I n t e r n a t i o n a l   T e l e c o m m u n i c a t i o n   U n i o n

ITU-T G.8011.3/Y.1307.3

(08/2013)

TELECOMMUNICATION
STANDARDIZATION SECTOR
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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Packet over Transport aspects – Ethernet over Transport aspects

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

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Recommendation ITU-T G.8011.3/Y.1307.3

Ethernet virtual private LAN service

Summary

Recommendation ITU-T G.8011.3/Y.1307.3 defines the service attributes and parameters for carrying Ethernet characteristic information over shared bandwidth, multipoint-to-multipoint connections provided by synchronous digital hierarchy (SDH), plesiochronous digital hierarchy (PDH), asynchronous transfer mode (ATM), multi-protocol label switching (MPLS), optical transport hierarchy (OTH), Ethernet MAC layer network (ETH) or Ethernet PHY layer network (ETY) server layer networks. This type of service is referred to as Ethernet virtual private LAN (EVP-LAN) service. This Recommendation is based on the Ethernet service framework as defined in Recommendation ITU-T G.8011/Y.1307.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.8011.3/Y.1307.3	2010-02-06	15	11.1002/1000/10423-en
2.0	ITU-T G.8011.3/Y.1307.3	2013-08-29	15	11.1002/1000/12026-en

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Recommendation ITU-T G.8011.3/Y.1307.3

Ethernet virtual private LAN service

1 Scope

This Recommendation defines the service attributes and parameters for carrying Ethernet characteristic information over shared-bandwidth, multipoint-to-multipoint connections provided by SDH, ATM, MPLS, PDH, OTH, ETH or ETY server layer networks. This type of service is referred to as Ethernet Virtual private LAN (EVP-LAN) service. This Recommendation is based on the Ethernet service framework as defined in [ITU-T G.8011] and is aligned with the EVP-LAN services specified in [MEF 6.1].

This Recommendation specifies four attributes sets (EVC, EC, UNI and NNI) and values to describe an Ethernet Virtual private LAN service from the perspective of the network.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T G.805] Recommendation ITU-T G.805 (2000), *Generic functional architecture of transport network*.

[ITU-T G.809] Recommendation ITU-T G.809 (2003), *Functional architecture of connectionless layer networks*.

[ITU-T G.8001] Recommendation ITU-T G.8001/Y.1354 (2013), *Terms and definitions for Ethernet frames over transport*.

[ITU-T G.8010] Recommendation ITU-T G.8010/Y.1306 (2012), *Architecture of Ethernet layer networks*.

[ITU-T G.8011] Recommendation ITU-T G.8011/Y.1307 (2012), *Ethernet service characteristics*.

[ITU-T G.8012] Recommendation ITU-T G.8012/Y.1308 (2004), *Ethernet UNI and Ethernet NNI*.

[ITU-T G.8012.1] Recommendation ITU-T G.8012.1/Y.1308.1 (2012), *Interfaces for the Ethernet transport network*.

[ITU-T G.8013] Recommendation ITU-T G.8013/Y.1731 (2013), *OAM functions and mechanisms for Ethernet based networks*.

[ITU-T G.8021] Recommendation ITU-T G.8021/Y.1341 (2010), *Characteristics of Ethernet transport network equipment functional blocks*.

[IEEE 802.1aq] IEEE 802.1aq-2012, *IEEE Standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks—Amendment 20: Shortest Path Bridging*.

[IEEE 802.1AX] IEEE 802.1AX-2008, *IEEE Standard for Local and metropolitan area networks – Link Aggregation*.

[IEEE 802.1Q] IEEE 802.1Q-2011, *IEEE standard for Local and metropolitan area networks – Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks*.

[IEEE 802.3] IEEE 802.3-2012, *IEEE Standard for Ethernet*.

[MEF 6.1] The Metro Ethernet Forum, Technical Specification MEF 6.1 (2008), *Ethernet Services Definitions – Phase 2*.

[MEF 6.1.1] The Metro Ethernet Forum, Technical Specification MEF 6.1.1 (2012), *Layer 2 Control Protocol Handling Amendment to MEF 6.1*.

[MEF 10.2] The Metro Ethernet Forum, Technical Specification MEF 10.2 (2009), *Ethernet Services Attributes – Phase 2*.

[MEF 26.1] The Metro Ethernet Forum, Technical Specification MEF 26.1 (2012), *External Network Network Interface (ENNI) – Phase 2*.

[MEF 30] The Metro Ethernet Forum, Technical Specification MEF 30 (2011), *Service OAM Fault Management Implementation Agreement*.

[MEF 35] The Metro Ethernet Forum, Technical Specification MEF 35 (2012), *Service OAM Performance Monitoring Implementation Agreement*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 customer: [ITU-T G.8001].

3.1.2 ENNI: [MEF 26.1].

3.1.3 ETH link: See clause 6.6 of [ITU-T G.8010].

3.1.4 Ethernet connection (EC): [ITU-T G.8001].

3.1.5 Ethernet service: [ITU-T G.8001].

3.1.6 Ethernet virtual connection (EVC): [MEF 10.2].

3.1.7 flow point: [ITU-T G.809].

3.1.8 link: [ITU-T G.805].

3.1.9 link connection: [ITU-T G.805].

3.1.10 network-to-network interface (NNI): [ITU-T G.8001].

3.1.11 service frame: [MEF 10.2].

3.1.12 subnetwork: [ITU-T G.805].

3.1.13 traffic conditioning function: [ITU-T G.8010].

3.1.14 user-to-network interface (UNI): [ITU-T G.8001].

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

APS	Automatic Protection Switching
ATM	Asynchronous Transfer Mode
CBS	Committed Burst Size
CCM	Continuity Check Message
CE	Customer Edge
CE-VLAN	Carrier Ethernet VLAN
CFM	Connectivity Fault Management
CI	Characteristic Information
CIR	Committed Information Rate
CLPS	Connectionless Packet Switched
CM	Colour Mode
CO-CS	Connection Oriented Circuit Switched
CO-PS	Connection Oriented Packet Switched
DA	Destination Address
DMM	Delay Measurement Message
DMR	Delay Measurement Reply
EBS	Excess Burst Size
EC	Ethernet Connection
EFM	Ethernet in the First Mile
EIR	Excess Information Rate
E-LAN	Ethernet Local Area Network
E-LMI	Ethernet Local Management Interface
ENNI	External Network Network Interface
ETH	Ethernet MAC layer network
ETH_CI	Ethernet MAC Characteristic Information
ETH_FF	Ethernet Flow Forwarding Function
ETH_FP	Ethernet Flow Point
ETY	Ethernet PHY Layer Network
EVC	Ethernet Virtual Connection
EVP-LAN	Ethernet Virtual Private LAN
FCS	Frame Check Sequence
FF	Flow Forwarding
FP	Flow Point
GARP	Generic Attribute Registration Protocol
GVRP	GARP VLAN registration protocol

ID	Identification
LACP	Link Aggregation Control Protocol
LAMP	Link Aggregation Marker Protocol
LC	Link Connection
MAC	Media Access Control
MEG	Maintenance Entity Group
MEN	Metro Ethernet Network
MEP	MEG End Point
MIP	MEG Intermediate Point
MPLS	Multi-Protocol Label Switching
MSTP	Multiple Spanning Tree Protocol
MTU	Maximum Transmission Unit
MVRP	Multiple VLAN Registration Protocol
NNI	Network-to-Network Interface
OAM	Operation, Administration, Maintenance
OTH	Optical Transport Hierarchy
OTN	Optical Transport Network
OVC	Operator Virtual Connection
PDH	Plesiochronous Digital Hierarchy
PHY	Physical layer entity
RSTP	Rapid Spanning Tree Protocol
SDH	Synchronous Digital Hierarchy
SN	Subnetwork
STP	Spanning Tree Protocol
UNI	User-to-Network Interface
UNI-C	Customer side of UNI
UNI-N	Network side of UNI
VLAN	Virtual local area network

5 Conventions

The diagrammatic convention for Ethernet services described in this Recommendation is that of [ITU-T G.8010].

