Pyang and Yanglint examples:

Example of ietf-networks:

Ietf-network.yang and ietf-network-topology.yang are defined in https://tools.ietf.org/html/rfc8345

There are two models, one that defines networks of nodes and the other model that defines the links between the nodes.

Terminology:

> Network: Abstract representation of things and how the things are interconnected.
> Link: How nodes are connected
> Node: A generic thing
> Termination point: Contained in a node and serves as the anchor for a link.
> Supporting: Keyword used to indicate a hierarchy or stack related to the base element. For example, a network topology that has the connectivity defined for a service could have a "supporting network" that provides the Layer 2 topology and connectivity.
> Underlay: A supporting network.

Some concepts from RFC8345:

- "A node has a list of termination points that are used to terminate links"
- "A network can in turn be part of a hierarchy of networks, building on top of other networks. Any such networks are captured in the list "supporting-network". A supporting network is, in effect, an underlay network."

```
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
```
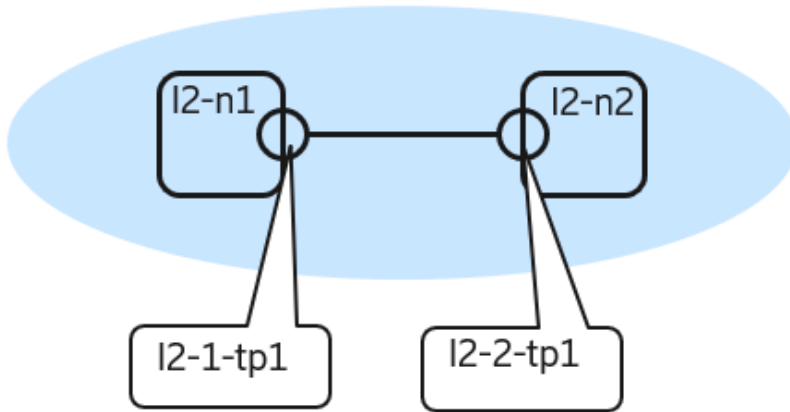
Simple Network:

