Transport Network Slice YANG Data Model

draft-liu-teas-transport-network-slice-yang-01

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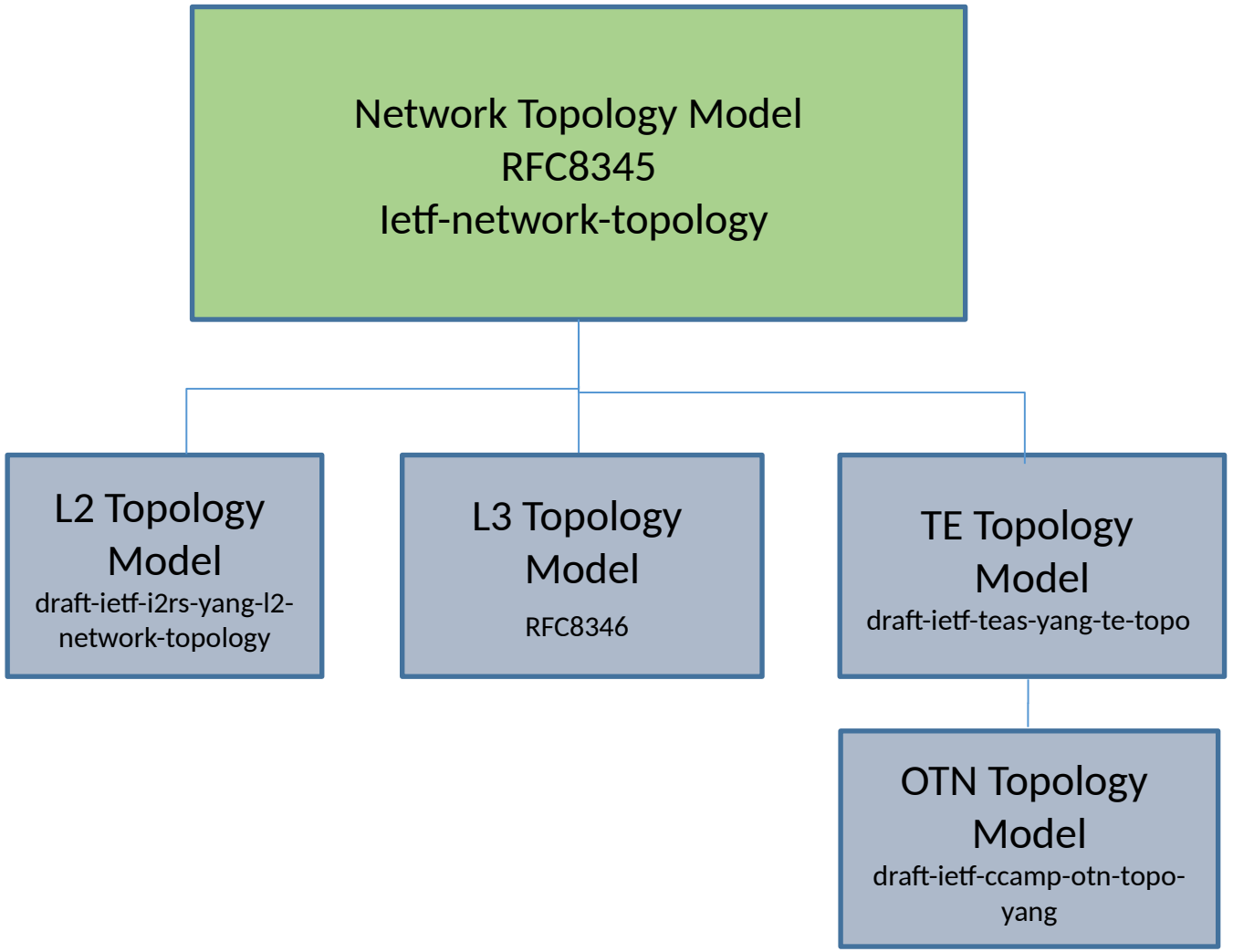
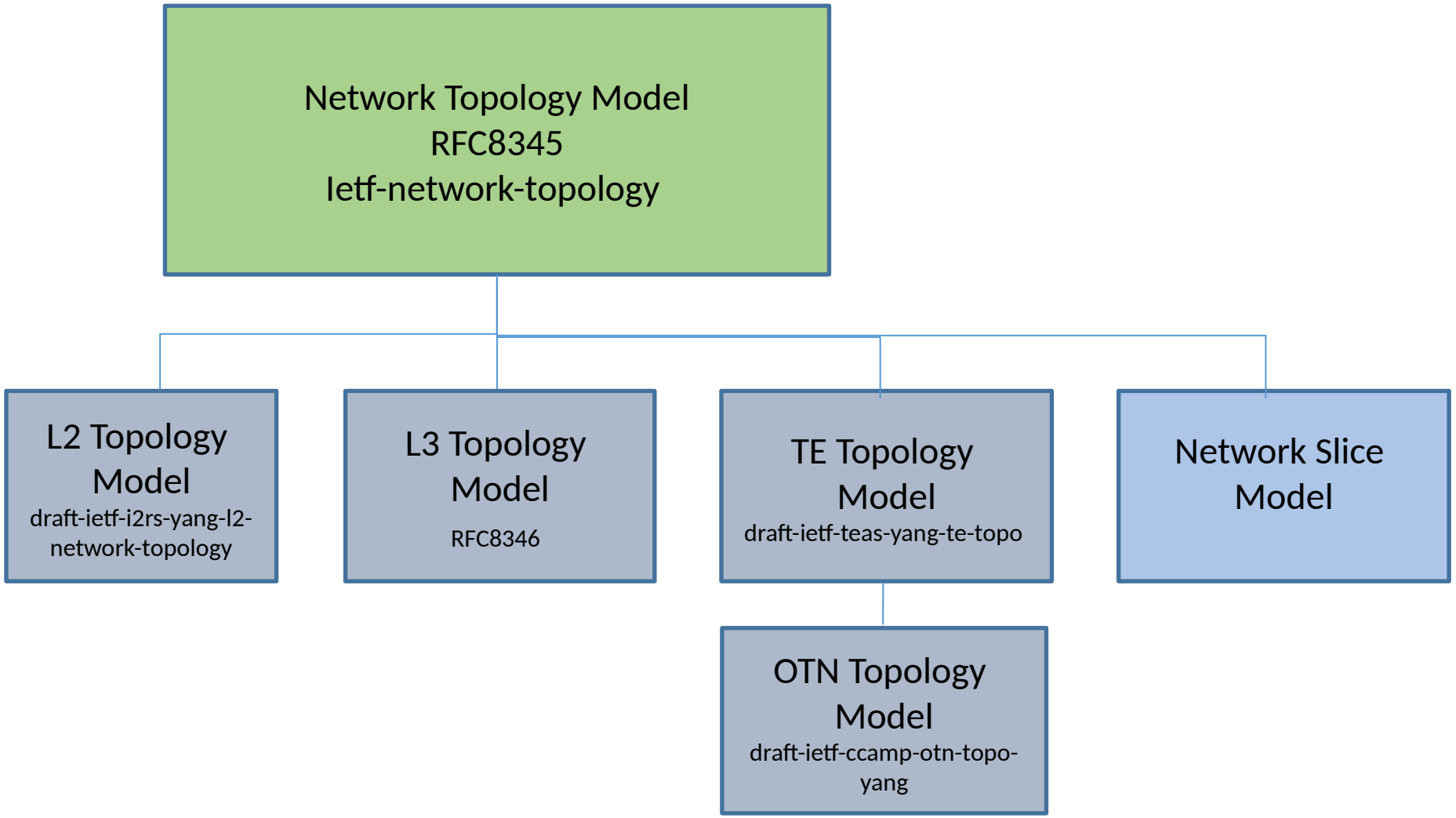
Existing Network Topology Models

