Technical Specification

MEF 6

Ethernet Services Definitions - Phase I

June 2004

MEF 6	

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1. Introduction

Ethernet has its origins in providing network connectivity and was not originally used to provide services. With the introduction of Metro Ethernet services, Service Providers started using this Ethernet "connectivity" technology to provide Ethernet "services". While the IEEE 802.3 Ethernet protocol is still used, service-related attributes and parameters need to be added in order to create an Ethernet service.

This document uses service attributes and parameters that are defined in both the Ethernet Services Model [5] and the Traffic Management [6] specifications. The relationship between this document and these other two MEF services documents is illustrated in Figure 1 below. This document applies the service attributes and parameters to create different Ethernet services.

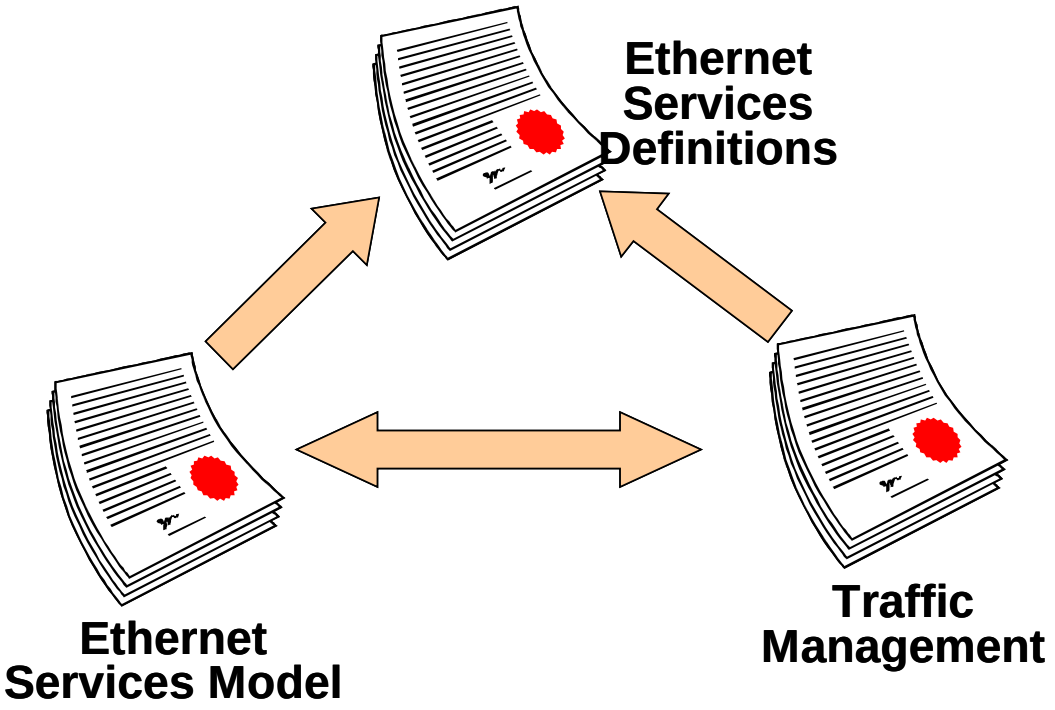

Figure 1: Relationship between different MEF Services documents

This document defines two generic service constructs called Ethernet Service types and specifies their associated service attributes and parameters used to create point-to-point and multipoint-to-multipoint Ethernet services. This document also defines the requirements for several Ethernet services that use these generic Ethernet Service types.

The services described in this document are from a Subscriber perspective and are defined based on the service attributes that might appear in a Service Level Agreement (SLA) or Service Level Specification (SLS). The services are instantiated at an Ethernet UNI with IEEE 802.3-2002

Ethernet interfaces interconnecting the customer equipment to the service provider network. These services, however, are agnostic of the underlying network infrastructure within the Metro Ethernet Network (MEN) and may be supported over different transport technologies in the Service Provider's network such as SONET, RPR, WDM, MPLS, etc.

