             PIM Join Attributes for LISP Environments
           draft-arango-pim-join-attributes-for-lisp-00.txt

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.

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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

```
            0                   1                   2
            0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
           |F|E|  Type = 5  | Length = 1    |  Transport    |
           +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
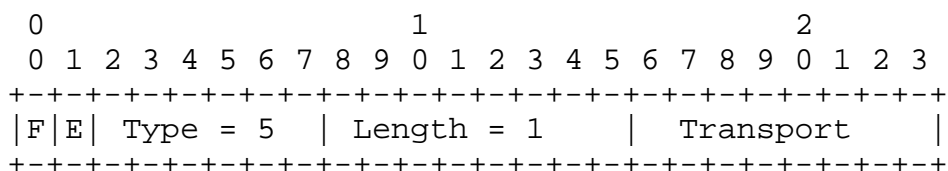
   F-bit: The Transitive bit. Specifies whether the attribute is
      transitive or non-transitive. MUST be set to zero. This
      attribute is ALWAYS non-transitive.

   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
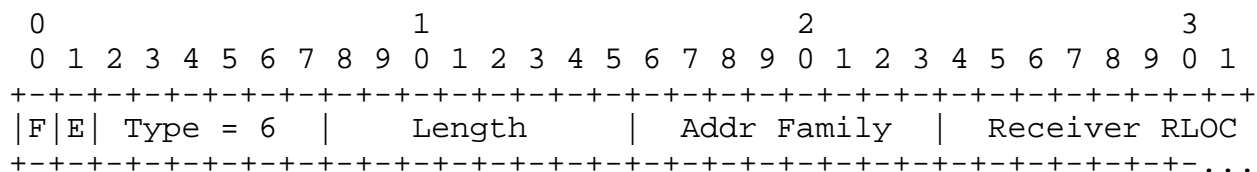sources.

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

```
         0                   1                   2                   3
         0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
        +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
        |F|E| Type = 6  |     Length      |  Addr Family  |  Receiver RLOC
        +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-...
```

   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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