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PIM Join Attributes for LISP Environments
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Abstract

This document defines two PIM Join/Prune attributes that support the construction of multicast distribution trees where the root and receivers are located in different LISP sites. These attributes allow the receiver site to select between unicast and multicast transport and to convey the receiver RLOC address to the control plane of the root xTR.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

The construction of multicast distribution trees where the root and receivers are located in different LISP sites [RFC6830] is defined in [RFC6831]. Creation of (root-EID,G) state in the root site requires that unicast LISP-encapsulated Join/Prune messages be sent from an xTR on the receiver site to an xTR on the root site.

[RFC6831] specifies that (root-EID,G) data packets are to be LISP-encapsulated into (root-RLOC,G) multicast packets. However, a wide deployment of multicast connectivity between LISP sites is unlikely to happen any time soon. In fact, some implementations are initially focusing on unicast transport with head-end replication between root and receiver sites.

The unicast LISP-encapsulated Join/Prune message specifies the (root-EID,G) state that needs to be established in the root site, but conveys nothing about the receivers capability or desire to use multicast as the underlying transport. This document specifies a Join/Prune attribute that allows the receiver to select the desired transport.

Knowledge of the receiver RLOC is also essential to the control plane of the root xTR. It determines the downstream destination for unicast head-end replication and identifies the receiver xTR that needs to be notified should the root of the distribution tree move to another site.

The outer source address field of the encapsulated Join/Prune message contains an RLOC address of the receiver xTR. This source address is message to the root xTR RLOC destination. Due to policy and load balancing considerations, the selected source address may not be the RLOC on which the receiver site wishes to receive a particular flow. This document specifies a Join/Prune attribute that conveys the appropriate receiver RLOC address to the control plane of the root xTR.

2. Requirements Notation

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. PIM Join/Prune Attributes

PIM Join/Prune attributes are defined in [RFC5384] by introducing a new Encoded-Source type that, in addition to the Join/Prune source, can carry multiple type-length-value (TLV) attributes. These attributes apply to the individual Join/Prune sources on which they are stored.

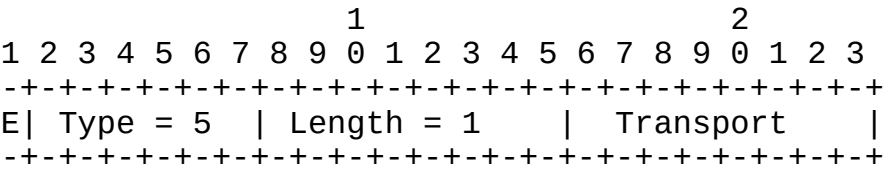
The attributes defined in this document conform to the format of the encoding type defined in [RFC5384]. The attributes would typically be the same for all the sources in the Join/Prune message. Hence we RECOMMEND using the hierarchical Join/Prune attribute scheme defined in [I-D.venaas-pim-hierarchicaljoinattr]. This hirarchichal system allows attributes to be conveyed on the Upstream Neighbor Address field, thus enabling the efficient application of a single attribute instance to all the sources in the Join/Prune message.

LISP xTRs do not exchange PIM Hello Messages and hence no Hello option is defined to negotiate support for these attributes. Systems that support unicast head-end replication are assumed to support these attributes.

4. The Transport Attribute

It is essential that a mechanism be provided by which the desired transport can be conveyed by receiver sites. Root sites with multicast connectivity will want to leverage multicast replication. However, not all receiver sites can be expected to have multicast connectivity. It is thus desirable that root sites be prepared to support (root-EID,G) state with a mixture of multicast and unicast output state. This document specifies a Join/Prune attribute that allows the receiver to select the desired underlying transport.

4.1. Transport Attribute Format



F-bit: The Transitive bit. Specifies whether the attribute is transitive or non-transitive. MUST be set to zero. This attribute is ALWAYS non-transitive.

E-bit: End-of-Attributes bit. Specifies whether this attribute is the last. Set to zero if there are more attributes. Set to 1 if this is the last attribute.

Type: The Transport Attribute type is 5.

Length: The length of the Transport Attribute value. MUST be set to 1.

Transport: The type of transport being requested. Set to 0 for multicast. Set to 1 for unicast.

4.2. Using the Transport Attribute

Hierarchical Join/Prune attribute instances [I-D.venaas-pim-hierarchicaljoinattr] SHOULD be used when the same Transport Attribute is to be applied to all the sources within the Join/Prune message or all the sources within a group set. The root xTR MUST accept Transport Attributes in the Upstream Neighbor Encoded-Unicast address, Encoded-Group addresses, and Encoded-Source addresses.

There MUST NOT be more than one Transport Attribute within the same encoded address. If an encoded address has more than one instance of the attribute, the root xTR MUST discard all affected Join/Prune sources.

