14

14.4

14.4.1

14.4.2

14.4.3 Branch 0xD7 “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 14-132 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 14-132—Extended attributes defined in branch 0xD7

Leaf	Attribute	Defined in
Object group: ONU management		
0x00-02	aOnuId	14.4.3.1.2
0x00-03	aOnuFwVersion	14.4.3.1.3
0x00-04	aOnuInfoChipset	14.4.3.1.4
0x00-05	aOnuInfoDateManufacture	14.4.3.1.5
0x00-06	aOnuInfoManufacturer	14.4.3.1.6
0x00-07	aOnuLlidCount	14.4.3.1.7
0x00-08	aOnuPonPortCount	14.4.3.1.8
0x00-09	aOnuUniPortCount	14.4.3.1.9
0x00-0A	aOnuInfoPacketBuffer	14.4.3.1.10
0x00-0B	aLlidReportThresholds	14.4.3.1.11
0x00-0C	aLlidForwardState	14.4.3.1.12
0x00-0D	aLlidOamFrameRate	14.4.3.1.13
0x00-0E	aOnuManOrgName	14.4.3.1.14
0x00-0F	aOnuCvcCvsValidity	14.4.3.1.15
0x00-10	aOnuUniPortType	14.4.3.1.16
0x00-11	aVendorName	[live link]
0x00-12	aModelNumber	[live link]
0x00-13	aHardwareVersion	[live link]
0x00-14	aLineRateMode	[live link]
Object group: Bridging		
0x01-01	aUniDynMacTableSize	14.4.3.2.1
0x01-02	aUniDynMacAgeLimit	14.4.3.2.2
0x01-03	aUniDynMacTable	14.4.3.2.3
0x01-04	aUniStatMacTable	14.4.3.2.4
0x01-05	aUniPortAutoNeg	14.4.3.2.5
0x01-06	aUniAdmissionControl	14.4.3.2.6
0x01-07	aUniMinLearnMacCount	14.4.3.2.7
0x01-08	aUniMaxLearnMacCount	14.4.3.2.8
0x01-09	aOnuMaxLearnMacCount	14.4.3.2.9
0x01-0A	aUniLengthDiscard	14.4.3.2.10
0x01-0B	aUniFloodUnknown	14.4.3.2.11
0x01-0C	aUniLocalSwitching	14.4.3.2.12
0x01-0D	aOnuLlidQueueConfig	14.4.3.2.13
0x01-0E	aOnuFwFileName	14.4.3.2.14

Leaf	Attribute	Defined in
0x01-0F	aUniMacTableFull	14.4.3.2.15
Object group: Statistics and counters		
0x02-01	aCountRxFramesGreen	14.4.3.3.1
0x02-02	aCountTxFramesGreen	14.4.3.3.2
0x02-03	aCountRxFrames2Short	14.4.3.3.3
0x02-04	aCountRxFrames64	14.4.3.3.4
0x02-05	aCountRxFrames65to127	14.4.3.3.5
0x02-06	aCountRxFrames128to255	14.4.3.3.6
0x02-07	aCountRxFrames256to511	14.4.3.3.7
0x02-08	aCountRxFrames512to1023	14.4.3.3.8
0x02-09	aCountRxFrames1024to1518	14.4.3.3.9
0x02-0A	aCountRxFrames1519	14.4.3.3.10
0x02-0B	aCountTxFrames64	14.4.3.3.11
0x02-0C	aCountTxFrames65to127	14.4.3.3.12
0x02-0D	aCountTxFrames128to255	14.4.3.3.13
0x02-0E	aCountTxFrames256to511	14.4.3.3.14
0x02-0F	aCountTxFrames512to1023	14.4.3.3.15
0x02-10	aCountTxFrames1024to1518	14.4.3.3.16
0x02-11	aCountTxFrames1519	14.4.3.3.17
0x02-12	aQueueDelayThr	14.4.3.3.18
0x02-13	aQueueDelayValue	14.4.3.3.19
0x02-14	aCountFramesDropped	14.4.3.3.20
0x02-15	aCountOctetsDropped	14.4.3.3.21
0x02-16	aCountOctetsDelayed	14.4.3.3.22
0x02-17	aCountUsOctetsUnused	14.4.3.3.23
0x02-1D	aPonOptMonitTemp	14.4.3.3.24
0x02-1E	aPonOptMonitVcc	14.4.3.3.25
0x02-1F	aPonOptMonitBias	14.4.3.3.26
0x02-20	aPonOptMonitTxPower	14.4.3.3.27
0x02-21	aPonOptMonitRxPower	14.4.3.3.28
0x02-22	aCounterRxFramesY	14.4.3.3.29
0x02-23	aCounterTxFramesY	14.4.3.3.30
0x02-24	aCounterTxOctetsG	14.4.3.3.31
0x02-25	aCounterRxOctetsY	14.4.3.3.32
0x02-26	aCounterRxOctetsG	14.4.3.3.33
0x02-27	aCounterTxOctetsY	14.4.3.3.34
0x02-28	aCounterTxFramesL2Unicast	14.4.3.3.35
0x02-29	aCounterTxFramesL2Multicast	14.4.3.3.36
0x02-2A	aCounterTxFramesL2Broadcast	14.4.3.3.37
0x02-2B	aCounterRxFramesL2Unicast	14.4.3.3.38
0x02-2C	aCounterRxFramesL2Multicast	14.4.3.3.39
0x02-2D	aCounterRxFramesL2Broadcast	14.4.3.3.40
0x02-2E	aOnuCounterNumber	14.4.3.3.41
0x02-2F	aCounterRxFramesL2CP	14.4.3.3.42
0x02-30	aCounterRxOctetsL2CP	14.4.3.3.43
0x02-31	aCounterTxFramesL2CP	14.4.3.3.44
0x02-32	aCounterTxOctetsL2CP	14.4.3.3.45
0x02-33	aCounterDiscardFramesL2CP	14.4.3.3.46
0x02-34	aCounterDiscardOctetsL2CP	14.4.3.3.47
0x02-35	aCounterL2TxErrors	14.4.3.3.48
0x02-36	aCounterL2RxErrors	14.4.3.3.49
Object group: Alarms		

Leaf	Attribute	Defined in
0x03-01	aAlarmPortStatThr	14.4.3.4.1
0x03-02	aAlarmLlidStatThr	14.4.3.4.2
0x03-03	aAlarmStatusControl	14.4.3.4.3
Object group: Encryption		
0x04-01	aEncryptionKeyExpiration	14.4.3.5.1
0x04-02	aEncryptionMode	14.4.3.5.2
Object group: Frame processing		
0x05-01	aRuleSetConfig	14.4.3.6.1
0x05-02	aRuleCustomField	14.4.3.6.2
0x05-03	aRuleTpidCAlter	14.4.3.6.3
0x05-04	aRuleTpidSAlter	14.4.3.6.4
0x05-05	aRuleIpmcFwrConfig	14.4.3.6.5
0x05-06	aRuleTpidIAlter	14.4.3.6.6
0x05-07	aRuleTpidBAlter	14.4.3.6.7
Object group: Service-level agreements		
0x06-01	aRateLimitBroadcast	14.4.3.7.1
0x06-04	aQueueCIR	14.4.3.7.2
0x06-05	aFecMode	14.4.3.7.3
0x06-06	aQueueEIR	14.4.3.7.4
0x06-07	aQueueColorMarking	14.4.3.7.5
0x06-08	aQueueRateLimiterCap	14.4.3.7.6
0x06-09	aCouplingFlag	14.4.3.7.7
Object group: Clock transport		
0x07-01	aClockTranspCapab	14.4.3.9.1
0x07-02	aClockTranspStatus	14.4.3.9.2
0x07-03	aClockTranspTransfer	14.4.3.9.3
0x07-04	aClockTranspPropagParam	14.4.3.9.4
0x07-05	aClockTranspRtt	14.4.3.9.5
Object group: Demarc auto-configuration		
0x08-00	aDacConfig	14.4.3.10.1
0x08-01	aDacConfigFlags	14.4.3.10.2
0x08-02	aDacPassChallenge	14.4.3.10.3
0x08-03	aDacStatus	14.4.3.10.4
Object group: UNI management		
0x08-20	aEeeStatus	[live link]
0x08-21	aPoeStatus	[live link]
0x08-22	aMediaType	[live link]
Object group: Power saving		
0xFF-FF	aOnuPwrSavingCap	14.4.3.8.1

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

14.4.3.1 ONU management

14.4.3.1.1 *Sequence* TLV (0xD7/0x00-01)

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 14.4.1.1). The Variable Container TLV for the *Sequence* TLV shall be as specified in Table 14-133.

Table 14-133—*Sequence* TLV (0xD7/0x00-01)

Size (bits)	Field (name)	Value	Notes
8	Branch	0xD7	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.
1	LastResponse	Varies	When set to 1, this eOAMPDU carries the last part of the given sequence. Otherwise, it is set to 0.

14.4.3.1.2 Attribute *aOnuId* (0xD7/0x00-02)

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 lowest (numerically smallest) MAC address among all MAC addresses associated with the PON port of an ONU (there is one MAC address associated with each L-ONU).
All L-ONUs in an mL-ONU report the same ONU identification number, despite having different link MAC addresses.

The *aOnuId* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aOnuId* attribute shall be as specified in Table 14-134.

Table 14-134—*ONU ID* TLV (0xD7/0x00-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.1.3 Attribute *aOnuFwVersion* (0xD7/0x00-03)

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 14.4.1.1). The Variable Container TLV for the *aOnuFwVersion* attribute shall be as specified in Table 14-135.

Table 14-135—*ONU Firmware Version* TLV (0xD7/0x00-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.1.4 Attribute *aOnuInfoChipset* (0xD7/0x00-04)

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 14.4.1.1). The Variable Container TLV for the *aOnuInfoChipset* attribute shall be as specified in Table 14-136.

Table 14-136—*ONU Chipset ID* TLV (0xD7/0x00-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.1.5 Attribute *aOnuInfoDateManufacture* (0xD7/0x00-05)

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 14.4.1.1). The Variable Container TLV for the *aOnuInfoDateManufacture* attribute shall be as specified in Table 14-137.

Table 14-137—*ONU Date of Manufacture* TLV (0xD7/0x00-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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
1	Day	Varies	Value of *sDay* sub-attribute

14.4.3.1.6 Attribute *aOnuInfoManufacturer* (0xD7/0x00-06)

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 14.4.1.1). The Variable Container TLV for the *aOnuInfoManufacturer* attribute shall be as specified in Table 14-138.

Table 14-138—*ONU Manufacturer Info* TLV (0xD7/0x00-06)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.1.7 Attribute *aOnuLlidCount* (0xD7/0x00-07)

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

Sub-attribute *aOnuLlidCount.sBidirectional*:

Syntax: Unsigned integer
Remote access: Read-Only
Description: This sub-attribute represents the number of bidirectional LLIDs supported by the given ONU.

Sub-attribute *aOnuLlidCount.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 *aOnuLlidCount* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aOnuLlidCount* attribute shall be as specified in Table 14-139.

Table 14-139—*ONU L-ONU Count* TLV (0xD7/0x00-07)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.1.8 Attribute *aOnuPonPortCount* (0xD7/0x00-08)

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

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

The *aOnuPonPortCount* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aOnuPonPortCount* attribute shall be as specified in Table 14-140.

Table 14-140—*ONU PON Port Count* TLV (0xD7/0x00-08)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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 *aOnuPonPortCount* attribute, mapped into 2-octet-wide value, right justified

14.4.3.1.9 Attribute *aOnuUniPortCount* (0xD7/0x00-09)

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

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

The *aOnuUniPortCount* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aOnuUniPortCount* attribute shall be as specified in Table 14-141.

