



## Design a Topology

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- [Design a Topology Overview, page 1](#)
- [Topology Nodes and Connections, page 1](#)
- [Create a Topology, page 4](#)
- [Place the Nodes on the Canvas, page 5](#)
- [Create Connections and Interfaces, page 6](#)
- [Use Unmanaged Switches, page 7](#)
- [The Cisco IOSvL2 Switch Image, page 8](#)
- [Create a Site, page 12](#)

## Design a Topology Overview

The design phase is the initial step in creating a network topology. During the design phase, you will perform the tasks described in the following sections.

## Topology Nodes and Connections

The topology you design consists of nodes and connection functions. See [Navigating Within the Cisco Modeling Labs Client](#) for additional information about how to select and edit nodes and connection functions.

### Topology Nodes

**Table 1: Node Subtypes**

Node Name	Node Type
Cisco IOSv	Router node. Runs a Cisco IOS operating system.
Cisco IOSvL2	Router node. Runs a Cisco IOS Layer 2 operating system.

Node Name	Node Type
Server	Server node. Runs a Linux operating system.
Cisco IOS XRv	Router node. Runs a Cisco IOS XR operating system.
Cisco CSR1000v	Router node. Runs a Cisco CSR 1000 operating system.
Cisco NX-OSv	Router node. Runs a Cisco NX-OS operating system. (Available separately.)

A node subtype is a virtual machine that runs on top of OpenStack, which itself is running in a Linux virtual machine that is running on top of VMware software. Because the node is virtual, specific hardware is not emulated. For example, there are no power supplies, no fans, no ASICs, and no physical interfaces. For all router nodes, the interface type is a Gigabit Ethernet network interface. A server node has an Ethernet network interface.

You can choose an image and image flavor for each node type. See the *User Workspace Management* chapter in the *Cisco Modeling Labs Corporate Edition System Administrator Installation Guide, Release 1.1* for information on how to access the VM Image and the VM Flavor choices. In most cases, you need not select an image and flavor. By default, the node subtype is associated with an image and flavor that runs with the topology.

**Table 2: Node VM Images**

VM Image Name	Used For
server	Server node
CSR1000v	Cisco CSR1000 node
IOSv	Cisco IOS node
IOSvL2	Cisco IOS Layer 2 node
IOS XRv	Cisco IOS XR node
NX-OSv	Cisco NX-OS node

**Table 3: Node VM Flavors**

VM Flavor Name	Used For
m1_tiny	Linux server
m1_small	Linux server
m1_medium	Linux server

VM Flavor Name	Used For
m1_large	Linux server
m1_xlarge	Linux server
server	Linux server
CSR1000v	Cisco CSR 1000 node
IOS XRv	Cisco IOS XR node
IOSv	Cisco IOS node
IOSvL2	Cisco IOS Layer 2 node
NX-OSv	Cisco NX-OS node

Each Linux flavor provides a different amount of memory and CPU allocated to the server.

### Connection Functions

Cisco Modeling Labs provides the connection functions shown in the following table.

**Table 4: Connection Functions**

Connection Type	Description
<b>Connection</b>	Creates a connection between two interfaces. Interfaces are created in the node to support a connection. Any unused interfaces present are automatically assigned. All the interfaces in router nodes are represented as Gigabit Ethernet interfaces. Multiple parallel connections are supported.
<b>External Router</b>	Creates an external router connection point. When the external router is used in conjunction with a Layer 2 External (Flat) network and IOSv instances, AutoNetkit is able to configure an L2TPv3 tunnel to connect simulations to remote devices in a transparent manner.
<b>Layer 3 External (SNAT)</b>	Creates a Layer 3 external connection point using static network address translation (SNAT). This external connection point allows connections outside of Cisco Modeling Labs to connect to the topology.
<b>Layer 2 External (Flat)</b>	Creates a Layer 2 external connection point using FLAT. This external connection point allows connections outside of Cisco Modeling Labs to connect to the topology.

Connection Type	Description
Layer 2 External (Flat1)	Creates a Layer 2 external connection point using FLAT1. This second external connection point allows connections outside of Cisco Modeling Labs to connect to the topology.

Table 5: Site Groups

Type	Description
Site	Creates a site that uses levels of hierarchy in a Cisco Modeling Labs topology. Sites can be added to a topology, objects can be created within a site, and objects can be linked between sites and parent sites.

