Cisco NSO Crosswork Hierarchical Controller - Function Pack

User Guide

Version 1.0.0

Contents

Preface

Abstract

This document serves as the documentation reference and user guide for the Cisco NSO Crosswork Hierarchical Controller - Function Pack (NSO CHCO FP).

Audience

This document describes how to configure and use CHCO FP. This document is intended for Cisco Advanced Services developers, network engineers, and system engineers who configure and deliver Cisco CHCO FP automation functionalities to Cisco customers.

Additional Documentation

This documentation requires the reader to have a good understanding of Cisco NSO and its usage as described in the Cisco NSO documentation. For documentation on additional Cisco products, see the Cisco documentation website.

Sl. No.	Documentation
1.	Cisco NSO CHCO FP Installation Guide
2.	Cisco NSO Installation Guide
3.	Cisco NSO User Guide

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Getting Started

This topic provides an overview of Cisco Network Services Orchestrator (NSO) and an understanding of Cisco Crosswork Hierarchical Controller Function Pack.

Cisco Network Services Orchestrator - Overview

Network engineers use NSO as a central point of management for the entire network by using a network command line interface (CLI). NSO enables service providers to dynamically adopt their orchestration solution with changes in the offered service portfolio. NSO is built on a Model-Driven Architecture which supports the dynamic addition and modification of service definitions. The service models are written in the YANG modeling language (RFC 6020).
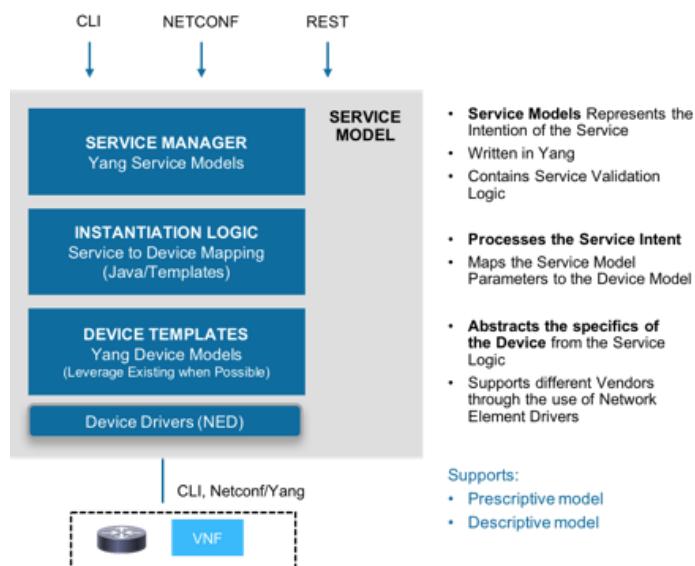
You can also upload the configuration information to NSO by using the payloads. These payloads contain the desired service configurations in an XML format. Each service can have a single file or multiple files. Deploy the configuration information by using payloads through the NSO CLI or by invoking the Northbound interface to create and modify service configurations. This documentation uses both network CLI and sample XML payloads.

From a Linux console, invoke the Network Configuration Protocol NETCONF NBI command to push or load the XML payload into NSO.

```
# netconf-console --port=[port_number]--host=[host_IP_address] -u [username] -p
[password] --edit-config payload.xml
```

Example

```
# netconf-console --port=830 --host=127.0.0.1 -u admin -p Fr3eB!rd$ --edit-
config payload.xml
```

Run the following command to get the configuration details from the configuration database in the NSO. For more information about NETCONF, see *Cisco Networking Services Configuration Guide*.

```
# netconf-console --port=[port_number]--host=[host_IP_address] -u
[host_username] -p [host_password] --get-config
```

Example

```
# netconf-console --port=830 --host=127.0.0.1 -u admin -p Fr3eB!rd$ --get-
config
```

NETCONF supports the following operations:

```
<get-config>
<edit-config> (operation="create")
<edit-config> (operation="replace")
<edit-config> (operation="merge")
<edit-config> (operation="delete")
```

The typical workflow when using the network CLI in NSO is as follows:

- All changes are initially made to a (logical) copy of the NSO database of configurations.

- You can view and verify the changes prior to committing them.

- The changes are committed, meaning that the changes are copied to the NSO database and pushed out to the network. Changes that violate integrity constraints or network policies are not committed. The changes to the devices are done in a holistic distributed atomic transaction, across all devices in parallel.

Changes either succeed and remain committed or fail and are rolled back as a whole, returning the entire network to the uncommitted state.

Cisco NSO CHCO FP – Overview and Architecture

Cisco Crosswork Hierarchical Controller is a solution that enables communication service providers (CSPs) to efficiently build and operate transport networks to deliver strong customer experience.

Cisco converges the IP and optical layers so routers can natively connect to a standardized pluggable coherent optics. CHCO is the perfect solution to improve the economics to operate such a network and to simplify the operations of the multi-layer and multi-vendor infrastructure. CHCO empowers operations with speed to orchestrate services and automate assurance across converged networks.

Crosswork Hierarchical Controller (CHCO) unifies complete network visibility from the service layer to the underlying topology, service discovery, and service assurance to control the network seamlessly in a multi-layer and multi-vendor environment. CHCO discovers the network into its own hierarchical and structured model. The network inventory is pulled from multiple domain controllers to construct a consistent multi-vendor view. The service health is determined and optimized by using real time and historical data, and by guided actions to provision services and automate assurance. This helps CHCO to correlate failures in different layers, optimize services, and intelligently provide assurance.

CHCO Function Pack integrates Cisco NSO with Nokia Service Provider (NSP) controller to deploy services on the NSP controller. NSO communicates with the NSP controller through a Representational State Transfer Configuration Protocol (RESTCONF) NSP Network Element Driver (NED). The function pack uses Layer 2 Network Model (L2NM) and Layer 3 Network Model (L3NM) IETF standard data models as the NBI service models. The data models are same as the Nokia NSP controller data models and have the following specifications. For more information about these models, see the IETF documentation.

- draft-ietf-opsawg-l2nm-07
- draft-ietf-opsawg-vpn-common-10
- draft-ietf-opsawg-l3sm-l3nm-17

The following diagram explains the architecture and process flow of CHCO FP.
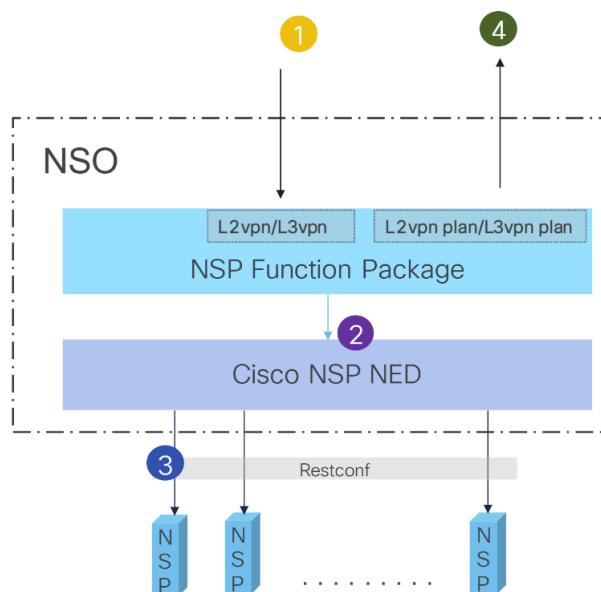
Service requests are submitted to NSO through the L2VPN and/or L3VPN data models as service. The FP interacts with the NSP NED in NSO to realize the services on the NSP controller.

Each service deployment can specify an NSP controller to determine to which controller the service is pushed to. You can also define a global default nsp-controller.

The service submission to NSO and passing the processed request to the NSP controller is synchronous. The transaction is successful if the NSP controller accepts the service. If the NSP controller encounters any issues, it aborts the RESTCONF transaction and the service commit on NSO fails. The L2NM and the L3NM service plans show the deployment status of the services.

Setting up a Default NSP Controller

CHCO FP provides a single pane to configure different devices, such as Nokia devices and Cisco devices. Make sure the Nokia NSP controller is configured before proceeding to use CHCO FP. For more information on configuring the Nokia NSP controller, see ***Nokia*** documentation.

To set up a default NSP controller:

1. Onboard the NSP controller as a device to the NSO device tree. NSO uses the nokia-nsp_rc-gen-1.0 NED to onboard the controller to the NSO device tree.

   Load merge the following sample payload to NSO to onboard the **nsp-0** NSP controller with sample NED settings and configuration. Make sure to modify the NSP controller IP address and the authentication information according to your NSP device. For a detailed information about NED settings for your environment, see the **/nso-6.1-hco-1.0.0/function-packages/nokia-nsp_rc-gen-1.0/README** file located in the CHCO FP installation directory.

```
<devices xmlns="http://tail-f.com/ns/ncs">
  <device>
    <name>nsp-0</name> <!-- set the desired name -->
    <address>10.10.0.1</address> <!-- nsp controller IP address -->
    <port>7888</port> <!-- nsp controller restconf port -->
    <authgroup>nsp-auth</authgroup> <!-- authgroup to authenticate to NSP-->
    <device-type>
      <generic>
        <ned-id xmlns:nokia-nsp_rc-gen-1.0="http://tail-f.com/ns/ned-id/nokia-nsp_rc-gen-1.0">nokia-nsp_rc-gen-1.0:nokia-nsp_rc-gen-1.0</ned-id>
      </generic>
    </device-type>
    <state>
      <admin-state>unlocked</admin-state>
    </state>
    <ned-settings> <!-- for more on the ned settings please refer to ned readme -->
```

```
<nokia-nsp_rc xmlns="http://tailf.com/ned/nokia-nsp_rc/meta">
  <connection>
    <authentication>
      <method>basic</method>
    </authentication>
    <ssl>
      <accept-any>true</accept-any>
    </ssl>
  </connection>
  <live-status>
    <time-to-live>30</time-to-live>
  </live-status>
  <restconf>
    <profile>nokia-nsp</profile>
  </restconf>
</nokia-nsp_rc>
        </ned-settings>
      </device>
  </devices>
```

2. Verify the NSP controller is onboarded as a device to the NSO device tree.

```
admin@ncs% run show devices list

NAME   ADDRESS     DESCRIPTION  NED ID               ADMIN STATE
---------------------------------------------------------------
nsp-0  10.10.0.1    -           nokia-nsp_rc-gen-1.0  unlocked
```

3. Connect the controller to authenticate the NSP controller and perform a sync-from to sync information from the NSP controller to NSO.

```
admin@ncs% request devices device nsp-0 connect
result true
info (admin) Connected to nsp-0 - 10.10.0.1:7888

admin@ncs% request devices device nsp-0 sync-from
result true
```

Note: You can onboard or host more than one NSP controller to the NSO device tree. Repeat step 1 to step 3 for each NSP controller you want to onboard to the NSO device tree.

4. Perform the following NED settings. These settings are required to be able to make modifications at the device level for existing services and also to delete services.

```
ubuntu@ncs> show configuration devices device nsp-1 ned-settings nokia-
nsp_rc restconf config custom-set-endpoints

custom-set-endpoints PATCH /[^:]*:?l2vpn-ntw/vpn-services/vpn-service[^/]+;

custom-set-endpoints PATCH /[^:]*:?l3vpn-ntw/vpn-services/vpn-service[^/]+;

custom-set-endpoints PATCH /[^:]*:l2vpn-ntw/vpn-services/vpn-
service[^/]+/vpn-nodes/vpn-node[^/]+/signaling-option;

custom-set-endpoints PATCH /[^:]*:l3vpn-ntw/vpn-services/vpn-
service[^/]+/vpn-nodes/vpn-node[^/]+;

custom-set-endpoints DELETE /[^:]*:?l2vpn-ntw/vpn-services/vpn-
service[^/]+/underlay-transport;

custom-set-endpoints DELETE /[^:]*:?l2vpn-ntw/vpn-services/vpn-
service[^/]+/vpn-nodes/vpn-node[^/]+/signaling-option;

custom-set-endpoints DELETE /[^:]*:?l3vpn-ntw/vpn-services/vpn-
service[^/]+/vpn-nodes/vpn-node[^/]+/vpn-network-accesses/vpn-network-
access[^/]+/connection/encapsulation/dot1q;

custom-set-endpoints DELETE /[^:]*:?l3vpn-ntw/vpn-services/vpn-
service[^/]+/vpn-nodes/vpn-node[^/]+/vpn-network-accesses/vpn-network-
access[^/]+/connection/encapsulation/priority-tagged;

ubuntu@ncs> show configuration devices device nsp-1 ned-settings nokia-
nsp_rc restconf profile
profile nokia-nsp;
```

5. Set up a default NSP controller to push the service configuration to if you are hosting multiple NSP controllers. The controller name can either be specified in the service or it can be configured as a default controller at the global level to use in both L2VPN and L3VPN services. If configured as a default controller, it is not required to specify the controller in the service payload. The controller specified in a service overrides the default controller.

```
admin@ncs% set nsp-nm-settings default-nsp-controller nsp-0
[ok]
[edit]
admin@ncs% commit

Commit complete.
[ok]
[edit]
admin@ncs% show nsp-nm-settings default-nsp-controller | display xml
<config xmlns="http://tail-f.com/ns/config/1.0">
  <nsp-nm-settings xmlns="http://cisco.com/ns/nso/fp/cisco-nsp-nm">
    <default-nsp-controller>nsp-0</default-nsp-controller>
  </nsp-nm-settings>
</config>
[ok]
```

Creating Services

The following topics discuss how to create and deploy L2VPN-NM and L3VPN-NM services and push the configuration information to NSP controller, which further configures the Nokia devices.

