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**Abstract**

This document provides Draft Amendment 1 to G.8013/Y.1731 (2013) (for consent)

Amendment 1 to Recommendation G.8013/Y.1731 provides:

* New OAM PDU called “Generic Notification Message”.
* New OAM functions and mechanism for Bandwidth Notification (ETH-BN) that notifies the change of bandwidth of link to MEPs. Its PDU uses Generic Notification Message with a SubOpCode for Bandwidth Notification.
* New OAM functions and mechanism for Expected Defect (ETH-ED) that enables transmission of CCM frames expected to be interrupted without any interruption to data frames. Its PDU uses MCC with ITU-T OUI (00-19-A7) and SubOpCode for Expected Defect.
* Some corrections in clause 2
* New abbreviations to ETH-BN and ETH-ED

Note: Latest draft of G.8013/Y.1731 is posted as TD207r1(WP3).

**Draft Recommendation ITU-T G.8013/Y.1731**

**OAM functions and mechanisms for Ethernet based networks**

**Amendment 1**

**Summary**

Amendment 1 to Recommendation G.8013/Y.1731 provides:

* New OAM PDU called “Generic Notification Message”
* New OAM functions and mechanism for Bandwidth Notification (ETH-BN) that notifies the change of bandwidth of link to MEPs. Its PDU uses Generic Notification Message with a SubOpCode for Bandwidth Notification.
* New OAM functions and mechanism for Expected Defect (ETH-ED) that enables transmission of CCM frames expected to be interrupted without any interruption to data frames. Its PDU uses MCC with SubOpCode for Expected Defect.
* transmission of CCM frames expected to be interrupted without any interruption to data frames. Its PDU uses MCC with ITU-T OUI (00-19-A7) and SubOpCode for Expected Defect.
* Some corrections in clause 2
* New abbreviations to ETH-BN and ETH-ED in clause 4

**Reference**

[G.8013/Y.1731] Recommendation ITU-T G.8013/Y.1731, “OAM functions and mechanisms for Ethernet based networks”, 11/2013

**Text correction for ITU-T G.8013/Y.1731**

**1) Clause 2, References**

*Update the following References as below:*

[ITU-T G.8021] Recommendation ITU-T G.8021/Y.1341 (2015), *Characteristics of Ethernet transport network equipment functional blocks.*

[IEEE 1588] IEEE 1588‑2002, *IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems*.  
< http://standards.ieee.org/findstds/standard/1588-2002.html >

[IEEE 802] IEEE 802‑2001, *IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture*.  
<<http://standards.ieee.org/findstds/standard/802-2001.html>>

[IEEE 802.1D] IEEE 802.1D-2004, *IEEE Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges*.  
< <http://standards.ieee.org/findstds/standard/802-2001.html>>

[IEEE 802.1Q] IEEE 802.1Q-2011, *IEEE Standard for Local and metropolitan area networks--Media Access Control (MAC) Bridges and Virtual Bridged Local Area Networks*  
<<http://standards.ieee.org/findstds/standard/802.1Q-2011.html>>

[IEEE 802.3] IEEE 802.3-2012, *IEEE Standard for Ethernet*.  
<<http://standards.ieee.org/findstds/standard/802.1Q-2011.html>>

[MEF 10.2] MEF 10.2 (2009), *Ethernet Services Attributes: Phase 2*.  
<<http://www.metroethernetforum.org/Assets/Technical_Specifications/PDF/MEF10.2.pdf>>

[ISO 3166-1] ISO 3166-1 (2006), *“Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes.”*

**2)** **Clause 4, Abbreviations**

*Add following abbreviations below:*

BNM Bandwidth Notification Message

EDM Expected Defect Message

ETH-BN Ethernet Bandwidth Notification function

ETH-ED Ethernet Expected Defect function

GNM Generic Notification Message

**3) Clause 7.9, Ethernet maintenance communication channel (ETH-MCC)**

*Update the first paragraph of clause 7.9 as below:*

## 7.9 Ethernet maintenance communication channel (ETH-MCC)

The Ethernet maintenance communication channel function (ETH-MCC) provides a maintenance communication channel between a pair of MEPs. ETH-MCC can be used to perform remote management. The specific use of ETH-MCC with an OUI other than the ITU-T OUI (00-19-A7) is outside the scope of this Recommendation.

