP provides E-Line (point-to-point) and E-LAN (multi-point) services to enable multiple streams of traffic – voice, video, and data – to be prioritized to the carrier's Ethernet Services Network using Q-tags and Q-in-Q tags (VLAN stacking) over Ethernet Virtual Connections (EVC's).

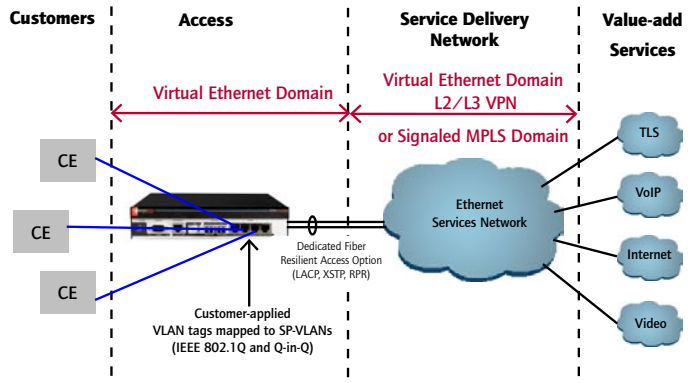
The EVC connects two or more subscriber sites to enable the transfer of Ethernet service frames between them and prevents data transfer between subscriber sites that are not part of the same EVC.[1] Based on MEF services definitions, an EVC aggregates multiple user VLANs and can be used to construct a Layer 2 VPN.

The ESPP supports advanced Layer 2 VPN services that can be deployed across the service provider's network to create new opportunities for revenue. MAC addresses are used for automatic discovery and address management, and as a system and service identifier that is linked with service features and user policies. The management framework uses the device's MAC address to retrieve pre-determined policies from work-flow records, and provisions them over a standards-based protocol, for example SNMP.

A similar discovery framework is also used with proxy-based management. In this case, the IEEE 802.3ah OAM (or IEEE 802.1x) protocol is used between customer-located, provider-edge devices and the proxy management system to provide similar functions. These capabilities lead to direct gains in provisioning cost and complexity by enabling rapid deployment, managed delivery, and flexible modification.

Metrobility's ESPP and NetBeacon EMS framework provide service providers a standards-based, scalable, and secure solution that allows rapid deployment, managed delivery and flexible upgrades for deployment of revenue-creating Ethernet services. These features lead to scalable multi-user, multi-service Ethernet delivery for access to multiple value-added network services.

Ethernet Service utilizing Layer 2 SP-VLANs



[1] From "Metro Ethernet Services - A Technical Overview" published by the Metro Ethernet Form

Advanced Multi-layer Interworking with Optional AccessMPLS™ Software Module

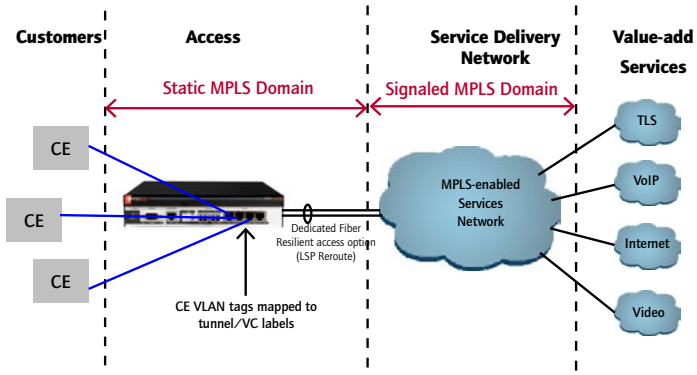
Metrobility's patent-pending **AccessMPLS™** is a complementary superset of the Virtual Ethernet Access Model. However, instead of a virtual Ethernet service domain in the access network, one that is based on either untagged, Q-tagged, and/or QinQ-tagged information, a static MPLS domain is extended to the customer premises, to the user-facing provide edge device, the U-PE. Interworking with meshed and signaled domains is achieved by provisioned LSPs (Label Switched Path). This model extends benefits including consistent service definitions, service differentiation, traffic management, edge-to-edge OAM and SLA, access transport layer independence, scalability, and, protection to the customer edge.

Access MPLS creates a true end-to-end network architecture for the delivery of converged services. AccessMPLS aggregates data flows that share a common forwarding path at the customer site to enable greater network scaling and security, the ability to engineer end-to-end QoS and SLAs, and OAM and performance monitoring.

AccessMPLS provides service providers with total flexibility in the deployment, provisioning and delivery of Ethernet services through static MPLS tunnels using baseline Label Switched Path (LSP) point-to-point pseudowire Martini technologies and hierarchical VPLS (H-VPLS). Ethernet frames are mapped onto pre-provisioned LSPs, allowing 1-in-1, many-in-1, and all-in-1 bundling, or multiplexing.

Utilizing rich management toolsets available with MPLS, along with vendor-independent OAM frameworks, service providers can achieve better end-to-end management leading to higher network availability, lower operating expenses, and ultimately greater revenues.

