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Pica8 Deployment Guide | June 2022

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# PicOS-V User Guide

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## PicOS-V

**PicOS-V** is a free **Virtual Machine (VM)** from Pica8 that can help you get familiar with PicOS Software Switches. PicOS-V is used for validating the configuration of PicOS and testing L2 and L3 features at your own pace, with no costs associated. PicOS-V runs on **VMware, GNS3** and **VirtualBox hypervisors, without the need** for a bare-metal switch or specialized hardware..

### PicOS-V Benefits

Following are benefits of PicOS-V:

- ✓ No need to wait for switching hardware
- ✓ Free and no license required
- ✓ Get familiar with PicOS Software Switches
- ✓ Validate configuration of PicOS switches
- ✓ Prototype network operations before you commit
- ✓ Test features without any risk – L2, L3 and upgrade
- ✓ Test Automation with PicOS-V
- ✓ Simulate whitebox switch hardware by simply changing models (and serial numbers)

### PicOS-V Image Download

PicOS-V version 4.2.2 is now available for multiple virtual environments. Download the image that best suits your use case.

Name	Format
ONIE	bin
VMware	ova
GNS3	qcow2
VirtualBox	vdi

[Download PicOS-V images for free on the Pica8 website](#)

### PicOS-V vs PicOS

The PicOS-V VM is the same as PicOS Network Operating System (NOS) software supported on whitebox switches and contains all the same software features but in a VM format. PicOS-V provides full data plane functionality with layer 2 and layer 3 capabilities. Due to hardware specific implementations, PicOS-V does not support certain features. Hardware centric features like PoE are not supported. The current release does not support OpenFlow, CrossFlow and EVPN but it will be supported in the next release.

## PicOS-V Installation and Setup

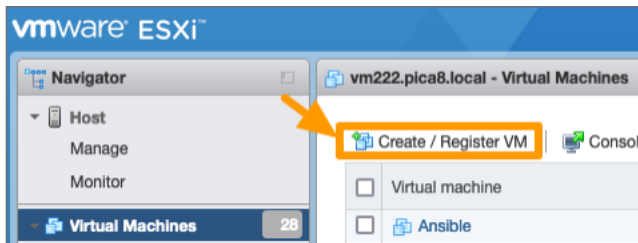
This section describes how to install and set up PicOS-V in various hypervisors.

# PicOS-V Installation and Setup in VMware vSphere ESXi

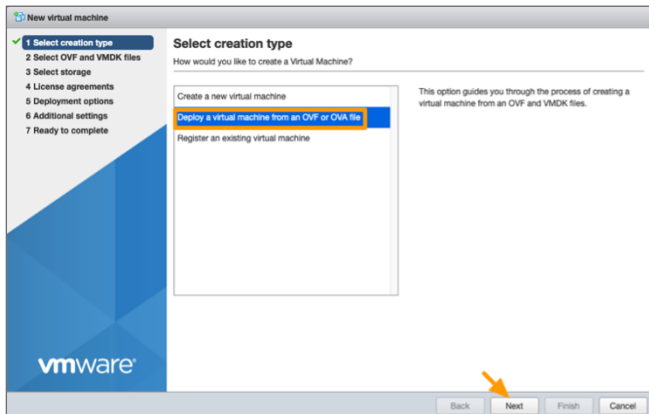
## Create VMs

The following are steps to create a PicOS-V VM in a VMware vSphere ESXi hypervisor.

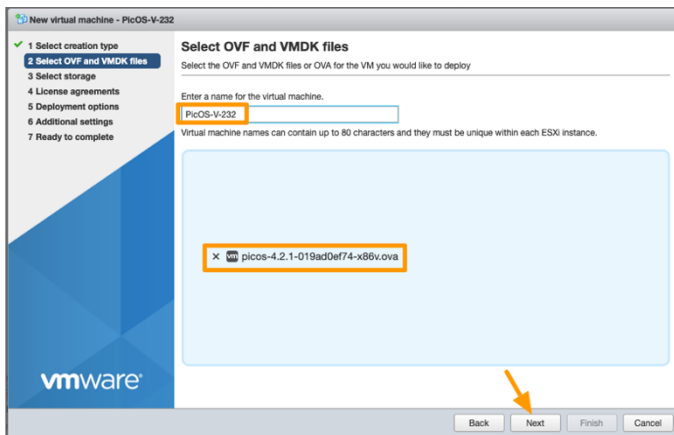
1. Download the **OVA disk image for VMware**.
2. Start the VMware vSphere Web client and connect to your ESXi server.
3. Click Create/Register VM as shown below.



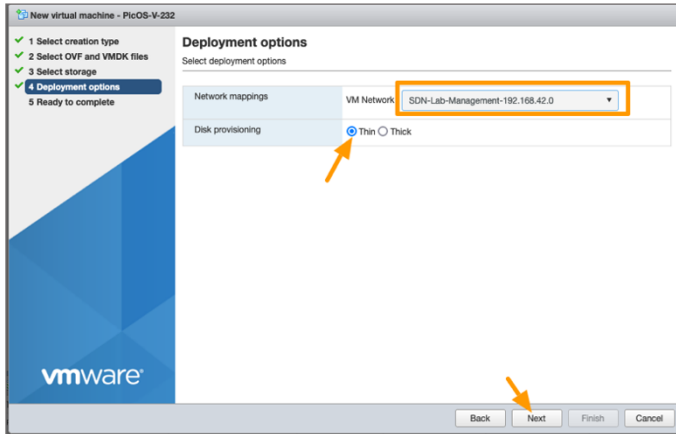
4. Select **Deploy a virtual machine from an OVF or OVA file** and click **Next**.



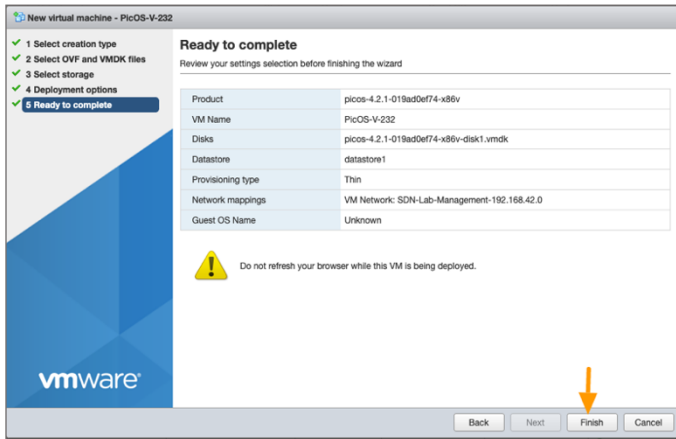
5. Select OVA image file by entering the name of the PicOS-V VM and drag the PicOS-V OVA image file into the box highlighted in blue and then click Next. Click Next on the Select Storage part of the setup wizard.



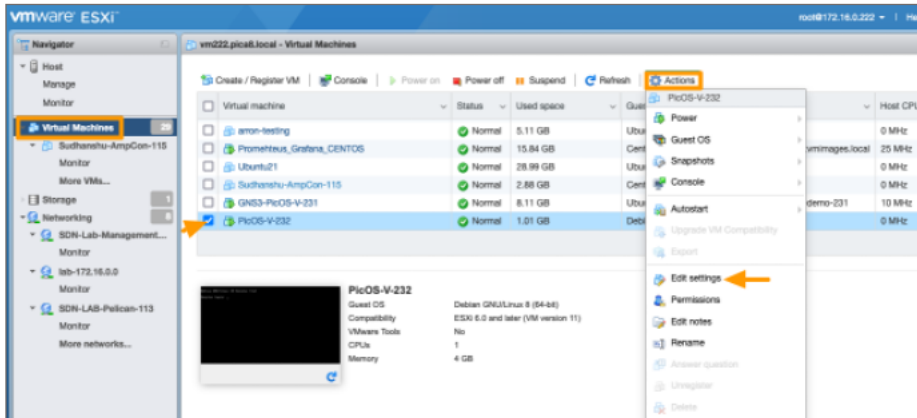
6. Select **Deployment** options, select the appropriate network for the Out-Of-Band (OOB) port for the Virtual Switch, select **Thin Disk** provisioning and click **Next**.



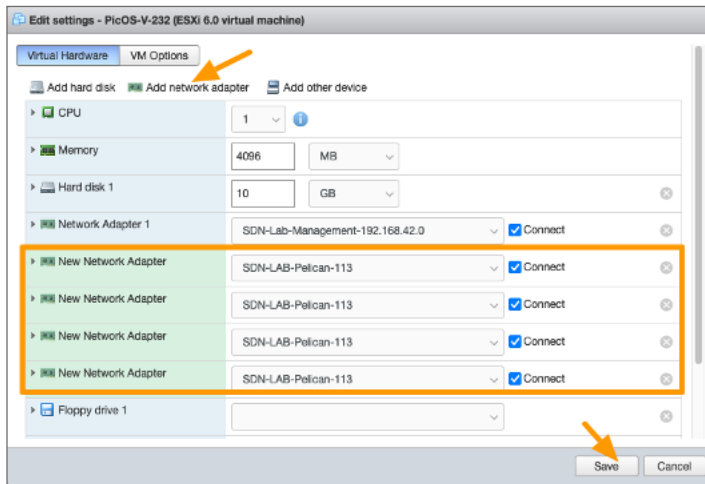
7. Click **Finish** as shown below. If your goal is to only verify the PicOS configuration commands syntax, then you can stop with this step. If you want to test functionality of L2 and L3 features, you need to setup data ports in the VM provided in the following step.



8. Add four data ports to the newly created PicOS-V VM. Turn off the power to the VM and select the Virtual Machines menu, select the VM you just provisioned and select the Actions menu and click **Edit settings as shown below**. Limit the number of data ports to 4 as Hypervisor Servers do not have a large number of ports like whitebox switches.



