



**CCIE DevNet v1.0 Real Labs**

**Deploy Module**

**Lab 2 – Perpetual Motion Machine**

## Lab Workbook Policy

1. We highly discourage sharing of the workbook hence the workbooks are mapped to Laptop/Desktop MAC address. If one tries to open the workbook on desktop or laptop other than the registered MAC address; account will get locked and we will not unlock it for any reasons.
2. The workbook does not have print access; kindly do not request to enable to print access. You will have access to the documents for 120 days post that your document will not be accessible.
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12. We do not provide Refund in any circumstances once the product is sold.
13. The most Updated deploy workbooks are given 30 days before the Exam. Exam booking is manually verified using remote desktop.
14. If there is any update, one will receive the update automatically on their respective skype id.
15. Design Module will be given only 15 days before the CCIE exam .
17. CCIE Labs are always published in phases. For e.g. if there is a new lab we publish it as First, Second, Third ... till Final release.
18. Client who have purchased our workbooks and services and wishes to attempt the lab, need to consult our experts before their CCIE Lab.

## DevNet Expert Developer Environment

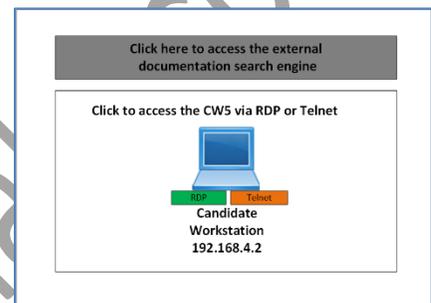
### Assigned Tasks to complete

Locate your exam tasks under “Exam Content”.

Any additional resources or Information that might be needed to complete a task can be found under “Resources”.

### Candidate Workstation (CWS)

The Candidate Workstation (CWS) is your workspace for writing code, accessing infrastructure components, and interacting with all development systems. It has the standard development tools and utilities installed and ready for your use.



It is an Ubuntu based desktop environment that can be accessed through RDP for a full GUI experience, Or through telnet if a pure command line interface is preferred.

To grab all keyboard events (such as Alt+Tab) in the RDP session, click the keyboard  icons in the toolbar (of the RDP session) on the left side.

Upon logging into your CWS, a web browser will open to a homepage that contains useful links for the tasks you will be working on. Also opening automatically is a terminal window that displays some useful Information for running code.

Note: Also, upon accessing your CWS for the first time, you’ll be promoted to “Choose a password for new keyring”. This password would be used if you were to save passwords within your web browser for accessing systems. You can set a passphrase or just “Cancel”. This prompt may come up twice.

### Source Code, Version Control, and CICD Tooling

All code repositories are located at `~/src/tasks`. There is one directory per question. Be sure to push all commits to the main branch in Gitlab.

GitLab can be accessed at <https://gitlab-01.ppm.example.com> from your Candidate Workstation.

All necessary configuration of your git, client, including ssh keys for communication, have been configured on your CWS for you. You will be able to commit and push without any changes.

### Python Virtual Environments

Python libraries and environments are already configured on your CWS and are as follows.

`~/venvs/main` - The primary virtual environment used for most tasks

`~/venvs/ansible` - A virtual environment with Ansible installed

`~/venvs/yangsuite` - A virtual environment with YANG Suite installed

Terminal sessions will automatically have the “main” venv activated.

The following terminal aliases have been created to change venvs if you need to do so:

`venvs-main`

`venvs-ansible`

`venvs-yangsuite`



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## PART1: DAY 0 Infrastructure Provisioning

