# 14 Management entities

## 14.1 Introduction

Clause 14 defines sets of basic and extended management attributes and actions for the OLT and ONU devices specified in this standard.

In general, attributes and actions are defined to be independent of any particular management application or management protocol. Such definitions of attributes and actions are focused on the associated device characteristics and behaviors. Within the constraints imposed by the described characteristics and behaviors, the internal representations of the attributes and actions remain implementation dependent and outside the scope of this standard.

NOTE—When no default value is specified for an attribute, the attribute is assumed to initialize to a vendor-specific value.

To address the system-level and service-level interoperability between the OLT and ONU devices, precise definitions of the TLV structures and encodings of individual attributes into TLV structure are also provided.

## 14.2 Branch 0xDA "identification"

### 14.2.1 Object Context TLV

The eOAM defined in this subclause can manage objects other than the immediate EPON MAC instance. The *Object Context* TLV is used by the OLT and ONU to identify the context for other specific attributes, indicating, e.g., the LLID or the service port to which the given attribute refers. The OLT is not required to know or use the MAC addresses of UNIs to manage them via eOAM.

The *Object Context* TLV carried in an eOAMPDU sets the object to which all subsequent TLVs apply. Once set, this context remains unchanged until the next *Object Context* TLV is found and processed or until the eOAMPDU terminates. If no *Object Context* TLV is supplied, the default object context is the MLID on which the eOAMPDU was received.

The source OAM Client shall set the proper context, as specified for each attribute and action in 14.3 through 14.6 using the *Object Context* TLV. The source OAM Client should not insert the *Object Context* TLV in front of Variable Container TLVs or Variable Descriptor TLVs if the proper context is already set, either explicitly via an earlier *Object Context* TLV or implicitly as a default object context.

Until the first *Object Context* TLV is encountered in the received eOAMPDU, the destination OAM Client shall use the MLID on which the eOAMPDU was received as the default object context. The destination OAM Client shall apply the current object context to all subsequent Variable Container TLVs and Variable Descriptor TLVs until another *Object Context TLV* is encountered or until the eOAMPDU terminates.

This TLV is of a Variable Container type. The format of this TLV shall be as specified in Table 14-1.

**Table 14-1—*Object Context* TLV (0xDA/Varies)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDA | Branch identifier. |
| 2 | ObjectType | Varies | Indicates the type of the target object, as defined in 14.2.1.1. |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | Varies | Represents the size of the ObjectInstance field:<br>0x01 for `ObjectType` values 0x00-00, 0x00-01, and 0x00-03<br>0x02 for `ObjectType` value 0x00-02<br>0x04 for `ObjectType` value 0x00-04<br>Other values are reserved and ignored on reception |
| Varies | ObjectInstance | Varies | Indicates the instance of the target object, as defined in 14.2.1.1. |

#### 14.2.1.1 `ObjectType` field

The `ObjectType` value in the *Object Context* TLV identifies the type of the target object. The ONU and the OLT shall support the values for the `ObjectType` field as shown in Table 14-2.

**Table 14-2—Code point allocation for the `ObjectType` field**

| ObjectType | Code | Notes |
|---|---|---|
| ONU | 0x00-00 | Identifies the ONU as a whole |
| PON Port | 0x00-01 | Identifies a PON interface |
| LLID | 0x00-02 | Identifies an LLID |
| Service Port | 0x00-03 | Identifies service port in the ONU |
| Queue | 0x00-04 | Identifies the specific queue in the ONU |
| reserved | 0x00-05 | See DPoE-SP-OAM for details |
| reserved | 0x00-07 | See DPoE-SP-OAM for details |

Other values are reserved and ignored on reception. When the destination OAM Client encounters an *Object Context* TLV carrying one of the reserved `ObjectType` values, the destination OAM Client shall discard this *Object Context* TLV and all the subsequent TLVs present in the same eOAMPDU until it encounters another *Object Context* TLV with one of the supported values.

#### 14.2.1.2 `ObjectInstance` field

The `ObjectInstance` field in the *Object_ID* TLV identifies the specific instance of the object identified by the `ObjectType` field and has the form of a 1-octet-wide or 4-octet-wide value. The internal structure of the value carried in the `ObjectInstance` field depends on the value of the `ObjectType` field carried in this *Object Context* TLV and is specified in the following subclauses.

##### 14.2.1.2.1 `ObjectInstance` field for ONU (0xDA/0x00-00)

When the `ObjectType` field is equal to 0x00-00 (ONU), the *Object Context* TLV identifies the ONU as a whole. In most cases, the context is obvious, and the addition of the *Object Context* TLV with the `ObjectInstance` field equal to 0x00-00 (ONU) is not needed. In some cases, especially when carrying alarm indication, the addition of the *Object Context* TLV with the `ObjectInstance` field equal to 0x00-00 (ONU) is necessary.

The value carried in the `ObjectInstance` field when the `ObjectType` field is equal to 0x00-00 (ONU) shall be as specified in Table 14-3.

**Table 14-3—Structure of the `ObjectInstance` field for ONU (0xDA/0x00-00)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ONU | 0x00 | Represents the ONU instance |

#### 14.2.1.2.2 `ObjectInstance` field for PON Port (0xDA/0x00-01)

When the `ObjectType` field is equal to 0x00-01 (PON Port), the *Object Context* TLV identifies one of PON ports available in the ONU. The value carried in the `ObjectInstance` field when the `ObjectType` field is equal to 0x00-01 (PON Port) shall be as specified in Table 14-4.

Individual PON port instances are numbered sequentially and start from 0x00, with the maximum value equal to *N*−1, where *N* is the total number of PON ports present on the given ONU.

**Table 14-4—Structure of the `ObjectInstance` field for PON Port (0xDA/0x00-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | PON Port | 0x00 to *N*−1 | Represents the PON port instance |

#### 14.2.1.2.3 `ObjectInstance` field for LLID (0xDA/0x00-02)

When the `ObjectType` field is equal to 0x00-02 (LLID), the *Object Context* TLV identifies one of the LLIDs available at the ONU. The value carried in the `ObjectInstance` field when the `ObjectType` field is equal to 0x00-02 (LLID) shall be as specified in Table 14-5.

The LLID object identified by this TLV may represent any LLID instance available at a given ONU, including the unicast PLID and MLID assigned during ONU's registration (see TBD), pre-configured broadcast `BCAST_PLID` and `BCAST_MLID`, or any other LLID configured via eOAM action *acConfigLlid* (see 14.6.2.8).

**Table 14-5—Structure of the `ObjectInstance` field for LLID (0xDA/0x00-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | LLID | 0x00-00 to 0xFF-FF | Represents the LLID value |

#### 14.2.1.2.4 `ObjectInstance` field for Service Port (0xDA/0x00-03)

When the `ObjectType` field is equal to 0x00-03 (Service Port), the *Object Context* TLV identifies one of the service ports available in the ONU. The value carried in the `ObjectInstance` field when the `ObjectType` field is equal to 0x00-03 shall be as specified in Table 14-6.

The Service Port object identified by this TLV may represent any service port instance that has been properly configured/provisioned via eOAM action *acConfigServicePort* (see 14.6.2.9). The indices of the service ports available in the ONU may be non-consecutive (see 5.x).

**Table 14-6—Structure of the `ObjectInstance` field for Service Port (0xDA/0x00-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Service Port | 0x00 to *N*−1 | Represents the service port instance |

#### 14.2.1.2.5 `ObjectInstance` field for Queue (0xDA/0x00-04)

When the `ObjectType` field is equal to 0x00-04 (Queue), the *Object Context* TLV identifies one of the queues available in the ONU. The value carried in the `ObjectType` field for an upstream queue (i.e., a queue associated with an LLID) shall be as specified in Table 14-7.

**Table 14-7—Structure of the `ObjectInstance` field for Queue (0xDA/0x00-04) for upstream queues**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | PortType | 0x00-02 | The port type represents an LLID |
| 2 | LlidInstance | 0x00-00 to 0xFF-FF | Represents the LLID instance with which the given queue is associated (see Table 14-2 for definition) |

The value carried in the `ObjectType` field for a downstream queue (i.e., a queue associated with a service port) shall be as specified in Table 14-8. There may be multiple queues associated with a single service port and for each port, the individual queue instances are numbered sequentially starting from 0x00, with the maximum value equal to $Q-1$, where $Q$ is the total number of queues associated with the given port.

**Table 14-8—Structure of the `ObjectInstance` field for Queue (0xDA/0x00-04) for downstream queues**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | PortType | 0x00-03 | The port type represents a service port |
| 1 | ServicePortInstance | 0x00 to $N-1$ | Represents the service port instance with which the given queue is associated (see Table 14-2 for definition) |
| 1 | QueueInstance | 0x00 to $Q-1$ | Represents the queue instance number associated with the given object |

## 14.3 Branch 0x07 “basic attributes”

This subclause lists basic management attributes as defined in IEEE Std 802.3, Clause 30. The basic attributes shown in Table 14-9 shall be supported.

The basic attributes can be part of *eOAM_Get_Request*, *eOAM_Get_Response*, *eOAM_Set_Request*, and *eOAM_Set_Response* eOAMPDUs.

**Table 14-9—Basic attributes defined in branch 0x07**

| Leaf | Attribute | Defined in |
|---|---|---|
| Object group: ONU management | | |
| 0x00-02 | aFramesTransmittedOK | 14.3.1.1 |
| 0x00-03 | aSingleCollisionFrames | 14.3.1.2 |
| 0x00-04 | aMultipleCollisionFrames | 14.3.1.3 |
| 0x00-05 | aFramesReceivedOK | 14.3.1.4 |
| 0x00-06 | aFrameCheckSequenceErrors | 14.3.1.5 |
| 0x00-07 | aAlignmentErrors | 14.3.1.6 |
| 0x00-08 | aOctetsTransmittedOK | 14.3.1.7 |
| 0x00-09 | aFramesWithDeferredXmissions | 14.3.1.8 |
| 0x00-0A | aLateCollisions | 14.3.1.9 |
| 0x00-0B | aFramesAbortedDueToXSColls | 14.3.1.10 |

| Leaf | Attribute | Defined in |
|---|---|---|
| 0x00-0C | aFramesLostDueToIntMACXmitError | 14.3.1.11 |
| 0x00-0E | aOctetsReceivedOK | 14.3.1.12 |
| 0x00-0F | aFramesLostDueToIntMACRcvError | 14.3.1.13 |
| 0x00-12 | aMulticastFramesXmittedOK | 14.3.1.14 |
| 0x00-13 | aBroadcastFramesXmittedOK | 14.3.1.15 |
| 0x00-14 | aFramesWithExcessiveDeferral | 14.3.1.16 |
| 0x00-15 | aMulticastFramesReceivedOK | 14.3.1.17 |
| 0x00-16 | aBroadcastFramesReceivedOK | 14.3.1.18 |
| 0x00-17 | aInRangeLengthErrors | 14.3.1.19 |
| 0x00-18 | aOutOfRangeLengthField | 14.3.1.20 |
| 0x00-19 | aFrameTooLongErrors | 14.3.1.21 |
| 0x00-1A | aMACEnableStatus | 14.3.1.22 |
| 0x00-1D | aReadWriteMACAddress | 14.3.1.23 |
| Object group: PHY management | | |
| 0x00-20 | aPhyType | 14.3.2.1 |
| 0x00-23 | aSymbolErrorDuringCarrier | 14.3.2.2 |
| 0x00-25 | aPhyAdminState | 14.3.2.3 |
| Object group: MAU management | | |
| 0x00-47 | aMediaAvailable | 14.3.3.1 |
| Object group: MAC management | | |
| 0x00-5A | aDuplexStatus | 14.3.4.1 |
| Object group: MAC control management | | |
| 0x00-5D | aMACControlFunctionsSupported | 14.3.5.1 |
| 0x00-5E | aMACControlFramesTransmitted | 14.3.5.2 |
| 0x00-5F | aMACControlFramesReceived | 14.3.5.3 |
| 0x00-60 | aUnsupportedOpcodesReceived | 14.3.5.4 |
| 0x00-62 | aPAUSEMACCtrlFramesTransmitted | 14.3.5.5 |
| 0x00-63 | aPAUSEMACCtrlFramesReceived | 14.3.5.6 |
| Object group: OMP emulation management | | |
| 0x01-18 | aMPCPMACCtrlFramesTransmitted | 14.3.6.1 |
| 0x01-19 | aMPCPMACCtrlFramesReceived | 14.3.6.2 |
| 0x01-20 | aMPCPDiscoveryWindowsSent | 14.3.6.3 |
| 0x01-22 | aMPCPDiscoveryTimeout | 14.3.6.4 |
| Object group: FEC management | | |
| 0x01-24 | aFECCorrectedBlocks | 14.3.7.1 |
| 0x01-25 | aFECUncorrectableBlocks | 14.3.7.2 |
| 0x01-39 | aFECAbility | 14.3.7.3 |
| Object group: OMP emulation management (cont.) | | |
| 0x01-3C | aMPCPTxRegAck | 14.3.6.5 |
| 0x01-3E | aMPCPTxRegRequest | 14.3.6.6 |
| 0x01-3F | aMPCPTxReport | 14.3.6.7 |
| 0x01-40 | aMPCPRxGate | 14.3.6.8 |
| 0x01-42 | aMPCPRxRegister | 14.3.6.9 |

All other `Leaf` values are reserved and ignored on reception.

### 14.3.1 ONU management

#### 14.3.1.1 Attribute *aFramesTransmittedOK* (0x07/0x00-02)

This attribute represents the number of successfully transmitted frames.

Attribute *aFramesTransmittedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.2.

The *aFramesTransmittedOK* attribute is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFramesTransmittedOK* attribute shall be as specified in Table 14-10.

**Table 14-10—*Frames Transmitted OK* TLV (0x07/0x00-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-02 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesTransmittedOK | Varies | Value of *aFramesTransmittedOK* attribute |

#### 14.3.1.2 Attribute *aSingleCollisionFrames* (0x07/0x00-03)

This attribute represents the number of frames that are involved in a single collision, and are subsequently transmitted successfully.

Attribute *aSingleCollisionFrames*:
**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.3.

The *aSingleCollisionFrames* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aSingleCollisionFrames* attribute shall be as specified in Table 14-11.

**Table 14-11—*Single Collision Frames* TLV (0x07/0x00-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-03 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | SingleCollisionFrames | Varies | Value of *aSingleCollisionFrames* attribute |

#### 14.3.1.3 Attribute *aMultipleCollisionFrames* (0x07/0x00-04)

This attribute represents the number of frames that are involved in more than one collision and are subsequently transmitted successfully.

Attribute *aMultipleCollisionFrames*:
**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.4.

The *aMultipleCollisionFrames* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aMultipleCollisionFrames* attribute shall be as specified in Table 14-12.

**Table 14-12—*Multiple Collision Frame* TLV (0x07/0x00-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-04 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MultipleCollisionFrame | Varies | Value of *aMultipleCollisionFrame* attribute |

#### 14.3.1.4 Attribute *aFramesReceivedOK* (0x07/0x00-05)

This attribute represents the number of frames successfully received.

Attribute *aFramesReceivedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.5.

The *aFramesReceivedOK* attribute is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFramesReceivedOK* attribute shall be as specified in Table 14-13.

**Table 14-13—*Frames Received OK* TLV (0x07/0x00-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-05 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesReceivedOK | Varies | Value of *aFramesReceivedOK* attribute |

#### 14.3.1.5 Attribute *aFrameCheckSequenceErrors* (0x07/0x00-06)

This attribute represents the number of frames received with non-matching frame check sequence.

Attribute *aFrameCheckSequenceErrors*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.6.

The *aFrameCheckSequenceErrors* attribute is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFrameCheckSequenceErrors* attribute shall be as specified in Table 14-14.

**Table 14-14—*Frame Check Sequence Errors* TLV (0x07/0x00-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-06 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FrameCheckSequenceErrors | Varies | Value of *aFrameCheckSequenceErrors* attribute |

#### 14.3.1.6 Attribute *aAlignmentErrors* (0x07/0x00-07)

This attribute represents the number of alignment error.

Attribute *aAlignmentErrors*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.7.

The *aAlignmentErrors* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aAlignmentErrors* attribute shall be as specified in Table 14-15.

**Table 14-15—*Alignment Errors* TLV (0x07/0x00-07)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-07 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | AlignmentErrors | Varies | Value of *aAlignmentErrors* attribute |

#### 14.3.1.7 Attribute *aOctetsTransmittedOK* (0x07/0x00-08)

This attribute represents the number of successfully transmitted octets.

Attribute *aOctetsTransmittedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.8.

The *aOctetsTransmittedOK* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aOctetsTransmittedOK* attribute shall be as specified in Table 14-16.

**Table 14-16—*Octets Transmitted OK* TLV (0x07/0x00-08)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-08 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | OctetsTransmittedOK | Varies | Value of *aOctetsTransmittedOK* attribute |

#### 14.3.1.8 Attribute *aFramesWithDeferredXmissions* (0x07/0x00-09)

This attribute represents the number of frames whose transmission was delayed on its first attempt because the medium was busy.

Attribute *aFramesWithDeferredXmissions*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.9.

The *aFramesWithDeferredXmissions* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aFramesWithDeferredXmissions* attribute shall be as specified in Table 14-17.

**Table 14-17—*Frames With Deferred Transmissions* TLV (0x07/0x00-09)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-09 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesWithDeferredXmissions | Varies | Value of *aFramesWithDeferredXmissions* attribute |

#### 14.3.1.9 Attribute *aLateCollisions* (0x07/0x00-0A)

This attribute represents the number of the times that a collision has been detected later than one slot time from the start of the packet transmission.

Attribute *aLateCollisions*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.10.

The *aLateCollisions* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aLateCollisions* attribute shall be as specified in Table 14-18.

**Table 14-18—*Late Collisions* TLV (0x07/0x00-0A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-0A | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | LateCollisions | Varies | Value of *aLateCollisions* attribute |

#### 14.3.1.10 Attribute *aFramesAbortedDueToXSColls* (0x07/0x00-0B)

This attribute represents the number of frames that were not transmitted successfully due to excessive collisions.

Attribute *aFramesAbortedDueToXSColls*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.11.

The *aFramesAbortedDueToXSColls* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aFramesAbortedDueToXSColls* attribute shall be as specified in Table 14-19.

**Table 14-19—*Frames Aborted Collisions* TLV (0x07/0x00-0B)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | Leaf | 0x00-0B | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesAbortedDueToXSColls | Varies | Value of *aFramesAbortedDueToXSColls* attribute |

#### 14.3.1.11 Attribute *aFramesLostDueToIntMACXmitError* (0x07/0x00-0C)

This attribute represents the number of frames that would otherwise be transmitted by the station, but could not be sent due to an internal MAC sublayer transmit error.

Attribute *aFramesLostDueToIntMACXmitError*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.12.

The *aFramesLostDueToIntMACXmitError* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFramesLostDueToIntMACXmitError* attribute shall be as specified in Table 14-20.

**Table 14-20—*Frames Lost Internal Tx Error* TLV (0x07/0x00-0C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-0C | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesAbortedDueToXSColls | Varies | Value of *aFramesAbortedDueToXSColls* attribute |

#### 14.3.1.12 Attribute *aOctetsReceivedOK* (0x07/0x00-0E)

This attribute represents the number of data and padding octets in frames that are successfully received.

Attribute *aOctetsReceivedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.14.

The *aOctetsReceivedOK* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aOctetsReceivedOK* attribute shall be as specified in Table 14-21.

**Table 14-21—*Octets Received OK* TLV (0x07/0x00-0E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-0E | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | OctetsReceivedOK | Varies | Value of *aOctetsReceivedOK* attribute |

#### 14.3.1.13 Attribute *aFramesLostDueToIntMACRcvError* (0x07/0x00-0F)

This attribute represents the number of frames that would otherwise be received by the station, but could not be accepted due to an internal MAC sublayer receive error.

Attribute *aFramesLostDueToIntMACRcvError*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.15.

The *aFramesLostDueToIntMACRcvError* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFramesLostDueToIntMACRcvError* attribute shall be as specified in Table 14-22.

**Table 14-22—*Frames Lost Internal Rx Error* TLV (0x07/0x00-0F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-0F | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesLostDueToIntMACRcvError | Varies | Value of *aFramesLostDueToIntMACRcvError* attribute |

#### 14.3.1.14 Attribute *aMulticastFramesXmittedOK* (0x07/0x00-12)

This attribute represents the number of frames that are successfully transmitted to a group destination address other than broadcast.

Attribute *aMulticastFramesXmittedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.18.

The *aMulticastFramesXmittedOK* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aMulticastFramesXmittedOK* attribute shall be as specified in Table 14-23.

**Table 14-23—*Multicast Frames Transmitted OK* TLV (0x07/0x00-12)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-12 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MulticastFramesXmittedOK | Varies | Value of *aMulticastFramesXmittedOK* attribute |

#### 14.3.1.15 Attribute *aBroadcastFramesXmittedOK* (0x07/0x00-13)

This attribute represents the number of frames that were successfully transmitted to the broadcast address.

Attribute *aBroadcastFramesXmittedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.19.

The *aBroadcastFramesXmittedOK* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aBroadcastFramesXmittedOK* attribute shall be as specified in Table 14-24.

**Table 14-24—*Broadcast Frames Transmitted OK* TLV (0x07/0x00-13)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-13 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | BroadcastFramesXmittedOK | Varies | Value of *aBroadcastFramesXmittedOK* attribute |

#### 14.3.1.16 Attribute *aFramesWithExcessiveDeferral* (0x07/0x00-14)

This attribute represents the number of frames that deferred for an excessive period of time.

Attribute *aFramesWithExcessiveDeferral*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.20.

The *aFramesWithExcessiveDeferral* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFramesWithExcessiveDeferral* attribute shall be as specified in Table 14-25.

**Table 14-25—*Frames With Excessive Deferral* TLV (0x07/0x00-14)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-14 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FramesWithExcessiveDeferral | Varies | Value of *aFramesWithExcessiveDeferral* attribute |

#### 14.3.1.17 Attribute *aMulticastFramesReceivedOK* (0x07/0x00-15)

This attribute represents the number of frames that are successfully received and are directed to an active non-broadcast group address.

Attribute *aMulticastFramesReceivedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.21.

The *aMulticastFramesReceivedOK* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aMulticastFramesReceivedOK* attribute shall be as specified in Table 14-26.

**Table 14-26—*Multicast Frames Received OK* TLV (0x07/0x00-15)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-15 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MulticastFramesReceivedOK | Varies | Value of *aMulticastFramesReceivedOK* attribute |

#### 14.3.1.18 Attribute *aBroadcastFramesReceivedOK* (0x07/0x00-16)

This attribute represents the number of frames that are successfully received and are directed to the broadcast group address.

Attribute *aBroadcastFramesReceivedOK*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.22.

The *aBroadcastFramesReceivedOK* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aBroadcastFramesReceivedOK* attribute shall be as specified in Table 14-27.

**Table 14-27—*Broadcast Frames Received OK* TLV (0x07/0x00-16)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-16 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | BroadcastFramesReceivedOK | Varies | Value of *aBroadcastFramesReceivedOK* attribute |

#### 14.3.1.19 Attribute *aInRangeLengthErrors* (0x07/0x00-17)

This attribute represents the number of MAC frames received with a Length/Type field value between the minimum MAC client data size and *maxBasicDataSize* (see IEEE Std 802.3, 4.2.7.1) inclusive, and that does not match the number of data octets received.

Attribute *aInRangeLengthErrors*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.23.

The *aInRangeLengthErrors* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aInRangeLengthErrors* attribute shall be as specified in Table 14-28.

**Table 14-28—*In Range Length Errors* TLV (0x07/0x00-17)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-17 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | InRangeLengthErrors | Varies | Value of *aInRangeLengthErrors* attribute |

#### 14.3.1.20 Attribute *aOutOfRangeLengthField* (0x07/0x00-18)

This attribute represents the number of MAC frames received with a Length/Type field value that is greater than *maxBasicDataSize* (see IEEE Std 802.3, 4.2.7.1).

Attribute *aOutOfRangeLengthField*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.24.

The *aOutOfRangeLengthField* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aOutOfRangeLengthField* attribute shall be as specified in Table 14-29.

**Table 14-29—*Out Of Range Length* TLV (0x07/0x00-18)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-18 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | OutOfRangeLengthField | Varies | Value of *aOutOfRangeLengthField* attribute |

#### 14.3.1.21 Attribute *aFrameTooLongErrors* (0x07/0x00-19)

This attribute represents the number of received MAC frames that exceed *maxFrameSizeLimit* (see IEEE Std 802.3, 4.2.7.1).

Attribute *aFrameTooLongErrors*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.25.

The *aFrameTooLongErrors* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aFrameTooLongErrors* attribute shall be as specified in Table 14-30.

**Table 14-30—*Frame Too Long Errors* TLV (0x07/0x00-19)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-19 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FrameTooLongErrors | Varies | Value of *aFrameTooLongErrors* attribute |

#### 14.3.1.22 Attribute *aMACEnableStatus* (0x07/0x00-1A)

This attribute represents the status of the MAC.

Attribute *aMACEnableStatus*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `enabled`
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.26. Upon writing of this attribute, the following actions take place:

`enabled`: MAC sublayer enters the normal operational state at idle.
`disabled`: MAC sublayer ceases all transmit and receive operations and enters a disabled state.

The *aMACEnableStatus* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aMACEnableStatus* attribute shall be as specified in Table 14-31.

**Table 14-31—*MAC Enable Status* TLV (0x07/0x00-1A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-1A | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | MACEnableStatus | Varies | Value of *aMACEnableStatus* attribute, attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |

#### 14.3.1.23 Attribute *aReadWriteMACAddress* (0x07/0x00-1D)

This attribute represents the MAC address assigned to a UNI Port.

Attribute *aReadWriteMACAddress*:

**Syntax:** MAC address
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.29.

The *aReadWriteMACAddress* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aReadWriteMACAddress* attribute shall be as specified in Table 14-32.

**Table 14-32—*Read-Write MAC Address* TLV (0x07/0x00-1D)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-1D | Leaf identifier |
| 1 | Length | 0x06 | The size of TLV fields following the `Length` field |
| 6 | ReadWriteMACAddress | Varies | Value of *aReadWriteMACAddress* attribute |

### 14.3.2 PHY management

#### 14.3.2.1 Attribute *aPhyType* (0x07/0x00-20)

This attribute represents a PHY type.

Attribute *aPhyType*:

**Syntax:** Enumeration

**Remote access:** Read-Only

**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.2.1.2. The following values are defined:

| | |
|---|---|
| `other:` | Undefined |
| `unknown:` | Initializing, true state or type not yet known |
| `none:` | MII present and nothing connected |
| `10Mbps:` | IEEE Std 802.3, Clause 7 10 Mb/s Manchester |
| `100BASE-T4:` | IEEE Std 802.3, Clause 23 100 Mb/s 8B/6T |
| `100BASE-X:` | IEEE Std 802.3, Clause 24 or subclause 66.1 100 Mb/s 4B/5B |
| `100BASE-T2`: | IEEE Std 802.3, Clause 32 100 Mb/s PAM5X5 |
| `1000BASE-X:` | IEEE Std 802.3, Clause 36 or subclause 66.2 1000 Mb/s 8B/10B |
| `1000BASE-T:` | IEEE Std 802.3, Clause 40 1000 Mb/s 4D-PAM5 |
| `10GBASE-X:` | IEEE Std 802.3, Clause 48 10 Gb/s 4 lane 8B/10B |
| `10GBASE-R:` | IEEE Std 802.3, Clause 49 10 Gb/s 64B/66B |
| `10GBASE-W:` | IEEE Std 802.3, Clause 49 10 Gb/s 64B/66B and Clause 50 WIS |
| `10GBASE-T:` | IEEE Std 802.3, Clause 55 10 Gb/s DSQ128 |

The *aPhyType* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aPhyType* attribute shall be as specified in Table 14-33.

**Table 14-33—*PHY Type* TLV (0x07/0x00-20)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-20 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | PhyType | Varies | Value of *aPhyType* attribute, defined as follows:<br>`other:` 0x01<br>`unknown:` 0x02<br>`none:` 0x03<br>`10Mbps:` 0x07<br>`100BASE-T4:` 0x17<br>`100BASE-X:` 0x18<br>`100BASE-T2:` 0x20<br>`1000BASE-X:` 0x24<br>`1000BASE-T:` 0x28<br>`10GBASE-X:` 0x30<br>`10GBASE-R:` 0x31<br>`10GBASE-W:` 0x32<br>`10GBASE-T:` 0x37 |

#### 14.3.2.2 Attribute *aSymbolErrorDuringCarrier* (0x07/0x00-23)

This attribute represents the number of carrier events (media being non-idle) that had PHY reception errors.

Attribute *aSymbolErrorDuringCarrier*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.2.1.5.

The *aSymbolErrorDuringCarrier* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aSymbolErrorDuringCarrier* attribute shall be as specified in Table 14-34.

**Table 14-34—*Symbol Error During Carrier* TLV (0x07/0x00-23)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-23 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | SymbolErrorDuringCarrier | Varies | Value of *aSymbolErrorDuringCarrier* attribute |

#### 14.3.2.3 Attribute *aPhyAdminState* (0x07/0x00-25)

This attribute represents the PHY administrative state.

Attribute *aPhyAdminState*:

**Syntax:** Boolean
**Default value:** `enabled`
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.2.1.7. The following values are defined:

`enabled`: PHY is enabled.
`disabled`: PHY is disabled.

The *aPhyAdminState* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aPhyAdminState* attribute shall be as specified in Table 14-35.

**Table 14-35—*PHY Admin State* TLV (0x07/0x00-25)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-25 | Leaf identifier |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field |
| 4 | PhyAdminState | Varies | Value of *aPhyAdminState* attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |

### 14.3.3 MAU management

#### 14.3.3.1 Attribute *aMediaAvailable* (0x07/0x00-47)

This attribute represents the status of the media.

Attribute *aMediaAvailable*:

**Syntax:** Enumeration
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.5.1.1.4. The following values are defined:

`available:` link or light normal, loopback normal
`not_available:` link loss or low light, no loopback

The *aMediaAvailable* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aMediaAvailable* attribute shall be as specified in Table 14-36.

**Table 14-36—*Media Available* TLV (0x07/0x00-47)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-47 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | MediaAvailable | Varies | Value of *aMediaAvailable* attribute, defined as follows:<br>`available:` 0x03<br>`not_available:` 0x04 |

### 14.3.4 MAC management

#### 14.3.4.1 Attribute *aDuplexStatus* (0x07/0x00-5A)

This attribute represents the current mode of operation of the MAC entity.

Attribute *aDuplexStatus*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Default value:** `full_duplex`
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.1.1.32. The following values are defined:

`half_duplex`: Half-duplex mode.
`full_duplex`: Full-duplex mode.
`unknown:` Duplex status unknown

The *aDuplexStatus* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aDuplexStatus* attribute shall be as specified in Table 14-37.

**Table 14-37—*Duplex Status* TLV (0x07/0x00-5A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-5A | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | DuplexStatus | Varies | Value of *aDuplexStatus* attribute, defined as follows:<br>`half_duplex`: 0x01<br>`full_duplex`: 0x02<br>`unknown`: 0x03 |

### 14.3.5 MAC Control management

#### 14.3.5.1 Attribute *aMACControlFunctionsSupported* (0x07/0x00-5D)

#### 14.3.5.2 Attribute *aMACControlFramesTransmitted* (0x07/0x00-5E)

This attribute represents the number of MAC Control frames passed to the MAC sublayer for transmission.

Attribute *aMACControlFramesTransmitted*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.3.3.

The *aMACControlFramesTransmitted* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aMACControlFramesTransmitted* attribute shall be as specified in Table 14-38.

**Table 14-38—*MAC Control Frames Transmitted* TLV (0x07/0x00-5E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-5E | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MACControlFramesTransmitted | Varies | Value of *aMACControlFramesTransmitted* attribute |

#### 14.3.5.3 Attribute *aMACControlFramesReceived* (0x07/0x00-5F)

This attribute represents the number of MAC Control frames passed by the MAC sublayer to the MAC Control sublayer.

Attribute *aMACControlFramesReceived*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.3.4.

The *aMACControlFramesReceived* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aMACControlFramesTransmitted* attribute shall be as specified in Table 14-39.

**Table 14-39—*MAC Control Frames Received* TLV (0x07/0x00-5F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-5F | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MACControlFramesReceived | Varies | Value of *aMACControlFramesReceived* attribute |

#### 14.3.5.4 Attribute *aUnsupportedOpcodesReceived* (0x07/0x00-60)

This attribute represents the number of received MAC Control frames that contain an opcode not supported by the ONU.

Attribute *aUnsupportedOpcodesReceived*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.3.5.

The *aUnsupportedOpcodesReceived* is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *aUnsupportedOpcodesReceived* attribute shall be as specified in Table 14-40.

**Table 14-40—*Unsupported Opcodes Received* TLV (0x07/0x00-60)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-60 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | UnsupportedOpcodesReceived | Varies | Value of *aUnsupportedOpcodesReceived* attribute |

#### 14.3.5.5 Attribute *aPAUSEMACCtrlFramesTransmitted* (0x07/0x00-62)

This attribute represents the number of *PAUSE* frames passed to the MAC sublayer for transmission

Attribute *aPAUSEMACCtrlFramesTransmitted*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.4.2.

The *aPAUSEMACCtrlFramesTransmitted* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aPAUSEMACCtrlFramesTransmitted* attribute shall be as specified in Table 14-41.

**Table 14-41—*PAUSE Frames Transmitted* TLV (0x07/0x00-62)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-62 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | PAUSEMACCtrlFramesTransmitted | Varies | Value of *aPAUSEMACCtrlFramesTransmitted* attribute |

#### 14.3.5.6 Attribute *aPAUSEMACCtrlFramesReceived* (0x07/0x00-63)

This attribute represents the number of *PAUSE* frames passed by the MAC sublayer to the MAC Control sublayer.

