

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.984.4

Amendment 2

(11/2009)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line
systems for local and access networks

Gigabit-capable passive optical networks (G-PON):
ONT management and control interface
specification

**Amendment 2: Changes and extensions to the
OMCI, editorial clarifications and corrections**

Recommendation ITU-T G.984.4 (2008) –
Amendment 2

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Recommendation ITU-T G.984.4

Gigabit-capable passive optical networks (G-PON): ONT management and control interface specification

Amendment 2

Changes and extensions to the OMCI, editorial clarifications and corrections

Summary

Amendment 2 to Recommendation ITU-T G.984.4 contains various updates to Recommendation ITU-T G.984.4 (2008) and Recommendation ITU-T G.984.4 (2008) Amendment 1 (2009). A number of editorial corrections and clarifications are included, along with the following substantive changes and extensions to the G-PON OMCI.

- A virtual interface definition for use when an ONT is managed by two domains, OMCI and for example TR-69.
- An extended form of the OMCI message set to facilitate exchange of larger quantities of control plane information between ONT and OLT.
- An ageing time attribute on dynamically learned MAC bridge addresses.
- A means to distribute time of day from an OLT to an ONT.
- Additional features to support the use of OMCI in ITU-T G.986 systems.
- A mechanism that supports mutual authentication of OLT and ONT and secure transport of encryption keys.

Source

Amendment 2 to Recommendation ITU-T G.984.4 (2008) was approved on 13 November 2009 by ITU-T Study Group 15 (2009-2012) under Recommendation ITU-T A.8 procedures.

FOREWORD

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Recommendation ITU-T G.984.4

Gigabit-capable passive optical networks (G-PON): ONT management and control interface specification

Amendment 2

Changes and extensions to the OMCI, editorial clarifications and corrections

1) Modifications to clause 2, References

1.1) New references to the list in clause 2

Add the following references:

- [IEEE 1588] IEEE 1588-2008, *IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems*.
- [ITU-T G.986] Recommendation ITU-T G.986 (2010), *1 Gbit/s point-to-point Ethernet-based optical access system*.

1.2) Deletion

Delete the following reference:

- [IETF RFC 2069] IETF RFC 2069 (1997), *An Extension to HTTP: Digest Access Authentication*.

1.3) Modification

Modify the following reference:

- [ATIS-0322000] ATIS-0322000 (2005), *Representation of the Communications Industry Manufacturers, Suppliers, and Related Service Companies for Information Exchange*.

To:

- [ATIS-0300220] ATIS-0300220.2005, *Representation of the Communications Industry Manufacturers, Suppliers, and Related Service Companies for Information Exchange*.

2) Modification to clause 7.3, Performance management

Revise clause 7.3 to read as follows:

The ONT has only *limited* performance monitoring. The OMCI supports performance monitoring using a subset of managed entities that are described throughout clause 9. These managed entities can be identified by the words "performance monitoring history data" or "extended PM" in their names.

3) Modification to clause 7.4, Security management

Revise clause 7.4 to read:

7.4 Security management

[ITU-T G.984.3] specifies some mechanisms from the viewpoint of security. That includes the downstream data encryption of the ONT. The ONT2-G managed entity can select the downstream encryption algorithm from a list that presently includes only AES.

OMCI also supports a mechanism to allow mutual authentication of OLT and ONT and subsequent secure communication of encryption keys.

4) New clause 7.5

Add the following new clause 7.5:

7.5 PON protection

This Recommendation supports the protection function. The type C protection configuration that is defined in [b-ITU-T G.984.1] is considered in this Recommendation. As the switching behaviour for PON protection will be done in the TC layer, this Recommendation defines a managed entity to specify the protection capability.

5) Modification to Table 8-1 of clause 8.1, Managed entities

Add the following entries to Table 8-1, in alphabetic sequence:

Table 8-1 – Managed entities of the OMCI

Managed entity	Required/ Optional	Description	Clause
Virtual Ethernet interface point	CR	Defines a data plane handoff to other management domains such as TR-69 or SNMP	9.5.5
ONT-E	CR	Defines the top-level ONT entity for G.986 systems	9.1.13
Enhanced security control	CR	Supports mutual authentication between OLT and ONT	9.13.11
MPLS pseudowire termination point	CR	Supports TDM pseudowires over MPLS	9.8.14

Revise the description of GEM traffic descriptor to read as follows, and relocate it into the proper alphabetic order in the table:

Table 8-1 – Managed entities of the OMCI

Managed entity	Required/ Optional	Description	Clause
Traffic descriptor	CR	Used to specify traffic management parameters	9.11.3

6) Modification of clause 8.2, Managed entity relation diagrams

Replace clause 8.2 with the following:

8.2 Managed entity relation diagrams

This clause shows the relationships between managed entities. Figure 8.2-1 gives the legend of symbols used in these diagrams. The name of the managed entity, sometimes abbreviated for ease of documentation, appears in each box, with the clause in which it is defined shown in the lower right corner.

