Cisco Nexus 9000v (9300v/9500v) Guide, Release 10.2(x)

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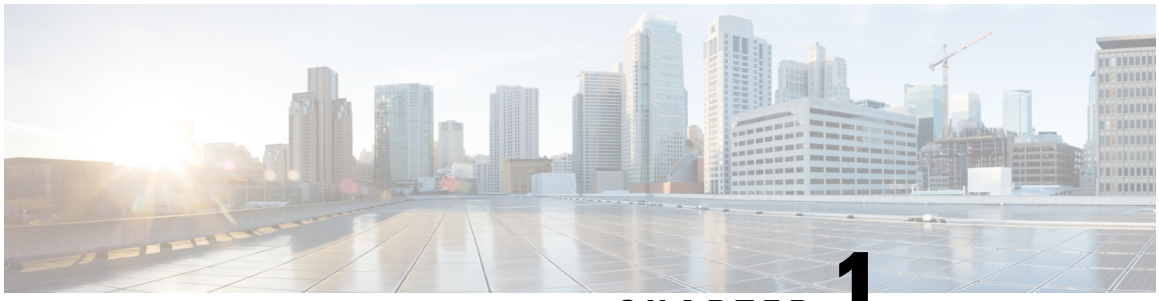


CHAPTER 1

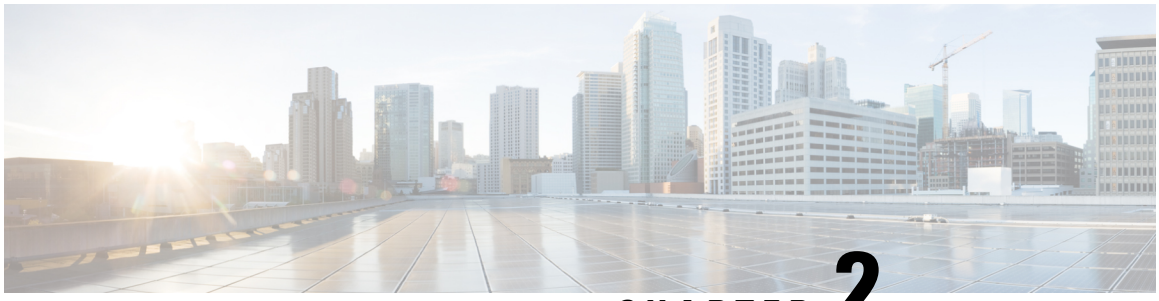
New and Changed Information

New and Changed Information

The table provides a list of the features introduced/ modified for Release 10.1(x).

Feature	Description	Changed in Release	Where Documented
Vagrant Sync Folder	Support for Vagrant Sync Folder on Nexus 9300v.	Release 10.1(1)	Support for Sync Folder in Vagrant
vPC Fabric Peering	Support for VXLAN vPC Fabric Peering	Release 10.1(1)	VXLAN and Segment Routing Features
Memory Requirement	Minimum memory requirement on Host	Release 10.1(1)	Minimum Memory Requirement on Host , on page 3

New and Changed Information



CHAPTER 2

Overview

This chapter contains the following sections:

About Cisco Nexus 9000v Platform Family

The Cisco Nexus 9000v is a virtual platform family that is designed to simulate control plane aspects of a standalone switch running Cisco Nexus 9000 software. This platform family uses the same software image that runs the Cisco Nexus 9000 hardware platforms. Although the virtual platforms don't attempt to simulate any specific ASICs or hardware SKUs, they are aligned with their hardware counterparts. An optimized Cisco software data plane handles the traffic across the line card interfaces. The Cisco Nexus 9000v virtual platform family consists of two virtual platforms: Nexus 9300v and Nexus 9500v. The following sections describe the capabilities of these two platforms.

The virtual platforms in the Nexus 9000v platform family allows you to simulate their network in a cost-effective manner. Use the simulated network to validate configurations prior to their application on a production network. Use these platforms to rapidly develop and test network automation tools using Cisco NX-OS programmability interfaces.

Minimum Memory Requirement on Host

Beginning with Release 10.1(1), Nexus 9000v requires a minimum of 8GB of RAM to boot up. Ensure that the underlying host (or laptop) has additional memory available.

Cisco Nexus 9300v Platform

The Cisco Nexus 9300v platform simulates a single supervisor non-modular chassis with a single co-located line card. This virtual chassis closely aligns with the standalone Cisco Nexus 9300 hardware platform running in the 'lxc' mode. The following tables show the specifications for this virtual platform:

Form-Factor

Component/Parameter	Specification
Usage	Simulation
Binary	Same as NX-OS Hardware
Management Interface	1
Line Cards	1
Line Card Interfaces	64

Resource Requirements

Resource	Specification
Minimum RAM	8.0 G (basic bootup)
Recommended RAM	8.0 G (depending on the number of features)
Minimum vCPUs	1
Recommended vCPUs	2
Minimum vNICs	1
Maximum vNICs	65

Deployment Environment

- KVM/QEMU 3.0.0 or higher
- ESXI 6.5 or higher
- Vagrant 2.2.6 or higher

To deploy a Nexus 9300v platform, fetch the appropriate virtual artifacts from Cisco CCO. The following table documents the supported virtual artifacts. After deploying the virtual machine, it reports itself as a Nexus 9300v platform.

Note The Cisco Nexus 9300v platform supports only the 32-bit image of the Cisco NX-OS Release 10.1(1).

The following table displays the virtual artifact(s):

Hypervisor	Virtual Artifact	Description
ESXI 6.5 or higher	nexus9300v.10.1.1.ova	Contains virtual disk, machine definition, and NXOS image.
KVM/QEMU 3.0.0 or higher	nexus9300v.10.1.1.qcow2	Contains virtual disk and NXOS image on bootflash.
Vagrant 2.2.6 or higher	nexus9300v.10.1.1.box	Contains a preinstalled NXOS image on a virtual disk along with a machine definition.

After the initial virtual machine deployment, you can upgrade the Cisco NX-OS image on the platform using the typical NX-OS workflow (example: **install all** <>).

Note When you upgrade an older Nexus 9000v to the current release, it's automatically transformed into the Nexus 9300v. Even after subsequent reloads and NX-OS image upgrades, the platform will continue to present itself as a Nexus 9300v.

Cisco Nexus 9300v Platform Components

The Cisco Nexus 9300v platform, like its reference hardware counterpart, consists of three key components: chassis, supervisor, and one line card. The following table presents the product identifications (PIDs) and the SNMP sysOID used associated with the platform

Component	Description	PID	sysOID
Chassis	Nexus9000 C9300v Chassis	N9K-C9300v	EntPhysicalVendorType = cevChassisN9KV9000 **Note** To ensure backward compatibility, the sysOID used in the previous release Nexus 9000v platform is reused for the Nexus 9300v platform.
Supervisor	Supervisor Module	N9K-vSUP	
Line Card	Nexus 9000v 64-port Ethernet Module	N9K-X9364v	

Cisco Nexus 9300v Chassis

The following references sample chassis-related information outputs from relevant **show** commands.

```
switch# show version

Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Documents: http://www.cisco.com/en/US/products/ps9372/tsd_products_support_serie
s_home.html
Copyright (c) 2002-2020, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained herein are owned by
other third parties and are used and distributed under license.
Some parts of this software are covered under the GNU Public
License. A copy of the license is available at
http://www.gnu.org/licenses/gpl.html.
Nexus 9000v is a demo version of the Nexus Operating System
Software
  BIOS: version
  NXOS: version 10.1(1) [build 10.1(0.287)]
  BIOS compile time:
  NXOS image file is: bootflash:///nxos.10.1.0.287.bin
  NXOS compile time:  12/18/2020 19:00:00 [12/19/2020 05:52:10]

Hardware
  cisco Nexus9000 C9300v Chassis
  Intel(R) Xeon(R) CPU E5-2658 v4 @ 2.30GHz with 12276412 kB of memory.
  Processor Board ID 9QG9VHFFQ7B
  Device name: switch
  bootflash:    4287040 kB

Kernel uptime is 0 day(s), 0 hour(s), 7 minute(s), 31 second(s)

Last reset
  Reason: Unknown
  System version:
  Service:

plugin
  Core Plugin, Ethernet Plugin
Active Package(s):
switch# sh module
Mod Ports             Module-Type                       Model           Status
--- ----- ------------------------------------ ---------------------- ---------
1    64   Nexus 9000v 64 port Ethernet Module   N9K-X9364v            ok
27   0    Virtual Supervisor Module             N9K-vSUP              active *
Mod  Sw                       Hw    Slot
---  ---------------------- ------ ----
1    10.1(0.287)              0.0    LC1
27   NA                       0.0    SUP1
Mod  MAC-Address(es)                         Serial-Num
---  --------------------------------------  ----------
1    00-74-1a-ea-01-01 to 00-74-1a-ea-01-40  9EYCX8KHIQF
27   00-74-1a-ea-1b-01 to 00-74-1a-ea-1b-12  9QG9VHFFQ7B
Mod  Online Diag Status
---  ------------------
1    Pass
27   Pass
* this terminal session

switch# show inventory
NAME: "Chassis",  DESCR: "Nexus9000 C9300v Chassis"
PID: N9K-C9300v          ,  VID:     ,  SN: 9IQGKO7W2Z9         \
```

```
NAME: "Slot 1",  DESCR: "Nexus 9000v 64 port Ethernet Module"
PID: N9K-X9364v          ,  VID:     ,  SN: 9EYCX8KHIQF
NAME: "Slot 27",  DESCR: "Supervisor Module"
PID: N9K-vSUP            ,  VID:     ,  SN: 9QG9VHFFQ7B
```

Cisco Nexus 9300v Line Card

Cisco Nexus 9300v platform supports a single virtual line card with 64 virtual interfaces. The line card automatically populates when the platform boots. You can't insert or remove the line card from this chassis. The line card boot process starts after the Supervisor successfully boots and reaches the "active" state. Like its hardware counterpart, the line card boot-up starts with the “present” state and becomes fully functional when it reaches the “ok” state.

vNIC Mapping

On an actual Cisco Nexus 9300 hardware platform, you can "plug in" fibers to the front panel ports on a line card. On a virtual platform, like the Nexus 9300v, you must export the required number of virtual network interface cards/interfaces (vNICs) from the hypervisor into the Nexus 9300v platform.

The Nexus 9300v platform uses a sequential vNIC mapping. It maps the first vNIC passed in by the hypervisor into the Nexus 9300v management port. Subsequent vNICs are mapped sequentially into the line card interfaces. For example, if you export two vNICs onto the Nexus 9300v, the first vNIC is mapped to the NX-OS “mgmt” interface. The second vNIC is mapped to the “Ethernet1/1” interface.

vNIC Mapping Informational Show Commands

Show Platform vNIC Commands

On the Cisco Nexus 9300v platform, CLI commands are available to show the current vNIC mapping scheme, the number of vNICs mapped, and the mapping of MAC addresses to vNICs. Using these commands, you can ensure that the correct number of vNICs were passed to their virtual machine, and you can see which interfaces have been mapped.

