Optionality in Cisco NX-OS Software

This chapter describes optionality in Cisco NX-OS software.

Optionality in Cisco NX-OS Software

Beginning with Cisco NXOS Release 9.2(1), Cisco NX-OS software image supports modular package management. Cisco NX-OS software now provides flexibility to add, remove, and upgrade the features selectively without changing the base NX-OS software.

The advantages for using modular Cisco NX-OS software are:

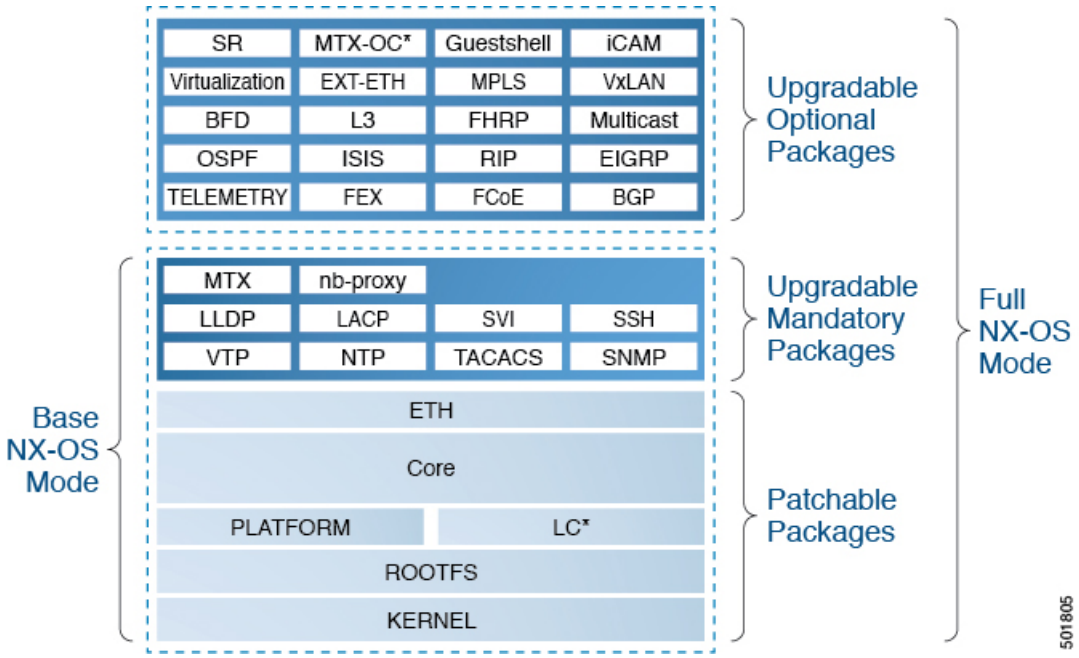
- Lean NX-OS software
- Asynchronous delivery of the features and the fixes: Quick fixes are provided that are independent of the releases, including new features.
- Reduced footprint of binaries and libraries at run time

Cisco NX-OS software is provisioned to boot the NX-OS software in two modes as described in the following illustration:

- Base NX-OS mode
- Full NX-OS mode

Optionality in Cisco NX-OS Software

Figure 1: Optionality in Cisco NX-OS Software



- Base NX-OS mode contains:
  - Upgradable mandatory packages
  - Patchable packages
- Full NX-OS mode contains:
  - Upgradable optional packages
  - Upgradable mandatory packages
  - Patchable packages

Note The default mode is full NX-OS mode.

In base NX-OS mode, basic Layer 2 and Layer 3 features are available. All dynamic routing features (for example, BGP, OSPF, EIGRP, RIP, and ISIS) and other optional feature RPMs are not available by default. You have to install the optional feature RPMs on top of the base image.

In full NX-OS mode, all feature RPMs are installed during boot time when Ethernet plugin is activated by the plugin manager. There is no change in the user behavior as compared to the previous releases.

