Network Working Group
Request for Comments: 4679
Category: Informational

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September 2006

DSL Forum Vendor-Specific RADIUS Attributes

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Abstract

This document describes the set of Remote Authentication Dial-In User Service Vendor-Specific Attributes (RADIUS VSAs) defined by the DSL Forum.

These attributes are designed to transport Digital Subscriber Line (DSL) information that is not supported by the standard RADIUS attribute set. It is expected that this document will be updated if and when the DSL Forum defines additional vendor-specific attributes, since its primary purpose is to provide a reference for DSL equipment vendors wishing to interoperate with other vendors' products.

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1. Introduction

The DSL Forum has created additional RADIUS [RFC2865] [RFC2866] vendor-specific attributes to carry DSL line identification and characterization information. This information is forwarded from the Access Node/DSLAM to the BRAS via Vendor-Specific PPPoE Tags [RFC2516], DHCP Relay Options [RFC3046], and Vendor-Specific Information Suboptions [RFC4243]. This document describes the subscriber line identification and characterization information and its mapping to RADIUS VSAs by the BRAS.

The information acquired may be used to provide authentication and accounting functionality. It may also be collected and used for management and troubleshooting purposes.

2. Terminology

The following sections define the usage and meaning of certain specialized terms in the context of this document.

2.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC2119].

2.2. Technical Terms and Acronyms

AAL5
: ATM Adaption Layer 5 [ITU.I363-5.1996]

Access Node/DSLAM
: The Access Node/DSLAM is a DSL signal terminator that contains a minimum of one Ethernet interface that serves as its northbound interface into which it aggregates traffic from several Asynchronous Transfer Mode (ATM)-based (subscriber ports) or Ethernet-based southbound interfaces.

BNG
: Broadband Network Gateway. A BNG is an IP edge router where bandwidth and QoS policies are applied; the functions performed by a BRAS are a superset of those performed by a BNG.

BRAS
: Broadband Remote Access Server. A BRAS is a BNG and is the aggregation point for the subscriber traffic. It provides aggregation capabilities (e.g., IP, PPP, Ethernet) between the access network and the core network. Beyond its aggregation function, the BRAS is also an injection point for policy management and IP QoS in the access network.

DSL
: Digital Subscriber Line. DSL is a technology that allows digital data transmission over wires in the local telephone network.

DSLAM
: Digital Subscriber Line Access Multiplexer. DSLAM is a device that terminates DSL subscriber lines. The data is aggregated and forwarded to ATM- or Ethernet-based aggregation networks.

FCS
: Frame Check Sequence. The FCS is a checksum added to an Ethernet frame for error detection/correction purposes.

IPoA
: IP over ATM

IWF
: Interworking Function. The set of functions required for interconnecting two networks of different technologies (e.g., ATM and Ethernet). IWF is utilized to enable the carriage of PPP over ATM (PPPoA) traffic over PPPoE.

LLC
: Logical Link Control

3. Attributes

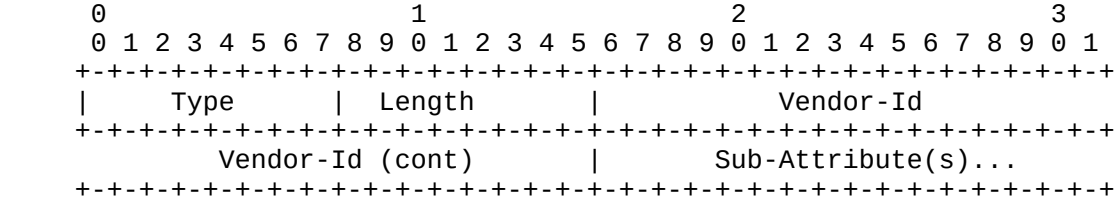
The following subsections describe the Attributes defined by this document. These Attributes MAY be transmitted in one or more RADIUS Attributes of type Vendor-Specific [RFC2865]. More than one attribute MAY be transmitted in a single Vendor-Specific Attribute; if this is done, the attributes SHOULD be packed as a sequence of Vendor-Type/Vendor-Length/Value triples following the initial Type, Length, and Vendor-Id fields.

