draft-ietf-rtgwg-ni-model-03 Impact on LxVPN device models

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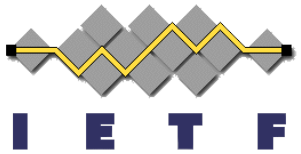
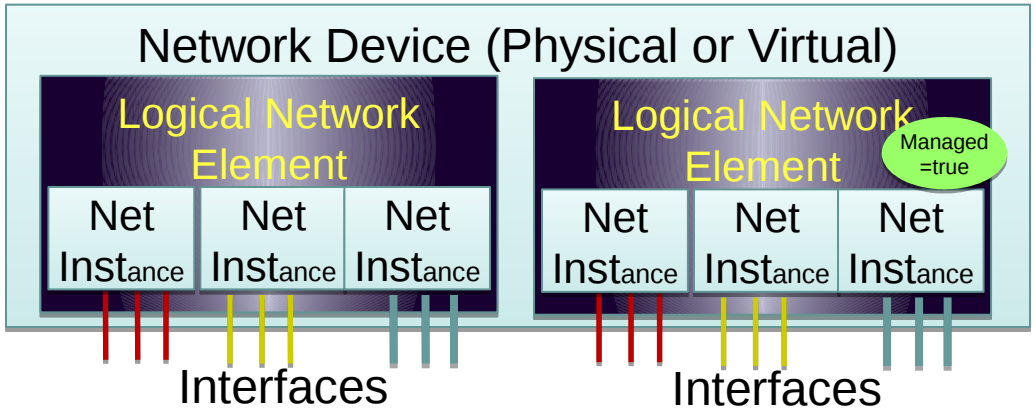


Repo: https://github.com/ietf-rtg-area-yang-arch-dt/meta-model

LNEs and NIs: Modeling Device Partitioning



LNE: Logical Network Element

- Separate management sub-domains
  - Sub-domains can be **managed independently** and by a top level manager (managed=true)
  - Commonly called logical system or router; or virtual switch, chassis, fabric, or device context
- Can be supported via multiple logical devices and VMs
  - Where only limited top level management of subdomains is supported

NI: Network Instance

Focus of this discussion

- Separate routing / switching domains
  - Can represent of an RFC 4364 VRF or a Layer 2 Virtual Switch Instance (VSI) or a bridge/router (i.e., both)
- General virtualized instance implying a separate L2, L3, or L2/L3 context.
  - For L3, this implies a unique IPv4/IPv6 address space.

Status Summary

- Drafts use YANG Schema Mount to support virtual/logical partitioning of router and switch resources
  - draft-ietf-netmod-schema-mount-05
  - Each LNE/NI gets an independent **data** instance
  - With a YANG module root, and separate instances of YANG modules
  - **Implementations decide** what modules are included under a root
    - Modules included under mount point may be different from modules at device's top level
- Both drafts have been updated and are ready for LC
  - Technical details were in flux due to Schema Mount open issues
  - Issues now resolved, expected LC without significant technical changes

Schema Mount Tree Representation

- Schema Mount Additions
  - **mp** for schema mount points
  - **/** for a mounted module
  - @ for a node made available via a schema mount parent reference
  - Module (nodes/leaves/etc) marked **ro** when schema mount config leaf = false

Example

```
+--mp vrf-root?
   +--ro rt:routing-state/
   |  ...
   +--ro rt:routing/
   |  ...
   +--ro if:interfaces@
   |  ...
   +--ro if:interfaces-state@
      ...
```

- See draft-ietf-netmod-yang-tree-diagrams-01

draft-ietf-rtgwg-ni-model-03

NIs are used to model:

1. Information within an instance, i.e. CE context information
   - Using one of 3 *well known mount points:* VRFs, VSIs, VSI+VRFs
2. *Per instance*, related information in the core/PE instance
   - Using LxVPN *technology-specific augmentations*
     - L3VPN examples: BGP MPLS L3VPN over MPLS, over tunnels
     - L2VPN examples: VPLS, EVPN+MPLS, EVPN+VxLAN, …

LxVPN Support

- NI Type
  - For per VRF, PE/core information
- Root Type
  - For VRF/VSI information in the CE/Vxx context

draft-ietf-rtgwg-ni-model-03:

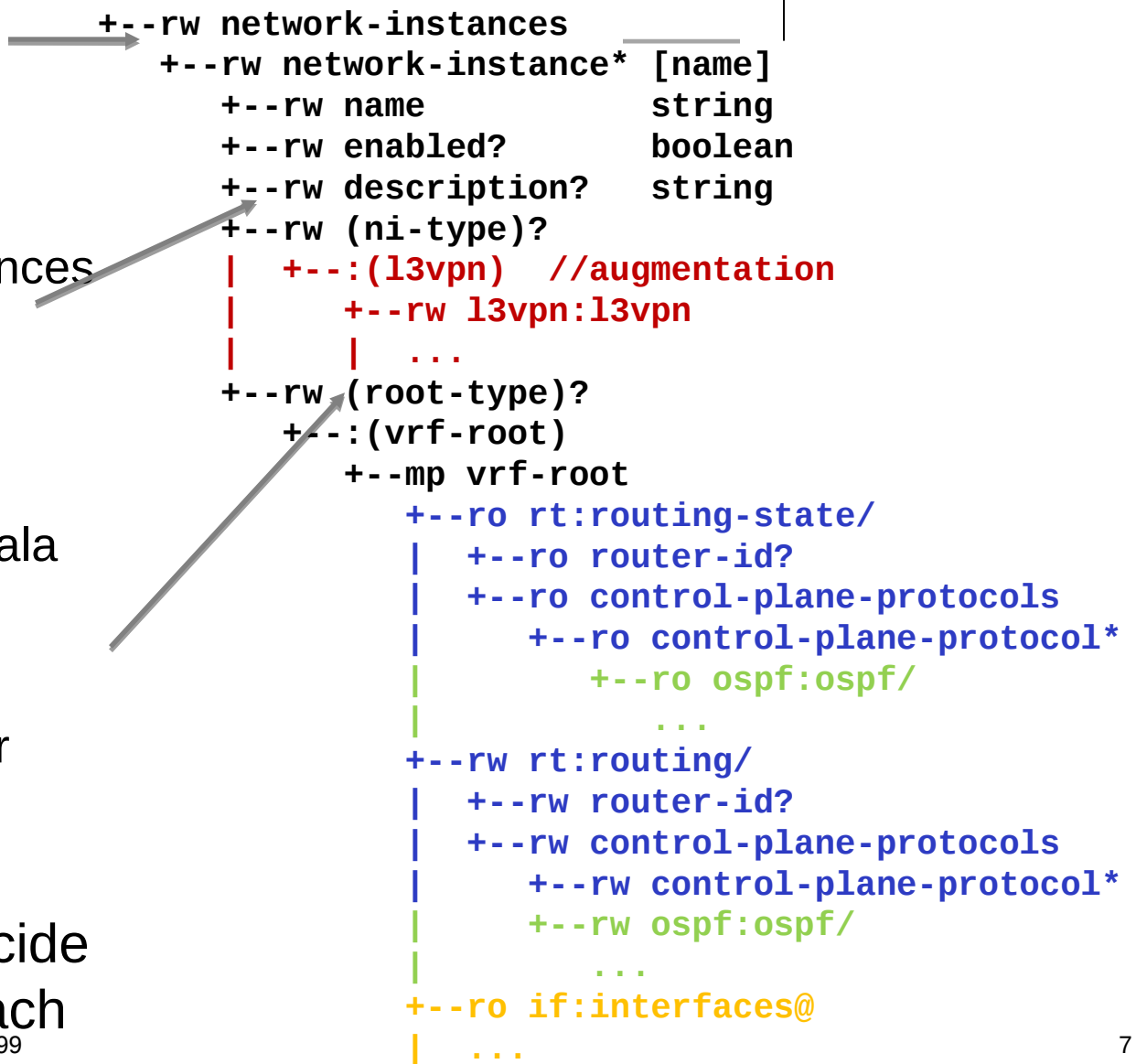
```
module: ietf-network-instance
  +--rw network-instances
     +--rw network-instance* [name]
        +--rw name                string
        +--rw enabled?            boolean
        +--rw description?        string
        +--rw (ni-type)?
        +--rw (root-type)?
           +--:(vrf-root)
           |  +--mp vrf-root?
           +--:(vsi-root)
           |  +--mp vsi-root?
           +--:(vv-root)
              +--mp vv-root?
```

NI Likely Impact on BESS

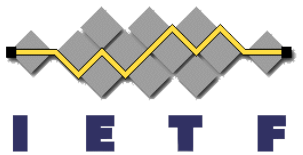
There are three types of LxVPN information to model:

1. Core/PE + **not** instance specific
   - Goes in augmentation of a module present at top level
     e.g., bgp, interfaces, or even top of network instances
2. Core/PE + **is** associated with a named NI
   - Goes into augmentation of:
   a) ni-types (preferred) or
   b) other module and associated with bind-ni-name (ala interfaces)
3. CE-Context Information, per VRF/VSI
   - Goes in augmentation of a module present under vrf/vsi-root
   - Do any any of these exist?

- Reminder: Implementations, not models, decide what gets mounted at top level and under each



Thank you!