## Create a Topology

### Before You Begin

A topology project folder must exist.

There are several methods for creating a topology. These are discussed in the following sections.

### Method 1: Create a Topology from the Menu Bar

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- Step 1** From the menu bar, choose **File > New > Topology File**.
  - Step 2** Select a topology project folder.
  - Step 3** Enter a filename, ensuring that it ends with the extension **.virl**.
  - Step 4** Click **Finish**.  
A filename **.virl** topology file is created in the selected project folder.
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## Method 2: Create a Topology from the Projects View

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- Step 1** Right-click **Projects** view.
- Step 2** Choose **New > Topology**.
- Step 3** Select a topology project folder.
- Step 4** Enter a filename, ensuring that it ends with the extension **.virl**.
- Step 5** Click **Finish**.  
A filename .virl topology file is created in the selected project folder.
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## Method 3: Create a Topology from the Toolbar

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- Step 1** Click the **New Topology File** icon in the toolbar.
- Step 2** Select a topology project folder.
- Step 3** Enter a filename, ensuring that it ends with the extension **.virl**.
- Step 4** Click **Finish**.  
A filename .virl file is created in the selected project folder.
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### What to Do Next

Place the nodes.

## Place the Nodes on the Canvas

### Before You Begin

- A topology file must exist.
- The topology file must be open and the canvas visible in the **Topology Editor**.

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- Step 1** Click a node type, which is under the **Nodes** heading in the **Palette** view.
- Step 2** Click the canvas at each point where you want to place a node. You can also drag the nodes on the canvas to position them. You can then arrange the nodes using several methods:
- Use **Shift-click** to select two or more nodes. Alternatively, click and drag a selection box around two or more nodes. You can also use **Ctrl-click** (Windows) or **Cmd-click** (OS X) to toggle between node selections.

- From the menu bar, use **Edit > Distribute Nodes** to arrange the selected nodes vertically, horizontally, or to distribute them on a grid.
  - Note** The grid is determined dynamically, based on the selected nodes.
- Use **Edit > Alignment** from the menu bar to arrange the selected nodes in a variety of alignments, namely, Left, Center, Right, Top, Middle, and Bottom.
  - Note** The use of **Distribute Nodes** and **Alignment** is mutually exclusive.
- When no nodes are selected, use the **Edit > Layout Nodes** from the menu bar to arrange the nodes in a Tree Layout or a Fruchterman-Reingold (F-R) Layout.
  - A basic tree layout is to choose a node as the root of the tree, and the nodes connected to the root become children of the root node.
  - A F-R layout has connected nodes close to each other, while unconnected nodes are further apart from each other.

See the section [Toolbar](#) for information on using these tools.

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### What to Do Next

Create connections and interfaces.

## Create Connections and Interfaces

### Before You Begin

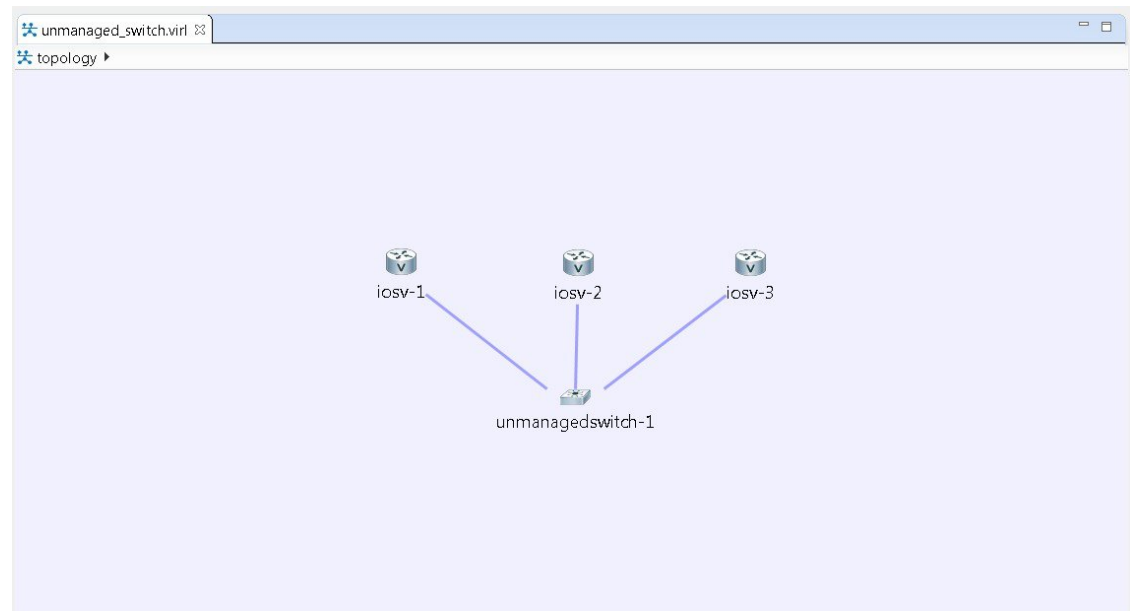
Nodes must be in place on the canvas of the **Topology Editor**.