2. Terminology (Normative)

Term	Definition
All to One Bundling	A UNI service attribute defined in [5].
Bandwidth Profile	A term defined in [5].
Bandwidth profile per CoS ID	A UNI service attribute defined in [5]
Bandwidth profile per EVC	A UNI service attribute defined in [5]
Bandwidth profile per ingress UNI	A UNI service attribute defined in [5]
Broadcast Service Frame Delivery	An EVC service attribute defined in [5]
Bundling	A UNI service attribute defined in [5]
CBS	Committed Burst Size
CE	Customer Edge
CE-VLAN CoS	Customer Edge VLAN CoS
CE-VLAN CoS Preservation	An EVC service attribute defined in [5]
CE-VLAN ID	Customer Edge VLAN ID
CE-VLAN ID Preservation	An EVC service attribute defined in [5]
CE-VLAN ID / EVC Map	A UNI service attribute defined in [5]
CE-VLAN Tag	Customer Edge VLAN Tag
CE-VLAN tag preservation	A set of EVC service attributes defined in [5]
CF	Coupling Flag
CIR	Committed Information Rate
Class of Service	A term defined in [5]
Class of Service Performance	A set of EVC-related service attributes defined in [6]
CM	Color Mode
Color Mode	A parameter of the UNI service attribute 'Bandwidth Profile' defined in [6]
Committed Burst Size	A parameter of the UNI service attribute 'Bandwidth Profile'

Term	Definition
	defined in [6]
Committed Information Rate	A parameter of the UNI service attribute 'Bandwidth Profile' defined in [6]
CoS	Class of Service
CoS Identifier	An EVC service attribute defined in [5]
Coupling Flag	A parameter of the UNI service attribute 'Bandwidth Profile' defined in [6]
Customer Edge	A term defined in [5]
Customer Edge VLAN CoS	A term defined in [5]
Customer Edge VLAN ID	A term defined in [5]
Customer Edge VLAN Tag	A term defined in [5]
DLCI	Data Link Connection Identifier. A number attached to a data frame that identifies the PVC for the data frame.
Egress Service Frame	A term defined in [5]
EIR	Excess Information Rate
E-LAN	An Ethernet service type that is based on a Multipoint-to-Multipoint EVC
E-Line	An Ethernet service type that is based on a Point-to-Point EVC
EPL	Ethernet Private Line
Ethernet Virtual Connection	A term defined in [5]
EVPL	Ethernet Virtual Private Line
Excess Burst Size	A parameter of the UNI service attribute 'Bandwidth Profile' defined in [6]
Excess Information Rate	A parameter of the UNI service attribute 'Bandwidth Profile' defined in [6]
EVC	Ethernet Virtual Connection
FDX	Full Duplex
Frame	Short for Ethernet Frame
Frame Delay	A parameter defined in [6]
Frame Delay Variation	A parameter defined in [6]
Frame Loss	A parameter defined in [6]
Ingress Service Frame	A term defined in [5]
Layer 2 Control Protocol Service Frame Delivery	An EVC service attribute defined in [5]
Layer 2 Control Protocol	A UNI service attribute and an EVC service attribute defined in

Term	Definition
Processing	[5]
Maximum number of EVCs	A UNI service attribute defined in [5]
MEN	Metro Ethernet Network
Metro Ethernet Network	The Service Provider's network providing Ethernet services
Multicast Service Frame Delivery	An EVC service attribute defined in [5]
Multipoint-to-Multipoint EVC	A parameter of the EVC service attribute 'EVC Type' defined in [5]
N/A	Not Applicable
N/S	Not Specified
Point-to-Point EVC	A parameter of the EVC service attribute 'EVC Type' defined in [5]
Service Frame	A term defined in [5]
Service Frame Delivery	A set of EVC service attributes defined in [5]
Service Level Agreement	The contract between the Subscriber and Service Provider specifying the agreed to service level commitments
Service Level Specification	The technical specification of the service being offered by the Service Provider to the Subscriber
Service Multiplexing	A UNI service attribute defined in [5]
Service Provider	The organization providing Ethernet Services
SLA	Service Level Agreement
Subscriber	The organization purchasing and/or using Ethernet Services
SLS	Service Level Specification
Transparency	A term used to describe that the content of a Service Frame is delivered unaltered across a MEN
UNI	User Network Interface
UNI Identifier	A UNI service attribute defined in [5]
Unicast Service Frame Delivery	An EVC service attribute defined in [5]
UNI EVC ID	A UNI service attribute defined in [5]
UNI List	An EVC service attribute defined in [5]
User Network Interface	A term defined in [5]
VLAN	Virtual LAN, as defined in [1]

3. Scope

This document defines generic service constructs called Ethernet Service Types used to create Ethernet services over a Metro Ethernet Network (MEN). This document specifies the Ethernet Service Attributes and parameters that are used with the different Ethernet Service Types but does not define how the service attributes may be implemented.