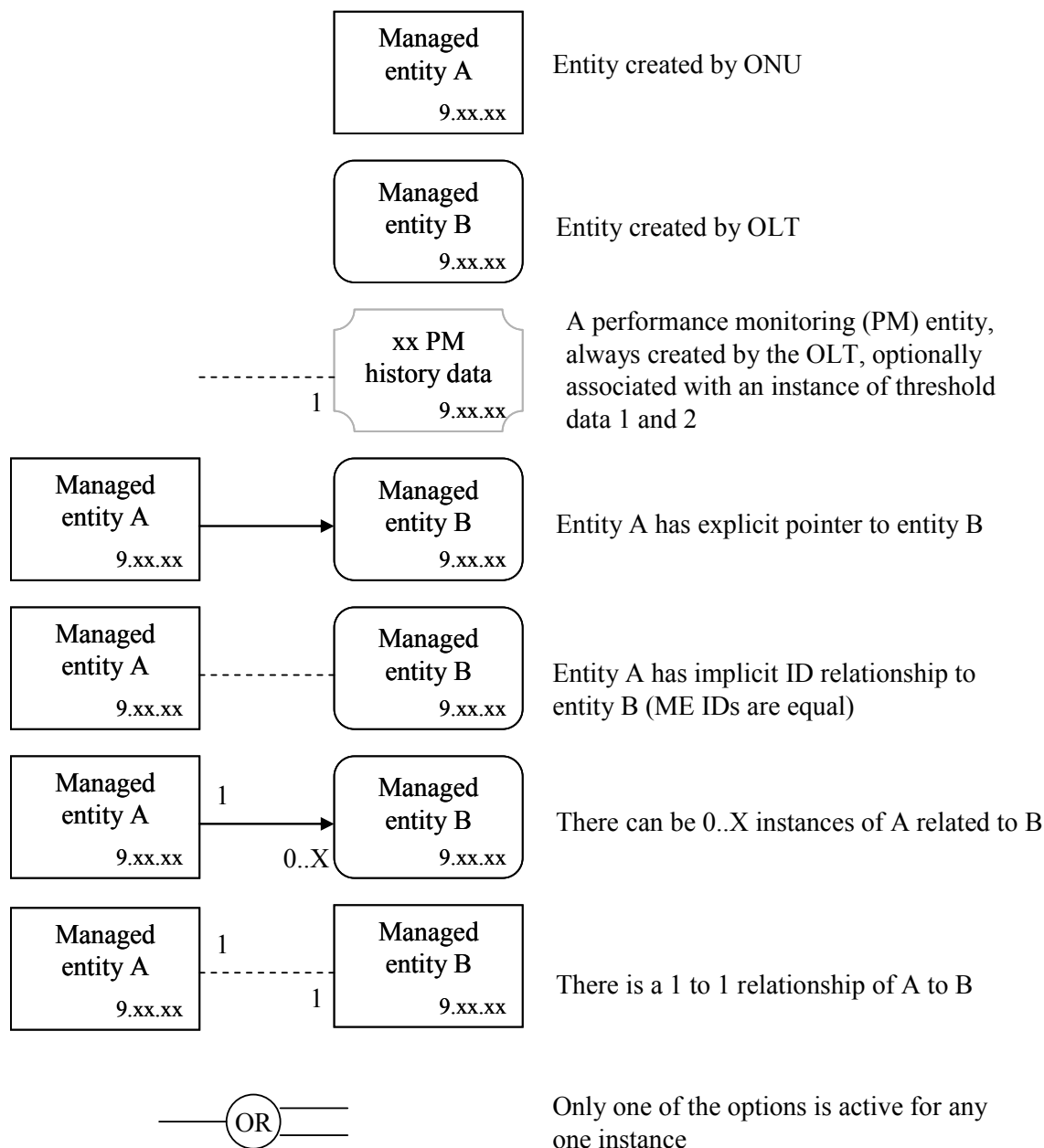


Figure 8.2-1 – Legend for managed entity relation diagrams

8.2.1 ONT common functions

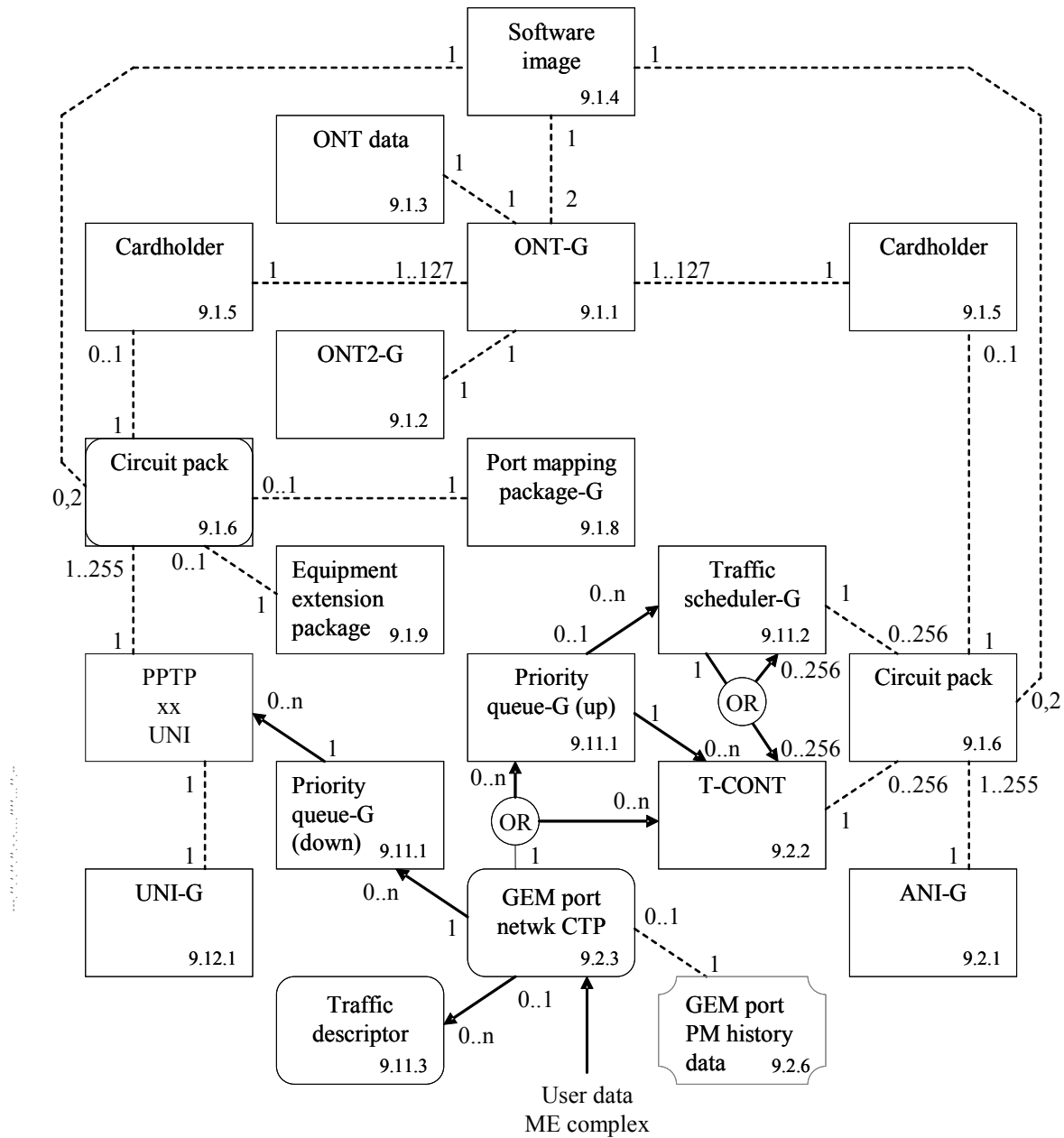


Figure 8.2.1-1 – ONT core

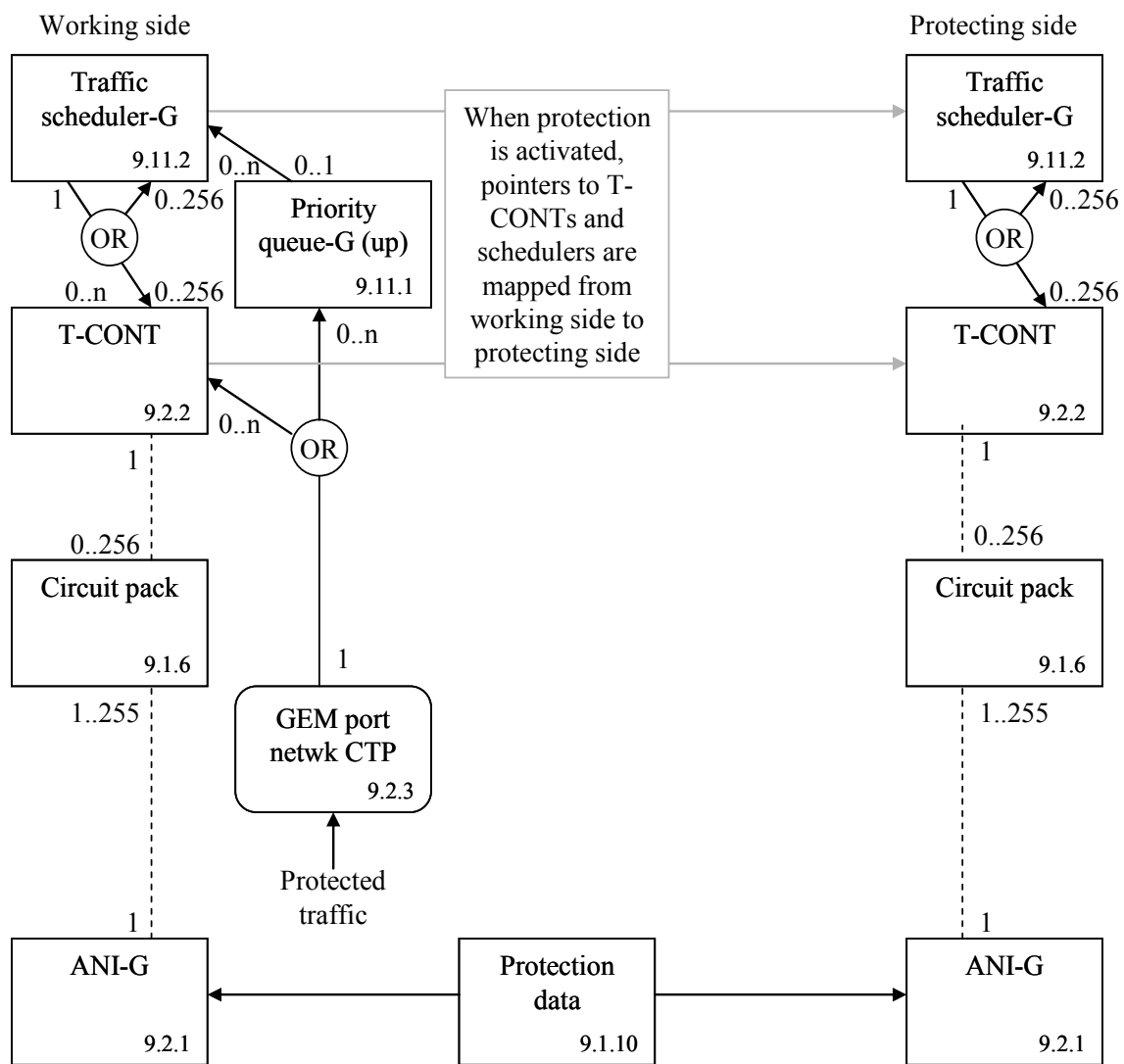


Figure 8.2.1-2 – 1+1 PON protection

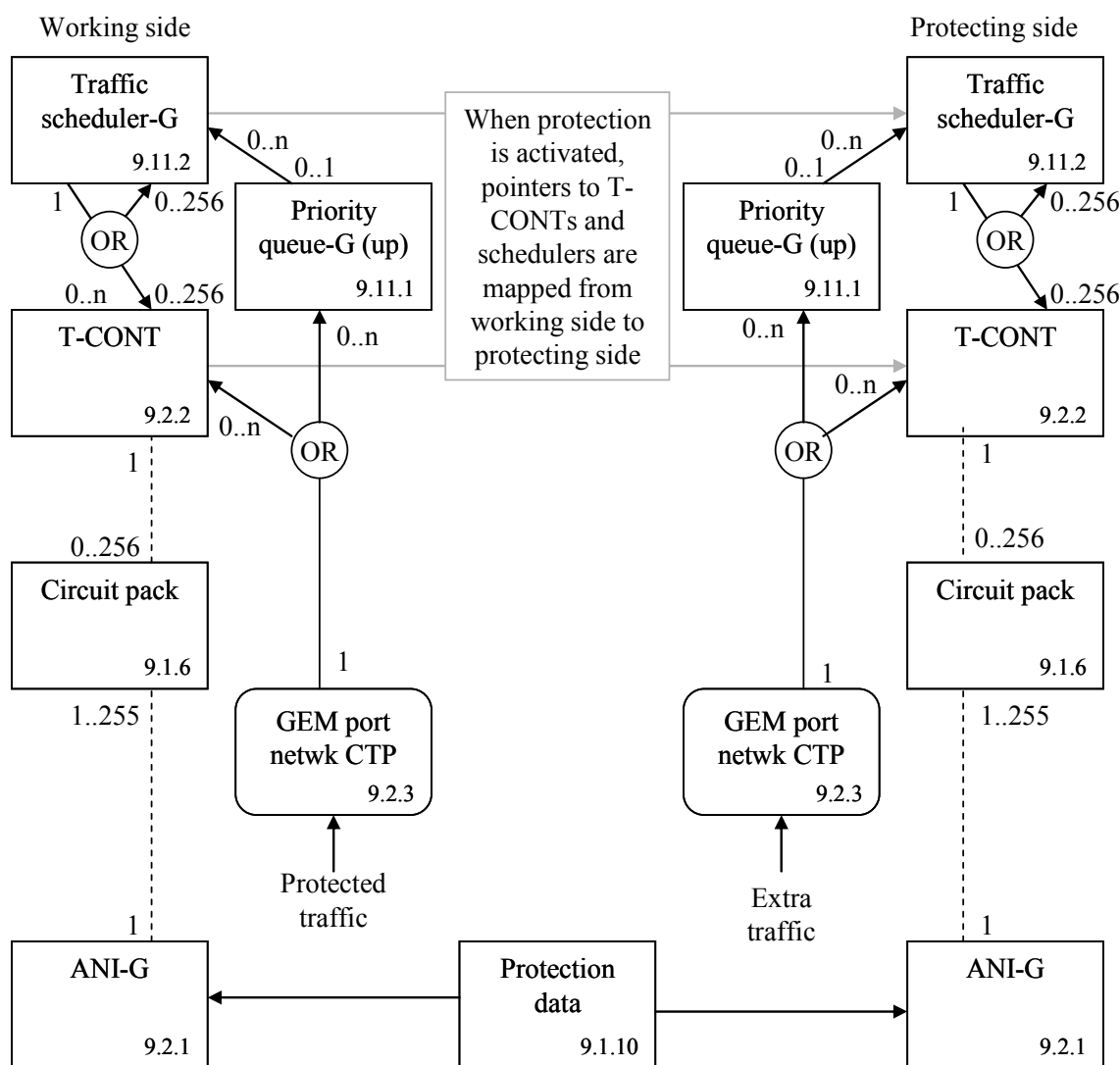


Figure 8.2.1-3 – 1:1 PON protection

8.2.2 Layer 2 functions

OMCI supports two major layer 2 traffic mapping models: MAC bridging and "802.1p mapping." MAC bridging is described in [IEEE 802.1D] and [IEEE 802.1Q]. The bridge described in Figure 8.2.2-1 below has many features, and can be used to direct traffic based on MAC address (that is, true bridging) or on VLAN characteristics (using the VLAN filter feature). The mapping function describes the steering of traffic from one UNI-side entity to 1-8 ANI-side Port-IDs, as shown in Figure 8.2.2-2 below. The mapper is equivalent to a MAC bridge with VLAN filters that only operate on the priority bits of the VLAN tags.

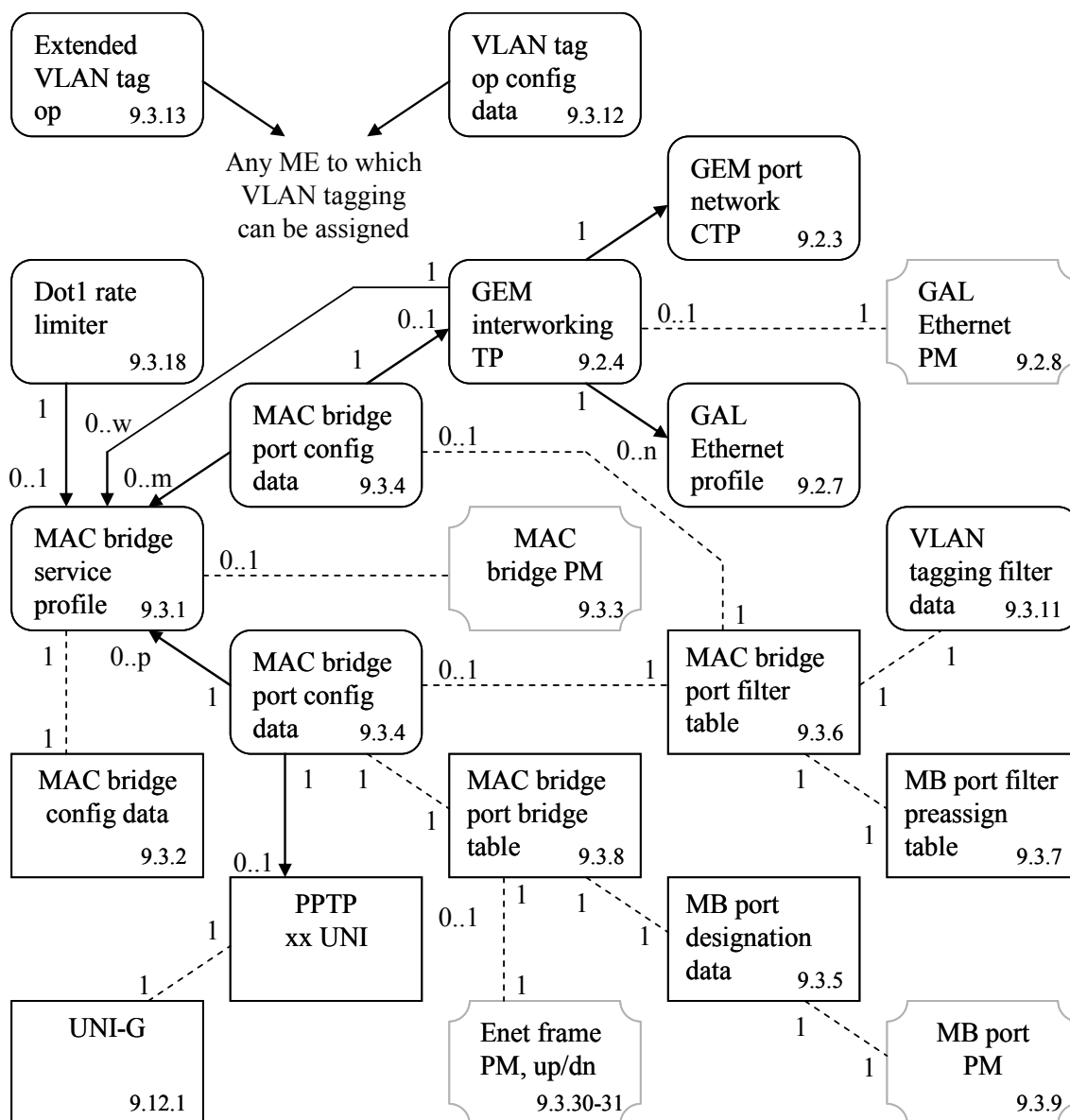


Figure 8.2.2-1 – MAC bridged LAN

NOTE 1 – A bridge port may be associated with any IEEE 802.3 UNI, such as Ethernet or xDSL, or another 802.3 function such as an IP host config data ME.

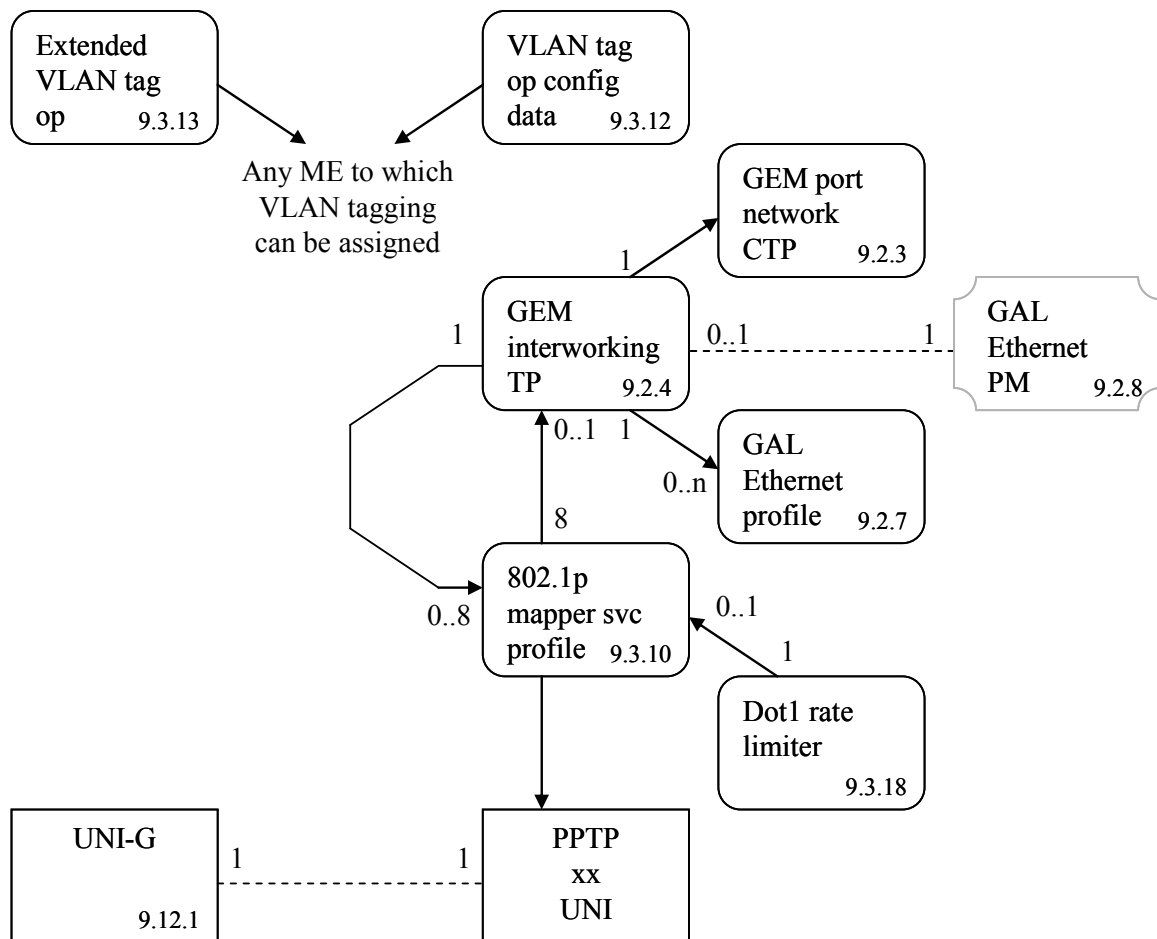


Figure 8.2.2-2 – 802.1p mapper

NOTE 2 – A mapper service profile may be associated with any IEEE 802.3 UNI, such as Ethernet or xDSL, or another 802.3 function such as an IP host config data ME.

The two basic layer 2 services can be used in various combinations to achieve different overall connectivities. There are three major functional styles of layer 2 connectivity, illustrated in Figures 8.2.2-3 to 8.2.2-5:

- N:1 bridging, where a bridge is used to serve multiple UNI ports from a single ANI service;
- 1:M mapping, where a mapper is used to serve a single UNI with multiple ANI connections, based on 802.1p priorities;
- 1:P filtering, where a bridge with filters is used to serve a single UNI with multiple ANI connections, based on some VLAN information other than 802.1p priorities.

Given these three basic possibilities, there are also four more complex combinations as well, illustrated in Figures 8.2.2-6 to 8.2.2-9. It is strongly encouraged that these applications be utilized before other, more exotic styles of usage.