A service payload contains device identification information to push the service configuration to. A service can be pushed to only one controller at a time. You can, however, edit the service to modify the controller information and commit again. A single NSP controller can accept multiple services. The service plan displays the status of the deployment.

The NSP controller name can either be specified in the service or can be configured as a default controller at the global level to use in both the L2VPN and L3VPN services. If configured as a default controller, it is not required to specify the controller in the service payload. For more information on configuring a default NSP controller, see **Setting up a Default NSP Controller**.

Creating L2VPN Service

The following sample payloads demonstrate the L2VPN service deployments using a default controller and by specifying a controller in the service payload.

Creating L2VPN service using a default nsp-controller

1. The following is a sample payload **l2vpn-PW01-tldp-interAS-A-55000-1130.xml** to create the L2VPN-NM service and to push the configuration to a default nsp-controller nsp-0.

```xml
<config xmlns="http://tail-f.com/ns/config/1.0">
  <l2vpn-ntw xmlns="urn:ietf:params:xml:ns:yang:ietf-l2vpn-ntw">
    <vpn-services>
      <vpn-service>
        <vpn-id>PW01-tldp-interAS-A-55000-1130</vpn-id>
        <vpn-name>PW01-tldp-interAS-A-55000-1130</vpn-name>
        <vpn-description>demo</vpn-description>
        <customer-name>1</customer-name>
        <vpn-type xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:vpws</vpn-type>
        <signaling-type xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:ldp-signaling</signaling-type>
        <underlay-transport>
          <protocol xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:ldp</protocol>
          <protocol xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:rsvp-te</protocol>
        </underlay-transport>
        <status>
          <admin-status>
            <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:admin-up</status>
```

```
        </admin-status>
      </status>
      <vpn-nodes>
        <vpn-node>
          <vpn-node-id>PW01-tldp-interAS-A-55000-1130_R8</vpn-node-id>
          <description>ietf_l2vpn</description>
          <ne-id>10.10.10.8</ne-id>
          <status>
            <admin-status>
              <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
            </admin-status>
          </status>
          <signaling-option>
            <signaling-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:ldp-
signaling</signaling-type>
              <ldp-or-l2tp>
                <t-ldp-pw-type>vpws-type</t-ldp-pw-type>
                <pw-type>ethernet</pw-type>
                <ac-pw-list>
                  <peer-addr>10.10.10.9</peer-addr>
                  <vc-id>1130</vc-id>
                  <pw-priority>1</pw-priority>
                </ac-pw-list>
              </ldp-or-l2tp>
          </signaling-option>
          <vpn-network-accesses>
            <vpn-network-access>
              <id>1</id>
              <interface-id>Port 1/1/1</interface-id>
              <connection>
                <encapsulation>
                  <encap-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-
common:dot1q</encap-type>
                    <dot1q>
                      <cvlan-id>1130</cvlan-id>
                    </dot1q>
                </encapsulation>
```

```
        </connection>
        <service>
          <mtu>1492</mtu>
        </service>
      </vpn-network-access>
    </vpn-network-accesses>
  </vpn-node>
  <vpn-node>
    <vpn-node-id>PW01-tldp-interAS-A-55000-1130_R9</vpn-node-id>
    <description>ietf_l2vpn</description>
    <ne-id>10.10.10.9</ne-id>
    <status>
      <admin-status>
        <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
      </admin-status>
    </status>
    <signaling-option>
      <signaling-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:ldp-
signaling</signaling-type>
        <ldp-or-l2tp>
          <t-ldp-pw-type>vpws-type</t-ldp-pw-type>
          <pw-type>ethernet</pw-type>
          <ac-pw-list>
            <peer-addr>10.10.10.8</peer-addr>
            <vc-id>1130</vc-id>
            <pw-priority>1</pw-priority>
          </ac-pw-list>
        </ldp-or-l2tp>
    </signaling-option>
    <vpn-network-accesses>
      <vpn-network-access>
        <id>1</id>
        <interface-id>Port 1/1/1</interface-id>
        <connection>
          <encapsulation>
            <encap-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-
common:dot1q</encap-type>
```

```
                <dot1q>
                    <cvlan-id>1130</cvlan-id>
                </dot1q>
             </encapsulation>
          </connection>
          <service>
             <mtu>1492</mtu>
          </service>
        </vpn-network-access>
      </vpn-network-accesses>
    </vpn-node>
  </vpn-nodes>
 </vpn-service>
</vpn-services>
</l2vpn-ntw>
</config>
```

2. Load merge the payload and commit the transaction to create the service.

```
admin@ncs% load merge l2vpn-PW01-tldp-interAS-A-55000-1130.xml
[ok]
[edit]
admin@ncs% commit
Commit complete.
[ok]
```

3. Display the service plan to view and verify the status of the service. A successful plan in the ready reached state indicates the l2vpn-service definition is pushed onto the nsp controller.

```
admin@ncs% run show l2vpn-ntw vpn-services vpn-service-plan PW01-tldp-
interAS-A-55000-1130 plan

                                                          POST
            BACK                                          ACTION
TYPE  NAME  TRACK  GOAL  STATE  STATUS   WHEN          ref STATUS
-------------------------------------------------------------------
self  self  false  -     init   reached  2023-01-17T23:09:49  -   -
                         ready  reached  2023-01-17T23:09:49  -   -

[ok]
```

Creating L2VPN-NM service with nsp-controller set during service creation

1. The following is a sample payload **l2vpn-PW02-tldp-multi-Instance-igp-1210.xml** to create the L2VPN-NM service. The service configuration is pushed to the **nsp-controller nsp-dev-19** specified in the payload.

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <l2vpn-ntw xmlns="urn:ietf:params:xml:ns:yang:ietf-l2vpn-ntw">
    <vpn-services>
      <vpn-service>
        <vpn-id>PW02-tldp-multi-Instance-igp-1210</vpn-id>
        <vpn-name>PW02-tldp-multi-Instance-igp-1210</vpn-name>
        <nsp-controller xmlns="http://cisco.com/ns/nso/fp/cisco-nsp-nm">nsp-
dev-19</nsp-controller> <!-- nsp-controller setting -->
        <vpn-description>demo</vpn-description>
        <customer-name>1</customer-name>
        <vpn-type xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:vpws</vpn-type>
        <signaling-type xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:ldp-signaling</signaling-type>
        <underlay-transport>
          <protocol xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:ldp</protocol>
          <protocol xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:rsvp-te</protocol>
        </underlay-transport>
        <status>
          <admin-status>
            <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:admin-up</status>
          </admin-status>
        </status>
        <vpn-nodes>
          <vpn-node>
            <vpn-node-id>PW02-tldp-single-Instance-1210_R1</vpn-node-id>
            <description>ietf_l2vpn</description>
            <ne-id>10.10.10.1</ne-id>
            <status>
              <admin-status>
                <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:admin-up</status>
              </admin-status>
            </status>
            <signaling-option>
              <signaling-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:ldp-
signaling</signaling-type>
```

```
        <ldp-or-l2tp>
          <t-ldp-pw-type>vpws-type</t-ldp-pw-type>
          <pw-type>ethernet</pw-type>
          <ac-pw-list>
            <peer-addr>10.10.10.6</peer-addr>
            <vc-id>1210</vc-id>
            <pw-priority>1</pw-priority>
          </ac-pw-list>
        </ldp-or-l2tp>
      </signaling-option>
      <vpn-network-accesses>
        <vpn-network-access>
          <id>1</id>
          <interface-id>Port 1/1/c10/1</interface-id>
          <connection>
            <encapsulation>
              <encap-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:priority-
tagged</encap-type>
            </encapsulation>
          </connection>
          <service>
            <mtu>1492</mtu>
          </service>
        </vpn-network-access>
      </vpn-network-accesses>
    </vpn-node>
    <vpn-node>
      <vpn-node-id>PW02-tldp-single-Instance-1210_R6</vpn-node-id>
      <description>ietf_l2vpn</description>
      <ne-id>10.10.10.6</ne-id>
      <status>
        <admin-status>
          <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:admin-up</status>
        </admin-status>
      </status>
      <signaling-option>
```

```
                <signaling-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:ldp-
signaling</signaling-type>
                <ldp-or-l2tp>
                  <t-ldp-pw-type>vpws-type</t-ldp-pw-type>
                  <pw-type>ethernet</pw-type>
                  <ac-pw-list>
                    <peer-addr>10.10.10.1</peer-addr>
                    <vc-id>1210</vc-id>
                    <pw-priority>1</pw-priority>
                  </ac-pw-list>
                </ldp-or-l2tp>
              </signaling-option>
              <vpn-network-accesses>
                <vpn-network-access>
                  <id>1</id>
                  <interface-id>Port 1/1/11</interface-id>
                  <connection>
                    <encapsulation>
                      <encap-type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:priority-
tagged</encap-type>
                    </encapsulation>
                  </connection>
                  <service>
                    <mtu>1492</mtu>
                  </service>
                </vpn-network-access>
              </vpn-network-accesses>
            </vpn-node>
          </vpn-nodes>
          <nsp-controller xmlns="http://cisco.com/ns/nso/fp/cisco-nsp-nm">nsp-
0</nsp-controller>
        </vpn-service>
      </vpn-services>
    </l2vpn-ntw>
    </config>
```

2. Load merge the payload and commit the transaction to create the service.

```
admin@ncs% load merge l2vpn-PW02-tldp-multi-Instance-igp-1210.xml
[ok]
```

```
[edit]
admin@ncs% commit
Commit complete.
[ok]
```

3. Display the service plan to view and verify the status of the service. A successful plan in the ready-reached state indicates the l2vpn-service definition is pushed onto the NSP controller.

```
admin@ncs% run show l2vpn-ntw vpn-services vpn-service-plan PW02-tldp-multi-
Instance-igp-1210 plan

                                                        POST
              BACK                                       ACTION
TYPE  NAME   TRACK  GOAL  STATE  STATUS  WHEN                ref  STATUS
------------------------------------------------------------------
self  self   false  -     init   reached 2023-01-17T23:09:49  -    -
                          ready  reached 2023-01-17T23:09:49  -    -