Table 14-141—*ONU UNI Port Count* TLV (0xD7/0x00-09)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x00-09	Leaf identifier
1	Length	Varies	The size of TLV fields following the `Length` field
Varies	OnuUniPortCount	Varies	Value of *aOnuUniPortCount* attribute, mapped into 2-octet-wide value, right justified

14.4.3.1.10 Attribute *aOnuInfoPacketBuffer* (0xD7/0x00-0A)

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 to 0xFF-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 to 0xFF-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 to 0xFF-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 14.4.1.1). The Variable Container TLV for the *aOnuInfoPacketBuffer* attribute shall be as specified in Table 14-142.

Table 14-142—*ONU Packet Buffer* TLV (0xD7/0x00-0A)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x00-0A	Leaf identifier
1	Length	0x0C	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
2	BufferSizeTotal	Varies	Value of *sBufferSizeTotal* sub-attribute
2	BufferUsSize	Varies	Value of *sBufferUsSize* sub-attribute
2	BufferDsSize	Varies	Value of *sBufferDsSize* sub-attribute

14.4.3.1.11 Attribute *aLlidReportThresholds* (0xD7/0x00-0B)

This attribute represents threshold levels used to generate *REPORT* MPCPDUs. Information stored in this attribute corresponds to the format of the *REPORT* MPCPDU generated by the ONU. This attribute also includes information about the number of Queue Sets and the number of values reported in each Queue Set

to be used on the link. This attribute consists of the following sub-attributes: *sQueueSetCount*, *sQueueCount*, and *sThreshold[sQueueSetCount][sQueueCount]*.

Sub-attribute *aLlidReportThresholds.sQueueSetCount*:

Syntax: Unsigned integer
Range: 0x01 to 0x04
Default value: 0x04
Remote access: Read/Write
Description: This sub-attribute represents the total number of Queue Sets to be used in the generated *REPORT* MPCPDU.

Sub-attribute *aLlidReportThresholds.sQueueCount*:

Syntax: Unsigned integer
Range: 0x01 to 0x08
Default value: 0x01
Remote access: Read/Write
Description: This sub-attribute represents the number of queues per Queue Set, to be used in the generated *REPORT* MPCPDU.

Sub-attribute *aLlidReportThresholds.sThreshold[sQueueSetCount][sQueueCount]*:

Syntax: Unsigned integer
Range: 0x00-00 to 0xFF-FF
Default value: 0x08-00 (2048 TQ)
Unit: 1 TQ
Remote access: Read/Write
Description: This sub-attribute represents the report threshold identified by *sQueueCount* for Queue Set identified by *sQueueSetCount*. This value is expressed in units of time quanta.

The *aLlidReportThresholds* attribute is associated with the LLID object (see 14.4.1.1). The Variable Container TLV for the *aLlidReportThresholds* attribute shall be as specified in Table 14-143.

Table 14-143—*REPORT Threshold* TLV (0xD7/0x00-0B)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x00-0B	Leaf identifier
1	Length	Varies	The size of TLV fields following the `Length` field, calculated as $2 + M \times N \times 2$, where M = *sQueueSetCount* and N = *sQueueCount*
1	QueueSetCount	Varies	Value of *sQueueSetCount* sub-attribute
1	ThresholdCount	Varies	Value of *sQueueCount* sub-attribute
2	Threshold[0][0]	Varies	Value of *sThreshold[0][0]* sub-attribute
…	…	…	…
2	Threshold[0][N−1]	Varies	Value of *sThreshold[0][N−1]* sub-attribute
…	…	…	…
2	Threshold[M−1][0]	Varies	Value of *sThreshold[M−1][0]* sub-attribute
…	…	…	…
2	Threshold[M−1][N−1]	Varies	Value of *sThreshold[M−1][N−1]* sub-attribute

14.4.3.1.12 Attribute *aLlidForwardState* (0xD7/0x00-0C)

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 (0xD9/0x06-01) and *Disable User Traffic* TLV (0xD9/0x06-02) 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 14.4.1.1). The Variable Container TLV for the *aLlidForwardState* attribute shall be as specified in Table 14-144.

Table 14-144—*L-ONU Forwarding State* TLV (0xD7/0x00-0C)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `forward`: 0x00 `block`: 0x01

14.4.3.1.13 Attribute *aLlidOamFrameRate* (0xD7/0x00-0D)

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 14.4.1.1). The Variable Container TLV for the *aLlidOamFrameRate* attribute shall be as specified in Table 14-145.

Table 14-145—*OAM Frame Rate* TLV (0xD7/0x00-0D)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.1.14 Attribute *aOnuManOrgName* (0xD7/0x00-0E)

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 14.4.1.1). The Variable Container TLV for the *aOnuManOrgName* attribute shall be as specified in Table 14-146.

Table 14-146—*ONU CVC Identifier* TLV (0xD7/0x00-0E)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x00-0E	Leaf identifier
1	Length	Varies	The size of TLV fields following the `Length` field
Varies	OnuManOrgName	Varies	Value of *aOnuManOrgName* attribute

14.4.3.1.15 Attribute *aOnuCvcCvsValidity* (0xD7/0x00-0F) NVS

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
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 14.4.1.1). The Variable Container TLV for the *aOnuCvcCvsValidity* attribute shall be as specified in Table 14-147.

Table 14-147—*ONU CVC Validity* TLV (0xD7/0x00-0F)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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.

14.4.3.1.16 Attribute *aOnuUniPortType* (0xD7/0x00-10)

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

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

Sub-attribute *aOnuUniPortType.sPortCount*:

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

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

Syntax: Enumeration
Remote access: Read-Only
Description: This sub-attribute indicates the type of individual UNI ports supported on the ONU and devices connected to individual UNI ports (if present), including

embedded (eSAFE) and other known CPE devices with values specified as follows:

`unspecified`: this ONU UNI port is not connected to a known external or internal device.
`emta`: this ONU UNI port is connected to a PacketCable/eMTA.
`estb_ip`: this ONU UNI port is connected to an eSTB-IP.
`estb_dsg`: this ONU UNI port is connected to an eSTB-DSG.
`etea`: this ONU UNI port is connected to an eTEA.
`esg`: this ONU UNI port is connected to an ESG.
`erouter`: this ONU UNI port is connected to an eRouter.
`edva`: this ONU UNI port is connected to an eDVA.
`seb_estp_ip`: this ONU UNI port is connected to an SEB eSTB-IP.

Each UNI port is associated with only one *sPortType* sub-attribute.
Individual types of UNI-connected devices are defined in DPoE-SP-ARCH.

The *aOnuUniPortType* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aOnuUniPortType* attribute shall be as specified in Table 14-148.

Table 14-148—*ONU UNI Port Type* TLV (0xD7/0x00-10)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x00-10	Leaf identifier
1	Length	Varies	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: `unspecified`: 0x00 `emta`: 0x01 `estb_ip`: 0x02 `estb_dsg`: 0x03 `etea`: 0x04 `esg`: 0x05 `erouter`: 0x06 `edva`: 0x07 `seb_estp_ip`: 0x08
…	…	…	..
1	PortType[N−1]	Varies	Value of *sPortType[N−1]*sub-attribute

14.4.3.1.17 Attribute *aVendorName* (0xD7/0x00-11)

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 atrribute is vendor-specific.

The *aVendorName* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aVendorName* attribute shall be as specified in Table 14-147.

Table 14-147—*Vendor Name* TLV (0xD7/0x00-11)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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.

14.4.3.1.18 Attribute *aModelNumber* (0xD7/0x00-12)

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 atrribute is vendor-specific.

The *aModelNumber* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aModelNumber* attribute shall be as specified in Table 14-147.

Table 14-147—*Model Number* TLV (0xD7/0x00-12)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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.

14.4.3.1.19 Attribute *aHardwareVersion* (0xD7/0x00-13)

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 atrribute is vendor-specific.

The *aHardwareVersion* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aHardwareVersion* attribute shall be as specified in Table 14-147.

Table 14-147—*Hardware Version* TLV (0xD7/0x00-13)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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.

14.4.3.1.20 Attribute *aLineRateMode* (0xD7/0x00-14)

This attribute represents the EPON mode(s) supported by the given ONU.

Sub-attribute *aLineRateMode.sDownstream1G*:
Syntax: Boolean
Remote access: Read-Only
Description: This sub-attribute indicates whether the ONU supports the downstream data rate of 1 Gbps. The following values are defined:
`yes`: the ONU supports the downstream data rate of 1 Gbps.
`no`: the ONU does not support the downstream data rate of 1 Gbps.

Sub-attribute *aLineRateMode.sDownstream2G*:
Syntax: Boolean
Remote access: Read-Only
Description: This sub-attribute indicates whether the ONU supports the downstream data rate of 2 Gbps. The following values are defined:
`yes`: the ONU supports the downstream data rate of 2 Gbps.
`no`: the ONU does not support the downstream data rate of 2 Gbps.

Sub-attribute *aLineRateMode.sDownstream10G*:
Syntax: Boolean
Remote access: Read-Only
Description: This sub-attribute indicates whether the ONU supports the downstream data rate of 10 Gbps. The following values are defined:
`yes`: the ONU supports the downstream data rate of 10 Gbps.
`no`: the ONU does not support the downstream data rate of 10 Gbps.

Sub-attribute *aLineRateMode.sUpstream1G*:
Syntax: Boolean
Remote access: Read-Only
Description: This sub-attribute indicates whether the ONU supports the Upstream data rate of 1 Gbps. The following values are defined:
`yes`: the ONU supports the Upstream data rate of 1 Gbps.
`no`: the ONU does not support the Upstream data rate of 1 Gbps.

Sub-attribute *aLineRateMode.sUpstream2G*:
Syntax: Boolean
Remote access: Read-Only
Description: This sub-attribute indicates whether the ONU supports the Upstream data rate of 2 Gbps. The following values are defined:
`yes`: the ONU supports the Upstream data rate of 2 Gbps.
`no`: the ONU does not support the Upstream data rate of 2 Gbps.

Sub-attribute *aLineRateMode.sUpstream10G*:

Syntax: Boolean
Remote access: Read-Only
Description: This sub-attribute indicates whether the ONU supports the Upstream data rate of 10 Gbps. The following values are defined:

`yes`: the ONU supports the Upstream data rate of 10 Gbps.
`no`: the ONU does not support the Upstream data rate of 10 Gbps.

The *aLineRateMode* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aLineRateMode* attribute shall be as specified in Table 14-147.

Table 14-147—*EPON Line Rate Mode TLV* (0xD7/0x00-14)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x00-14	Leaf identifier
1	Length	2	The size of TLV fields following the `Length` field
1	Downstream	Varies	bit 0: value of *aLineRateMode.sDownstream1G* sub-attribute, defined as follows: `yes`: 0b1 `no`: 0b0 bit 1: value of *aLineRateMode.sDownstream2G* sub-attribute, defined as follows: `yes`: 0b1 `no`: 0b0 bit 2: value of *aLineRateMode.sDownstream10G* sub-attribute, defined as follows: `yes`: 0b1 `no`: 0b0 bit 3-7: reserved and ignored on reception
1	Upstream	Varies	bit 0: value of *aLineRateMode.sUpstream1G* sub-attribute, defined as follows: `yes`: 0b1 `no`: 0b0 bit 1: value of *aLineRateMode.sUpstream2G* sub-attribute, defined as follows: `yes`: 0b1 `no`: 0b0 bit 2: value of *aLineRateMode.sUpstream10G* sub-attribute, defined as follows: `yes`: 0b1 `no`: 0b0 bit 3-7: reserved and ignored on reception

14.4.3.2 Bridging

14.4.3.2.1 Attribute *aUniDynMacTableSize* (0xD7/0x01-01)

This attribute represents the maximum size of the ONU 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 *aUniDynMacTableSize*:

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 *aUniDynMacTableSize* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aUniDynMacTableSize* attribute shall be as specified in Table 14-149.

