International Telecommunication Union

ITU-T G.8012/Y.1308

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Amendment 1

(05/2006)

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

Ethernet over Transport aspects – General aspects

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

Internet protocol aspects – Transport

Ethernet UNI and Ethernet NNI

Amendment 1

ITU-T Recommendation G.8012/Y.1308 (2004) – Amendment 1

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ITU-T Recommendation G.8012/Y.1308

Ethernet UNI and Ethernet NNI

Amendment 1

Summary

This amendment contains extensions to the first version (2004) of ITU-T Rec. G.8012/Y.1308, related to the addition of:

– Ethernet over MPLS.

– Ethernet over RPR.

This amendment incorporates the frame format of provider bridges and deletes specifications of length encapsulation of client data since that encapsulation is not used for Ethernet over Transport.

The two Ethernet over Transport NNIs and the provider bridge frame were already considered for the first version of this Recommendation, but the standards defining these frames (ITU-T Rec. Y.1415, IEEE 802.1ad and IEEE 802.17) were not approved at that moment.

Source

Amendment 1 to ITU-T Recommendation G.8012/Y.1308 (2004) was approved on 7 May 2006 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

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.

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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, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation G.8012/Y.1308

Ethernet UNI and Ethernet NNI

Amendment 1

1) Introduction

This amendment contains extensions to the first version (2004) of ITU-T Rec. G.8012/Y.1308, related to the addition of:

– Ethernet over MPLS.

– Ethernet over RPR.

This amendment incorporates the frame format of provider bridges and deletes specifications of length encapsulation of client data.

2) Additions

2.1) Clause 1

Add the following references:

– ITU-T Recommendation G.8112/Y.1371 (2006), *Interfaces for the Transport MPLS (T-MPLS) hierarchy.*

– ITU-T Recommendation Y.1415 (2005), *Ethernet-MPLS network interworking – User plane interworking*.

– IEEE 802.1ad-2005, *IEEE standard for local and metropolitan area networks – Virtual Bridged Local Area Networks – Amendment 4: Provider Bridges*.

– IEEE 802.17-2004, *IEEE standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 17: Resilient packet ring (RPR) access method and physical layer specifications*.

2.2) Clause 4

Add the following abbreviation:

TPID Tag Protocol Identifier

2.3) Clause 6.2.1

Add a new subclause 6.2.1.6:

6.2.1.6 MPLS link frame

6.2.1.6.1 MPLS link frame without common interworking indicators and without MAC FCS

An ETH_CI traffic unit is mapped without any extension into the payload of the MPLS_CI traffic unit. See Figure 6-18a.

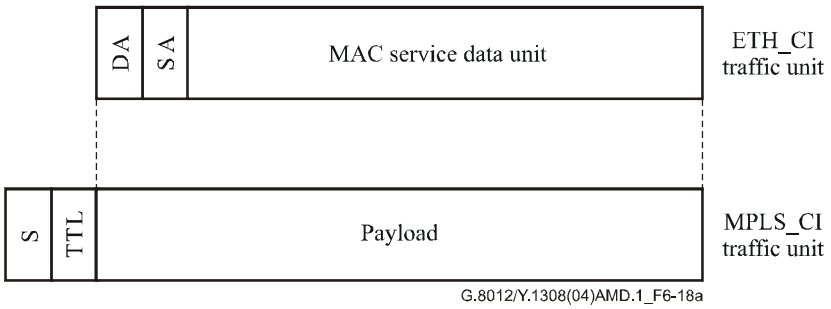


Figure 6-18a/G.8012/Y.1308 – MPLS link header without common interworking indicators and without MAC FCS preservation

6.2.1.6.2 MPLS link frame without common interworking indicators and with MAC FCS

An ETH_CI traffic unit is extended with a MAC FCS and then mapped into the payload of the MPLS_CI traffic unit. See Figure 6-18b.

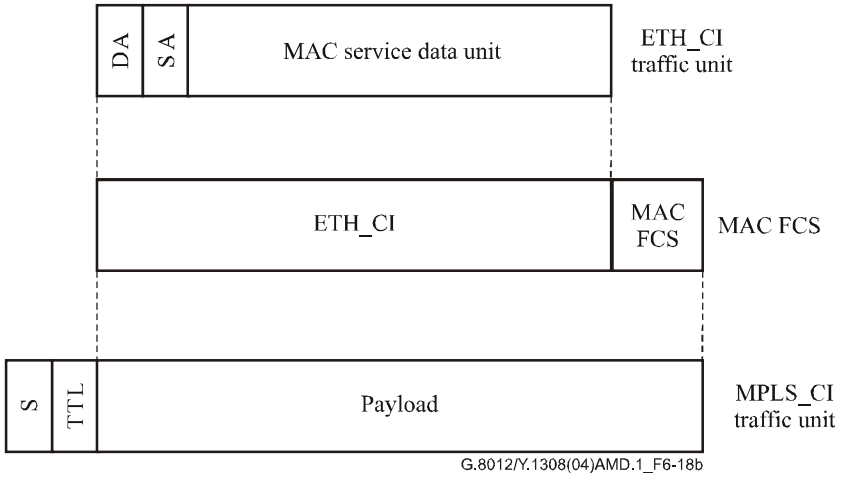


Figure 6-18b/G.8012/Y.1308 – MPLS link header without common interworking indicators and with MAC FCS preservation

6.2.1.6.3 MPLS link frame with common interworking indicators and without MAC FCS

An ETH_CI traffic unit is extended with 32-bit common interworking indicators as specified in ITU-T Rec. Y.1415 and then mapped into the payload of the MPLS_CI traffic unit. The 32-bit common interworking indicators comprise an 8-bit control field set to all-0s, an 8-bit Fragmentation and Length field set to all-0s and a 16-bit Sequence Number field. See Figure 6-18c.