Example outputs of the show vNIC platform commands:

show platform vnic mapped

```
v-switch# show platform vnic mapped
    NXOS Interface    VNIC MAC-Address    Internal VNIC
    --------------    ----------------    -------------
    Ethernet1/1       00c0.c000.0101      phyEth1-1
    Ethernet1/2       00c0.c000.0102      phyEth1-2
    Ethernet1/3       00c0.c000.0103      phyEth1-3
    Ethernet1/4       00c0.c000.0104      phyEth1-4
    Ethernet1/5       00c0.c000.0105      phyEth1-5
    Ethernet1/6       00c0.c000.0106      phyEth1-6
    Ethernet1/7       00c0.c000.0107      phyEth1-7
    Ethernet1/8       00c0.c000.0108      phyEth1-8
    Ethernet1/9       00c0.c000.0109      phyEth1-9
    Ethernet1/10      00c0.c000.010a      phyEth1-10
    Ethernet1/11      00c0.c000.010b      phyEth1-11
    Ethernet1/12      00c0.c000.010c      phyEth1-12
    Ethernet1/13      00c0.c000.010d      phyEth1-13
    Ethernet1/14      00c0.c000.010e      phyEth1-14
    Ethernet1/15      00c0.c000.010f      phyEth1-15
    Ethernet1/16      00c0.c000.0110      phyEth1-16
```

show platform vnic info

```
v-switch# show platform vnic info
    VNIC Scheme: Sequential
        mgmt0 interface: eth1  (00c0.c000.aabb)
        Module       # VNICs Mapped
        ------       --------------
        16           16
        ------       --------------
        VNICs passed: 16
        VNICs mapped: 16
        VNICs unmapped: 0
```

Cisco Nexus 9500v Platform

The Cisco Nexus 9500v simulates a single-supervisor platform 16 slot modular chassis that supports dynamic line card insertion and removal. This virtual chassis closely aligns with the standalone Cisco Nexus 9500 hardware platform. This version of Nexus 9500v currently doesn't simulate the system controller or fabric card typically found on the modular hardware chassis. This platform supports four different form factors of the generic line cards. These line cards share the same Linux kernel and differ only in the supported number of interfaces. The following tables show the specifications for this virtual platform.

Form-Factor

Component/Parameter	Specification
Usage	Simulation
Binary	Same as NX-OS Hardware
Management Interface	1
Line Cards	Up to 16
Line Card Interfaces	Up to 400 interfaces in the KVM/QEMU environment

Resource Requirements

Resource	Specification
Minimum RAM	8.0G (basic bootup with one line card; 1.2G for each additional line card)
Recommended RAM	12.0G (depends on the number of features)
Minimum vCPUs	4 (if you configure 16 line cards, we recommend 6 vCPUs)
Minimum vNICs	1
Maximum vNICs	400 interfaces in the KVM/QEMU environment

Deployment Environment

- KVM/QEMU 3.0.0 or higher
- ESXI 6.5 or higher
- Vagrant 2.2.6 or higher

To deploy a Cisco Nexus 9500v platform, fetch the appropriate virtual artifacts from Cisco CCO. The following table documents the supported virtual artifacts. Once you deploy the virtual machine, it reports itself as a Nexus 9500v.

Note The Cisco Nexus 9500v platform supports only the 64-bit image of the Cisco NX-OS Release 10.1(1).

The table displays the virtual artifact(s):

Hypervisor	Virtual Artifact	Description
ESXI 6.5 or higher	nexus9500v64.10.1.1.ova	Contains virtual disk, machine definition, and NXOS image The 64-bit .ova file boots the N9500v platform, which in turn boots up the 64-bit image of Cisco NX-OS Release 10.1(1) Software. **Note** The Supervisor is 64-bit, and the line card is 32-bit.
KVM/QEMU 3.0.0 or higher	nexus9500v64.10.1.1.qcow2	Contains virtual disk and NXOS image on bootflash.

After the initial virtual machine deployment, you can upgrade the Cisco NX-OS image on the platform using the typical NX-OS workflow (example: **install all** <>).

Note You can't transform a Cisco Nexus 9000v from a previous release into a Nexus 9500v platform. You can change it by applying the Nexus 9500v virtual artifact.

Cisco Nexus 9500v Platform Components

The Cisco Nexus 9500v platform, like its reference hardware counterpart, consists of three key components: chassis, supervisor, and line cards. The following table presents the product identifications (PIDs) and the SNMP sysOID used associated with the platform

Component	Description	PID	sysOID
Chassis	Nexus9000 C9500v Chassis	N9K-C9500v	EntPhysicalVendorType = cevChassisN9KC9500v
Supervisor	Supervisor Module	N9K-vSUP	
Line Card	Nexus 9000v 64-port Ethernet Module	N9K-X9564v	

Cisco Nexus 9500v Chassis

The following references sample chassis-related information outputs from relevant **show** commands, for a Nexus 9500v platform with a single line card.

```
switch# show version
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
Documents: http://www.cisco.com/en/US/products/ps9372/tsd_products_support_serie
s_home.html
Copyright (c) 2002-2020, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained herein are owned by
other third parties and are used and distributed under license.
Some parts of this software are covered under the GNU Public
License. A copy of the license is available at
http://www.gnu.org/licenses/gpl.html.

Nexus 9000v is a demo version of the Nexus Operating System

Software
  BIOS: version
  NXOS: version 10.1(1) [build 10.1(0.287)]
  BIOS compile time:
  NXOS image file is: bootflash:///nxos64.10.1.0.287.bin
  NXOS compile time:  12/19/2020 2:00:00 [12/19/2020 11:43:33]

Hardware
  cisco Nexus9000 C9500v Chassis ("Supervisor Module")
  Intel(R) Xeon(R) CPU E5-2658 v4 @ 2.30GHz with 7936160 kB of memory.
  Processor Board ID 9C2P3YNTGNO
  Device name: switch
  bootflash:    4287040 kB

Kernel uptime is 0 day(s), 1 hour(s), 42 minute(s), 18 second(s)

Last reset
  Reason: Unknown
  System version:
  Service:

plugin
  Core Plugin, Ethernet Plugin

Active Package(s):

switch# show module
Mod Ports             Module-Type                       Model           Status
--- ----- ------------------------------------ ---------------------- ---------
1    64   Nexus 9000v 64 port Ethernet Module   N9K-X9564v            ok
27   0    Virtual Supervisor Module             N9K-vSUP              active *
```

```
Mod  Sw                     Hw     Slot
---  ---------------------- ------ ----
1    10.1(0.287)            0.0    LC1
27   10.1(0.287)            0.0    SUP1


Mod  MAC-Address(es)                         Serial-Num
---  --------------------------------------  ----------
1    00-67-9d-38-01-01 to 00-67-9d-38-01-40  9ZCLA64300V
27   00-67-9d-38-1b-01 to 00-67-9d-38-1b-12  9C2P3YNTGNO

Mod  Online Diag Status
---  ------------------
1    Pass
27   Pass

* this terminal session
switch# sh in
inactive-if-config    incompatibility-all   interface
incompatibility       install               inventory

switch# show inventory
NAME: "Chassis",  DESCR: "Nexus9000 C9500v Chassis"
PID: N9K-C9500v          ,  VID:     ,  SN: 91NFZXOHUP3

NAME: "Slot 1",  DESCR: "Nexus 9000v 64 port Ethernet Module"
PID: N9K-X9564v          ,  VID:     ,  SN: 9ZCLA64300V

NAME: "Slot 27",  DESCR: "Supervisor Module"
PID: N9K-vSUP            ,  VID:     ,  SN: 9C2P3YNTGNO
```

Cisco Nexus 9500v Line Cards

The Cisco Nexus 9500v platform can support up to 16 virtual line cards. The platform supports five different forms of line cards. The differences between these virtual line cards are the number of NX-OS interfaces they support. By default, the Nexus 9500v platform boots with a single line card.

You can insert or remove virtual line cards using a CLI command. When using the sequential Sequential vNIC Mapping Scheme, insert the line cards sequentially from module 1. The removal operation must be in the opposite order. However, when using MAC-Encoded vNIC Mapping Scheme, you can insert line cards in any order. This mode supports sparse population of the line card.

The line card boot process starts after the Supervisor successfully boots and reaches the "active" state. Like their hardware counterparts, line card boot up starts with the “present” state and becomes fully functional when it reaches the “ok” state.

To support line insertion, the **platform insert module** *number* **linecard** command is used. A line card can be removed by prefixing the command with **no**. Once the chassis is configured with line cards, the chassis configuration remains persistent across switch reboots.

```
switch# platform insert ?
  module  Insert a specific module

switch# platform insert module?
  <1-30>  Please enter the module number

switch# platform insert module 2?
  <CR>
  linecard  Linecard module

switch# platform insert module 2 linecard ?
  N9K-X9516v  Nexus 9000v 16 port Ethernet Module
```

```
N9K-X9532v  Nexus 9000v 32 port Ethernet Module
N9K-X9536v  Nexus 9000v 36 port Ethernet Module
N9K-X9548v  Nexus 9000v 48 port Ethernet Module
N9K-X9564v  Nexus 9000v 64 port Ethernet Module
```

vNIC Mapping

On actual Cisco Nexus 9500 hardware platforms, you can "plug in" fibers to the front panel ports on a line card. On a virtual platform, like the Nexus 9500v, export the required number of virtual network interface cards/interfaces (vNICs) from the hypervisor into the Nexus 9500v platform.

The Nexus 9500v platform supports two vNIC mapping schemes. Depending on the specified scheme, the system maps the vNIC passed in by the hypervisor into the appropriate Nexus 9500v NX-OS interface. The following sections describe the capabilities of both the vNIC mapping schemes.

Sequential vNIC Mapping Scheme

In this scheme, vNICs acquired from the hypervisor are mapped into the NX-OS interfaces sequentially. For example, if you export two vNICs to the Nexus 9500v, the first vNIC is mapped to the NX-OS “mgmt” interface. The second vNIC is mapped to the “Ethernet1/1” interface. This is the default mapping mode when the virtual switch boots up for the first time.

Other limitations are:

- This mode doesn't support sparse population of line cards or interfaces.
- The line cards must be inserted in sequence from module 1 and removed in the opposite order.

  When a line card is removed, the vNICs remain within the system and are automatically remapped into the appropriate NX-OS interface upon reinsertion of the line card.