Table 14-149—*Dynamic Learning Table Size* TLV (0xD7/0x01-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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 *aUniDynMacTableSize* attribute

14.4.3.2.2 Attribute *aUniDynMacAgeLimit* (0xD7/0x01-02)

This attribute represents the age limit for the dynamically learned MAC addresses.

Attribute *aUniDynMacAgeLimit*:

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 *aUniDynMacAgeLimit* attribute is associated with the ONU object (see 14.4.1.1). The Variable Container TLV for the *aUniDynMacAgeLimit* attribute shall be as specified in Table 14-150.

Table 14-150—*Dynamic Address Age Limit* TLV (0xD7/0x01-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x01-02	Leaf identifier
1	Length	0x01 to 0x02	The size of TLV fields following the `Length` field
1..2	OnuDynMacAgeLimit	Varies	Value of *aUniDynMacAgeLimit* attribute

14.4.3.2.3 Attribute *aUniDynMacTable* (0xD7/0x01-03)

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 (0xD7/0x01-03) may carry up to 21 instances of the sub-attribute *sMacAddress[sMacAddressCount]*. If necessary, more than one *Dynamic Address MAC Table* TLV (0xD7/0x01-03) 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 (0xD7/0x01-03) 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 (0xD7/0x01-03).

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 (0xD7/0x00-01) to indicate that the ONU response spans multiple eOAMPDUs.

The *aUniDynMacTable* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniDynMacTable* attribute shall be as specified in Table 14-151.

Table 14-151—*Dynamic Address MAC Table* TLV (0xD7/0x01-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.2.4 Attribute *aUniStatMacTable* (0xD7/0x01-04)

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 (0xD7/0x01-04) may carry up to 21 instances of the sub-attribute *sMacAddress[sMacAddressCount]*. If necessary, more than one *Static Address MAC Table* TLV (0xD7/0x01-04) 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 (0xD7/0x01-04) 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 (0xD7/0x01-04).

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 (0xD7/0x00-01) to indicate that the ONU response spans multiple eOAMPDUs.

The *aUniStatMacTable* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniStatMacTable* attribute shall be as specified in Table 14-152.

Table 14-152—*Static Address MAC Table* TLV (0xD7/0x01-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.2.5 Attribute *aUniPortAutoNeg* (0xD7/0x01-05)

This attribute represents the auto-negotiation parameters for the selected UNI port or the PON port. This attribute consists of the following sub-attributes: *sCapabilityMax* and *sCapabilityCurrent*.

Sub-attribute *aUniPortAutoNeg.sCapabilityMax*:
Syntax: Bitmap
Size (octets): 2
Remote access: Read-Only
Description: This sub-attribute represents the maximum capabilities of the given ONU port, defined per Table 14-153.

Table 14-153—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 8–15

Sub-attribute *aUniPortAutoNeg.sCapabilityCurrent*:

Syntax: Bitmap
Size (octets): 2
Remote access: Read/Write
Description: This sub-attribute represents the current capabilities of the given ONU port, defined per Table 14-153.

The *aUniPortAutoNeg* attribute is associated with the UNI Port or PON Port object (see 14.4.1.1). The Variable Container TLV for the *aUniPortAutoNeg* attribute shall be as specified in Table 14-154.

Table 14-154—*UNI Port Auto-Negotiation* TLV (0xD7/0x01-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier.
2	Leaf	0x01-05	Leaf identifier.
1	Length	0x04	The size of TLV fields following the `Length` field.
2	CapabilityMax	Varies	Value of *sCapabilityMax* sub-attribute. The value of this sub-attribute is set to 0x00-00 when the *UNI Port Auto-Negotiation* TLV (0xD7/0x01-05) is carried in the *eOAM_Set_Response* eOAMPDU.
2	CapabilityCurrent	Varies	Value of *sCapabilityCurrent* sub-attribute.

14.4.3.2.6 Attribute *aUniAdmissionControl* (0xD7/0x01-06)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniAdmissionControl* attribute shall be as specified in Table 14-155.

Table 14-155—*Source Address Admission Control* TLV (0xD7/0x01-06)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `enabled`: 0x01 `disabled`: 0x00

14.4.3.2.7 Attribute *aUniMinLearnMacCount* (0xD7/0x01-07)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniMinLearnMacCount* attribute shall be as specified in Table 14-156.

Table 14-156—*MAC Learning Min Guarantee* TLV (0xD7/0x01-07)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.2.8 Attribute *aUniMaxLearnMacCount* (0xD7/0x01-08)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniMaxLearnMacCount* attribute shall be as specified in Table 14-157.

Table 14-157—*MAC Learning Max Allowed* TLV (0xD7/0x01-08)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.2.9 Attribute *aOnuMaxLearnMacCount* (0xD7/0x01-09)

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 14.4.1.1). The Variable Container TLV for the *aOnuMaxLearnMacCount* attribute shall be as specified in Table 14-158.

Table 14-158—*MAC Learning Aggregate Limit* TLV (0xD7/0x01-09)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.2.10 Attribute *aUniLengthDiscard* (0xD7/0x01-0A)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniLengthDiscard* attribute shall be as specified in Table 14-159.

Table 14-159—*Length Error Discard* TLV (0xD7/0x01-0A)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `discard`: 0x01 `forward`: 0x00

14.4.3.2.11 Attribute *aUniFloodUnknown* (0xD7/0x01-0B)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniFloodUnknown* attribute shall be as specified in Table 14-160.

Table 14-160—*Flood Unknown* TLV (0xD7/0x01-0B)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `flood`: 0x01 `discard`: 0x00

14.4.3.2.12 Attribute *aUniLocalSwitching* (0xD7/0x01-0C)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniLocalSwitching* attribute shall be as specified in Table 14-161.

Table 14-161—*Local Switching* TLV (0xD7/0x01-0C)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `disable`: 0x00 `enable`: 0x01

14.4.3.2.13 Attribute *aOnuLlidQueueConfig* (0xD7/0x01-0D)

This attribute represents

— The number of L-ONUs to be registered by the given ONU,

— The number of UNI ports to be enabled in the given ONU,

— The assignment of upstream queues to individual L-ONUs, and

— The assignment of downstream queues to individual UNI ports.

The upstream queues hold frames to be transmitted by the given L-ONU. The downstream queues hold frames to be transmitted by the given UNI ports. Queue sizes are specified in the order of queue priority, where the first queue associated with the given L-ONU or the UNI port has the highest priority.

This attribute consists of the following sub-attributes: *sLlidCount*, *sLlidQueCount[sLlidCount]*, *sLlidQueSize[sLlidCount][sLlidQueCount]*, *sUniCount*, *sUniQueCount[sUniCount]*, and *sUniQueSize[sUniCount][sUniQueCount]*.

Sub-attribute *aOnuLlidQueueConfig.sLlidCount*:
Syntax: Unsigned integer
Range: 0x01 to 0xFF
Default value: 0x01
Remote access: Read/Write
Description: This sub-attribute represents the number of upstream L-ONUs (LLIDs) configured on the given ONU.

Sub-attribute *aOnuLlidQueueConfig.sLlidQueCount[sLlidCount]*:
Syntax: Unsigned integer
Range: 0x01 to 0x08
Default value: 0x01
Remote access: Read/Write

Description: This sub-attribute represents the number of upstream queues associated with the given L-ONU designated by *sLlidCount*.
The ONU shall always return the value of 0x01 on read of this sub-attribute.
The ONU shall ignore any attempts to write a value other than 0x01 into this sub-attribute.

Sub-attribute *aOnuLlidQueueConfig.sLlidQueSize[sLlidCount][sLlidQueCount[sLlidCount]]*:

Syntax: Unsigned integer
Range: 0x00 to 0xFF
Default value: 0x01
Unit: 4 kB
Remote access: Read/Write
Description: This sub-attribute represents the size of the upstream queue associated with L-ONU designated by *sLlidCount*.

Sub-attribute *aOnuLlidQueueConfig.sUniCount*:

Syntax: Unsigned integer
Range: 0x01 to 0xFF
Default value: 0x01
Remote access: Read/Write
Description: This sub-attribute represents the number of downstream UNI ports configured on by the given ONU.

Sub-attribute *aOnuLlidQueueConfig.sUniQueCount[sUniCount]*:

Syntax: Unsigned integer
Range: 0x00 to 0x08
Default value: 0x08
Remote access: Read/Write
Description: This sub-attribute represents the number of downstream queues associated with the given UNI port designated by *sUniCount*.

Sub-attribute *aOnuLlidQueueConfig.sUniQueSize[sUniCount][sUniQueCount[sUniCount]]*:

Syntax: Unsigned integer
Range: 0x00 to 0xFF
Default value: 0x01
Unit: 4 kB
Remote access: Read/Write
Description: This sub-attribute represents the size of the downstream queue associated with the given UNI port designated by *sUniCount*.

The *aOnuLlidQueueConfig* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aOnuLlidQueueConfig* attribute shall be as specified in Table 14-162.

The ONU shall ignore the *L-ONU and Queue Configuration* TLV (0xD7/0x01-0D) requesting the deletion of, or changing the size of, any queues if there exist Classifier rules that use those queues. Before attempting to reconfigure the number or the sizes of any queues, the OLT shall delete all the Classifier rules associated with these queues.

The sum of queue sizes shall not exceed the size reported via the *ONU Packet Buffer* TLV (0xD7/0x00-0A).

Table 14-162—*L-ONU and Queue Configuration* TLV (0xD7/0x01-0D)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x01-0D	Leaf identifier

Size (octets)	Field (name)	Value	Notes
1	Length	Varies	The size of TLV fields following the `Length` field
1	LlidCount	Varies	Value of *sLlidCount* sub-attribute (*N*)
1	LlidQueCount[0]	Varies	Value of *sLlidQueCount[0]* sub-attribute
1	LlidQueSize[0][0]	Varies	Value of *sLlidQueSize[0][0]* sub-attribute
…	…	…	…
1	LlidQueSize[0][LlidQueCount[0] −1]	Varies	Value of *sLlidQueSize[0][sLlidQueCount[0] −1]* sub-attribute
…	…	…	…
1	LlidQueCount[N−1]	Varies	Value of *sLlidQueCount[N−1]* sub-attribute
1	LlidQueSize[N−1][0]	Varies	Value of *sLlidQueSize[N−1][0]* sub-attribute
…	…	…	…
1	LlidQueSize[N−1][LlidQueCount[N−1] −1]	Varies	Value of *sLlidQueSize[N−1] [sLlidQueCount[N−1] −1]* sub-attribute
1	UniCount	Varies	Value of *sUniCount* sub-attribute (*M*)
1	UniQueCount[0]	Varies	Value of *sUniQueCount[0]* sub-attribute
1	UniQueSize[0][0]	Varies	Value of *sUniQueSize[0][0]* sub-attribute
…	…	…	…
1	UniQueSize[0][UniQueCount[0] −1]	Varies	Value of *sUniQueSize[0][sUniQueCount[0] −1]* sub-attribute
…	…	…	…
1	UniQueCount[M−1]	Varies	Value of *sUniQueCount[M−1]* sub-attribute
1	UniQueSize[M−1][0]	Varies	Value of *sUniQueSize[M−1][0]* sub-attribute
…	…	…	…
1	UniQueSize[M−1][UniQueCount[M−1] −1]	Varies	Value of *sUniQueSize[M−1] [sUniQueCount[M−1] −1]* sub-attribute

14.4.3.2.14 Attribute *aOnuFwFileName* (0xD7/0x01-0E) NVS

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
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 14.4.1.1). The Variable Container TLV for the *aOnuFwFileName* attribute shall be as specified in Table 14-163.