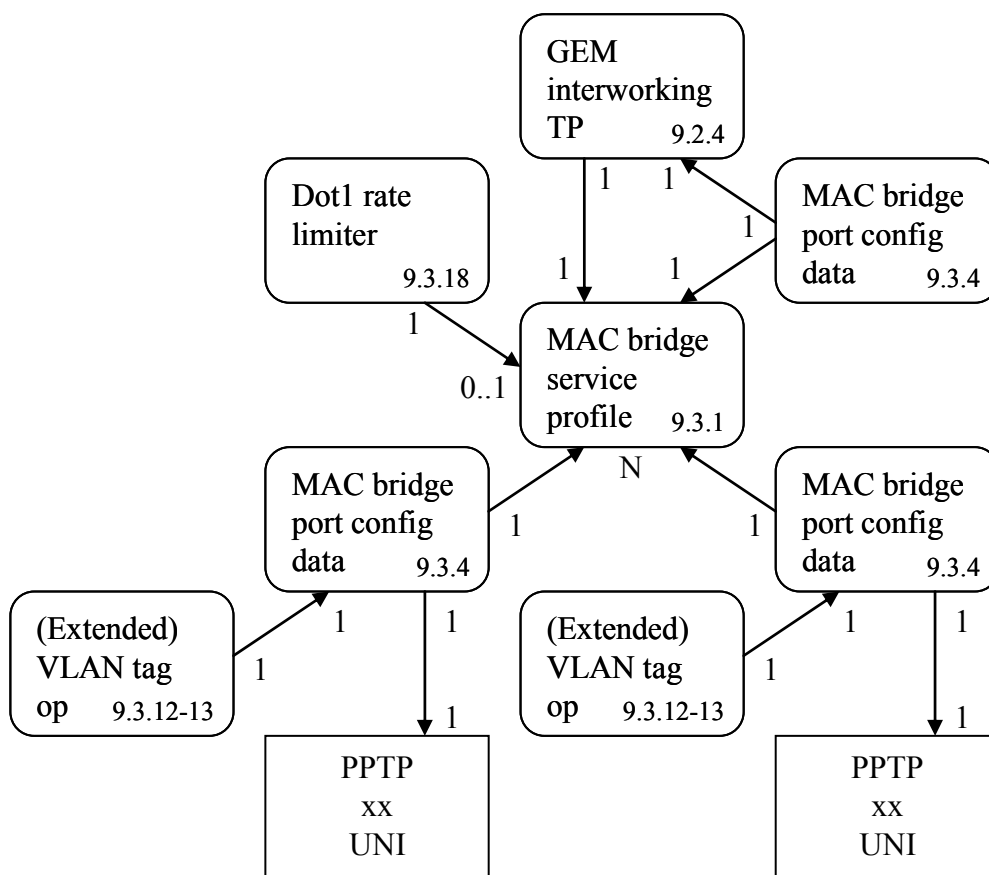


Figure 8.2.2-3 – Illustration of N:1 bridging

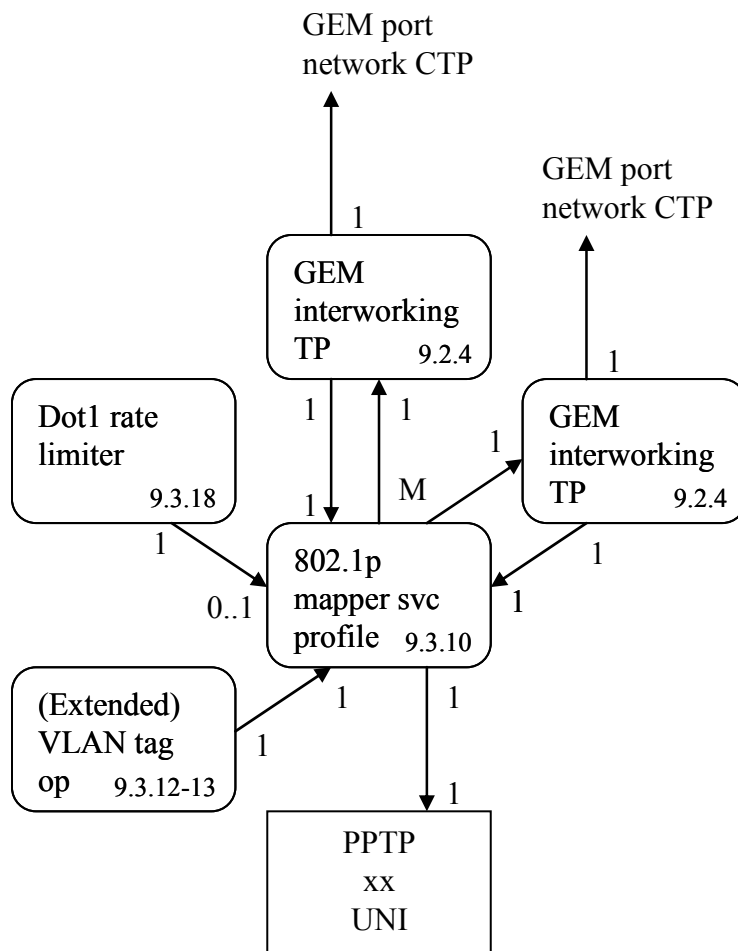


Figure 8.2.2-4 – Illustration of 1:M mapping

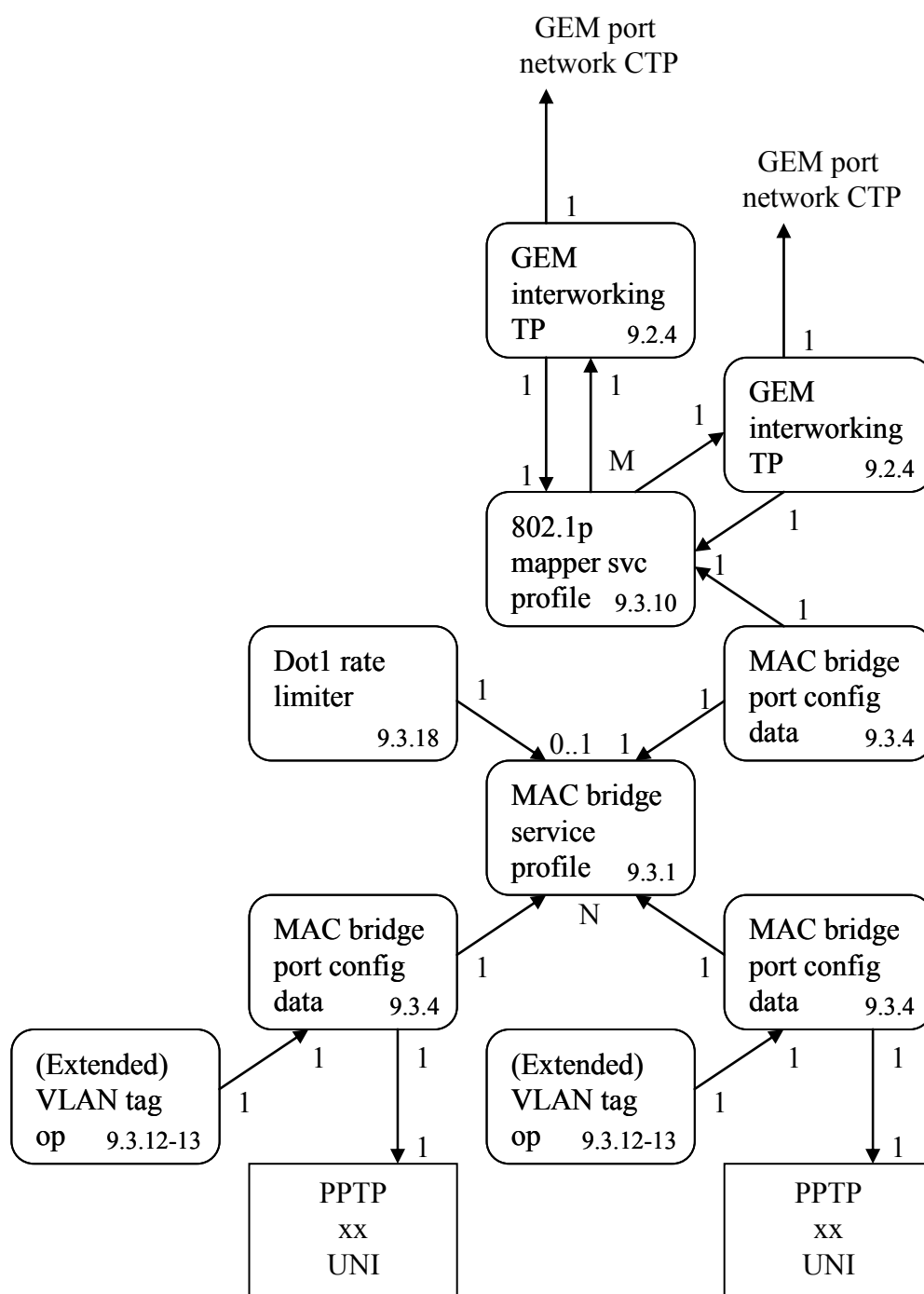


Figure 8.2.2-6 – Illustration of N:M bridge-mapping

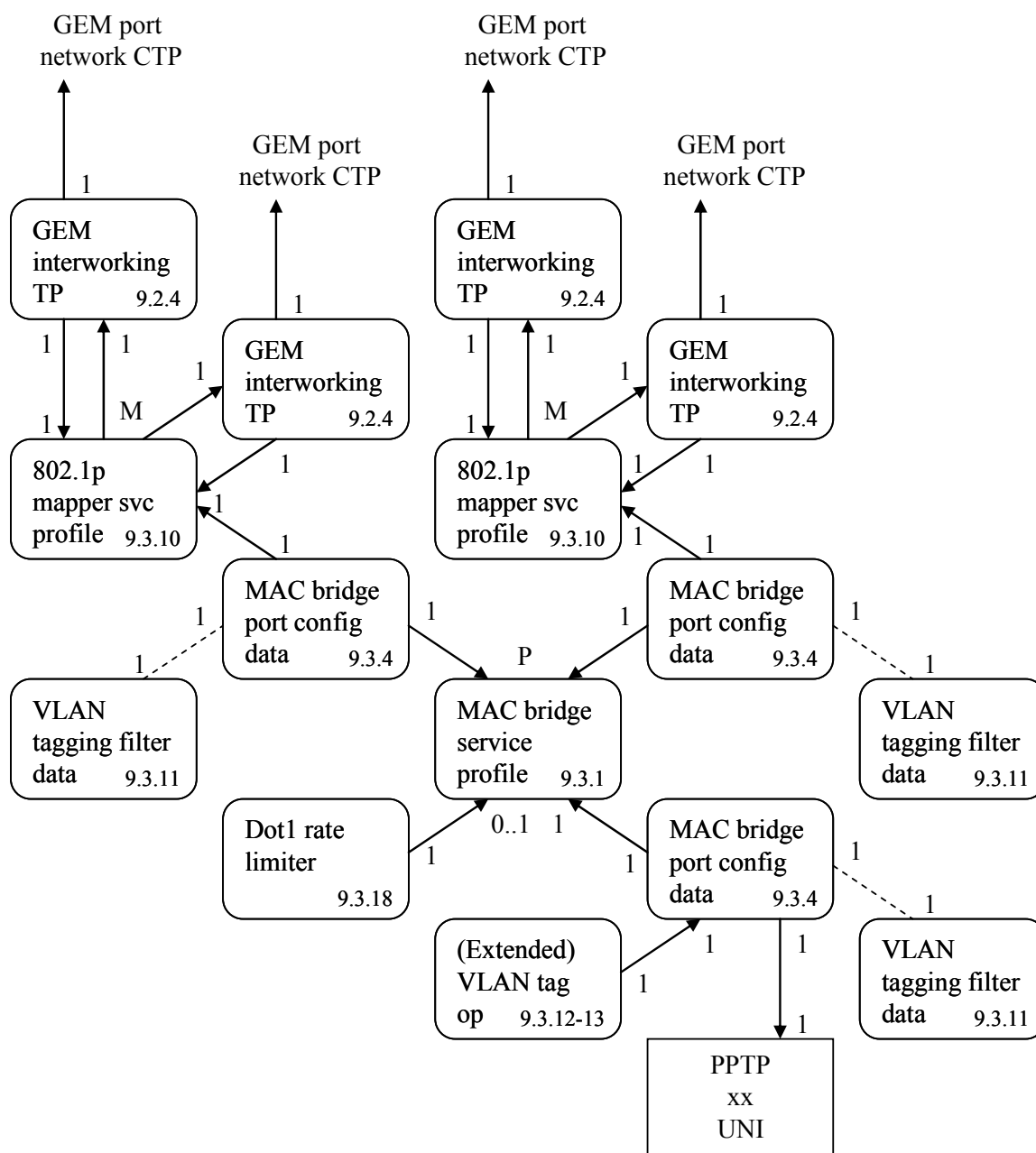


Figure 8.2.2-7 – Illustration of 1:MP map-filtering

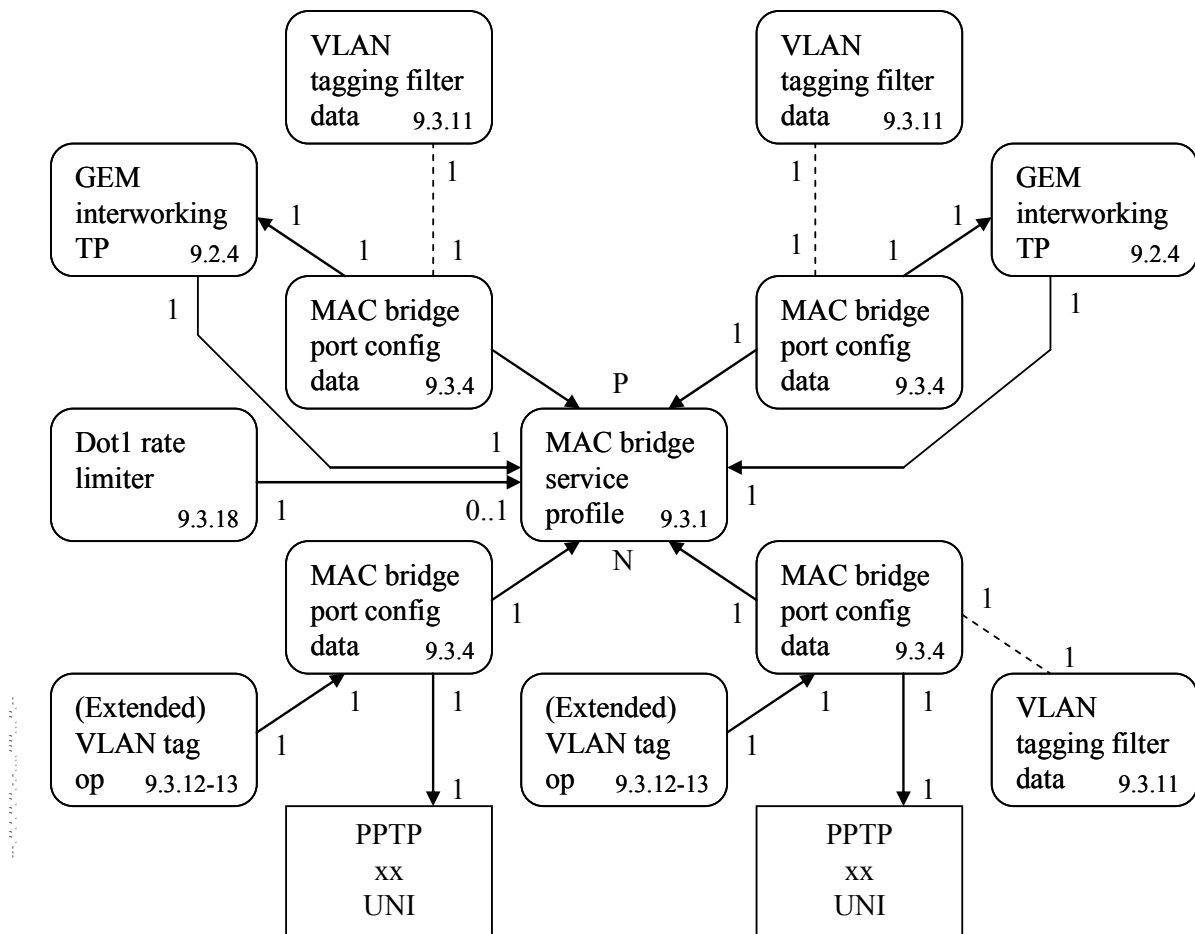


Figure 8.2.2-8 – Illustration of N:P bridge-filtering

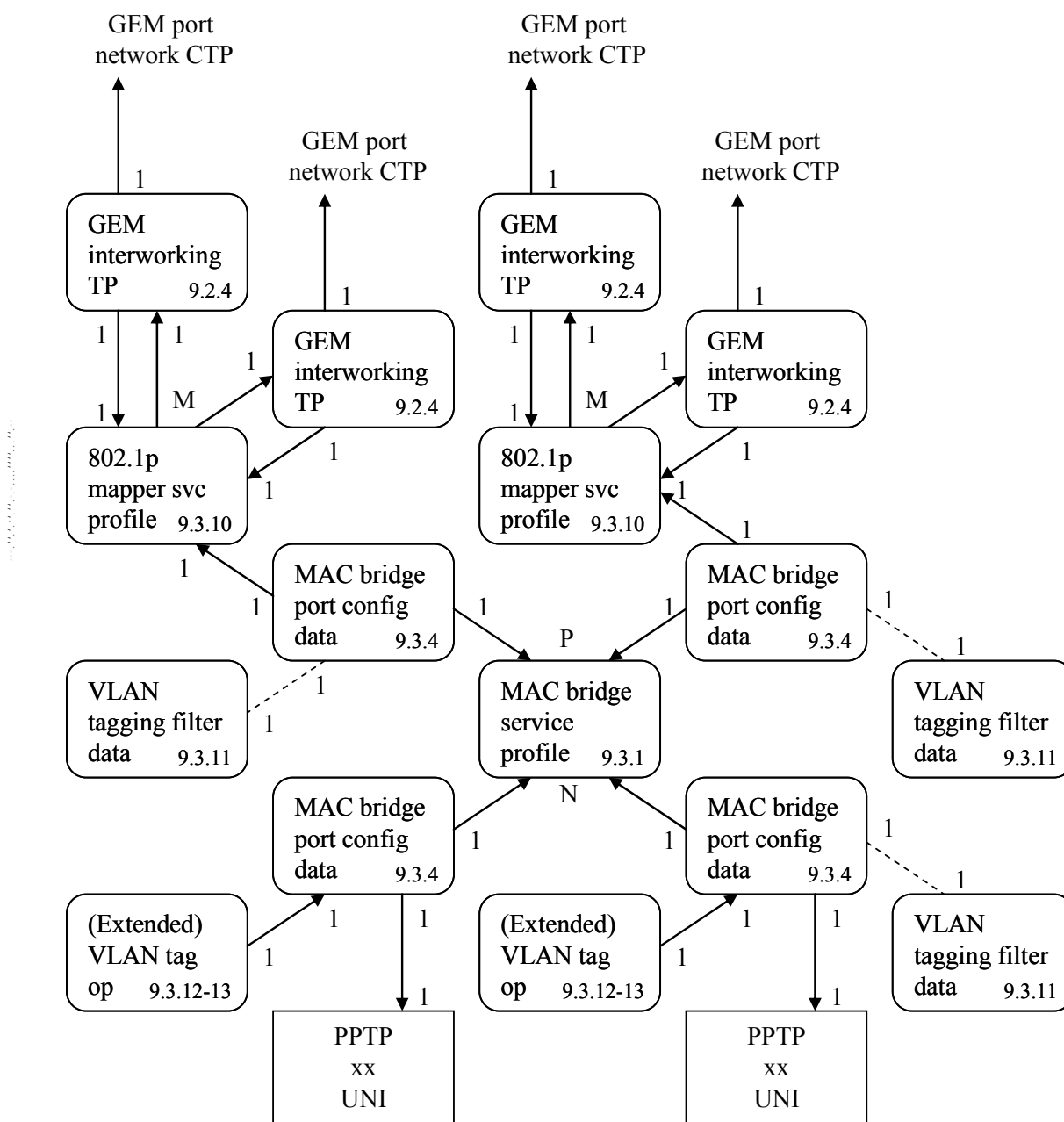


Figure 8.2.2-9 – Illustration of N:MP bridge-map-filtering

Figure 8.2.2-10 illustrates the use of the multicast interworking termination point. A bridge is used to multiplex the multiple ANI-side ports into the single (in this case) UNI-side port. It is essential to have a unicast path in parallel