BGP Segment Routing  Yang Model


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Introduction

- BGP Segment Routing (SR) YANG data model can be used to configure and manage Segment Routing extensions in BGP
- 00 version submitted prior to IETF-102
- This Yang model covers following SR extensions in BGP
  - Prefix Sid extensions in the context of SR MPLS, as described in [I-D.ietf-idr-bgp-prefix-sid]
  - Egress Peer Engineering (EPE) as described in [I-D.ietf-spring-segment-routing-central-epe]
  - BGP Signaled SR Policy as described in [I-D.ietf-idr-segment-routing-te-policy]
  - Automatic Steering as described in [I-D.ietf-spring-segment-routing-policy] and [I-D.ietf-idr-segment-routing-te-policy]
  - SRv6 VPN extensions as described in [I-D.draft-dawra-idr-srv6-vpn]
- This model will be evolved to cover remaining SR extensions in subsequent revisions
BGP SR Yang Model

• This model augments base BGP model defined in [I-D.ietf-idr-bgp-model]
• The model complies with the Network Management Datastore Architecture (NMDA) [RFC8342].
• Imports common Routing Yang data types from [RFC8294]
• Expected to import/augment SR specific common elements from
  • Base SR Yang model
  • Base SR Policy Yang model
  • Base SRv6 Yang model
SR Prefix SID

- Prefix SID attribute in BGP in the context of SR MPLS, carries the label index and SRGB block information
- The configuration to attach the label index is modeled as a new route-policy set action
- Per BGP route Prefix SID attribute state is modeled under BGP AF mode for select address families

module: ietf-bgp-sr
augment /rpol:routing-policy/rpol:policy-definitions/rpol:policy-definition +
 /rpol:statements/rpol:statement/rpol:actions/bgp-pol:bgp-actions:
  +++rw set-label-index? Uint32

  +++ro routes
    +++ro route* [prefix neighbor add-path-id]
      +++ro prefix inet:ip-prefix
      +++ro neighbor inet:ip-address
      +++ro add-path-id uint32
      +++ro prefix-sid
        | +++ro label-index? Uint32
        | +++ro originator-srgb
        |   +++ro srgb-ranges* [srgb-min srgb-max]
        |     +++ro srgb-min rt-types:mpls-label
        |     +++ro srgb-max rt-types:mpls-label
Egress Peer Engineering

- The configuration and state for the EPE parameters is modeled by augmenting the neighbor container defined in the base BGP model [l-D.iotf-idr-bgp-model]
- Peer node SID, Peer adjacency SID and Peer set SID
- Static and dynamic EPE SID configuration
- FRR backup policy and backup SID specification

```
module: ietf-bgp-sr
augment /bgp:bgp/bgp:neighbors/bgp:neighbor:
  +---rw egress-peer-engineering
  +---rw sid-allocation-type?  enumeration
  +---rw explicit-sid?  sid-type
  +---ro allocated-sid?  sid-type
  +---rw peer-set-name?  string
  +---rw backup
    |  +---ro active?  boolean
    |  +---rw backup-type?  enumeration
    |  +---rw backup-peer?  inet:ip-address
    |  +---rw backup-sid?  sid-type
  +---rw peer-adjacency* [first-hop-ipaddress]
    +---rw first-hop-ipaddress  inet:ip-address
    +---ro first-hop-interface?  string
    +---rw sid-allocation-type?  enumeration
    +---rw explicit-sid?  sid-type
    +---ro allocated-sid?  sid-type
    +---rw backup  +---ro active?
  boolean
    +---rw backup-type?  enumeration
    +---rw backup-peer?  inet:ip-address
    +---rw backup-sid?  sid-type
```
SR Policies

- SR Policies configuration and state data in the context of BGP
  - Addition of two AF identities corresponding to IPv4 SR-policy and IPv6 SR-policy
  - BGP Signaled SR Policy Explicit Candidate paths
  - On Demand SR Policy Candidate paths triggered by BGP
  - SR Policy state in the context of BGP
SR Explicit Policies