Table 14-163—*Firmware Filename* TLV (0xD7/0x01-0E)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.2.15 Attribute *aUniMacTableFull* (0xD7/0x01-0F)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aUniMacTableFull* attribute shall be as specified in Table 14-164.

Table 14-164—*MAC Table Full Behavior* TLV (0xD7/0x01-0F)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `discard`: 0x00 `overwrite`: 0x01

14.4.3.3 Statistics and counters

14.4.3.3.1 Attribute *aCountRxFramesGreen* (0xD7/0x02-01)

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, mLLID, or Queue object (see 14.4.1.1). The Variable Container TLV for the *aCountRxFramesGreen* attribute shall be as specified in Table 14-165.

Table 14-165—*RX Frames Green* TLV (0xD7/0x02-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
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

14.4.3.3.2 Attribute *aCountTxFramesGreen* (0xD7/0x02-02)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFramesGreen* attribute shall be as specified in Table 14-166.

Table 14-166—*TX Frames Green* TLV (0xD7/0x02-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.3 Attribute *aCountRxFrames2Short* (0xD7/0x02-03)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames2Short* attribute shall be as specified in Table 14-167.

Table 14-167—*RX Frames Too Short* TLV (0xD7/0x02-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.4 Attribute *aCountRxFrames64* (0xD7/0x02-04)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames64* attribute shall be as specified in Table 14-168.

Table 14-168—*RX Frames 64 Octets* TLV (0xD7/0x02-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.5 Attribute *aCountRxFrames65to127* (0xD7/0x02-05)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames65to127* attribute shall be as specified in Table 14-169.

Table 14-169—*RX Frames 65–127 Octets* TLV (0xD7/0x02-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.6 Attribute *aCountRxFrames128to255* (0xD7/0x02-06)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames128to255* attribute shall be as specified in Table 14-170.

Table 14-170—*RX Frames 128–255 Octets* TLV (0xD7/0x02-06)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.7 Attribute *aCountRxFrames256to511* (0xD7/0x02-07)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames256to511* attribute shall be as specified in Table 14-171.

Table 14-171—*RX Frames 256–511 Octets* TLV (0xD7/0x02-07)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.8 Attribute *aCountRxFrames512to1023* (0xD7/0x02-08)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames512to1023* attribute shall be as specified in Table 14-172.

Table 14-172—*RX Frames 512–1023 Octets* TLV (0xD7/0x02-08)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.9 Attribute *aCountRxFrames1024to1518* (0xD7/0x02-09)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames1024to1518* attribute shall be as specified in Table 14-173.

Table 14-173—*RX Frames 1024–1518 Octets* TLV (0xD7/0x02-09)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.10 Attribute *aCountRxFrames1519* (0xD7/0x02-0A)

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 14.4.1.1). The Variable Container TLV for the *aCountRxFrames1519* attribute shall be as specified in Table 14-174.

Table 14-174—*RX Frames 1519 Octets* TLV (0xD7/0x02-0A)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.11 Attribute *aCountTxFrames64* (0xD7/0x02-0B)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames64* attribute shall be as specified in Table 14-175.

Table 14-175—*TX Frames 64 Octets* TLV (0xD7/0x02-0B)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.12 Attribute *aCountTxFrames65to127* (0xD7/0x02-0C)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames65to127* attribute shall be as specified in Table 14-176.

Table 14-176—*TX Frames 65–127 Octets* TLV (0xD7/0x02-0C)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.13 Attribute *aCountTxFrames128to255* (0xD7/0x02-0D)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames128to255* attribute shall be as specified in Table 14-177.

Table 14-177—*TX Frames 128–255 Octets* TLV (0xD7/0x02-0D)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.14 Attribute *aCountTxFrames256to511* (0xD7/0x02-0E)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames256to511* attribute shall be as specified in Table 14-178.

Table 14-178—*TX Frames 256–511 Octets* TLV (0xD7/0x02-0E)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.15 Attribute *aCountTxFrames512to1023* (0xD7/0x02-0F)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames512to1023* attribute shall be as specified in Table 14-179.

Table 14-179—*TX Frames 512–1023 Octets* TLV (0xD7/0x02-0F)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.16 Attribute *aCountTxFrames1024to1518* (0xD7/0x02-10)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames1024to1518* attribute shall be as specified in Table 14-180.

Table 14-180—*TX Frames 1024–1518 Octets* TLV (0xD7/0x02-10)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.17 Attribute *aCountTxFrames1519* (0xD7/0x02-11)

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 14.4.1.1). The Variable Container TLV for the *aCountTxFrames1519* attribute shall be as specified in Table 14-181.

Table 14-181—*TX Frames 1519 Octets* TLV (0xD7/0x02-11)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.18 Attribute *aQueueDelayThr* (0xD7/0x02-12)

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 14.4.1.1). The Variable Container TLV for the *aQueueDelayThr* attribute shall be as specified in Table 14-182.

Table 14-182—*Delay Threshold* TLV (0xD7/0x02-12)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.19 Attribute *aQueueDelayValue* (0xD7/0x02-13)

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 14.4.1.1). The Variable Container TLV for the *aQueueDelayValue* attribute shall be as specified in Table 14-183.

Table 14-183—*Delay* TLV (0xD7/0x02-13)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.20 Attribute *aCountFramesDropped* (0xD7/0x02-14)

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 14.4.1.1). The Variable Container TLV for the *aCountFramesDropped* attribute shall be as specified in Table 14-184.

Table 14-184—*Frames Dropped* TLV (0xD7/0x02-14)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.21 Attribute *aCountOctetsDropped* (0xD7/0x02-15)

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 14.4.1.1). The Variable Container TLV for the *aCountOctetsDropped* attribute shall be as specified in Table 14-185.

Table 14-185—*Octets Dropped* TLV (0xD7/0x02-15)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.22 Attribute *aCountOctetsDelayed* (0xD7/0x02-16)

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 14.4.1.1). The Variable Container TLV for the *aCountOctetsDelayed* attribute shall be as specified in Table 14-186.

Table 14-186—*Octets Delayed* TLV (0xD7/0x02-16)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.23 Attribute *aCountUsOctetsUnused* (0xD7/0x02-17)

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 14.4.1.1). The Variable Container TLV for the *aCountUsOctetsUnused* attribute shall be as specified in Table 14-187.

Table 14-187—*Upstream Octets Unused* TLV (0xD7/0x02-17)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.24 Attribute *aPonOptMonitTemp* (0xD7/0x02-1D)

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: ~~0x00~~0x80-00 to ~~0xFF~~0x7F-FF
Unit: 1/256 °C
~~**Default value:** 0x00-01~~
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 ~~0x00-~~0x80-00 on write of any value to this attribute.

The *aPonOptMonitTemp* attribute is associated with the PON Port object (see 14.4.1.1). The Variable Container TLV for the *aPonOptMonitTemp* attribute shall be as specified in Table 14-188.

Table 14-188—*Optical Monitoring Temperature* TLV (0xD7/0x02-1D)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-1D	Leaf identifier
1	Length	~~0x01 to~~ 0x02	The size of TLV fields following the `Length` field
~~1..~~2	aPonOptMonitTemp	Varies	Value of *aPonOptMonitTemp* attribute

14.4.3.3.25 Attribute *aPonOptMonitVcc* (0xD7/0x02-1E)

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 14.4.1.1). The Variable Container TLV for the *aPonOptMonitVcc* attribute shall be as specified in Table 14-189.

Table 14-189—*Optical Monitoring VCC* TLV (0xD7/0x02-1E)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.26 Attribute *aPonOptMonitBias* (0xD7/0x02-1F)

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 14.4.1.1). The Variable Container TLV for the *aPonOptMonitBias* attribute shall be as specified in Table 14-190.

Table 14-190—*Optical Monitoring Tx Bias Current* TLV (0xD7/0x02-1F)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.27 Attribute *aPonOptMonitTxPower* (0xD7/0x02-20)

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 14.4.1.1). The Variable Container TLV for the *aPonOptMonitTxPower* attribute shall be as specified in Table 14-191.

Table 14-191—*Optical Monitoring Tx Power* TLV (0xD7/0x02-20)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.28 Attribute *aPonOptMonitRxPower* (0xD7/0x02-21)

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 14.4.1.1). The Variable Container TLV for the *aPonOptMonitRxPower* attribute shall be as specified in Table 14-192.

Table 14-192—*Optical Monitoring Rx Power* TLV (0xD7/0x02-21)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.29 Attribute *aCounterRxFramesY* (0xD7/0x02-22)

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, mLLID, or Queue object (see 14.4.1.1). The Variable Container TLV for the *aCounterRxFramesY* attribute shall be as specified in Table 14-193.

Table 14-193—*Rx Frames Yellow* TLV (0xD7/0x02-22)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.30 Attribute *aCounterTxFramesY* (0xD7/0x02-23)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxFramesY* attribute shall be as specified in Table 14-194.

Table 14-194—*Tx Frames Yellow* TLV (0xD7/0x02-23)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.31 Attribute *aCounterTxOctetsG* (0xD7/0x02-24)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxOctetsG* attribute shall be as specified in Table 14-195.

Table 14-195—*Tx Octets Green* TLV (0xD7/0x02-24)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.32 Attribute *aCounterRxOctetsY* (0xD7/0x02-25)

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, mLLID, or Queue object (see 14.4.1.1). The Variable Container TLV for the *aCounterRxOctetsY* attribute shall be as specified in Table 14-196.

Table 14-196—*Rx Octets Yellow* TLV (0xD7/0x02-25)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.33 Attribute *aCounterRxOctetsG* (0xD7/0x02-26)

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, mLLID, or Queue object (see 14.4.1.1). The Variable Container TLV for the *aCounterRxOctetsG* attribute shall be as specified in Table 14-197.

Table 14-197—*Rx Octets Green* TLV (0xD7/0x02-26)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.34 Attribute *aCounterTxOctetsY* (0xD7/0x02-27)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxOctetsY* attribute shall be as specified in Table 14-198.

Table 14-198—*Tx Octets Yellow* TLV (0xD7/0x02-27)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.35 Attribute *aCounterTxFramesL2Unicast* (0xD7/0x02-28)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxFramesL2Unicast* attribute shall be as specified in Table 14-199.

Table 14-199—*Tx Frames Layer 2 Unicast* TLV (0xD7/0x02-28)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.36 Attribute *aCounterTxFramesL2Multicast* (0xD7/0x02-29)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxFramesL2Multicast* attribute shall be as specified in Table 14-200.

Table 14-200—*Tx Frames Layer 2 Multicast* TLV (0xD7/0x02-29)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.37 Attribute *aCounterTxFramesL2Broadcast* (0xD7/0x02-2A)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxFramesL2Broadcast* attribute shall be as specified in Table 14-201.