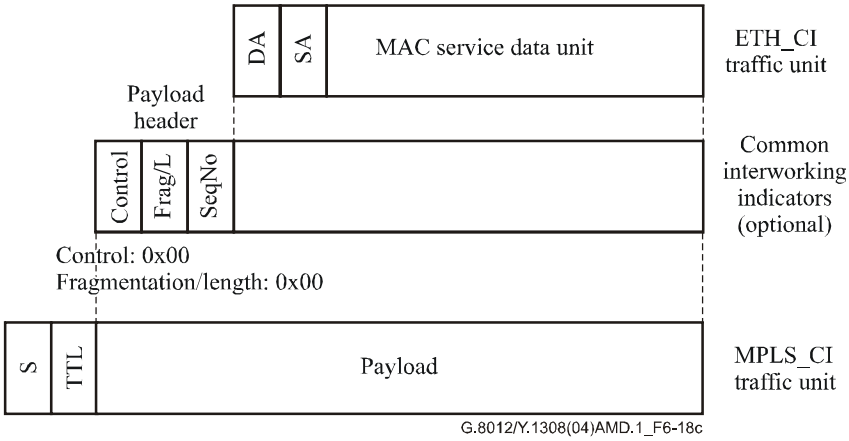


Figure 6-18c/G.8012/Y.1308 – MPLS link header with common interworking indicators and without MAC FCS preservation

6.2.1.6.4 MPLS link frame with common interworking indicators and with MAC FCS

An ETH_CI traffic unit is extended with a MAC FCS and with 32-bit common interworking indicators as specified in ITU-T Rec. Y.1415 and then mapped into the payload of the MPLS_CI traffic unit. The 32-bit common interworking indicators comprise an 8-bit control field set to all-0s, an 8-bit Fragmentation and Length field set to all-0s and a 16-bit Sequence Number field. See Figure 6-18d.

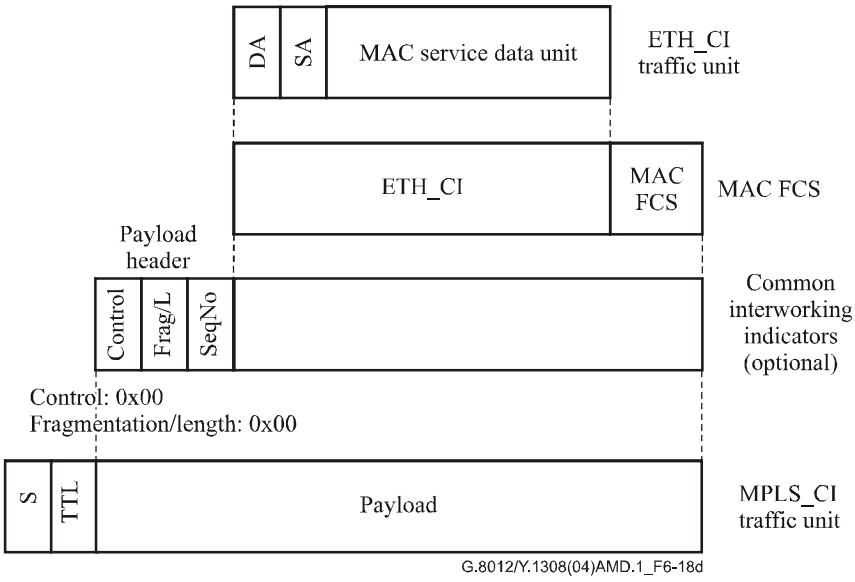


Figure 6-18d/G.8012/Y.1308 – MPLS link header with common interworking indicators and MAC FCS preservation

2.4) Clause 6.2.1

Add a new subclause 6.2.1.7:

6.2.1.7 RPR link frame

Clause 9.2 of IEEE 802.17 defines a basic and extended RPR data frame format. As a result, the ETH client frame mapping to IEEE 802.17 RPR frames has three variations as described in the following subclauses.

6.2.1.7.1 Basic RPR link frame

The ETH client DA & SA addresses may be mapped to DA & SA addresses fields found within the RPR header. This basic mapping is applicable to RPR MAC client ETH frame transmission requests where both the MAC DA and MAC SA are local to the RPR ring MAC topology. This would typically include RPR router/host station to RPR router/host station transmissions.

The ETH frame is extended with RPR overhead and a MAC FCS (which is not the same as the client MAC FCS) as specified in IEEE 802.17 Annex F. See Figure 6-18e.

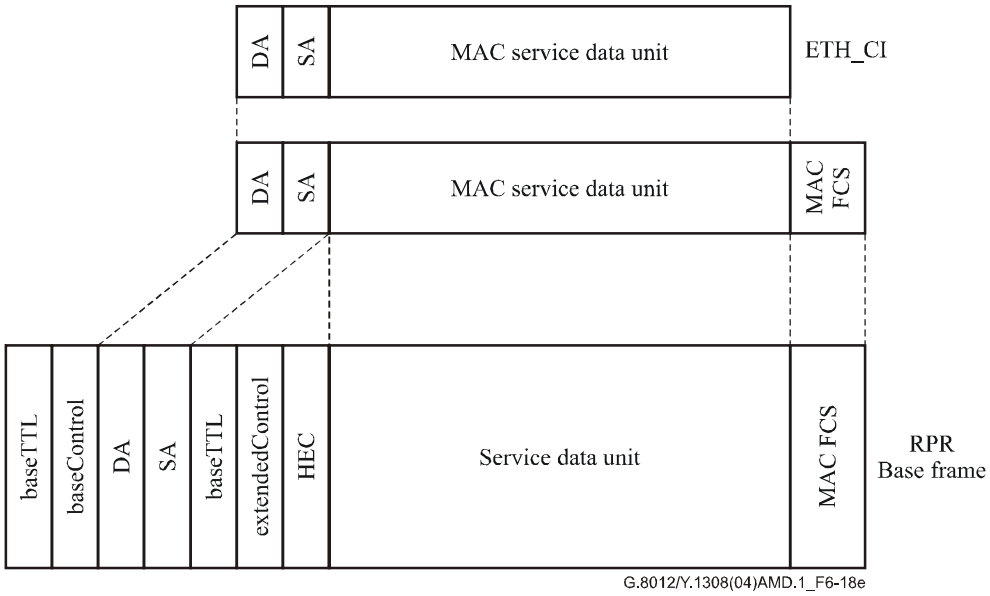


Figure 6-18e/G.8012/Y.1308 – Basic RPR link frame

6.2.1.7.2 Extended type 1 RPR link frame

The ETH client DA address may be mapped to both the DA field found in the RPR header and the daExtended field found within the RPR payload. The Ethernet client SA address is then mapped to the saExtended field found within the RPR payload. The RPR source station is the SA in the RPR header. This extended type 1 mapping is applicable to RPR MAC client ETH frame transmission requests where either the MAC DA or MAC SA is not local to the RPR ring MAC topology. This typically involves RPR bridge station transmissions.