This document also defines the service attribute requirements for several Ethernet Services that utilize the generic Ethernet Service Type constructs. Where possible, recommendations for the service attributes and associated parameters are made for these particular Ethernet Services.

This document does not define application-based services that may be offered using these Ethernet Service Types, e.g., IP Telephony service, nor does it define non-Ethernet-based services that may be offered over the MEN, e.g., Circuit Emulation Services over a TDM (e.g., T1) UNI. All services in this document use an Ethernet UNI. This document does not define how the services may be supported in the MEN using different transport and switching technologies.

Finally, this document uses service attributes defined in the Metro Ethernet Forum's Ethernet Services Model, Phase 1 [5] and Traffic Management – Phase I [6] documents. This document may be updated as future phases of these other documents become available.

3.1 Scope of Future Phases

Subsequent phases of this specification may add additional services or augment existing services with newly defined service attributes or parameters defined in other MEF Technical Committee specifications.

4. Compliance Levels

The key words "**MUST**", "**MUST NOT**", "**REQUIRED**", "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**RECOMMENDED**", "**MAY**", and "**OPTIONAL**" in this document are to be interpreted as described in RFC 2119 [7]. All key words use upper case, bold text.

5. Ethernet Service Definition Framework

The Ethernet Service Definition Framework provides a model for specifying Ethernet services. Ethernet Service Types are generic constructs used to create a broad range of services. Each Ethernet Service Type has a set of Ethernet Service Attributes that define the service characteristics. These Ethernet Service Attributes in turn have a set of parameters associated with them that provide various options for the different Service Attributes. Refer to Figure 2.

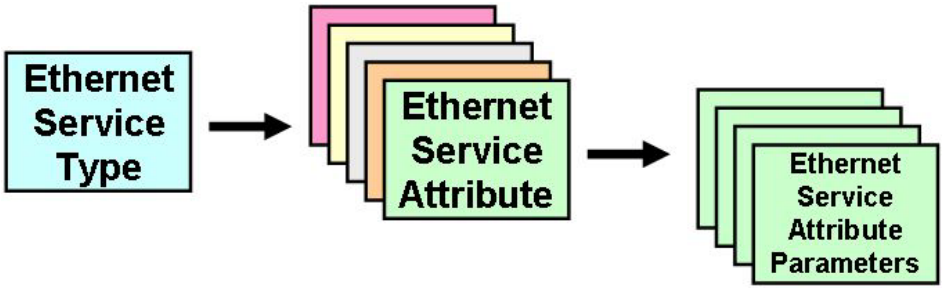

Figure 2: Ethernet Service Definition Framework

This document defines two Ethernet Service Type generic constructs, namely, Ethernet Line (E-Line) Service type (Refer to Section 5.1) and Ethernet LAN (E-LAN) Service type (Refer to Section 5.2), and their associated Service Attributes and parameters. The UNI and EVC service attributes and parameters are normatively defined in [5] and [6].

5.1 ETHERNET LINE (E-LINE) SERVICE TYPE (NORMATIVE)

Any Ethernet service that is based on a Point-to-Point Ethernet Virtual Connection **SHALL** be designated as an Ethernet Line Service (E-Line) type. The Ethernet Line Service (E-Line Service) is illustrated in Figure 3. An E-Line Service type can be used to create a broad range of point-to-point services.

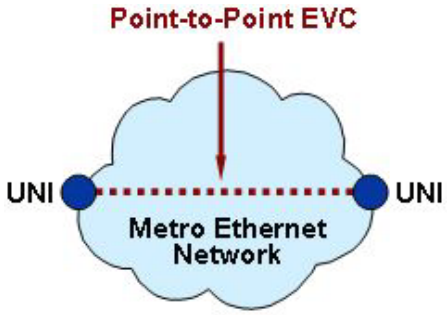

Figure 3: E-Line Service type using Point-to-Point EVC

In its simplest form, an E-Line Service type can provide symmetrical bandwidth for data sent in either direction with no performance assurances, e.g., best effort service between two 10Mbps UNIs. In more sophisticated forms, an E-Line Service type may be between two different speed UNIs and may be defined with performance assurances such as CIR with an associated CBS, EIR with an associated EBS, delay, delay variation, and loss. Service Multiplexing **MAY** occur at 1 or both UNIs in the EVC. For example, more than one point-to-point EVC (E-Line Service) may be offered on the same physical port at one or both of the UNIs.

