BGP-LS Extensions for Segment Routing based Enhanced VPN

draft-dong-idr-bGPLS-sr-enhanced-vpn-03

Jie Dong, Zhibo Hu, Zhenbin Li @Huawei
Xiongyan Tang, Ran Pang @China Unicom

IDR WG IETF 110 Online Meeting Mar. 2021
Background

• VPN+ framework is described in draft-ietf-teas-enhanced-vpn
  • A layered architecture and technologies to provide VPN+ service, such as network slices
  • VPN+ service is enabled by integrating overlay VPN and underlay VTN

• SR based VTN is described in draft-ietf-spring-sr-for-enhanced-vpn
  • Provides the mechanism and procedures to build SR based VTN using resource-aware SIDs

• IGP extensions for SR VTN is under discussion in LSR WG
  • Multi-Topology or Flex-Algo can be reused/combined with necessary specification/extensions

• This documents define the BGP-LS extensions for SR VPN+
  • To of intra-domain and inter-domain VTN attributes to the network controller
Design Principle Overview

- A VTN may cover one or multiple areas/domains and the inter-domain links

- In each area/domain, use MT/Flex-Algo to advertise the topology attributes of VTNs
  - The same or different topology/algorithim IDs may be used in different domains
  - Multiple VTNs may share the same topology/algorithim in one area/domain
- For each link, use L2 bundle to advertise the link TE attributes associated with VTN
BGP-LS Extensions

- VTN Definition TLV
  - Specifies the association of VTN and topology/algorithm
  - Multiple VTNs could refer to the same topology/algorithm
  - Can be further extended for other attributes

- VTN ID TLV
  - Identifies the set of VTNs an intra-domain or inter-domain link belongs to

- Link Attribute Flags TLV
  - Correspond to the IS-IS link attribute sub-TLV
  - A new flag V is defined to indicate whether a link is a virtual link
Intra-domain Topology Advertisement

• Option 1: BGP-LS with multi-topology
  • Use MT-ID TLV in BGP-LS Link NLRI and Prefix NLRI to identify the link-state information of different topologies
  • Topology-specific SR prefix-SIDs and adj-SIDs carried in BGP-LS attribute
  • The SRv6 Locators and SIDs are also topology-specific

• Option 2: BGP-LS with Flex-Algo
  • Use BGP-LS FAD to advertise the topological constraints on a particular topology
  • Algorithm-specific SR prefix-SIDs are carried in BGP-LS attribute
  • The SRv6 Locators and SIDs are also algorithm-specific

• With either option, the collected topology information and the topology-specific SPF computation can be shared by multiple VTNs
VTN Inter-domain Topology advertisement

- BGP-LS EPE with the VTN ID TLV is used to specify the VTN specific inter-domain topology

- Multi-domain VTNs can have different inter-domain connectivity, and may use different inter-domain physical/virtual links on a shared BGP peering
  - Different BGP Peer-Adj-SIDs can be allocated to identify the inter-domain links for different VTNs
  - Different BGP Peer-Node-SIDs may be allocated to identify the BGP peers for different VTNs
  - Different BGP Peer-Set-SIDs may be allocated to identify the BGP peer groups for different VTNs
VTN TE/Resource Attribute Advertisement

• The BGP-LS L2 bundle mechanism is extended for VTN-specific link attribute advertisement
• An L2 bundle can be a bundle of physical member links, or it can represent a set of virtual member links, each with a separate set of TE link attributes
  • The V flag in the Link Attribute Flags TLV is used to distinguish the two cases
• For each L2 bundle member link, a VTN-ID TLV is used to describe the associated VTNs
  • A member link may be associated with one or multiple VTNs
• The TE attributes of an L2 bundle member link will be used as the link attributes of the associated VTN
Advertisement of VTN-specific Data Plane IDs

- Used to steer packets to the set of network resources allocated to the VTN

- SR-MPLS
  - New TLVs for VTN-specific SR-MPLS Prefix and Adj SIDs

- SRv6
  - New TLVs for VTN-specific SRv6 Locators

- Dedicated VTN-IDs in data plane
  - No new TLV needed in control plane
  - The options of data plane encapsulation are under discussion
Next Steps

• Solicit feedbacks and comments

• Refine the document accordingly
Thank You