The ETH frame is extended with RPR overhead (including an additional DA & SA) and a MAC FCS (which is not the same as the client MAC FCS) as specified in IEEE 802.17. See Figure 6-18f.

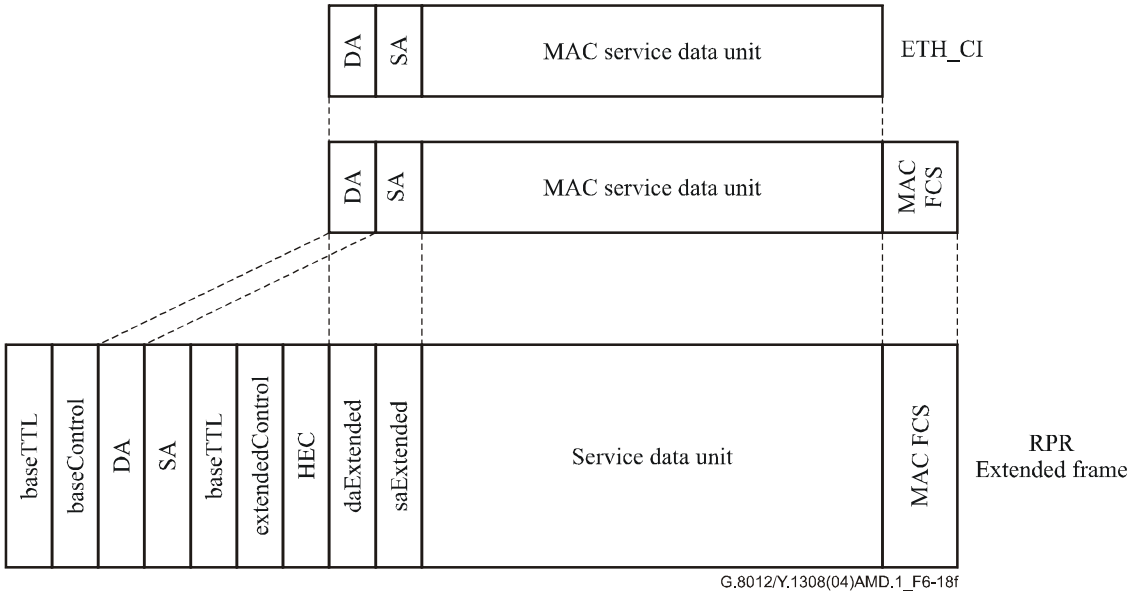


Figure 6-18f/G.8012/Y.1308 – Extended type 1 RPR link frame

6.2.1.7.3 Extended type 2 RPR link frame

The ETH client DA & SA addresses may be mapped to daExtended and saExtended fields found within the RPR payload. RPR MAC clients other than IEEE 802.1D/Q bridges may use this mapping. This is the extended mapping.

This extended type 2 mapping is applicable to RPR MAC client Ethernet frame transmission requests where either the MAC DA or MAC SA is not local to the RPR ring MAC topology. This typically involves RPR bridge station transmissions.

The ETH frame is extended with RPR overhead (including an additional DA & SA) and a MAC FCS (which is not the same as the client MAC FCS) as specified in IEEE 802.17b. See Figure 6-18g.

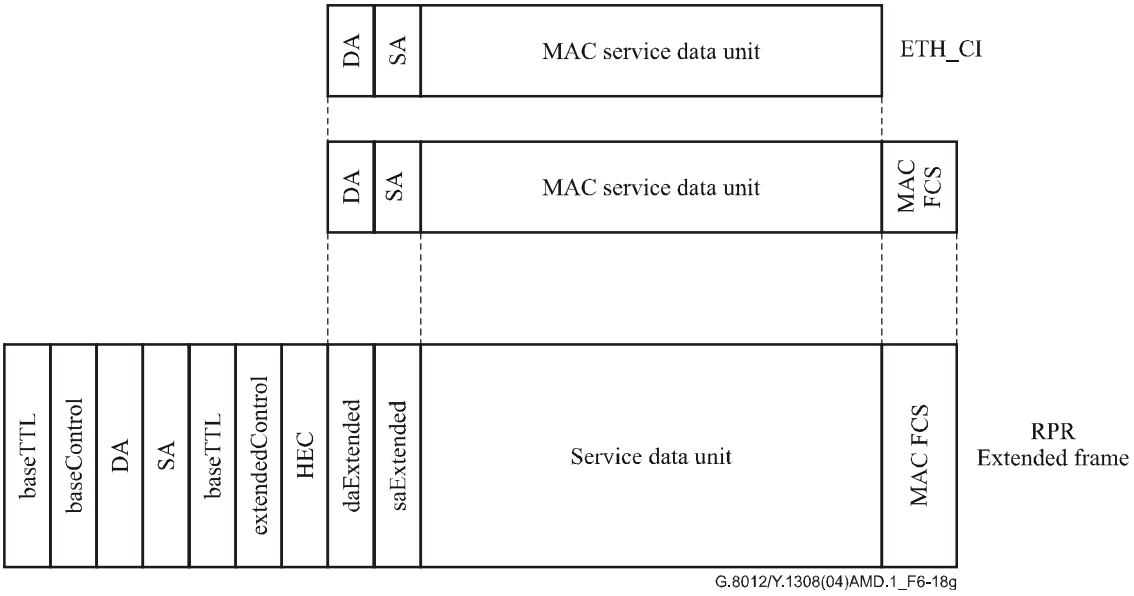


Figure 6-18g/G.8012/Y.1308 – Extended type 2 RPR link frame

2.5) Clause 6.2.3

Add a new subclause 6.2.3.6.

6.2.3.6 EoM NNI

The Ethernet over MPLS NNI deploys four MPLS link frames as specified in 6.2.1.6, two of them use common interworking indicators, the other two do not. The components of both types are illustrated in Figures 6-24a and 6-24b. The MPLS over transport NNI is specified in ITU-T Rec. G.8112/Y.1371.