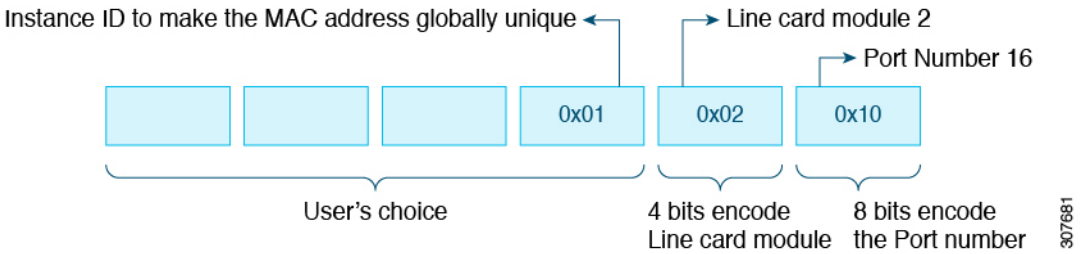
Use the **platform vnic scheme** command to select the vNIC mapping scheme. Once you select a mapping scheme, it remains persistent through a switch reload. By default, the Nexus 9500v switch boots up in the sequential vNIC mapping scheme. Changing this scheme requires a switch reload.

```
 switch# platform vnic ?
  scheme  Virtual Network Interface Card allocation scheme

switch# platform vnic scheme ?
  mac-encoded  MAC address encoded allocation of VNICs to linecard modules
  sequential   Sequential allocation of VNICs to linecard modules
```

MAC-Encoded vNIC Mapping Scheme

In this scheme, vNICs acquired from the hypervisor are mapped to NX-OS interfaces based on the MAC address configured on the vNIC (at the hypervisor level). This mode allows you to map any vNIC to any NX-OS line card interface. To use this mode, add the line card module and port number into the last 2 bytes of the vNIC MAC address. This MAC address configuration must be performed at the hypervisor level before powering up the Nexus 9500v virtual switch. The following diagram presents the required vNIC MAC address format:



Other features:

- This mode supports sparse population of line cards and interfaces.
- While the Nexus 9500v is in this mode, you can insert and remove the line cards in any order.
- When a line card is removed, the vNICs remain within the system and are automatically remapped into the appropriate NX-OS interface upon reinsertion of the line card.

Use the **platform vnic scheme** command to select the vNIC mapping scheme. Once you select a mapping scheme, it remains persistent through the switch reload. By default, the Nexus 9500v switch boots up in the sequential vNIC mapping scheme. Changing this scheme requires a switch reload.

```
 switch# platform vnic ?
  scheme  Virtual Network Interface Card allocation scheme

switch# platform vnic scheme ?
  mac-encoded  MAC address encoded allocation of VNICs to linecard modules
  sequential   Sequential allocation of VNICs to linecard modules
```

Note This scheme allows line card modules to be inserted and removed in any order. However, once the line cards have been inserted, the mapping scheme must not be changed to sequential unless absolutely necessary. If the mapping scheme is changed to "sequential", you must remove all line cards in non-sequential order and insert them back starting with module 1. If you insert line cards in non-sequential order, change the scheme to sequential, and reboot the switch, none of the line cards will come online. The switch, booted in the sequential scheme, expects any existing line cards to be present in serial order, starting with module 1. An error message similar to the following displays the mismatch in the vNIC scheme and the line cards inserted:

```
2020 Jul 15 14:44:03 N9Kv_3 %$ VDC-1 %$ %PLATFORM-2-MOD_INSERTION_FAILED:
Failed to insert module 6 (Nexus 9000v 64 port Ethernet Module - VNIC allocation scheme
is set to sequential, modules must be inserted in sequence)
```

You can validate the scheme by entering the **show platform vnic info** command. To recover from the above state, change the vNIC scheme back to MAC-encoded by entering the **platform vnic scheme mac-encoded** command and reboot the switch. If you require the vNIC scheme to be sequential, remove all line cards first before changing the scheme to sequential.

vNIC Mapping Informational Show Commands

Show Platform vNIC Commands

On the Cisco Nexus Nexus 9500v platform, CLI commands are available to show the current vNIC mapping scheme, the number of vNICs mapped, and the mapping of MAC addresses to vNICs. Using these commands, you can ensure that the correct number of vNICs were passed to their virtual machine, and you can see which interfaces have been mapped.

Example outputs of the show vNIC platform commands:

show platform vnic mapped

```
v-switch# show platform vnic mapped
    NXOS Interface    VNIC MAC-Address    Internal VNIC
    --------------    ----------------    -------------
    Ethernet1/1       00c0.c000.0101      phyEth1-1
    Ethernet1/2       00c0.c000.0102      phyEth1-2
    Ethernet1/3       00c0.c000.0103      phyEth1-3
    Ethernet1/4       00c0.c000.0104      phyEth1-4
    Ethernet1/5       00c0.c000.0105      phyEth1-5
    Ethernet1/6       00c0.c000.0106      phyEth1-6
    Ethernet1/7       00c0.c000.0107      phyEth1-7
    Ethernet1/8       00c0.c000.0108      phyEth1-8
    Ethernet1/9       00c0.c000.0109      phyEth1-9
    Ethernet1/10      00c0.c000.010a      phyEth1-10
    Ethernet1/11      00c0.c000.010b      phyEth1-11
    Ethernet1/12      00c0.c000.010c      phyEth1-12
    Ethernet1/13      00c0.c000.010d      phyEth1-13
    Ethernet1/14      00c0.c000.010e      phyEth1-14
    Ethernet1/15      00c0.c000.010f      phyEth1-15
    Ethernet1/16      00c0.c000.0110      phyEth1-16
```

show platform vnic info

```
v-switch# show platform vnic info
    VNIC Scheme: Mac-Encoded
    mgmt0 interface: eth1  (00c0.c000.aabb)
    Module     # VNICs Mapped
    ------     --------------
    1          16
    ------     --------------
    VNICs passed: 32
    VNICs mapped: 16
    VNICs unmapped: 16
```

Nexus 9000v Throughput

This section describes approximate throughput values for the Nexus 9000v virtual platform and the resource requirements to achieve the stated values.

2vCPU/6GB

The following table identifies the approximate throughput values for the Nexus 9000v with two virtual CPUs and 6 GB of RAM.

Feature(s)	Throughput
L2 switching, unicast forwarding	~500 Mbps
L3 routing, unicast forwarding	~30 Mbps

4vCPU/16GB

The following table identifies the approximate throughput values for the Nexus 9000v with four virtual CPUs and 16 GB of RAM.

Feature(s)	Throughput
L2 switching, unicast forwarding	~700 Mbps
L3 routing, unicast forwarding	~60 Mbps

Nexus 9000v Feature Support

The Cisco Nexus 9000v platform family simulates a broad set of Nexus features. The forwarding plane of these features is implemented on a Cisco proprietary software data plane. Therefore, there can be some behavior differences. For example, the amount of system throughput is different between the virtual simulation platform and its hardware counterpart.

The following tables list the Cisco NX-OS features that have been tested on the Nexus 9000v platforms. You can configure and simulate untested NX-OS platform-independent features on the Nexus 9000v platforms. However, consider these features as unsupported. As more features are tested on the platform, the following table will be updated.

It's important to note that some of the chassis form-factor dependent feature commands can be available only on the corresponding Nexus 9000v platform. For example, NAT commands will be enabled only on the N9300 hardware platform and not on the N9500 hardware platform. It is also important to note that availability of a command does not imply that the feature is supported on the data plane. Please refer to the following feature tables for the supported features.

Layer 2 Features

The following table lists layer 2 feature support for the Nexus 9300v and Nexus 9500v platforms.

Feature	Nexus 9300v Support	Nexus 9500v Support
802.1AB LLDP	Yes	Yes
802.1Q VLANs/Trunk	Yes	Yes
802.1s RST	Yes	Yes
802.3ad LACP	Yes	Yes
L2 Multicast	Yes (as broadcast)	Yes (as broadcast)
MLAG	Yes	Yes
Port Channel	Yes	Yes
VLANs	Yes	Yes

Layer 3 Features

The following table lists layer 3 feature support for the Nexus 9300v and Nexus 9500v platforms.

Feature	Nexus 9300v Support	Nexus 9500v Support
OSPF	Yes	Yes
OSPFv3	Yes	Yes
BGP	Yes	Yes
MP-BGP	Yes	Yes
IS-IS	Yes (as broadcast)	Yes (as broadcast
RIPv2	Yes	Yes
Equal Cost Multipath Routing (ECMP)	Yes	Yes
PIM-SM	Yes	Yes
HSRP	Yes	Yes
VRRP	Yes	Yes
MPLS	Yes	Yes
EIFRP	Yes	Yes
CDP	Yes	Yes
L3 SVI	Yes	Yes
Sub Interfaces	Yes	Yes

VXLAN and Segment Routing Features

The following table lists VXLAN and segment routing feature support for the Nexus 9300v and Nexus 9500v platforms.

Feature	Nexus 9300v Support	Nexus 9500v Support
VXLAN flood and Learn BUM Replication (PIM/ASM, IR)	(Yes, Yes)	(Yes, Yes)
VXLAN EVPN BUM Replication (PIM/ASM, BIDIR, IR)	(Yes, No, Yes)	(Yes, No, Yes)
VXLAN EVPN Routing	Yes	Yes
VXLAN EVPN Bridging	Yes	Yes
VXLAN EVPN Anycast GW	Yes (as broadcast)	Yes (as broadcast)

Feature	Nexus 9300v Support	Nexus 9500v Support
VXLAN Tunnel Endpoint	Yes	Yes
VXLAN ARP Suppression	Yes	Yes
VXLAN EVPN Multi-Site BGW	Yes (with non-vPC on border-leafs)	Yes (with non-vPC on border-leafs)
VXLAN EVPN TRM	No	No
VXLAN EVPN Downstream VNI	Yes	Yes
VXLAN IPv6 Underlay	Yes	Yes
MPLS Segment Routing (SRv4)	No	No
Downstream VNI	Yes	Yes
vPC with Fabric Peering [1]	Yes	Yes

[1] The vPC Fabric Peering peer-link is established over the transport network (the spine layer of the fabric). DSCP is not supported on N9000v/N9300v/N9500v; hence, overloading the spine with traffic burst may result in disruptions on the vPC state of the leaf switches.

Programmability Features

The following table lists programmability feature support for the Nexus 9300v and Nexus 9500v platforms.

Feature	Nexus 9300v Support	Nexus 9500v Support
Bash shell access and scripting	Yes	Yes
RPM support	Yes	Yes
Programmatic access to system state (Python)	Yes	Yes
Guest Shell within OS	Yes	Yes
Docker within OS	Yes	Yes
NXAPI	Yes	Yes
DME	Yes	Yes
RESTCONF	Yes	Yes
NETCONF	Yes	Yes
YANG Models	Yes	Yes

Feature	Nexus 9300v Support	Nexus 9500v Support
Telemetry	Yes	Yes
GNMI	Yes	Yes
NxSDK	Yes	Yes

Guestshell Support

The Cisco Nexus 9000v supports Nexus Guestshell. However, this feature isn't enabled by default. You can use Guestshell functionality by following proper Nexus Guestshell documentation to enable it.

Note The Cisco Nexus 9000v virtual artifacts currently have enough bootflash size to fit two binary images. However, Guestshell requires more bootflash disk size once enabled. There may not be enough space in bootflash to boot two binary images respectively in released virtual artifacts. Plan to clear enough disk space if you need to enable Guestshell.

Nexus 9000v Platform MIB Support

The Nexus 9000v platforms support the Simple Network Management Protocol (SNMP) along with many of the Cisco NX-OS SNMP MIBs. Note that some of the managed objects may not be relevant to the simulation platform and may not be supported.