to the multicast path, because the unicast path carries the upstream signalling that is required for control of the multicast transmissions. In most scenarios, a unicast path already exists for other user communications.

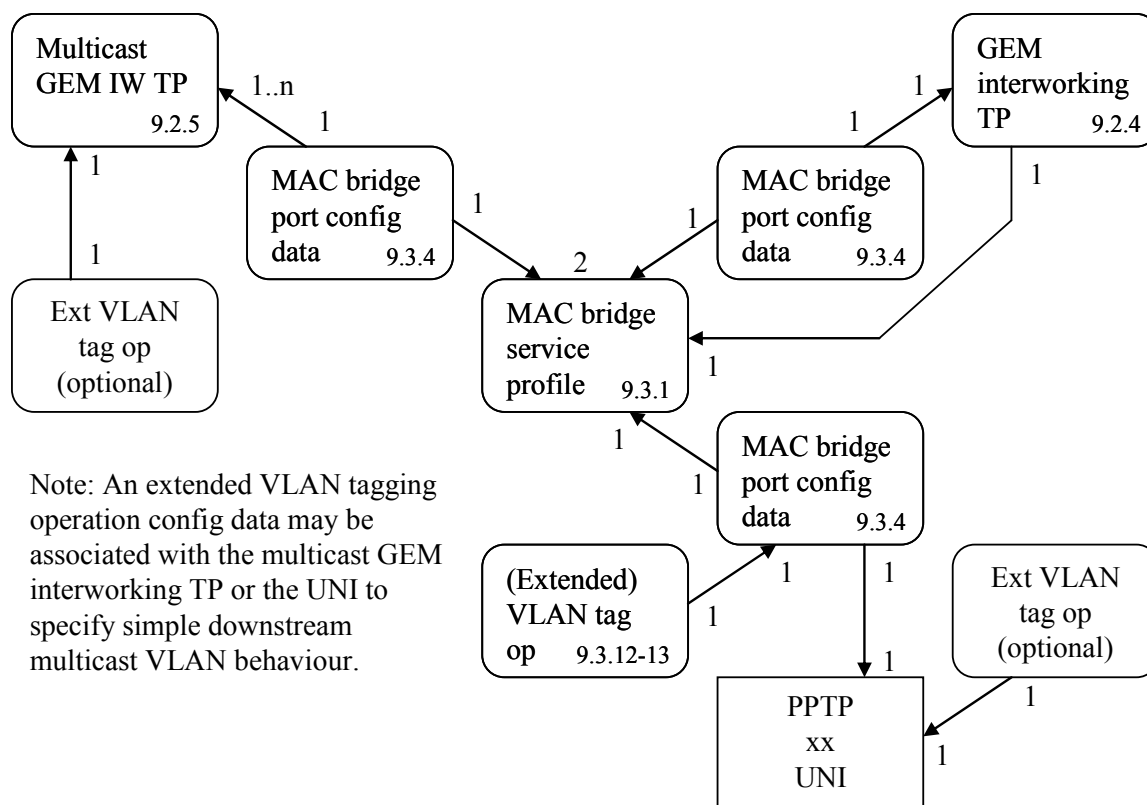


Figure 8.2.2-10 – Illustration of multicast service

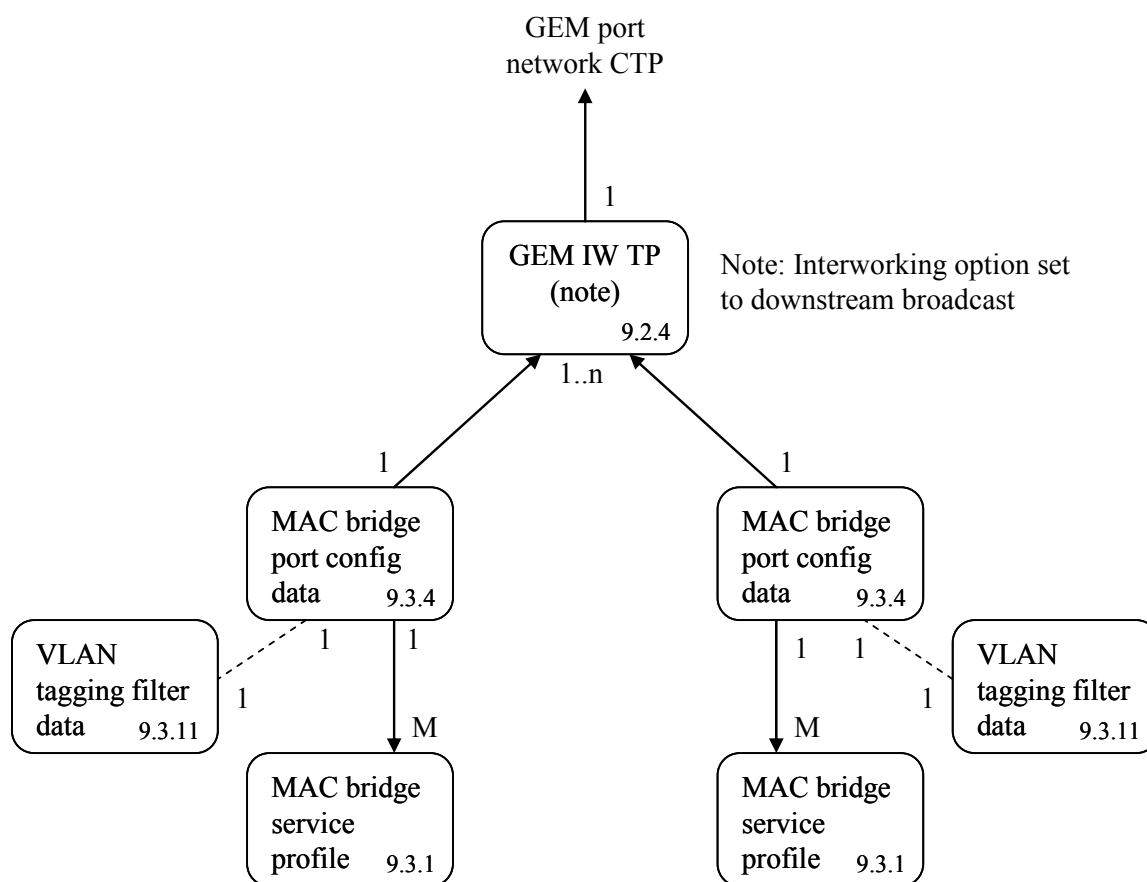


Figure 8.2.2-11 – Illustration of downstream broadcast configuration

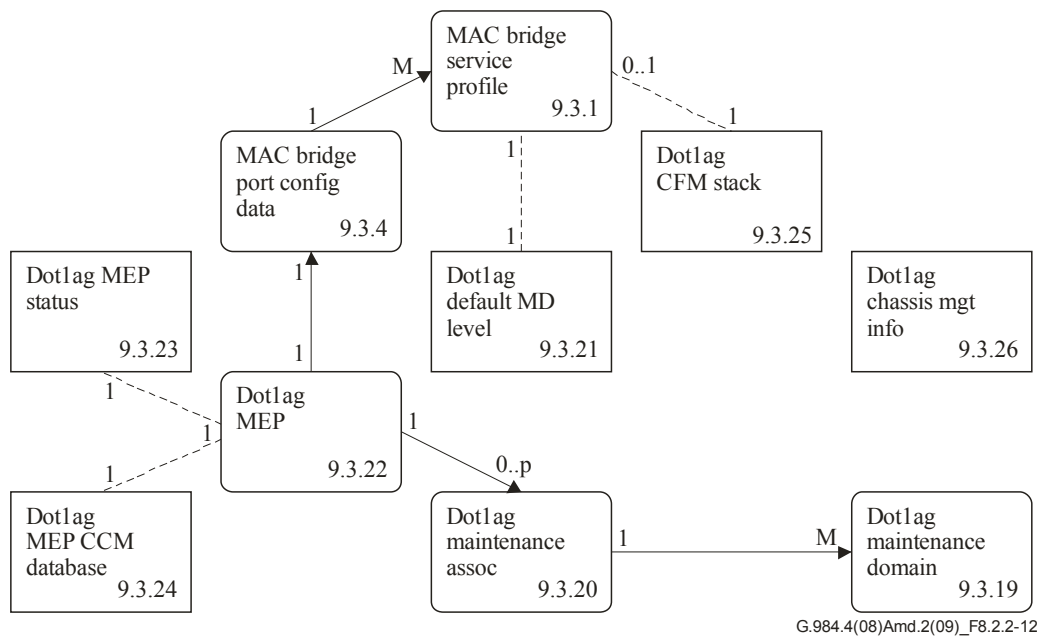


Figure 8.2.2-12 – Illustration of 802.1ag in MAC bridge model

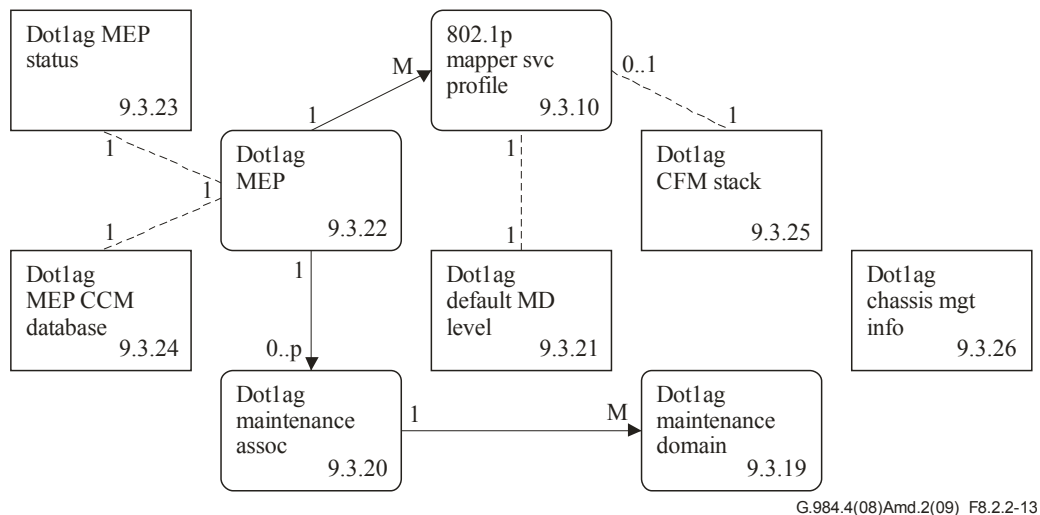


Figure 8.2.2-13 – Illustration of 802.1ag in 802.1p mapper model

NOTE 3 – If a mapper is associated with ports of a bridge, the 802.1ag entities should be associated with the bridge and its ports, rather than with the mapper.