3.1. DSL Forum RADIUS VSA Definition

Description

This Attribute functions as a "container", encapsulating one or more vendor-specific sub-attributes; the encoding follows the recommendations in [RFC2865].

A summary of the generic DSL Forum VSA format is shown below. The fields are transmitted from left to right.



Type

26 for Vendor-Specific

Length

This field MUST be set equal to the sum of the Vendor-Length fields of the sub-attributes contained in the Vendor-Specific Attribute, plus six (Type + Length + Vendor-Id).

Vendor-Id

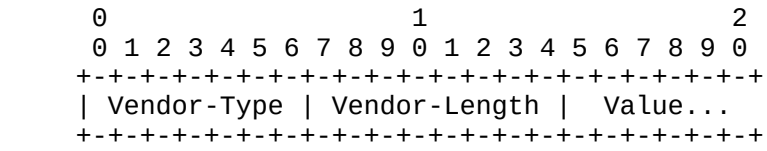
This field MUST be set to decimal 3561, the enterprise number assigned to the ADSL Forum [IANA].

Sub-Attributes

This field MUST contain one or more DSL Forum Vendor-Specific sub-attributes, as specified below.

3.2. DSL Forum Vendor Specific Sub-Attribute Encoding

A summary of the sub-attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

The Vendor-Type field is one octet in length and contains the sub-attribute type, as assigned by the DSL Forum.

Vendor-Length

The Vendor-Length field is one octet and indicates the length of the entire sub-attribute, including the Vendor-Type, Vendor-Length, and Value fields.

Value

The Value field is zero or more octets and contains information specific to the sub-attribute. The format and length of the Value field is determined by the Vendor-Type and Vendor-Length fields. The format of the value field is one of 2 data types, string or integer [RFC2865].

3.3. Sub-attribute Definitions

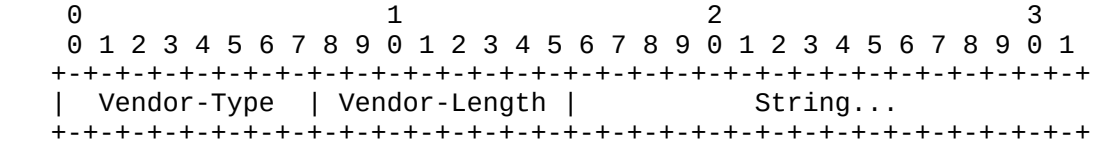
The following sub-sections define the DSL Forum vendor-specific sub-attributes.

3.3.1. Agent-Circuit-Id

Description

This Attribute contains information describing the subscriber agent circuit identifier corresponding to the logical access loop port of the Access Node/DSLAM from which a subscriber’s requests are initiated. It MAY be present in both Access-Request and Accounting-Request packets.

A summary of the Agent-Circuit-Id Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

1 for Agent-Circuit-Id

Vendor-Length

<= 65

String

The String field contains information about the Access-Node to which the subscriber is attached, along with an identifier for the subscriber's DSL port on that Access-Node.

The exact syntax of the string is implementation dependent; however, a typical practice is to subdivide it into two or more space-separated components, one to identify the Access-Node and another the subscriber line on that node, with perhaps an indication of whether that line is Ethernet or ATM. Example formats for this string are shown below.

"Access-Node-Identifier atm slot/port:vpi.vci"
(when ATM/DSL is used)

"Access-Node-Identifier eth slot/port[:vlan-id]"
(when Ethernet/DSL is used)

An example showing the slot and port field encoding is given below:

"[Relay-identifier] atm 3/0:100.33"
(slot = 3, port = 0, vpi = 100, vci = 33)

The Access-Node-Identifier is a unique ASCII string that does not include 'space' characters. The syntax of the slot and port fields reflects typical practices currently in place. The slot identifier does not exceed 6 characters in length, and the port identifier does not exceed 3 characters in length using a '\' as a delimiter.

The exact manner in which slots are identified is Access Node/DSLAM implementation dependent. The vpi, vci, and vlan-id fields (when applicable) are related to a given access loop (U-interface).