Attribute *aPAUSEMACCtrlFramesReceived*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.4.3.

The *aPAUSEMACCtrlFramesReceived* is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aPAUSEMACCtrlFramesReceived* attribute shall be as specified in Table 14-42.

**Table 14-42—*PAUSE Frames Received* TLV (0x07/0x00-63)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x00-63 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | PAUSEMACCtrlFramesReceived | Varies | Value of *aPAUSEMACCtrlFramesReceived* attribute |

### 14.3.6 OMP emulation management

#### 14.3.6.1 Attribute *aMPCPMACCtrlFramesTransmitted* (0x07/0x01-18)

This attribute represents the number of MPCP frames passed to the MAC sublayer for transmission.

Attribute *aMPCPMACCtrlFramesTransmitted*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.7.

The *aMPCPMACCtrlFramesTransmitted* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPMACCtrlFramesTransmitted* attribute shall be as specified in Table 14-43.

**Table 14-43—*MPCP Frames Transmitted* TLV (0x07/0x01-18)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-18 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPMACCtrlFramesTransmitted | Varies | Value of *aMPCPMACCtrlFramesTransmitted* attribute |

#### 14.3.6.2 Attribute *aMPCPMACCtrlFramesReceived* (0x07/0x01-19)

This attribute represents the number of MPCP frames passed by the MAC sublayer to the MAC Control sublayer.

Attribute *aMPCPMACCtrlFramesReceived*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.8.

The *aMPCPMACCtrlFramesReceived* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPMACCtrlFramesTransmitted* attribute shall be as specified in Table 14-44.

**Table 14-44—*MPCP Frames Received* TLV (0x07/0x01-19)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-19 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPMACCtrlFramesReceived | Varies | Value of *aMPCPMACCtrlFramesReceived* attribute |

#### 14.3.6.3 Attribute *aMPCPDiscoveryWindowsSent* (0x07/0x01-20)

This attribute represents the number of discovery windows generated.

Attribute *aMPCPDiscoveryWindowsSent*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.22.

The *aMPCPDiscoveryWindowsSent* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPDiscoveryWindowsSent* attribute shall be as specified in Table 14-45.

**Table 14-45—*MPCP Discovery Windows Sent* TLV (0x07/0x01-20)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-20 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPDiscoveryWindowsSent | Varies | Value of *aMPCPDiscoveryWindowsSent* attribute |

#### 14.3.6.4 Attribute *aMPCPDiscoveryTimeout* (0x07/0x01-22)

This attribute represents the number of times a discovery time-out occurred.

Attribute *aMPCPDiscoveryTimeout*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.23.

The *aMPCPDiscoveryTimeout* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPDiscoveryTimeout* attribute shall be as specified in Table 14-46.

**Table 14-46—*MPCP Discovery Timeout* TLV (0x07/0x01-22)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-22 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPDiscoveryTimeout | Varies | Value of *aMPCPDiscoveryTimeout* attribute |

#### 14.3.6.5 Attribute *aMPCPTxRegAck* (0x07/0x01-3C)

This attribute represents the number of times a *REGISTER_ACK* MPCPDU transmission occurred.

Attribute *aMPCPTxRegAck*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.10.

The *aMPCPTxRegAck* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPTxRegAck* attribute shall be as specified in Table 14-47.

**Table 14-47—*REGISTER_ACK MPCPDUs Transmitted* TLV (0x07/0x01-3C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-3C | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPTxRegAck | Varies | Value of *aMPCPTxRegAck* attribute |

#### 14.3.6.6 Attribute *aMPCPTxRegRequest* (0x07/0x01-3E)

This attribute represents the number of times a *REGISTER_REQ* MPCPDU transmission occurred.

Attribute *aMPCPTxRegRequest*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.12.

The *aMPCPTxRegRequest* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPTxRegRequest* attribute shall be as specified in Table 14-48.

**Table 14-48—*REGISTER_REQ MPCPDUs Transmitted* TLV (0x07/0x01-3E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-3E | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPTxRegRequest | Varies | Value of *aMPCPTxRegRequest* attribute |

#### 14.3.6.7 Attribute *aMPCPTxReport* (0x07/0x01-3F)

This attribute represents the number of times a *REPORT* MPCPDU transmission occurred.

Attribute *aMPCPTxReport*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.13.

The *aMPCPTxReport* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPTxReport* attribute shall be as specified in Table 14-49.

**Table 14-49—*REPORT MPCPDUs Transmitted* TLV (0x07/0x01-3F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-3F | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPTxReport | Varies | Value of *aMPCPTxReport* attribute |

#### 14.3.6.8 Attribute *aMPCPRxGate* (0x07/0x01-40)

This attribute represents the number of times a *GATE* MPCPDU reception occurred.

Attribute *aMPCPRxGate*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.14.

The *aMPCPRxGate* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPRxGate* attribute shall be as specified in Table 14-50.

**Table 14-50—*GATE MPCPDUs Received* TLV (0x07/0x01-40)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-40 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPRxGate | Varies | Value of *aMPCPRxGate* attribute |

#### 14.3.6.9 Attribute *aMPCPRxRegister* (0x07/0x01-42)

This attribute represents the number of times a *REGISTER* MPCPDU reception occurred.

Attribute *aMPCPRxRegister*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.3.5.1.16.

The *aMPCPRxRegister* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aMPCPRxRegister* attribute shall be as specified in Table 14-51.

**Table 14-51—*REGISTER MPCPDUs Received* TLV (0x07/0x01-42)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-42 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | MPCPRxRegister | Varies | Value of *aMPCPRxRegister* attribute |

### 14.3.7 FEC management

#### 14.3.7.1 Attribute *aFECCorrectedBlocks* (0x07/0x01-24)

This attribute represents the number corrected FEC blocks.

Attribute *aFECCorrectedBlocks*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only
**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.5.1.1.17.

The *aFECCorrectedBlocks* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aFECCorrectedBlocks* attribute shall be as specified in Table 14-52.

**Table 14-52—*FEC Corrected Blocks* TLV (0x07/0x01-24)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-24 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FECCorrectedBlocks | Varies | Value of *aFECCorrectedBlocks* attribute |

#### 14.3.7.2 Attribute *aFECUncorrectableBlocks* (0x07/0x01-25)

This attribute represents the number of uncorrectable FEC blocks.

Attribute *aFECUncorrectableBlocks*:

**Syntax:** Counter, Nonresettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read-Only

**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.5.1.1.18.

The *aFECUncorrectableBlocks* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aFECUncorrectableBlocks* attribute shall be as specified in Table 14-53.

**Table 14-53—*FEC Uncorrectable Blocks* TLV (0x07/0x01-25)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-25 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | FECUncorrectableBlocks | Varies | Value of *aFECUncorrectableBlocks* attribute |

#### 14.3.7.3 Attribute *aFECAbility* (0x07/0x01-39)

This attribute represents the FEC capability of the PON Port.

Attribute *aFECAbility*:

**Syntax:** Enumeration

**Remote access:** Read-Only

**Description:** The behavior of this attribute is defined in IEEE Std 802.3, 30.5.1.1.15. The following values are defined:

`unknown`: Device is initializing, true FEC capability is unknown.

`supported`: FEC is supported.

`not_supported`: FEC is not supported

The *aFECAbility* is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aFECAbility* attribute shall be as specified in Table 14-54.

**Table 14-54—*FEC Ability* TLV (0x07/0x01-39)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x07 | Branch identifier |
| 2 | Leaf | 0x01-39 | Leaf identifier |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field |
| 4 | FECAbility | Varies | Value of *aFECAbility* attribute, defined as follows:<br>`unknown`: 0x00-00-00-00<br>`supported`: 0x00-00-00-01<br>`not_supported`: 0x00-00-00-02 |

## 14.4 Branch 0xDB "extended attributes"

This subclause lists extended management attributes, which are not part of the definitions in IEEE Std 802.3, Clause 30. The extended attributes shown in Table 14-55 shall be supported.

The extended attributes can be part of *eOAM_Get_Request*, *eOAM_Get_Response*, *eOAM_Set_Request*, and *eOAM_Set_Response* eOAMPDUs.

**Table 14-55—Extended attributes defined in branch 0xDB**

| Leaf | Attribute | Defined in |
|---|---|---|

| Leaf | Attribute | Defined in |
|---|---|---|
| Object group: ONU management | | |
| 0x00-02 | aOnuId | 14.4.1.2 |
| 0x00-03 | aOnuFwVersion | 14.4.1.3 |
| 0x00-04 | aOnuInfoChipset | 14.4.1.4 |
| 0x00-05 | aOnuInfoDateManufacture | 14.4.1.5 |
| 0x00-06 | aOnuInfoManufacturer | 14.4.1.6 |
| 0x00-07 | aOnuLlidCapability | 14.4.1.7 |
| 0x00-08 | aOnuPonPortCapability | 14.4.1.8 |
| 0x00-0A | aOnuInfoPacketBuffer | 14.4.1.9 |
| 0x00-0C | aLlidForwardState | 14.2.10 |
| 0x00-0D | aLlidOamFrameRate | 14.2.11 |
| 0x00-0E | aOnuManOrgName | 14.2.12 |
| 0x00-0F | aOnuCvcCvsValidity | 14.2.13 |
| 0x00-10 | aOnuServicePortCapability | 14.2.14 |
| 0x00-11 | aVendorName | 14.2.15 |
| 0x00-12 | aModelNumber | 14.2.16 |
| 0x00-13 | aHardwareVersion | 14.2.17 |
| 0x00-14 | aDataRateMode | 14.2.18 |
| 0x00-16 | aMediaTypeCapability | 14.2.19 |
| 0x00-17 | aMediaType | 14.4.1.20 |
| 0x00-18 | aOnuServicePortDescription | 14.4.1.21 |
| 0x01-0E | aOnuFwFileName | 14.4.1.22 |
| Object group: Bridging | | |
| 0x01-01 | aOnuDynMacTableSize | 14.4.2.1 |
| 0x01-02 | aOnuDynMacAgeLimit | 14.4.2.2 |
| 0x01-03 | aUniDynMacTable | 14.4.2.3 |
| 0x01-04 | aUniStatMacTable | 14.4.2.4 |
| 0x01-05 | aUniPortAutoNeg | 14.4.2.5 |
| 0x01-06 | aUniAdmissionControl | 14.4.2.6 |
| 0x01-07 | aUniMinLearnMacCount | 14.4.2.7 |
| 0x01-08 | aUniMaxLearnMacCount | 14.4.2.8 |
| 0x01-09 | aOnuMaxLearnMacCount | 14.4.2.9 |
| 0x01-0A | aUniLengthDiscard | 14.4.2.10 |
| 0x01-0B | aUniFloodUnknown | 14.4.2.11 |
| 0x01-0C | aUniLocalSwitching | 14.4.2.12 |
| 0x01-0F | aUniMacTableFull | 14.4.2.13 |
| 0x01-12 | aOnuMaxFrameSizeCapability | 14.4.2.14 |
| 0x01-13 | aUniMaxFrameSizeLimit | 14.4.2.15 |
| 0x01-20 | aLlidType | 14.4.2.16 |
| 0x01-21 | aServicePortType | 14.4.2.17 |
| 0x01-22 | aQueueInfo | 14.4.2.18 |
| Object group: Statistics and counters | | |
| 0x02-01 | aCountRxFramesGreen | 14.4.3.1 |
| 0x02-02 | aCountTxFramesGreen | 14.4.3.2 |
| 0x02-03 | aCountRxFrames2Short | 14.4.3.3 |
| 0x02-04 | aCountRxFrames64 | 14.4.3.4 |
| 0x02-05 | aCountRxFrames65to127 | 14.4.3.5 |
| 0x02-06 | aCountRxFrames128to255 | 14.4.3.6 |
| 0x02-07 | aCountRxFrames256to511 | 14.4.3.7 |
| 0x02-08 | aCountRxFrames512to1023 | 14.4.3.8 |
| 0x02-09 | aCountRxFrames1024to1518 | 14.4.3.9 |
| 0x02-0A | aCountRxFrames1519 | 14.4.3.10 |

| Leaf | Attribute | Defined in |
|---|---|---|
| 0x02-0B | aCountTxFrames64 | 14.4.3.11 |
| 0x02-0C | aCountTxFrames65to127 | 14.4.3.12 |
| 0x02-0D | aCountTxFrames128to255 | 14.4.3.13 |
| 0x02-0E | aCountTxFrames256to511 | 14.4.3.14 |
| 0x02-0F | aCountTxFrames512to1023 | 14.4.3.15 |
| 0x02-10 | aCountTxFrames1024to1518 | 14.4.3.16 |
| 0x02-11 | aCountTxFrames1519 | 14.4.3.17 |
| 0x02-12 | aQueueDelayThr | 14.4.3.18 |
| 0x02-13 | aQueueDelayValue | 14.4.3.19 |
| 0x02-14 | aCountFramesDropped | 14.4.3.20 |
| 0x02-15 | aCountOctetsDropped | 14.4.3.21 |
| 0x02-16 | aCountOctetsDelayed | 14.4.3.22 |
| 0x02-17 | aCountUsOctetsUnused | 14.4.3.23 |
| 0x02-1D | aPonOptMonitTemp | 14.4.3.24 |
| 0x02-1E | aPonOptMonitVcc | 14.4.3.25 |
| 0x02-1F | aPonOptMonitBias | 14.4.3.26 |
| 0x02-20 | aPonOptMonitTxPower | 14.4.3.27 |
| 0x02-21 | aPonOptMonitRxPower | 14.4.3.28 |
| 0x02-22 | aCounterRxFramesY | 14.4.3.29 |
| 0x02-23 | aCounterTxFramesY | 14.4.3.30 |
| 0x02-24 | aCounterTxOctetsG | 14.4.3.31 |
| 0x02-25 | aCounterRxOctetsY | 14.4.3.32 |
| 0x02-26 | aCounterRxOctetsG | 14.4.3.33 |
| 0x02-27 | aCounterTxOctetsY | 14.4.3.34 |
| 0x02-28 | aCounterTxFramesL2Unicast | 14.4.3.35 |
| 0x02-29 | aCounterTxFramesL2Multicast | 14.4.3.36 |
| 0x02-2A | aCounterTxFramesL2Broadcast | 14.4.3.37 |
| 0x02-2B | aCounterRxFramesL2Unicast | 14.4.3.38 |
| 0x02-2C | aCounterRxFramesL2Multicast | 14.4.3.39 |
| 0x02-2D | aCounterRxFramesL2Broadcast | 14.4.3.40 |
| 0x02-2E | aOnuCounterNumber | 14.4.3.41 |
| 0x02-2F | aCounterRxFramesL2CP | 14.4.3.42 |
| 0x02-30 | aCounterRxOctetsL2CP | 14.4.3.43 |
| 0x02-31 | aCounterTxFramesL2CP | 14.4.3.44 |
| 0x02-32 | aCounterTxOctetsL2CP | 14.4.3.45 |
| 0x02-33 | aCounterDiscardFramesL2CP | 14.4.3.46 |
| 0x02-34 | aCounterDiscardOctetsL2CP | 14.4.3.47 |
| 0x02-35 | aCounterL2TxErrors | 14.4.3.48 |
| 0x02-36 | aCounterL2RxErrors | 14.4.3.49 |
| 0x02-37 | aCountFramesOverLimitDroppedUni | 14.4.3.50 |
| 0x02-38 | aCountOctetsOverLimitDroppedUni | 14.4.3.51 |
| Object group: Alarms | | |
| 0x03-01 | aAlarmPortStatThr | 14.4.4.1 |
| 0x03-02 | aAlarmLlidStatThr | 14.4.4.2 |
| 0x03-03 | aAlarmStatusControl | 14.4.4.3 |
| Object group: Encryption | | |
| 0x04-01 | aEncryptionKeyExpiration | 14.4.5.1 |
| 0x04-02 | aEncryptionMode | 14.4.5.2 |
| Object group: Frame processing | | |
| 0x05-01 | aRuleSetConfig | 14.4.6.1 |
| 0x05-02 | aRuleCustomField | 14.4.6.2 |
| 0x05-03 | aRuleTpidCAlter | 14.4.6.3 |

| Leaf | Attribute | Defined in |
|---|---|---|
| 0x05-04 | aRuleTpidSAlter | 14.4.6.4 |
| 0x05-06 | aRuleTpidIAlter | 14.4.6.6 |
| 0x05-07 | aRuleTpidBAlter | 14.4.6.7 |
| Object group: Service-level agreements | | |
| 0x06-01 | aRateLimitBroadcast | 14.4.7.1 |
| 0x06-04 | aQueueCIR | 14.4.7.2 |
| 0x06-06 | aQueueEIR | 14.4.7.3 |
| 0x06-07 | aQueueColorMarking | 14.4.7.4 |
| 0x06-08 | aQueueRateLimiterCap | 14.4.7.5 |
| 0x06-09 | aCouplingFlag | 14.4.7.6 |
| Object group: Clock transport | | |
| 0x07-01 | aClockTranspCapab | 14.4.10.1 |
| 0x07-02 | aClockTranspStatus | 14.4.10.2 |
| 0x07-03 | aClockTranspTransfer | 14.4.10.3 |
| 0x07-04 | aClockTranspPropagParam | 14.4.10.4 |
| 0x07-05 | aClockTranspRtt | 14.4.10.5 |
| 0x08-00 | Reserved, ignored on reception | |
| 0x08-01 | Reserved, ignored on reception | |
| 0x08-02 | Reserved, ignored on reception | |
| 0x08-03 | Reserved, ignored on reception | |
| Object group: UNI management | | |
| 0x08-20 | aEeeStatus | 14.4.11.1 |
| 0x08-21 | aPoeStatus | 14.4.11.2 |
| Object group: Optical Line Protection | | |
| 0x09-00 | aOnuProtectionCapability | 14.4.9.1 |
| 0x09-01 | aOnuConfigProtection | 14.4.9.2 |
| 0x09-02 | aOnuConfigPonActive | 14.4.9.3 |
| 0x09-03 | aONUConfigHoldoverPeriod | 14.4.9.4 |
| Object group: Power saving | | |
| 0xFF-FF | aOnuPwrSavingCap | 14.4.8.1 |

All other `Leaf` values are reserved and ignored on reception.

### 14.4.1 ONU management

#### 14.4.1.1 *Sequence* TLV (0xDB/0x00-01)

The *Sequence* TLV is used by the source OAM Client to indicate that the given eOAMPDU is part of a multipart eOAMPDU sequence, as defined in 13.4.1.4.

The *Sequence* TLV is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *Sequence* TLV shall be as specified in Table 14-56.

**Table 14-56—*Sequence* TLV (0xDB/0x00-01)**

| Size (bits) | Field (name) | Value | Notes |
|---|---|---|---|
| 8 | Branch | 0xDB | Branch identifier. |
| 16 | Leaf | 0x00-01 | Leaf identifier. |
| 8 | Length | 0x02 | The size of TLV fields following the `Length` field. |
| 15 | SequenceNumber | Varies | This field represents a 15-bit wide sequence number. |

| Size (bits) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | LastResponse | Varies | When set to 1, this eOAMPDU carries the last part of the given sequence. Otherwise, it is set to 0. |

#### 14.4.1.2 Attribute *aOnuId* (0xDB/0x00-02)

This attribute represents the ONU identification number.

Attribute *aOnuId*:

**Syntax:** MAC address
**Remote access:** Read-Only
**Description:** This attribute represents a nonvolatile number that uniquely identifies the C-ONU. The ONU identification number is equal to the ONU's PON MAC address.

The *aOnuId* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuId* attribute shall be as specified in Table 14-57.

**Table 14-57—*ONU ID* TLV (0xDB/0x00-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-02 | Leaf identifier |
| 1 | Length | 0x06 | The size of TLV fields following the `Length` field |
| 6 | OnuId | Varies | Value of *aOnuId* attribute |

#### 14.4.1.3 Attribute *aOnuFwVersion* (0xDB/0x00-03)

This attribute represents the current bootstrap loader and chipset firmware version used in the ONU. This attribute consists of the following sub-attributes: *sBootVersion*, *sBootCrc*, *sFirmwareVersion*, and *sFirmwareCrc*.

Sub-attribute *aOnuFwVersion.sBootVersion*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Description:** This sub-attribute represents the version of the bootstrap used by the ONU. Version numbers 0x00-00 and 0xFF-FF indicate bootstrap version that is not installed or not available.

Sub-attribute *aOnuFwVersion.sBootCrc*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read-Only
**Description:** This sub-attribute represents the value of CRC32 for the bootstrap used by the ONU. It is also used as an additional unique ONU identifier.

Sub-attribute *aOnuFwVersion.sFirmwareVersion*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only

**Description:** This sub-attribute represents the version of the main firmware used by the ONU. Version numbers 0x00-00 and 0xFF-FF indicate firmware version that is not installed or not available.

Sub-attribute *aOnuFwVersion.sFirmwareCrc*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read-Only
**Description:** This sub-attribute represents the value of CRC32 for the main firmware used by the ONU. It is also used as an additional unique ONU identifier.

The *aOnuFwVersion* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuFwVersion* attribute shall be as specified in Table 14-58.

**Table 14-58—*ONU Firmware Version* TLV (0xDB/0x00-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-03 | Leaf identifier |
| 1 | Length | 0x0C | The size of TLV fields following the `Length` field |
| 2 | BootVersion | Varies | Value of *sBootVersion* sub-attribute |
| 4 | BootCrc | Varies | Value of *sBootCrc* sub-attribute |
| 2 | FirmwareVersion | Varies | Value of *sFirmwareVersion* sub-attribute |
| 4 | sFirmwareCrc | Varies | Value of *sFirmwareCrc* sub-attribute |

#### 14.4.1.4 Attribute *aOnuInfoChipset* (0xDB/0x00-04)

This attribute represents information about the ONU, including vendor identifier, ONU chipset model, and ONU chipset version information. This attribute consists of the following sub-attributes: *sVendorId*, *sChipModel*, and *sChipVersion*.

Sub-attribute *aOnuInfoChipset.sVendorId*:

**Syntax:** String
**Size (octets):** 2
**Remote access:** Read-Only
**Description:** This sub-attribute represents the chipset vendor-specific JEDEC Manufacturer ID as defined in IEEE Std 1149.1.

Sub-attribute *aOnuInfoChipset.sChipModel*:

**Syntax:** String
**Size (octets):** 4
**Remote access:** Read-Only
**Description:** This sub-attribute represents the printable ASCII string used to identify the ONU chipset model. The format of the chipset model designation is vendor specific.

Sub-attribute *aOnuInfoChipset.sChipVersion*:

**Syntax:** String
**Size (octets):** 4
**Remote access:** Read-Only
**Description:** This sub-attribute represents the printable ASCII string used to identify the ONU chipset version. The format of the chipset version designation is vendor specific.

The *aOnuInfoChipset* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuInfoChipset* attribute shall be as specified in Table 14-59.

**Table 14-59—*ONU Chipset ID* TLV (0xDB/0x00-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-04 | Leaf identifier |
| 1 | Length | 0x0A | The size of TLV fields following the `Length` field |
| 2 | VendorId | Varies | Value of *sVendorId* sub-attribute |
| 4 | ChipModel | Varies | Value of *sChipModel* sub-attribute |
| 4 | ChipVersion | Varies | Value of *sChipVersion* sub-attribute |

#### 14.4.1.5 Attribute *aOnuInfoDateManufacture* (0xDB/0x00-05)

This attribute represents information about the ONU manufacturing date (day, month, and year). This attribute consists of the following sub-attributes: *sYear*, *sMonth*, and *sDay*.

Sub-attribute *aOnuInfoDateManufacture.sYear*:

**Syntax:** String
**Size (octets):** 2
**Remote access:** Read-Only
**Description:** This sub-attribute represents the year when the ONU was manufactured. This information is presented in the BCD format.

Sub-attribute *aOnuInfoDateManufacture.sMonth*:

**Syntax:** String
**Size (octets):** 1
**Remote access:** Read-Only
**Description:** This sub-attribute represents the month when the ONU was manufactured. This information is presented in the BCD format.

Sub-attribute *aOnuInfoDateManufacture.sDay*:

**Syntax:** String
**Size (octets):** 1
**Remote access:** Read-Only
**Description:** This sub-attribute represents the day when the ONU was manufactured. This information is presented in the BCD format.

For example, the date of ONU manufacture equal to June 24, 2010, corresponding to "20-10-06-24" in BCD encoding, is represented as "2010" in *sYear* sub-attribute, "06" in *sMonth* sub-attribute, and "24" in *sDay* sub-attribute.

The *aOnuInfoDateManufacture* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuInfoDateManufacture* attribute shall be as specified in Table 14-60.

**Table 14-60—*ONU Date of Manufacture* TLV (0xDB/0x00-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-05 | Leaf identifier |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field |
| 2 | Year | Varies | Value of *sYear* sub-attribute |
| 1 | Month | Varies | Value of *sMonth* sub-attribute |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Day | Varies | Value of *sDay* sub-attribute |

#### 14.4.1.6 Attribute *aOnuInfoManufacturer* (0xDB/0x00-06)

This attribute represents information about the ONU manufacturer.

Attribute *aOnuInfoManufacturer*:

**Syntax:** String
**Size (octets):** 128 (max)
**Remote access:** Read-Only
**Description:** This attribute represents the information about the ONU manufacturer, including the ONU serial number, and possibly other manufacturing information, such as lot numbers or component revisions. It is formatted as a NULL-terminated ASCII string.
The internal structure and data organization in this attribute is vendor specific.

The *aOnuInfoManufacturer* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuInfoManufacturer* attribute shall be as specified in Table 14-61.

**Table 14-61—*ONU Manufacturer Info* TLV (0xDB/0x00-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-06 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | OnuInfoManufacturer | Varies | Value of *aOnuInfoManufacturer* attribute |

#### 14.4.1.7 Attribute *aOnuLlidCapability* (0xDB/0x00-07)

This attribute represents the number of LLIDs supported by the given ONU, including both the bidirectional and unidirectional LLIDs. This attribute consists of the following sub-attributes: *sBidirectional* and *sUnidirectional*.

Sub-attribute *aOnuLlidCapability.sBidirectional*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of bidirectional LLIDs supported by the given ONU. The value of this sub-attribute includes the primary PLID and primary MLID assiged during ONU registration.

Sub-attribute *aOnuLlidCapability.sUnidirectional*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of unidirectional (multicast) LLIDs supported by the given ONU. The value of this sub-attribute includes the broadcast PLID (`BCAST_PLID`) and broadcast MLID (`BCAST_MLID`) that are pre-configured in each ONU (see IEEE Std 802.3ca, 144.3.5).

The *aOnuLlidCapability* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuLlidCapability* attribute shall be as specified in Table 14-62.

**Table 14-62—*ONU LLID Capability* TLV (0xDB/0x00-07)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-07 | Leaf identifier |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field |
| 2 | Bidirectional | Varies | Value of *sBidirectional* sub-attribute |
| 2 | Unidirectional | Varies | Value of *sUnidirectional* sub-attribute |

#### 14.4.1.8 Attribute *aOnuPonPortCapability* (0xDB/0x00-08)

This attribute represents the number of PON ports supported by the given ONU.

Attribute *aOnuPonPortCapability*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This attribute represents the number of PON ports supported by the given ONU.

The *aOnuPonPortCapability* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuPonPortCapability* attribute shall be as specified in Table 14-63.

**Table 14-63—*ONU PON Port Capability* TLV (0xDB/0x00-08)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-08 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | OnuPonPortCount | Varies | Value of *aOnuPonPortCapability* attribute, mapped into 2-octet-wide value, right justified |

#### 14.4.1.9 Attribute *aOnuInfoPacketBuffer* (0xDB/0x00-0A)

This attribute represents information about the ONU packet buffer capabilities, including the number of upstream and downstream queues, the maximum number of upstream and downstream queues per L-ONU, the upstream and downstream queue increment, the total buffer size, as well as downstream and upstream buffer sizes. This attribute consists of the following sub-attributes: *sQueuesUs*, *sQueuesUsMax*, *sQueuesUsIncrement*, *sQueuesDs*, *sQueuesDsMax*, *sQueuesDsIncrement*, *sBufferSizeTotal*, *sBufferUsSize*, and *sBufferDsSize*.

Sub-attribute *aOnuInfoPacketBuffer.sQueuesUs*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the total number of queues available to be assigned to L-ONU in the upstream direction.

Sub-attribute *aOnuInfoPacketBuffer.sQueuesUsMax*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the maximum number of queues that can be assigned to a single L-ONU in the upstream direction.

Sub-attribute *aOnuInfoPacketBuffer.sQueuesUsIncrement*:

**Syntax:** Unsigned integer

**Range:** 0x00 to 0xFF
**Remote access:** Read-Only
**Unit:** 1 kB
**Description:** This sub-attribute represents the smallest increment of packet buffer memory in the upstream direction that can be allocated, expressed in units of 1 kB.

Sub-attribute *aOnuInfoPacketBuffer.sQueuesDs*:
**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the total number of queues available to be assigned to L-ONU in the downstream direction.

Sub-attribute *aOnuInfoPacketBuffer.sQueuesDsMax*:
**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the maximum number of queues that can be assigned to a single L-ONU in the downstream direction.

Sub-attribute *aOnuInfoPacketBuffer.sQueuesDsIncrement*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read-Only
**Unit:** 1 kB
**Description:** This sub-attribute represents the smallest increment of packet buffer memory in the downstream direction that can be allocated, expressed in units of 1 kB.

Sub-attribute *aOnuInfoPacketBuffer.sBufferSizeTotal*:
**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read-Only
**Unit:** 1 kB
**Description:** This sub-attribute represents the total packet buffer memory supported on the ONU, expressed in units of 1 kB.

Sub-attribute *aOnuInfoPacketBuffer.sBufferUsSize*:
**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read-Only
**Unit:** 1 kB
**Description:** This sub-attribute represents the maximum amount of packet buffer memory that can be allocated to upstream queues, expressed in units of 1 kB.

Sub-attribute *aOnuInfoPacketBuffer.sBufferDsSize*:
**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read-Only
**Unit:** 1 kB
**Description:** This sub-attribute represents the maximum amount of packet buffer memory that can be allocated to downstream queues, expressed in units of 1 kB.

The *aOnuInfoPacketBuffer* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuInfoPacketBuffer* attribute shall be as specified in Table 14-64.

**Table 14-64—*ONU Packet Buffer* TLV (0xDB/0x00-0A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-0A | Leaf identifier |
| 1 | Length | 0x12 | The size of TLV fields following the `Length` field |
| 1 | QueuesUs | Varies | Value of *sQueuesUs* sub-attribute |
| 1 | QueuesUsMax | Varies | Value of *sQueuesUsMax* sub-attribute |
| 1 | QueuesUsIncrement | Varies | Value of *sQueuesUsIncrement* sub-attribute |
| 1 | QueuesDs | Varies | Value of *sQueuesDs* sub-attribute |
| 1 | QueuesDsMax | Varies | Value of *sQueuesDsMax* sub-attribute |
| 1 | QueuesDsIncrement | Varies | Value of *sQueuesDsIncrement* sub-attribute |
| 4 | BufferSizeTotal | Varies | Value of *sBufferSizeTotal* sub-attribute |
| 4 | BufferUsSize | Varies | Value of *sBufferUsSize* sub-attribute |
| 4 | BufferDsSize | Varies | Value of *sBufferDsSize* sub-attribute |

#### 14.4.1.10 Attribute *aLlidForwardState* (0xDB/0x00-0C)

This attribute represents the current forwarding state for the given L-ONU. User data traffic may be enabled (normal operation) or disabled (discarded by the ONU). Only OAM, eOAM, and MPCP remain enabled regardless of the L-ONU forwarding state. The forwarding state of the given ONU is changed via *Enable User Traffic* TLV (0xDD/0x06-01) and *Disable User Traffic* TLV (0xDD/0x06-02) actions.

Attribute *aLlidForwardState*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This attribute represents the forwarding state for the given L-ONU. Individual values have the following meanings:

`forward`: the L-ONU is in the forwarding state.
`block`: the L-ONU is in the blocking state.

The *aLlidForwardState* attribute is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *aLlidForwardState* attribute shall be as specified in Table 14-65.

**Table 14-65—*L-ONU Forwarding State* TLV (0xDB/0x00-0C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-0C | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | OnuLlidForwardState | Varies | Value of *aLlidForwardState* attribute, defined as follows:<br>`forward`: 0x00<br>`block`: 0x01 |

#### 14.4.1.11 Attribute *aLlidOamFrameRate* (0xDB/0x00-0D)

This attribute represents the maximum OAM frame rate and the maximum OAM heartbeat rate used by the given L-ONU. This attribute consists of the following sub-attributes: *sOamRate* and *sOamHearbeat*.

Sub-attribute *aLlidOamFrameRate.sOamRate*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF

**Default value:** 0x00
**Unit:** frame/100 ms
**Remote access:** Read/Write
**Description:** This sub-attribute represents the maximum rate at which ONU is allowed to transmit OAM frames. The following values are defined:
0x00: unlimited OAM frame rate.
0x01 to 0xFF: allowed number of OAM frames per 100 ms.

Sub-attribute *aLlidOamFrameRate.sOamHearbeat*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0x0A
**Default value:** 0x0A
**Unit:** 100 ms
**Remote access:** Read/Write
**Description:** This sub-attribute represents the ONU's configured OAM heartbeat period. The following values are defined:
0x00: OAM heartbeat is disabled.
0x01 to 0x0A: the specific OAM heartbeat period.

The *aLlidOamFrameRate* attribute is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *aLlidOamFrameRate* attribute shall be as specified in Table 14-66.