[ok]
```

Creating L3VPN Service

The following sample payloads demonstrate the L3VPN service deployments using a default controller and by specifying a controller in the service payload.

Creating L3VPN service using a default nsp-controller

1. The following is a sample payload **L3VPN01-multi-instance-InterAS-B-2140.xml** to create the L3VPN-NM service and to push the configuration to a default nsp-controller **nsp-0**.

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <l3vpn-ntw xmlns="urn:ietf:params:xml:ns:yang:ietf-l3vpn-ntw">
    <vpn-services>
      <vpn-service>
        <vpn-id>L3VPN01-multi-instance-InterAS-B-2140</vpn-id>
        <vpn-name>L3VPN01-multi-instance-InterAS-B-2140</vpn-name>
        <vpn-description>L3VPN01-multi-instance-InterAS-B-2140</vpn-
description>
        <customer-name>1</customer-name>
        <vpn-type xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:l3vpn</vpn-type>
        <vpn-service-topology xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:hub-
spoke</vpn-service-topology>
        <vpn-instance-profiles>
          <vpn-instance-profile>
            <profile-id>profile1</profile-id>
```

```xml
            <rd>0:65000:2140</rd>
            <address-family>
              <address-family xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-
common:ipv4</address-family>
                <vpn-targets>
                  <vpn-policies>
                    <import-policy>L3VPN01-multi-instance-InterAS-B-2140-
IMPORT</import-policy>
                    <export-policy>L3VPN01-multi-instance-InterAS-B-2140-
EXPORT</export-policy>
                  </vpn-policies>
                </vpn-targets>
            </address-family>
          </vpn-instance-profile>
        </vpn-instance-profiles>
        <underlay-transport>
          <protocol xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:rsvp-te</protocol>
        </underlay-transport>
        <vpn-nodes>
          <vpn-node>
            <vpn-node-id>L3VPN01-multi-instance-InterAS-B-2140-1</vpn-node-
id>
            <description>L3VPN01-multi-instance-InterAS-B-2140</description>
            <ne-id>10.10.10.1</ne-id>
            <router-id>10.10.10.1</router-id>
            <active-vpn-instance-profiles>
              <vpn-instance-profile>
                <profile-id>profile1</profile-id>
                <rd>0:45000:2140</rd>
              </vpn-instance-profile>
            </active-vpn-instance-profiles>
            <status>
              <admin-status>
                <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
              </admin-status>
            </status>
            <vpn-network-accesses>
```

```
        <vpn-network-access>
          <id>int_2140_1</id>
          <interface-id>1/1/c1/1</interface-id>
          <description>L3VPN01-multi-instance-InterAS-B-
2140</description>
            <connection>
              <encapsulation>
                <type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:dot1q</type>
                  <dot1q>
                    <cvlan-id>2140</cvlan-id>
                  </dot1q>
              </encapsulation>
            </connection>
            <ip-connection>
              <ipv4>
                <local-address>1.1.1.1</local-address>
                <prefix-length>24</prefix-length>
              </ipv4>
            </ip-connection>
            <service>
              <mtu>1492</mtu>
            </service>
          </vpn-network-access>
        </vpn-network-accesses>
      </vpn-node>
      <vpn-node>
        <vpn-node-id>L3VPN01-multi-instance-InterAS-B-2140-5</vpn-node-
id>
        <description>L3VPN01-multi-instance-InterAS-B-2140</description>
        <ne-id>10.10.10.5</ne-id>
        <router-id>10.10.10.5</router-id>
        <active-vpn-instance-profiles>
          <vpn-instance-profile>
            <profile-id>profile1</profile-id>
            <rd>0:45000:2140</rd>
          </vpn-instance-profile>
        </active-vpn-instance-profiles>
        <status>
```

```
            <admin-status>
                <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
            </admin-status>
        </status>
        <vpn-network-accesses>
          <vpn-network-access>
            <id>int_2140_1</id>
            <interface-id>1/1/9</interface-id>
            <description>L3VPN01-multi-instance-InterAS-B-
2140</description>
                <ip-connection>
                  <ipv4>
                    <local-address>5.5.5.5</local-address>
                    <prefix-length>24</prefix-length>
                  </ipv4>
                </ip-connection>
                <service>
                  <mtu>1492</mtu>
                </service>
          </vpn-network-access>
        </vpn-network-accesses>
      </vpn-node>
      <vpn-node>
        <vpn-node-id>L3VPN01-multi-instance-InterAS-B-2140-7</vpn-node-
id>
        <description>L3VPN01-multi-instance-InterAS-B-2140</description>
        <ne-id>10.10.10.7</ne-id>
        <router-id>10.10.10.7</router-id>
        <active-vpn-instance-profiles>
          <vpn-instance-profile>
            <profile-id>profile1</profile-id>
            <rd>0:45000:2140</rd>
          </vpn-instance-profile>
        </active-vpn-instance-profiles>
        <status>
          <admin-status>
                <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
```

```xml
          </admin-status>
        </status>
        <vpn-network-accesses>
          <vpn-network-access>
            <id>int_2140_1</id>
            <interface-id>1/1/10</interface-id>
            <description>L3VPN01-multi-instance-InterAS-B-
2140</description>
              <connection>
                <encapsulation>
                  <type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:dot1q</type>
                    <dot1q>
                      <cvlan-id>2140</cvlan-id>
                    </dot1q>
                </encapsulation>
              </connection>
              <ip-connection>
                <ipv4>
                  <local-address>7.7.7.7</local-address>
                  <prefix-length>24</prefix-length>
                </ipv4>
              </ip-connection>
              <service>
                <mtu>1492</mtu>
              </service>
          </vpn-network-access>
        </vpn-network-accesses>
      </vpn-node>
      <vpn-node>
      <vpn-node-id>L3VPN01-multi-instance-InterAS-B-2140-8</vpn-node-id>
        <description>L3VPN01-multi-instance-InterAS-B-2140</description>
        <ne-id>10.10.10.8</ne-id>
        <router-id>10.10.10.8</router-id>
        <active-vpn-instance-profiles>
          <vpn-instance-profile>
            <profile-id>profile1</profile-id>
            <rd>0:45000:2140</rd>
          </vpn-instance-profile>
```

```xml
                    </active-vpn-instance-profiles>
                <status>
                  <admin-status>
                    <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
                  </admin-status>
                </status>
                <vpn-network-accesses>
                  <vpn-network-access>
                    <id>int_2140_1</id>
                    <interface-id>1/1/1</interface-id>
                    <description>L3VPN01-multi-instance-InterAS-B-
2140</description>
                    <connection>
                      <encapsulation>
                        <type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:dot1q</type>
                        <dot1q>
                          <cvlan-id>2140</cvlan-id>
                        </dot1q>
                      </encapsulation>
                    </connection>
                    <ip-connection>
                      <ipv4>
                        <local-address>8.8.8.8</local-address>
                        <prefix-length>24</prefix-length>
                      </ipv4>
                    </ip-connection>
                    <service>
                      <mtu>1492</mtu>
                    </service>
                  </vpn-network-access>
                </vpn-network-accesses>
              </vpn-node>
            </vpn-nodes>
          </vpn-service>
        </vpn-services>
      </l3vpn-ntw>
    </config>
```

2. Load merge the payload and commit the transaction to create the service.

```
admin@ncs% load merge L3VPN01-multi-instance-InterAS-B-2140.xml
[ok]
[edit]
admin@ncs% commit
Commit complete.
[ok]
```

3. Display the service plan to view and verify the status of the service. A successful plan in the ready-reached state indicates the l3vpn-service definition is pushed onto the NSP controller.

```
admin@ncs% run show l3vpn-ntw vpn-services vpn-service-plan L3VPN01-multi-
instance-InterAS-B-2140 plan
```

		BACK						POST ACTION
TYPE	NAME	TRACK	GOAL	STATE	STATUS	WHEN	ref	STATUS
self	self	false	–	init	reached	2023-01-17T23:09:49	–	–
				ready	reached	2023-01-17T23:09:49	–	–

```
[ok]
```

Creating L3VPN-NM service with nsp-controller set during service creation

1. The following is a sample payload **L3VPN04-multi-instance-2421.xml** to create the L3VPN-NM service. The service configuration is pushed to the nsp-controller nsp-dev-19 specified in the payload.

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <l3vpn-ntw xmlns="urn:ietf:params:xml:ns:yang:ietf-l3vpn-ntw">
    <vpn-services>
      <vpn-service>
        <vpn-id>L3VPN04-multi-instance-2421</vpn-id>
        <vpn-name>L3VPN04-multi-instance-2421</vpn-name>
        <nsp-controller xmlns="http://cisco.com/ns/nso/fp/cisco-nsp-nm">nsp-
dev-19</nsp-controller> <!-- nsp-controller setting -->
        <vpn-description>L3VPN04-multi-instance-2421</vpn-description>
        <customer-name>1</customer-name>
        <vpn-type xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:l3vpn</vpn-type>
        <vpn-service-topology xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:any-to-
any</vpn-service-topology>
        <underlay-transport>
          <protocol xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-vpn-
common">vpn-common:sr-mpls</protocol>
```

```
        </underlay-transport>
        <vpn-nodes>
          <vpn-node>
            <vpn-node-id>L3VPN04-multi-instance-2421-1</vpn-node-id>
            <description>L3VPN04-multi-instance-2421</description>
            <ne-id>10.10.10.1</ne-id>
            <router-id>10.10.10.1</router-id>
            <active-vpn-instance-profiles>
              <vpn-instance-profile>
                <profile-id>profile1</profile-id>
                <rd>0:65000:2421</rd>
                <address-family>
                  <address-family xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-
common:ipv4</address-family>
                    <vpn-targets>
                      <vpn-policies>
                        <import-policy>L3VPN04-multi-instance-2421-
IMPORT</import-policy>
                        <export-policy>L3VPN04-multi-instance-2421-
EXPORT</export-policy>
                      </vpn-policies>
                    </vpn-targets>
                </address-family>
              </vpn-instance-profile>
            </active-vpn-instance-profiles>
            <status>
              <admin-status>
                <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
              </admin-status>
            </status>
            <vpn-network-accesses>
              <vpn-network-access>
                <id>int_2421_1</id>
                <interface-id>1/1/c1/1</interface-id>
                <description>L3VPN04-multi-instance-2421</description>
                <connection>
                  <encapsulation>
```

```xml
            <type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:dot1q</type>
              <dot1q>
                <cvlan-id>2421</cvlan-id>
              </dot1q>
            </encapsulation>
          </connection>
          <ip-connection>
            <ipv4>
              <local-address>1.1.1.1</local-address>
              <prefix-length>24</prefix-length>
            </ipv4>
          </ip-connection>
          <service>
            <mtu>1492</mtu>
          </service>
        </vpn-network-access>
      </vpn-network-accesses>
    </vpn-node>
    <vpn-node>
      <vpn-node-id>L3VPN04-multi-instance-2421-5</vpn-node-id>
      <description>L3VPN04-multi-instance-2421</description>
      <ne-id>10.10.10.5</ne-id>
      <router-id>10.10.10.5</router-id>
      <active-vpn-instance-profiles>
        <vpn-instance-profile>
          <profile-id>profile1</profile-id>
          <rd>0:65000:2421</rd>
          <address-family>
            <address-family xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-
common:ipv4</address-family>
            <vpn-targets>
              <vpn-policies>
                <import-policy>L3VPN04-multi-instance-2421-
IMPORT</import-policy>
                <export-policy>L3VPN04-multi-instance-2421-
EXPORT</export-policy>
              </vpn-policies>
            </vpn-targets>
```

```
          </address-family>
        </vpn-instance-profile>
      </active-vpn-instance-profiles>
      <status>
        <admin-status>
          <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
        </admin-status>
      </status>
      <vpn-network-accesses>
        <vpn-network-access>
          <id>int_2421_1</id>
          <interface-id>1/1/1</interface-id>
          <description>L3VPN04-multi-instance-2421</description>
          <connection>
            <encapsulation>
              <type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:dot1q</type>
              <dot1q>
                <cvlan-id>2421</cvlan-id>
              </dot1q>
            </encapsulation>
          </connection>
          <ip-connection>
            <ipv4>
              <local-address>5.5.5.5</local-address>
              <prefix-length>24</prefix-length>
            </ipv4>
          </ip-connection>
          <service>
            <mtu>1492</mtu>
          </service>
        </vpn-network-access>
      </vpn-network-accesses>
    </vpn-node>
    <vpn-node>
      <vpn-node-id>L3VPN04-multi-instance-2421-7</vpn-node-id>
      <description>L3VPN04-multi-instance-2421</description>
      <ne-id>10.10.10.7</ne-id>
```

```xml
            <router-id>10.10.10.7</router-id>
            <active-vpn-instance-profiles>
              <vpn-instance-profile>
                <profile-id>profile1</profile-id>
                <rd>0:65000:2421</rd>
                <address-family>
                  <address-family xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-
common:ipv4</address-family>
                    <vpn-targets>
                      <vpn-policies>
                        <import-policy>L3VPN04-multi-instance-2421-
IMPORT</import-policy>
                        <export-policy>L3VPN04-multi-instance-2421-
EXPORT</export-policy>
                      </vpn-policies>
                    </vpn-targets>
                  </address-family>
              </vpn-instance-profile>
            </active-vpn-instance-profiles>
            <status>
              <admin-status>
                <status xmlns:vpn-common="urn:ietf:params:xml:ns:yang:ietf-
vpn-common">vpn-common:admin-up</status>
              </admin-status>
            </status>
            <vpn-network-accesses>
              <vpn-network-access>
                <id>int_2421_1</id>
                <interface-id>1/1/10</interface-id>
                <description>L3VPN04-multi-instance-2421</description>
                <connection>
                  <encapsulation>
                    <type xmlns:vpn-
common="urn:ietf:params:xml:ns:yang:ietf-vpn-common">vpn-common:dot1q</type>
                    <dot1q>
                      <cvlan-id>2421</cvlan-id>
                    </dot1q>
                  </encapsulation>
                </connection>
```

```
              <ip-connection>
                <ipv4>
                  <local-address>7.7.7.7</local-address>
                  <prefix-length>24</prefix-length>
                </ipv4>
              </ip-connection>
              <service>
                <mtu>1492</mtu>
              </service>
            </vpn-network-access>
          </vpn-network-accesses>
        </vpn-node>
      </vpn-nodes>
    </vpn-service>
  </vpn-services>
</l3vpn-ntw>
</config>
```

2. Load merge the payload and commit the transaction to create the service.