The following list shows supported platform-related MIBs:

- CISCO entity Asset MIB
- ceEXTEntityLEDTable
- ciscoEntityExtMIB
- ciscoRFMIB
- ciscoTSMIB
- ciscoEntityFRUControlMIB
- ciscoSyslogMIB

Nexus 9000v Platform Guidelines and Limitations

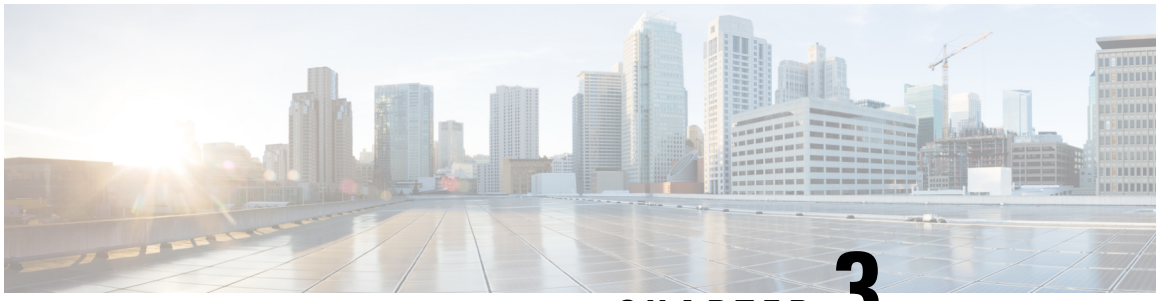
The following guidelines and limitations apply to the Nexus 9000v platforms:

- Hardware consistency checker isn't supported
- Statistics for Routed packet and Multicast packets are not supported
- Nondisruptive ISSU isn't supported

- Link carrier status of NX-OS interface depends on the capability of the underlying hypervisor.

Nested VM use cases are supported. However, take care about deploying Nexus 9000v VMs in different environments, based on requirements. In a nested VM environment, performances in terms of bootup time, admin operation, and feature application, are degraded depending on the available vCPU and memory resources.

- If you want to simulate large number of nodes, or more than 10 Nexus 9000v nodes, use a Bare metal environment. VIRL2 is currently not supported.
- Bootup time takes longer when simulating large number of nodes.
- Sparse mode is currently not supported in the VIRL environment.
- Beginning with Cisco NX-OS Release 9.3(5), interface statistics are supported. The show interface counters is supported for analyzing packet-flow on network topology. You can use CLI, MDT (Model Driven Telemetry) including gNMI, or any SNMP query to get traffic flow counters on a N9Kv device.
- Beginning with Cisco NX-OS Release 10.1(1), when multiple VMs are needed to boot on an ESXi at the same time, it is recommended to boot a cluster of 2 to 3 VMs at one time, then, after providing some time interval, the next cluster of 2 to 3 VMs should be booted. Otherwise, the VMs may become unresponsive.



CHAPTER 3

Nexus 9000v Deployment

This chapter contains the following sections:

Nexus 9000v Hypervisor Support

Both platforms in the Nexus 9000v platform family are designed to run as virtual machines on the supported hypervisors. Limitations of the underlying hypervisor may restrict some of the platform capabilities. This section provides the level of support and associated limitations.

KVM/QEMU Attributes

The following table provides the supported attributes for the KVM/QEMU hypervisor.

Attribute	Support
QEMU Version	3.0.0 or higher (4.1 recommended)
BIOS	OVMF version 16, https://www.kraxel.org/repos/jenkins/edk2/ This URL accesses an index page containing the latest OVMF RPM package files. An example of the file is: `edk2.git-ovmf-x64-0-20200515.1388.g9099dcbd61.noarch.rpm` Download and extract the package file with an RPM utility. The package contains a number of files. Locate `OVMF-pure-efi.fd` and use it as the BIOS file. You can rename it `bios.bin` if you want.
Linux Version	Ubuntu 14.4 Fedora 29

Attribute	Support
Platform	Nexus 9300v deployment Nexus 9500v deployment
Line Cards	Nexus 9300v: 1 line card Nexus 9500v: up to 16 line cards
Line Card Interfaces	Nexus 9300v: up to 64 line card interfaces Nexus 9500v: up to 400 line cards interfaces

ESXI Attributes

The following table provides the supported attributes for the ESXI hypervisor.

Attribute	Support
Version	6.5
Platform	Nexus 9300v deployment Nexus 9500v deployment
Line Card	Nexus 9300v: 1 line card Nexus 9500v: up to 16 line cards
Line Card Interface	Nexus 9300v: up to 9 line card interfaces Nexus 9500v: up to 9 line cards interfaces

Vagrant Attributes

The following table provides the supported attributes for the Vagrant hypervisor.

Attribute	Support
Version	6.0
Platform	Nexus 9300v deployment
Line Card	Nexus 9300v: 1 line card
Line Card Interface	Nexus 9300v: up to 4 line card interfaces

Nexus 9000v Deployment Workflow for KVM/QEMU

This section describes the steps required to deploy Nexus 9000v platforms on KVM/QEMU hypervisors. Three types of deployment are available:

- Common Deployment
- Platform-Specific Deployment
- Interconnecting Deployment

Common Deployment Workflow

You can deploy the Cisco Nexus 9000v platforms through the KVM/QEMU hypervisor. The following table lists the supported parameters for the Cisco Nexus 9000v deployment on KVM/QEMU.

Parameter	Example	Description
/path_to/qemu	/usr/bin/qemu-system-x86_64	Path to QEMU executable. (download the QEMU software from http://wiki.qemu.org/download for different versions.)
-nographic	-nographic	Recommended, as the Cisco Nexus 9000v platforms don't support VGA.
-bios file	-bios bios.bin	Required. Cisco Nexus 9000v platforms use EFI boot and require a compatible BIOS image to operate. We recommend using the latest OVMF BIOS file with the SATA controller for better performance in terms of disk operation. QEMU 2.6 is recommended with the SATA controller. For more information, see http://www.linux-kvm.org/page/OVMF.
-smp	-smp 4	Cisco Nexus 9000v platforms support one to four vCPUs (we recommend two to four).
-m memory	-m 8096	Memory in MB.
-serial telnet:host:port,server,nowait	-serial telnet:localhost:8888,server,nowait or -serial telnet:server_ip:8888,server,nowait	Requires at least one.

Parameter	Example	Description
-net ... -net ... or -netdev ... -device ...	-net socket,vlan=x,name=nl_s0,listen=localhost:12000 -net nic, vlan=x, model=e1000, macaddr=aaaa.bbbb.cccc -netdev socket,listen=localhost:12000,id=eth_s_f -device e1000,addr=s.f,netdev=eth_s_f, mac=aaaa.bbbb.cccc, multifunction=on,romfile= or -netdev tap,ifname=tap_s_f,script=no, downscript=no,id=eth_s_f -device e1000,addr=s.f,netdev=eth_s_f, mac=aaaa.bbbb.ccc, multifunction=on,romfile=	The net/net or netdev/device pairs are for networking a virtual network interface card (vNIC). The _s_f represents the PCI slot number and function number. QEMU 2.0 or above can plug in at least 20 PCI slots and four functions, which accommodates about 80 vNICs in total. The slot range is 3-19, and the function number range is 0-3. The mac= option passes the MAC address of each vNIC MAC address to the VM interfaces. The first -netdev is automatically mapped to the mgmt0 interface on the VM. The second -netdev is mapped to the e1/1 interface, and so on, up to the 65th on e1/64. Check that the MAC addresses are unique for each network device.
-enable-kvm	-enable-kvm	This flag is required for the Cisco Nexus 9000v.
-drive ... -device ... (for the SATA controller)	-device ahci, id=ahci0,bus=pci.0 -drive file=img.qcow2, if=none,id=drive-sata-disk0, format=qcow2 -device ide-drive, bus=ahci0.0, drive=drive-sata-disk0, id=drive-sata-disk0	Format to use for the SATA controller. We recommend using the SATA controller with QEMU 2.6.0 because this controller offers better performance than the IDE controller. However, if there's an early QEMU version that doesn't support the SATA controller, you can use the IDE controller.
-drive ... media=cdrom	-drive file=cfg.iso,media=cdrom	CD-ROM disk containing a switch configuration file applied after the Cisco Nexus 9000v platform comes up. 1. Name a text file (nxos_config.txt). 2. Use Linux commands to make cfg.iso, mkisofs -o cfg.iso -l --iso-level 2 nxos_config.txt.

Platform Specific Workflow

The Cisco Nexus 9500v platform runs in two different modes: sequential and mac-encoded mode. The Nexus 9300v and Nexus 9500v sequential mode deployment steps are the exact same on KVM/QEMU hypervisor. The maximum interfaces for both platforms in this case are 401 interfaces (1 management or 400 data ports).

The Nexus 9500v emulates interface traffic on multiple line cards. The virtual switch uses a single VM on KVM/QEMU for up to a total number of 400 interfaces. Based on the Nexus 9500v mac-encoded schema, specify each network adapter MAC address with the encoded slot and port number when the KVM/QEMU CLI command is invoked.

Interconnecting Platforms

Interconnecting between Nexus 9000v platform instances or any other virtual platform is based on Linux bridges and taps. Prior to invoke any CLI commands, make sure that the following is available (example configuration provided).

In the configuration example below, you can create bridges and tap interfaces along with two N9Kv swicthes with one management and one data interface each. Management interfaces “interface mgmt0” are connected to management network with the bridge “mgmt_bridge. The data port interfaces “interface Eth1/1” from both switches are connected back to back by using the bridge “interconnect_br”.

Note The minimum QEMU version required is 3.0.0 from Cisco NX-OS Release 9.3(3) and higher.

- Bridges (similar to vSwitch in ESXi hypervisor) are created and set to the "up" state.

  Linux commands to create bridges and bring them up:

  sudo brctl addbr *mgmt_bridge*

  sudo brctl addbr *interconnect_br*

  sudo ifconfig *mgmt_bridge* **up**

  sudo ifconfig *interconnect_br* **up**

- Tap interfaces are created based on number of interfaces the Nexus 9000v is using.

  Linux command to create tap interfaces:

  sudo openvpn --mktun –dev *tap_sw1_mgmt*

  sudo openvpn --mktun –dev *tap_sw2_mgmt*

  sudo openvpn --mktun –dev *tap_sw1_eth1_1*

  sudo openvpn --mktun –dev *tap_sw2_eth1_1*

- Bridges are connected to tap interfaces.

  Linux commands to connect bridges to tap interfaces:

  sudo brctl addif *mgmt_bridge tap_sw1_mgmt*

  sudo brctl addif *mgmt_bridge tap_sw2_mgmt*

  sudo brctl addif *interconnect_br tap_sw1_eth1_1*

sudo brctl addif *interconnect_br tap_sw2_eth1_1*

- All tap interfaces must be in the "up" state.