**4) Clause 7.13, Bandwidth Notification (ETH-BN)**

*Add following new clause 7.13 below:*

## 7.13 Bandwidth Notification (ETH-BN)

The Ethernet Bandwidth Notification function (ETH-BN) is used by a Server MEP to signal the server layer link bandwidth in the transmit direction to a MEP at the client layer, for example when the server layer runs over a microwave link which has the capability to adapt its bandwidth according to the prevailing atmospheric conditions. Frames with ETH-BN information carry the current and nominal bandwidth of the server layer link. On receiving frames with ETH-BN information, the client layer MEP can use bandwidth information to adjust service policies, e.g. to reduce the rate of traffic being directed towards the degraded link.

Transmission of frames with ETH-BN information can be enabled or disabled on a server MEP. Only a server MEP can transmit frames with ETH-BN information.

When enabled, frames with ETH-BN information are transmitted at the client MEG level by a server MEP, upon detecting bandwidth degradation conditions. A server MEP continues to transmit periodic frames with ETH-BN information until the full bandwidth is restored. In addition, periodic frames with ETH-BN information may optionally be sent when there is no degradation or when the bandwidth degrades to 0.

In a multipoint client MEG, frames with ETH-BN information may need to include a Port Identification (Port ID), to identify which port is associated with the ETH-BN information. This is required if server MEPs for different links transmit frames using the same source MAC address.

Upon receiving a frame with ETH-BN information, a MEP passes the received information to the management system. The management system may take further action to reduce the rate of traffic being directed towards the degraded link or otherwise adjust the service policy for the link.

Note: use of ETH-BN for protection switching is for further study.

The specific configuration information required by a server MEP to support ETH-BN transmission is the following:

• Client MEG level – MEG level at which the most immediate client layer MIPs and MEPs exist.

• ETH-BN transmission period – Determines transmission periodicity of frames with ETH-BN information.

• ETH-BN transmission period during no degradation (optional) – Determines transmission periodicity of frames with ETH-BN information during periods of no degradation.

• Hold time – Determines the time between detecting degradation, and transmission of the first frame with BNM information that indicates degradation (up to 10s).

• Priority – Identifies the priority of frames with ETH-BN information.

• Drop eligibility – Frames with ETH-BN information are always marked as drop ineligible. This information is not necessarily configured.

• Port ID – A 32-bit unique identifier for the port; this is needed in multipoint MEGs if frames with ETH-BN information about different ports would otherwise be identical. It is optional otherwise. The value must be unique over all server links within the client MEG.

Specific configuration information required by a MEP to support ETH-BN reception is the following:

• Local MEG level – MEG level at which the MEP operates.

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

The PDU used for ETH-BN information is BNM, as described in clause 9.25. Frames carrying the BNM PDU are called BNM frames.

### 7.13.1 BNM transmission

A server MEP, upon detecting a transmission bandwidth degrade condition, can transmit periodic BNM frames in a direction opposite to its peer server MEP, indicating that the current bandwidth isless than the nominal bandwidth. Transmission of BNM frames is shown in Figure 7.13-1.



Figure 7.13-1 – Example of ETH-BN transmission

A server MEP may also transmit periodic BNM frames when there is no degradation, indicating that the current and nominal bandwidth are the same, or when the port detects failure, to indicate that the current bandwidth is 0.

NOTE – when the port detects failure, AIS frames are also transmitted by the peer server MEP.

Upon detecting a change in the transmission bandwidth, the first BNM frame that indicates the new transmission bandwidth must be transmitted after the hold time (up to 10s) after detection of the transmission bandwidth change provided the condition has persisted for that time. If the change lasts for less than the hold time, no BNM frame indicating the change of transmission bandwidth is transmitted.

NOTE – BNM notifications are expected to be used where the server layer is a microwave link that uses adaptive bandwidth modulation. A hold time is used to prevent notifications if the degradation is very short, such as might be cause by an object passing through the line of sight of the microwave. The applicability of BNM notifications to other technologies is for further study.

The first BNM frames are transmitted in quick succession so that reliable and fast actions at the receiver MEP are possible even if some BNM frames are lost or corrupted. The interval and the number of the first BNM frames are implementation specific.