```
admin@ncs% load merge L3VPN04-multi-instance-2421.xml
[ok]
[edit]
admin@ncs% commit
Commit complete.
[ok]
```

3. Display the service plan to view and verify the status of the service. A successful plan in the ready reached state indicates the l3vpn-service definition is pushed onto the NSP controller.

```
admin@ncs% run show l3vpn-ntw vpn-services vpn-service-plan L3VPN04-multi-
instance-2421 plan
```

								POST
---	---	BACK	---	---	---	---	---	ACTION
TYPE	NAME	TRACK	GOAL	STATE	STATUS	WHEN	ref	STATUS
self	self	false	-	init	reached	2023-01-17T23:09:49	-	-
				ready	reached	2023-01-17T23:09:49	-	-

```
[ok]
```

Managing CHCO FP

Use the information in this section to understand the log directories for CHCO FP and how to delete the L2VPN/L3VPN services.

Maintaining Logs

The log data contains information about the operation and the usage patterns of the services.

The NED log (ned-nokia-nsp_rc-gen-1.0-nsp-0.trace) is available in the **/var/log/ncs** folder.

Deleting Services

Use the following command to delete L2VPN/L3VPN services. The service plan data is automatically removed if the service deletion is successful.

```
admin@ncs% delete l2vpn-ntw vpn-services vpn-service <l2vpn-service-name>
admin@ncs% delete l3vpn-ntw vpn-services vpn-service <l3vpn-service-name>
```

Example

```
admin@ncs% delete l2vpn-ntw vpn-services vpn-service PW01-tldp-interAS-A-55000-
1130
[ok]
[edit]
admin@ncs% commit
Commit complete.
[ok]
[edit]
admin@ncs% delete l3vpn-ntw vpn-services vpn-service L3VPN04-multi-instance-
2421
[ok]
[edit]
admin@ncs% commit
Commit complete.
[ok]
```

Appendix A - Yang Models

This topic contains the yang models for the CHCO FP services.

Ietf-l2vpn-ntw.yang

```
module: ietf-l2vpn-ntw
  +--rw l2vpn-ntw
    +--rw vpn-services
      +--rw vpn-service* [vpn-id]
      | +--rw vpn-id                       vpn-common:vpn-id
      | +--rw vpn-name?                    string
      | +--rw vpn-description?             string
      | +--rw customer-name?              string
      | +--rw parent-service-id?          vpn-common:vpn-id
      | +--rw vpn-type?                    identityref
      | +--rw vpn-service-topology?        identityref
      | +--rw signaling-type?             identityref
      | +--rw global-parameters-profiles
      | | +--rw global-parameters-profile* [profile-id]
      | |     +--rw profile-id                 string
      | |     +--rw (rd-choice)?
      | |     | +--:(directly-assigned)
      | |     | | +--rw rd?                     rt-types:route-
distinguisher
      | |     | +--:(directly-assigned-suffix)
      | |     | | +--rw rd-suffix?         uint16
      | |     | +--:(auto-assigned)
      | |     | | +--rw rd-auto
      | |     | |    +--rw (auto-mode)?
      | |     | |    | +--:(from-pool)
      | |     | |    | | +--rw rd-pool-name?   string
      | |     | |    | +--:(full-auto)
      | |     | |       +--rw auto?         empty
      | |     | +--:(auto-assigned-suffix)
      | |     | | +--rw rd-auto-suffix
      | |     | |    +--rw (auto-mode)?
      | |     | |    | +--:(from-pool)
      | |     | |    | | +--rw rd-pool-name?        string
      | |     | |    | +--:(full-auto)
      | |     | |       +--rw auto?                empty
```

```
|  |      |  +--:(no-rd)
|  |      |     +--rw no-rd?                    empty
|  |      +--rw vpn-target* [id]
|  |      |  +--rw id                     uint8
|  |      |  +--rw route-targets* [route-target]
|  |      |  |  +--rw route-target     rt-types:route-target
|  |      |  +--rw route-target-type     rt-types:route-target-
type
|  |      +--rw vpn-policies
|  |      |  +--rw import-policy?   string
|  |      |  +--rw export-policy?   string
|  |      +--rw local-autonomous-system?   inet:as-number
|  |      +--rw svc-mtu?                    uint32
|  |      +--rw ce-vlan-preservation?      boolean
|  |      +--rw ce-vlan-cos-preservation?   boolean
|  |      +--rw control-word-negotiation?   boolean
|  |      +--rw mac-policies
|  |      |  +--rw mac-addr-limit
|  |      |  |  +--rw mac-num-limit?   uint16
|  |      |  |  +--rw time-interval?   uint32
|  |      |  |  +--rw action?          identityref
|  |      |  +--rw mac-loop-prevention
|  |      |     +--rw window?           uint32
|  |      |     +--rw frequency?        uint32
|  |      |     +--rw retry-timer?      uint32
|  |      |     +--rw protection-type?   identityref
|  |      +--rw multicast-like {vpn-common:multicast}?
|  |         +--rw enabled?                  boolean
|  |         +--rw customer-tree-flavors
|  |            +--rw tree-flavor*   identityref
|  +--rw underlay-transport
|  |  +--rw (type)?
|  |     +--:(abstract)
|  |     |  +--rw transport-instance-id?   string
|  |     |  +--rw instance-type?           identityref
|  |     +--:(protocol)
|  |        +--rw protocol*                identityref
|  +--rw status
|  |  +--rw admin-status
```

```
|  |  |  +--rw status?        identityref
|  |  |  +--rw last-change?   yang:date-and-time
|  |  +--rw oper-status
|  +--rw vpn-nodes
|  |  +--rw vpn-node* [vpn-node-id]
|  |     +--rw vpn-node-id                       vpn-common:vpn-id
|  |     +--rw description?                      string
|  |     +--rw ne-id?                            string
|  |     +--rw role?                             identityref
|  |     +--rw router-id?                        rt-types:router-id
|  |     +--rw active-global-parameters-profiles
|  |     |  +--rw global-parameters-profile* [profile-id]
|  |     |     +--rw profile-id                -> /l2vpn-
ntw/vpn-services/vpn-service/global-parameters-profiles/global-
parameters-profile/profile-id
|  |     |        +--rw local-autonomous-system?   inet:as-number
|  |     |        +--rw svc-mtu?                   uint32
|  |     |        +--rw ce-vlan-preservation?      boolean
|  |     |        +--rw ce-vlan-cos-preservation?  boolean
|  |     |        +--rw control-word-negotiation?  boolean
|  |     |        +--rw mac-policies
|  |     |        |  +--rw mac-addr-limit
|  |     |        |  |  +--rw mac-num-limit?   uint16
|  |     |        |  |  +--rw time-interval?   uint32
|  |     |        |  |  +--rw action?          identityref
|  |     |        |  +--rw mac-loop-prevention
|  |     |        |     +--rw window?          uint32
|  |     |        |     +--rw frequency?       uint32
|  |     |        |     +--rw retry-timer?     uint32
|  |     |        |     +--rw protection-type?  identityref
|  |     |        +--rw multicast-like {vpn-common:multicast}?
|  |     |           +--rw enabled?                   boolean
|  |     |           +--rw customer-tree-flavors
|  |     |              +--rw tree-flavor*   identityref
|  |     +--rw status
|  |     |  +--rw admin-status
|  |     |  |  +--rw status?        identityref
|  |     |  |  +--rw last-change?   yang:date-and-time
|  |     |  +--rw oper-status
```

```
  |   |        +--rw bgp-auto-discovery
  |   |        |  +--rw (bgp-type)?
  |   |        |  |  +--:(l2vpn-bgp)
  |   |        |  |  |  +--rw vpn-id?              vpn-common:vpn-id
  |   |        |  |  +--:(evpn-bgp)
  |   |        |  |     +--rw evpn-type?           -> /l2vpn-ntw/vpn-
services/vpn-service/vpn-type
  |   |        |  |     +--rw auto-rt-enable?    boolean
  |   |        |  +--rw (rd-choice)?
  |   |        |  |  +--:(directly-assigned)
  |   |        |  |  |  +--rw rd?                  rt-types:route-
distinguisher
  |   |        |  |  +--:(directly-assigned-suffix)
  |   |        |  |  |  +--rw rd-suffix?           uint16
  |   |        |  |  +--:(auto-assigned)
  |   |        |  |  |  +--rw rd-auto
  |   |        |  |  |     +--rw (auto-mode)?
  |   |        |  |  |     |  +--:(from-pool)
  |   |        |  |  |     |  |  +--rw rd-pool-name?   string
  |   |        |  |  |     |  +--:(full-auto)
  |   |        |  |  |     |     +--rw auto?        empty
  |   |        |  |  +--:(auto-assigned-suffix)
  |   |        |  |  |  +--rw rd-auto-suffix
  |   |        |  |  |     +--rw (auto-mode)?
  |   |        |  |  |     |  +--:(from-pool)
  |   |        |  |  |     |  |  +--rw rd-pool-name?      string
  |   |        |  |  |     |  +--:(full-auto)
  |   |        |  |  |     |     +--rw auto?              empty
  |   |        |  |  +--:(no-rd)
  |   |        |  |     +--rw no-rd?              empty
  |   |        |  +--rw vpn-target* [id]
  |   |        |  |  +--rw id                 uint8
  |   |        |  |  +--rw route-targets* [route-target]
  |   |        |  |  |  +--rw route-target    rt-types:route-target
  |   |        |  |  +--rw route-target-type    rt-types:route-
target-type
  |   |        |  +--rw vpn-policies
  |   |        |     +--rw import-policy?   string
  |   |        |     +--rw export-policy?   string
```

```
      |  |        +--rw signaling-option
      |  |        |  +--rw advertise-mtu?                     boolean
      |  |        |  +--rw mtu-allow-mismatch?                boolean
      |  |        |  +--rw signaling-type?
identityref
      |  |        |  +--rw (signaling-option)?
      |  |        |     +--:(bgp)
      |  |        |     |  +--rw (bgp-type)?
      |  |        |     |     +--:(l2vpn-bgp)
      |  |        |     |     |  +--rw ce-id?                  uint16
      |  |        |     |     |  +--rw ce-range?               uint16
      |  |        |     |     |  +--rw pw-encapsulation-type?
identityref
      |  |        |     |     |  +--rw vpls-instance
      |  |        |     |     |     +--rw vpls-edge-id?        uint16
      |  |        |     |     |     +--rw vpls-edge-id-range?  uint16
      |  |        |     |     +--:(evpn-bgp)
      |  |        |     |        +--rw evpn-type?              ->
/l2vpn-ntw/vpn-services/vpn-service/vpn-nodes/vpn-node/bgp-auto-
discovery/evpn-type
      |  |        |     |        +--rw service-interface-type?
identityref
      |  |        |     |        +--rw evpn-policies
      |  |        |     |           +--rw mac-learning-mode?
identityref
      |  |        |     |           +--rw ingress-replication?
boolean
      |  |        |     |           +--rw p2mp-replication?
boolean
      |  |        |     |           +--rw arp-proxy {vpn-common:ipv4}?
      |  |        |     |           |  +--rw enable?
boolean
      |  |        |     |           |  +--rw arp-suppression?
boolean
      |  |        |     |           |  +--rw ip-mobility-threshold?
uint16
      |  |        |     |           |  +--rw duplicate-ip-detection-
interval?   uint16
      |  |        |     |           +--rw nd-proxy {vpn-common:ipv6}?
      |  |        |     |           |  +--rw enable?
boolean
```

```
  |   |      |      |                    |  +--rw nd-suppression?
boolean
  |   |      |      |                    |  +--rw ip-mobility-threshold?
uint16
  |   |      |      |                    |  +--rw duplicate-ip-detection-
interval?   uint16
  |   |      |      |                    +--rw underlay-multicast?
boolean
  |   |      |      |                    +--rw flood-unknown-unicast-
supression?   boolean
  |   |      |      |                    +--rw vpws-vlan-aware?
boolean
  |   |      |      |                    +--rw bum-management
  |   |      |      |                    |  +--rw discard-broadcast?
boolean
  |   |      |      |                    |  +--rw discard-unknown-multicast?
boolean
  |   |      |      |                    |  +--rw discard-unknown-unicast?
boolean
  |   |      |      |                    +--rw pbb
  |   |      |      |                       +--rw backbone-src-mac?
yang:mac-address
  |   |      |      +--:(ldp-or-l2tp)
  |   |      |         +--rw ldp-or-l2tp
  |   |      |            +--rw agi?    rt-types:route-distinguisher
  |   |      |            +--rw saii?                         uint32
  |   |      |            +--rw remote-targets* [taii]
  |   |      |            |  +--rw taii         uint32
  |   |      |            |  +--rw peer-addr?   inet:ip-address
  |   |      |            +--rw (ldp-or-l2tp)?
  |   |      |               +--:(ldp)
  |   |      |                  |  +--rw t-ldp-pw-type?
identityref
  |   |      |                  |  +--rw pw-type?
identityref
  |   |      |                  |  +--rw pw-description?      string
  |   |      |                  |  +--rw mac-addr-withdraw?   boolean
  |   |      |                  |  +--rw ac-pw-list* [peer-addr vc-id]
  |   |      |                  |  |  +--rw peer-addr       inet:ip-
address
  |   |      |                  |  |  +--rw vc-id           string
  |   |      |                  |  |  +--rw pw-priority?    uint32
```

