YANG Data Model for Slice Policy

draft-bestbar-teas-yang-slice-policy-00
Replaces draft-bestbar-teas-yang-ns-phd-00

Tarek Saad, Vishnu Pavan Beeram Presenter Juniper Networks
Bin Wen Comcast
Daniele Ceccarelli Ericsson
Shaofu Peng, Ran Chen ZTE Corporation
Luis M. Contreras Telefonica
Xufeng Liu Volta Networks

Contributors: Colby Barth, Srihari Sangli, Chandra Ramachandran
Overview

Slice policy enables instantiation of mechanisms in support of IETF network slices. Enforcement of the slice policy results in the creation of a slice aggregate. Slice policy dictates how a slice aggregate can be realized in IP/MPLS networks using one of three modes. Partitioning of the shared network resources can be achieved in:
(a) Just the data plane or in
(b) Just the control plane or in
(c) Both the control and data planes

Slice policy modes (a) and (c):
- Require the forwarding engine to identify the traffic belonging to a specific slice aggregate and to apply the corresponding Per-Hop Behavior (PHB)
- Identification of the slice aggregate that the packet belongs to and the corresponding forwarding treatment that needs to be applied to the packet are dictated by the slice policy.

Slice policy modes (b) and (c):
- Require the distributed/centralized resource reservation manager in the control plane to manage slice aggregate resource reservation.
- The provisions for enabling slice aggregate aware traffic engineering are dictated by the slice policy.

Slice policy modes (a), (b) and (c):
- Require the topology associated with the slice aggregate to be specified.
- The rules for determining which topological elements cater to the slice aggregate are dictated by the slice policy.

Draft defines a YANG data model for the management of slice policies on slice policy capable nodes and controllers in IP/MPLS networks.
The latest (renamed) version aligns with the terminology used in <draft-ietf-teas-ietf-network-slice-definition>, <draft-nsdt-teas-ns-framework> and <draft-bestbar-teas-ns-packet>.
- Addresses all comments received so far.
Model Structure

- Top-level container includes placeholders for:
  - Set of Slice Policies
  - Set of PHBs that are referenced by the slice policies
  - Set of topology filters that are referenced by the slice policies.
Per-Hop-Behaviors

'phbs' container:

- Carries a list of PHB entries.
- Each of these entries can be referenced by one or more slice policies.
- A PHB entry can either
  - Carry a reference to a generic PHB profile available on the node or
  - Carry a custom PHB profile.
    - Custom PHB profile includes attributes to construct a slice aggregate specific QoS profile and any classes within it.
'topology-filters' container:
- Carries a list of topology filters.
- Each topology filter entry could either
  - Reference a predefined topology (or)
  - Specify the rules to construct a customized topology using a set of include-any, include-all and exclude filters.
Slice Policies

- 'slice-policies' container:
  - Carries a list of slice policies.
  - Each slice-policy entry is identified by a name and holds the set of attributes needed to instantiate a slice aggregate.
  - Key elements of slice-policy entry:
    - Resource Reservation
    - Slice Selectors
    - Per-Hop-Behavior
    - Member Topologies
Slice Policy – Resource Reservation

- 'resource-reservation' container:
  - Carries data nodes that are used to support slice aggregate aware bandwidth engineering.
  - Facilitates preference-based preemption of slice aggregate aware TE paths, sharing of resources amongst a group of slice aggregates and backup slice aggregate path bandwidth protection.

```plaintext
++-rw 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-sa-id? uint32
 |  |  +--rw (backup-bw-type)?
 |  |  |  +--:(backup-bw-value)
 |  |  |  |  +--rw backup-bandwidth? uint64
 |  |  +--:(backup-bw-percentage)
 |  |  +--rw backup-bandwidth-percent? rt-types:percentage
```
'slice-selectors' container:

- Carries a set of data plane field selectors which are used to identify the packets belonging to the given slice aggregate.

- Each slice-selector entry in the list has an index associated with it.
  - The slice selector with the lowest index is the default slice selector used by all the topological elements that are members of the given slice policy.
  - The other entries are used only when there is a need to override the default slice selector on some select topological elements.

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### Slice Policy – Slice Selectors

- **+--rw slice-selectors**
  - **+--rw slice-selector* [index]**
    - **++--rw index** 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*** slice-policy-acl-ref
Slice Policy – Per-Hop-Behavior

- 'phb' leaf:
  - Carries a reference to the PHB that needs to be applied for the given slice aggregate.
    - Unless specified otherwise, this is the default phb to be used by all the topological elements that are members of the given slice policy.
'member-topologies' container:

- Consists of a set of member topologies.
- Each member topology references a topology filter.
- The topological elements that satisfy the membership criteria can optionally override the default PHB and/or the default slice selector.
Next Steps

▪ Request further review and feedback.

▪ Draft provides the foundation for realizing slice aggregates
  ▪ Authors believe it is sufficiently baked (ready to be considered for WG adoption).