Guidelines for Cisco NX-OS Patchable Packages/RPM Installation

For guidelines on Cisco NX-OS patchable packages/RPM installation (Release 7.x feature), see the Performing Software Maintenance Upgrades section in the Cisco Nexus 9000 Series NX-OS System Management Configuration Guide.

Using Modular Packages

The Cisco NX-OS software image is traditionally constructed with the packaging that forms a Cisco Linux distribution. It makes upgrading certain packages difficult as each package is large in size.

This section describes a new package management for the Cisco NX-OS software image. Beginning with Cisco NX-OS Release 9.2(1), some NXOS features are considered as optional, for example, BGP, OSPF, VXLAN, MPLS, Segment Routing.

Each modular package has the following important characteristics:

- Upgrade functionality: The modular packages can be independently upgraded. The modular packages should be used from the same release as performing upgrades on these packages across multiple releases is not supported.
- Optionality: The modular packages are optional, for example, these packages can be removed or uninstalled at run time. The removal of the modular packages does not affect bringing-up the system and it does not affect any other functionality of the switches.

Note All APIs exported by the modular package should be used only after the installation of the feature.

RPM and YUM

RPM (Red Hat Package Manager) is the package management system used for packaging in the Linux Standard Base (LSB). The RPM command options are grouped into three subgroups for:

- Querying and verifying packages
- Installing, upgrading, and removing packages
- Performing miscellaneous functions

rpm is the command name for the main command that is used with RPM, whereas .rpm is the extension that is used for the RPM files.

YUM (Yellowdog Updater, Modified) is an open source command-line tool for RPM based Linux systems. It allows users and system administrators to easily install, update, remove, or search software packages on the systems. YUM adds the automatic updates and the package management, including dependency management, to the RPM systems. In addition to understanding the installed packages on a system, YUM works with the repositories that are collections of the packages and they are typically accessible over a network connection.

Booting the NX-OS Image in Base or Full Mode

You can now boot the NX-OS image in base or full mode. The full boot mode installs the complete NX-OS software which is similar to the software of the previous releases. This is the default boot mode. The base boot mode has no optional RPMs installed.

To use the command line option, see the following steps:

- Use the **install reset nxos base** option to install the NX-OS image in the base boot mode using the VSH prompt. After reload, the switch is in the base mode with no optional packages installed.
- Use the **install reset nxos full** option to install the NX-OS image in the full boot mode using the VSH prompt. After reload, the switch is in the full mode with the optional packages automatically installed.

For more information, see Using Install CLIs for Feature RPM Operation section.

Information About RPMs

RPMs can be upgraded or downgraded to a new software version using NXOS install commands or by using YUM commands. An upgradable RPM can be optional or mandatory.

See the following sections for more information about optional and mandatory RPMs.

Format of the RPM

The general format of a RPM is <name>-<version>-<release>.<arch>.rpm. The same format is followed for NXOS feature RPMS.

- Name: package name, for example, BGP
- Version in <x.y.x.b> format: <major.minor.patch.build_number>, for example, 2.0.1.0
- Release: The branch from which the RPM is created, for example, 9.2.1
- Arch: The architecture type of the RPM, for example, lib32_n9000

See the following table for more information on the naming convention, for example, fex-2.0.0.0-9.2.1.lib32_n9000.rpm:

Table 1: RPM Naming Convention

RPM Naming Convention **Example: fex-2.0.0.0-9.2.1.lib32_n9000.rpm**	**Description**
fex	Indicates the name of the component.
2	Indicates that the RPM is not backward compatible. Configuration loss takes place during an upgrade.

RPM Naming Convention Example: fex-2.0.0.0-9.2.1.lib32_n9000.rpm	Description
0	Indicates the incremental API changes/CLI changes/Schema changes with backward compatibility. It is applicable to the new features on top of the existing capabilities. No configuration is lost during an upgrade.
0	Indicates a bug fix without any functionality change. No configuration is lost during an upgrade.
0	This number tracks how many times the component has changed during the development cycle of a release. This value will be 0 for all the release images.
9.2.1	Indicates the release number or the distribution version for the RPM. It aligns to the NVR format. Since the feature RPM is only applicable to a NXOS release, this field has NXOS release version number present.
lib32_n9000	Indicates the architecture type of the RPM.