The E-Line Service type UNI service attributes, parameters and values can be found in Table 1 below. It should be noted that this table is almost identical to the UNI service attribute table

defined in [5] and that there are no differences in the UNI tables for E-Line and E-LAN. It is presented here in its entirety to provide context for understanding the E-Line service type.

UNI Service Attribute	E-Line Service type Requirement
UNI Identifier	Arbitrary text string to identify the UNI.
Physical Medium	IEEE 802.3-2002 Physical Interface [4]
Speed	10 Mbps, 100 Mbps, 1 Gbps or 10 Gbps
Mode	Full Duplex or Auto negotiation.
MAC Layer	IEEE 802.3-2002 [4]
Service Multiplexing	Yes or No. **MUST** be No if All to One Bundling is Yes.
Bundling	Yes or No. **MUST** be No if All to One Bundling is Yes
All to One Bundling	Yes or No. **MUST** be No if Bundling or Service Multiplexing is Yes.
UNI EVC ID	Arbitrary text string to identify each EVC instance at the UNI.
CE-VLAN ID / EVC Map	Mapping table of CE-VLAN IDs to EVCs at the UNI.
Maximum number of EVCs	**MUST** be an integer >=1
Bandwidth Profile Per Ingress UNI	**OPTIONAL**[1]. If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> [6]
Bandwidth Profile Per EVC	**OPTIONAL.** If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> [6]
Bandwidth Profile Per CoS Identifier	**OPTIONAL.** If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> and **MUST** support <EVC> and <EVC, set of CE-VLAN CoS values> CoS Identifiers [5][6]
Layer 2 Control Protocol Processing	Bridge Block of protocols with destination MAC addresses 0x0180c2000000 through 0x0180c200000f. For each protocol, **MUST** specify one of: Peer, Discard, or Pass to EVC.
	GARP Block of protocols with destination MAC addresses 0x0180c2000020 through 0x0180c200002f. For each protocol, **MUST** specify one of: Peer, Discard, or Pass to EVC.
	All LANs Bridge Management Group protocols with destination MAC address 0x0180c2000010. For each protocol, **MUST** specify one of: Peer, Discard, or Pass to EVC.

Table 1: E-Line Service type UNI service attributes and parameter values

[1] It is the intent of MEF 1 [5] to recommend, but not require, that a bandwidth profile be applied to Service Frames on a UNI. So, provisioning a given UNI without any bandwidth profile is allowed.

The E-Line Service type EVC service attributes, parameters and values can be found in Table 2 below. It should be noted that this table is almost identical to the EVC service attribute table defined in [5]. The only difference between E-Line and E-LAN service types is the 'EVC Type' service attribute. The entire table is presented here to provide context.

EVC Service Attribute	E-Line Service type Requirement
EVC Type	**MUST** be Point-to-Point
UNI List	List the UNI Identifiers for the UNIs associated with the EVC.
CE-VLAN ID Preservation	Yes or No
CE-VLAN CoS Preservation	Yes or No
Unicast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Multicast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Broadcast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Layer 2 Control Protocol Processing (only applies for L2CPs passed to the EVC)	Bridge Block of protocols with destination MAC addresses 0x0180c2000000 through 0x0180c200000f. For each protocol passed to the EVC, **MUST** specify one of: Discard or Tunnel.
	GARP Block of protocols with destination MAC addresses 0x0180c2000020 through 0x0180c200002f. For each protocol passed to the EVC, **MUST** specify one of: Discard or Tunnel
	All LANs Bridge Management Group protocols with destination MAC address 0x0180c2000010. For each protocol passed to the EVC, **MUST** specify one of: Discard or Tunnel.
Service Performance	For each CoS, **MUST** specify a CoS Identifier. **MAY** specify a Frame Delay value, a Frame Delay Variation value and a Frame Loss value.

