BGP Signaled Multicast

draft-zzhang-bess-bgp-multicast-01

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98th IETF, Chicago
Multicast: fear/dislike & necessity

• Many operators, especially DC ones, do not want to burden their infrastructure with multicast trees
  • They can live with ingress replication for multicast traffic
  • They do not like the following aspects of multicast trees
    • Per-tree state
    • PIM soft-state refresh overhead
    • PIM-ASM complexity due to shared-to-source tree switch
    • Yet another protocol to set up the trees

• Nonetheless, some operators have a lot of mission-critical multicast traffic, and still need the efficiency gains of having multicast trees in the infrastructure
  • at least until BIER arrives

BGP Signaled Multicast: What & Why

• Use BGP to signal multicast
  • Use as a replacement for PIM
    • (s,g)/(*,g) unidirectional/bidirectional trees
      • Optionally with MPLS data plane
  • Use as a replacement for mLDP
    • Use mLDP FEC (<root, opaque_value>) to identify tree

• Why?
  • Remove PIM-ASM complexities & soft state
    • PIM-Port only removed soft state and deployment has been limited
    • PIM-SSM removes ASM complexities but requires good source discovery methods
  • Consolidate to BGP signaling
    • Single, scalable protocol for unicast/multicast, labeled/unlabeled
How to signal tree/tunnel using BGP

- Use receiver-initiated “joins” - Leaf A-D routes in C-MCAST SAFI
  - Propagated over hop by hop EBGP/IBGP sessions or through RRs
- Each node determines upstream hop by using same RPF procedure as PIM/mLDP
- Leaf A-D routes serve the purpose of PIM Join or mLDP P2MP label mapping
  - NLRI encodes (s,g)/(*,g) or mLDP FEC
  - Route Target identifies Upstream node
  - Routes processed by upstream node and not propagated further
    - A new route with different NLRI is originated for the next node in the tree
  - Tunnel Encapsulation Attribute carries forwarding information
    - In case of labeled tree/tunnel, or
    - If downstream/upstream are not directly connected
- For MP2MP labeled tunnels, S-PMSI/Leaf A-D routes serve the purpose of mLDP MP2MP-U/MP2MP-D label mappings
- For ASM, source specific trees are set up after source discovery via Source Active (SA) A-D routes, avoiding RP/shared-trees
Signal mLDP Tunnels

- Signal entire or part of an mLDP tunnel using BGP
  - Transition from an existing mLDP deployment w/o changing anything else
  - Reuse mLDP tunnel identification
- Where a P2MP Label Mapping or an MP2MP-D Label Mapping would be sent, a Leaf A-D route is sent instead
  - Unsolicited, but as if an S-PMSI had been received
- Where an MP2MP-U Label Mapping would be sent, an S-PMSI A-D route is sent instead
  - Only MP2MP-D FEC is used
  - Route Targets correspond to the set of downstream neighbors
Signal \((s,g)/(\ast,g)\) Trees

- Where a PIM join would be sent, a Leaf A-D route is sent instead
  - Unsolicited, but as if an S-PMSI had been received
- In case of labeled bidirectional trees, an S-PMSI A-D route is sent to signal the label for upstream path
- \((\ast,g)\) unidirectional tree allowed when sources can send traffic to root of the tree w/o intersecting the tree
  - Source tree is not used in this case
Source Discovery for ASM

• First Hop Routers (FHRs) advertise SA routes
  • Upon receiving locally originated traffic

• Last Hop Routers (LHRs) receive SA routes and join source specific trees

• Similar to MSDP method, but:
  • Extended from among RPs to among FHRs and LHRs
  • With BGP advantages:
    • No periodical refreshing
    • No RPF checks for SA propagation
    • RRs and Route Target Constrain (RTC) can be used to avoid flooding SA routes
      • FHRs attach a RT that encodes the group address and advertise to RRs
      • LHRs advertise RT Membership NLRIs that encode the above mentioned RT for groups that they’re interested in
      • SAs are only advertised to interested LHRs due to the RTC mechanism
Incremental Transition

• For mLDP or PIM-SSM replacement, transition can independently happen at any node
  • If the upstream neighbor can support BGP multicast signaling, then use it

• For PIM-ASM replacement, first upgrade the RPs so that they can advertise SA routes. After that each node can independently transition
  • If an upgraded node receives (*,g) PIM join, and its upstream supports BGP multicast signaling, it behaves as if it were a LHR
    • Terminate (*,g) join
    • Send RT Membership NRLI corresponding to the group
    • Establish source trees after receiving corresponding SA routes.
Next steps

• Add details like handling of neighbors not directly connected
• Seek comments and feedback