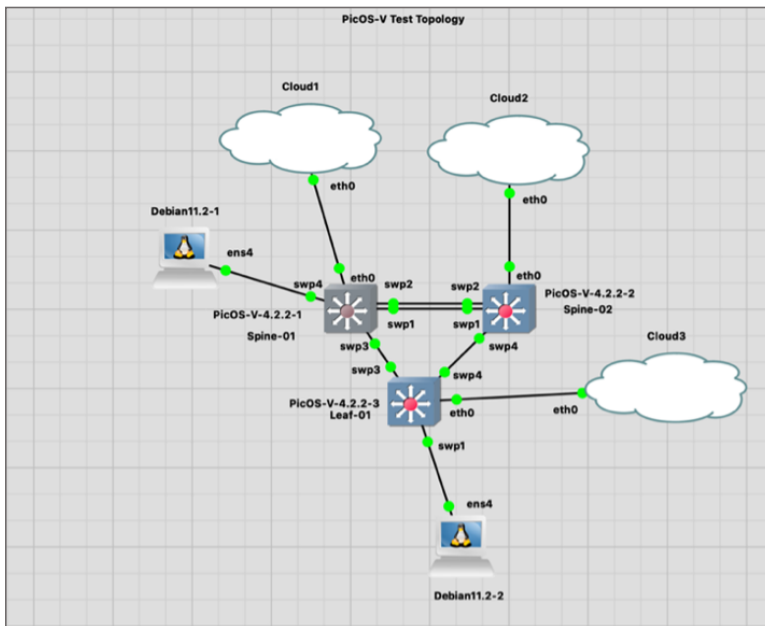
9. Add four data ports by clicking **Add** network adapter four times and select appropriate network for each adapter and click **Save** as shown below. Turn the power for the VM on.



After creating PicOS-V VM, refer to the section [Quick Start Steps to Setup PicOS-V](#).

## PicOS-V Installation, Setup and Testing in GNS3

This section describes how to install and set-up PicOS-V with VMware and [GNS3](#) to create two spines and one leaf virtual switch topology shown below to test PicOS' L2 and L3 software features. In this example, we will test the [MLAG](#) feature. The following is a test topology in a GNS3 environment.



Leaf-01 switch accesses the network through **Spine-01** and **Spine-02** switches using LACP LAG. The peer link between the **Spine-01** and **Spine-02** switches is configured to carry MLAG related control traffic and is very critical to the operation of the MLAG function. Two Debian Linux servers are used in GNS3 to test MLAG.

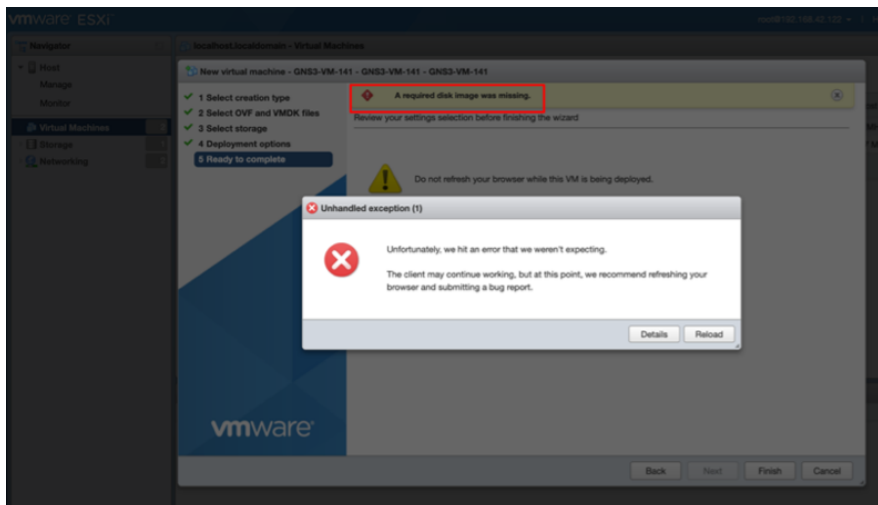
Installation, setup and testing requires the following six major steps:

1. Install GNS3 VM
2. Import PicOS-V VM inside GNS3 environment
3. Import Debian Linux Server in GNS3 environment
4. Create MLAG test topology in GNS3 environment (similar to the one given in the above picture)
5. Configure PicOS-V virtual switches and Debian Linux servers to test MLAG
6. Test MLAG test topology in GNS3

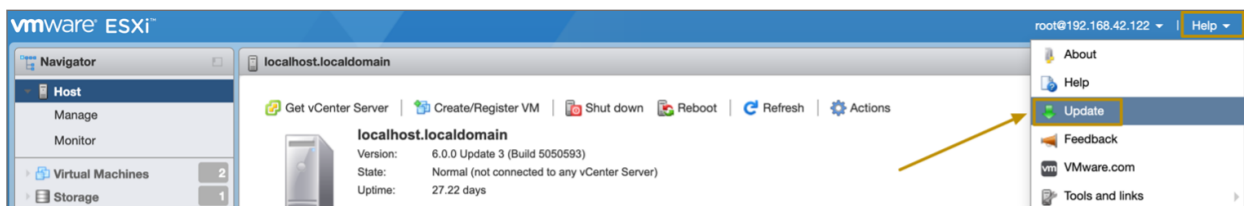
## Install GNS3 VM in VMware vSphere ESXi Hypervisor

The following are steps to create a GNS3 VM in a VMware vSphere ESXi hypervisor:

1. **Download GNS3 VM** to run in [VMware vSphere ESXi hypervisor](#).
2. **Install the GNS3 VM on ESXi server**: Follow the documentation given in this link to install GNS3.  
**Please note:** If you are using ESXi 6.0 or 6.5, you may run into the following bug when you import the GNS3 VM.

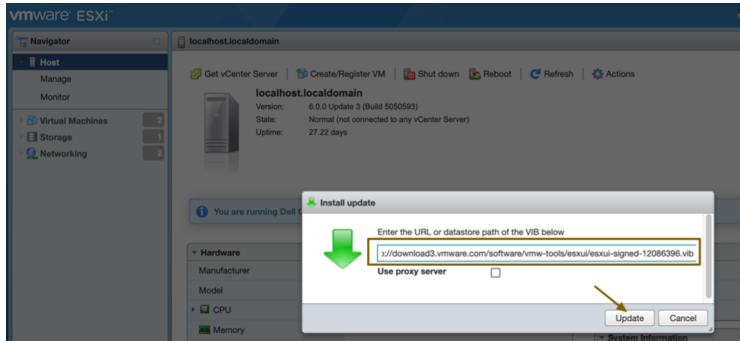


Click **Reload** and log back into vSphere Web client. Click **Help** and click **Update** as shown below:



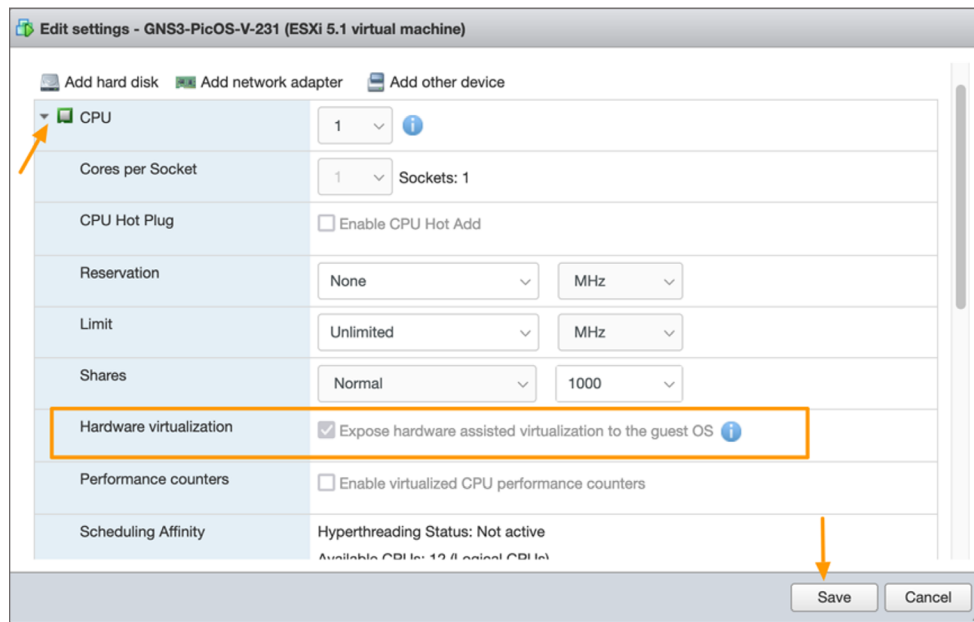
Enter the URL provided here in the box and click **Update** as shown below:

<http://download3.vmware.com/software/vmw-tools/esxui/esxui-signed-12086396.vib>

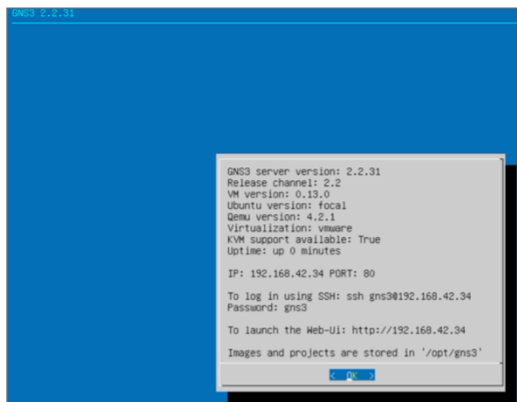


Click **Continue** to install the hot patch in the ESXi server. After the hot patch is installed in the GNS3 server, follow this link to [Install the GNS3 VM on ESXi Server](#).

After you install the GNS3 VM, turn off the VM power, select **edit settings** and expand **CPU** to check the nested VM support in the ESXi server. Hardware Virtualization needs to be enabled in this case. In addition Set **Memory** to 8 GB and click **Save**.



Power up the VM on the console of the VM and click **OK**. The GNS3 VM gets its **IP address** (192.168.42.34 in this example) from the DHCP server and it is displayed on the console. The credentials to login to the console are given: username is gns3 and password is gns3. The Web URL to access the GNS environment is given (<http://192.168.42.34>).

