BGP-LS Filters
A Framework for Network Slicing and Enhanced VPNs

draft-drake-bess-enhanced-vpn-02

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Network Slicing/Enhanced VPN

• Described in draft-ietf-teas-enhanced-vpn

• A set of VPN overlay networks over a common underlay network
  • Different performance and scaling properties
  • Each requires a subset, either dedicated or shared, of the underlay network resources
  • First proposed for 5G mobile networks (network slicing)

• Requires a mechanism to inform each VPN of the underlay network resources (links and nodes) it can use

• Each VPN uses only those resources
  • Segment routing or RSVP-TE

• Approach is a generalization of SR TE policy
  • Supports MP2MP, P2MP, and P2P bi-directional topologies
  • Integrates BGP-VPN support (L3VPN, EVPN)
  • DSCP and Color based forwarding
Approach

• Network Controller performs global optimization across all enhanced VPNs
  • [Source, Destination] traffic matrix for each VPN
  • Performance and scaling properties for each VPN
  • Underlay network topology (BGP-LS northbound)

• Network controller assigns P router link bandwidth to DSCP or adjacency SID

• Each enhanced VPN gets a subset of the underlay network resources
  • BGP-LS Filter
  • PEs have a complete view of underlay network resources, BGP-LS Filter acts as a filter
  • Encoded w/ BGP-LS (southbound)

• Granularity
  • All PEs in a VPN
  • Set of PEs in a VPN
  • Individual PE in a VPN

• Distribute BGP-LS Filter to PEs using standard VPN tools
  • Route targets (RTs), route reflectors, RT constraints
Approach – Continued

• BGP-LS
  • Integrates easily /w VPNs
  • Supports segment routing and RSVP-TE
  • Supports inter-AS
  • Supports both IS-IS and OSPF
  • No new invention required

• Follows VPN scaling model
  • Per-VPN information restricted to its PEs
  • P-routers have no per-VPN information

• Non-enhanced VPN PEs don’t receive BGP-LS Filters
  • Network controller ensures underlay network resources for enhanced VPNs have higher IGP and TE metric
  • Enhanced VPNs may use non-enhanced VPN underlay network resources
BGP-LS Filter

• Provides connectivity between the PEs in a VPN or set of VPNs
• Should provide multiple paths between a given ingress/egress PE pair
• Tagged with the RTs of the VPNs whose PEs are to import it
• When sending a packet an ingress PE
  • Selects a path to the egress PE using the BGP-LS Filters for the packet’s VPN
  • Adds a segment routing header to the packet *OR*
  • Places the packet in an RSVP-TE LSP using that path
  • Can use any path computation it wishes as long as path is constrained
• An underlay network link or node may appear in multiple BGP-LS Filters
  • Requires AFI (BGP-LS) and SAFI (BGP-LS-VPN) w/ a different RD for each BGP-LS Filter
• Requires a new attribute for a BGP-LS UPDATE
BGP-LS Filter example

Base Network Topology

BGP-LS from Controller:
Filter filter1:
Nodes, Links, Color
Community X, Y

BGP-LS from Controller:
Filter filter2:
Nodes, Links, Color
Community Z
BGP-LS Filter Attribute

• Assumptions:
  • A PE may import more than one BGP-LS Filter
  • A BGP-LS Filter may change over time
  • A given BGP-LS Filter may contain multiple BGP-LS UPDATEs
  • The BGP-LS UPDATEs for a given BGP-LS Filter may arrive in any order
  • The BGP-LS UPDATEs for multiple BGP-LS Filters may be interleaved

• This requires:
  • A Filter identifier
  • A version number
  • A Filter type (MP2MP, P2MP, P2P (uni- or bi-directional) )
  • Total # of fragments
  • Fragment # of the current fragment

• Also may contain a DSCP and/or a Color List
  • If present, indicates which DSCPs and/or Colors may use it
Details

• Cannot use a BGP-LS Filter until it is completely assembled
• Underlay network resource can only be used if active
• Underlay network topology is the union of all imported BGL-LS Filters
• Filter precedence: P2P, P2MP, MP2MP

• New version of BGP-LS Filters when
  • The PE membership of a given VPN changes
    • Network controller must track PE membership
  • The underlay network topology changes
    • Not required if connectivity still exists

• Enhanced VPNs may use non-enhanced VPN underlay network resources when:
  • A new PE is activated
  • No connectivity to an egress PE

• Should be corrected when new BGP-LS Filters are received
Plans

• Check back with draft-ietf-teas-enhanced-vpn

• Work with authors of related drafts...
  • draft-dong-spring-sr-for-enhanced-vpn
  • draft-dong-teas-enhanced-vpn-control-plane
  • draft-dong-idr-bGPLS-sr-enhanced-vpn

  ... We believe that the concepts are similar and that our draft is a functional superset

• Iterate the draft

• Discuss with implementers