Further, the use of ETH link in this Recommendation is that of [ITU-T G.8010]. Specifically, ETH link is a generalization that collectively refers to ETH link and ETH link connection.

6 Ethernet virtual private LAN (EVP-LAN) service

6.1 Description

An EVP-LAN service is a multipoint-to-multipoint service between two or more demarcation points as illustrated in Figure 6-1. The service is provided over connection oriented server layer networks with a committed information rate (CIR). Note that if a CO-PS server layer is used traffic management is required to ensure that the CIR is maintained. The level of transparency of an EVP-LAN is Frame-based characteristic information.

Some subscribers commonly desire an E-LAN service type to connect their UNIs in a metro network, while at the same time accessing other services from one or more of those UNIs. An example of such a UNI is a subscriber site that wants to access a public or private IP service from a UNI that is also used to for E-LAN service among the subscriber's several metro locations. The Ethernet virtual private LAN (EVP-LAN) service is defined in this clause to address this need.

Bundling may or may not be used on the UNIs in the multipoint-to-multipoint EC. As such, CE-VLAN tag preservation and tunnelling of certain Layer 2 control protocols may or may not be provided. Figure 6-1 below shows the basic structure of EVP-LAN service.

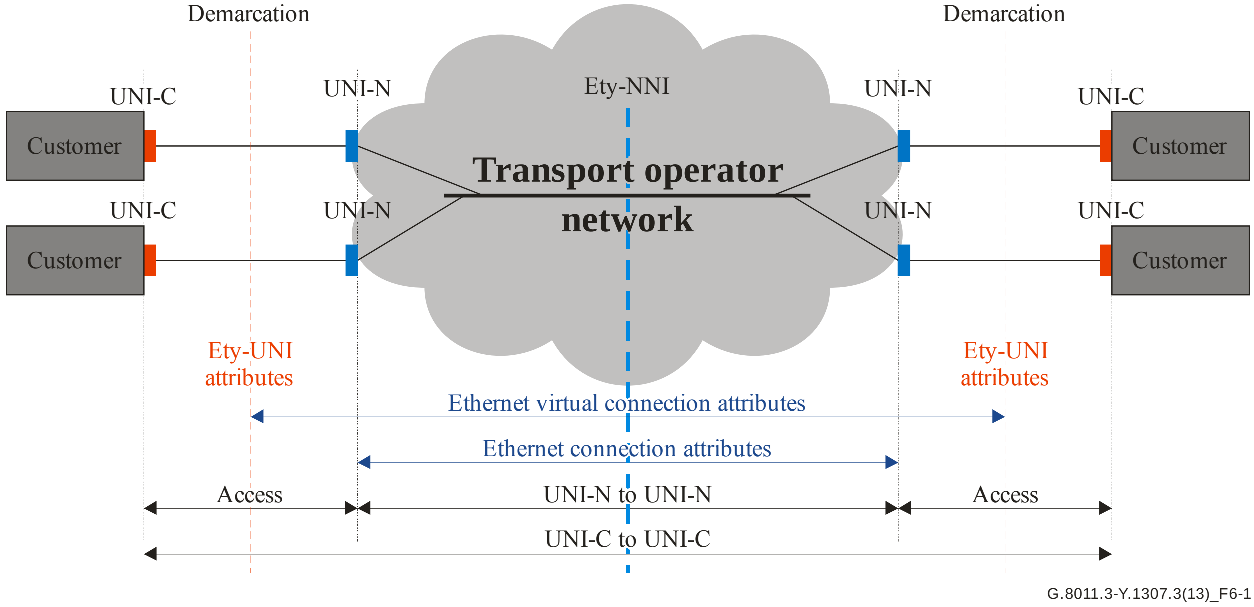

Figure 6-1 – Ethernet virtual private LAN (EVP-LAN) service

6.2 Ethernet virtual private LAN (EVP-LAN) service architecture

There are three types of EVP-LAN described in this clause:

- EVP-LAN type 1 (dedicated server layer with multiplexed access);
- EVP-LAN type 2 (shared server layer with dedicated access);
- EVP-LAN type 3 (shared server layer with multiplexed access).

These types are based on a combination of [ITU-T G.8011] attributes shown in Table 6-1. The subtypes shown in the following clauses are degenerate cases of the base type.

Table 6-1 – EVP-LAN types

Type	Shared server layer	Multiplexed access
EVP-LAN type 1	N	Y
EVP-LAN type 2	Y	N
EVP-LAN type 3	Y	Y

The following clauses describe the three basic types and their subtypes.

6.2.1 EVP-LAN type 1

For this type of EVP-LAN service, the ETY layer is terminated at the UNI-N and the multiplexed ETH frames are forwarded over single ETH_FPs to the dedicated server layer. The UNI uses the VLAN tag for multiplexing at the demarcation point. Multiplexed access based on the service multiplexing ETH UNI service attribute (per clause 8.1 of [ITU-T G.8011]) indicates that multiple service instances exist across a single Ethernet UNI demarcation. Since multiplexed access is the principal feature of EVP-LAN type 1 service ingress, EVP-LAN type 1 service is also referred to as multiplexed access service.

There are two subtypes of EVP-LAN type 1, based on the loop prevention mechanism, as described by Table 6-2:

Table 6-2 – EVP-LAN type 1 subtypes

Type	Loop prevention
EVP-LAN type 1a	Split horizon
EVP-LAN type 1b	Spanning tree

6.2.1.1 EVP-LAN type 1a

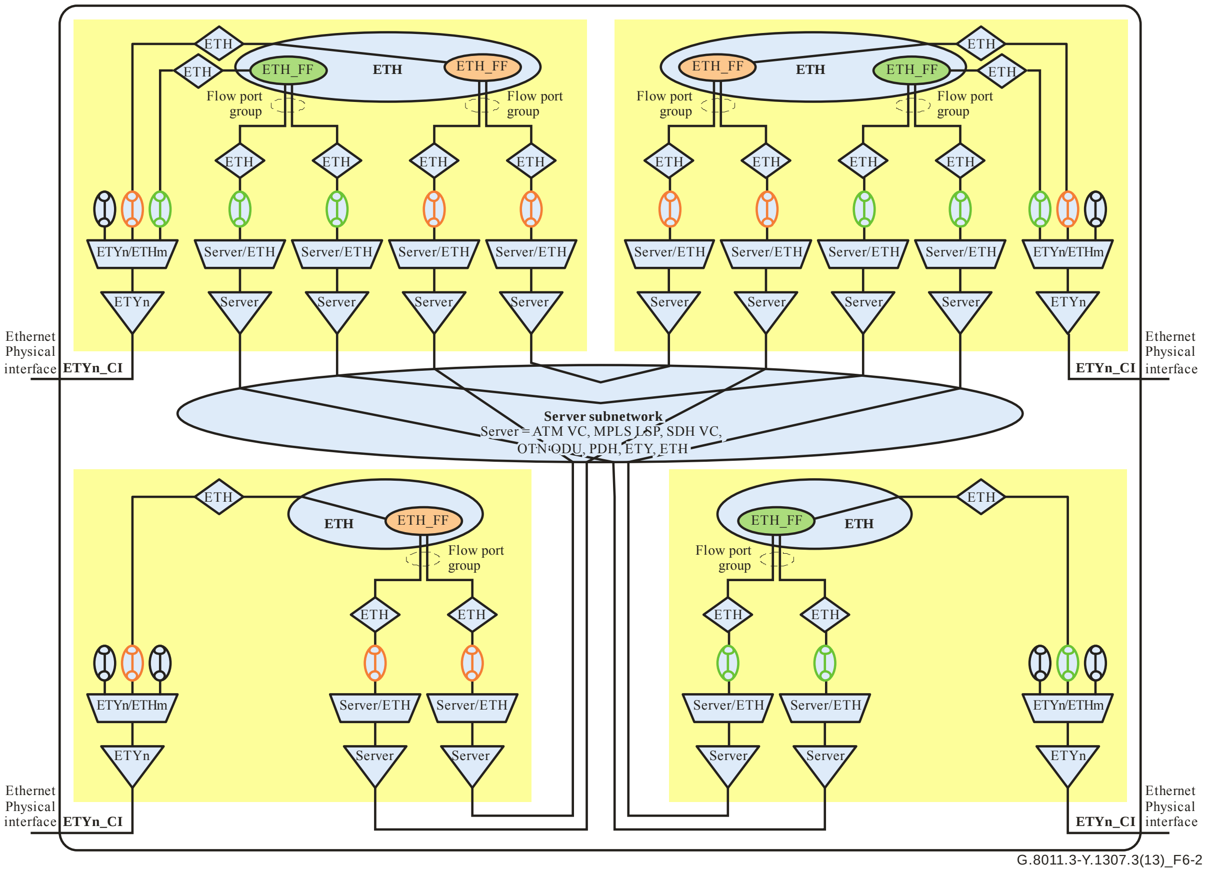

Figure 6-2 – EVP-LAN type 1a service architecture

Figure 6-2 shows the basic architecture of the EVP-LAN type 1a service. For each service, there is a dedicated server layer connection to any of the other UNIs. At the user side, a traffic conditioning function is present for controlling the traffic rate from/to the user network. An ETH_FF is present at each UNI for traffic forwarding based on the destination MAC address. The Ethernet traffic from the user will be mapped/de-mapped to/from server layer connections by a server/ETH adaptation function.

Since the full-mesh connection could form traffic looping, split horizon should be deployed at the ETH_FF, i.e., the packet received from one UNI will not be forwarded to another UNI.

6.2.1.2 EVP-LAN type 1b

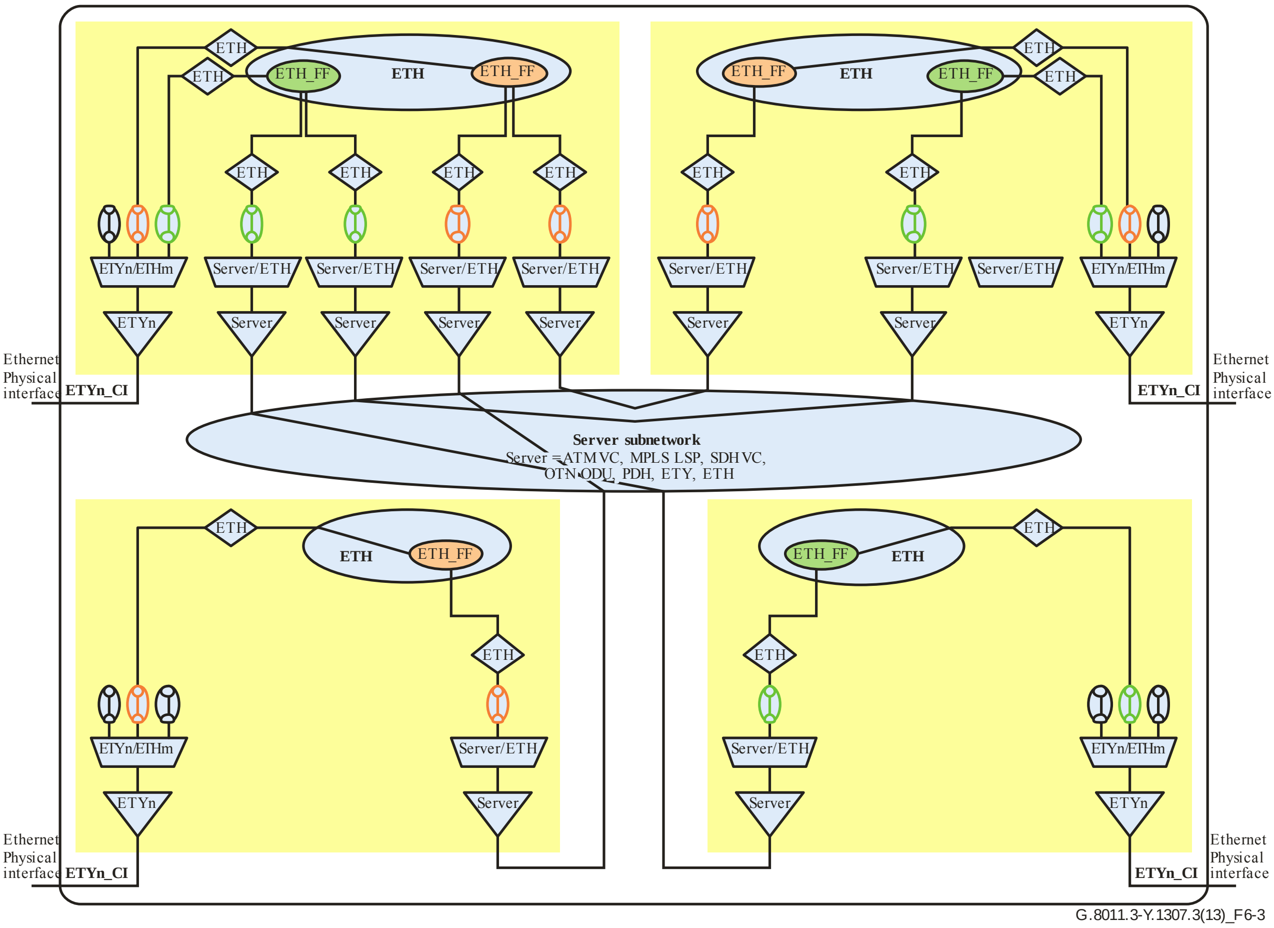

Figure 6-3 – EVP-LAN type 1b service architecture

Figure 6-3 shows the basic architecture of the EVP-LAN type 1b service. For each service, the EVP-LAN UNIs are connected by a dedicated spanning tree connection. The tree-style connectivity could avoid traffic looping. A traffic conditioning function should be provided at the UNI for controlling the rates from/to each point before mapping the traffic to the server layer connection.