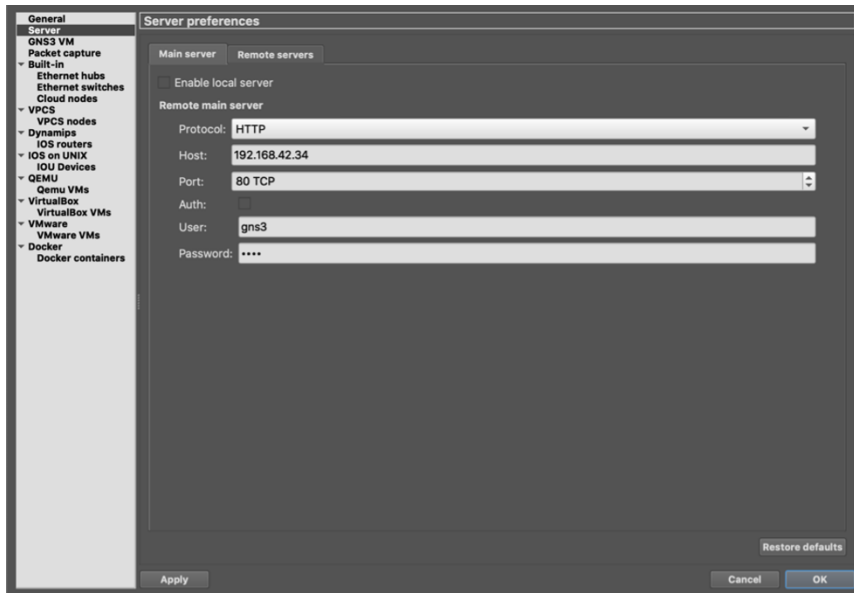




## Install GNS3 Client on the Laptop and Setup GNS3 Environment for Testing PicOS-V Features

Following are steps to create a GNS3 client on the laptop and setup a GNS3 environment for testing PicOS-V features:

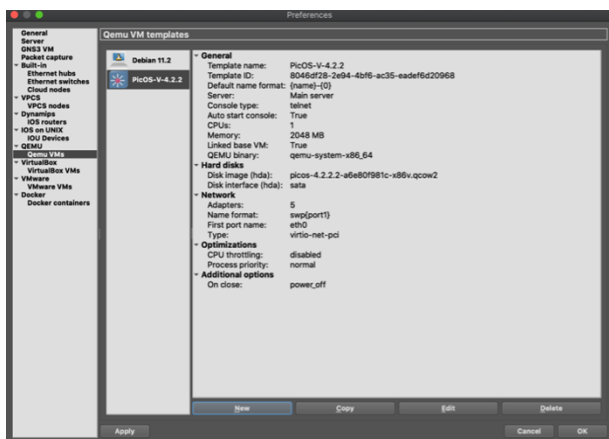
1. **Install GNS3 client** on your laptop. Follow the instruction provided below to install the GNS3 client.
  - a. Install [GNS3 on Mac OS X environment](#).
  - b. Install [GNS3 using a Windows environment](#).
2. **Run GNS3 client** on the laptop
3. **Configure Main GNS3 server** as follows in the GNS3 Application. **Select GNS3->Preferences** menu and enter remote GNS server parameters as shown below (use GNS3 VM info at the end of page 9) and click **OK**.



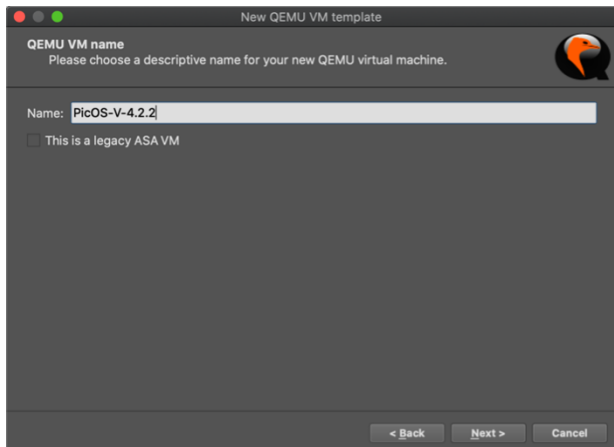
## Import PicOS-V VM in GNS3 Environment

Following are steps to import PicOS-V VM in GNS3:

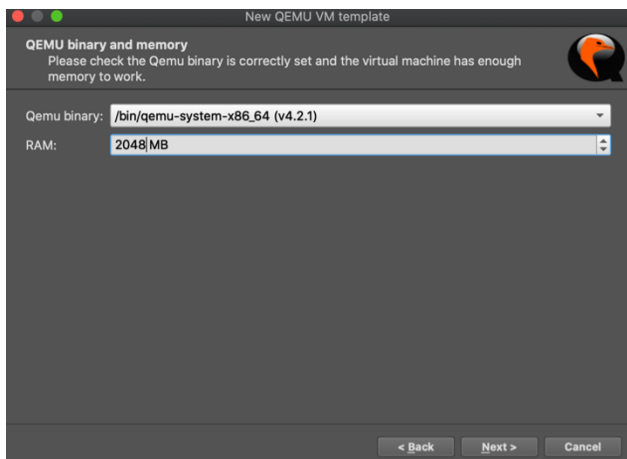
Import PicOS-V VM: Select **GNS3->Preferences->QEMU->Qemu VMs** menu and click **New** as shown below.



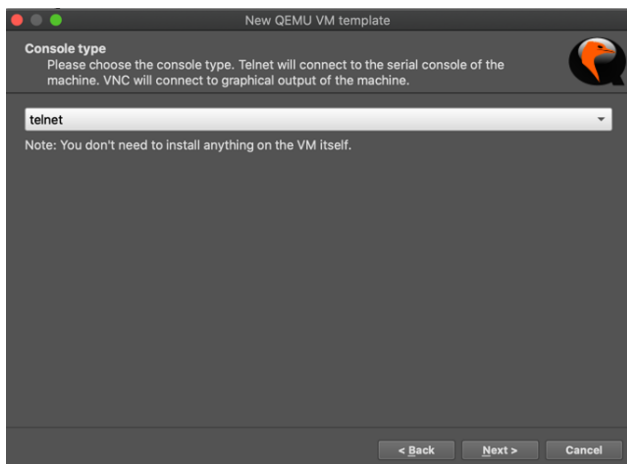
Enter the name of the QEMU VM as shown below and click **Next**.



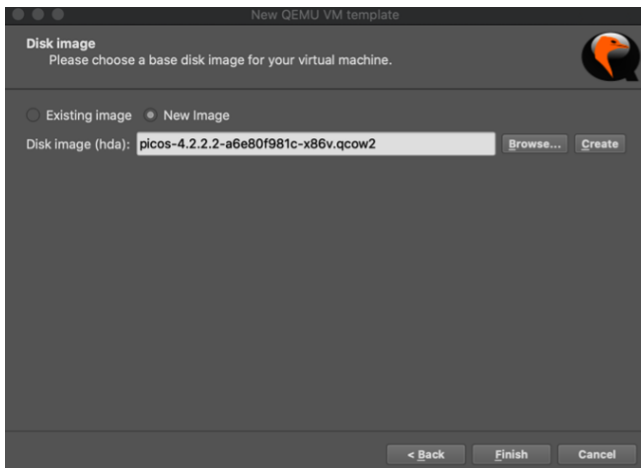
Select the QEMU binary as shown below. Enter the **2048 MB** for RAM and click **Next** as shown below.



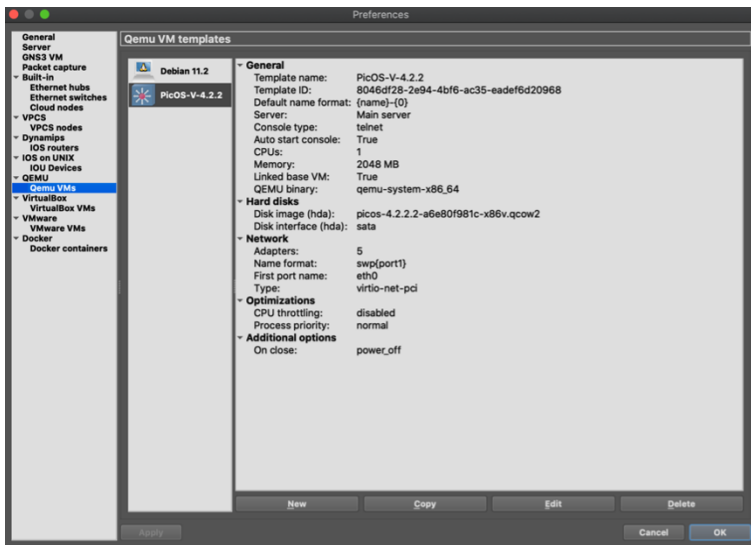
Set the **Console type** to **telnet** and click **Next** as shown below.



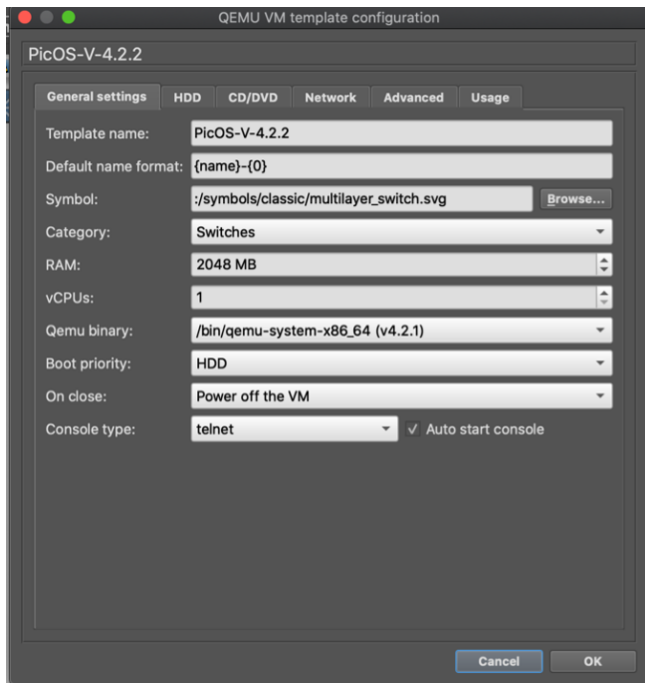
Select **New Image** and select Disk image **picos-4.2.2.2-a6e80f981c-x86v.qcow2** and click **Finish**.



