Build a Configuration

Build a Configuration Overview

In the build phase, you build the configurations for each node. After selecting the options for the overall topology and each node, you create the configuration files. Alternatively, you can use AutoNetkit to create the configuration files.

You can modify and save configuration files for the topology and for each node in your topology.

Create and Modify a Node Configuration

While AutoNetkit is useful for generating configuration files for all the nodes in the topology, you can bypass AutoNetkit and enter node configuration information directly.

You can enter configuration information in either of the following ways:

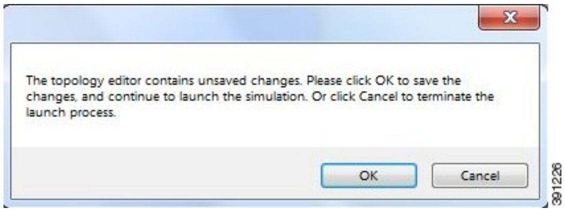
- During the design phase, copy and paste configuration commands for each node.
- During the simulation phase, connect to a node console and change its configuration when the topology is running. See the chapter Simulate the Topology for more information on how to modify, extract, and save a running configuration.

Note When you create your configuration files:

- Changes that are manually entered are not visible in the topology design. If you create a new interface by entering configuration commands, the interface is not created in OpenStack nor does the interface show up in any of the node views.
- Depending on how the AutoNetkit **Auto-generate the configuration based on these attributes** feature is set, you may overwrite the changes you enter.

While in the **Design** perspective, any changes you manually make to a node configuration are saved in the current filename .virl file. Before you launch a simulation from the **Design** perspective, a notification window advises you to save the changes or cancel the simulation launch.

Figure 1: Save Changes Before Launch



The topology editor contains unsaved changes. Please click OK to save the changes, and continue to launch the simulation. Or click Cancel to terminate the launch process.

Create a Node Configuration Manually

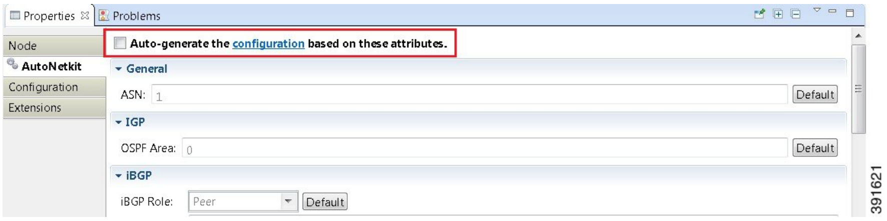
Before You Begin

The topology design should be complete.

Step 1 In the **Topology Editor**, click a node.

Step 2 In the **Properties** view, click **AutoNetkit** and uncheck the **Auto-generate the configuration based on these attributes** check box.

Figure 2: Uncheck Auto-generate Check Box



□ Auto-generate the configuration based on these attributes.

General

ASN: 1

IGP

OSPF Area: 0

iBGP

iBGP Role: Peer

Step 3 Click the **Configuration** tab.

Step 4 Enter the configuration commands in the **Configuration** view.

Note All changes are automatically saved to the filename .virl file. However, the changes made do not appear in the topology on the canvas.

Use an Existing Node Configuration

You can use an existing configuration file to create a node configuration in Cisco Modeling Labs.

Before You Begin

The topology design should be complete.

Step 1 In the **Topology Editor**, click a node.

Step 2 In the **Properties** view, click **AutoNetkit** and uncheck the **Auto-generate the configuration based on these attributes** check box.

Step 3 Click the **Configuration** tab.

a) Open the configuration file you want to use and copy the configuration commands.

b) In the **Configuration** view, paste the configuration commands.

Note All changes are automatically saved to the *filename*.virl file. However, the changes made do not appear in the topology on the canvas.

What to Do Next

Launch a simulation to observe the changes.

Import the Configuration from Other Types of Files

For this version of Cisco Modeling Labs, you are able to import configurations from a number of other file types, such as, Cariden MATE, Visio, GNS3 to name a few. These are discussed in the following sections.

Import the Configuration from a Cariden MATE File

You can import a topology from an existing Cariden MATE file, version 5.2.0 or later or version 6.1.0. Cisco Modeling Labs client will accept site imports up to two layers deep. Any Cariden MATE file that has a topology with more than two layers of sites will not import correctly.

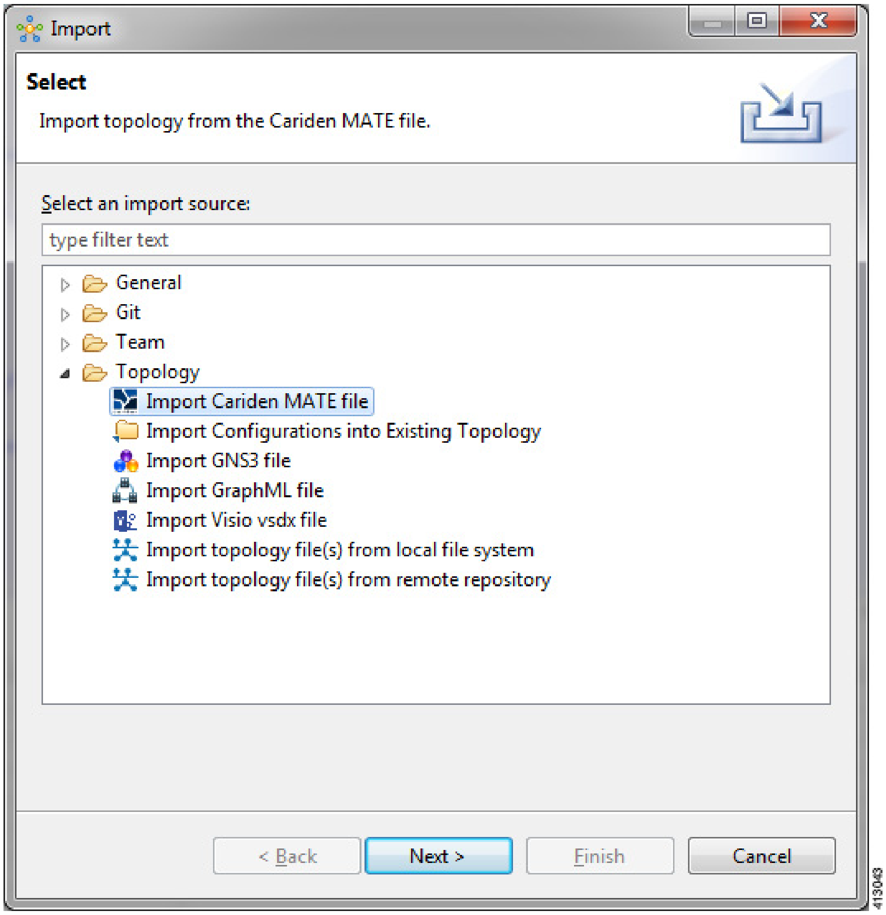
Before You Begin

- A valid Cariden MATE file is available on your file system.
- Cisco Modeling Labs client is running.
- Your license allows Cariden MATE file import.

Step 1 Choose **File** > **Import**.
A window appears, prompting you to Import Cariden MATE file.

Step 2 Choose **Import Cariden MATE File** then click **Next**.

Figure 3: Import Cariden MATE File



Import

Select

Import topology from the Cariden MATE file.

Select an import source:

type filter text

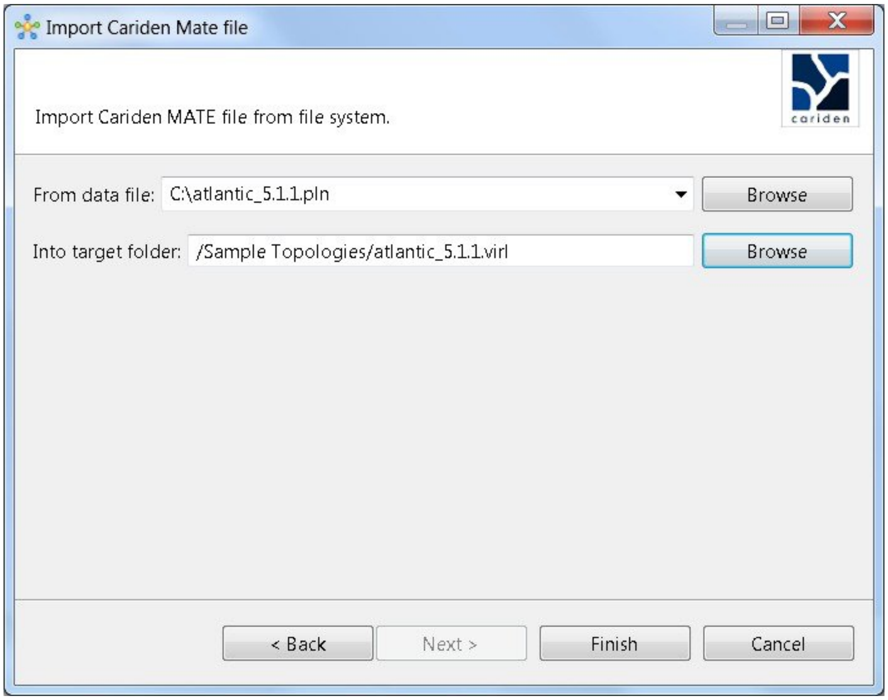
- General
- Git
- Team
- Topology
  - Import Cariden MATE file
  - Import Configurations into Existing Topology
  - Import GNS3 file
  - Import GraphML file
  - Import Visio vsdx file
  - Import topology file(s) from local file system
  - Import topology file(s) from remote repository

< Back | Next > | Finish | Cancel

Step 3 Choose the **From data file** Cariden MATE file to import. Use **Browse** to select the directory and file to import.

Step 4 Choose the location **Into target folder** for the Cariden MATE file. Use **Browse** to select the target Project folder.

Figure 4: Choose the From and To Locations



Import Cariden Mate file

Import Cariden MATE file from file system.

From data file: C:\atlantic_5.1.1.pln

Into target folder: /Sample Topologies/atlantic_5.1.1.virl

Step 5 Enter a filename for the imported Cariden MATE file.

Important The filename you enter must have the extension .virl. For example, **Lab_import.virl** is a valid filename. Otherwise, you cannot open the file in the topology editor.

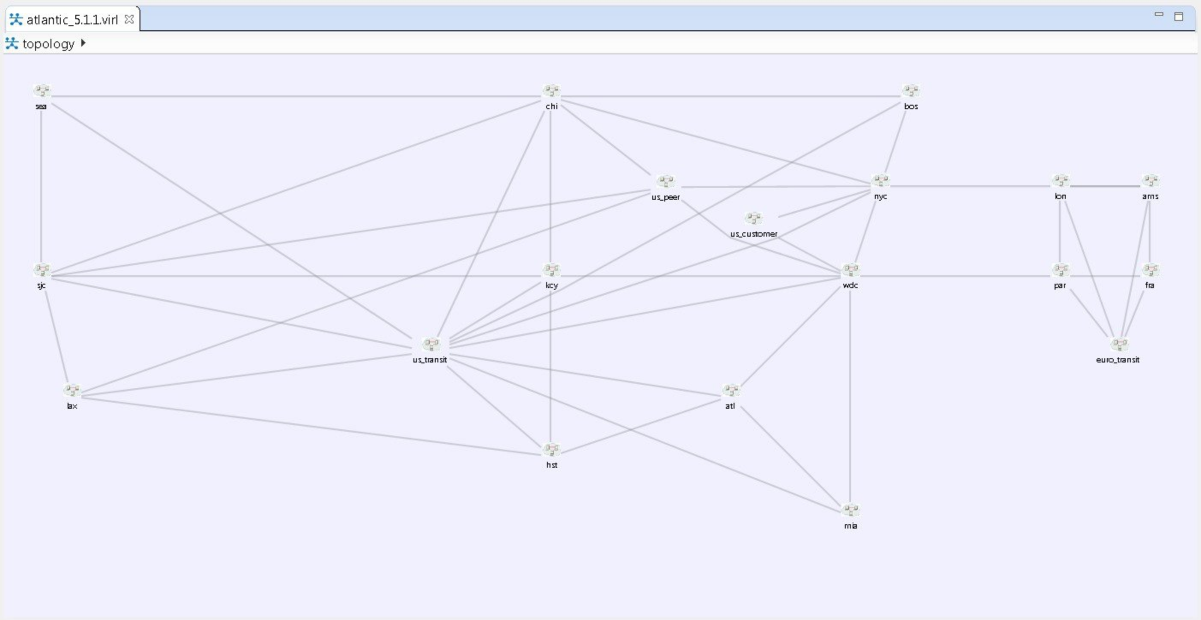
The Cariden MATE file converts to a Cisco Modeling Labs .virl file.

Step 6 In the **Projects** view, expand the project folder where you saved the imported file.

Step 7 Right click on the imported file, for example, **Lab_import.virl** and choose **Open With** > **Topology Editor**.

The canvas opens and displays the topology.

Figure 5: Imported Cariden MATE File



Export the Configuration to Cariden MATE File

Before You Begin

- Cisco Modeling Labs client is running.
- A topology is open in the Topology Editor.
- Your license allows Cariden MATE file export.

Step 1 Choose **File** > **Export**.
A window appears, prompting you to **Export to Cariden MATE file**.

Step 2 Choose **Export Cariden MATE File** then click **Next**.

Step 3 Choose the location **To file** for the Cariden MATE file export. Use **Browse** to select the target Project folder.

Step 4 Enter a filename for the exported Cariden MATE file, or use the default filename. For example, **sample_topology.virl** is converted to **sample_topology.pln** and saved in the target directory.

Step 5 Click **Finish**.
The Cisco Modeling Labs .virl file silently converts to a Cariden MATE .pln file.

Import the Configuration from a Visio vsdx File

You can import a topology from an existing Visio .vsdx file, version 2013 and later.

Before You Begin

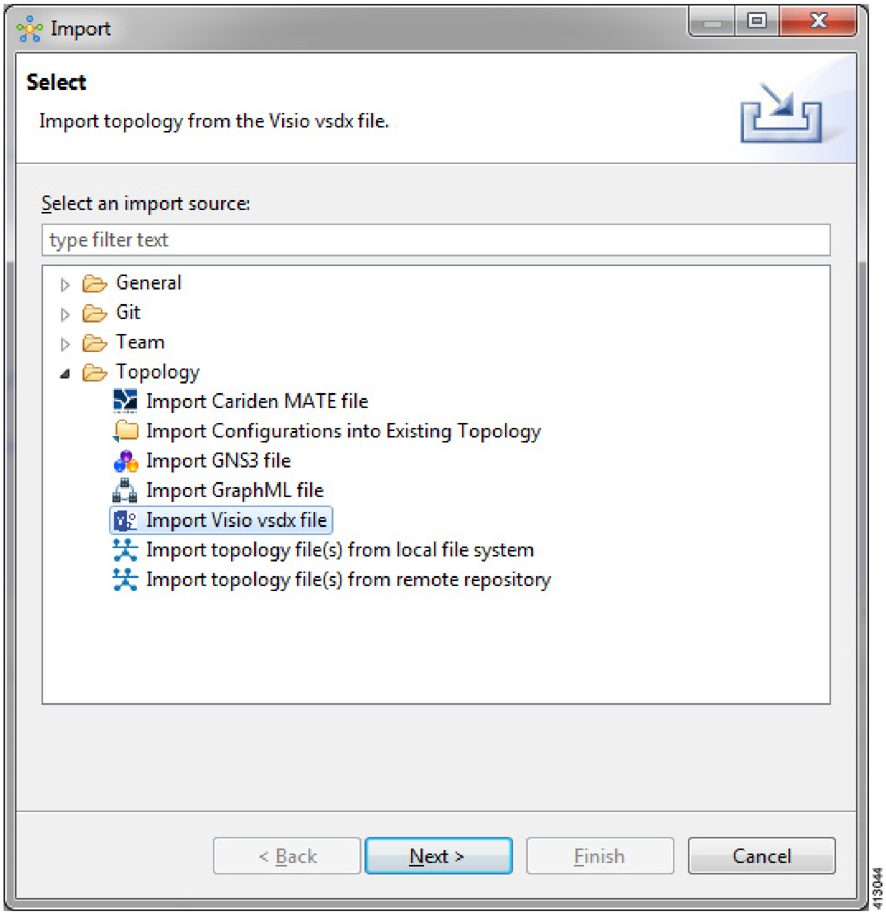
- A valid Visio file is available on your file system.
- Cisco Modeling Labs client is running.
- Your license allows Visio file import.

Step 1 Choose **File** > **Import**.

The **Import** dialog box appears.