6.2.2 EVP-LAN type 2

For this type of EVP-LAN service, each service instance has dedicated access to the UNI-N. The ETY layer is terminated at the UNI-N and the ETH frames are forwarded over ETH_FPs to the shared server layer. A frame tag is associated with each frame in the server layer (i.e., logical separation) to perform the multiplexing.

There are two subtypes of EVP-LAN type 2, based on the loop prevention mechanism, as described by Table 6-3:

Table 6-3 – EVP-LAN type 2 subtypes

Type	Loop prevention
EVP-LAN type 2a	Split horizon
EVP-LAN type 2b	Spanning tree

6.2.2.1 EVP-LAN type 2a

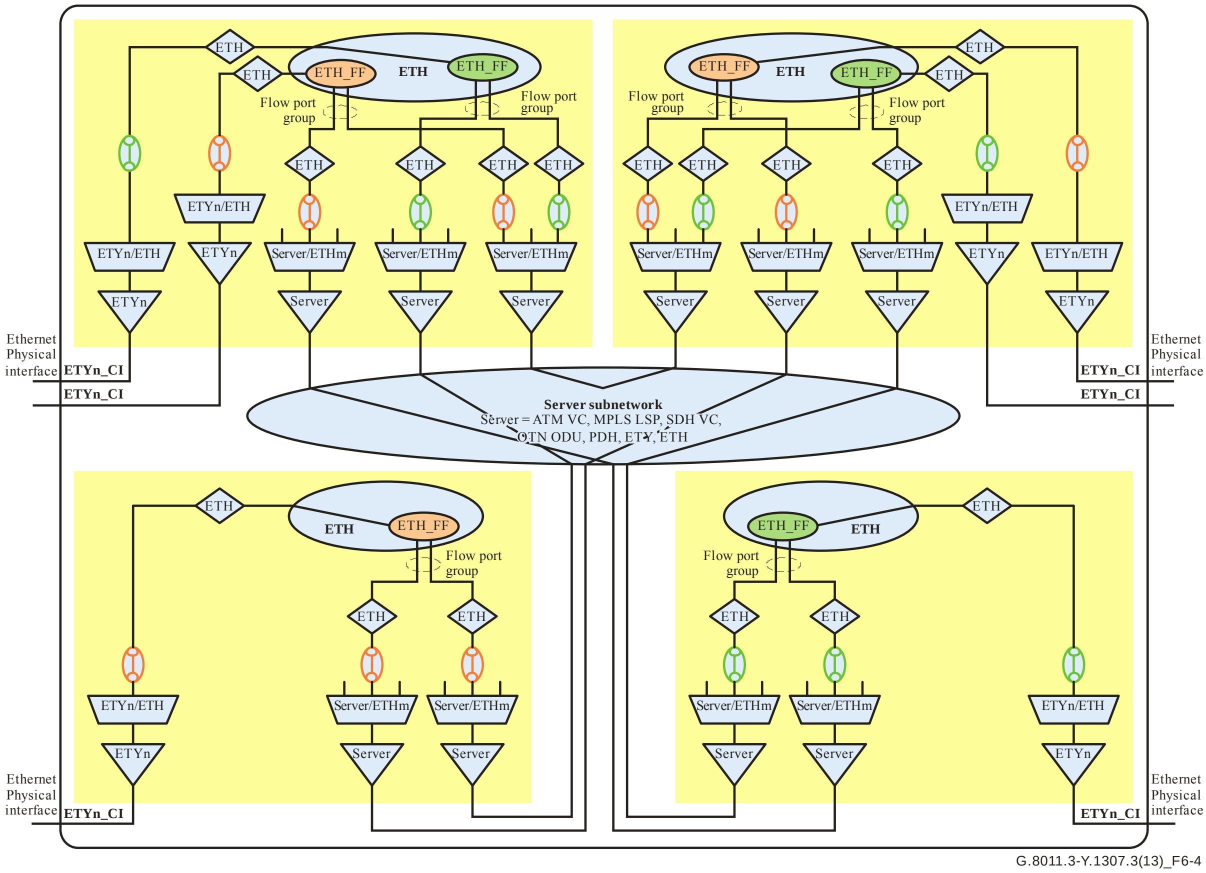

Figure 6-4 – EVP-LAN type 2a service architecture

Figure 6-4 shows the basic architecture of the EVP-LAN type 2a service. For each pair of UNIs, there is a server layer connection between them. Each server layer connection can be shared by multiple services between the two UNIs. At the user side, a traffic conditioning function is present for controlling the traffic rate from/to the user network. An ETH_FF is present at each UNI for traffic forwarding based on destination MAC address. The Ethernet traffic from a user will be mapped/de-mapped to/from server layer connections by a server/ETH adaptation function.

Since the full-mesh connection could form traffic looping, split horizon should be deployed at the ETH_FF, i.e., the packet received from one UNI will not be forwarded to another UNI.