3.3.2. Agent-Remote-Id

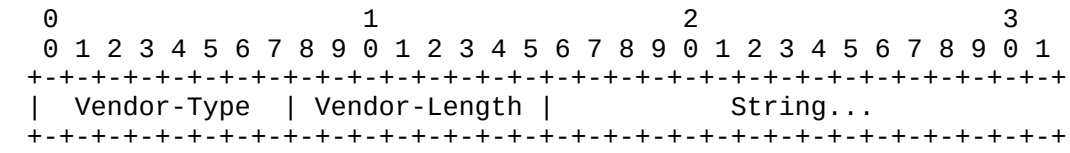
Description

The Agent-Remote-Id Attribute contains an operator-specific, statically configured string that uniquely identifies the subscriber on the associated access loop of the Access Node/DSLAM.

In a typical subscriber environment, multiple attributes can be used to identify the user, among others: Username (for example, as defined on a PPP client); Agent-Circuit-Id (a static, pre-defined string sent from the Access Node/DSLAM); Agent-Remote-Id (an operator-defined string configured on and sent by the Access Node/DSLAM).

This Attribute MAY be included in both Access-Request and Accounting-Request packets.

A summary of the Agent-Remote-Id Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

2 for Agent-Remote-Id

Vendor-Length

<= 65

String

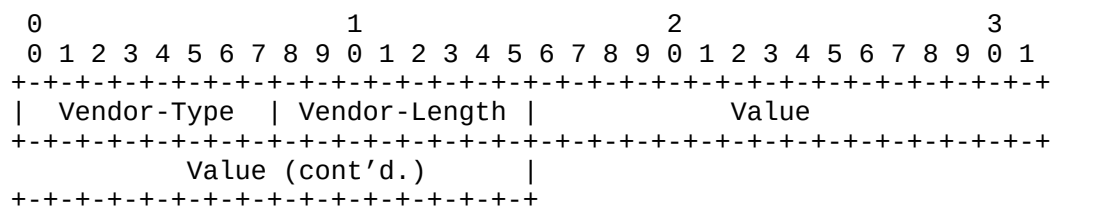
This value of this field is entirely open to the service provider’s discretion. For example, it MAY contain a subscriber billing identifier or telephone number.

3.3.3. Actual-Data-Rate-Upstream

Description

This Attribute contains the actual upstream train rate of a subscriber's synchronized DSL link. It MAY be included in both Access-Request and Accounting-Request packets.

A summary of the Actual-Data-Rate-Upstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

129 (0x81) for Actual-Data-Rate-Upstream

Vendor-Length

6

Value

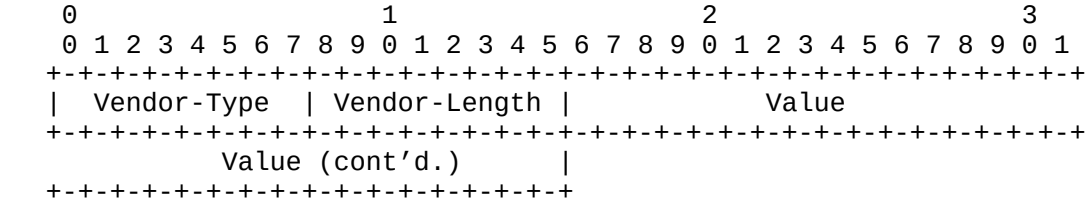
This field contains a 4-byte unsigned integer, indicating the subscriber's actual data rate upstream of a synchronized DSL link. The rate is coded in bits per second.

3.3.4. Actual-Data-Rate-Downstream

Description

This Attribute contains the actual downstream train rate of a subscriber's synchronized DSL link. It MAY be included in both Access-Request and Accounting-Request packets.

A summary of the Actual-Data-Rate-Downstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

130 (0x82) for Actual-Data-Rate-Downstream

Vendor-Length

6

Value

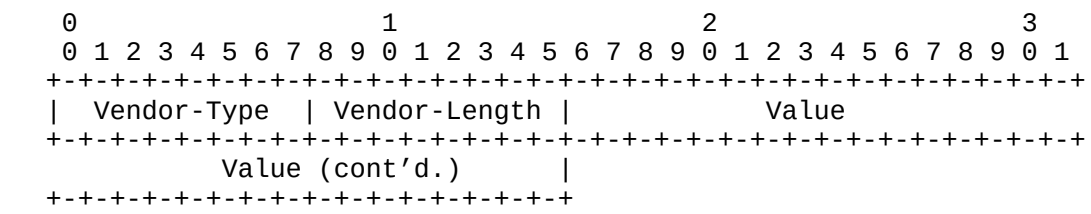
This field contains a 4-byte unsigned integer, indicating the subscriber's actual data rate downstream of a synchronized DSL link. The rate is coded in bits per second.

