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1 8 VLC Management

2 8.1 VLC Configuration

3 8.2 Management Attributes

4 8.2.1 Introduction

5 This subclause defines a set of extended management attributes for querying statistics in the VLC sublayer.
6 In general, attributes are defined to be independent of any particular management application or
7 management protocol. Such definitions of attributes and actions are focused on the associated device
8 characteristics and behaviors. Within the constraints imposed by the described characteristics and
9 behaviors, the internal representations of the attributes remain implementation dependent and outside the
10 scope of this standard.

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

13 To address the interoperability between multiple VLC clients, precise definitions of the TLV structures and
14 encodings of individual attributes into TLV structure are also provided.

15 The protocol used to set and query these management attributes is outside the scope of this standard. It is
16 generally assumed that the OAM protocol defined in IEEE Std 802.3 and extended in IEEE Std 1904.1 is
17 supported, but other protocols, such as Netconf and SNMP, may also be supported.

18 8.2.2 VLC Management using extended OAM

19 The Extended OAM mechanisms utilize the organization-specific OAMPDU, as defined in IEEE Std 802.3,
20 57.4.3.6. The organization-specific OAMPDUs are identified by an organizationally unique identifier
21 (OUI). The organization-specific OAMPDUs used for VLC management shall use OUI 0x58-D0-8F, which
22 is the same OUI value as used for Package A extended OAMPDUs in IEEE Std. 1904.1.

23 8.2.3 Branch 0xD6 – CTE Table Context TLV

24 The CTE Table Context TLV carried in an eOAMPDU identifies a specific CTE Table instance to which all
25 subsequent TLVs apply. Once set, this context remains unchanged until the next CTE Table Context TLV
26 is found and processed or until the eOAMPDU terminates.

27 The source OAM Client shall set the proper CTE table context using the CTE Table Context TLV. The
28 source OAM Client should not insert the CTE Table Context TLV in front of variable container TLVs or
29 variable descriptor TLVs if the proper context is already set.

30 The destination OAM Client shall apply the current CTE Table context to all subsequent variable container
31 TLVs and variable descriptor TLVs until another CTE Table Context TLV is encountered. The destination
32 OAM Client shall ignore the variable container TLVs or variable descriptor TLVs for which no valid CTE
33 Table Context TLV was supplied.

34 In addition, in response to every variable container TLV or variable descriptor TLV transmitted by the
35 eOAM Requestor without properly set CTE Table context, the eOAM Responder shall generate a variable
36 indication TLV containing code 0xA1, signaling to the Requestor that the requested attribute is not
37 supported on this device (see IEEE Std 1904.1, 13.4.3).

The *CTE Table Context* TLV is of a variable container type. The format of this TLV shall be as specified in Table 8-x.

Table 8-x—CTE Table Context TLV

<u>Size (octets)</u>	<u>Field name</u>	<u>Value</u>	<u>Description</u>
<u>1</u>	<u>Branch</u>	<u>0xD6</u>	<u>Object Context branch identifier</u>
<u>2</u>	<u>ObjectType</u>	<u>0xA8-00</u>	<u>TLV leaf value identifies an object of type CTE Table. Other object types are defined in IEEE Std 1904.1, 14.1.1.1.</u>
<u>1</u>	<u>Length</u>	<u>2</u>	<u>The size of TLV fields following the Length field</u>
<u>2</u>	<u>ObjectInstance</u>	<u>varies</u>	<u>Bits 14:0 identify a port (VLC Sublayer instance) Bit 15 identifies the CTE table as follows: — 0 – Context is the egress CTE table — 1 – Context is the ingress CTE table</u>

8.2.4 Branch 0xA7 -- VLC Service Interface Counters

This subclause lists extended management attributes that are not part of the definitions in IEEE Std 802.3, Clause 30. The VLC Service Interface counters collect frame and octet statistics per each VLC sublayer service interface. The extended attributes shown in Table 8-8 shall be supported.