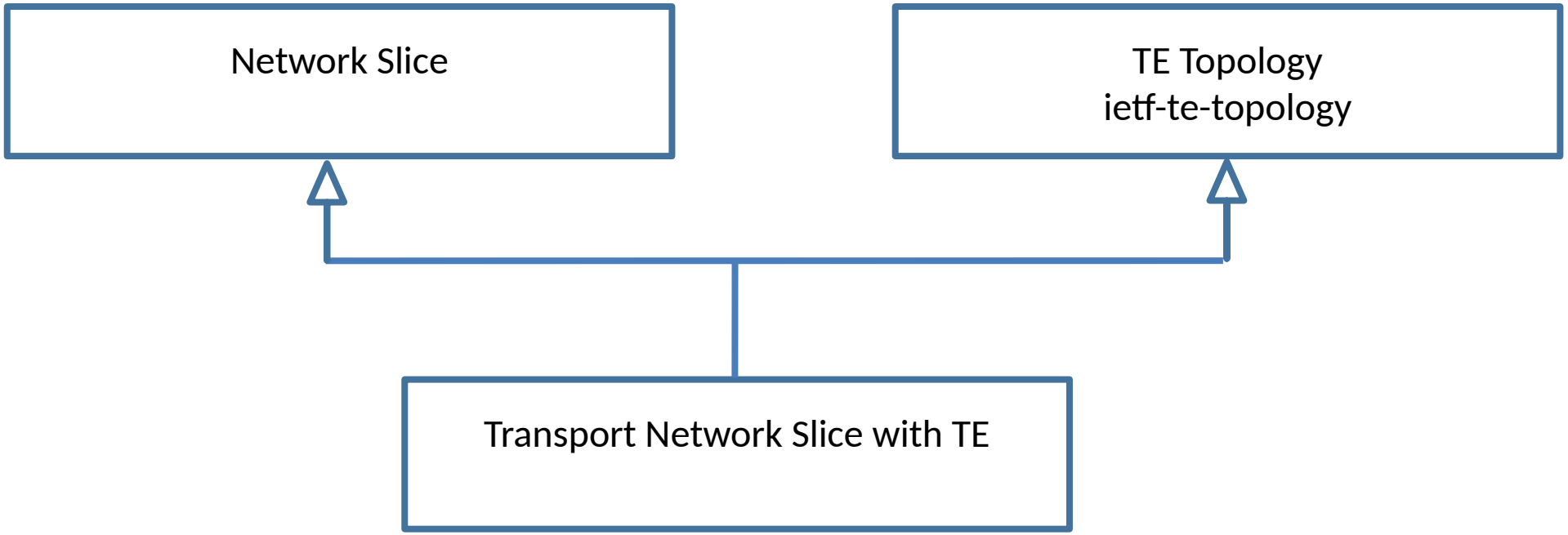


Augmentation for Network Slice



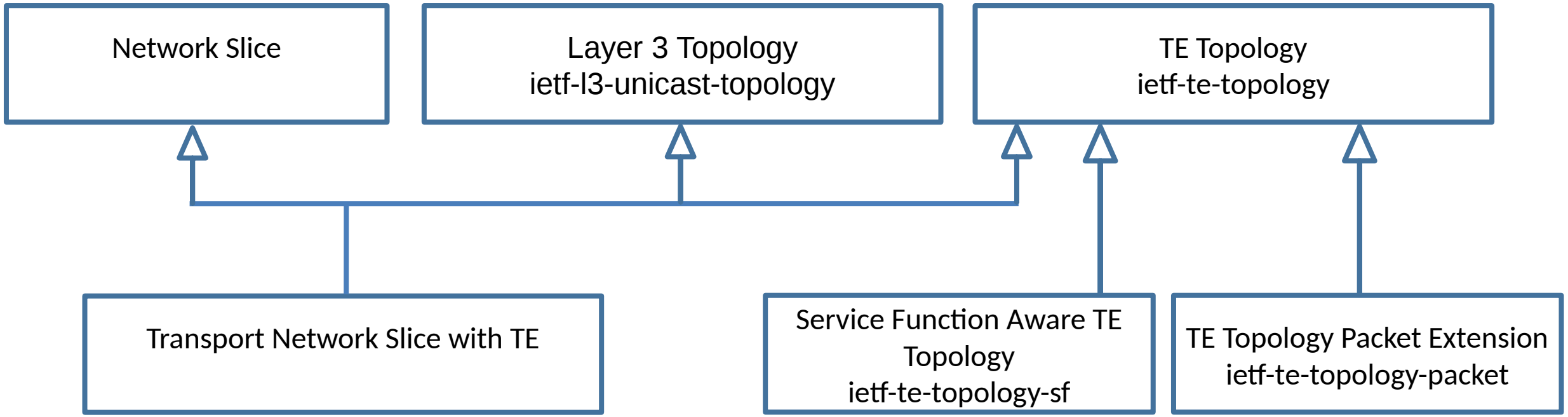
Transport Network Slice with TE

- Multiple inheritance:
  - Is both Network Slice topology and TE topology.
  - Uses multiple network types: “network-slice” and “te-topology”.