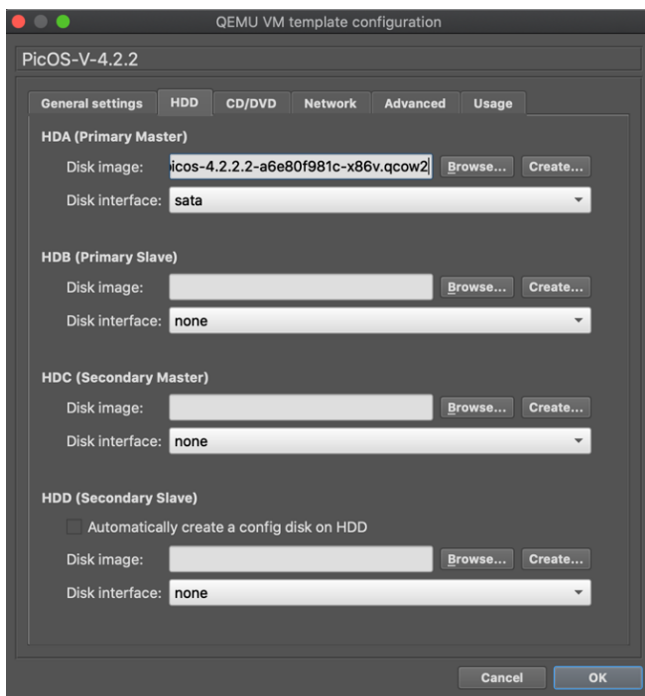
**Configure PicOS-V QEMU VM Template:** Select **GNS3->Preferences->QEMU->Qemu VMs->PicOSV-4.2.2** menu and click **Edit** as shown below.



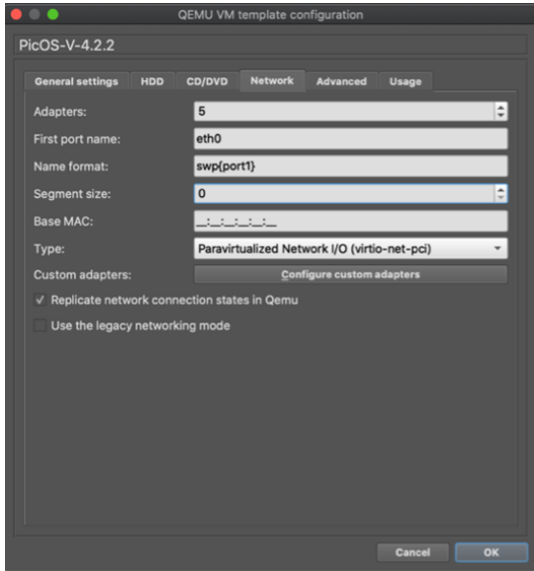
Set the **Symbol** to `:/symbols/classic/multilayer_switch.svg` and **Category** to **Switches** as shown below.



Click the **HDD** tab and make sure **Disk interface** is set to **sata** as shown below:

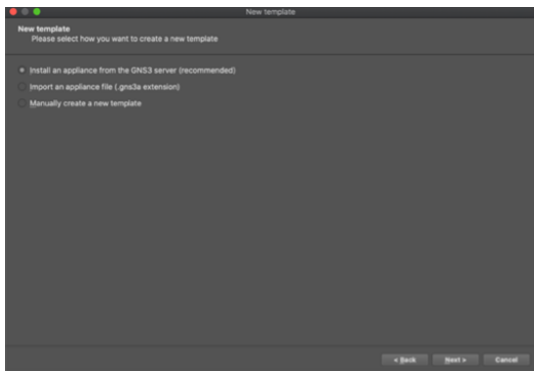


Click the **Network** tab and set the value of **Adapters** to **5**, **port name** to **eth0**, **name format** to **swp{port1}** and **Type** to **Paravirtualized Network I/O (virtio-net-pci)** and then click **OK** as shown below. **eth0** is used as Out-Of-Band (OOB) management port, and **four more switch ports** are added for traffic testing.

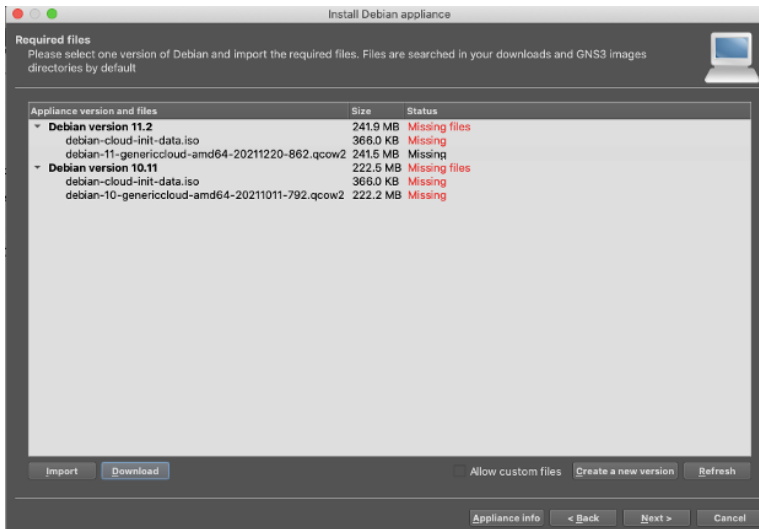


## Import Debian Linux Server in GNS3 Environment

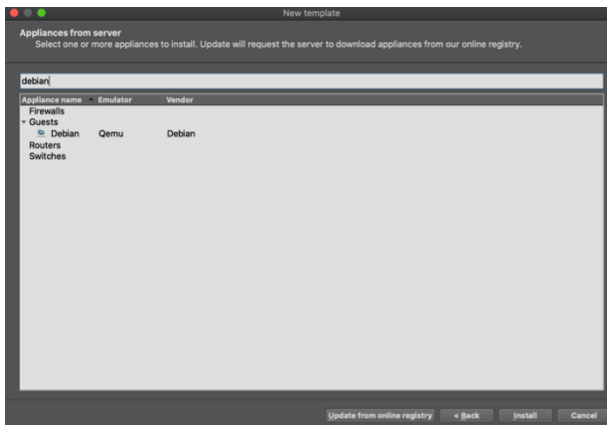
**Provision Linux Server VM for generating traffic:** Select **File->New Template** menu and select **Install an appliance from the GNS3** server and click **Next** as shown below.



Click **Update from online registry** and search for **Debian** on the filter field as shown below. Click **Install** and select **install the appliance on the main server** for the Server type field, then click **Next** two times. If you find a **Missing** status for the server image, click **Download** to download both qcow2 and iso images under Debian version 11.2 to your laptop and click **Import to import** the server images you downloaded.



Click **Install** to install the Debian Server in your GNS3 environment.



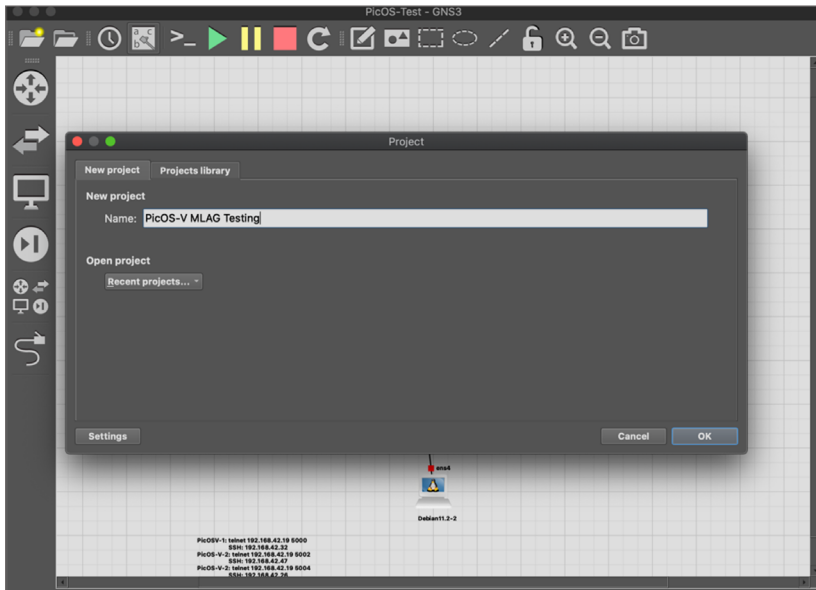
## Create MLAG Test Topology in GNS3 Environment

We have already imported the PicOS-V virtual switch and Debian Linux server templates in GNS3.

Create the project: First create a new GNS3 Project by selecting **File-> New blank project menu**, as shown below. Enter the name of the new project as **PicOS-V MLAG Testing** and click **OK** as shown below.