Table 8-1—VLC Rule Counter attributes defined in branch 0xA7

<u>Leaf</u>	<u>Attribute</u>	<u>Defined in</u>
<u>0x00-00</u>	<u><i>aVlcFramesSiVlcpdu</i></u>	<u>8.2.4.1</u>
<u>0x00-01</u>	<u><i>aVlcFramesSiMaData</i></u>	<u>8.2.4.2</u>
<u>0x00-02</u>	<u><i>aVlcFramesSiOmci</i>^a</u>	<u>8.2.4.3</u>
<u>0x00-03 to 0x7F-FF</u>	<u>Reserved</u>	<u>n/a</u>
<u>0x80-00</u>	<u><i>aVlcOctetsSiVlcpdu</i></u>	<u>8.2.4.4</u>
<u>0x80-01</u>	<u><i>aVlcOctetsSiMaData</i></u>	<u>8.2.4.5</u>
<u>0x80-02</u>	<u><i>aVlcOctetsSiOmci</i>^a</u>	<u>8.2.4.6</u>
<u>0x80-03 to 0xFF-FF</u>	<u>Reserved</u>	<u>n/a</u>

^a – this attribute may not be supported if the optional *VLCSI:OMCI* service interface is absent in a given implementation.

8.2.4.1 Attribute *aVlcFramesSiVlcPdu* (0xA7/0x00-00)

This attribute represents the current number of frames that traversed the *VLCSI:VLC PDU* service interface. Whether the received frames (i.e., invocations of *VLCSI:VLC PDU.indication* primitives) or the transmit frames (i.e., invocations of *VLCSI:VLC PDU.request* primitives) are counted is determined by the preceding *CTE Table Context TLV*.

Attribute *aVlcFramesSiVlcPdu*:

Syntax: Counter, Resettable, Wrap-around

Range: 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

Default value: 0x00

Remote access: Read/Write

Description: This attribute indicates current number of frames transmitted from or received on the *VLCSI:VLC PDU* interface. On write of any value to this attribute, the counter shall reset to the value of 0x00.

The *aVlcFramesSiVlcPdu* attribute is associated with a CTE Table instance. The variable container TLV for the *aVlcFramesSiVlcPdu* attribute shall be as specified in Table 8-9.

Table 8-2—VLCSI:VLC PDU service interface frame counter (0xA7/0x00-00)

Size (octets)	Field name	Value	Description
1	Branch	0xA7	VLC attribute branch identifier
2	Leaf	0x00-00	Leaf identifier
1	Length	8	The size of TLV fields following the Length field
8	VlcFramesSiVlcPdu	varies	Value of <i>aVlcFramesSiVlcPdu</i> attribute

8.2.4.2 Attribute *aVlcFramesSiMaData* (0xA7/0x00-01)

This attribute represents the current number of frames that traversed the *VLCSI:MA DATA* service interface. Whether the received frames (i.e., invocations of *VLCSI:MA DATA.indication* primitives) or the transmit frames (i.e., invocations of *VLCSI:MA DATA.request* primitives) are counted is determined by the preceding *CTE Table Context TLV*.

Attribute *aVlcFramesSiMaData*:

Syntax: Counter, Resettable, Wrap-around

Range: 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

Default value: 0x00

Remote access: Read/Write

Description: This attribute indicates current number of frames transmitted from or received on the *VLCSI:MA DATA* interface. On write of any value to this attribute, the counter shall reset to the value of 0x00.

The *aVlcFramesSiMaData* attribute is associated with a CTE Table instance. The variable container TLV for the *aVlcFramesSiMaData* attribute shall be as specified in Table 8-x.

Table 8-3—VLCSI:MA DATA service interface frame counter (0xA7/0x00-01)

<u>Size (octets)</u>	<u>Field name</u>	<u>Value</u>	<u>Description</u>
1	<u>Branch</u>	0xA7	VLC attribute branch identifier
2	<u>Leaf</u>	0x00-01	Leaf identifier
1	<u>Length</u>	8	The size of TLV fields following the Length field
8	<u>VlcFramesSiMaData</u>	varies	Value of <i>aVlcFramesSiMaData</i> attribute

8.2.4.3 Attribute *aVlcFramesSiOmci* (0xA7/0x00-02)

This attribute represents the current number of frames that traversed the *VLCSI:OMCI* service interface. Whether the received frames (i.e., invocations of *VLCSI:OMCI.indication* primitives) or the transmit frames (i.e., invocations of *VLCSI:OMCI.request* primitives) are counted is determined by the preceding *CTE Table Context TLV*.

Attribute *aVlcFramesSiOmci*:

Syntax: Counter, Resettable, Wrap-around

Range: 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

Default value: 0x00

Remote access: Read/Write

Description: This attribute indicates current number of frames transmitted from or received on the *VLCSI:OMCI* interface. On write of any value to this attribute, the counter shall reset to the value of 0x00.

The *aVlcFramesSiOmci* attribute is associated with a CTE Table instance. The variable container TLV for the *aVlcFramesSiOmci* attribute shall be as specified in Table 8-x.