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- Step 1** Click **Connection** in the **Tools** view.
- Step 2** Click the first node.
- Step 3** Click the next node to create the connection.
  - Note** When you connect two nodes, the interfaces are created and named automatically when you choose **File > Preferences > Topology Editor > Associate new connection with interfaces silently** check box. You can view the node interfaces when you click the connection and the two end points of the connection appear in the **Node Editor**.
- Step 4** Repeat Step 2 and Step 3 until all the connections are in place.
  - Tip** You can create multiple parallel connections between two nodes. When a connection is selected, the **Topology Editor** shows the connection end points and the **Node Editor** shows the two nodes involved in the connection, all of the interfaces on those nodes, and all the connections between those two nodes.
  - Note** Choose **File > Export > Export Topology Diagram to Image** to capture an image of the current topology on the canvas.
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# Use Unmanaged Switches

Users have the choice to use either an unmanaged switch or Cisco IOSv layer 2 to provide a switching service. Unmanaged switches are used in place of the multipoint connection which was available in previous versions of Cisco Modeling Labs. For example, in the following figure there are 3 IOSv instances connected to an unmanaged switch. Each of the interfaces on iosv-1, iosv-2, and iosv-3 appear to be on the same subnet for point to point communication through the unmanaged switch.

**Figure 1: Using an Unmanaged Switch in a Simple Topology**



Unmanaged switch instances use the underlying Linux bridge process running under OpenStack control to provide this connectivity between the various virtual machines. It is a transparent switch.

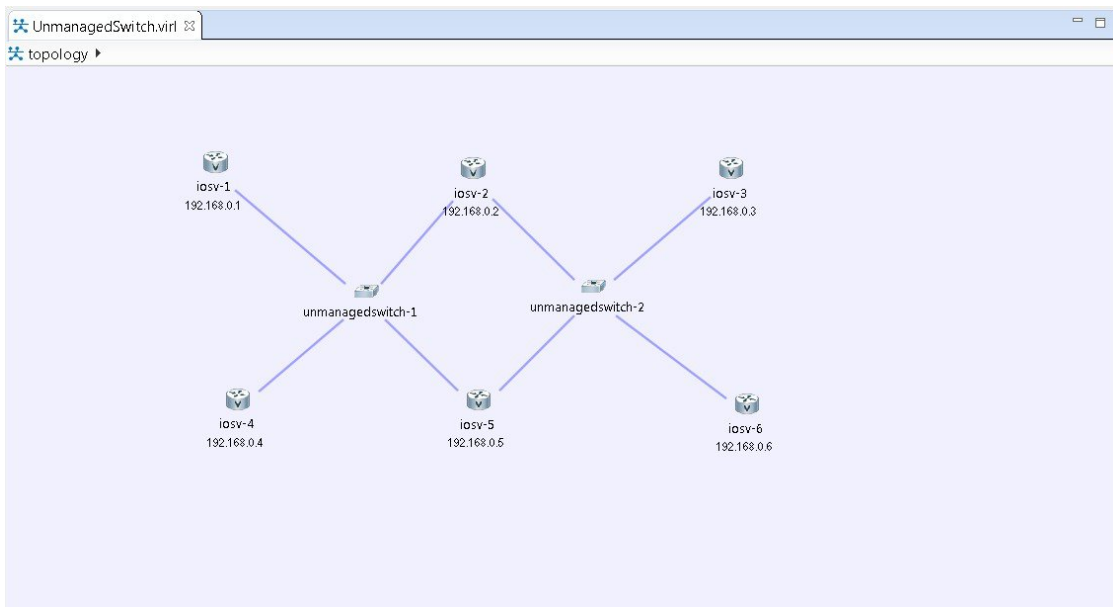
## Before You Begin

A topology file with the extension .virl must exist. Router nodes or server nodes are placed on the canvas. Optionally, connections may exist between nodes.