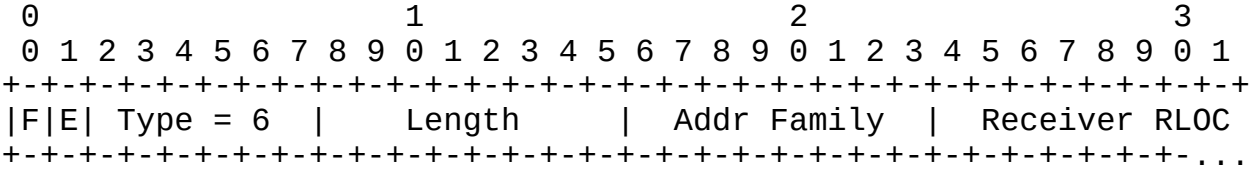
5. Receiver RLOC Attribute

The root xTR must know the receiver RLOC addresses of all receiver sites for a given (root-EID,G) so that it can perform unicast LISP-encapsulation of multicast data packets to each and every receiver site that has requested unicast head-end replication.

To support mobility of EIDs, the root xTR must keep track of ALL receiver RLOCs even when the corresponding downstream site has not requested unicast replication. The root xTR may detect that a local multicast source "root-EID" has moved to a remote LISP site. Under such circumstances LISP sends a SMR message to all receiver xTRs, prompting them to update their map cache. This is only possible if LISP can obtain from PIM the set of all receiver RLOCS that have active Join state for the root-EID.

The outer source address field of the encapsulated Join/Prune message contains an RLOC address of the receiver xTR. LISP xTRs, as edge devices, are commonly subject to URPF checks by the network providers on each core-facing interface. The source address for the encapsulation header must therefore be the RLOC of the core-facing interface used to physically transmit the encapsulated Join/Prune message. Due to policy and load balancing considerations, that may not be the RLOC on which the receiver site wishes to receive a particular flow. This document specifies a Join/Prune attribute that conveys the appropriate receiver RLOC address to the control plane of the root xTR.

5.1. Receiver RLOC Attribute Format



F-bit: The Transitive bit. Specifies whether this attribute is transitive or non-transitive. MUST be set to zero. This attribute is ALWAYS non-transitive.

E-bit: End-of-Attributes bit. Specifies whether this attribute is the last. Set to zero if there are more attributes. Set to 1 if this is the last attribute.

Type: The Receiver RLOC Attribute type is 6.

Length: The length in octets of the attribute value. MUST be set to the length in octets of the receiver RLOC address plus one octet to account for the Address Family field.

Addr Family: The PIM Address Family of the receiver RLOC as defined in [RFC4601].

Receiver RLOC: The RLOC address on which the receiver xTR wishes to receiver the unicast-encapsulated flow.">

5.2. Using the Receiver RLOC Attribute

Hierarchical Join/Prune attribute instances [I-D.venaas-pim-hierarchicaljoinattr] SHOULD be used when the same Receiver RLOC attribute is to be applied to all the sources within the message or all the sources within a group set. The root xTR MUST accept Transport Attributes in the Upstream Neighbor Encoded-Unicast address, Encoded-Group addresses, and Encoded-Source addresses.

There MUST NOT be more than one Receiver RLOC Attribute within the same encoded address. If an encoded address has more than one instance of the attribute, the root xTR MUST discard all affected Join/Prune sources.

6. Security Considerations

Security of the Join Attribute is only guaranteed by the security of the PIM packet. The attributes specified herein do not enhance or diminish the privacy or authenticity of a Join/Prune message. A site that legitimately or maliciously sends and delivers a Join/Prune message to another site will equally be able to append these and any other attributes it wishes.

7. IANA Considerations

Two new PIM Join/Prune attribute types need to be assigned. Type 5 is being requested for the Transport Attribute. Type 6 is being requested for the Receiver RLOC Attribute.

8. Normative References

[AFI] IANA, , "Address Family Numbers", http://www.iana.org/assignments/address-family-numbers.

[I-D.venaas-pim-hierarchicaljoinattr] Venaas, S., Kouvelas, I., and J. Arango, "Hierarchical Join/Prune Attributes", draft-venaas-pim-hierarchicaljoinattr-00 (work in progress), February 2013.

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

[RFC4601] Fenner, B., Handley, M., Holbrook, H., and I. Kouvelas, "Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)", RFC 4601, August 2006.

[RFC5384] Boers, A., Wijnands, I., and E. Rosen, "The Protocol Independent Multicast (PIM) Join Attribute Format", RFC 5384, November 2008.

[RFC6830] Farinacci, D., Fuller, V., Meyer, D., and D. Lewis, "The Locator/ID Separation Protocol (LISP)", RFC 6830, January 2013.

[RFC6831] Farinacci, D., Meyer, D., Zwiebel, J., and S. Venaas, "The Locator/ID Separation Protocol (LISP) for Multicast Environments", RFC 6831, January 2013.

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