Create a new project

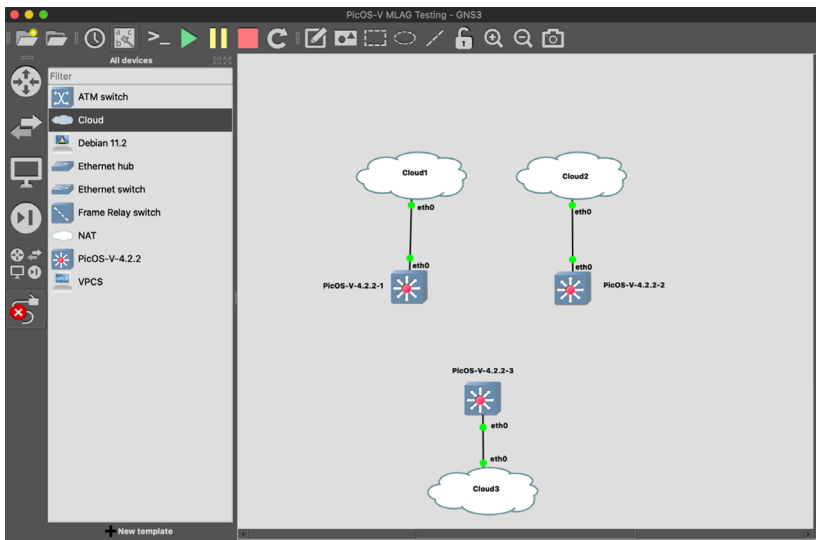
First create a new GNS3 Project by selecting **File->New blank project** menu, enter the name of the new project as **PicOS-V MLAG Testing** and click **OK** as shown below.



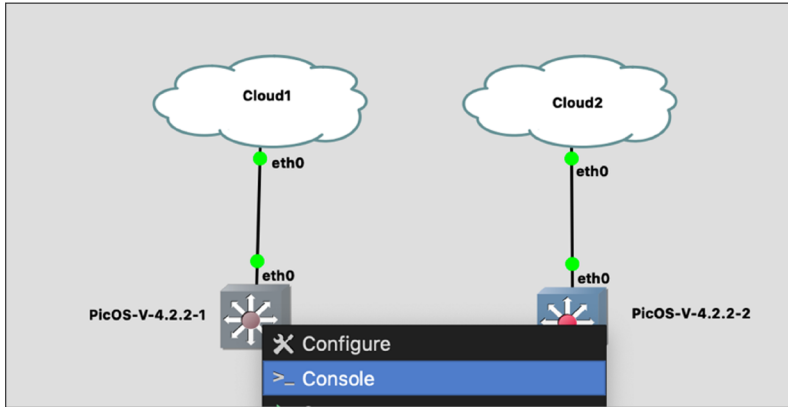
### Spin up 3 PicOS-V Switches and Connect Them

Select **PicOS-V** device from the Devices Menu on the left and drag three PicOS-V devices into the new project window as shown below. Also drag a Cloud device over each PicOS-V switch as shown below. Select **connector icon** from the **Devices Menu** on the right, then right click on each Cloud device and select **eth0 port** and connect it to the **eth0 port** of the PicOS switch as shown below. Click **Play** button on the top menu to activate the connection, and power up all the three switches.

Using GNS3 Cloud you can make a connection between your PicOS-V switch and your local network or with the internet. PicOS-V management interface eth0 will get an IP address from a DHCP server located in the local network.



Right click first PicOS-V switch and select console as shown below.



Login to the first PicOS-V switch using the default credentials with username **admin** and password **pica8**. It will prompt you to change the password for **admin** user. Change password for **admin** user.

```
Xorplus login: admin
Password:
You are required to change your password immediately (administrator enforced)
Changing password for admin.
Current password:
New password:
Retype new password:
```

Now check the management IP address assigned to the interface **eth0** by the DHCP server using the following CLI. Note down this management IP address. We will later need this IP address for importing this switch into PicOS-V.

```
admin@Xorplus> bash "ifconfig eth0"
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.42.10 netmask 255.255.255.0 broadcast 192.168.42.255
```

Verify whether ssh to this PicOS-V switch works from your laptop as shown below:

```
$ ssh admin@192.168.42.10
The authenticity of host '192.168.42.10 (192.168.42.10)' can't be established.
ECDSA key fingerprint is SHA256:yP06uqTcOY9T2Jo2F4EDyZpfV7CaLSC36UWqJTXfdfY.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.42.10' (ECDSA) to the list of known hosts.
Debian GNU/Linux 10
admin@192.168.42.10's password:
Synchronizing configuration...OK.
Welcome to PICOS on Xorplus
```

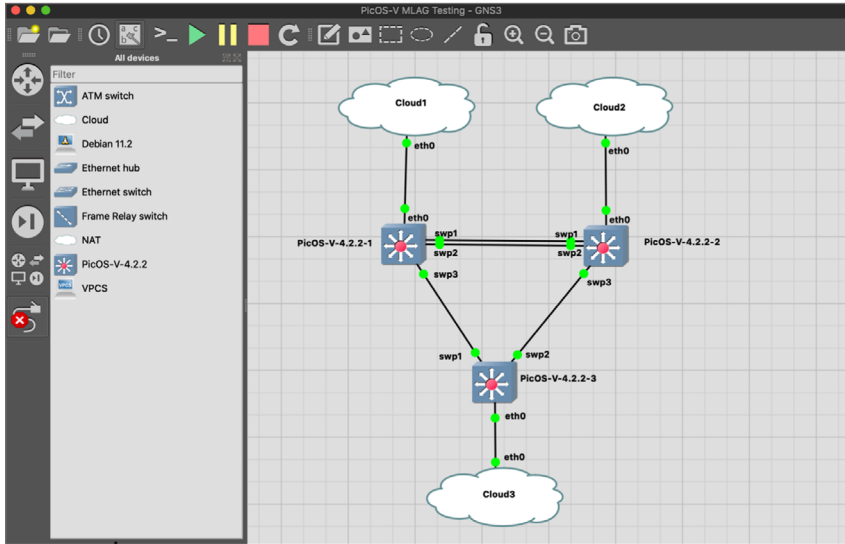
Similarly note down the management IP address of second and third PicOS-V switches (Example: 192.168.42.37 and 192.168.42.14).



## Make Connections Between the Three PicOS-V Switches

Following connections are made as shown in the topology below:

1. Connect port swp1 of the first switch with port swp1 of the second switch
2. Connect port swp2 of the first switch with port swp2 of the second switch
3. Connect port swp3 of the first switch with port swp1 of the third switch
4. Connect port swp3 of the second switch with port swp2 of the third switch



We are planning to use AmpCon to configure the newly provisioned PicOS-V switches. AmpCon expects a unique **Serial Number** from each PicOS or PicOS-V switch. Following needs to be done to set the Serial Number in the first PicOS-V switch. Right click the first switch and select **Console** and login to the switch using **admin** user credentials. Execute the following command from the CLI. It sets the first PicOS-V switch's Serial Number to **62A544A8C505**

```
admin@Xorplus> bash "sudo /etc/reset-product.sh -s 62A544A8C505"
Reset serial-number '62A544A8C508' to '62A544A8C505'
Reset has been done. Please reboot the virtual machine.
```

Execute the following command to reboot the PicOS-V switch and make the new Serial Number take effect. (Readability grammar?)

```
admin@Xorplus> bash "sudo reboot"
```

Similarly set the **Serial Number** of the second PicOS-V switch to **62A544A8C506** and third switch to **62A544A8C507**.

## Spin Up Two Debian Servers and Connect

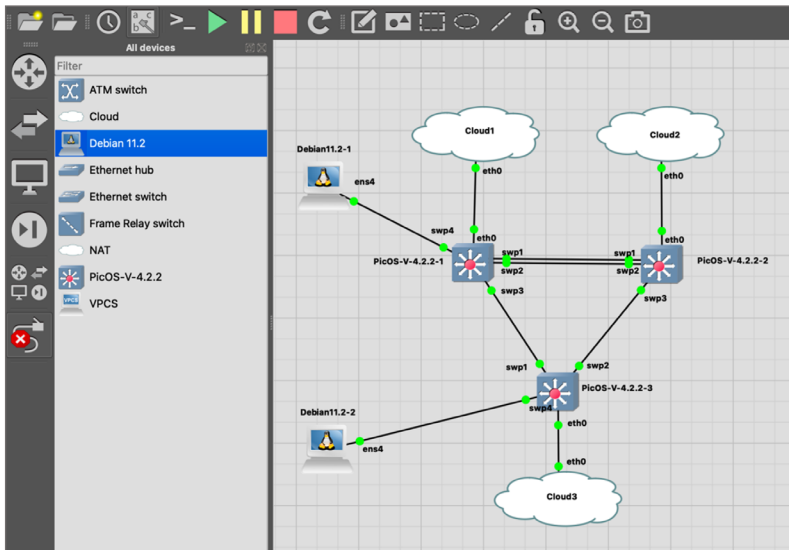
Select **Debian Server** device from the Devices Menu on the left and drag two **Debian Server** devices into the new project window as shown below.

Following connections are made as shown in the topology below:

1. Select **connector icon** from the Devices Menu on the left, then right click on the first **Debian Server** and select **ens4** port and connect it to the **swp4** port of the first PicOS-V switch as shown below.

2. Select **connector icon** from the Devices Menu on the left, then right click on the second **Debian Server** and select **ens4** port and connect it to the **swp4** port of the first the third PicOS-V switch as shown below.

Click the **Play** icon on the top to power up the two Debian Servers.



Following are the steps to setup management IP for the first Debian Server.

1. Right click on the first Debian Server and select **Console**. Login to the Debian server with the following default credentials:  
username: **debian** and password: **debian**
2. Execute the following command to backup the current interfaces file:  
`sudo cp /etc/network/interfaces /etc/network/interface.bak`
3. Setup IP address for the management interface as follows:
  - a. Execute the following command to edit the interfaces file:  
`sudo vim /etc/network/interfaces`  
Add the following lines to end of the file and save the file  
`auto ens4`  
`iface ens4 inet static`  
`address 192.168.15.99`  
`netmask 255.255.255.0`  
`gateway 192.168.15.1`  
`dns-nameservers 8.8.8.8`
  - b. Restart the networking using the following command:  
`sudo systemctl restart networking`
4. Verify whether management IP is setup correctly using the following command:

```
debian@debian:~$ ip addr show ens4
2: ens4: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 0c:a4:6c:ae:00:00 brd ff:ff:ff:ff:ff:ff
    altname enp0s4
    inet 192.168.15.99/24 brd 192.168.15.255 scope global ens4
        valid_lft forever preferred_lft forever
    inet6 fe80::ea4:6cff:feae:0/64 scope link
        valid_lft forever preferred_lft forever
```

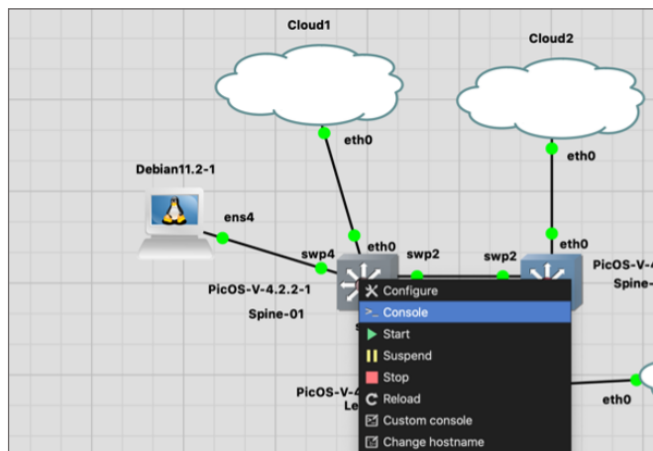
Similarly, setup the management IP for the second Debian Server to **192.168.15.100/24**.