3.3.5. Minimum-Data-Rate-Upstream

Description

This Attribute contains the subscriber's operator-configured minimum upstream data rate. It MAY be included in Accounting-Request packets.

A summary of the Minimum-Data-Rate-Upstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

131 (0x83) for Minimum-Data-Rate-Upstream

Vendor-Length

6

Value

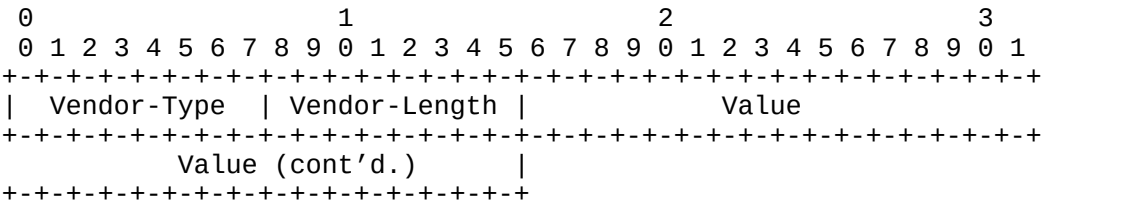
This field contains a 4-byte unsigned integer, indicating the subscriber's minimum upstream data rate (as configured by the operator). The rate is coded in bits per second.

3.3.6. Minimum-Data-Rate-Downstream

Description

This Attribute contains the subscriber's operator-configured minimum downstream data rate. It MAY be included in Accounting-Request packets.

A summary of the Minimum-Data-Rate-Downstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

132 (0x84) for Minimum-Data-Rate-Downstream

Vendor-Length

6

Value

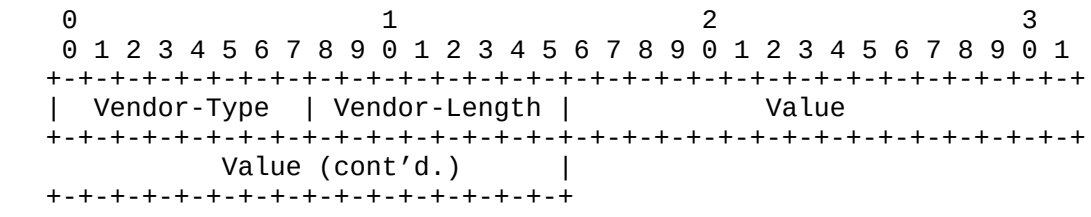
This field contains a 4-byte unsigned integer, indicating the subscriber's minimum downstream data rate (as configured by the operator). The rate is coded in bits per second.

3.3.7. Attainable-Data-Rate-Upstream

Description

This Attribute contains the subscriber's attainable upstream data rate. It MAY be included in Accounting-Request packets.

A summary of the Attainable-Data-Rate-Upstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

133 (0x85) for Attainable-Data-Rate-Upstream

Vendor-Length

6

Value

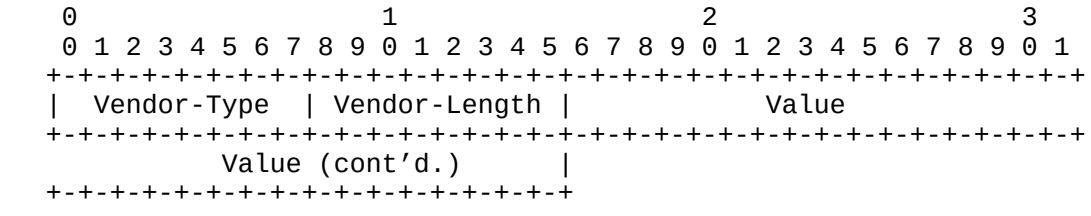
This field contains a 4-byte unsigned integer, indicating the subscriber's actual DSL attainable upstream data rate. The rate is coded in bits per second.

