BGP-Based SPF
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Keyur Patel, Arrcus
Acee Lindem, Cisco
Shawn Zandi, Linkedin
Gunter Van de Velde, Nokia
Review of BGP SPF Protocol Specifics

- New BGP-LS SAFI
  - BGP-LS encodings utilized with minimal new BGP-LS attributes for Node and Link NLRI
  - Separate NLRI for each Link, Node, or Prefix – only changes are advertised.
  - Other BGP-LS encodings can be leverage (e.g., segment routing)
- Best-Path Simplified since most recent version of NLRI is re-advertised and used in SPF.
  - Enables changes to be advertised immediately
- With full topology view, other IGP advantages can be realized
  - Loop-Free Alternative (LFA) including Topology-Independent LFA with segment routing.
  - Micro-loop avoidance
Review of BGP SPF
Advantages over RFC 4271

• Nodes have complete view of topology
  ➢ Ideal when BGP is used as an underlay for other BGP address families
• Only network failures (e.g., link) need be advertised vis-à-vis all routes impacted by failure.
  ➢ Faster convergence
  ➢ Better scaling
• SPF lends itself better to optimal path selection in Route-Reflector (RR) and controller topologies.
Operational Simplicity with Single DC Protocol

- BGP SPF for underlay in data center fabric
  - BGP-LS encodings used for link-state advertisement
  - Segment Routing SIDs can be advertised using existing SR encodings
- BGP EVPN for L2VPN and L3VPN Services
  - EVPN for Virtual VLANs (classic RFC 7432)
  - EVPN Type 5 Route for L3VPNs (draft)
  - EVPN Extended Community for VPWS (draft)
- BGP SR-TE for Traffic Engineering
  - BGP-LS NLRI can be leveraged for traffic engineering as well
BGP-Only Data Center Routing

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SDN Controller

BGP SR-TE for Traffic Engineering
BGP-LS for Topology Collection

Spine Layer

BGP SPF Underlay with Sparse Mesh of Sessions

Leaf Layer

Overlay Services
EVPN L2VPNs & L3VPNs

Servers
Servers
Servers
Servers
Servers
Servers
Servers
Servers
BGP SPF Data Center Peering Example

BGP SPF Data Center Topology

Controllers act as hierarchial Route Reflectors - but only reflect routes left to right and right to left.

Spines act as hierarchial Route Reflectors.

Left Spine

Right Spine

Leaf

Each leaf has BGP Sessions with 2 Spines (shown in ---)
Sparse BGP Peering

- Liveness detection for links done outside of BGP (i.e., based solely on link status or using BFD)
- Leaves peer with subset of spines (e.g., only 2 to offer redundancy)
  - Spines act as Route Reflector
  - Savings in sessions depends on the number of spines to which leaves are connected
- Spines peer with controllers
  - Controllers reflect between spines that peer with a unique set of leaves
SDN Controller Role

- Selective hierarchal route reflection between groups of spine nodes
- Provision Overlay Services
  - EVPN for L2 and L3 VPNs
- Use BGP-LS Based topology to provision traffic engineered routes
  - BGP SR-TE could be used for this provisioning
Next Steps

- Determine home for work
- Request WG Adoption