

cnMaestro On-Premises Quick Start Guide

Program Name: cnMaestro



DOC NO:

Version 1.0

1 Table of Contents

1	Table of Contents	2
2	Overview.....	3
2.1	Introduction	3
2.2	Where to Get Help.....	3
2.3	Device Software	3
3	cnMaestro On-Premises	4
3.1	Supported Virtualization Infrastructures.....	4
3.1.1	Hardware Requirements	4
4	Architecture.....	5
4.1	Overview	5
4.2	Networking	5
5	Installation.....	6
5.1	Overview	6
5.1.1	Default Passwords	6
5.2	Virtualization.....	6
5.3	cnMaestro Deployment	7
5.3.1	VMware Workstation Player.....	7
5.3.2	Configure Networking.....	11
5.3.3	cnMaestro UI Access	16
5.4	Device Software	18
5.5	Device Access.....	19
5.5.1	Static URL.....	19
5.5.2	DHCP Options (Linux).....	20
5.5.3	DHCP Options (Windows).....	22
6	Operations	22
6.1	Onboarding Devices.....	22
6.1.1	Pre-Configuration and Acceptance of Devices	22
6.1.2	Device Authentication	23
6.2	Updating cnMaestro Software	24
6.2.1	Package Types	24
6.2.2	Exporting/Importing Data	25
6.2.3	OVA Update Process	25
6.3	Managing Device Software Images.....	25
6.4	Server Technical Support Dump.....	26
7	Appendix: Frequently Asked Questions	27
8	Appendix: Additional Deployments	27
8.1	VMware ESXi	27
8.1.1	cnMaestro VM Deployment.....	27
8.1.2	cnMaestro Setup.....	32
8.2	Oracle VirtualBox 5 or Later	34
8.2.1	Deployment.....	34

2 Overview

2.1 Introduction

Welcome to cnMaestro On-Premises! This guide provides a brief overview of the product along with steps to get up-and-running quickly. Much of this information is also presented in the User Guide.

2.2 Where to Get Help

If you run into issues, there are a number of ways to get help:

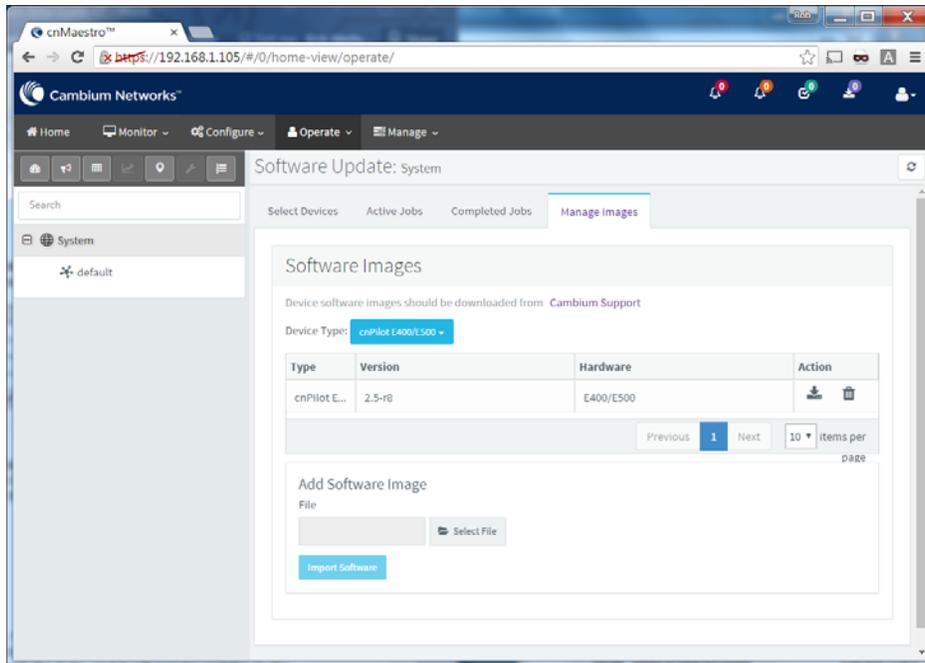
1. [Cambium Community](#): The cnMaestro Forum provides the best place to ask questions and get up-to-date information.
2. **cnMaestro On-Premises User Guide**: The User Guide is embedded into the cnMaestro image and can be accessed on the Home Page of the UI. It can also be downloaded in PDF format from the Cambium Support website.
3. [Cambium Support](#): The Cambium Support team is available 24x7 to answer questions and resolve issues.

2.3 Device Software

cnMaestro On-Premises only works with the latest Cambium device software. You should make sure your Cambium devices support the versions below or later.

Family	Model	Version
cnPilot	cnPilot R200	4.2.3-R4
	cnPilot R200P	
	cnPilot R201	4.2.3-R4
	cnPilot R201P	
ePMP 1000 Hotspot	ePMP 1000 Hotspot	2.5.2-r3
cnPilot	cnPilot E400/E500	2.5.2-r3
ePMP	ePMP 1000, Force 180/200	2.6.2

If you don't have the minimum software versions, you can download them from the Cambium Support Center (<http://support.cambiumnetworks.com>). Software images are also embedded within cnMaestro On-Premises and can be downloaded to your local computer. The software is located at: **Operate > Software Update > Manage Images**. Select your device type to display the available images, and then click the download icon ().



Warning

Device software is included with the virtual machine software; however, it is not updated automatically. New device software needs to be manually added. See the User Guide for more information.

3 cnMaestro On-Premises

3.1 Supported Virtualization Infrastructures

cnMaestro On-Premises is released as an Open Virtualization Archive (OVA) file. The following platforms are supported.

Platform	Details
VMware Workstation	Version 12
VMware vSphere ESXi	Version 5.5 or later (this is the preferred platform)
Oracle VirtualBox	Version 5.0.18 (tested on Windows and Linux)

Note

Oracle VirtualBox is free and open source software. The pricing model for VMware is detailed on their website.

3.1.1 Hardware Requirements

cnMaestro On-Premises is preconfigured with an 80 GB virtual drive. The image will support up-to 4,000 total devices (including ePMP and WLAN). The virtual hardware requirements are listed below.

Note

Virtual hardware is different than physical hardware. Virtual hardware is used to execute the cnMaestro application; physical hardware needs to execute the VMware virtualization infrastructure in addition to the cnMaestro application (and possibly other independent services).

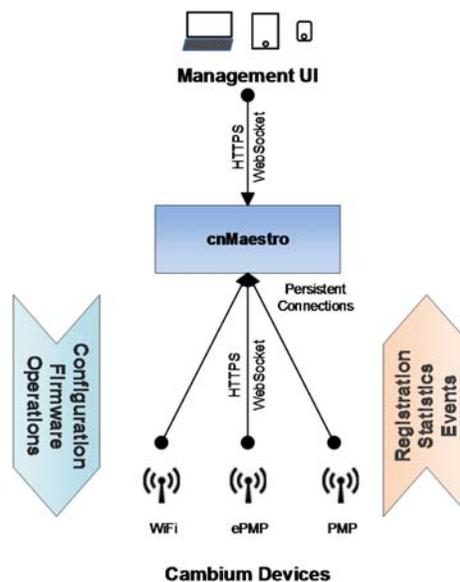
For best performance, servers with recent generation Intel Core i7 or Xeon CPUs are recommended. Older quad-core CPUs may not scale sufficiently.

Number of Devices	Number of vCPUs	RAM Size (GB)
1 to 100	2	2
101 – 1,000	4	4
1,001 – 4,000	4	8

4 Architecture

4.1 Overview

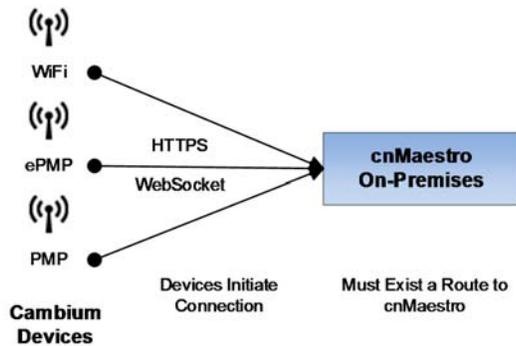
The cnMaestro On-Premises architecture is similar to cnMaestro Cloud: devices contact cnMaestro over an HTTPS connection after they boot up. With Cloud, devices access <https://cloud.cambiumnetworks.com>. With On-Premises, devices must be configured with the IP address / URL of the cnMaestro instance. A simplified overview is below.



The management connection is initiated by the devices and remains persistent. Devices forward events and statistics to the cnMaestro server, and cnMaestro applies configuration, updates software, and executes operations.

4.2 Networking

In order for devices to contact cnMaestro, they need to know its IP address. This is accomplished by configuring the IP directly using the Device UI or SNMP. Alternatively, the URL can be set on the DHCP server and propagated through DHCP Options (discussed later in this document and in the User Guide).



Warning

If devices do not have a route to the cnMaestro On-Premises server, they cannot be managed.

Warning

You should configure a static IP address for cnMaestro server, so it will persist over time.

5 Installation

5.1 Overview

5.1.1 Default Passwords

The default passwords for cnMaestro are:

Component	Username / Password
Virtual Machine Console	cambium / cnmaestro
cnMaestro UI	admin / admin

Warning: Please change your passwords after logging in the first time.

5.2 Virtualization

There are two types of virtualization architecture cnMaestro On-Premises supports: Desktop Virtualization and Bare-Metal Virtualization

5.2.1.1 Desktop Virtualization

Desktop virtualization executes a virtual machine within an existing operating system environment (Windows, Mac, or Linux). The administrator installs virtualization software, such as VMware Workstation or Oracle VirtualBox, and it executes in tandem with other desktop applications. cnMaestro can then be installed within one of these platforms.

The desktop environment is the easiest way to get cnMaestro up-and-running quickly. You can download a trial version of VMware Workstation Player [here](#).

5.2.1.2 Bare Metal Hypervisor

A bare metal hypervisor takes over the entire physical machine and uses it to host virtual machines. This type of virtualization is best for production environments, but it take time to set it up correctly. VMware vSphere ESXi is an example of this type of virtualization, and it is discussed in detail in the appendix. You can download ESXi [here](#).

5.3 cnMaestro Deployment

This document presents cnMaestro deployment using VMware Workstation Player. Directions for VMware vSphere ESXi and VirtualBox are found in the appendix. VMware Workstation Player (and Oracle VirtualBox) tend to be the easiest to install and evaluate, though ESXi is preferred for production systems supporting more than a few hundred devices.

Note

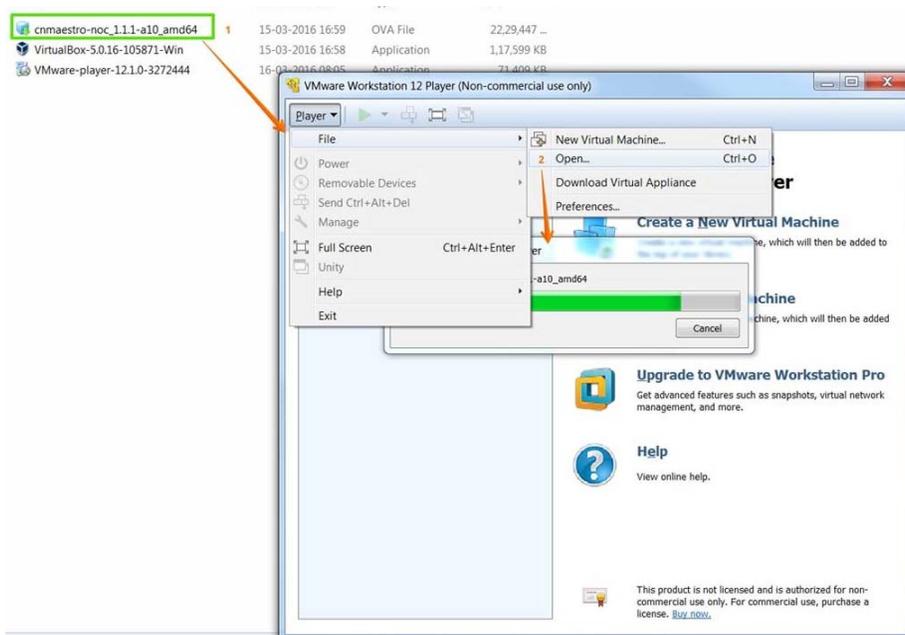
cnMaestro is packaged as a 64-bit virtual machine. This means the CPU must have VT-x enabled in order to run on VMware or VirtualBox. If your CPU supports VT-x, but you are still having issues, you may need to enable it in the system BIOS when the host machine first boots up.

5.3.1 VMware Workstation Player

The steps to import cnMaestro On-Premises into VMware Workstation Player are below.