Optional RPMs and Their Associated Features

The optional RPMs are the RPMs that can be installed to enable the features without affecting the native NXOS behavior or they can be removed using the **install deactivate** command from the switch.

Optional RPMs, for example, EIGRP are not a part of the base software. They can be added, upgraded, and removed as required using either **yum** or **install** CLI commands from the switch.

See the following list of the optional RPMs and their associated features:

Table 2: List of Optional RPMs and Their Associated Features

Package Name	Associated Features
BGP	feature bgp
BFD	feature bfd
Container-tracker	feature container-tracker
EIGRP	feature eigrp

Package Name	Associated Features
Ext-Eth	• feature openflow • feature evb • feature imp • feature netflow • feature sla_sender • feature sla_responder • feature sla twamp-server • feature sflow
FCoE	• feature-set fcoe • feature-set fcoe-npv
FEX	feature-set fex
FHRP	• feature hsrp • feature vrrpv3
iCAM	feature icam
ISIS	feature isis
MPLS	• feature mpls segment-routing • feature mpls evpn
Multicast	• feature pim • feature pim6 • feature msdp • feature ngmvpn
OSPF	• feature ospf • feature ospfv3
RIP	feature rip
Services	feature catena
SR	feature mpls segment-routing traffic-engineering
TELEMETRY	feature telemetry

Package Name	Associated Features
Virtualization	NA
VXLAN	• feature nv overlay • feature fabric forwarding

Guidelines for NX-OS Feature RPM Installation

See the following NX-OS system RPM repositories that are present in the Cisco NX-OS Series switches for the RPM management.

Note Avoid manually copying the RPMs to system repositories. Instead use the install or YUM commands.

Table 3: RPM Repositories That Are Present in the Switches

Repository Name	Repository Path	Description
groups-repo	/rpms	Part of the bundled NX-OS image. It is used to keep all the RPMs that are bundled as part of the NX-OS image. All RPMs based in this repository are known as base RPMs.

Repository Name	Repository Path	Description
localdb	/bootflash/.rpmstore/patching/localrepo	Used for RPM persistency. When a user adds a NX-OS feature RPM as part of **install add** command, the RPM is copied to this location and it is persisted during the reloads. User has the responsibility to clean the repository. To add a RPM to this repository, use **install add** command. To remove a RPM from this repository, use **install remove** command. YUM commands can be used to populate the repository too. The maximum space for the repository is 200Mb along with the patching repository for Cisco Nexus 9000 Series switches except Cisco Nexus 3000 Series switches. For Cisco Nexus 3000 Series switches, the maximum space for the repository is 20 Mb only.
patching	/bootflash/.rpmstore/patching/patchrepo	Used for RPM persistency. When a user adds a NX-OS patch RPM to the switch, the patch RPM is copied to this repository.
thirdparty	/bootflash/.rpmstore/thirdparty	Used for RPM persistency when a user adds a third party RPM.

The **groups-repo** and **localdb** repositories hold the NX-OS feature RPMs that should be installed during the system boot or during activation. YUM commands or **install** command can be used for the installation or the removal of these RPMs.

The following rules are applied to the feature RPM installation procedure during boot or install time:

- Only RPMs with the same NX-OS release number should be selected for the installation.
- Base RPMs cannot be added to the **localdb** repository.

