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Amendment 1
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SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Operation, administration and maintenance

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OAM functions and mechanisms for Ethernet based networks

Amendment 1: Addition of new OAM "ETH-CSF", interoperability between ETH-LT (2006) and ETH-LT (2008)

Recommendation ITU-T Y.1731 (2008) – Amendment 1

ITU-T

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Recommendation ITU-T Y.1731

OAM functions and mechanisms for Ethernet based networks

Amendment 1

Addition of new OAM "ETH-CSF", interoperability between ETH-LT (2006) and ETH-LT (2008)

Summary

Amendment 1 to Recommendation ITU-T Y.1731 provides the following modifications:

– A new OAM, "ETH-CSF", is introduced in clauses 7 and 9.

– The consideration of interoperability between ETH-LT (2006) and ETH-LT (2008) is added in clause 7 and Annex B.

– The clarification of ETH-LCK transmission is added in clause 7.

– Some definitions in clause 5 are moved to clause 3.

– Revision of the Introduction, clauses 2, 6, 8, Annex A and Appendix I.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T Y.1731	2006-05-22	13
2.0	ITU-T Y.1731	2008-02-29	13
2.1	ITU-T Y.1731 (2008) Amend. 1	2010-07-29	15

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Recommendation ITU-T Y.1731

OAM functions and mechanisms for Ethernet based networks

Amendment 1

Addition of new OAM "ETH-CSF", interoperability between ETH-LT (2006) and ETH-LT (2008)

1) Introduction

Modify the Introduction as shown below:

~~SG13~~ITU-T has prepared this Recommendation in cooperation with the IEEE Project 802.1ag (Connectivity Fault Management). Since the IEEE work is now complete, this Recommendation contains amendments to fully align the final results and include the appropriate normative references to IEEE documents. Moreover, further detailed work on the implementation details (i.e., the specification of the equipment functions) has been undertaken by ~~SG15~~ITU-T.

2) Clause 2, References

Add or modify the following references below:

[ITU-T G.806]	Recommendation ITU-T G.806 (2009~~6~~), *Characteristics of transport equipment – Description methodology and generic functionality.*
[ITU-T G.8001]	Recommendation ITU-T G.8001/Y.1354 (2008), *Terms and definitions for Ethernet frames over Transport.*
[ITU-T G.8031]	Recommendation ITU-T G.8031/Y.1342 (2009~~6~~), *Ethernet linear protection switching.*
[ITU-T Y.1563]	Recommendation ITU-T Y.1563 (2009), *Ethernet frame transfer and availability performance.*
[MEF 10.2]	MEF 10.2 (200~~4~~9), *Ethernet Services Attributes: Phase 2~~1~~* http://metroethernetforum.org/MSWord_Documents/MEF10.2.doc.

3) Clause 3, Definitions

a) *Insert the following definitions alphabetically in clause 3.1:*

maintenance entity: [ITU-T G.8001].

maintenance entity group: [ITU-T G.8001].

b) *Add the following definitions in clause 3.2:*

MEG end point (MEP): MEG end point (MEP) marks the end point of an ETH MEG which is capable of initiating and terminating OAM frames for fault management and performance monitoring. A MEP does not add a new forwarding identifier to the transit ETH flows. A MEP does not terminate the transit ETH flows, though it can observe these flows (e.g., count frames).

MEG intermediate point (MIP): MEG intermediate point (MIP) is an intermediate point in a MEG which is capable of reacting to some OAM frames. A MIP does not initiate OAM frames. A MIP takes no action on the transit ETH flows.

server MEP: A server MEP represents the compound function of the server layer termination function and server/ETH adaptation function which is used to notify the ETH layer MEPs upon failure detection by the server layer termination function or server/ETH adaptation function, where the server layer termination function is expected to run OAM mechanisms specific to the server layer.