**Table 14-66—*OAM Frame Rate* TLV (0xDB/0x00-0D)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-0D | Leaf identifier |
| 1 | Length | 0x02 | The size of TLV fields following the `Length` field |
| 1 | OamRate | Varies | Value of *sOamRate* sub-attribute |
| 1 | OamHearbeat | Varies | Value of *sOamHearbeat* sub-attribute |

#### 14.4.1.12 Attribute *aOnuManOrgName* (0xDB/0x00-0E)

This attribute represents the identification of the organization that manufactured the given ONU. The value stored in this attribute is used to validate the manufacturer Code Verification Certificate (CVC) during the process of software update and is expected to match the subject `organizationName` value stored in the downloaded ONU firmware image. Technical details of the CVC validation process are described in DPoE-SP-SEC.

Attribute *aOnuManOrgName*:
**Syntax:** String
**Remote access:** Read-Only
**Description:** This attribute represents the ASCII string (without the null terminator) carrying the CVC used to verify the authenticity of the ONU firmware. The format of the CVC is defined in DPoE-SP-SEC.

The *aOnuManOrgName* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuManOrgName* attribute shall be as specified in Table 14-67.

**Table 14-67—*ONU CVC Identifier* TLV (0xDB/0x00-0E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-0E | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | OnuManOrgName | Varies | Value of *aOnuManOrgName* attribute |

#### 14.4.1.13 Attribute *aOnuCvcCvsValidity* (0xDB/0x00-0F)

This attribute represents the ONU firmware CVC and Code Verification Signature (CVS) validity times as configured into the ONU. The value stored in this attribute affects the validity of the ONU firmware updates. Technical details of the CVC validation process are described in DPoE-SP-SEC.

This attribute consists of the following sub-attributes: *sCvsStart* and *sCvcStart*.

Sub-attribute *aOnuCvcCvsValidity.sCvsStart*:

**Syntax:** Coordinated Universal Time (UTC) time reference
**Remote access:** Read/Write
**Storage:** Non-Volatile
**Unit:** 1 second
**Description:** This sub-attribute indicates the start of the CVS validity period, expressed as UTC time reference.

Sub-attribute *aOnuCvcCvsValidity.sCvcStart*:

**Syntax:** UTC time reference
**Remote access:** Read/Write
**Unit:** 1 second
**Description:** This sub-attribute indicates the start of the CVC validity period, expressed as UTC time reference.

The *aOnuCvcCvsValidity* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuCvcCvsValidity* attribute shall be as specified in Table 14-68.

**Table 14-68—*ONU CVC Validity* TLV (0xDB/0x00-0F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-0F | Leaf identifier |
| 1 | Length | 0x1A | The size of TLV fields following the `Length` field |
| 13 | CvsStart | Varies | Value of *sCvsStart* sub-attribute, represented in the BCD format of YYMMDDhhmmssZ, with no null terminator. The year information (YY) in range from “50” to “99” denotes years 1950 to 1999 and in range from “00” to “49” denotes years 2000 to 2049. |
| 13 | CvcStart | Varies | Value of *sCvcStart* sub-attribute, represented in the BCD format of YYMMDDhhmmssZ, with no null terminator. The year information (YY) in range from “50” to “99” denotes years 1950 to 1999 and in range from “00” to “49” denotes years 2000 to 2049. |

#### 14.4.1.14 Attribute *aOnuServicePortCapability* (0xDB/0x00-10)

This attribute represents information about the type of individual service ports supported on the ONU and devices connected to individual service ports (if present), including embedded (eSAFE) and other known CPE devices.

This attribute consists of the following sub-attributes: *sPortCount*, *sPortType[sPortCount]*, and *sTypeInstance[sPortCount]*.

Sub-attribute *aOnuServicePortCapability.sPortCount*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read-Only
**Description:** This sub-attribute indicates the number of service ports (including both physical and logical ports) supported by the ONU and listed in *aOnuServicePortCapability* attribute.

Sub-attribute *aOnuServicePortCapability.sPortType[sPortCount]*:

**Syntax:** Enumeration
**Remote access:** Read-Only
**Description:** This sub-attribute indicates the type of individual service ports supported on the ONU and devices connected to individual service ports (if present), including embedded (eSAFE) and other known CPE devices with values specified as follows:

| | |
|---|---|
| `unspecified:` | service port is not connected to a known external or internal device |
| `emta:` | service port is connected to an embedded PacketCable Multimedia Terminal Adapter (eMTA) |
| `estb_ip:` | service port is connected to an IP interface of an embedded Set-Top Box (eSTB-IP) |
| `estb_dsg:` | service port is connected to an embedded Set-Top Box compliant with DOCSIS Set-Top Gateway specification (eSTB-DSG) |
| `etea:` | service port is connected to an embedded T1/E1 TDM Emulation Adapter (eTEA) |
| `esg:` | service port is connected to an embedded Security, Monitoring, and Automation Gateway (eSG) |
| `erouter:` | service port is connected to an embedded router (eRouter) |
| `edva:` | service port is connected to an embedded PacketCable 2.0 Digital Voice Adaptor (eDVA). |
| `seb_estb_ip:` | service port is connected to an embedded Set-Top Box with a Set-Top Extender Bridge (SEB eSTB-IP) |
| `uni_port:` | service port is connected to an external UNI port. This port type may be equivalent to CMCI, MN, or MI port types defined in [DPoE-ARCHv2.0] |
| `other_internal:` | service port is connected to non-eSAFE device and not exposed externally as a subscriber UNI |
| `epta:` | service port is connected to an embedded Performance Test Agent (ePTA) |
| `eps:` | service port is connected to an embedded CableHome Portal Services Logical Element (ePS) |

Each service port is associated with only one *sPortType* sub-attribute. Types of eSAFE devices connected to service ports are defined in DPoE-SP-ARCH.

Sub-attribute *aOnuServicePortCapability.sTypeInstance[sPortCount]*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read-Only
**Description:** This sub-attribute indicates the instance of a service port with a given type. The first instance of a given type has value of 0. If more instances of the same type exists, the value of this sub-attribute is incremented by one for each subsequent instance.

The *aOnuServicePortCapability* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuServicePortCapability* attribute shall be as specified in Table 14-69.

**Table 14-69— *ONU Service Port Capability* TLV (0xDB/0x00-10)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-10 | Leaf identifier |
| 1 | Length | 2×N | The size of TLV fields following the `Length` field, equal to value of *sPortCount* sub-attribute |
| 1 | PortType[0] | Varies | Value of *sPortType[0]* sub-attribute, defined as follows:<br>`unspecified`: 0x00<br>`emta`: 0x01<br>`estb_ip`: 0x02<br>`estb_dsg`: 0x03<br>`etea`: 0x04<br>`esg`: 0x05<br>`erouter`: 0x06<br>`edva`: 0x07<br>`seb_estp_ip`: 0x08<br>`uni_port`: 0x09<br>`other_internal`: 0x0C<br>`epta`: 0x0D<br>`eps`: 0x0E |
| 1 | TypeInstance[0] | Varies | Value of *sTypeInstance[0]* sub-attribute |
| … | … | … | .. |
| 1 | PortType[N−1] | Varies | Value of *sPortType[N−1]* sub-attribute |
| 1 | TypeInstance[N-1] | Varies | Value of *sTypeInstance[N-1]* sub-attribute |

#### 14.4.1.15 Attribute *aVendorName* (0xDB/0x00-11)

This attribute represents the name of the vendor of the given ONU.

Attribute *aVendorName*:

**Syntax:** String
**Remote access:** Read-Only
**Size (octets):** 32 (max)
**Description:** This attribute represents the ASCII string (without the null terminator) carrying the name of the ONU vendor. Internal format of this attribute is vendor-specific.

The *aVendorName* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aVendorName* attribute shall be as specified in Table 14-70.

**Table 14-70—*Vendor Name* TLV (0xDB/0x00-11)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-11 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | VendorName | Varies | Value of *aVendorName* attribute. |

#### 14.4.1.16 Attribute *aModelNumber* (0xDB/0x00-12)

This attribute represents the model of the given ONU.

Attribute *aModelNumber*:

**Syntax:** String
**Remote access:** Read-Only
**Size (octets):** 32 (max)
**Description:** This attribute represents the ASCII string (without the null terminator) carrying the ONU model number. Internal format of this attribute is vendor-specific.

The *aModelNumber* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aModelNumber* attribute shall be as specified in Table 14-71.

**Table 14-71—*Model Number* TLV (0xDB/0x00-12)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-12 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | ModelNumber | Varies | Value of *aModelNumber* attribute. |

#### 14.4.1.17 Attribute *aHardwareVersion* (0xDB/0x00-13)

This attribute represents the hardware version of the given ONU.

Attribute *aHardwareVersion*:

**Syntax:** String
**Remote access:** Read-Only
**Size (octets):** 32 (max)
**Description:** This attribute represents the ASCII string (without the null terminator) carrying the ONU hardware version. Internal format of this attribute is vendor-specific.

The *aHardwareVersion* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aHardwareVersion* attribute shall be as specified in Table 14-72.

**Table 14-72—*Hardware Version* TLV (0xDB/0x00-13)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-13 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | ModelNumber | Varies | Value of *aHardwareVersion* attribute. |

#### 14.4.1.18 Attribute *aDataRateMode* (0xDB/0x00-14)

This attribute represents the EPON mode(s) supported by the given ONU. The ONU only reports the data rate at which the ONU can fully instantiate. Full instantiation of a particular data rate depends on factors such as hardware configuration, both internal and pluggable to the ONU, software configuration, and other factors. As an example, an ONU that has internal hardware capable of supporting a 50 Gb/s data rate, but an optical module only capable of supporting a 25 Gb/s rate does not report a 50 Gb/s data rate capability.

Sub-attribute *aDataRateMode.sDownstream25G*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the downstream data rate of 25 Gb/s. The following values are defined:
- `yes`: the ONU supports the downstream data rate of 25 Gb/s.
- `no`: the ONU does not support the downstream data rate of 25 Gb/s.

Sub-attribute *aDataRateMode.sDownstream50G*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the downstream data rate of 50 Gb/s. The following values are defined:
- `yes`: the ONU supports the downstream data rate of 50 Gb/s.
- `no`: the ONU does not support the downstream data rate of 50 Gb/s.

Sub-attribute *aDataRateMode.sUpstream10G*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the upstream data rate of 10 Gb/s. The following values are defined:
- `yes`: the ONU supports the upstream data rate of 10 Gb/s.
- `no`: the ONU does not support the upstream data rate of 10 Gb/s.

Sub-attribute *aDataRateMode.sUpstream25G*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the upstream data rate of 25 Gb/s. The following values are defined:
- `yes`: the ONU supports the upstream data rate of 25 Gb/s.
- `no`: the ONU does not support the upstream data rate of 25 Gb/s.

Sub-attribute *aDataRateMode.sUpstream50G*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the upstream data rate of 50 Gb/s. The following values are defined:
- `yes`: the ONU supports the upstream data rate of 50 Gb/s.
- `no`: the ONU does not support the upstream data rate of 50 Gb/s.

The *aDataRateMode* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aDataRateMode* attribute shall be as specified in Table 14-73.

**Table 14-73—*Data Rate Mode TLV* (0xDB/0x00-14)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-14 | Leaf identifier |
| 1 | Length | 2 | The size of TLV fields following the `Length` field |
| 1 | Downstream | Varies | bit 1: value of *aDataRateMode.sDownstream25G* sub-attribute, defined as follows:<br>`yes:` 0b1<br>`no:` 0b0<br>bit 2: value of *aDataRateMode.sDownstream50G* sub-attribute, defined as follows:<br>`yes:` 0b1<br>`no:` 0b0<br>bits 0, 3 to 7: reserved and ignored on reception |
| 1 | Upstream | Varies | bit 0: value of *aDataRateMode.sUpstream10G* sub-attribute, defined as follows:<br>`yes:` 0b1<br>`no:` 0b0<br>bit 1: value of *aDataRateMode.sUpstream25G* sub-attribute, defined as follows:<br>`yes:` 0b1<br>`no:` 0b0<br>bit 2: value of *aDataRateMode.sUpstream50G* sub-attribute, defined as follows:<br>`yes:` 0b1<br>`no:` 0b0<br>bits 3 to 7: reserved and ignored on reception |

#### 14.4.1.19 Attribute *aMediaTypeCapability* (0xDB/0x00-16)

This attribute represents the list of media types supported by the given context object. This attribute consists of the following sub-attributes: *sMediaTypeCount* and *sMediaType[sMediaTypeCount]*.

Sub-attribute *aMediaTypeCapability.sMediaTypeCount*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of media types supported by the given context object.

Sub-attribute *aMediaTypeCapability.sMediaType[sMediaTypeCount]*:

**Syntax:** Enumeration
**Remote access:** Read-Only
**Description:** This sub-attribute represents the given media type supported by the given context object. The values defined in Table 14-74 are supported.

**Table 14-74—Supported values for sub-attribute *aMediaTypeCapability.sMediaType[sMediaTypeCount]***

| Media Type | Description | Value |
|---|---|---|
| N/A | No media attached | 0x00 |

| Media Type | Description | Value |
|---|---|---|
| 25/10GBASE-PQG-U2 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x01 |
| 25/10GBASE-PQG-U3 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x02 |
| 25/10GBASE-PQX-U2 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x03 |
| 25/10GBASE-PQX-U3 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x04 |
| 25GBASE-PQG-U2 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x05 |
| 25GBASE-PQG-U3 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x06 |
| 25GBASE-PQX-U2 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x07 |
| 25GBASE-PQX-U3 | One single mode fiber, 1 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x08 |
| 50/10GBASE-PQG-U2 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x09 |
| 50/10GBASE-PQG-U3 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x0A |
| 50/10GBASE-PQX-U2 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x0B |
| 50/10GBASE-PQX-U3 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 10.3125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x0C |
| 50/25GBASE-PQG-U2 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x0D |
| 50/25GBASE-PQG-U3 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x0E |
| 50/25GBASE-PQX-U2 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x0F |
| 50/25GBASE-PQX-U3 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 1 × 25.78125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x10 |
| 50GBASE-PQG-U2 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 2 × 25.78125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x11 |
| 50GBASE-PQG-U3 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 2 × 25.78125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x12 |

| Media Type | Description | Value |
|---|---|---|
| 50GBASE-PQX-U2 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 2 × 25.78125 GBd burst mode transmission, medium power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x13 |
| 50GBASE-PQX-U3 | One single mode fiber, 2 × 25.78125 GBd continuous reception / 2 × 25.78125 GBd burst mode transmission, high power class, as specified in IEEE Std 802.3ca, Clause 141 | 0x14 |
| 100BASE-TX | Two-pair Category 5 twisted-pair cabling as specified in IEEE Std 802.3, Clause 25 | 0x15 |
| 1000BASE-T | Four-pair Category 5 twisted-pair cabling PHY as specified in IEEE Std 802.3, Clause 40 | 0x16 |
| 2.5GBASE-T | Four-pair twisted-pair balanced copper cabling PHY as specified in IEEE Std 802.3, Clause 126 | 0x17 |
| 5GBASE-T | Four-pair twisted-pair balanced copper cabling PHY as specified in IEEE Std 802.3, Clause 126 | 0x18 |
| 10GBASE-T | Four-pair twisted-pair balanced copper cabling PHY as specified in IEEE Std 802.3, Clause 55 | 0x19 |
| 25GBASE-T | Four-pair twisted-pair balanced copper cabling PHY as specified in IEEE Std 802.3, Clause 113 | 0x1A |
| 40GBASE-T | Four-pair twisted-pair balanced copper cabling PHY as specified in IEEE Std 802.3, Clause 113 | 0x1B |
| 1000BASE-X | X PCS/PMA as specified in IEEE Std 802.3, Clause 36 over undefined PMD, duplex mode unknown | 0x20 |
| 1000BASE-LX10 | Two fiber 10 km PHY as specified in IEEE Std 802.3, Clause 59 | 0x21 |
| 1000BASE-SX10 | X fiber over short-wavelength laser PMD as specified in IEEE Std 802.3, Clause 38, duplex mode unknown | 0x22 |
| 2.5GBASE-X | 2.5GBASE-X PCS/PMA as specified in IEEE Std 802.3, Clause 127 over undefined PMD | 0x25 |
| 5GBASE-R | 5GBASE-R PCS/PMA as specified in IEEE Std 802.3, Clause 129 over undefined PMD | 0x26 |
| 10GBASE-R | R PCS/PMA as specified in IEEE Std 802.3, Clause 49 over undefined PMD | 0x2A |
| 10GBASE-LR | R fiber over 1310nm optics as specified in IEEE Std 802.3, Clause 52 | 0x2B |
| 10GBASE-SR | R fiber over 850nm optics as specified in IEEE Std 802.3, Clause 52 | 0x2C |
| 25GBASE-R | PCS as specified in IEEE Std 802.3, Clause 107 with PMA as specified in IEEE Std 802.3, Clause 109 over undefined PMD | 0x30 |
| 25GBASE-SR | 25GBASE-R PCS/PMA over multimode fiber PMD as specified in IEEE Std 802.3, Clause 112 | 0x31 |
| 25GBASE-LR | 25GBASE-R PCS/PMA over single-mode fiber PMD, with long reach, as specified in IEEE Std 802.3, Clause 114 | 0x32 |
| 40GBASE-R | Multi-lane PCS as specified in IEEE Std 802.3, Clause 82 over undefined PMA/PMD | 0x35 |
| 40GBASE-LR4 | 40GBASE-R PCS/PMA over 4 WDM lane single mode fiber PMD, with long reach, as specified in IEEE Std 802.3, Clause 87 | 0x36 |
| 40GBASE-SR4 | 40GBASE-R PCS/PMA over 4 lane multimode fiber PMD as specified in IEEE Std 802.3, Clause 86 | 0x37 |
| 40GBASE-FR | 40GBASE-R PCS/PMA over single mode fiber PMD as specified in IEEE Std 802.3, Clause 89 | 0x38 |
| 50GBASE-R | Multi-lane PCS as specified in IEEE Std 802.3, Clause 133 with PMA as specified in IEEE Std 802.3, Clause 135 over undefined PMD | 0x3A |

| Media Type | Description | Value |
|---|---|---|
| 50GBASE-LR | 50GBASE-R PCS/PMA over single mode fiber PMD as specified in IEEE Std 802.3, Clause 139 | 0x3B |
| 50GBASE-SR | 50GBASE-R PCS/PMA over multimode fiber PMD as specified in IEEE Std 802.3, Clause 138 | 0x3C |
| 50GBASE-FR | 50GBASE-R PCS/PMA over single mode fiber PMD as specified in IEEE Std 802.3, Clause 139 | 0x3D |

The *aMediaTypeCapability* attribute shall declare the support for multiple media types only if each of the supported media types can be selected programmatically using the *aMediaType* (0xDB/0x00-17) attribute (see 14.4.1.20) and without requiring local access to physical ONU device.

The *aMediaTypeCapability* attribute is associated with the PON port object or the Service Port object (see 14.2.1). The Variable Container TLV for the *aMediaTypeCapability* attribute shall be as specified in Table 14-75.

If the context object is a Service Port of a type other than `uni_port`, the *aMediaTypeCapability* attribute shall contain a single value 0x00 (No media attached).

**Table 14-75—*Media Type Capability* TLV (0xDB/0x00-16)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-16 | Leaf identifier |
| 1 | Length | *M* | The size of TLV fields following the `Length` field, where *M* is the number of individual media type entries |
| 1 | MediaTypeValue[0] | Varies | Value of *sMediaType[0] sub*-attribute, per Table 14-74 |
| … | … | … | … |
| 1 | MediaTypeValue[M-1] | Varies | Value of *sMediaType[M-1] sub*-attribute, per Table 14-74 |

#### 14.4.1.20 Attribute *aMediaType* (0xDB/0x00-17)

This attribute reports the currently-selected media type associated with a given port, or selects a specific media type when more than one media type is supported.

Attribute *aMediaType*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Description:** On read, this sub-attribute represents the media type used by the given context object. On write, this attribute sets the media type to be used by the given context object. The values defined in Table 14-74 are supported.
**Default value:** One of the media types supported by the given port (as reported by *aMediaTypeCapability* attribute) shall be selected by default.

The *aMediaType* attribute is associated with the PON port object or the Service Port object (see 14.2.1). The Variable Container TLV for the *aMediaType* attribute shall be as specified in Table 14-76.

If the context object is a Service Port of a type other than `uni_port`, the *aMediaType* attribute shall contain a single value 0x00 (No media attached).

**Table 14-76—*Media Type* TLV (0xDB/0x00-17)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x00-17 | Leaf identifier |
| 1 | Length | 1 | The size of TLV fields following the `Length` field. |
| 1 | MediaType | Varies | Value of *aMediaType* sub-attribute |

#### 14.4.1.21 Attribute *aOnuServicePortDescription* (0xDB/0x00-18)

This attribute provides a description of the specific service port instance identified by a context object. For example, for the exposed physical ports (i.e., UNI ports) the description may represent the marking/label printed on the outside panel of the ONU.

Attribute *aOnuServicePortDescription*:

**Syntax:** String
**Remote access:** Read-Only
**Size (octets):** 64 (max)
**Description:** This attribute represents the ASCII string (with the null terminator) carrying the description of the instance of the service port. The content of this attribute is vendor-specific, but for every service port instance, the description string shall be unique.

The *aOnuServicePortDescription* attribute is associated with the service port object (see 14.2.1). The Variable Container TLV for the *aOnuServicePortDescription* attribute shall be as specified in Table 14-77.

**Table 14-77—Service Port Description TLV (0xDB/0x00-18)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | *Branch* | 0xDB | Branch identifier |
| 2 | *Leaf* | 0x00-18 | Leaf identifier |
| 1 | *Length* | Varies | The size of TLV fields following the `Length` field |
| Varies | *ServicePortDescription* | Varies | Value of *aOnuServicePortDescription* attribute. |

#### 14.4.1.22 Attribute *aOnuFwFileName* (0xDB/0x01-0E)

This attribute represents the current ONU firmware filename. The filename is a null-terminated ASCII string representing the name of the file as received from the management system. The ONU shall retain the value of this attribute across the reset event. The ONU changes the value of this attribute during the firmware update process.

Attribute *aOnuFwFileName*:

**Syntax:** String
**Remote access:** Read-Only
**Storage:** Non-Volatile
**Description:** This attribute represents the current ONU firmware filename, formatted as a null-terminated ASCII string.

The *aOnuFwFileName* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuFwFileName* attribute shall be as specified in Table 14-78.

**Table 14-78—*Firmware Filename* TLV (0xDB/0x01-0E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-0E | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | OnuFwFileName | Varies | Value of *aOnuFwFileName* attribute |

### 14.4.2 Bridging

#### 14.4.2.1 Attribute *aOnuDynMacTableSize* (0xDB/0x01-01)

This attribute represents the maximum size of the MAC address learning table for the ONU as a whole. The total number of MAC addresses learned by the ONU does not exceed the number stored in this attribute.

Attribute *aOnuDynMacTableSize*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read-Only
**Description:** This attribute represents the maximum size of the ONU MAC address learning table for the ONU as a whole.

The *aOnuDynMacTableSize* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuDynMacTableSize* attribute shall be as specified in Table 14-79.

**Table 14-79—*Dynamic Learning Table Size* TLV (0xDB/0x01-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-01 | Leaf identifier |
| 1 | Length | 0x01 to 0x04 | The size of TLV fields following the `Length` field |
| 1..4 | OnuDynMacTableSize | Varies | Value of *aOnuDynMacTableSize* attribute |

#### 14.4.2.2 Attribute *aOnuDynMacAgeLimit* (0xDB/0x01-02)

This attribute represents the age limit of the dynamic MAC addresses learned by the ONU. The value of 0x00-00 disables the MAC address aging, i.e., the MAC addresses do not age out.

Attribute *aOnuDynMacAgeLimit*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Unit:** 10 ms
**Remote access:** Read/Write
**Description:** This attribute represents the maximum size of the ONU MAC address learning table for the ONU as a whole.

The *aOnuDynMacAgeLimit* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuDynMacAgeLimit* attribute shall be as specified in Table 14-80.

**Table 14-80—*Dynamic Address Age Limit* TLV (0xDB/0x01-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-02 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | OnuDynMacAgeLimit | Varies | Value of *aOnuDynMacAgeLimit* attribute |

#### 14.4.2.3 Attribute *aUniDynMacTable* (0xDB/0x01-03)

This attribute represents the content of the table of MAC addresses dynamically learned by the ONU. This attribute consists of the following sub-attributes: *sMacAddressCount* and *sMacAddress[sMacAddressCount]*.

Sub-attribute *aUniDynMacTable.sMacAddressCount*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of MAC addresses in the dynamic MAC address table.

Sub-attribute *aUniDynMacTable.sMacAddress[sMacAddressCount]*:

**Syntax:** MAC address
**Remote access:** Read-Only
**Description:** This sub-attribute represents the MAC address entry in the dynamic MAC address table.

A single *Dynamic Address MAC Table* TLV (0xDB/0x01-03) may carry up to 21 instances of the sub-attribute *sMacAddress[sMacAddressCount]*. If necessary, more than one *Dynamic Address MAC Table* TLV (0xDB/0x01-03) can be used within the same eOAMPDU to deliver the list of dynamic MAC addresses learned on the given UNI port.

In this case, the subsequent instance of the *Dynamic Address MAC Table* TLV (0xDB/0x01-03) continues reporting *sMacAddress[sMacAddressCount]* sub-attributes from the position following the last sub-attribute reported in the previous instance of the *Dynamic Address MAC Table* TLV (0xDB/0x01-03).

The *aUniDynMacTable* attribute may also require more than one eOAMPDU to deliver all the *sMacAddress[sMacAddressCount]* sub-attributes to the OLT. In such a case, each eOAMPDU carries the *Sequence* TLV (0xDB/0x00-01) to indicate that the ONU response spans multiple eOAMPDUs.

The *aUniDynMacTable* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniDynMacTable* attribute shall be as specified in Table 14-81.

**Table 14-81—*Dynamic Address MAC Table* TLV (0xDB/0x01-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-03 | Leaf identifier |
| 1 | Length | $6 \times K$ | The size of TLV fields following the `Length` field, where $K$ is the number of MAC addresses present in this TLV ($K = M - N + 1 \leq 21$) |
| 6 | MacAddress[N] | Varies | Value of *sMacAddress[N]* sub-attribute |
| … | … | … | … |
| 6 | MacAddress[M] | Varies | Value of *sMacAddress[M]* sub-attribute |

#### 14.4.2.4 Attribute *aUniStatMacTable* (0xDB/0x01-04)

This attribute represents the content of the table of MAC addresses statically configured on the ONU. This attribute consists of the following sub-attributes: *sMacAddressCount* and *sMacAddress[sMacAddressCount]*.

Sub-attribute *aUniStatMacTable.sMacAddressCount*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of MAC addresses in the static MAC address table.

Sub-attribute *aUniStatMacTable.sMacAddress[sMacAddressCount]*:

**Syntax:** MAC address
**Remote access:** Read-Only
**Description:** This sub-attribute represents the MAC address entry in the static MAC address table.

A single *Static Address MAC Table* TLV (0xDB/0x01-04) may carry up to 21 instances of the sub-attribute *sMacAddress[sMacAddressCount]*. If necessary, more than one *Static Address MAC Table* TLV (0xDB/0x01-04) can be used within the same eOAMPDU to deliver the list of static MAC addresses learned on the given UNI port.

In this case, the subsequent instance of the *Static Address MAC Table* TLV (0xDB/0x01-04) continues reporting *sMacAddress[sMacAddressCount]* sub-attributes from the position following the last sub-attribute reported in the previous instance of the *Static Address MAC Table* TLV (0xDB/0x01-04).

The *aUniStatMacTable* attribute may also require more than one eOAMPDU to deliver all the *sMacAddress[sMacAddressCount]* sub-attributes to the OLT. In such a case, each eOAMPDU carries the *Sequence* TLV (0xDB/0x00-01) to indicate that the ONU response spans multiple eOAMPDUs.

The *aUniStatMacTable* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniStatMacTable* attribute shall be as specified in Table 14-82.

**Table 14-82—*Static Address MAC Table* TLV (0xDB/0x01-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-04 | Leaf identifier |
| 1 | Length | $6 \times K$ | The size of TLV fields following the `Length` field, where $K$ is the number of MAC addresses present in this TLV ($K = M - N + 1 \leq 21$) |
| 6 | MacAddress[N] | Varies | Value of *aUniStatMacTable.sMacAddress[N]* sub-attribute |
| … | … | … | … |
| 6 | MacAddress[M] | Varies | Value of *aUniStatMacTable.sMacAddress[M]* sub-attribute |

#### 14.4.2.5 Attribute *aUniPortAutoNeg* (0xDB/0x01-05)

This attribute represents the auto-negotiation parameters for the selected UNI port. This attribute consists of the following sub-attributes: *sCapability* and *sCurrentSetting*.

Sub-attribute *aUniPortAutoNeg.sCapability*:

**Syntax:** Bitmap
**Size (octets):** 2
**Remote access:** Read-Only
**Description:** This sub-attribute represents the auto-negotiation capability of the given UNI port, defined per Table 14-83.

**Table 14-83—Port capability bitmap**

| Auto-negotiation capability | Location |
|---|---|
| Half duplex | Bit 0 (LSB) |
| Full duplex | Bit 1 |
| 10 Mb/s | Bit 2 |
| 100 Mb/s | Bit 3 |
| 1000 Mb/s | Bit 4 |
| 10 Gb/s | Bit 5 |
| Flow Control | Bit 6 |
| Auto MDI/MDI-X | Bit 7 |
| Reserved, set to 0 | Bits 8 to 15 |

Sub-attribute *aUniPortAutoNeg.sCurrentSetting*:

**Syntax:** Bitmap
**Size (octets):** 2
**Remote access:** Read/Write
**Description:** This sub-attribute represents the current auto-negotiation settings of the given UNI port, defined per Table 14-83.

The *aUniPortAutoNeg* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniPortAutoNeg* attribute shall be as specified in Table 14-84.

**Table 14-84—*UNI Port Auto-Negotiation* TLV (0xDB/0x01-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier. |
| 2 | Leaf | 0x01-05 | Leaf identifier. |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field. |
| 2 | Capability | Varies | Value of *sCapability* sub-attribute. The value of this field is set to 0x00-00 when the *UNI Port Auto-Negotiation* TLV (0xDB/0x01-05) is carried in the *eOAM_Set_Request* eOAMPDU. |
| 2 | CurrentSetting | Varies | Value of *sCurrentSetting* sub-attribute. |

#### 14.4.2.6 Attribute *aUniAdmissionControl* (0xDB/0x01-06)

This attribute represents the status of the MAC-Source-Address-based admission control function operating on the selected ONU UNI port in the upstream direction.

Attribute *aUniAdmissionControl*:

**Syntax:** Boolean
**Remote access:** Read/Write

**Default value:** `enabled`

**Description:** This attribute represents the status of the MAC-Source-Address-based admission control function operating on the selected ONU UNI port in the upstream direction. The following values are defined:

`enabled`: the MAC-Source-Address-based admission control function is enabled.

`disabled`: the MAC-Source-Address-based admission control function is disabled.

The *aUniAdmissionControl* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniAdmissionControl* attribute shall be as specified in Table 14-85.

**Table 14-85—*Source Address Admission Control* TLV (0xDB/0x01-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-06 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | UniAdmissionControl | Varies | Value of *aUniAdmissionControl* attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |

#### 14.4.2.7 Attribute *aUniMinLearnMacCount* (0xDB/0x01-07)

This attribute represents the minimum guaranteed number of MAC addresses that can be learned on the given UNI port.

Attribute *aUniMinLearnMacCount*:

**Syntax:** Unsigned integer

**Range:** 0x00 to 0x28

**Remote access:** Read/Write

**Default value:** 0x00

**Description:** This attribute represents the minimum guaranteed number of MAC addresses that can be learned on the given UNI port.

The *aUniMinLearnMacCount* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniMinLearnMacCount* attribute shall be as specified in Table 14-86.

**Table 14-86—*MAC Learning Min Guarantee* TLV (0xDB/0x01-07)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-07 | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | UniMinLearnMacCount | Varies | Value of *aUniMinLearnMacCount* attribute, mapped into 1-octet or 2-octet field |

#### 14.4.2.8 Attribute *aUniMaxLearnMacCount* (0xDB/0x01-08)

This attribute represents the maximum guaranteed number of MAC addresses that can be learned on the given UNI port.

Attribute *aUniMaxLearnMacCount*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Default value:** 0x00-00
**Description:** This attribute represents the maximum guaranteed number of MAC addresses that can be learned on the given UNI port.

The *aUniMaxLearnMacCount* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniMaxLearnMacCount* attribute shall be as specified in Table 14-87.

**Table 14-87—*MAC Learning Max Allowed* TLV (0xDB/0x01-08)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-08 | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | UniMaxLearnMacCount | Varies | Value of *aUniMaxLearnMacCount* attribute, mapped into 1-octet or 2-octet field |

#### 14.4.2.9 Attribute *aOnuMaxLearnMacCount* (0xDB/0x01-09)

This attribute represents the maximum guaranteed number of MAC addresses that can be learned by the ONU as a whole, including all UNI ports.

Attribute *aOnuMaxLearnMacCount*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Default value:** 0x00-00
**Description:** This attribute represents the maximum guaranteed number of MAC addresses that can be learned by the ONU as a whole, including all UNI ports.

The *aOnuMaxLearnMacCount* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuMaxLearnMacCount* attribute shall be as specified in Table 14-88.