## Configure MLAG in PicOS-V Virtual Switches

You may do this in one of two ways:

1. Use AmpCon to automate configuration of MLAG in PicOS-V switches and test. If you choose this option, please read [Using AmpCon to manage PicOS-V switches -Evaluation Guide](#).
2. Manually configure MLAG in PicOS-V switches. Refer to the [Example for Configuring a Basic MLAG](#) document for configuring MLAG in three PicOS-V virtual switches. An example MLAG configuration used for testing MLAG functionality in the GNS3 environment is provided in Appendix A of this document.

From the GNS3 client Application, right click on the **Spine-01 switch** to log into its console as shown below.



Execute the following CLIs to verify the MLAG functionality.

```
admin@spine-01> show mlag domain summary
```

```
Domain ID: 10   Domain MAC: 48:6E:73:FF:00:0a   Node ID: 0
```

```
-----
Peer Link  Peer IP           Peer Vlan  Neighbor Status  Config Matched  MAC Synced  # of Links
-----
ae2        10.10.0.2         4088      ESTABLISHED      Yes              Yes          1
```

```
admin@spine-01> show mlag link
```

```
summary Total Links: 1
```

```
-----
Link  Local  LAG  Link Status  Local Status  Peer Status  Config Matched  Flood
-----
      1    ae1  FULL         UP            UP            UP              Yes No
```

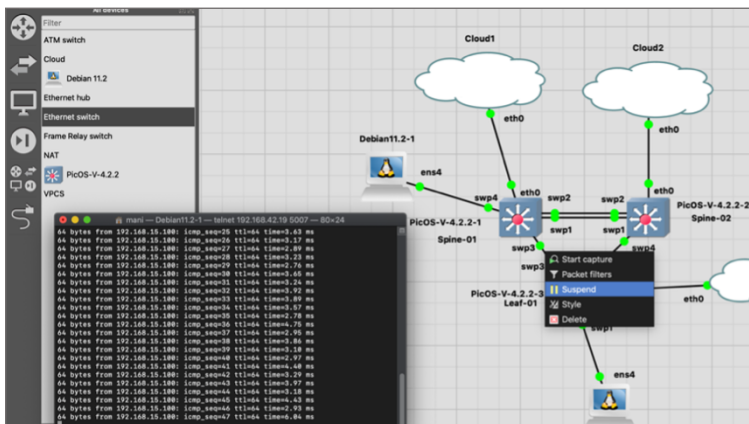
**ae2** is the peer link between Spine-01 and Spine-02 to carry MLAG related control traffic. **ae1** is the LAG port in the Leaf-01 switch with two **directly connected** physical ports to guarantee reliable communication with peer devices. The above CLI commands verify that both Peer Link port **ae2** and LAG port **ae1** are up and functional.

## Verify MLAG Functionality with Traffic Test

Log into the console of the **Debian11.2-1** Server from the GNS3 client Application and execute the following Linux shell command to send **100 packets from the Debian11.2-1 Server** connected to the Spine-01 switch to the **Debian11.2-2 Server** connected to the Leaf-01 switch.

```
debian@debian:~$ ping -c 100 192.168.15.100
PING 192.168.15.100 (192.168.15.100) 56(84) bytes of data.
64 bytes from 192.168.15.100: icmp_seq=1 ttl=64 time=6.73 ms
64 bytes from 192.168.15.100: icmp_seq=2 ttl=64 time=40.9 ms
64 bytes from 192.168.15.100: icmp_seq=3 ttl=64 time=3.06 ms
```

When the ICMP traffic is flowing, right click on the link between the **Spine-01** and the **Leaf-01**. Select **Suspend** to stop the traffic flowing through that link as shown below. MLAG will make the traffic flow **from the Spine-01 switch to the Leaf-01 switch via the Spine-02 switch**.



The output of ping traffic verifies that there is no packet loss when the link between Spine-01 and Leaf-01 goes down. This verifies MLAG functionality.

```
<... output suppressed ...>
64 bytes from 192.168.15.100: icmp_seq=97 ttl=64 time=4.52 ms
64 bytes from 192.168.15.100: icmp_seq=98 ttl=64 time=4.55 ms
64 bytes from 192.168.15.100: icmp_seq=99 ttl=64 time=4.14 ms
64 bytes from 192.168.15.100: icmp_seq=100 ttl=64 time=4.22 ms
--- 192.168.15.100 ping statistics ---
100 packets transmitted, 100 received, 0% packet loss, time 99912ms
rtt min/avg/max/mdev = 2.761/4.428/40.906/3.756 ms
```

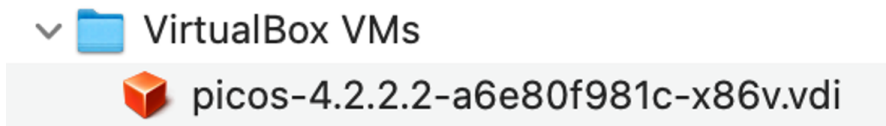
## PicOS-V Installation and Setup in VirtualBox

### Create VMs

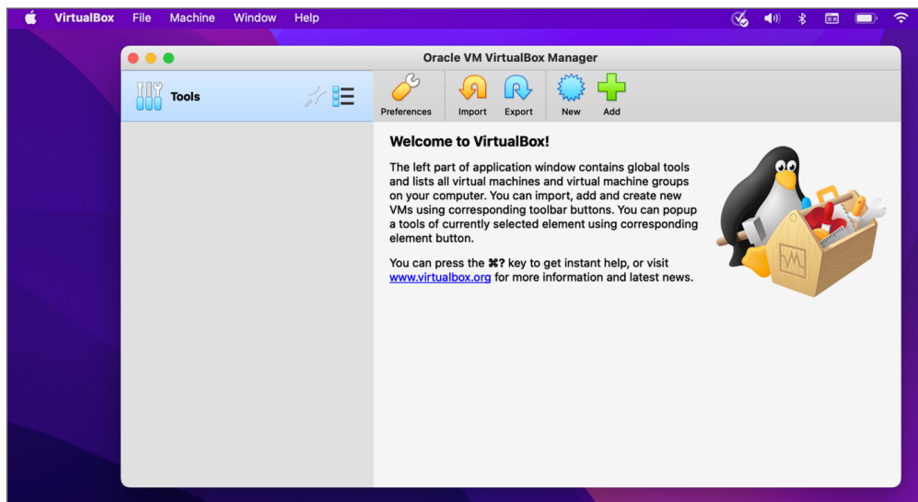
The following are steps to create a PicOS-V VM in VirtualBox.

In this example VirtualBox is installed on a MacOS laptop. VirtualBox can be downloaded from [Download VirtualBox](#). Quit VirtualBox Software before starting the install instructions below:

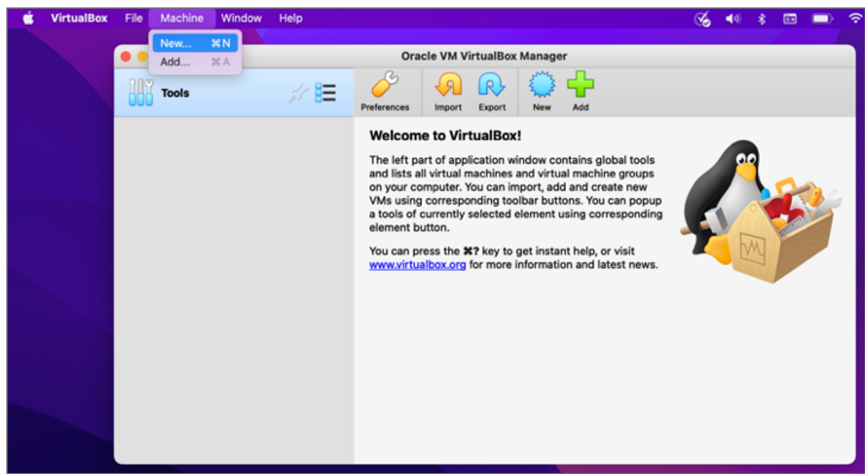
1. Copy the PicOS-V VDI format image to your laptop