4) Clause 4, Abbreviations

Add the following abbreviations:

CSF Client Signal Fail

ETH-CSF Ethernet Client Signal Fail function

5) Clause 5, Conventions

Delete clauses 5.1 – Maintenance entity (ME), 5.3 – MEG end point (MEP) and 5.4 – MEG intermediate point (MIP), and renumber the remaining clauses as follows:

5.1 ME group (MEG)

5.2 Traffic conditioning point (TrCP)

5.3 MEG level

5.4 OAM transparency

5.5 Representation of octets

6) Clause 6, OAM relationships

Revise clause 6.2 as shown below:

6.2 MEs, MEGs and MEG level relationship

The MEPs associated with an administrative domain operate at an assigned MEG Level. Inter-domain MEPs, associated with MEGs between two administrative domains, can operate at a MEG level agreeable between the two administrative domains, such that associated inter-domain OAM flows are prevented from leaking into either administrative domain. The default MEG level for inter-domain OAM flows is 0.

MEs in Ethernet networks have been identified in Figure 23 of [ITU-T G.8010] (see Figure 6-1), Figure 24 of [ITU-T G.8010] and clause 9 of [ITU-T Y.1730]. MEs can nest but not overlap.

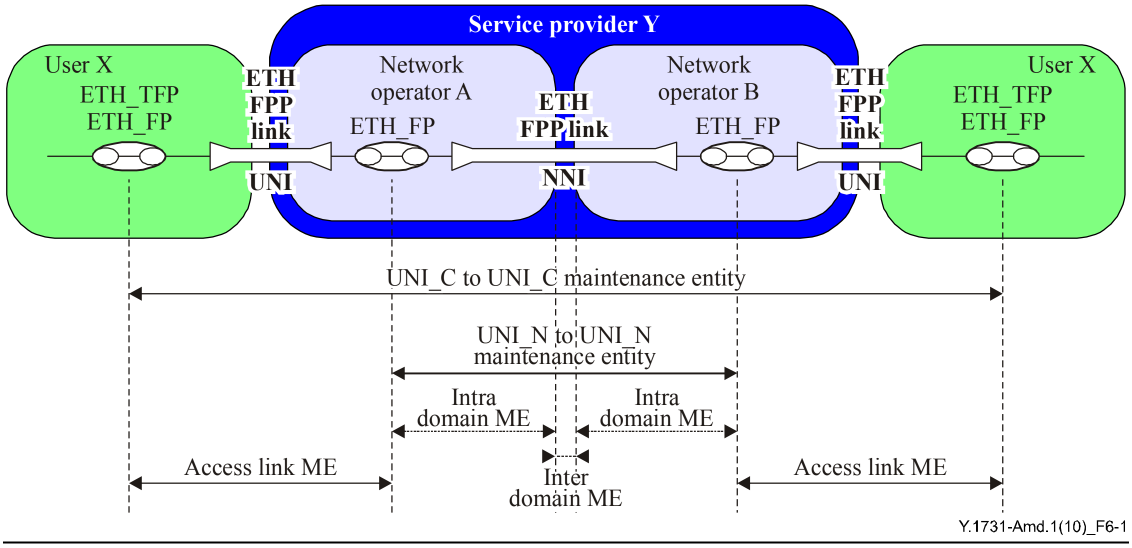

Figure 6-1 – Example of MEs associated with a point-to-point connection administrative domain shown in Figure 23 of [ITU-T G.8010]

Table 6-1 highlights possible MEG level assignments for MEGs within the context of customer, provider and operator administrative domains that share the MEG levels, as mapped to [ITU-T G.8010] and [ITU-T Y.1730].

Table 6-1 – Example MEG level assignments for shared MEG levels

G.8010 MEG	Y.1730 ME	MEG Level(s)
UNI_C to UNI-C ME	UNI-UNI (customer)	7, 6 or 5
UNI_N to UNI_N ME	UNI-UNI (provider)	4 or 3
Intra-domain ME	Segment (PE-PE) intra-provider	4 or 3
Inter-domain ME	Segment (PE-PE) inter-provider (provider-provider)	0 (default)
Access link ME	ETY link OAM-UNI (customer-provider)	0 (default)
Inter-domain ME	ETY link OAM-NNI (operator-operator)	0 (default)

As mentioned in clause 5.3~~6~~, MEG levels are shared when the OAM flows of nested MEGs of customer, provider and operator cannot be distinguished based on ETH layer encapsulation. However, when OAM flows of nested MEGs of customer, provider and operator can be distinguished based on ETH layer encapsulation, MEG levels are not shared except for inter-domain MEGs (e.g., MEGs between customer and provider, MEGs between provider and operator, MEGs between operators, MEs between providers, etc.).