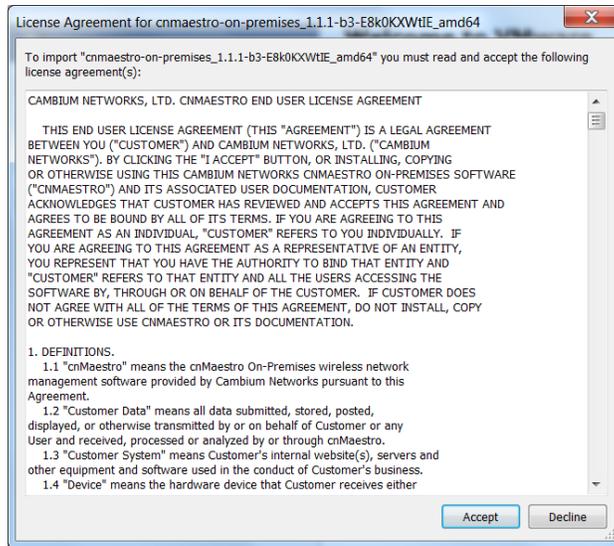
5.3.1.1 Install OVA File

Open VMware Workstation Player chose **Player > File > Open Menu**. Select cnMaestro OVA file to import.

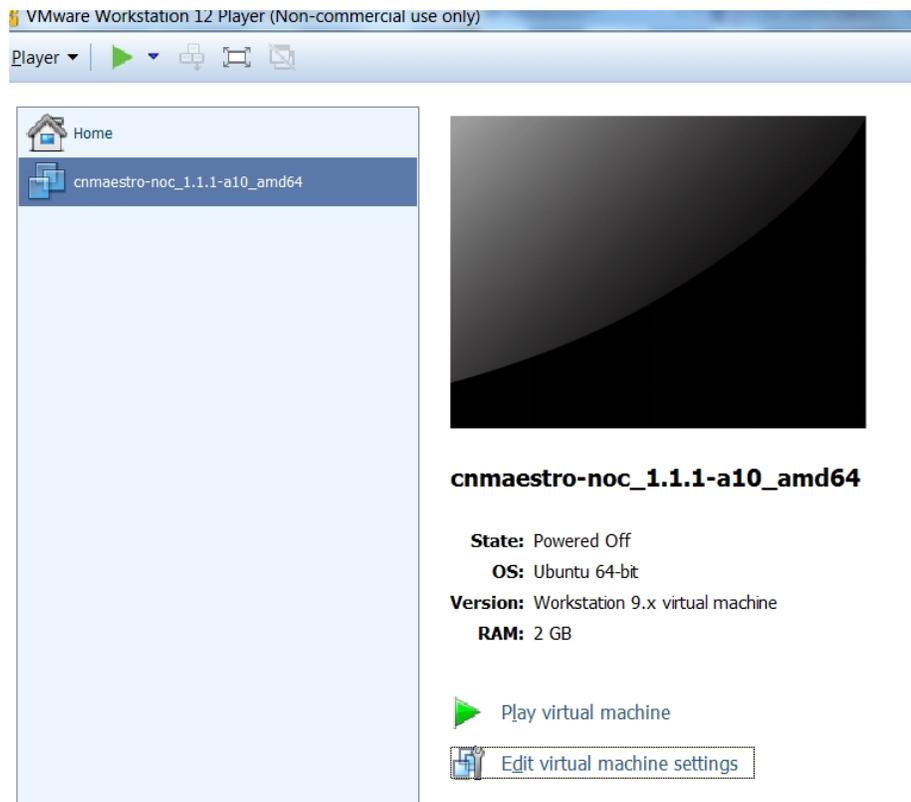


5.3.1.2 Accept the cnMaestro EULA

Once the EULA is accepted, cnMaestro will be imported into the VM environment. This process could take a couple minutes.

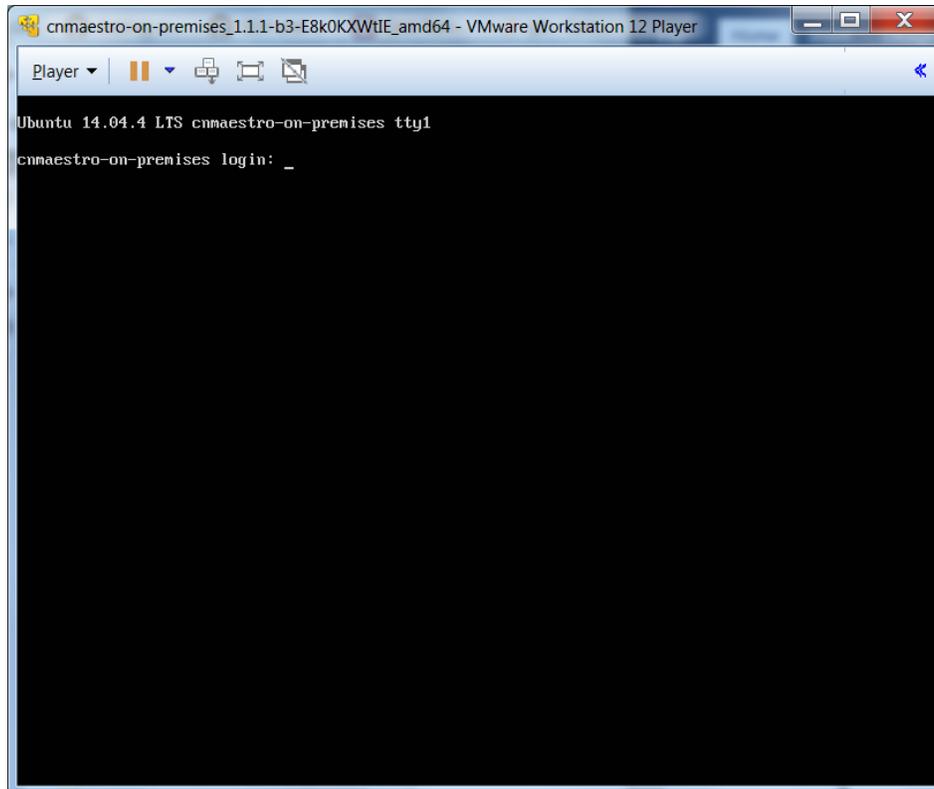


5.3.1.3 Click Play Button to Start the Virtual Machine.



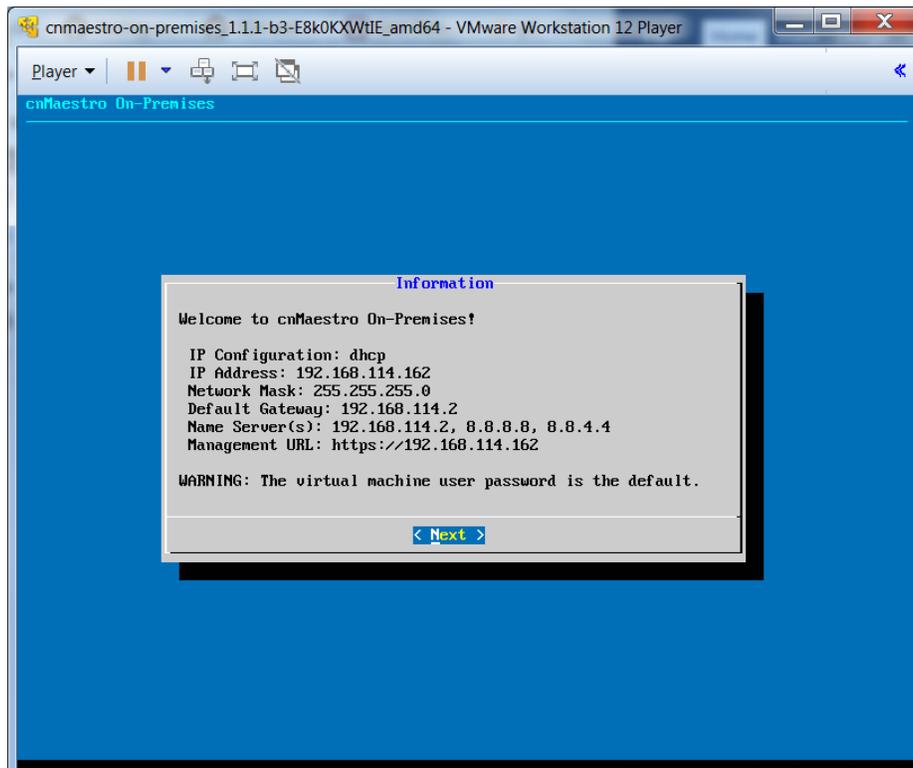
5.3.1.4 Login to the cnMaestro Console

The virtual machine console is the only way to access the cnMaestro CLI (Command Line Interface). Login using the default username/password (*cambium/cnmaestro*).



5.3.1.5 View Information Page

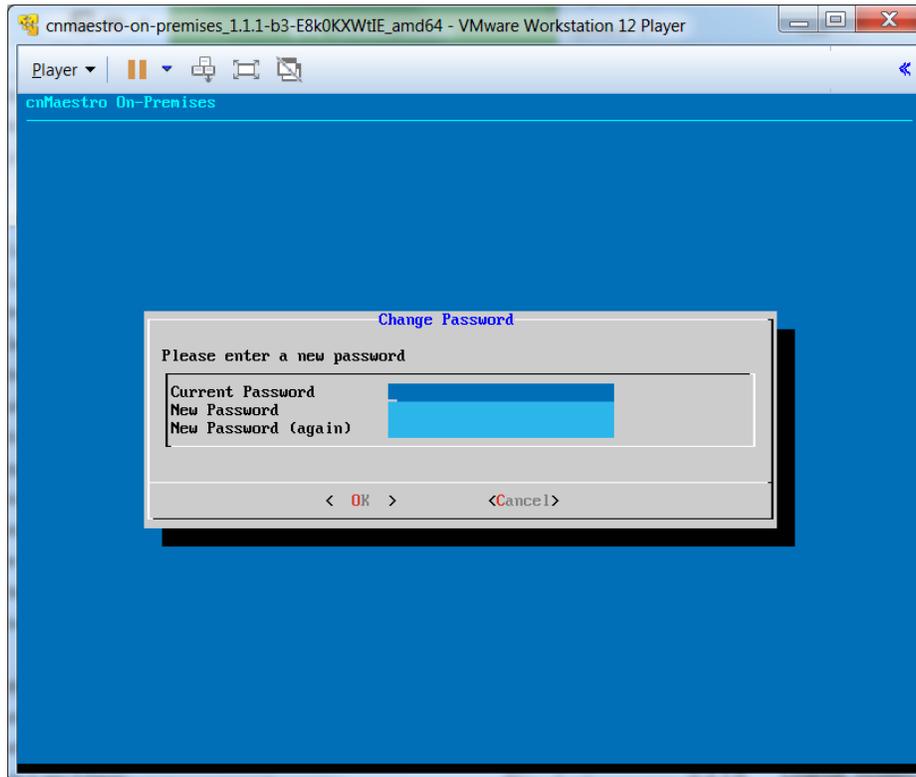
The CLI displays the current network settings and allows you to change IP configuration and select a new system password.



5.3.1.6 Change System Password

Click Next and navigate to the Password page and update the password.

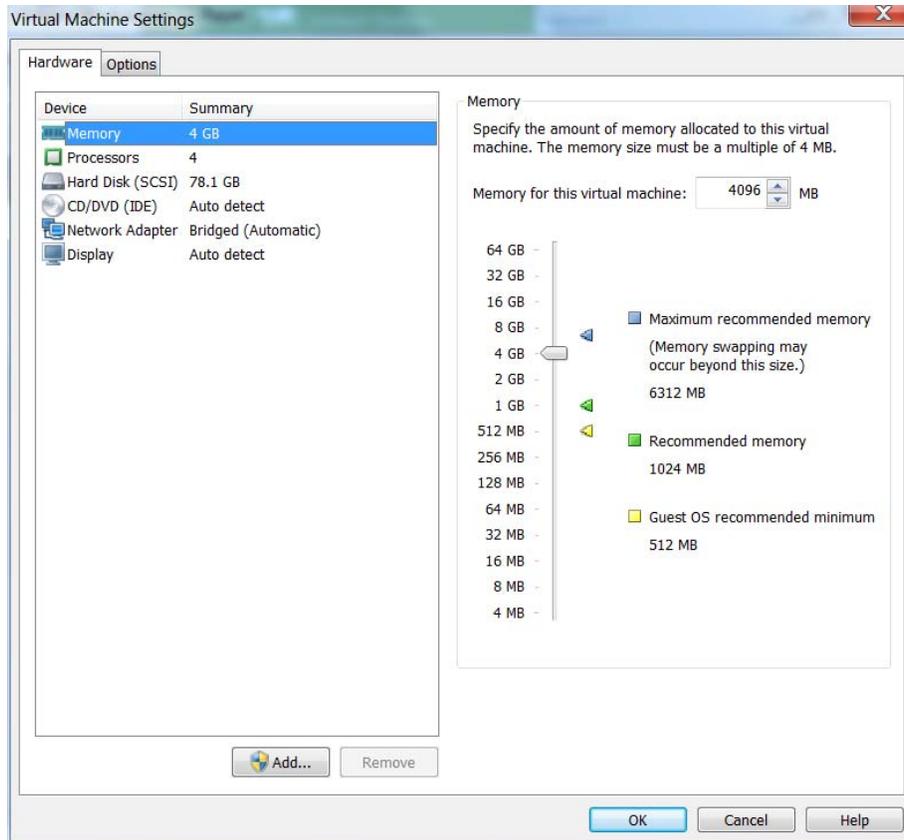
Warning
You should change the system password on the first login.