Step 2 Expand the **Topology** folder, choose **Import Visio vsdx File** and click **Next**.

Figure 6: Import Visio vsdx File



Import

Select

Import topology from the Visio vsdx file.

Select an import source:

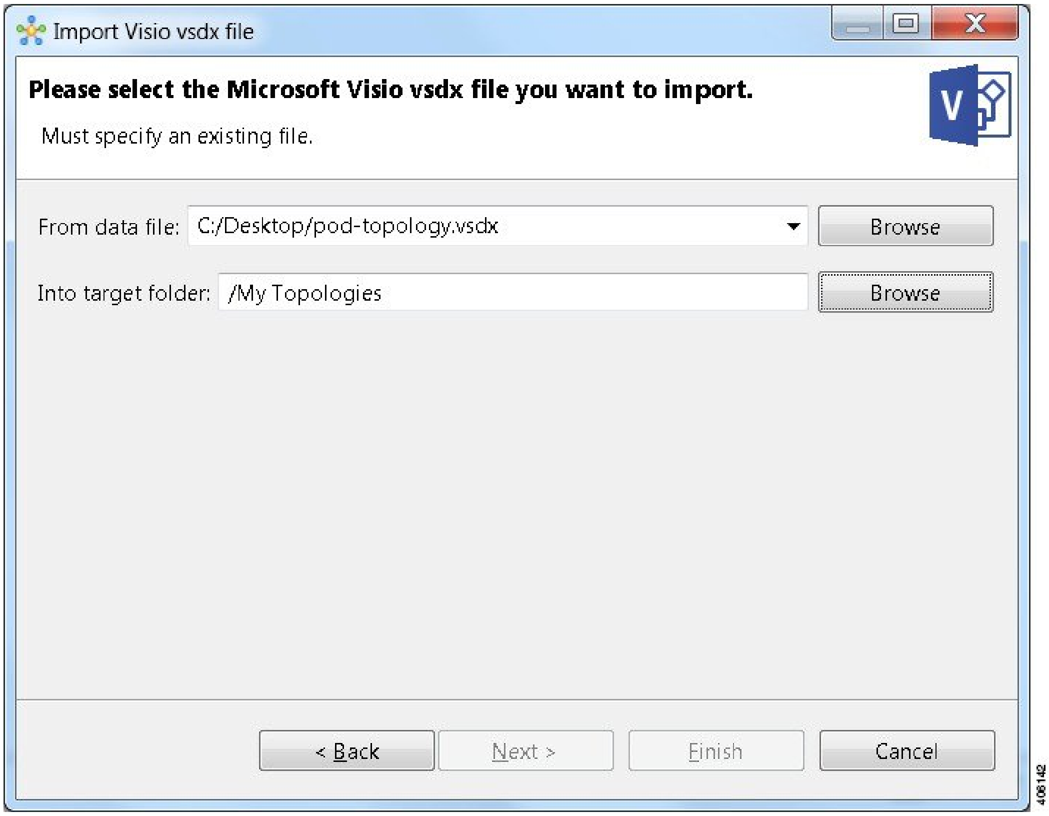
type filter text

General
Git
Team
Topology
Import Cariden MATE file
Import Configurations into Existing Topology
Import GNS3 file
Import GraphML file
Import Visio vsdx file
Import topology file(s) from local file system
Import topology file(s) from remote repository
< Back
Next >
Finish
Cancel
413044

Step 3 Choose the **From data file** Visio .vsdx file to import. Use **Browse** to select the directory and file to import.

Step 4 Choose the location **Into target folder** for the Visio .vsdx file. Use **Browse** to select the target Project folder.

Figure 7: Choose the From and To Locations



Import Visio vsdx file

Please select the Microsoft Visio vsdx file you want to import.

Must specify an existing file.

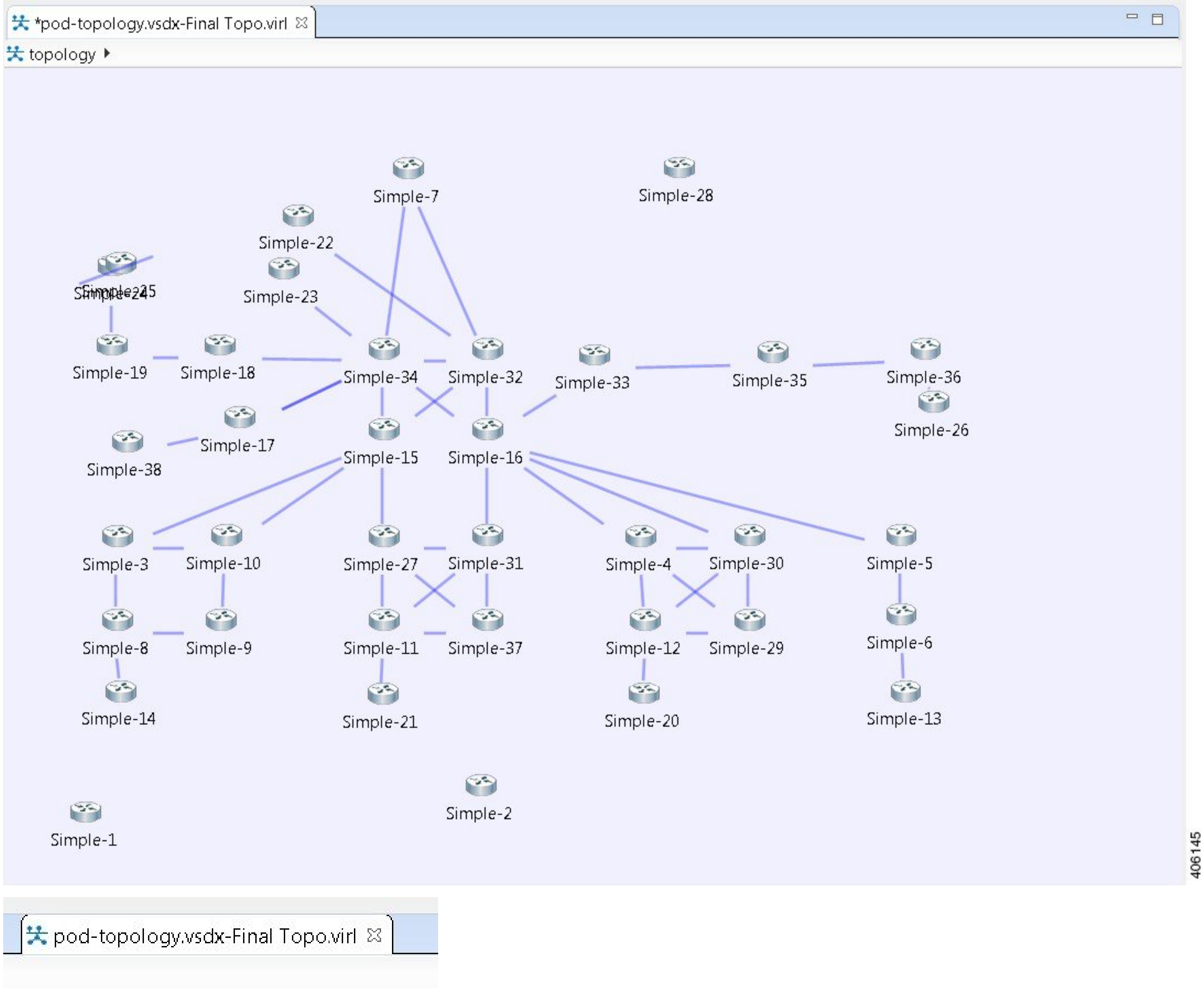
From data file: C:/Desktop/pod-topology.vsdx

Into target folder: /My Topologies

Step 5 Click **Finish**.

The Visio .vsdx file converts to a Cisco Modeling Labs .virl file, using the original filename of the file and it is automatically opened on the canvas.

Figure 8: Imported Visio .vsdx File



Note In this example, the file **pod-topology.vsdx** has been renamed by Cisco Modeling Labs to **pod-topology.vsdx-Final Topo**.virl. We recommend that for your .vsdx file imports, you rename the file(s) replacing the dot in .vsdx with '_'. In this example, **pod-topology.vsdx-Final Topo.virl** becomes **pod-topology_vsdx-Final Topo.virl**. You must do this as in Cisco Modeling Labs, the roster will parse the extra dot as a hierarchy delimiter and the simulation will fail.

Export the Configuration to SVG Files

For this release of Cisco Modeling Labs, export to Visio .vsdx files is not supported. However, export to .svg files is supported, as Visio supports the use of .svg files. The **Export** option can be used to export .virl files as .svg files.

Before You Begin

- Cisco Modeling Labs client is running.
- A topology is open in the Topology Editor.
- Your license allows SVG file export.

Step 1 Choose **File** > **Export**.
A window appears, prompting you to **Export to SVG file**.

Step 2 Choose **Export to SVG file** then click **Next**.

Step 3 Choose the location **To file** for the SVG file export. Use **Browse** to select the target Project folder.

Step 4 Enter a filename for the exported SVG file, or use the default filename. For example, **sample_topology.virl** is converted to **sample_topology.svg** and saved in the target directory.

Step 5 Click **Finish**.
The Cisco Modeling Labs .virl file silently converts to a SVG .svg file.

Import the Configuration from a GNS3 File

You can import a topology from an existing GNS3 .gns3 file.

Before You Begin

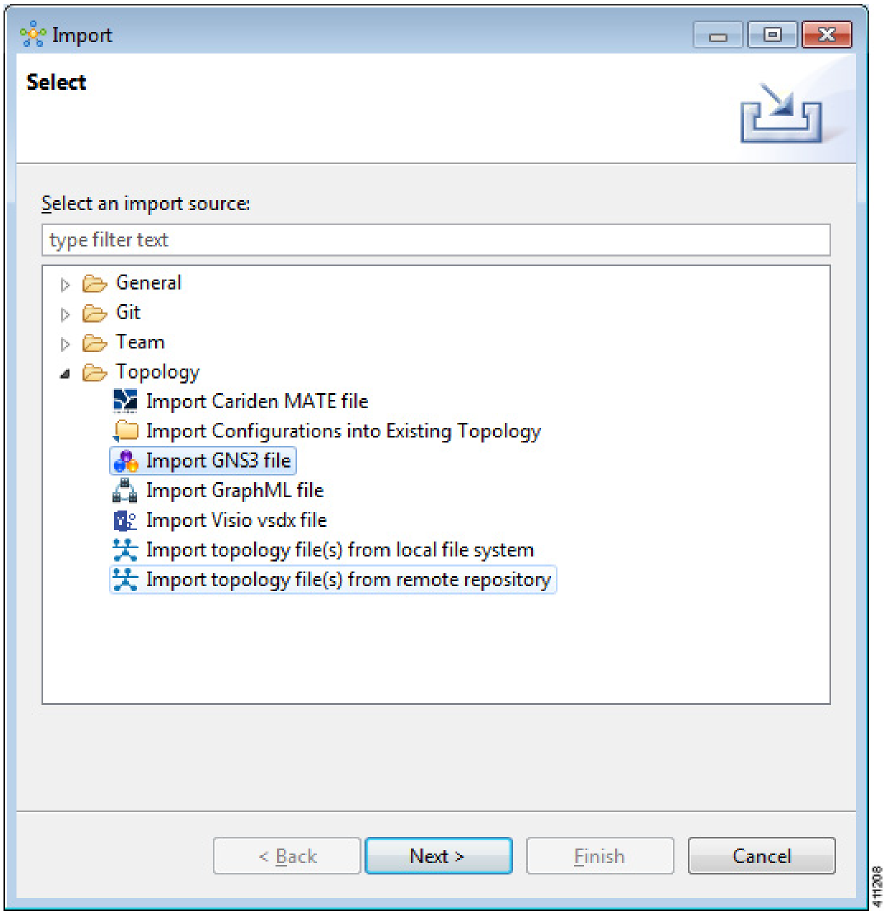
- A valid GNS3 JSON-based (.gns3) file is available on your file system.
- Cisco Modeling Labs client is running.

Step 1 Choose **File** > **Import**.

The **Import** dialog box appears.

Step 2 Expand the **Topology** folder, choose **Import GNS3 File** and click **Next**.

Figure 9: Import a GNS3 .gns3 File



Import

Select

Select an import source:

type filter text

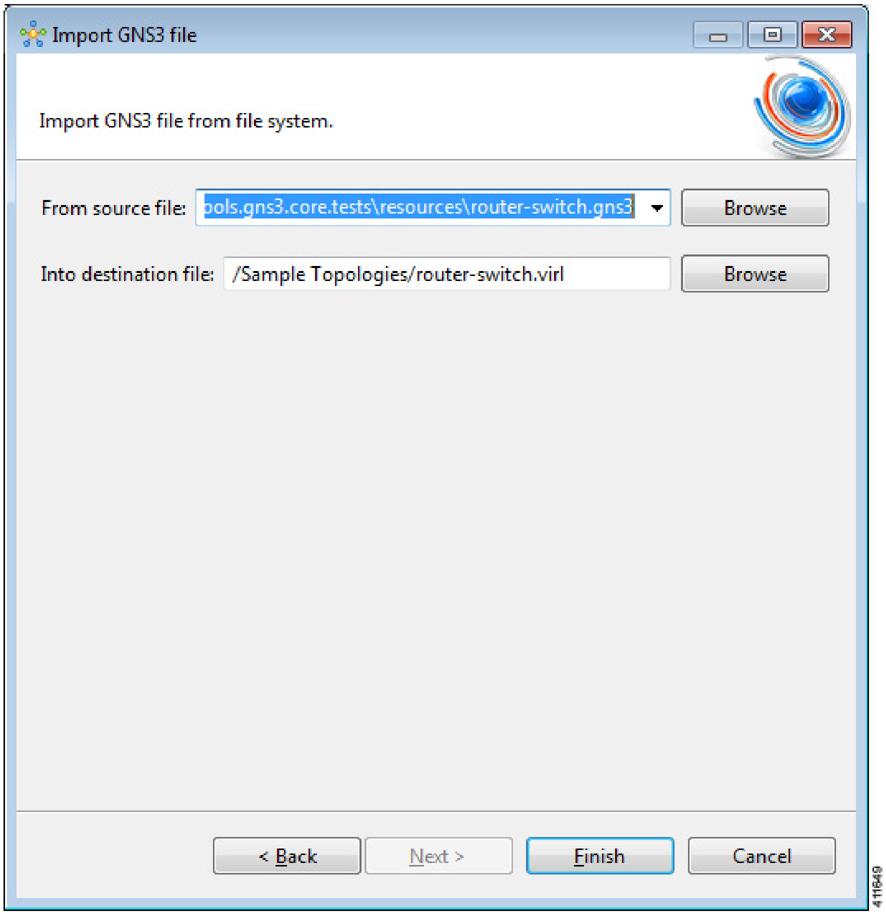
- General
- Git
- Team
- Topology
  - Import Cariden MATE file
  - Import Configurations into Existing Topology
  - Import GNS3 file
  - Import GraphML file
  - Import Visio vsdx file
  - Import topology file(s) from local file system
  - Import topology file(s) from remote repository

The **Import GNS3 File** dialog box is displayed.

Step 3 In the **From source file** field, use **Browse** to select the directory and GNS3 .gns3 file to import.

Step 4 In the **Into destination file** field, use **Browse** to select the target folder.

Figure 10: Choose the From and To Locations



Import GNS3 file

Import GNS3 file from file system.

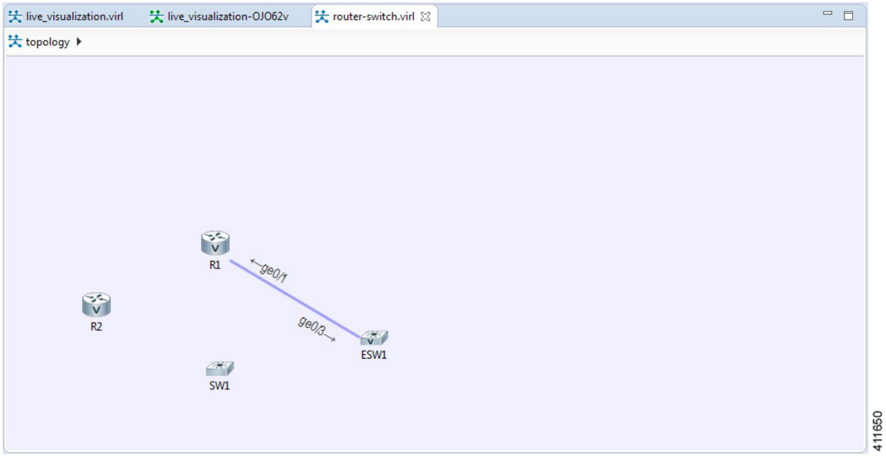
From source file: ools.gns3.core.tests\resources\router-switch.gns3

Into destination file: /Sample Topologies/router-switch.virl

Step 5 Click **Finish**.