### Welcome back to Perpetual Motion Machine!

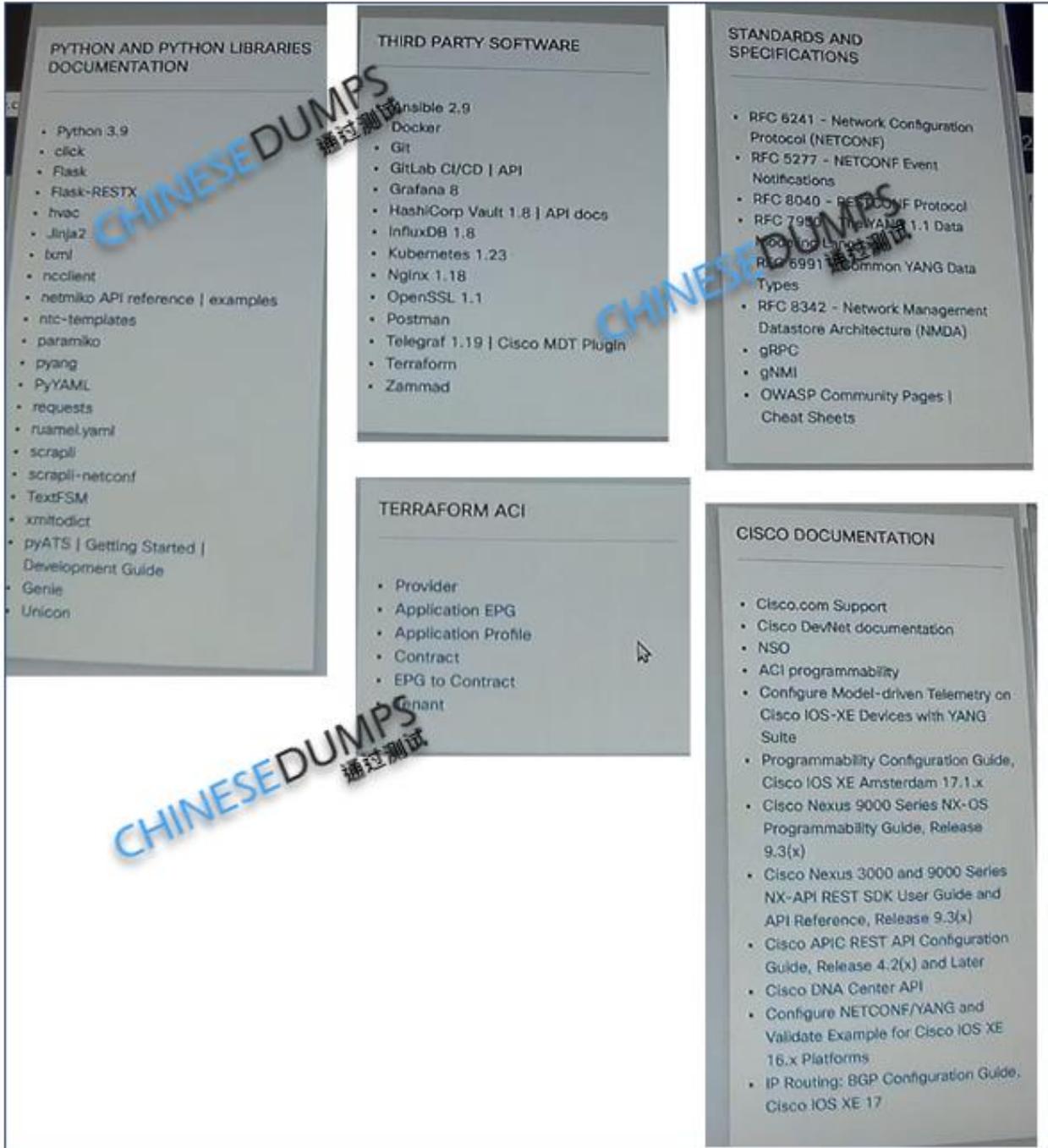
You will now develop, test, deploy, and maintain software solutions.

The topology that you will be working with will be similar, but not necessarily identical, to the network that was designed in the previous module. It might include technologies and feature sets that were not touched upon previously

The best of success!