5.3.1.7 Changing Virtual Machine Configuration

cnMaestro by default is configured to use 2 CPUs, 2 GB of memory, and NAT. To change these parameters, you should halt the virtual machine, update the virtual machine settings in VMware, and then restart. You can click "Edit Virtual Machine Settings" from the VMware home screen. From there you can update the virtual hardware.

Note
If you are evaluating more than 100 devices, we recommend you use 4 GB of memory and 4 processors.

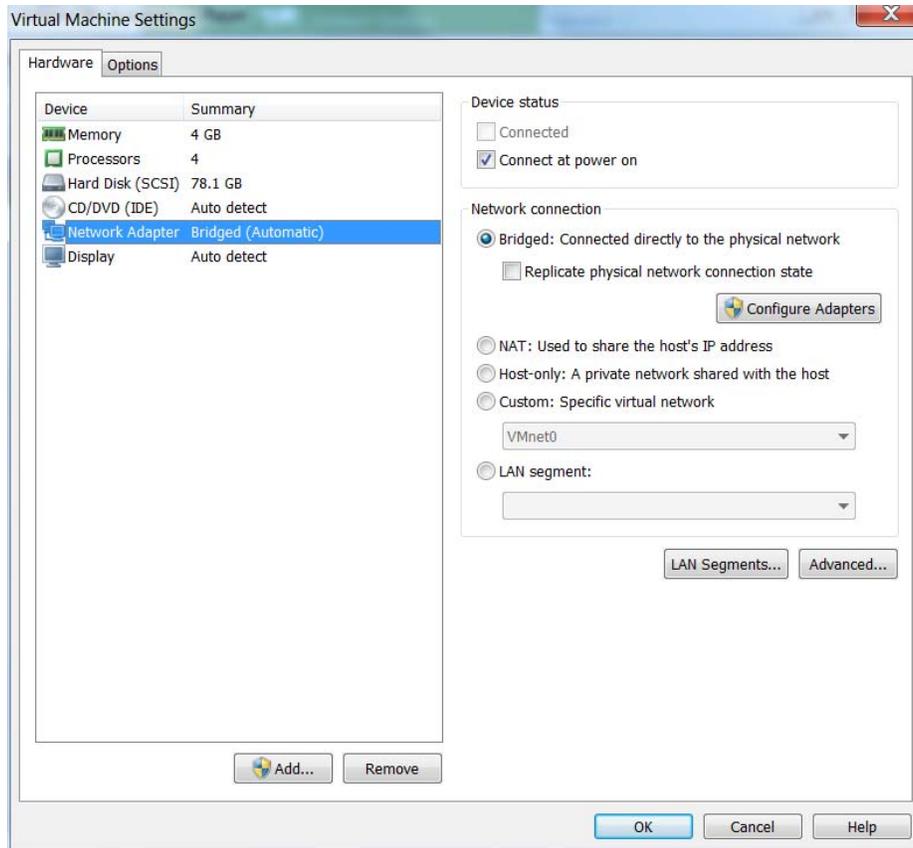


5.3.2 Configure Networking

By default, cnMaestro acquires its IP address from a DHCP Server. With desktop virtualization, the DHCP server is located on a private network hosted in the device, and therefore the IP address cnMaestro receives will not be accessible from the LAN. Instead VMware should be configured so the virtual machine network interface is shared with the device.

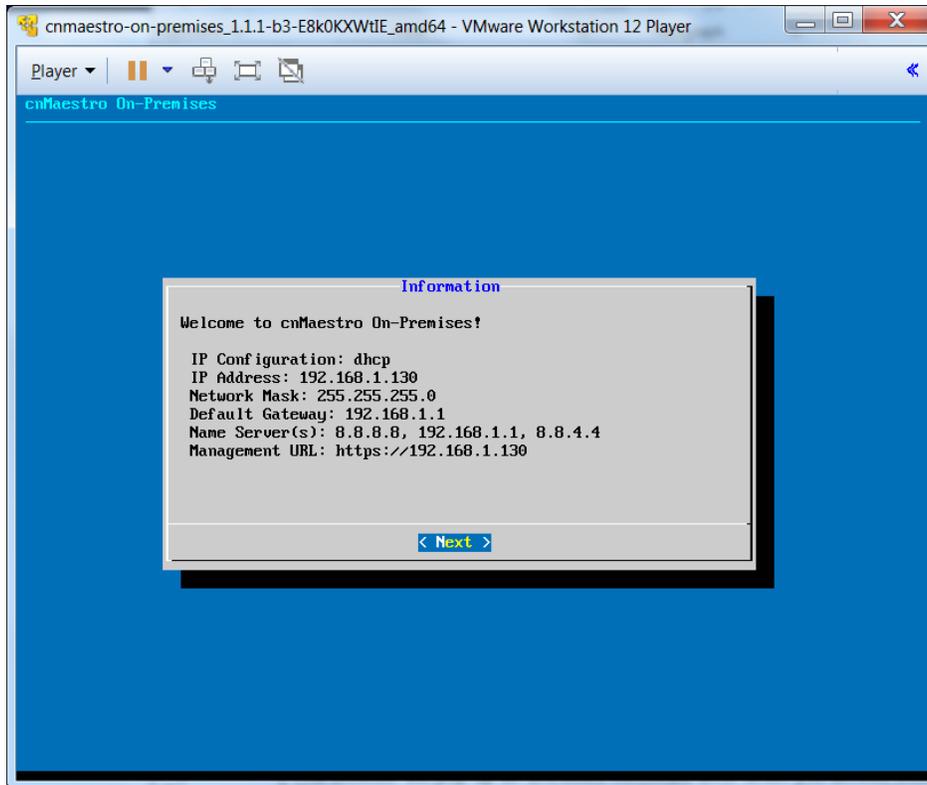
5.3.2.1 Set Network Adapter to Bridged

In the VMware settings, select Bridged for the Network Adapter state.



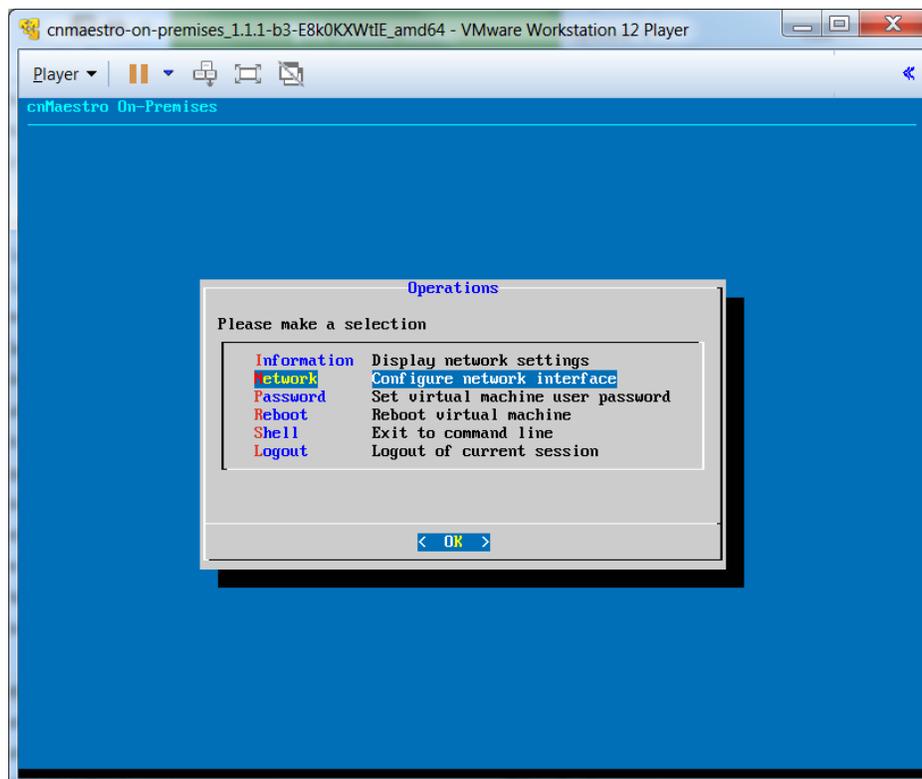
5.3.2.2 Restart cnMaestro

Restart the virtual machine and login. You should now see an IP address from the LAN instead of one local to the device.

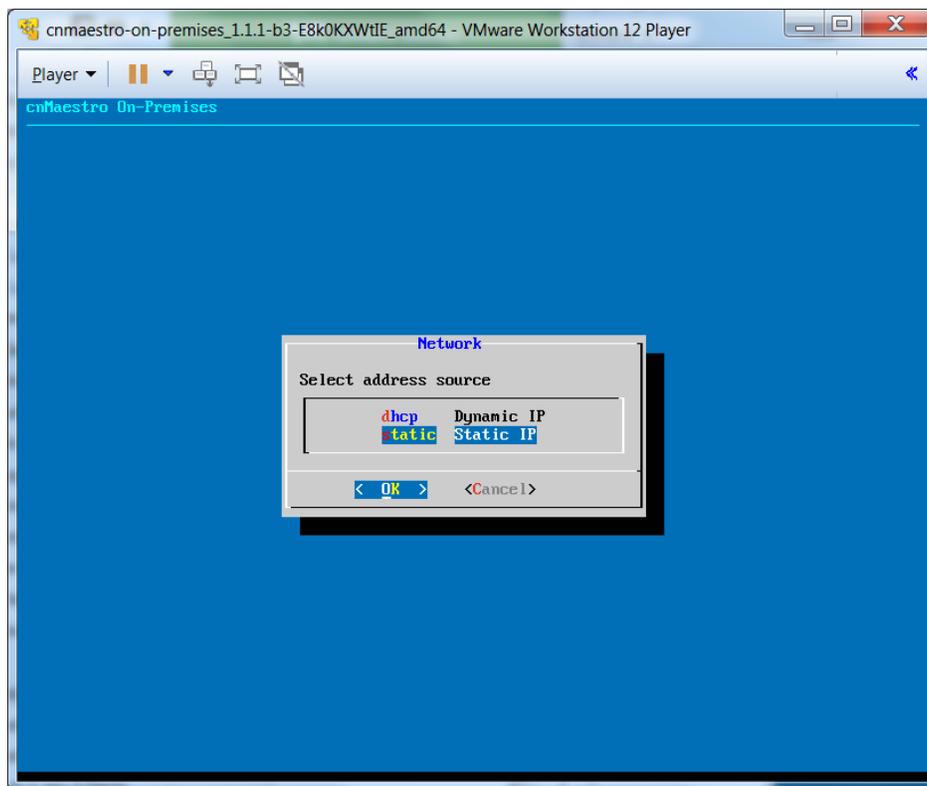


5.3.2.3 Click Next to View the Operations Menu

After clicking Next and reaching the Operations Menu, select Network.