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- Step 1** In the **Nodes** view, click **Unmanaged Switch**.
  - Step 2** Click the area on the canvas where you want the unmanaged switch to appear.
  - Step 3** In the **Tool** view, click **Connect**.
  - Step 4** On the canvas, click the unmanaged switch node then click an end node. A connection appears.

Continue clicking unmanaged switch-node combinations until all connections are made.

**Figure 2: Using an Unmanaged Switch**



## The Cisco IOSvL2 Switch Image

The Cisco IOSvL2 switch image is available in Cisco Modeling Labs, Release 1.1. The Cisco IOSvL2 switch image is a virtual machine like Cisco IOSv, Cisco IOS XRv, and so on. It runs and is configured in the same way as all other virtual machines. It runs a Cisco IOSv 15.2 switch image.



**Note** All Cisco IOSvL2 switch images in a topology are counted against the node limit.

A Cisco IOSvL2 switch image provides sixteen Gigabit Ethernet interfaces, reserving Gi0/0 for OOB management. It can be configured manually or using AutoNetkit.

Cisco IOSvL2 switch instances can operate in:

- Layer 2 mode
- Layer 3 mode

By default the instances operate in layer 3 mode. However, the primary use of the Cisco IOSvL2 switch image is for switching purposes.

Any routers set up to connect to the Cisco IOSvL2 switch will be in switchport access mode. By default, all routers are placed in VLAN 2. You can specify which VLAN to place a port in by setting a VLAN attribute on the router interface. See [Assign VLANs](#) for details on how to do this.

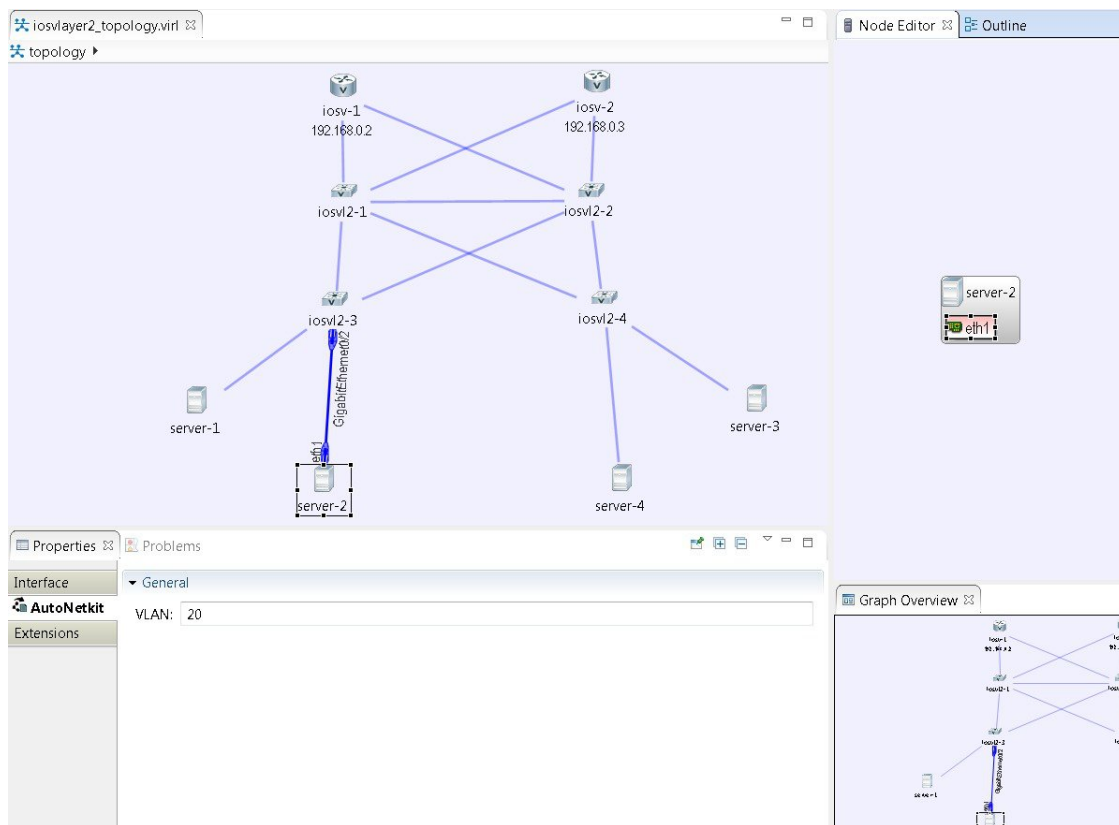


When using a switch to switch connection, it defaults to a 802.1q trunk port between the switches when configured using AutoNetkit.

