SR Multicast: Non-source-routed Options

draft-zzhang-pim-non-source-routed-sr-mcast-00

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A Few Clarifications

• An informational draft
  • For discussions and considerations
  • A replacement of draft-zzhang-pim-sr-multicast

• Source-routed options not considered in this document
  • Not that they’re not good – they’re just not in the scope of this document
  • BIER is not source-routed – the BitString does not encode the (sub-)tree
SR Principles

• #1 SR Principle – no per-flow/tunnel states in the network
  • Loose(strict) path encoded in packets themselves

• #2 SR Principle/Characteristics – optional use of controllers
  • Ingress routers may be instructed by omnipotent/omniscient god-box
    controllers on how packets should be steered
Multicast Options per #1 Principle

• Ingress Replication (IR)
  • Simple, mature, but inefficient replication
  • Applicable for certain scenarios – e.g., low-rate/fanout sporadic flows
  • Can use both SR or non-SR paths – IP, MPLS or SRv6

• Bit Index Explicit Replication (BIER)
  • Efficient replication w/o per-tree state - perfect solution for SR Multicast
  • Works for all situations
    • Scenarios where convergence under scale is critical benefit the most

• Interestingly, both IR and BIER are developed independently of SR
BIER Status

• Good protocol progress in IETF
  • Base architecture, encapsulation, and signaling RFCs
  • Extensions and brownfield deployment solutions

• Limited deployment due to the chicken-and-egg dilemma
  • New encapsulation/forwarding requires new/programmable ASIC
  • Operators are very interested in BIER, but had to back off due to platform limitations
  • Vendors back off due to unclear demand

• Prime time is coming – pioneering vendors/operators will break the dilemma
  • ASIC capability from several major vendors across edge/access/core platforms
  • Interop testing among major vendors
Multicast Options per #2 Principle

• Controller-calculated trees
  • The trees could still be set up using traditional signaling
• Controller-calculated and controller-signaled trees
  • SR-P2MP: draft-ietf-pim-sr-p2mp-policy
  • BGP-signaled mLDP/IP multicast: draft-ietf-bess-bgp-multicast-controller
    • The only relevance to mLDP is the use of mLDP FEC as a tree identifier
      • This is a good option for transitioning from traditional mLDP-based MVPN
SR-P2MP Considerations

• With the MPLS data plane, SR-P2MP is similar to mLDP/RSPVP P2MP
  • Tree nodes have identical per-tunnel forwarding state: label in label out
  • The difference is in the control plane: different tree identifiers and signaling

• SR-P2MP avoids tree-state on non-replication nodes
  • This is good for sparse replication situations
  • PIM/mLDP supports that as well
    • PIM adjacency over tunnels or mLDP signaling over targeted sessions
      • In the case of SR-P2MP, this is avoided by the use of controller
SRv6-P2MP

• With the SRv6 data plane, the tree node state is like the MPLS case
• The incoming/outgoing tree-identifying label corresponds to the FUNCT bits in an SRv6 DST address
• The Locator in an SRv6 DST address gets a packet to a downstream tree node
  • Whether it is directly connected or not; this is like the “base” label
  • SRH can be used to explicitly steer the packet to a remote downstream node
  • Each tree node needs to update the DST address

• New/programmable ASIC is needed to support SRv6-P2MP
  • Though those supporting SRv6 unicast may already support SRv6-P2MP
    • Older SR-incapable ASIC is out of luck – IPv6 multicast can be used in this case
  • Since IPv6 Multicast and SRv6-P2MP all use an IPv6 header, IPv6 Multicast is a very good alternative to SRv6-p2mp
    • Especially when you use controller-signaled IP multicast
Traditional Solutions

• Traditional IR/PIM/P2MP solutions can still be used
  • If they address the use cases w/o pain points
  • Plain old IPv6 multicast may be a better choice than SRv6 in many situations

• While SR removes the need for LDP/RSVP for unicast label distribution, they can still be used for multicast purposes only
  • Unless it is important to use new signaling from controllers
    • To completely remove LDP/RSVP
  • The key is the operator’s preference or choice of taste
Summary: Order of Considerations

1. BIER
   • if efficient replication w/o per-tree state is important, and,
   • most replication nodes support BIER

2. Traditional Multicast solutions (IR/PIM/P2MP)
   • If they address the needs w/o pain points, especially if:
     • No need/desire to use controllers, and,
     • Willing to run PIM/mLDP/RSVP for multicast purposes
       • While not using LDP/RSVP for unicast

3. Controller-signaled Multicast
   • SR-P2MP – just keep in mind that they still have per-tree state on tree nodes
   • BGP-signaled mLDP or IP Multicast
     • PIM/controller-signaled IPv6 Multicast is a very good choice for non-MPLS IPv6 networks
Next Steps

• Discussions, please!