  Linux commands for bringing tap interfaces up:

  sudo ifconfig *tap_sw1_mgmt* **up**

  sudo ifconfig *tap_sw2_mgmt* **up**

  sudo ifconfig *tap_sw1_eth1_1* **up**

  sudo ifconfig *tap_sw2_eth1_1* **up**

- Verify that all tap interfaces are connected to bridges

  Linux commands to confirm that tap interfaces are connected to bridges:

  brctl show

```
bridge name        bridge id            STP enabled        interfaces
interconnect_br    8000.1ade2e11ec42    no                 tap_sw1_eth1_1
                                                           tap_sw2_eth1_1

mgmt_bridge        8000.0a52a9089354    no                 tap_sw1_mgmt
                                                           tap_sw2_mgmt
```

To bring up two Nexus 9000v platforms, connecting one interface each back to back, you can use the following commands as examples. The connection can be a socket-based or bridge-based connection. In this example, bridges are used to connect instances of management interface and one data port. Similarly, more Nexus 9000v data ports can be connected in the same way by adding more net device in the command line options. In this example, two interfaces each (interface mgmt0 and interface eth1/1) on both the Nexus 9000v instances are mapped.

For a Nexus 9000v first instance:

```
sudo qemu-system-x86_64 -smp 2  -m 8196 -enable-kvm -bios bios.bin
-device i82801b11-bridge,id=dmi-pci-bridge
-device pci-bridge,id=bridge-1,chassis_nr=1,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-2,chassis_nr=2,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-3,chassis_nr=3,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-4,chassis_nr=4,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-5,chassis_nr=5,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-6,chassis_nr=6,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-7,chassis_nr=7,bus=dmi-pci-bridge
-netdev tap,ifname=tap_sw1_mgmt,script=no,downscript=no,id=eth1_1_0
-device e1000,bus=bridge-1,addr=1.0,netdev=eth1_1_0,mac=00:b0:b0:01:aa:bb,multifunction=on,
romfile=
-netdev tap,ifname=tap_sw1_eth1_1,script=no,downscript=no,id=eth1_1_1
-device e1000,bus=bridge-1,addr=1.1,netdev=eth1_1_1,mac=00:b0:b0:01:01:01,multifunction=on,
romfile=
-device ahci,id=ahci0 -drive file=test1.qcow2,if=none,id=drive-sata-disk0,id=drive-sata-disk0,
format=qcow2
-device ide-drive,bus=ahci0.0,drive=drive-sata-disk0,id=drive-sata-disk0
-serial telnet:localhost:9000,server,nowait -M q35 -daemonize
```

For a Nexus 9000v second instance:

```
sudo qemu-system-x86_64 -smp 2  -m 8196 -enable-kvm -bios bios.bin
-device i82801b11-bridge,id=dmi-pci-bridge
-device pci-bridge,id=bridge-1,chassis_nr=1,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-2,chassis_nr=2,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-3,chassis_nr=3,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-4,chassis_nr=4,bus=dmi-pci-bridge
```

```
-device pci-bridge,id=bridge-5,chassis_nr=5,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-6,chassis_nr=6,bus=dmi-pci-bridge
-device pci-bridge,id=bridge-7,chassis_nr=7,bus=dmi-pci-bridge
-netdev tap,ifname=tap_sw2_mgmt,script=no,downscript=no,id=eth1_1_0
-device e1000,bus=bridge-1,addr=1.0,netdev=eth1_1_0,mac=00:b0:b0:02:aa:bb,multifunction=on,
romfile=
-netdev tap,ifname=tap_sw2_eth1_1,script=no,downscript=no,id=eth1_1_1
-device e1000,bus=bridge-1,addr=1.1,netdev=eth1_1_1,mac=00:b0:b0:02:01:01,multifunction=on,
romfile=
-device ahci,id=ahci0 -drive file=test2.qcow2,if=none,id=drive-sata-disk0,id=drive-sata-disk0,
format=qcow2
-device ide-drive,bus=ahci0.0,drive=drive-sata-disk0,id=drive-sata-disk0
-serial telnet:localhost:9100,server,nowait -M q35 -daemonize
```

The qemu-system-x86_64 or above KVM command is equivalent depending on how Linux is deployed. After successful invocation, you should be able to access both instances of the serial console via “telnet localhost 9000” or “telnet localhost 9100 respectively.

To pass traffic for LLDP and LACP multicast-specific packets through a Linux bridge, set the following values on all bridges connecting to each instance:

- Set LLDP and LACP communication between the VMs:

  echo 0x4004 > /sys/class/net/br_test/bridge/group_fwd_mask

- Allow Multicast packet flow through the Linux bridge:

  echo 0 > /sys/devices/virtual/net/br_test/bridge/multicast_snooping

Nexus 9000v Deployment Workflow for ESXi

This section describes the steps required to deploy Nexus 9000v platforms on ESXi hypervisors. Three types of deployment are available:

- Common Deployment
- Platform-Specific Deployment
- Interconnecting Deployment

Common Deployment Workflow

Before you begin

The following procedure provisions a Cisco Nexus 9300v or 9500v platform in the ESXi hypervisor using the distributed OVA.

Ensure the following:

- You have installed the ESXi 6.5 hypervisor
- You have a valid license for ESXi 6.5 to run on both server and vCenter.
- The distributed OVA file has been downloaded to the desktop.

Step 1 Log into the ESXi vCenter.

Step 2 Right-click version 6.5 and select **Deploy OVF Template**.

Note Perform the self-guided instructions in the subsequent screens that appear.

Step 3 In the **Need name** screen, choose **Local file** and click **Browse**. Choose the downloaded distribute OVA file from your desktop.

Step 4 In the **need name** screen, choose the data center (or a folder and enter the VM name.

Step 5 In the **need name** screen, select an ESXi server for the Virtual Machine to be deployed into, and click **Finish** after the validation.

Step 6 In the **need name** screen, review the details, and click **Next**.

Step 7 In the **Configuration** screen click **Next**.

Step 8 In the **Select Storage** screen, select the data store, and click **Next**.

Step 9 In the **Select Networks** screen, ensure that the following values are selected:

- Source Network name - mgmt 0
- Destination Network - lab management LAN vSwitch

Don't select other vNIC destinations as the lab management LAN vSwitch. Failure to do so results in management connectivity issues because the Cisco Nexus 9000v data ports will conflict with the physical switches.

Step 10 In the **Ready to Complete** screen, click **Finish**, and wait for the completion of the process.

Step 11 Under the **Virtual Hardware** tab, select **Serial Port 1**. For the serial port type, select the **Use Network** panel, and select the following options:

- Direction - Server
- Port URL - telnet://0.0.0.0:1000, where 1000 is the unique port number in this server.

Note Nexus 9000v only supports E1000 network adapters. When you add any network adapter, verify that the adapter type is E1000.

Step 12 Under the **VM Options** tab, select the **Boot Options** panel, and choose **EFI**.

Step 13 Under the **VM Options** tab, select the **Advance** panel and in the **Edit Configuration** screen, add the following values using the **Add Configuration Params** option:

- Name - efi.serialconsole.enabled
- Value - TRUE

Click **OK** to view the boot up process in both the VGA and the serial console mode.

Note Nexus 9000v platforms require the serial console to be provisioned in order to access the switch prompt (although some of the initial grub boot messages are shown on VGA console). Ensure that the serial console is provisioned on the VM correctly. Successful bootup should show kernel boot up messages after "**Image Signature verification for Nexus9000v is not performed**" is displayed from the VGA or serial console if "efi.serialconsole.enabled=TRUE" is provisioned.

Step 14 Power on the virtual machine.

Platform Specific Workflow

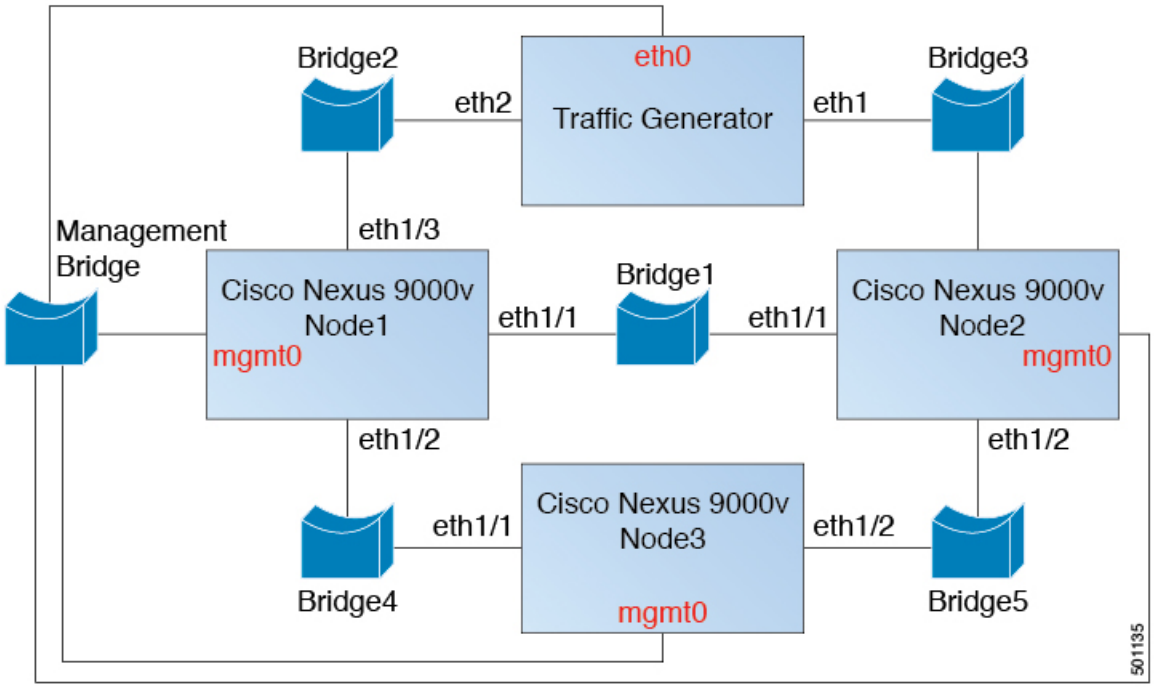
The Cisco Nexus 9500v runs in two different modes: sequential and mac-encoded mode. Nexus 9300v and Nexus 9500v sequential mode deployment steps are the exact same on ESXi hypervisor. The maximum number of interfaces for both platform types is 10 (one management port and nine data ports); this is a hypervisor limitation.

The Nexus 9500v emulates multiple-line-card interface traffic in single VM on ESXi hypervisor even though the total number of interfaces is limited to 10. If you choose to use the Nexus 9500v mac-encoded schema, change each network adapter MAC address to match slots and ports that are being emulated.

Interconnecting Platforms

Networking between Nexus 9300v and Nexus 9500v, or any other virtual platform, is based on vSwitch as the bridge on the ESXi hypervisor. You can have any topology as designed to simulate various customer use cases.

Figure 1: Interconnecting Cisco Nexus 9000v Platforms through EXSi



Nexus 9000v Deployment Workflow for Vagrant

This section describes the steps required to deploy Nexus 9000v platforms on Vagrant hypervisors. Three types of deployment are available:

- Common Deployment
- Platform-Specific Deployment
- Interconnecting Deployment

Common Deployment Workflow

You can't deploy the Cisco Nexus 9300v in the Vagrant/VBox environment. The virtual artifacts .box file is only available on distribution.