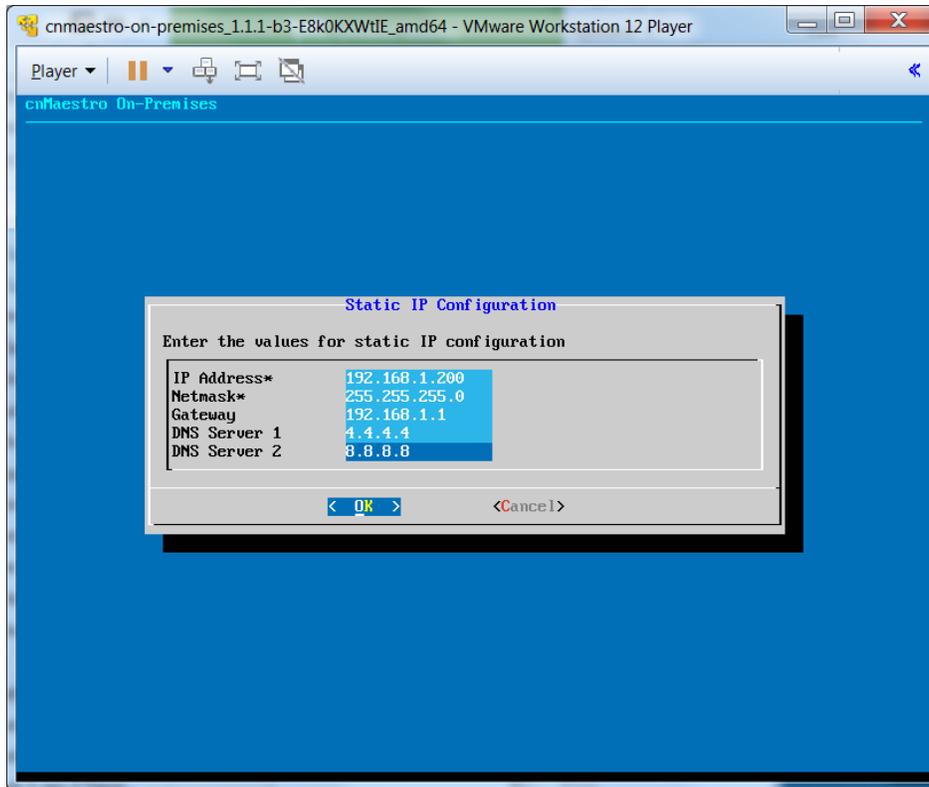


5.3.2.4 Select Static IP Address



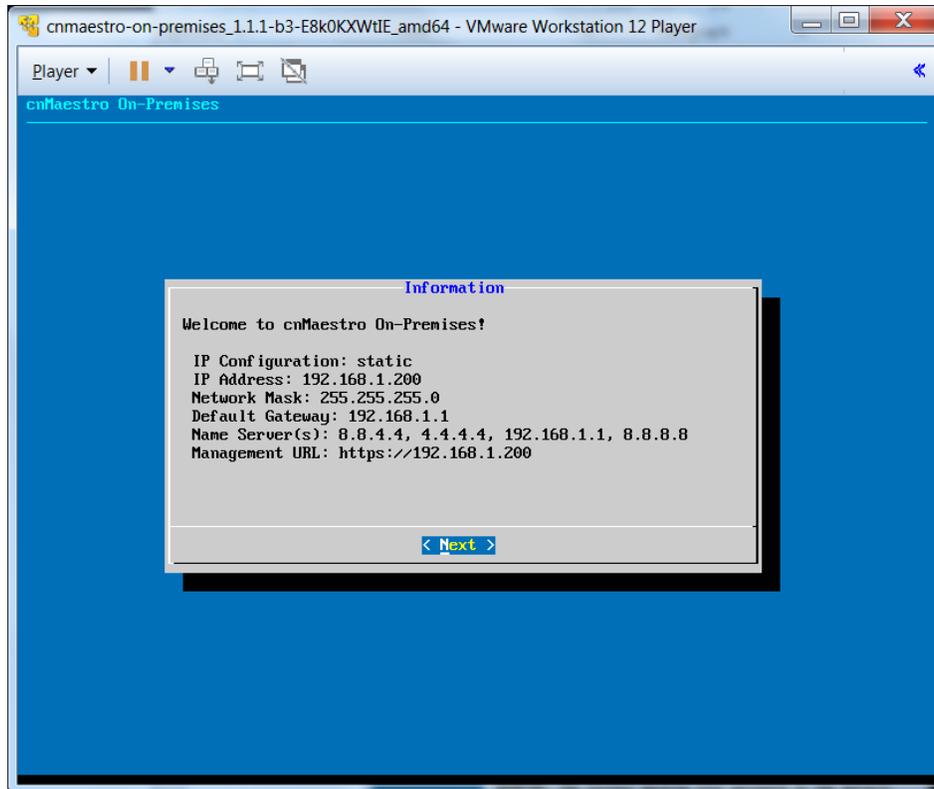
5.3.2.5 Configure Networking

The IP address can now be configured on the LAN.



5.3.2.6 Validate Change

You can validate your update by navigating back to the Information page and viewing the current network configuration.



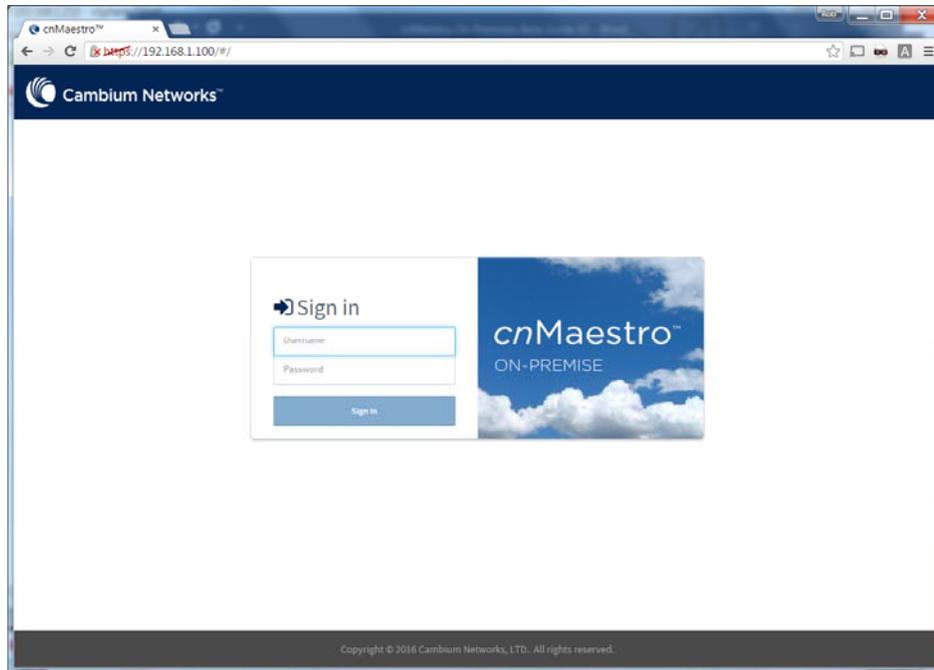
5.3.3 cnMaestro UI Access

5.3.3.1 Access the UI through Virtual Machine IP Address

The cnMaestro UI requires HTTPS. The default username/password are *admin/admin*.

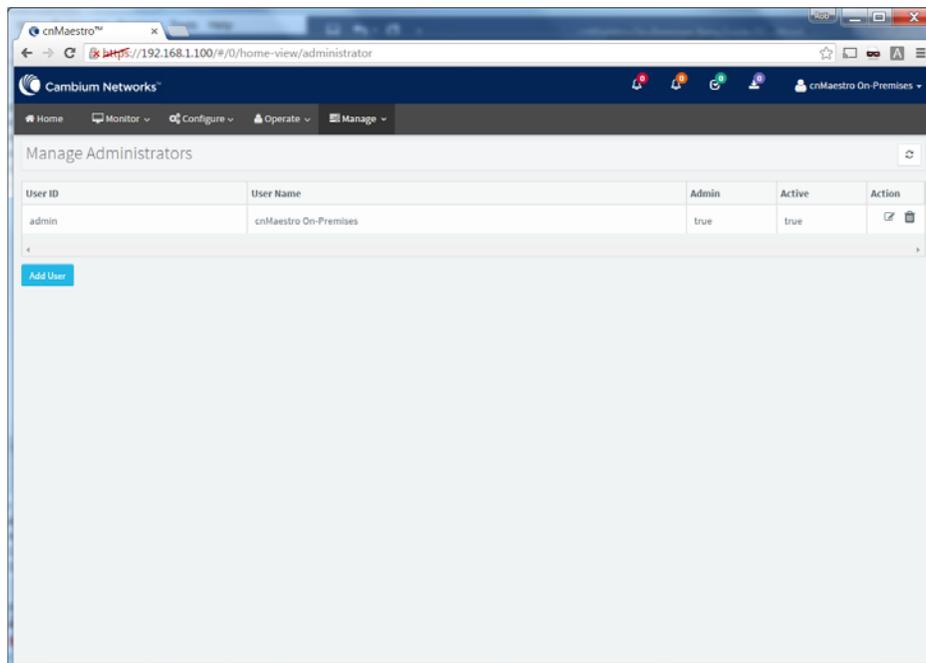
Warning

The browser will display an untrusted certificate error when you access cnMaestro On-Premises. This is because it uses a self-signed certificate. In later versions we will provide directions on how to install your own signed certificate.



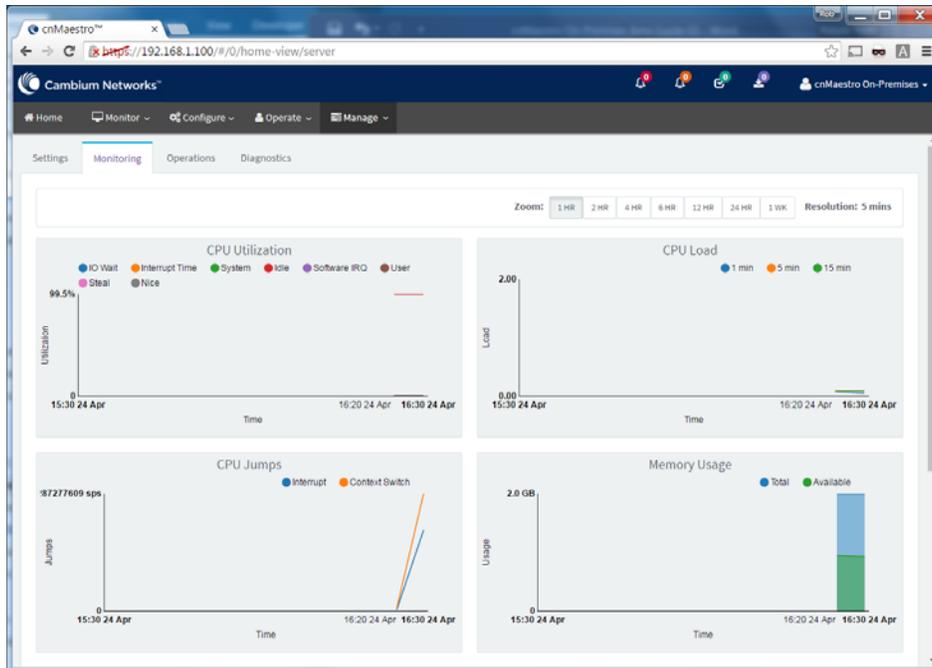
5.3.3.2 Navigate to Manage > Administrators and Change Admin Password

On the Manage Administrators page, click the Edit icon to update the administrator password.



5.3.3.3 Navigate to Manage > Server

The Server section provides monitoring and operations for the virtual machine instance.



5.4 Device Software

Devices must have the correct software installed in order to access cnMaestro. The minimum required versions are listed earlier in the document under the High Priority Items section. They can be downloaded directly from cnMaestro On-Premises. The software is located at: **Operate > Software Update > Manage Images**. Select your device type to display the available images, and then click the download icon (📄).

The screenshot displays the 'Operate' section of the cnMaestro interface, specifically the 'Software Update: system' page. The 'Manage Images' tab is active, showing a table of software images:

Type	Version	Hardware	Action
cnPilot E...	2.5-r8	E400/E500	 

Below the table, there is a section for 'Add Software Image' with a 'File' input field and a 'Select File' button. A 'Import Software' button is also present.

Once the device has been updated with the correct software version, it can be onboarded.

For some device types, newer versions may be available from the Cambium Website, <https://support.cambiumnetworks.com/files>.

5.5 Device Access

In order to access cnMaestro, devices need to be configured with the cnMaestro URL. There are currently two ways to do this (listed in priority order).

1. Static URL configured on the device
2. Using DHCP Option 43

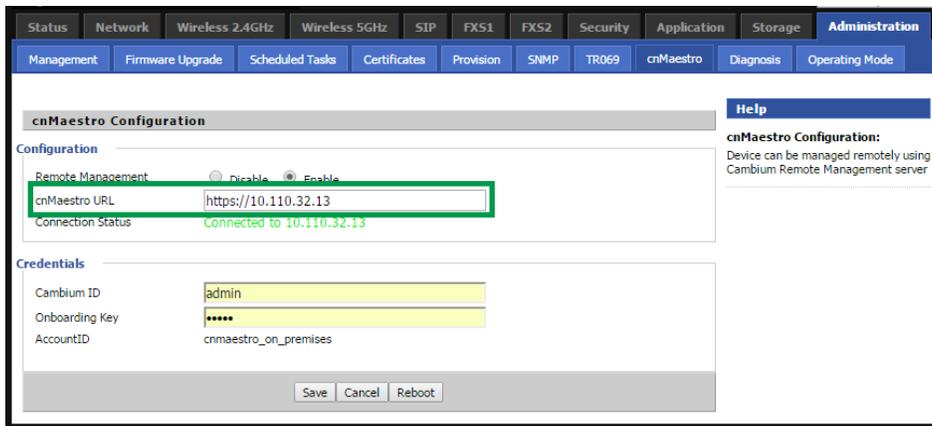
If neither of these are present, the default action is to access the cnMaestro Cloud URL: <https://cloud.cambiumnetworks.com>.