Table 2: E-Line Service type EVC service attributes and parameter values

5.2 ETHERNET LAN (E-LAN) SERVICE TYPE (NORMATIVE)

Any Ethernet Service that is based upon a Multipoint-to-Multipoint Ethernet Virtual Connection **SHALL** be designated as an Ethernet LAN (E-LAN) Service type. The Ethernet LAN (E-LAN) service type is illustrated in Figure 4.

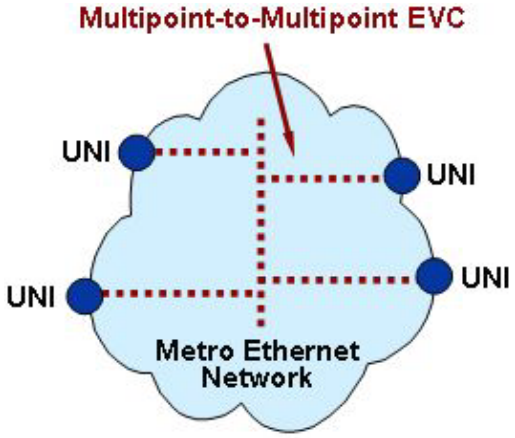

Figure 4: E-LAN Service type using Multipoint-to-Multipoint EVC

An E-LAN Service type can be used to create a broad range of services. In its simplest form, an E-LAN Service type can provide a best effort service with no performance assurances between the UNIs. In more sophisticated forms, an E-LAN Service type may be defined with performance assurances such as CIR with an associated CBS and EIR with an associated EBS for a given CoS instance. The MEF has not defined service performance (delay, delay variation, and loss) attributes for the E-LAN Service type.

For an E-LAN service type, Service Multiplexing MAY occur at none, one or more of the UNIs in the EVC. For example, an E-LAN Service type (Multipoint-to-Multipoint EVC) and an E-Line Service type (Point-to-Point EVC) may be service multiplexed at the same UNI. In this example, the E-LAN Service type may be used to interconnect other Subscriber sites while the E-Line Service type is used to connect to the Internet with both services offered via EVC service multiplexing at the same UNI.

The E-LAN Service type UNI Service Attributes and requirements can be found in Table 3 below. It should be noted that this table is almost identical to the UNI service attribute table defined in [5] and that there are no differences in the UNI tables for E-Line and E-LAN. It is presented here in its entirety to provide context for understanding the E-LAN Service type.

UNI Service Attribute	**E-LAN Service type Requirement**
UNI Identifier	Arbitrary text string to identify the UNI.
Physical Medium	IEEE 802.3-2002 Physical Interface [4]
Speed	10 Mbps, 100 Mbps, 1 Gbps or 10 Gbps
Mode	Full Duplex or Auto negotiation.
MAC Layer	IEEE 802.3-2002 [4]
Service Multiplexing	Yes or No. **MUST** be No if All to One Bundling is Yes.
Bundling	Yes or No. **MUST** be No if All to One Bundling is Yes

UNI Service Attribute	E-LAN Service type Requirement
All to One Bundling	Yes or No. **MUST** be No if Bundling or Service Multiplexing is Yes.
UNI EVC ID	Arbitrary text string to identify each EVC instance at the UNI
CE-VLAN ID / EVC Map	Mapping table of CE-VLAN IDs to EVCs at the UNI.
Maximum number of EVCs	**MUST** be an integer >= 1
Bandwidth Profile Per Ingress UNI	**OPTIONAL**. If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> [6]
Bandwidth Profile Per EVC	**OPTIONAL.** If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> [6]
Bandwidth Profile Per CoS Identifier	**OPTIONAL**. If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> and **MUST** support <EVC> and <EVC, set of one or more CE-VLAN CoS values> CoS Identifiers [5][6]
Layer 2 Control Protocol Processing	Bridge Block of protocols with destination MAC addresses 0x0180c2000000 through 0x0180c200000f. For each protocol, **MUST** specify one of: Peer, Discard, or Pass to EVC.
	GARP Block of protocols with destination MAC addresses 0x0180c2000020 through 0x0180c200002f. For each protocol, **MUST** specify one of: Peer, Discard, or Pass to EVC.
	All LANs Bridge Management Group protocols with destination MAC address 0x0180c2000010. For each protocol, **MUST** specify one of: Peer, Discard, or Pass to EVC.