Using Install CLIs for Digital Signature Support

Use the following CLI commands to install CLIs for digital signature support:

SUMMARY STEPS

1. switch#**install add bootflash**:<*keyfile*> **gpg-key**

2. switch#**install verify package** <*package-name*>
3. OR switch#**install verify bootflash**:<*RPM file*>

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	switch#**install add bootflash**:<*keyfile*> **gpg-key** **Example:** `install add bootflash:RPM-GPG-KEY-puppetlabs gpg-key` `[####################] 100%` `Install operation 304 completed successfully at Thu Jun 19 16:40:28 2018`	Cisco release RPMs are signed with Cisco GPG (GNU Privacy Guard) key. The public GPG key is present at **/etc/pki/rpm-gpg/arm-Nexus9k-rel.gpg**. To add other public keys from different sources, use the steps in this section.
Step 2	switch#**install verify package** <*package-name*>	Verifies the package.
Step 3	OR switch#**install verify bootflash**:<*RPM file*> **Example:** `switch# install verify bootflash:vxlan-2.0.0.0-9.2.1.lib32_n9000.rpm` `RSA signed` `switch#`	Use step 2 or 3 to verify whether the RPM file is a signed or non-signed file.

Querying All Installed RPMs

Complete the following step to query all the installed RPMs:

SUMMARY STEPS

1. **show install packages**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**show install packages** **Example:** `switch# show install packages` `Boot Image:` `NXOS Image: bootflash:/nxos.9.2.1.bin`	Queries all the installed RPMs.

	Command or Action	Purpose
	`` -- Installed Packages attr.x86_64 2.4.47-r0.0 installed Unsigned aufs-util.x86_64 3.14+git0+b59a2167a1-r0.0 installed Unsigned base-files.n9000 3.0.14-r89.0 installed Unsigned base-passwd.lib32_x86 3.5.29-r0.1.0 installed Unsigned bash.lib32_x86 4.3.30-r0.0 installed Unsigned bfd.lib32_n9000 2.0.0.0-9.2.1 installed Signed bgp.lib32_n9000 2.0.0.0-9.2.1 installed Signed binutils.x86_64 2.25.1-r0.0 installed Unsigned bridge-utils.x86_64 1.5-r0.0 installed Unsigned busybox.x86_64 1.23.2-r0.0 installed Unsigned busybox-udhcpc.x86_64 1.23.2-r0.0 installed Unsigned bzip2.x86_64 1.0.6-r5.0 installed Unsigned ca-certificates.all 20150426-r0.0 installed Unsigned cgroup-lite.x86_64 1.1-r0.0 installed Unsigned chkconfig.x86_64 1.3.58-r7.0 installed Unsigned container-tracker.lib32_n9000 2.0.0.0-9.2.1 installed Signed containerd-docker.x86_64 0.2.3+gitaa8187dbd3b7ad67d8e5e3a15115d3eef43a7ed1-r0.0 installed Unsigned core.lib32_n9000 2.0.0.0-9.2.1 installed Signed coreutils.lib32_x86 8.24-r0.0 installed Unsigned cpio.x86_64 2.12-r0.0 installed Unsigned cracklib.lib32_x86 2.9.5-r0.0 installed Unsigned cracklib.x86_64 2.9.5-r0.0 installed Unsigned createrepo.x86_64 0.4.11-r9.0 installed Unsigned cronie.x86_64 1.5.0-r0.0 installed Unsigned curl.lib32_x86 7.60.0-r0.0 installed Unsigned db.x86_64 6.0.30-r0.0 installed Unsigned dbus-1.lib32_x86 1.8.20-r0.0 installed Unsigned dhcp-client.x86_64 4.3.2-r0.0 installed Unsigned dhcp-server.x86_64 4.3.2-r0.0 installed Unsigned switch# ```	

Installing the RPMs Using One Step Procedure

The CLIs for both install and upgrade RPMs are the same. See the following step to install the RPMs using one step procedure:

Procedure

	Command or Action	Purpose
Step 1	**install add** *<rpm>* **activate** **Example:** `switch# install add bootflash:chef.rpm activate` `Adding the patch (/chef.rpm)`	Installs and activates the RPM.