Network Slice with L3 TE and SF Aware

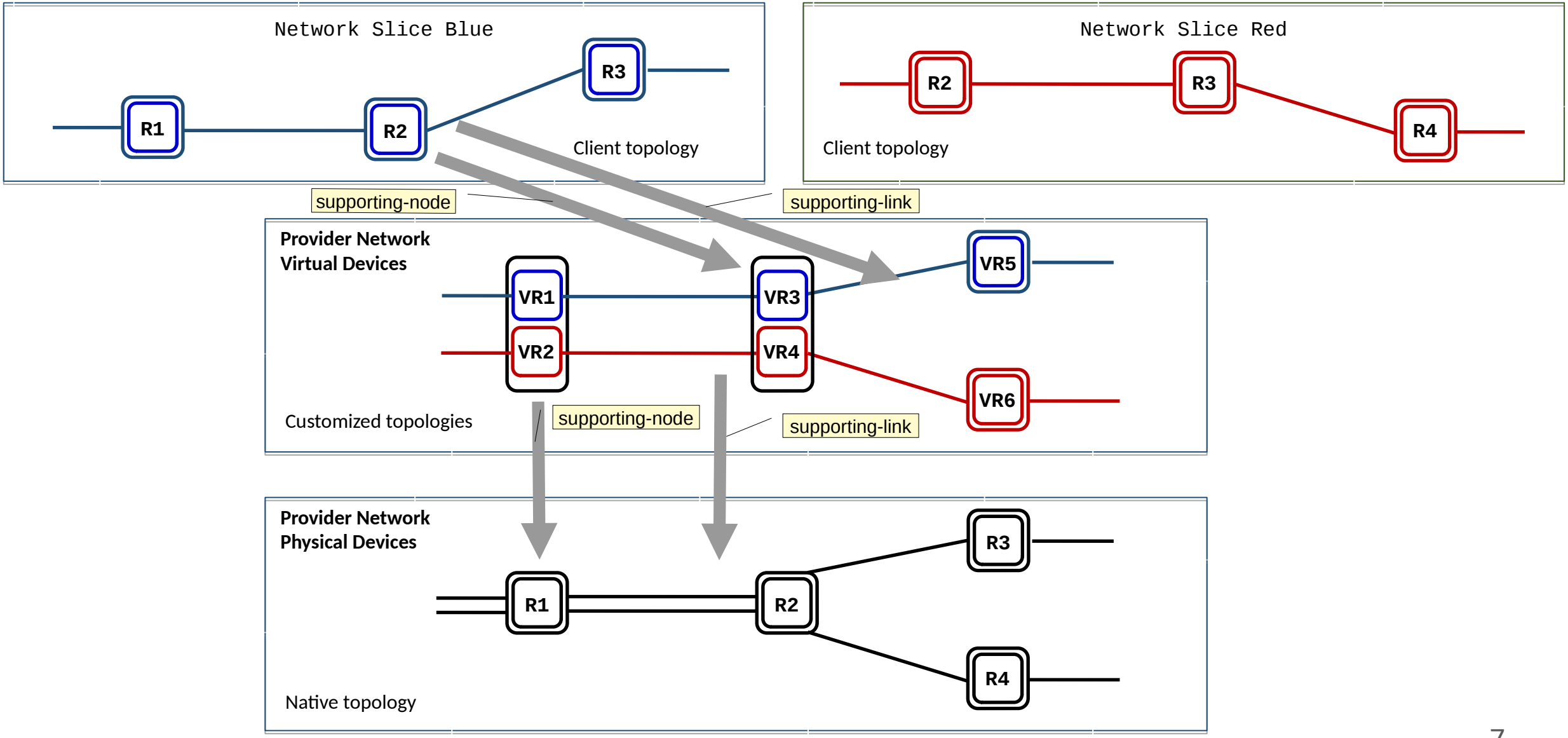
- For L3 packet use cases
  - ietf-te-topology-packet provides extensions for packet network.
  - ietf-l3-unicast-topology provides extensions for L3 network.
  - ietf-te-topology-sf supports network services and functions.