## Use the Cisco IOSvL2 Switch Image

- Step 1** In the **Nodes** view, click **IOSvL2**.
- Step 2** Click the canvas at each point where you want to place an IOSvL2 node. You can also drag the nodes on the canvas to position them.
- Step 3** Add additional node types as required.
- Step 4** Use the **Connect** tool to create connections between the nodes.
- Step 5** To specify which VLAN to place a port in, select the interface for the host or router in the **Node Editor**.
- Step 6** Under **Properties** > **AutoNetkit**, enter a value for the **VLAN** field, as shown.

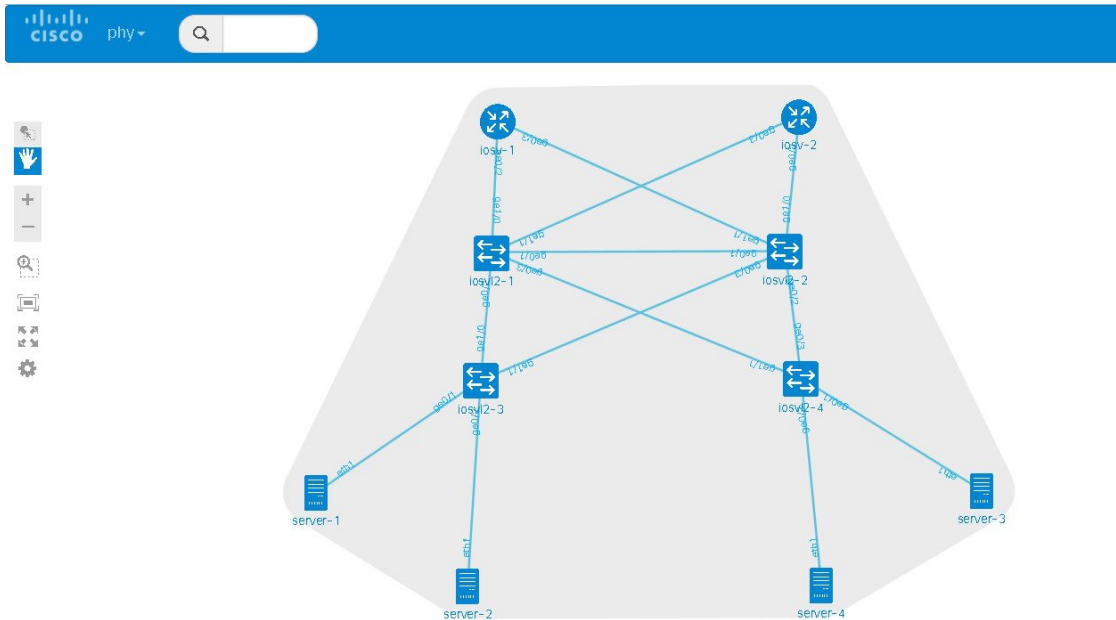
**Figure 3: Setting the VLAN Attribute**



- Step 7** From the toolbar, click **Build Initial Configurations** to generate a configuration for the topology using AutoNetkit. When prompted to open AutoNetkit visualization, click **Yes**.

AutoNetkit visualization for the topology opens in a browser window.