Table 6-2 highlights possible MEG level assignments for MEs within the context of customer, provider and operator administrative domains that do not share the MEG levels but require inter-domain MEs.

Table 6-2 – Example MEG level assignments for independent MEG levels

G.8010 MEG	Y.1730 ME	MEG level(s)
UNI_C to UNI_C ME	UNI-UNI (customer)	7-1
UNI_N to UNI_N ME	UNI-UNI (provider)	7-1
Intra-domain ME	Segment (PE-PE) intra-provider	7-1
Inter-domain ME	Segment (PE-PE) inter-provider (provider-provider)	0 (default)
Access link ME	ETY Link OAM-UNI (customer-provider)	0 (default)
Inter-domain ME	ETY Link OAM-NNI (operator-operator)	0 (default)

Further, if inter-domain MEs are not required, each customer, provider and operator can use all eight MEG levels. However, as already stated in clause 5.~~6~~3, not all MEG levels may be used.

7) Clause 7, OAM functions for Fault Management

7.1) Clause 7.2, Ethernet loopback (ETH-LB)

a) *Revise the fourth paragraph of clause 7.2.1 as shown below:*

When used for performing bidirectional diagnostics tests, a MEP sends Unicast frames with ETH-LB request information to a peer MEP. This ETH-LB request information includes test patterns. When out-of-service diagnostic tests are performed, data traffic is not delivered on either side of the diagnosed ME. Instead the MEPs are configured to send frames with ETH-LCK information, as described in clause 7.6, for~~at~~ the immediate client MEG level~~ on either side of the ME~~.

b) *Revise the last sentence of clause 7.2.1.1 as noted below:*

When the MEP is configured for an out-of-service diagnostic test, the MEP also generates LCK frames, as described in clause 7.6, for~~at~~ the client MEG level~~ in a direction opposite to the direction where LBM frames are issued~~.

c) *Revise the last sentence of clause 7.2.1.2 as noted below:*

Further, when a receiving MEP is configured for an out-of-service diagnostic test, it also generates LCK frames, as described in clause 7.6, for~~at~~ the client MEG level~~ in a direction opposite to the direction where LBR frames are issued~~.

7.2) Clause 7.3.1, LTM transmission

Revise clause 7.3.1 as noted below:

LTM frame is transmitted by a MEP on an on-demand basis. If the MEP resides at an ingress port, the LTM frame is forwarded towards the network element's own ETH-LT responder. However, if the MEP resides on an egress port, the LTM frame is transmitted out of that egress port. LTM frame contains an LTM egress identifier TLV which identifies the network element initiating the LTM frame.

NOTE – ETH-LT responder is not defined in ITU-T Y.1731 (2006), but just MEP and MIP of ingress and egress ports are defined. LTM egress identifier TLV is regarded as optional in ITU-T Y.1731 (2006).

After transmitting the LTM frame with a specific Transaction number, the MEP expects to receive LTR frames within 5 seconds. The Transaction number of each LTM frame transmitted is therefore retained for at least 5 seconds after the LTM frame is transmitted. A different Transaction number must be used for every LTM frame, and no Transaction number from the same MEP may be repeated within one minute.

7.3) Clause 7.3.2, LTM reception, forwarding and LTR transmission

a) *Revise the third bullet (LTM reception) as noted below:*

- Thereafter, the LTM frame is checked to see if LTM egress identifier TLV is present. The LTM frame is discarded if it does not contain LTM egress identifier TLV. It is noted that the LTM frame generated by ITU-T Y.1731 (2006) may not contain LTM egress identifier TLV. See Annex B for keeping compatibility, i.e., LTM frame TLV may be processed at the MIP or MEP even if the LTM egress identifier TLV is absent.

b) *Revise the last bullet in the LTR transmission section, and add a new bullet point as follows:*