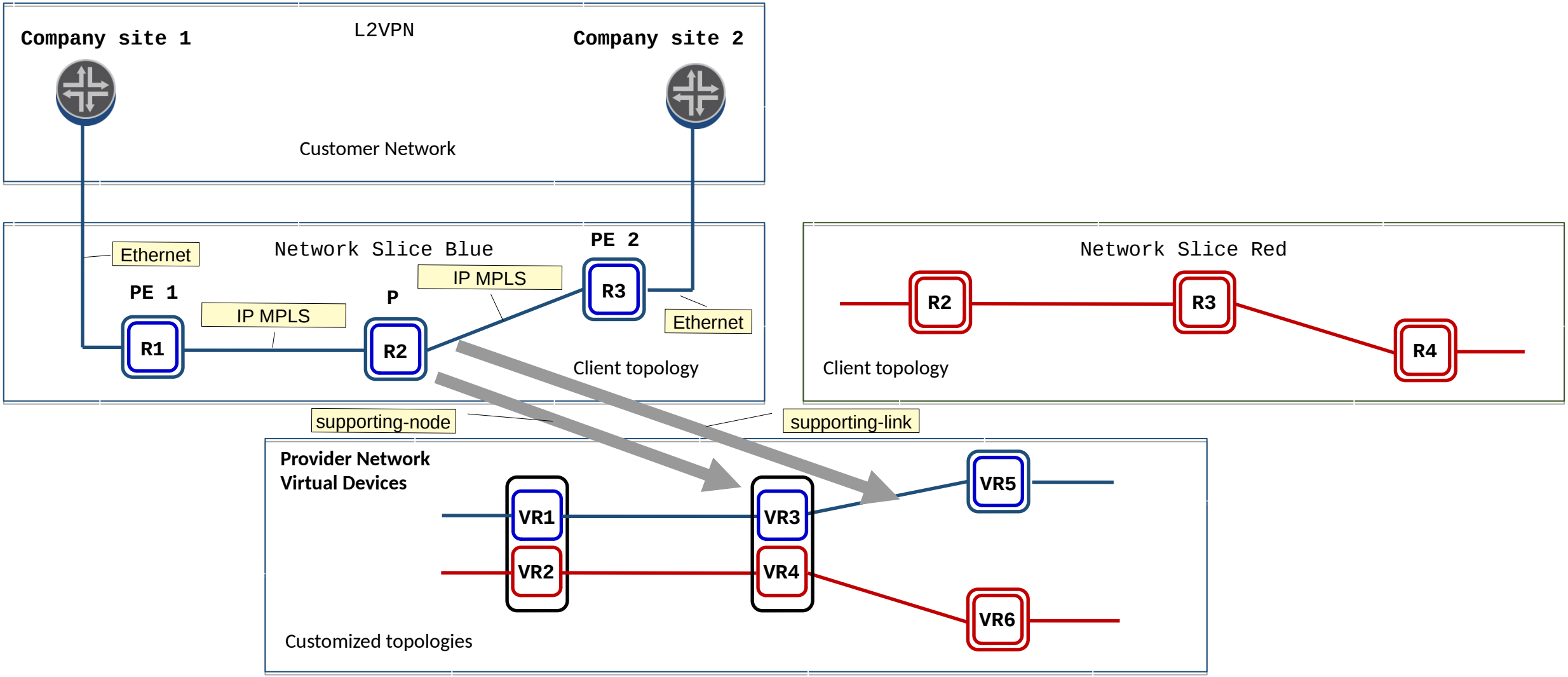
ACTN for Network Slicing

- ACTN topology data models are based on the network topology model defined in RFC8345.
- The augmentations defined in this document are effective augmentations to the ACTN topology data models
- The augmentations make the ACTN framework [RFC8453] and data