Platform Specific Workflow

Deploy the nexus9300v.9.3.3.IDI9.0.XXX.box on a VirtualBox. See the following customization guidelines and caveats for using Vagrant/Vbox:

- The user customization in Vagrant file isn't required.
- There's no need to change named pipe for Windows. Access the serial console using default port 2023, for both Mac or Windows. If needed, use this serial console via **telnet localhost 2023** to monitor the switch boot up process.
- The standard box process is used as any other appliance distribution. You can simply bring up a VM using the base box name.
- The box name can be changed to a different name other than "base" using the **config.vm.box** field from the Vagrant file.
- The bootstrap configuration is possible if you want to apply a different configuration on the switch, other than the existing generic configuration in **.box** from the release image file. In this case, use **vb.customize pre-boot**. For example:

```
vb.customize "pre-boot", [
             "storageattach", :id,
             "--storagectl", "SATA",
             "--port", "1",
             "--device", "0",
             "--type", "dvddrive",
             "--medium", "../common/nxosv_config.iso",
```

- Customize the VM interface MAC address by using the **config.vm.base_mac** field. This modification must be performed prior to entering the **vagrant up** CLI command and after entering the **vagrant init** CLI command. If you want to modify the MAC address after entering the **vagrant up** CLI command, or after the VM is created, use the box commands to modify the VM.

Support for Sync Folder in Vagrant

Starting with Release 10.1(1), Nexus 9300v supports Vagrant sync folder with which a directory/folder on a host machine can be shared with a Nexus 9300v machine. The **vagrant up** command in the Vagrant scripts logs into the virtual box and mounts the directory based on user configuration in the Vagrantfile. By default, the Vagrant scripts use the *vagrant* username, and expect bash to be the login shell. In order to facilitate this feature, the default login shell for pre-configured *vagrant* username has been changed to bash. However, you have the option to change the default shell (for user *vagrant*) to NX-OS CLI with explicit configuration in Nexus or in the Vagrantfile .

By default, Vagrant mounts the current working directory on the host at `directory/vagrant` on the Nexus 9300v. If you do not want the current folder on host to be shared with the Nexus 9300v, you must include the following line in the Vagrantfile.

```
config.vm.synced_folder ".", "/vagrant", disabled: true
```

Sample Vagrantfile - when you want to share the host folder, say, **/home/james/my_shared_folder/** on Nexus 9300v at **/bootflash/home/vagrant**:

```
# -*- mode: ruby -*-
# vi: set ft=ruby :
Vagrant.configure("2") do |config|
  # The most common configuration options are documented and commented below.
  # For a complete reference, please see the online documentation at
  # https://docs.vagrantup.com.

  # Every Vagrant development environment requires a box. You can search for
  # boxes at https://vagrantcloud.com/search.

config.vm.define "n9kv1" do |n9kv1|

        n9kv1.vm.box = "10.1.1"

        n9kv1.ssh.insert_key = false
        n9kv1.vm.boot_timeout = 600

        if Vagrant.has_plugin?("vagrant-vbguest")
          config.vbguest.auto_update = false
        end

        config.vm.synced_folder ".", "/vagrant", disabled: true
        config.vm.synced_folder "/home/james/my_shared_folder"  "/bootflash/home/vagrant/"
        config.vm.box_check_update = false

 end
```

Given below is Nexus 9300v platform-specific deployment example:

```
vagrant box add 10.1.1 nexus9300v.10.1.1.box

$ vagrant init 10.1.1
$ vagrant up

Bringing machine 'n9kv1' up with 'virtualbox' provider...
==> n9kv1: Importing base box '10.1.1'...
==> n9kv1: Matching MAC address for NAT networking...
==> n9kv1: Setting the name of the VM: vagrant_n9kv1_1605848223701_17342
==> n9kv1: Clearing any previously set network interfaces...
==> n9kv1: Preparing network interfaces based on configuration...
    n9kv1: Adapter 1: nat
==> n9kv1: Forwarding ports...
    n9kv1: 22 (guest) => 2222 (host) (adapter 1)
==> n9kv1: Booting VM...
==> n9kv1: Waiting for machine to boot. This may take a few minutes...
    n9kv1: SSH address: 127.0.0.1:2222
    n9kv1: SSH username: vagrant
    n9kv1: SSH auth method: private key
==> n9kv1: Machine booted and ready!
==> n9kv1: Checking for guest additions in VM...
    n9kv1: The guest additions on this VM do not match the installed version of
    n9kv1: VirtualBox! In most cases this is fine, but in rare cases it can
    n9kv1: prevent things such as shared folders from working properly. If you see
    n9kv1: shared folder errors, please make sure the guest additions within the
```

```
    n9kv1: virtual machine match the version of VirtualBox you have installed on
    n9kv1: your host and reload your VM.
    n9kv1:
    n9kv1: Guest Additions Version: 5.2.18 r123745
    n9kv1: VirtualBox Version: 6.1
==> n9kv1: Mounting shared folders...
    n9kv1: /bootflash/home/vagrant => /home/james/my_shared_folder


$ vagrant ssh

-bash-4.4$
```

Changing Default Shell to NX-OS CLI

When you need to login to NX-OS CLI, use one of these options:

- By manually executing the **vsh** command on bash prompt on every login.
- You may make use of a pre-packaged script in Nexus 9300v virtual box and execute it from Vagrantfile as shown below.

```
 config.vm.synced_folder ".", "/vagrant", disabled: true
config.vm.synced_folder "/home/james/my_shared_folder"  "/bootflash/home/vagrant/"

 config.vm.box_check_update = false

    config.vm.provision "shell", inline: "vsh -r /var/tmp/set_vsh_as_default.cmd"
```

- You may login with username *admin* instead of username *vagrant* (Username *vagrant* is used by default when you use the **vagrant ssh** command)

```
ssh -p 2222 admin@127.0.0.1
```

Using Ansible with Nexus 9300v

Vagrant is a generic orchestrator which supports configuration and management of boxes with various *provisioners* such as, Ansible, Shell scripts, Ruby scripts, Puppet, Chef, Docker, Salt etc.

Vagrant file may contain sections for one (or more) provisioners along with its configurations. An example for Ansible, is shown here.

```
n9kv1.vm.provision "ansible" do |ansible|
          ansible.playbook = "n9kv1.yml"
          ansible.compatibility_mode = "2.0"
end
```

These provisioners are automatically triggered every time a virtual box boots up or when triggered manually with the **vagrant provision** command or with the **vagrant provision –provision-wth** command. Provide login credentials in an Ansible host config file for Ansible to log into the virtual box and execute NX-OS CLIs. Since Ansible would expect to see NX-OS CLI after logging in, you can use the pre-configured username *admin* or create a new username manually, and use it in the Ansible host configuration files.

Shutdown VM

Use the following to shutdown the VM:

```
$ vagrant halt -f
==> default: Forcing shutdown of VM...
```

Destroy VM for cleanup

Use the following if you want to completely delete the VM instance:

```
$ vagrant box remove base
Removing box 'base' (v0) with provider 'virtualbox'...
                  $ vagrant destroy
                      default: Are you sure you want to destroy the 'default' VM? [y/N] y
==> default: Destroying VM and associated drives..
```

Interconnecting Platforms

Networking between Nexus 9300v and other virtual platforms, is based on VBox Internal Network. See the following connection diagram:

Figure 2: Interconnecting Cisco Nexus 9000v Platforms through Vagrant VM

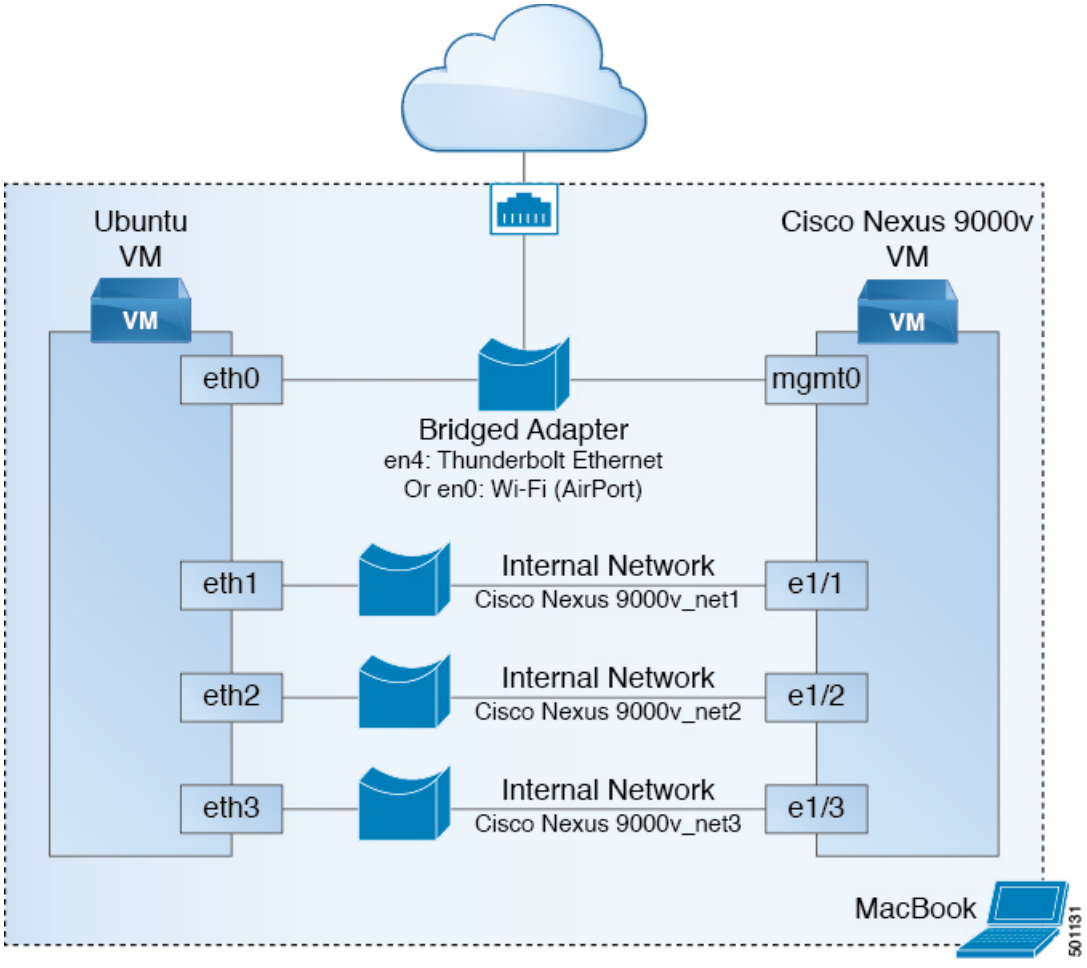


Image Upgrade Workflow

This section describes the typical upgrade steps for the Cisco Nexus 9000v platforms.