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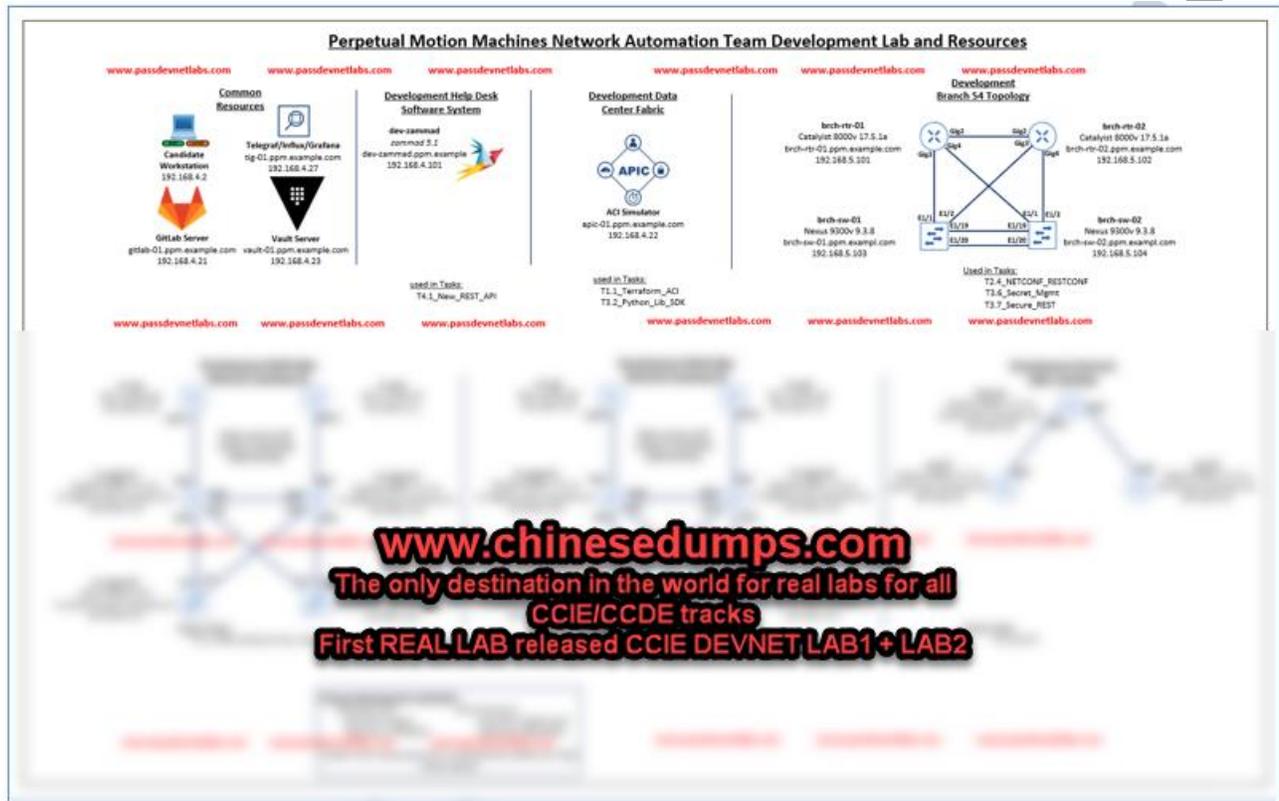
## External Documentation





## Diagrams

### PPM Network Diagram



## 1.2: Cisco NSO service package

Your leadership has instructed you to create a service to automate the provisioning of Layer 2 and Layer 3 networks and their corresponding access ports on the switches. The network will be provided in an IPv4 prefix format with a VLAN identifier. Each network will be given a unique name to be used when provisioning the ports.

### Service Design Requirements From the Network Architecture Team

- Ability to create a network based on name, prefix, description, and network identifier (VLAN ID)
- Ability to create Layer 2 and Layer 3 network characteristics (VLAN database, VLAN interface)
- The gateway address (SVI) must be the last available address within the prefix
- Ability to attach a network to a GigabitEthernet access port based on a lookup of available network names

Work has already begun on this service, and you must to complete these tasks:

- The `list networks` and `list access-ports` within the YANG model (`access-service.yang`) must be completed using this model:

```
module: access-service
  +-rw access-service* [device]
    +-rw device
      -> /ncs:devices/device/name
    +-rw networks* [name]
      | +-rw name          string
      | +-rw network-id   uint16
      | +-rw prefix       inet:ipv4-prefix
```

Note: The `networks/name` leaf provides the name of the network within the NSO `access-service`. The `networks/description` provides the name of the VLAN when configured on devices.