6.2.2.2 EVP-LAN type 2b

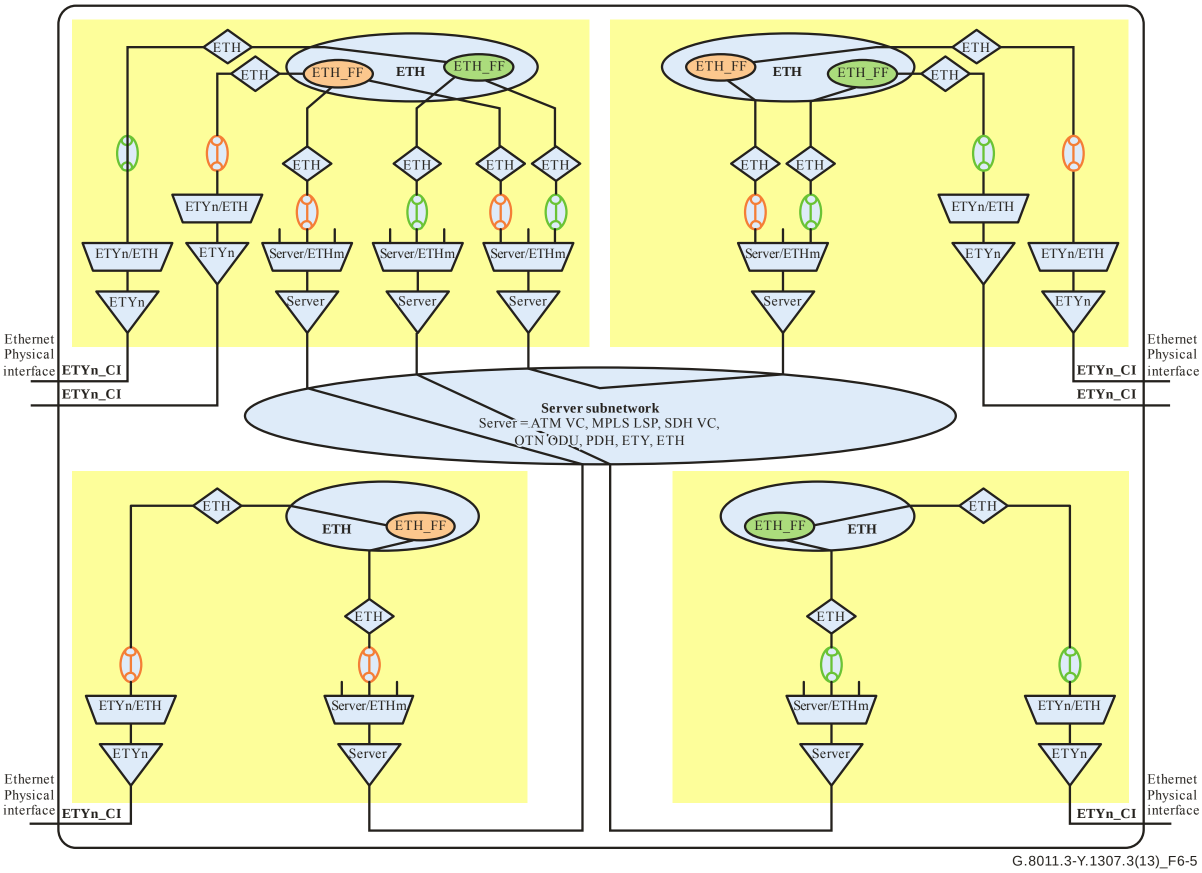

Figure 6-5 – EVP-LAN type 2b service architecture

Figure 6-5 shows the basic architecture of the EVP-LAN type 2b service. For each UNI, the EVP-LAN UNIs are connected by a dedicated spanning tree connection. The tree-style connectivity could avoid traffic looping. A traffic conditioning function should be provided at the UNI for controlling the rates from/to each point before mapping the traffic to the server layer connection.

6.2.3 EVP-LAN type 3

For this type of EVP-LAN service, each service instance is separated either logically or spatially at the UNI-N. The ETY layer is terminated at the UNI-N and the multiplexed ETH frames (i.e., logical separation) are forwarded over ETH_FPs to the shared server layer.

There are two subtypes of EVP-LAN type 3, based on the loop prevention mechanism, as described by Table 6-4:

Table 6-4 – EVP-LAN type 3 subtypes

Type	Loop prevention
EVP-LAN type 3a	Split horizon
EVP-LAN type 3b	Spanning tree

6.2.3.1 EVP-LAN type 3a

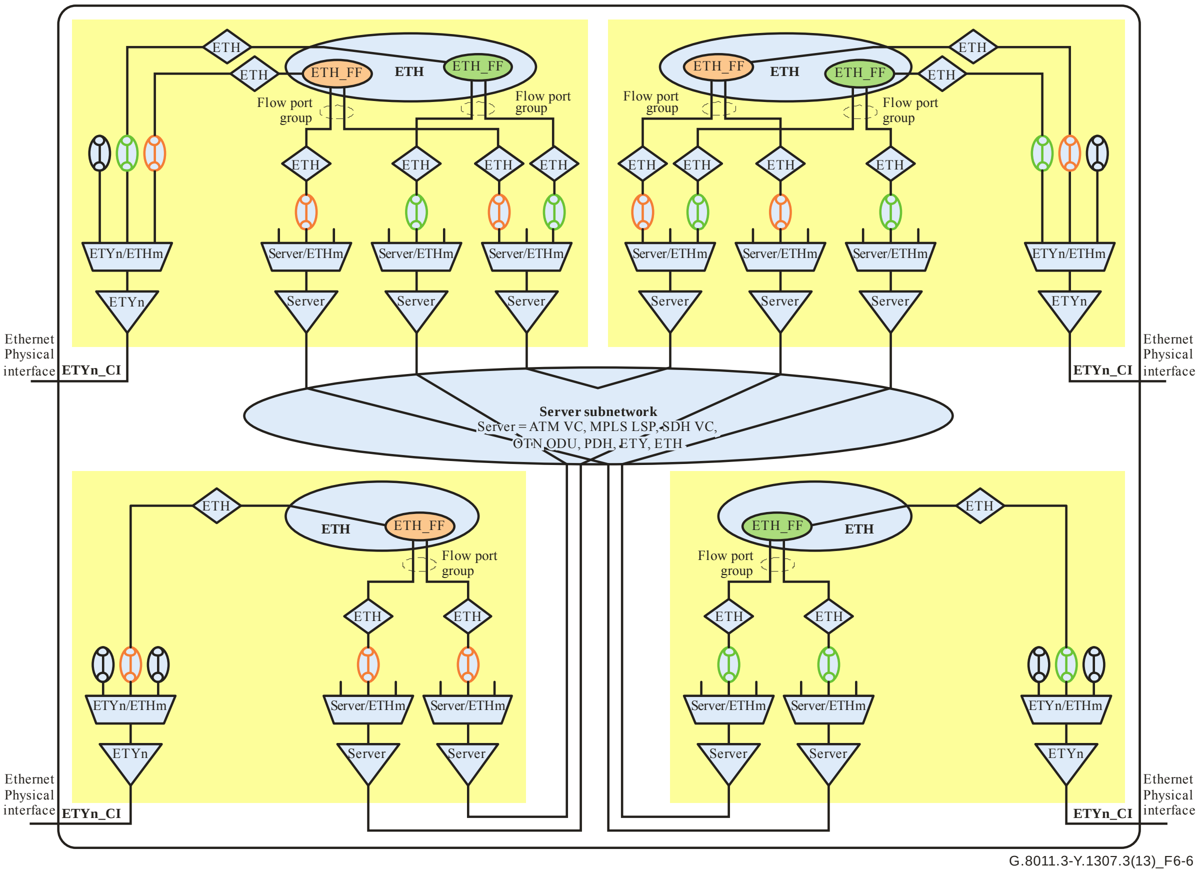

Figure 6-6 – EVP-LAN type 3a service architecture

Figure 6-6 shows the basic architecture of the EVP-LAN type 3a service. For each pair of UNIs, there is a server layer connection between them. Each server layer connection can be shared by multiple services between the two UNIs. At the user side, a traffic conditioning function is present for controlling the traffic rate from/to the user network. An ETH_FF is present at each UNI for traffic forwarding based on destination MAC address. The Ethernet traffic from the user will be mapped/de-mapped to/from server layer connections by a server/ETH adaptation function.

Since the full-mesh connection could form traffic looping, split horizon should be deployed at the ETH_FF, i.e., the packet received from one UNI will not be forwarded to another UNI.