3.3.8. Attainable-Data-Rate-Downstream

Description

This Attribute contains the subscriber's attainable downstream data rate. It MAY be included in Accounting-Request packets.

A summary of the Attainable-Data-Rate-Downstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

134 (0x86) for Attainable-Data-Rate-Downstream

Vendor-Length

6

Value

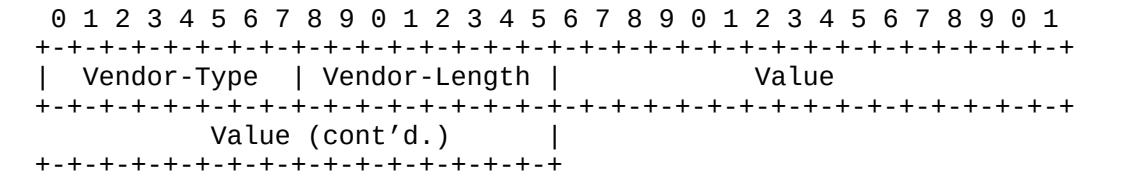
This field contains a 4-byte unsigned integer, indicating the subscriber's actual DSL attainable downstream data rate. The rate is coded in bits per second.

3.3.9. Maximum-Data-Rate-Upstream

Description

This Attribute contains the subscriber's maximum upstream data rate, as configured by the operator. It MAY be included in Accounting-Request packets.

A summary of the Maximum-Data-Rate-Upstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

135 (0x87) for Maximum-Data-Rate-Upstream

Vendor-Length

6

Value

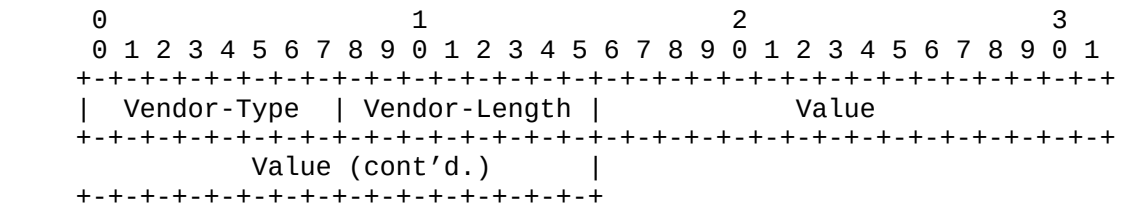
This field is a 4-byte unsigned integer, indicating the numeric value of the subscriber's DSL maximum upstream data rate. The rate is coded in bits per second.

3.3.10. Maximum-Data-Rate-Downstream

Description

This Attribute contains the subscriber's maximum downstream data rate, as configured by the operator. It MAY be included in Accounting-Request packets.

A summary of the Maximum-Data-Rate-Downstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

136 (0x88) for Maximum-Data-Rate-Downstream

Vendor-Length

6

Value

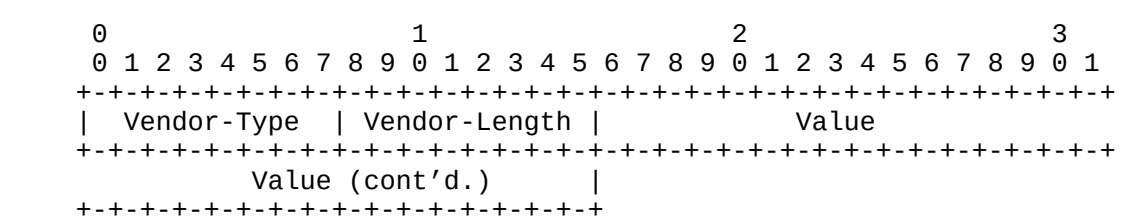
This field is a 4-byte unsigned integer, indicating the numeric value of the subscriber's DSL maximum downstream data rate. The rate is coded in bits per second.

3.3.11. Minimum-Data-Rate-Upstream-Low-Power

Description

This Attribute contains the subscriber's minimum upstream data rate in low power state, as configured by the operator. It MAY be included in Accounting-Request packets.