Table 8-4—VLCSI:OMCI service interface frame counter (0xA7/0x00-02)

<u>Size (octets)</u>	<u>Field name</u>	<u>Value</u>	<u>Description</u>
1	<u>Branch</u>	0xA7	VLC attribute branch identifier
2	<u>Leaf</u>	0x00-02	Leaf identifier
1	<u>Length</u>	8	The size of TLV fields following the Length field
8	<u>VlcFramesSiOmci</u>	varies	Value of <i>aVlcFramesSiOmci</i> attribute

8.2.4.4 Attribute *aVlcOctetsSiVlcpdu* (0xA7/0x80-00)

This attribute represents the current number of octets that traversed the *VLCSI:VLC PDU* service interface. Whether the received octets (i.e., octets in the *VLCSI:VLC PDU.indication* primitives) or the transmit

1 octets (i.e., octets in the VLCSI:VLCPCDU.request primitives) are counted is determined by the
 2 preceding CTE Table Context TLV.

3 Attribute aVlcFramesSiVlcpdu:

4 **Syntax:** Counter, Resettable, Wrap-around

5 **Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

6 **Default value:** 0x00

7 **Remote access:** Read/Write

8 **Description:** This attribute indicates current number of octets transmitted from or received on
 9 the VLCSI:VLCPCDU interface. On write of any value to this attribute, the
 10 counter shall reset to the value of 0x00.

11 The aVlcOctetsSiVlcpdu attribute is associated with a CTE Table instance. The variable container TLV for
 12 the aVlcOctetsSiVlcpdu attribute shall be as specified in Table 8-x.

13 **Table 8-5—VLCSI:VLCPCDU service interface octet counter (0xA7/0x80-00)**

<u>Size (octets)</u>	<u>Field name</u>	<u>Value</u>	<u>Description</u>
<u>1</u>	<u>Branch</u>	<u>0xA7</u>	<u>VLC attribute branch identifier</u>
<u>2</u>	<u>Leaf</u>	<u>0x80-00</u>	<u>Leaf identifier</u>
<u>1</u>	<u>Length</u>	<u>8</u>	<u>The size of TLV fields following the Length field</u>
<u>8</u>	<u>VlcOctetsSiVlcpdu</u>	<u>varies</u>	<u>Value of aVlcOctetsSiVlcpdu attribute</u>

14 **8.2.4.5 Attribute aVlcOctetsSiMaData (0xA7/0x80-01)**

15 This attribute represents the current number of Octets that traversed the VLCSI:MA_DATA service
 16 interface. Whether the received octets (i.e., octets in the VLCSI:MA_DATA.indication primitives) or
 17 the transmit octets (i.e., octets in the VLCSI:MA_DATA.request primitives) are counted is determined
 18 by the preceding CTE Table Context TLV.

19 Attribute aVlcOctetsSiMaData:

20 **Syntax:** Counter, Resettable, Wrap-around

21 **Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

22 **Default value:** 0x00

23 **Remote access:** Read/Write

24 **Description:** This attribute indicates current number of octets transmitted from or received on
 25 the VLCSI:MA_DATA interface. On write of any value to this attribute, the
 26 counter shall reset to the value of 0x00.

27 The aVlcOctetsSiMaData attribute is associated with a CTE Table instance. The variable container TLV for
 28 the aVlcOctetsSiMaData attribute shall be as specified in Table 8-x.

Table 8-6—VLCSI:MA DATA service interface octet counter (0xA7/0x80-01)

<u>Size (octets)</u>	<u>Field name</u>	<u>Value</u>	<u>Description</u>
<u>1</u>	<u>Branch</u>	<u>0xA7</u>	<u>VLC attribute branch identifier</u>
<u>2</u>	<u>Leaf</u>	<u>0x80-01</u>	<u>Leaf identifier</u>
<u>1</u>	<u>Length</u>	<u>8</u>	<u>The size of TLV fields following the Length field</u>
<u>8</u>	<u>VlcOctetsSiMaData</u>	<u>varies</u>	<u>Value of aVlcOctetsSiMaData attribute</u>

8.2.4.6 Attribute aVlcOctetsSiOmci (0xA7/0x80-02)

This attribute represents the current number of octets that traversed the VLCSI:OMCI service interface. Whether the received octets (i.e., octets in the VLCSI:OMCI.indication primitives) or the transmit octets (i.e., octets in the VLCSI:OMCI.request primitives) are counted is determined by the preceding CTE Table Context TLV.