**Table 14-88—*MAC Learning Aggregate Limit* TLV (0xDB/0x01-09)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-09 | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | OnuMaxLearnMacCount | Varies | Value of *aOnuMaxLearnMacCount* attribute, mapped into 1-octet or 2-octet field |

#### 14.4.2.10 Attribute *aUniLengthDiscard* (0xDB/0x01-0A)

This attribute represents the configuration of the given UNI port in terms of discarding frames due to length errors. The length error occurs when the Layer 2 length does not match the actual frame length.

Attribute *aUniLengthDiscard*:

**Syntax:** Boolean
**Remote access:** Read/Write

**Default value:** `discard`
**Description:** This attribute indicates whether frames with length error are discarded or forwarded by the given UNI port. The following values are defined:
`discard`: frames with length errors are discarded by the UNI port.
`forward`: frames with length errors are forwarded by the UNI port.

The *aUniLengthDiscard* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniLengthDiscard* attribute shall be as specified in Table 14-89.

**Table 14-89—*Length Error Discard* TLV (0xDB/0x01-0A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-0A | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | UniLengthDiscard | Varies | Value of *aUniLengthDiscard* attribute, defined as follows:<br>`discard`: 0x01<br>`forward`: 0x00 |

#### 14.4.2.11 Attribute *aUniFloodUnknown* (0xDB/0x01-0B)

This attribute represents the configuration of the given UNI port for frames whose DAs have not been learned or configured via management. Such frames may be either discarded or flooded across the given UNI port.

Attribute *aUniFloodUnknown*:
**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `discard`
**Description:** This attribute indicates the configuration of the given UNI port for frames whose DAs have not been learned or configured via management. The following values are defined:
`discard`: frames with unknown DAs are discarded by the UNI port.
`flood`: frames with unknown DAs are flooded by the UNI port.

The *aUniFloodUnknown* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aUniFloodUnknown* attribute shall be as specified in Table 14-90.

**Table 14-90—*Flood Unknown* TLV (0xDB/0x01-0B)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-0B | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | UniFloodUnknown | Varies | Value of *aUniFloodUnknown* attribute, defined as follows:<br>`flood`: 0x01<br>`discard`: 0x00 |

#### 14.4.2.12 Attribute *aUniLocalSwitching* (0xDB/0x01-0C)

This attribute represents the configuration of the given UNI port for local switching. With the local switching enabled for the given UNI port, this UNI port may send traffic to any other UNI port of the same ONU. This function needs to be used with caution when flooding for frames with unknown DA is enabled.

Attribute *aUniLocalSwitching*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This attribute indicates whether the local switching for the given UNI port is enabled. The following values are defined:
`disable`: local switching on this UNI port is disabled.
`enable`: local switching on this UNI port is enabled.

The *aUniLocalSwitching* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniLocalSwitching* attribute shall be as specified in Table 14-91.

**Table 14-91—*Local Switching* TLV (0xDB/0x01-0C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-0C | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | UniLocalSwitching | Varies | Value of *aUniLocalSwitching* attribute, defined as follows:<br>`disable`: 0x00<br>`enable`: 0x01 |

#### 14.4.2.13 Attribute *aUniMacTableFull* (0xDB/0x01-0F)

This attribute represents the behavior of the ONU MAC address learning process when it has reached a limit of MAC addresses and a new MAC address is discovered. The ONU MAC may discard a newly discovered addressed. Alternatively, the ONU MAC may overwrite the oldest address in the MAC address table with the newly discovered address.

Attribute *aUniMacTableFull*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `discard`
**Description:** This attribute indicates whether a newly discovered MAC address is discarded or overwrites the oldest address in the MAC address table. The following values are defined:
`discard`: newly discovered MAC address is discarded.
`overwrite`: newly discovered MAC address overwrites the oldest address in the MAC address table.

The *aUniMacTableFull* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniMacTableFull* attribute shall be as specified in Table 14-92.

**Table 14-92—*MAC Table Full Behavior* TLV (0xDB/0x01-0F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-0F | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | UniMacTableFull | Varies | Value of *aUniMacTableFull* attribute, defined as follows:<br>`discard`: 0x00<br>`overwrite`: 0x01 |

#### 14.4.2.14 Attribute *aOnuMaxFrameSizeCapability* (0xDB/0x01-12)

This attribute represents the maximum size of an Ethernet frame (see IEEE 802.3, 3.1.1) supported by the ONU.

Attribute *aOnuMaxFrameSizeCapability*:

**Syntax:** Unsigned integer
**Range:** 0x00-40 to 0xFF-FF
**Unit:** 1 octet
**Remote access:** Read-Only
**Description:** This attribute represents the maximum size of an Ethernet frame (see IEEE 802.3, 3.1.1) supported by the ONU.

The *aOnuMaxFrameSizeCapability* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuMaxFrameSizeCapability* attribute shall be as specified in Table 14-93.

**Table 14-93—*ONU Maximum Frame Capability* TLV (0xDB/0x01-12)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-12 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| 2 | OnuMaxFrameSizeCapability | Varies | Value of *aOnuMaxFrameSizeCapability* attribute |

#### 14.4.2.15 Attribute *aUniMaxFrameSizeLimit* (0xDB/0x01-13)

This attribute represents the current setting of the maximum size of an Ethernet frame (see IEEE 802.3, 3.1.1) supported by the UNI port in the ingress direction.

Attribute *aUniMaxFrameSizeLimit*:

**Syntax:** Unsigned integer
**Range:** 0x00-40 to 0xFF-FF
**Unit:** 1 octet
**Remote access:** Read/Write
**Description:** This attribute represents the current setting of the maximum size of an Ethernet frame (see IEEE 802.3, 3.1.1) configured for the UNI port in the ingress direction. Each Ethernet frame with the size exceeding the value of *aUniMaxFrameSizeLimit* attribute for the given UNI port is dropped, and the values of counters *aCountFramesOverLimitDroppedUni* and *aCountOctetsOverLimitDroppedUni* are incremented.
An attempt to write a value larger than the value of the *aOnuMaxFrameSizeCapability* (0xDB/0x01-12) attribute results in generation

of a return code “Bad Parameters” (see Table 13-26) and the value of *aMaxFrameSizeLimit* attribute remaining unchanged.

The *aUniMaxFrameSizeLimit* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aUniMaxFrameSizeLimit* attribute shall be as specified in Table 14-94.

**Table 14-94—*UNI Maximum Frame Length* TLV (0xDB/0x01-13)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x01-13 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| 2 | UniMaxFrameSizeLimit | Varies | Value of *aUniMaxFrameSizeLimit* attribute |

#### 14.4.2.16 Attribute *aLlidType* (0xDB/0x01-20)

This attribute represents the set of LLIDs provisioned in the given ONU, including the LLIDs added via *acConfigLlid* action (14.6.2.8) as well as system LLIDs, i.e., the primary PLID, the primary MLID, broadcast PLID (`BCAST_PLID`), and broacast MLID (`BCAST_MLID`). This attribute consists of the following sub-attributes: *sLlidCount*, *sLlidValue[sLlidCount]*, and *sLlidType[sLlidCount]*.

Sub-attribute *aLlidType.sLlidCount*:

**Syntax:** Unsigned integer
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of LLIDs provisioned in the given ONU, including the system LLIDs.

Sub-attribute *aLlidType.sLlidValue[sLlidCount]*:

**Syntax:** LLID value
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Description:** This sub-attribute represents the values of the LLID that exist (were provisioned) in the given ONU. Valid LLID values are defined in IEEE Std 802.3ca, 144.3.5.

Sub-attribute *aLlidType.sLlidType[sLlidCount]*:

**Syntax:** Enumeration
**Remote access:** Read-Only
**Description:** This sub-attribute indicates the type of each LLID that is provisioned in the given ONU. The following types are valid:

- `bd_ulid`: the LLID is a bidirectional ULID.
- `bd_plid`: the LLID is a bidirectional PLID.
- `bd_mlid`: the LLID is a bidirectional MLID.
- `ud_ulid`: the LLID is a unidirectional ULID.
- `ud_plid`: the LLID is a unidirectional PLID.
- `ud_mlid`: the LLID is a unidirectional MLID.

The Variable Container TLV for the *aLlidType* attribute shall be as specified in Table 14-95. The *aLlidType* attribute is associated with either the ONU object or the LLID object (see 14.2.1).

When the object is ONU, the Variable Container TLV for the *aLlidType* attribute contains information about all LLIDs provisioned in the given ONU. The order of LLIDs is implementation-dependent.

When the object is LLID, the Variable Container TLV contains information about a single LLID represented by the supplied object context.

**Table 14-95—*LLID Type* TLV (0xDB/0x01-20)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | *Branch* | 0xDB | Branch identifier |
| 2 | *Leaf* | 0x01-20 | Leaf identifier |
| 1 | *Length* | 1 + 3×*N* | The size of TLV fields following the `Length` field |
| 2 | *LlidValue[0]* | Varies | Value of *sLlidValue[0]* sub-attribute. |
| 1 | *LlidType[0]* | Varies | Value of *sLlidType[0]* sub-attribute, encoded as follows:<br>`bd_ulid`: 0xB0<br>`bd_plid`: 0xB1<br>`bd_mlid`: 0xB2<br>`ud_ulid`: 0xD0<br>`ud_plid`: 0xD1<br>`ud_mlid`: 0xD2 |
| … | … | … | … |
| 2 | *LlidValue[N-1]* | Varies | Value of *sLlidValue[N-1]* sub-attribute (*N* = *sLlidCount*). This field is only present if the supplied object context is the ONU. |
| 1 | *LlidType[N-1]* | Varies | Value of *sLlidType[N-1]* sub-attribute. (See *sLlidType[0]* for encoding.) This field is only present if the supplied object context is the ONU. |

### 14.4.2.17 Attribute *aServicePortType* (0xDB/0x01-21)

This attribute represents the set of service ports provisioned in the given ONU via *acConfigServicePort* action (14.6.2.9). This attribute consists of the following sub-attributes: *sServicePortCount* and *sServicePortIndex[sServicePortCount]*.

Sub-attribute *aServicePortType.sServicePortCount*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of service ports provisioned in the given ONU. Note that this value may be different from the value of *aOnuServicePortCapability.sPortCount* sub-attribute, which represents the total number of service ports supported by the ONU.

Sub-attribute *aServicePortType.sServicePortIndex[sServicePortCount]*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFE
**Remote access:** Read-Only
**Description:** This sub-attribute indicates the value of the service port index that has been added by *acConfigServicePort* action. Valid service port index values range from 0x00 up to the maximum supported service port index in the given ONU (i.e., up to *aOnuServicePortCapability.sPortCount* - 1, see 14.4.1.14).

The Variable Container TLV for the *aServicePortType* attribute shall be as specified in Table 14-96. The *aServicePortType* attribute is associated with either the ONU object or the Service Port object (see 14.2.1).

When the object is ONU, the Variable Container TLV for the *aServicePortType* attribute contains information about all service ports provisioned in the given ONU. The order of service ports is implementation-dependent.

When the object is service port, the Variable Container TLV contains information about a single service port represented by the supplied object context.

**Table 14-96—*Service Port Type* TLV (0xDB/0x01-21)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | *Branch* | 0xDB | Branch identifier |
| 2 | *Leaf* | 0x01-21 | Leaf identifier |
| 1 | *Length* | $1 + 3 \times N$ | The size of TLV fields following the `Length` field |
| 1 | *ServicePortIndex[0]* | Varies | Value of *sServicePortIndex[0]* sub-attribute. |
| 1 | *ServicePortType[0]* | Varies | The type of the port with index *sServicePortIndex[0]*. The value of this field is equal to *aOnuServicePortCapability.sPortType[sServicePortIndex[0]]* (see 14.4.1.14) |
| 1 | *TypeInstance[0]* | Varies | The instance of the port of the type *ServicePortType[0]*. The value of this field is equal to *aOnuServicePortCapability.sTypeInstance [sServicePortIndex[0]]* (see 14.4.1.14) |
| … | … | … | … |
| 1 | *ServicePortIndex[N-1]* | Varies | Value of *sServicePortIndex [N-1]* sub-attribute (*N* = *sServicePortCount*). This field is only present if the supplied object context is the ONU. |
| 1 | *ServicePortType[N-1]* | Varies | The type of the port with index *sServicePortIndex[N-1]*. The value of this field is equal to *aOnuServicePortCapability.sPortType[sServicePortIndex[N-1]]* (see 14.4.1.14). This field is only present if the supplied object context is the ONU. |
| 1 | *TypeInstance[N-1]* | Varies | The instance of the port of the type *ServicePortType[N-1]*. The value of this field is equal to *aOnuServicePortCapability.sTypeInstance [sServicePortIndex[N-1]]* (see 14.4.1.14) |

#### 14.4.2.18 Attribute *aQueueInfo* (0xDB/0x01-22)

This attribute represents the number of queues provisioned for a given LLID or service port. The upstream queues hold frames to be transmitted by the given LLID. The downstream queues hold frames to be transmitted by the given service port. Only a single queue is provisioned per each LLID. For the service ports, queue sizes are listed in the order of queue priority, where the queue listed first has the highest priority.

This attribute consists of the following sub-attributes: *sQueueCount* and *sQueueSize[sQueueCount]*:

Sub-attribute *aQueueInfo.sQueueCount*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0x08
**Remote access:** Read-Only
**Description:** This sub-attribute represents the number of queues associated with the given LLID or Service Port object. When the context object is a bidirectional LLID, this sub-attribute is equal to 1. If the object context is a unidirectional LLID, this sub-attribute is equal to 0 and the *sQueueSize* sub-attribute for this LLID object is not present.

Sub-attribute *aQueueInfo.sQueueSize[sQueueCount]*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Default value:** 0x02
**Unit:** 1 kB
**Remote access:** Read-Only
**Description:** This sub-attribute represents the sizes of individual queues associated with the given LLID or Service Port object.

The *aQueueInfo* attribute is associated with either the LLID or the Service Port object (see 14.2.1). The Variable Container TLV for the *aQueueInfo* attribute shall be as specified in Table 14-97.

**Table 14-97—*Queue Info* TLV (0xDB/0x01-22)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | *Branch* | 0xDB | Branch identifier |
| 2 | *Leaf* | 0x01-22 | Leaf identifier |
| 1 | *Length* | 1 + 4×*N* | The size of TLV fields following the `Length` field |
| 1 | *QueueCount* | Varies | Value of *sQueueCount* sub-attribute (N) |
| 4 | *QueueSize[0]* | Varies | Value of *sQueueSize[0]* sub-attribute (highest priority queue). This field is not present if the *QueueCount* field has the value of 0, i.e., if the context object is a unidirectional LLID. |
| … | … | … | … |
| 4 | *QueueSize[N-1]* | Varies | Value of *sQueueSize[N-1]* sub-attribute (lowest priority queue). This field is not present if the context object is an LLID. |

### 14.4.3 Statistics and counters

#### 14.4.3.1 Attribute *aCountRxFramesGreen* (0xDB/0x02-01)

This attribute represents the current number of green frames received by the element identified by the *Object Context* TLV. If the color marking function is not in use, all the received frames are considered green.

Attribute *aCountRxFramesGreen*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of green frames received by the element identified by the *Object Context* TLV.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFramesGreen* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCountRxFramesGreen* attribute shall be as specified in Table 14-98.

**Table 14-98—*RX Frames Green* TLV (0xDB/0x02-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | Leaf | 0x02-01 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFramesGreen | Varies | Value of *aCountRxFramesGreen* attribute |

#### 14.4.3.2 Attribute *aCountTxFramesGreen* (0xDB/0x02-02)

This attribute represents the current number of green frames transmitted by the element identified by the *Object Context* TLV. If the color marking function is not in use, all the transmitted frames are considered green.

Attribute *aCountRxFramesGreen*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of green frames transmitted by the element identified by the *Object Context* TLV.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFramesGreen* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCountTxFramesGreen* attribute shall be as specified in Table 14-99.

**Table 14-99—*TX Frames Green* TLV (0xDB/0x02-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-02 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFramesGreen | Varies | Value of *aCountTxFramesGreen* attribute |

#### 14.4.3.3 Attribute *aCountRxFrames2Short* (0xDB/0x02-03)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and considered too short, i.e., with the length smaller than 64 octets.

Attribute *aCountRxFrames2Short*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and considered too short, i.e., with the length smaller than 64 octets.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames2Short* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames2Short* attribute shall be as specified in Table 14-100.

**Table 14-100—*RX Frames Too Short* TLV (0xDB/0x02-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-03 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames2Short | Varies | Value of *aCountRxFrames2Short* attribute |

#### 14.4.3.4 Attribute *aCountRxFrames64* (0xDB/0x02-04)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size of 64 octets.

Attribute *aCountRxFrames64*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size of 64 octets.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames64* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames64* attribute shall be as specified in Table 14-101.

**Table 14-101—*RX Frames 64 Octets* TLV (0xDB/0x02-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-04 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames64 | Varies | Value of *aCountRxFrames64* attribute |

#### 14.4.3.5 Attribute *aCountRxFrames65to127* (0xDB/0x02-05)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size from 65 to 127 octets (inclusive).

Attribute *aCountRxFrames65to127*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size from 65 to 127 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames65to127* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames65to127* attribute shall be as specified in Table 14-102.

**Table 14-102—*RX Frames 65–127 Octets* TLV (0xDB/0x02-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-05 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames65to127 | Varies | Value of *aCountRxFrames65to127* attribute |

#### 14.4.3.6 Attribute *aCountRxFrames128to255* (0xDB/0x02-06)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size from 128 to 255 octets (inclusive).

Attribute *aCountRxFrames128to255*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size from 128 to 255 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames128to255* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames128to255* attribute shall be as specified in Table 14-103.

**Table 14-103—*RX Frames 128–255 Octets* TLV (0xDB/0x02-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-06 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames128to255 | Varies | Value of *aCountRxFrames128to255* attribute |

#### 14.4.3.7 Attribute *aCountRxFrames256to511* (0xDB/0x02-07)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size from 256 to 511 octets (inclusive).

Attribute *aCountRxFrames256to511*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size from 256 to 511 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames256to511* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames256to511* attribute shall be as specified in Table 14-104.

**Table 14-104—*RX Frames 256–511 Octets* TLV (0xDB/0x02-07)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-07 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames256to511 | Varies | Value of *aCountRxFrames256to511* attribute |

#### 14.4.3.8 Attribute *aCountRxFrames512to1023* (0xDB/0x02-08)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size from 512 to 1023 octets (inclusive).

Attribute *aCountRxFrames512to1023*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size from 512 to 1023 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames512to1023* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames512to1023* attribute shall be as specified in Table 14-105.

**Table 14-105—*RX Frames 512–1023 Octets* TLV (0xDB/0x02-08)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-08 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames512to1023 | Varies | Value of *aCountRxFrames512to1023* attribute |

#### 14.4.3.9 Attribute *aCountRxFrames1024to1518* (0xDB/0x02-09)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size from 1024 to 1518 octets (inclusive).

Attribute *aCountRxFrames1024to1518*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size from 1024 to 1518 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames1024to1518* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames1024to1518* attribute shall be as specified in Table 14-106.

**Table 14-106—*RX Frames 1024–1518 Octets* TLV (0xDB/0x02-09)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-09 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames1024to1518 | Varies | Value of *aCountRxFrames1024to1518* attribute |

#### 14.4.3.10 Attribute *aCountRxFrames1519* (0xDB/0x02-0A)

This attribute represents the current number of frames received by the element identified by the *Object Context* TLV and having the size of 1519 octets or more.

Attribute *aCountRxFrames1519*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames received by the element identified by the *Object Context* TLV and having the size of 1519 octets or more. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountRxFrames1519* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountRxFrames1519* attribute shall be as specified in Table 14-107.

**Table 14-107—*RX Frames 1519 Octets* TLV (0xDB/0x02-0A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-0A | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountRxFrames1519 | Varies | Value of *aCountRxFrames1519* attribute |

#### 14.4.3.11 Attribute *aCountTxFrames64* (0xDB/0x02-0B)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size of 64 octets.

Attribute *aCountTxFrames64*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size of 64 octets. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames64* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames64* attribute shall be as specified in Table 14-108.

**Table 14-108—*TX Frames 64 Octets* TLV (0xDB/0x02-0B)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-0B | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames64 | Varies | Value of *aCountTxFrames64* attribute |

#### 14.4.3.12 Attribute *aCountTxFrames65to127* (0xDB/0x02-0C)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 65 to 127 octets (inclusive).

Attribute *aCountTxFrames65to127*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 65 to 127 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames65to127* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames65to127* attribute shall be as specified in Table 14-109.

**Table 14-109—*TX Frames 65–127 Octets* TLV (0xDB/0x02-0C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-0C | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames65to127 | Varies | Value of *aCountTxFrames65to127* attribute |

#### 14.4.3.13 Attribute *aCountTxFrames128to255* (0xDB/0x02-0D)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 128 to 255 octets (inclusive).

Attribute *aCountTxFrames128to255*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 128 to 255 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames128to255* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames128to255* attribute shall be as specified in Table 14-110.

**Table 14-110—*TX Frames 128–255 Octets* TLV (0xDB/0x02-0D)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-0D | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames128to255 | Varies | Value of *aCountTxFrames128to255* attribute |

#### 14.4.3.14 Attribute *aCountTxFrames256to511* (0xDB/0x02-0E)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 256 to 511 octets (inclusive).

Attribute *aCountTxFrames256to511*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 256 to 511 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames256to511* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames256to511* attribute shall be as specified in Table 14-111.

**Table 14-111—*TX Frames 256–511 Octets* TLV (0xDB/0x02-0E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-0E | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames256to511 | Varies | Value of *aCountTxFrames256to511* attribute |

#### 14.4.3.15 Attribute *aCountTxFrames512to1023* (0xDB/0x02-0F)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 512 to 1023 octets (inclusive).

Attribute *aCountTxFrames512to1023*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 512 to 1023 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames512to1023* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames512to1023* attribute shall be as specified in Table 14-112.

**Table 14-112—*TX Frames 512–1023 Octets* TLV (0xDB/0x02-0F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-0F | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames512to1023 | Varies | Value of *aCountTxFrames512to1023* attribute |

#### 14.4.3.16 Attribute *aCountTxFrames1024to1518* (0xDB/0x02-10)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 1024 to 1518 octets (inclusive).

Attribute *aCountTxFrames1024to1518*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size from 1024 to 1518 octets (inclusive).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames1024to1518* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames1024to1518* attribute shall be as specified in Table 14-113.

**Table 14-113—*TX Frames 1024–1518 Octets* TLV (0xDB/0x02-10)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-10 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames1024to1518 | Varies | Value of *aCountTxFrames1024to1518* attribute |

#### 14.4.3.17 Attribute *aCountTxFrames1519* (0xDB/0x02-11)

This attribute represents the current number of frames transmitted by the element identified by the *Object Context* TLV and having the size of 1519 octets or more.

Attribute *aCountTxFrames1519*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates current number of frames transmitted by the element identified by the *Object Context* TLV and having the size of 1519 octets or more.

The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountTxFrames1519* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCountTxFrames1519* attribute shall be as specified in Table 14-114.

**Table 14-114—*TX Frames 1519 Octets* TLV (0xDB/0x02-11)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-11 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountTxFrames1519 | Varies | Value of *aCountTxFrames1519* attribute |

#### 14.4.3.18 Attribute *aQueueDelayThr* (0xDB/0x02-12)

This attribute represents the value of delay threshold used by the ONU to determine when octets in the queue identified by the *Object Context* TLV awaiting transmission experience excessive delay. When an octet waits in a queue longer than the value recorded in the *aQueueDelayThr* attribute, the related counter *aCountOctetsDelayed* is incremented accordingly.

Attribute *aQueueDelayThr*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Unit:** 100 µs
**Default value:** 0x1E (3 ms)
**Remote access:** Read/Write
**Description:** This attribute indicates the value of delay threshold used by the ONU to determine when octets in the queue identified by the *Object Context* TLV awaiting transmission experience excessive delay.

The *aQueueDelayThr* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aQueueDelayThr* attribute shall be as specified in Table 14-115.

**Table 14-115—*Delay Threshold* TLV (0xDB/0x02-12)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-12 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | QueueDelayThr | Varies | Value of *aQueueDelayThr* attribute |

#### 14.4.3.19 Attribute *aQueueDelayValue* (0xDB/0x02-13)

This attribute represents the maximum delay experienced by a frame residing in the queue identified by the *Object Context* TLV awaiting transmission.

Attribute *aQueueDelayValue*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Unit:** 100 µs
**Remote access:** Read/Write

**Description:** This attribute indicates the maximum delay experienced by a frame residing in the queue identified by the *Object Context* TLV awaiting transmission.
The ONU shall reset this attribute to the value of 0x00 on write of any value to this attribute.

The *aQueueDelayValue* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aQueueDelayValue* attribute shall be as specified in Table 14-116.

**Table 14-116—*Delay* TLV (0xDB/0x02-13)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-13 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | QueueDelayValue | Varies | Value of *aQueueDelayValue* attribute |

#### 14.4.3.20 Attribute *aCountFramesDropped* (0xDB/0x02-14)

This attribute represents the current number of frames dropped by the queue identified by the *Object Context* TLV due to overflow or rate control discard (red frames).

Attribute *aCountFramesDropped*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of frames dropped by the queue identified by the *Object Context* TLV.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountFramesDropped* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aCountFramesDropped* attribute shall be as specified in Table 14-117.

**Table 14-117—*Frames Dropped* TLV (0xDB/0x02-14)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-14 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountFramesDropped | Varies | Value of *aCountFramesDropped* attribute |

#### 14.4.3.21 Attribute *aCountOctetsDropped* (0xDB/0x02-15)

This attribute represents the current number of octets dropped by the queue identified by the *Object Context* TLV due to queue overflow or rate control discard.

Attribute *aCountOctetsDropped*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets dropped by the queue identified by the *Object Context* TLV.

The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountOctetsDropped* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aCountOctetsDropped* attribute shall be as specified in Table 14-118.

**Table 14-118—*Octets Dropped* TLV (0xDB/0x02-15)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-15 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountOctetsDropped | Varies | Value of *aCountOctetsDropped* attribute |

#### 14.4.3.22 Attribute *aCountOctetsDelayed* (0xDB/0x02-16)

This attribute represents the current number of octets in frames with the residency time in the queue identified by the *Object Context* TLV greater than the value stored in the *aQueueDelayThr* attribute.

Attribute *aCountOctetsDelayed*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets in frames with the residency time in the queue identified by the *Object Context* TLV greater than the value stored in the *aQueueDelayThr* attribute.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountOctetsDelayed* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aCountOctetsDelayed* attribute shall be as specified in Table 14-119.

**Table 14-119—*Octets Delayed* TLV (0xDB/0x02-16)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-16 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountOctetsDelayed | Varies | Value of *aCountOctetsDelayed* attribute |

#### 14.4.3.23 Attribute *aCountUsOctetsUnused* (0xDB/0x02-17)

This attribute represents the current number of octets granted to the given L-ONU but not filled in with transmitted data.

Attribute *aCountUsOctetsUnused*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets granted to the given L-ONU but not filled in with transmitted data.
The ONU shall reset this attribute to the value of 0x00 on write of any value to this attribute.

The *aCountUsOctetsUnused* attribute is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *aCountUsOctetsUnused* attribute shall be as specified in Table 14-120.

**Table 14-120—*Upstream Octets Unused* TLV (0xDB/0x02-17)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-17 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountUsOctetsUnused | Varies | Value of *aCountUsOctetsUnused* attribute |

#### 14.4.3.24 Attribute *aPonOptMonitTemp* (0xDB/0x02-1D)

This attribute represents the value of the current optical module temperature on the PON port of the ONU.

Attribute *aPonOptMonitTemp*:

**Syntax:** 16-bit signed two's-complement integer
**Range:** 0x80-00 to 0x7F-FF
**Unit:** 1/256 °C
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the current optical module temperature on the PON port of the ONU, expressed in units of 1/256 °C.
The ONU shall reset this attribute to the value of 0x80-00 on write of any value to this attribute.

The *aPonOptMonitTemp* attribute is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aPonOptMonitTemp* attribute shall be as specified in Table 14-121.

**Table 14-121—*Optical Monitoring Temperature* TLV (0xDB/0x02-1D)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-1D | Leaf identifier |
| 1 | Length | 0x02 | The size of TLV fields following the `Length` field |
| 2 | aPonOptMonitTemp | Varies | Value of *aPonOptMonitTemp* attribute |

#### 14.4.3.25 Attribute *aPonOptMonitVcc* (0xDB/0x02-1E)

This attribute represents the value of the current optical module supply voltage on the PON port of the ONU.

Attribute *aPonOptMonitVcc*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Unit:** 100 µV
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the current optical module supply voltage on the PON port of the ONU, expressed in units of 100 µV.
The ONU shall reset this attribute to the value of 0x00 on write of any value to this attribute.

The *aPonOptMonitVcc* attribute is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aPonOptMonitVcc* attribute shall be as specified in Table 14-122.

**Table 14-122—*Optical Monitoring VCC* TLV (0xDB/0x02-1E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-1E | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | PonOptMonitVcc | Varies | Value of *aPonOptMonitVcc* attribute |

#### 14.4.3.26 Attribute *aPonOptMonitBias* (0xDB/0x02-1F)

This attribute represents the value of the current optical module transmitter bias current on the PON port of the ONU.

Attribute *aPonOptMonitBias*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Unit:** 2 µA
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the current optical module transmitter bias current on the PON port of the ONU, expressed in units of 2 µA.
The ONU shall reset this attribute to the value of 0x00 on write of any value to this attribute.

The *aPonOptMonitBias* attribute is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aPonOptMonitBias* attribute shall be as specified in Table 14-123.

**Table 14-123—*Optical Monitoring Tx Bias Current* TLV (0xDB/0x02-1F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-1F | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | PonOptMonitBias | Varies | Value of *aPonOptMonitBias* attribute |

#### 14.4.3.27 Attribute *aPonOptMonitTxPower* (0xDB/0x02-20)

This attribute represents the value of the current optical module transmitter output power on the PON port of the ONU.

Attribute *aPonOptMonitTxPower*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Unit:** 0.1 µW
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the current optical module transmitter output power on the PON port of the ONU, expressed in units of 0.1 µW.
The ONU shall reset this attribute to the value of 0x00 on write of any value to this attribute.

The *aPonOptMonitTxPower* attribute is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aPonOptMonitTxPower* attribute shall be as specified in Table 14-124.

**Table 14-124—*Optical Monitoring Tx Power* TLV (0xDB/0x02-20)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-20 | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | PonOptMonitTxPower | Varies | Value of *aPonOptMonitTxPower* attribute |

#### 14.4.3.28 Attribute *aPonOptMonitRxPower* (0xDB/0x02-21)

This attribute represents the value of the current optical module receiver input power on the PON port of the ONU.

Attribute *aPonOptMonitRxPower*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Unit:** 0.1 µW
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the current optical module receiver input power on the PON port of the ONU, expressed in units of 0.1 µW.
The ONU shall reset this attribute to the value of 0x00 on write of any value to this attribute.

The *aPonOptMonitRxPower* attribute is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *aPonOptMonitRxPower* attribute shall be as specified in Table 14-125.

**Table 14-125—*Optical Monitoring Rx Power* TLV (0xDB/0x02-21)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-21 | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | PonOptMonitRxPower | Varies | Value of *aPonOptMonitRxPower* attribute |

#### 14.4.3.29 Attribute *aCounterRxFramesY* (0xDB/0x02-22)

This attribute represents the current number of frames received by the given element (as indicated by the *Object Context* TLV) and considered to be yellow.

Attribute *aCounterRxFramesY*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of frames received by the given element (as indicated by the *Object Context* TLV) and considered to be yellow.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxFramesY* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterRxFramesY* attribute shall be as specified in Table 14-126.

**Table 14-126—*Rx Frames Yellow* TLV (0xDB/0x02-22)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-22 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxFramesY | Varies | Value of *aCounterRxFramesY* attribute |

#### 14.4.3.30 Attribute *aCounterTxFramesY* (0xDB/0x02-23)

This attribute represents the current number of frames transmitted by the given element (as indicated by the *Object Context* TLV) and considered to be yellow.

Attribute *aCounterTxFramesY*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of frames transmitted by the given element (as indicated by the *Object Context* TLV) and considered to be yellow. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxFramesY* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterTxFramesY* attribute shall be as specified in Table 14-127.

**Table 14-127—*Tx Frames Yellow* TLV (0xDB/0x02-23)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-23 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxFramesY | Varies | Value of *aCounterTxFramesY* attribute |

#### 14.4.3.31 Attribute *aCounterTxOctetsG* (0xDB/0x02-24)

This attribute represents the current number of octets transmitted by the given element (as indicated by the *Object Context* TLV) and considered to be green.

Attribute *aCounterTxOctetsG*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets transmitted by the given element (as indicated by the *Object Context* TLV) and considered to be green. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxOctetsG* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterTxOctetsG* attribute shall be as specified in Table 14-128.

**Table 14-128—*Tx Octets Green* TLV (0xDB/0x02-24)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-24 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxOctetsG | Varies | Value of *aCounterTxOctetsG* attribute |

#### 14.4.3.32 Attribute *aCounterRxOctetsY* (0xDB/0x02-25)

This attribute represents the current number of octets received by the given element (as indicated by the *Object Context* TLV) and considered to be yellow.

Attribute *aCounterRxOctetsY*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets received by the given element (as indicated by the *Object Context* TLV) and considered to be yellow. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxOctetsY* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterRxOctetsY* attribute shall be as specified in Table 14-129.

**Table 14-129—*Rx Octets Yellow* TLV (0xDB/0x02-25)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-25 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxOctetsY | Varies | Value of *aCounterRxOctetsY* attribute |

#### 14.4.3.33 Attribute *aCounterRxOctetsG* (0xDB/0x02-26)

This attribute represents the current number of octets received by the given element (as indicated by the *Object Context* TLV) and considered to be green.

