

A YANG Data Model for Network Resource Partitions (NRPs)

[draft-wdbsp-teas-nrp-yang](#)

TEAS WG

Nov. 2023

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I E T F

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Recap Background of NRPs YANG Modules

- **Draft background**

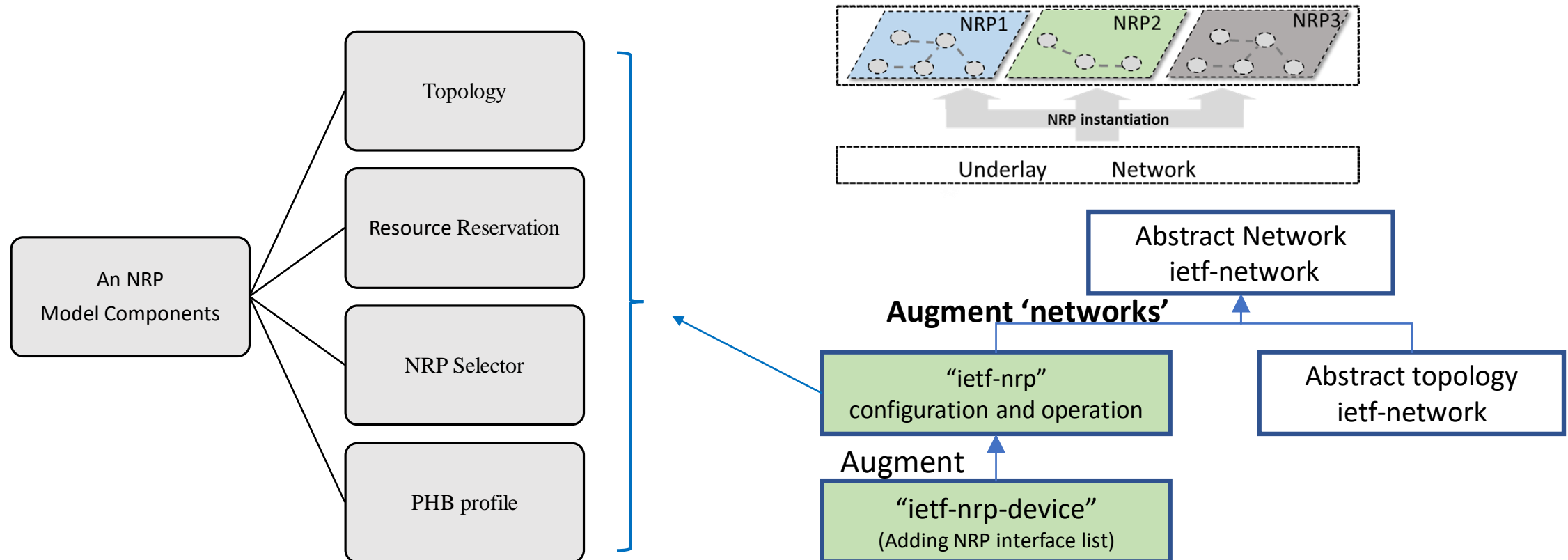
- **Goal:** Support the **management of NRPs**. NRP is introduced in **NS framework** draft-ietf-teas-ietf-network-slices
- **Scope:** Covers YANG data for **configuration** and **operational** state of **NRPs network model** and **NRPs device-specific model**
- Support the mechanisms described in **draft-ietf-teas-ns-ip-mpls** and **draft-ietf-teas-nrp-scalability**, including the control plane, data plane, and management plane of the NRPs
- A merge of **draft-bestbar-teas-yang-nrp-policy-03** and **draft-wd-teas-nrp-yang-02**

- **Current status**

- Complete **IPR process** of rev-01
- Rev-02 was submitted to address the comments received during the IPR process. The updates are NOT about adding new solutions.
 - #1: Comments from **Joel Halpern** that for the **MPLS encapsulation as an NRP selector**, an **empty container “mpls”** should be defined for future updates, as the MPLS mechanism is still under discussion in MPLS WG
 - #2: Comments from **Tom Petch** and **Greg Mirsky** are about the definition of **NRPs and NRP topology “igp-congruent”** should be clarified. A new example of IGP Multi-topology (MT) or flex-algo is added to clarify the IGP congruency of NRPs

Summary of NRPs YANG modelling

- The NRPs model is used to manage **multiple NRPs** on an IP/MPLS network.
- Compared with the **flat resource management** of the underlying physical network, the NRPs can provide **hierarchical management** on IP/MPLS network resources to meet **service categories** with different SLO and SLE characteristics. E.g. on top of each NRP, the existing flat QoS 8 traffic classes can be provided



#1 Summary of NRP Selector Changes

- **NRP selector** defines the data plane encapsulation types and values that are used to identify NRP-specific network resources.
- **Text changes:** Adds references of the encapsulation mechanisms in [draft-ietf-6man-enhanced-vpn-vtn-id](#) and [draft-ietf-spring-sr-for-enhanced-vpn](#) described in [draft-teas-nrp-scalability](#)
- **YANG model changes:** “mpls” container provides a place holder for future updates.

```
+--rw selector
  +--rw ipv4
  | +--rw destination-prefix*   inet:ipv4-prefix
  +--rw ipv6
  | +--rw (selector-type)?
  |   +--:(dedicated)
  |     | +--rw ipv6-hbh-eh?      uint32
  |     +--:(srv6-sid-derived)
  |       | +--rw srv6-sid*       inet:ipv6-prefix
  |       +--:(ipv6-destination-derived)
  |         +--rw destination-prefix*   inet:ipv6-prefix
  +--rw mpls
  | +--rw (selector-type)?
  |   +--:(dedicated)
  |     | +--rw label?           rt-types:mpls-label
  |     | +--rw label-position?  identityref
  |     | +--rw label-position-offset?  uint8
  |     +--:(derived)
  |       +--rw forwarding-label?     empty
  +--rw acl-ref*   nrp-acl-ref
```