Attribute aVlcOctetsSiOmci:

Syntax: Counter, Resettable, Wrap-around

Range: 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

Default value: 0x00

Remote access: Read/Write

Description: This attribute indicates current number of octets transmitted from or received on the VLCSI:OMCI interface. On write of any value to this attribute, the counter shall reset to the value of 0x00.

The aVlcOctetsSiOmci attribute is associated with a CTE Table instance. The variable container TLV for the aVlcOctetsSiOmci attribute shall be as specified in Table 8-x.

Table 8-7—VLCSI:OMCI service interface octet counter (0xA7/0x80-02)

<u>Size (octets)</u>	<u>Field name</u>	<u>Value</u>	<u>Description</u>
<u>1</u>	<u>Branch</u>	<u>0xA7</u>	<u>VLC attribute branch identifier</u>
<u>2</u>	<u>Leaf</u>	<u>0x80-02</u>	<u>Leaf identifier</u>
<u>1</u>	<u>Length</u>	<u>8</u>	<u>The size of TLV fields following the Length field</u>
<u>8</u>	<u>VlcOctetsSiOmci</u>	<u>varies</u>	<u>Value of aVlcOctetsSiOmci attribute</u>

8.2.5 Branch 0xA8 -- VLC Rule Counters

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 8-8 shall be supported.

Deleted: Table 8-8

1 **Table 8-8—VLC Rule Counter attributes defined in branch 0xA8**

Leaf	Attribute	Defined in
0x00-00	<i>aVlcFramesUnmatched</i>	8.2.2.1
0x00-01	<i>aVlcFramesMatchedByRule1</i>	8.2.2.2
...	...	
0x7F-FF	<i>aVlcFramesMatchedByRule32767</i>	
0x80-00	<i>aVlcOctetsUnmatched</i>	8.2.2.3
0x80-01	<i>aVlcOctetsMatchedByRule1</i>	8.2.2.4
...	...	
0xFF-FF	<i>aVlcOctetsMatchedByRule32767</i>	

Deleted: 0x10

Deleted: 0x10

2 **8.2.5.1 Attribute *aVlcFramesUnmatched* (0xA8/0x00-00)**

3 This attribute represents the current number of frames that are not matched by any rules in a port identified
4 by the *CTE Table Context* TLV.

Deleted: Object Context

5 Attribute *aVlcFramesUnmatched*:

6 **Syntax:** Counter, Resettable, Wrap-around

7 **Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

8 **Default value:** 0x00

9 **Remote access:** Read/Write

10 **Description:** This attribute indicates current number of frames not matched by any of the
11 rules provisioned at the port identified by the *CTE Table Context* TLV. On write
12 of any value to this attribute, the counter shall reset to the value of 0x00.

Deleted: Object Context

13 The *aVlcFramesUnmatched* attribute is associated with a port. In an EPON ONU or OLT, this can be a
14 UNI/NNI port, or an LLID.

15 The variable container TLV for the *aVlcFramesUnmatched* attribute shall be as specified in [Table 8-9](#).

Deleted: Table 8-9

16 **Table 8-9—VLC counter of frames unmatched by any rule (0xA8/0x00-00)**

Size (octets)	Field name	Value	Description
1	Branch	0xA8	VLC attribute branch identifier
2	Leaf	0x00-00	Leaf identifier
1	Length	8	The size of TLV fields following the Length field

Deleted: identified

Size (octets)	Field name	Value	Description
8	VlcFramesUnmatched	varies	Value of <i>aVlcFramesUnmatched</i> attribute

1

2 **8.2.5.2 Attribute *aVlcFramesMatchedByRuleN* (0xA8/0x00-01 to 0xA8/0x7F-FF)**

3 This attribute represents the current number of frames matched by a rule with *RuleId* equal to *N*, in a port
4 identified by the *CTE Table Context* TLV.

Deleted: Object Context

5 Attribute *aVlcFramesMatchedByRuleN*:

6 **Syntax:** Counter, Resettable, Wrap-around

7 **Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

8 **Default value:** 0x00

9 **Remote access:** Read/Write

10 **Description:** This attribute indicates current number of frames matched by the rule with the
11 *RuleId* = *N* at the port identified by the *CTE Table Context* TLV. On write of
12 any value to this attribute, the counter shall reset to the value of 0x00.

Deleted: Object Context

13 The *aVlcFramesMatchedByRuleN* attribute is associated with a port. In an EPON ONU or OLT, this can be
14 a UNI/NNI port, or an LLID.