6.2.3.2 EVP-LAN type 3b

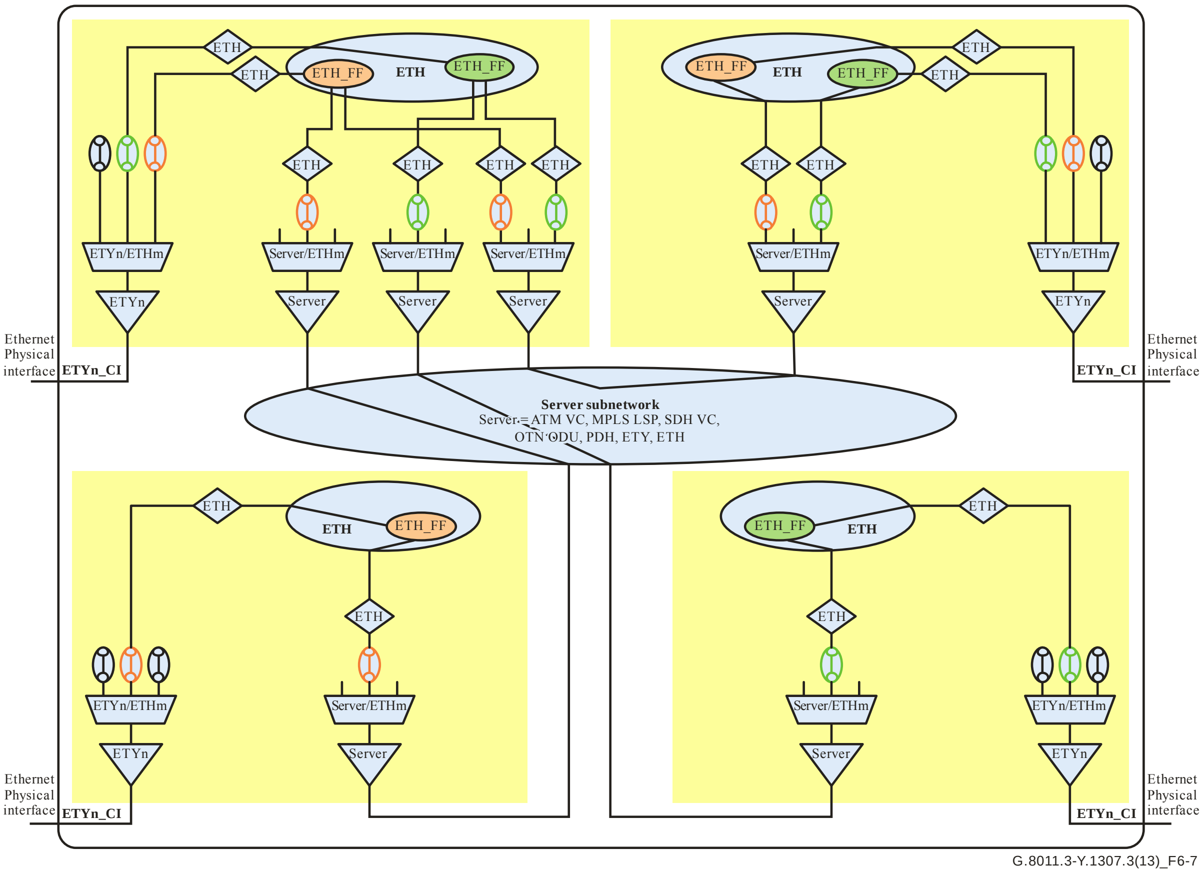

Figure 6-7 – EVP-LAN type 3b service architecture

Figure 6-7 shows the basic architecture of the EVP-LAN type 3b service. For each UNI, the EVP-LAN UNIs are connected by a dedicated spanning tree connection. The tree-style connectivity could avoid traffic looping. A traffic conditioning function should be provided at the UNI for controlling the rates from/to each point before mapping the traffic to the server layer connection.

7 EVC and EC service attributes for EVP-LAN service

7.1 EVC service attributes

This clause describes EVC service attributes for the EVP-LAN service. The base set of EVC service attributes is the same as the EVC service attributes defined in [MEF 6.1] Table 23, as amended in [MEF 6.1.1]. Table 7-1 summarizes the EVC service attributes, parameters and values for the EVP-LAN service.

Table 7-1 – EVC service attributes, parameters and values for the EVP-LAN service

EVC service attribute	Service attribute parameters and values	[MEF 10.2] reference
EVC type	**MUST** be multipoint-to-multipoint	6.1
EVC ID	An arbitrary string, unique across the MEN, for the EVC supporting the service instance	6.2
UNI list	**MUST** list the UNIs associated with the EVC. The UNI type **MUST** be Root for each UNI	6.3

Table 7-1 – EVC service attributes, parameters and values for the EVP-LAN service

EVC service attribute	Service attribute parameters and values	[MEF 10.2] reference
Maximum number of UNIs	**Integer. MUST** be ≥ 2	6.4
EVC MTU size	**MUST** be 1522 ≤ Integer ≤ 2000	6.10
CE-VLAN ID preservation	**MUST** be either Yes or No	6.6.1
CE-VLAN CoS preservation	**MUST** be either Yes or No	6.6.2
Unicast service frame delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria	6.5.1.1, 6.5.2
Multicast service frame delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria	6.5.1.2, 6.5.2
Broadcast service frame delivery	Deliver Unconditionally or Deliver Conditionally. If Delivered Conditionally, **MUST** specify the delivery criteria	6.5.1.3, 6.5.2
Layer 2 control protocols processing (only applies for L2CP frame passed to the EVC)	For each protocol passed to the EVC, **MUST** specify one of: Tunnel or Discard. **MUST** specify in accordance with section 8.4 of [MEF 6.1]	6.5.2, 6.7
EVC performance	At least one CoS is REQUIRED. **MUST** specify CoS ID, per section 6.8 of [MEF 10.2]. For each CoS, **MUST** list values for each of the following attributes {Frame Delay, Frame Delay Variation, Frame Loss Ratio, and Availability}, where Not Specified (N/S) is an acceptable value, for one or more sets of ordered UNI pairs where each ordered pair contains at least one Root UNI. Each ordered UNI pair containing at least one Root UNI in the EVC **MUST** be mapped to at least one CoS	6.8, 6.9

NOTE – The upper bound of 2000 bytes for EVC MTU size is not indicated in [MEF 10.2]. It only applies for transport server layers that impose this restriction (e.g., 802.3 PHYs per [IEEE 802.3]).

7.2 EC service attributes

The Ethernet connection attributes are described in the following clauses and are summarized in Table 7-2. These attributes are in addition to those defined in [MEF 6.1] and summarized in clause 7.1.

Table 7-2 – EC service attributes, parameters and values for the EVP-LAN service

EC service attribute	Service attribute parameters and values
Link type	Dedicated, shared
Survivability	None, Ethernet protection or server specific

7.2.1 Link type

The server link is referred to as dedicated for EVP-LAN type 1 as defined in clause 7.2.1.1 of [ITU-T G.8011]. The server link is referred to as shared for EVP-LAN types 2 and 3 as defined in clause 7.2.1.2 of [ITU-T G.8011].

7.2.2 Survivability

The transport network (service layer) can provide survivability for the EVP-LAN service. The survivability alternatives for the ETH link are, for example:

– No protection.

– Protection by means of SDH or OTH or ATM or MPLS or ETH protection schemes.

– Restoration by means of SDH or OTH or ATM or MPLS or ETH restoration schemes.

The applicability of survivability by means of linear protection switching and ring protection switching based on APS can also be an option.

Other options include:

- [IEEE 802.1AX] – Link aggregation.
- [IEEE 802.1Q] (RSTP, MSTP, GVRP, MVRP) – Spanning tree restoration.
- [IEEE 802.1aq] – Shortest path bridging.

8 UNI service Attributes for EVP-LAN service

This clause describes service UNI service attributes that characterize a particular instance of an EVP-LAN service at the demarcation of the UNI. The base set of UNI service attributes is the same as the UNI service attributes defined in [MEF 6.1] Table 21 and the EVC per UNI service attributes defined in [MEF 6.1] Table 22, as amended in [MEF 6.1.1]. They are summarized in Table 8-1 (with ITU-specific information provided as applicable).