Ethernet Service utilizing AccessMPLS at customer edge



Advantages of Ethernet over MPLS at the edge:

- **Multi-service convergence framework – voice, video and data integration over a single connection – simplifies management**
- **Ultra-fast frame forwarding: High-touch edge ("access"), low-touch core ensures application performance**
- **Multiple standardized management schemes (802.3ah and multi-layer PINGS) for the transport and services layers provide a rich set of OAM&P tools to lower operating costs**
- **Economical Ethernet technology at customer premise minimizes capital expenditures**
- **Transporting Ethernet over MPLS using standards-based and emerging standards-based technologies extends hard QoS to Ethernet services.**

Available Models

Model #	Access Ports 1 - 4	Network Ports 1 - 2	Mgmt Port	Console Port
RS960-C04000-F2	10/100/1000BASE-T RJ-45	1000BASE-X SFP	10/100/1000BASE-T RJ-45	Male DB-9
RS960-F04000-F2	1000BASE-X SFP	1000BASE-X SFP	10/100/1000BASE-T RJ-45	Male DB-9

Software Options

AccessMPLS™ Software Module

Hardware Options

SFP Optics

O211-M5	LC multimode	500m*
O211-10	LC singlemode	10km*
O211-25	LC singlemode	25km*
O211-40	LC singlemode	40km*
O211-70	LC singlemode	70km*
O211-1A	LC singlemode	100km*
O311-10-31	BWDM SC singlemode	10km*
O311-10-49	BWDM SC singlemode	10km*

CWDM (80km)** (LC)

O411-80-31	1310nm	O411-80-47	1470nm
O411-80-33	1330nm	O411-80-49	1490nm
O411-80-35	1350nm	O411-80-51	1510nm
O411-80-37	1370nm	O411-80-53	1530nm
O411-80-39	1390nm	O411-80-55	1550nm
O411-80-41	1410nm	O411-80-57	1570nm
O411-80-43	L1430nm	O411-80-59	1590nm
O411-80-45	1450nm	O411-80-61	1610nm

**For 40km, use O413-40-xx .
* Actual segment length is dependent on the quality of fiber cable plant and loss budget of each device. See manual for cable type and product specifications.

Accessories

RS900-AC	External AC Power Supply - 40 watt
R200-RM-1A	19" Rack mount kit (ears)
R200-RM-2A	19" Rack mount kit (tray) supports 2 units
R200-RM-EXT23	23" Rack mount extension kit (ears) for the R200-RM-xx
RS900-CA	Kit, Console Cable, External

Specifications

Environmental

Oper. Temp.	0°C to 50°C
Oper. Humidity	5% to 95% non-condensing
Storage Temp.	-25°C to 70°C
Output Power	12V @ 2amps, 24W
Dimensions	8.625"L x 5.5"W x 1.625"H 21.9cmL x 14cmW x 4.1cmH
Weight	2.5lbs.

Regulatory Compliance (Safety/EMC)

UL, CSA, CE, CB
NEBS Level III,
EN60950 (safety)
FCC Part 15 Class B
ICES-003 Class B (emissions)
EN55022 Class A (emissions)
EN55024:1998 (immunity)
IEC 825-1 Classification (eye safety)
Class 1 Laser Product (eye safety)

Standards Compliance

- IEEE 802.3-2002
- IEEE 802.1D/D4-2003 Forwarding Aspects
- IEEE 802.1Q-2003 VLAN Bridge Forwarding Aspects
- IEEE 802.1Q/p Traffic Class Extensions
- IEEE 802.3ah OAM
- SNMPv1, v2, v2c, v3
- RFC 768 (UDP)
- RFC 791 (IP)
- RFC 792 (ICMP)
- RFC 793 (TCP)
- RFC 826 (ARP)
- RFC 854 (Telnet)
- RFC 950 (Internet Standard Subnetting Procedure)
- RFC 1213 (MIB-II)
- RFC 1349 (IP) – updates RFC 791
- RFC 1350 (TFTP)
- RFC 1782 (TFTP) – updates RFC 1350
- RFC 1783 (TFTP) – updates RFC 1350
- RFC 1784 (TFTP) – updates RFC 1350
- RFC 1785 (TFTP) – updates RFC 1350
- RFC 2011 (MIB-II) – updates RFC 1213
- RFC 2012 (MIB-II) – updates RFC 1213
- RFC 2013 (MIB-II) – updates RFC 1213
- RFC 2131 (DHCP)
- RFC 2347 (TFTP) – updates RFC 1350
- RFC 2348 (TFTP) – updates RFC 1350
- RFC 2349 (TFTP) – updates RFC 1350
- RFC 2819 (RMON Group 1)
- RFC 2863 (Interfaces Group MIB) - updates RFC 1213
- RFC 2865 (Radius Client Support)
- RFC 3031 (MPLS)
- RFC 3032 (MPLS)
- RFC 3036 (MPLS)
- RFC 3168 (TCP) – updates RFC 793
- RFC 3273 (RMON Group 1)
- RFC 3396 (DHCP) - updates 2131
- RFC 3443 (MPLS)
- RFC 3811 (MPLS)
- RFC 3814 (MPLS)
- IETF PWE3 Working Group Compliance
- IETFL2VPN Working Group Compliance

MIB-II

The RS960 ESPP supports the following standard Management Information Base (MIB-II) managed object groups. Objects from within these MIB groups are accessible by, and available to, SNMP-based management stations over UDP/IP.

- System (end-station only)
- Interfaces (end-station and data interfaces)
- IpNetToMedia (end-station only)
- IP (end-station only)
- ICMP (end-station only)
- TCP (end-station only)
- UDP (end-station only)
- SNMP (end-station only)
- AT (end-station only)

Enterprise-Specific Managed Objects

Metrobility-specific managed objects provide control of the following objects:

- End-station IP addressing information
- SNMP access communities
- SNMP trap destination addresses and communities
- Download server addresses
- Download management software
- Interface control (enable/disable)
- Input/output laser levels

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Metrobility Optical Systems is an innovative next generation optical networking company whose focus is on delivering optical access platforms and to harness the power of Ethernet and fiber optics to deliver superior network edge access, connectivity and wavelength multiplexing solutions.