```
| |      |               | +--rw qinq
| |      |               |    +--rw s-tag    uint32
| |      |               |    +--rw c-tag    uint32
| |      |            +--:(l2tp)
| |      |               +--rw router-id?            rt-
types:router-id
| |      |               +--rw pseudowire-type?
identityref
| |      +--rw vpn-network-accesses
| |         +--rw vpn-network-access* [id]
| |            +--rw id                       vpn-common:vpn-id
| |            +--rw description?             string
| |            +--rw interface-id?            string
| |            +--rw global-parameters-profile?   -> /l2vpn-
ntw/vpn-services/vpn-service/vpn-nodes/vpn-node/active-global-
parameters-profiles/global-parameters-profile/profile-id
| |            +--rw status
| |            | +--rw admin-status
| |            | | +--rw status?       identityref
| |            | | +--rw last-change?   yang:date-and-time
| |            | +--rw oper-status
| |            +--rw connection
| |            | +--rw l2-termination-point?   string
| |            | +--rw local-bridge-reference?   string
| |            | +--rw bearer-reference?       string {vpn-
common:bearer-reference}?
| |            | +--rw encapsulation
| |            | | +--rw encap-type?       identityref
| |            | | +--rw dot1q
| |            | | | +--rw tag-type?   identityref
| |            | | | +--rw cvlan-id?   uint16
| |            | | | +--rw rewrite
| |            | | |    +--rw (tag-choice)?
| |            | | |    | +--:(pop)
| |            | | |    | | +--rw pop?        enumeration
| |            | | |    | +--:(push)
| |            | | |    | | +--rw push?        empty
| |            | | |    | +--:(translate)
| |            | | |    |    +--rw translate?   enumeration
| |            | | |    +--rw cvlan-id?        uint16
```

```
| |                 | | |      +--rw direction?         enumeration
| |                 | | +--rw priority-tagged
| |                 | | | +--rw tag-type?   identityref
| |                 | | +--rw qinq
| |                 | |   +--rw tag-type?   identityref
| |                 | |   +--rw svlan-id    uint16
| |                 | |   +--rw cvlan-id    uint16
| |                 | +--rw lag-interface {vpn-common:lag-
interface}?
| |                 |   +--rw lag-interface-id?   string
| |                 |   +--rw lacp
| |                 |   | +--rw lacp-state?        boolean
| |                 |   | +--rw mode?              identityref
| |                 |   | +--rw speed?             uint32
| |                 |   | +--rw mini-link-num?     uint32
| |                 |   | +--rw system-id?         yang:mac-
address
| |                 |   | +--rw admin-key?         uint16
| |                 |   | +--rw system-priority?   uint16
| |                 |   | +--rw member-link-list
| |                 |   | | +--rw member-link* [name]
| |                 |   | |   +--rw name                string
| |                 |   | |   +--rw port-speed?         uint32
| |                 |   | |   +--rw mode?
identityref
| |                 |   | |   +--rw link-mtu?           uint32
| |                 |   | |   +--rw oam-802.3ah-link {oam-3ah}?
| |                 |   | |     +--rw enable?   boolean
| |                 |   | +--rw flow-control?      string
| |                 |   | +--rw lldp?              boolean
| |                 |   +--rw split-horizon
| |                 |     +--rw group-name?   string
| |               +--rw vpws-service-instance
| |               | +--rw (local-vsi-choice)?
| |               | | +--:(directly-assigned)
| |               | | | +--rw local-vpws-service-instance?
uint32
| |               | | +--:(auto-assigned)
| |               | |   +--rw local-vsi-auto
```

```
| |                | |            +--rw (auto-mode)?
| |                | |            | +--:(from-pool)
| |                | |            | | +--rw vsi-pool-name?   string
| |                | |            | +--:(full-auto)
| |                | |            |   +--rw auto?            empty
| |                | +--rw (remote-vsi-choice)?
| |                |    +--:(directly-assigned)
| |                |    | +--rw remote-vpws-service-instance?
uint32
| |                |    +--:(auto-assigned)
| |                |      +--rw remote-vsi-auto
| |                |         +--rw (auto-mode)?
| |                |            | +--:(from-pool)
| |                |            | | +--rw vsi-pool-name?   string
| |                |            | +--:(full-auto)
| |                |            |   +--rw auto?            empty
| |          +--rw group* [group-id]
| |          | +--rw group-id                    string
| |          | +--rw precedence?
identityref
| |          | +--rw ethernet-segment-identifier?   string
| |          +--rw ethernet-service-oam
| |          | +--rw md-name?        string
| |          | +--rw md-level?       uint8
| |          | +--rw cfm-802.1-ag
| |          | | +--rw n2-uni-c* [maid]
| |          | | | +--rw maid                string
| |          | | | +--rw mep-id?             uint32
| |          | | | +--rw mep-level?          uint32
| |          | | | +--rw mep-up-down?        enumeration
| |          | | | +--rw remote-mep-id?      uint32
| |          | | | +--rw cos-for-cfm-pdus?   uint32
| |          | | | +--rw ccm-interval?       uint32
| |          | | | +--rw ccm-holdtime?       uint32
| |          | | | +--rw ccm-p-bits-pri?     ccm-priority-
type
| |          | | +--rw n2-uni-n* [maid]
| |          | |    +--rw maid                string
| |          | |    +--rw mep-id?             uint32
```

```
| |                    | |       +--rw mep-level?         uint32
| |                    | |       +--rw mep-up-down?        enumeration
| |                    | |       +--rw remote-mep-id?      uint32
| |                    | |       +--rw cos-for-cfm-pdus?   uint32
| |                    | |       +--rw ccm-interval?       uint32
| |                    | |       +--rw ccm-holdtime?       uint32
| |                    | |       +--rw ccm-p-bits-pri?     ccm-priority-
type
| |                    | +--rw y-1731* [maid]
| |                    |    +--rw maid
string
| |                    |    +--rw mep-id?
uint32
| |                    |    +--rw pm-type?
identityref
| |                    |    +--rw remote-mep-id?
uint32
| |                    |    +--rw message-period?
uint32
| |                    |    +--rw measurement-interval?
uint32
| |                    |    +--rw cos?
uint32
| |                    |    +--rw loss-measurement?
boolean
| |                    |    +--rw synthethic-loss-measurement?
boolean
| |                    |    +--rw delay-measurement
| |                    |    | +--rw enable-dm?   boolean
| |                    |    | +--rw two-way?     boolean
| |                    |    +--rw frame-size?
uint32
| |                    |    +--rw session-type?
enumeration
| |            +--rw service
| |               +--rw mtu?
uint32
| |               +--rw svc-inbound-bandwidth {vpn-
common:inbound-bw}?
| |               | +--rw inbound-bandwidth* [bw-type]
| |               |    +--rw bw-type    identityref
```

```
   |   |                      |       +--rw cos-id?    uint8 {vpn-
common:qos}?
   |   |                      |       +--rw cir?       uint64
   |   |                      |       +--rw cbs?       uint64
   |   |                      |       +--rw eir?       uint64
   |   |                      |       +--rw ebs?       uint64
   |   |                      |       +--rw pir?       uint64
   |   |                      |       +--rw pbs?       uint64
   |   |                   +--rw svc-outbound-bandwidth {vpn-
common:outbound-bw}?
   |   |                   |  +--rw outbound-bandwidth* [bw-type]
   |   |                   |     +--rw bw-type    identityref
   |   |                   |     +--rw cos-id?    uint8 {vpn-
common:qos}?
   |   |                   |     +--rw cir?       uint64
   |   |                   |     +--rw cbs?       uint64
   |   |                   |     +--rw eir?       uint64
   |   |                   |     +--rw ebs?       uint64
   |   |                   |     +--rw pir?       uint64
   |   |                   |     +--rw pbs?       uint64
   |   |                   +--rw qos {vpn-common:qos}?
   |   |                   |  +--rw qos-classification-policy
   |   |                   |  |  +--rw rule* [id]
   |   |                   |  |     +--rw id
string
   |   |                   |  |     +--rw (match-type)?
   |   |                   |  |     |  +--:(match-flow)
   |   |                   |  |     |  |  +--rw match-flow
   |   |                   |  |     |  |     +--rw dscp?
inet:dscp
   |   |                   |  |     |  |     +--rw dot1q?
uint16
   |   |                   |  |     |  |     +--rw pcp?
uint8
   |   |                   |  |     |  |     +--rw src-mac-address?
yang:mac-address
   |   |                   |  |     |  |     +--rw dst-mac-address?
yang:mac-address
   |   |                   |  |     |  |     +--rw color-type?
identityref
```

```
       |  |              |  |      |  |      +--rw any?
empty
       |  |              |  |      |  +--:(match-application)
       |  |              |  |      |     +--rw match-application?
identityref
       |  |              |  |      +--rw target-class-id?
string
       |  |              |  +--rw qos-profile
       |  |              |     +--rw qos-profile* [profile]
       |  |              |        +--rw profile      string
       |  |              |        +--rw direction?   identityref
       |  |           +--rw mac-policies
       |  |           |  +--rw access-control-list* [name]
       |  |           |  |  +--rw name                    string
       |  |           |  |  +--rw src-mac-address*        yang:mac-
address
       |  |           |  |  +--rw src-mac-address-mask*   yang:mac-
address
       |  |           |  |  +--rw dst-mac-address*        yang:mac-
address
       |  |           |  |  +--rw dst-mac-address-mask*   yang:mac-
address
       |  |           |  |  +--rw action?
identityref
       |  |           |  |  +--rw rate-limit?             decimal64
       |  |           |  +--rw mac-loop-prevention
       |  |           |  |  +--rw window?            uint32
       |  |           |  |  +--rw frequency?         uint32
       |  |           |  |  +--rw retry-timer?       uint32
       |  |           |  |  +--rw protection-type?   identityref
       |  |           |  +--rw mac-addr-limit
       |  |           |     +--rw mac-num-limit?   uint16
       |  |           |     +--rw time-interval?   uint32
       |  |           |     +--rw action?          identityref
       |  |           +--rw broadcast-unknown-unicast-multicast
       |  |              +--rw multicast-site-type?
enumeration
       |  |              +--rw multicast-gp-address-mapping* [id]
       |  |              |  +--rw id                 uint16
       |  |              |  +--rw vlan-id?           uint32
```

```
        |   |                            |  +--rw mac-gp-address?    yang:mac-
address
        |   |                            |  +--rw port-lag-number?   uint32
        |   |                            +--rw bum-overall-rate?
uint32
        |   +--rw cisco-nsp-nm:nsp-controller?    ->
/ncs:devices/device/name
```

ietf-l3vpn-ntw.yang

```
module: ietf-l3vpn-ntw
  +--rw l3vpn-ntw
     +--rw vpn-services
        +--rw vpn-service* [vpn-id]
        |  +--rw vpn-id                       vpn-common:vpn-id
        |  +--rw vpn-name?                    string
        |  +--rw vpn-description?             string
        |  +--rw customer-name?              string
        |  +--rw parent-service-id?          vpn-common:vpn-id
        |  +--rw vpn-type?                   identityref
        |  +--rw vpn-service-topology?       identityref
        |  +--rw status
        |  |  +--rw admin-status
        |  |  |  +--rw status?         identityref
        |  |  |  +--rw last-change?   yang:date-and-time
        |  |  +--rw oper-status
        |  +--rw vpn-instance-profiles
        |  |  +--rw vpn-instance-profile* [profile-id]
        |  |     +--rw profile-id            string
        |  |     +--rw role?                 identityref
        |  |     +--rw local-as?             inet:as-number {vpn-
common:rtg-bgp}?
        |  |     +--rw (rd-choice)?
        |  |     |  +--:(directly-assigned)
        |  |     |  |  +--rw rd?                 rt-types:route-
distinguisher
        |  |     |  +--:(directly-assigned-suffix)
        |  |     |  |  +--rw rd-suffix?         uint16
        |  |     |  +--:(auto-assigned)
        |  |     |  |  +--rw rd-auto
```