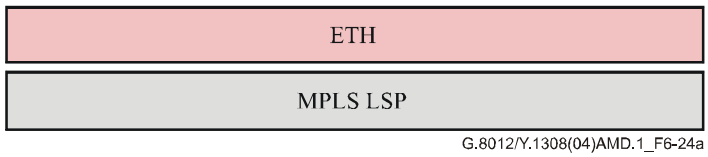


Figure 6-24a/G.8012/Y.1308 – Components of the Ethernet over MPLS-NNI without common interworking indicators

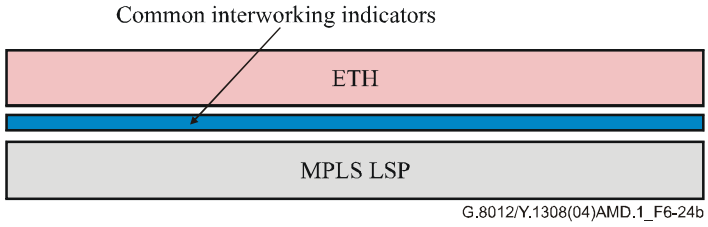


Figure 6-24b/G.8012/Y.1308 – Components of the Ethernet over MPLS-NNI with common interworking indicators

For interworking at administrative domain boundaries between EoM NNI interfaces, the following rule applies:

At international boundaries, or at the boundaries between networks of different operators, the Ethernet encapsulation over MPLS should be applied as described in 6.2.1.6.1, without common interworking indicators and without FCS, unless otherwise mutually agreed by the operators providing the transport. Within a national network or within the domain of a single operator, the control word may be used.

2.6) Clause 6.2.3

Add a new subclause 6.2.3.7.

6.2.3.7 EoR NNI

The Ethernet over RPR NNI deploys the RPR link frame as specified in 6.2.1.7 and their components are illustrated in Figure 6-24c.

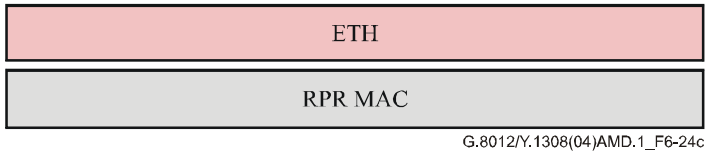


Figure 6-24c/G.8012/Y.1308 – Components of the Ethernet over RPR NNI

2.7) New clause 7.4

Add a new clause 7.4:

7.4 Provider backbone bridge

The specification of the encapsulation of ETH_CI into a Provider Backbone Bridge frame format and the associated bridging aspects are being defined in IEEE P802.1ah. See Appendix IV.

2.8) New Appendix III

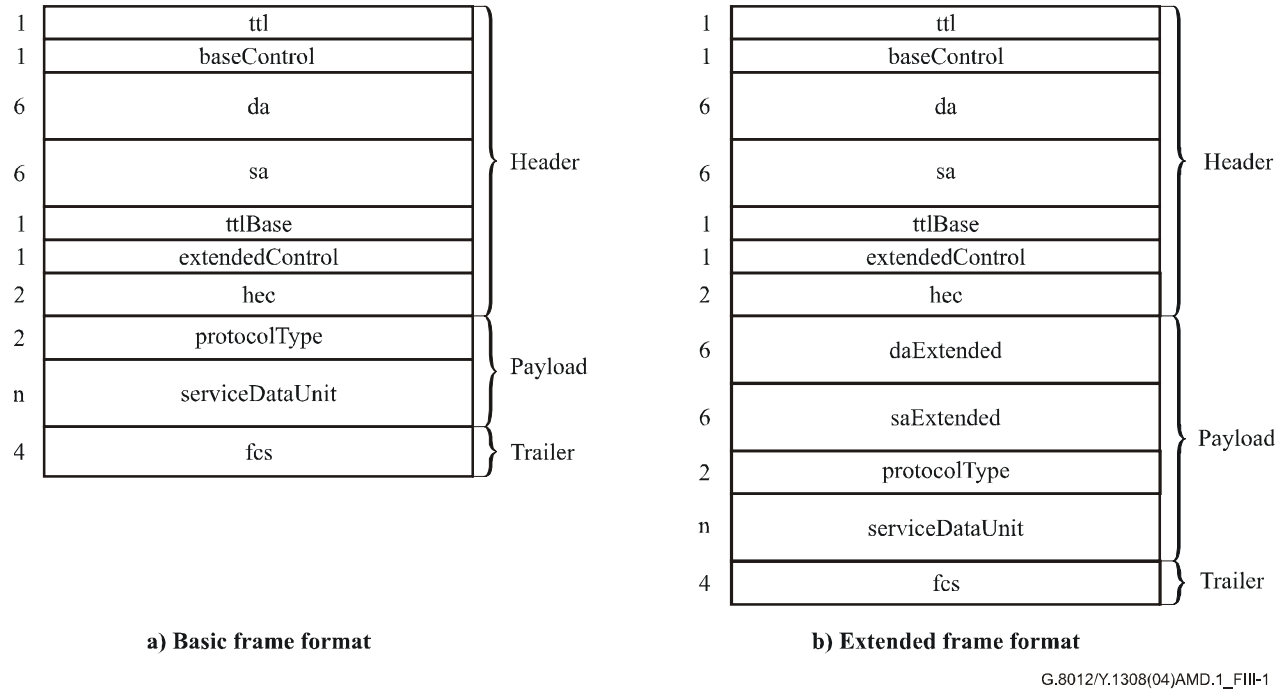
Add new Appendix III as follows:

Appendix III

Mapping of Ethernet frames into RPR frame

III.1 Introduction

RPR is defined in IEEE 802.17. While the mapping of an Ethernet frame into an RPR frame is defined in IEEE 802.17 all variations were not defined in order to allow the timely publication of that standard. As a result, an amendment to define a spatially aware sub-layer that completes the mappings is being defined in IEEE 802.17b. The frame format is defined in clause 9.2 of IEEE 802.17 and Figure 9.1/IEEE 802.17 is reproduced below:



NOTE – This figure is reproduced from "Figure 9.1/IEEE 802.17 – Data frame formats".

Figure III.1/G.8012/Y.1308 – RPR data frame format

Client Ethernet frame mapping to RPR frame is defined in Annex F/IEEE 802.17 and is being extended in IEEE 802.17b. There are three variations of this mapping that are summarized in the following clauses.

III.2 RPR basic frame

The Ethernet client DA & SA addresses may be mapped to DA & SA addresses fields found within the RPR header. This is typical for clients residing on host stations on the ring.