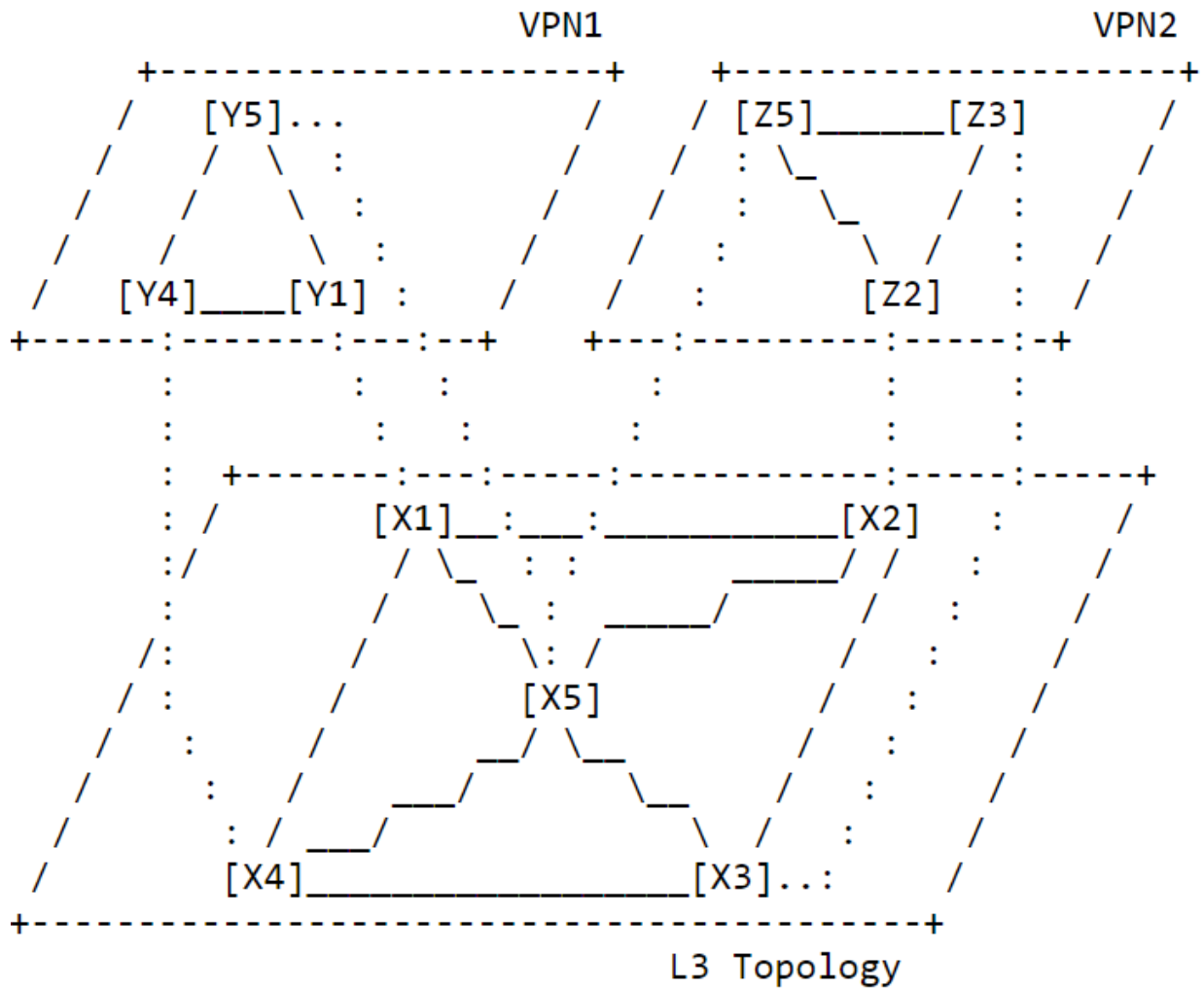Instance data for above (in json format):

```json
{
  "ietf-network:networks": {
    "network": [
      {
        "network-id": "network-01",
        "node": [
          {
            "node-id": "l2-n1",
            "ietf-network-topology:termination-point": [
              {
                "tp-id": "l2-1-tp1"
              }
            ]
          },
          {
            "node-id": "l2-n2",
            "ietf-network-topology:termination-point": [
              {
                "tp-id": "l2-2-tp1"
              }
            ]
          }
        ],
        "ietf-network-topology:link": [
          {
            "link-id": "l2-1-2",
            "source": {
              "source-node": "l2-n1",
              "source-tp": "l2-1-tp1"
            },
```

```
            "destination": {
              "dest-node": "l2-n2",
              "dest-tp": "l2-2-tp1"
            }
          },
          {
            "link-id": "l2-2-1",
            "source": {
              "source-node": "l2-n2",
              "source-tp": "l2-2-tp1"
            },
            "destination": {
              "dest-node": "l2-n1",
              "dest-tp": "l2-1-tp1"
            }
          }
        ]
      }
    ]
  }
}
```

Using example from RFC 8345:

```
                    VPN1                            VPN2
         +-------------------+          +--------------------+
        /     [Y5]...        /         / [Z5]_____[Z3]    /
       /    /  \   :        /         / :  \_       / :    /
      /    /    \   :      /         / :    \_     /  :   /
     /    /      \   :    /         / :      \ /   :   /
    /   [Y4]____[Y1] :   /         / :        [Z2]    :  /
   +------:---:---:--+      +---:----------:-----:-+
        :       :   :              :         :     :
        :       :   :              :         :     :
        :       :   :              :         :     :
     :  +-------:---:-----:-------------:-----:----+
     : /       [X1]__:___:_____[X2]    :    /
     :/       / \_   : :            _____/ /   :   /
     :       /   \_  :   _____/     /    :   /
    /:      /     \: /            /    :   /
   / :     /      [X5]           /    :   /
  /  :    /      _/ \__         /   :   /
 /   :   /    ___/    \_       /   :   /
/    : / ___/          \ /   :   /
/        [X4]_____[X3]..:   /
+-------------------------------------+
                   L3 Topology
```

The figure above shows two VPNs that use a common supporting network.