- The XML templates `access-service-network.xml` and `access-service-port.xml` must generate the required configuration to implement the final device configuration for the service.

This XML code was autogenerated on your behalf with sample values. These examples are starting points in the XML templates within the code.

- Access Service Network Template



```
Access Service Network Template
<vlan xmlns="urn:ios">
  <vlan-list>
    <id>10</id>
    <name>workstation</name>
  </vlan-list>
</vlan>
<interface xmlns="urn:ios">
  <Vlan>
    <name>10</name>
    <ip>
      <address>
        <primary>

```

- Access Service Port Template



```
Access Service Port Template
<interface xmlns="urn:ios">
  <GigabitEthernet>
    <name>0/1</name>
    <switchport>
      <mode>
        <access/>
      </mode>
    <access>

```

Note: The Python script and code that is required for this service is already completed, including the determination of the gateway address to be used for the SVI. No changes

should be made to the Python script.

Your solution should yield this CLI output from access-sw-01. The NetSim device `access-sw-01` is based on the `cisco-ios` NED:



```

vlan 100
 name workstation
vlan 200
 name voice
Interface Vlan100
 ip address 10.10.100.254 255.255.255.0
Interface Vlan200
 ip address 10.10.201.254 255.255.254.0
Interface GigabitEthernet0/1
 switchport access vlan 100

```

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and your solution within NSO should yield this CLI output:



```

admin@ncs# show running-config access-service access-sw-01
access-service access-sw-01
 networks voice
  network-id 200
  prefix 10.10.200.0/23
  description voice
 |
 networks workstation
  network-id 100
  prefix 10.10.100.0/24
  description workstation
 |
 access-ports 0/1

```

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## NSO Development Environment Details

An NSO local installation has been completed on your workstation in the ``${HOME}/nso` directory. ``${HOME}/nso/ncsrc` has been sourced as part of the bash profile configuration.

In the code directory for this task, you will find the `access-service` folder, which provides the initial state for your service package development. The YANG file and XML templates that you need to complete are located in the folder, as is the Python script that applies the configuration. No changes to the Python script are necessary to complete this task.

The `setup-nso.sh` script has been executed already. It sets up NSO within the code directory for this task, along with a NetSim IOS device for development and testing.

The `clean-nso.sh` script can be run to delete the NSO development environment. You can re-run `setup-nso.sh` to reset NSO and Netsim.

The `start-nso.sh` script is available to restart the NetSim device and NSO if they are stopped.

**Your complete and functional service must be committed to the Git repository for the project and pushed to GitLab. Make sure to merge your updates into the main branch**

3 points

You have to give permission in our lab you do not have to do this in Cisco lab

```
(main) expert@expert-cws:~/src/tasks/T1.2_NS0$ chmod +x *.sh
(main) expert@expert-cws:~/src/tasks/T1.2_NS0$ ls
access-service clean-nso.sh setup-nso.sh start-nso.sh
(main) expert@expert-cws:~/src/tasks/T1.2_NS0$
```

In Lab this should be our first step

```
(main) expert@expert-cws:~/src/tasks/T1.2_NS0$ bash setup-nso.sh
DEVICE access-sw-01 CREATED
DEVICE access-sw-01 OK STARTED
Using netsim dir /home/expert/src/tasks/T1.2_NS0/netsim
sync-result {
  device access-sw-01
```

Now we just have to modify 3 files to complete this task.

access-service-network.xml  
access-service-ports.xml  
access-service.yang

access-service-network.xml

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The screenshot shows an IDE with the following content:

- Explorer: `access-service-network.xml`, `access-service-port.xml`, `access-service.yang`, `templates`, `access-service-network.xml`, `access-service-port.xml`
- Code Editor: `access-service-network.xml` with XML content:

```
<config-template xmlns="http://tail-f.com/ns/config/1.0">
  <devices xmlns="http://tail-f.com/ns/nics">
    <device>
      <!--
        Select the devices from some data structure in the service
        model. In this skeleton the devices are specified in a leaf-list.
        Select all devices in that leaf-list:
      -->
      <name>access-sw-01</name>
      <!--
        TODO: Modify this sample device configuration to create the configuration
        rendered based on the access-service definition.
      -->
    <config>
      <vlan xmlns="urn:ios">
        <vlan-list>
          <id>{SVLAN_ID}</id>
```

Overlaid text on the screenshot:

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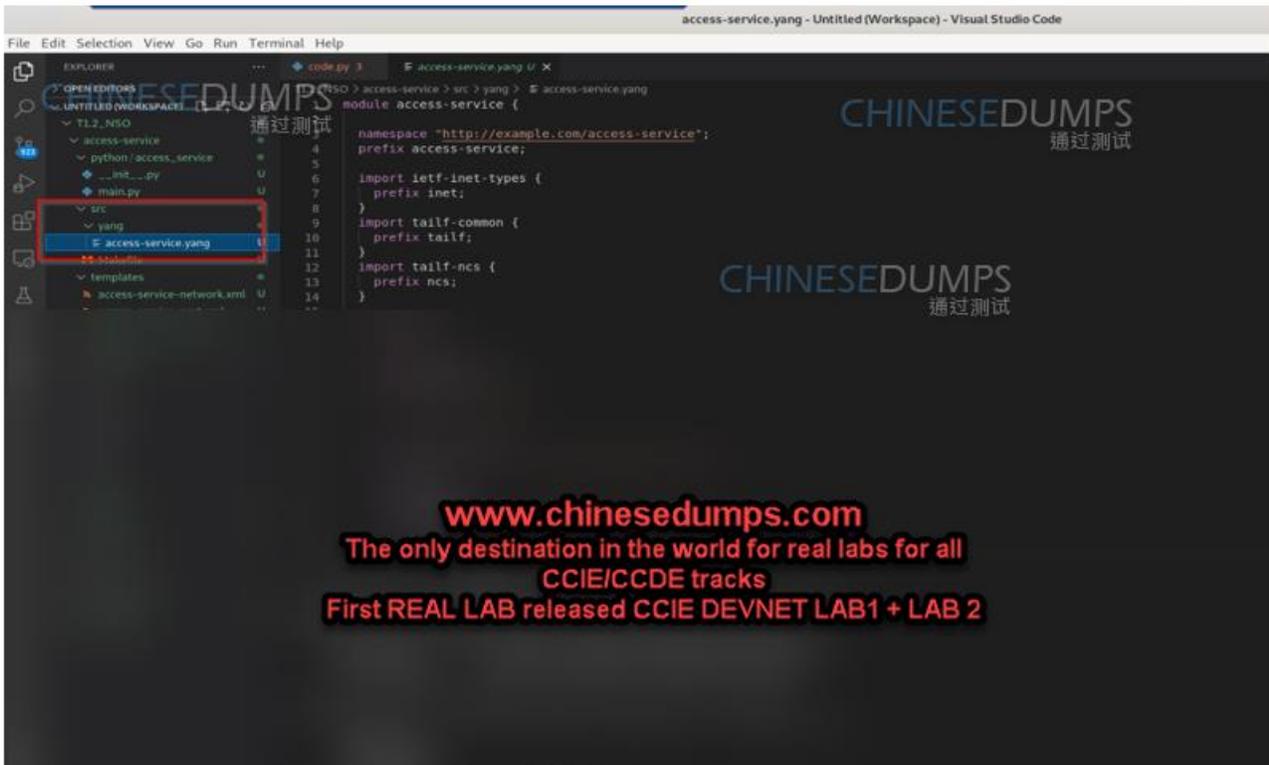
access-service-ports.xml