Attribute *aCounterRxOctetsG*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets received by the given element (as indicated by the *Object Context* TLV) and considered to be green. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxOctetsG* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterRxOctetsG* attribute shall be as specified in Table 14-130.

**Table 14-130—*Rx Octets Green* TLV (0xDB/0x02-26)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-26 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxOctetsG | Varies | Value of *aCounterRxOctetsG* attribute |

#### 14.4.3.34 Attribute *aCounterTxOctetsY* (0xDB/0x02-27)

This attribute represents the current number of octets transmitted by the given element (as indicated by the *Object Context* TLV) and considered to be yellow.

Attribute *aCounterTxOctetsY*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets transmitted by the given element (as indicated by the *Object Context* TLV) and considered to be yellow. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxOctetsY* attribute is associated with the UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterTxOctetsY* attribute shall be as specified in Table 14-131.

**Table 14-131—*Tx Octets Yellow* TLV (0xDB/0x02-27)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-27 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | aCounterTxOctetsY | Varies | Value of *aCounterTxOctetsY* attribute |

#### 14.4.3.35 Attribute *aCounterTxFramesL2Unicast* (0xDB/0x02-28)

This attribute represents the current number of Layer 2 unicast frames (frames with unicast DA) transmitted by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterTxFramesL2Unicast*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 unicast frames transmitted by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxFramesL2Unicast* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterTxFramesL2Unicast* attribute shall be as specified in Table 14-132.

**Table 14-132—*Tx Frames Layer 2 Unicast* TLV (0xDB/0x02-28)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-28 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxFramesUnicast | Varies | Value of *aCounterTxFramesL2Unicast* attribute |

#### 14.4.3.36 Attribute *aCounterTxFramesL2Multicast* (0xDB/0x02-29)

This attribute represents the current number of Layer 2 multicast frames (with bit number 40 in DA set to 1) transmitted by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterTxFramesL2Multicast*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 multicast frames transmitted by the given element (as indicated by the *Object Context* TLV). The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxFramesL2Multicast* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterTxFramesL2Multicast* attribute shall be as specified in Table 14-133.

**Table 14-133—*Tx Frames Layer 2 Multicast* TLV (0xDB/0x02-29)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-29 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxFramesMulticast | Varies | Value of *aCounterTxFramesL2Multicast* attribute |

#### 14.4.3.37 Attribute *aCounterTxFramesL2Broadcast* (0xDB/0x02-2A)

This attribute represents the current number of Layer 2 broadcast frames (all 48 bits of DA are set to 1) transmitted by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterTxFramesL2Broadcast*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 broadcast frames transmitted by the given element (as indicated by the *Object Context* TLV). The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxFramesL2Broadcast* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterTxFramesL2Broadcast* attribute shall be as specified in Table 14-134.

**Table 14-134—*Tx Frames Layer 2 Broadcast* TLV (0xDB/0x02-2A)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-2A | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxFramesBroadcast | Varies | Value of *aCounterTxFramesL2Broadcast* attribute |

### 14.4.3.38 Attribute *aCounterRxFramesL2Unicast* (0xDB/0x02-2B)

This attribute represents the current number of Layer 2 unicast frames (frames with unicast DA) received by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterRxFramesL2Unicast*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 unicast frames received by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxFramesL2Unicast* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterRxFramesL2Unicast* attribute shall be as specified in Table 14-135.

**Table 14-135—*Rx Frames Layer 2 Unicast* TLV (0xDB/0x02-2B)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-2B | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxFramesUnicast | Varies | Value of *aCounterRxFramesL2Unicast* attribute |

### 14.4.3.39 Attribute *aCounterRxFramesL2Multicast* (0xDB/0x02-2C)

This attribute represents the current number of Layer 2 multicast frames (with bit number 40 in DA set to 1) received by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterRxFramesL2Multicast*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 multicast frames received by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxFramesL2Multicast* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterRxFramesL2Multicast* attribute shall be as specified in Table 14-136.

**Table 14-136—*Rx Frames Layer 2 Multicast* TLV (0xDB/0x02-2C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-2C | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxFramesMulticast | Varies | Value of *aCounterRxFramesL2Multicast* attribute |

#### 14.4.3.40 Attribute *aCounterRxFramesL2Broadcast* (0xDB/0x02-2D)

This attribute represents the current number of Layer 2 broadcast frames (all 48 bits of DA are set to 1) received by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterRxFramesL2Broadcast*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 broadcast frames received by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxFramesL2Broadcast* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterRxFramesL2Broadcast* attribute shall be as specified in Table 14-137.

**Table 14-137—*Rx Frames Layer 2 Broadcast* TLV (0xDB/0x02-2D)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-2D | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxFramesBroadcast | Varies | Value of *aCounterRxFramesL2Broadcast* attribute |

#### 14.4.3.41 Attribute *aOnuCounterNumber* (0xDB/0x02-2E)

This attribute represents the total number of programmable counters supported by the ONU.

Attribute *aOnuCounterNumber*:

**Syntax:** Unsigned integer
**Size (octets):** 2 (max)
**Remote access:** Read-Only
**Description:** This attribute indicates the total number of programmable counters supported by the ONU.

The *aOnuCounterNumber* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuCounterNumber* attribute shall be as specified in Table 14-138.

**Table 14-138—*Counter Number* TLV (0xDB/0x02-2E)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-2E | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | OnuCounterNumber | Varies | Value of *aOnuCounterNumber* attribute |

#### 14.4.3.42 Attribute *aCounterRxFramesL2CP* (0xDB/0x02-2F)

This attribute represents the current number of Layer 2 Control Protocol (L2CP) frames received by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterRxFramesL2CP*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of L2CP frames received by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxFramesL2CP* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterRxFramesL2CP* attribute shall be as specified in Table 14-139.

**Table 14-139—*L2CP Frames Rx* TLV (0xDB/0x02-2F)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-2F | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxFramesL2CP | Varies | Value of *aCounterRxFramesL2CP* attribute |

#### 14.4.3.43 Attribute *aCounterRxOctetsL2CP* (0xDB/0x02-30)

This attribute represents the current number of octets of L2CP frames received by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterRxOctetsL2CP*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets of L2CP frames received by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterRxOctetsL2CP* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterRxOctetsL2CP* attribute shall be as specified in Table 14-140.

**Table 14-140—*L2CP Octets Rx* TLV (0xDB/0x02-30)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-30 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterRxOctetsL2CP | Varies | Value of *aCounterRxOctetsL2CP* attribute |

#### 14.4.3.44 Attribute *aCounterTxFramesL2CP* (0xDB/0x02-31)

This attribute represents the current number of L2CP frames transmitted by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterTxFramesL2CP*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of L2CP frames transmitted by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxFramesL2CP* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterTxFramesL2CP* attribute shall be as specified in Table 14-141.

**Table 14-141—*L2CP Frames Tx* TLV (0xDB/0x02-31)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-31 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxFramesL2CP | Varies | Value of *aCounterTxFramesL2CP* attribute |

#### 14.4.3.45 Attribute *aCounterTxOctetsL2CP* (0xDB/0x02-32)

This attribute represents the current number of octets of L2CP frames transmitted by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterTxOctetsL2CP*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets of L2CP frames transmitted by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterTxOctetsL2CP* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterTxOctetsL2CP* attribute shall be as specified in Table 14-142.

**Table 14-142—*L2CP Octets Tx* TLV (0xDB/0x02-32)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-32 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterTxOctetsL2CP | Varies | Value of *aCounterTxOctetsL2CP* attribute |

#### 14.4.3.46 Attribute *aCounterDiscardFramesL2CP* (0xDB/0x02-33)

This attribute represents the current number of L2CP frames discarded by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterDiscardFramesL2CP*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of L2CP frames discarded by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterDiscardFramesL2CP* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterDiscardFramesL2CP* attribute shall be as specified in Table 14-143.

**Table 14-143—*L2CP Frames Discarded* TLV (0xDB/0x02-33)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-33 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterDiscardFramesL2CP | Varies | Value of *aCounterDiscardFramesL2CP* attribute |

#### 14.4.3.47 Attribute *aCounterDiscardOctetsL2CP* (0xDB/0x02-34)

This attribute represents the current number of octets of L2CP frames discarded by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterDiscardOctetsL2CP*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets of L2CP frames discarded by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterDiscardOctetsL2CP* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterDiscardOctetsL2CP* attribute shall be as specified in Table 14-144.

**Table 14-144—*L2CP Octets Discarded* TLV (0xDB/0x02-34)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-34 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CounterDiscardOctetsL2CP | Varies | Value of *aCounterDiscardOctetsL2CP* attribute |

#### 14.4.3.48 Attribute *aCounterL2TxErrors* (0xDB/0x02-35)

This attribute represents the current number of Layer 2 frames that failed to be transmitted upstream, as observed by the given element (as indicated by the *Object Context* TLV). Any type of event may be responsible for upstream transmission error, including link down state, excessive collisions, and frame corruption.

Attribute *aCounterL2TxErrors*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 frames that failed to be transmitted upstream, as observed by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterL2TxErrors* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterL2TxErrors* attribute shall be as specified in Table 14-145.

**Table 14-145—*L2 Tx Errors* TLV (0xDB/0x02-35)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-35 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | aCounterL2TxErrors | Varies | Value of *aCounterL2TxErrors* attribute |

#### 14.4.3.49 Attribute *aCounterL2RxErrors* (0xDB/0x02-36)

This attribute represents the current number of Layer 2 frames discarded due to FCS errors, length errors, etc., as observed by the given element (as indicated by the *Object Context* TLV).

Attribute *aCounterL2RxErrors*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of Layer 2 frames discarded due to FCS errors, length errors, etc., as observed by the given element (as indicated by the *Object Context* TLV).
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterL2RxErrors* attribute is associated with the UNI Port or PON Port object (see 14.2.1). The Variable Container TLV for the *aCounterL2RxErrors* attribute shall be as specified in Table 14-146.

**Table 14-146—*L2 Rx Errors* TLV (0xDB/0x02-36)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-36 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | aCounterL2RxErrors | Varies | Value of *aCounterL2RxErrors* attribute |

#### 14.4.3.50 Attribute *aCountFramesOverLimitDroppedUni* (0xDB/0x02-37)

This attribute represents the current number of frames dropped by the UNI port identified by the *Object Context* TLV due to the Ethernet frame size exceeding the value of *aUniMaxFrameSizeLimit* attribute associated with this UNI port.

Attribute *aCountFramesGiantsUni*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of frames dropped by the UNI port identified by the *Object Context* TLV.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountFramesOverLimitDroppedUni* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aCountFramesOverLimitDroppedUni* attribute shall be as specified in Table 14-147.

**Table 14-147—*Count Frames Over Limit Dropped* TLV (0xDB/0x02-37)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-37 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountFramesOverLimitDroppedUni | Varies | Value of *aCountFramesOverLimitDroppedUni* attribute |

#### 14.4.3.51 Attribute *aCountFramesOverLimitDroppedUni* (0xDB/0x02-38)

This attribute represents the current number of octets in frames dropped by the UNI port identified by the *Object Context* TLV due to the Ethernet frame size exceeding the value of *aUniMaxFrameSizeLimit* attribute associated with this UNI port.

Attribute *aCountFramesGiantsUni*:

**Syntax:** Counter, Resettable
**Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the current number of octets frames dropped by the UNI port identified by the *Object Context* TLV.
The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCountOctetsOverLimitDroppedUni* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aCountOctetsOverLimitDroppedUni* attribute shall be as specified in Table 14-148.

**Table 14-148—*Count Octets Over Limit Dropped* TLV (0xDB/0x02-38)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x02-38 | Leaf identifier |
| 1 | Length | 0x01 to 0x08 | The size of TLV fields following the `Length` field |
| 1..8 | CountOctetsOverLimitDroppedUni | Varies | Value of *aCountOctetsOverLimitDroppedUni* attribute |

### 14.4.4 Alarms

Individual alarms are exchanged between the ONU and the OLT using DPoE *Event Notification* TLVs, carried in the *Event Notification* OAMPDU, as defined in IEEE Std 802.3, Clause 57.

#### 14.4.4.1 Attribute *aAlarmPortStatThr* (0xDB/0x03-01)

This attribute represents the current configuration of the ONU in terms of the conditions under which the specific alarm is generated when a PON/UNI port statistics counter exceeds a certain value at the end of a 1-second sampling period. A rising threshold and a falling threshold (high-water mark and low-water mark) are provided to support hysteresis. The alarm condition occurs when the value for the given statistic is greater than or equal to the high threshold. The alarm condition is cleared when the statistic is less than or equal to the low threshold.

This attribute consists of the following sub-attributes: *sStatBranch*, *sStatLeaf*, *sThresholdH*, and *sThresholdL*.

Sub-attribute *aAlarmPortStatThr.sStatBranch*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Description:** This attribute indicates the branch for the statistical attribute that the high and low thresholds reference.

Sub-attribute *aAlarmPortStatThr.sStatLeaf*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the leaf for the statistical attribute that the high and low thresholds reference.

Sub-attribute *aAlarmPortStatThr.sThresholdH*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the high threshold for the given statistical attribute, referenced by *sStatBranch* and *sStatLeaf* pair.
A write of the value 0x00-00-00-00 into this attribute disables the associated alarm referenced by *sStatBranch* and *sStatLeaf* pair.

Sub-attribute *aAlarmPortStatThr.sThresholdL*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the low threshold for the given statistical attribute, referenced by *sStatBranch* and *sStatLeaf* pair.

The *aAlarmPortStatThr* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aAlarmPortStatThr* attribute shall be as specified in Table 14-149.

**Table 14-149—*Port Stat Threshold* TLV (0xDB/0x03-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x03-01 | Leaf identifier |
| 1 | Length | 0x0B | The size of TLV fields following the `Length` field |
| 1 | StatBranch | Varies | Value of *sStatBranch* sub-attribute |
| 2 | StatLeaf | Varies | Value of *sStatLeaf* sub-attribute |
| 4 | ThresholdHigh | Varies | Value of *sThresholdH* sub-attribute |
| 4 | ThresholdLow | Varies | Value of *sThresholdL* sub-attribute |

#### 14.4.4.2 Attribute *aAlarmLlidStatThr* (0xDB/0x03-02)

This attribute represents the current configuration of the ONU in terms of the conditions under which the specific alarm is generated when an LLID statistics counter exceeds a certain value at the end of a 1-second sampling period. A rising threshold and a falling threshold (high-water mark and low-water mark) are provided to support hysteresis. The alarm condition occurs when the value for the given statistic is greater than or equal to the high threshold. The alarm condition is cleared when the statistic is less than or equal to the low threshold.

This attribute consists of the following sub-attributes: *sStatBranch*, *sStatLeaf*, *sThresholdH*, and *sThresholdL*.

Sub-attribute *aAlarmLlidStatThr.sStatBranch*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Description:** This attribute indicates the branch for the statistical attribute that the high and low thresholds reference.

Sub-attribute *aAlarmLlidStatThr.sStatLeaf*:
**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the leaf for the statistical attribute that the high and low thresholds reference.

Sub-attribute *aAlarmLlidStatThr.sThresholdH*:
**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the high threshold for the given statistical attribute, referenced by *sStatBranch* and *sStatLeaf* pair.
A write of the value 0x00-00-00-00 into this attribute disables the associated alarm referenced by *sStatBranch* and *sStatLeaf* pair.

Sub-attribute *aAlarmLlidStatThr.sThresholdL*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the low threshold for the given statistical attribute, referenced by *sStatBranch* and *sStatLeaf* pair.

The *aAlarmLlidStatThr* attribute is associated with the LLID or mLLID object (see 14.2.1). The Variable Container TLV for the *aAlarmLlidStatThr* attribute shall be as specified in Table 14-150.

**Table 14-150—*L-ONU Stat Threshold* TLV (0xDB/0x03-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x03-02 | Leaf identifier |
| 1 | Length | 0x0B | The size of TLV fields following the `Length` field |
| 1 | StatBranch | Varies | Value of *sStatBranch* sub-attribute |
| 2 | StatLeaf | Varies | Value of *sStatLeaf* sub-attribute |
| 4 | ThresholdHigh | Varies | Value of *sThresholdH* sub-attribute |
| 4 | ThresholdLow | Varies | Value of *sThresholdL* sub-attribute |

#### 14.4.4.3 Attribute *aAlarmStatusControl* (0xDB/0x03-03)

This attribute enables or disables selected alarm(s). Alarms can be enabled or disabled on a per-object basis, identified using the *Object Context* TLV (see 14.2.1) preceding the TLV carrying this attribute.

This attribute consists of the following sub-attributes: *sErrLoS*, *sErrKeyExchange*, *sErrPortDown*, *sErrPowerFail*, *sErrStatAlarm*, *sErrOnuBusy*, and *sErrMacOverflow*.

Sub-attribute *aAlarmStatusControl.sErrLoS*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the LoS alarm for the context object (see Table 13-7) is enabled. The following values are defined:
`enable`: the LoS alarm is enabled.
`disable`: the LoS alarm is disabled.

Sub-attribute *aAlarmStatusControl.sErrKeyExchange*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the Key Exchange Failure alarm for the context object (see Table 13-7) is enabled. The following values are defined:
`enable`: the Key Exchange Failure alarm is enabled.
`disable`: the Key Exchange Failure alarm is disabled.

Sub-attribute *aAlarmStatusControl.sErrPortDown*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the Port Disabled alarm for the context object (see Table 13-7) is enabled. The following values are defined:

`enable`: the Port Disabled alarm is enabled.
`disable`: the Port Disabled alarm is disabled.

Sub-attribute *aAlarmStatusControl.sErrPowerFail*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the Power Failure alarm for the context object (see Table 13-7) is enabled. The following values are defined:
`enable`: the Power Failure alarm is enabled.
`disable`: the Power Failure alarm is disabled.

Sub-attribute *aAlarmStatusControl.sErrStatAlarm*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the Statistics Alarm alarm for the context object (see Table 13-7) is enabled. The following values are defined:
`enable`: the Statistics Alarm alarm is enabled.
`disable`: the Statistics Alarm alarm is disabled.

Sub-attribute *aAlarmStatusControl.sErrOnuBusy*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the ONU Busy alarm for the context object (see Table 13-7) is enabled. The following values are defined:
`enable`: the ONU Busy alarm is enabled.
`disable`: the ONU Busy alarm is disabled.

Sub-attribute *aAlarmStatusControl.sErrMacOverflow*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disable`
**Description:** This sub-attribute indicates whether the MAC Table Overflow alarm for the context object (see Table 13-7) is enabled. The following values are defined:
`enable`: the MAC Table Overflow alarm is enabled.
`disable`: the MAC Table Overflow alarm is disabled.

The *aAlarmStatusControl* attribute is associated with the ONU, PON Port, LLID, UNI Port, or Queue object (see 14.2.1). The Variable Container TLV for the *aAlarmStatusControl* attribute shall be as specified in Table 14-151.

**Table 14-151—*Alarm Status Control* TLV (0xDB/0x03-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x03-03 | Leaf identifier |
| 1 | Length | $2 \times N$ | The size of TLV fields following the `Length` field.<br>Value $N$ represents the number of alarms carried in this TLV ($1 \leq N \leq 7$). |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | AlarmCode[0] | Varies | Alarm identifier (event code), per Table 13-7. The alarm identifiers are mapped to the sub-attributes as defined below:<br>0x11: *sErrLoS*<br>0x12: *sErrKeyExchange*<br>0x21: *sErrPortDown*<br>0x41: *sErrPowerFail*<br>0x81: *sErrStatAlarm*<br>0x82: *sErrOnuBusy*<br>0x83: *sErrMacOverflow* |
| 1 | AlarmStatus[0] | Varies | Value of the sub-attribute identified by the `AlarmCode[0]`, encoded as shown below:<br>`disable`: 0x00<br>`enable`: 0x01 |
| … | | | |
| 1 | AlarmCode[N−1] | Varies | Alarm identifier (event code), per Table 13-7. The alarm identifiers are mapped to the sub-attributes as shown for the `AlarmCode[0]` field. |
| 1 | AlarmStatus[N−1] | Varies | Value of the sub-attribute identified by the `AlarmCode[N−1]`, encoded as shown below:<br>`disable`: 0x00<br>`enable`: 0x01 |

When the *Alarm Status Control* TLV (0xDB/0x03-03) is carried in the *eOAM_Get_Response* eOAMPDU, it contains all defined alarm codes, i.e., $N = 7$.

### 14.4.5 Encryption

#### 14.4.5.1 Attribute *aEncryptionKeyExpiration* (0xDB/0x04-01)

This attribute represents the current value of the timeout for encryption keys used by the given L-ONU.

Attribute *aEncryptionKeyExpiration*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Unit:** 1 second
**Default value:** 0x00-00
**Description:** This attribute indicates the duration of validity for the current encryption key used by the ONU.

The *aEncryptionKeyExpiration* attribute is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *aEncryptionKeyExpiration* attribute shall be as specified in Table 14-152.

**Table 14-152—*Encryption Key Expiry Time* TLV (0xDB/0x04-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x04-01 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | EncryptionKeyExpiration | Varies | Value of *aEncryptionKeyExpiration* attribute |

#### 14.4.5.2 Attribute *aEncryptionMode* (0xDB/0x04-02)

This attribute represents the current encryption mode configured on the given L-ONU. Individual encryption modes are defined in DPoE-SP-SEC.

Attribute *aEncryptionMode*:

**Syntax:** Enumeration
**Default value:** `none`
**Remote access:** Read/Write
**Description:** This attribute indicates the current encryption mode configured on the given L-ONU. The following values are defined:

- `none`: encryption is disabled.
- `1GD`: encryption is enabled; 1G-EPON downstream encryption is used.
- `10GD`: encryption is enabled; 10G-EPON downstream encryption is used.
- `10GB`: encryption is enabled; 10G-EPON bidirectional encryption is used.

The *aEncryptionMode* attribute is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *aEncryptionMode* attribute shall be as specified in Table 14-153.

**Table 14-153—*Encryption Mode* TLV (0xDB/0x04-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x04-02 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | EncryptionMode | Varies | Value of *aEncryptionMode* attribute, defined as follows:<br>`none`: 0x00<br>`1GD`: 0x01<br>`10GD`: 0x02<br>`10GB`: 0x03 |

### 14.4.6 Frame processing

#### 14.4.6.1 Attribute *aRuleSetConfig* (0xDB/0x05-01)

This attribute represents the current configuration of the rule set associated with the given element (as identified by the *Object Context* TLV).

NOTE—The Classifier rule model ~~used by this profile~~ differs from the model described in 6.5.2.1 in the following aspects:

- All rules configured on the ONU are verified for each frame, where any frame may match multiple rules. The frame processing does not stop on the first matched rule, as described in 6.5.2.1.
- Results of multiple rules configured on the ONU and verified to match the given frame are applied to the given frame in order of precedence. Consequently, results associated with higher-priority rules can override partially or completely results associated with lower-priority rules.

This attribute consists of the following sub-attributes: *sPrecedence*, *sClauseCount*, at least one instance of *sClause*, *sResultCount*, and at least one instance of *sResult*. These sub-attributes are defined below:

Sub-attribute *aRuleSetConfig.sPrecedence*

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the precedence of the given classification rule. The lower value indicates the higher precedence.

Sub-attribute *aRuleSetConfig.sClauseCount*

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the total number of clauses configured for the given rule.

Sub-attribute *aRuleSetConfig.sClause[sClauseCount]*

**Syntax:** Structure
**Remote access:** Read/Write
**Description:** This sub-attribute represents a single clause configured for the given rule. The *sClause* sub-attribute is itself a compound sub-attribute that consists of multiple sub-attributes. It is further defined in 14.4.6.1.1.

Sub-attribute *aRuleSetConfig.sResultCount*

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the total number of results configured for the given rule.

Sub-attribute *aRuleSetConfig.sResult[sResultCount]*

**Syntax:** Structure
**Remote access:** Read/Write
**Description:** This sub-attribute represents a single result (i.e., an action to be performed on a frame) configured for the given rule. The *sResult* sub-attribute is itself a compound sub-attribute that consists of multiple sub-attributes. It is further defined in 14.4.6.1.2.

#### 14.4.6.1.1 *aRuleSetConfig.sClause* sub-attribute

This sub-attribute represents one of the clauses used to construct a fully functional frame processing rule. A frame processing rule shall contain at least one *sClause* sub-attribute. All *sClause* sub-attributes for the given frame processing rule are evaluated, and the individual logical results are ANDed to determine the match condition.

This sub-attribute comprises the following, second-level sub-attributes: *sFieldCode*, *sFieldInstance*, *sMaskMsb*, *sMaskLsb*, *sOperator*, and *sMatchVal*.

Sub-attribute *aRuleSetConfig.sClause.sFieldCode*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the field of the frame header used for matching by this instance of *sClause* sub-attribute. The following values are defined:
`LINK_INDEX`: local logical link index [a]

| | |
|---|---|
| DA: | *Outermost MAC Destination Address* field [b] |
| SA: | *Outermost MAC Source Address* field [b] |
| ETYPE_LEN: | *Ethernet Type/Length* field [b] |
| B_DA: | *Backbone MAC Destination Address* field [b] |
| B_SA: | *Backbone MAC Source Address* field [b] |
| I_TAG: | *Backbone Service Instance Tag* field [b] |
| S_TAG: | *Service VLAN Tag* field [b,e] |
| C_TAG: | *Customer VLAN Tag* field [b,e] |
| MPLS_LSE : | MPLS header [e] |
| IP_TOS_TC: | depending on the version of IP header present in the frame, either *IPv4 Type of Service* [c] (IPv4_TOS) field or *IPv6 Traffic Class* [c] (IPv6_TC) field [g] |
| IP_TTL_HL: | depending on the version of IP header present in the frame, either *IPv4 Time-to-Live* [c] (IPv4_TTL) field or *IPv6 Hop Limit* [c] (IPv6_HL) field [g] |
| IP_PT: | depending on the version of IP header present in the frame, either *IPv4 Protocol Type* [c] (IPv4_PROTOCOL) field or the last Next Header field in the chain of Next Header fields present in the IPv6 extension headers [g] |
| IPv4_DA: | *IPv4 Destination Address* field [c] |
| IPv6_DA: | *IPv6 Destination Address* field [c] |
| IPv4_SA: | *IPv4 Source Address* field [c] |
| IPv6_SA: | *IPv6 Source Address* field [c] |
| IPv6_NEXT_HEADER: | *IPv6 Next Header* field [c,f] |
| IPv6_FLOWLABEL: | *IPv6 Flow Label* field [c] |
| TCP_UDP_SP: | *TCP/UDP Source Port* field [d] |
| TCP_UDP_DP: | *TCP/UDP Destination Port* field [d] |
| B_TAG: | *B-Tag* field [b] |
| CUST_0: | custom field 0 |
| CUST_1: | custom field 1 |
| CUST_2: | custom field 2 |
| CUST_3: | custom field 3 |
| CUST_4: | custom field 4 |
| CUST_5: | custom field 5 |
| CUST_6: | custom field 6 |
| CUST_7: | custom field 7 |
| LLID_VALUE: | LLID Value [h] |

[a] The local logical link index represents the local index of the logical link instantiated on the C-ONU. For example, for a C-ONU supporting 8 L-ONUs, the value of local logical link index ranges from 0 to 7. In this way, the local logical link index has only local, C-ONU–specific meaning. The local logical link index represents the order of registration of the L-ONU. The L-ONUs are registered in the order of increasing numerical value of their MAC addresses.

[b] This field is as defined in Table 6-2.

[c] This field is as defined in Table 6-3.

[d] This field is as defined in Table 6-4.

[e] A frame may contain multiple instances of this field.

[f] There can be multiple instances of the IPv6 extension headers in a single frame. However, they are not ordered in an IPv6 frame as are ordered, e.g., multiple VLAN tags. The instance number for this field is not the usual

0..N−1st instance of an instanced field, but is instead the Next Header value for that header type assigned by the Internet Assigned Numbers Authority.

[g] Since IPv4 and IPv6 headers have similar semantics and since a single frame can be of only IPv4 or IPv6 type but not both, for these frame types, some field codes are reused for the IP equivalents, e.g., protocol types or priority fields. Rule sets that need to treat the same field differently based on IP version are expected to use the ETYPE_LEN field to distinguish IPv4 from IPv6.

[h] Valid LLID values are defined in IEEE Std 802.3, 76.2.6.1.3.2.

Sub-attribute *aRuleSetConfig.sClause.sFieldInstance*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the instance of the given field within the frame header that is used for matching by this instance of *sClause* sub-attribute. Some fields, such as VLAN tags, may occur in multiple instances in some frames. To distinguish two such fields, the *sFieldInstance* sub-attribute is used in conjunction with the *sFieldCode* sub-attribute. Instances of such fields are numbered starting from 0 in the order in which they are transmitted in the frame. Therefore, for example, C-VLAN tag 0 would be the outermost tag in a frame, immediately after the MAC addresses. In the case of a frame with two C-VLAN tags, C-VLAN tag 1 is the inner tag, closer to the payload of the frame.

Sub-attribute *aRuleSetConfig.sClause.sMaskMsb*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the number of bits to ignore on the most significant side of the frame field identified by the *sFieldCode* sub-attribute. The most-significant-bit and least-significant-bit masks (*sMaskMsb* and *sMaskLsb*) are used to reduce the number of field codes and provide flexibility for frame processing rules. A VLAN tag, for instance, is coded as one field (*sFieldCode*). Typically, the processing rules might be using just one of the subfields, e.g., a TPID, CoS, or VID portion of this field. A rule can compare these subfields by using the MSB and LSB masks to isolate the subfield of interest within a larger field.

Sub-attribute *aRuleSetConfig.sClause.sMaskLsb*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the number of bits to ignore on the least significant side of the frame field identified by the *sFieldCode* sub-attribute. See additional explanation in the description of the s*MaskMsb* sub-attribute.

Sub-attribute *aRuleSetConfig.sClause.sOperator*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the binary operator for this instance of *aRuleSetConfig.sClause* sub-attribute. The following values are defined:

NEVER: condition never matches.
EQUAL: condition matches if the field is equal to value.
DIFFERENT: condition matches if the field is not equal to value.
LESS_EQUAL: condition matches if the field is less than or equal to value.
MORE_EQUAL: condition matches if the field is greater than or equal to value.
EXISTS: condition matches if the field exists (field value is ignored).
NOT_EXISTS: condition matches if the field does not exist.
ALWAYS: condition always matches.

Sub-attribute *aRuleSetConfig.sClause.sMatchVal*:

**Syntax:** Unsigned Integer
**Size (octets):** 120 (max)
**Remote access:** Read/Write
**Description:** This sub-attribute represents the numeric value being matched by this instance of *sClause* sub-attribute.

#### 14.4.6.1.2 *aRuleSetConfig.sResult* sub-attribute

This sub-attribute represents one of the results of the given frame processing rule, when the given frame matches the combined rule condition. The results of all rules matching a given frame are applied to the frame after all rules have been processed. Multiple results may be applied to each frame. Higher-priority results may overwrite or cancel results of lower-priority rules.

This sub-attribute comprises the following, second-level sub-attributes: *sFrameAction*, *sQueueId, sFieldCode*, *sFieldInstance*, *sMaskMsb*, *sMaskLsb*, *sFieldvalue,* and *sCounterIndex*.

Sub-attribute *aRuleSetConfig.sResult.sFrameAction*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the type of result (action on a frame) described by this instance of the *sResult* sub-attribute. Individual values are defined below:

NOP: this result has no net effect and does not affect the state of the frame. It may be used as a placeholder result.
DISCARD: indicates that all frames matching this rule are to be discarded upon completion of the frame processing operation. This is equivalent to setting the `discard` flag in the frame to `true`.
FORWARD: indicates that all frames matching this rule are to be forwarded (not discarded) upon completion of the frame processing operation. This result also sets the `discard` flag in the frame to `false`.
QUEUE: indicates the destination queue for frames matching this rule. The destination queue is identified by *sQueueId* sub-attribute.
SET: indicates that a specific value is to be written into the selected field in all frames matching this rule. The Field Code, Field Instance, MSB Mask, LSB Mask, and new Field Value are provided in the *sFieldCode*, *sFieldInstance*, *sMaskMsb*, *SMaskLsb*, and *sFieldValue* sub-attributes, respectively. This action does not insert a new field into the frame.
COPY: indicates that the value of a selected field (source field) is to be copied into another field (target field). The source field is the field used in the last clause of the rule condition. The

target field is identified by *sFieldCode* and *sFieldInstance* sub-attributes. Typically this result is used to copy priority fields, such as IP TOS to IEEE 802.1Q CoS bits, or to copy an inner VLAN tag to an outer one.

DELETE: indicates that a field is to be deleted from the processed frame. The field is deleted only when all rules have been processed and no matching higher-priority rule had the CLEAR_DELETE result.. The Field Code and Field Instance are provided in the *sFieldCode* and *sFieldInstance* sub-attributes, respectively. This result is commonly used to remove VLAN tags or other encapsulation from a frame.

INSERT: indicates that a field is to be inserted into the processed frame. The field is inserted only when all rules have been processed and no matching higher-priority rule had the CLEAR_INSERT result. The new field is filled with zeros by default. To set this field to a specific value, an additional SET result is provisioned. The Field Code and Field Instance are provided in the *sFieldCode* and *sFieldInstance* sub-attributes, respectively. This result is commonly used to add VLAN tags or other encapsulation to a frame.

REPLACE: represents the combination of INSERT and DELETE results in a single operation. Effectively, the selected field in the frame is replaced with another field. The Field Code and Field Instance are provided in the *sFieldCode* and *sFieldInstance* sub-attributes, respectively. This result is commonly used to translate priority values or VLAN tag values.