```
|  |       |  |       +--rw (auto-mode)?
|  |       |  |       |  +--:(from-pool)
|  |       |  |       |  |  +--rw rd-pool-name?   string
|  |       |  |       |  +--:(full-auto)
|  |       |  |       |     +--rw auto?           empty
|  |       |  +--:(auto-assigned-suffix)
|  |       |  |  +--rw rd-auto-suffix
|  |       |  |     +--rw (auto-mode)?
|  |       |  |     |  +--:(from-pool)
|  |       |  |     |  |  +--rw rd-pool-name?       string
|  |       |  |     |  +--:(full-auto)
|  |       |  |     |     +--rw auto?               empty
|  |       |  +--:(no-rd)
|  |       |     +--rw no-rd?            empty
|  |       +--rw address-family* [address-family]
|  |       |  +--rw address-family    identityref
|  |       |  +--rw vpn-targets
|  |       |  |  +--rw vpn-target* [id]
|  |       |  |  |  +--rw id                 uint8
|  |       |  |  |  +--rw route-targets* [route-target]
|  |       |  |  |  |  +--rw route-target     rt-types:route-
target
|  |       |  |  |  +--rw route-target-type    rt-types:route-
target-type
|  |       |  |  +--rw vpn-policies
|  |       |  |     +--rw import-policy?   string
|  |       |  |     +--rw export-policy?   string
|  |       |  +--rw maximum-routes* [protocol]
|  |       |     +--rw protocol           identityref
|  |       |     +--rw maximum-routes?   uint32
|  |       +--rw multicast {vpn-common:multicast}?
|  |          +--rw tree-flavor?   identityref
|  |          +--rw rp
|  |          |  +--rw rp-group-mappings
|  |          |  |  +--rw rp-group-mapping* [id]
|  |          |  |     +--rw id                 uint16
|  |          |  |     +--rw provider-managed
|  |          |  |     |  +--rw enabled?
boolean
```

```
|  |              |  |          |  +--rw rp-redundancy?
boolean
|  |              |  |          |  +--rw optimal-traffic-delivery?
boolean
|  |              |  |          |  +--rw anycast
|  |              |  |          |     +--rw local-address?    inet:ip-
address
|  |              |  |          |     +--rw rp-set-address*   inet:ip-
address
|  |              |  |          +--rw rp-address            inet:ip-address
|  |              |  |          +--rw groups
|  |              |  |             +--rw group* [id]
|  |              |  |                +--rw id                        uint16
|  |              |  |                +--rw (group-format)
|  |              |  |                   +--:(group-prefix)
|  |              |  |                   |  +--rw group-address?
inet:ip-prefix
|  |              |  |                   +--:(startend)
|  |              |  |                      +--rw group-start?
inet:ip-address
|  |              |  |                      +--rw group-end?
inet:ip-address
|  |              |  +--rw rp-discovery
|  |              |     +--rw rp-discovery-type?   identityref
|  |              |     +--rw bsr-candidates
|  |              |        +--rw bsr-candidate-address*   inet:ip-
address
|  |              +--rw igmp {vpn-common:igmp and vpn-common:ipv4}?
|  |              |  +--rw static-group* [group-addr]
|  |              |  |  +--rw group-addr    rt-types:ipv4-multicast-
group-address
|  |              |  |  +--rw source-addr?  rt-types:ipv4-multicast-
source-address
|  |              |  +--rw max-groups?    uint32
|  |              |  +--rw max-entries?   uint32
|  |              |  +--rw version?       identityref
|  |              +--rw mld {vpn-common:mld and vpn-common:ipv6}?
|  |              |  +--rw static-group* [group-addr]
|  |              |  |  +--rw group-addr    rt-types:ipv6-multicast-
group-address
```

```
    |  |             |  |  +--rw source-addr?    rt-types:ipv6-multicast-
source-address
    |  |             |  +--rw max-groups?     uint32
    |  |             |  +--rw max-entries?    uint32
    |  |             |  +--rw version?        identityref
    |  |          +--rw pim {vpn-common:pim}?
    |  |             +--rw hello-interval?   rt-types:timer-value-
seconds16
    |  |             +--rw dr-priority?      uint32
    |  +--rw underlay-transport
    |  |  +--rw (type)?
    |  |     +--:(abstract)
    |  |     |  +--rw transport-instance-id?   string
    |  |     |  +--rw instance-type?           identityref
    |  |     +--:(protocol)
    |  |        +--rw protocol*               identityref
    |  +--rw external-connectivity {vpn-common:external-
connectivity}?
    |  |  +--rw (profile)?
    |  |     +--:(profile)
    |  |        +--rw profile-name?   string
    |  +--rw vpn-nodes
    |  |  +--rw vpn-node* [vpn-node-id]
    |  |     +--rw vpn-node-id                       vpn-common:vpn-
id
    |  |     +--rw description?                      string
    |  |     +--rw ne-id?                            string
    |  |     +--rw local-as?                         inet:as-number
{vpn-common:rtg-bgp}?
    |  |     +--rw router-id?                        rt-types:router-id
    |  |     +--rw active-vpn-instance-profiles
    |  |     |  +--rw vpn-instance-profile* [profile-id]
    |  |     |     +--rw profile-id              string
    |  |     |     +--rw router-id* [address-family]
    |  |     |     |  +--rw address-family    identityref
    |  |     |     |  +--rw router-id?        inet:ip-address
    |  |     |     +--rw local-as?               inet:as-number
{vpn-common:rtg-bgp}?
    |  |     |     +--rw (rd-choice)?
    |  |     |     |  +--:(directly-assigned)
```

```
|  |       |     |  | +--rw rd?                   rt-types:route-
distinguisher
|  |       |     |  +--:(directly-assigned-suffix)
|  |       |     |  | +--rw rd-suffix?        uint16
|  |       |     |  +--:(auto-assigned)
|  |       |     |  | +--rw rd-auto
|  |       |     |  |    +--rw (auto-mode)?
|  |       |     |  |    | +--:(from-pool)
|  |       |     |  |    | | +--rw rd-pool-name?   string
|  |       |     |  |    | +--:(full-auto)
|  |       |     |  |    |    +--rw auto?          empty
|  |       |     |  +--:(auto-assigned-suffix)
|  |       |     |  | +--rw rd-auto-suffix
|  |       |     |  |    +--rw (auto-mode)?
|  |       |     |  |    | +--:(from-pool)
|  |       |     |  |    | | +--rw rd-pool-name?       string
|  |       |     |  |    | +--:(full-auto)
|  |       |     |  |    |    +--rw auto?              empty
|  |       |     |  +--:(no-rd)
|  |       |     |     +--rw no-rd?           empty
|  |       |     +--rw address-family* [address-family]
|  |       |     | +--rw address-family   identityref
|  |       |     | +--rw vpn-targets
|  |       |     | | +--rw vpn-target* [id]
|  |       |     | | | +--rw id                    uint8
|  |       |     | | | +--rw route-targets* [route-target]
|  |       |     | | | | +--rw route-target     rt-
types:route-target
|  |       |     | | | +--rw route-target-type     rt-
types:route-target-type
|  |       |     | | +--rw vpn-policies
|  |       |     | |    +--rw import-policy?   string
|  |       |     | |    +--rw export-policy?   string
|  |       |     | +--rw maximum-routes* [protocol]
|  |       |     |    +--rw protocol         identityref
|  |       |     |    +--rw maximum-routes?   uint32
|  |       |     +--rw multicast {vpn-common:multicast}?
|  |       |        +--rw tree-flavor?   identityref
|  |       |        +--rw rp
```

```
         |  |       |            |  +--rw rp-group-mappings
         |  |       |            |  |  +--rw rp-group-mapping* [id]
         |  |       |            |  |     +--rw id                  uint16
         |  |       |            |  |     +--rw provider-managed
         |  |       |            |  |     |  +--rw enabled?
boolean
         |  |       |            |  |     |  +--rw rp-redundancy?
boolean
         |  |       |            |  |     |  +--rw optimal-traffic-delivery?
boolean
         |  |       |            |  |     |  +--rw anycast
         |  |       |            |  |     |     +--rw local-address?
inet:ip-address
         |  |       |            |  |     |     +--rw rp-set-address*
inet:ip-address
         |  |       |            |  |     +--rw rp-address          inet:ip-
address
         |  |       |            |  |     +--rw groups
         |  |       |            |  |        +--rw group* [id]
         |  |       |            |  |           +--rw id
uint16
         |  |       |            |  |           +--rw (group-format)
         |  |       |            |  |              +--:(group-prefix)
         |  |       |            |  |              |  +--rw group-address?
inet:ip-prefix
         |  |       |            |  |              +--:(startend)
         |  |       |            |  |                 +--rw group-start?
inet:ip-address
         |  |       |            |  |                 +--rw group-end?
inet:ip-address
         |  |       |            |  +--rw rp-discovery
         |  |       |            |     +--rw rp-discovery-type?   identityref
         |  |       |            |     +--rw bsr-candidates
         |  |       |            |        +--rw bsr-candidate-address*
inet:ip-address
         |  |       |         +--rw igmp {vpn-common:igmp and vpn-
common:ipv4}?
         |  |       |         |  +--rw static-group* [group-addr]
         |  |       |         |  |  +--rw group-addr    rt-types:ipv4-
multicast-group-address
         |  |       |         |  |  +--rw source-addr?  rt-types:ipv4-
multicast-source-address
```

```
|  |     |          | +--rw max-groups?     uint32
|  |     |          | +--rw max-entries?    uint32
|  |     |          | +--rw version?        identityref
|  |     |          +--rw mld {vpn-common:mld and vpn-
common:ipv6}?
|  |     |          | +--rw static-group* [group-addr]
|  |     |          | | +--rw group-addr     rt-types:ipv6-
multicast-group-address
|  |     |          | | +--rw source-addr?   rt-types:ipv6-
multicast-source-address
|  |     |          | +--rw max-groups?     uint32
|  |     |          | +--rw max-entries?    uint32
|  |     |          | +--rw version?        identityref
|  |     |          +--rw pim {vpn-common:pim}?
|  |     |             +--rw hello-interval?  rt-types:timer-
value-seconds16
|  |     |             +--rw dr-priority?     uint32
|  |     +--rw msdp {msdp}?
|  |     | +--rw peer?            inet:ipv4-address
|  |     | +--rw local-address?   inet:ipv4-address
|  |     | +--rw status
|  |     |    +--rw admin-status
|  |     |    | +--rw status?        identityref
|  |     |    | +--rw last-change?   yang:date-and-time
|  |     |    +--rw oper-status
|  |     +--rw groups
|  |     | +--rw group* [group-id]
|  |     |    +--rw group-id    string
|  |     +--rw status
|  |     | +--rw admin-status
|  |     | | +--rw status?        identityref
|  |     | | +--rw last-change?   yang:date-and-time
|  |     | +--rw oper-status
|  |     +--rw vpn-network-accesses
|  |        +--rw vpn-network-access* [id]
|  |           +--rw id                      vpn-common:vpn-
id
|  |           +--rw interface-id?           string
|  |           +--rw description?            string
|  |           +--rw vpn-network-access-type?  identityref
```

```
|  |                  +--rw vpn-instance-profile?      -> /l3vpn-
ntw/vpn-services/vpn-service/vpn-nodes/vpn-node/active-vpn-instance-
profiles/vpn-instance-profile/profile-id
|  |                  +--rw status
|  |                  |  +--rw admin-status
|  |                  |  |  +--rw status?        identityref
|  |                  |  |  +--rw last-change?   yang:date-and-time
|  |                  |  +--rw oper-status
|  |                  +--rw connection
|  |                  |  +--rw encapsulation
|  |                  |  |  +--rw type?                identityref
|  |                  |  |  +--rw dot1q
|  |                  |  |  |  +--rw tag-type?   identityref
|  |                  |  |  |  +--rw cvlan-id?   uint16
|  |                  |  |  +--rw priority-tagged
|  |                  |  |  |  +--rw tag-type?   identityref
|  |                  |  |  +--rw qinq
|  |                  |  |     +--rw tag-type?   identityref
|  |                  |  |     +--rw svlan-id    uint16
|  |                  |  |     +--rw cvlan-id    uint16
|  |                  |  +--rw (l2-service)?
|  |                  |  |  +--:(l2-tunnel-service)
|  |                  |  |  |  +--rw l2-tunnel-service
|  |                  |  |  |     +--rw type?        identityref
|  |                  |  |  |     +--rw pseudowire
|  |                  |  |  |     |  +--rw vcid?      uint32
|  |                  |  |  |     |  +--rw far-end?   union
|  |                  |  |  |     +--rw vpls
|  |                  |  |  |     |  +--rw vcid?      uint32
|  |                  |  |  |     |  +--rw far-end*   union
|  |                  |  |  |     +--rw vxlan
|  |                  |  |  |        +--rw vni-id             uint32
|  |                  |  |  |        +--rw peer-mode?
identityref
|  |                  |  |  |        +--rw peer-ip-address*   inet:ip-
address
|  |                  |  |  +--:(l2vpn)
|  |                  |  |     +--rw l2vpn-id?          vpn-
common:vpn-id
|  |                  |  +--rw l2-termination-point?      string
```