The GNS3 .gns3 file converts to a Cisco Modeling Labs .virl file, using the original filename of the file and it is automatically opened on the canvas.

Figure 11: Imported GNS3 .gns3 File



Export the Configuration to GNS3 Files

Before You Begin

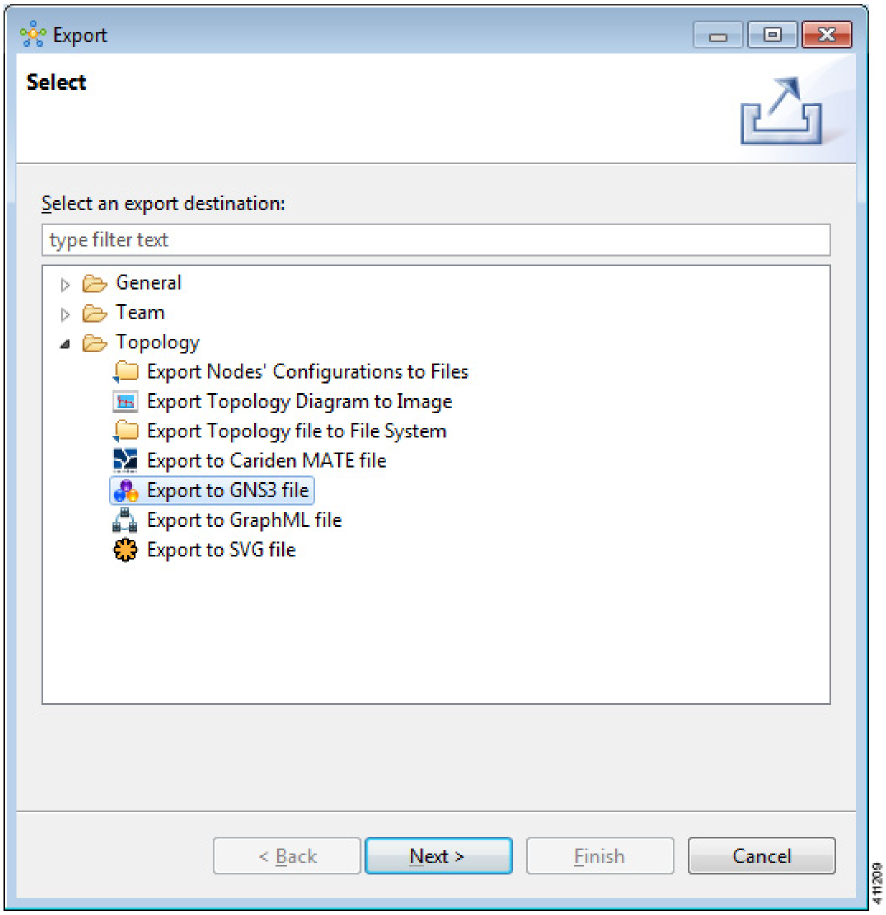
- Cisco Modeling Labs client is running.
- A topology is open in the Topology Editor.

Step 1 Choose **File** > **Export**.

The **Export** dialog box appears.

Step 2 Expand the **Topology** folder, choose **Export to GNS3 File** and click **Next**.

Figure 12: Export a GNS3 .gns3 File



Export

Select

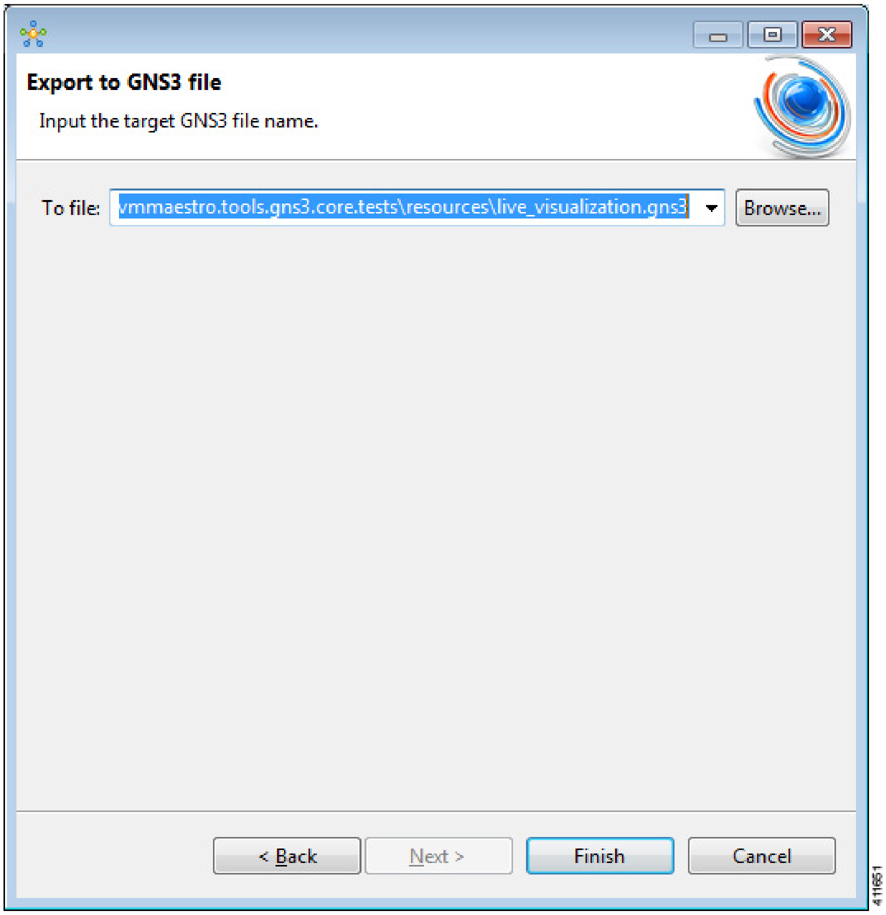
Select an export destination:

type filter text

- General
- Team
- Topology
  - Export Nodes' Configurations to Files
  - Export Topology Diagram to Image
  - Export Topology file to File System
  - Export to Cariden MATE file
  - Export to GNS3 file
  - Export to GraphML file
  - Export to SVG file

Step 3 In the **To file** field, use **Browse** to select the target folder.

Figure 13: Export a GNS3 .gs3 File



Export to GNS3 file

Input the target GNS3 file name.

To file: vmmaestro.tools.gns3.core.tests\resources\live_visualization.gns3

Step 4 Enter a filename for the exported GNS3 file, or use the default filename. For example, **sample_topology.virl** is converted to **sample_topology.gns3** and saved in the target directory.

Step 5 Click **Finish**.
The Cisco Modeling Labs .virl file silently converts to a GNS3 .gns3 file.

Import the Configuration from a GraphML File

You can import a topology from an existing GraphML .graphml file.

Before You Begin

- A valid GraphML file is available on your file system.

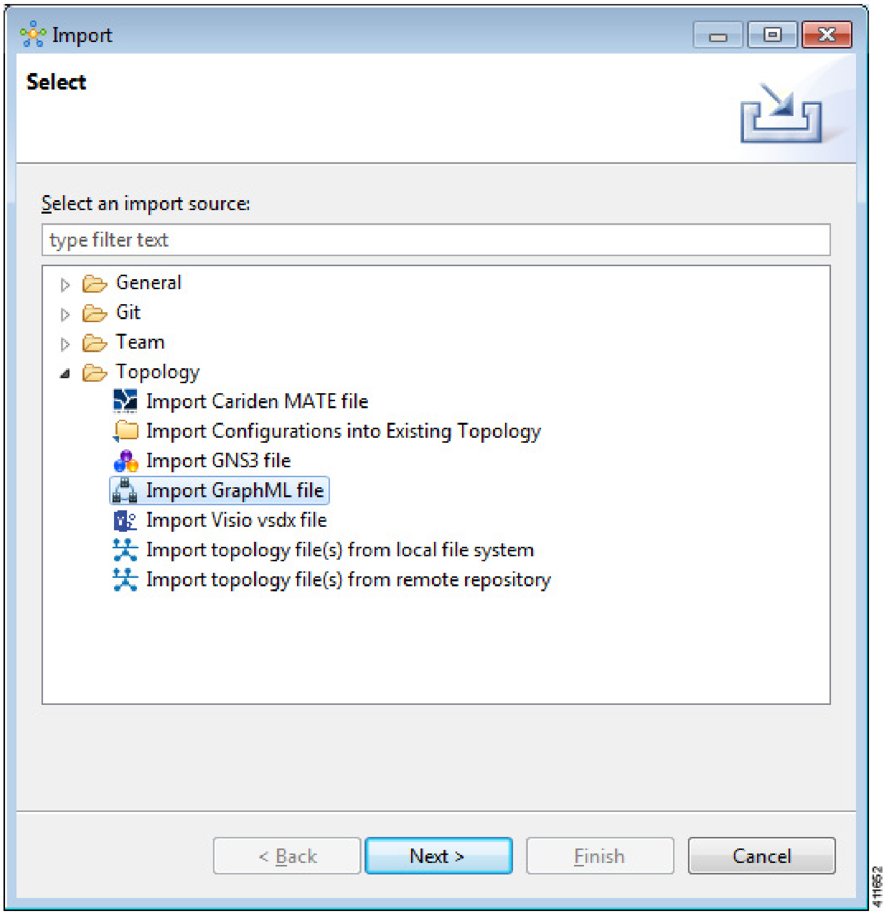
- Cisco Modeling Labs client is running.

Step 1 Choose **File** > **Import**.

The **Import** dialog box appears.

Step 2 Expand the **Topology** folder, choose **Import GraphML** and click **Next**.

Figure 14: Import a GraphML .graphml File



Import

Select

Select an import source:

type filter text

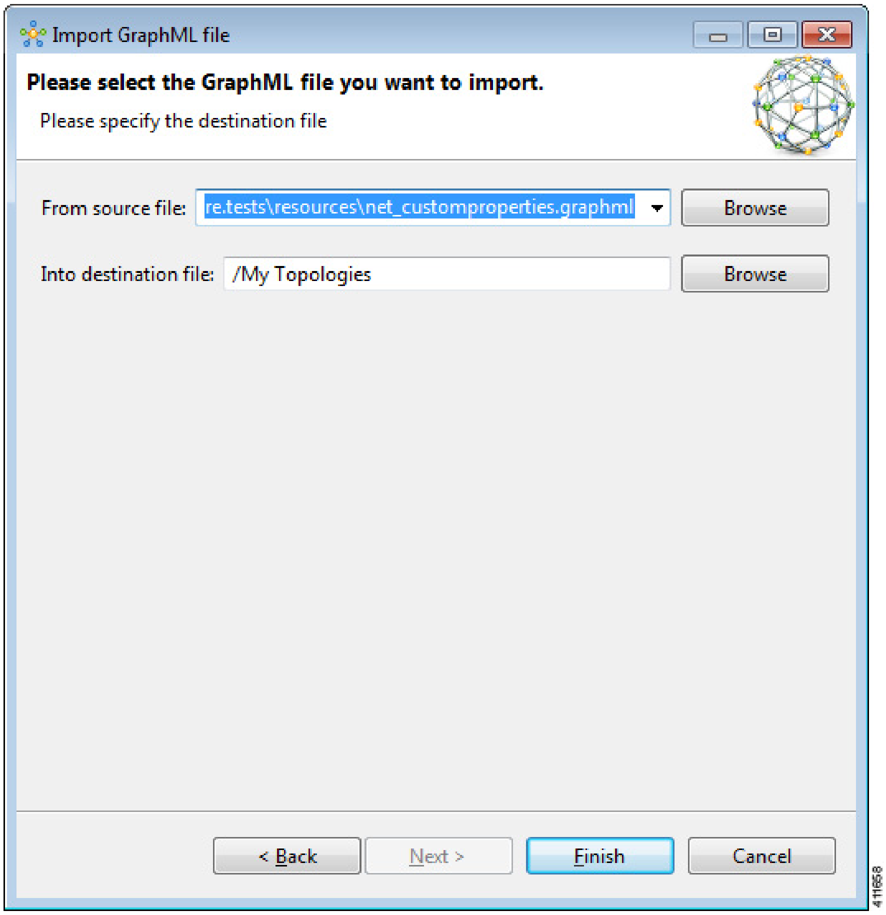
- General
- Git
- Team
- Topology
  - Import Cariden MATE file
  - Import Configurations into Existing Topology
  - Import GNS3 file
  - Import GraphML file
  - Import Visio vsdx file
  - Import topology file(s) from local file system
  - Import topology file(s) from remote repository

The **Import GraphML File** dialog box is displayed.

Step 3 In the **From source file** field, use **Browse** to select the directory and GraphML .graphml file to import.

Step 4 In the **Into destination file** field, use **Browse** to select the target folder.

Figure 15: Choose the From and To Locations



Import GraphML file

Please select the GraphML file you want to import.

Please specify the destination file

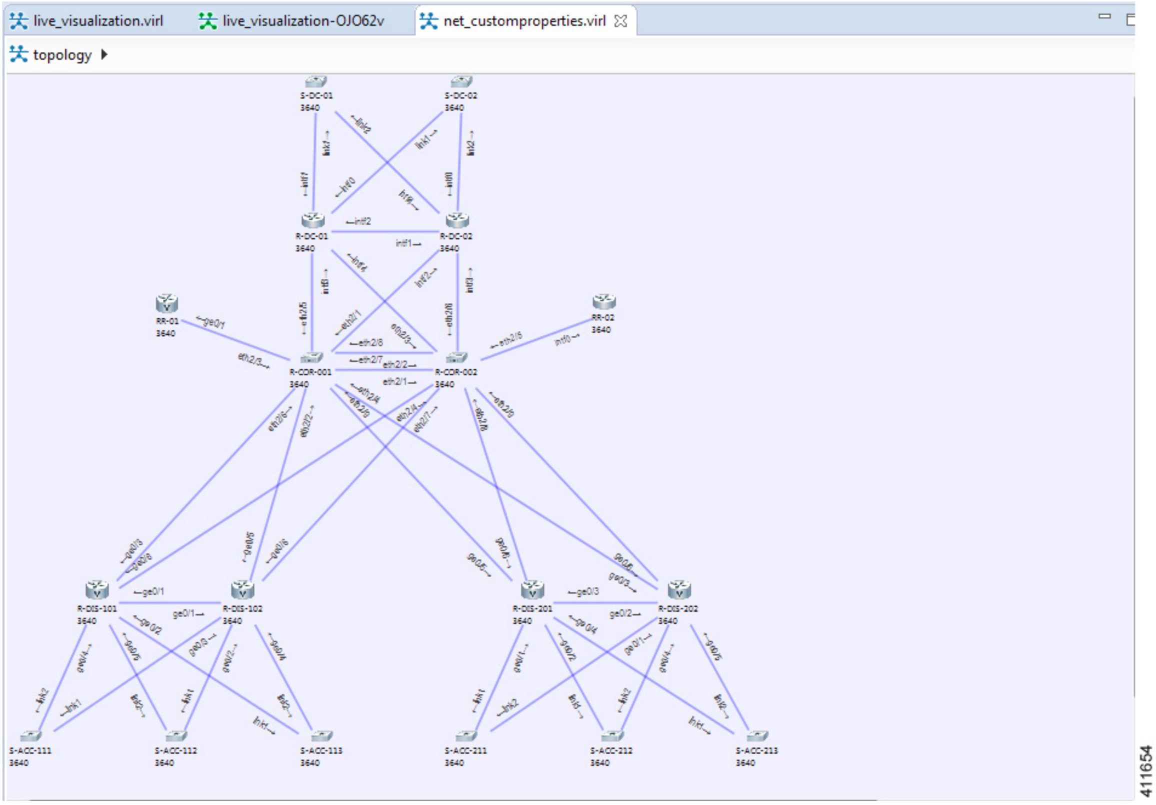
From source file: re.tests\resources\net_customproperties.graphml

Into destination file: /My Topologies

Step 5 Click **Finish**.

The GraphML .graphml file converts to a Cisco Modeling Labs .virl file, using the original filename of the file and it is automatically opened on the canvas.