	Command or Action	Purpose
	[####################] 100% Install operation 868 completed successfully at Tue May 8 11:20:10 2018 Activating the patch (/chef.rpm) [####################] 100% Install operation 869 completed successfully at Tue May 8 11:20:20 2018	

Example

```
switch# show install active
Boot Image:
        NXOS Image: bootflash:/nxos.9.2.1.bin

Active Packages:
bgp-2.0.1.0-9.2.1.lib32_n9000
chef-12.0.0alpha.2+20150319234423.git.1608.b6eb10f-1.el5.x86_64

Active Base Packages:
        lacp-2.0.0.0-9.2.1.lib32_n9000
        lldp-2.0.0.0-9.2.1.lib32_n9000
        mtx-device-2.0.0.0-9.2.1.lib32_n9000
        mtx-grpc-agent-2.0.0.0-9.2.1.lib32_n9000
        mtx-infra-2.0.0.0-9.2.1.lib32_n9000
        mtx-netconf-agent-2.0.0.0-9.2.1.lib32_n9000
        mtx-restconf-agent-2.0.0.0-9.2.1.lib32_n9000
        mtx-telemetry-2.0.0.0-9.2.1.lib32_n9000
        ntp-2.0.0.0-9.2.1.lib32_n9000
        nxos-ssh-2.0.0.0-9.2.1.lib32_n9000
        snmp-2.0.0.0-9.2.1.lib32_n9000
        svi-2.0.0.0-9.2.1.lib32_n9000
        tacacs-2.0.0.0-9.2.1.lib32_n9000
        vtp-2.0.0.0-9.2.1.lib32_n9000
switch(config)#
```

Installing the RPMs Using Two Steps Procedure

The CLIs for both install and upgrade RPMs are the same. See the following steps to install the RPMs using two steps procedure:

SUMMARY STEPS

1. **install add** <*rpm*>
2. **install activate** <*rpm*>

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**install add** <*rpm*> **Example:** `switch# install add bootflash:vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm` `[####################] 100%` `Install operation 892 completed successfully at Thu Jun 7 13:56:38 2018` `switch(config)# sh install inactive | grep vxlan` `vxlan-2.0.1.0-9.2.1.lib32_n9000`	Installs the RPM.
Step 2	**install activate** <*rpm*> **Example:**	Activates the RPM.

Example

```
switch#install activate vxlan

[####################] 100%
Install operation 891 completed successfully at Thu Jun  7 13:53:07 2018

switch# show install active | grep vxlan

vxlan-2.0.0.0-9.2.1.lib32_n9000

switch# sh install inactive | grep vxlan

switch#
```

Upgrading the RPMs Using One Step

The CLIs for both install and upgrade RPMs are the same. See the following steps to upgrade the RPMs:

Procedure

	Command or Action	Purpose
Step 1	**install add** *<rpm>***activate upgrade** **Example:** `switch(config)# install add bootflash:bgp-2.0.2.0-9.2.1.lib32_n9000.rpm activate upgrade` `Adding the patch (/bgp-2.0.2.0-9.2.1.lib32_n9000.rpm) [####################] 100% Install operation 870 completed successfully at Tue May 8 11:22:30 2018` `Activating the patch (/bgp-2.0.2.0-9.2.1.lib32_n9000.rpm) [####################] 100% Install operation 871 completed successfully at Tue May 8 11:22:40 2018`	Installs the RPM.