models [I-D.ietf-teas-actn-yang] capable of slicing networks with the required network characteristics.

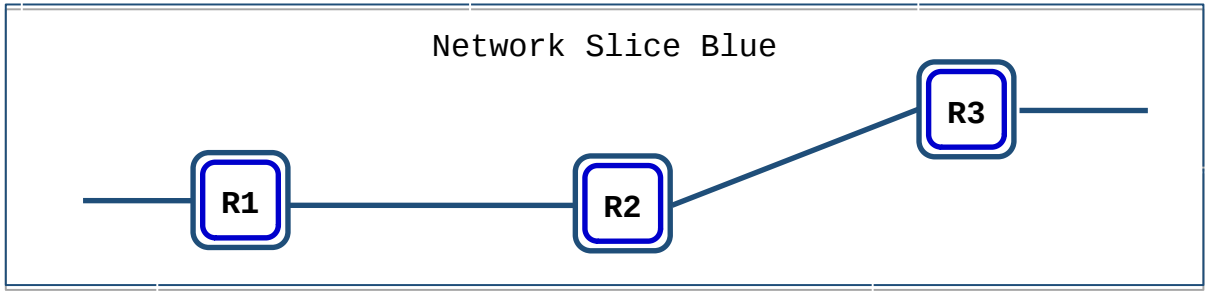
Transport Network Slicing – by Virtualization

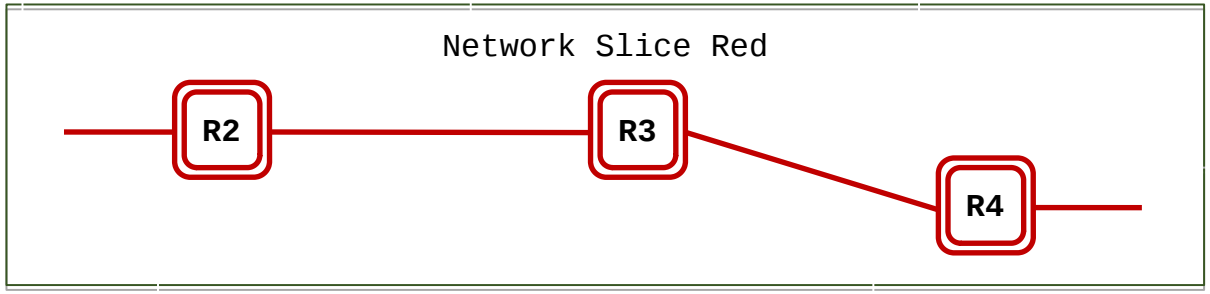


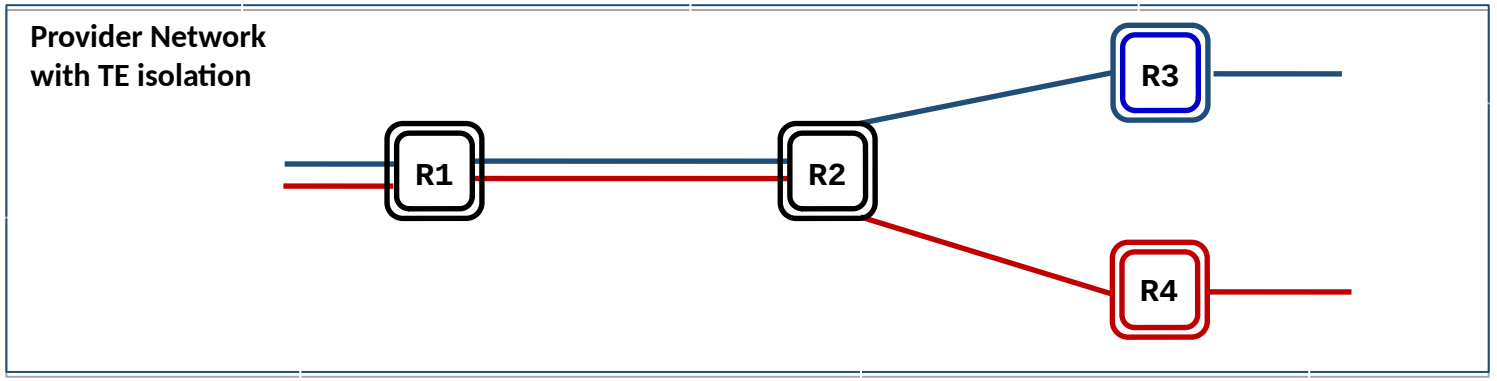
Use Case with Slicing – by Virtualization