Table 3 : E-LAN Service type UNI service attributes and parameter values

The E-LAN Service type EVC service attributes, parameters and values can be found in the table below. It should be noted that this table is almost identical to the EVC service attribute table defined in [5]. The only difference between E-Line and E-LAN service types is the 'EVC Type' service attribute. The entire table is presented here to provide context.

EVC Service Attribute	E-LAN Service type Requirement
EVC Type	**MUST** be Multipoint-to-Multipoint
UNI List	**MUST** provide the list of UNI Identifiers for the UNIs associated with the EVC.
CE-VLAN ID Preservation	Yes or No
CE-VLAN CoS Preservation	Yes or No

EVC Service Attribute	E-LAN Service type Requirement
Unicast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Multicast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Broadcast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Layer 2 Control Protocol Processing (only applies for L2CPs passed to the EVC)	Bridge Block of protocols with destination MAC addresses 0x0180c2000000 through 0x0180c200000f. For each protocol passed to the EVC, **MUST** specify one of: Discard or Tunnel.
	GARP Block of protocols with destination MAC addresses 0x0180c2000020 through 0x0180c200002f. For each protocol passed to the EVC, **MUST** specify one of: Discard or Tunnel.
	All LANs Bridge Management Group protocols with destination MAC address 0x0180c2000010. For each protocol passed to the EVC, **MUST** specify one of: Discard or Tunnel.
Service Performance	N/S - The MEF has not defined service performance attribute requirements for the E-LAN service type

Table 4: E-LAN Service type EVC service attributes and parameter values

6. Service Definitions (Normative)

An Ethernet service is defined by specifying service attribute parameter values for a given Ethernet Service type. This section defines the required service attributes and related parameter values for several Ethernet Services. If the Ethernet services in this section are offered, the normative text for each service attribute is applied. Note that other variations of these Ethernet Services are also possible.

6.1 ETHERNET PRIVATE LINE USING E-LINE SERVICE TYPE (NORMATIVE)

An Ethernet Private Line (EPL) service is specified using an E-Line Service type. EPL uses a point-to-point EVC between two UNIs and provides a high degree of transparency for Service Frames between the UNIs it interconnects such that the Service Frame's header and payload are identical at both the source and destination UNI. The service also has an expectation of low Frame Delay, Frame Delay Variation and Frame Loss Ratio. It does not allow for Service Multiplexing, i.e., a dedicated UNI (physical interface) is used for the service. Because of the amount of transparency of this service, there is no need for coordination between the Subscriber and Service Provider on a detailed CE-VLAN ID/EVC Map for each UNI because all Service Frames are mapped to a single EVC at the UNI. Refer to [5] for more information on CE-VLAN ID/EVC Map attribute.

The table below provides the UNI service attributes, parameters and values for the Ethernet Private Line (EPL) Service Level Specification (SLS), using the E-Line Service type.

UNI Service Attribute	Service Attribute Parameters and Values
UNI Identifier	Arbitrary text string to identify the UNI.
Physical Medium	IEEE 802.3-2002 Physical Interface [4]
Speed	10 Mbps, 100 Mbps, 1 Gbps or 10 Gbps
Mode	**MUST** be Full Duplex
MAC Layer	IEEE 802.3-2002 [4]
Service Multiplexing	**MUST** be No
Bundling	**MUST** be No
All to One Bundling	**MUST** be Yes
UNI EVC ID	Arbitrary text string to identify the EVC instance at the UNI
CE-VLAN ID / EVC Map	All Service Frames at the UNI **MUST** map to a single E-Line Service type EVC
Maximum number of EVCs	**MUST** be 1
Bandwidth Profile Per Ingress UNI	CIR: **MUST** be <= UNI Speed CBS: **MUST** be > largest Service Frame size EIR: **MUST** be 0 EBS: **MUST** be 0 CM: **MUST** be 'False' (color-blind) CF: Not Specified[2]
Layer 2 Control Protocol Processing	See section 7 of this document for these parameters/values.

Table 5: UNI service attributes and parameters for the EPL application (Normative)

The table below provides the EVC service attributes, parameters and values for the Ethernet Private Line (EPL) Service Level Specification (SLS), using the E-Line Service type.