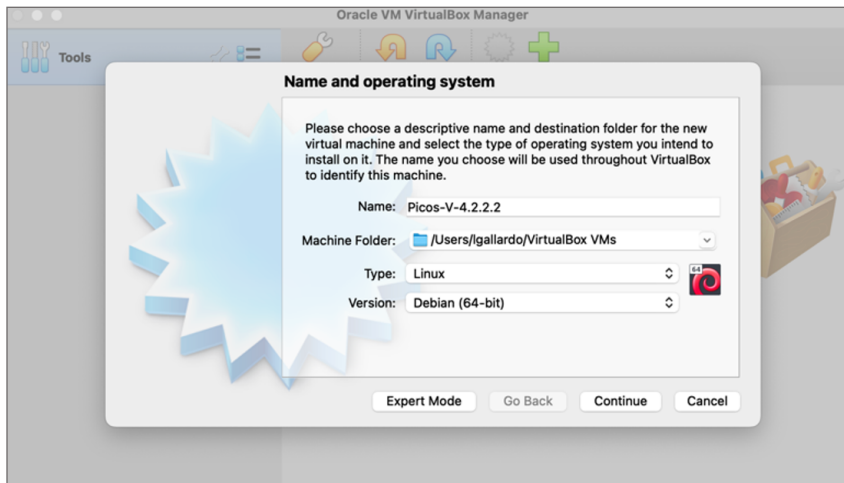
2. Start VirtualBox



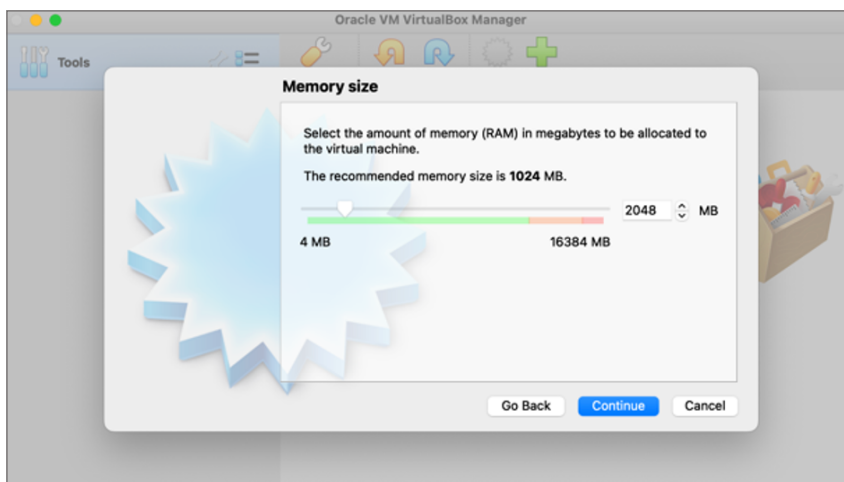
3. Create a PicOS-V virtual machine by selecting **Machine -> New**



4. Give the new virtual machine a name and select the appropriate OS and version as shown below and click **Continue**



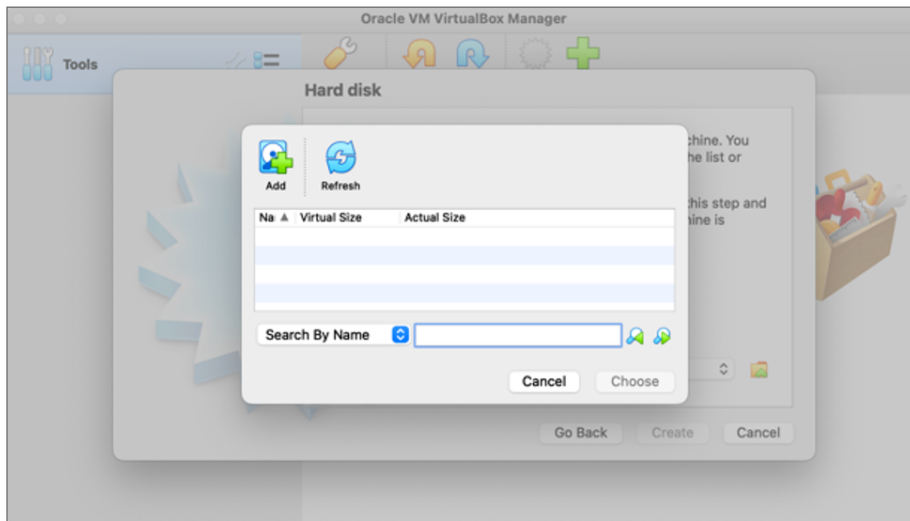
5. Set **Memory Size** for PicOS-V VM to **2048 MB** as required and click **Continue**



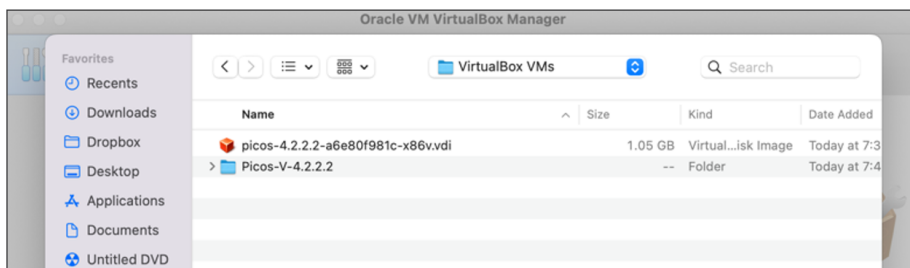
6. Select Use an **existing virtual hard drive file** then click the folder icon



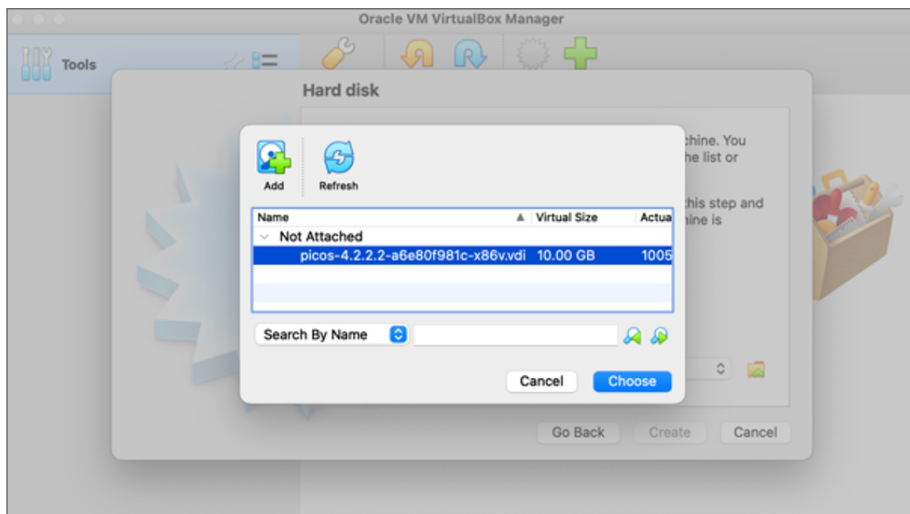
7. Click **Add**



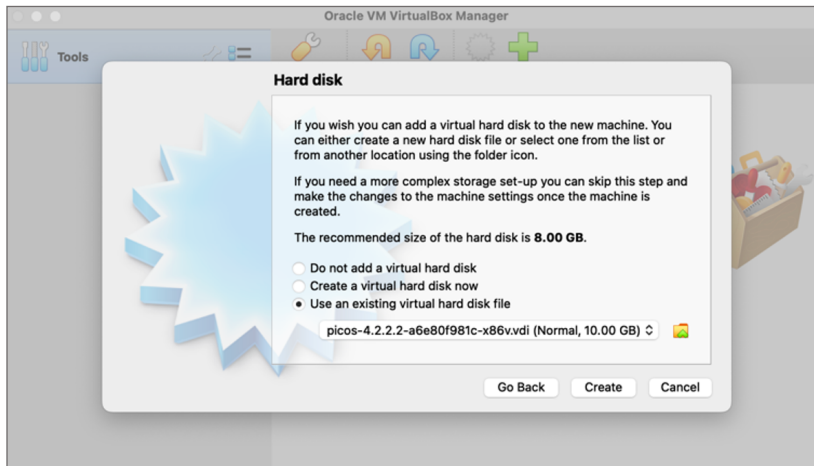
8. Select the PicOS-V VDI image file you copied in step 1 and click **Open** as shown below:



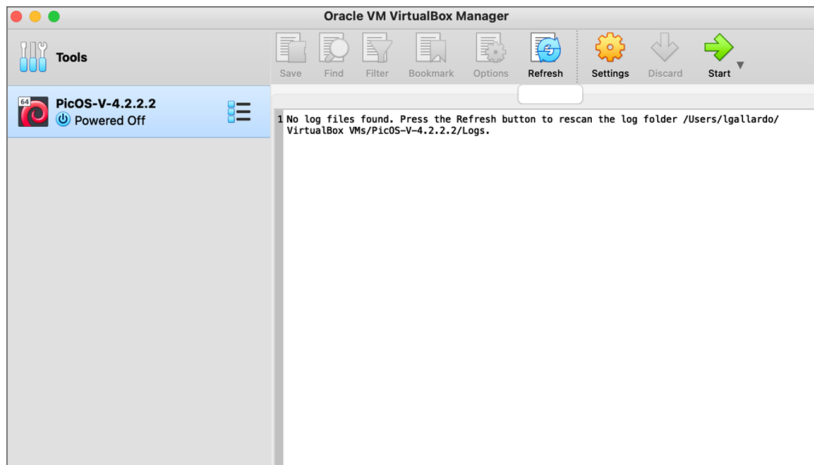
9. Select the VDI image and click **Choose** as shown below:



10. Finish by clicking **Create** as shown below.



11. Click **Start** to start the PicOS-V VM as shown below:



After creating PicOS-V VM, refer to the section **Quick Start Steps to Setup PicOS-V**.

## Quick Start Steps to Set-up PicOS-V

Following are steps to set-up the PicOS-V VM.