8.2.4 xDSL service

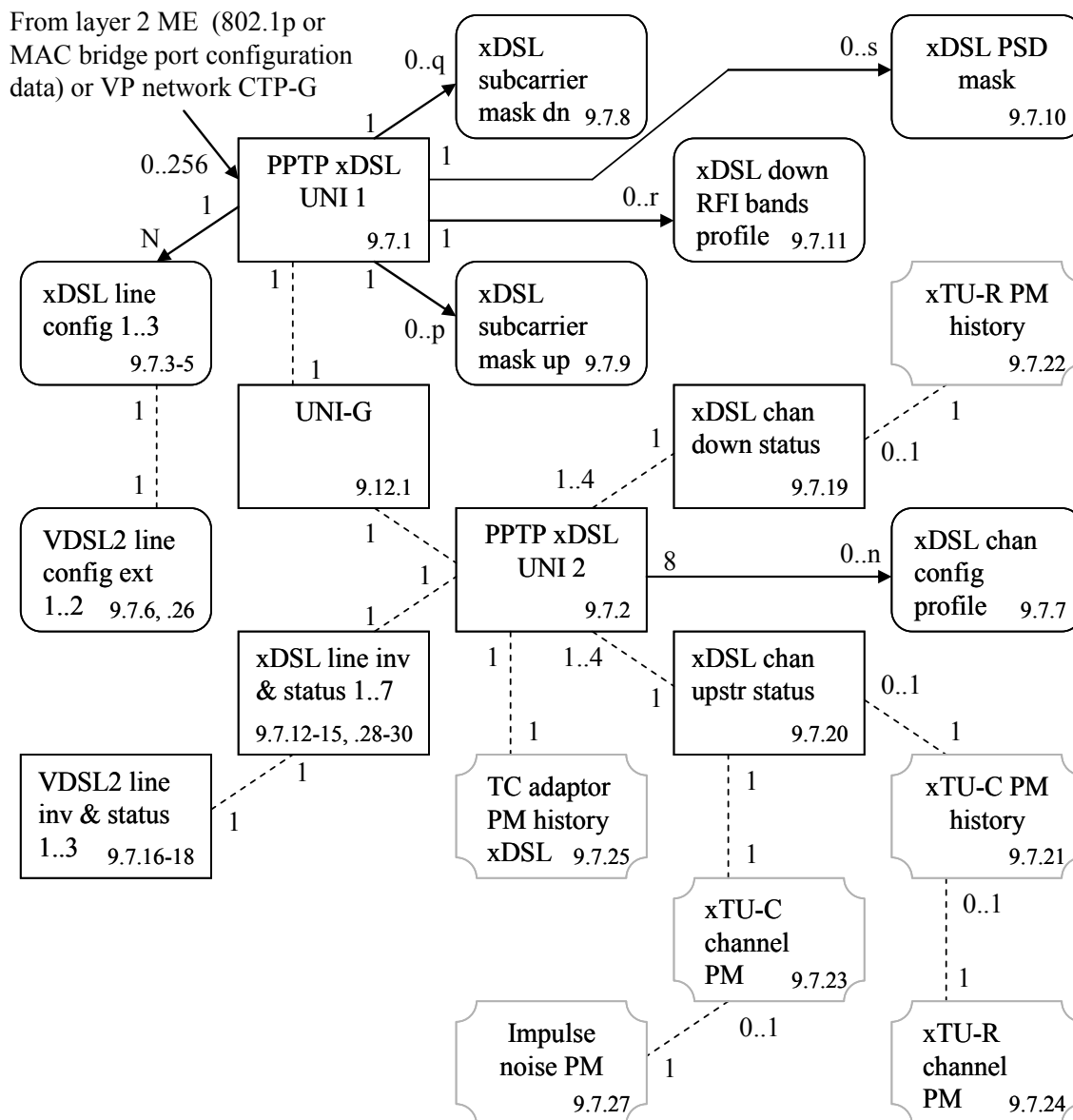


Figure 8.2.4-1 – xDSL

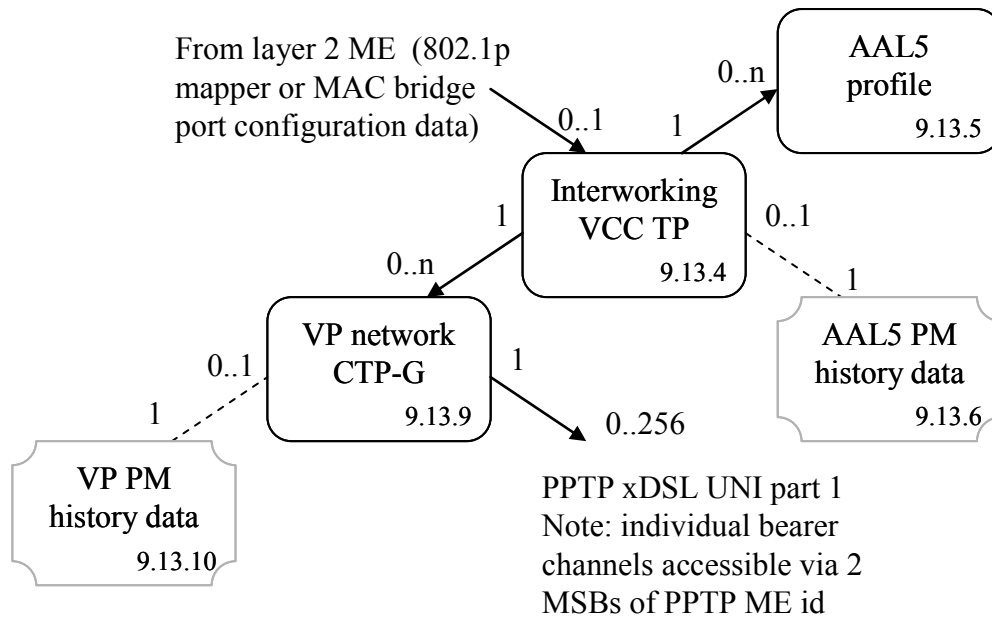


Figure 8.2.4-2 – ATM interworking for xDSL

8.2.5 802.11 service

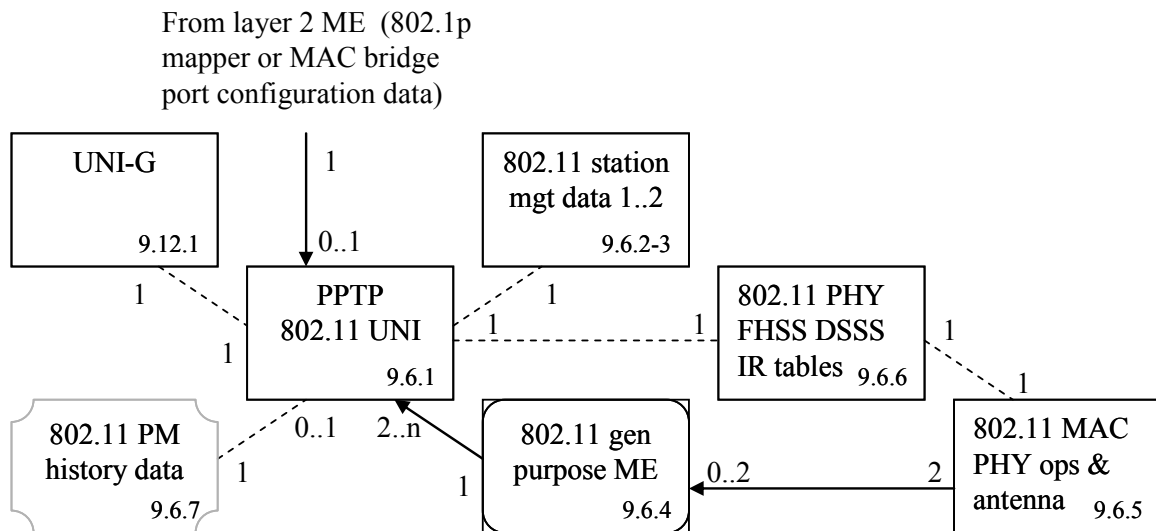


Figure 8.2.5-1 – 802.11 wireless LAN

8.2.6 MoCA service

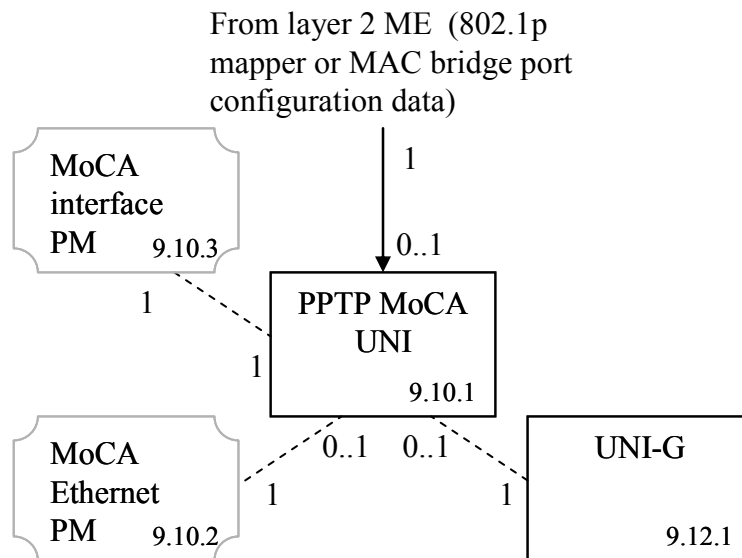


Figure 8.2.6-1 – Multimedia over Coax Alliance (MoCA)

8.2.7 Video return path

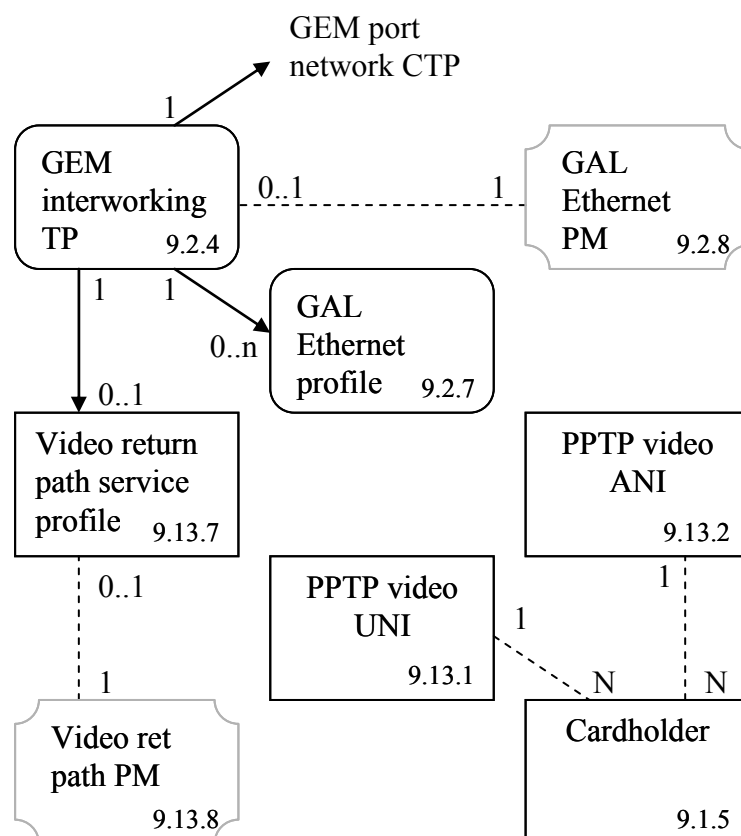
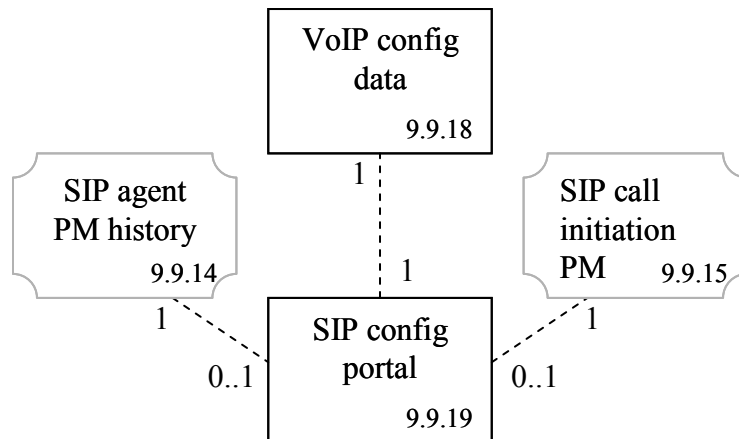


Figure 8.2.7-1 – Video return path

8.2.8 VoIP service



Note: MEs that require long character strings point to large string MEs. MEs that require a network address point to network address MEs.

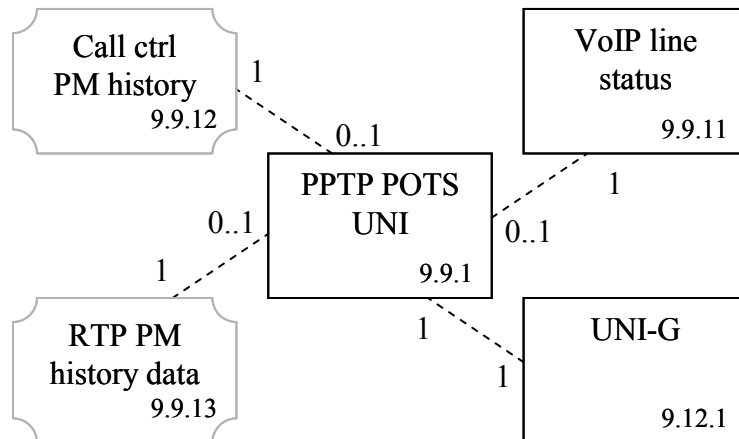
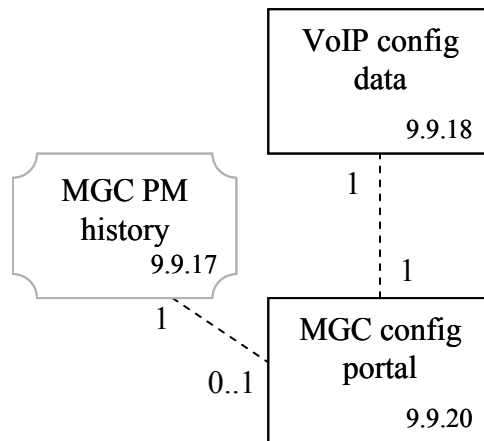


Figure 8.2.8-1 – IP-path managed SIP VoIP



Note: MEs that require long character strings point to large string MEs. MEs that require a network address point to network address MEs.

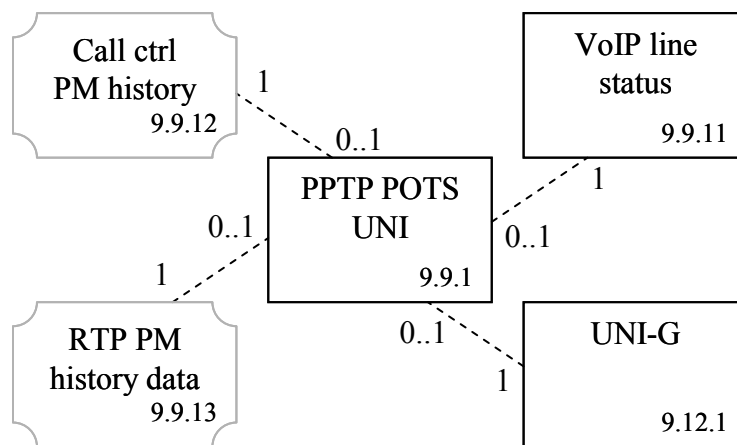
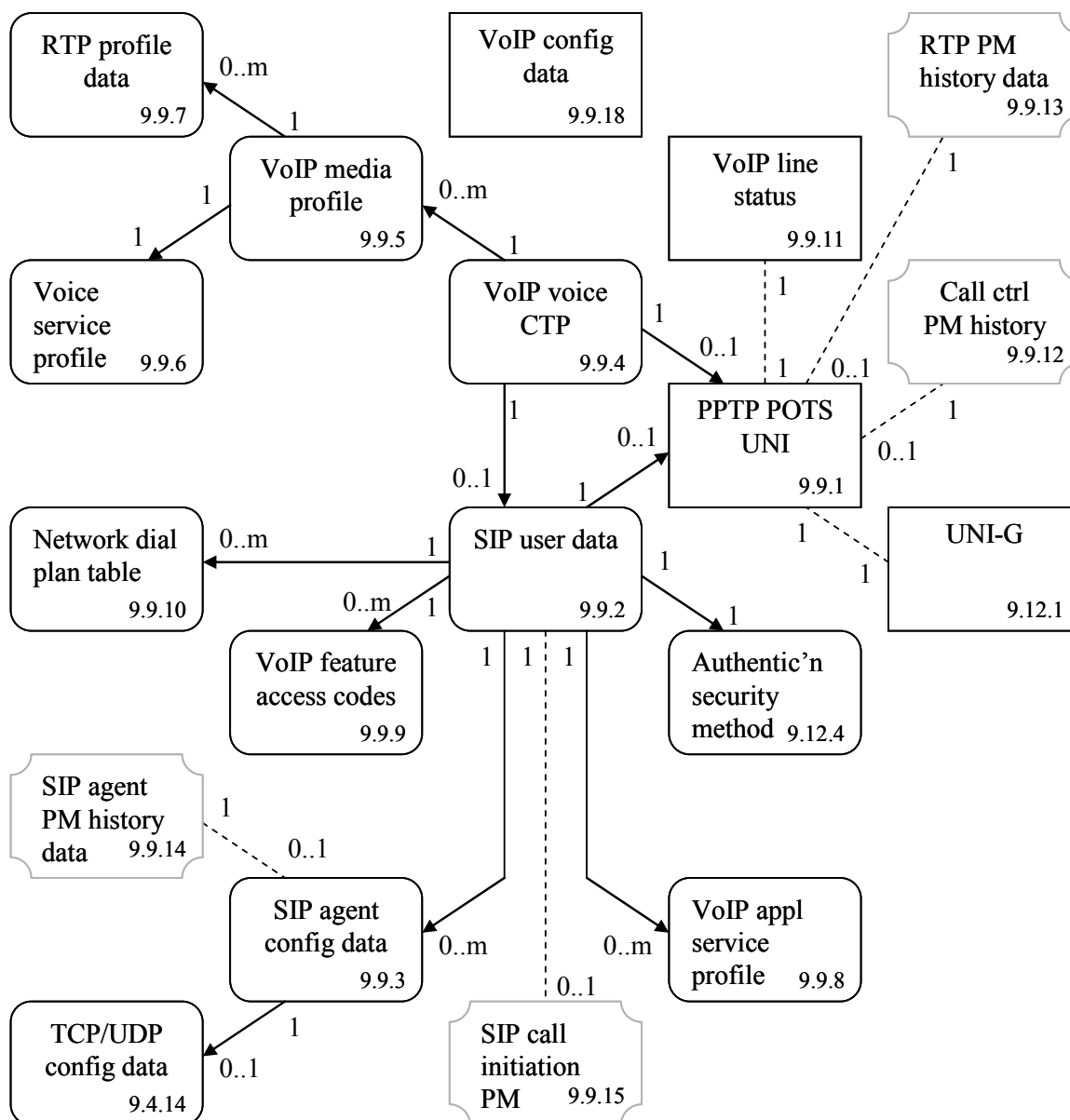


Figure 8.2.8-2 – IP path managed ITU-T H.248 VoIP



Note: MEs that require long character strings point to large string MEs. MEs that require a network address point to network address MEs.