The periodicity of BNM frame transmission is based on the configured value, and this is also communicated via the Period field in all the BNM frames. When detecting the full bandwidth recovery or a link failure, after the transmission of first BNM frames, the server MEP may cease transmission of periodic BNM frames.

The periodic BNM frames may be transmitted by configuration even when there is no degradation or full bandwidth recovery. The periodicity is based on the same configured value for periods of degradation.

### 7.13.2 BNM reception

Upon receiving an BNM frame, a MEP examines it to ensure that its MEG level corresponds to its own MEG level. The Period field indicates the period at which the BNM frames can be expected. The source MAC, Port ID and bandwidth information are extracted and passed to the management system. Subsequently, if no BNM frames are received within an interval of 3.5 times the BNM transmission period indicated in the last BNM frame received, the MEP signals to the management system that it no longer has any bandwidth information (e.g., because the full bandwidth has been restored).

As described in clause 7.13.1, the first BNM frames are transmitted in quick succession upon detecting a change in the transmission bandwidth. In this case, BNM frames are also received in quick succession to detect the change of bandwidth.

**5) Clause 7.14, Expected Defect function (ETH-ED)**

*Add following new clause 7.14 below:*

## 7.14 Expected Defect function (ETH-ED)

The Ethernet Expected Defect function (ETH-ED) is used by a MEP to signal to its peer MEPs that transmission of CCM frames is expected to be interrupted, without any interruption to data frames, and that the consequent Loss of Continuity defects at the peer MEPs should therefore be suppressed. Frames with ETH-ED information carry the MEP ID of the MEP and the expected duration of the interruption.

Frames with ETH-ED information are transmitted by a MEP shortly in advance of an expected interruption of CCM frame transmission, if no interruption is expected in the forwarding of data frames. Examples of this are when a in-service software or firmware upgrade is performed, or when a new MEP is added to an existing MEG.

Upon receiving a frame with ETH-ED information, a MEP passes the received information to the Element Management Function (EMF). If enabled by the management system, the EMF can take action to disable the reception of CCMs, and hence avoid any loss of continuity defects that would otherwise be triggered.

Note: Further details on how Expected Defect notifications can be used, and considerations on handling received notifications in the EMF at the peer MEP can be found in Appendix IX of [ITU-T G.8021].

The specific configuration information required by a MEP to support ETH-ED transmission is the following:

• MEG level – MEG level at which the MEP exists.

• MEP ID – the MEP’s identity within the MEG.

• Expected Defect duration – Duration for which the peer MEPs are requested to suppress Loss of Continuity alarms.

• ETH-ED Transmission Period – Determines transmission periodicity of frames with ETH-ED information.

• Priority – Identifies the priority of frames with ETH-ED information.

• Drop eligibility – Frames with ETH-ED information are always marked as drop ineligible. This information is not necessarily configured.

Specific configuration information required by a MEP to support ETH-ED reception is the following:

• Local MEG level – MEG level at which the MEP operates.

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

The PDU used for ETH-ED information is EDM, as described in clause 9.26. Frames carrying the EDM PDU are called EDM frames.

### 7.14.1 EDM transmission

A MEP can transmit one or more periodic EDM frames shortly in advance of an expected interruption of CCM frame transmission, or when CCM frame transmission has not yet commenced. Transmission of EDM frames ceases once the interruption occurs or when normal CCM transmission is (re)started.

### 7.14.2 EDM reception

Upon receiving an EDM frame, a MEP examines it to ensure that its MEG level corresponds to its own MEG level. The source MEP ID and the expected duration are extracted and passed to the management system.