A UNI can have a number of characteristics that will be important to the way that the CE sees a service. One of the key aspects of a service description will be the allowable mix of UNIs with different characteristics in an EVC. For example, a specific (simple) service might require all UNIs to have the same speed at the physical layer. A more sophisticated service may allow a wide variety of speeds.

Table 8-1 provides the UNI service attributes, parameters and values for the EVP-LAN service.

Table 8-1 – UNI service attributes for the EVP-LAN service

Layer	UNI service attribute	Service attribute parameters and values	[MEF 10.2] reference
ETH	UNI identifier	Arbitrary text string to identify the UNI	7.1
	MAC layer	[IEEE 802.3]	7.3
	UNI MTU size	**MUST** be 2000 ≥ Integer ≥ 1522	7.4
	Service multiplexing	**SHOULD** be supported at one or more UNIs	7.5
	UNI EVC ID	A string formed by the concatenation of the UNI ID and the EVC ID	7.6.2
	CE-VLAN ID for untagged and priority tagged service frames	**MUST** specify CE-VLAN ID for untagged and priority tagged Service Frames in the range of 1-4094	7.6.1
	CE-VLAN ID/EVC map	**MUST** specify mapping table of CE-VLAN IDs to the EVC ID	7.7
	Maximum number of EVCs	**MUST** be ≥ 1	7.8
	Bundling	Yes or No. If Yes, then CE-VLAN ID Preservation **MUST** be Yes	7.9
	All to one bundling	**MUST** be No	7.10
	Ingress bandwidth profile per UNI	**OPTIONAL.** If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF>. **MUST NOT** be combined with any other type of ingress bandwidth profile	7.11.2.1, 7.11.1
	Ingress bandwidth profile per EVC	**OPTIONAL**, If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF>. **MUST NOT** be combined with any other type of ingress bandwidth profile	7.11.2.2, 7.11.1
	Ingress bandwidth profile per CoS ID	**OPTIONAL**. If supported, **MUST** specify CoS ID per section 6.8 of [MEF 10.2], and **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> for each CoS. **MUST NOT** be combined with any other type of ingress bandwidth profile	7.11.2.3, 7.11.1
	Egress bandwidth profile per UNI	**OPTIONAL**, If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF>. **MUST NOT** be combined with any other type of egressbandwidth profile	7.11.3.1, 7.11.1
	Egress bandwidth profile per EVC	**OPTIONAL**, If supported, **MUST** specify <CIR, CBS, EIR, EBS, CM, CF>. **MUST NOT** be combined with any other type of egress bandwidth profile	7.11.3.2, 7.11.1
	Egress bandwidth profile per class of service identifier	**OPTIONAL**. If supported, **MUST** specify CoS ID per section 6.8 of [MEF 10.2] , and **MUST** specify <CIR, CBS, EIR, EBS, CM, CF> for each CoS. **MUST NOT** be combined with any other type of egress bandwidth profile	7.11.3.3, 7.11.1

Table 8-1 – UNI service attributes for the EVP-LAN service

Layer	UNI service attribute	Service attribute parameters and values	[MEF 10.2] reference
	Layer 2 control protocols processing	A list of Layer 2 control protocols with each being labelled with one of Discard, Peer, Pass to EVC, Peer and Pass to EVC. **MUST** specify in accordance with section 8.4 of [MEF 6.1]	7.13
ETY	Physical medium	A Standard Ethernet PHY	7.2
	Speed	10 Mbit/s, 100 Mbit/s, 10/100 Mbit/s Auto-negotiation, 1 Gbit/s, or 10 Gbit/s	7.2
	Mode	**MUST** be Full duplex	7.2

NOTE – The upper bound of 2000 bytes for UNI MTU size is not indicated in [MEF 10.2]. It only applies for transport server layers that impose this restriction (e.g., 802.3 PHYs per [IEEE 802.3]).

9 NNI service attributes for EVP-LAN service

9.1 Internal NNI attributes

As it is internal to a network operator's network, this Recommendation does not specify INNI service attributes. However, an operator may specify service attributes to characterize a particular instance of an EVP-LAN service at the demarcation line of the Internal NNI in Figure 6-1. There is an INNI defined at each of the ETH and server layers. These are described in [ITU-T G.8012] and [ITU-T G.8012.1].

9.2 External NNI attributes

This clause describes ENNI service attributes that characterize a particular instance of an EVP-LAN service at the demarcation line of the External NNI. The base set of ENNI service attributes is the same as the ENNI service attributes defined in [MEF 26.1] Table 2. They are summarized in Table 9-1.

Table 9-1 – ENNI service attributes for EVP-LAN service

ENNI service attribute	Service attribute parameters and values	[MEF 26.1] reference
Operator ENNI identifier	A string that is unique across the Operator MEN	7.1.1
Physical layer	One of the PHYs listed in [R5] of [MEF 26.1]	7.1.2
Frame format	Frame formats as specified in Section 7.1.3 of [MEF 26.1]	7.1.3
Number of links	An integer with value 1 or 2	7.1.4
Protection mechanism	Link Aggregation, none, or other	7.1.5
ENNI maximum transmission unit size	An integer number of bytes greater than or equal to 1526	7.1.6

Table 9-1 – ENNI service attributes for EVP-LAN service

ENNI service attribute	Service attribute parameters and values	[MEF 26.1] reference
End-point map	A table with rows of the form <S-VLAN ID value, End Point Identifier, End Point Type>	7.1.7
Maximum number of OVCs	An integer greater than or equal to 1	7.1.8
Maximum number of OVC end-points per OVC	An integer greater than or equal to 1	7.1.9

10 Connectivity monitoring for EVP-LAN service

While EVP-LAN services must be supported by multipoint-to-multipoint Ethernet (VLAN) connections that include ETH_C functions, server layer OAM (used in inherent monitoring) is unable to determine the status of those multipoint-to-multipoint Ethernet connections. Such status can only be determined by means of Ethernet OAM (proactive or on-demand).

Status monitoring of multipoint-to-multipoint Ethernet connections requires the use of Ethernet OAM specified in [ITU-T G.8013] and ETH MEP and ETH MIP functions specified in [ITU-T G.8021]. ETH MEP and ETH MIP functions and their ownership (customer, service provider, network operator) are illustrated in Figures 10-1 and 10-2.

Figures 10-1 and 10-2 provide the typical OAM configurations on UNI-N and intra domain NNI ports for EVP-LAN services supported by a single network operator of full mesh (see Figures 6-1, 6-2, 6-4 and 6-6) type and spanning tree (see Figures 6-1, 6-3, 6-5 and 6-7) type:

- ETH MIP functions on the UNI-N ports which are accessible from ETH MEP functions located in the customer network;
- ETH MEP functions on the UNI-N ports which are accessible by the service provider (which is the network operator); and
- ETH MIP functions on the intra domain NNI ports which are accessible from the service provider ETH MEP functions.

The service provider ETH MEP functions are responsible for UNI-N-to-UNI-N connectivity monitoring.

The ETH MIP functions on the UNI-N ports are used to help locating connectivity faults observed by the customer, which are not observed by the network. The ETH MIP functions on the intra domain NNI ports are used to help locating connectivity faults inside the network.