Figure 8.2.8-3 – OMCI managed SIP VoIP

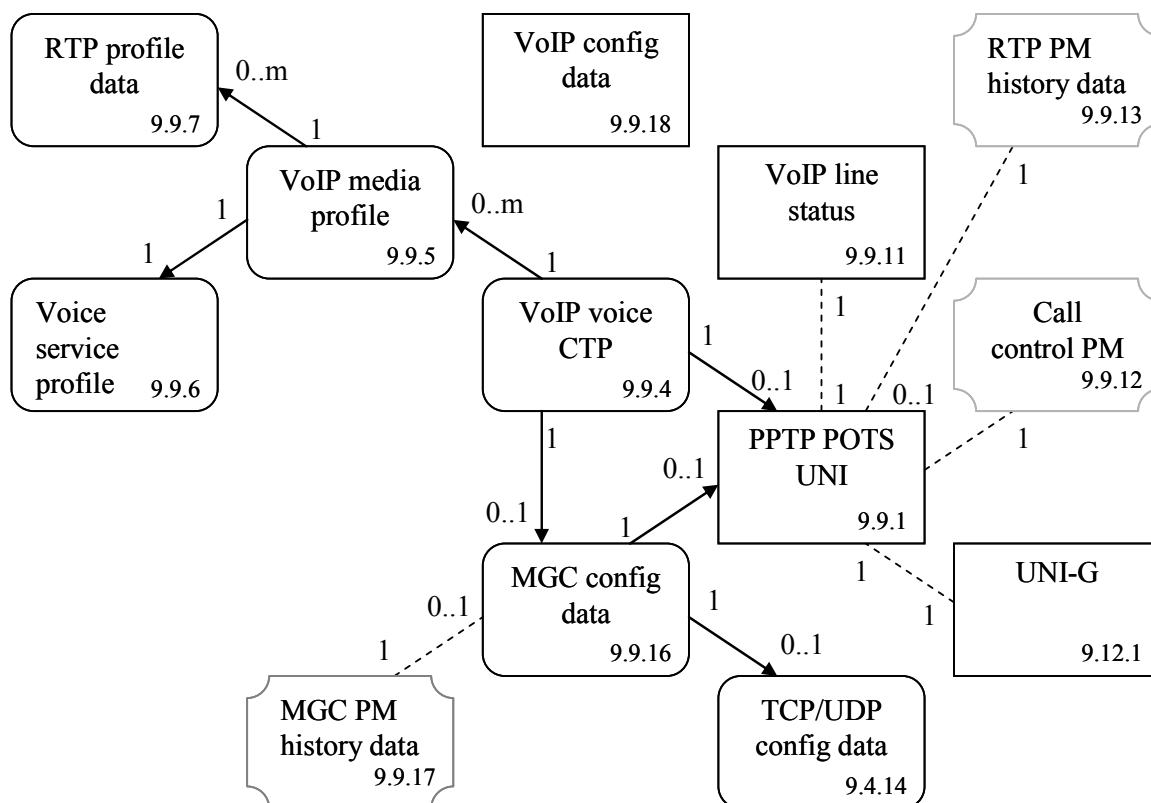


Figure 8.2.8-4 – OMCI managed ITU-T H.248 VoIP

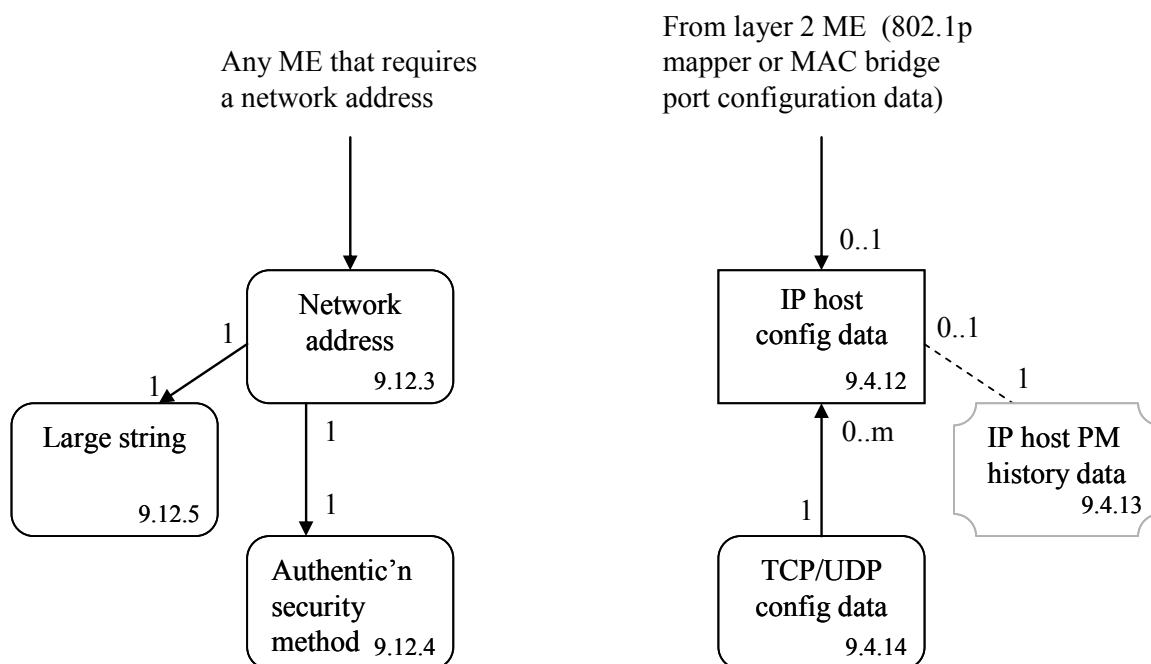


Figure 8.2.8-5 – Common IP services

8.2.9 Circuit emulation service

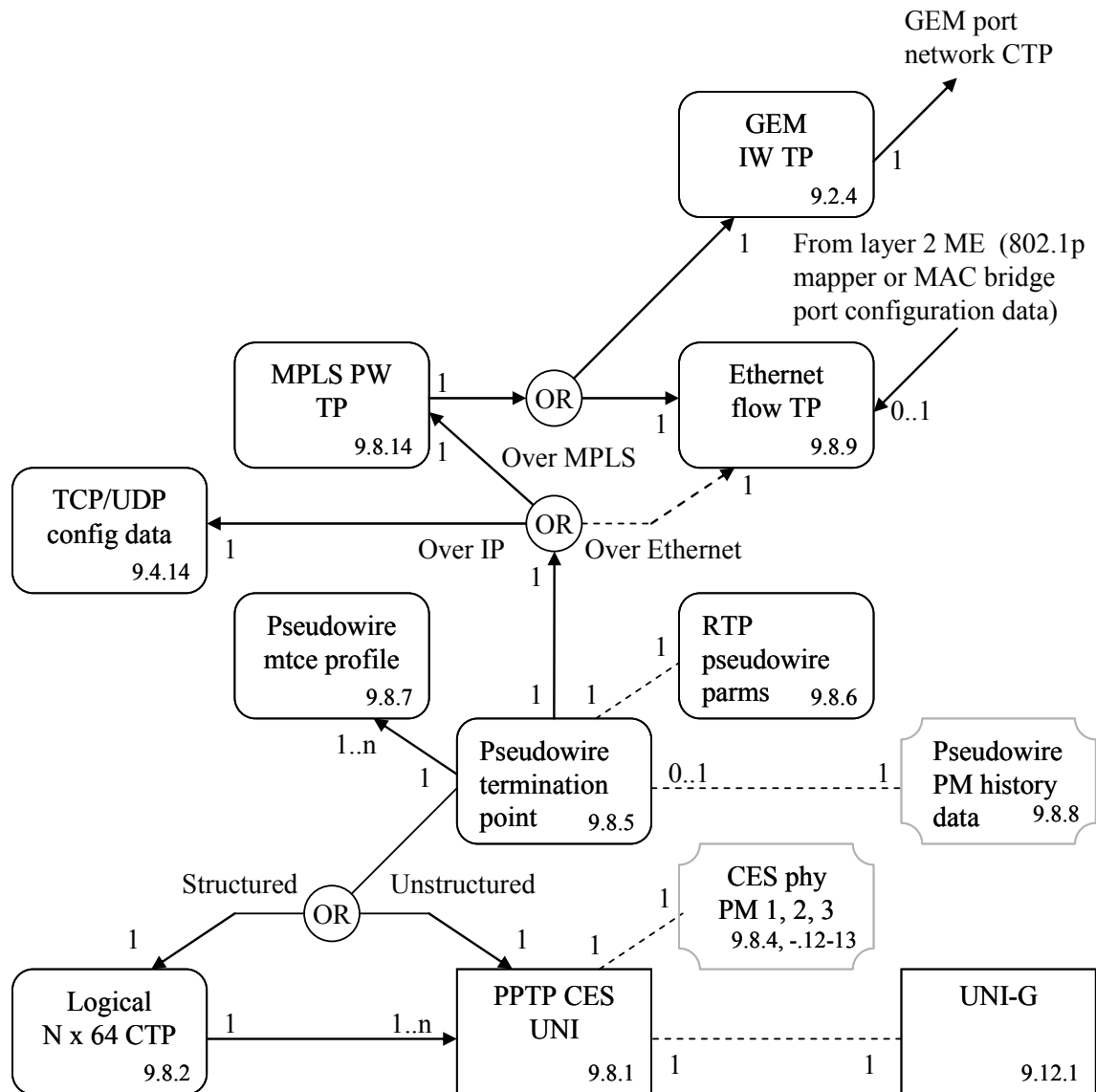


Figure 8.2.9-1 – Pseudowire TDM

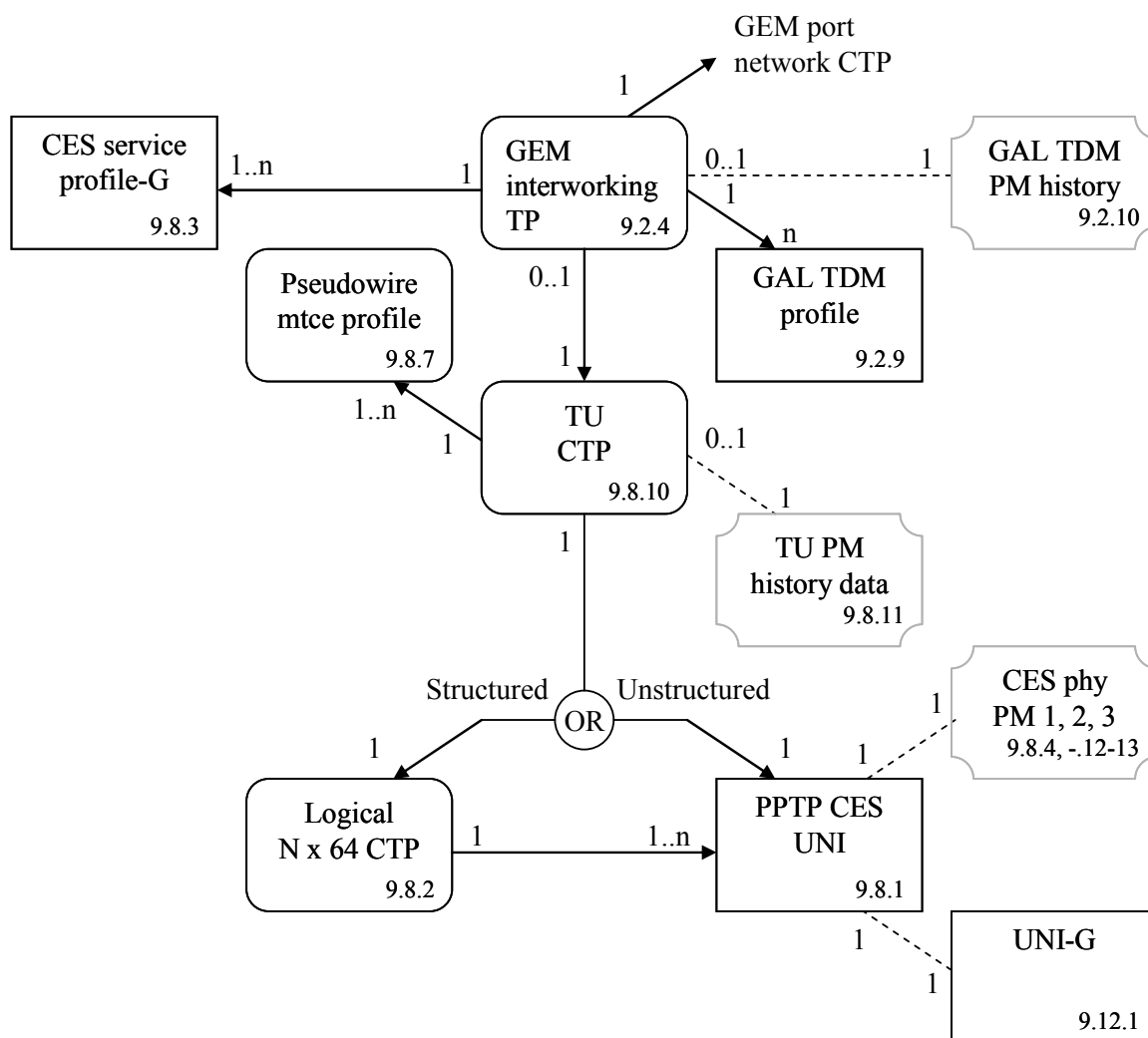


Figure 8.2.9-2 – SDH over GEM

8.2.10 Mid-span PON reach extenders

The PON reach extender is modelled as an ONT (the management entity) containing cardholders and circuit packs whose functions are to extend the reach of one or more PONs. The PON reach extender's own management ONT is understood to exist as a member of one of the extended PONs.

