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Attachment Individual Identifier (AII) Types for Aggregation

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Abstract

The signaling protocols used to establish point-to-point pseudowires include type-length-value (TLV) fields that identify pseudowire endpoints called attachment individual identifiers (AIIs). This document defines AII structures in the form of new AII TLV fields that support AII aggregation for improved scalability and Virtual Private Network (VPN) auto-discovery. It is envisioned that this would be useful in large inter-domain virtual private wire service networks where pseudowires are established between selected local and remote provider edge (PE) nodes based on customer need.

Table of Contents

1. Introduction

[RFC4447] defines the signaling mechanisms for establishing point-to-point pseudowires (PWs) between two provider edge (PE) nodes. When a PW is set up, the LDP signaling messages include a forwarding equivalence class (FEC) element containing information about the PW type and an endpoint identifier used in the selection of the PW forwarder that binds the PW to the attachment circuit at each end.

There are two types of FEC elements defined for this purpose: PWid FEC (type 128) and the Generalized ID (GID) FEC (type 129). The PWid FEC element includes a fixed-length 32-bit value called the PWid that serves as an endpoint identifier. The same PWid value must be configured on the local and remote PE prior to PW setup.

The GID FEC element includes TLV fields for attachment individual identifiers (AIIs) that, in conjunction with an attachment group identifier (AGI), serve as PW endpoint identifiers. The endpoint identifier on the local PE (denoted as <AGI, source AII, or SAII>) is called the source attachment identifier (SAI) and the endpoint identifier on the remote PE (denoted as <AGI, target AII, or TAII>) is called the target attachment identifier (TAI). The SAI and TAI can be distinct values. This is useful for applications and provisioning models where the local PE (with a particular SAI) does not know and must somehow learn (e.g., via Multiprotocol BGP (MP-BGP) auto-discovery) of remote TAI values prior to launching PW setup messages towards the remote PE.

The use of the GID FEC TLV provides the flexibility to structure (source or target) AII values to best fit the needs of a particular application or provisioning model [L2VPN-SIG]. For example, an AII structure that enables many individual AII values to be identified as a single value could significantly reduce the burden on AII distribution mechanisms (e.g., MP-BGP) and on PE memory needed to store this AII information. It should be noted that Pseudowire Emulation Edge-to-Edge (PWE3) signaling messages will always include a fully qualified AII value.

An AII that is globally unique would facilitate PW management and security in large inter-AS (autonomous system) and inter-provider environments. Providers would not have to worry about AII value overlap during provisioning or the need for AII network address translation (NAT) boxes during signaling. Globally unique AII values could aid in troubleshooting and could be subjected to source-validity checks during AII distribution and signaling. An AII automatically derived from a provider’s existing IP address space can simplify the provisioning process.

This document defines an AII structure based on [RFC4447] that:

- Enables many discrete attachment individual identifiers to be summarized into a single AII summary value. This will enhance scalability by reducing the burden on AII distribution mechanisms and on PE memory.

- Ensures global uniqueness if desired by the provider. This will facilitate Internet-wide PW connectivity and provide a means for providers to perform source validation on the AII distribution (e.g., MP-BGP) and signaling (e.g., LDP) channels.

This is accomplished by defining new AII types and the associated formats of the value field.

2. Specification of Requirements

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].

3. Structure for the New AII Type

[RFC4447] defines the format of the GID FEC TLV and the use and semantics of the attachment group identifier (AGI).

3.1. AII Type 1

AII Type 1 has been allocated by IANA for use with provisioning models requiring a fixed-length 32-bit value [L2VPN-SIG]. This value is unique on the local PE.

3.2. AII Type 2

The AII Type 2 structure permits varying levels of AII summarization to take place, thus reducing the scaling burden on the aforementioned AII distribution mechanisms and PE memory. In other words, it no longer becomes necessary to distribute or configure all individual AII values (which could number in the tens of thousands or more) on local PEs prior to establishing PWs to remote PEs. The details of how and where the aggregation of AII values is performed and then distributed as AII reachability information are not discussed in this document.