CLEAR_DELETE: reverses the decision of a lower-precedence rule to delete the given field in the processed frame. The Field Code and Field Instance are provided in the *sFieldCode* and *sFieldInstance* sub-attributes, respectively.

CLEAR_INSERT: reverses the decision of a lower-precedence rule to insert the given field. The Field Code and Field Instance are provided in the *sFieldCode* and *sFieldInstance* sub-attributes, respectively.

INC_COUNTER: increments programmable counter for frames that match this rule and for octets in those frames.

Sub-attribute *aRuleSetConfig.sResult.sQueueId*:

**Syntax:** {object type, object instance, queue number} tuple as defined in 14.2.1.2.5
**Remote access:** Read/Write
**Description:** Object type is equal 0x00-02 or 0x00-03 since only LLIDs and UNI ports have associated queues (see 14.2.1.1). This sub-attribute is used only when *sFrameActio*n is set to the value QUEUE.

Sub-attribute *aRuleSetConfig.sResult.sFieldCode*:

See definition of *aRuleSetConfig.sClause.sFieldCode* sub-attribute in 14.4.6.1.1.

**Description:** This sub-attribute represents the code of the field acted upon by the given rule result. This sub-attribute is used when *sFrameAction* is set to one of the following values: SET, COPY, DELETE, INSERT, REPLACE, CLEAR_DELETE, or CLEAR_INSERT.

Sub-attribute *aRuleSetConfig.sResult.sFieldInstance*:

See definition of *aRuleSetConfig.sClause.sFieldInstance* sub-attribute in 14.4.6.1.1.

**Description:** This sub-attribute represents the instance of the field acted upon by the given rule result. This sub-attribute is used when *sFrameAction* is set to one of the following values: SET, COPY, DELETE, INSERT, REPLACE, CLEAR_DELETE, or CLEAR_INSERT.

Sub-attribute *aRuleSetConfig.sResult.sMaskMsb*:

See definition of *aRuleSetConfig.sClause.sMaskMsb* sub-attribute in 14.4.6.1.1.

**Description:** This sub-attribute represents the number of most significant bits of the field that are to be excluded from the action taken by this rule result. This sub-attribute is used only when *sFrameAction* is set to the values SET or COPY.

Sub-attribute *aRuleSetConfig.sResult.sMaskLsb*:

See definition of *aRuleSetConfig.sClause.sMaskLsb* sub-attribute in 14.4.6.1.1.

**Description:** This sub-attribute represents the number of least-significant bits of the field that are to be excluded from the action taken by this rule result. This sub-attribute is used only when *sFrameAction* is set to the values SET or COPY.

Sub-attribute *aRuleSetConfig.sResult.sFieldValue*:

**Syntax:** Unsigned integer
**Size (octets):** 118 (max)
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the new value to be written into the field identified by the *sFieldCode* and *sFieldInstance* sub-attributes. This sub-attribute is used only when *sFrameAction* is set to the value SET. Values for fields that are not an integral multiple of eight-bit units are right justified and are padded with zeros on the left (most significant) bits.

Sub-attribute *aRuleSetConfig.sResult.sCounterIndex*:

**Syntax:** Unsigned integer
**Size (octets):** 0x00-00 to 0x7F-FF
**Remote access:** Read/Write
**Description:** This sub-attribute represents the index of the programmable frame counter to be used in a given result. This sub-attribute is used only when *sFrameAction* is set to the value INC_COUNTER. The programmable counters are defined in 14.7.

#### 14.4.6.1.3 *Port Ingress Rule* TLV

A single rule is represented in an eOAMPDU as a series of at least one *Port Ingress Rule* TLV. Each rule can be of an arbitrary complexity and can require more than 128 octets to be fully described, hence exceeding the capacity of a single Variable Container TLV.

The *aRuleSetConfig* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aRuleSetConfig* attribute shall be as specified in Table 14-154.

**Table 14-154—*Port Ingress Rule* TLV (0xDB/0x05-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x05-01 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the Length field |
| 1 | HeaderIndicator | 0x01 | Start-of-Rule indicator. For rules that require multiple TLVs, this field may not be present in a given rule TLV. |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Precedence | Varies | Value of *sPrecedence* sub-attribute. This field is present only when the `HeaderIndicator` is present. |
| Varies | Clause[0] | Varies | Value of *sClause[0]* sub-attribute (see Table 14-155) |
| … | … | … | … |
| Varies | Clause[N−1] | Varies | Value of *sClause[N−1]* sub-attribute (see Table 14-155) |
| Varies | Result[0] | Varies | Value of *sResult[0]* sub-attribute (see Table 14-156 through Table 14-161) |
| … | … | … | … |
| Varies | Result[M−1] | Varies | Value of *sResult[M−1]* sub-attribute (see Table 14-156 through Table 14-161) |
| 1 | TerminatorIndicator | 0x00 | End-of-Rule indicator. For rules that require multiple TLVs, this field may not be present in a given rule TLV. |

When carried in a Variable Container TLV, the *sClause* sub-attribute shall have the structure as defined in Table 14-155.

**Table 14-155—Field structure of *sClause* sub-attribute**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ClauseIndicator | 0x02 | The value that indicates the beginning of a new clause. |
| 1 | FieldCode | Varies | Value of *sFieldCode* sub-attribute, encoded as follows:<br>0x00: `LINK_INDEX` field<br>0x01: `DA` field<br>0x02: `SA` field<br>0x03: `ETYPE_LEN` field<br>0x04: `B_DA` field<br>0x05: `B_SA` field<br>0x06: `I_TAG` field<br>0x07: `S_TAG` field<br>0x08: `C_TAG` field<br>0x09: `MPLS_LSE` field<br>0x0A: `IP_TOS_TC` field<br>0x0B: `IP_TTL_HL` field<br>0x0C: `IP_PT` field<br>0x0D: `IPv4_DA` field<br>0x0E: `IPv6_DA` field<br>0x0F: `IPv4_SA` field<br>0x10: `IPv6_SA` field<br>0x11: `IPv6_NEXT_HEADER` field<br>0x12: `IPv6_FLOWLABEL` field<br>0x13: `TCP_UDP_SP` field<br>0x14: `TCP_UDP_DP` field<br>0x15: `B_TAG` field<br>0x16 to 0x17: reserved<br>0x18: `CUST_0` field<br>0x19: `CUST_1` field<br>0x1A: `CUST_2` field<br>0x1B: `CUST_3` field<br>0x1C: `CUST_4` field<br>0x1D: `CUST_5` field<br>0x1E: `CUST_6` field<br>0x1F: `CUST_7` field<br>0x20: reserved<br>0x21: `LLID_VALUE` field<br><br>For definitions of individual fields, see 6.5.2.1.1. |
| 1 | FieldInstance | Varies | Value of *sFieldInstance* sub-attribute |
| 1 | MaskMsb | Varies | Value of *sMaskMsb* sub-attribute |
| 1 | MaskLsb | Varies | Value of *sMaskLsb* sub-attribute |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Operator | Varies | Value of *sOperator* sub-attribute, encoded as follows:<br>0x00: NEVER operator<br>0x01: EQUAL operator<br>0x02: DIFFERENT operator<br>0x03: LESS_EQUAL operator<br>0x04: MORE_EQUAL operator<br>0x05: EXISTS operator<br>0x06: NOT_EXISTS operator<br>0x07: ALWAYS operator |
| 1 | MatchValLength | Varies | Length of the MatchVal field. If the Operator field is equal to NEVER, EXISTS, NOT_EXISTS, or ALWAYS, MatchValLength may be equal to 0x00, in which case the MatchVal field is not present. |
| Varies | MatchVal | Varies | Value of *sMaskVal* sub-attribute. |

When carried in a Variable Container TLV, the *sResult* sub-attribute for the frame actions NOP, DISCARD, and FORWARD shall have the structure as defined in Table 14-156.

**Table 14-156—Field structure of *sResult* sub-attribute (NOP, DISCARD, and FORWARD actions)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ResultIndicator | 0x03 | The value that indicates the beginning of a new result |
| 1 | FrameAction | Varies | Value of *sFrameAction* sub-attribute, encoded as follows:<br>0x00: NOP operation<br>0x01: DISCARD operation<br>0x02: FORWARD operation |

When carried in a Variable Container TLV, the *sResult* sub-attribute for the frame action QUEUE shall have the structure as defined in Table 14-157.

**Table 14-157—Field structure of *sResult* sub-attribute (QUEUE action)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ResultIndicator | 0x03 | The value that indicates the beginning of a new result |
| 1 | FrameAction | 0x03 | Value of *sFrameAction* sub-attribute indicating QUEUE operation |
| 4 | ObjectType | Varies | Value of *sQueueId* sub-attribute |

When carried in a Variable Container TLV, the *sResult* sub-attribute for the frame action SET shall have the structure as defined in Table 14-158.

**Table 14-158—Field structure of *sResult* sub-attribute (SET action)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ResultIndicator | 0x03 | The value that indicates the beginning of a new result |
| 1 | FrameAction | 0x04 | Value of *sFrameAction* sub-attribute indicating SET operation |
| 1 | FieldCode | Varies | Value of *sFieldCode* sub-attribute, encoded as shown in FieldCode field in Table 14-155 |
| 1 | FieldInstance | Varies | Value of *sFieldInstance* sub-attribute |
| 1 | MaskMsb | Varies | Value of *sMaskMsb* sub-attribute |
| 1 | MaskLsb | Varies | Value of *sMaskLsb* sub-attribute |
| 1 | FieldValueLength | Varies | Length of the FieldValue field |
| Varies | FieldValue | Varies | Value of *sFieldValue* sub-attribute |

When carried in a Variable Container TLV, the *sResult* sub-attribute for the frame action COPY shall have the structure as defined in Table 14-159.

**Table 14-159—Field structure of *sResult* sub-attribute (COPY action)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ResultIndicator | 0x03 | The value that indicates the beginning of a new result |
| 1 | FrameAction | 0x05 | Value of *sFrameAction* sub-attribute indicating COPY operation |
| 1 | FieldCode | Varies | Value of *sFieldCode* sub-attribute, encoded as shown in FieldCode field in Table 14-155 |
| 1 | FieldInstance | Varies | Value of *sFieldInstance* sub-attribute |
| 1 | MaskMsb | Varies | Value of *sMaskMsb* sub-attribute |
| 1 | MaskLsb | Varies | Value of *sMaskLsb* sub-attribute |

When carried in a Variable Container TLV, the *sResult* sub-attribute for the frame actions DELETE, INSERT, REPLACE, CLEAR_DELETE, and CLEAR_INSERT shall have the structure as defined in Table 14-160.

**Table 14-160—Field structure of *sResult* sub-attribute (DELETE, INSERT, REPLACE, CLEAR_DELETE, and CLEAR_INSERT actions)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ResultIndicator | 0x03 | The value that indicates the beginning of a new result |
| 1 | FrameAction | Varies | Value of *sFrameAction* sub-attribute, encoded as follows:<br>0x06: DELETE operation<br>0x07: INSERT operation<br>0x08: REPLACE operation<br>0x09: CLEAR_DELETE operation<br>0x0A: CLEAR_INSERT operation |
| 1 | FieldCode | Varies | Value of *sFieldCode* sub-attribute, encoded as shown in FieldCode field in Table 14-155 |
| 1 | FieldInstance | Varies | Value of *sFieldInstance* sub-attribute |

When carried in a Variable Container TLV, the *sResult* sub-attribute for the frame action `INC_COUNTER` shall have the structure as defined in Table 14-161.

**Table 14-161—Field structure of *sResult* sub-attribute (`INC_COUNTER` action)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ResultIndicator | 0x03 | The value that indicates the beginning of a new result |
| 1 | FrameAction | 0x0B | Value of *sFrameAction* sub-attribute indicating `INC_COUNTER` operation |
| 2 | CounterIndex | Varies | Value of *sCounterIndex* sub-attribute |

#### 14.4.6.2 Attribute *aRuleCustomField* (0xDB/0x05-02)

This attribute represents a custom field to be used in the frame classification rule. Each ONU port (PON port or UNI port) contains a table of ingress rules that are applied to the frames received on that port. Each field in that table is programmed with a specific field code. The field code describes the field parsed from the ingress frame in terms of protocol layer, Dword in the frame, bit start, and bit width.

This attribute consists of the following sub-attributes: *sFieldCode*, *sLayerSelect*, *sOffsetDword*, *sOffsetBitsLsb*, *sWidth*, and *sReferenceCount*.

Sub-attribute *aRuleCustomField.sFieldCode*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the code for the given field, with values specified in Table 14-155 for the `FieldCode` field. Only values `CUST_0`, `CUST_1`, `CUST_2`, `CUST_3`, `CUST_4`, `CUST_5`, `CUST_6`, and `CUST_7` are supported.

Sub-attribute *aRuleCustomField.sLayerSelect*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the code for the target layer, with values specified in Table 14-162.

**Table 14-162—*aRuleCustomField.sLayerSetect* sub-attribute**

| Value | Layer Code | Notes | Reference |
|---|---|---|---|
| 0x00 | L2_PREAMBLE | LLID, DA, SA, SNAP headers (if present) | Table 14-164, Table 14-165 |
| 0x01 | PREAMBLE_ MAC_IN_MAC | LLID, B-DA, B-SA, I-Tag | Table 14-166 |
| 0x02 | EtherType | L2 protocol type of remainder of the frame | Table 14-167 |
| 0x03 | S_TAG | All S-VLAN tags in the frame | Table 14-168 |
| 0x04 | C_TAG | All C-VLAN tags in the frame | Table 14-169 |
| 0x05 | MPLS | The MPLS stack, if any, in the frame | Table 14-170 |
| 0x06 | IPv4 | Frames with EtherType 0x08-00 | Table 14-171 |
| 0x07 | IPv6 | Frames with EtherType 0x86-DD | Table 14-172 |
| 0x08 | L3_GENERIC | Payload of a frame that is not IPv4 or IPv6 (according to the EtherType value) | — |
| 0x09 | TCP_UDP | IPv4 or IPv6 frames containing UDP or TCP (according to the IP type field) | Table 14-173 |
| 0x0A | L4_GENERIC | Payload of an IP frame that is not TCP or UDP | — |

Sub-attribute *aRuleCustomField.sOffsetDword*:

**Syntax:** Unsigned integer
**Range:** 0x01 to 0x08
**Remote access:** Read/Write
**Unit:** 4 octets
**Description:** This sub-attribute indicates the offset between the reference field (indicated by *sFieldCode* sub-attribute) and the target custom field.

Sub-attribute *aRuleCustomField.sOffsetBitsLsb*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0x1F
**Remote access:** Read/Write
**Unit:** 1 bit
**Description:** This sub-attribute indicates the offset between the start of the custom field (as indicated by the combination of *sOffsetDword* and *sFieldCode* sub-attributes) and the actual value within this custom field.

Sub-attribute *aRuleCustomField.sWidth*:

**Syntax:** Unsigned integer
**Range:** 0x01 to 0x20
**Remote access:** Read/Write
**Unit:** 1 bit
**Description:** This sub-attribute indicates the size of the target custom field.

Sub-attribute *aRuleCustomField.sReferenceCount*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the total number of *sClause* sub-attributes in the frame processing rules that are currently using this specific frame field. If the specific frame field is currently unused, the *sReferenceCount* sub-attribute contains the value of 0x00.
On read, this sub-attribute returns the total number of *sClause* sub-attributes in the frame processing rules that are currently using this specific frame field. Other sub-attributes (*sWidth*, *sOffsetBitsLsb*, *sOffsetDword*, and *sLayerSelect*) return then the maximum permitted value.
ONU shall ignore any request to write a value into this sub-attribute.

Frame fields with nonzero values returned by the *sReferenceCount* sub-attribute cannot be reprogrammed with the *eOAM_Set_Request* eOAMPDU. All frame processing rules using a given field need to be deleted first, reducing the value returned by the *sReferenceCount* sub-attribute to zero, before the meaning of that specific custom frame field may be changed.

The *aRuleCustomField* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aRuleCustomField* attribute shall be as specified in Table 14-163.

**Table 14-163—*Custom Field* TLV (0xDB/0x05-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x05-02 | Leaf identifier |
| 1 | Length | 0x06 | The size of TLV fields following the `Length` field |
| 1 | FieldCode | Varies | Value of *sFieldCode* sub-attribute, defined in Table 14-155 |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | LayerSelect | Varies | Value of *sLayerSelect* sub-attribute, defined in Table 14-162 |
| 1 | OffsetDword | Varies | Value of *sOffsetDword* sub-attribute |
| 1 | OffsetBitsLsb | Varies | Value of *sOffsetBitsLsb* sub-attribute |
| 1 | Width | Varies | Value of *sWidth* sub-attribute |
| 1 | ReferenceCount | Varies | When carried in *eOAM_Get_Response* eOAMPDU, this field represents the value of *sReferenceCount* sub-attribute.<br>When carried in *eOAM_Set_Request* eOAMPDU, this field is set to 0. |

#### 14.4.6.2.1 Preamble/L2 Header layer

The preamble/L2 layer consists of the LLID and L2 Ethernet header fields of the received frame. This layer also contains the Subnetwork Access Protocol (SNAP) headers if they are present.

Table 14-164 shows the offsets within this layer when the frame does not have SNAP encapsulation.

**Table 14-164—Preamble/L2 without SNAP**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reserved (Unknown) | | | | | | | | LLID Value | | | | | | | | | | | | | | | | Reserved | | | | | | | |
| Reserved (Always 0) | | | | | | | | | | | | | | | | L2 DA [47:32] | | | | | | | | | | | | | | |
| L2 DA [31:0] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L2 SA [47:16] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L2 SA [15:0] | | | | | | | | | | | | | | | | L2 Type Field [15:0] | | | | | | | | | | | | | | |

Table 14-165 shows the offsets into this layer when the frame has SNAP encapsulation.

**Table 14-165—Preamble/L2 with SNAP**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reserved (Unknown) | | | | | | | | LLID Value | | | | | | | | | | | | | | | | Reserved | | | | | | | |
| Reserved (Always 0) | | | | | | | | | | | | | | | | L2 DA [47:32] | | | | | | | | | | | | | | |
| L2 DA [31:0] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L2 SA [47:16] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L2 SA [15:0] | | | | | | | | | | | | | | | | L2 Length Field [15:0] | | | | | | | | | | | | | | |
| DSAP [7:0] | | | | | | | | SSAP [7:0] | | | | | | | | CTL [7:0] | | | | | | | | OUI [23:16] | | | | | | |
| OUI [15:0] | | | | | | | | | | | | | | | | L2 Type Field [15:0] | | | | | | | | | | | | | | |

#### 14.4.6.2.2 MAC-in-MAC layer

The MAC-in-MAC layer consists of the MAC-in-MAC encapsulation header, as specified in IEEE Std 802.1Q, including the B-DA, B-SA, and I-Tag fields. This layer exists only in MAC-in-MAC encapsulated frames, as determined by the presence of the I-Tag (a TPID value of 0x88-E7 immediately following the B-SA).

Table 14-166 shows the offsets into this layer.

**Table 14-166—MAC-in-MAC layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reserved (Unknown) | | | | | | | | LLID Value | | | | | | | | | | | | | | | | Reserved | | | | | | | |
| Reserved (Always 0) | | | | | | | | | | | | | | | | B-DA [47:32] | | | | | | | | | | | | | | | |
| B-DA [31:0] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B-SA [47:16] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B-SA [15:0] | | | | | | | | | | | | | | | | I-Tag TPID | | | | | | | | | | | | | | | |
| Reserved (Always 0) | | | | | | | | I-SID | | | | | | | | | | | | | | | | | | | | | | | |

#### 14.4.6.2.3 EtherType layer

The EtherType layer consists only of the 16-bit EtherType value, wherever it may be located in the source frame. Note that the `Length` value in an IEEE 802.3 format frame is not considered an EtherType value. In order to test whether the frame is of Ethernet II or IEEE 802.3 format, the existence of the EtherType needs to be tested.

Table 14-167 shows the offsets into this layer.

**Table 14-167—EtherType layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reserved (Unknown) | | | | | | | | | | | | | | | | Layer 2 EtherType | | | | | | | | | | | | | | | |

#### 14.4.6.2.4 S-VLAN layer

The S-VLAN tag layers consist of all S-VLAN tags identified in the frame. An S-VLAN tag is defined by the TPID value recognized by the frame parser, including the value specified in IEEE Std 802.1Q (0x88-A8).

Table 14-168 shows the offsets into this layer.

**Table 14-168—S-VLAN layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPID 0 | | | | | | | | | | | | | | | | PRI | | | C | VID 0 | | | | | | | | | | | |
| TPID 1 | | | | | | | | | | | | | | | | PRI | | | C | VID 1 | | | | | | | | | | | |
| TPID 2 | | | | | | | | | | | | | | | | PRI | | | C | VID 2 | | | | | | | | | | | |
| … | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

#### 14.4.6.2.5 C-VLAN layer

The C-VLAN tag layers consist of all C-VLAN tags identified in the frame. A C-VLAN tag is defined by the TPID value recognized by the frame parser, including the value specified in IEEE Std 802.1Q (0x81-00).

Table 14-169 shows the offsets into this layer.

**Table 14-169—C-VLAN layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TPID 0 | | | | | | | | | | | | | | | | PRI | | | C | VID 0 | | | | | | | | | | | |
| TPID 1 | | | | | | | | | | | | | | | | PRI | | | C | VID 1 | | | | | | | | | | | |
| TPID 2 | | | | | | | | | | | | | | | | PRI | | | C | VID 2 | | | | | | | | | | | |
| … | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

#### 14.4.6.2.6 Multiprotocol Label Switching (MPLS) layer

The MPLS Tags layer consists of all MPLS labels identified in the frame.

Table 14-170 shows the offsets into this layer.

**Table 14-170—MPLS layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Label 0 | | | | | | | | | | | | | | | | | | | | Exp 0 | | | S | TTL 0 | | | | | | | |
| Label 1 | | | | | | | | | | | | | | | | | | | | Exp 1 | | | S | TTL 1 | | | | | | | |
| Label 2 | | | | | | | | | | | | | | | | | | | | Exp 2 | | | S | TTL 2 | | | | | | | |

#### 14.4.6.2.7 IPv4 layer

The IPv4 layer exists only for frames with EtherType 0x08-00 and consists of the 32 octets of the standard IPv4 header, followed by any IPv4 options. Note the bit ordering in this layer is consistent with the other layers in this specification, but is the reverse of IETF documentation.

Table 14-171 shows the offsets into this layer.

**Table 14-171—IPv4 layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version | | | | Hdr Len | | | | Type of Service | | | | | | | | Length of datagram | | | | | | | | | | | | | | | |
| Identification | | | | | | | | | | | | | | | | Flags | | | Fragment Offset | | | | | | | | | | | |
| Time to Live | | | | | | | | Protocol | | | | | | | | Header Checksum | | | | | | | | | | | | | | | |
| Source IP Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destination IP Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IP Options (if any) … | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

#### 14.4.6.2.8 IPv6 field

The IPv6 layer exists only in frames with EtherType 0x86-DD and consists of the 40 octets of base the IPv6 header, followed by extension headers. Note the bit ordering in this layer is consistent with the other layers in this specification, but is the reverse of IETF documentation.

Table 14-172 shows the offsets into this layer. The IPv6 header shown in Table 14-172 represents the fixed IPv6 header, without Next Header.

**Table 14-172—IPv6 layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Version | | | | Traffic Class | | | | | | | | Flow Label | | | | | | | | | | | | | | | | | | | |
| Payload Length | | | | | | | | | | | | | | | | Next Header | | | | | | | | | | Hop Limit | | | | | |
| Source Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Source Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Source Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Source Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destination Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destination Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destination Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Destination Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

#### 14.4.6.2.9 Generic L3 layer

The Generic L3 layer consists of all octets after the VLAN or MPLS layers in frames that are not IP frames, that is, frames with EtherType values other than 0x08-00 or 0x86-DD. Rules that match custom fields in the Generic L3 layer likely need also to match the EtherType to ensure that the frame contains the expected protocol.

#### 14.4.6.2.10 TCP/UDP layer

The TCP/UDP layer consists of the octets of the standard TCP or UDP header if the frame is an IP frame (v4 or v6) and if the IP type indicates the presence of UDP or TCP.

Table 14-173 shows the offsets into this layer.

**Table 14-173—TCP/UDP layer**

| 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Source Port | | | | | | | | | | | | | | | | Destination Port | | | | | | | | | | | | | | | |

#### 14.4.6.2.11 Generic L4 layer

The Generic L4 layer consists of all octets after the IP header (v4 or v6) if the IP type is not UDP and not TCP. Rules that match custom fields in the Generic L4 layer likely need also to match the IP type field to ensure that the frame contains the expected protocol.

### 14.4.6.3 Attribute *aRuleTpidCAlter* (0xDB/0x05-03)

This attribute represents the alternative C-TPID value that is used to identify a C-VLAN tag in a frame, in addition to the value of 0x81-00 defined in IEEE Std 802.1Q.

This attribute consists of the following sub-attributes: *sTpidValue* and *sTpidDefault*.

Sub-attribute *aRuleTpidCAlter.sTpidValue*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Default value:** 0x81-00

**Description:** This sub-attribute indicates the alternative value for the C-TPID value, in addition to the value of 0x81-00. When configured on an ONU, the ONU accepts either the alternative value or 0x81-00 as indicating a C-VLAN tag.

Sub-attribute *aRuleTpidCAlter.sTpidDefault*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Defalut value:** `regular`
**Description:** This sub-attribute indicates whether the provisioned alternative C-TPID value is used as default C-TPID value when ONU inserts C-VLAN tags to ingress frames. The following values are defined:

`alternative`: the ONU uses the provisioned alternative C-TPID value when inserting C-VLAN tags.
`regular`: the ONU uses the IEEE Std 802.1Q-defined C-TPID value of 0x81-00 when inserting C-VLAN tags.

The *aRuleTpidCAlter* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aRuleTpidCAlter* attribute shall be as specified in Table 14-174.

**Table 14-174—*Alternative C-TPID* TLV (0xDB/0x05-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x05-03 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 2 | TpidValue | Varies | Value of *sTpidValue* sub-attribute |
| 1 | State | Varies | Value of *sTpidDefault* sub-attribute, as defined below:<br>`regular`: 0x01<br>`alternative`: 0x00 |

#### 14.4.6.4 Attribute *aRuleTpidSAlter* (0xDB/0x05-04)

This attribute represents the alternative S-TPID value on the ONU that is used to identify an S-VLAN tag in a frame, in addition to the value of 0x88-A8 defined in IEEE Std 802.1Q.

This attribute consists of the following sub-attributes: *sTpidValue* and *sTpidDefault*.

Sub-attribute *aRuleTpidSAlter.sTpidValue*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Default value:** 0x88-A8
**Description:** This sub-attribute indicates the alternative value for the S-TPID value, in addition to the value of 0x88-A8. When configured on an ONU, the ONU accepts either the alternative value or 0x88-A8 as indicating an S-VLAN tag.

Sub-attribute *aRuleTpidSAlter.sTpidDefault*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Defalut value:** `regular`
**Description:** This sub-attribute indicates whether the provisioned alternative S-TPID value is used as default S-TPID value when ONU inserts S-VLAN tags to ingress frames. The following values are defined:

`alternative`: the ONU uses the provisioned alternative S-TPID value when inserting S-VLAN tags.
`regular`: the ONU uses the IEEE Std 802.1Q-defined S-TPID value of 0x88-A8 when inserting S-VLAN tags.

The *aRuleTpidSAlter* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aRuleTpidSAlter* attribute shall be as specified in Table 14-175.

**Table 14-175—*Alternative S-TPID* TLV (0xDB/0x05-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x05-04 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 2 | TpidValue | Varies | Value of *sTpidValue* sub-attribute |
| 1 | State | Varies | Value of *sTpidDefault* sub-attribute, as defined below:<br>`alternative`: 0x01<br>`regular`: 0x00 |

#### 14.4.6.5 Attribute *aRuleIpmcFwrConfig* (0xDB/0x05-05)

This attribute represents the current configuration of the ONU indicating fields in a frame that are used to identify a unique IP multicast group. In some networks, the DA alone may not uniquely identify a group. This attribute is used to start or stop forwarding to the given multicast group.

This attribute consists of the following sub-attributes: *sFieldLlid*, *sFieldL2Sa*, *sFieldL2Da*, *sFieldL3Sa*, and *sFieldL3Da*.

Sub-attribute *aRuleIpmcFwrConfig.sFieldLlid*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `used`
**Description:** This sub-attribute indicates whether LLID is used to identify multicast group. The following values are defined:
`used`: LLID is used to identify multicast group.
`not_used`: LLID is not used to identify multicast group.

Sub-attribute *aRuleIpmcFwrConfig.sFieldL2Sa*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `not_used`
**Description:** This sub-attribute indicates whether C-SA is used to identify multicast group. The following values are defined:
`used`: C-SA is used to identify multicast group.
`not_used`: C-SA is not used to identify multicast group.

Sub-attribute *aRuleIpmcFwrConfig.sFieldL2Da*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `not_used`
**Description:** This sub-attribute indicates whether C-DA is used to identify multicast group. The following values are defined:

`used`: C-DA is used to identify multicast group.
`not_used`: C-DA is not used to identify multicast group.

Sub-attribute *aRuleIpmcFwrConfig.sFieldL3Sa*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `not_used`
**Description:** This sub-attribute indicates whether IP-SA is used to identify multicast group. The following values are defined:
`used`: IP-SA is used to identify multicast group.
`not_used`: IP-SA is not used to identify multicast group.

Sub-attribute *aRuleIpmcFwrConfig.sFieldL3Da*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `not_used`
**Description:** This sub-attribute indicates whether IP-DA is used to identify multicast group. The following values are defined:
`used`: IP-DA is used to identify multicast group.
`not_used`: IP-DA is not used to identify multicast group.

If L2 address fields are used, the L2 addresses are derived from the L3 IP addresses using the standard address mapping rules for IP multicast addresses, defined in IETF RFC 1112.

The *aRuleIpmcFwrConfig* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aRuleIpmcFwrConfig* attribute shall be as specified in Table 14-176.

**Table 14-176—*Multicast Group Identifier* TLV (0xDB/0x05-05)**

| Size (bits) | Field (name) | Value | Notes |
|---|---|---|---|
| 8 | Branch | 0xDB | Branch identifier |
| 16 | Leaf | 0x05-05 | Leaf identifier |
| 8 | Length | 0x02 | The size of TLV fields following the `Length` field |
| 1 | FieldLLID | 0/1 | 0: *sFieldLlid* is equal to `not_used`.<br>1: *sFieldLlid* is equal to `used`. |
| 1 | FieldL2Sa | 0/1 | 0: *sFieldL2Sa* is equal to `not_used`.<br>1: *sFieldL2Sa* is equal to `used`. |
| 1 | FieldL2Da | 0/1 | 0: *sFieldL2Da* is equal to `not_used`.<br>1: *sFieldL2Da* is equal to `used`. |
| 1 | FieldL3Sa | 0/1 | 0: *sFieldL3Sa* is equal to `not_used`.<br>1: *sFieldL3Sa* is equal to `used`. |
| 1 | FieldL3Da | 0/1 | 0: *sFieldL3Da* is equal to `not_used`.<br>1: *sFieldL3Da* is equal to `used`. |
| 11 | Pad | 0x00 | Ignored on reception |

#### 14.4.6.6 Attribute *aRuleTpidIAlter* (0xDB/0x05-06)

This attribute represents the alternative I-TPID value on the ONU that is used to identify an I-TAG tag in a frame, in addition to the standard IEEE Std 802.1Q-defined value of 0x88-E7.

This attribute consists of the following sub-attributes: *sTpidValue* and *sTpidDefault*.

Sub-attribute *aRuleTpidIAlter.sTpidValue*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Default value:** 0x88-E7
**Description:** This sub-attribute indicates the alternative value for the I-TPID value, in addition to the IEEE Std 802.1Q-defined value of 0x88-E7. When configured on an ONU, the ONU accepts either the alternative value or 0x88-E7 as indicating an I-TAG tag.

Sub-attribute *aRuleTpidIAlter.sTpidDefault*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `regular`
**Description:** This sub-attribute indicates whether the provisioned alternative I-TPID value is used as default I-TPID value when ONU inserts I-TAG tags to ingress frames. The following values are defined:

`alternative`: the ONU uses the provisioned alternative I-TPID value when inserting I-TAG tags
`regular`: the ONU uses the IEEE Std 802.1Q-defined I-TPID value of 0x88-E7 when inserting I-TAG tags.

The *aRuleTpidIAlter* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aRuleTpidIAlter* attribute shall be as specified in Table 14-177.

**Table 14-177—*Alternative I-TPID* TLV (0xDB/0x05-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x05-06 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 2 | TpidValue | Varies | Value of *sTpidValue* sub-attribute |
| 1 | State | Varies | Value of *sTpidDefault* sub-attribute, as defined below:<br>`alternative`: 0x01<br>`regular`: 0x00 |

### 14.4.6.7 Attribute *aRuleTpidBAlter* (0xDB/0x05-07)

This attribute represents the alternative B-TPID value on the ONU that is used to identify a B-Tag tag in a frame, in addition to the standard IEEE Std 802.1Q-defined value of 0x88-A8.

This attribute consists of the following sub-attributes: *sTpidValue* and *sTpidDefault*.

Sub-attribute *aRuleTpidBAlter.sTpidValue*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Default value:** 0x88-A8
**Description:** This sub-attribute indicates the alternative value for the B-TPID value, in addition to the IEEE Std 802.1Q-defined value of 0x88-A8. When configured on an ONU, the ONU accepts either the alternative value or 0x88-A8 as indicating a B-Tag tag.