EVC Service Attribute	Service Attribute Parameters and Values
EVC Type	**MUST** be Point-to-Point
UNI List	**MUST** list the two UNIs associated with the EVC.
CE-VLAN ID Preservation	**MUST** be Yes
CE-VLAN CoS Preservation	**MUST** be Yes
Unicast Service Frame Delivery	**MUST** Deliver Unconditionally
Multicast Service Frame Delivery	**MUST** Deliver Unconditionally
Broadcast Service Frame Delivery	**MUST** Deliver Unconditionally

[2] Since the UNI is 'color blind' for this service, the 'CF' parameter is not specified. See [6]

EVC Service Attribute	Service Attribute Parameters and Values
Layer 2 Control Protocols Processing (only applies for L2CPs passed to the EVC)	See section 7 of this document for these parameters/values.
Service Performance	Only one CoS is **REQUIRED**. A CoS ID of <EVC> **MUST** be specified. Frame Delay, Frame Delay Variation and Frame Loss Ratio **MUST** be specified.[3]

Table 6: EVC service attributes and parameters for the EPL application (Normative)

6.2 ETHERNET VIRTUAL PRIVATE LINE USING E-LINE SERVICE TYPE (NORMATIVE)

An Ethernet Virtual Private Line (EVPL) is created using an E-Line Service type. An EVPL can be used to create services similar to the Ethernet Private Line (EPL) with some notable exceptions. First, an EVPL allows for service multiplexing at the UNI. This capability allows more than one EVC to be supported at the UNI where the EPL does not allow this. Second, an EVPL need not provide full transparency of Service Frames as with an EPL. Because service multiplexing is permitted, some Service Frames may be sent to one EVC while other Service Frames may be sent to other EVCs.

The table below provides the UNI service attributes, parameters and values for the Ethernet Virtual Private Line (EVPL) Service Level Specification (SLS) using the E-Line Service type.

UNI Service Attribute	Service Attribute Parameters and Values
UNI Identifier	Arbitrary text string to identify the UNI.
Physical Medium	IEEE 802.3-2002 Physical Interface [4]
Speed	10 Mbps, 100 Mbps, 1 Gbps or 10 Gbps
Mode	**SHOULD** be Full Duplex
MAC Layer	IEEE 802.3-2002 [4]
Service Multiplexing	**SHOULD** be supported. When more than one EVC is multiplexed at a UNI, All to One Bundling **MUST** be No.
Bundling	Yes or No. If Yes, then CE-VLAN ID Preservation **MUST** be Yes. **MUST** be No if All to One Bundling is Yes
All to One Bundling	Yes or No. If Yes, then CE-VLAN ID Preservation **MUST** be Yes. **MUST** be No if Bundling or Service Multiplexing is Yes.
UNI EVC ID	Arbitrary text string to identify each EVC instance

[3] For an EPL service, Frame Delay, Frame Delay Variation and Frame Loss Ratio are typically very low values.

UNI Service Attribute	Service Attribute Parameters and Values
CE-VLAN ID / EVC Map	Mapping table of CE-VLAN IDs to E-Line Service type UNI EVC IDs.
Maximum number of EVCs	>= 1
Bandwidth Profile Per Ingress UNI	No or <CIR, CBS, EIR, EBS, CM, CF>
Bandwidth Profile Per EVC	No or <CIR, CBS, EIR, EBS, CM, CF>
Bandwidth Profile Per CoS Identifier	No or <CIR, CBS, EIR, EBS, CM, CF>
Layer 2 Control Protocol Processing	See section 7 of this document for these parameters/values.

Table 7: UNI service attributes and parameters for EVPL application (Normative)

The table below provides the EVC service attributes, parameters and values for the Ethernet Virtual Private Line (EVPL) Service Level Specification (SLS) using the E-Line Service type.

EVC Service Attribute	Service Attribute Parameters and Values
EVC Type	**MUST** be Point-to-Point
UNI List	**MUST** list the two UNIs associated with the EVC.
CE-VLAN ID Preservation	Yes or No
CE-VLAN CoS Preservation	Yes or No
Unicast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Multicast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Broadcast Service Frame Delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria.
Layer 2 Control Protocols Processing (only applies for L2CPs passed to the EVC)	See section 7 of this document for these parameters/values.
Service Performance	**MAY** support none, one or more CoS. If supported, a CoS ID, Frame Delay and Frame Loss Ratio **MUST** be specified. Frame Delay Variation **MAY** be specified.