Example

```
switch(config)# show install active

Boot Image:
 NXOS Image: bootflash:/nxos.9.2.1.bin

Active Packages:
bgp-2.0.2.0-9.2.1.lib32_n9000
chef-12.0.0alpha.2+20150319234423.git.1608.b6eb10f-1.el5.x86_64

Active Base Packages:
 lacp-2.0.0.0-9.2.1.lib32_n9000
 lldp-2.0.0.0-9.2.1.lib32_n9000
 mtx-device-2.0.0.0-9.2.1.lib32_n9000
 mtx-grpc-agent-2.0.0.0-9.2.1.lib32_n9000
 mtx-infra-2.0.0.0-9.2.1.lib32_n9000
 mtx-netconf-agent-2.0.0.0-9.2.1.lib32_n9000
 mtx-restconf-agent-2.0.0.0-9.2.1.lib32_n9000
 mtx-telemetry-2.0.0.0-9.2.1.lib32_n9000
 ntp-2.0.0.0-9.2.1.lib32_n9000
 nxos-ssh-2.0.0.0-9.2.1.lib32_n9000
 snmp-2.0.0.0-9.2.1.lib32_n9000
 svi-2.0.0.0-9.2.1.lib32_n9000
 tacacs-2.0.0.0-9.2.1.lib32_n9000
 vtp-2.0.0.0-9.2.1.lib32_n9000
```

Downgrading the RPMs

The downgrade procedure needs a special CLI attribute. See the following step to downgrade the RPMs using the one step procedure:

Procedure

	Command or Action	Purpose
Step 1	**install add** *<rpm>***activate downgrade** **Example:** `switch(config)# install add bootflash:bgp-2.0.1.0-9.2.1.lib32_n9000.rpm activate downgrade` `Adding the patch (/bgp-2.0.1.0-9.2.1.lib32_n9000.rpm) [####################] 100% Install operation 872 completed successfully at Tue May 8 11:24:43 2018` `Activating the patch (/bgp-2.0.1.0-9.2.1.lib32_n9000.rpm) [####################] 100% Install operation 873 completed successfully at Tue May 8 11:24:52 2018`	Downgrades the RPM.

Example

```
switch(config)# show install active
Boot Image:
 NXOS Image: bootflash:/nxos.9.2.1.bin

Active Packages:
 bgp-2.0.1.0-9.2.1.lib32_n9000
 chef-12.0.0alpha.2+20150319234423.git.1608.b6eb10f-1.el5.x86_64

Active Base Packages:
 lacp-2.0.0.0-9.2.1.lib32_n9000
 lldp-2.0.0.0-9.2.1.lib32_n9000
 mtx-device-2.0.0.0-9.2.1.lib32_n9000
 mtx-grpc-agent-2.0.0.0-9.2.1.lib32_n9000
 mtx-infra-2.0.0.0-9.2.1.lib32_n9000
 mtx-netconf-agent-2.0.0.0-9.2.1.lib32_n9000
 mtx-restconf-agent-2.0.0.0-9.2.1.lib32_n9000
 mtx-telemetry-2.0.0.0-9.2.1.lib32_n9000
 ntp-2.0.0.0-9.2.1.lib32_n9000
 nxos-ssh-2.0.0.0-9.2.1.lib32_n9000
 snmp-2.0.0.0-9.2.1.lib32_n9000
 svi-2.0.0.0-9.2.1.lib32_n9000
 tacacs-2.0.0.0-9.2.1.lib32_n9000
 vtp-2.0.0.0-9.2.1.lib32_n9000
switch(config)#
```

Removing the RPMs

See the following steps to remove the RPMs:

SUMMARY STEPS

1. **install remove** *<rpm>*

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**install remove** *<rpm>* **Example:** `switch(config)# show install inactive | grep vxlan` `vxlan-2.0.0.0-9.2.1.lib32_n9000` `switch(config)# install remove vxlan` `Proceed with removing vxlan? (y/n)? [n] y` `[####################] 100%` `Install operation 890 Removal of base rpm package is not permitted at Thu Jun 7 13:52:15 2018`	Removes the RPM from the repository.

Information About YUM Commands

See the following sections for more information about YUM commands.

Note YUM commands do not support ctrl+c. Install commands do support ctrl+c. If YUM commands are aborted using ctrl+c, manual cleanup must be performed using "/isan/bin/patching_utils.py --unlock".