Instance data for above:

```
{
  "ietf-network:networks": {
   "network": [
    {
      "network-id": "VPN1",
      "node": [
       {
         "node-id": "Y1",
         "supporting-node": [
          {
            "network-ref": "L3TOPO",
            "node-ref": "X1"
          }
```

```json
        ],
        "ietf-network-topology:termination-point": [
          {
            "tp-id": "Y1-tp1"
          }
        ]
      },
      {
        "node-id": "Y4",
        "supporting-node": [
          {
            "network-ref": "L3TOPO",
            "node-ref": "X4"
          }
        ],
        "ietf-network-topology:termination-point": [
          {
            "tp-id": "Y4-tp1"
          }
        ]
      },
      {
        "node-id": "Y5",
        "supporting-node": [
          {
            "network-ref": "L3TOPO",
            "node-ref": "X5"
          }
        ],
        "ietf-network-topology:termination-point": [
          {
            "tp-id": "Y5-tp1"
          }
        ]
      }
    ],
    "ietf-network-topology:link": [
      {
        "link-id": "Y1-Y4",
        "source": {
          "source-node": "Y1",
          "source-tp": "Y1-tp1"
        },
        "destination": {
```

```json
      "dest-node": "Y4",
      "dest-tp": "Y4-tp1"
     }
    },
    {
     "link-id": "Y4-Y1",
     "source": {
      "source-node": "Y4",
      "source-tp": "Y4-tp1"
     },
     "destination": {
      "dest-node": "Y1",
      "dest-tp": "Y1-tp1"
     }
    },
    {
     "link-id": "Y1-Y5",
     "source": {
      "source-node": "Y1",
      "source-tp": "Y1-tp1"
     },
     "destination": {
      "dest-node": "Y5",
      "dest-tp": "Y5-tp1"
     }
    },
    {
     "link-id": "Y5-Y1",
     "source": {
      "source-node": "Y5",
      "source-tp": "Y5-tp1"
     },
     "destination": {
      "dest-node": "Y1",
      "dest-tp": "Y1-tp1"
     }
    },
    {
     "link-id": "Y4-Y5",
     "source": {
      "source-node": "Y4",
      "source-tp": "Y4-tp1"
     },
     "destination": {
```

```
          "dest-node": "Y5",
          "dest-tp": "Y5-tp1"
        }
      },
      {
        "link-id": "Y5-Y4",
        "source": {
          "source-node": "Y5",
          "source-tp": "Y5-tp1"
        },
        "destination": {
          "dest-node": "Y4",
          "dest-tp": "Y4-tp1"
        }
      }
    ]
  },
  {
    "network-id": "VPN2",
    "node": [
      {
        "node-id": "Z2",
        "supporting-node": [
          {
            "network-ref": "L3TOPO",
            "node-ref": "X2"
          }
        ],
        "ietf-network-topology:termination-point": [
          {
            "tp-id": "Z2-tp1"
          }
        ]
      },
      {
        "node-id": "Z3",
        "supporting-node": [
          {
            "network-ref": "L3TOPO",
            "node-ref": "X3"
          }
        ],
        "ietf-network-topology:termination-point": [
          {
```

```json
      "tp-id": "Z3-tp1"
    }
   ]
  },
  {
   "node-id": "Z5",
   "supporting-node": [
    {
     "network-ref": "L3TOPO",
     "node-ref": "X5"
    }
   ],
   "ietf-network-topology:termination-point": [
    {
     "tp-id": "Z5-tp1"
    }
   ]
  }
 ],
 "ietf-network-topology:link": [
  {
   "link-id": "Z2-Z3",
   "source": {
    "source-node": "Z2",
    "source-tp": "Z2-tp1"
   },
   "destination": {
    "dest-node": "Z3",
    "dest-tp": "Z3-tp1"
   }
  },
  {
   "link-id": "Z3-Z2",
   "source": {
    "source-node": "Z3",
    "source-tp": "Z3-tp1"
   },
   "destination": {
    "dest-node": "Z2",
    "dest-tp": "Z2-tp1"
   }
  },
  {
   "link-id": "Z2-Z5",
```

```json
      "source": {
        "source-node": "Z2",
        "source-tp": "Z2-tp1"
      },
      "destination": {
        "dest-node": "Z5",
        "dest-tp": "Z5-tp1"
      }
    },
    {
      "link-id": "Z5-Z2",
      "source": {
        "source-node": "Z5",
        "source-tp": "Z5-tp1"
      },
      "destination": {
        "dest-node": "Z2",
        "dest-tp": "Z2-tp1"
      }
    },
    {
      "link-id": "Z3-Z5",
      "source": {
        "source-node": "Z3",
        "source-tp": "Z3-tp1"
      },