```
   |   |                 |  +--rw local-bridge-reference?    string
   |   |                 |  +--rw bearer-reference?          string {vpn-
common:bearer-reference}?
   |   |                 |  +--rw lag-interface {vpn-common:lag-
interface}?
   |   |                 |     +--rw lag-interface-id?   string
   |   |                 |     +--rw member-link-list
   |   |                 |        +--rw member-link* [name]
   |   |                 |           +--rw name    string
   |   |              +--rw ip-connection
   |   |                 |  +--rw l3-termination-point?   string
   |   |                 |  +--rw ipv4 {vpn-common:ipv4}?
   |   |                 |  |  +--rw local-address?
inet:ipv4-address
   |   |                 |  |  +--rw prefix-length?
uint8
   |   |                 |  |  +--rw address-allocation-type?
identityref
   |   |                 |  |  +--rw (allocation-type)?
   |   |                 |  |     +--:(provider-dhcp)
   |   |                 |  |     |  +--rw dhcp-service-type?
enumeration
   |   |                 |  |     |  +--rw (service-type)?
   |   |                 |  |     |     +--:(relay)
   |   |                 |  |     |     |  +--rw server-ip-address*
inet:ipv4-address
   |   |                 |  |     |     +--:(server)
   |   |                 |  |     |        +--rw (address-assign)?
   |   |                 |  |     |           +--:(number)
   |   |                 |  |     |           |  +--rw number-of-dynamic-
address?   uint16
   |   |                 |  |     |           +--:(explicit)
   |   |                 |  |     |              +--rw customer-addresses
   |   |                 |  |     |                 +--rw address-pool*
[pool-id]
   |   |                 |  |     |                    +--rw pool-id
string
   |   |                 |  |     |                    +--rw start-
address    inet:ipv4-address
   |   |                 |  |     |                    +--rw end-address?
inet:ipv4-address
```

```
   |  |                |  |         +--:(dhcp-relay)
   |  |                |  |         |  +--rw customer-dhcp-servers
   |  |                |  |         |     +--rw server-ip-address*
inet:ipv4-address
   |  |                |  |         +--:(static-addresses)
   |  |                |  |            +--rw primary-address?
string
   |  |                |  |            +--rw address* [address-id]
   |  |                |  |               +--rw address-id          string
   |  |                |  |               +--rw customer-address?
inet:ipv4-address
   |  |                |  +--rw ipv6 {vpn-common:ipv6}?
   |  |                |     +--rw local-address?
inet:ipv6-address
   |  |                |     +--rw prefix-length?               uint8
   |  |                |     +--rw address-allocation-type?
identityref
   |  |                |     +--rw (allocation-type)?
   |  |                |        +--:(provider-dhcp)
   |  |                |        |  +--rw provider-dhcp
   |  |                |        |     +--rw dhcp-service-type?
enumeration
   |  |                |        |     +--rw (service-type)?
   |  |                |        |        +--:(relay)
   |  |                |        |        |  +--rw server-ip-address*
inet:ipv6-address
   |  |                |        |        +--:(server)
   |  |                |        |           +--rw (address-assign)?
   |  |                |        |              +--:(number)
   |  |                |        |              |  +--rw number-of-
dynamic-address?   uint16
   |  |                |        |              +--:(explicit)
   |  |                |        |                 +--rw customer-
addresses
   |  |                |        |                    +--rw address-
pool* [pool-id]
   |  |                |        |                       +--rw pool-id
string
   |  |                |        |                       +--rw start-
address   inet:ipv6-address
   |  |                |        |                       +--rw end-
address?   inet:ipv6-address
```

```
   |   |               |          +--:(dhcp-relay)
   |   |               |          |   +--rw customer-dhcp-servers
   |   |               |          |       +--rw server-ip-address*
inet:ipv6-address
   |   |               |          +--:(static-addresses)
   |   |               |             +--rw primary-address?          ->
../address/address-id
   |   |               |             +--rw address* [address-id]
   |   |               |                +--rw address-id         string
   |   |               |                +--rw customer-address?
inet:ipv6-address
   |   |           +--rw routing-protocols
   |   |           |   +--rw routing-protocol* [id]
   |   |           |      +--rw id                 string
   |   |           |      +--rw type?              identityref
   |   |           |      +--rw routing-profiles* [id]
   |   |           |      |   +--rw id     string
   |   |           |      |   +--rw type?   identityref
   |   |           |      +--rw static
   |   |           |      |   +--rw cascaded-lan-prefixes
   |   |           |      |      +--rw ipv4-lan-prefixes* [lan next-
hop] {vpn-common:ipv4}?
   |   |           |      |      |   +--rw lan             inet:ipv4-
prefix
   |   |           |      |      |   +--rw lan-tag?      string
   |   |           |      |      |   +--rw next-hop      union
   |   |           |      |      |   +--rw bfd-enable?   boolean {vpn-
common:bfd}?
   |   |           |      |      |   +--rw metric?      uint32
   |   |           |      |      |   +--rw preference?  uint32
   |   |           |      |      |   +--rw status
   |   |           |      |      |      +--rw admin-status
   |   |           |      |      |      |   +--rw status?
identityref
   |   |           |      |      |      |   +--rw last-change?
yang:date-and-time
   |   |           |      |      |      +--rw oper-status
   |   |           |      |      +--rw ipv6-lan-prefixes* [lan next-
hop] {vpn-common:ipv6}?
   |   |           |      |         +--rw lan             inet:ipv6-
prefix
```

```
   |  |              |      |          +--rw lan-tag?       string
   |  |              |      |          +--rw next-hop       union
   |  |              |      |          +--rw bfd-enable?    boolean {vpn-
common:bfd}?
   |  |              |      |          +--rw metric?        uint32
   |  |              |      |          +--rw preference?    uint32
   |  |              |      |          +--rw status
   |  |              |      |             +--rw admin-status
   |  |              |      |             |  +--rw status?
identityref
   |  |              |      |             |  +--rw last-change?
yang:date-and-time
   |  |              |      |             +--rw oper-status
   |  |              |   +--rw bgp
   |  |              |   |  +--rw description?            string
   |  |              |   |  +--rw local-as?
inet:as-number
   |  |              |   |  +--rw peer-as
inet:as-number
   |  |              |   |  +--rw address-family?
identityref
   |  |              |   |  +--rw local-address?          string
   |  |              |   |  +--rw neighbor*
inet:ip-address
   |  |              |   |  +--rw multihop?               uint8
   |  |              |   |  +--rw as-override?            boolean
   |  |              |   |  +--rw allow-own-as?           uint8
   |  |              |   |  +--rw prepend-global-as?      boolean
   |  |              |   |  +--rw send-default-route?     boolean
   |  |              |   |  +--rw site-of-origin?         rt-
types:route-origin
   |  |              |   |  +--rw ipv6-site-of-origin?    rt-
types:ipv6-route-origin
   |  |              |   |  +--rw redistribute-connected* [address-
family]
   |  |              |   |  |  +--rw address-family    identityref
   |  |              |   |  |  +--rw enable?           boolean
   |  |              |   |  +--rw bgp-max-prefix
   |  |              |   |  |  +--rw max-prefix?         uint32
   |  |              |   |  |  +--rw warning-threshold?  decimal64
```

```
      |  |            |      |  |  +--rw violate-action?
enumeration
      |  |            |      |  |  +--rw restart-timer?        uint32
      |  |            |      |  +--rw bgp-timers
      |  |            |      |  |  +--rw keepalive?   uint16
      |  |            |      |  |  +--rw hold-time?   uint16
      |  |            |      |  +--rw authentication
      |  |            |      |  |  +--rw enable?              boolean
      |  |            |      |  |  +--rw keying-material
      |  |            |      |  |     +--rw (option)?
      |  |            |      |  |        +--:(ao)
      |  |            |      |  |        |  +--rw enable-ao?
boolean
      |  |            |      |  |        |  +--rw ao-keychain?
key-chain:key-chain-ref
      |  |            |      |  |        +--:(md5)
      |  |            |      |  |        |  +--rw md5-keychain?
key-chain:key-chain-ref
      |  |            |      |  |        +--:(explicit)
      |  |            |      |  |        |  +--rw key-id?
uint32
      |  |            |      |  |        |  +--rw key?
string
      |  |            |      |  |        |  +--rw crypto-algorithm?
identityref
      |  |            |      |  |        +--:(ipsec)
      |  |            |      |  |           +--rw sa?
string
      |  |            |      +--rw status
      |  |            |      |  +--rw admin-status
      |  |            |      |  |  +--rw status?        identityref
      |  |            |      |  |  +--rw last-change?   yang:date-
and-time
      |  |            |      |  +--rw oper-status
      |  |            |   +--rw ospf
      |  |            |      +--rw address-family?   identityref
      |  |            |      +--rw area-id           yang:dotted-
quad
      |  |            |      +--rw metric?           uint16
      |  |            |      +--rw sham-links {vpn-common:rtg-ospf-
sham-link}?
```

```
|  |                  |      |  | +--rw sham-link* [target-site]
|  |                  |      |  |    +--rw target-site    string
|  |                  |      |  |    +--rw metric?        uint16
|  |                  |      | +--rw max-lsa?         uint32
|  |                  |      | +--rw authentication
|  |                  |      | | +--rw enable?            boolean
|  |                  |      | | +--rw keying-material
|  |                  |      | |    +--rw (option)?
|  |                  |      | |       +--:(auth-key-chain)
|  |                  |      | |       | +--rw key-chain?
key-chain:key-chain-ref
|  |                  |      | |       +--:(auth-key-explicit)
|  |                  |      | |       | +--rw key-id?
uint32
|  |                  |      | |       | +--rw key?
string
|  |                  |      | |       | +--rw crypto-algorithm?
identityref
|  |                  |      | |       +--:(ipsec)
|  |                  |      | |          +--rw sa?
string
|  |                  |      | +--rw status
|  |                  |      |    +--rw admin-status
|  |                  |      |    | +--rw status?         identityref
|  |                  |      |    | +--rw last-change?   yang:date-
and-time
|  |                  |      |    +--rw oper-status
|  |                  |    +--rw isis
|  |                  |      | +--rw address-family?   identityref
|  |                  |      | +--rw area-address       area-address
|  |                  |      | +--rw level?             identityref
|  |                  |      | +--rw metric?            uint16
|  |                  |      | +--rw mode?              enumeration
|  |                  |      | +--rw authentication
|  |                  |      | | +--rw enable?            boolean
|  |                  |      | | +--rw keying-material
|  |                  |      | |    +--rw (option)?
|  |                  |      | |       +--:(auth-key-chain)
|  |                  |      | |       | +--rw key-chain?
key-chain:key-chain-ref
```

```
|  |                |     |  |              +--:(auth-key-explicit)
|  |                |     |  |                 +--rw key-id?
uint32
|  |                |     |  |                 +--rw key?
string
|  |                |     |  |                 +--rw crypto-algorithm?
identityref
|  |                |     +--rw status
|  |                |     |  +--rw admin-status
|  |                |     |  |  +--rw status?        identityref
|  |                |     |  |  +--rw last-change?   yang:date-
and-time
|  |                |     |     +--rw oper-status
|  |                |  +--rw rip
|  |                |  |  +--rw address-family?   identityref
|  |                |  |  +--rw timers
|  |                |  |  |  +--rw update-interval?     uint16
|  |                |  |  |  +--rw invalid-interval?    uint16
|  |                |  |  |  +--rw holddown-interval?   uint16
|  |                |  |  |  +--rw flush-interval?      uint16
|  |                |  |  +--rw default-metric?  uint8
|  |                |  |  +--rw authentication
|  |                |  |  |  +--rw enable?             boolean
|  |                |  |  |  +--rw keying-material
|  |                |  |  |     +--rw (option)?
|  |                |  |  |        +--:(auth-key-chain)
|  |                |  |  |        |  +--rw key-chain?
key-chain:key-chain-ref
|  |                |  |  |        +--:(auth-key-explicit)
|  |                |  |  |           +--rw key?
string
|  |                |  |  |           +--rw crypto-algorithm?
identityref
|  |                |  |  +--rw status
|  |                |  |     +--rw admin-status
|  |                |  |     |  +--rw status?        identityref
|  |                |  |     |  +--rw last-change?   yang:date-
and-time
|  |                |  |        +--rw oper-status
|  |                |  +--rw vrrp
```