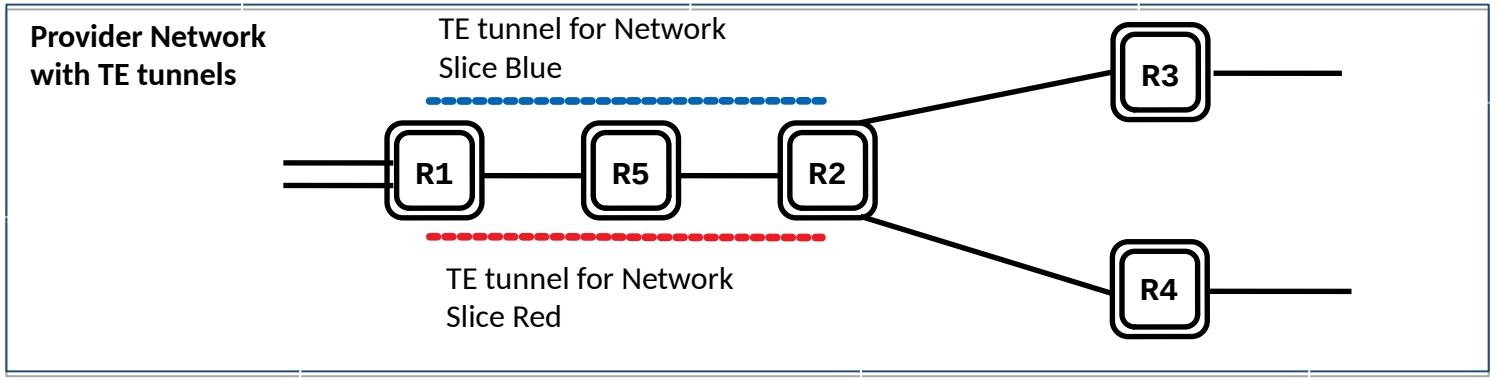


Transport Network Slicing – by TE Overlay

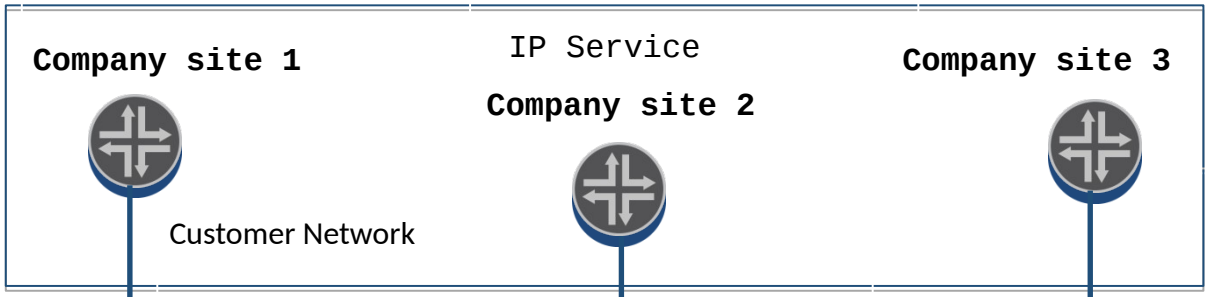


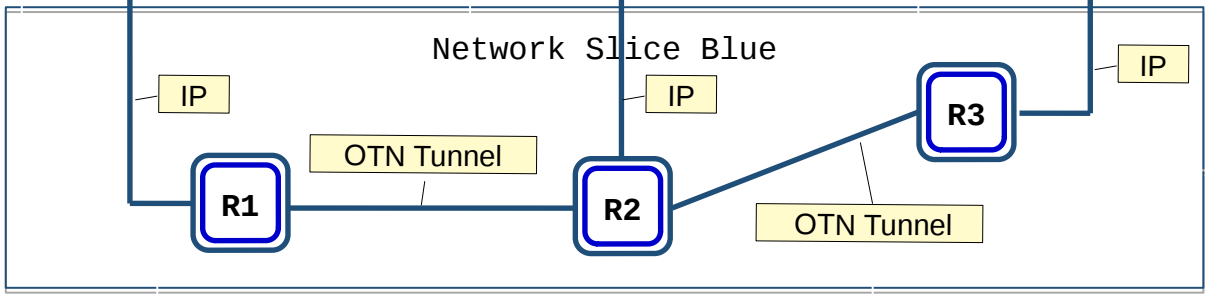


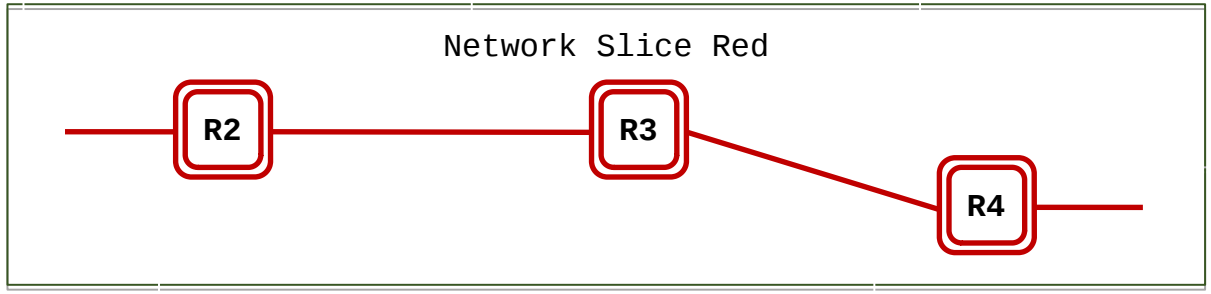


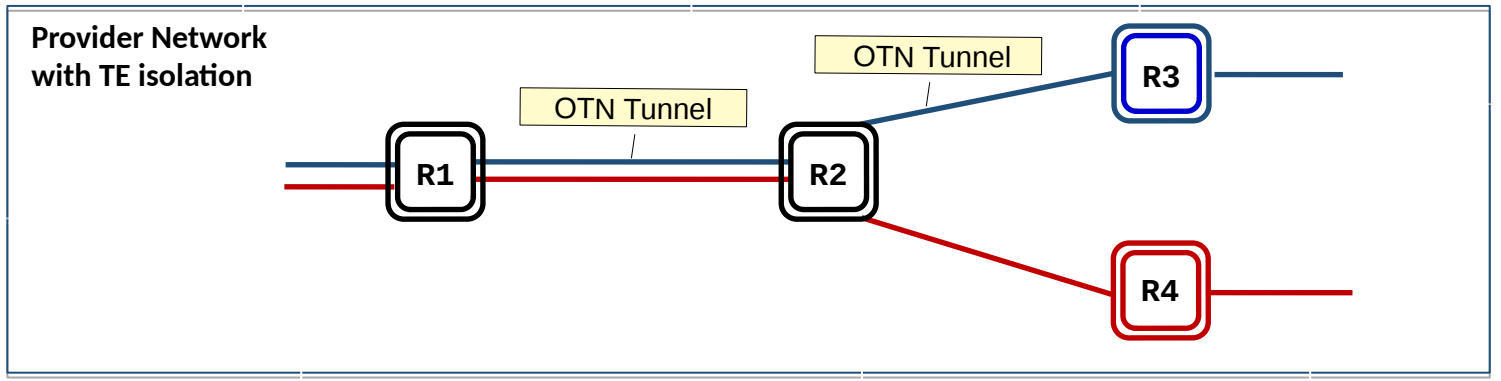


Transport Network Slicing – by TE Overlay









Base Network Topology Model Schema (RFC8345)

```
module: ietf-network
  +--rw networks
     +--rw network* [network-id]
        +--rw network-id            network-id
        +--rw network-types
        +--rw supporting-network* [network-ref]
        |  +--rw network-ref    -> /networks/network/network-id
        +--rw node* [node-id]
        |  +--rw node-id                 node-id
        |  +--rw supporting-node* [network-ref node-ref]
        |  |  +--rw network-ref    -> ../../../supporting-network/network-ref
        |  |  +--rw node-ref       -> /networks/network/node/node-id
        |  +--rw nt:termination-point* [tp-id]
        |     +--rw nt:tp-id                            tp-id
        |     +--rw nt:supporting-termination-point* [network-ref node-ref tp-ref]
        |        +--rw nt:network-ref    -> ../../../nw:supporting-node/network-ref
        |        +--rw nt:node-ref       -> ../../../nw:supporting-node/node-ref
        |        +--rw nt:tp-ref         -> /nw:networks/network[nw:network-id=current()/../network-ref]/node[nw:node-
id=current()/../node-ref]/termination-point/tp-id
        +--rw nt:link* [link-id]
           +--rw nt:link-id           link-id
           +--rw nt:source
           |  +--rw nt:source-node?   -> ../../../nw:node/node-id
           |  +--rw nt:source-tp?     -> ../../../nw:node[nw:node-id=current()/../source-node]/termination-point/tp-id
           +--rw nt:destination
           |  +--rw nt:dest-node?   -> ../../../nw:node/node-id
           |  +--rw nt:dest-tp?     -> ../../../nw:node[nw:node-id=current()/../dest-node]/termination-point/tp-id
           +--rw nt:supporting-link* [network-ref link-ref]
              +--rw nt:network-ref    -> ../../../nw:supporting-network/network-ref
              +--rw nt:link-ref       -> /nw:networks/network[nw:network-id=current()/../network-ref]/link/link-id
```