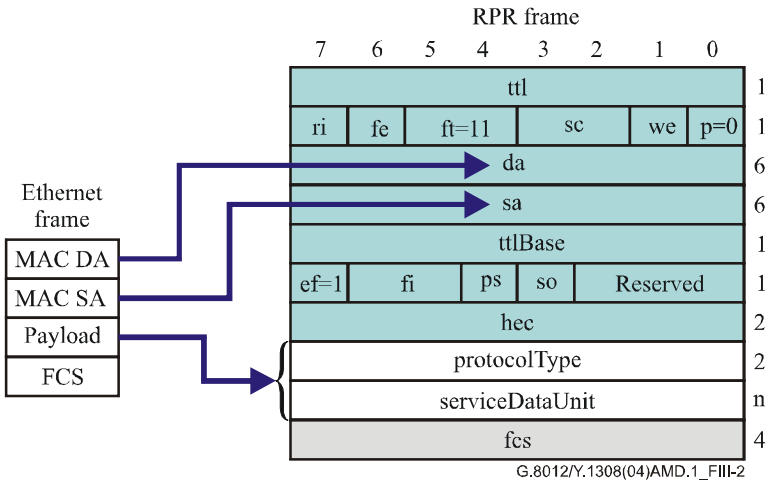


Figure III.2/G.8012/Y.1308 – Mapping Ethernet frame into 802.17 basic frame

III.3 RPR extended frame – Type 1

The Ethernet client DA address may be mapped to both the DA field found in the RPR header and the daExtended field found within the RPR payload. The Ethernet client SA address is then mapped to the saExtended field found within the RPR payload. The RPR source station is the SA in the RPR header. RPR MAC clients other than IEEE 802.1D/Q bridges may use this mapping.

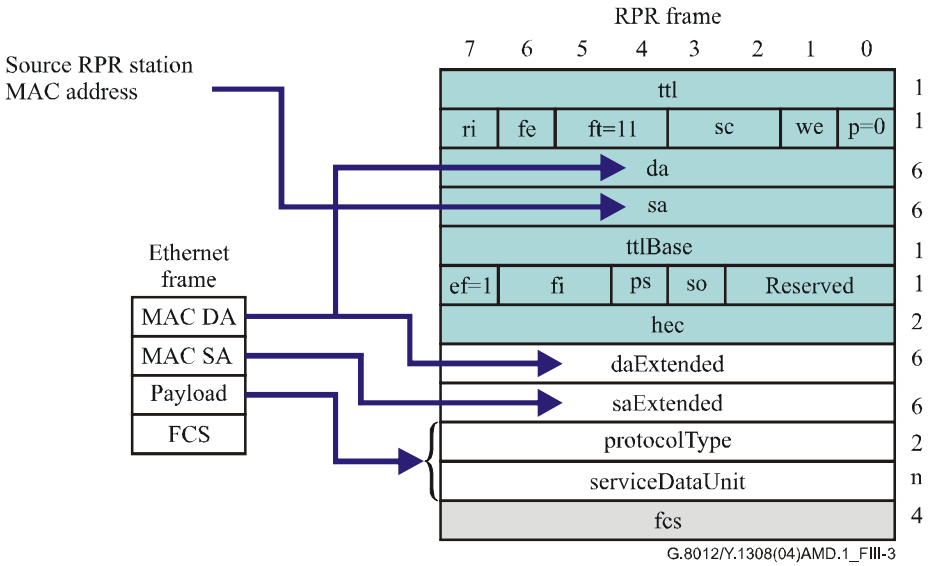


Figure III.3/G.8012/Y.1308 – Mapping Ethernet frame into 802.17 extended frame – Type 1

III.4 RPR extended frame – Type 2

The Ethernet client DA & SA addresses may be mapped to daExtended and saExtended fields found within the RPR payload. RPR MAC clients other than IEEE 802.1D/Q bridges may use this mapping and is typical where the Ethernet client is not local to the ring.

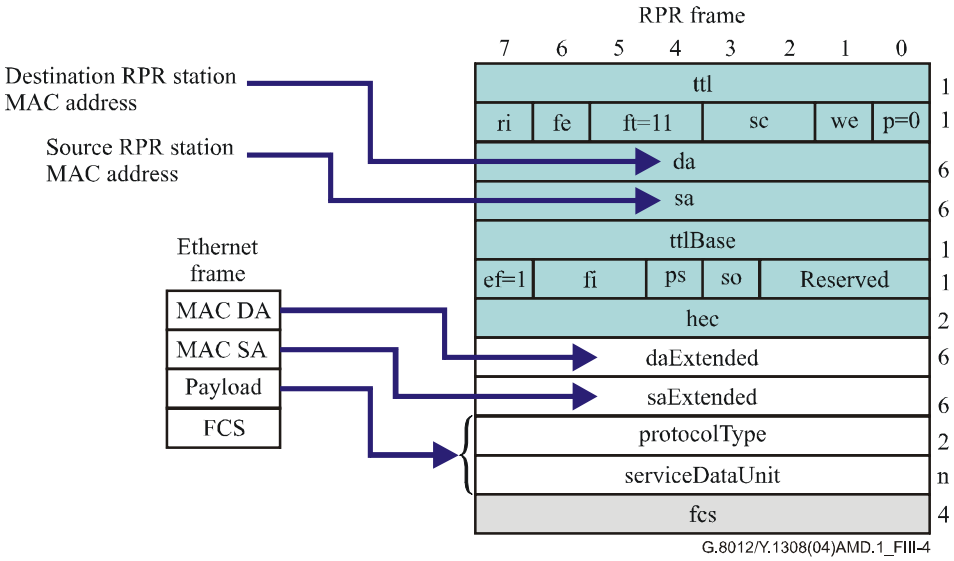


Figure III.4/G.8012/Y.1308 – Mapping Ethernet frame into 802.17 extended frame – Type 2

Note that while the first 2 variations are defined in Annex F of the base standard (IEEE 802.17) for RPR, the third variation is being defined by IEEE 802.17b. The latter is currently a draft with publication expected in 2006.

2.9) New Appendix IV

Add new Appendix IV as follows:

Appendix IV

Provider backbone bridges

Figure IV.1 illustrates the PBB information containment.