- Further, if the above condition applies and LTM frame does not terminate at the MIP ~~or MEP~~ (when the TargetMAC address is not the same as the MIP's own address, if received by a MIP~~, or when received by a MEP~~) and the TTL field in LTM frame is greater than 1, the LTM frame is forwarded towards the single egress port. All the fields of the relayed LTM frame are the same as the original LTM frame except for TTL which is decremented by 1, the Source Address which becomes the MIP's own MAC address, and LTM egress identifier TLV which identifies the network element relaying the modified LTM frame. It is noted that MIP supporting ITU-T Y.1731 (2006) may forward LTM egress identifier TLV as it is. See Annex B for keeping compatibility.
- Further, when the TargetMAC address is not the same as the MEP's own address, if received by a MEP, the LTM frame is always terminated at the MEP and the MEP does not send back the LTR frames.

c) *Add the following text after the last paragraph:*

It is noted that both reply ingress TLV and reply egress TLV are documented as optional in ITU-T Y.1731 (2006), so they may not be included in the LTR frame of that version. See Annex B for keeping compatibility.

7.4) Clause 7.6.1, LCK transmission

Modify the first paragraph of clause 7.6.1 noted below:

A (server) MEP, when administratively locked, transmits LCK frames ~~in a direction opposite to its peer MEP(s)~~to each of its client (sub-)layer MEGs, as shown in Figure 7-1.

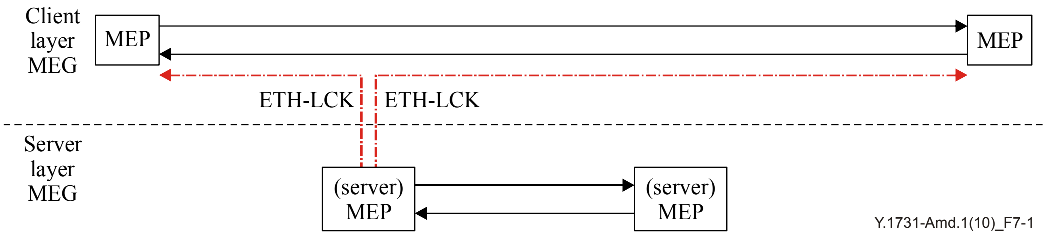

Figure 7-1 – Example of ETH-LCK transmission

The periodicity of LCK frames transmission is based on the LCK transmission period. The LCK transmission period is the same as the AIS transmission period. The first LCK frame must always be transmitted immediately following the administrative/diagnostic action.

7.5) Clause 7.7, Ethernet test signal (ETH-Test)

a) *Revise the third paragraph of clause 7.7 as shown below:*

When out-of-service ETH-Test function is performed, client data traffic is disrupted in the diagnosed entity. The MEP configured for the out-of-service test transmits LCK frames, as described in clause 7.6, for~~in~~ the immediate client ETH (sub-) layer.

b) *Revise the second paragraph of clause 7.7.1 as shown below:*

When a MEP is configured for an out-of-service test, the MEP also generates LCK frames for~~at~~ the immediate client MEG level~~ in the same direction where TST frames are transmitted~~.

c) *Revise clause 7.7.2 as shown below:*

When a MEP receives TST frames, it examines them to ensure that the MEG level corresponds to its own configured MEG level. If the receiving MEP is configured for ETH-TST function, the test signal detector associated with the MEP detects bit errors from the pseudo-random bit sequence of the received TST frames and reports such errors. Further, when the receiving MEP is configured for an out-of-service test, it also generates LCK frames for~~at~~ the client MEG Level~~ in the direction where the TST frames are received~~.

7.6) Clause 7.12, Ethernet client signal fail (ETH-CSF)

Create a new clause 7.12 as follows:

7.12 Ethernet client signal fail (ETH-CSF)

The Ethernet client signal fail function (ETH-CSF) is used by a MEP to propagate to a peer MEP the detection of a failure or defect event in an Ethernet client signal when the client itself does not support appropriate fault or defect detection or propagation mechanisms, such as ETH-CC or ETH-AIS. The ETH-CSF messages propagate in the direction from the Ethernet source-adaptation function detecting the failure or defect event to the Ethernet sink-adaptation function associated with the peer MEP.