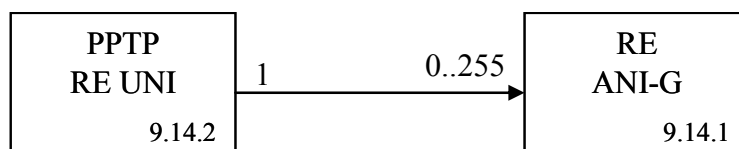


Figure 8.2.10-1 – Mid-span PON reach extender core (repeater)

NOTE 1 – In many cases, the RE ANI-G and PPTP RE UNI are implemented on the same circuit pack. If so, the port mapping package can be used to create the hybrid line card.

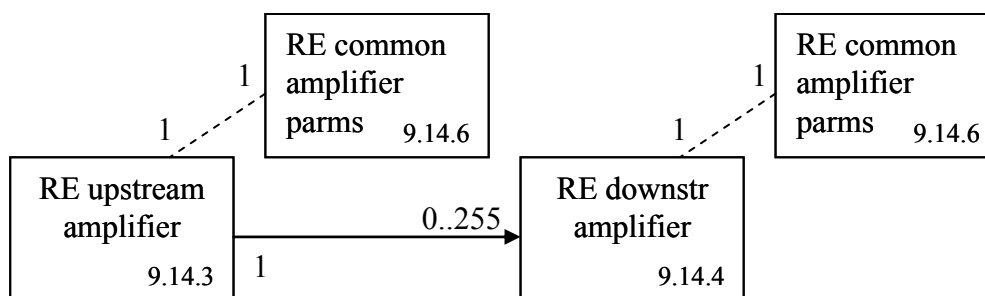


Figure 8.2.10-2 – Mid-span PON reach extender core (optical amplifier)

NOTE 2 – In many cases, the RE upstream amplifier and RE downstream amplifier are implemented on the same circuit pack. If so, the port mapping package can be used to create the hybrid line card.

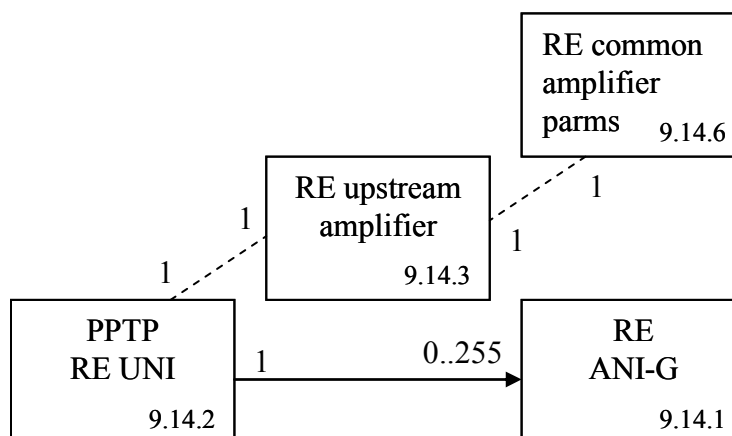


Figure 8.2.10-3 – Mid-span PON reach extender core (hybrid)

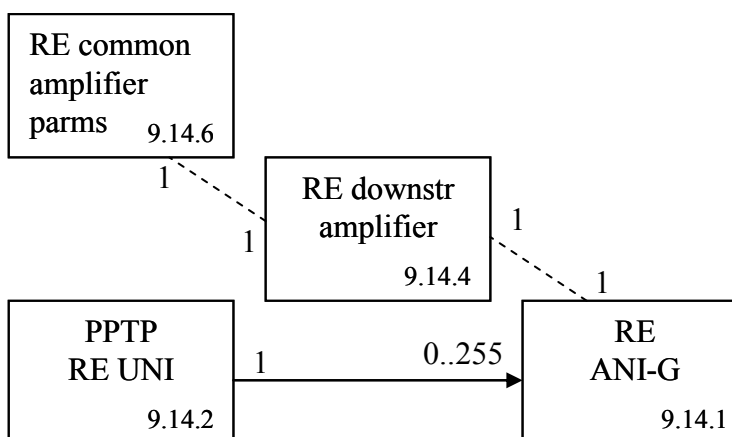


Figure 8.2.10-4 – Mid-span PON reach extender core (hybrid)

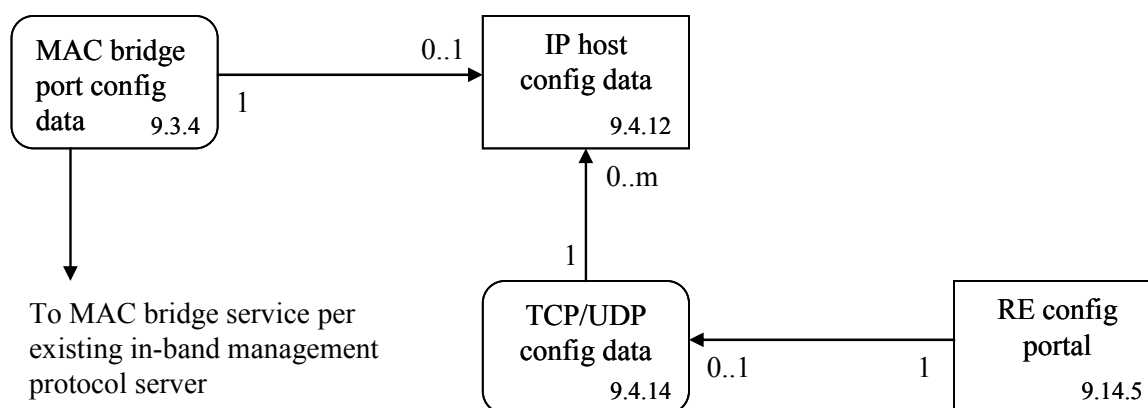


Figure 8.2.10-5 – In-band management for mid-span PON reach extender

8.2.11 Point-to-point Gigabit-Ethernet-fed ONT

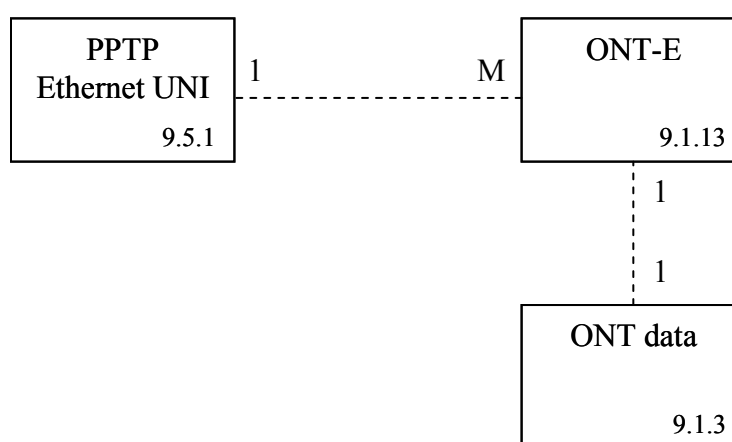


Figure 8.2.11-1 – P2P GbE-fed ONT

7) Modification of clause 9, MIB description

Add new clause 9.14 to the Table of Contents, as shown:

These clauses are organized as follows:

...

9.13 Miscellaneous services

9.14 Mid-span PON reach extender

8) Modification of clause 9.1.1, ONT-G

8.1) Revision of AVC table

Revise the attribute value change (AVC) table to read as follows. This removes AVCs on vendor ID, model and SN.

Attribute value change

Number	Attribute value change	Description
1..7	N/A	
8	Op state	Operational state change
9	N/A	
10..16	Reserved	

8.2) Revision of alarms table

Revise the alarms table to read as follows:

Alarm

Number	Alarm	Description
0	Equipment alarm	Functional failure on an internal interface.
1	Powering alarm	Loss of external power to battery backup unit. This alarm is typically derived through an external interface to a battery backup unit, and indicates that AC is no longer available to maintain battery charge.
2	Battery missing	Battery is provisioned but missing.
3	Battery failure	Battery is provisioned and present but cannot recharge.
4	Battery low	Battery is provisioned and present but its voltage is too low.
5	Physical intrusion	Applies if the ONT supports detection such as door or box open.
6	ONT self test failure	ONT has failed autonomous self test.
7	Dying gasp	ONT is powering off imminently due to loss of power to the ONT itself. This alarm may be sent in conjunction with the powering alarm if a backup unit cannot supply power and the ONT is shutting down.
8	Temperature yellow	No service shutdown at present, but the circuit pack is operating beyond its recommended range.
9	Temperature red	Some services have been shut down to avoid equipment damage. The operational state of the affected PPTPs indicates the affected services.
10	Voltage yellow	No service shutdown at present, but the line power voltage is below its recommended minimum. Service restrictions may be in effect, such as permitting no more than N lines off-hook or ringing at one time.
11	Voltage red	Some services have been shut down to avoid power collapse. The operational state of the affected PPTPs indicates the affected services.
12	ONT manual power off	The ONT is shutting down because the subscriber has turned off its power switch.
13..207	Reserved	
208..223	Vendor-specific alarms	Not to be standardized.

9) Modification of clause 9.1.2, ONT2-G

9.1) Addition of code points to the OMCC version attribute

Add code points 0x86 and 0x96 to the following attribute, as shown:

OMCC version: This attribute identifies the version of the OMCC protocol being used by the ONT. This allows the OLT to manage a network with ONTs that support different OMCC versions. Release levels of G.984.4 may be supported with the following code points:

0x80 G.984.4 (06/04)

NOTE 1 – For historic reasons, this codepoint may also appear in ONTs that support later versions of G.984.4.

0x81 G.984.4 Amd.1 (06/05)

0x82 G.984.4 Amd.2 (03/06)

0x83 G.984.4 Amd.3 (12/06)

0x84 G.984.4 (02/08)

0x85 G.984.4 (2008) Amd.1 (06/09)

0x86 G.984.4 (2008) Amd.2 (11/09). Baseline message set only, without the extended message set option

0x96 G.984.4 (2008) Amd.2 (11/09). Extended message set option, in addition to the baseline message set.

(R) (mandatory) (1 byte)

9.2) Revision of total priority queue number attribute

Revise the total priority queue number attribute to read as follows:

Total priority queue number: This attribute reports the total number of upstream priority queues that are not associated with a circuit pack, but with the ONT in its entirety. Upon ME instantiation, the ONT sets this attribute to the value that represents its capabilities. (R) (mandatory) (2 bytes)

9.3) Addition of new attributes

Append the following new attributes to the list of attributes:

Connectivity capability: This attribute indicates the Ethernet connectivity models that the ONU can support. The value 0 indicates that the capability is not supported; 1 signifies support. The following codepoints are defined:

Bit	Model
1 (LSB)	N:1 bridging, Figure 8.2.2-3
2	1:M mapping, Figure 8.2.2-4
3	1:P filtering, Figure 8.2.2-5
4	N:M bridge-mapping, Figure 8.2.2-6
5	1:MP map-filtering, Figure 8.2.2-7
6	N:P bridge-filtering, Figure 8.2.2-8
7	N:MP bridge-map-filtering, Figure 8.2.2-9
8...16	Reserved

NOTE 2 – It is not implied that an ONU may not support other connectivity models.

(R) (optional) (2 bytes)

Current connectivity mode:

This attribute specifies the Ethernet connectivity model that the OLT wishes to use. The following code points are defined:

Value	Connectivity model
0	No selection (default)
1	N:1 bridging
2	1:M mapping
3	1:P filtering
4	N:M bridge-mapping
5	1:MP map-filtering
6	N:P bridge-filtering
7	N:MP bridge-map-filtering
8...255	Reserved

NOTE 3 – It is not implied that an ONU supports a given connectivity model only when that model is explicitly selected by this attribute. The ONU is free to support additional models at any and all times.

(R, W) (optional) (1 byte)

QoS configuration flexibility:

This attribute reports whether various managed entities in the ONT are hard-wired or configurable. For backward compatibility, and if the ONT does not support this attribute, all such attributes are understood to be hard-wired. (R) (optional) (2 bytes)

Bit	Interpretation when bit value = 1
1 (LSB)	Priority queue ME: Related port attribute is read-write and can point to any T-CONT or UNI port in the same slot
2	Priority queue ME: The traffic scheduler-G pointer is permitted to refer to any traffic scheduler-G in the same slot
3	Traffic scheduler-G ME: T-CONT pointer is read-write
4	Traffic scheduler-G ME: Policy attribute is read-write
5	T-CONT ME: Policy attribute is read-write
6..16	Reserved

Discussion:

To allow for the possibility that the OLT does not support flexible configuration, the ONT vendor must assure that the priority queues and traffic schedulers are configured in a meaningful and useful way by factory default, and that this default configuration is restored upon ONT initialization and MIB reset. The specifics of such a configuration are beyond the scope of this Recommendation.

The managed entity ID of both the T-CONT and traffic scheduler contains a slot number. Even when attributes in the above list are read-write, it is never permitted to change the slot number in a reference. That is, configuration flexibility never extends across slots. It is also not permitted to change the directionality of an upstream queue to downstream, or vice versa.

10) Modification of clause 9.1.3, ONT data

Replace the MIB upload action description with the following:

MIB upload

Latch a snapshot (i.e., copy) of the current MIB. Not every managed entity or every attribute is included in a MIB upload. Table attributes are excluded. Only the control block attributes of performance monitoring MEs are uploaded. Other MEs and attributes, such as the PPTP for the local craft terminal, are excluded as documented in their specific definitions.

11) Modification of clause 9.1.5, Cardholder

11.1) Addition of new attributes

Add the following attributes at the end of the attributes list:

ARC: See clause I.1.8. (R, W) (optional) (1 byte)

ARC interval: See clause I.1.8. (R, W) (optional) (1 byte)

11.2) Revision of AVC table

Revise the attribute value change table to read as follows (add ARC):

Attribute value change

Number	Attribute value change	Description
1	Actual type	Actual type of circuit pack in cardholder
2..4	N/A	
5	Actual equipment id	Actual equipment ID of circuit pack in cardholder
6..7	N/A	
8	ARC	ARC timer expiration
9..16	Reserved	

12) Modification of clause 9.1.10, Protection data

Replace the present definition with the following:

This managed entity models the capability and parameters of PON protection. An ONT that supports PON protection automatically creates one instance of this managed entity. A chassis-based reach extender could have the capability of protecting a number of PONs, possibly by way of circuit packs configured in arbitrary (rather than predefined) slots. Protection data managed entities in a multi-PON reach extender may therefore be auto-created or created by the OLT, depending on the reach extender's architecture, and the ANI-G pointers may be either populated by the ONT itself (read-only) or configured by the OLT (read-write, set-by-create). Likewise, the nature of protection may be set read-only by the ONT's architecture, or may be settable by the OLT.

NOTE 1 – Equipment protection is modelled with the equipment protection profile and cardholder managed entities.

NOTE 2 – For ONTs that implement reach extender functions, this ME can be used to describe OMCI protection, reach extender R/S' protection, or both. For reach extender R/S' protection, the protection type must be 1:1 without extra traffic, because the switching is done on a link-by-link basis, and the protection link is in cold standby mode. The instance that pertains to OMCI protection has ME ID = 0.

Relationships

One instance of this managed entity is associated with two instances of the ANI-G, RE ANI-G or RE upstream amplifier. One of the ANI managed entities represents the working side; the other represents the protection side.

Attributes

Managed entity id: This attribute uniquely identifies each instance of this managed entity. If there is more than one protection data ME, they are numbered in ascending order from 0. (R, Set-by-create (if applicable)) (mandatory) (2 bytes)

Working ANI-G pointer: This attribute points to the ANI-G, RE ANI-G or RE upstream amplifier managed entity that represents the working side of a protected PON. (R, W (if applicable), Set-by-create (if applicable)) (mandatory) (2 bytes)

NOTE 3 – It is possible, and indeed likely, that an ANI-G will have the same ME ID as the RE ANI-G or even the RE upstream amplifier that supports its physical PON interface. The ANI-G represents the embedded ONT that terminates the OMCC. Since it is not expected that the protection of management communications will be implemented independently from the protection of the optical layer, the ambiguity is not expected to cause a problem.