Deploying from a New Artifact

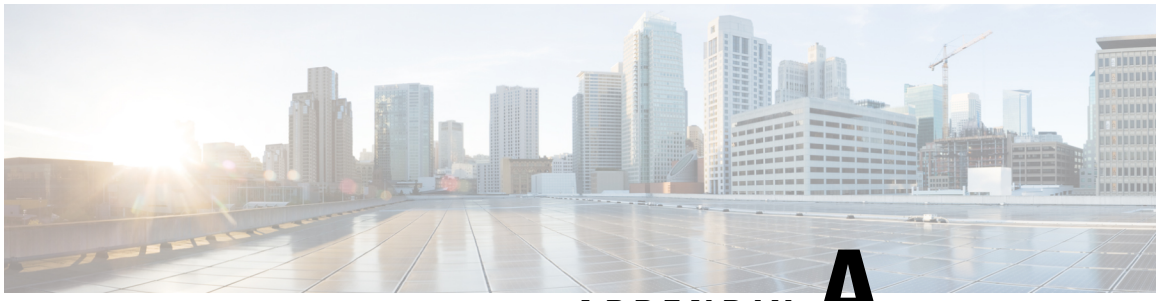
Depending on the environment, use the appropriate virtual artifact and refer to one of the following sections to deploy the VM:

- Nexus 9000v Deployment Workflow for KVM/QEMU, on page 22
- Nexus 9000v Deployment Workflow for ESXi, on page 27
- Nexus 9000v Deployment Workflow for Vagrant, on page 29

Upgrading from a New NX-OS Image

Nexus 9300v upgrades are only allowed from a VM created with virtual artifacts from Cisco Nexus 9000v, Release 9.3(1) and onwards. Before upgrading, ensure there's 400Mb + of new NX-OS binary image on the bootflash. To upgrade, copy the new binary to the bootflash and then upgrade using the standard NX-OS workflow (for example: ‘install all nxos bootflash:///<nxos.bin>’).

Nexus 9500v upgrades aren't supported as this is the first release of the platform.



APPENDIX A

Troubleshooting the Cisco Nexus 9000v

This chapter contains the following sections:

Troubleshooting the Cisco Nexus 9000v Platform

General Troubleshooting/Debugging

The following CLI command provides troubleshooting help for both the Nexus 9300v and Nexus 9500v platforms:

show tech-support nexus9000v

The following is an example output of this command:

```
switch# show tech-support nexus9000v

------------------ Virtual Chassis Manager Debugs ------------------

###############
# /cmn/pss/virt_cmgr.log
###############
[19-12-10 20:42:34.160609]: virt_cmgr_startup_init called
[19-12-10 20:42:34.161351]: virt_cmgr_validate_file returned success
[19-12-10 20:42:34.161390]: Version 1, VNIC_scheme 2
[19-12-10 20:42:34.161404]: VM sup1: Module no 26, upg_version 1, type 1, card_i
ndex 0, image loc None
…
…
…
```

Common Issues for All Hypervisors

Boot when VM drops into "loader >" prompt

Generally, the initial boot is successful. However, the system boot could fail and drop into the "loader >" prompt on the VGA console or serial console, depending on how you provisioned the VM.

Example:

```
                Loader Version 5.9

Loader > dir

bootflash::

  .rpmstore
  nxos.9.3.2.20.bin
  bootflash_sync_list
  .swtam
  eem_snapshots
  virtual-instance
  scripts
  platform-sdk.cmd

loader > boot nxos.9.3.2.20.bin
```

To continue the boot, enter the **boot nxos.9.3.2.20.bin** command at the "loader >" prompt

Prevent VM from dropping into "loader >" prompt

After you set up your Cisco Nexus 9000v (and following the set-up of the POAP interface), configure the boot image in your system to avoid dropping to the "loader >" prompt after reload/shut down.

Example:

```
nx-osv9000-2# config t
Enter configuration commands, one per line. End with CNTL/Z.
nx-osv9000-2(config)# boot nxos bootflash:nxos.9.3.2.20.bin
Performing image verification and compatibility check, please wait....
nx-osv9000-2(config)# copy running-config startup-config
```

Bootup Warning Message

During bootup, you may get a warning message similar to the following:

```
Checking all filesystems. **Warning** : Free memory available in bootflash is
553288 bytes
need at least 2 GB space for full image installation ,run df -h
```

This message generally indicates that the Nexus 9000v bootflash doesn't have enough memory space for holding another image. To eliminate this warning message, free up bootflash space to allow for the download of another binary image.

Nexus 9000v Mac-Encoded Mode Network Mapping Check

This check is only relevant if you explicitly enter the **platform vnic scheme mac-encoded** command on Nexus 9500v platform. This command enables the vNIC mac-encoded scheme. If any data traffic passes, or vNIC-mapped interfaces show the “Link not connected” state, refer to the Nexus 9000v informational show commands to verify correct vNIC mapping.

ESXi Hypervisor Issues

Nexus 9000v boot not seen after powering on the VM

The likely cause of this issue is that the EFI boot isn't set in the VM configuration. To resolve this issue, refer to the ESXi deployment guide to change "BIOS" to "EFI" in **Edit virtual machine settings** > **VM Options** > **Boot Options** after deployment using the distributed OVA virtual artifacts.

Bootup logs not seen after VGA output

A common problem during ESXi bootup is that the VGA console displays output similar to the following:

```
Sysconf checksum failed. Using default values
console (dumb)

Booting nxos.9.3.2.6.bin...
Booting nxos.9.3.2.bin
Trying diskboot
 Filesystem type is ext2fs, partition type 0x83
Image valid


Image Signature verification for Nexus9000v is not performed.

Boot Time: 12/5/2019 10:38:41
```

The issue is that, in the VGA console, there's no following activity in the bootup process. It's often misunderstood as a switch bootup process hang. To see the output of a switch bootup, connect to the provisioned serial console based on steps provided in the ESXi hypervisor deployment guide.

If nothing happens in the serial console, or you see the "telnet: Unable to connect to remote host: Connection refused" error message, it indicates one or more of the following issues:

- The serial console provisioning is incorrect in the VM configuration. Read and follow the instructions for serial console connectivity in the ESXi deployment guide.
- ESXi 6.5 deployment is the only version supported. Make sure that you have a valid license for ESXi vCenter and a valid UCS server license.
- Make sure that the "Security Profile" in the server has "VM serial port connected over network", both for incoming connections and outgoing connections.

No access to "loader>" prompt after powering down the VM

This issue occurs if you power on the VM and it boots up as expected, but the serial console wasn't correctly provisioned. Then the “config t; boot nxos bootflash:nxos.9.3.2.20.bin” configure is performed and saved. Powering up the VM again results in a drop to the VGA console.

The following recommendations help to avoid this issue in the ESXi hypervisor.

EFI BIOS defaults all input/output to the VM console. When a VM drops to the "loader >" prompt, go to the vSphere client or VGA console to access the "loader >" prompt to boot the image in the hard disk. You can change this behavior by adding an extra configuration in the ESXi VM editing mode. Use one of the following methods:

1. In the vSphere client Configuration Parameters window, add one row in the configuration (Edit Settings > VM Options > Advanced > Edit Configuration).
2. Add efi.serialconsole.enabled = "TRUE" to the .vmx file once the VM is created.

The vCenter or UCS server connectivity is lost as soon as the Cisco Nexus 9000v is up

⚠

Caution When connecting a vNIC to a vSwitch or bridge, an incorrect network connection might result in losing the connectivity to your hypervisor server or vCenter on ESXi.

The Cisco Nexus 9000v uses vNICs entered from a graphical representation on ESXi for networking, either externally or internally within a hypervisor server. The first NIC is always used as the Cisco Nexus 9000v management interface.

The first NIC in the Cisco Nexus 9000v VM is the management interface. Connect it directly to your lab LAN physical switch or vSwitch (VM Network). Don't connect any data port vNIC to any physical switch conflicting with your server management connectivity.

Cisco Nexus 9000v data port isn't passing traffic in the ESXi server

To ensure a smooth operation, specific configuration settings on the vSwitch must be enabled:

- Ensure that all instances of the vSwitch connecting to the Cisco Nexus 9000v are in "Promiscuous Mode" = "Accept", and pointing to the UCS server. You can access this option through "Configuration > Properties > Edit" from the vSphere Client.
- Ensure that all instances of vSwitch pass through all VLANs. You can access this option through "Configuration > Properties > Edit" from the vSphere Client.

ESXi 6.5 hypervisor often defaults the network interfaces adapter to the “E1000E” type which isn’t supported in the Nexus 9000v platform. After deployment, make sure that all Network adapter types are “E1000”.

KVM/QEMU Hypervisor Issues

Understanding the KVM/QEMU command line options requires a basic Linux background. In order to deploy the Nexus 9000v in this hypervisor, follow the deployment instruction and pay attention to the following areas:

- Make sure that the user guide recommends bios.bin.
- If the command line supports multiple disk inputs, check that the bootable disk is set to bootindex=1 so that the VM doesn't try to boot from other devices.
- If you're attempting to implement a complicated command line, follow basic KVM/QEMU deployment instruction to bring up a simple switch instance first to verify the user environment.

Multicast on KVM or QEMU Hypervisor

The multicast feature on the Cisco Nexus 9000v is supported as broadcast. To make this feature to work properly, disable IGMP multicast snooping in this environment on all bridge interfaces.

The following example shows how to disable vxlan_br1, vxlan_br2, vxlan_br3, and vxlan_br4 from the linux prompt:

```
echo 0 > /sys/devices/virtual/net/vxlan_br1/bridge/multicast_snooping
echo 0 > /sys/devices/virtual/net/vxlan_br2/bridge/multicast_snooping
echo 0 > /sys/devices/virtual/net/vxlan_br3/bridge/multicast_snooping
echo 0 > /sys/devices/virtual/net/vxlan_br4/bridge/multicast_snooping
```

Follow the Linux bridge mask setup in the KVM/QEMU deployment guide, for passing L2 packets such as LLDP, LACP, and others.

Vagrant/VirtualBox Issues

Networking on VirtualBox/Vagrant

To use the dataplane interfaces on VirtualBox/Vagrant, ensure the following:

- The interfaces must be in "Promiscuous" mode.
- In the VirtualBox network settings, select "Allow All" for the Promiscuous mode.
- Ensure all instances of Cisco Nexus 9000v in your topology have unique MAC addresses by using the **show interface mac** command.

VM normal bootup on VirtualBox/Vagrant:

```
Bringing machine 'default' up with 'virtualbox' provider...
==> default: Clearing any previously set forwarded ports...
==> default: Clearing any previously set network interfaces...
==> default: Preparing network interfaces based on configuration...
    default: Adapter 1: nat
==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Booting VM...
==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
The configured shell (config.ssh.shell) is invalid and unable
to properly execute commands. The most common cause for this is
using a shell that is unavailable on the system. Please verify
you're using the full path to the shell and that the shell is
executable by the SSH user.
```

The **vagrant ssh** command will access the Nexus 9000v switch prompt after the successful normal bootup.