5.5.1 **Static URL**

If a static URL is configured in the Device UI, the device will always try to connect using it.

5.5.1.1 cnPilot R200/201

1. Navigate to **Administrator > cnMaestro** tab
2. Enter static URL in the cnMaestro URL field.



5.5.1.2 cnPilot E400/E500

1. Navigate to **Configure > System**
2. Under **Management** section, enter static URL in the cnMaestro URL field.

Management

Admin Password Configure password for authentication of GUI and CLI sessions

Telnet Enable Telnet access to the device CLI

SSH Enable SSH access to the device CLI

HTTP Enable HTTP access to the device GUI

HTTPS Enable HTTPS access to the device GUI

cnMaestro

Remote Management

Validate Server Certificate

cnMaestro URL

Cambium ID

Onboarding Key

5.5.1.3 ePMP 1000 AP/SM

1. Navigate to **Configuration > System**
2. Under **cnMaestro** section, enter static URL in the cnMaestro URL field.

cnMaestro

Remote Management Disabled Enabled

cnMaestro URL

Cambium ID

Onboarding Key

5.5.1.4 ePMP 1000 Hotspot

1. Navigate to **Configure > System**
2. Under **Management** section, enter static URL in the cnMaestro URL field.

Management

Admin Password Configure password for authentication of GUI and CLI sessions

Telnet Enable Telnet access to the device CLI

SSH Enable SSH access to the device CLI

HTTP Enable HTTP access to the device GUI

HTTPS Enable HTTPS access to the device GUI

cnMaestro

Remote Management

Validate Server Certificate

cnMaestro URL

Cambium ID

Onboarding Key

5.5.2 DHCP Options (Linux)

A DHCP Server can be used to configure the IP Address, Gateway, and DNS servers for Cambium devices. If you administer the DHCP Server, you can also configure DHCP Options that will tell the

devices how to access the cnMaestro (so the URL doesn't need to be set on each device). Cambium devices support DHCP Options 43 and 15 for setting the cnMaestro On-Premises URL.

The priority order for determining the cnMaestro URL is the following:

1. Static URL manually set through the Device UI.
2. DHCP Option 43
3. DHCP Option 15
4. Default Cambium Cloud URL (cloud.cambiumnetworks.com)

5.5.2.1 Using DHCP Option 43

DHCP Option 43 returns the cnMaestro On-Premises URL as a Vendor-Specific Option. DHCP Option 43 is returned in tandem with DHCP Option 60 (the Vendor Class Identifier, or VCI). The VCI for the individual Cambium products is listed below.

Product	VCI (DHCP Option 60)
cnPilot R200P	Cambium-cnPilot R200P
cnPilot R201P	Cambium-cnPilot R201P
cnPilot E400/E500	Cambium-WiFi-AP
ePMP	Cambium
ePMP 1000 Hotspot	Cambium-WiFi-AP

Typically, Option 43 will be the preferred mechanism to configure the cnMaestro URL. Example configuration for the ISC DHCP Server is presented below (from the `/etc/dhcp/dhcpd.conf` file).

```
option option-43 code 43 = string;

# ePMP/PMP Devices
class "Cambium" {
    match if option vendor-class-identifier = "Cambium";
    # DHCP server MUST return the device's Vendor Class back, in the offer.
    option vendor-class-identifier "Cambium";
    # cnMaestro On-Premises IP is 192.168.0.100
    option option-43 "https://192.168.0.100";
}

# WiFi Devices
class "Cambium-WiFi-AP" {
    match if option vendor-class-identifier = "Cambium-WiFi-AP";
    option vendor-class-identifier "Cambium-WiFi-AP";
    option option-43 "https://192.168.0.100";
}

# cnPilot R200P Devices
class "Cambium-cnPilot R200P" {
    match if option vendor-class-identifier = "Cambium-cnPilot R200P";
    option vendor-class-identifier "Cambium-cnPilot R200P";
    option option-43 "https://192.168.0.100";
}

# cnPilot R201P Devices
class "Cambium-cnPilot R201P" {
    match if option vendor-class-identifier = "Cambium-cnPilot R201P";
    option vendor-class-identifier "Cambium-cnPilot R201P";
    option option-43 "https://192.168.0.100";
}
```

5.5.2.2 Using DHCP Option 15

DHCP Option 15 allows the device to derive the cnMaestro URL from the domain name. For example, if the domain name in DHCP Option 15 is "mycompany.com", then the device will try to access the cnMaestro server at "cnmaestro.mycompany.com" (essentially the string "cnmaestro" is prepended to

the domain). The domain itself, and the IP address of cnMaestro, must be configured in the DNS server for this to work correctly.

Sample configuration for the ISC DHCP Server is presented below (from the `/etc/dhcp/dhcpd.conf` file).

```
option domain-name "mycompany.com";
```

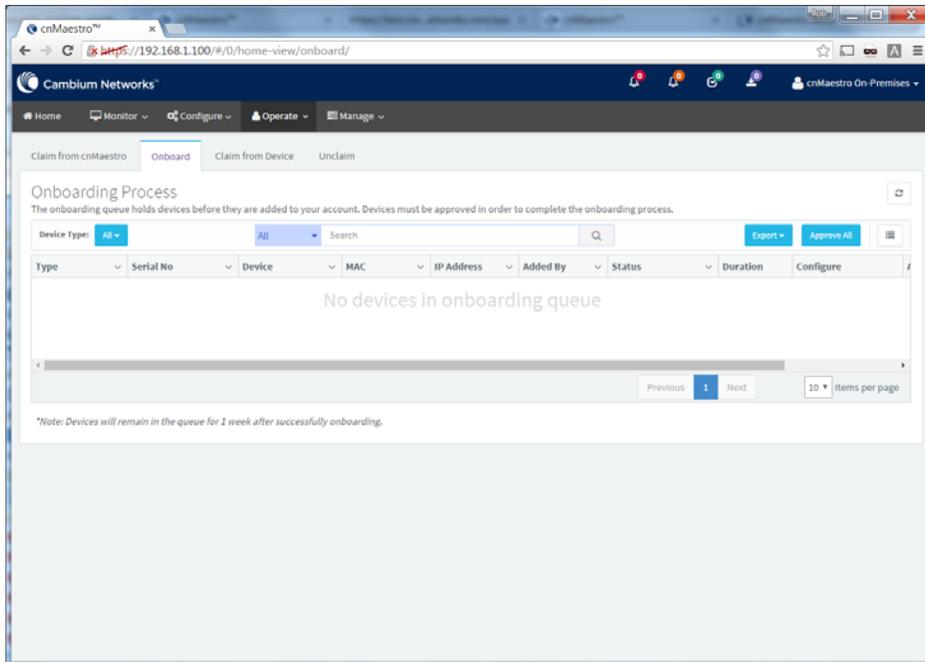
5.5.3 DHCP Options (Windows)

Note
Configuration for the Windows DHCP Server is provided in the User Guide.

6 Operations

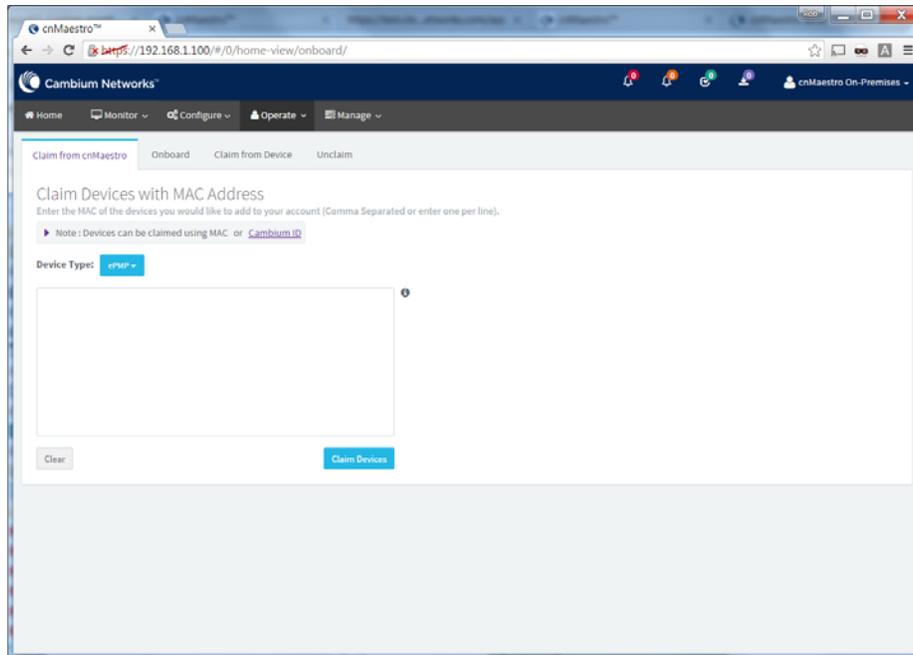
6.1 Onboarding Devices

By default, all devices contacting cnMaestro On-Premises will be placed in the Onboarding Queue, where they will persist until they are Accepted (after which they become managed). The Onboarding Queue (**Operate > Onboard Devices > Onboard**) is shown below.



6.1.1 Pre-Configuration and Acceptance of Devices

To automatically configure and accepted devices when they access cnMaestro, add the device MAC address to the **Operate > Onboard Devices > Claim from cnMaestro** page. Adding devices here places them in the Onboarding Queue, where they can be pre-configured and/or pre-accepted.

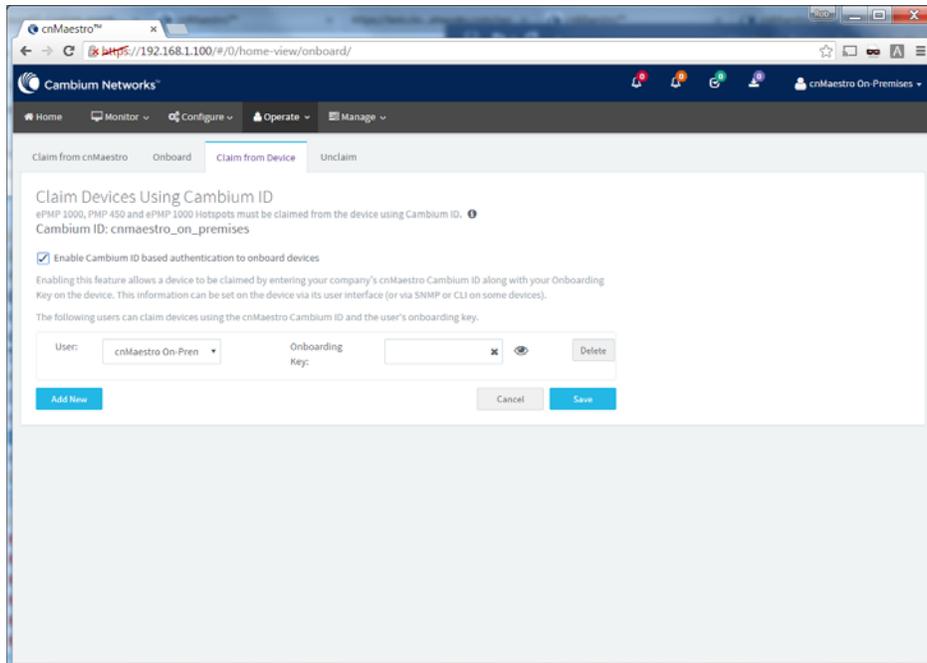


6.1.2 Device Authentication

To require devices to authenticate with cnMaestro before being added to the Onboarding Queue, enable Cambium ID based authentication at **Operate > Onboard Devices > Claim from Device**. When configured, an Onboarding Key must also be created. Each user can have their own Onboarding Key. The Onboarding Key needs to be entered into the Device UI before cnMaestro will allow it into the Onboarding Queue.

Note

When Cambium ID authentication is enabled, the Device UI requires both a Cambium ID and an Onboarding Key. For cnMaestro On-Premises, the Cambium ID is ignored.