Figure 16: Imported GraphML .graphml File



Export the Configuration to GraphML Files

Before You Begin

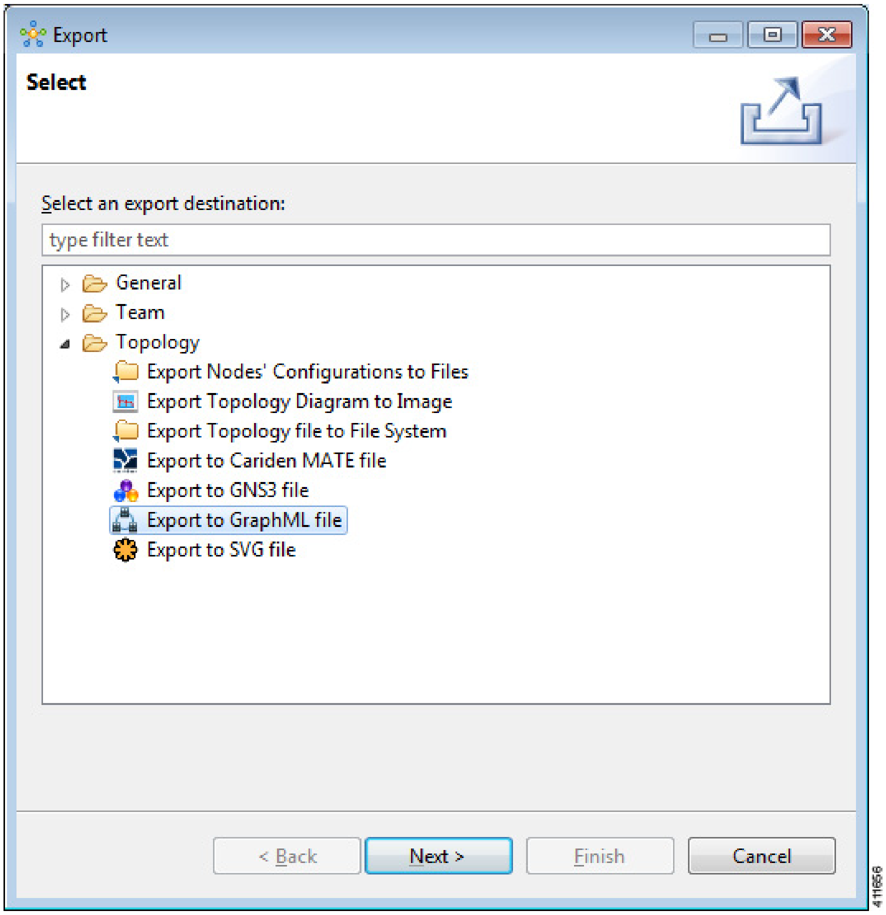
- Cisco Modeling Labs client is running.
- A topology is open in the Topology Editor.

Step 1 Choose **File** > **Export**.

The **Export** dialog box appears.

Step 2 Expand the **Topology** folder, choose **Export to GraphML File** and click **Next**.

Figure 17: Export a GraphML .graphml File



Export

Select

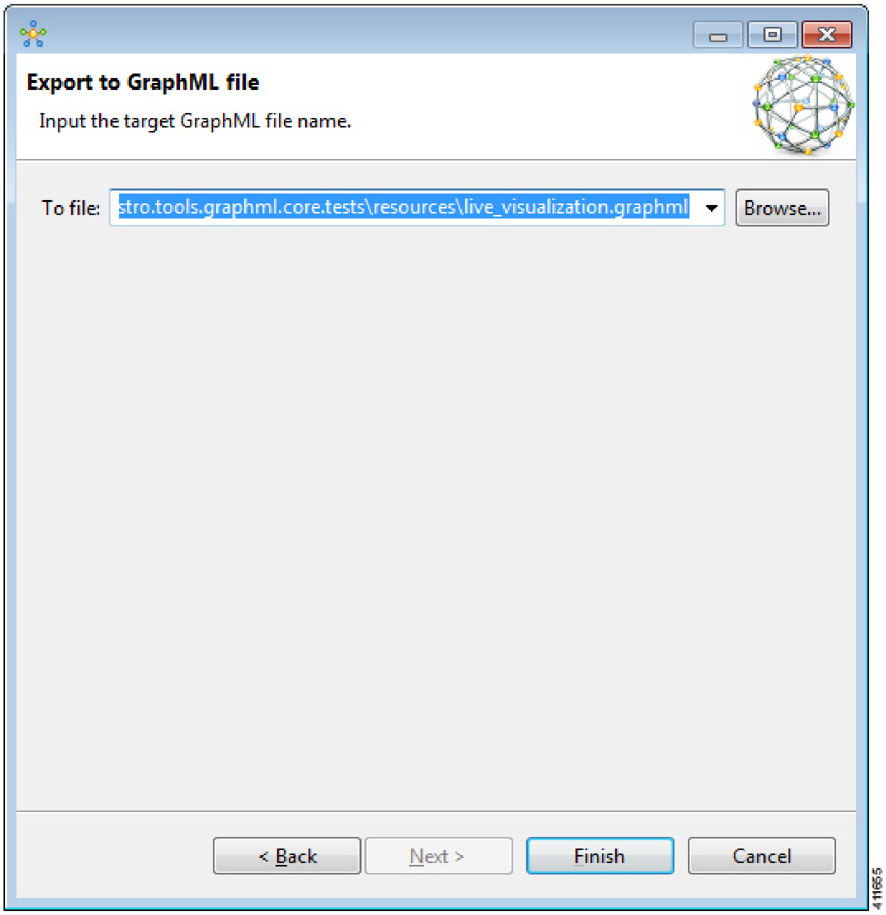
Select an export destination:

type filter text

- General
- Team
- Topology
  - Export Nodes' Configurations to Files
  - Export Topology Diagram to Image
  - Export Topology file to File System
  - Export to Cariden MATE file
  - Export to GNS3 file
  - Export to GraphML file
  - Export to SVG file

Step 3 In the **To file** field, use **Browse** to select the target folder.

Figure 18: Choose the To Location



Export to GraphML file

Input the target GraphML file name.

To file: stro.tools.graphml.core.tests\resources\live_visualization.graphml

Step 4 Enter a filename for the exported GraphML file, or use the default filename. For example, **sample_topology.virl** is converted to **sample_topology.graphml** and saved in the target directory.

Step 5 Click **Finish**.
The Cisco Modeling Labs .virl file silently converts to a GraphML .graphml file.

Import the Nodes Configuration Files

You can import the per-node configurations previously exported as individual text files (.cfg suffix) into your .virl file. You can import the configuration files having made any necessary changes to them.

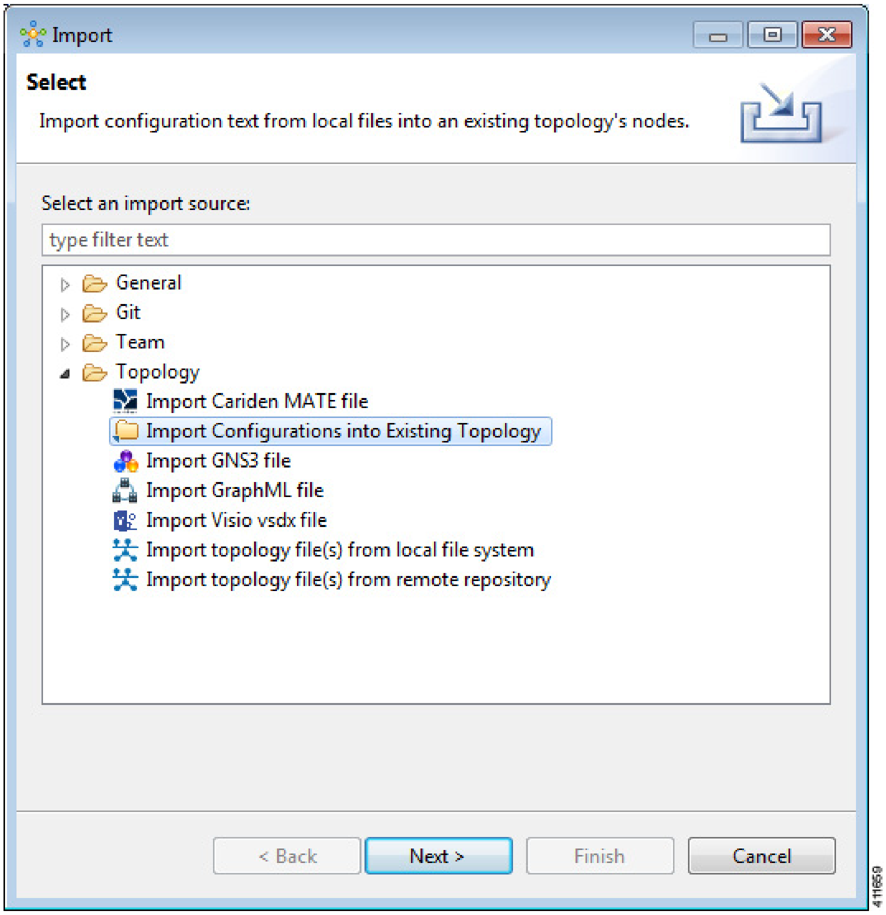
Before You Begin

- Cisco Modeling Labs client is running.

- A topology file is open in the Topology Editor.

Step 1 Choose **File** > **Import**.
The **Import** dialog box is displayed.

Figure 19: Import Dialog Box



Select

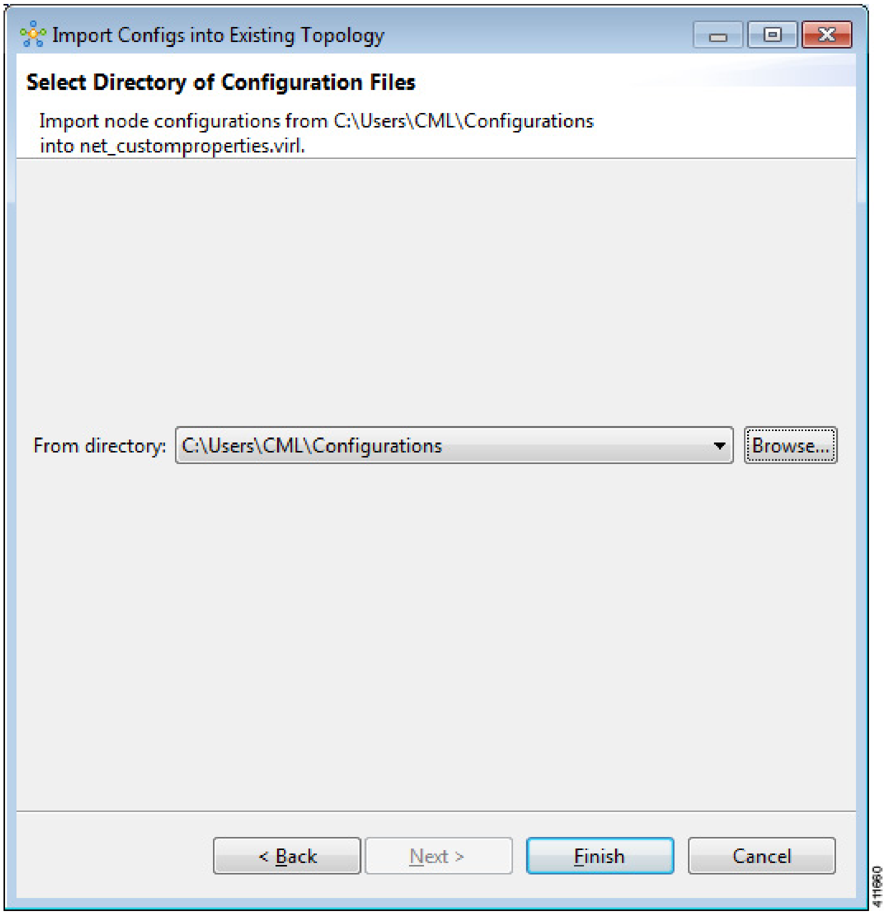
Import configuration text from local files into an existing topology's nodes.

Select an import source:

Step 2 Choose **Import Configurations into Existing Topology** and click **Next**.

The **Import Configurations into Existing Topology** dialog box is displayed.

Figure 20: Import Configurations into Existing Topology



Import Configs into Existing Topology

Select Directory of Configuration Files

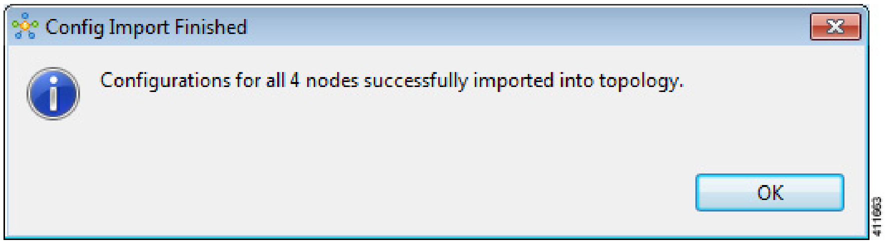
Import node configurations from C:\Users\CML\Configurations into net_customproperties.virl.

From directory: C:\Users\CML\Configurations

Step 3 Select the applicable location from the **From Directory** drop-down list or choose **Browse**.

Step 4 Click **Finish** to import the node configuration files.
The node configuration files are imported into the existing topology and a message is displayed to confirm this

Figure 21: Config Import Finished Dialog Box



Config Import Finished

Configurations for all 4 nodes successfully imported into topology.

.

Export the Nodes Configuration Files

You can export the per-node configurations from within your .virl file and export them to a directory location of your choice as individual text files (.cfg suffix). There you can make necessary changes to the configuration files before importing the configuration files back into the .virl file.

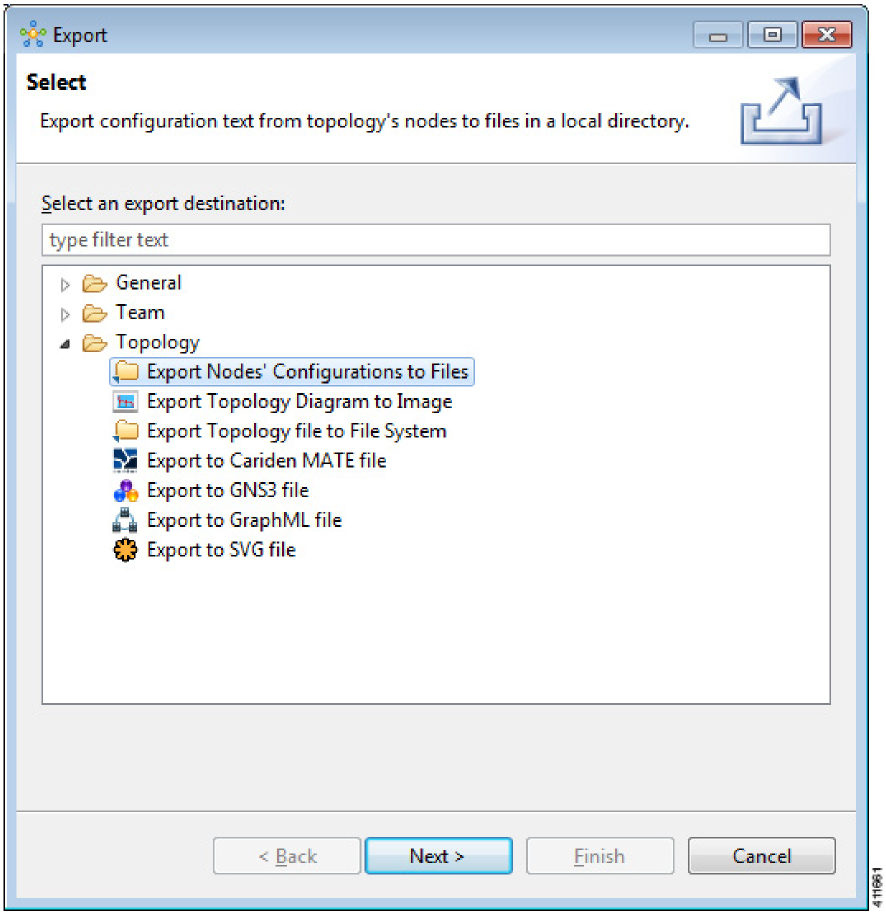
Before You Begin

- Cisco Modeling Labs client is running.
- A topology file is open in the Topology Editor.

Step 1 Choose **File** > **Export**.

The **Export** dialog box is displayed.

Figure 22: Export Dialog Box



Export

Select

Export configuration text from topology's nodes to files in a local directory.

