

Transport Network Slice YANG Data Model

draft-liu-teas-transport-network-slice-
yang-00

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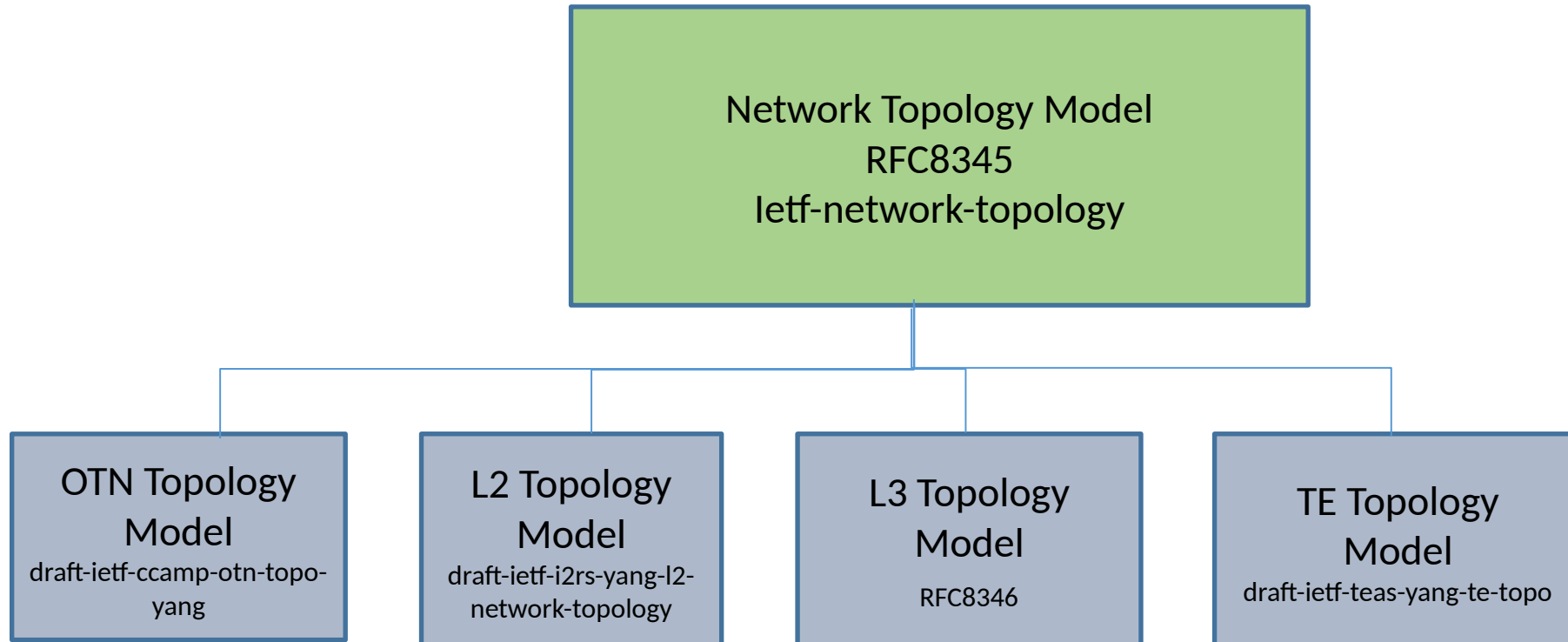
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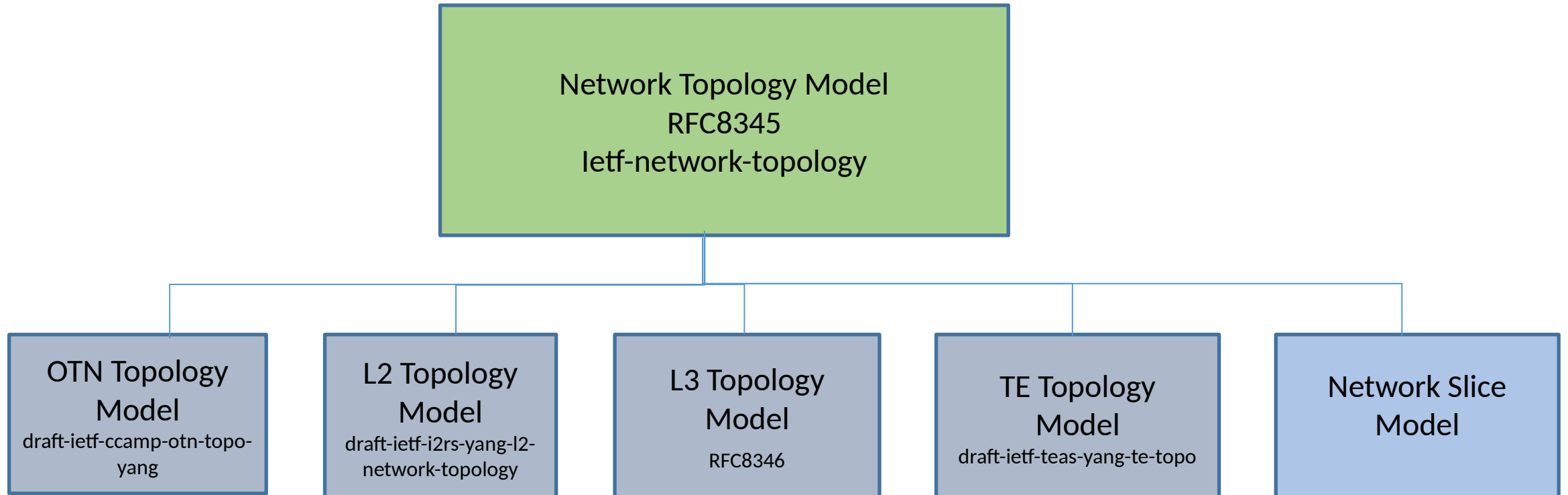
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Existing Network Topology Models