Table 8: EVC service attributes and parameters for the EVPL application (Normative)

7. Layer 2 Control Protocol Processing Requirements (Normative)

This section provides requirements for the processing of a customer's Layer 2 Control Protocol (L2CP) frames on a given UNI for the EPL and EVPL service definitions. Specifically, requirements are specified by protocol, describing which protocols to tunnel or discard. The intent of this section is to allow for peering in specific cases, but these specific cases are beyond the scope of this document. Requirements are specified for the normatively defined services, EVPL and EPL, where peering is not implemented on the UNI. It is intended to provide guidance for actual deployments of these Metro Ethernet services, while at the same time allowing for flexibility among the Service Provider offerings.

The following table provides L2CP processing requirements as to how to handle the customer's layer-2 control protocols on a given UNI. The first column identifies the IEEE standard protocol (or block of protocols). The second column in the table provides requirements for the EVPL service definition. The third column provides requirements for the EPL service definition. The Ethernet Services Model (ESM) [5] defines three alternatives for processing customer's L2CP frames at the UNI: discard, peer and pass to the EVC. In the table, 'discard' means that the MEN will discard ingress L2CP frames of a given protocol, and will not generate that protocol on egress from the MEN. 'Peer' means that the MEN will actively participate with the Customer Equipment (CE) and 'Tunnel' means that frames associated with a given protocol are transparently passed to a given EVC for transport across the MEN to the destination UNI.

Protocol	EVPL	EPL
Spanning Tree Protocol (STP)[1], Rapid Spanning Tree Protocol (RSTP)[1], Multiple Spanning Tree Protocol (MSTP)[2]	**SHOULD** Discard	**MUST** Tunnel
PAUSE (802.3x) [4]	**SHOULD** Discard **MUST** Not Tunnel	**SHOULD** Discard
Link Aggregation Control Protocol (LACP) [4]	**SHOULD** Discard	**SHOULD** Tunnel
Marker Protocol [4]	**SHOULD** Discard	**SHOULD** Tunnel
Authentication (802.1x) [8]	**SHOULD** Discard	**SHOULD** Tunnel
All LANs Bridge Management Group Block of Protocols [1]	**SHOULD** Discard	**MUST** Tunnel
Generic Attribute Registration Protocol (GARP) Block of Protocols [1]	**SHOULD** Discard	**MUST** Tunnel

Table 9: Layer 2 Control Protocol Processing Requirements

Notes:

1. Note that where 'tunnel' is shown, specification of the tunneling method is beyond the scope of this document.
2. Care needs to be taken in tunneling LACP such that all UNIs involved in the link aggregation group are the same speed.

3. Marker protocol is an optional protocol that is specified as part of link aggregation. As such, requirements for Marker Protocol and LACP Protocol are aligned.

Some observations relating to the above requirements:

- Pause Frames: For all UNIs and service types, the requirement is to discard these frames, while allowing for the possibility of peering in some specific cases. Since pause frames control the flow of all data frames on a UNI – regardless of service class – supporting pause frames on a UNI can result in poor SLA performance. In addition, not all CEs support the use of pause frames.

- Ethernet Private Line (EPL): For the EPL case, the requirement is to generally tunnel L2CP, with the exception of pause frames indicated above. This is due to the nature of the application – EPL should be the most transparent of the service applications, providing point-to-point connectivity across the MEN between a pair of non-service multiplexed UNIs.

8. References

[1] IEEE 802.1D-2004, "Part 3: Media Access Control (MAC) Bridges"

[2] IEEE 802.1s – 2002, "Virtual Bridged Local Area Networks – Amendment 3: Multiple Spanning Trees"

[3] IEEE 802.1Q – 2003, "Virtual Bridged Local Area Networks"

[4] IEEE 802.3-2002, "Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications"

[5] Technical Specification MEF 1 "Ethernet Services Model, Phase 1"

[6] MEF "Traffic Management Specification – Phase I"

[7] RFC 2119, "Key words for use in RFCs to Indicate Requirement Levels", S. Bradner

[8] IEEE 802.1X – 2001, "Port-Based Network Access Control"