Table 14-201—*Tx Frames Layer 2 Broadcast* TLV (0xD7/0x02-2A)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.38 Attribute *aCounterRxFramesL2Unicast* (0xD7/0x02-2B)

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 14.4.1.1). The Variable Container TLV for the *aCounterRxFramesL2Unicast* attribute shall be as specified in Table 14-202.

Table 14-202—*Rx Frames Layer 2 Unicast* TLV (0xD7/0x02-2B)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.39 Attribute *aCounterRxFramesL2Multicast* (0xD7/0x02-2C)

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 14.4.1.1). The Variable Container TLV for the *aCounterRxFramesL2Multicast* attribute shall be as specified in Table 14-203.

Table 14-203—*Rx Frames Layer 2 Multicast* TLV (0xD7/0x02-2C)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.40 Attribute *aCounterRxFramesL2Broadcast* (0xD7/0x02-2D)

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 14.4.1.1). The Variable Container TLV for the *aCounterRxFramesL2Broadcast* attribute shall be as specified in Table 14-204.

Table 14-204—*Rx Frames Layer 2 Broadcast* TLV (0xD7/0x02-2D)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.3.41 Attribute *aOnuCounterNumber* (0xD7/0x02-2E)

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 14.4.1.1). The Variable Container TLV for the *aOnuCounterNumber* attribute shall be as specified in Table 14-205.

Table 14-205—*Counter Number* TLV (0xD7/0x02-2E)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-2E	Leaf identifier
1	Length	~~Varies~~0x01 to 0x02	The size of TLV fields following the `Length` field
~~Varies~~1..2	OnuCounterNumber	Varies	Value of *aOnuCounterNumber* attribute

14.4.3.3.42 Attribute *aCounterRxFramesL2CP* (0xD7/0x02-2F)

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 ONU object (see 14.4.1.1). The Variable Container TLV for the *aCounterRxFramesL2CP* attribute shall be as specified in Table 14-206.

Table 14-206—*L2CP Frames Rx* TLV (0xD7/0x02-2F)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-2F	Leaf identifier
1	Length	~~Varies~~0x01 to 0x08	The size of TLV fields following the `Length` field
~~Varies~~1..8	CounterRxFramesL2CP	Varies	Value of *aCounterRxFramesL2CP* attribute

14.4.3.3.43 Attribute *aCounterRxOctetsL2CP* (0xD7/0x02-30)

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 14.4.1.1). The Variable Container TLV for the *aCounterRxOctetsL2CP* attribute shall be as specified in Table 14-207.

Table 14-207—*L2CP Octets Rx* TLV (0xD7/0x02-30)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-30	Leaf identifier
1	Length	~~Varies~~0x01 to 0x08	The size of TLV fields following the `Length` field
~~Varies~~1..8	CounterRxOctetsL2CP	Varies	Value of *aCounterRxOctetsL2CP* attribute

14.4.3.3.44 Attribute *aCounterTxFramesL2CP* (0xD7/0x02-31)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxFramesL2CP* attribute shall be as specified in Table 14-208.

Table 14-208—*L2CP Frames Tx* TLV (0xD7/0x02-31)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-31	Leaf identifier
1	Length	~~Varies~~0x01 to 0x08	The size of TLV fields following the `Length` field
~~Varies~~1..8	CounterTxFramesL2CP	Varies	Value of *aCounterTxFramesL2CP* attribute

14.4.3.3.45 Attribute *aCounterTxOctetsL2CP* (0xD7/0x02-32)

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 14.4.1.1). The Variable Container TLV for the *aCounterTxOctetsL2CP* attribute shall be as specified in Table 14-209.

Table 14-209—*L2CP Octets Tx* TLV (0xD7/0x02-32)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-32	Leaf identifier
1	Length	~~Varies~~0x01 to 0x08	The size of TLV fields following the `Length` field
~~Varies~~1..8	CounterTxOctetsL2CP	Varies	Value of *aCounterTxOctetsL2CP* attribute

14.4.3.3.46 Attribute *aCounterDiscardFramesL2CP* (0xD7/0x02-33)

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 14.4.1.1). The Variable Container TLV for the *aCounterDiscardFramesL2CP* attribute shall be as specified in Table 14-210.

Table 14-210—*L2CP Frames Discarded* TLV (0xD7/0x02-33)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-33	Leaf identifier
1	Length	0x01 to 0x08~~Varies~~	The size of TLV fields following the `Length` field
1..8~~Varies~~	CounterDiscardFramesL2CP	Varies	Value of *aCounterDiscardFramesL2CP* attribute

14.4.3.3.47 Attribute *aCounterDiscardOctetsL2CP* (0xD7/0x02-34)

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 14.4.1.1). The Variable Container TLV for the *aCounterDiscardOctetsL2CP* attribute shall be as specified in Table 14-211.

Table 14-211—*L2CP Octets Discarded* TLV (0xD7/0x02-34)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-34	Leaf identifier
1	Length	0x01 to 0x08~~Varies~~	The size of TLV fields following the `Length` field
1..8~~Varies~~	CounterDiscardOctetsL2CP	Varies	Value of *aCounterDiscardOctetsL2CP* attribute

14.4.3.3.48 Attribute *aCounterL2TxErrors* (0xD7/0x02-35)

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 14.4.1.1). The Variable Container TLV for the *aCounterL2TxErrors* attribute shall be as specified in Table 14-212.

Table 14-212—*L2 Tx Errors* TLV (0xD7/0x02-35)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-35	Leaf identifier
1	Length	0x01 to 0x08~~Varies~~	The size of TLV fields following the `Length` field
1..8~~Varies~~	aCounterL2TxErrors	Varies	Value of *aCounterL2TxErrors* attribute

14.4.3.3.49 Attribute *aCounterL2RxErrors* (0xD7/0x02-36)

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 14.4.1.1). The Variable Container TLV for the *aCounterL2RxErrors* attribute shall be as specified in Table 14-213.

Table 14-213—*L2 Rx Errors* TLV (0xD7/0x02-36)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x02-36	Leaf identifier
1	Length	~~Varies~~0x01 to 0x08	The size of TLV fields following the `Length` field
1..8~~Varies~~	aCounterL2RxErrors	Varies	Value of *aCounterL2RxErrors* attribute

14.4.3.4 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.

14.4.3.4.1 Attribute *aAlarmPortStatThr* (0xD7/0x03-01)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aAlarmPortStatThr* attribute shall be as specified in Table 14-214.

Table 14-214—*Port Stat Threshold* TLV (0xD7/0x03-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.4.2 Attribute *aAlarmLlidStatThr* (0xD7/0x03-02)

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 14.4.1.1). The Variable Container TLV for the *aAlarmLlidStatThr* attribute shall be as specified in Table 14-215.

Table 14-215—*L-ONU Stat Threshold* TLV (0xD7/0x03-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.4.3 Attribute *aAlarmStatusControl* (0xD7/0x03-03)

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 14.4.1.1) 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 13-85) 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 13-85) 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 13-85) 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 13-85) 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 13-85) 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 13-85) 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 13-85) 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, mLLID, UNI Port, or Queue object (see 14.4.1.1). The Variable Container TLV for the *aAlarmStatusControl* attribute shall be as specified in Table 14-216.

Table 14-216—*Alarm Status Control* TLV (0xD7/0x03-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x03-03	Leaf identifier
1	Length	$2 \times N$	The size of TLV fields following the `Length` field. 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 13-85. The alarm identifiers are mapped to the sub-attributes as defined below: 0x11: *sErrLoS* 0x12: *sErrKeyExchange* 0x21: *sErrPortDown* 0x41: *sErrPowerFail* 0x81: *sErrStatAlarm* 0x82: *sErrOnuBusy* 0x83: *sErrMacOverflow*
1	AlarmStatus[0]	Varies	Value of the sub-attribute identified by the `AlarmCode[0]`, encoded as shown below: `disable`: 0x00 `enable`: 0x01
…			
1	AlarmCode[N−1]	Varies	Alarm identifier (event code), per Table 13-85. 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: `disable`: 0x00 `enable`: 0x01

When the *Alarm Status Control* TLV (0xD7/0x03-03) is carried in the *eOAM_Get_Response* eOAMPDU, it contains all defined alarm codes, i.e., $N = 7$.

14.4.3.5 Encryption

14.4.3.5.1 Attribute *aEncryptionKeyExpiration* (0xD7/0x04-01)

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 14.4.1.1). The Variable Container TLV for the *aEncryptionKeyExpiration* attribute shall be as specified in Table 14-217.

Table 14-217—*Encryption Key Expiry Time* TLV (0xD7/0x04-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.5.2 Attribute *aEncryptionMode* (0xD7/0x04-02)

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 14.4.1.1). The Variable Container TLV for the *aEncryptionMode* attribute shall be as specified in Table 14-218.

Table 14-218—*Encryption Mode* TLV (0xD7/0x04-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `none`: 0x00 `1GD`: 0x01 `10GD`: 0x02 `10GB`: 0x03

14.4.3.6 Frame processing

14.4.3.6.1 Attribute *aRuleSetConfig* (0xD7/0x05-01)

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
Range: 0x00 to 0xFF
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 14.4.3.6.1.1.

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
Range: 0x00 to 0xFF
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 14.4.3.6.1.2.

14.4.3.6.1.1 *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

[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 6-1.

[c] This field is as defined in Table 6-2.

[d] This field is as defined in Table 6-3.

[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 $0..N-1^{th}$ 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.

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.

14.4.3.6.1.2 *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 14.4.1.1.2.5
Remote access: Read/Write
Description: Object type is equal 0x00-02 or 0x00-03 since only LLIDs and UNI ports have associated queues (see 14.4.1.1.1). 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 14.4.3.6.1.1.
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 14.4.3.6.1.1.
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 14.4.3.6.1.1.
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 14.4.3.6.1.1.
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 14.4.6.

14.4.3.6.1.3 *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 ONU, PON Port, LLID, UNI Port, or Queue object (see 14.4.1.1). The Variable Container TLV for the *aRuleSetConfig* attribute shall be as specified in Table 14-219.

Table 14-219—*Port Ingress Rule* TLV (0xD7/0x05-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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.
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 14-220)
…	…	…	…
Varies	Clause[N−1]	Varies	Value of *sClause[N−1]* sub-attribute (see Table 14-220)
Varies	Result[0]	Varies	Value of *sResult[0]* sub-attribute (see Table 14-221 through Table 14-226)
…	…	…	…
Varies	Result[M−1]	Varies	Value of *sResult[M−1]* sub-attribute (see Table 14-221 through Table 14-226)
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 14-220.

Table 14-220—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: 0x00: `LINK_INDEX` field 0x01: `DA` field 0x02: `SA` field 0x03: `ETYPE_LEN` field 0x04: `B_DA` field 0x05: `B_SA` field 0x06: `I_TAG` field 0x07: `S_TAG` field 0x08: `C_TAG` field 0x09: `MPLS_LSE` field 0x0A: `IP_TOS_TC` field 0x0B: `IP_TTL_HL` field 0x0C: `IP_PT` field 0x0D: `IPv4_DA` field 0x0E: `IPv6_DA` field 0x0F: `IPv4_SA` field 0x10: `IPv6_SA` field 0x11: `IPv6_NEXT_HEADER` field 0x12: `IPv6_FLOWLABEL` field 0x13: `TCP_UDP_SP` field 0x14: `TCP_UDP_DP` field 0x15: `B_TAG` field 0x16 to 0x17: reserved 0x18: `CUST_0` field 0x19: `CUST_1` field 0x1A: `CUST_2` field 0x1B: `CUST_3` field 0x1C: `CUST_4` field 0x1D: `CUST_5` field 0x1E: `CUST_6` field 0x1F: `CUST_7` field
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: 0x00: NEVER operator 0x01: EQUAL operator 0x02: DIFFERENT operator 0x03: LESS_EQUAL operator 0x04: MORE_EQUAL operator 0x05: EXISTS operator 0x06: NOT_EXISTS operator 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 14-221.