Figure 3: NRP Selector YANG subtree structure

```
+--rw selector
  | +--rw ipv4
  | | +--rw destination-prefix*   inet:ipv4-prefix
  | +--rw ipv6
  | | +--rw (selector-type)?
  | |   +--:(dedicated)
  | |     | +--rw ipv6-hbh-eh?      uint32
  | |     +--:(srv6-sid-derived)
  | |       | +--rw srv6-sid*       inet:ipv6-prefix
  | |       +--:(ipv6-destination-derived)
  | |         +--rw destination-prefix*   inet:ipv6-prefix
  | +--rw mpls
  | +--rw acl-ref*   nrp-acl-ref
```

Figure 3: NRP Selector YANG subtree structure

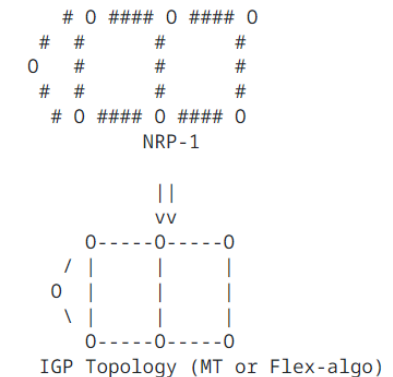
#2: NRPs “topology” Changes

- **Text#1 IGP congruency:** When an NRP support IGP forwarding, the topology of the NRP must be congruent with an IGP instance. The topology used for IGP route computation and forwarding can be derived using Multi-Topology Routing (MTR) or Flex-algo.
- **Text#2** Adds references of **draft-bestbar-teas-yang-topology-filter** as **normative**
- **Summary:** **No change** on the YANG model. The figure and text are added for clarification.

```

+--rw topology
  +--rw igp-congruent!
  |   +--rw multi-topology-id?    uint32
  |   +--rw algo-id?             uint32
  |   +--rw sharing?             boolean
  +--rw (topology-type)?
  |   +--:(selection)
  |   |   +--rw select
  |   |   |   +--rw topology-group* [group-id]
  |   |   |   ...
  |   +--:(filter)
  |   |   +--rw filter* [filter-ref]
  |   |   |   +--rw filter-ref
  |   |   |   |   nrp-topo-filter-ref
  |   |   |   |   ...
  
```

Figure 4: NRP Topology YANG subtree structure



Legend

- 0 Virtual node
- IGP links
- ### Virtual links with a set of reserved resources

Figure 4: IGP Congruency Example

Next Step

- Solicit WG adoption
- Reviews and comments are welcome

NRPs YANG Tree

```
module: ietf-nrp
  augment /nw:networks:
    +--rw nrp-policies
      +--rw nrp-policy* [name]
        +--rw name                string
        +--rw nrp-id?             uint32
        +--rw mode?               identityref
        +--rw resource-reservation
          |   ...
        +--rw selector
          |   ...
        +--rw phb-profile?        string
        +--rw topology
          |   ...
          +--rw ...
```

NRPs instantiation

Figure 1: NRP Policy subtree high-level structure

```
augment /nw:networks/nw:network/nw:network-types:
  +--rw nrp!
  augment /nw:networks/nw:network/nw:node:
    +--ro nrp
      +--ro nrp-aware-dp-id
      ...
  augment /nw:networks/nw:network/nt:link:
    +--ro nrp
      +--ro link-partition-type? identityref
      +--ro bandwidth-value?    uint64
      +--ro nrp-aware-dp-id
      |   ...
      +--ro statistics
      ...
  augment /nw:networks/nw:network/nw:node:
    +--ro nrps* [nrp-id]
      +--ro nrp-id  uint32
      +--ro nrp
      ...
  augment /nw:networks/nw:network/nt:link:
    +--ro nrps* [nrp-id]
      +--ro nrp-id                uint32
      +--ro link-partition-type? identityref
      +--ro bandwidth-value?    uint64
      +--ro nrp-aware-dp-id
      ...
```

NRPs monitoring

```
module: ietf-nrp-device
  augment /nw:networks/nrp:nrp-policies/nrp:nrp-policy: NRPs device
    +--rw interfaces
      +--rw interface* [interface]
        +--rw interface                if:interface-ref
        +--rw resource-reservation
          |   +--rw (max-bw-type)?
          |   |   +--:(bw-value)
          |   |   |   ...
          |   |   +--:(bw-percentage)
          |   |   |   ...
          |   +--rw selector
          |   |   +--rw ipv4
          |   |   |   +--rw destination-prefix*  inet:ipv4-prefix
          |   |   +--rw ipv6
          |   |   |   +--rw (selector-type)?
          |   |   |   |   ...
          |   |   +--rw mpls
          |   |   |   +--rw (selector-type)?
          |   |   |   |   ...
          |   |   +--rw acl-ref*  nrp-acl-ref
          |   +--rw phb-profile?  string
```

Figure 7: NRPs Device YANG subtree high-level structure