LxVPN Technology Specific Information

Two type of PE/Core information:

1. Per VRF/VSI instance information
   - May differs based on LxVPN technology
     - L2VPN – VPLS, VxLAN, EVPN, …
     - L3VPN – MPLS, IP tunnels, …
   - Supported via ***ni-types*** choice statement
     - Empty in base model
     - To be augmented with technology specific cases
2. Information shared across NI instances
   - Supported via augmentations to any top top-level module(s)
     - E.g., BGP or even top of NI model

Type-specific augmentation

```
augment "/ni:network-instances/ni:network-instance/ni:ni-type" {
  case l3vpn {
    container l3vpn {
        ...
    }
  }
}
```

Composite Tree

```
   +--rw network-instances
      +--rw network-instance* [name]
         +--rw name              string
         +--rw enabled?          boolean
         +--rw description?      string
         +--rw (ni-type)?
         |  +--:(l3vpn)  //augmentation
         |     +--rw l3vpn:l3vpn
         |     |  ...    // config data
```

Per VRF/VSI (CE Context) Information

- Supported via standard top level modules under a per-instance root mount point
  - Specific modules included under a mount point is an *implementation* choice
  - Modules are typically based on L2 or L3 type and not (PE) VPN technology
- Three types of Nis have been identified
  1. VRFs for L3VPNs
  2. VSIs for L2VPNs
  3. VSI+VRF for L2+L3VPNs (bridge/routers)
- Schema mount defines the schema (i.e., module list) on a per mount point *name* basis
  - So need named mount point per type

```
module: ietf-network-instance
  +--rw network-instances
     +--rw network-instance* [name]
        +--rw name                string
        +--rw enabled?            boolean
        +--rw description?        string
        +--rw (ni-type)?
        +--rw (root-type)?
           +--:(vrf-root)
           |  +--mp vrf-root?
           +--:(vsi-root)
           |  +--mp vsi-root?
           +--:(vv-root)
              +--mp vv-root?
                //one root required per NI
```

VRF Mount Point Example: OSPF in VRF

```
module: ietf-network-instance
+--rw network-instances
   +--rw network-instance* [name]
      +--rw name            string
      +--rw enabled?        boolean
      +--rw description?    string
      +--rw (ni-type)?
      +--rw (root-type)?
         +--:(vrf-root)
            +--mp vrf-root
               +--ro rt:routing-state/
               |  +--ro router-id?
               |  +--ro control-plane-protocols
               |     +--ro control-plane-protocol*
               |        +--ro ospf:ospf/
               |           ...
               +--rw rt:routing/
               |  +--rw router-id?
               |  +--rw control-plane-protocols
               |     +--rw control-plane-protocol*
               |     +--rw ospf:ospf/
               |        ...
               +--ro if:interfaces@
               |  ...
               +--ro if:interfaces-state@
               |  ...
```

```
"ietf-yang-schema-mount:schema-mounts": {
   "mount-point": [
     {
       "module": "ietf-network-instance",
       "name": "vrf-root",
       "use-schema": [
         {
           "name": "ni-schema",
           "parent-reference": [
        "/*[namespace-uri() = 'urn:ietf:...:ietf-interfaces']'
           ]
         }
       ]
     }
   ],
   "schema": [
     {
       "name": "ni-schema",
       "module": [
         {
            "name": "ietf-routing",
            "revision": "2016-11-04",
            "namespace":
              "urn:ietf:params:xml:ns:yang:ietf-routing",
            "conformance-type": "implement"
          },
         {
            "name": "ietf-ospf",
            "revision": "2017-03-12",
```

draft-ietf-rtgwg-lne-model-03: LNE Impact on BESS and LxVPNs

- None really
- But LNEs are related to NIs as both are used to manage logical partitioning of device resources and sometimes confused
  - LNEs ~= VM/VNF
    - Sometimes called: logical system or router; virtual switch, chassis, or fabric
  - NI = VRF or VSI (Virtual Switch Instance)

LNE: Module Tree

```
module: ietf-logical-network-element
    +--rw logical-network-elements
       +--rw logical-network-element* [name]
          +--rw name              string
          +--rw managed?          boolean
          +--rw description?      string
          +--mp root
  augment /if:interfaces/if:interface:
    +--rw bind-lne-name?
            -> /logical-network-elements/logical-network-element/name
  notifications:
    +---n bind-lne-name-failed
       +--ro name                 -> /if:interfaces/interface/name
       +--ro bind-lne-name        -> /if:interfaces/interface/lne:bind-lne-name
       +--ro error-info?          string
```

LNE Root

Covers cases of asynchronous interface ⇔ NI bind failures

LNE: Module Example

```
module: ietf-logical-network-element
   +--rw logical-network-elements
      +--rw logical-network-element* [name]
         +--rw managed?        boolean
         +--rw name            string
         +--mp root
            ...
```

Managed=true

```
+--ro yanglib:modules-state/
|  ...
+--rw sys:system/
|  ...
+--ro sys:system-state/
|  ...
+--ro rt:routing-state/
|  +--ro router-id? quad
|  +--ro control-plane-protocols
|     +--ro control-plane-protocol* []
|        +--ro ospf:ospf/
|           +--ro instance* [af]
|           ...
+--rw rt:routing/
|  ...
+--rw if:interfaces/
|  ...
+--ro if:interfaces-state/
   ...
```