Sub-attribute *aRuleTpidBAlter.sTpidDefault*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `regular`
**Description:** This sub-attribute indicates whether the provisioned alternative B-TPID value is used as default B-TPID value when ONU inserts B-Tag tags to ingress frames. The following values are defined:

`alternative`: the ONU uses the provisioned alternative B-TPID value when inserting B-Tag tags.
`regular`: the ONU uses the IEEE Std 802.1Q-defined B-TPID value of 0x88-A8 when inserting B-Tag tags.

The *aRuleTpidBAlter* attribute is associated with the PON Port or Service Port object (see 14.2.1). The Variable Container TLV for the *aRuleTpidBAlter* attribute shall be as specified in Table 14-178.

**Table 14-178—*Alternative B-TPID* TLV (0xDB/0x05-07)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x05-07 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 2 | TpidValue | Varies | Value of *sTpidValue* sub-attribute |
| 1 | State | Varies | Value of *sTpidDefault* sub-attribute, as defined below:<br>`alternative`: 0x01<br>`regular`: 0x00 |

### 14.4.7 Service-level agreements (SLAs)

#### 14.4.7.1 Attribute *aRateLimitBroadcast* (0xDB/0x06-01)

This attribute represents the limit of the number of broadcast frames that can be received through the selected UNI port.

Attribute *aRateLimitBroadcast*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Unit:** 1 frame/second
**Default value:** 20000
**Description:** This attribute indicates the limit for broadcast frames received at the selected UNI port. This value is expressed in units of frames/second.
The ONU shall disable the broadcast frame limitation function for the given UNI port on the write of the value of 0xFF-FF-FF-FF into this attribute.

The *aRateLimitBroadcast* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aRateLimitBroadcast* attribute shall be as specified in Table 14-179.

**Table 14-179—*Broadcast Rate Limit* TLV (0xDB/0x06-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x06-01 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x01 to 0x04 | The size of TLV fields following the `Length` field |
| 1..4 | RateLimitBroadcast | Varies | Value of *aRateLimitBroadcast* attribute |

#### 14.4.7.2 Attribute *aQueueCIR* (0xDB/0x06-04)

This attribute represents the current configuration of the CIR and CBS for the given queue. This attribute consists of the following sub-attributes: *sCBS* and *sCIR*.

Sub-attribute *aQueueCIR.sCBS*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Unit:** 256 octets
**Default value:** 0x00
**Description:** This sub-attribute indicates the CBS configured for the given queue. The following values are defined:

- 0x00-00: shaping is disabled.
- 0x00-01 to 0xFF-FF: shaping is enabled with CBS defined by *sCBS* sub-attribute.

Sub-attribute *aQueueCIR.sCIR*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Unit:** 1 kb/s
**Default value:** 0x00
**Description:** This sub-attribute indicates the CIR configured for the given queue.

The *aQueueCIR* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aQueueCIR* attribute shall be as specified in Table 14-180.

**Table 14-180—*Queue Committed Information Rate* TLV (0xDB/0x06-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x06-04 | Leaf identifier |
| 1 | Length | 0x06 | The size of TLV fields following the `Length` field |
| 2 | CBS | Varies | Value of *sCBS* sub-attribute |
| 4 | CIR | Varies | Value of *sCIR* sub-attribute |

#### 14.4.7.3 Attribute *aQueueEIR* (0xDB/0x06-06)

This attribute represents the current configuration of the ONU in terms of the EIR and EBS for the given queue. This attribute consists of the following sub-attributes: *sEBS* and *sEIR*.

Sub-attribute *aQueueEIR.sEBS*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read/Write
**Unit:** 256 octets
**Default value:** 0x00

**Description:** This sub-attribute indicates the EBS configured for the given queue. The following values are defined:

- 0x00-00: shaping is disabled.
- 0x00-01 to 0xFF-FF: shaping is enabled with EBS defined by *sEBS* sub-attribute.

Sub-attribute *aQueueEIR.sEIR*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Unit:** 1 kb/s
**Default value:** 0x00
**Description:** This sub-attribute indicates the EIR configured for the given queue.

The *aQueueEIR* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aQueueEIR* attribute shall be as specified in Table 14-181.

**Table 14-181—*Queue Excess Information Rate* TLV (0xDB/0x06-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x06-06 | Leaf identifier |
| 1 | Length | 0x06 | The size of TLV fields following the `Length` field |
| 2 | EBS | Varies | Value of *sEBS* sub-attribute |
| 4 | EIR | Varies | Value of *sEIR* sub-attribute |

#### 14.4.7.4 Attribute *aQueueColorMarking* (0xDB/0x06-07)

This attribute represents the current configuration of frame marking function according to particular shaper results, usually described as color values. When color marking is enabled, the field indicated in this TLV is overwritten before frame egress with the green or yellow color value according to the rate limiter results for that frame. This attribute consists of the following sub-attributes: *sStatus*, *sFieldCode*, *sFieldInstance*, *sMaskMsb*, *sMaskLsb*, *sValueGreen*, and *sValueYellow*.

Sub-attribute *aQueueColorMarking.sStatus*:

**Syntax:** Boolean
**Default value:** `disabled`
**Remote access:** Read/Write
**Description:** This sub-attribute indicates whether the color marking function is enabled. The following values are defined:

- `enabled`: the color marking function is enabled.
- `disabled`: the color marking function is disabled.

Sub-attribute *aQueueColorMarking.sFieldCode*:

**Syntax:** Enumeration
**Remote access:** Read/Write
**Default value:** `LINK_INDEX`
**Description:** This sub-attribute indicates the field in the processed frame that is targeted by this instance of *aQueueColorMarking* attribute. Individual values for the `FieldCode` field are defined in Table 14-155.

Sub-attribute *aQueueColorMarking.sFieldInstance*:

**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF

**Remote access:** Read/Write
**Default value:** 0x00
**Description:** See *aRuleSetConfig.sClause.sFieldInstance* for description in 14.4.6.1.1.

Sub-attribute *aQueueColorMarking.sMaskMsb*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the number of bits to ignore on the most significant side of the frame field identified by the *sFieldCode* sub-attribute.
The most-significant-bit and least-significant-bit masks (*sMaskMsb* and *sMaskLsb*) are used to reduce the number of field codes and provide flexibility for frame processing rules. A VLAN tag, for instance, is coded as one field (*sFieldCode*).

Sub-attribute *aQueueColorMarking.sMaskLsb*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the number of bits to ignore on the least significant side of the frame field identified by the *sFieldCode* sub-attribute.
The most-significant-bit and least-significant-bit masks (*sMaskMsb* and *sMaskLsb*) are used to reduce the number of field codes and provide flexibility for frame processing rules. A VLAN tag, for instance, is coded as one field (*sFieldCode*).

Sub-attribute *aQueueColorMarking.sValueGreen*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the value to be written into the field identified by *sFieldCode* and *sFieldInstance* sub-attributes, when the given frame is identified to be green.

Sub-attribute *aQueueColorMarking.sValueYellow*:
**Syntax:** Unsigned integer
**Range:** 0x00 to 0xFF
**Remote access:** Read/Write
**Default value:** 0x00
**Description:** This sub-attribute indicates the value to be written into the field identified by *sFieldCode* and *sFieldInstance* sub-attributes, when the given frame is identified to be “yellow”.

The *aQueueColorMarking* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aQueueColorMarking* attribute shall be as specified in Table 14-182.

**Table 14-182—*Queue Color Marking* TLV (0xDB/0x06-07)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x06-07 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x07 | The size of TLV fields following the `Length` field |
| 1 | Status | Varies | Value of *sStatus* sub-attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |
| 1 | FieldCode | Varies | Value of *sFieldCode* sub-attribute, defined in Table 14-155 |
| 1 | FieldInstance | Varies | Value of *sFieldInstance* sub-attribute |
| 1 | MaskMsb | Varies | Value of *sMaskMsb* sub-attribute |
| 1 | MaskLsb | Varies | Value of *sMaskLsb* sub-attribute |
| 1 | ValueGreen | Varies | Value of *sValueGreen* sub-attribute |
| 1 | ValueYellow | Varies | Value of *sValueYellow* sub-attribute |

#### 14.4.7.5 Attribute *aQueueRateLimiterCap* (0xDB/0x06-08)

This attribute represents the capabilities of queue rate limiting function. This attribute consists of the following sub-attributes: *sRateCount*, *sCbsIncrement*, *sCirIncrement*, *sEbsIncrement*, *sEirIncrement*, *sColorAware*, *sCouplingConfigurable*, *sCouplingDefault*, and *sColorMarking.*

Sub-attribute *aQueueRateLimiterCap.sRateCount*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Description:** This sub-attribute indicates how many instances of rate limiters are available; that is, how many different services can be independently controlled with this feature. A value of 0x00-00 indicates the rate limiting function is not supported.

Sub-attribute *aQueueRateLimiterCap.sCbsIncrement*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Unit:** 256 octets
**Description:** This sub-attribute indicates the minimum increment for the CBS parameter that can be enforced by the ONU.

Sub-attribute *aQueueRateLimiterCap.sCirIncrement*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Unit:** 1 kb/s
**Description:** This sub-attribute indicates the minimum increment for the CIR parameter that can be enforced by the ONU.

Sub-attribute *aQueueRateLimiterCap.sEbsIncrement*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Unit:** 256 octets
**Description:** This sub-attribute indicates the minimum increment for the EBS parameter that can be enforced by the ONU.

Sub-attribute *aQueueRateLimiterCap.sEirIncrement*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0xFF-FF
**Remote access:** Read-Only
**Unit:** 1 kb/s
**Description:** This sub-attribute indicates the minimum increment for the EIR parameter that can be enforced by the ONU.

Sub-attribute *aQueueRateLimiterCap.sColorAware*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the color-aware mode is enabled on the ONU. The following values are defined:
`disabled`: the color-aware mode is disabled.
`enabled`: the color-aware mode is enabled.

Sub-attribute *aQueueRateLimiterCap.sCouplingConfigurable*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the color coupling flag function is configurable. The following values are defined:
`configurable`: the color coupling flag function is configurable.
`not_configurable`:the color coupling flag function is not configurable.

Sub-attribute *aQueueRateLimiterCap.sCouplingDefault*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the default coupling flag behavior is enforced by the ONU. The following values are defined:
`disabled`: the color coupling flag function is disabled.
`enabled`: the color coupling flag function is enabled.

Sub-attribute *aQueueRateLimiterCap.sColorMarking*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the color marking function is supported. The following values are defined:
`supported`: the color marking function is supported.
`not_supported`: the color marking function is not supported.

The *aQueueRateLimiterCap* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aQueueRateLimiterCap* attribute shall be as specified in Table 14-183.

**Table 14-183—*Queue Rate Limiter Capabilities* TLV (0xDB/0x06-08)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x06-08 | Leaf identifier |
| 1 | Length | 0x0E | The size of TLV fields following the `Length` field |
| 2 | RateCount | Varies | Value of *sRateCount* sub-attribute |
| 2 | CbsIncrement | Varies | Value of *sCbsIncrement* sub-attribute |
| 2 | CirIncrement | Varies | Value of *sCirIncrement* sub-attribute |
| 2 | EbsIncrement | Varies | Value of *sEbsIncrement* sub-attribute |
| 2 | EirIncrement | Varies | Value of *sEirIncrement* sub-attribute |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | ColorAware | Varies | Value of *sColorAware* sub-attribute, defined as follows:<br>`disabled`: 0x00<br>`enabled`: 0x01 |
| 1 | CouplingConfigurable | Varies | Value of *sCouplingConfigurable* sub-attribute, defined as follows:<br>`not_configurable`: 0x00<br>`configurable`: 0x01 |
| 1 | CouplingDefault | Varies | Value of *sCouplingDefault* sub-attribute, defined as follows:<br>`disabled`: 0x00<br>`enabled`: 0x01 |
| 1 | ColorMarking | Varies | Value of *sColorMarking* sub-attribute, defined as follows:<br>`not_supported`: 0x00<br>`supported`: 0x01 |

#### 14.4.7.6 Attribute *aCouplingFlag* (0xDB/0x06-09)

This attribute represents the current configuration of the ONU for the value of the MEF 10.2 coupling flag for joint behavior of the CIR/EIR shapers.

Attribute *aCouplingFlag*:

**Syntax:** Boolean
**Default value:** `disabled`
**Remote access:** Read/Write
**Description:** This attribute indicates the value of the MEF 10.2 coupling flag for joint behavior of the CIR/EIR shapers. The following values are defined:
`disabled`: the coupling flag is disabled.
`enabled`: the coupling flag is enabled.

The *aCouplingFlag* attribute is associated with the Queue object (see 14.2.1). The Variable Container TLV for the *aCouplingFlag* attribute shall be as specified in Table 14-184.

**Table 14-184—*Coupling Flag* TLV (0xDB/0x06-09)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x06-09 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | CouplingFlag | Varies | Value of *aCouplingFlag* attribute, defined as follows:<br>`disabled`: 0x00<br>`enabled`: 0x01 |

### 14.4.8 Power saving

#### 14.4.8.1 Attribute *aOnuPwrSavingCap* (0xDB/0xFF-FF)

This attribute represents the capabilities of the power-saving mechanism.

This attribute consists of the following sub-attributes: *sPwrMode*, *sPwrEarlyWakeUp*, and *sVenSpecField.*

Sub-attribute *aOnuPwrSavingCap.sPwrMode*:

**Syntax:** Enumeration
**Remote access:** Read-Only
**Description:** This sub-attribute indicates the power-saving mode supported by the ONU. The following values are defined:

`mode_none`: ONU does not support power-saving mode.
`mode_tx`: only the Tx sleep mode is supported.
`mode_trx`: only the TRx sleep mode is supported.
`mode_tx_trx`: both the Tx and TRx sleep modes are supported.

Sub-attribute *aOnuPwrSavingCap.sPwrEarlyWakeUp*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the early wake-up function is supported on the ONU. The following values are defined:

`supported`: early wake-up function is supported.
`not_supported`: early wake-up function is not supported.

Sub-attribute *aOnuPwrSavingCap.sVenSpecField*:

**Syntax:** Vendor-specific
**Size (octets):** 120 (max)
**Remote access:** Read-Only
**Description:** This sub-attribute represents vendor-specific information associated with power-saving mode supported by the ONU

The *aOnuPwrSavingCap* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuPwrSavingCap* attribute shall be as specified in Table 14-185.

**Table 14-185—*ONU Power Saving Capabilities* TLV (0xDB/0xFF-FF)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0xFF-FF | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field, calculated as 3 + *N*, where *N* = *VenSpecFieldSize* |
| 1 | PwrMode | Varies | Value of *sPwrMode* sub-attribute, defined as follows:<br>`mode_none`: 0x00<br>`mode_tx`: 0x01<br>`mode_trx`: 0x02<br>`mode_tx_trx`: 0x03 |
| 1 | PwrEarlyWakeUp | Varies | Value of *sPwrEarlyWakeUp* sub-attribute, defined as follows:<br>`supported`: 0x00<br>`not_supported`: 0x01 |
| 1 | VenSpecFieldSize | Varies | Size of the `VenSpecField` field, expressed in units of octets |
| *N* | VenSpecField | Varies | Value of*sVenSpecField* sub-attribute |

### 14.4.9 Optical Link Protection

#### 14.4.9.1 Attribute *aOnuProtectionCapability* (0xDB/0x09-00)

This attribute represents the ONU's optical link protection capabilities, including support for trunk and tree protection modes. This attribute consists of the following sub-attributes: *sSupportTrunk*, *sSupportTreeLine*, and *sSupportTreeClient*.

Sub-attribute *aOnuProtectionCapability.sSupportTrunk*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the trunk protection scheme (**TBD**). The following values are defined:

`supported`: Trunk protection scheme is supported.
`not_supported`: Trunk protection scheme is not supported.

Sub-attribute *aOnuProtectionCapability.sSupportTreeLine*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the tree protection scheme (9.3.4) utilizing L-ONU protection switching (9.3.2.1.1). The following values are defined:

`supported`: Tree protection scheme with L-ONU protection switching is supported.
`not_supported`: Tree protection scheme with L-ONU protection switching is not supported.

Sub-attribute *aOnuProtectionCapability.sSupportTreeClient*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether the ONU supports the tree protection scheme (9.3.4) utilizing C-ONU protection switching (9.3.2.1.2). The following values are defined:

`supported`: Tree protection scheme with C-ONU protection switching is supported.
`not_supported`: Tree protection scheme with C-ONU protection switching is not supported.

The *aOnuProtectionCapability* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aProtectionCapability* attribute shall be as specified in Table 14-186.

**Table 14-186—*ONU Protection Capability* TLV (0xDB/0x09-00)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x09-00 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 1 | SupportTrunk | Varies | Value of *sSupportTrunk* sub-attribute, defined as follows:<br>`supported`: 0x01<br>`not_supported`: 0x00 |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | SupportTreeLine | Varies | Value of *sSupportTreeLine* sub-attribute, defined as follows:<br>`supported`: 0x01<br>`not_supported`: 0x00 |
| 1 | SupportTreeClient | Varies | Value of *sSupportTreeClient* sub-attribute, defined as follows:<br>`supported`: 0x01<br>`not_supported`: 0x00 |

#### 14.4.9.2 Attribute *aOnuConfigProtection* (0xDB/0x09-01)

This attribute represents the protection function configuration of the ONU, including the duration of the optical and MAC loss-of-signal detection thresholds. This attribute consists of the following sub-attributes: *sLosOptical* and *sLosMac*.

Sub-attribute *aOnuConfigProtection.sLosOptical*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0x03-E8 (1 second)
**Default value:** 0x00-02
**Unit:** 1 ms
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the period of time that has to elapse before the ONU moves to the HOLD_OVER_START state (see 9.3.3.3) if no optical signal is detected.

Sub-attribute *aOnuConfigProtection.sLosMac*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0x03-E8 (1 second)
**Default value:** 0x00-32 (50 ms)
**Unit:** 1 ms
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the period of time that has to elapse before the ONU moves to the HOLD_OVER_START state if no *GATE* MPCPDU is received. This attribute corresponds to the `gate_timeout` as specified in IEEE Std 802.3, 64.3.5.1 and 77.3.5.1.

The *aOnuConfigProtection* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuConfigProtection* attribute shall be as specified in Table 14-187.

**Table 14-187—*ONU Protection Configuration* TLV (0xDB/0x09-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x09-01 | Leaf identifier |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field |
| 2 | LosOptical | Varies | Value of *sLosOptical* sub-attribute |
| 2 | LosMac | Varies | Value of *sLosMac* sub-attribute |

#### 14.4.9.3 Attribute *aOnuConfigPonActive* (0xDB/0x09-02)

This attribute represents the active PON port on the ONU.

Attribute *aOnuConfigPonActive*

**Syntax:** Unsigned integer
**Size (octets):** 1
**Default value:** 0x00
**Remote access:** Read/Write
**Description:** This attribute represents the index of the active PON port on the ONU. Individual PON ports are numbered sequentially starting with 0x00. For ONU supporting the tree protection mode, the PON port 0x00 is designated as the primary port, and the PON port 0x01 is designated as the backup port. Either the primary or the backup port can be in active (i.e., working) state. A port that is not in the working state is in the standby state.

The *aOnuConfigPonActive* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuConfigPonActive* attribute shall be as specified in Table 14-188.

**Table 14-188—*PON Interface Administrate* TLV (0xDB/0x09-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x09-02 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | PonPortActive | Varies | Value of *aOnuConfigPonActive* attribute |

#### 14.4.9.4 Attribute *aOnuConfigHoldoverPeriod* (0xDB/0x09-03)

This attribute represents the support for the timestamp drift prevention mechanism on the ONU, including its administrative status and duration of the holdover status, loaded to `timerHoldOver`, as defined in 9.3.3. This attribute consists of the following sub-attributes: *sAdminStatus* and *sHoldOverPeriod*.

Sub-attribute *aOnuConfigHoldoverPeriod.sAdminStatus*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `enabled`
**Description:** This sub-attribute represents the administrative status of the timestamp drift prevention mechanism on the given ONU. Individual values have the following meanings:

`disabled`: timestamp drift prevention mechanism is disabled.
`enabled`: timestamp drift prevention mechanism is enabled.

Sub-attribute *aOnuConfigHoldoverPeriod.sHoldOverPeriod*:

**Syntax:** Unsigned integer
**Range:** 0x00-00 to 0x03-E8 (1 second)
**Remote access:** Read/Write
**Unit:** 1 ms
**Default value:** 0x00-C8
**Description:** This sub-attribute represents the value loaded into the `timerHoldOver` timer, as defined in 9.3.3.

The *aOnuConfigHoldoverPeriod* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aOnuConfigHoldoverPeriod* attribute shall be as specified in Table 14-189.

**Table 14-189—*ONU Config HoldOver Period* TLV (0xDB/0x09-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x09-03 | Leaf identifier |
| 1 | Length | 0x08 | The size of TLV fields following the `Length` field |
| 4 | AdminStatus | Varies | Value of *sAdminStatus* sub-attribute, defined as follows:<br>`disabled`: 0x00-00-00-01<br>`enabled`: 0x00-00-00-02 |
| 4 | HoldOverPeriod | Varies | Value of *sHoldOverPeriod* sub-attribute, mapped into the 4-octet-wide value, right justified. |

### 14.4.10 Clock transport

#### 14.4.10.1 Attribute *aClockTranspCapab* (0xDB/0x07-01)

This attribute represents the ONU's clock transport capabilities, including support for one-pulse-per-second (1PPS), time-of-day (ToD), and IEEE 1588v2 timing interfaces, on the selected UNI port. This attribute consists of the following sub-attributes: *sSupport1PPS*, *sSupportToD*, and *sSupport1588v2*.

Sub-attribute *aClockTranspCapab.sSupport1PPS*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether 1PPS interface is supported on the selected UNI port. The following values are defined:
`supported`: 1PPS is supported on the selected UNI port.
`not_supported`: 1PPS is not supported on the selected UNI port.

Sub-attribute *aClockTranspCapab.sSupportToD*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether ToD interface is supported on the selected UNI port. The following values are defined:
`supported`: ToD is supported on the selected UNI port.
`not_supported`: ToD is not supported on the selected UNI port.

Sub-attribute *aClockTranspCapab.sSupport1588v2*:

**Syntax:** Boolean
**Remote access:** Read-Only
**Description:** This sub-attribute indicates whether IEEE 1588v2 interface is supported on the selected UNI port. The following values are defined:
`supported`: IEEE 1588v2 is supported on the selected UNI port.
`not_supported`: IEEE 1588v2 is not supported on the selected UNI port.

The *aClockTranspCapab* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aClockTranspCapab* attribute shall be as specified in Table 14-190.

**Table 14-190—*Clock Transport Capability* TLV (0xDB/0x07-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | Leaf | 0x07-01 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 1 | Support1PPS | Varies | Value of *sSupport1PPS* sub-attribute, defined as follows:<br>`supported`: 0x01<br>`not_supported`: 0x00 |
| 1 | SupportToD | Varies | Value of *sSupportToD* sub-attribute, defined as follows:<br>`supported`: 0x01<br>`not_supported`: 0x00 |
| 1 | Support1588v2 | Varies | Value of *sSupport1588v2* sub-attribute, defined as follows:<br>`supported`: 0x01<br>`not_supported`: 0x00 |

#### 14.4.10.2 Attribute *aClockTranspStatus* (0xDB/0x07-02)

This attribute represents the current status of different timing and synchronization interfaces (1PPS, ToD, and IEEE 1588v2) on the selected UNI port. This attribute consists of the following sub-attributes: *sStatus1PPS*, *sStatusToD*, and *sStatus1588v2*.

Sub-attribute *aClockTranspStatus.sStatus1PPS*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disabled`
**Description:** This sub-attribute indicates whether 1PPS interface is enabled on the selected UNI port. The following values are defined:
`enabled`: 1PPS interface is enabled on the selected UNI port.
`disabled`: 1PPS interface is disabled on the selected UNI port.

Sub-attribute *aClockTranspStatus.sStatusToD*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disabled`
**Description:** This sub-attribute indicates whether ToD interface is enabled on the selected UNI port. The following values are defined:
`enabled`: ToD interface is enabled on the selected UNI port.
`disabled`: ToD interface is disabled on the selected UNI port.

Sub-attribute *aClockTranspStatus.sStatus1588v2*:

**Syntax:** Boolean
**Remote access:** Read/Write
**Default value:** `disabled`
**Description:** This sub-attribute indicates whether IEEE 1588v2 interface is enabled on the selected UNI port. The following values are defined:
`enabled`: IEEE 1588v2 interface is enabled on the selected UNI port.
`disabled`: IEEE 1588v2 interface is disabled on the selected UNI port.

The *aClockTranspStatus* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aClockTranspStatus* attribute shall be as specified in Table 14-191.

**Table 14-191—*Clock Transport Admin Status* TLV (0xDB/0x07-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x07-02 | Leaf identifier |
| 1 | Length | 0x03 | The size of TLV fields following the `Length` field |
| 1 | Status1PPS | Varies | Value of *sStatus1PPS* sub-attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |
| 1 | StatusToD | Varies | Value of *sStatusToD* sub-attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |
| 1 | Status1588v2 | Varies | Value of *sStatus1588v2* sub-attribute, defined as follows:<br>`enabled`: 0x01<br>`disabled`: 0x00 |

#### 14.4.10.3 Attribute *aClockTranspTransfer* (0xDB/0x07-03)

This attribute represents the time reference for the next ToD synchronization event, containing information on the reference MPCP clock time and the optional ToD value when the local ONU MPCP clock reaches the reference MPCP clock value. This attribute consists of the following sub-attributes: *sMpcpRefClock* and *sStringToD*.

Sub-attribute *aClockTranspTransfer.sMpcpRefClock*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Unit:** 1 TQ
**Description:** This sub-attribute indicates the reference MPCP clock value (local to the ONU) when the next synchronization event takes place.

Sub-attribute *aClockTranspTransfer.sStringToD*:

**Syntax:** String
**Size (octets):** 120 (max)
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the ToD string provided on the 1PPS+ToD interface on the ONU when the next synchronization event takes place. The format of the ToD string is implementation dependent and may contain all ASCII characters, including NULL and other nonprintable characters.

The *aClockTranspTransfer* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aClockTranspTransfer* attribute shall be as specified in Table 14-192.

**Table 14-192—*Clock Transfer Time* TLV (0xDB/0x07-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x07-03 | Leaf identifier |
| 1 | Length | 4+*N* | The size of TLV fields following the `Length` field, calculated as 4 + *N*, where *N* = length of the *sStringToD* sub-attribute |
| 4 | MpcpRefClock | Varies | Value of *sMpcpRefClock* sub-attribute |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| *N* | StringToD | Varies | Value of *sStringToD* sub-attribute |

#### 14.4.10.4 Attribute *aClockTranspPropagParam* (0xDB/0x07-04)

This attribute represents the effective refractive index of the fiber in use to this ONU in the upstream and downstream wavelengths, multiplied by $2^{24}$, i.e., there is an implied radix point after the most significant 8 bits of this value. This attribute consists of the following sub-attributes: *sDown* and *sUp*.

Sub-attribute *aClockTranspPropagParam.sDown*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Default value:** 0x01-99-99-99
**Remote access:** Read/Write
**Unit:** dimensionless
**Description:** This sub-attribute indicates the effective refractive index of the fiber at the downstream transmission wavelength defined by IEEE Std 802.3.

Sub-attribute *aClockTranspPropagParam.sUp*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Default value:** 0x01-99-99-99
**Remote access:** Read/Write
**Unit:** dimensionless
**Description:** This sub-attribute indicates the effective refractive index of the fiber at the upstream transmission wavelength defined by IEEE Std 802.3.

The *aClockTranspPropagParam* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aClockTranspPropagParam* attribute shall be as specified in Table 14-193.

**Table 14-193—*Clock Transfer Propagation Parameters* TLV (0xDB/0x07-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x07-04 | Leaf identifier |
| 1 | Length | 0x08 | The size of TLV fields following the `Length` field |
| 4 | Down | Varies | Value of *sDown* sub-attribute |
| 4 | Up | Varies | Value of *sUp* sub-attribute |

#### 14.4.10.5 Attribute *aClockTranspRtt* (0xDB/0x07-05)

This attribute represents the latest value of the round-trip time (RTT) measured by the OLT for the given ONU, using the mechanisms defined by IEEE Std 802.3 for EPON.

Attribute *aClockTranspRtt*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-00 to 0xFF-FF-FF-FF
**Remote access:** Read/Write
**Unit:** 1 TQ
**Description:** This attribute indicates the RTT value for the given ONU, measured by the OLT using the mechanisms defined by IEEE Std 802.3 for EPON.

The *aClockTranspRtt* attribute is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *aClockTranspRtt* attribute shall be as specified in Table 14-194.

**Table 14-194—*Clock Transfer RTT* TLV (0xDB/0x07-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x07-05 | Leaf identifier |
| 1 | Length | 0x04 | The size of TLV fields following the `Length` field |
| 4 | ClockTranspRtt | Varies | Value of *aClockTranspRtt* attribute |

### 14.4.11 UNI management

#### 14.4.11.1 Attribute *aEeeStatus* (0xDB/0x08-20)

This attribute represents the status of the Energy Efficient Ethernet (EEE) functon on the given UNI port on the ONU. When the EEE function is not supported on the given UNI port, the ONU returns the value of *not_supported*.

Attribute *aEeeStatus*:

**Syntax:** Enumeration
**Remote access:** Read-Only
**Description:** This attribute represents the status of the EEE function on the given UNI port on the ONU. The following values are defined:

`not_supported`: EEE function is not supported
`enabled`: EEE function is enabled
`disabled`: EEE function is disable.

The *aEeeStatus* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aEeeStatus* attribute shall be as specified in Table 14-195.

**Table 14-195—*EEE Status* TLV (0xDB/0x08-00)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x08-20 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | EeeStatus | Varies | Value of *aEeeStatus* attribute, defined as follows:<br>`not_supported`: 0x02<br>`enabled`: 0x01<br>`disabled`: 0x00 |

#### 14.4.11.2 Attribute *aPoeStatus* (0xDB/0x08-21)

This attribute represents the status of the Power over Ethernet (PoE) functon on the given UNI port on the ONU. If the PoE function is not supported by the given UNI port, the ONU returns the value of *not_supported*.

Attribute *aPoeStatus*:

**Syntax:** Enumeration
**Remote access:** Read-Only

**Description:** This attribute represents the status of the PoE function on the given UNI port on the ONU. The following values are defined:

`not_supported`: the PoE function is not supported
`enabled`: the PoE function is enabled.
`disabled`: the PoE function is disabled.

The *aPoeStatus* attribute is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *aPoeStatus* attribute shall be as specified in Table 14-196.

**Table 14-196—*PoE Status* TLV (0xDB/0x08-21)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDB | Branch identifier |
| 2 | Leaf | 0x08-21 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | PoeStatus | Varies | Value of *aPoeServicePort* attribute, defined as follows:<br>`not_supported`: 0x02<br>`enabled`: 0x01<br>`disabled`: 0x00 |

## 14.5 Branch 0x09 "basic actions"

This subclause lists basic management actions, which are part of the definitions in IEEE Std 802.3, Clause 30. The basic management actions shown in Table 14-197 shall be supported.

**Table 14-197—Basic actions defined in branch 0x09**

| Leaf | Actions | Defined in |
|---|---|---|
| 0x00-05 | acPhyAdminControl | 14.5.1 |
| 0x00-0B | acAutoNegRestartAutoConfig | 14.5.2 |
| 0x00-0C | acAutoNegAdminControl | 14.5.3 |

All other `Leaf` values are reserved and ignored on reception.

### 14.5.1 Attribute *acPhyAdminControl* (0x09/0x00-05)

This action provides a means to enable or disable a UNI port PHY.

Action *acPhyAdminControl*:

**Syntax:** Boolean
**Remote access:** Write-only
**Description:** The behavior of this action is defined in IEEE Std 802.3, 30.3.2.2.1. The following values are defined:

`enable`: enable PHY.
`disable`: disable PHY.

The *acPhyAdminControl* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acPhyAdminControl* attribute shall be as specified in Table 14-198.

**Table 14-198—*PHY Admin Control* TLV (0x09/0x00-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x09 | Branch identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | Leaf | 0x00-05 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | PhyAdminControl | Varies | Value of *acPhyAdminControl* attribute, defined as follows:<br>`enable`: 0x02<br>`disable`: 0x01 |

### 14.5.2 Attribute acAutoNegRestartAutoConfig (0x09/0x00-0B)

This action forces a UNI port to renegotiate the Auto-Negotiation parameters. This action has no effect if Auto-Negotiation signaling is disabled. The behavior of this action is defined in IEEE Std 802.3, 30.6.1.2.1.

The *acAutoNegRestartAutoConfig* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acAutoNegRestartAutoConfig* attribute shall be as specified in Table 14-199.

**Table 14-199—*UNI Auto-Negotiation Restart* TLV (0x09/0x00-0B)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x09 | Branch identifier |
| 2 | Leaf | 0x00-0B | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

### 14.5.3 Attribute *acAutoNegAdminControl* (0x09/0x00-0C)

This action provides a means to turn Auto-Negotiation signaling on or off.

Action *acAutoNegAdminControl*:

**Syntax:** Boolean
**Remote access:** Write-only
**Description:** The behavior of this action is defined in IEEE Std 802.3, 30.6.1.2.2. The following values are defined:
`enable`: enable Auto-Negotiation signaling.
`disable`: disable Auto-Negotiation signaling.

The *acAutoNegAdminControl* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acAutoNegAdminControl* attribute shall be as specified in Table 14-200.