A summary of the Minimum-Data-Rate-Upstream-Low-Power Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

137 (0x89) for Minimum-Data-Rate-Upstream-Low-Power

Vendor-Length

6

Value

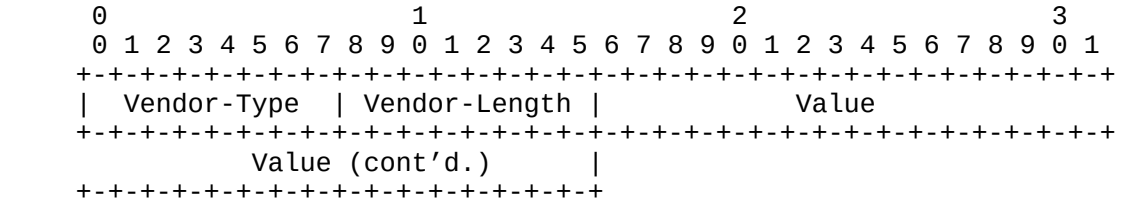
This field is a 4-byte unsigned integer, indicating the numeric value of the subscriber's DSL minimum upstream data rate when in low power state (L1/L2). The rate is coded in bits per second.

3.3.12. Minimum-Data-Rate-Downstream-Low-Power

Description

This Attribute contains the subscriber's minimum downstream data rate in low power state, as configured by the operator. It MAY be included in Accounting-Request packets.

A summary of the Minimum-Data-Rate-Downstream-Low-Power Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

138 (0x8A) for Minimum-Data-Rate-Downstream-Low-Power

Vendor-Length

6

Value

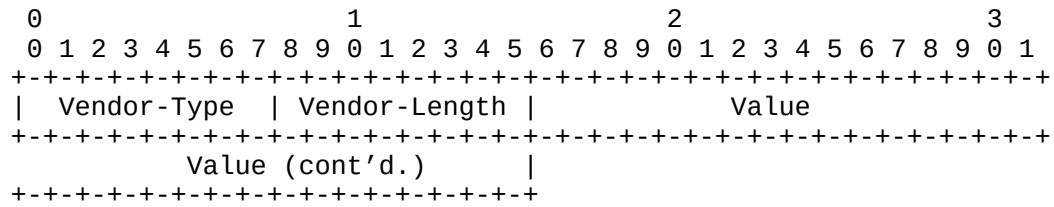
This field is a 4-byte unsigned integer, indicating the numeric value of the subscriber's DSL minimum downstream data rate. The rate is coded in bits per second.

3.3.13. Maximum-Interleaving-Delay-Upstream

Description

This Attribute contains the subscriber's maximum one-way upstream interleaving delay, as configured by the operator. It MAY be included in Accounting-Request packets.

A summary of the Maximum-Interleaving-Delay-Upstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

139 (0x8B) for Maximum-Interleaving-Delay-Upstream

Vendor-Length

6

Value

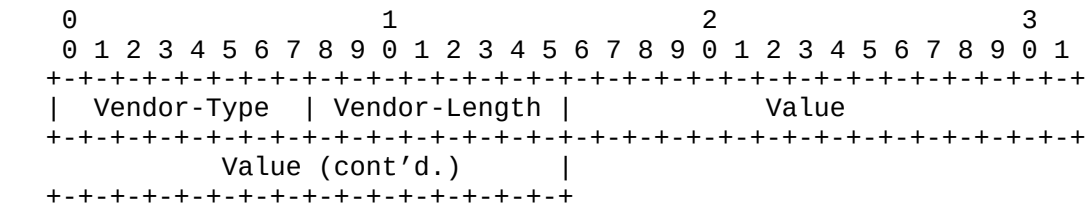
This field is a 4-byte unsigned integer, indicating the numeric value in milliseconds of the subscriber's DSL maximum one-way upstream interleaving delay.

3.3.14. Actual-Interleaving-Delay-Upstream

Description

This Attribute contains the subscriber's actual one-way upstream interleaving delay. It MAY be included in Accounting-Request packets.