6.2 Updating cnMaestro Software

6.2.1 Package Types

cnMaestro On-Premises software will be released in two forms:

6.2.1.1 OVA Image

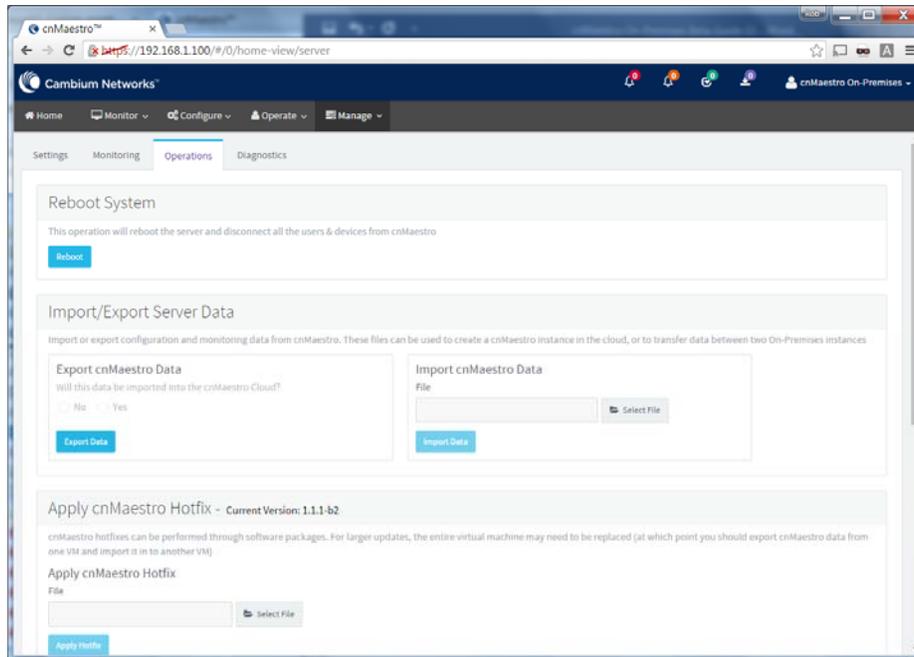
The OVA image contains all software needed to run the cnMaestro application. It is installed on a virtual machine and will be released intermittently to update system software. Moving to a new OVA image requires one to export the configuration/data from the old cnMaestro instance and import it into the new. The OVA tends to run about 2.5 GB in size.

6.2.1.2 Package

The package file can be installed on top of an OVA image and will only update the cnMaestro application. Packages will be released more frequently, and they won't require one to export/import existing data. Packages can be installed by downloading them from Cambium and uploading them through the UI (at **Manage > Server > Operations**).

Note

The general update flow will be an OVA file followed by package releases. For significant system-level updates, a new OVA file will be generated.



6.2.2 Exporting/Importing Data

Exporting data from cnMaestro (to be imported into another virtual machine) can be done through the **Manage > Server > Operations** page (see the graphic above).

6.2.3 OVA Update Process

Updating an OVA image can be managed through the following process (which assumes the hardware has enough hard disk space for two instances of cnMaestro).

1. Export the cnMaestro Server data from the old instance.
2. Stop the old instance.
3. Start the new instance (using the directions presented above).
4. Import the data into the new instance.
5. Set the IP address of the new instance to that of the old instance.

6.3 Managing Device Software Images

cnMaestro On-Premises allows one to add new device software images as they are released by the device teams. (New OVA images should have the latest device software preinstalled.) Currently adding new device software is a manual process: one needs to download the images from the [Cambium Support Center](#) and then upload them into cnMaestro. The steps are presented below.

1. Navigate to **Manage > Server page**.
2. Switch to **Operations** tab.
3. Select device image file under **“Manage Device Software Image”** section.
4. Click on **“Import Software”** button.
5. Once file is successfully uploaded to the server, it will appear in the grid.

Manage Device Software

Device software image should be downloaded from the cambium support centre and added here

Device Type: **ePMP**

Type	Version	Action
ePMP	2.6.2-RC8	

Previous 1 Next 10 items per page

Add Software Image

File

Select File

Upload Software

Warning

cnMaestro uses the name of the uploaded file to determine the version and device type. Please don't change the name during the download process.

6.4 Server Technical Support Dump

The technical support dump gathers important runtime information on the cnMaestro instance. It is accessed **at Manage > Server > Diagnostics** and can be used by Cambium Support to aid in resolving issues.

7 Appendix: Frequently Asked Questions

Question	Answer
Can devices on a private subnet be managed?	Yes. Devices contact cnMaestro directly over HTTPS (this is the opposite of SNMP-based managers). This means that as long as the device has a route to cnMaestro, it can be managed.
Can I export my cloud configuration to on-premises?	Please contact Cambium Support if you are interested in exporting from Cloud to On-Premises. This is a manual process that requires coordination with the engineering team to limit management down time.
When will cnMaestro support PMP?	We expect to start our PMP beta in the cloud in July. We will also release an on-premises beta at the same time that will support PMP.
Can I add my own signed certificate to cnMaestro?	Not yet. We are working on allowing this for Comodo and Verisign certificates. Support for certificates from other vendors, including self-signed certificates, will be even further out.

8 Appendix: Additional Deployments

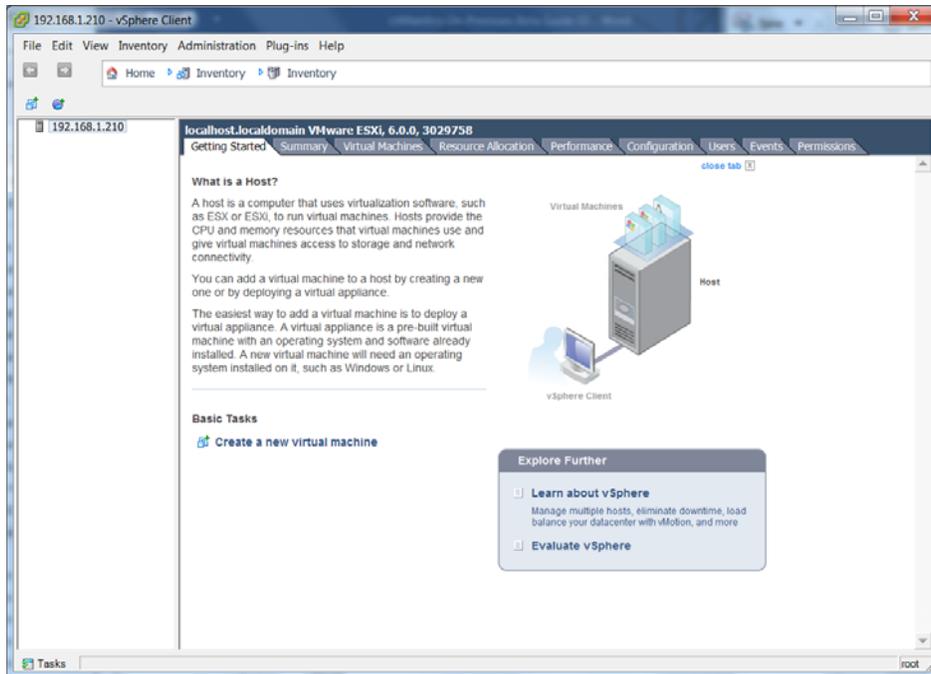
8.1 VMware ESXi

Warning

Deploying ESXi is an involved process. The steps below assume you have VMware ESXi already installed on hardware, and you are able to access it using the vSphere Client. If you don't have an ESXi hypervisor available, you can download it from [here](#). VMware provides directions for installing the ESXi ISO on a server (thereby overwriting it completely) and the vSphere Client on your desktop (to communicate with the ESXi hypervisor).