Protection ANI-G pointer:	This attribute points to the ANI-G, RE ANI-G or RE upstream amplifier managed entity that represents the protection side of a protected PON. (R, W (if applicable), Set-by-create (if applicable)) (mandatory) (2 bytes)
Protection type:	This attribute indicates the type of PON protection. Valid values are: 0 1+1 protection 1 1:1 protection without extra traffic 2 1:1 protection with ability to support extra traffic (R, W (if applicable), Set-by-create (if applicable)) (mandatory) (1 byte)
Revertive ind:	This attribute indicates whether protection is revertive (1) or non-revertive (0). (R, W (if applicable), Set-by-create (if applicable)) (mandatory) (1 byte)
Wait to restore time:	This attribute specifies the time, in seconds, to wait after a fault clear before switching back to the working side. Upon ME instantiation, the ONT sets this attribute to 3 seconds. (R, W, Set-by-create (if applicable)) (mandatory) (2 bytes)
Switching guard time:	This attribute specifies the time, in milliseconds, to wait after the detection of a fault before performing a protection switch. Selection of a default value for this attribute is outside the scope of this Recommendation, as it is normally handled through supplier-operator negotiations. (R, W, Set-by-create (if applicable)) (optional) (2 bytes)

Actions

Create, delete (if applicable)

Get, set

Notifications

None.

13) Modification of clause 9.1.12, ONT remote debug

Revise the reply table attribute description to read as follows:

Reply table: This attribute is used to pass reply information back to the OLT. Its format is defined by the command format attribute. The get, get next action sequence must be used with this attribute, since its size is unspecified. (R) (mandatory) (N bytes)

14) Addition of new clause 9.1.13, ONT-E

Add new clause 9.1.13 as follows:

9.1.13 ONT-E

This managed entity represents a point-to-point Gigabit Ethernet-fed ONT as equipment, as defined in [ITU-T G.986]. The ONT automatically creates an instance of this managed entity. It assigns values to read-only attributes according to data within the ONT itself.

Relationships

All other managed entities in this Recommendation are related directly or indirectly to the ONT-E entity.

Attributes

Managed entity id: This attribute uniquely identifies each instance of this managed entity. There is only one instance, number 0. (R) (mandatory) (2 bytes)

Vendor id: This attribute identifies the vendor of the ONT. Both the code set for the Vendor_ID, specified in [ATIS-0300220] and the organizationally unique identifier (OUI) specified in clause 9 of [IEEE 802], could be applied for this attribute.

When the code set for the Vendor_ID, specified in [ATIS-0300220], is applied for this attribute, the 4 characters are mapped into the 4-byte field by concatenating the ASCII/ANSI character codes.

When the OUI is applied for this attribute, the 3 characters are mapped into the 4-byte field with 0xFF assigned to the first octet.

(R) (mandatory) (4 bytes)

Octet	Content	
	Vendor_ID in [ATIS-0300220]	OUI in [IEEE 802]
1	First byte of Vendor_ID	0xFF
2	Second byte of Vendor_ID	First byte of OUI
3	Third byte of Vendor_ID	Second byte of OUI
4	Fourth byte of Vendor_ID	Third byte of OUI

Version: This attribute identifies the version of the ONT as defined by the vendor. The character value "0" indicates that version information is not available or applicable. (R) (mandatory) (14 bytes)

Serial number: The serial number is unique for each ONT. It is defined by the vendor. The character value "0" indicates that serial number information is not available or applicable. (R) (mandatory) (8 bytes)

Actions

Get

Reboot: Reboot the ONT

Notifications

Alarm

Number	Alarm	Description
0	Equipment alarm	Functional failure on an internal interface
1..207	Reserved	
208..223	Vendor-specific alarms	Not to be standardized

15) Modification of clause 9.2, ANI management

15.1) Deletion of introductory paragraph

Delete the following introductory paragraph:

Although the OLT maintains some of the PON-related managed entities and attributes via G.984.3 PLOAM messages, there is also information to be negotiated in OMCC. Therefore, the ONT autonomously creates at least one instance of each of the managed entities ANI-G and T-CONT. These ANI management MEs are included in a MIB upload.

15.2) Correction of a reference in clause 9.2.2, T-CONT

In the introductory text, correct the reference to clause 11.3.3 to read 11.4.3.

15.3) Revision of the policy attribute in clause 9.2.2

Revise the Policy attribute description to read as follows:

Policy: This attribute indicates the T-CONT's traffic scheduling policy. Valid values:

- 0 Null.
- 1 HOL – Head of line queuing.
- 2 WRR – Weighted round robin.

(R, W) (mandatory) (1 byte)

NOTE – This attribute is read-only, unless otherwise specified by the QoS configuration flexibility attribute of the ONT2-G managed entity. If flexible configuration is not supported, the ONT should reject an attempt to set it with a parameter error result-reason code.

15.4) Revision of attributes descriptions in clause 9.2.3, GEM port network CTP

Revise the descriptions of the two following attributes to read as shown (change GEM traffic descriptor to traffic descriptor):

Traffic descriptor profile pointer for upstream: This attribute points to the instance of the traffic descriptor managed entity that contains the upstream traffic parameters used for this GEM port network CTP ME. This attribute is used when the traffic management option attribute in the ONT-G ME is 1 (rate controlled), specifying the PIR/PBS to which the upstream traffic is shaped. This attribute is also used when the traffic management option attribute in the ONT-G ME is 2 (priority and rate controlled), specifying the CIR/CBS/PIR/PBS to which the upstream traffic is policed. (R, W, Set-by-create) (optional) (2 bytes)

See also Appendix III.

Traffic descriptor profile pointer for downstream: This attribute points to the instance of the traffic descriptor managed entity that contains the downstream traffic parameters used for this GEM port network CTP ME. This attribute is used when the traffic management option attribute in the ONT-G ME is 2 (priority and rate controlled), specifying the CIR/CBS/PIR/PBS to which the downstream traffic is policed. (R, W, Set-by-create) (optional) (2 bytes)

See also Appendix III.

15.5) Modification of attributes in clause 9.2.4, GEM interworking termination point

Modify the following attributes as shown:

Managed entity id: This attribute uniquely identifies each instance of this managed entity.
(R, Set-by-create) (mandatory) (2 bytes).

Interworking option: This attribute identifies the type of non-GEM function that is being interworked. The options are:

- 0 Unstructured TDM.
- 1 MAC bridge LAN.
- 2 Reserved for future use.
- 3 IP data service.
- 4 Video return path.
- 5 802.1p mapper.
- 6 Downstream broadcast.
- 7 MPLS data service.

(R, W, Set-by-create) (mandatory) (1 byte)

Service profile pointer: This attribute points to an instance of a service profile, such as:

CES service profile-G	if interworking option = 0
MAC bridge service profile	if interworking option = 1
IP router service profile	if interworking option = 3
Video return path service profile	if interworking option = 4
802.1p mapper service profile	if interworking option = 5
Null pointer	if interworking option = 6
Null pointer	if interworking option = 7

(R, W, Set-by-create) (mandatory) (2 bytes)

GAL profile pointer: This attribute points to an instance of the GAL profile. The relationship between the interworking option and the related GAL profile is:

Interworking option	GAL profile type
0	GAL TDM profile
1	GAL Ethernet profile
2	Reserved for future use
3	GAL Ethernet profile for data service
4	GAL Ethernet profile for video return path
5	GAL Ethernet profile for 802.1p mapper
6	Null pointer
7	Null pointer

(R, W, Set-by-create) (mandatory) (2 bytes)

15.6) Addition of an action in clause 9.2.5, Multicast GEM interworking termination point

To the list of actions, add:

Set table (optional)

16) Addition of an attribute in clause 9.3.1, MAC bridge service profile

Add the following new attribute at the end of the attributes list:

Dynamic filtering ageing time: This attribute specifies the age of dynamic filtering entries in the bridge database, after which unrefreshed entries are discarded. In accordance with [IEEE 802.1D] clause 7.9.2 and [IEEE 802.1Q] clause 8.8.3, the range is 10..1 000 000 seconds, with a resolution of 1 second and a default of 300 seconds. (R, W, Set-by-create) (optional) (4 bytes)

17) Deletion of an action in clause 9.3.2, MAC bridge configuration data

*Remove **set** from the list of actions.*

18) Modification of clause 9.3.4, MAC bridge port configuration data

18.1) Addition of a code point

Add code point 11 to the TP type attribute, as shown:

TP type: This attribute identifies the type of termination point associated with this MAC bridge port. Valid values are:

- 1 Physical path termination point Ethernet UNI
- 2 Interworking VCC termination point
- 3 802.1p mapper service profile
- 4 IP host config data
- 5 GEM interworking termination point
- 6 Multicast GEM interworking termination point
- 7 Physical path termination point xDSL UNI part 1
- 8 Physical path termination point VDSL UNI
- 9 Ethernet flow termination point
- 10 Physical path termination point 802.11 UNI
- 11 Virtual Ethernet interface point

(R, W, Set-by-create) (mandatory) (1 byte)

18.2) Revision of two attributes

Revise the descriptions of the two following attributes to read as shown (change GEM traffic descriptor to traffic descriptor):

Outbound TD pointer: This attribute points to a traffic descriptor that limits the traffic rate leaving the MAC bridge. (R, W) (optional) (2 bytes)

Inbound TD pointer: This attribute points to a traffic descriptor that limits the traffic rate entering the MAC bridge. (R, W) (optional) (2 bytes)

18.3) Addition of a new attribute

Add the following attribute:

MAC learning depth: This attribute specifies the maximum number of MAC addresses to be learned by this MAC bridge port. The default value 0 specifies that there is no administratively-imposed limit. (R, W, Set-by-create) (optional) (1 byte)

NOTE 1 – If this attribute is not zero, its value overrides the value set in the MAC learning depth attribute of the MAC bridge service profile.

18.4) Revision of the notifications section

Revise the notifications section to read:

Notifications

Alarm

Number	Alarm	Description
0	Port blocking	This port has been blocked due to loop detection in accordance with IEEE 802.1D
1..207	Reserved	
208..223	Vendor-specific alarms	Not to be standardized

NOTE 2 – To determine the state of a MAC bridge port, the OLT can read the port state attribute of the MAC bridge port designation data.

19) Addition of an action in clause 9.3.6, MAC bridge port filter table data

To the list of actions, add:

Set table (optional)

20) Addition of two code points in clause 9.3.10, 802.1p mapper service profile

Add code points 7 and 8 to the following attributes, as shown:

TP pointer: This attribute points to an instance of the associated termination point. The termination point type is determined by the TP type attribute:

<u>TP type</u>	<u>TP pointer points to...</u>
0	Bridging mapping. Pointer should be set to 0xFFFF by OLT and ignored by ONT.
1	PPTP Ethernet UNI
2	IP host config data
3	Ethernet flow TP
4	PPTP xDSL UNI
5	PPTP 802.11 UNI
6	PPTP MoCA UNI
7	Virtual Ethernet interface point
8	Interworking VCC termination point

Not supported: Bridging mapping if TP pointer value is 0xFFFF. TP pointer may also point to PPTP Ethernet UNI.

NOTE – When the TP type is xDSL, the two most significant bits may be used to indicate a bearer channel.

(R, W, Set-by-create) (mandatory) (2 bytes)

TP type: This attribute identifies the type of termination point associated with the mapper.

0	Mapper used for bridging-mapping
1	Mapper directly associated with a PPTP Ethernet UNI
2	Mapper directly associated with an IP host service
3	Mapper directly associated with an Ethernet flow termination point
4	Mapper directly associated with a PPTP xDSL UNI

- 5 Mapper directly associated with a PPTP 802.11 UNI
- 6 Mapper directly associated with a PPTP MoCA UNI
- 7 Mapper directly associated with a virtual Ethernet interface point
- 8 Mapper directly associated with an interworking VCC termination point

(R, W, Set-by-create) (optional) (1 byte)

21) Addition of a code point in clause 9.3.12, VLAN tagging operation configuration data

Add code point 11 to the association type attribute, as shown:

Association type: This attribute specifies the type of the ME that is associated with this VLAN tagging operation configuration data ME. Values are assigned in accordance with the following list:

- 0 (default) Physical path termination point Ethernet UNI (for backward compatibility, may also be an IP host config data ME; they must not have the same ME ID). The associated ME instance is implicit; its identifier is the same as that of this VLAN tagging operation configuration data.
- 1 IP host config data
- 2 802.1p mapper service profile
- 3 MAC bridge port configuration data
- 4 Physical path termination point xDSL UNI
- 5 GEM interworking termination point
- 6 Multicast GEM interworking termination point
- 7 Physical path termination point MoCA UNI
- 8 Physical path termination point 802.11 UNI
- 9 Ethernet flow termination point
- 10 Physical path termination point Ethernet UNI
- 11 Virtual Ethernet interface point

The associated ME instance is identified by the associated ME pointer.
(R, W, Set-by-create) (optional) (1 byte)

22) Modification of clause 9.3.13, Extended VLAN tagging operation configuration data

22.1) Addition of a code point

Add code point 10 to the association type attribute:

Association type: This attribute identifies the type of the ME associated with this extended VLAN tagging ME. Values are assigned as follows:

- 0 MAC bridge port configuration data
- 1 802.1p mapper service profile
- 2 Physical path termination point Ethernet UNI
- 3 IP host config data
- 4 Physical path termination point xDSL UNI
- 5 GEM interworking termination point
- 6 Multicast GEM interworking termination point
- 7 Physical path termination point MoCA UNI
- 8 Physical path termination point 802.11 UNI
- 9 Ethernet flow termination point
- 10 Virtual Ethernet interface point

(R, W, Set-by-create) (mandatory) (1 byte)

22.2) Revision of the description of an attribute

Where the text presently reads:

When the table is created, the ONT should predefine three entries that list the default treatment (of normal forwarding) for untagged, single tagged, and double tagged frames. As an exception to the rule on ordered processing, these default rules are always considered as a last resort for frames that do not match any other applicable rule. Best practice dictates that these entries not be deleted; however, they can be modified to produce the desired default behaviour.

15, x, x, 15, x, x, x, (0, 15, x, x, 15, x, x)

15, x, x, 14, x, x, x, (0, 15, x, x, 15, x, x)

14, x, x, 14, x, x, x, (0, 15, x, x, 15, x, x)

Revise it to read:

When the table is created, the ONT should predefine three entries that list the default treatment (of normal forwarding) for untagged, single tagged, and double tagged frames. As an exception to the rule on ordered processing, these default rules are always considered as a last resort for frames that do not match any other applicable rule. Best practice dictates that these entries not be deleted; however, they can be modified to produce the desired default behaviour.

15, x, x, 15, x, x, 0, (0, 15, x, x, 15, x, x) – no tags, Ethertype do not care

15, x, x, 14, x, x, 0, (0, 15, x, x, 15, x, x) – 1 tag, Ethertype do not care

14, x, x, 14, x, x, 0, (0, 15, x, x, 15, x, x) – 2 tags, Ethertype do not care

22.3) Revision of the description for filter inner priority

Where the text presently reads:

Filter inner priority: (4 bits)

- 0..7 Filter received frames on this inner priority value.
- 8 Do not filter on inner priority.
- 14 This is the default filter when no other one-tag rule applies.
- 15 This entry is a no-tag rule; ignore all other filter fields.

Other values: Reserved

Revise it to read:

Filter inner priority: (4 bits)

- 0..7 Filter received frames on this inner priority value.
- 8 Do not filter on inner priority.
- 14 This is the default filter when no other one-tag rule applies.
- 15 This entry is a no-tag rule; ignore all other VLAN tag filter fields.

NOTE – The Ethertype filter field is a valid criterion.

Other values: Reserved