A summary of the Actual-Interleaving-Delay-Upstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

140 (0x8C) for Actual-Interleaving-Delay-Upstream

Vendor-Length

6

Value

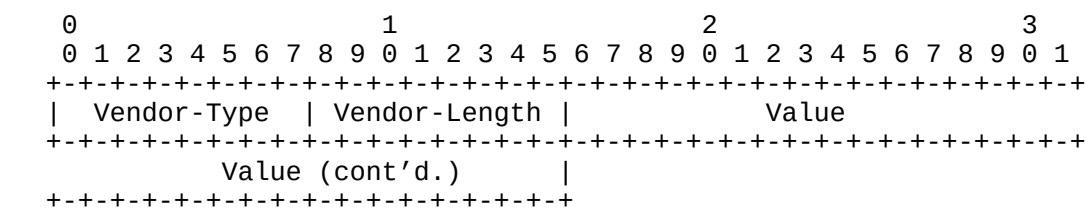
This field is a 4-byte unsigned integer, indicating the numeric value in milliseconds of the subscriber's DSL actual upstream interleaving delay.

3.3.15. Maximum-Interleaving-Delay-Downstream

Description

This Attribute contains the subscriber's maximum one-way downstream interleaving delay, as configured by the operator. It MAY be included in Accounting-Request packets.

A summary of the Maximum-Interleaving-Delay-Downstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

141 (0x8D) for Maximum-Interleaving-Delay-Downstream

Vendor-Length

6

Value

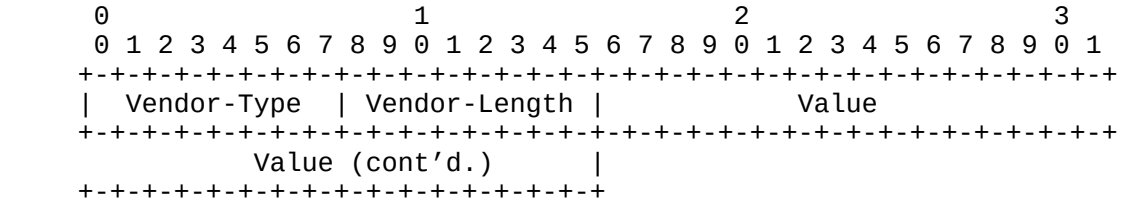
This field is a 4-byte unsigned integer, indicating the numeric value in milliseconds of the subscriber's DSL maximum one-way downstream interleaving delay.

3.3.16. Actual-Interleaving-Delay-Downstream

Description

This Attribute contains the subscriber's actual one-way downstream interleaving delay. It MAY be included in Accounting-Request packets.

A summary of the Actual-Interleaving-Delay-Downstream Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

142 (0x8E) for Actual-Interleaving-Delay-Downstream

Vendor-Length

6

Value

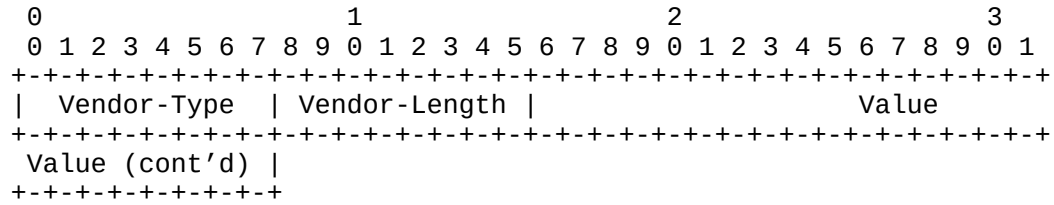
This field is a 4-byte unsigned integer, indicating the numeric value in milliseconds of the subscriber's DSL actual downstream interleaving delay.

3.3.17. Access-Loop-Encapsulation

Description

This Attribute describes the encapsulation(s) used by the subscriber on the DSL access loop. It MAY be present in both Access-Request and Accounting-Request packets.