Transport Network Slice YANG Model Schema

```
+--rw networks
   +--rw network* [network-id]
      +--rw network-id            network-id
      +--rw network-types
      |  +--rw ns:network-slice!
      +--rw supporting-network* [network-ref]
      |  +--rw network-ref    -> /networks/network/network-id
      +--rw node* [node-id]
      |  +--rw node-id                 node-id
      |  +--rw supporting-node* [network-ref node-ref]
      |  +--rw nt:termination-point* [tp-id]
      |  |  +--rw nt:tp-id                           tp-id
      |  |  +--rw nt:supporting-termination-point* [network-ref node-ref tp-ref]
      |  +--rw ns:network-slice
      |     +--rw ns:isolation-level?   identityref
      |     +--rw ns:compute-node-id?   string
      |     +--rw ns:storage-id?        string
      +--rw nt:link* [link-id]
      |  +--rw nt:link-id            link-id
      |  +--rw nt:source
      |  +--rw nt:destination
      |  +--rw nt:supporting-link* [network-ref link-ref]
      |  +--rw ns:network-slice
      |     +--rw ns:delay-tolerance?   boolean
      |     +--rw ns:periodicity*       uint64
      |     +--rw ns:isolation-level?   identityref
      +--rw ns:network-slice
         +--rw ns:optimization-criterion?   identityref
         +--rw ns:delay-tolerance?          boolean
         +--rw ns:periodicity*              uint64
         +--rw ns:isolation-level?          identityref
```

Data Instance Example – Native Topology

```
{
  "ietf-network:networks": {
    "network": [
      {
        "network-id":"example-native-topology",
        "network-types": {
        },
        "node": [
          {
            "node-id":"R1",
            "ietf-network-topology:termination-point": [
              {
                "tp-id":"1-0-1"
              }
            ]
          }
        ],
        "ietf-network-topology:link": [
          {
            "link-id":"R1,1-0-1,,",
            "source": {
              "source-node":"R1",
              "source-tp":"1-0-1"
            }
          }
        ]
      }
    ]
  }
}
```

Data Instance Example – Customized Blue

```
{
  "ietf-network:networks": {
    "network": [
      {
        "network-id":"example-customized-blue-topology",
        "network-types": {
          "ietf-network-slice:network-slice": {
          }
        },
        "supporting-network": [
          {
            "network-ref":"example-native-topology"
          }
        ],
        "node": [
          {
            "node-id":"VR1",
            "supporting-node": [
              {
                "network-ref":"example-native-topology",
                "node-ref":"R1"
              }
            ],
            "ietf-network-slice:network-slice": {
              "isolation-level":"ietf-network-
slice:physical-memory-isolation"
            }
          ],
                {
                  "link-id":",,VR1,1-0-1",
                  "destination": {
                    "dest-node":"VR1",
                    "dest-tp":"1-0-1"
                  },
                  "supporting-link": [
                    {
                      "network-ref":"example-native-topology",
                      "link-ref":",,R1,1-0-1"
                    }
                  ],
                  "ietf-network-slice:network-slice": {
                    "isolation-level":"ietf-network-
slice:physical-network-isolation"
                  }
                }
              ],
              "ietf-network-slice:network-slice": {
                "optimization-criterion":"ietf-te-types:of-
minimize-cost-path",
                "isolation-level":"ietf-network-slice:physical-
isolation"
              }
            }
          ]
        }
      }
```

Data Instance Example – Customized Blue with TE

```
{
  "ietf-network:networks": {
    "network": [
      {
        "network-id":"example-customized-blue-topology",
        "network-types": {
          "ietf-te-topology:te-topology": {
          },
          "ietf-network-slice:network-slice": {
          }
        },
        "supporting-network": [
          {
            "network-ref":"example-native-topology"
          }
        ],
        "node": [
          {
            "node-id":"R1",
            "supporting-node": [
              {
                "network-ref":"example-native-topology",
                "node-ref":"R1"
              }
            ],
            "ietf-network-slice:network-slice": {
              "isolation-level":"ietf-network-
slice:virtual-resource-isolation"
            }
        ],
                {
                  "link-id":"R1,1-2-1,R2,2-1-1",
                  "source": {
                    "source-node":"R1",
                    "source-tp":"1-2-1"
                  },
                  "destination": {
                    "dest-node":"R2",
                    "dest-tp":"2-1-1"
                  },
                  "ietf-te-topology:te": {
                    "te-link-attributes": {
                      "underlay": {
                        "enabled": true,
                        "primary-path": {
                          "network-ref":"example-native-
topology",
                          "path-element": [
                            {
                              "path-element-id":10,
                              "numbered-node-hop" {
                                "node-id": "1.0.1.5"
                              }}]}}
                  },
                  "ietf-network-slice:network-slice": {
                    "isolation-level":"ietf-network-
slice:virtual-resource-isolation"
                  }}
      ]
    }
}
```

Next Steps

- Align the terminology with the consensus of the TEAS Network Slicing Design Team and TEAS Working Group.
- Further examine proper attributes to be included in this model.
- Welcome reviews and suggestions.
- Working Group adoption.