YANG Data Model for Network Slice Per-Hop Definition

draft-bestbar-teas-yang-ns-phd-00

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Overview

- YANG data model for programming Network Slice Per Hop Definition (Slice-PHD) on IP/MPLS devices
  - Multiple Slice Selector options
  - Flexible and hierarchical Slice PHB(s)
  - Covers resource management in control plane and data plane
  - Mapping of a slice to a logical topology

Network Slice Per Hop Definition Model

Model Structure

```
module: ietf-network-slice-phd
      +--rw network-slicing!
        +--rw network-slice-phbs
        |  +--rw network-slice-phb* [id]
        |     .............
        +--rw network-slices
           +--rw network-slice* [name]
              |  .............
              +--rw slice-resource-reservation
              |  .............
              +--rw slice-selectors
              |  +--rw slice-selector* [id]
              |     .............
              +--rw slice-phb?                    ns-phb-ref
              |  .............
              +--rw slice-membership
                 .............
```

Slice-PHDs

network-slices container

- Key elements
  - Slice Resource Reservation
  - Slice Selectors
  - Slice PHB
  - Slice Membership

Slice-PHBs

network-slice-phbs container

- Referenced by Slice-PHDs

Network Slice Per Hop Definition Model

Slice Per-Hop-Behaviors

```
   +--rw network-slice-phbs
   |  +--rw network-slice-phb* [id]
   |     +--rw id                                  uint16
   |     +--rw (profile-type)?
   |        +--:(profile)
   |        |  +--rw profile?                      string
   |        +--:(custom-profile)
   |           ............
```

Slice-PHBs container (network-slice-phbs)

- Carries a list of Slice-PHB entries
- Slice-PHB entry
  - Referenced by one or more Slice-PHD
  - Options:
    - Reference to a generic PHB profile
    - Custom PHB profile

Network Slice Per Hop Definition Model

Slice Resource Reservation

```
   +--rw slice-resource-reservation
   |  +--rw preference?                          uint16
   |  +--rw (max-bw-type)?
   |  |  +--:(bw-value)
   |  |  |  +--rw maximum-bandwidth?             uint64
   |  |  +--:(bw-percentage)
   |  |     +--rw maximum-bandwidth-percent?
   |  |             rt-types:percentage
   |  +--rw shared-resource-groups*              uint32
   |  +--rw protection
   |     +--rw backup-slice-id?                    uint32
   |     +--rw (backup-bw-type)?
   |        +--:(backup-bw-value)
   |        |  +--rw backup-bandwidth?             uint64
   |        +--:(backup-bw-percentage)
   |           +--rw backup-bandwidth-percent?
   |                   rt-types:percentage
```

slice-resource-reservation Container

- Slice-aware Bandwidth Engineering
- Preference-based preemption of Slice-aware TE paths
- Sharing of resources amongst a group of slices
- Slice Protection

Network Slice Per Hop Definition Model

Slice Selectors

```
+--rw slice-selectors
|  +--rw slice-selector* [id]
|     +--rw id         uint16
|     +--rw mpls
|     |  +--rw (ss-mpls-type)?
|     |     +--:(label-value)
|     |     |  +--rw label?
|     |     |  |       rt-types:mpls-label
|     |     |  +--rw label-position?          identityref
|     |     |  +--rw label-position-offset?   uint8
|     |     +--:(label-ranges)
|     |        +--rw label-range* [index]
|     |           +--rw index                    string
|     |           +--rw start-label?
|     |           |       rt-types:mpls-label
|     |           +--rw end-label?
|     |           |       rt-types:mpls-label
|     |           +--rw label-position?
|     |           |       identityref
|     |           +--rw label-position-offset?   uint8
|     +--rw ipv4
|     |  +--rw destination-prefix*   inet:ipv4-prefix
|     +--rw ipv6
|     |  +--rw (ss-ipv6-type)?
|     |     +--:(ipv6-destination)
|     |     |  +--rw destination-prefix*
|     |     |          inet:ipv6-prefix
|     |     +--:(ipv6-flow-label)
|     |        +--rw slid-flow-labels
|     |           +--rw slid-flow-label* [slid]
|     |              +--rw slid       inet:ipv6-flow-label
|     |              +--rw bitmask?   uint32
|     +--rw acl-ref*   ns-acl-ref
```

slice-selectors Container

- Set of data plane field selectors
- Slice Selector (SS)
  - Identify packets belonging to the given network slice
  - 16-bit ID
    - SS with the lowest ID is the default used by all the topological elements that are members of the given network slice
      - Other entries are used to override the default on select topological elements

Network Slice Per Hop Definition Model

Slice Membership

```
   +--rw slice-membership
      +--rw filter-policies
         +--rw filter-policy* [id]
         +--rw id
         |       uint16
         +--rw (filter-type)?
         |  +--:(topology-ref)
         |  |  +--rw (topo-ref-type)?
         |  |     +--:(algo-id)
         |  |     |  +--rw algo-id?                 uint8
         |  |     +--:(te-topo-id)
         |  |        +--rw te-topology-identifier
         |  |           +--rw provider-id?   te-global-id
         |  |           +--rw client-id?     te-global-id
         |  |           +--rw topology-id?
         |  |                   te-topology-id
         |  +--:(custom-topology)
         |     +--rw include
         |     |  +--rw link-affinity*   string
         |     |  +--rw link-name*       string
         |     |  +--rw node-prefix*     inet:ip-prefix
         |     |  +--rw as*              inet:as-number
         |     +--rw exclude
         |        +--rw link-affinity*   string
         |        +--rw link-name*       string
         |        +--rw node-prefix*     inet:ip-prefix
         |        +--rw as*              inet:as-number
         +--rw slice-selector?
         |       ns-ss-ref
         +--rw slice-phb?
                 ns-phb-ref
```

slice-membership Container

- Set of filtering policies
  - Determine which topological elements belong the specific network slice
- Filtering Policy
  - Reference a predefined topology (or)
  - Specify rules to construct customized topology
- Slice members can optionally override the default Slice-PHB and/or the default slice selector.

Next Steps

- Request review and feedback