**6) Clause 9.1, Common OAM information elements**

*Update Table 9-1 below:*

| Table 9-1 – OpCode values | | |
| --- | --- | --- |
| OpCode value | OAM PDU type | OpCode relevance for MEPs/MIPs |
| OpCodes common with IEEE 802.1 | | |
| 1 | CCM | MEPs |
| 3 | LBM | MEPs and MIPs (connectivity verification) |
| 2 | LBR | MEPs and MIPs (connectivity verification) |
| 5 | LTM | MEPs and MIPs |
| 4 | LTR | MEPs and MIPs |
| 0, 6-31, 64-255 | Reserved (Note 1) | |
| OpCodes specific to this Recommendation | | |
| 32 | GNM (Note 4) | MEPs |
| 33 | AIS | MEPs |
| 35 | LCK | MEPs |
| 37 | TST | MEPs |
| 39 | Linear APS | Refer to [ITU-T G.8031] |
| 40 | Ring APS | Refer to [ITU-T G.8032] |
| 41 | MCC | MEPs |
| 43 | LMM | MEPs |
| 42 | LMR | MEPs |
| 45 | 1DM | MEPs |
| 47 | DMM | MEPs |
| 46 | DMR | MEPs |
| 49 | EXM | Outside the scope of this Recommendation |
| 48 | EXR | Outside the scope of this Recommendation |
| 51 | VSM | Outside the scope of this Recommendation |
| 50 | VSR | Outside the scope of this Recommendation |
| 52 | CSF | MEPs |
| 53 | 1SL | MEPs |
| 55 | SLM | MEPs |
| 54 | SLR | MEPs |
| 34, 36, 38, 44, 60-63 | Reserved (Note 2) | |
| 56 - 59 | Reserved (Note 3) | |
| NOTE 1 – Reserved for definition by IEEE 802.1.  NOTE 2 – Reserved for future standardization by ITU-T.  NOTE 3 – Reserved for definition by MEF.  NOTE 4 – The Generic Notification Message (GNM) PDU type is used to carry other OAM PDUs using the Sub-Opcodes in Table 9-1a | | |

**7) Clause 9.1.1, Common OAM PDU format**

*Update this clause below:*

### 9.1.1 Common OAM PDU format

The common format used in all OAM PDUs is shown in Figure 9.1-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 | | | | | | OpCode | | | | | | | | Flags | | | | | | | | TLV Offset | | | | | | | |
| 5 |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| : |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| : |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| last | End TLV (0) | | | | | | | |  | | | | | | | | | | | | | | | | | | | | | | | | |

Figure 9.1-1 – Common OAM PDU format

When OpCode 32 (GNM) is used, there is an additional one-octet Sub-OpCode field following the TLV Offset field. Sub-OpCode values are shown in Table 9-1a.

Table 9-1a – Sub-OpCode values

| Sub-OpCode value | OAM PDU type |
| --- | --- |
| 1 | BNM |
| 0, 2-255 | Reserved (Note 1) |
| NOTE 1: Reserved for future standardization by ITU-T. | |

The general format of TLVs is shown in Figure 9.1-2. Type values are specified in Table 9-2.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 |
| 0 | Type | | | | | | | | Length | | | | | | | | | | | | | | | | Value [optional] | | | | | | | |
| : |  | | | | |  | | |  | | | | | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Figure 9.1-2 – Generic TLV format

NOTE – In an End TLV, Type = 0, and both Length and Value fields are not used.

Table 9-2 – Type values

|  |  |
| --- | --- |
| Type value | TLV name |
| Types common with IEEE 802.1 | |
| 0 | End TLV |
| 3 | Data TLV |
| 5 | Reply ingress TLV |
| 6 | Reply egress TLV |
| 7 | LTM egress identifier TLV |
| 8 | LTR egress identifier TLV |
| 2, 4, 9-31, 64-255 | Reserved (Note 1) |
| Types specific to this Recommendation | |
| 32 | Test TLV |
| 33-35 | Reserved (Note 2) |
| 36 | Test ID TLV |
| 37, 38 | Reserved (Note 3) |
| 39-63 | Reserved (Note 4) |
| NOTE 1 – Reserved for definition by IEEE 802.1.  NOTE 2 – Reserved for definition by [ITU-T G.8113.1].  NOTE 3 – Reserved for definition by MEF.  NOTE 4 – Reserved for future standardization by ITU-T. | |

**8) Clause 9.11, MCC PDU**

*Update subclause 9.11.2 below:*

### 9.11.2 MCC PDU format

The MCC PDU format used by a MEP to transmit MCC information is shown in Figure 9.11-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 (MCC=41) | | | | | | | | Flags (0) | | | | | | | | TLV Offset | | | | | | | | |
| 5 | OUI | | | | | | | | | | | | | | | | | | | | | | | | SubOpCode | | | | | | | | |
| 9 | *[optional MCC data; else End TLV]* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| : |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| : |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Last |  | | | | | | | | | | | | | | | | | | | | | | | | End TLV (0) | | | | | | | | |

Figure 9.11-1 – MCC PDU format

The fields of the MCC PDU format are as follows:

• MEG Level: Refer to clause 9.1.