Select an export destination:

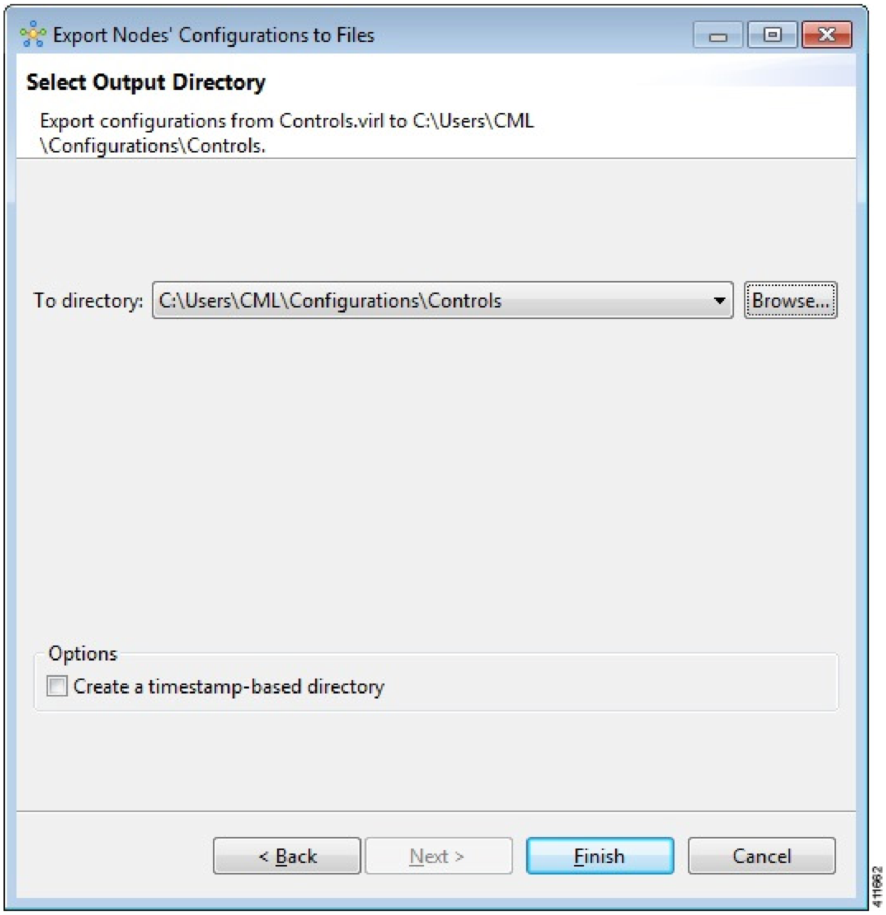
type filter text

- General
- Team
- Topology
  - Export Nodes' Configurations to Files
  - Export Topology Diagram to Image
  - Export Topology file to File System
  - Export to Cariden MATE file
  - Export to GNS3 file
  - Export to GraphML file
  - Export to SVG file

Step 2 Choose **Export Nodes' Configurations to Files** and click **Next**.

The **Export Nodes' Configurations to Files** dialog box is displayed.

Figure 23: Export Nodes' Configurations to Files



Export Nodes' Configurations to Files

Select Output Directory

Export configurations from Controls.virl to C:\Users\CML
\Configurations\Controls.

To directory: C:\Users\CML\Configurations\Controls

Options

□ Create a timestamp-based directory

Step 3 Select a location from the **To Directory** drop-down list or choose **Browse** to select the applicable location.

Step 4 Click **Finish** to export the node configuration files.
The node configuration files are exported to the chosen location.

Create Node and Interface Configurations Using AutoNetkit

Before You Begin

The topology design should be complete.

Step 1 Verify the configuration for each node in the topology.

a) In the **Topology Editor**, click a node.

b) In the **Properties** view, click **AutoNetkit**. Verify **Auto-generate the configuration based on these attributes** is checked or unchecked, depending on whether AutoNetkit will generate a configuration for that node.

Note Any pre-existing configuration for this node is overwritten when you choose **Build Initial Configurations** from the toolbar. Uncheck the **Auto-generate the configuration based on these attributes** check box if you do not want the router configuration for this node updated by AutoNetkit.

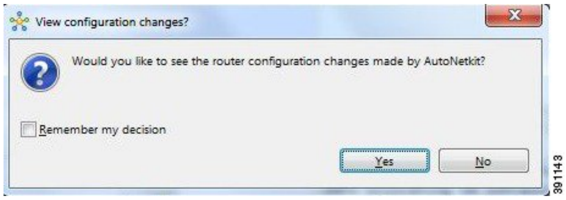
Step 2 Generate a configuration for the topology. Click **Build Initial Configurations** from the toolbar. Alternatively, from the menu bar, choose **Configuration** > **Build Initial Configurations**. You are prompted to save any changes made since the previous configuration update.

If the **Auto-generate the configuration based on these attributes** check box is checked for a node, the configuration updates are generated by AutoNetkit.

Note When using the **Build Initial Configurations** option, the out-of-band management interface is, by default, placed into a “Mgmt-intf” VRF. By placing the interface into a VRF, it ensures that there is no route-leaking by the routing protocols and that CDP will not report the OOB interface.

Step 3 AutoNetkit displays a notification after it generates the configuration. Click **No** to skip a comparison of configuration changes. Click **Yes** to open a comparison view of the configuration changes.

Figure 24: View Configuration Changes? Notification



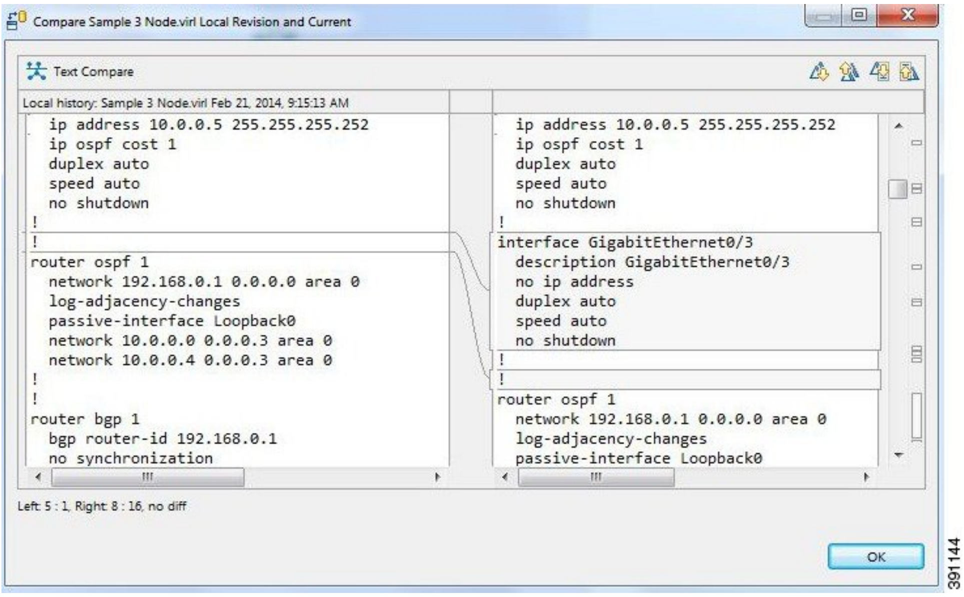
View configuration changes?

Would you like to see the router configuration changes made by AutoNetkit?

☐ Remember my decision

The .virl file opens and displays previous and current configurations side-by-side, with the changes highlighted. You can scroll through the contents and see the differences. However, you cannot edit the configurations.

Figure 25: Show Configuration Comparison Side-by-Side



Compare Sample 3 Node.virl Local Revision and Current

Text Compare

Local history: Sample 3 Node.virl Feb 21, 2014, 9:15:13 AM

```
  ip address 10.0.0.5 255.255.255.252
  ip ospf cost 1
  duplex auto
  speed auto
  no shutdown
!
!
router ospf 1
  network 192.168.0.1 0.0.0.0 area 0
  log-adjacency-changes
  passive-interface Loopback0
  network 10.0.0.0 0.0.0.3 area 0
  network 10.0.0.4 0.0.0.3 area 0
!
!
router bgp 1
  bgp router-id 192.168.0.1
  no synchronization
```

```
  ip address 10.0.0.5 255.255.255.252
  ip ospf cost 1
  duplex auto
  speed auto
  no shutdown
!
interface GigabitEthernet0/3
  description GigabitEthernet0/3
  no ip address
  duplex auto
  speed auto
  no shutdown
!
!
router ospf 1
  network 192.168.0.1 0.0.0.0 area 0
  log-adjacency-changes
  passive-interface Loopback0
```

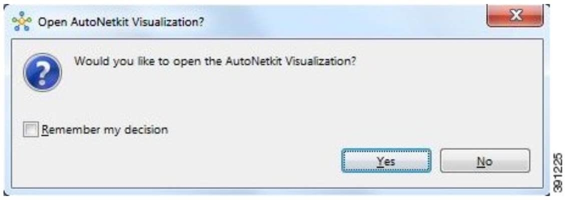
Left: 5 : 1, Right: 8 : 16, no diff

Click **OK** to close the comparison view.

Step 4 When you close the comparison view, a notification is displayed, and you can choose whether or not to open AutoNetkit Visualization.

- Click **No** to skip the visualization. You return to the **Design** perspective.
- Click **Yes** to display the visualization. The AutoNetkit Visualization opens in a browser window. For more information about this feature, see AutoNetkit Visualization.

Figure 26: Open AutoNetkit Visualization? Notification



Open AutoNetkit Visualization?

Would you like to open the AutoNetkit Visualization?

□ Remember my decision

Note Selecting the **Remember my decision** check box will always open AutoNetkit visualization for subsequent invocations. You can later change this behavior by choosing **File** > **Preferences** > **Web Services** > **AutoNetkit**.

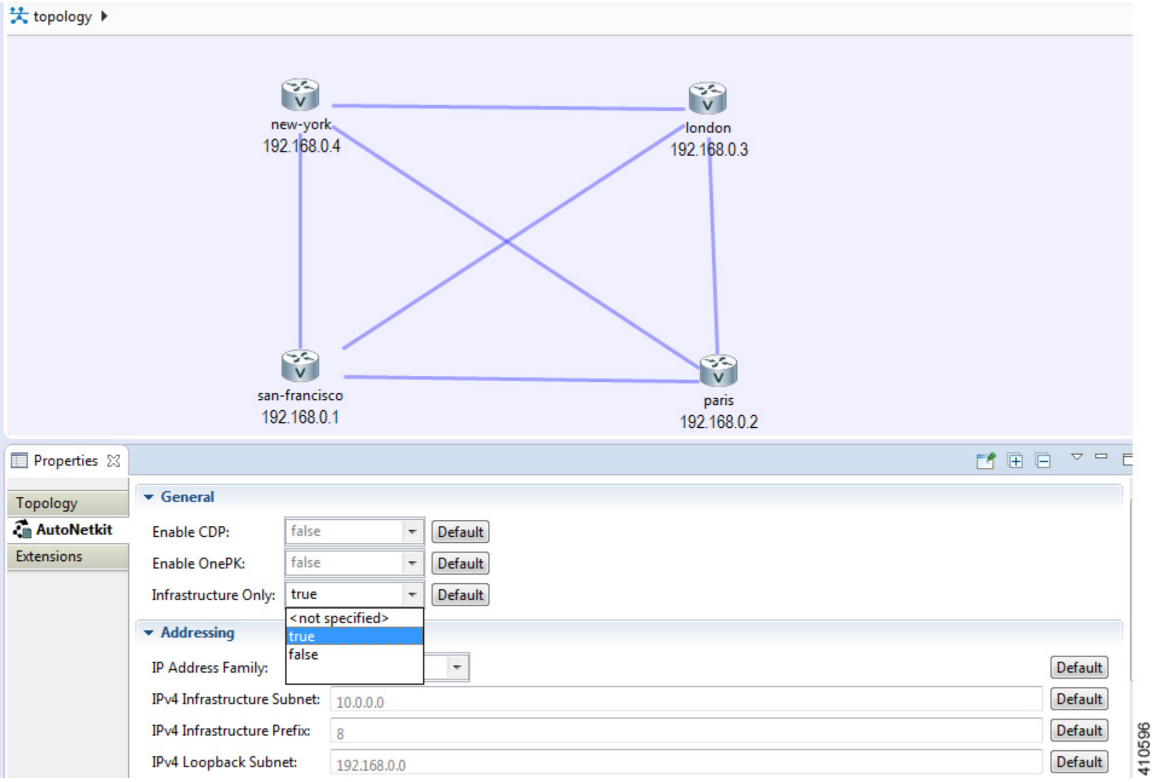
Generate a Infrastructure-only Configuration Using AutoNetkit

AutoNetkit allows you to generate a stripped-back configuration that provides the basic infrastructure configuration required to support configuration extraction and Live Visualization.

With this feature enabled, no IP addressing or routing protocol configuration is created. This leaves the node in a state where it is ready for manual configuration. This is ideal when using a simulation for study practice or when wanting to go through the process of building an environment by hand.

The feature is enabled in the Cisco Modeling Labs client, by selecting the **Infrastructure Only** option available under **General** at the topology level under the **AutoNetkit** tab, as shown.

Figure 27: Infrastructure Only Option in AutoNetkit



General

Enable CDP: false Default

Enable OnePK: false Default

Infrastructure Only: true Default

<not specified>
true
false

Addressing

IP Address Family: Default

IPv4 Infrastructure Subnet: 10.0.0.0 Default

IPv4 Infrastructure Prefix: 8 Default

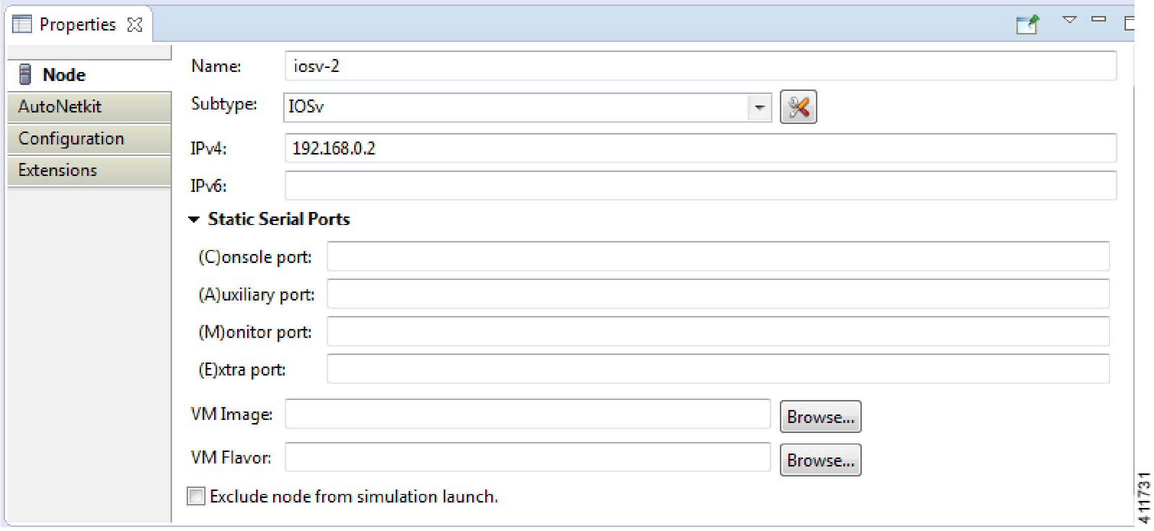
IPv4 Loopback Subnet: 192.168.0.0 Default

Static TCP Port Allocation Control

You can specify the TCP port number that you want to use when connecting to the **console**, **auxiliary**, or **monitor** ports of a particular node running in a simulation. These port numbers are optional and can be set via the Cisco Modeling Labs client. The port number allocation is retained in the settings.ini file and is applied each time the simulation is started. Functionality is provided so that the TCP port numbers in use are easily adjusted.

To set these port numbers, in the **Design** perspective, select a node and choose the **Node** configuration tab. Update the **Static Serial Ports**' fields as required.

Figure 28: Specify TCP Port Numbers



Properties

Name: iosv-2

Subtype: IOSv

IPv4: 192.168.0.2

IPv6:

Static Serial Ports

(C)onsole port:

(A)uxiliary port:

(M)onitor port:

(E)xtra port:

VM Image:

VM Flavor:

□ Exclude node from simulation launch.