Table 14-221—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: 0x00: NOP operation 0x01: DISCARD operation 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 14-222.

Table 14-222—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 14-223.

Table 14-223—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
2	FieldCode	Varies	Value of *sFieldCode* sub-attribute, encoded as shown in FieldCode field in Table 14-220
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 14-224.

Table 14-224—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
2	FieldCode	Varies	Value of *sFieldCode* sub-attribute, encoded as shown in FieldCode field in Table 14-220
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 14-225.

Table 14-225—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: 0x06: DELETE operation 0x07: INSERT operation 0x08: REPLACE operation 0x09: CLEAR_DELETE operation 0x0A: CLEAR_INSERT operation

Size (octets)	Field (name)	Value	Notes
2	FieldCode	Varies	Value of *sFieldCode* sub-attribute, encoded as shown in `FieldCode` field in Table 14-220
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 14-226.

Table 14-226—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

14.4.3.6.2 Attribute *aRuleCustomField* (0xD7/0x05-02)

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 14-220 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 14-227.

Table 14-227—*aRuleCustomField.sLayerSetect* sub-attribute

Value	Layer Code	Notes	Reference
0x00	L2_PREAMBLE	LLID, DA, SA, SNAP headers (if present)	Table 14-229, Table 14-230
0x01	PREAMBLE_802.1ah	LLID, B-DA, B-SA, I-Tag	Table 14-231
0x02	EtherType	L2 protocol type of remainder of the frame	Table 14-232
0x03	S_TAG	All S-VLAN tags in the frame	Table 14-233
0x04	C_TAG	All C-VLAN tags in the frame	Table 14-234
0x05	MPLS	The MPLS stack, if any, in the frame	Table 14-235
0x06	IPv4	Frames with EtherType 0x08-00	Table 14-236
0x07	IPv6	Frames with EtherType 0x86-DD	Table 14-237

Value	Layer Code	Notes	Reference
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 14-238
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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aRuleCustomField* attribute shall be as specified in Table 14-228.

Table 14-228—*Custom Field* TLV (0xD7/0x05-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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 14-220
1	LayerSelect	Varies	Value of *sLayerSelect* sub-attribute, defined in Table 14-227
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. When carried in *eOAM_Set_Request* eOAMPDU, this field is set to 0.

14.4.3.6.2.1 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 14-229 shows the offsets within this layer when the frame does not have SNAP encapsulation.

Table 14-229—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 14-230 shows the offsets into this layer when the frame has SNAP encapsulation.

Table 14-230—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]														

14.4.3.6.2.2 IEEE 802.1ah layer

The IEEE 802.1ah layer consists of the MAC-in-MAC encapsulation header, as specified in IEEE Std 802.1ah, including the B-DA, B-SA, and I-Tag fields. This layer exists only in IEEE 802.1ah encapsulated frames, as determined by the presence of the I-Tag (a TPID value of 0x88-E7 immediately following the B-SA).

Table 14-231 shows the offsets into this layer.

Table 14-231—IEEE 802.1ah 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																							

14.4.3.6.2.3 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 14-232 shows the offsets into this layer.

Table 14-232—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															

14.4.3.6.2.4 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 14-233 shows the offsets into this layer.

Table 14-233—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											
…																															

14.4.3.6.2.5 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 14-234 shows the offsets into this layer.

Table 14-234—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											
…																															

14.4.3.6.2.6 Multiprotocol Label Switching (MPLS) layer

The MPLS Tags layer consists of all MPLS labels identified in the frame.

Table 14-235 shows the offsets into this layer.

Table 14-235—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								

14.4.3.6.2.7 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 14-236 shows the offsets into this layer.

Table 14-236—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) …																															

14.4.3.6.2.8 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 14-237 shows the offsets into this layer. The IPv6 header shown in Table 14-237 represents the fixed IPv6 header, without Next Header.

Table 14-237—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																															

14.4.3.6.2.9 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.

14.4.3.6.2.10 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 14-238 shows the offsets into this layer.

Table 14-238—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															

14.4.3.6.2.11 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.

14.4.3.6.3 Attribute *aRuleTpidCAlter* (0xD7/0x05-03)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aRuleTpidCAlter* attribute shall be as specified in Table 14-239.

Table 14-239—*Alternative C-TPID* TLV (0xD7/0x05-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

Size (octets)	Field (name)	Value	Notes
1	State	Varies	Value of *sTpidDefault* sub-attribute, as defined below: `regular`: 0x01 `alternative`: 0x00

14.4.3.6.4 Attribute *aRuleTpidSAlter* (0xD7/0x05-04)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aRuleTpidSAlter* attribute shall be as specified in Table 14-240.

Table 14-240—*Alternative S-TPID* TLV (0xD7/0x05-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `alternative`: 0x01 `regular`: 0x00

14.4.3.6.5 Attribute *aRuleIpmcFwrConfig* (0xD7/0x05-05)

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 14.4.1.1). The Variable Container TLV for the *aRuleIpmcFwrConfig* attribute shall be as specified in Table 14-241.

Table 14-241—*Multicast Group Identifier* TLV (0xD7/0x05-05)

Size (bits)	Field (name)	Value	Notes
8	Branch	0xD7	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`. 1: *sFieldLlid* is equal to `used`.
1	FieldL2Sa	0/1	0: *sFieldL2Sa* is equal to `not_used`. 1: *sFieldL2Sa* is equal to `used`.
1	FieldL2Da	0/1	0: *sFieldL2Da* is equal to `not_used`. 1: *sFieldL2Da* is equal to `used`.
1	FieldL3Sa	0/1	0: *sFieldL3Sa* is equal to `not_used`. 1: *sFieldL3Sa* is equal to `used`.
1	FieldL3Da	0/1	0: *sFieldL3Da* is equal to `not_used`. 1: *sFieldL3Da* is equal to `used`.
11	Pad	0x00	Ignored on reception

14.4.3.6.6 Attribute *aRuleTpidIAlter* (0xD7/0x05-06)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aRuleTpidIAlter* attribute shall be as specified in Table 14-242.

Table 14-242—*Alternative I-TPID* TLV (0xD7/0x05-06)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `alternative`: 0x01 `regular`: 0x00

14.4.3.6.7 Attribute *aRuleTpidBAlter* (0xD7/0x05-07)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aRuleTpidBAlter* attribute shall be as specified in Table 14-243.

Table 14-243—*Alternative B-TPID* TLV (0xD7/0x05-07)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `alternative`: 0x01 `regular`: 0x00

14.4.3.7 Service-level agreements (SLAs)

14.4.3.7.1 Attribute *aRateLimitBroadcast* (0xD7/0x06-01)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aRateLimitBroadcast* attribute shall be as specified in Table 14-244.

Table 14-244—*Broadcast Rate Limit* TLV (0xD7/0x06-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x06-01	Leaf identifier
1	Length	0x01 to 0x04	The size of TLV fields following the `Length` field
1..4	RateLimitBroadcast	Varies	Value of *aRateLimitBroadcast* attribute

14.4.3.7.2 Attribute *aQueueCIR* (0xD7/0x06-04)

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 14.4.1.1). The Variable Container TLV for the *aQueueCIR* attribute shall be as specified in Table 14-245.

Table 14-245—*Queue Committed Information Rate* TLV (0xD7/0x06-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.7.3 Attribute *aFecMode* (0xD7/0x06-05)

This attribute represents the current configuration of upstream and downstream FEC mode. This attribute consists of the following sub-attributes: *sFecDown* and *sFecUp*.

Sub-attribute *aFecMode.sFecDown*:

Syntax: Boolean
Default value: `disabled`
Remote access: Read/Write
Description: This sub-attribute indicates whether the downstream FEC is enabled. The following values are defined:

- `enabled`: downstream FEC is enabled.
- `disabled`: downstream FEC is disabled.
  The ONU shall always return the value of `enabled` for this sub-attribute for all downstream links operating at 10 Gb/s.
  The ONU shall ignore any attempts to write a value other than `enabled` into this sub-attribute for any downstream links operating at 10 Gb/s.

Sub-attribute *aFecMode.sFecUp*:

Syntax: Boolean
Default value: `disabled`
Remote access: Read/Write
Description: This sub-attribute indicates whether the upstream FEC is enabled. The following values are defined:

- `enabled`: upstream FEC is enabled.

`disabled`: upstream FEC is disabled.
The ONU shall always return the value of `enabled` for this sub-attribute for all upstream links operating at 10 Gb/s. The ONU shall ignore any attempts to write a value other than `enabled` into this sub-attribute for any upstream links operating at 10 Gb/s.

The *aFecMode* attribute is associated with the LLID, mLLID, or the ONU object (see 14.4.1.1). The Variable Container TLV for the *aFecMode* attribute shall be as specified in Table 14-246. If *aFecMode* attribute is associated with the mLLID object, the OLT and the ONU ignore the sub-attribute *aFecMode.sFecUp*.

Table 14-246—*FEC Mode* TLV (0xD7/0x06-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x06-05	Leaf identifier
1	Length	0x02	The size of TLV fields following the `Length` field
1	FecDown	Varies	Value of *sFecDown* sub-attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00
1	FecUp	Varies	Value of *sFecUp* sub-attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00

14.4.3.7.4 Attribute *aQueueEIR* (0xD7/0x06-06)

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 14.4.1.1). The Variable Container TLV for the *aQueueEIR* attribute shall be as specified in Table 14-247.

Table 14-247—*Queue Excess Information Rate* TLV (0xD7/0x06-06)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.7.5 Attribute *aQueueColorMarking* (0xD7/0x06-07)

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 14-220.

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 14.4.3.6.1.1.

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 14.4.1.1). The Variable Container TLV for the *aQueueColorMarking* attribute shall be as specified in Table 14-248.

Table 14-248—*Queue Color Marking* TLV (0xD7/0x06-07)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x06-07	Leaf identifier
1	Length	0x07	The size of TLV fields following the `Length` field
1	Status	Varies	Value of *sStatus* sub-attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00
1	FieldCode	Varies	Value of *sFieldCode* sub-attribute, defined in Table 14-220
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

14.4.3.7.6 Attribute *aQueueRateLimiterCap* (0xD7/0x06-08)

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 14.4.1.1). The Variable Container TLV for the *aQueueRateLimiterCap* attribute shall be as specified in Table 14-249.

Table 14-249—*Queue Rate Limiter Capabilities* TLV (0xD7/0x06-08)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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
1	ColorAware	Varies	Value of *sColorAware* sub-attribute, defined as follows: `disabled`: 0x00 `enabled`: 0x01
1	CouplingConfigurable	Varies	Value of *sCouplingConfigurable* sub-attribute, defined as follows: `not_configurable`: 0x00 `configurable`: 0x01
1	CouplingDefault	Varies	Value of *sCouplingDefault* sub-attribute, defined as follows: `disabled`: 0x00 `enabled`: 0x01

Size (octets)	Field (name)	Value	Notes
1	ColorMarking	Varies	Value of *sColorMarking* sub-attribute, defined as follows: `not_supported`: 0x00 `supported`: 0x01

14.4.3.7.7 Attribute *aCouplingFlag* (0xD7/0x06-09)

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 14.4.1.1). The Variable Container TLV for the *aCouplingFlag* attribute shall be as specified in Table 14-250.