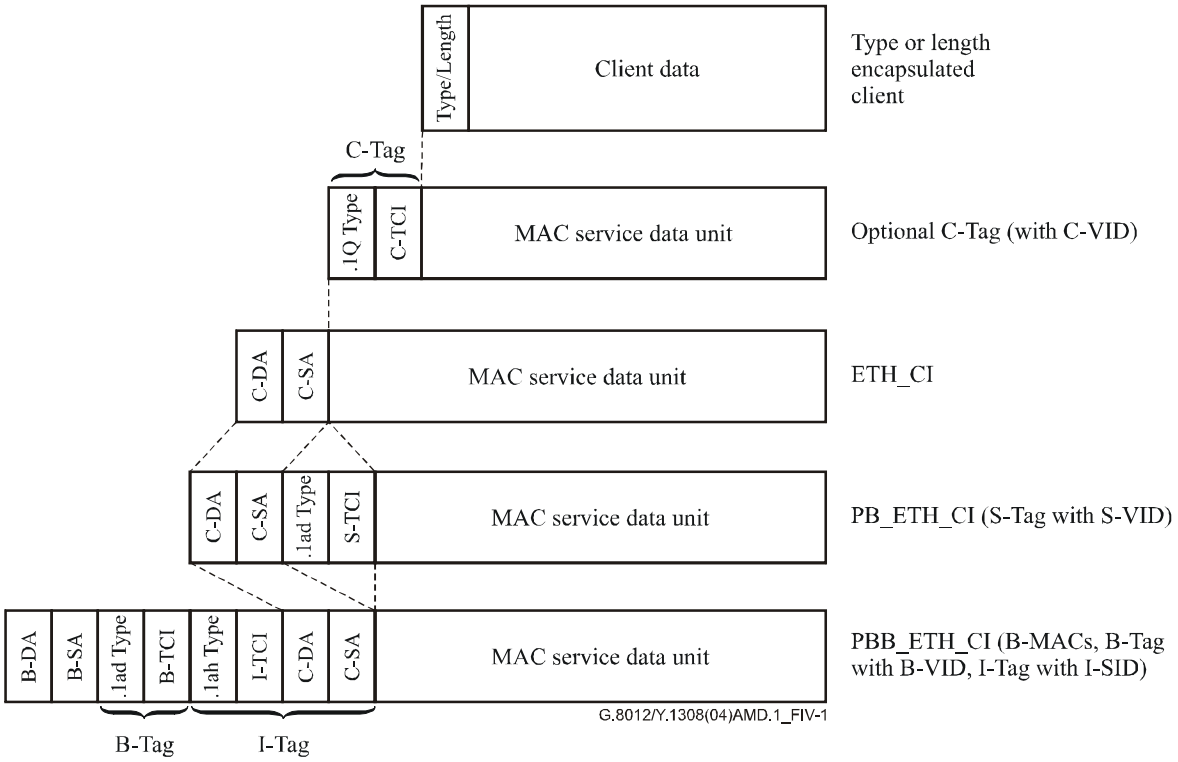


Figure IV.1/G.8012/Y.1308 – PBB Ethernet principle information containment for a one-to-one mapped S-tagged service interface

The ETH_CI as defined in ITU-T Rec. G.8010/Y.1306 may be encapsulated with an S-Tag comprising:

– 802.1ad Type field;

– Service Provider S-TCI (which includes the S-VID),

to form the PB_ETH_CI.

The PB_ETH_CI can be further encapsulated with Provider Backbone B-MAC addresses, a B-Tag comprising:

– 802.1ad Type field;

– Backbone Provider B-TCI (which includes the B-VID used for backbone tunnel identification),

and an I-Tag comprising:

– 802.1ah Type field;

– I-TCI (which includes the I-SID used for service instance identification);

– the Customer C-MAC addresses,

to form the PBB_ETH_CI.

The PBB_ETH_CI is then further encapsulated to form a link frame. In general, for all the subclause 6.2.3.x describing the Ethernet NNI interfaces, the ETH_CI could alternatively be the PB_ETH_CI or PBB_ETH_CI.

Figure IV.2 illustrates the additional PB and PBB mapping steps.

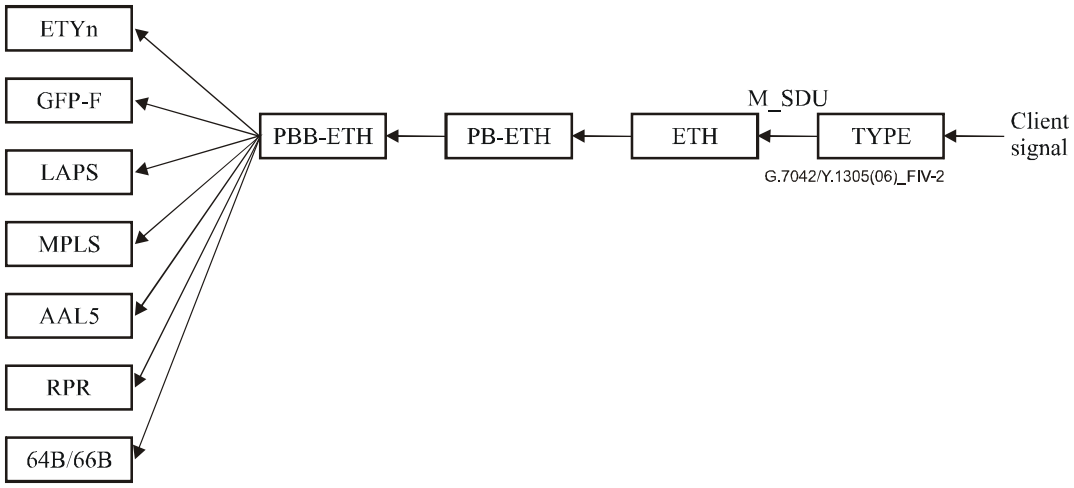


Figure IV.2/G.8012/Y.1308 – Ethernet mapping and multiplexing with PB and PBB

2.10) Bibliography

Add a new item.

– IEEE Standards Association Project Authorization Request, Project P802.17b (C/LM) *Information Technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Resilient Packet Ring Access Method & Physical Layer Specifications – Amendment 1 – Spatially Aware Sublayer*. http://standards.ieee.org/cgi-bin/status?802

3) Modifications

3.1) Clause 4

Remove ETHP and ETHS from the list of abbreviations.

3.2) Clause 6.1

Replace text and figure by the following:

The basic structure is shown in Figure 6-9. A client signal of the ETH layer network is mapped into the M_SDU by adding a 2-byte type field/length field.

NOTE – Length encapsulation is not used in Ethernet over Transport and, therefore, not addressed in this Recommendation. However, Ethernet over Transport is transparent for MAC-SDUs that contain length encapsulated client data.