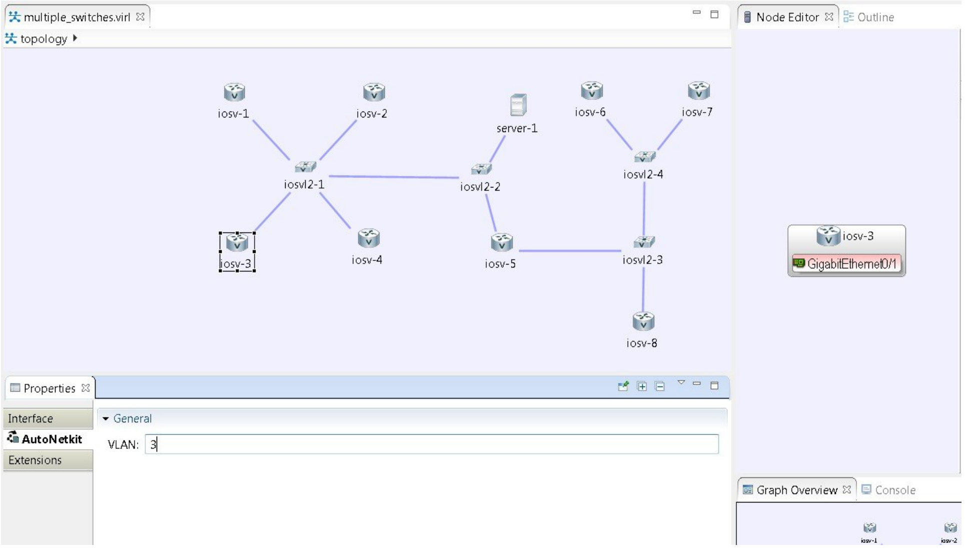
Assign VLANs

VLANs can be assigned to the interfaces of the end nodes, using the **Properties** > **Interface** view.

VLANs are set using the **VLAN** property under the **General** tab in the **AutoNetkit** field on the interface. The interface is selected in the **Node Editor**. The properties are set on the interfaces of the nodes connected to the IOSvL2 image, such as on the IOSv nodes, server node interfaces.

The following example shows how to set a VLAN property.

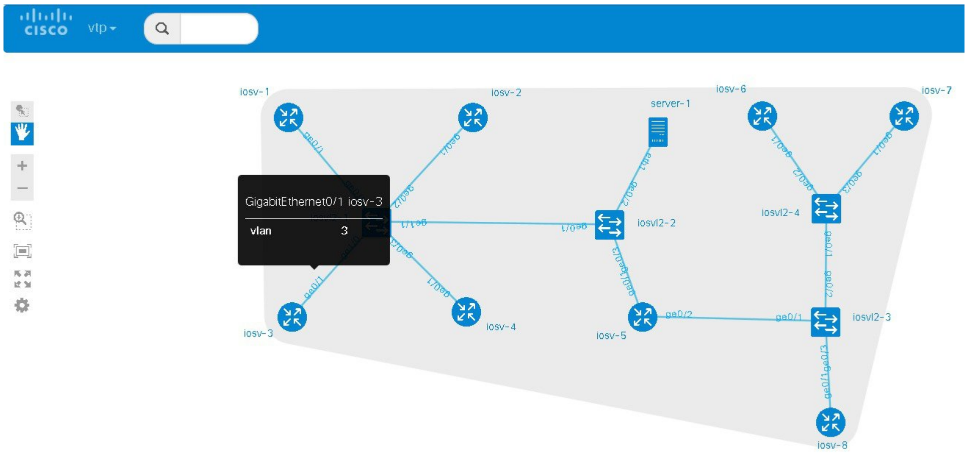
Figure 29: Set a VLAN Property



VLAN: 3

These VLAN values are displayed in the VLAN attribute of the interfaces in AutoNetkit visualization:

Figure 30: VLAN Property Assigned



GigabitEthernet0/1 iosv-3

vlan 3

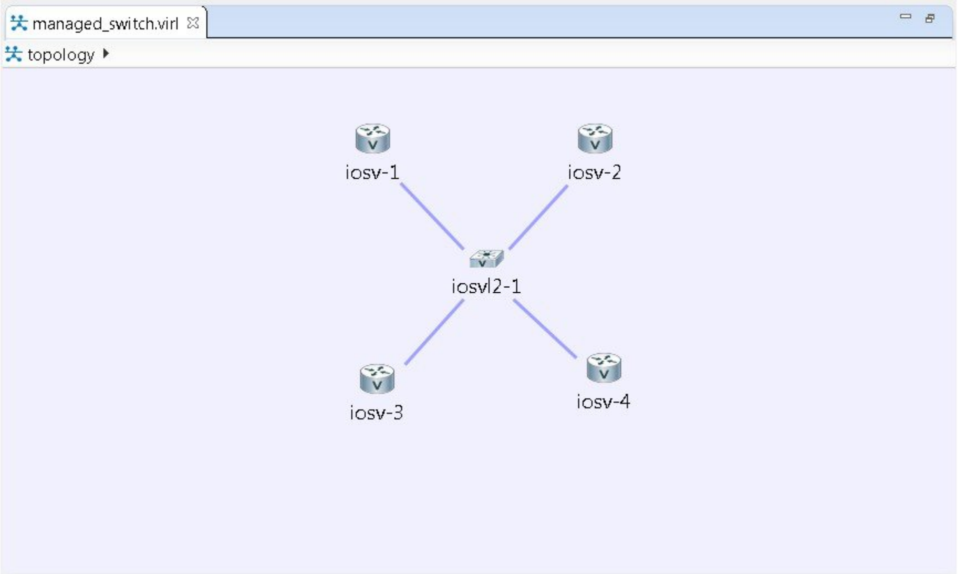
Use a Managed Switch

The Cisco IOSv Layer 2 switch introduces a managed switch to the Cisco Modeling Labs environment.

By default, all VLANs are placed in vlan2.

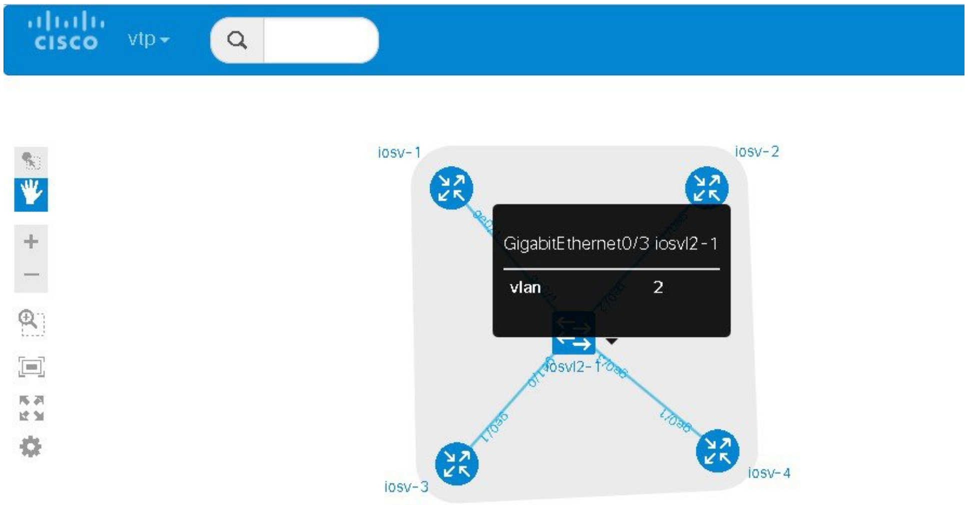
For example, consider the following topology which includes four nodes and one IOSvL2 image:

Figure 31: Using a Managed Switch



After running AutoNetkit, you can see the default VLAN assigned using the **vtp** view:

Figure 32: VLAN Assignment

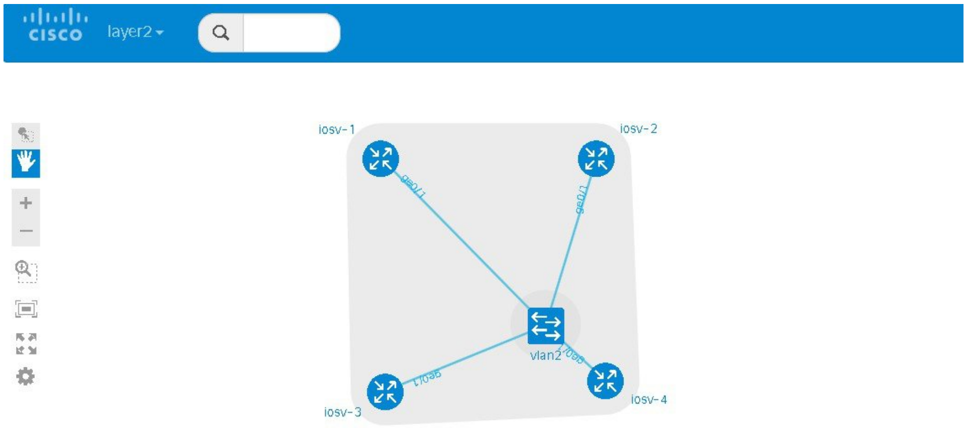


GigabitEthernet0/3 iosvl2-1

vlan 2

The **layer2** view shows the vtp domain originating from the virtual switch for vlan2:

Figure 33: Vtp Domain - layer2.tiff



The relevant configuration for the IOSvL2 image is:

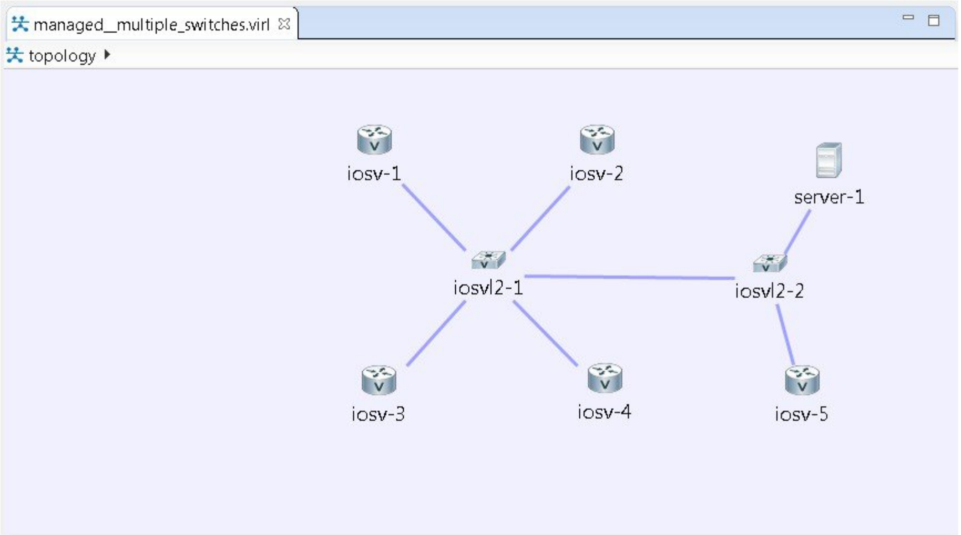
```
interface GigabitEthernet0/1
 description to iosv-1
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet0/2
 description to iosv-3
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet0/3
 description to iosv-2
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet1/0
 description to iosv-4
 switchport access vlan 2
 switchport mode access
 no shutdown
!
```

Use Multiple Managed Switches

It is permissible to connect multiple managed switches together. Multiple managed switches connected together form a trunk link between the switches and their appropriate vtp domains.

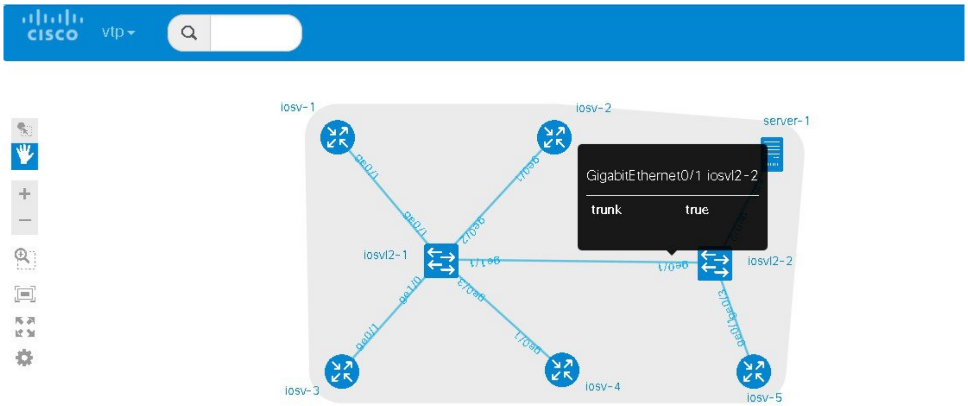
In the following example, two managed switches are connected together:

Figure 34: Using Multiple Managed Switches



The **vtp** view shows the trunk link created between the two managed switches:

Figure 35: Trunk Link Created

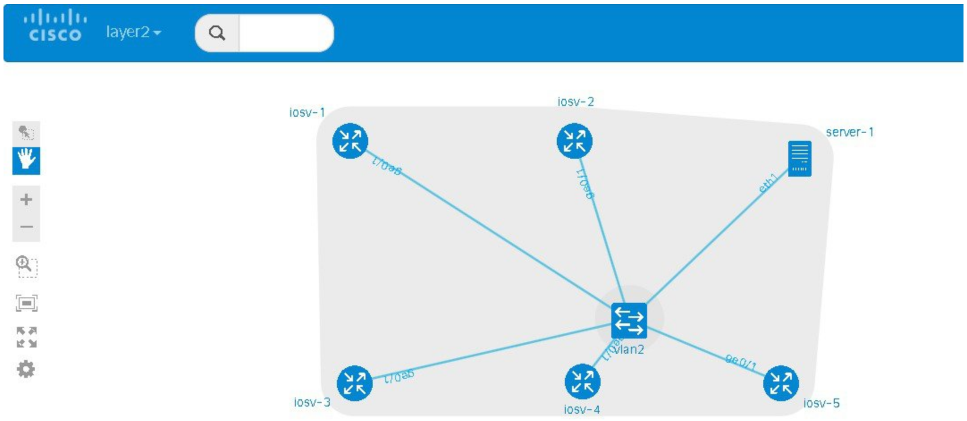


GigabitEthernet0/1 iosvl2-2

trunk true

The **layer2** view shows the resulting layer2 connectivity, where both of the managed switches have been aggregated into a single vtp domain for the default vlan2:

Figure 36: Layer2 Connectivity



The relevant configurations for iosvl2-1 and iosvl2-2 on the trunk port are shown below.

iosvl2-1

```
interface GigabitEthernet0/1
 description to iosv-1
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet0/2
 description to iosv-3
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet0/3
 description to iosv-2
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet1/0
 description to iosv-4
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet1/1
 description to iosvl2-2
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
!
```

iosvl2-2

```
interface GigabitEthernet0/1
 description to iosvl2-1
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
!
interface GigabitEthernet0/2
```

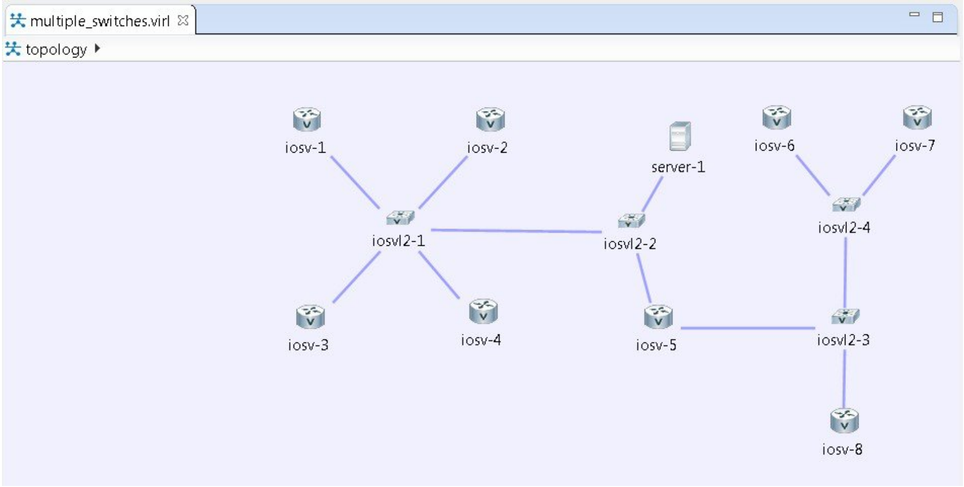
```
 description to server-1
 switchport access vlan 2
 switchport mode access
 no shutdown
!
interface GigabitEthernet0/3
 description to iosv-5
 switchport access vlan 2
 switchport mode access
 no shutdown
!
```

Use Multiple Unconnected Managed Switches

In cases where there are multiple managed switches, only those that are directly connected, either through a point-to-point link or via an unmanaged switch are connected.