15 The variable container TLV for the *aVlcFramesMatchedByRuleN* attribute shall be as specified in [Table](#)
16 [8-10](#).

Deleted: Table 8-10

17 **Table 8-10—VLC counter of frames matched by rule *N* TLV**
18 **(0xA8/0x00-01 to 0xA8/0x7F-FF)**

Size (octets)	Field name	Value	Description
1	Branch	0xA8	VLC attribute branch <i>identifier</i>
2	Leaf	<i>N</i>	Leaf identifier. <i>aVlcFramesMatchedByRule1</i> through <i>aVlcFramesMatchedByRule32767</i> are represented by <i>Leaf</i> values ranging from 0x00-01 through 0x7F-FF.
1	Length	8	The size of TLV fields following the <i>Length</i> field
8	VlcFramesMatchedByRuleN	varies	Value of <i>aVlcFramesMatchedByRuleN</i> attribute

Deleted: identified

1 **8.2.5.3 Attribute *aVlcOctetsUnmatched* (0xA8/0x80-00)**

Deleted: 0x10

2 This attribute represents the total number of octets in the current number of frames that are not matched by
3 any rules in a port identified by the *CTE Table Context* TLV.

Deleted: Object Context

4 Attribute *aVlcOctetsUnmatched*:

5 **Syntax:** Counter, Resettable, Wrap-around

6 **Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

7 **Default value:** 0x00

8 **Remote access:** Read/Write

9 **Description:** This attribute indicates the total number of octets in the current number of
10 frames not matched by any of the rules provisioned at the port identified by the
11 *CTE Table Context* TLV. On write of any value to this attribute, the counter
12 shall reset to the value of 0x00.

Deleted: Object Context

13 The *aVlcOctetsUnmatched* attribute is associated with a port. In an EPON ONU or OLT, this can be a
14 UNI/NNI port, or an LLID.

15 The variable container TLV for the *aVlcOctetsUnmatched* attribute shall be as specified in *Table 8-11*.

Deleted: Table 8-11

16 **Table 8-11—VLC counter of octets unmatched by any rule (0xA8/0x80-00)**

Deleted: 0x10

Size (octets)	Field name	Value	Description
1	Branch	0xA8	VLC attribute branch <i>identifier</i>
2	Leaf	0x80-00	Leaf identifier
1	Length	8	The size of TLV fields following the Length field
8	VlcOctetsUnmatched	varies	Value of <i>aVlcOctetsUnmatched</i> attribute

Deleted: identified

Deleted: 0x10

17 **8.2.5.4 Attribute *aVlcOctetsMatchedByRuleN* (0xA8/0x80-01 to 0xA8/0xFF-FF)**

Deleted: 0x10

18 This attribute represents the total number of octets in the current number of frames matched by a rule with
19 *RuleId* equal to *N*, in a port identified by the *CTE Table Context* TLV.

Deleted: Object Context

20 Attribute *aVlcOctetsMatchedByRuleN*:

21 **Syntax:** Counter, Resettable, Wrap-around

22 **Range:** 0x00 to 0xFF-FF-FF-FF-FF-FF-FF-FF

23 **Default value:** 0x00

24 **Remote access:** Read/Write

25 **Description:** This attribute indicates current number of octets in frames matched by the rule
26 with the *RuleId* = *N* at the port identified by the *CTE Table Context* TLV. On
27 write of any value to this attribute, the counter shall reset to the value of 0x00.

Deleted: Object Context

28 The *aVlcOctetsMatchedByRuleN* attribute is associated with a port. In an EPON ONU or OLT, this can be
29 a UNI/NNI port, or an LLID.

1 The variable container TLV for the *aVlcOctetsMatchedByRuleN* attribute shall be as specified in [Table](#)
 2 [8-12](#).

Deleted: Table 8-12

3 **Table 8-12—VLC counter of octets matched by rule N TLV**
 4 **(0xA8/0x80-01 to 0xA8/0xFF-FF)**

Deleted: 0x10

Size (octets)	Field name	Value	Description
1	Branch	0xA8	VLC attribute branch <i>identifier</i>
2	Leaf	<i>N</i>	Leaf identifier. <i>aVlcOctetsMatchedByRule0</i> through <i>aVlcOctetsMatchedByRule32767</i> are represented by Leaf values ranging from 0x80-01 through 0xFF-FF.
1	Length	8	The size of TLV fields following the Length field
8	VlcOctetsMatchedByRuleN	varies	Value of <i>aVlcOctetsMatchedByRuleN</i> attribute

Deleted: identified

Deleted: 0x10

5

6