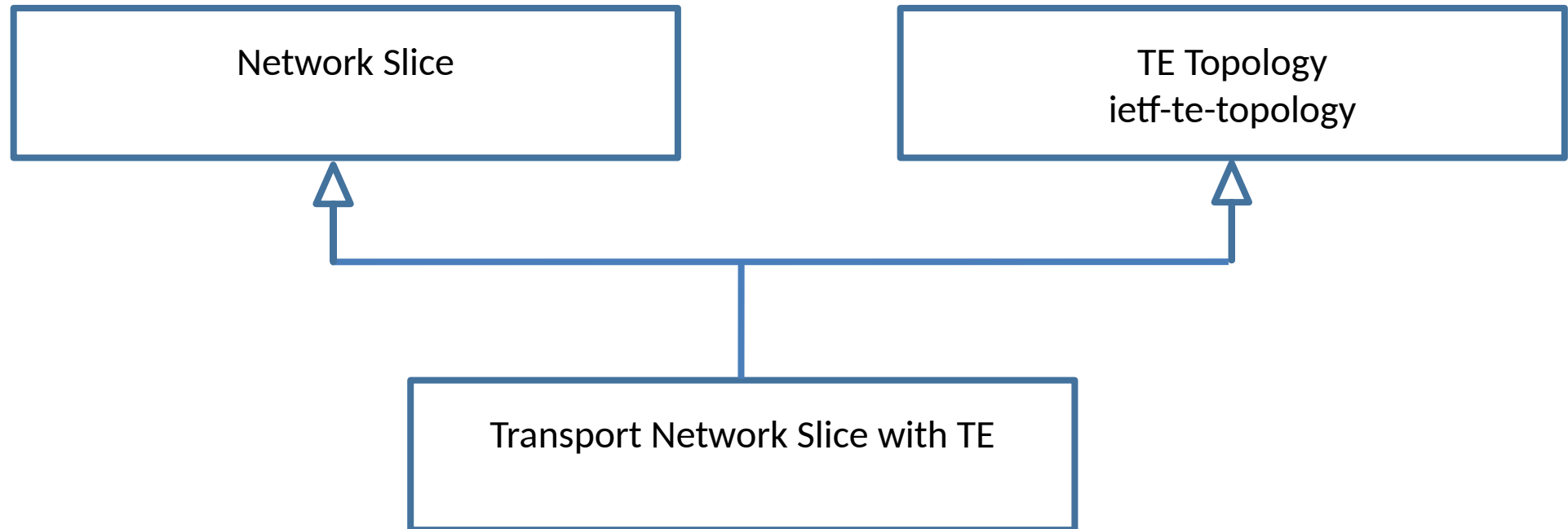


Augmentation for Network Slice



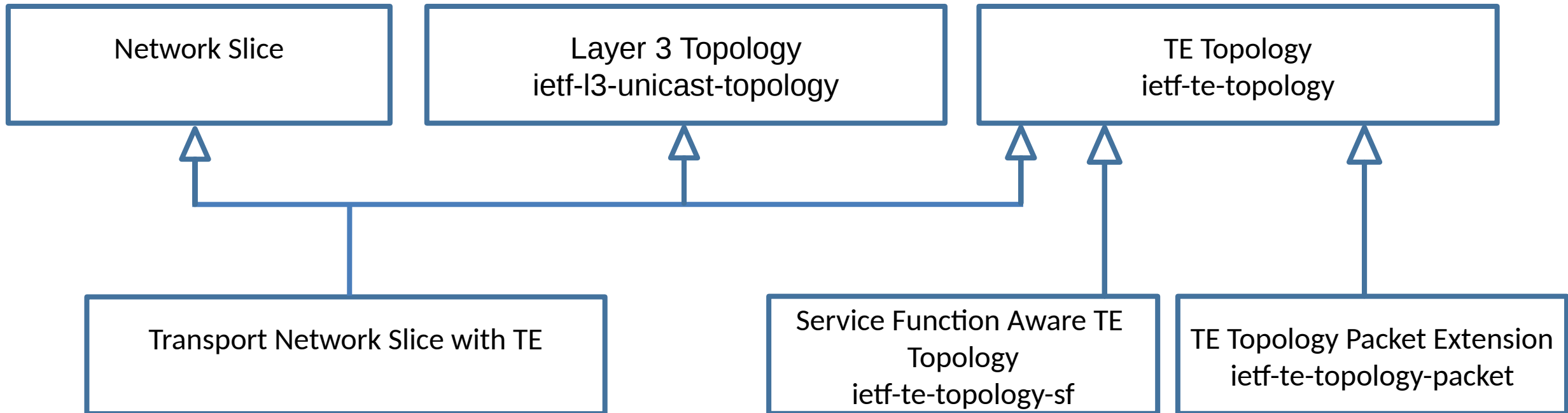
Transport Network Slice with TE

- 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

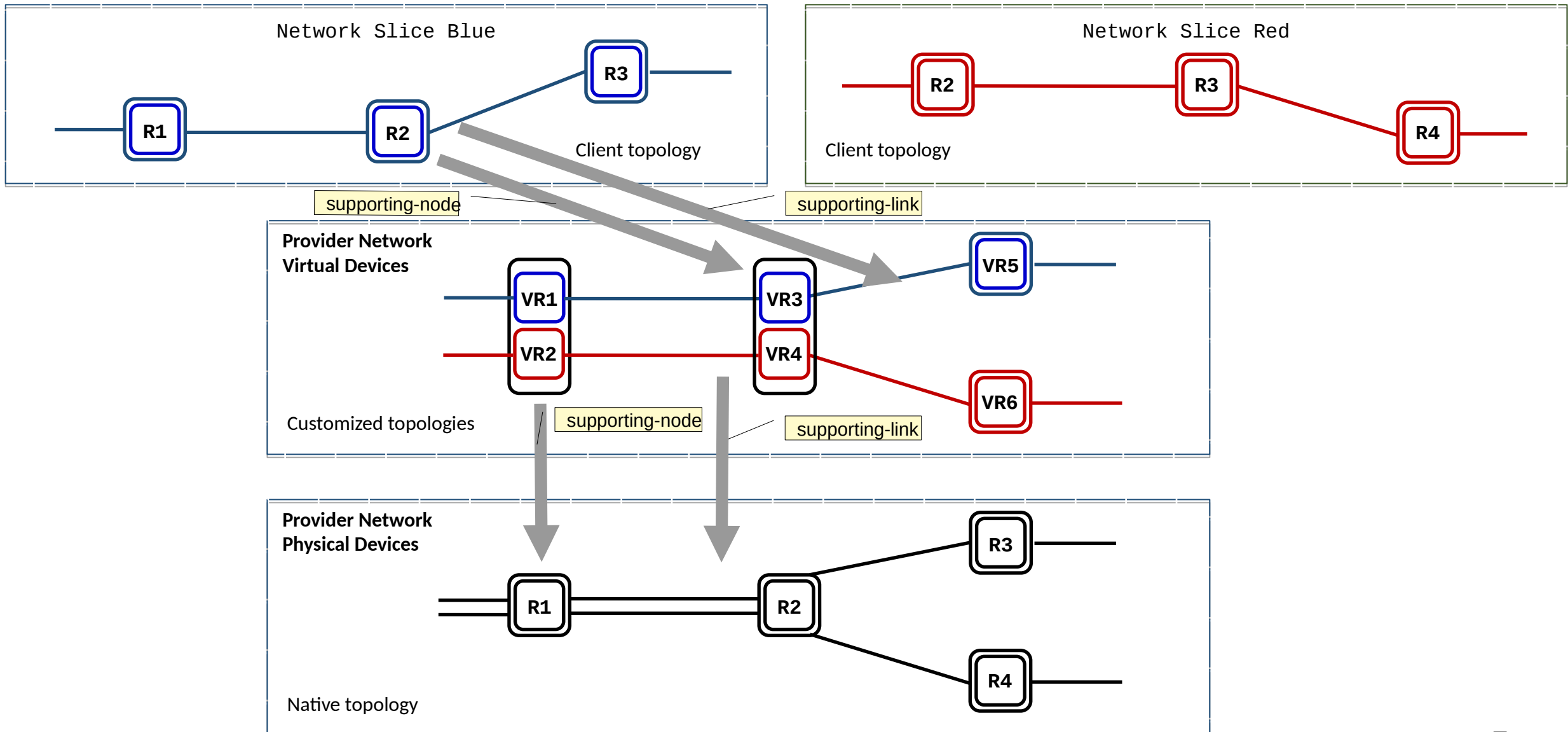
- For L3 packet use cases
 - ietf-te-topology-packet provides extensions for packet network.
 - ietf-l3-unicast-topology provides extensions for L3 network.
 - ietf-te-topology-sf supports network services and functions.