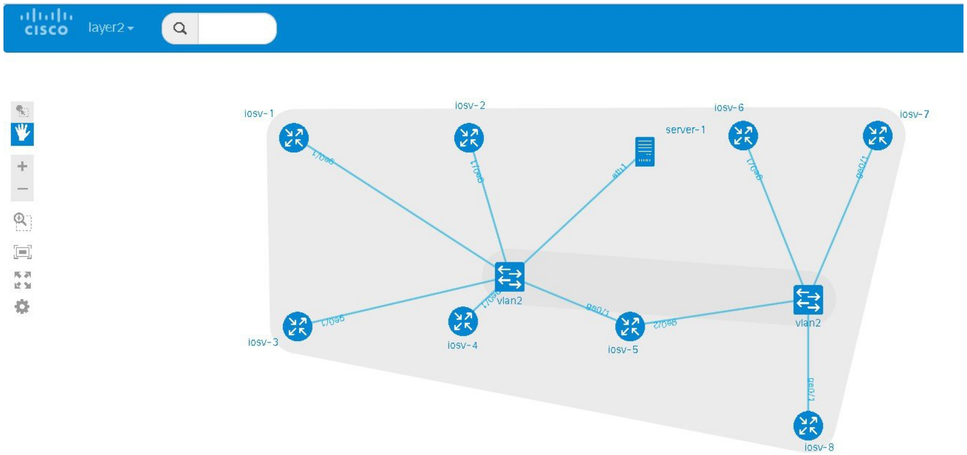
For example, in this topology, there are two sets of managed switches:

Figure 37: Using Multiple Managed Switches



After running AutoNetkit, the resulting **layer2** view shows two separate layer 2 domains:

Figure 38: Separate Layer2 Domains



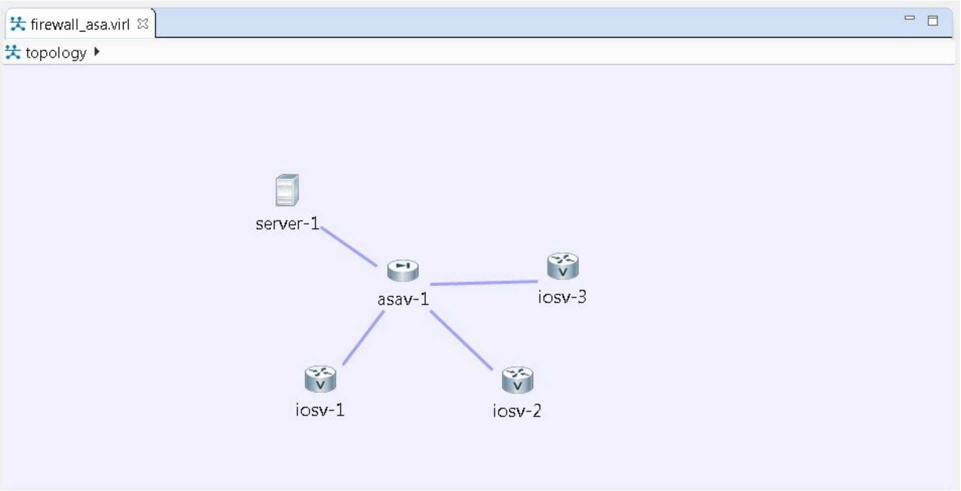
Set Firewall Capabilities

For this release of Cisco Modeling Labs, the Cisco ASAv image is available to purchase separately. The Cisco ASAv image adds firewall capabilities to Cisco Modeling Labs.

The default AutoNetkit configuration puts each interface into security-level 0, adds a nameif, and allows http, SSH, and Telnet access to this nameif.

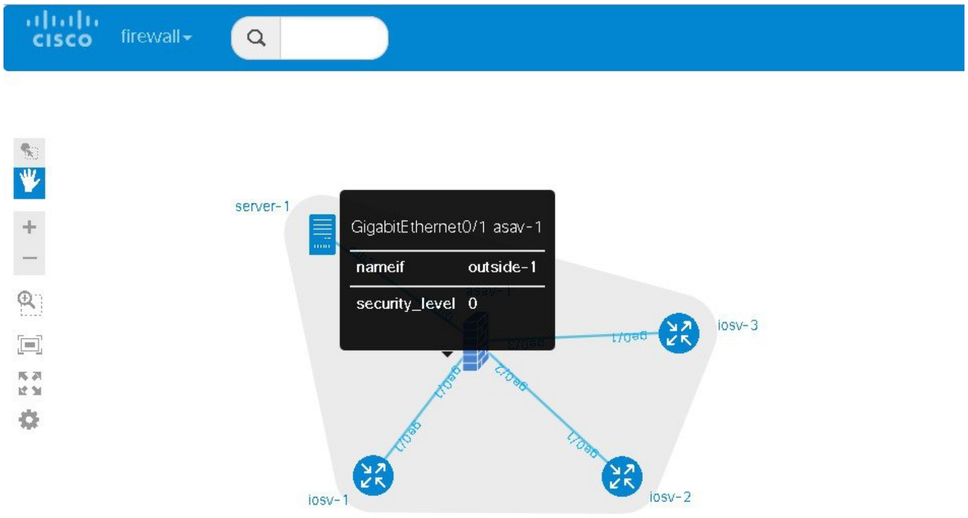
For example, consider the following topology which includes three IOSv nodes, one server node and one ASAv node:

Figure 39: Example Topology Showing a Cisco ASAv Node



After running AutoNetkit, the firewall view shows the allocated properties on the interfaces:

Figure 40: Allocated Firewall Properties



GigabitEthernet0/1 asav-1

nameif	outside-1
security_level	0

The configuration for the interface is:

```
interface GigabitEthernet0/0
 description to server-1
 nameif outside
 security-level 0
 no shutdown
 ip address 10.0.0.5 255.255.255.252
interface GigabitEthernet0/1
 description to iosv-1
 nameif outside-1
 security-level 0
 no shutdown
 ip address 10.0.0.9 255.255.255.252
interface GigabitEthernet0/2
 description to iosv-2
 nameif outside-2
 security-level 0
 no shutdown
 ip address 10.0.0.13 255.255.255.252
interface GigabitEthernet0/3
 description to iosv-3
 nameif outside-3
 security-level 0
 no shutdown
 ip address 10.0.0.17 255.255.255.252
```

The access details are:

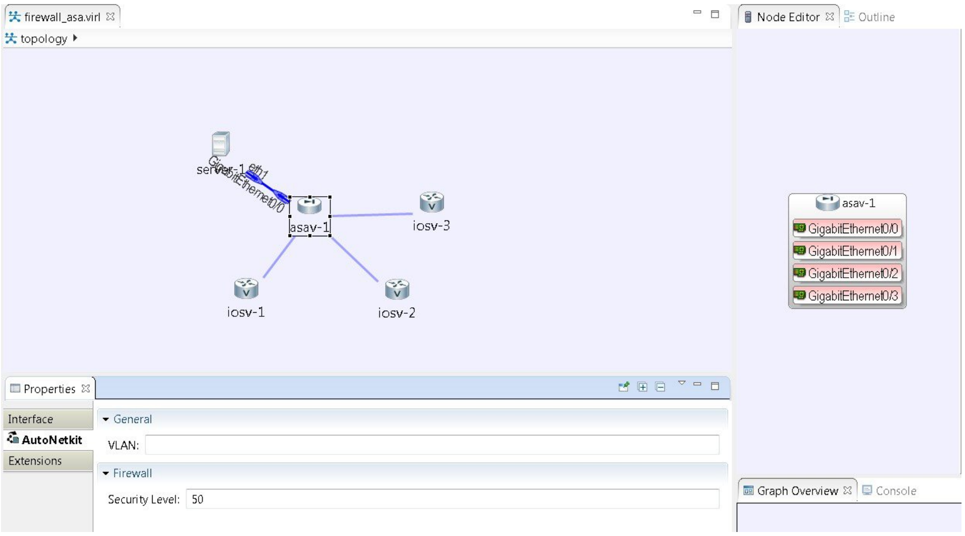
```
http 0.0.0.0 0.0.0.0 mgmt
ssh 0.0.0.0 0.0.0.0 mgmt
telnet 0.0.0.0 0.0.0.0 mgmt
http 0.0.0.0 0.0.0.0 outside
ssh 0.0.0.0 0.0.0.0 outside
telnet 0.0.0.0 0.0.0.0 outside
http 0.0.0.0 0.0.0.0 outside-1
ssh 0.0.0.0 0.0.0.0 outside-1
telnet 0.0.0.0 0.0.0.0 outside-1
http 0.0.0.0 0.0.0.0 outside-2
ssh 0.0.0.0 0.0.0.0 outside-2
telnet 0.0.0.0 0.0.0.0 outside-2
```

```
http 0.0.0.0 0.0.0.0 outside-3
ssh 0.0.0.0 0.0.0.0 outside-3
telnet 0.0.0.0 0.0.0.0 outside-3
```

Set Security Levels

Security levels are set using the **Security Level** property under the **Firewall** tab in the **AutoNetkit** field on the interface. The interface is selected in the **Node Editor**. The properties are set on the Cisco ASAv node's interfaces, as shown.

Figure 41: Set the Security Level

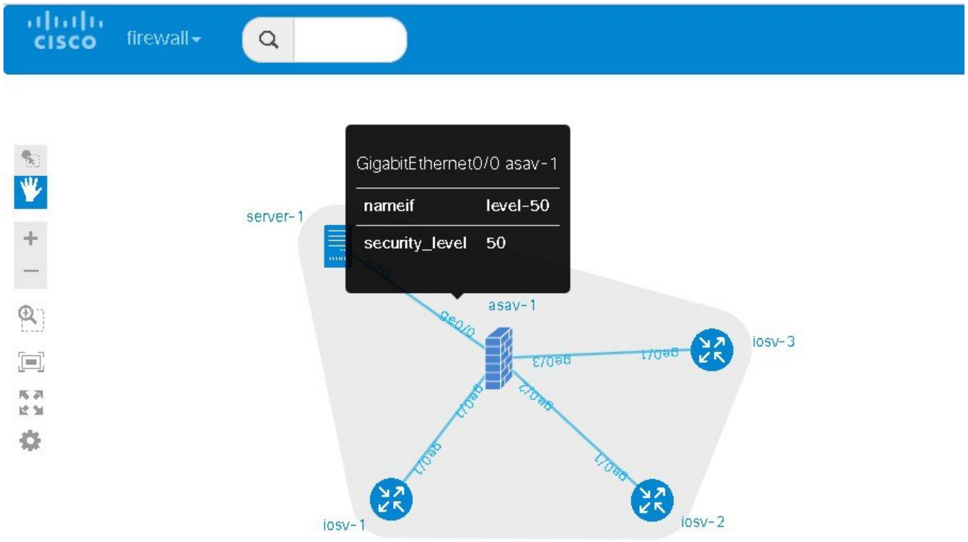


VLAN:

Security Level: 50

The security level is displayed in the **security_level** attribute of the interfaces in AutoNetkit visualization:

Figure 42: Security Level Attribute Set



GigabitEthernet0/0 asav-1

nameif	level-50
security_level	50

The configuration for **nameif** is updated.

```
interface GigabitEthernet0/0
 description to server-1
 nameif level-50
 security-level 50
 no shutdown
 ip address 10.0.0.5 255.255.255.252
interface GigabitEthernet0/1
 description to iosv-1
 nameif outside
 security-level 0
 no shutdown
 ip address 10.0.0.9 255.255.255.252
interface GigabitEthernet0/2
 description to iosv-2
 nameif outside-1
 security-level 0
 no shutdown
 ip address 10.0.0.13 255.255.255.252
interface GigabitEthernet0/3
 description to iosv-3
 nameif outside-2
 security-level 0
 no shutdown
 ip address 10.0.0.17 255.255.255.252
```

The access details are also updated.

```
http 0.0.0.0 0.0.0.0 level-50
ssh 0.0.0.0 0.0.0.0 level-50
telnet 0.0.0.0 0.0.0.0 level-50
http 0.0.0.0 0.0.0.0 mgmt
ssh 0.0.0.0 0.0.0.0 mgmt
telnet 0.0.0.0 0.0.0.0 mgmt
http 0.0.0.0 0.0.0.0 outside
ssh 0.0.0.0 0.0.0.0 outside
telnet 0.0.0.0 0.0.0.0 outside
http 0.0.0.0 0.0.0.0 outside-1
ssh 0.0.0.0 0.0.0.0 outside-1
```

```
telnet 0.0.0.0 0.0.0.0 outside-1
http 0.0.0.0 0.0.0.0 outside-2
ssh 0.0.0.0 0.0.0.0 outside-2
telnet 0.0.0.0 0.0.0.0 outside-2
```

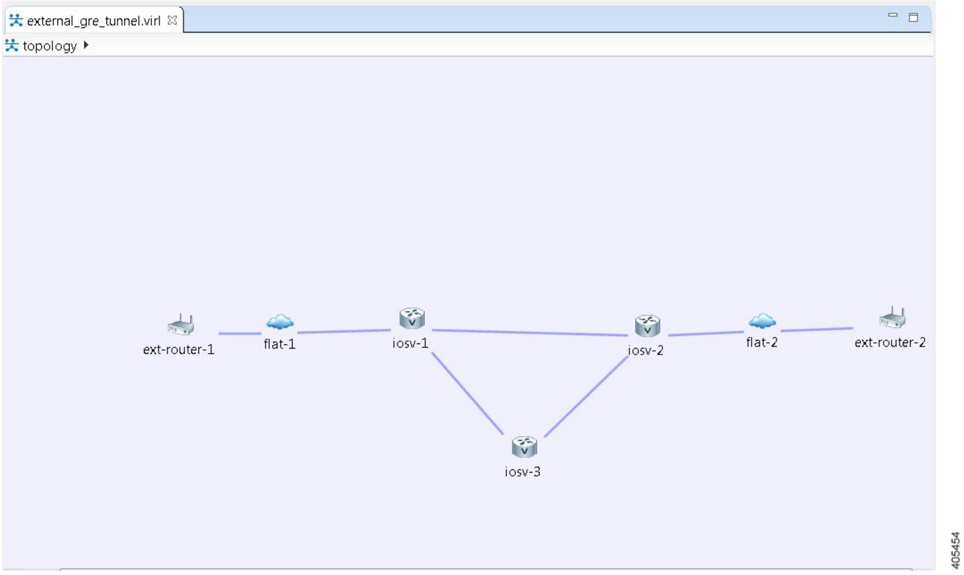
Note AutoNetkit automatically renames the nameif if there are multiple interfaces with the same security level.

Configure GRE Tunnels

Generic routing encapsulation (GRE) is a simple IP packet encapsulation protocol that is used to transport packets over a network. Information is sent from one network to the other through a GRE tunnel.

The GRE tunnel functionality uses the IOSv subtype as the GRE tunnel head and connects from an IOSv instance out over the FLAT/FLAT1/SNAT connector to some other device which is the far-end of the GRE Tunnel.

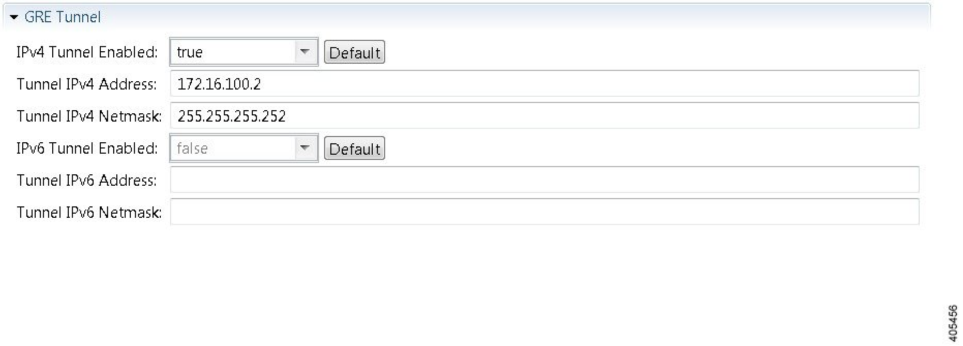
Figure 43: Using GRE Tunnels



In this example, you set the values on node iosv-1 and node iosv-2 to tell AutoNetkit to create the configuration for a GRE tunnel terminating on the external router node, ext_router_1.

So on iosv-1, set the tunnel IP address and subnet mask of the far-end device ext-router-1. Similarly, on the ext-router-1, set the tunnel IP address and subnet mask of the far-end device iosv-1.