```
      |  |           |           +--rw address-family?      identityref
      |  |           |           +--rw vrrp-group?          uint8
      |  |           |           +--rw backup-peer?         inet:ip-
address
      |  |           |           +--rw virtual-ip-address*  inet:ip-
address
      |  |           |           +--rw priority?            uint8
      |  |           |           +--rw ping-reply?          boolean
      |  |           |           +--rw status
      |  |           |              +--rw admin-status
      |  |           |              |  +--rw status?        identityref
      |  |           |              |  +--rw last-change?   yang:date-
and-time
      |  |           |              +--rw oper-status
      |  |        +--rw oam
      |  |        |  +--rw bfd {vpn-common:bfd}?
      |  |        |     +--rw session-type?
identityref
      |  |        |     +--rw desired-min-tx-interval?   uint32
      |  |        |     +--rw required-min-rx-interval?  uint32
      |  |        |     +--rw local-multiplier?          uint8
      |  |        |     +--rw holdtime?                  uint32
      |  |        |     +--rw profile?                   string
      |  |        |     +--rw authentication!
      |  |        |     |  +--rw key-chain?    key-chain:key-
chain-ref
      |  |        |     |  +--rw meticulous?   boolean
      |  |        |     +--rw status
      |  |        |        +--rw admin-status
      |  |        |           |  +--rw status?        identityref
      |  |        |           |  +--rw last-change?   yang:date-and-
time
      |  |        |           +--rw oper-status
      |  |        +--rw security
      |  |        |  +--rw encryption {vpn-common:encryption}?
      |  |        |  |  +--rw enabled?   boolean
      |  |        |  |  +--rw layer?     enumeration
      |  |        |  +--rw encryption-profile
      |  |        |     +--rw (profile)?
      |  |        |        +--:(provider-profile)
```

```
 |  |                |         | +--rw profile-name?        string
 |  |                |             +--:(customer-profile)
 |  |                |                 +--rw customer-key-chain?   key-
chain:key-chain-ref
 |  |             +--rw service
 |  |                +--rw inbound-bandwidth?    uint64 {vpn-
common:inbound-bw}?
 |  |                +--rw outbound-bandwidth?   uint64 {vpn-
common:outbound-bw}?
 |  |                +--rw mtu?                  uint32
 |  |                +--rw qos {vpn-common:qos}?
 |  |                |  +--rw qos-classification-policy
 |  |                |  |  +--rw rule* [id]
 |  |                |  |     +--rw id
string
 |  |                |  |     +--rw (match-type)?
 |  |                |  |     |  +--:(match-flow)
 |  |                |  |     |  |  +--rw (l3)?
 |  |                |  |     |  |  |  +--:(ipv4)
 |  |                |  |     |  |  |  |  +--rw ipv4
 |  |                |  |     |  |  |  |     +--rw dscp?
inet:dscp
 |  |                |  |     |  |  |  |     +--rw ecn?
uint8
 |  |                |  |     |  |  |  |     +--rw length?
uint16
 |  |                |  |     |  |  |  |     +--rw ttl?
uint8
 |  |                |  |     |  |  |  |     +--rw protocol?
uint8
 |  |                |  |     |  |  |  |     +--rw ihl?
uint8
 |  |                |  |     |  |  |  |     +--rw flags?
bits
 |  |                |  |     |  |  |  |     +--rw offset?
uint16
 |  |                |  |     |  |  |  |     +--rw identification?
uint16
 |  |                |  |     |  |  |  |     +--rw (destination-
network)?
 |  |                |  |     |  |  |  |     |  +--:(destination-
ipv4-network)
```

```
            |  |               |  |     |  |  |  |      |        +--rw
destination-ipv4-network?   inet:ipv4-prefix
            |  |               |  |     |  |  |  |      +--rw (source-
network)?
            |  |               |  |     |  |  |  |         +--:(source-ipv4-
network)
            |  |               |  |     |  |  |  |            +--rw source-
ipv4-network?        inet:ipv4-prefix
            |  |               |  |     |  |  +--:(ipv6)
            |  |               |  |     |  |     +--rw ipv6
            |  |               |  |     |  |        +--rw dscp?
inet:dscp
            |  |               |  |     |  |        +--rw ecn?
uint8
            |  |               |  |     |  |        +--rw length?
uint16
            |  |               |  |     |  |        +--rw ttl?
uint8
            |  |               |  |     |  |        +--rw protocol?
uint8
            |  |               |  |     |  |        +--rw (destination-
network)?
            |  |               |  |     |  |        |  +--:(destination-
ipv6-network)
            |  |               |  |     |  |        |     +--rw
destination-ipv6-network?   inet:ipv6-prefix
            |  |               |  |     |  |        +--rw (source-
network)?
            |  |               |  |     |  |        |  +--:(source-ipv6-
network)
            |  |               |  |     |  |        |     +--rw source-
ipv6-network?        inet:ipv6-prefix
            |  |               |  |     |  |        +--rw flow-label?
inet:ipv6-flow-label
            |  |               |  |     |  +--rw (l4)?
            |  |               |  |     |  |  +--:(tcp)
            |  |               |  |     |  |  |  +--rw tcp
            |  |               |  |     |  |  |     +--rw sequence-
number?                          uint32
            |  |               |  |     |  |  |     +--rw
acknowledgement-number?                 uint32
            |  |               |  |     |  |  |     +--rw data-offset?
uint8
```

```
   |  |                |  |     |  |     |        +--rw reserved?
uint8
   |  |                |  |     |  |     |        +--rw flags?
bits
   |  |                |  |     |  |     |        +--rw window-size?
uint16
   |  |                |  |     |  |     |        +--rw urgent-pointer?
uint16
   |  |                |  |     |  |     |        +--rw options?
binary
   |  |                |  |     |  |     |        +--rw (source-port)?
   |  |                |  |     |  |     |        |  +--:(source-port-
range-or-operator)
   |  |                |  |     |  |     |        |     +--rw source-
port-range-or-operator
   |  |                |  |     |  |     |        |        +--rw (port-
range-or-operator)?
   |  |                |  |     |  |     |        |           +--
:(range)
   |  |                |  |     |  |     |        |           |  +--rw
lower-port    inet:port-number
   |  |                |  |     |  |     |        |           |  +--rw
upper-port    inet:port-number
   |  |                |  |     |  |     |        |           +--
:(operator)
   |  |                |  |     |  |     |        |              +--rw
operator?     operator
   |  |                |  |     |  |     |        |              +--rw
port          inet:port-number
   |  |                |  |     |  |     |        +--rw (destination-
port)?
   |  |                |  |     |  |     |           +--:(destination-
port-range-or-operator)
   |  |                |  |     |  |     |              +--rw
destination-port-range-or-operator
   |  |                |  |     |  |     |                 +--rw (port-
range-or-operator)?
   |  |                |  |     |  |     |                    +--
:(range)
   |  |                |  |     |  |     |                    |  +--rw
lower-port    inet:port-number
   |  |                |  |     |  |     |                    |  +--rw
upper-port    inet:port-number
```

```
      |  |              |  |      |  |      |                  +--
:(operator)
      |  |              |  |      |  |      |                      +--rw
operator?     operator
      |  |              |  |      |  |      |                      +--rw
port          inet:port-number
      |  |              |  |      |  |   +--:(udp)
      |  |              |  |      |  |      +--rw udp
      |  |              |  |      |  |         +--rw length?
uint16
      |  |              |  |      |  |         +--rw (source-port)?
      |  |              |  |      |  |         |  +--:(source-port-
range-or-operator)
      |  |              |  |      |  |         |     +--rw source-
port-range-or-operator
      |  |              |  |      |  |         |        +--rw (port-
range-or-operator)?
      |  |              |  |      |  |         |           +--
:(range)
      |  |              |  |      |  |         |           |  +--rw
lower-port    inet:port-number
      |  |              |  |      |  |         |           |  +--rw
upper-port    inet:port-number
      |  |              |  |      |  |         |           +--
:(operator)
      |  |              |  |      |  |         |              +--rw
operator?     operator
      |  |              |  |      |  |         |              +--rw
port          inet:port-number
      |  |              |  |      |  |         +--rw (destination-
port)?
      |  |              |  |      |  |            +--:(destination-
port-range-or-operator)
      |  |              |  |      |  |               +--rw
destination-port-range-or-operator
      |  |              |  |      |  |                  +--rw (port-
range-or-operator)?
      |  |              |  |      |  |                     +--
:(range)
      |  |              |  |      |  |                     |  +--rw
lower-port    inet:port-number
      |  |              |  |      |  |                     |  +--rw
upper-port    inet:port-number
```

```
         |  |                  |  |     |  |                          +--
:(operator)
         |  |                  |  |     |  |                         +--rw
operator?     operator
         |  |                  |  |     |  |                         +--rw
port          inet:port-number
         |  |                  |  |     |  +--:(match-application)
         |  |                  |  |     |     +--rw match-application?
identityref
         |  |                  |  |        +--rw target-class-id?
string {qos}?
         |  |                  |  +--rw qos-action
         |  |                  |  |  +--rw rule* [id]
         |  |                  |  |     +--rw id                      string
         |  |                  |  |     +--rw target-class-id?        string
         |  |                  |  |     +--rw inbound-rate-limit?
decimal64
         |  |                  |  |     +--rw outbound-rate-limit?
decimal64
         |  |                  |  +--rw qos-profile
         |  |                  |     +--rw qos-profile* [profile]
         |  |                  |        +--rw profile      string
         |  |                  |        +--rw direction?   identityref
         |  |                  +--rw carriers-carrier {vpn-common:carriers-
carrier}?
         |  |                  |  +--rw signaling-type?   enumeration
         |  |                  +--rw ntp
         |  |                  |  +--rw broadcast?        enumeration
         |  |                  |  +--rw auth-profile
         |  |                  |  |  +--rw profile-id?   string
         |  |                  |  +--rw status
         |  |                  |     +--rw admin-status
         |  |                  |     |  +--rw status?         identityref
         |  |                  |     |  +--rw last-change?   yang:date-and-
time
         |  |                  |     +--rw oper-status
         |  |                  +--rw multicast {vpn-common:multicast}?
         |  |                     +--rw access-type?        enumeration
         |  |                     +--rw address-family?   identityref
         |  |                     +--rw protocol-type?      enumeration
         |  |                     +--rw remote-source?      boolean
```

```
|   |                              +--rw igmp {vpn-common:igmp}?
|   |                              |  +--rw static-group* [group-addr]
|   |                              |  |  +--rw group-addr     rt-types:ipv4-
multicast-group-address
|   |                              |  |  +--rw source-addr?   rt-types:ipv4-
multicast-source-address
|   |                              |  +--rw max-groups?        uint32
|   |                              |  +--rw max-entries?       uint32
|   |                              |  +--rw max-group-sources? uint32
|   |                              |  +--rw version?           identityref
|   |                              |  +--rw status
|   |                              |     +--rw admin-status
|   |                              |     |  +--rw status?       identityref
|   |                              |     |  +--rw last-change?  yang:date-
and-time
|   |                              |     +--rw oper-status
|   |                              +--rw mld {vpn-common:mld}?
|   |                              |  +--rw static-group* [group-addr]
|   |                              |  |  +--rw group-addr     rt-types:ipv6-
multicast-group-address
|   |                              |  |  +--rw source-addr?   rt-types:ipv6-
multicast-source-address
|   |                              |  +--rw max-groups?        uint32
|   |                              |  +--rw max-entries?       uint32
|   |                              |  +--rw max-group-sources? uint32
|   |                              |  +--rw version?           identityref
|   |                              |  +--rw status
|   |                              |     +--rw admin-status
|   |                              |     |  +--rw status?       identityref
|   |                              |     |  +--rw last-change?  yang:date-
and-time
|   |                              |     +--rw oper-status
|   |                              +--rw pim {vpn-common:pim}?
|   |                                 +--rw hello-interval?  rt-types:timer-
value-seconds16
|   |                                 +--rw dr-priority?     uint32
|   |                                 +--rw status
|   |                                    +--rw admin-status
|   |                                       |  +--rw status?       identityref
```

```
         |  |                                 |  +--rw last-change?   yang:date-
and-time
         |  |                              +--rw oper-status
         |  +--rw cisco-nsp-nm:nsp-controller? ->
ncs:devices/device/name
```