Performing Package Operations Using the YUM Commands

See the following sections for performing package operations using the YUM commands:

Note YUM commands are accessed only from the BASH shell on the box and they are not allowed from the NXOS VSH terminal.

Note Make sure that as a sudo user, you have access to the super user privileges.

Finding the Base Version RPM of the Image

Use the **ls /rpms** command to find the base version RPM of the image. The base RPM version is the pre-installed RPM that is archived in the system image.

```
#ls /rpms

bfd-2.0.0.0-9.2.1.lib32_n9000.rpm
ins_tor_sdk_t2-1.0.0.0-9.2.0.77.lib32_n9000.rpm
mtx-netconf-agent-2.0.0.0-9.2.1.lib32_n9000.rpm   snmp-2.0.0.0-9.2.1.lib32_n9000.rpm
bgp-2.0.0.0-9.2.1.lib32_n9000.rpm
ins_tor_sdk_t3-1.0.0.0-9.2.0.77.lib32_n9000.rpm
mtx-restconf-agent-2.0.0.0-9.2.1.lib32_n9000.rpm  sr-2.0.0.0-9.2.1.lib32_n9000.rpm
container-tracker-2.0.0.0-9.2.1.lib32_n9000.rpm  isis-2.0.0.0-9.2.1.lib32_n9000.rpm
         mtx-telemetry-2.0.0.0-9.2.1.lib32_n9000.rpm      svi-2.0.0.0-9.2.1.lib32_n9000.rpm
eigrp-2.0.0.0-9.2.1.lib32_n9000.rpm               lacp-2.0.0.0-9.2.1.lib32_n9000.rpm
          nbproxy-2.0.0.0-9.2.1.lib32_n9000.rpm
tacacs-2.0.0.0-9.2.1.lib32_n9000.rpm
ext-eth-2.0.0.0-9.2.1.lib32_n9000.rpm             lldp-2.0.0.0-9.2.1.lib32_n9000.rpm
          ntp-2.0.0.0-9.2.1.lib32_n9000.rpm
telemetry-2.3.4.0-9.2.1.lib32_n9000.rpm
fcoe-2.0.0.0-9.2.1.lib32_n9000.rpm                mcast-2.0.0.0-9.2.1.lib32_n9000.rpm
          nxos-ssh-2.0.0.0-9.2.1.lib32_n9000.rpm
virtualization-2.0.0.0-9.2.1.lib32_n9000.rpm
fex-2.0.0.0-9.2.1.lib32_n9000.rpm                 mpls-2.0.0.0-9.2.1.lib32_n9000.rpm
         ospf-2.0.0.0-9.2.1.lib32_n9000.rpm               vtp-2.0.0.0-9.2.1.lib32_n9000.rpm
fhrp-2.0.0.0-9.2.1.lib32_n9000.rpm                mtx-device-2.0.0.0-9.2.1.lib32_n9000.rpm
          repodata
vxlan-2.0.0.0-9.2.1.lib32_n9000.rpm
guestshell-2.0.0.0-9.2.1.lib32_n9000.rpm        mtx-grpc-agent-2.0.0.0-9.2.1.lib32_n9000.rpm
       rip-2.0.0.0-9.2.1.lib32_n9000.rpm
icam-2.0.0.0-9.2.1.lib32_n9000.rpm                mtx-infra-2.0.0.0-9.2.1.lib32_n9000.rpm
          services-2.0.0.0-9.2.1.lib32_n9000.rpm
```