ETH-CSF is only applicable to point-to-point Ethernet transport applications. In particular, the use of ETH-CSF with [IEEE 802.1Q], IEEE 802.1ad or other Ethernet spanning tree protocol (STP)-based networking environments is strictly restricted to point-to-point segments of the Ethernet flow. The use of client signal fail indications to support client failure applications is described in Appendix VIII of [ITU-T G.806].

The specific configuration information required by a MEP to support ETH-CSF transmission is:

- Enable/disable CSF.
- Client MEG level – MEG level at which the most immediate client layer MIPs and MEPs exist.
- ETH-CSF transmission period – Determines transmission periodicity of frames with ETH-CSF information.
- ETH-CSF type – Determines the type of defect indicated with the ETH-CSF information. Four CSF types are currently defined:
  - client loss of signal (C-LOS);
  - client forward defect indication (C-FDI);
  - client remote defect indication (C-RDI);
  - client defect clear indication (C-DCI).
- Priority – Identifies the priority of frames with ETH-CSF information.
- Drop eligibility – Frames with ETH-CSF information are always marked as drop ineligible.

Specific configuration information required by a MEP to support ETH-CSF reception is:

- Local MEG level – MEG level at which the MEP operates.
- Enable/disable CSF.

A MIP is transparent to frames with ETH-CSF information and therefore does not require any information to support ETH-CSF functionality.

The PDU used to convey ETH-CSF information is referred to as CSF PDU, as described in clause 9.21. Frames carrying the ETH-CSF indications are also referred to as CSF frames.

7.12.1 CSF transmission

Frames with ETH-CSF information can be issued by a MEP, upon notification of an Ethernet CSF event from its associated Ethernet client source adaptation function. Detection rules for Ethernet CSF events are Ethernet client and application specific.

Transmission of packets with CSF information can be enabled or disabled on a MEP.

Upon receiving an Ethernet CSF notification from its Ethernet client-specific source adaptation function the MEP can immediately start periodic transmission of frames with ETH-CSF information. A MEP continues periodic transmission of frames with ETH-CSF information until the Ethernet CSF indication is removed by the source adaptation function.

Clearing an Ethernet CSF condition by the Ethernet-specific source adaptation function is Ethernet client and application specific. The clearance of the Ethernet CSF condition by the source adaptation function is communicated to the sink adaptation function associated with the peer MEP via:

– the forwarding of client PDUs, or

– the forwarding of an ETH-CSF PDU with C-DCI information.

The period of CSF generation is application specific and outside the scope of this Recommendation.

7.12.2 CSF reception

Upon receiving a CSF frame with ETH-CSF information a MEP declares the beginning or end of an Ethernet CSF condition, depending on the received ETH-CSF information, and propagates this Ethernet client defect condition towards the corresponding egress client port.

Note that consequent actions by the sink adaptation function associated with the MEP to propagate the received ETH-CSF information to the Ethernet client are by definition Ethernet client and application specific.

8) Clause 8, OAM functions for performance monitoring

Revise clause 8 as follows:

OAM functions for performance monitoring allow measurement of different performance parameters. The performance parameters are defined for point-to-point ETH connections. Performance parameters and functions for multipoint ETH connectivity are for further study.

This Recommendation covers the following performance parameters which are based on [MEF 10.2] and [ITU T Y.1563].

…

- **Frame delay**

  Frame delay can be specified as round-trip delay for a frame, where frame delay is defined as the time elapsed since the start of transmission of the first bit of the frame by a source node until the reception of the last bit of the loopbacked frame by the same source node, when the loopback is performed at the frame's destination node.

- **Frame delay variation**

  Frame delay variation is a measure of the variations in the frame delay between a pair of service frames, where the service frames belong to the same CoS instance on a point-to-point ETH connection.

- **Availability**

  The Ethernet service definition is defined in [ITU-T Y.1563]. Although the mechanisms defined in this Recommendation can contribute to availability-related measurements, the details of measurements method of this Recommendation is for further study.