Figure 44: Tunnel IP Address and Subnet Mask for ext_router_1



GRE Tunnel

IPv4 Tunnel Enabled: true

Tunnel IPv4 Address: 172.16.100.2

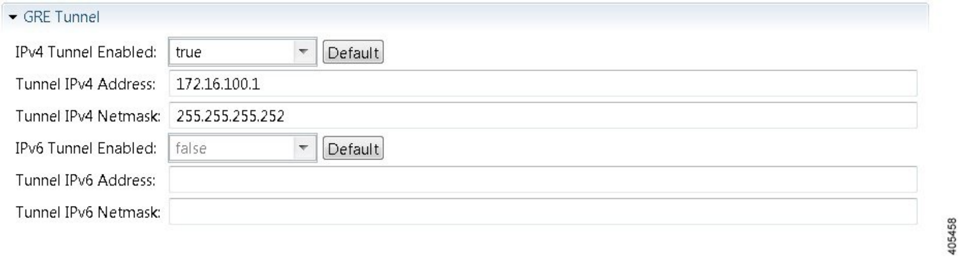
Tunnel IPv4 Netmask: 255.255.255.252

IPv6 Tunnel Enabled: false

Tunnel IPv6 Address:

Tunnel IPv6 Netmask:

Figure 45: Tunnel IP Address and Subnet Mask for iosv-1



GRE Tunnel

IPv4 Tunnel Enabled: true

Tunnel IPv4 Address: 172.16.100.1

Tunnel IPv4 Netmask: 255.255.255.252

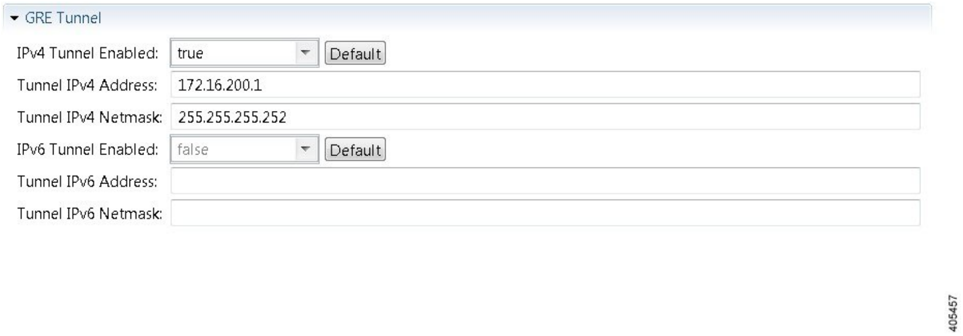
IPv6 Tunnel Enabled: false

Tunnel IPv6 Address:

Tunnel IPv6 Netmask:

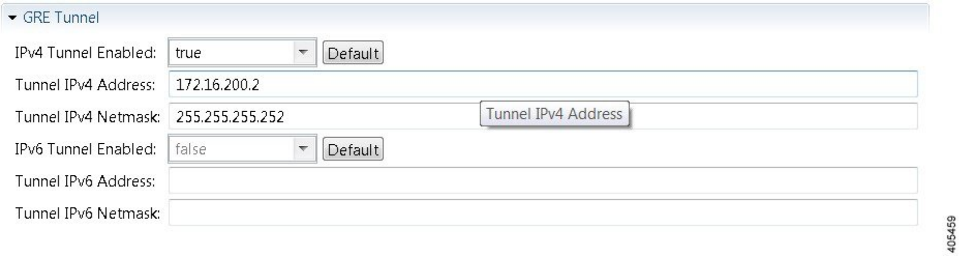
On iosv-2, set the tunnel IP address and subnet mask of the far-end device ext-router-2. Similarly, on the ext-router-2, set the tunnel IP address and subnet mask of the far-end device iosv-2.

Figure 46: Tunnel IP Address and Subnet Mask for ext_router_2



IPv4 Tunnel Enabled: true
Tunnel IPv4 Address: 172.16.200.1
Tunnel IPv4 Netmask: 255.255.255.252
IPv6 Tunnel Enabled: false
Tunnel IPv6 Address:
Tunnel IPv6 Netmask:

Figure 47: Tunnel IP Address and Subnet Mask for iosv-2



IPv4 Tunnel Enabled: true
Tunnel IPv4 Address: 172.16.200.2
Tunnel IPv4 Netmask: 255.255.255.252
IPv6 Tunnel Enabled: false
Tunnel IPv6 Address:
Tunnel IPv6 Netmask:

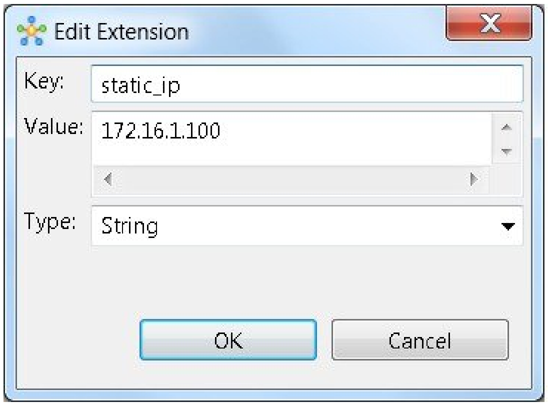
When the configurations are built, AutoNetkit selects the appropriate corresponding IP address and applies it to the interface as follows:

```
!
interface Tunnel1
  ip address 172.16.100.2 255.255.255.252
  tunnel source GigabitEthernet0/3
  tunnel destination 0.0.0.0
!
```

The tunnel destination is blank since it needs to be set to the IP address of the far-end device, which you may or may not know in advance. However, you can edit the configuration in the Cisco Modeling Labs client GUI before you start up the simulation. So if you do know the target address, you can add the target IP address in there (tunnel destination x.x.x.x.) Remember that it is not the IP address of the tunnel that goes in here but the IP address of the router/device terminating the GRE tunnel itself. If this is a devices that is on the FLAT network directly, then a 172.16.1.x address would go in here.

To make things simple and repeatable, you can use a static IP address on the interface of the IOSv GRE tunnel device that connects to the FLAT/FLAT1/SNAT connector.

Figure 48: Static IP Address for flat-1

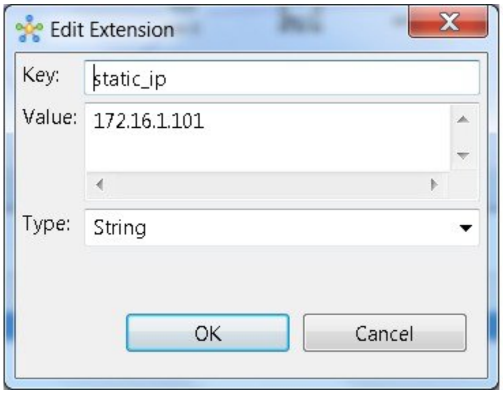


Key: static_ip

Value: 172.16.1.100

Type: String

Figure 49: Static IP Address for flat-2



Key: static_ip

Value: 172.16.1.101

Type: String

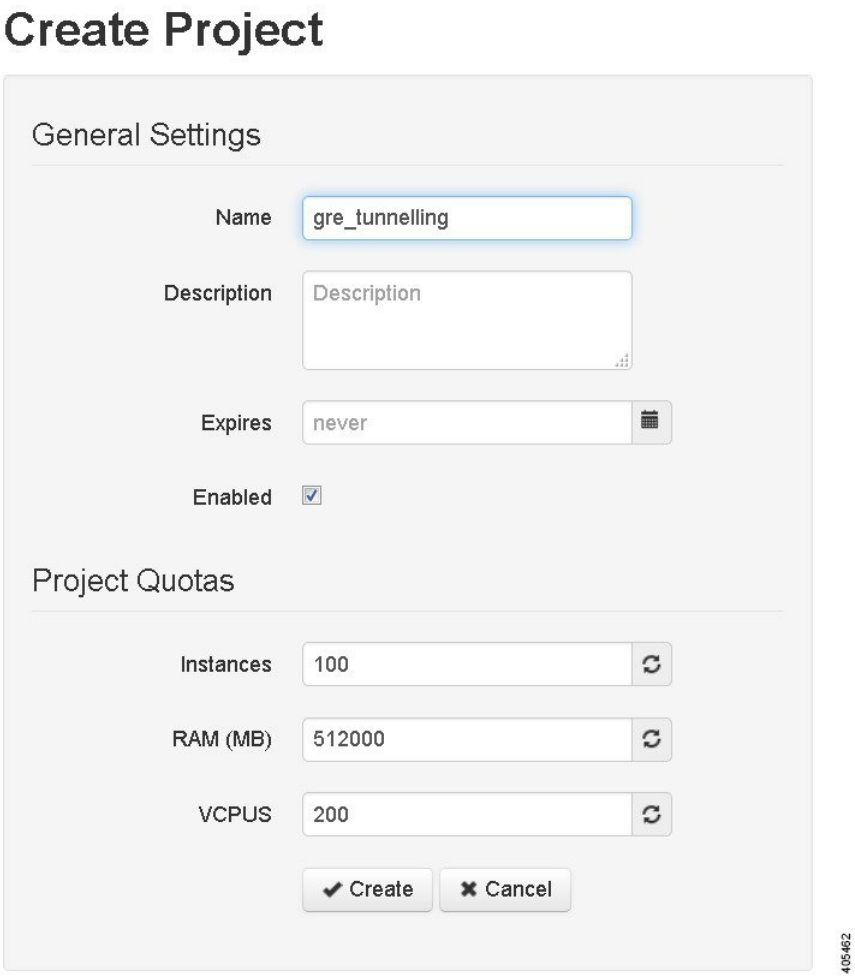
This provides a target address that the other device can then try to connect to and it is the same IP address each time the simulation is started.

Note You cannot do this using the standard guest account. The simulation will fail as you are using a system-level resource (the Static IP address), so an account with administrative permissions is required.

You must create this account in the **User Workspace Management** interface.

In the **User Workspace Management** interface, under the **Projects** tab, click **Add** to create a new project, as follows:

Figure 50: Create a New Project



Create Project

General Settings

Name: gre_tunnelling

Description: Description

Expires: never

Enabled: ☑

Project Quotas

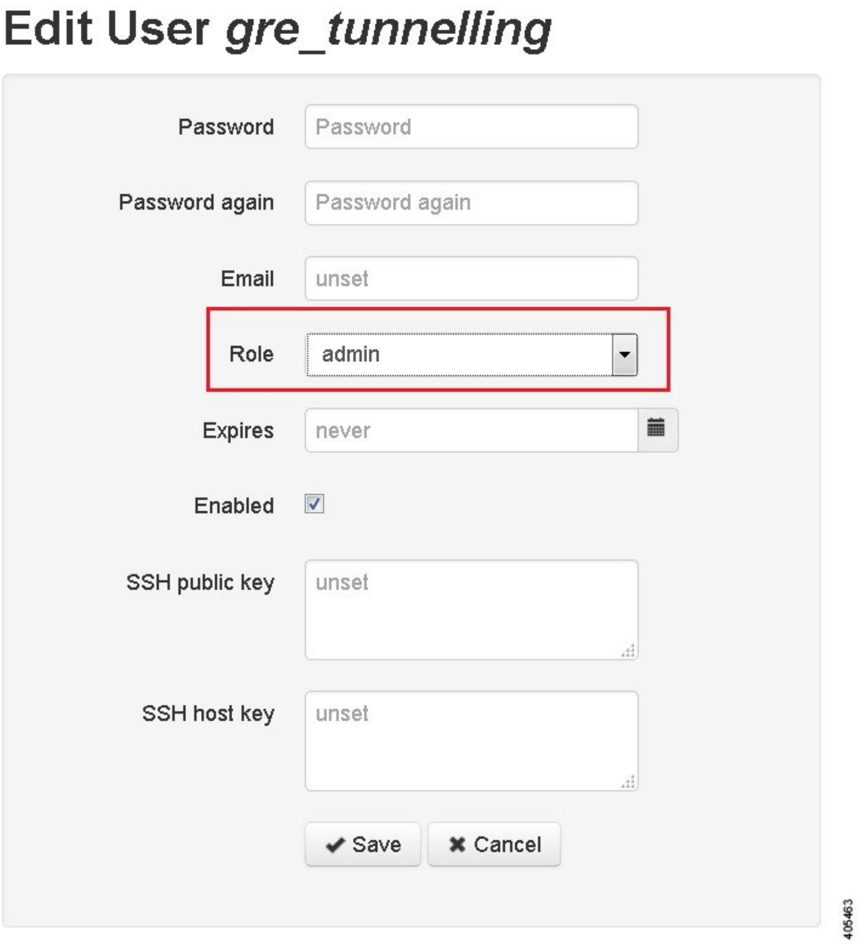
Instances: 100

RAM (MB): 512000

VCPUS: 200

In the corresponding user created for the project, set **Role** to **admin**.

Figure 51: Update the Role Field



Edit User *gre_tunnelling*

Password: Password

Password again: Password again

Email: unset

Role: admin

Expires: never

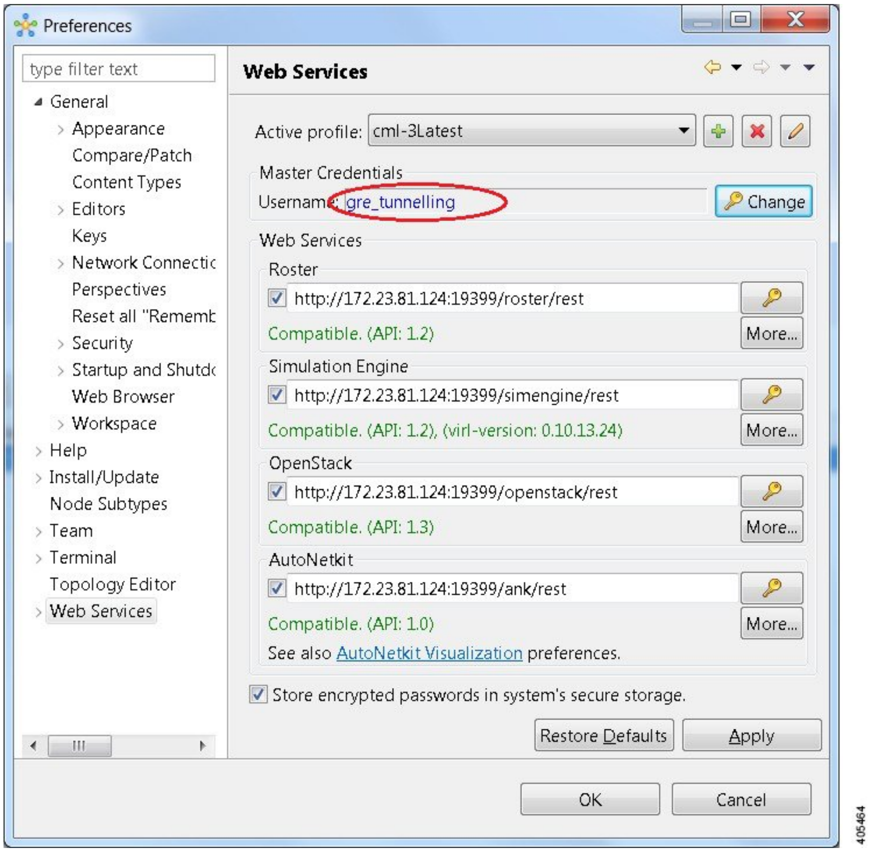
Enabled ☑

SSH public key: unset

SSH host key: unset

In the Cisco Modeling Labs client GUI, choose **File** > **Preferences** > **Web Services.**. In the **Web Services** dialog box, click **Change** under Master Credentials to login with the newly created user.

Figure 52: Log In as New Role



Web Services

Active profile: cml-3Latest

Master Credentials

Username: gre_tunnelling

Web Services

Roster

☑ http://172.23.81.124:19399/roster/rest

Compatible. (API: 1.2)

Simulation Engine

☑ http://172.23.81.124:19399/simengine/rest

Compatible. (API: 1.2), (virl-version: 0.10.13.24)

OpenStack

☑ http://172.23.81.124:19399/openstack/rest

Compatible. (API: 1.3)

AutoNetkit

☑ http://172.23.81.124:19399/ank/rest

Compatible. (API: 1.0)

See also AutoNetkit Visualization preferences.

☑ Store encrypted passwords in system's secure storage.

You can now start your simulation.

Automatic Configuration for OpenDayLight Controllers

Cisco IOS XRv virtual machines, version 5.3.0 and upwards can be automatically configured for communication and operation with an OpenDayLight (ODL) controller for path manipulation and control using MPLS TE tunnels. An option in available under the **AutoNetkit** properties tab in the Cisco Modeling Labs client called **ODL Management Group**. Cisco IOS XRv devices set with the ODL management group attribute must be paired with an external router entity, which is configured with the matching **ODL Management Group** attribute and an ODL external server IP address. The ODL server may be running on your Cisco Modeling Labs server or another location. It does not need to be part of the Cisco Modeling Labs simulation itself. However, connectivity between the simulation and the server must be provided.