1. **Login via console:** Once you import the PicOS-V VM into the hypervisor, from the VM console log into the PicOS-V VM with the default **admin** account and the default password is **pica8**. It will prompt you to change the password for the admin account first.
2. **Set the hardware model of the whitebox switch you want to simulate:** By default, the switch model of the PicOS-V VM is set to the Edgecore **AS5812\_54X** switch model. Run the following CLI to check the current simulated hardware model.





```
admin@Xorplus> show version
Copyright (C) 2009-2022 Pica8, Inc.
=====
Base ethernet MAC Address      : 00:0c:29:32:54:88
Hardware Model                  : AS5812_54X
Linux System Version/Revision  : 4.2.2.2/a6e80f981c
Linux System Released Date     : 04/02/2022
L2/L3 Version/Revision        : 4.2.2.2/a6e80f981c
L2/L3 Released Date           : 04/02/2022
```

To set the PicOS-V VM to the desired hardware model, execute the following command from the PicOS CLI prompt. In the following example we are setting the PicOS-V VM to simulate Dell's N3248P-ON switch.

```
admin@Xorplus> bash "sudo /etc/reset-product.sh -p N3248P-ON"
Reset product 'as5812_54x' to 'N3248P-ON'
Reset has been done. Please reboot the virtual machine.
```

When you change the hardware model, always delete the following files. It will erase the start-up config of old hardware model which includes specific interface names.

```
admin@Xorplus> bash "sudo rm /pica/config/*"
admin@Xorplus > bash "sudo rm /backup/pica/config/*"
```

Reboot the PicOS-V switch to change to the new hardware model, to take effect as follows from the console:

```
admin@Xorplus > request system reboot
```

### 3. Configure the Ethernet management port eth0 with a static IP address as show below in the console:

```
admin@Xorplus> configure
Entering configuration mode.
There are no other users in configuration mode.
admin@Xorplus# set system management-ethernet eth0 ip-address IPv4 "192.168.42.140/24"
admin@Xorplus# set system management-ethernet eth0 ip-gateway IPv4 192.168.42.1
admin@Xorplus# set system hostname PicOS-V-140
admin@Xorplus# commit
Commit OK.
Save done.
```

### 4. SSH to the newly created VM: After configuring the Ethernet management interface using the console, you will be able to SSH to the PicOS-V VM using **admin** account with the password you set in this step and start using it. You are not required to install any software license for PicOS-V to use it, and it is free.

```
$ ssh admin@192.168.42.140
The authenticity of host '192.168.42.140 (192.168.42.140)' can't be established.
ECDSA key fingerprint is SHA256:yP06uqTcOY9T2Jo2F4EDyZpfV7CaLSC36UWqJTXfdfY.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.42.140' (ECDSA) to the list of known hosts.
Debian GNU/Linux 10
admin@192.168.42.140's password:
Synchronizing configuration...OK.
Welcome to PICOS on PicOS-V-140
```



To verify the hardware model change, ssh to the PicOS-V-140 virtual switch and run the following CLI:

```
admin@PicOS-V-140> show version
Copyright (C) 2009-2022 Pica8, Inc.
=====
Base ethernet MAC Address      : 00:0c:29:32:54:88
Hardware Model                 : N3248P-ON
Linux System Version/Revision : 4.2.2.2/a6e80f981c
Linux System Released Date    : 04/02/2022
L2/L3 Version/Revision       : 4.2.2.2/a6e80f981c
L2/L3 Released Date          : 04/02/2022
```

5. **Data ports:** First four ports can be used for L2 and L3 feature functionality tests.

```
admin@PicOS-V-140> show interface brief
Interface      Management  Status  Flow Control  Duplex  Speed
-----
ge-1/1/1      Enabled    Up      Disabled      Full    1Gb/s
ge-1/1/2      Enabled    Up      Disabled      Full    1Gb/s
ge-1/1/3      Enabled    Up      Disabled      Full    1Gb/s
ge-1/1/4      Enabled    Up      Disabled      Full    1Gb/s
```

6. Anytime you want to erase the startup-config without changing the hardware model, you can run the following CLI:

```
admin@PicOS-V-140> configure
Entering configuration mode.
There are no other users in configuration mode
admin@PicOS-V-140 # rollback default
admin@PicOS-V-140 # commit
Commit OK.
Save done.
```

## Upgrade PicOS-V

This section describes how to upgrade PicOS-V from one version to another.

Check the current version of PicOS-V using the following CLI command.

```
admin@Spine-01> show version
Copyright (C) 2009-2022 Pica8, Inc.
=====
Base ethernet MAC Address      : 66:66:66:66:66:0b
Hardware Model                 : N3248P-ON
Linux System Version/Revision : 4.2.1/019ad0ef74
Linux System Released Date    : 01/27/2022
L2/L3 Version/Revision       : 4.2.1/019ad0ef74
L2/L3 Released Date          : 01/27/2022
```



In this example we are going to upgrade PicOS-V from version 4.2.1 to version 4.2.2. Upgrade involves following two steps:

1. Copy the new image to **/cftmp** directory in the PicOS switch. Use scp to copy the image to **/cftmp** directory first in the PicOS-V switch. The following is an example.

```
admin@Spine-01> bash "sudo scp admin@192.168.42.114:/home/admin/onie-installer-picos-4.2.2.2-a6e80f981c-x86v.bin /cftmp/onie-installer-picos-4.2.2.2-a6e80f981c-x86v.bin"
admin@192.168.42.114's password:

onie-installer-picos-4.2.2.2-a6e80f981cx86v.bin      100% 209MB 73.5MB/s 00:02
```

2. Execute **upgrade2** CLI. Execute the following CLI to upgrade the PicOS-V switch from version 4.2.1 to 4.2.2. admin@Spine-01> **upgrade2 image-file onie-installer-picos-4.2.2.2-a6e80f981c-x86v.bin**

## Next Steps

Read the [PicOS Routing and Switching Configuration Guide](#) to learn about using the PicOS NOS and test the features on your virtual switches.

## Reference

### PicOS

The following are reference materials related to PicOS:

- [PicOS Routing and Switching Configuration Guide](#)

### GNS3

The following are reference materials related to GNS3:

- [Getting Started with GNS3](#)

### AmpCon

The following are reference materials related to AmpCon:

- [AmpCon to manage PicOS-V switches - Evaluation Guide](#)



## Appendix-A - Example MLAG Configuration Used in GNS3 Environment

The following example configurations are used in the GNS3 environment to test MLAG functionality in PicOS-V virtual switches.

### Spine-01 PicOS-V Switch Configuration

The configuration used in the Spine-01 PicOS-V switch is given below:

```
admin@spine-01> show running-config | display set"
set interface aggregate-ethernet ae1 aggregated-ether-options lACP enable true
set interface aggregate-ethernet ae1 family ethernet-switching port-mode "trunk"
set interface aggregate-ethernet ae1 family ethernet-switching vlan members 15
set interface aggregate-ethernet ae1 family ethernet-switching vlan members 16
set interface aggregate-ethernet ae2 family ethernet-switching native-vlan-id 4088
set interface aggregate-ethernet ae2 family ethernet-switching port-mode "trunk"
set interface aggregate-ethernet ae2 family ethernet-switching vlan members 15
set interface aggregate-ethernet ae2 family ethernet-switching vlan members 16
set interface gigabit-ethernet te-1/1/1 ether-options 802.3ad "ae2"
set interface gigabit-ethernet te-1/1/2 ether-options 802.3ad "ae2"
set interface gigabit-ethernet te-1/1/3 ether-options 802.3ad "ae1"
set interface gigabit-ethernet te-1/1/4 family ethernet-switching native-vlan-id 15
set ip routing enable true
set l3-interface vlan-interface vlan4088 address 10.10.0.1 prefix-length 24
set protocols lldp enable true
set protocols mlag domain 10 node 0
set protocols mlag domain 10 peer-ip 10.10.0.2 peer-link "ae2"
set protocols mlag domain 10 peer-ip 10.10.0.2 peer-vlan 4088
set protocols mlag domain 10 interface ae1 link 1
set system hostname "spine-01"
set vlans vlan-id 15
set vlans vlan-id 16
set vlans vlan-id 4088 l3-interface "vlan4088"
```

### Spine-02 PicOS-V Switch Configuration

The configuration used in the Spine-02 PicOS-V switch is given below.

```
admin@spine-02> show running-config | display set
set interface aggregate-ethernet ae1 aggregated-ether-options lACP enable true
set interface aggregate-ethernet ae1 family ethernet-switching port-mode "trunk"
set interface aggregate-ethernet ae1 family ethernet-switching vlan members 15
set interface aggregate-ethernet ae1 family ethernet-switching vlan members 16
set interface aggregate-ethernet ae2 family ethernet-switching native-vlan-id 4088
set interface aggregate-ethernet ae2 family ethernet-switching port-mode "trunk"
set interface aggregate-ethernet ae2 family ethernet-switching vlan members 15
set interface aggregate-ethernet ae2 family ethernet-switching vlan members 16
set interface gigabit-ethernet te-1/1/1 ether-options 802.3ad "ae2"
set interface gigabit-ethernet te-1/1/2 ether-options 802.3ad "ae2"
```

```
set interface gigabit-ethernet te-1/1/3 ether-options 802.3ad "ae1"
set ip routing enable true
set l3-interface vlan-interface vlan4088 address 10.10.0.2 prefix-length 24
set protocols lldp enable true
set protocols mlag domain 10 node 1
set protocols mlag domain 10 peer-ip 10.10.0.1 peer-link "ae2"
set protocols mlag domain 10 peer-ip 10.10.0.1 peer-vlan 4088
set protocols mlag domain 10 interface ae1 link 1
set system hostname "spine-02"
set vlans vlan-id 15
set vlans vlan-id 16
set vlans vlan-id 4088 l3-interface "vlan4088"
```

## Leaf-01 PicOS-V Switch Configuration

The configuration used in the Leaf-01 PicOS-V switch is given below:

```
admin@Leaf-01> show running-config |display set
set alias s as "show/display set/no-more"
set interface aggregate-ethernet ae1 aggregated-ether-options lACP enable true
set interface aggregate-ethernet ae1 family ethernet-switching port-mode "trunk"
set interface aggregate-ethernet ae1 family ethernet-switching vlan members 15
set interface aggregate-ethernet ae1 family ethernet-switching vlan members 16
set interface gigabit-ethernet te-1/1/1 family ethernet-switching native-vlan-id 15
set interface gigabit-ethernet te-1/1/1 ether-options 802.3ad "ae1"
set interface gigabit-ethernet te-1/1/2 ether-options 802.3ad "ae1"
set ip routing enable true
set protocols lldp enable true
set system hostname "Leaf-01"
set vlans vlan-id 15
set vlans vlan-id 16
```