Performance parameters are applicable to service frames. Service frames are those frames that conform to an agreed-upon level of bandwidth profile conformance. Service frames are admitted at the ingress ETH flow point of a point-to-point ETH connection and should be delivered to the egress ETH flow point. Specification of bandwidth profile conformance is for further study~~is outside the scope of this Recommendation~~.

In addition, another performance parameter is identified as per [b-RFC 2544]:

- **Throughput**

  Throughput is the average rate of successful traffic delivery over a communication channel. [b-RFC 2544]-based procedure is typically used under test conditions, i.e., out-of-service test, when there is no traffic for the tested ETH connection. The procedure for in-service testing is for further study~~is defined as the maximum rate at which no frame is dropped. This is typically measured under test conditions~~.

~~NOTE – The definition of Availability is outside the scope of this Recommendation. However, the mechanisms defined in this Recommendation can contribute to Availability-related measurements.~~

8.1) Clause 8.2

Revise the following paragraph of clause 8.2 as shown below:

However, one-way frame delay measurement requires that the time and phase~~clocks~~ at the transmitting MEP and the receiving MEPs are synchronized. For the purposes of frame delay variation measurement, which is based on the difference between subsequent frame delay measurements, the requirement for the time and phase~~ clock~~ synchronizations can be relaxed since the out-of-phase period can be eliminated in the difference of subsequent frame delay measurements.

8.2) Clause 8.2.1.2, 1DM Reception

Update the formula below:

$$\text{Frame Delay}_{\text{one-way}} = \text{RxTimef} - \text{TxTimeStampf}$$

8.3) Clause 8.2.2, Two-way ETH-DM

Update this clause with the additions noted below:

A MEP sends frames with ETH-DM request information to its peer MEP and receives frames with ETH-DM reply information from its peer MEP to carry out two-way frame delay and two-way frame delay variation measurements. If two optional timestamps of RxTimeStampf and TxTimeStampb are supported on its peer MEP, the results of one-way frame delay and one-way frame delay variation measurements can be also calculated by the same ETH-DM request/reply information.

NOTE – Regarding the one-way measurements, if the clocks between the two MEPs are synchronized, one-way frame delay measurement can be carried out. Otherwise, only one-way frame delay variation measurement can be performed.

The PDU used for ETH-DM request is DMM, as described in clause 9.15. The PDU used for ETH-DM reply is DMR, as described in clause 9.16. Frames which carry the DMM PDU are called as DMM frames. Frames which carry the DMR PDU are called as DMR frames.

8.4) Clause 8.2.2.3, DMR reception

Update this clause with the modifications noted below:

Upon receiving a DMR frame, a MEP uses the following values to calculate two-way frame delay. This value serves as input for two-way frame delay variation measurement:

- DMR frame's TxTimeStampf value.
- RxTimeb – Reception time of the DMR frame.

$$\text{Frame Delay}_{\text{two-way}} = \text{RxTimeb} - \text{TxTimeStampf}$$

If the additional timestamps are carried in the DMR frame, which is determined by non-zero values of the RxTimeStampf and TxTimeStampb fields, the frame delay for one-way and two-way~~is~~ can be calculated to be:

$$\text{Frame Delay}_{\text{two-way}} = (\text{RxTimeb} - \text{TxTimeStampf}) - (\text{TxTimeStampb} - \text{RxTimeStampf})$$

$$\text{Frame Delay}_{\text{one-way\_far}} = \text{RxTimeStampf} - \text{TxTimeStampf}$$

$$\text{Frame Delay}_{\text{one-way\_near}} = \text{RxTimeb} - \text{TxTimeStampb}$$

9) Clause 9, OAM PDU types

9.1) Clause 9.1, Common OAM information elements

Update Table 9-1 by adding a new row after that for OpCode = 50 and making the modification noted below:

50	VSR	Outside the scope of this Recommendation
52	CSF	MEPs
32, 34, 36, 38, 44, 53~~52~~-63	Reserved (Note 2)	

9.2) Clause 9.21, Client signal fail (CSF)

Create new clause 9.21 as shown below:

9.21 Client signal fail (CSF)

The CSF PDU is used to support the ETH-CSF function, as described in clause 7.12.