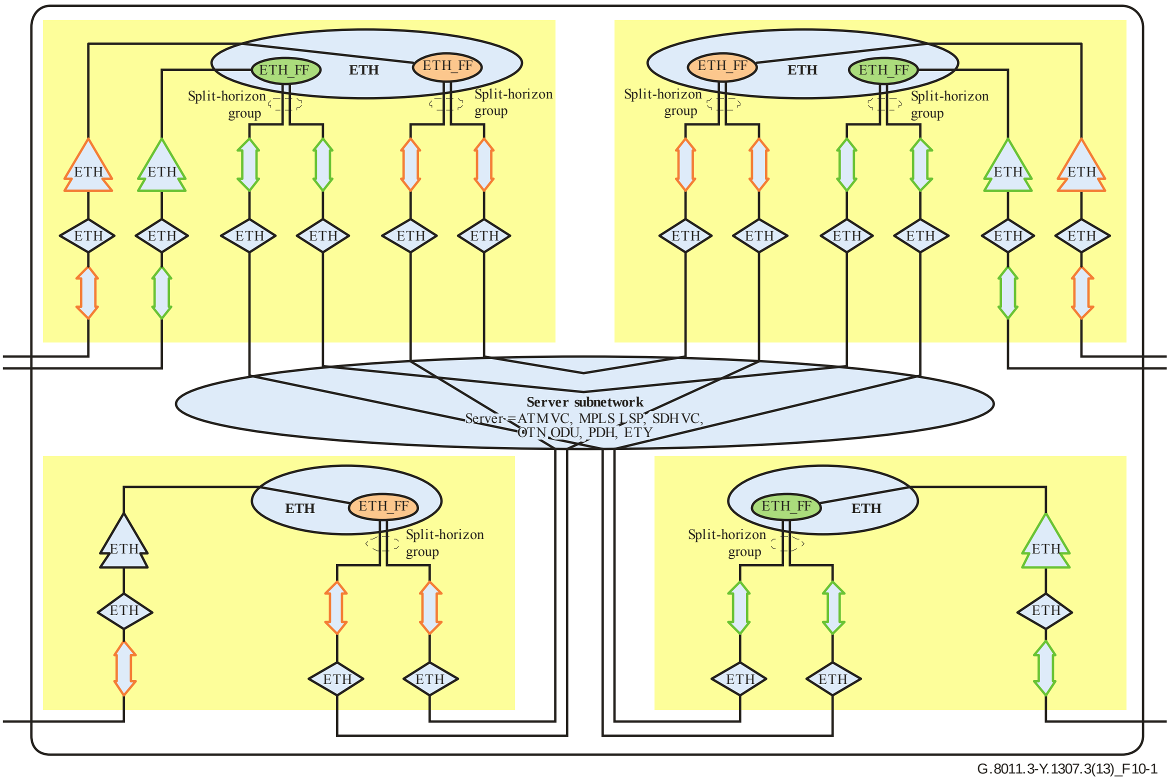

Figure 10-1 – Basic ETH MEP and MIP functions for the full mesh types 1a, 2a, 3a

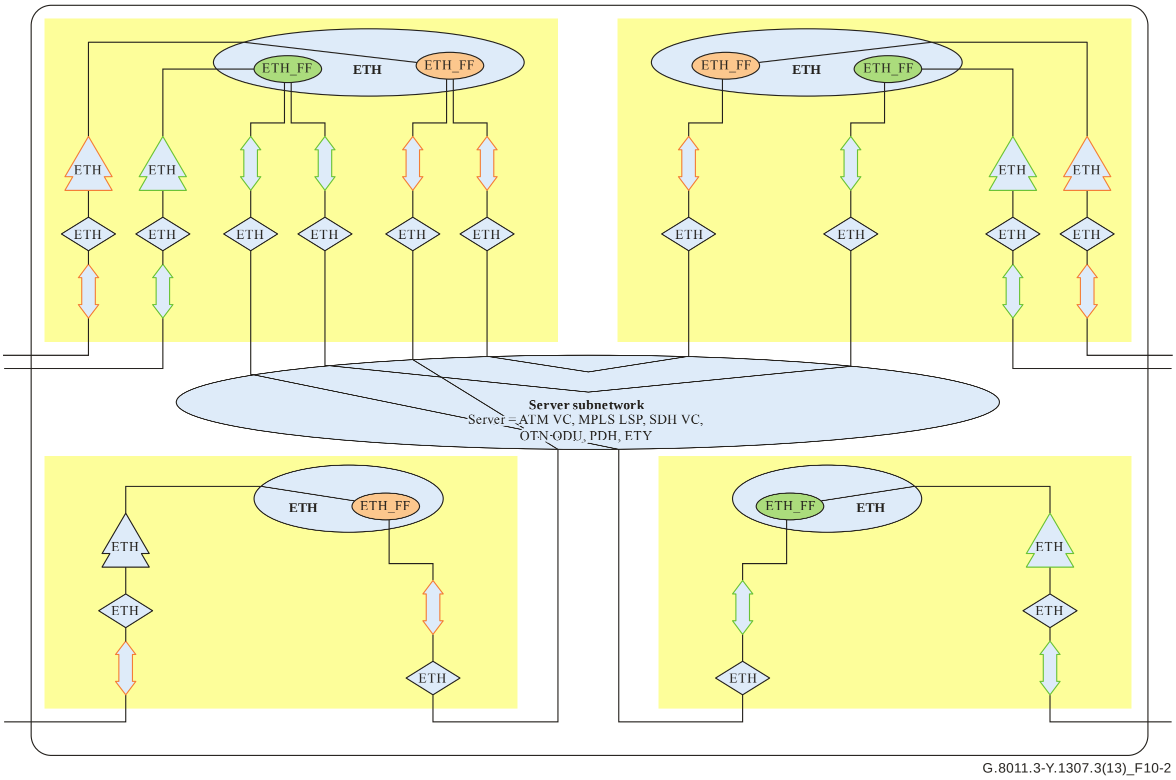

Figure 10-2 – Basic ETH MEP and MIP functions for the spanning tree types 1b, 2b, 3b

Frame delay and frame delay variation monitoring within these multipoint-to-multipoint Ethernet connections can be supported via on-demand Ethernet DMM/DMR OAM. Such DMM/DMR OAM is run between any two service provider ETH MEP functions.

Frame loss monitoring via the service provider ETH MEP functions is not possible with the Ethernet OAM frames currently specified in [ITU-T G.8013]. For the case frame, loss would be monitored between any two service provider ETH MEP functions or between any two network operator ETH MEP functions, then such measurement will count frames that are lost due to transmission errors (bit errors and congestion) on the ETH links and that are lost due to traffic conditioning at the ingress of the ETH link connections. The service provider and network operators are not accountable for the latter frame loss, which is due to customer traffic exceeding service level agreement for the link. Frames lost due to transmission errors on the ETH links can be detected when additional ETH MEP functions at the endpoints of the p2p ETH link connections are activated. Those ETH MEP functions are not illustrated in Figures 10-1 and 10-2.

Additional specifications on the use of connectivity fault management (CFM) as service OAM for fault management are defined in [MEF 30] and for performance monitoring are defined in [MEF 35].

Service OAM fault management [MEF 30] and service OAM performance monitoring [MEF 35] are used to implement the "EVC performance" EVC attribute.

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Printed in Switzerland
Geneva, 2014