Overview of Cisco Modeling Labs

Cisco Modeling Labs

Cisco Modeling Labs is a scalable and extensible software platform that enables operators, engineers, network designers, and architects to design Cisco-based networks and run simulations using virtual versions of selected Cisco operating systems. Cisco Modeling Labs comprises the Cisco Modeling Labs server and the Cisco Modeling Labs client. Together, they provide a sandbox environment that facilitates the design, configuration, visualization, and simulation of network topologies quickly and efficiently.

- **Cisco Modeling Labs server**: A shared resource containing the capability to initiate topologies using installed virtual images.

- **Cisco Modeling Labs client**: A point-and-click GUI that simplifies topology creation and initial device configurations along with continuous updates. It also permits access to the Cisco Modeling Labs server functionality.

Cisco Modeling Labs Server Components

The Cisco Modeling Labs server is available as:

- A Linux distribution that is bundled within the VMware Open Virtual Appliance (OVA) file for VMware ESXi. The bundle includes all the supporting files.

Cisco Modeling Labs comprises a framework of components. The main components are:

- **OpenStack**: An open-source platform for creating and managing large groups of virtual servers in a cloud-computing configuration. It is used for node control, management, and networking.

- **AutoNetkit**: An automated configuration engine that uses templates to provide working router configurations based on user-supplied and default parameters for each virtual machine (VM).

- **Services Topology Director**: Generates OpenStack calls for the creation of VMs and links based on the XML topology definition created by the Cisco Modeling Labs client. Additionally, it provides the bootstrap configuration, which can be autogenerated, generated manually, or imported.

Cisco Modeling Labs Client

The Cisco Modeling Labs client is a cross-platform user interface for creating and editing network designs and simulating those network topologies on the Cisco Modeling Labs server. The Cisco Modeling Labs client offers the following benefits:

- The ability to use a graphical point-and-click editor to quickly create and edit complex network topologies in a sandbox.

- Access to the build, visualization, and launch functions available in the Cisco Modeling Labs server.

The Cisco Modeling Labs client enables you to interact directly with your running simulations from the user interface. The Cisco Modeling Labs client also provides the functionality to generate default router configurations before launching the topology simulation.

For further information on the Cisco Modeling Labs client, see Using the Cisco Modeling Labs Client Overview.

Virtual Images

Cisco Modeling Labs 1.2 includes the following images built into the Cisco Modeling Labs client:

- Cisco Virtual IOS (IOSv) Software Release 15.6(2)T

- Cisco IOSv Layer 2 Switch Software Release 15.2 (4.0.55) DSGS

- Cisco IOS XRv Software Release 6.0.1 CCO

- Linux server (Ubuntu 14.04.2 Cloud-init)

- Cisco ASAv Software Release 9.5.1

Additionally, the following demonstration images are available from the Cisco FileExchange:

- Cisco IOS XRv 9000 Software Release 6.0.1

- Cisco CSR1000v Software Release 3.1.7 XE-based

See *Release Notes for Cisco Modeling Labs 1.2* for more information on Cisco virtual software supported features.

Cisco Modeling Labs Server Requirements

This section details the hardware and software requirements for installing the Cisco Modeling Labs server.

The following table lists hardware requirements that are based on the number of virtual nodes used.

Table 1: Hardware Requirements for Cisco Modeling Labs Server

Requirement	Description
Disk Space	250 GB minimum
Chip Set	Intel$^®$ with Intel virtualization technology VT-x and extended page tables (EPT)
Hypervisor	VMware ESXi 5.1 U2, ESXi 5.5 U1, ESXi 6.0 (Build 2494585)
Server type for OVA package	Any server with Intel virtualization technology VT-x and extended page tables (EPT)
Server type for ISO package	Supported only on Cisco UCS servers with local storage
Server Recommendation	Cisco UCS C220 M4 and Cisco UCS C420 M4

The recommended servers for Cisco Modeling Labs are the Cisco UCS C220 M4 and Cisco C420 M4 servers.

For more information on UCS servers, see the applicable data sheets at http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-c-series-rack-servers/index.html.

For bare metal installations, Cisco Modeling Labs ISO package is certified only with the Cisco UCS C220 M4 and Cisco C420 M4 servers.

Sizing the Server: Number of Cores and Memory Requirements

The calculation for the number of cores and memory requirement is dependent on a number of factors:

- Type and number of virtual machines concurrently active
- Number of routing protocols
- Timer sets within the configurations
- Amount of traffic generated

The general rule of thumb is three virtual nodes to one physical core CPU for simulation of 49 nodes and below, and two virtual nodes to one physical core CPU for 50 nodes and above.