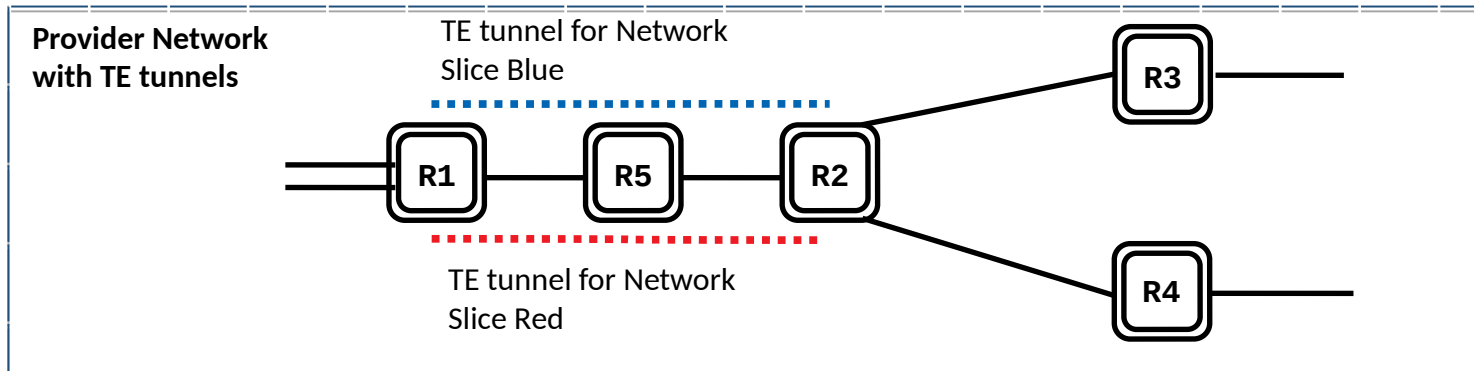
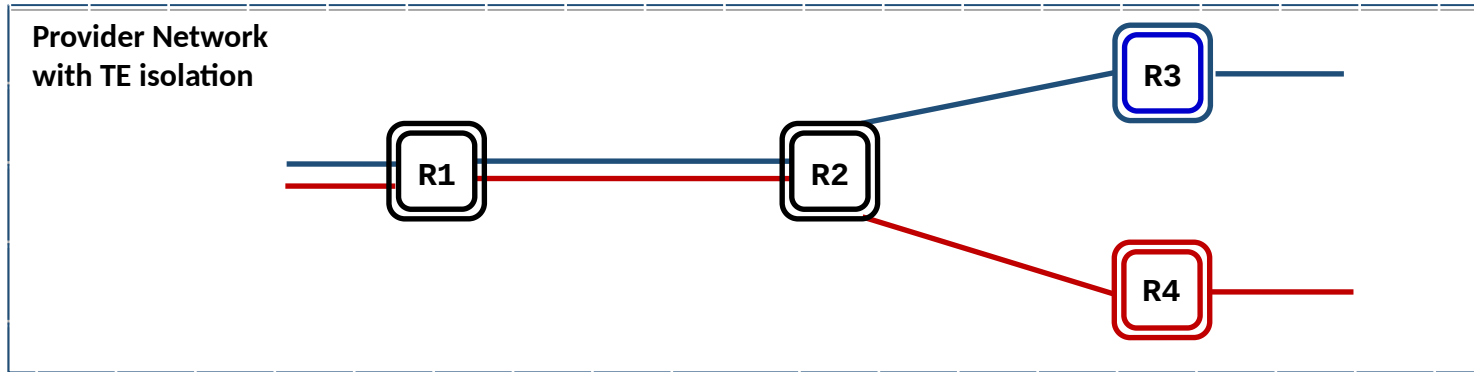
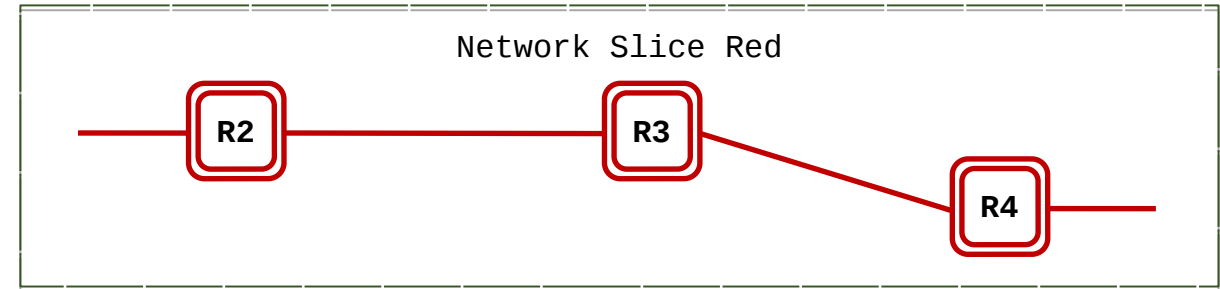
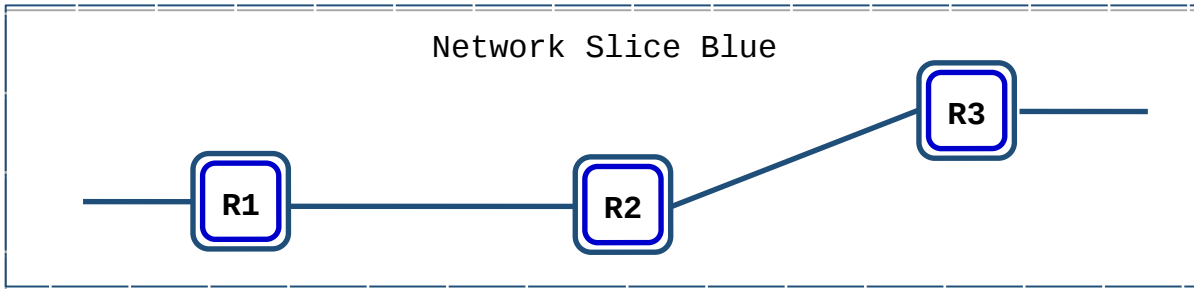
ACTN for Network Slicing

- 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



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 result 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.