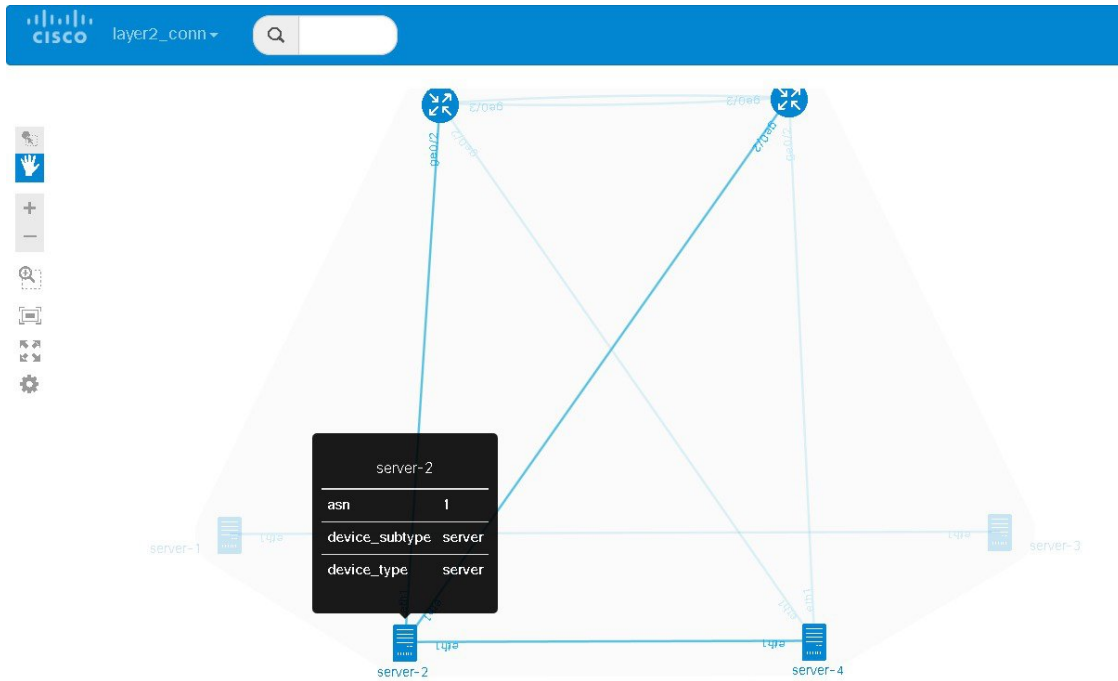
**Figure 4: AutoNetkit Visualization**



**Step 8**

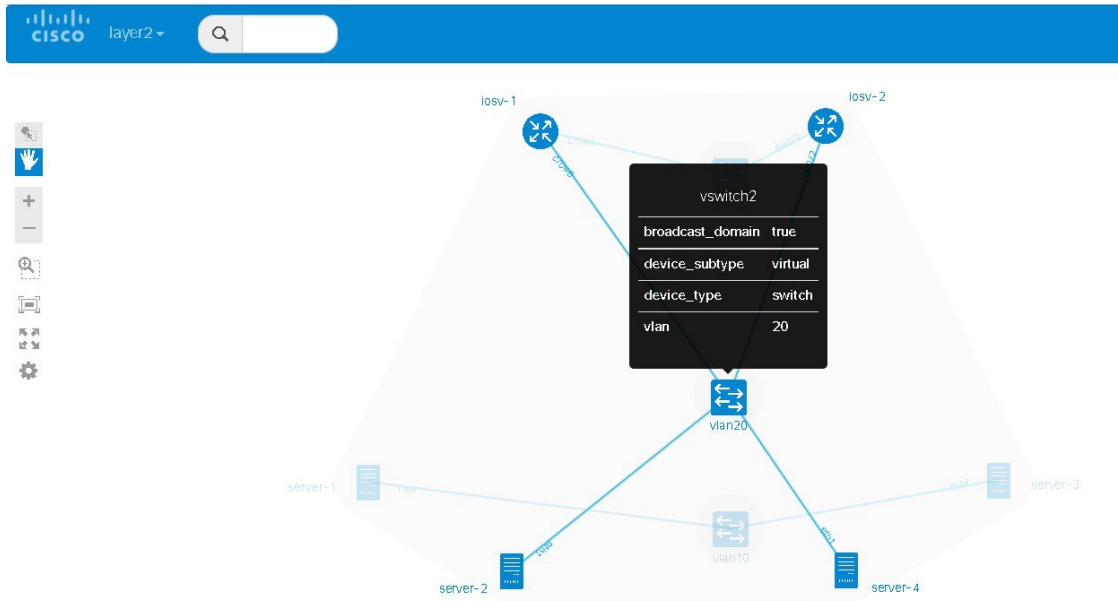
To view all broadcast domains that are enabled, select **layer2\_conn** from the **phy** drop-down list. For example, hovering over server-2 in this example shows the routers and servers that are in the same VLAN. All other devices are greyed out.