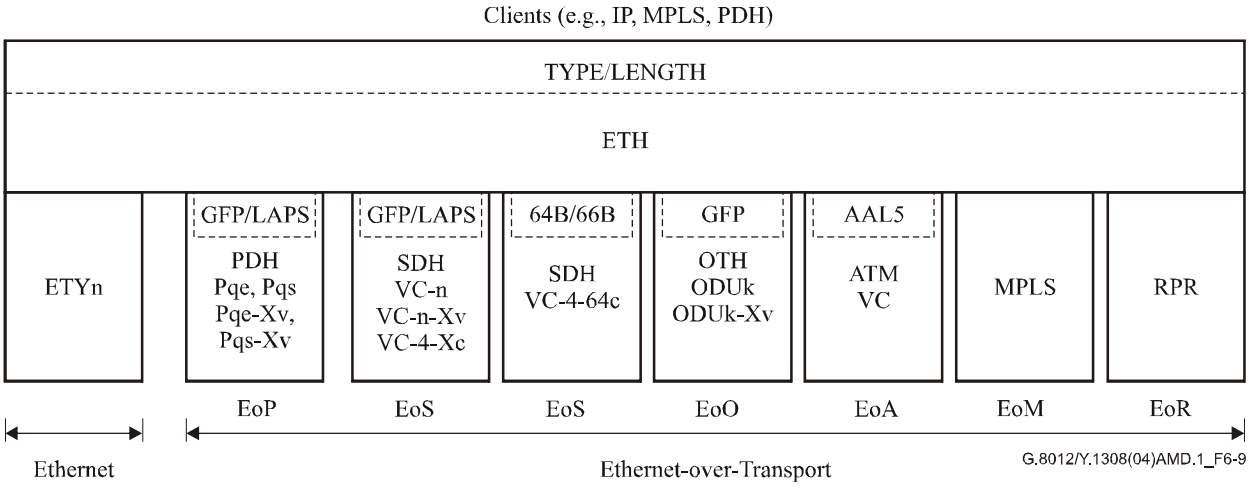


Figure 6-9/G.8012/Y.1308 – Structure of the ETH interfaces

3.3) Clause 6.1.1

Delete all three bullet items.

3.4) Clause 6.2.1

Replace text and figure by the following:

The ETH_CI consists of a MAC Destination Address (DA), a MAC Source Address (SA), a MAC Service Data Unit (M_SDU) (see ITU-T Rec. G.8010/Y.1306 and IEEE 802.3ae, clause 2). The M_SDU may optionally include a Tag (see IEEE 802.1Q). A client signal of the ETH layer network is mapped into the M_SDU via Type/Length encapsulation.

Table 6-4/G.8012/Y.1308 – Overview of encapsulated units

Encapsulation type	Reference
EtherType encapsulated client	IEEE 802.3, clause 3
Tag	IEEE 802.1Q, subclause 9.3.2
ETH encapsulated MAC SDU	IEEE 802.3, clause 3 IEEE 802.3ae, clause 2
MAC encapsulated ETH	IEEE 802.3, clause 3

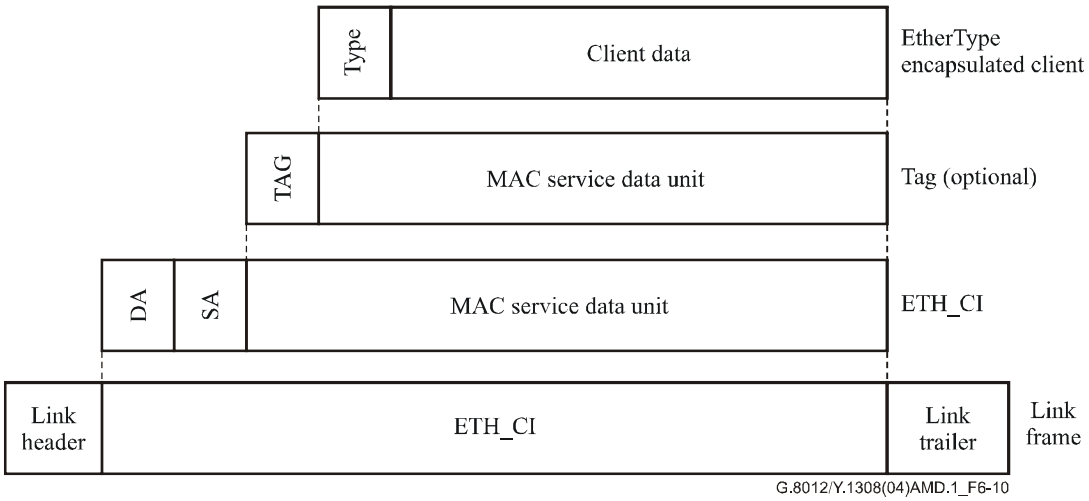


Figure 6-10/G.8012/Y.1308 – Ethernet principle information containment

3.5) Clause 7

Replace Figure 7-1 by the following one:

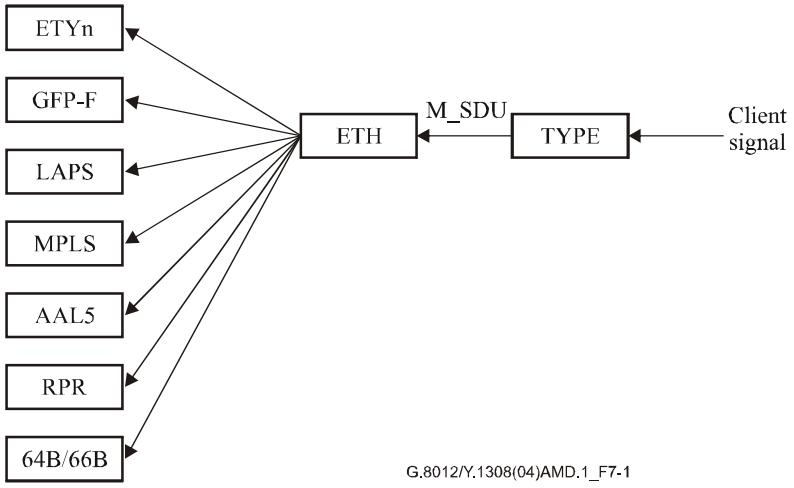


Figure 7-1/G.8012/Y.1308 – Ethernet mapping and multiplexing

3.6) Clause 7.1

Replace the first paragraph with the following one:

The client signal is mapped into the ETH signal (frame) directly via TYPE encapsulation, refer to 6.2.1.