8.1.1 cnMaestro VM Deployment

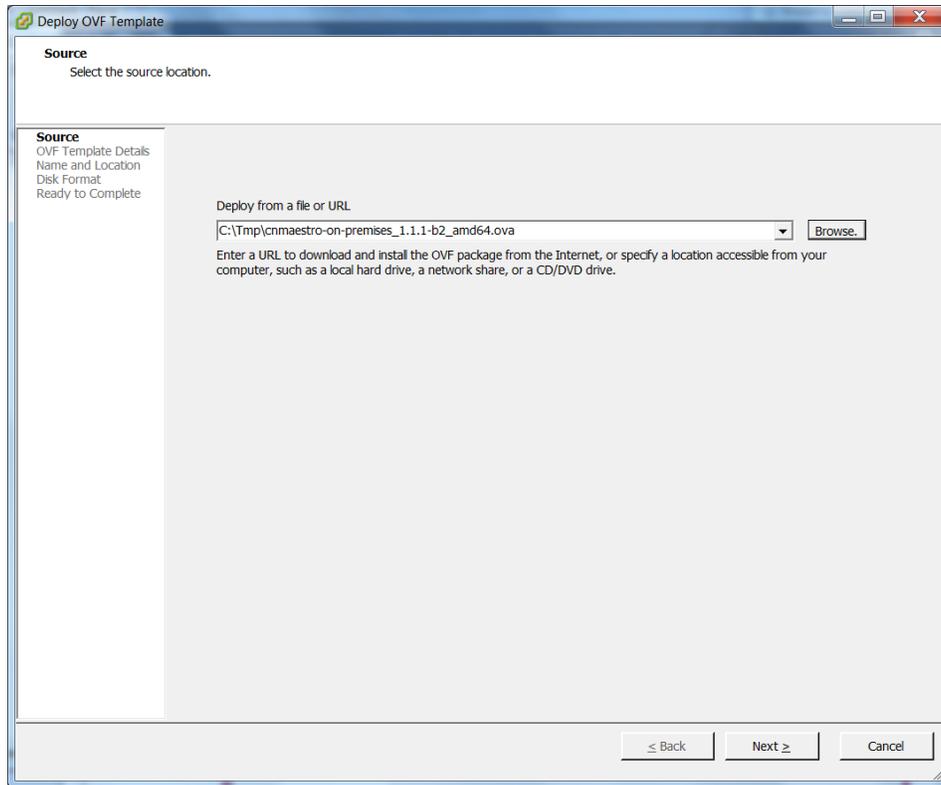
8.1.1.1 Open the vSphere Client



8.1.1.2 Select File > Deploy OVF Template

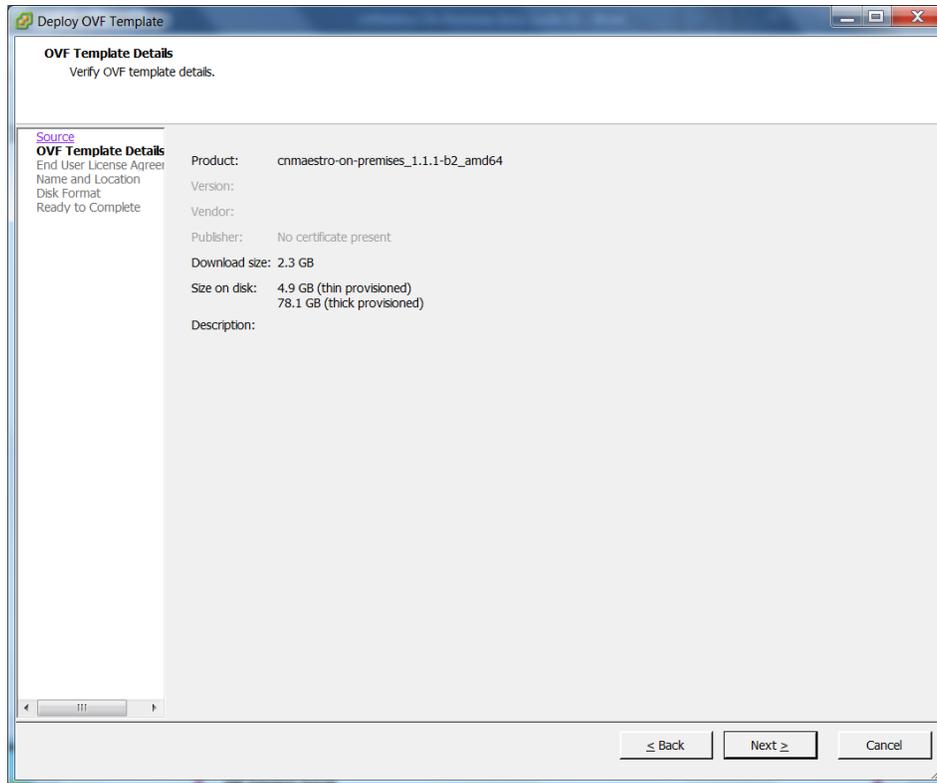


8.1.1.3 Choose the Downloaded cnMaestro OVA File

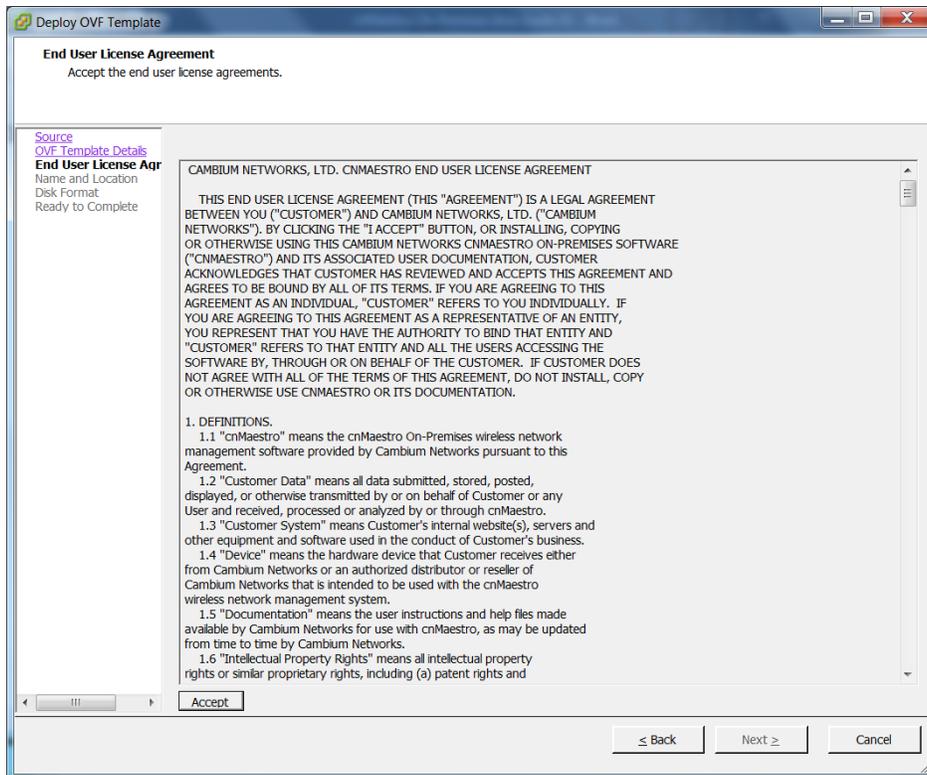


8.1.1.4 View OVF Template Details

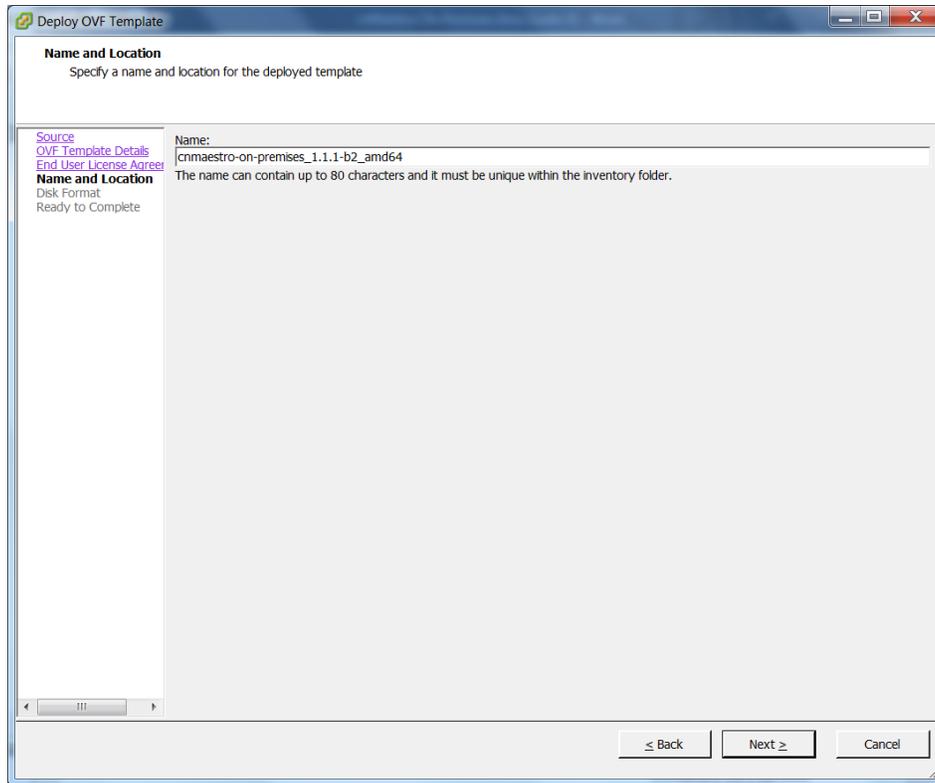
The size of the cnMaestro On-Premises disk can grow to 80 GB, but is only expected to use a fraction of that in smaller deployments. The initial virtual machine configuration has 2 CPU and 2 GB of memory, which can be changed in VMware after installation.



8.1.1.5 Accept cnMaestro End User License Agreement (EULA)

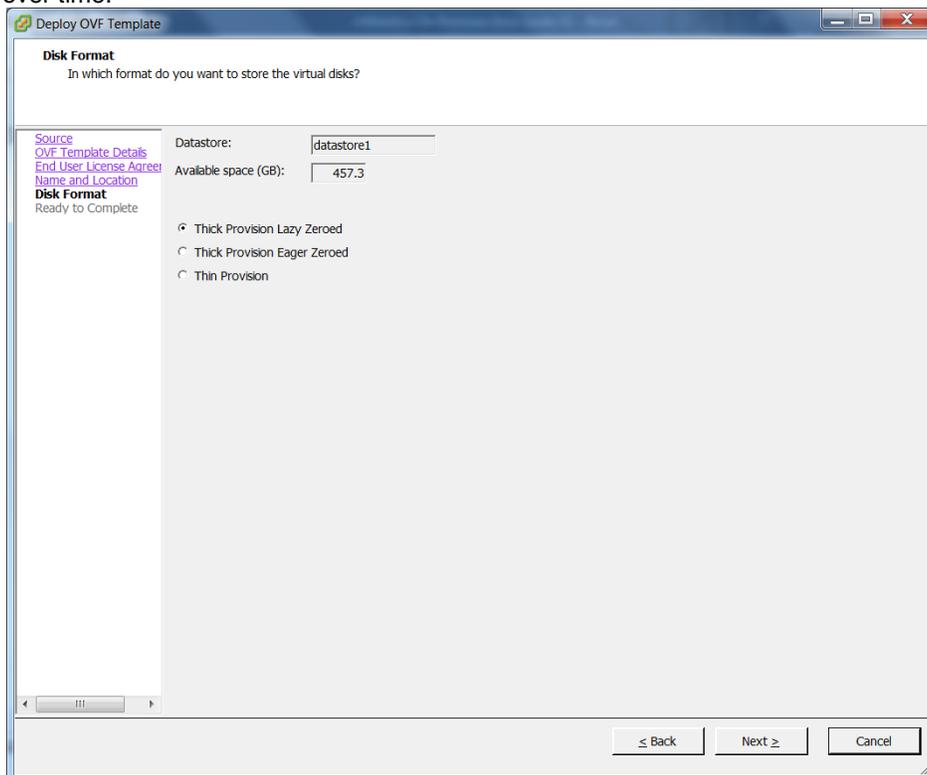


8.1.1.6 Rename the OVA if Desired

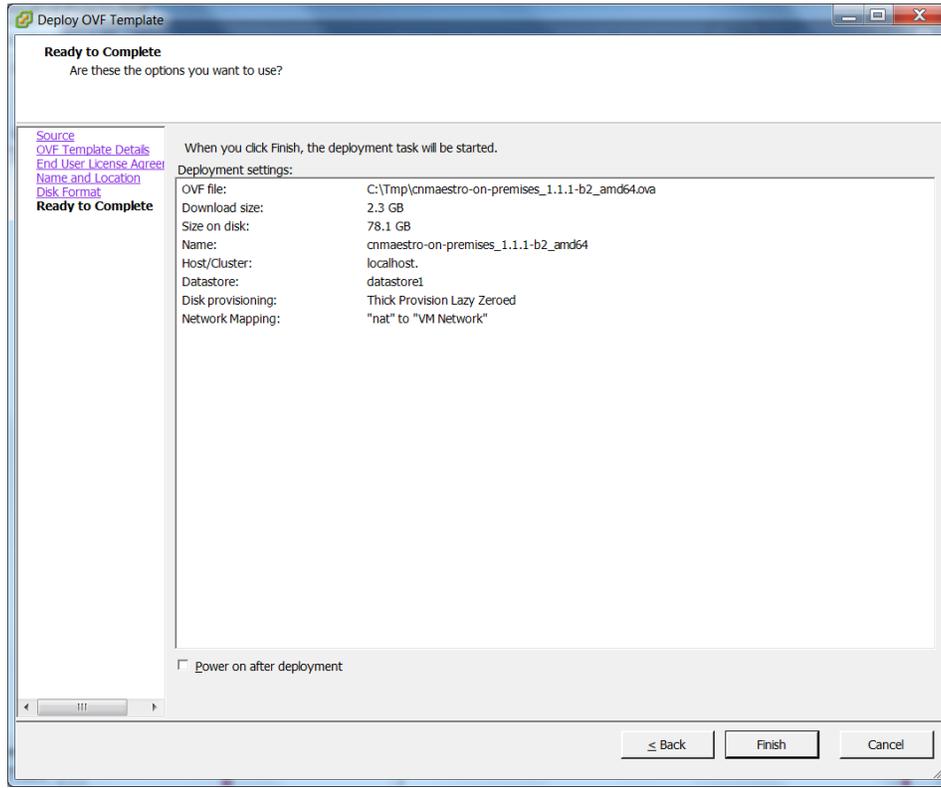


8.1.1.7 Choose Disk Format

Thick provisioning will allocate 80 GB up-front. Thin provisioning pre-allocates less space and grows the disk over time.



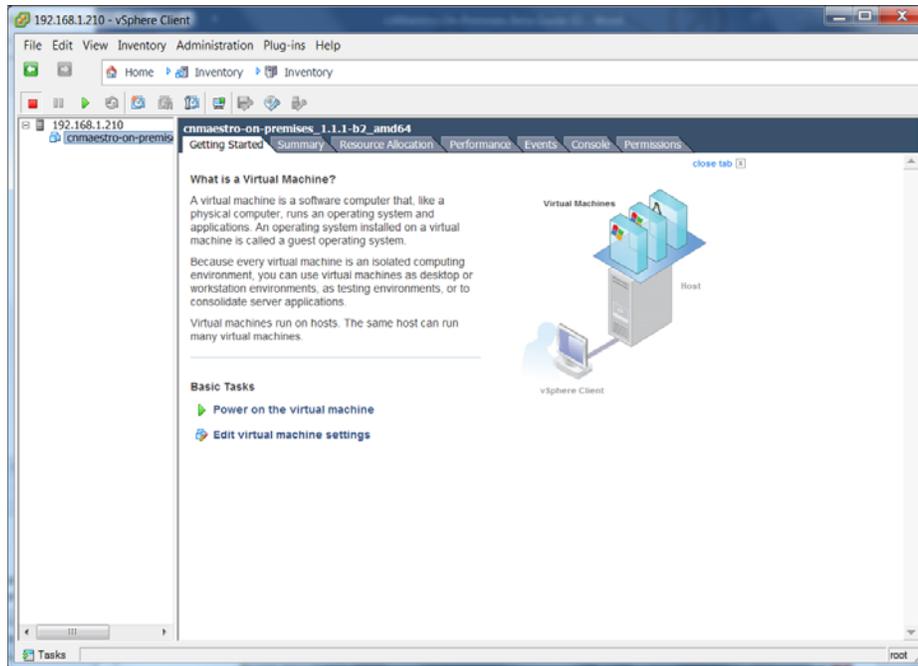
8.1.1.8 Click Finish to Deploy



8.1.2 **cnMaestro Setup**

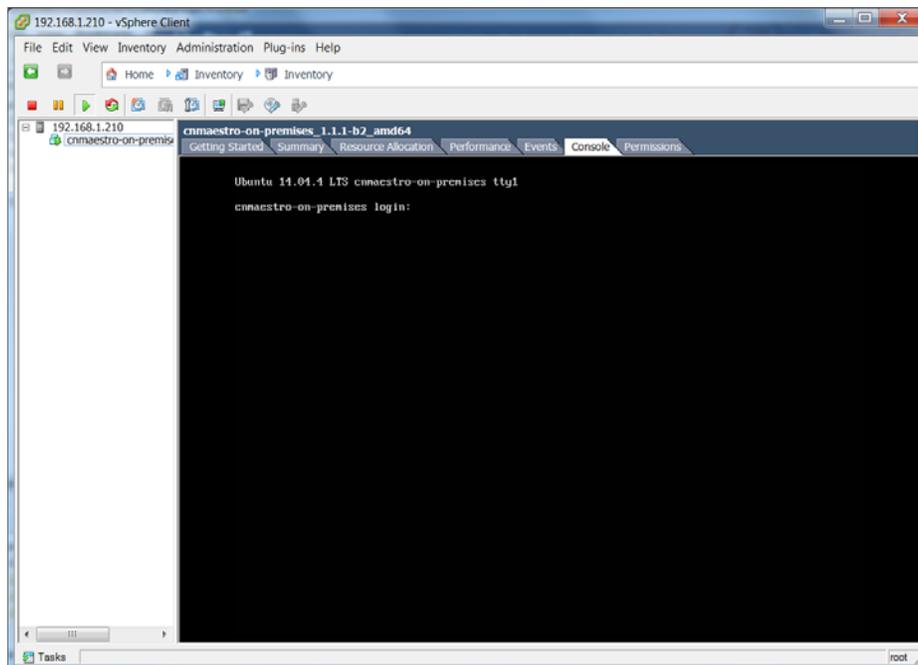
Once the virtual machine is loaded, you can power it on and start using cnMaestro.