A summary of the Access-Loop-Encapsulation Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

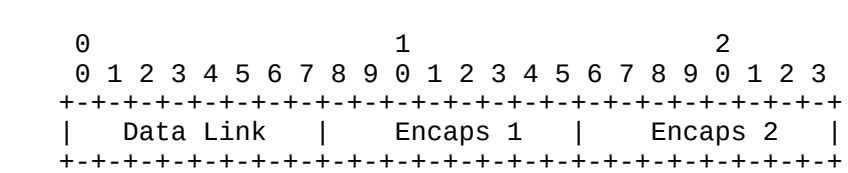
144 (0x90) for Access-Loop-Encapsulation

Vendor-Length

5

Value

This field is a string 3 bytes in length, logically divided into three 1-byte sub-fields as shown in the following diagram:



Valid values for the sub-fields are as follows:

Data Link

0x01 AAL5
0x02 Ethernet

Encaps 1

0x00 NA - Not Available
0x01 Untagged Ethernet
0x02 Single-Tagged Ethernet

Encaps 2

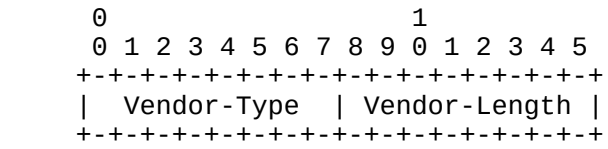
0x00 NA - Not Available
0x01 PPPoA LLC
0x02 PPPoA Null
0x03 IPoA LLC
0x04 IPoA Null
0x05 Ethernet over AAL5 LLC with FCS
0x06 Ethernet over AAL5 LLC without FCS
0x07 Ethernet over AAL5 Null with FCS
0x08 Ethernet over AAL5 Null without FCS

3.3.18. IWF-Session

Description

The presence of this Attribute indicates that the IWF has been performed with respect to the subscriber's session; note that no data field is necessary. It MAY be included in both Access-Request and Accounting-Request packets.

A summary of the IWF-Session Attribute format is shown below. The fields are transmitted from left to right.



Vendor-Type

254 (0xFE) for IWF-Session

Vendor-Length

2

4. Table of Attributes

The following table provides a guide to which attributes may be found in which kinds of packets, and in what quantity; note that since none of the DSL Forum VSAs may be present in the Access-Accept, Access-Reject or Access-Challenge packets, those columns have been omitted from the table.

Request	Acct-Request	#	Attribute
0-1	0-1	1	Agent-Circuit-Id
0-1	0-1	2	Agent-Remote-Id
0-1	0-1	129	Actual-Data-Rate-Upstream
0-1	0-1	130	Actual-Data-Rate-Downstream
0	0-1	131	Minimum-Data-Rate-Upstream
0	0-1	132	Minimum-Data-Rate-Downstream
0	0-1	133	Attainable-Data-Rate-Upstream
0	0-1	134	Attainable-Data-Rate-Downstream
0	0-1	135	Maximum-Data-Rate-Upstream
0	0-1	136	Maximum-Data-Rate-Downstream
0	0-1	137	Minimum-Data-Rate-Upstream-Low-Power
0	0-1	138	Minimum-Data-Rate-Downstream-Low-Power
0	0-1	139	Maximum-Interleaving-Delay-Upstream
0	0-1	140	Actual-Interleaving-Delay-Upstream
0	0-1	141	Maximum-Interleaving-Delay-Downstream
0	0-1	142	Actual-Interleaving-Delay-Downstream
0-1	0-1	144	Access-Loop-Encapsulation
0-1	0-1	254	IWF-Session

The following table defines the meaning of the above table entries.

0	This Attribute MUST NOT be present in packet.
0-1	Zero or one instances of this Attribute MAY be present in packet.

5. Security Considerations

The security of these Attributes relies on an implied trust relationship between the Access Node/DSLAM and the BRAS. The identifiers that are inserted by the Access Node/DSLAM are unconditionally trusted; the BRAS does not perform any validity check on the information received. These Attributes are intended to be used in environments in which the network infrastructure (the Access Node/DSLAM, the BRAS, and the entire network in which those two devices reside) is trusted and secure.

As used in this document, the word "trusted" implies that unauthorized traffic cannot enter the network except through secured and trusted devices and that all devices internal to the network are secure and trusted. Careful consideration should be given to the potential security vulnerabilities that are present in this model before deploying this option in actual networks.

The Attributes described in this document neither increase nor decrease the security of the RADIUS protocol. For discussions of various RADIUS vulnerabilities, see [RFC2607], [RFC3579], [RFC3162], and [RFC3580].

6. References

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Acknowledgement

Funding for the RFC Editor function is provided by the IETF Administrative Support Activity (IASA).