• Version: Refer to clause 9.1, value is 0 in the current version of this Recommendation.

• OpCode: Value for this PDU type is MCC (41).

• Flags: Set to all-ZEROes.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| MSB |  |  |  |  |  |  | LSB |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Reserved (0) | | | | | | | |

Figure 9.11-2 – Flags format in MCC PDU

• TLV Offset: 1-byte field. Its specific value for MCC is outside the scope of this Recommendation.

• OUI: 3-octet field that contains the organizationally unique identifier of the organization defining the format of MCC Data and values SubOpCode.

• SubOpCode: 1-octet field. When the OUI field contains the ITU-T OUI (00-19-A7), ETH-ED uses SubOpCode (1) as described in clause 9.26 and other values are reserved. When a different OUI is used, the values of the SubOpCode are outside the scope of this Recommendation.

• MCC Data: ETH-ED uses this field as described in clause 9.26. Other uses of this field are outside the scope of this Recommendation.

• End TLV: All-ZEROes octet value.

**9) Clause 9.25, BNM PDU**

*Add following new clause 9.25 below:*

## 9.25 BNM PDU

The BNM PDU is used to support the ETH-BNM function, as described in clause 7.13.

### 9.25.1 BNM information elements

The information element carried in BNM is:

• Period: Period is a 3-bit information element carried in the three least significant bits of the Flags field. Period contains the value of BNM transmission periodicity. BNM period values are specified in Table 9-7

• Nominal Bandwidth: Nominal full bandwidth of the link, expressed in integer Mb/s.

• Current Bandwidth: Current bandwidth of the link, expressed in integer Mb/s.

• Port ID: Either non-zero unique identifier for the port or zero if this identifier is not used.

The nominal full bandwidth and the current bandwidth values represent the available bandwidth of the Server layer.

### 9.25.2 BNM PDU format

The BNM PDU format used by a server MEP to transmit BNM information is shown in Figure 9.25-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 (GNM=32) | | | | | | | | Flags | | | | | | | | | TLV Offset (13) | | | | | | | |
| 5 | Sub-OpCode (BNM=1) | | | | | | | | Nominal Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Nominal Bandwidth (cont) | | | | | | | | Current Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | Current Bandwidth (Cont) | | | | | | | | Port ID | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Port ID (Cont) | | | | | | | | End TLV (0) | | | | | | | | |  | | | | | | | | | | | | | | | |

Figure 9.25-1 – BNM PDU format

The fields of the BNM 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 sub-clause 9.1, value is 0 in the current version of this Recommendation.

• OpCode: Value for this PDU type is GNM (32).

• Flags: One information element in the Flags field for the BNM PDU, Period, as follows:

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

Figure 9.25-2 – Flags format in BNM PDU

– Period: Bits 3 to 1 indicate transmission period with the encoding in Table 9-7

Table 9-7 – BNM period values

|  |  |  |
| --- | --- | --- |
| Flags[3:1] | Period value | Comments |
| 000 | Invalid value | Invalid value for BNM PDUs |
| 001 | For further study | For further study |
| 010 | For further study | For further study |
| 011 | For further study | For further study |
| 100 | 1s | 1 frame per second |
| 101 | 10s | 1 frame per 10 seconds |
| 110 | 1 min | 1 frame per minute |
| 111 | Invalid value | Invalid value for BNM PDUs |

• TLV Offset: Set to 13.

• Sub-OpCode: Value for this PDU type is BNM (1).

• Nominal bandwidth: The nominal full bandwidth of the link, expressed as integer Mb/s

• Current bandwidth: The current bandwidth of the link, expressed as integer Mb/s

• Port ID: An optionally used non-zero 32-bit identifier for the port to which the bandwidth information pertains. The value must be unique over all server links within the client MEG. If this identifier is not used, the value should be zero.