Table 14-250—*Coupling Flag* TLV (0xD7/0x06-09)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `disabled`: 0x00 `enabled`: 0x01

14.4.3.8 Power saving

14.4.3.8.1 Attribute *aOnuPwrSavingCap* (0xD7/0xFF-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 14.4.1.1). The Variable Container TLV for the *aOnuPwrSavingCap* attribute shall be as specified in Table 14-251.

Table 14-251—*ONU Power Saving Capabilities* TLV (0xD7/0xFF-FF)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `mode_none`: 0x00 `mode_tx`: 0x01 `mode_trx`: 0x02 `mode_tx_trx`: 0x03
1	PwrEarlyWakeUp	Varies	Value of *sPwrEarlyWakeUp* sub-attribute, defined as follows: `supported`: 0x00 `not_supported`: 0x01
1	VenSpecFieldSize	Varies	Size of the `VenSpecField` field, expressed in units of octets
N	VenSpecField	Varies	Value of*sVenSpecField* sub-attribute

14.4.3.9 Clock transport

14.4.3.9.1 Attribute *aClockTranspCapab* (0xD7/0x07-01)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aClockTranspCapab* attribute shall be as specified in Table 14-252.

Table 14-252—*Clock Transport Capability* TLV (0xD7/0x07-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
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: `supported`: 0x01 `not_supported`: 0x00
1	SupportToD	Varies	Value of *sSupportToD* sub-attribute, defined as follows: `supported`: 0x01 `not_supported`: 0x00
1	Support1588v2	Varies	Value of *sSupport1588v2* sub-attribute, defined as follows: `supported`: 0x01 `not_supported`: 0x00

14.4.3.9.2 Attribute *aClockTranspStatus* (0xD7/0x07-02)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aClockTranspStatus* attribute shall be as specified in Table 14-253.

Table 14-253—*Clock Transport Admin Status* TLV (0xD7/0x07-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `enabled`: 0x01 `disabled`: 0x00
1	StatusToD	Varies	Value of *sStatusToD* sub-attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00
1	Status1588v2	Varies	Value of *sStatus1588v2* sub-attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00

14.4.3.9.3 Attribute *aClockTranspTransfer* (0xD7/0x07-03)

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 14.4.1.1). The Variable Container TLV for the *aClockTranspTransfer* attribute shall be as specified in Table 14-254.

Table 14-254—*Clock Transfer Time* TLV (0xD7/0x07-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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
N	StringToD	Varies	Value of *sStringToD* sub-attribute

14.4.3.9.4 Attribute *aClockTranspPropagParam* (0xD7/0x07-04)

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 14.4.1.1). The Variable Container TLV for the *aClockTranspPropagParam* attribute shall be as specified in Table 14-255.

Table 14-255—*Clock Transfer Propagation Parameters* TLV (0xD7/0x07-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.9.5 Attribute *aClockTranspRtt* (0xD7/0x07-05)

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 14.4.1.1). The Variable Container TLV for the *aClockTranspRtt* attribute shall be as specified in Table 14-256.

Table 14-256—*Clock Transfer RTT* TLV (0xD7/0x07-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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

14.4.3.10 Demarc auto-configuration

14.4.3.10.1 Attribute *aDacConfig* (0xD7/0x08-00)

This attribute represents the set of configuration parameters related to Demarcation device Auto-Configuration (DAC) (see DPoE-SP-DAC) associated with the LLDP Transmit/Receive agent operating on the given UNI port, i.e., the aggregate of S-Tag, C-Tag, I-Tag, B-Tag, and B-DA in whatever combination that needs to be relayed to the demarcation device via the IEEE 802.1AB LLDP mechanism. This attribute consists of the following sub-attributes: *sTagS*, *sTagC*, *sTagI*, *sTagB*, and *sTagDaB*.

Sub-attribute *aDacConfig.sTagS*:

Syntax: VLAN tag
Remote access: Read/Write
Description: This sub-attribute indicates the value of the S-Tag applied to the management traffic exchanged between the demarcation device and the NMS.

Sub-attribute *aDacConfig.sTagC*:

Syntax: VLAN tag
Remote access: Read/Write

Description: This sub-attribute indicates the value of the C-Tag applied to the management traffic exchanged between the demarcation device and the NMS.

Sub-attribute *aDacConfig.sTagI*:
Syntax: Backbone Service Instance tag (I-Tag)
Remote access: Read/Write
Description: This sub-attribute indicates the value of the I-Tag applied to the management traffic exchanged between the demarcation device and the NMS.

Sub-attribute *aDacConfig.sTagB*:
Syntax: VLAN tag
Remote access: Read/Write
Description: This sub-attribute indicates the value of the B-Tag applied to the management traffic exchanged between the demarcation device and the NMS.

Sub-attribute *aDacConfig.sTagDaB*:
Syntax: MAC address
Remote access: Read/Write
Description: This sub-attribute indicates the value of the B-DA applied to the management traffic exchanged between the demarcation device and the NMS.

The *aDacConfig* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aDacConfig* attribute shall be as specified in Table 14-257.

Table 14-257—*DAC Configuration Fields* TLV (0xD7/0x08-00)

Size (octets)	**Field** (name)	**Value**	**Notes**
1	Branch	0xD7	Branch identifier
2	Leaf	0x08-00	Leaf identifier
1	Length	0x18	The size of TLV fields following the `Length` field
4	TagS	Varies	Value of *sTagS* sub-attribute
4	TagC	Varies	Value of *sTagC* sub-attribute
6	TagI	Varies	Value of *sTagI* sub-attribute
4	TagB	Varies	Value of *sTagB* sub-attribute
6	TagDaB	Varies	Value of *sTagDaB* sub-attribute

14.4.3.10.2 Attribute *aDacConfigFlags* (0xD7/0x08-01)

This attribute represents the set of DAC-related configuration parameters indicating which of the specific tags stored in *aDacConfig* attribute are used to tag the management frames (when enabled). This attribute consists of the following sub-attributes: *sTagS*, *sTagC*, *sTagI*, *sTagB*, and *sTagDaB*.

Sub-attribute *aDacConfigFlags.sTagS*:
Syntax: Boolean
Remote access: Read/Write
Description: This sub-attribute indicates whether S-Tag is added to all DAC management traffic. The following values are defined:
`used`: S-Tag is added to all DAC management traffic.
`not_used`: S-Tag is not added to all DAC management traffic.

Sub-attribute *aDacConfigFlags.sTagC*:
Syntax: Boolean
Remote access: Read/Write

Description: This sub-attribute indicates whether C-Tag is added to all DAC management traffic. The following values are defined:

`used`: C-Tag is added to all DAC management traffic.
`not_used`: C-Tag is not added to all DAC management traffic.

Sub-attribute *aDacConfigFlags.sTagI*:

Syntax: Boolean
Remote access: Read/Write
Description: This sub-attribute indicates whether I-Tag is added to all DAC management traffic. The following values are defined:

`used`: I-Tag is added to all DAC management traffic.
`not_used`: I-Tag is not added to all DAC management traffic.

Sub-attribute *aDacConfigFlags.sTagB*:

Syntax: Boolean
Remote access: Read/Write
Description: This sub-attribute indicates whether B-Tag is added to all DAC management traffic. The following values are defined:

`used`: B-Tag is added to all DAC management traffic.
`not_used`: B-Tag is not added to all DAC management traffic.

Sub-attribute *aDacConfigFlags.sTagDaB*:

Syntax: Boolean
Remote access: Read/Write
Description: This sub-attribute indicates whether B-DA is added to all DAC management traffic. The following values are defined:

`used`: B-DA is added to all DAC management traffic.
`not_used`: B-DA is not added to all DAC management traffic.

The *aDacConfigFlags* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aDacConfigFlags* attribute shall be as specified in Table 14-258.

Table 14-258—*DAC Configuration Field Flags* TLV (0xD7/0x08-01)

Size (bits)	Field (name)	Value	Notes
8	Branch	0xD7	Branch identifier
16	Leaf	0x08-01	Leaf identifier
8	Length	0x01	The size of TLV fields following the `Length` field
1	TagS	0/1	0:*sTagS* is equal to `not_used`. 1:*sTagS* is equal to `used`.
1	TagC	0/1	0:*sTagC* is equal to `not_used`. 1:*sTagC* is equal to `used`.
1	TagI	0/1	0:*sTagI* is equal to `not_used`. 1:*sTagI* is equal to `used`.
1	TagB	0/1	0:*sTagB* is equal to `not_used`. 1:*sTagB* is equal to `used`.
1	TagDaB	0/1	0:*sTagDaB* is equal to `not_used`. 1:*sTagDaB* is equal to `used`.
3	Pad	000	Ignored on reception

14.4.3.10.3 Attribute *aDacPassChallenge* (0xD7/0x08-02)

This attribute represents the password challenge for the given DAC instance, required for the operation of the DAC mechanism and secure configuration file download mechanism via SFTP/HTTPS, as defined in DPoE-SP-DAC. The password challenge may be set for each LLDP Transmit/Receive agent operating on the given UNI port and can be modified independently of the DAC configuration parameters stored in *aDacConfig* and *aDacConfigFlags* attributes.

Attribute *aDacPassChallenge*:

Syntax: String
Size (octets): 124 (max)
Remote access: Read/Write
Description: This attribute indicates the password challenge string in ASCII format, configured for the given DAC instance associated with the UNI port.

The *aDacPassChallenge* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aDacPassChallenge* attribute shall be as specified in Table 14-259.

Table 14-259—*DAC Password Challenge* TLV (0xD7/0x08-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x08-02	Leaf identifier
1	Length	Varies	The size of TLV fields following the `Length` field
Varies	DacPassChallenge	Varies	Value of *aDacPassChallenge* attribute

14.4.3.10.4 Attribute *aDacStatus* (0xD7/0x08-03)

This attribute represents the administrative status of the given LLDP instance associated with the specific UNI port.

Attribute *aDacStatus*:

Syntax: Boolean
Default value: `disabled`
Remote access: Read/Write
Description: This attribute indicates the administrative status of the given LLDP instance associated with the specific UNI port. The following values are defined:
`enabled`: DAC on the given UNI port is enabled.
`disabled`: DAC on the given UNI port is disabled.

The *aDacStatus* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aDacStatus* attribute shall be as specified in Table 14-260.

Table 14-260—*DAC Admin Status* TLV (0xD7/0x08-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x08-03	Leaf identifier
1	Length	0x01	The size of TLV fields following the `Length` field

Size (octets)	Field (name)	Value	Notes
1	DacStatus	Varies	Value of *aDacStatus* attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00

14.4.3.11 UNI management

14.4.3.11.1 Attribute *aEeeStatus* (0xD7/0x08-20)

This attribute represents the status of the Energy Efficient Ethernet (EEE) functon on the given UNI port on the ONU. When the auto-negotiation function on the given UNI port is enabled, the ONU ignores any requests to set this attribute.

Attribute *aEeeStatus*:
Syntax: Enumeration
Remote access: Read/Write
Description: This attribute represents the status of the EEE function on the given UNI port on the ONU. The following values are defined:
`enabled`: EEE function on the given UNI port is enabled.
`disabled`: EEE function on the given UNI port is disabled.

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The *aEeeStatus* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aEeeStatus* attribute shall be as specified in Table 14-257.

Table 14-257—*EEE Status* TLV (0xD7/0x08-00)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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: `enabled`: 0x01 `disabled`: 0x00

14.4.3.11.2 Attribute *aPoeStatus* (0xD7/0x08-21)

This attribute represents the status of the Power over Ethernet (PoE) functon on the given UNI port on the ONU. Wif the PoE function is not supported by the given UNI, the ONU ignores any requests to set this attribute.