**Figure 5: Layer 2 Connectivity**



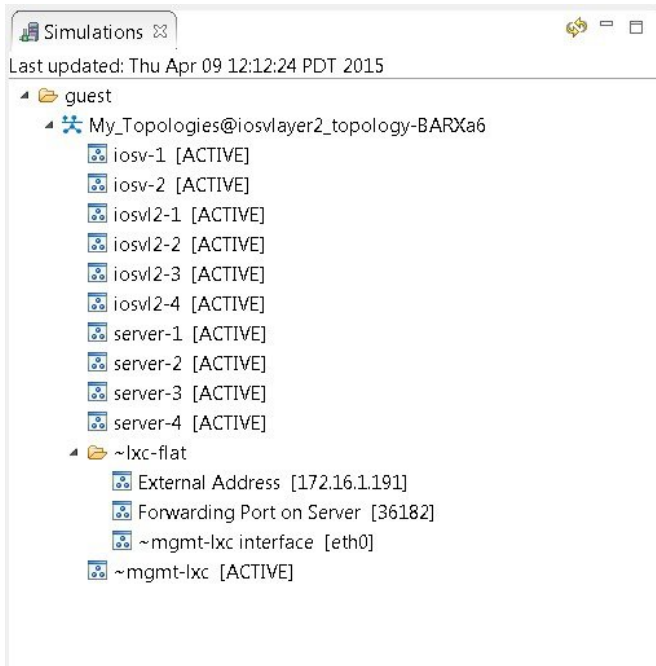
Selecting **layer2** from the **phy** drop-down list shows the switches representing the VLANs in place.

**Figure 6: Layer 2 Switches**



- Step 9** In the Cisco Modeling Labs client, click **Launch Simulation** to start the simulation. The simulation starts and is visible in the **Simulations** view.

**Figure 7: Simulation with Cisco IOSvL2 Switch Image**



## Create a Site

A site is a container that can hold one or more nodes. It is used to group multiple nodes within the same site, which provides a degree of hierarchy and simplifies the topology view.

A node interface within a site can connect to another node interface in the same site or to a node interface located in a different site. A connection cannot start on a node and terminate on a site. Sites can be nested, forming a hierarchical structure.

### Before You Begin

One or more nodes should be on the canvas.

- Step 1** In the **General** view, click **Site**.
- Step 2** Click an area on the canvas to place the site.
- Step 3** **Shift-Click** the nodes that you want in the site, or click and drag a selection window around the nodes.

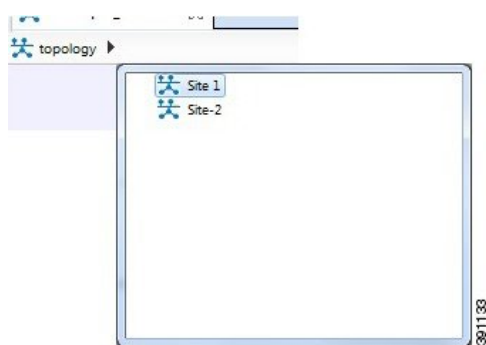
- From the **Edit** menu, choose **Group to Site**.
- Alternatively, you can drag the selected nodes to the site icon that you placed on the canvas.

**Step 4** To view the site, select the site name from the drop-down list under the **Topology** tab. A topology site tab opens and displays the site view.

The drop-down list under the **Topology** tab displays the site hierarchy as a navigation trail.

To open a site view, double-click on the site. The following figure shows the navigation trail selections for Site 1 and Site 2.

**Figure 8: Site Selection**



**Step 5** To ungroup the site, click the site icon and choose **Edit > Ungroup Site**.

**Step 6** To connect node interfaces between Site 1 and Site 2:

- Select **Site 1**.
- Click **Connect**.
- Click the node that is the starting point of the connection, Site 1.
- Move the cursor to the breadcrumbs and click **Site 2**. Site 2 is displayed.
- Click the node that is the endpoint of the connection. A connection now exists between the interfaces in the two sites.

**Step 7** To delete a node from a site:

- Select the applicable node.
- Right-click the node and select **Delete** from the list. The node is deleted.

**Step 8** To delete a site from a topology:

- Select the applicable site.
- Right-click the site and select **Delete** from the list. The site is deleted including all associated interfaces and connections.