The CSF PDU format is shown in Figure 9.21-1.

	1		2	3	4
	8 7 6	5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1
1	MEL	Version (0)	OpCode (CSF= 52)	Flags	TLV Offset (0)
5	End TLV (0)				

Figure 9.21-1 – CSF PDU format

The fields of the CSF PDU format are as follows:

– **MEG level**: A 3-bit field that is used to carry the MEG level of the client MEG.

– **Version**: Refer to clause 9.1, value is always 0.

– **OpCode**: Value for this PDU type is CSF (52).

– **Flags**: One information element in the Flags field for CSF PDU. It consists of a 3-bit type sub-element and a 3-bit period sub-element formatted as follows:

MSB 8	7	6	5	4	3	2	LSB 1
Reserved (0)		Type			Period		

Figure 9.21-2 – Flags format in CSF PDU

- **Type**: Bits 6 to 4 indicate the CSF type with the encoding in Table 9-5.
- **Period**: Bits 3 to 1 indicate transmission period.

Table 9-5 – CSF type values

Flags[6:4]	Type	Comments
000	LOS	Client loss of signal
001	FDI/AIS	Client forward defect indication
010	RDI	Client remote defect indication
011	DCI	Client defect clear indication

– **TLV offset**: Set to 0.

– **End TLV**: All-ZEROes octet value.

10) Annex A

Update Table A.1 as noted below:

Table A.1 – MEG ID Format type

MEG ID Format type value	TLV Name
00, 5-31, 64-255	Reserved (Note 1)
1-4	See Note 2
Types specific to this Recommendation	
32	ICC-based format
33-63	Reserved (Note 3~~2~~)
NOTE 1 – Reserved for definition by IEEE 802.1. NOTE 2 – Use values as defined in Table 21-20 of [IEEE 802.1ag]. NOTE 3 ~~2~~– Reserved for future standardization by ITU-T.	

11) Annex B

Create a new annex as noted below:

Annex B

Ethernet link trace (ETH-LT) of ITU-T Y.1731 (2006) – Interoperability considerations

(This annex forms an integral part of this Recommendation)

This annex describes the interworking of Ethernet MEPs and MIPs, supporting different types of Ethernet link trace (ETH-LT) (i.e., ETH-LT as defined in ITU-T Y.1731 (2006) and that specified in this Recommendation) and identifies the basic requirements to support interworking under the ME where two types of MEPs or MIPs exist.

B.1 Ethernet link trace (ETH-LT) as defined in ITU-T Y.1731 (2006)

The ETH-LT defined in ITU-T Y.1731 (2006) differs from the one defined in this Recommendation in the following:

- LTM transmission and its PDU, as given in clauses 7.3.1 and 9.5 of ITU-T Y.1731 (2006) do not define the LTM egress identifier TLV and its format, whereas they are defined as mandatory in this Recommendation.
- LTR transmission and its PDU, as given in clauses 7.3.2 and 9.6 of ITU-T Y.1731 (2006) do not define the LTR egress identifier TLV and its format, whereas they are defined as mandatory in this Recommendation. Also, Reply Ingress TLV and Reply Egress TLV were optional in ITU-T Y.1731 (2006), whereas they are defined as mandatory in this Recommendation.
- FwdYes and TerminalMEP were defined in bit 7 and bit 6 of Flags of LTR in this Recommendation, i.e., they were not defined in ITU-T Y.1731 (2006).
- At a MIP, ETH-LT responder was not defined, and both ingress and egress ports could be set as MIP in a *v2006* equipment, whereas in this Recommendation ETH-LT responder is defined so that there can only be one MIP per equipment.

B.2 Interworking with ITU-T Y.1731 (2006)

In the case of a ME consisting of a *v2006* MEP that transmits ETH-LTM and some *v2008* MIPs, or the case of a ME consisting of a *v2006* MEP that transmits ETH-LTM and a *v2008* MEP that receives ETH-LTM and transmits ETH-LTR, the *v2008* MIP or *v2008* MEP may discard ETH-LTM from the *v2006* MEP due to the absence of LTM egress identifier TLV. In this case, to maintain interoperability, the *v2008* MIP may forward ETH-LTM and transmit ETH-LTR by recognizing that the ETH-LTM does not have the TLV and behaving as a *v2006* MIP. Similarly, the *v2008* MEP may transmit ETH-LTR by recognizing that the ETH-LTM does not have the TLV and behaving as a *v2006* MEP. See Figure B.1.