3.7) Clause 7.3

Replace the text by the following:

Figure 7-4 illustrates a two-level multiplexing of up to 4094 × 4094 ETH signals into an ETH topological link. The ETH_CI traffic unit is for that purpose extended with a first level C-Tag including a C-VID as specified in IEEE 802.1Q and then multiplexed into an Ethernet Unit Group level 1. The EUG1 is extended with a second level S-Tag including also an S-VID (Figure 7-5) and then multiplexed into an Ethernet Unit Group level 2.

The structure of the S-Tag is defined in IEEE 802.1ad.

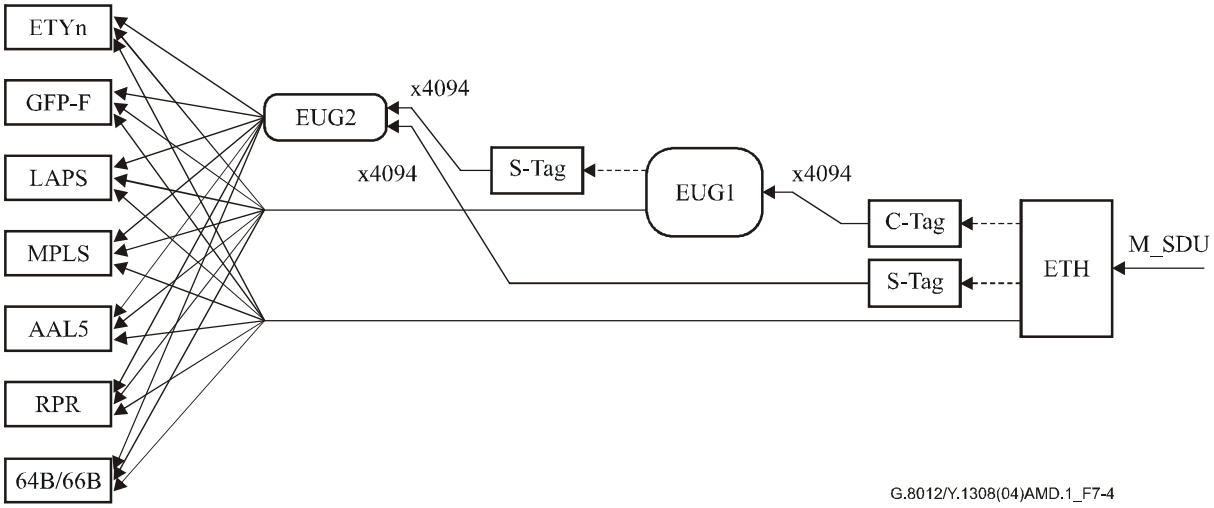


Figure 7-4/G.8012/Y.1308 – Ethernet two-level multiplexing

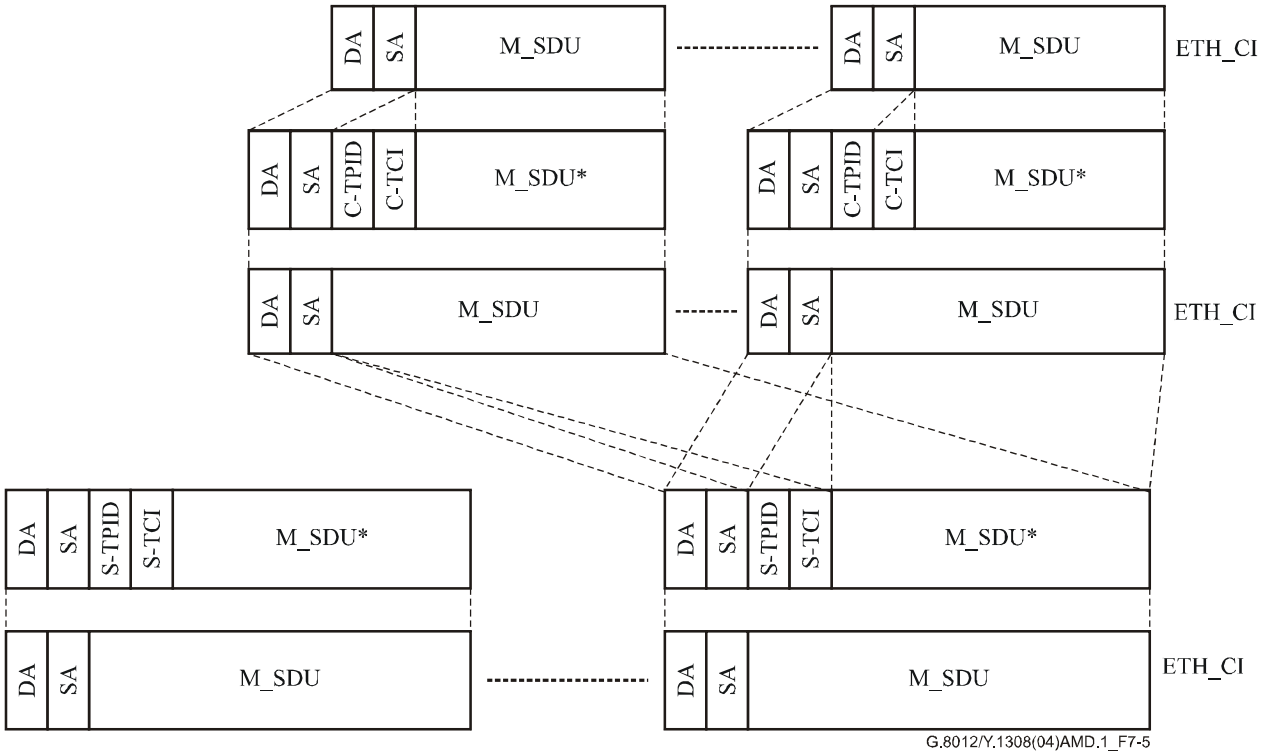


Figure 7-5/G.8012/Y.1308 – Ethernet two-level multiplexing method

3.8) Appendix I

Remove the complete Appendix I for this Recommendation.

3.9) Bibliography

Delete first reference (P802.1ad) from Bibliography.

ITU-T Y-SERIES RECOMMENDATIONS

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