Problem Being Solved

- LISP multicast (RFC6831) defaults to multicast transport over the RLOC core
- However, implementations are initially focusing on unicast transport with head-end replication at the root site
- Support LISP multicast over core networks that do have native multicast support
- Support mixed environments where some receivers have core multicast connectivity and some do not
RFC-6831 PIM Signaling

Legend:
- EIDs -> Green
- Locators -> Red
- site or core
- PIM router
- regular PIM JP
- unicast PIM JP
Unicast Transport

• Unicast Transport with head-end replication at the root-ITR only uses Unicast LISP encapsulated \((S\text{-}EID,G)\) J/P from receiver-ETR to root-ITR (no native PIM J/P over RLOC core)

• Unicast transport requires the communication of two additional pieces of information in the PIM \((S\text{-}EID,G)\) Join message:
  – An indication that the receiver-ETR wants unicast transport and is not additionally joining through native multicast by sending an \((S\text{-}RLOC,G)\) Join
  – The receiver-ETR RLOC address that should be used as the destination for the LISP unicast encapsulated multicast data packets
Encoding Receiver-ETR RLOC

- No options in current LISP encapsulated PIM J/P message format
- Outer and inner IP header source addresses cannot be used to carry receiver-ETR RLOC
Outer IP Source Unsuitable

• Outer (LISP encapsulation) IP header source address is determined by routing

• The receiver-ETR interface that the join message is sent out of is determined by the routing information for the root-ITR RLOC

• The outer header IP source address:
  – Must be the address of the interface that the encapsulated message is being transmitted on to avoid URPF issues
  – Must be of the same AF as the selected root-ITR RLOC
Inner IP Source Unsuitable

- Inner (PIM message) IP header source address must be of EID address family and cannot be used to carry an RLOC AF address
- RFC-4601 mandates that PIM J/P message IP header is of the same AF as the encoded group and source addresses that it carries
- The header must be of EID AF to ensure correct processing when received within the EID VRF of the root-ITR post LISP decapsulation
PIM J/P Attribute Solution

- PIM Join/Prune attributes can be used to carry additional information in a PIM J/P message (RFC 5384 + draft-venaas-pim-hierarchicaljoinattr)

- Attributes can be encoded on:
  - The Upstream Neighbor Address
  - A Multicast Group Address
  - A Joined or Pruned Source Address

![PIM J/P message structure diagram]
Encoding LISP Unicast Transport Information as PIM J/P Attributes

• We are defining two new PIM Join / Prune attributes:
  – The **Transport Attribute** conveys the receiver-ETR choice of unicast transport over multicast
  – The **Receiver RLOC Attribute** conveys the receiver-ETR RLOC that should be used as the target for the LISP encapsulated multicast data
Transport Attribute Format

• **Transport** field is set to 0 for multicast transport and is set to 1 for unicast transport.
Receiver RLOC Attribute Format

- **Address Family** field carries the PIM Address Family of the receiver RLOC as defined in RFC4601
- **Receiver RLOC** field carries the RLOC address on which the receiver xTR wishes to receive the unicast-encapsulated flow
Wrap Up

• Adding support for unicast transport to LISP multicast PIM signaling
• Introducing the Transport and Receiver RLOC attributes to carry additional required information in LISP encapsulated (S-EID,G) Join/Prune PIM messages