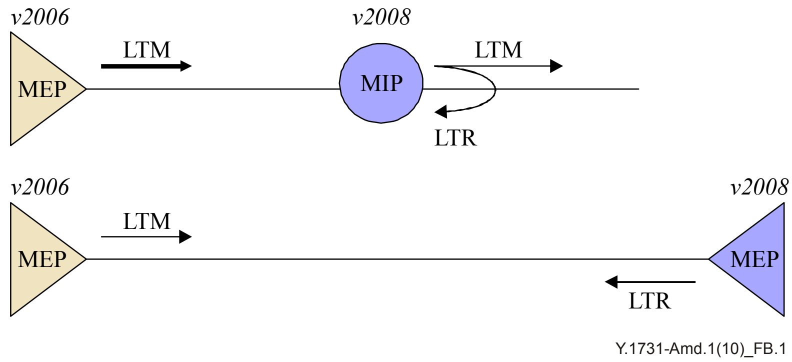

Figure B.1 – Interoperativity case 1

In the case of a ME consisting of a *v2008* MEP that transmits ETH-LTM and some *v2006* MIPs and/or of a *v2008* MEP that receives ETH-LTM and transmits ETH-LTR, the *v2008* MEP receives ETH-LTR without LTR egress identifier TLV and without reply ingress TLV or reply egress TLV generated by *v2006* MIPs and/or MEP. The absence of these TLVs in ETH-LTR is considered invalid in the *v2008* version. In order to keep interoperability, the *v2008* may identify this ETH-LTR as valid by configuration (see Figure B.2).

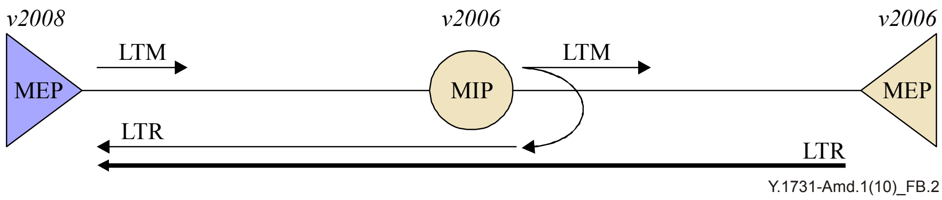

Figure B.2 – Interoperativity case 2

In the case of a ME consisting of a *v2008* MEP that transmits ETH-LTM and some *v2006* MIPs located in both the ingress and egress ports of an equipment, the equipment is allowed to transmit two ETH-LTRs to the *v2008* MEP. When receiving the ETH-LTRs at the *v2008* MEP, the behaviour is the same as in the case mentioned above (see Figure B.3). It is noted that this behaviour is compatible with the LTR analysis according to Annex J.5 of [IEEE 802.1ag], as long as each of the MPs that decrement the LTM's TTL field also return an LTR.

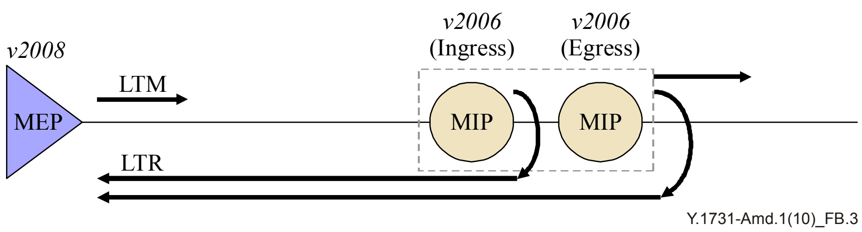

Figure B.3 – Interoperativity case 3

12) Appendix I

Replace all the text of this appendix with the following sentence:

The contents of this appendix have been moved to [ITU-T G.8021].

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
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Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
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