• End TLV: All-ZEROes octet value.

**10) Clause 9.26, EDM PDU**

*Add following new clause 9.26 below:*

## 9.26 EDM PDU

The EDM PDU is used to support the ETH-ED function, as described in clause 7.14.

### 9.26.1 EDM information elements

The information element carried in EDM is:

• MEP ID: MEP ID is a 2-octet field where the 13 least significant bits are used to identify the MEP transmitting the EDM frame. MEP ID is unique within the MEG.

• Expected Duration: Expected duration for which the peer MEP is requested to suppress Loss of Continuity defects.

### 9.26.2 EDM PDU format

The EDM PDU format used by a MEP to transmit EDM information is shown in Figure 9.26-1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 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 (MCC=41) | | | | | | | | | | Flags (0) | | | | | | | | TLV Offset (10) | | | | | | | | |
| 5 | OUI | | | | | | | | | | | | | | | | | | | | | | | | | | SubOpCode(EDM=1) | | | | | | | | |
| 9 | MEP ID | | | | | | | | | | | | | | | | | Expected Duration | | | | | | | | | | | | | | | | | |
| 13 | Expected Duration (cont) | | | | | | | | | | | | | | | | End TLV (0) | | | | | | | | | |  | | | | | | | | |

Figure 9.26 – EDM PDU format

The fields of the EDM 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 sub-clause 9.1, value is 0 in the current version of this Recommendation.

• OpCode: Value for this PDU type is MCC (41).

• Flags: Set to all ZEROes.

• TLV Offset: Set to 10.

• OUI: Set to the ITU-T OUI, 00-19-A7.

• Sub-OpCode: Value for this PDU type is EDM (1).

• MEP ID: A 13-bit integer value identifying the transmitting MEP within the MEG. The three MSBs of the first octet are not used and set to ZERO:

• Expected Duration: The duration, in seconds, for which the loss of continuity is expected to last (starting from when the first EDM is transmitted).

• End TLV: All-ZEROes octet value.

**11) Clause 10, OAM frame addresses**

*Add the new sub-clause 10.25 and 10.26 as below:*

## 10.25 BNM

BNM frames are generated with Multicast Class 1 DA in a multipoint MEG, and are typically generated with a multicast class 1 DA in a point-to-point MEG except as described below.

In provisioned environments for point-to-point connections where the data frames in different services instances are distinguished using Unicast DAs, BNM frames are generated with the unicast DA of the downstream MEP.

## 10.26 EDM

EDM frames are generated with Multicast Class 1 DA in a multipoint MEG, and are typically generated with a multicast class 1 DA in a point-to-point MEG except as described below.

In provisioned environments for point-to-point connections where the data frames in different services instances are distinguished using Unicast DAs, EDM frames are generated with the unicast DA of the downstream MEP.

*And update Table 10-1 as below:*

Table 10-1 – OAM frame DA

|  |  |
| --- | --- |
| OAM type | DAs for frames with OAM PDU |
| CCM | Multicast Class 1 DA or unicast DA |
| LBM | Unicast DA or multicast Class 1 DA |
| LBR | Unicast DA |
| LTM | Multicast Class 2 DA |
| LTR | Unicast DA |
| AIS | Multicast Class 1 DA or unicast DA |
| LCK | Multicast Class 1 DA or unicast DA |
| TST | Unicast DA or multicast Class 1 DA |
| Linear APS | Refer to [ITU-T G.8031] |
| Ring APS | Refer to [ITU-T G.8032] |
| MCC | Unicast DA or multicast Class 1 DA |
| LMM | Unicast DA or multicast Class 1 DA |
| LMR | Unicast DA |
| 1DM | Unicast DA or multicast Class 1 DA |
| DMM | Unicast DA or multicast Class 1 DA |
| DMR | Unicast DA |
| EXM, EXR, VSM, VSR | Outside the scope of this Recommendation |
| CSF | Multicast Class 1 DA or unicast DA |
| SLM | Unicast DA or multicast Class 1 DA |
| SLR | Unicast DA |
| 1SL | Unicast DA or Multicast class 1 DA |
| BNM | Multicast Class 1 DA or unicast DA |
| EDM | Multicast Class 1 DA or unicast DA |

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