Attribute *aPoEStatus*:
Syntax: Enumeration
Remote access: Read/Write
Description: This attribute represents the status of the PoE function on the given UNI port on the ONU. The following values are defined:
`enabled`: PoE function on the given UNI port is enabled.
`disabled`: PoE function on the given UNI port is disabled.

The *aPoEStatus* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aPoEStatus* attribute shall be as specified in Table 14-257.

Table 14-257—*PoE Status* TLV (0xD7/0x08-21)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	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 *aPoEStatus* attribute, defined as follows: `enabled`: 0x01 `disabled`: 0x00

14.4.3.11.3 Attribute *aMediaType* (0xD7/0x08-22)

This attribute represents the media type for a media-selectable UNI port on the ONU.

Attribute *aMediaType*:
Syntax: Enumeration
Remote access: Read/Write
Description: This attribute represents themedia type for a media-selectable UNI port on the ONU. The following values are defined:
`sfp`: the given UNI port is of SFP type.
`base-t`: the given UNI port is of BASE-T type.

The *aMediaType* attribute is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *aMediaType* attribute shall be as specified in Table 14-257.

Table 14-257—*Media Type* TLV (0xD7/0x08-22)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD7	Branch identifier
2	Leaf	0x08-22	Leaf identifier
1	Length	0x01	The size of TLV fields following the `Length` field
1	MediaType	Varies	Value of *aMediaType* attribute, defined as follows: `sfp`: 0x00 `base-t`: 0x01

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14.4.4 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 14-261 shall be supported.

Table 14-261—Basic actions defined in branch 0x09

Leaf	Actions	Definition in IEEE Std 802.3
0x00-05	acPhyAdminControl	30.3.2.2.1
0x00-0B	acAutoNegRestartAutoConfig	30.6.1.2.1
0x00-0C	acAutoNegAdminControl	30.6.1.2.2

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

14.4.5 Branch 0xD9 “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 14-262 shall be supported by this profile.

Table 14-262—Extended actions defined in branch 0xD9

Leaf	Attribute	Defined in
Object group: ONU management		
0x00-01	acOnuReboot	14.4.5.1.1
Object group: Bridging		
0x01-01	acMacClearDynamicTable	14.4.5.2.1
0x01-02	acMacAddDynamicAddress	14.4.5.2.2
0x01-03	acMacDeleteDynamicAddress	14.4.5.2.3
0x01-04	acMacClearStaticTable	14.4.5.2.4
0x01-05	acMacAddStaticAddress	14.4.5.2.5
0x01-06	acMacDeleteStaticAddress	14.4.5.2.6
Object group: Statistics and counters		
0x02-01	acCountersClear	14.4.5.3.1
Object group: Alarms		
0x03-01	acAlarmGetCurrentSummary	14.4.5.4.1
Object group: Frame processing		
0x05-01	acRulesClearAll	14.4.5.5.1
0x05-02	acRulesAddOne	14.4.5.5.2
0x05-03	acRulesDeleteOne	14.4.5.5.3
Object group: Transmission control		
0x06-01	acEnableUserTraffic	14.4.5.6.1
0x06-02	acDisableUserTraffic	14.4.5.6.2
0x06-03	acLoopbackEnable	14.4.5.6.3
0x06-04	acLoopbackDisable	14.4.5.6.4
0x06-05	acLaserTxPowerOff	14.4.5.6.5

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

14.4.5.1 ONU management

14.4.5.1.1 Action *acOnuReboot* (0xD9/0x00-01)

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 14.4.1.1). The Variable Descriptor TLV for the *acOnuReboot* action shall be as specified in Table 14-263.

Table 14-263—*ONU Reboot* TLV (0xD9/0x00-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x00-01	Leaf identifier

14.4.5.2 Bridging

14.4.5.2.1 Action *acMacClearDynamicTable* (0xD9/0x01-01)

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 14.4.1.1). The Variable Descriptor TLV for the *acMacClearDynamicTable* action shall be as specified in Table 14-264.

Table 14-264—*Clear Dynamic MAC Table* TLV (0xD9/0x01-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x01-01	Leaf identifier

14.4.5.2.2 Action *acMacAddDynamicAddress* (0xD9/0x01-02)

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 (0xD9/0x01-02) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Add Dynamic MAC Address* TLV (0xD9/0x01-02) 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 (0xD9/0x01-02) provides the continuation of the list of dynamic MAC addresses received in the previous instance of the *Add Dynamic MAC Address* TLV (0xD9/0x01-02).

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 (0xD7/0x00-01) to indicate that the OLT request spans multiple eOAMPDUs.

The *acMacAddDynamicAddress* action is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *acMacAddDynamicAddress* action shall be as specified in Table 14-265.

Table 14-265—*Add Dynamic MAC Address* TLV (0xD9/0x01-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	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

14.4.5.2.3 Action *acMacDeleteDynamicAddress* (0xD9/0x01-03)

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 (0xD9/0x01-03) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Delete Dynamic MAC Address* TLV (0xD9/0x01-03) 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 (0xD9/0x01-03) 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 (0xD9/0x01-03).

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 (0xD7/0x00-01) to indicate that the ONU request spans multiple eOAMPDUs.

The *acMacDeleteDynamicAddress* action is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *acMacDeleteDynamicAddress* action shall be as specified in Table 14-266.

Table 14-266—*Delete Dynamic MAC Address* TLV (0xD9/0x01-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	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

14.4.5.2.4 Action *acMacClearStaticTable* (0xD9/0x01-04)

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 14.4.1.1). The Variable Descriptor TLV for the *acMacClearStaticTable* action shall be as specified in Table 14-267.

Table 14-267—*Clear Static MAC Table* TLV (0xD9/0x01-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x01-04	Leaf identifier

14.4.5.2.5 Action *acMacAddStaticAddress* (0xD9/0x01-05)

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 (0xD9/0x01-05) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Add Static MAC Address* TLV (0xD9/0x01-05) 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 (0xD9/0x01-05) 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 (0xD9/0x01-05).

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 (0xD7/0x00-01) to indicate that the OLT request spans multiple eOAMPDUs.

The *acMacAddStaticAddress* action is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *acMacAddStaticAddress* action shall be as specified in Table 14-268.

Table 14-268—*Add Static MAC Address* TLV (0xD9/0x01-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	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

14.4.5.2.6 Action *acMacDeleteStaticAddress* (0xD9/0x01-06)

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 (0xD9/0x01-06) may carry up to 21 instances of the sub-attribute *sMacAddress[sCount]*. If necessary, more than one *Delete Static MAC Address* TLV (0xD9/0x01-06) 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 (0xD9/0x01-06) 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 (0xD9/0x01-06).

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 (0xD7/0x00-01) to indicate that the ONU request spans multiple eOAMPDUs.

The *acMacDeleteStaticAddress* action is associated with the UNI Port object (see 14.4.1.1). The Variable Container TLV for the *acMacDeleteStaticAddress* action shall be as specified in Table 14-269.

Table 14-269—*Delete Static MAC Address* TLV (0xD9/0x01-06)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x01-06	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

14.4.5.3 Statistics and counters

14.4.5.3.1 Action *acCountersClear* (0xD9/0x02-01)

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 14.4.1.1). The Variable Descriptor TLV for the *acCountersClear* action shall be as specified in Table 14-270.

Table 14-270—*Clear Counters* TLV (0xD9/0x02-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x02-01	Leaf identifier

14.4.5.4 Alarms

14.4.5.4.1 Action *acAlarmGetCurrentSummary* (0xD9/0x03-01)

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 14.4.1.1). The Variable Descriptor TLV for the *acAlarmGetCurrentSummary* action shall be as specified in Table 14-271.

Table 14-271—*Retrieve Current Alarm Summary* TLV (0xD9/0x03-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x03-01	Leaf identifier

14.4.5.5 Frame processing

14.4.5.5.1 Action *acRulesClearAll* (0xD9/0x05-01)

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 14.4.1.1). The Variable Descriptor TLV for the *acRulesClearAll* action shall be as specified in Table 14-272.

Table 14-272—*Clear Port Ingress Rules* TLV (0xD9/0x05-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x05-01	Leaf identifier

14.4.5.5.2 Action *acRulesAddOne* (0xD9/0x05-02)

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 14.4.1.1). The Variable Descriptor TLV for the *acRulesAddOne* action shall be as specified in Table 14-273.

Table 14-273—*Add Port Ingress Rule* TLV (0xD9/0x05-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x05-02	Leaf identifier

14.4.5.5.3 Action *acRulesDeleteOne* (0xD9/0x05-03)

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 14.4.1.1). The Variable Descriptor TLV for the *acRulesDeleteOne* action shall be as specified in Table 14-274.

Table 14-274—*Delete Port Ingress Rule* TLV (0xD9/0x05-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x05-03	Leaf identifier

14.4.5.6 Transmission control

14.4.5.6.1 Action *acEnableUserTraffic* (0xD9/0x06-01)

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 14.4.1.1). The Variable Descriptor TLV for the *acEnableUserTraffic* action shall be as specified in Table 14-275.

Table 14-275—*Enable User Traffic* TLV (0xD9/0x06-01)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x06-01	Leaf identifier

14.4.5.6.2 Action *acDisableUserTraffic* (0xD9/0x06-02)

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 14.4.1.1). The Variable Descriptor TLV for the *acDisableUserTraffic* action shall be as specified in Table 14-276.

Table 14-276—*Disable User Traffic* TLV (0xD9/0x06-02)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	Branch identifier
2	Leaf	0x06-02	Leaf identifier

14.4.5.6.3 Action *acLoopbackEnable* (0xD9/0x06-03)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *acLoopbackEnable* action shall be as specified in Table 14-277.

Table 14-277—*Loopback Enable* TLV (0xD9/0x06-03)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	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: `loop_phy`: 0x00 `loop_mac`: 0x01 `loop_pon`: 0x02

14.4.5.6.4 Action *acLoopbackDisable* (0xD9/0x06-04)

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 UNI Port object (see 14.4.1.1). The Variable Container TLV for the *acLoopbackDisable* action shall be as specified in Table 14-278.

Table 14-278—*Loopback Disable* TLV (0xD9/0x06-04)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	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: `loop_phy`: 0x00 `loop_mac`: 0x01 `loop_pon`: 0x02

14.4.5.6.5 Action *acLaserTxPowerOff* (0xD9/0x06-05)

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 second
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 14.4.1.1). The Variable Container TLV for the *acLaserTxPowerOff* action shall be as specified in Table 14-278.

Table 14-279—*Laser Tx Power Off* TLV (0xD9/0x06-05)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD9	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

14.4.6 Branch 0xD8 “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 14-280 shall be supported. The function, size, and context of each programmable counter are vendor specific.

Table 14-280—Programmable counters defined in branch 0xD8

Leaf	Attribute	Defined in
Object group: ONU management		
0x00-00	aCounterGeneral0	14.4.6.1
…	…	
0x7F-FF	aCounterGeneral32767	

14.4.6.1 Attribute *aCounterGeneralN* (0xD8/0x00-00 to 0xD8/0x7F-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 14.4.1.1). The Variable Container TLV for the *aCounterGeneralN* attribute shall be as specified in Table 14-281.

Table 14-281—*Programmable Counter N* TLV (0xD8/0x00-00 to 0xD8/0x7F-FF)

Size (octets)	Field (name)	Value	Notes
1	Branch	0xD8	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