AII Type 2 uses a combination of a provider’s globally unique identifier (Global ID), a 32-bit prefix field, and a 4-octet attachment circuit identifier (AC ID) field to create globally unique AII values.

The encoding of AII Type 2 is shown in Figure 1.

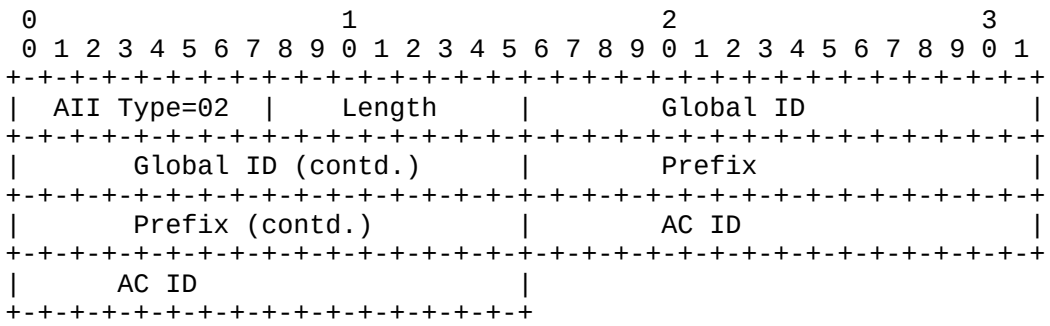

Figure 1. AII Type 2 TLV Structure

o AII Type = 0x02

  o Length = length of value field in octets. The length is set to 12.

  o Global ID = This is a 4-octet field containing a value that is unique to the provider. The global ID can contain the 2-octet or 4-octet value of the provider's Autonomous System Number (ASN). It is expected that the global ID will be derived from the globally unique ASN of the autonomous system hosting the PEs containing the actual AIIs. The presence of a global ID based on the provider's ASN ensures that the AII will be globally unique.

    If the global ID is derived from a 2-octet AS number, then the two high-order octets of this 4-octet field MUST be set to zero.

    Please note that the use of the provider's ASN as a global ID DOES NOT have anything at all to do with the use of the ASN in protocols such as BGP.

  o Prefix = The 32-bit prefix is a value assigned by the provider or it can be automatically derived from the PE's /32 IPv4 loopback address. Note that, for IP reachability, it is not required that the 32-bit prefix have any association with the IPv4 address space used in the provider's IGP or BGP.

  o Attachment Circuit (AC) ID = This is a fixed-length 4-octet field used to further refine identification of an attachment circuit on the PE. The inclusion of the AC ID is used to identify individual attachment circuits that share a common prefix.

4. IANA Considerations

IANA has allocated a value from the "Attachment Individual Identifier (AII) Type" registry defined in [RFC4446].

The value for this AII type is 0x02.

5. Security Considerations

AII values appear in AII distribution protocols [L2VPN-SIG] and PW signaling protocols [RFC4447] and are subject to various authentication schemes (i.e., MD5) if so desired.

The use of global ID values (e.g., ASN) in the inter-provider case could enable a form of source-validation checking to ensure that the AII value (aggregated or explicit) originated from a legitimate source.

6. Acknowledgments

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7. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4447] Martini, L., Ed., Rosen, E., El-Aawar, N., Smith, T., and G. Heron, "Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)", RFC 4447, April 2006.

[RFC4446] Martini, L., "IANA Allocations for Pseudowire Edge to Edge Emulation (PWE3)", BCP 116, RFC 4446, April 2006.

8. Informative References

[L2VPN-SIG] Rosen, E., Luo, W., Davie, B., and V. Radoaca, "Provisioning, Autodiscovery, and Signaling in L2VPNs", Work in Progress, May 2006.

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