YANG DATA MODEL FOR NETWORK RESOURCE PARTITION POLICY

draft-bestbar-teas-yang-nrp-policy-01

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INTRODUCTION

- A Network Resource Partition (NRP) [I-D.ietf-teas-ietf-network-slices] is a collection of resources identified in the underlay network to support the IETF Network Slice service (or any other service that needs logical network structures with required characteristics to be created).

- An NRP Policy [I-D.ietf-teas-ns-ip-mpls] is a policy construct that enables instantiation of mechanisms in support of service specific control and data plane behaviors on select topological elements associated with the NRP.

- Draft defines a YANG data model for the management of NRP policies on NRP capable nodes and controllers in IP/MPLS networks.
An NRP policy specifies the rules for determining the topology associated with the NRP and dictates how an NRP 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.

The NRP policy modes (a) and (c):

- Require the forwarding engine on each NRP capable node to identify the traffic belonging to a specific flow aggregate and to apply the corresponding Per-Hop Behavior (PHB).
- Identification of the flow aggregate that the packet belongs to and the corresponding forwarding treatment that needs to be applied to the packet is dictated by the NRP policy.
- When catering to IETF Network Slices, this flow aggregate is referred to as the Slice-Flow Aggregate [I-D.ietf-teas-ns-ip-mpls] and comprises of traffic streams from one or more connectivity constructs (belonging to one or more IETF network slices) mapped to a specific NRP.

The NRP policy modes (b) and (c):

- Require the distributed/centralized resource reservation manager in the control plane to manage NRP resource reservation.
- The provisions for enabling NRP state aware traffic engineering (NRP-TE) [I-D.ietf-teas-ns-ip-mpls] are dictated by the NRP policy.

The data model discussed in this document caters to all three NRP Policy modes.
The top-level 'networks' container [RFC8345] is augmented with a set of NRP policies.

```yaml
module: ietf-nrp-policy
augment /nw:networks:
  +++rw nrp-policies
  +++rw nrp-policy* [name]
    +++rw name                     string
    +++rw nrp-id?                  uint32
    +++rw resource-reservation
      |  +  ............
    +++rw flow-agg-selector
      |  +  ............
    +++rw phb?                     string
  +++rw topology
    +++rw filters
      |  +++rw filter* [filter-ref]
      |  +  ............
      |  +++rw resource-reservation
      |  |  +  ............
      |  +++rw flow-agg-selector
      |  |  +  ............
      |  +++rw phb?                     string
  +++ro filtered-topology
    +  ............
```
The 'nrp-policies' container carries a list of NRP policies.
Each 'nrp-policy' entry is identified by a name and holds the set of attributes needed to instantiate the NRP.
Each entry also carries an 'nrp-id' leaf which uniquely identifies the NRP created by the enforcement of this policy.
Key elements of an NRP policy:
- Resource Reservation
- Flow-Aggregate Selector
- Per-Hop-Behavior
- Topology
NRP POLICY: RESOURCE RESERVATION

- The 'resource-reservation' container carries data nodes that are used to support NRP state-aware bandwidth engineering.
- The data nodes in this container facilitate preference-based preemption of NRP state-aware TE paths, sharing of resources amongst a group of NRPs and backup path bandwidth protection.

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

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The 'resource-reservation' container carries data nodes that are used to support NRP state-aware bandwidth engineering.

The data nodes in this container facilitate preference-based preemption of NRP state-aware TE paths, sharing of resources amongst a group of NRPs and backup path bandwidth protection.
The 'flow-agg-selector' container carries data nodes that specify the rules for identifying which packets belong to the flow aggregate that this NRP caters to.
NRP POLICY: PER-HOP-BEHAVIOR

- The 'phb' leaf carries a name of a PHB profile available on the topological element where the policy is being enforced.

```text
rw phb? string
```
The 'topology' container consists of a list of filters where each entry references a topology filter [I-D.bestbar-teas-yang-topology-filter].

The topological elements that satisfy the membership criteria can optionally override the default resource-reservation, flow-agg-selector and phb specific leafs.

The 'topology' container also consists of a reference to the resultant filtered topology state formed from the union of the specified filters.

---rw topology
  ---rw filters
  | ---rw filter* [filter-ref]
  |   | ---rw filter-ref
  |   |     | nrp-policy-topo-filter-ref
  |   |     | ---rw resource-reservation
  |   |     |   | + ............
  |   |     | ---rw flow-agg-selector
  |   |     |   | + ............
  |   |     | ---rw phb?
  +---ro filtered-topology
    +---ro (filtered-topo-type)?
      +--(network)
      |   | ---ro network* [network-ref]
      |   |     | ---ro network-ref
      |   |     |     | nrp-policy-topo-network-ref
      |   |     | +--(network-elements)
      |   |     | ---ro node* [network-ref node-ref]
      |   |     |     | ---ro network-ref
      |   |     |     |     | nrp-policy-topo-network-ref
      |   |     |     | ---ro node-ref
      |   |     |     |     | nrp-policy-topo-node-ref
      |   |     | +--ro link* [network-ref link-ref]
      |   |     |     | ---ro network-ref
      |   |     |     |     | nrp-policy-topo-network-ref
      |   |     |     | ---ro link-ref
      |   |     |     |     | nrp-policy-topo-link-ref

* Tree diagram from draft-bestbar-teas-yang-nrp-policy-02

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NEXT STEPS

- Continue discussions with the authors of draft-wd-teas-nrp-yang [find ways to collaborate]
- Add JSON instances of the model to instantiate NRP on a network controller or on a device.
- Request review and feedback
THANK YOU

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