The following is an example of one possible VM bootup failure:

```
Bringing machine 'default' up with 'virtualbox' provider...
==> default: Importing base box 'base'...
==> default: Matching MAC address for NAT networking...
==> default: Setting the name of the VM: n9kv31_default_1575576865720_14975
==> default: Clearing any previously set network interfaces...
==> default: Preparing network interfaces based on configuration...
    default: Adapter 1: nat
==> default: Forwarding ports...
    default: 22 (guest) => 2222 (host) (adapter 1)
==> default: Booting VM...
==> default: Waiting for machine to boot. This may take a few minutes...
    default: SSH address: 127.0.0.1:2222
    default: SSH username: vagrant
    default: SSH auth method: private key
Timed out while waiting for the machine to boot. This means that
Vagrant was unable to communicate with the guest machine within
the configured ("config.vm.boot_timeout" value) time period.

If you look above, you should be able to see the error(s) that
Vagrant had when attempting to connect to the machine. These errors
are usually good hints as to what may be wrong.

If you're using a custom box, make sure that networking is properly
working and you're able to connect to the machine. It is a common
problem that networking isn't setup properly in these boxes.
Verify that authentication configurations are also setup properly,
```

```
as well.

If the box appears to be booting properly, you may want to increase
the timeout ("config.vm.boot_timeout") value.
```

To troubleshoot this failure, check the following:

- Ensure that enough resources, such as memory and vCPU, are available. Close all applications that consume a significant amount of memory in your PC or server. Check the available free memory.
- Power down VM by entering **vagrant halt –f**
- Go to the VirtualBox GUI after powering down the VM. Enable the VM serial console to observe the boot up process and to view possible issues through "Ports" -> "Enable Serial Port".

  Alternatively, use the following VBox command to enable this guest serial console. Find your VM name:

  ```
  VBoxManage list vms
       "n9kv_default_1575906706055_2646" {0b3480af-b9ac-47a4-9989-2f5e3bdf263f}
  ```

  Then enable serial console:

  ```
  VBoxManage modifyvm n9kv_default_1575906706055_2646 --uart1 0x3F8 4
  ```
- Power up the VM again by entering “vagrant up” from the same terminal, where you entered the original “vagrant up”.
- To access the serial console, enter “telnet localhost 2023” from another terminal on your computer.
- Check the bootup issue by observing the output from the serial console.
- Turn off the serial console if the guest serial console is no longer needed. Either use the following VBox command or go to the VirtualBox GUI setting and de-select “Enable Serial Port”.

  ```
  VBoxManage modifyvm n9kv_default_1575906706055_2646 --uart1 off
  ```

Troubleshooting the Cisco Nexus 9000v Dataplane

The debug and show commands in this section are available to troubleshoot both Nexus9300v and Nexus9500v platforms. These commands must be executed on the line card/module.

Debug Commands

- **debug l2fwder event**
- **debug l2fwder error**
- **debug l2fwder fdb**
- **debug l2fwder pkttrace**

To run any of these commands, attach to the line card by following this example:

```
switch# sh mod | inc Mod
Mod Ports             Module-Type                        Model          Status
1    64   Nexus 9000v 64 port Ethernet Module   N9K-X9364v            ok
27   0    Virtual Supervisor Module             N9K-vSUP              active *
Mod  Sw                      Hw    Slot
Mod  MAC-Address(es)                          Serial-Num
```

```
Mod  Online Diag Status
switch# attach mod 1
Attaching to module 1 ...
To exit type 'exit', to abort type '$.'
module-1# debug l2fwder ?
  error     Configure debugging of l2fwder control and data path errors
  event     Configure debugging of l2fwder events over ipc
  fdb       Configure debugging of l2fwder events over fdb
  ha        Configure debugging of l2fwder events from sysmgr
  logfile   Enable file logging to /logflash/l2fwder.debug
  packet    Configure debugging of l2fwder packet forwarding information
  pkttrace  Configure debugging of l2fwder packet trace

module-1# debug l2fwder
```

Event History Commands

- **show system internal l2fwder event-history events**
- **show system internal l2fwder event-history errors**
- **show system internal l2fwder event-history fdb**

Show Commands

show system internal l2fwder table bd

```
v-switch# show system internal l2fwder table bd

vlan    1  member 3, 4, 5,  untagged 3, 4, 5, STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan no
vlan   80  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan   90  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  110  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  210  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  310  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  410  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  510  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  550  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan no
vlan  560  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan no
vlan  610  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  650  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan no
vlan  660  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan no
vlan  710  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
vlan  810  member 3, 4, 5,  untagged none     STP ports 3, 4, 5,  dis none  blk_lis none
lrn none  fwd 3, 4, 5,  tid 1, 2,  vxlan yes
```

Troubleshooting the Cisco Nexus 9000v

show system internal l2fwder table if

```
v-switch# show system internal l2fwder table if

If_name       If_index    gport       fd    untagged  vlanid  Trunk  SVP Info  Native vlan
------------+-----------+-----------+-----+---------+-------+------+---------+------------+
Ethernet1/1   0x1a000000  0x8000801   14    1         4095    0x0     none     4095
Ethernet1/2   0x1a000200  0x8000802   15    1         4095    0x0     none     4095
Ethernet1/3   0x1a000400  0x8000803   16    0         4045    0x1     none     40451
Ethernet1/4   0x1a000600  0x8000804   17    0         810     0x2     none     810
Ethernet1/5   0x1a000800  0x8000805   18    0         810     0x0     none     810
Ethernet1/6   0x1a000a00  0x8000806    0    1         4095    0x0     none     4095
Ethernet1/7   0x1a000c00  0x8000807    0    1         4095    0x0     none     4095
Ethernet1/8   0x1a000e00  0x8000808    0    1         4095    0x0     none     4095
Ethernet1/9   0x1a001000  0x8000809    0    1         4095    0x0     none     4095
Ethernet1/10  0x1a001200  0x800080a    0    1         4095    0x0     none     4095
Ethernet1/11  0x1a001400  0x800080b    0    1         4095    0x0     none     4095
```

show system internal l2fwder table port-channel

```
v-switch# show system internal l2fwder table port-channel

Port-channel    Count    Member-list
--------------+--------+------------
0x1             1        0x8002004
0x4             2        0x8005001 0x8000805
0x5             2        0x8002001 0x8000801

Port-channel    Count    Local member-list6
--------------+--------+------------
0x1             0
0x4             1        0x8000805
0x5             1        0x8000801
```

show system internal l2fwder table vxlan peer

```
v-switch# show system internal l2fwder table vxlan peer

VXLAN Tunnel:
        src_ip: 6.6.6.6, Is VxLAN enabled = TRUE
                multisite: no, nve_tun_dci_sip: 0.0.0.0
VXLAN PEER: No of tunnels = 7
        peer_ip: 224.1.1.2, vxlan_port_id: 0x0,
                tunnel_id: 0x4c000000, is_dp: 0 is_dci: 0
        peer_ip: 224.1.1.4, vxlan_port_id: 0x0,
                tunnel_id: 0x4c000002, is_dp: 0 is_dci: 0
        peer_ip: 224.1.1.6, vxlan_port_id: 0x0,
                tunnel_id: 0x4c000004, is_dp: 0 is_dci: 0
        peer_ip: 224.1.1.8, vxlan_port_id: 0x0,
                tunnel_id: 0x4c000006, is_dp: 0 is_dci: 0
        peer_ip: 224.1.1.9, vxlan_port_id: 0x0,
                tunnel_id: 0x4c000008, is_dp: 0 is_dci: 0
        peer_ip: 224.1.1.10, vxlan_port_id: 0x0,
                tunnel_id: 0x4c00000a, is_dp: 0 is_dci: 0
        peer_ip: 6.5.5.5, vxlan_port_id: 0x80002db8,
                tunnel_id: 0x4c00050a, is_dp: 0 is_dci: 0
   Tunnel_id entry:
        peer_ip: 224.1.1.2, tunnel_id: 0x4c000000
        peer_ip: 224.1.1.4, tunnel_id: 0x4c000002
        peer_ip: 224.1.1.6, tunnel_id: 0x4c000004
        peer_ip: 224.1.1.8, tunnel_id: 0x4c000006
        peer_ip: 224.1.1.9, tunnel_id: 0x4c000008
        peer_ip: 224.1.1.10, tunnel_id: 0x4c00000a
        peer_ip: 6.5.5.5, tunnel_id: 0x4c00050a
```

```
   Vxlan_gport ucast-entry:
        peer_ip: 6.5.5.5, vxlan_port_id: 0x80002db8
```

show system internal l2fwder table vxlan vni

```
v-switch# show system internal l2fwder table vxlan vni

VNI      VLAN    DF
----     ----    ----
81000    810     no
51000    510     no
5001     1001    no
5002     1002    no
5003     1003    no
5004     1004    no
21000    210     no
71000    710     no
9000     90      no
41000    410     no
11000    110     no
61000    610     no
31000    310     no
```

show system internal l2fwder acl info

```
v-switch# show system internal l2fwder acl info

Inactive List:

Entry ID: 14596 Qualify: DstTrunk 4,    Action: RedirectTrunk 5 Prio: 4

Active List:


Inactive List:


Active List:

Entry ID: 15873 Qualify: EtherType ARP ForwardingVlanId 110, 610, 710, 1001, 1003,   Action:
 CopyToCpu SET Drop SET  Prio: 1
```

show system internal l2fwder mac

```
v-switch# show system internal l2fwder mac

Legend:
        * - primary entry, G - Gateway MAC, (R) - Routed MAC, O - Overlay MAC
        + - primary entry using vPC Peer-Link,
        (T) - True, (F) - False, C - ControlPlane MAC
   VLAN     MAC Address      Type     Secu NTF Del  Ports  Station_id
---------+----------------+--------+---------+----+------+------------------
*     1    008b.860d.1b08    static    F       F    0      0xc000005   0
G     -    008b:860d:1b08    static    F       F    0      sup-eth1(R) 508,
*   210    0000.4545.6767    dynamic   F       F    0      0xc000004   0
G   710    008b.bc90.1b08    static    F       F    0      sup-eth1(R) 0
G   310    008b.bc90.1b08    static    F       F    0      sup-eth1(R) 0
G     -    0002:0002:0002    static    F       F    0      sup-eth1(R) 1,
*   210    008b.860d.1b08    static    F       F    0      0xc000005   0
G   410    008b.bc90.1b08    static    F       F    0      sup-eth1(R) 0
*  1003    008b.2b34.1b08    dynamic   F       F    1      nve(0x80002db9)   0
*  1002    008b.2b34.1b08    dynamic   F       F    1      nve(0x80002db9)   0
*  1001    008b.2b34.1b08    dynamic   F       F    1      nve(0x80002db9)   0
```

```
*  1004    008b.2b34.1b08    dynamic   F       F    1      nve(0x80002db9)   0
*   810    008b.860d.1b08    static    F       F    0      0xc000005   0
G   510    008b.bc90.1b08    static    F       F    0      sup-eth1(R) 0
*   610    008b.2b34.1b08    dynamic   F       F    1      nve(0x80002db9)   0
G     1    008b.bc90.1b08    static    F       F    0      sup-eth1(R) 0
G     -    008b:bc90:1b08    static    F       F    0      sup-eth1(R) 511,
```

show system internal l2fwder port egress info

```
v-switch# show system internal l2fwder port egress info

Ingress port :        Blocked egress ports
+--------------------+-------------------+

0x8002001       1       5
0x8000801       1       5
0x8020821       1       5
```

show system internal l2fwder vpc info

```
v-switch# show system internal l2fwder vpc info

VPC role : Primary
```

Packet Capture Commands

The Cisco Nexus N9000v supports Ethanalyzer similarly to the standalone Nexus 9000 hardware switch.