- SR Explicit Policies refer to BGP Signaled SR Policy Candidate paths
- Signaled via BGP within SR Policy SAFI
- This is modeled by adding SR Policy address family specific container under generic BGP afi-safi list

```
module: ietf-bgp-sr

augment /bgp:bgp/bgp:global/bgp:afi-safis/bgp:afi-safi:
  +++rw ipv4-srpolicy
  +++ro explicit-policies
    +++ro sr-policy* [distinguisher color endpoint]
    +++ro distinguisher           uint32
    +++ro color                   uint32
    +++ro endpoint               inet:ip-address
    +++ro preference?             Uint32
    +++ro explicit-binding-sid
    |  +++ro binding-sid?          sid-type
    |  +++ro strict?               Boolean
    |  +++ro drop-on-invalid?      Boolean
    +++ro usable?                 Boolean
    +++ro registered?             boolean
```
SR ODN Policies

• There are two parts to the On Demand Policies in the context of BGP.
  • A set of authorized SR Policy Colors for On Demand Policy triggers
  • The actual instantiated candidate paths per BGP next-hop.
• New containers and lists are added under BGP global mode to model this information

```
augment /bgp:bgp/bgp:global:
  +---rw segment-routing
  +---rw on-demand-policies
      | +---ro authorized-colors
      |     | +---ro colors* [color]
      |     |     +---ro color uint32
      |     +---ro installed-policies
      |         +---ro sr-policy* [color end-point]
      |             +---ro color uint32
      |             +---ro end-point inet:ip-address
```
SR Policy State and Automatic Steering

- SR Policy state in BGP (regardless of method of instantiation of SR Policy)
- Automatic Steering (AS) refers to the ability to forward traffic over a SR Policy on the head-end
- Automatic Steering is modeled as state information per BGP path

```yml
module: ietf-bgp-sr
augment /bgp:bgp/global:
  +--rw segment-routing
      +--ro policy-state
          +--ro sr-policy* [color end-point]
                +--ro color      uint32
                +--ro end-point   inet:ip-address
                +--ro policy-state? Enumeration
                +--ro binding-sid? sid-type
                +--ro steering-disabled? Empty
                +--ro ref-count?    Uint32

augment /bgp:bgp/global/bgp:afi-safis/bgp:safi/bgp:ipv4-unicast:
  +--ro routes
      +--ro route* [prefix neighbor add-path-id]
                +--ro prefix      union
                +--ro neighbor    inet:ip-address
                +--ro add-path-id uint32
                +--ro automatic-steering
                    | +--ro co-flag?   Enumeration
```
SRv6 extensions

- SRv6 extensions for BGP refer to VPN programming as described in:
  - [I-D.draft-dawra-idr-srv6-vpn]
  - [I-D.draft-filsfils-spring-srv6-network-programming]

- SRv6 SID allocation mode
- SRv6 SID state per route

module: ietf-bgp-sr
  augment /bgp:bgp/global/bgp:afi-safis/bgp:afi-safi/bgp:ipv4-unicast:
  +--rw segment-routing
  +--rw srv6
  +--rw sid-alloc-mode? Enumeration

augment /bgp:bgp/global/bgp:afi-safis/bgp:afi-safi/bgp:ipv4-unicast:
  +--ro routes
  |   +--ro route* [rd prefix neighbor add-path-id]
  |     +--ro rd rt-types:route-distinguisher
  |     +--ro prefix union
  |     +--ro neighbor inet:ip-address
  |     +--ro add-path-id uint32
  |     +--ro srv6
  |     |   +--ro received-sids* [received-sid]
  |     |     |   +--ro received-sid srv6-types:srv6-sid
  |     |     +--ro local-sids* [local-sid]
  |     |     |   +--ro local-sid srv6-types:srv6-sid
  |     |     +--ro locator? string

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Next Steps

• Submit new revision with TBDs taken care of
• Discussion on dependencies on base BGP yang model.
• Request detailed review