**Table 14-200—*UNI Auto-Negotiation Admin Control* TLV (0x09/0x00-0C)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0x09 | Branch identifier |
| 2 | Leaf | 0x00-0C | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | AutoNegAdminControl | Varies | Value of *acAutoNegAdminControl* attribute, defined as follows:<br>`enable`: 0x02<br>`disable`: 0x01 |

## 14.6 Branch 0xDD “extended actions”

This subclause specifies a set of extended management actions used by the OLT to enforce a specific behavior in the ONU. The extended management actions shown in Table 14-201 shall be supported ~~by this profile~~.

**Table 14-201—Extended actions defined in branch 0xDD**

| Leaf | Attribute | Defined in |
|---|---|---|
| Object group: ONU management | | |
| 0x00-01 | acOnuReboot | 14.6.1.1 |
| Object group: Bridging | | |
| 0x01-01 | acMacClearDynamicTable | 14.6.2.1 |
| 0x01-02 | acMacAddDynamicAddress | 14.6.2.2 |
| 0x01-03 | acMacDeleteDynamicAddress | 14.6.2.3 |
| 0x01-04 | acMacClearStaticTable | 14.6.2.4 |
| 0x01-05 | acMacAddStaticAddress | 14.6.2.5 |
| 0x01-06 | acMacDeleteStaticAddress | 14.6.2.6 |
| 0x01-08 | acGetUniMacLearned | 14.6.2.7 |
| 0x01-20 | acConfigLlid | 14.6.2.8 |
| 0x01-21 | acConfigServicePort | 14.6.2.9 |
| Object group: Statistics and counters | | |
| 0x02-01 | acCountersClear | 14.6.3.1 |
| Object group: Alarms | | |
| 0x03-01 | acAlarmGetCurrentSummary | 14.6.4.1 |
| Object group: Frame processing | | |
| 0x05-01 | acRulesClearAll | 14.6.5.1 |
| 0x05-02 | acRulesAddOne | 14.6.5.2 |
| 0x05-03 | acRulesDeleteOne | 14.6.5.3 |
| Object group: Transmission control | | |
| 0x06-01 | acEnableUserTraffic | 14.6.6.1 |
| 0x06-02 | acDisableUserTraffic | 14.6.6.2 |
| 0x06-03 | acLoopbackEnable | 14.6.6.3 |
| 0x06-04 | acLoopbackDisable | 14.6.6.4 |
| 0x06-05 | acLaserTxPowerOff | 14.6.6.5 |
| Object group: Power management | | |
| 0x07-01 | acEeeChangeState | 14.6.7.1 |
| 0x07-02 | acPoeChangeState | 14.6.7.2 |

All other `Leaf` values are reserved and ignored on reception.

### 14.6.1 ONU management

#### 14.6.1.1 Action *acOnuReboot* (0xDD/0x00-01)

This action is used by the OLT to request the ONU to perform a reboot (power cycle).

The *acOnuReboot* action is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *acOnuReboot* action shall be as specified in Table 14-202.

**Table 14-202—*ONU Reboot* TLV (0xDD/0x00-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x00-01 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

### 14.6.2 Bridging

#### 14.6.2.1 Action *acMacClearDynamicTable* (0xDD/0x01-01)

This action is used by the OLT to request the ONU to clear the content of the table storing dynamically learned MAC addresses. The MAC address table may be associated with a particular UNI port or with the ONU as a whole, i.e., all UNI ports on the given ONU.

The *acMacClearDynamicTable* action is associated with the UNI Port or the ONU object (see 14.2.1). The Variable Container TLV for the *acMacClearDynamicTable* action shall be as specified in Table 14-203.

**Table 14-203—*Clear Dynamic MAC Table* TLV (0xDD/0x01-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-01 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

#### 14.6.2.2 Action *acMacAddDynamicAddress* (0xDD/0x01-02)

This action is used by the OLT to add at least one dynamic MAC address to the table storing dynamically learned MAC addresses, associated with the given UNI port. This action consists of the following sub-attributes: *sCount* and *sMacAddress[sCount]*.

Sub-attribute *acMacAddDynamicAddress.sCount*:

**Syntax:** Unsigned Integer
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the number of MAC address to be added to the dynamic MAC address table.

Sub-attribute *acMacAddDynamicAddress.sMacAddress[sCount]*:

**Syntax:** MAC address
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the MAC address to be added to the dynamic MAC address table.

A single *Add Dynamic MAC Address* TLV (0xDD/0x01-02) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Add Dynamic MAC Address* TLV (0xDD/0x01-02) can be used within the same eOAMPDU to deliver the list of dynamic MAC addresses to populate the list of dynamic MAC addresses on the given UNI port.

In this case, the subsequent instance of the *Add Dynamic MAC Address* TLV (0xDD/0x01-02) provides the continuation of the list of dynamic MAC addresses received in the previous instance of the *Add Dynamic MAC Address* TLV (0xDD/0x01-02).

The *acMacAddDynamicAddress* action may also require more than one eOAMPDU to deliver all the *sMacAddress[sCount]* sub-attributes to the ONU. In such a case, each eOAMPDU carries the *Sequence* TLV (0xDB/0x00-01) to indicate that the OLT request spans multiple eOAMPDUs.

The *acMacAddDynamicAddress* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acMacAddDynamicAddress* action shall be as specified in Table 14-204.

**Table 14-204—*Add Dynamic MAC Address* TLV (0xDD/0x01-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-02 | Leaf identifier |
| 1 | Length | $6 \times K$ | The size of TLV fields following the `Length` field, calculated as $6 \times K$, is the number of MAC addresses present in this TLV ($K = M - N + 1 \leq 21$) |
| 6 | MacAddress[N] | Varies | Value of *sMacAddress[N]* sub-attribute |
| … | … | … | … |
| 6 | MacAddress[M] | Varies | Value of *sMacAddress[M]* sub-attribute |

#### 14.6.2.3 Action acMacDeleteDynamicAddress (0xDD/0x01-03)

This action is used by the OLT to delete at least one dynamic MAC address from the table storing dynamically learned MAC addresses, associated with the given UNI port. This action consists of the following sub-attributes: *sCount* and *sMacAddress[sCount]*.

Sub-attribute *acMacDeleteDynamicAddress.sCount*:

**Syntax:** Unsigned Integer
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the number of MAC address to be deleted from the dynamic MAC address table.

Sub-attribute *acMacDeleteDynamicAddress.sMacAddress[sCount]*:

**Syntax:** MAC address
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the MAC address to be deleted from the dynamic MAC address table.

A single *Delete Dynamic MAC Address* TLV (0xDD/0x01-03) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Delete Dynamic MAC Address* TLV (0xDD/0x01-03) can be used within the same eOAMPDU to deliver the list of dynamic MAC addresses to be removed from the list of dynamic MAC addresses on the given UNI port.

In this case, the subsequent instance of the *Delete Dynamic MAC Address* TLV (0xDD/0x01-03) provides the continuation of the list of dynamic MAC addresses starting from the position following the last sub-attribute received in the previous instance of the *Delete Dynamic MAC Address* TLV (0xDD/0x01-03).

The *acMacDeleteDynamicAddress* action may also require more than one eOAMPDU to deliver all the *sMacAddress[sCount]* sub-attributes to the ONU. In such a case, each eOAMPDU carries the *Sequence* TLV (0xDB/0x00-01) to indicate that the ONU request spans multiple eOAMPDUs.

The *acMacDeleteDynamicAddress* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acMacDeleteDynamicAddress* action shall be as specified in Table 14-205.

**Table 14-205—*Delete Dynamic MAC Address* TLV (0xDD/0x01-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-03 | Leaf identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Length | $6 \times K$ | The size of TLV fields following the `Length` field, calculated as $6 \times K$, is the number of MAC addresses present in this TLV ($K = M - N + 1 \leq 21$) |
| 6 | MacAddress[N] | Varies | Value of *sMacAddress[N]* sub-attribute |
| … | … | … | … |
| 6 | MacAddress[M] | Varies | Value of *sMacAddress[M]* sub-attribute |

#### 14.6.2.4 Action *acMacClearStaticTable* (0xDD/0x01-04)

This action is used by the OLT to request the ONU to clear the content of the table storing statically provisioned MAC addresses. The MAC address table may be associated with a particular UNI port or with the ONU as a whole, i.e., all UNI ports on the given ONU.

The *acMacClearStaticTable* action is associated with the UNI Port or the ONU object (see 14.2.1). The Variable Container TLV for the *acMacClearStaticTable* action shall be as specified in Table 14-206.

**Table 14-206—*Clear Static MAC Table* TLV (0xDD/0x01-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-04 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

#### 14.6.2.5 Action *acMacAddStaticAddress* (0xDD/0x01-05)

This action is used by the OLT to add at least one MAC address to the table storing statically configured MAC addresses, associated with the given UNI port. This action consists of the following sub-attributes: *sCount* and *sMacAddress[sCount]*.

Sub-attribute *acMacAddStaticAddress.sCount*:

**Syntax:** Unsigned Integer
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the number of MAC address to be added to the static MAC address table.

Sub-attribute *acMacAddStaticAddress.sMacAddress[sCount]*:

**Syntax:** MAC address
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the MAC address to be added to the static MAC address table.

A single *Add Static MAC Address* TLV (0xDD/0x01-05) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Add Static MAC Address* TLV (0xDD/0x01-05) can be used within the same eOAMPDU to deliver the list of static MAC addresses to populate the list of static MAC addresses on the given UNI port.

In this case, the subsequent instance of the *Add Static MAC Address* TLV (0xDD/0x01-05) provides the continuation of the list of static MAC addresses starting from the position following the last sub-attribute received in the previous instance of the *Add Static MAC Address* TLV (0xDD/0x01-05).

The *acMacAddStaticAddress* action may also require more than one eOAMPDU to deliver all the *sMacAddress[sCount]* sub-attributes to the ONU. In such a case, each eOAMPDU carries the *Sequence* TLV (0xDB/0x00-01) to indicate that the OLT request spans multiple eOAMPDUs.

The *acMacAddStaticAddress* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acMacAddStaticAddress* action shall be as specified in Table 14-207.

**Table 14-207—*Add Static MAC Address* TLV (0xDD/0x01-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-05 | Leaf identifier |
| 1 | Length | $6 \times K$ | The size of TLV fields following the `Length` field, calculated as $6 \times K$, is the number of MAC addresses present in this TLV ($K = M - N + 1 \leq 21$) |
| 6 | MacAddress[N] | Varies | Value of *sMacAddress[N]* sub-attribute |
| … | … | … | … |
| 6 | MacAddress[M] | Varies | Value of *sMacAddress[M]* sub-attribute |

#### 14.6.2.6 Action acMacDeleteStaticAddress (0xDD/0x01-06)

This action is used by the OLT to delete at least one MAC address from the table storing statically configured MAC addresses, associated with the given UNI port. This action consists of the following sub-attributes: *sCount* and *sMacAddress[sCount]*.

Sub-attribute *acMacDeleteStaticAddress.sCount*:

**Syntax:** Unsigned Integer
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the number of MAC address to be deleted from the static MAC address table.

Sub-attribute *acMacDeleteStaticAddress.sMacAddress[sCount]*:

**Syntax:** MAC address
**Remote access:** Write-Only
**Description:** This sub-attribute identifies the MAC address to be deleted from the static MAC address table.

A single *Delete Static MAC Address* TLV (0xDD/0x01-06) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Delete Static MAC Address* TLV (0xDD/0x01-06) can be used within the same eOAMPDU to deliver the list of static MAC addresses to be removed from the list of static MAC addresses on the given UNI port.

In this case, the subsequent instance of the *Delete Static MAC Address* TLV (0xDD/0x01-06) provides the continuation of the list of static MAC addresses starting from the position following the last sub-attribute received in the previous instance of the *Delete Static MAC Address* TLV (0xDD/0x01-06).

The *acMacDeleteStaticAddress* action may also require more than one eOAMPDU to deliver all the *sMacAddress[sCount]* sub-attributes to the ONU. In such a case, each eOAMPDU carries the *Sequence* TLV (0xDB/0x00-01) to indicate that the ONU request spans multiple eOAMPDUs.

The *acMacDeleteStaticAddress* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acMacDeleteStaticAddress* action shall be as specified in Table 14-208.

**Table 14-208—*Delete Static MAC Address* TLV (0xDD/0x01-06)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-06 | Leaf identifier |
| 1 | Length | $6 \times K$ | The size of TLV fields following the `Length` field, calculated as $6 \times K$, is the number of MAC addresses present in this TLV ($K = M - N + 1 \leq 21$) |
| 6 | MacAddress[N] | Varies | Value of *sMacAddress[N]* sub-attribute |
| … | … | … | … |
| 6 | MacAddress[M] | Varies | Value of *sMacAddress[M]* sub-attribute |

#### 14.6.2.7 Attribute *acGetUniMacLearned* (0xDD/0x01-08)

This action retrieves the UNI port on which the given MAC address was learned. This action consists of the following sub-attributes: *sMacAddress* and *sUniPort*.

Attribute *acGetUniMacLearned.sMacAddress*:

**Syntax:** MAC address
**Remote access:** Read/Write
**Description:** This sub-attribute indicates the MAC address queried by the OLT.

Attribute *acGetUniMacLearned.sUniPort*:

**Syntax:** UNI port
**Remote access:** Read-Only
**Description:** This sub-attribute represents the instance of UNI port on which the MAC address value *sMacAddress* has been learned or configured via management. The following values are defined:

`0x00-0xFE`: Instance of UNI port.
`0xFF`: MAC address sMacAddress has not been learned on any UNI port.

The *acGetUniMacLearned* action is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *acGetUniMacLearned* action shall be as specified in Table 14-209.

**Table 14-209—*UNI MAC Learned* TLV (0xDD/0x01-08)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x01-08 | Leaf identifier |
| 1 | Length | Varies | The size of TLV fields following the `Length` field. This field takes the following values:<br>In *eOAM_Set_Request* eOAMPDU:<br>`0x06`<br>In *eOAM_Set_Response* eOAMPDU:<br>`0x07` |
| 6 | MacAddress | Varies | Value of *sMacAddress* sub-attribute |
| 1 | UniPort | Varies | Value of *sUniPort* sub-attribute. This field is only present in *eOAM_Set_Response* eOAMPDU. |

#### 14.6.2.8 Action *acConfigLlid* (0xDD/0x01-20)

This action is used by the NMS to either (a) add a new LLID entity to the given ONU or (b) delete one LLID entity, or (c) delete all LLID entitiess that were previously added to the given ONU. Multiple LLIDs may be provisioned in the ONU. This action consists of the following sub-attributes: *sLlidAction, sLlidValue, sLlidType,* and *sQueueSzie*.

Sub-attributen *acConfigLlid.sLlidAction*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This sub-atribute dteremines the action, as follows:

- `add_llid`: a single LLID entity identified by the *sLlidValue* sub-attribute is added.
- `del_llid`: a single LLID entity identified by the *sLlidValue* sub-attribute is deleted.
- `del_all`: all previously-added LLID entities are deleted.

Sub-attribute *acConfigLlid.sLlidValue*:

**Syntax:** LLID value
**Range:** 0x10-00 to 0xFF-FF
**Remote access:** Write-Only
**Description:** This sub-attribute indicates the value of the LLID that is to be added or deleted by this action. Valid LLID values are defined in IEEE Std 802.3ca, 144.3.5.

Sub-attribute *acConfigLlid.sLlidType*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This sub-attribute specifies the type of the LLID that is being added by this action. The following types are valid:

- `bd_ulid`: the LLID is a bidirectional ULID.
- `ud_ulid`: the LLID is a unidirectional ULID.
- `ud_plid`: the LLID is a unidirectional PLID.
- `ud_mlid`: the LLID is a unidirectional MLID.

Sub-attribute *acConfigLlid.sQueueSize*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-01 to 0xFF-FF-FF-FF
**Unit:** 1kB
**Remote access:** Write-Only
**Description:** This sub-attribute represents the size of the upstream queue to be bound to the bidirectional ULID that is being added by this action.

The action of adding a bidirectional ULID entity also allocates an upstream queue for that ULID. The action of deleting a bidirectional ULID entity also deallocates (frees) the upstream queue associated with that ULID. Allocating or deallocating a queue shall not affect the data stored in queues associated with other LLID or UNI port entities.

The request to delete all LLID entities (*sLlidAction* = `del_all`) deletes only the LLID entities that were previously created using the `add_llid` request. It shall not delete the system LLIDs (i.e., the primary PLID and MLID assigned during the registration and the pre-configured `BCAST_PLID` and `BCAST_MLID`).

The ONU shall respond with the “Insufficient Resources” code 0x87 (see 13.4) to a request to add a new LLID entity (*sLlidAction* = `add_llid`) if any of the following conditions are present:

— the maximum supported number of LLID entitities has already been created;

— the queue of the size indicated by the *sQueueSize* sub-attribute cannot be allocated.

The ONU shall respond with the "Bad Parameters" code 0x86 (see 13.4) to a request to add or delete an LLID entity if any of the following conditions are present:

— `add_llid` request containing an LLID value that already exists in this ONU;
— `del_llid` request containing an LLID value that does not exist in this ONU;
— `del_llid` request containing an LLID value corresponding to one of the system LLIDs.

The *acConfigLlid* action is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *acConfigLlid* action shall be as specified in Table 14-210.

**Table 14-210—*Config Logical Link* TLV (0xDD/0x01-20)**

| Size (octets) | Field name | Value | Notes |
|---|---|---|---|
| 1 | *Branch* | 0xDD | Branch identifier |
| 2 | *Leaf* | 0x01-20 | Leaf identifier |
| 1 | *Length* | Varies | The size of TLV fields following the *Length* field. This field takes the following values:<br>1 if *LlidAction* = `del_all;`<br>3 if *LlidAction* = `del_llid;`<br>4 if *LlidAction* = `add_llid` and *LlidType* ≠ `bd_ulid`;<br>8 if *LlidAction* = `add_llid` and *LlidType* = `bd_ulid`. |
| 1 | *LlidAction* | Varies | Value of *sLlidAction* sub-attribute, encoded as follows:<br>`add_llid`: 0xA1<br>`del_llid`: 0xD1<br>`del_all`: 0xDA |
| 2 | *LlidValue* | Varies | Value of *sLlidValue* sub-attribute. This field is only present when the *LlidAction* field is equal to `add_llid` or `del_llid`. |
| 1 | *LlidType* | Varies | Value of *sLlidType* sub-attribute, encoded as follows:<br>`bd_ulid`: 0xB0<br>`ud_ulid`: 0xD0<br>`ud_plid`: 0xD1<br>`ud_mlid`: 0xD2<br>This field is only present when the *LlidAction* field is equal to `add_llid`. |
| 4 | *QueueSize* | Varies | Valiue of *sQueueSize* sub-attribute. This field is only present when the *LlidType* field is equal to `bd_ulid.` |

### 14.6.2.9 Action *acConfigServicePort* (0xDD/0x01-21)

This action is used by the NMS to either (a) add a new service port entity to the given ONU or (b) delete one service port entity, or (c) delete all service port entitiess that were previously added to the given ONU. Multiple service ports may be provisioned in the ONU. This action consists of the following sub-attributes: *sServicePortAction*, *sServicePortIndex*, *sQueueCount*, and *sQueueSize[sQueueCount]*.

Sub-attributen *acConfigServicePort.sServicePortAction*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This sub-atribute dteremines the action, as follows:

- `add_port`: a single service port entity identified by the *sServicePortIndex* sub-attribute is added.
- `del_port`: a single service port entity identified by the *sServicePortIndex* sub-attribute is deleted.
- `del_all`: all previously-added service port entities are deleted.

Sub-attribute *acConfigServicePort.sServicePortIndex*:

**Syntax:** integer
**Range:** 0x00 to 0xFF
**Remote access:** Write-Only
**Description:** This sub-attribute indicates the value of the service port index that is to be added or deleted by this action. Valid service port index values range from 0x00 up to the maximum supported Service Port index in the given ONU (i.e., up to *aOnuServicePortCapability.sPortCount* - 1, see 14.4.1.14).

Sub-attribute *acConfigServicePort.sQueueCount*:

**Syntax:** Unsigned integer
**Range:** 0x01 to 0x08
**Remote access:** Write-Only
**Description:** This sub-attribute represents the number of queues to be assigned to the new Service Port object. The queues associated with a service port are served in strict priority order with index 0x00 being the highest priority.

Sub-attribute *acConfigServicePort.sQueueSize[sQueueCount]*:

**Syntax:** Unsigned integer
**Range:** 0x00-00-00-01 to 0xFF-FF-FF-FF
**Unit:** 1kB
**Remote access:** Read/Write
**Description:** This sub-attribute represents the sizes of individual queues.

The action of adding a service port entity also allocates downstream queue(s) for that service port. The action of deleting a service port entity also deallocates (frees) the upstream queue(s) associated with that service port. Allocating or deallocating a queue shall not affect the data stored in queues associated with other LLID or service port entities.

The ONU shall respond with the “Insufficient Resources” code 0x87 (see 13.4) to a request to add a new service port entity (*sServicePortAction* = `add_port`) if the queues with the sizes indicated by the *sQueueSize[sQueueCount]* sub-attribute cannot be allocated.

The ONU shall respond with the “Bad Parameters” code 0x86 (see 13.4) to a request to add or delete an LLID entity if any of the following conditions are present:

- `add_port` request containing an service port index that already added to this ONU;
- `del_port` request containing an service port index that has not been previously added to this ONU.

The *acConfigServicePort* action is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *acConfigServicePort* action shall be as specified in Table 14-211.

**Table 14-211—*Config Service Port* TLV (0xDD/0x01-21)**

| Size (octets) | Field name | Value | Notes |
|---|---|---|---|
| 1 | *Branch* | 0xDD | Branch identifier |
| 2 | *Leaf* | 0x01-21 | Leaf identifier |
| 1 | *Length* | Varies | The size of TLV fields following the *Length* field. This field takes the following values:<br>1 if *ServicePortAction* = `del_all;`<br>3 if *ServicePortAction* = `del_port;`<br>4 + 4*N* if *ServicePortAction* = `add_port`. |
| 1 | *ServicePortAction* | Varies | Value of *sServicePortAction* sub-attribute, encoded as follows:<br>`add_port`: 0xA1<br>`del_port`: 0xD1<br>`del_all`: 0xDA |
| 2 | *ServicePortIndex* | Varies | Value of *sServicePortIndex* sub-attribute. This field is only present when the *ServicePortAction* field is equal to `add_port` or `del_port`. |
| 1 | *QueueCount* | Varies | Value of *sQueueCount* sub-attribute (*N*). This field and subsequent fields are only present when the *ServicePortAction* field is equal to `add_port`. |
| 4 | *QueueSize[0]* | Varies | Value of *sQueueSize[0]* sub-attribute (highest priority queue). |
| … | … | … | … |
| 4 | *QueueSize[N-1]* | Varies | Value of *sQueueSize[N-1]* sub-attribute (lowest priority queue) |

### 14.6.3 Statistics and counters

#### 14.6.3.1 Action *acCountersClear* (0xDD/0x02-01)

This action is used by the OLT to request the ONU to clear all the statistics counters instantiated on the ONU.

The *acCountersClear* action is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *acCountersClear* action shall be as specified in Table 14-212.

**Table 14-212—*Clear Counters* TLV (0xDD/0x02-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x02-01 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

### 14.6.4 Alarms

#### 14.6.4.1 Action acAlarmGetCurrentSummary (0xDD/0x03-01)

This action is used by the OLT to request the ONU to report all currently raised alarm conditions. To report these conditions, the ONU generates a series of at least one *Event Notification* eOAMPDUs containing *Alarm* TLVs corresponding to all current alarm conditions at the given ONU.

The *acAlarmGetCurrentSummary* action is associated with the ONU object (see 14.2.1). The Variable Container TLV for the *acAlarmGetCurrentSummary* action shall be as specified in Table 14-213.

**Table 14-213—*Retrieve Current Alarm Summary* TLV (0xDD/0x03-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x03-01 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

### 14.6.5 Frame processing

#### 14.6.5.1 Action *acRulesClearAll* (0xDD/0x05-01)

This action is used by the OLT to request the ONU to delete all frame processing rules associated with the given UNI port or the PON port, as indicated by the *Object Context* TLV.

The *acRulesClearAll* action is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *acRulesClearAll* action shall be as specified in Table 14-214.

**Table 14-214—*Clear Port Ingress Rules* TLV (0xDD/0x05-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x05-01 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

#### 14.6.5.2 Action *acRulesAddOne* (0xDD/0x05-02)

This action is used by the OLT to request the ONU to add the ingress frame processing rule, described by the *aRuleSetConfig* attribute carried in the *Port Ingress Rule* TLV that preceded this action.

The *acRulesAddOne* action is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *acRulesAddOne* action shall be as specified in Table 14-215.

**Table 14-215—*Add Port Ingress Rule* TLV (0xDD/0x05-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x05-02 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

#### 14.6.5.3 Action *acRulesDeleteOne* (0xDD/0x05-03)

This action is used by the OLT to request the ONU to delete the ingress frame processing rule, described by the *aRuleSetConfig* attribute carried in the *Port Ingress Rule* TLV that preceded this action.

The *acRulesDeleteOne* action is associated with the UNI Port or the PON Port object (see 14.2.1). The Variable Container TLV for the *acRulesDeleteOne* action shall be as specified in Table 14-216.

**Table 14-216—*Delete Port Ingress Rule* TLV (0xDD/0x05-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 2 | Leaf | 0x05-03 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

### 14.6.6 Transmission control

#### 14.6.6.1 Action *acEnableUserTraffic* (0xDD/0x06-01)

This action is used by the OLT to request the ONU to enable user data traffic on the given L-ONU, as indicated by the *Object Context* TLV.

The *acEnableUserTraffic* action is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *acEnableUserTraffic* action shall be as specified in Table 14-217.

**Table 14-217—*Enable User Traffic* TLV (0xDD/0x06-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x06-01 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

#### 14.6.6.2 Action *acDisableUserTraffic* (0xDD/0x06-02)

This action is used by the OLT to request the ONU to disable user data traffic on the given L-ONU, as indicated by the *Object Context* TLV. OAM and MPCP traffic remains unaffected by the use of this action. An ONU boots with the user data traffic disabled.

The *acDisableUserTraffic* action is associated with the LLID object (see 14.2.1). The Variable Container TLV for the *acDisableUserTraffic* action shall be as specified in Table 14-218.

**Table 14-218—*Disable User Traffic* TLV (0xDD/0x06-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x06-02 | Leaf identifier |
| 1 | Length | 0x80 | The length of the TLV `Value` field is zero |

#### 14.6.6.3 Action *acLoopbackEnable* (0xDD/0x06-03)

This action is used by the OLT to request the ONU to enable the loopback function on the LLID or the UNI port, as indicated by the *Object Context* TLV.

Action *acLoopbackEnable*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This action requests the ONU to enable the loopback function on the LLID or the UNI port at the specific location, defined as follows:

- `loop_phy`: enable the loopback function at the PHY.
- `loop_mac`: enable the loopback function at the MAC.
- `loop_pon`: enable the loopback function at the PON port.

The *acLoopbackEnable* action is associated with the LLID or the Service Port object (see 14.2.1). The Variable Container TLV for the *acLoopbackEnable* action shall be as specified in Table 14-219.

**Table 14-219—*Loopback Enable* TLV (0xDD/0x06-03)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x06-03 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | LoopbackEnable | Varies | Value of *acLoopbackEnable* action, defined as follows:<br>`loop_phy`: 0x00<br>`loop_mac`: 0x01<br>`loop_pon`: 0x02 |

#### 14.6.6.4 Action *acLoopbackDisable* (0xDD/0x06-04)

This action is used by the OLT to request the ONU to disable the loopback function on the LLID or the UNI port, as indicated by the *Object Context* TLV.

Action *acLoopbackDisable*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This action requests the ONU to disable the loopback function on the LLID or the UNI port at the specific location, defined as follows:

`loop_phy`: disable the loopback function at the PHY.
`loop_mac`: disable the loopback function at the MAC.
`loop_pon`: disable the loopback function at the PON port.

The *acLoopbackDisable* action is associated with the LLID or the Service Port object (see 14.2.1). The Variable Container TLV for the *acLoopbackDisable* action shall be as specified in Table 14-220.

**Table 14-220—*Loopback Disable* TLV (0xDD/0x06-04)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x06-04 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | LoopbackDisable | Varies | Value of *acLoopbackDisable* action, defined as follows:<br>`loop_phy`: 0x00<br>`loop_mac`: 0x01<br>`loop_pon`: 0x02 |

#### 14.6.6.5 Action *acLaserTxPowerOff* (0xDD/0x06-05)

This action is used by the OLT to request the ONU to enable or disable its optical transmitter.

Action *acLaserTxPowerOff*:

**Syntax:** Unsigned Integer
**Range:** 0x00 to 0xFF-FF
**Unit:** 1 ms
**Remote access:** Write-Only

**Description:** This action requests the ONU to enable or disable its optical transmitter. When disabling, the value of this attribute indicates the duration of time for which the transmitter is disabled. Individual values are defined as follows:

0x00-00: enable ONU transmitter.
0x00-01 to 0xFF-FE: disable ONU transmitter for a specific period of time.
0xFF-FF: disable ONU transmitter until next reboot or explicit enable.

The *acLaserTxPowerOff* action is associated with the PON Port object (see 14.2.1). The Variable Container TLV for the *acLaserTxPowerOff* action shall be as specified in Table 14-221.

**Table 14-221—*Laser Tx Power Off* TLV (0xDD/0x06-05)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x06-05 | Leaf identifier |
| 1 | Length | 0x01 to 0x02 | The size of TLV fields following the `Length` field |
| 1..2 | LaserTxPowerOff | Varies | Value of *acLaserTxPowerOff* action |

### 14.6.7 Power management

#### 14.6.7.1 Action *acEeeChangeState* (0xDD/0x07-01)

This action is used by the OLT to request the ONU to change the state of the EEE function on the selected service port. If the OLT requests to change the state of the EEE function on the service port that does not support the EEE function, the ONU ignores this request.

Action *acEeeChangeState*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This action requests the ONU to change the status of the EEE function on the given UNI port, enabling or disabling the EEE function, as defined below:

`enable`: enable the EEE function on the UNI port
`disable`: disable the EEE function on the UNI port

The *acEeeChangeState* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acEeeChangeState* action shall be as specified in Table 14-222.

**Table 14-222—*EEE Change State* TLV (0xDD/0x07-01)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x07-01 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | TargetEeeState | Varies | Value of *acEeeChangeState* action, defined as follows:<br>`enable`: 0x00<br>`disable`: 0x01 |

#### 14.6.7.2 Action *acPoeChangeState* (0xDD/0x07-02)

This action is used by the OLT to request the ONU to change the state of the PoE function on the selected service port. If the OLT requests to change the state of the PoE function on the service port that does not support the PoE function, the ONU ignores this request.

Action *acPoeChangeState*:

**Syntax:** Enumeration
**Remote access:** Write-Only
**Description:** This action requests the ONU to change the status of the PoE function on the given UNI port, enabling or disabling the PoE function, as defined below:
`enable`: enable the PoE function on the UNI port
`disable`: disable the PoE function on the UNI port

The *acPoeChangeState* action is associated with the Service Port object (see 14.2.1). The Variable Container TLV for the *acPoeChangeState* action shall be as specified in Table 14-223.

**Table 14-223—*PoE Change State* TLV (0xDD/0x07-02)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDD | Branch identifier |
| 2 | Leaf | 0x07-02 | Leaf identifier |
| 1 | Length | 0x01 | The size of TLV fields following the `Length` field |
| 1 | TargetPoeState | Varies | Value of *acPoeChangeState* action, defined as follows:<br>`enable`: 0x00<br>`disable`: 0x01 |

## 14.7 Branch 0xDC "programmable counters"

This branch provides the code space for a total of 32 768 programmable, general-purpose counters. The extended attributes can be part of *eOAM_Get_Request*, *eOAM_Get_Response*, *eOAM_Set_Request*, and *eOAM_Set_Response* eOAMPDUs. The programmable, general-purpose counter attributes shown in Table 14-224 shall be supported. The function, size, and context of each programmable counter are vendor specific.

**Table 14-224—Programmable counters defined in branch 0xDC**

| Leaf | Attribute | Defined in |
|---|---|---|
| Object group: ONU management | | |
| 0x00-00 | aCounterGeneral0 | 14.4.6.1 |
| … | … | |
| 0x7F-FF | aCounterGeneral32767 | |

#### 14.7.1 Attribute *aCounterGeneralN* (0xDC/0x00-00 to 0xDC/0x7F-FF)

This attribute represents the current value of a general-purpose counter number N.

Attribute *aCounterGeneralN*:

**Syntax:** Counter, Resettable, Wrap-around
**Range:** Vendor-specific
**Remote access:** Read/Write
**Unit:** Vendor-specific

**Description:** This attribute indicates the current value of a general-purpose counter number 0. The ONU shall reset this counter to the value of 0x00 on write of any value to this attribute.

The *aCounterGeneralN* attribute is associated with the ONU, UNI Port, PON Port, LLID, or Queue object (see 14.2.1). The Variable Container TLV for the *aCounterGeneralN* attribute shall be as specified in Table 14-225.

**Table 14-225—*Programmable Counter N* TLV (0xDC/0x00-00 to 0xDC/0x7F-FF)**

| Size (octets) | Field (name) | Value | Notes |
|---|---|---|---|
| 1 | Branch | 0xDC | Branch identifier |
| 2 | Leaf | *N* | Leaf identifier. *aCounterGeneral0* through *aCounterGeneral32767* are represented by Leaf values ranging from 0x00-00 through 0x7F-FF. |
| 1 | Length | Varies | The size of TLV fields following the `Length` field |
| Varies | CounterGeneralN | Varies | Value of *aCounterGeneralN* attribute |