      "destination": {
        "dest-node": "Z5",
        "dest-tp": "Z5-tp1"
      }
    },
    {
      "link-id": "Z5-Z3",
      "source": {
        "source-node": "Z5",
        "source-tp": "Z5-tp1"
      },
      "destination": {
        "dest-node": "Z3",
        "dest-tp": "Z3-tp1"
      }
    }
  ]
},
```

```json
{
  "network-id": "L3TOPO",
  "node": [
    {
      "node-id": "X1",
      "ietf-network-topology:termination-point": [
        {
          "tp-id": "X1-tp1"
        }
      ]
    },
    {
      "node-id": "X2",
      "ietf-network-topology:termination-point": [
        {
          "tp-id": "X2-tp1"
        }
      ]
    },
    {
      "node-id": "X3",
      "ietf-network-topology:termination-point": [
        {
          "tp-id": "X3-tp1"
        }
      ]
    },
    {
      "node-id": "X4",
      "ietf-network-topology:termination-point": [
        {
          "tp-id": "X4-tp1"
        }
      ]
    },
    {
      "node-id": "X5",
      "ietf-network-topology:termination-point": [
        {
          "tp-id": "X5-tp1"
        }
      ]
    }
  ],
```

```
"ietf-network-topology:link": [
 {
   "link-id": "X1-X2",
   "source": {
     "source-node": "X1",
     "source-tp": "X1-tp1"
   },
   "destination": {
     "dest-node": "X2",
     "dest-tp": "X2-tp1"
   }
 },
 {
   "link-id": "X2-X1",
   "source": {
     "source-node": "X2",
     "source-tp": "X2-tp1"
   },
   "destination": {
     "dest-node": "X1",
     "dest-tp": "X1-tp1"
   }
 },
 {
   "link-id": "X1-X4",
   "source": {
     "source-node": "X1",
     "source-tp": "X1-tp1"
   },
   "destination": {
     "dest-node": "X4",
     "dest-tp": "X4-tp1"
   }
 },
 {
   "link-id": "X4-X1",
   "source": {
     "source-node": "X4",
     "source-tp": "X4-tp1"
   },
   "destination": {
     "dest-node": "X1",
     "dest-tp": "X1-tp1"
   }
```

```
    },
    {
      "link-id": "X1-X5",
      "source": {
        "source-node": "X1",
        "source-tp": "X1-tp1"
      },
      "destination": {
        "dest-node": "X5",
        "dest-tp": "X5-tp1"
      }
    },
    {
      "link-id": "X5-X1",
      "source": {
        "source-node": "X5",
        "source-tp": "X5-tp1"
      },
      "destination": {
        "dest-node": "X1",
        "dest-tp": "X1-tp1"
      }
    },
    {
      "link-id": "X2-X5",
      "source": {
        "source-node": "X2",
        "source-tp": "X2-tp1"
      },
      "destination": {
        "dest-node": "X5",
        "dest-tp": "X5-tp1"
      }
    },
    {
      "link-id": "X5-X2",
      "source": {
        "source-node": "X5",
        "source-tp": "X5-tp1"
      },
      "destination": {
        "dest-node": "X2",
        "dest-tp": "X2-tp1"
      }
```

```json
    },
    {
      "link-id": "X2-X3",
      "source": {
        "source-node": "X2",
        "source-tp": "X2-tp1"
      },
      "destination": {
        "dest-node": "X3",
        "dest-tp": "X3-tp1"
      }
    },
    {
      "link-id": "X3-X2",
      "source": {
        "source-node": "X3",
        "source-tp": "X3-tp1"
      },
      "destination": {
        "dest-node": "X2",
        "dest-tp": "X2-tp1"
      }
    },
    {
      "link-id": "X3-X4",
      "source": {
        "source-node": "X3",
        "source-tp": "X3-tp1"
      },
      "destination": {
        "dest-node": "X4",
        "dest-tp": "X4-tp1"
      }
    },
    {
      "link-id": "X4-X3",
      "source": {
        "source-node": "X4",
        "source-tp": "X4-tp1"
      },
      "destination": {
        "dest-node": "X3",
        "dest-tp": "X3-tp1"
      }
```

```json
        },
        {
          "link-id": "X4-X5",
          "source": {
            "source-node": "X4",
            "source-tp": "X4-tp1"
          },
          "destination": {
            "dest-node": "X5",
            "dest-tp": "X5-tp1"
          }
        },
        {
          "link-id": "X5-X4",
          "source": {
            "source-node": "X5",
            "source-tp": "X5-tp1"
          },
          "destination": {
            "dest-node": "X4",
            "dest-tp": "X4-tp1"
          }
        }
      ]
    }
  ]
}
}
```