Note   In order to size the Cisco Modeling Lab Server resources, you must use the Cisco Modeling Labs resource calculator available at http://www.cisco.com/go/cml

Table 2: Software Requirements

| Requirement	Description
VMware	
VMware vSphere	Any of the following: • Release 5.1 U2 (Build 1483097) with VMware ESXi • Release 5.5 U1 (Build 1623387) with VMware ESXi • Release 6.0 (Build 2494585) with VMware ESXi **Note** You must verify that you are using vSphere Client v5.5 Update 2 (Build 1993072) or later before deploying Cisco Modeling Labs. Failure to use the minimum version will result in a failed deployment that will return an error stating that nested virtualization is not supported.
Browser	Any of the following: • Google Chrome 33.0 or later • Internet Explorer 10.0 or later • Mozilla Firefox 28.0 or later • Safari 7.0 or later **Note** Internet Explorer is not supported for use with the AutoNetkit Visualization feature, the Live Visualization feature or with the **User Workspace Management** interface. See Cisco Modeling Labs Corporate Edition User Guide, Release 1.2 for more information.

Table 3: Required BIOS Virtualization Parameters

Name	Description
Intel Hyper-Threading Technology	**Note** This parameter must be **Enabled**. The processor uses Intel Hyper-Threading Technology, which allows multithreaded software applications to execute threads in parallel within each processor. The processor can be either of the following: • **Enabled**—The processor allows for the parallel execution of multiple threads. • **Disabled**—The processor does not permit Hyper-Threading.

Name	Description
Intel VT	**Note** This parameter must be **Enabled**. **Note** If you change this option, you must power-cycle the server before the change takes effect. The processor uses Intel Virtualization Technology (VT), which allows a platform to run multiple operating systems and applications in independent partitions. The processor can be either of the following: • **Enabled**—The processor allows multiple operating systems in independent partitions. • **Disabled**—The processor does not permit virtualization.
Intel VT-d	**Note** This parameter must be **Enabled**. The processor uses Intel Virtualization Technology for Directed I/O (VT-d). The processor can be either of the following: • **Enabled**—The processor uses virtualization technology. • **Disabled**—The processor does not use virtualization technology.

Cisco Modeling Labs Framework

Figure 1: Cisco Modeling Labs Framework
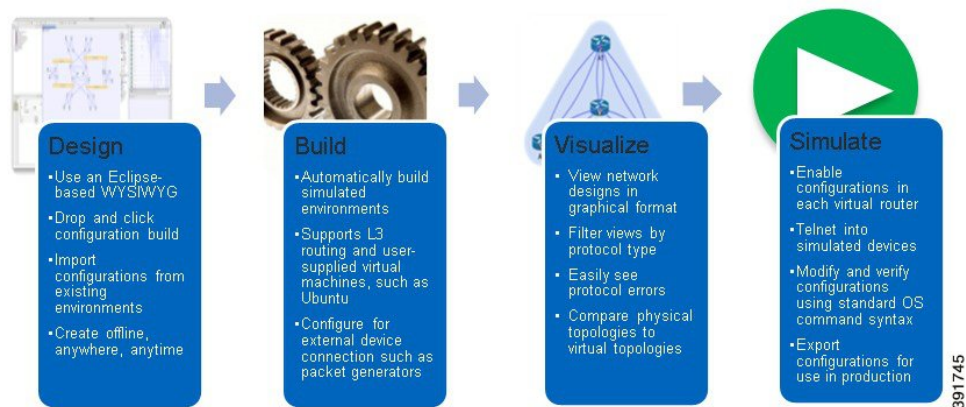
Cisco Modeling Labs includes numerous features that enable you to create and simulate small and large network designs. This user guide is organized in a task-based format where the main features are grouped into four sections that are referred to as phases.

The following items describe each phase which should help you determine, which section to refer to when using this guide:

1 **Design**: This phase includes the tasks for creating a network topology. You use a blank canvas to create topologies from scratch or import existing network topologies. You can also adjust where and how interfaces are used on each device.

2 **Build**: This phase includes the tasks associated with configuring routers, external connections, and servers, creating the required configurations, setting up interfaces, IP addressing, and routing protocols for the virtual routers. There are several ways to create these configurations. You can use the AutoNetkit functionality to set up the initial configuration, or you can input your own configuration details. Whatever configurations you create in this phase will be the configurations that the Cisco Modeling Labs server will use when it initiates the node simulations.

3 **Visualization**: This phase is optional and operates only if you use AutoNetkit to create your configurations during the build phase. It includes the tasks related to running visualization scenarios of your network design and configuration. It provides visual views of your topology whereby you can see how the nodes will interact with each other in specific circumstances, including physical set up, as well as with specific routing protocols, such as IS-IS and OSPF. It also supports MPLS and BGP.

4 **Simulation**: This phase includes the tasks for initiating the nodes and making them active. Once the nodes are operational, you can use Telnet or SSH to connect to the consoles as you would connect to a router console. You can run connectivity tests and modify configurations. This is where the power of the product is realized: you can modify and test configurations as if you were on actual physical devices. In this phase, you can also save your configurations and extract them for sharing with others or save them and use them as reference when configuring the production network.