8.1.2.1 Power On the Virtual Machine



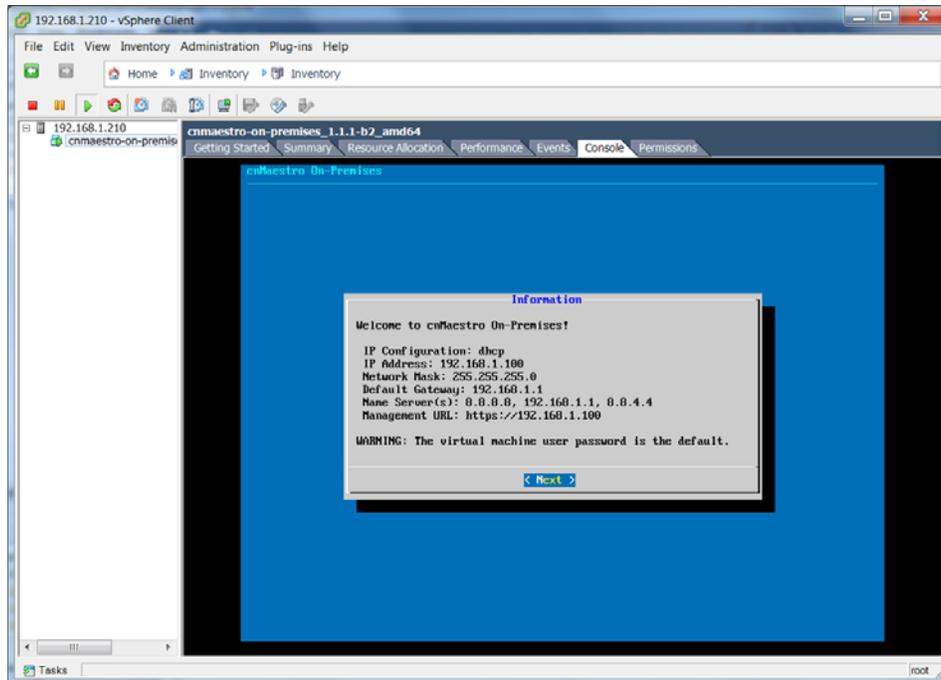
8.1.2.2 Access the Virtual Machine Console

The virtual machine console is the only way to access the cnMaestro CLI (Command Line Interface).



8.1.2.3 Login to cnMaestro

Login using the default username/password (*cambium/cnmaestro*) and access the CLI. The CLI allows you to change the network settings and select a new system password.

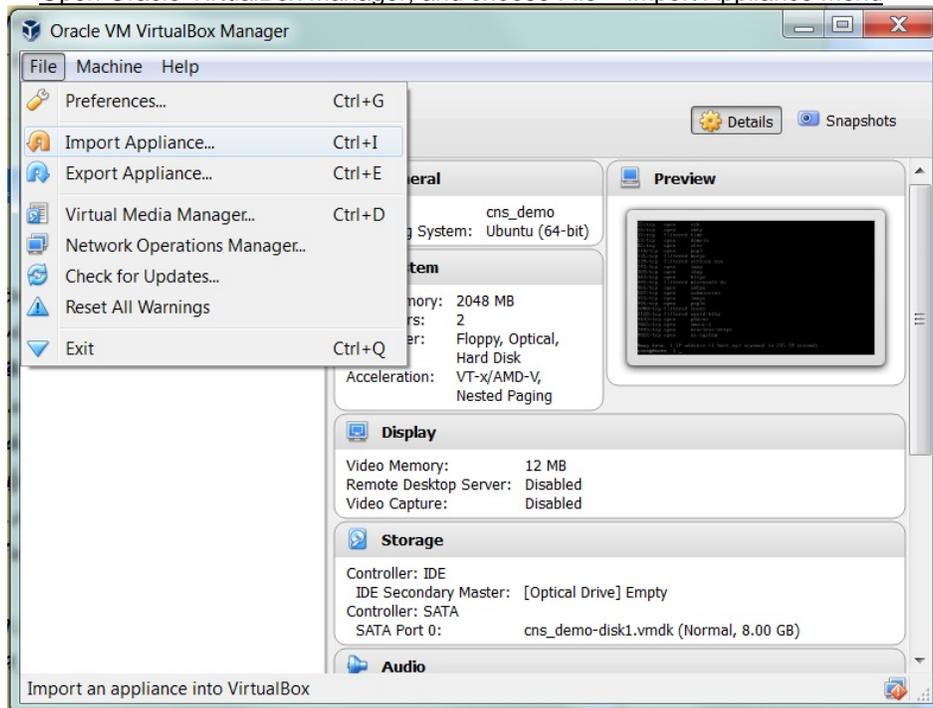


8.2 Oracle VirtualBox 5 or Later

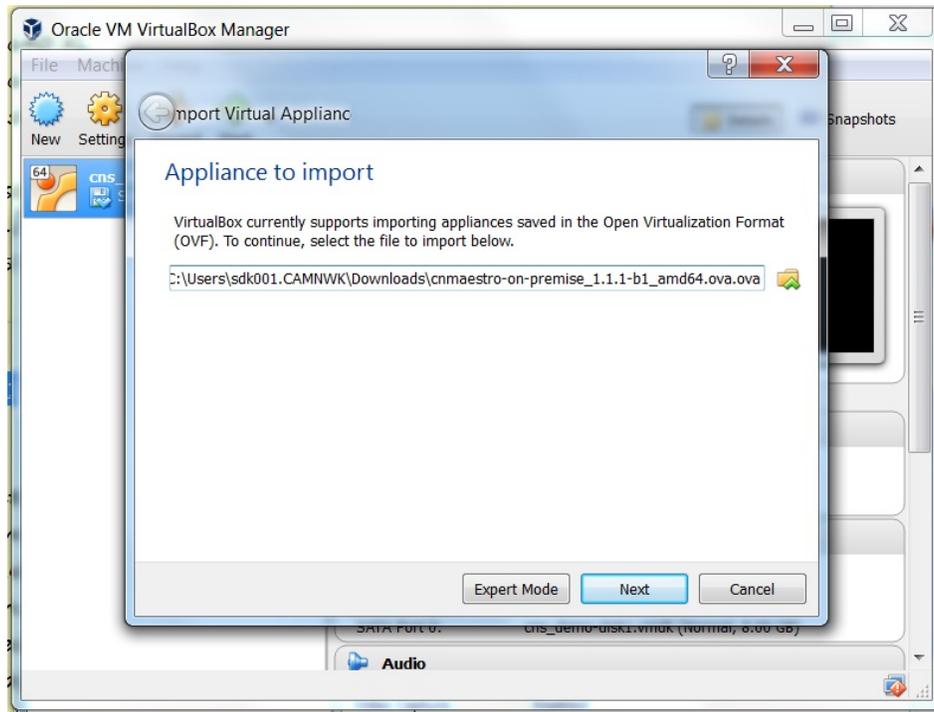
8.2.1 Deployment

The steps to import cnMaestro On-Premises into Oracle VirtualBox are below. VirtualBox is not recommended for a production environment.

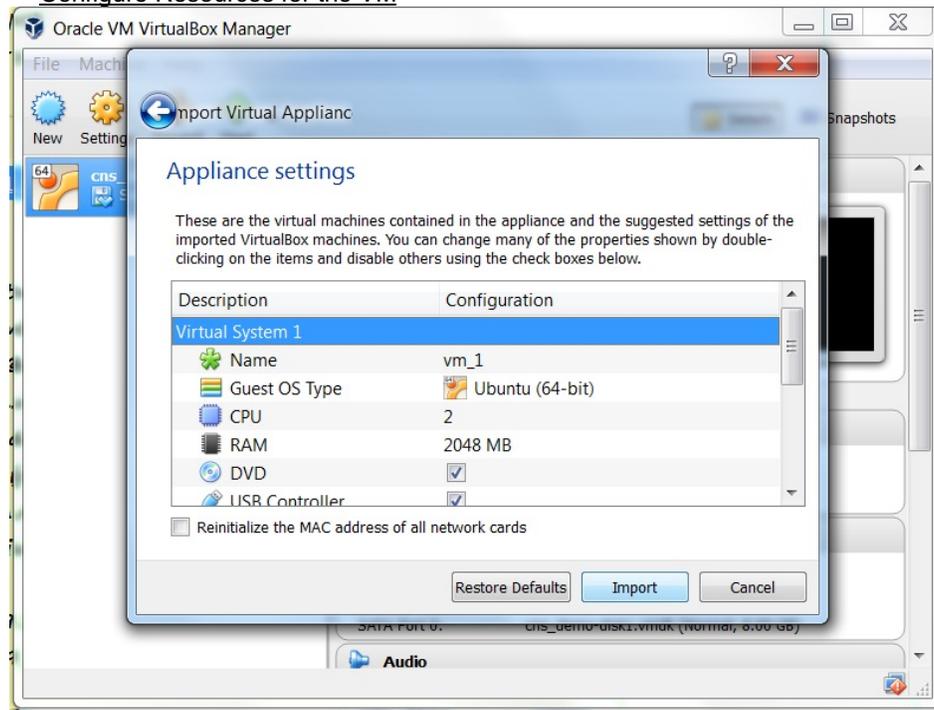
8.2.1.1 Open Oracle VirtualBox Manager, and choose File > Import Appliance Menu



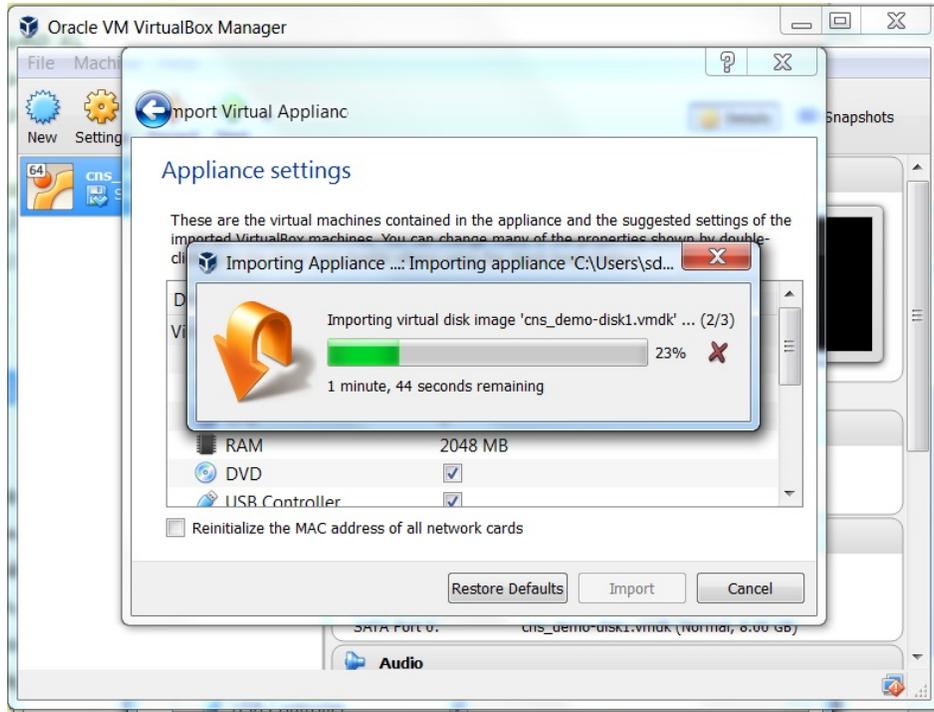
8.2.1.2 Select CnMaestro On-Premises OVA File and Click Next to Continue



8.2.1.3 Configure Resources for the VM



8.2.1.4 Click the Import Button to Continue



8.2.1.5 4. Select the VM and Click Start VM

Note

You may need to configure VirtualBox networking prior to launching the virtual machine.

1. If you just want to test out cnMaestro locally, and you don't want to register any devices with it, then you can choose the **Host Only** network adapter. This will assign an IP address that is local to the host machine, and you can access cnMaestro from a local UI.
2. If you want to allow external devices to register and onboard with cnMaestro, then you should select the **Gateway** network adapter. This will provide cnMaestro with an IP address on the same subnet as the host machine.

The new virtual machine will appear in the left panel. After the VM is started, you will get the login screen, and you can continue to configure cnMaestro and access the UI.