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access-service.yang



You have to replace here

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```
list access-service {
  description "This is an RFS skeleton service";
  key device;
  leaf device {
    type leafref {
      path "/ncs:devices/ncs:device/ncs:name";
    }
  }
}

// TODO: Complete the definition of the list of networks aligned to the
// model description provided in the question.
list networks {
}
```

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You have modified this and save the file.

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The screenshot shows an IDE window with the following content:

```

T1.2_NS0 > access-service > src > yang > access-service.yang
26 leaf device {
29   type leafref {
30     path "/ncs:devices/ncs:device/ncs:name";
31   }
32 }
33
34 list networks {
35   key name;
36   leaf name {
37     tailf:info "Service Instance Name";
38     type string;
39   }
40   leaf network-id {
41     tailf:info "VLAN ID";
42     type uint16;

```

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Verification: -

The terminal screenshot shows the following command and output:

```

(main) expert@expert-01:~/ncs/tasks/T1.2_NS0/access-service/src$ cd yang
(main) expert@expert-01:~/ncs/tasks/T1.2_NS0/access-service/src/yang$ pyang -f tree --tree-depth=3 access-service.yang
module: access-service
  +-rw access-service* [device]
  +-rw device
  +-rw networks* [name]
  | +-rw name string
  | +-rw network-id uint16
  | +-rw prefix inet:ipv4-prefix
  | +-rw description string

```

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After we configure above file you have to configure make this is compulsory to recompile the file perfectly.

```

(main) expert@expert-cws:~/src/tasks/T1.2_NS0/access-service/src/yang$ cd ..
(main) expert@expert-cws:~/src/tasks/T1.2_NS0/access-service/src$ make
mkdir -p ../load-dir
mkdir -p java/src//
/home/expert/nso/bin/ncsc ls access-service-ann.yang > /dev/null 2>&1 && echo "-a access-service-ann.yang" \
-c -o ../load-dir/access-service.fxs yang/access-service.yang
(main) expert@expert-cws:~/src/tasks/T1.2_NS0/access-service/src$

-----
(main) expert@expert-cws:~/src/tasks/T1.2_NS0/access-service/src$ ncs_cli -u admin -c
User admin last logged in 2022-12-14T00:59:29.923416+00:00, to expert-cws, from 127.0.0.1 using cli-console
admin connected from 127.0.0.1 using console on expert-cws
admin@ncs#

-----
(main) expert@expert-cws:~/src/tasks/T1.2_NS0/access-service/src$ ncs_cli -u admin -c
User admin last logged in 2022-12-14T00:59:29.923416+00:00, to expert-cws, from 127.0.0.1 using cli-console
admin connected from 127.0.0.1 using console on expert-cws
admin@ncs# packages reload
>>> System upgrade is starting.

```

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```

admin connected from 127.0.0.1 using console on expert-cws
admin@n3s# config t
Enter configuration mode
admin@n3s(config)# access-service access-sw-01 networks voice network-id 200 prefix 10.10.200.0/23 description voice
admin@n3s(config-networks-voice)# top
admin@n3s(config)# access-service access-sw-01 networks workstation network-id 100 prefix 10.10.100.0/24 description workstation
admin@n3s(config-networks-workstation)# access-service access-sw-01 access-ports 0/1 network workstation
admin@n3s(config-access-ports-0/1)# top
admin@n3s(config)# access-service access-sw-01 access-ports 0/2 network voice
admin@n3s(config-access-ports-0/2)# top
admin@n3s(config)# commit dry-run
11 /

```

```

local-node {
  data +access-service access-sw-01 {
    + networks voice {
    +   network-id 200;
    +   prefix 10.10.200.0/23;
    +   description voice;
    + }
    + networks workstation {
    +   network-id 100;
    +   prefix 10.10.100.0/24;
    +   description workstation;
    + }
  }
}

```

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```
Commit complete.  
admin@n3s# show running-config access-service access-sw-01  
access-service access-sw-01  
networks voice  
network-id 200  
prefix 10.10.200.0/23  
description voice  
!  
networks workstation  
network-id 100  
prefix 10.10.100.0/24  
description workstation  
!
```

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