Checking the List of the Installed RPMs

Use the **yum list installed** command to query the feature and third party RPMs and grep a specific RPM. See the following example for feature RPMs:

```
bash-4.2# yum list installed | grep lib32_n9000

bfd.lib32_n9000                          2.0.0.0-9.2.1          @groups-repo
core.lib32_n9000                         2.0.0.0-9.2.1          installed
eth.lib32_n9000                          2.0.0.0-9.2.1          installed
guestshell.lib32_n9000                   2.0.0.0-9.2.1          @groups-repo
lacp.lib32_n9000                         2.0.0.0-9.2.1          installed
linecard2.lib32_n9000                    2.0.0.0-9.2.1          installed
lldp.lib32_n9000                         2.0.0.0-9.2.1          installed
mcast.lib32_n9000                        2.0.0.0-9.2.1          @groups-repo
mtx-device.lib32_n9000                   2.0.0.0-9.2.1          installed
mtx-grpc-agent.lib32_n9000               2.0.0.0-9.2.1          installed
mtx-infra.lib32_n9000                    2.0.0.0-9.2.1          installed
mtx-netconf-agent.lib32_n9000            2.0.0.0-9.2.1          installed
mtx-restconf-agent.lib32_n9000           2.0.0.0-9.2.1          installed
```

```
mtx-telemetry.lib32_n9000              2.0.0.0-9.2.1           installed
nbproxy.lib32_n9000                    2.0.0.0-9.2.1           installed
ntp.lib32_n9000                        2.0.0.0-9.2.1           installed
nxos-ssh.lib32_n9000                   2.0.0.0-9.2.1           installed
ospf.lib32_n9000                       2.0.0.0-9.2.1           @groups-repo
platform.lib32_n9000                   2.0.0.0-9.2.1           installed
snmp.lib32_n9000                       2.0.0.0-9.2.1           installed
svi.lib32_n9000                        2.0.0.0-9.2.1           installed
tacacs.lib32_n9000                     2.0.0.0-9.2.1           installed
tor.lib32_n9000                        2.0.0.0-9.2.0.77        installed
virtualization.lib32_n9000             2.0.1.0-9.2.1           @localdb
vtp.lib32_n9000                        2.0.0.0-9.2.1           installed
vxlan.lib32_n9000                      2.0.0.0-9.2.1           @groups-repo
...
```

Getting Details of the Installed RPMs

The **yum info** <*rpmname*> command lists out the detailed info of the installed RPM.

```
yum info vxlan

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo

                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
Installed Packages
Name        : vxlan
Arch        : lib32_n9000
Version     : 2.0.0.0
Release     : 9.2.1
Size        : 6.4 M
Repo        : installed
From repo   : groups-repo
Summary     : Cisco NXOS VxLAN
URL         : http://cisco.com/
License     : Proprietary
Description : Provides VxLAN support
```

Installing the RPMs

Installing the RPMs downloads the RPMs and copies the respective program to the switches. See the following example for installing the RPMs from a remote server (that is reachable in the network):

```
bash-4.3# yum install
http://10.0.0.2/modularity/rpms/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo
```

```
                                                          | 1.1 kB     00:00 ...
localdb
                                                          |  951 B     00:00 ...
localdb/primary
                                                          |  886 B     00:00 ...
localdb
                                                                 1/1
patching
                                                          |  951 B     00:00 ...
thirdparty
                                                          |  951 B     00:00 ...
Setting up Install Process
vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm
                                                 | 1.6 MB     00:00
Examining /var/tmp/yum-root-RaANgb/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm:
vxlan-2.0.1.0-9.2.1.lib32_n9000
Marking /var/tmp/yum-root-RaANgb/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm to be installed
Resolving Dependencies
--> Running transaction check
---> Package vxlan.lib32_n9000 0:2.0.1.0-9.2.1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package                  Arch                          Version
          Repository                                   Size
================================================================================
Installing:
vxlan                    lib32_n9000                   2.0.1.0-9.2.1
     /vxlan-2.0.1.0-9.2.1.lib32_n9000                  6.4 M
Transaction Summary
================================================================================
Install       1 Package

Total size: 6.4 M
Installed size: 6.4 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : vxlan-2.0.1.0-9.2.1.lib32_n9000
                                                                       1/1
starting pre-install package version mgmt for vxlan
pre-install for vxlan complete
starting post-install package version mgmt for vxlan
post-install for vxlan complete

Installed:
  vxlan.lib32_n9000 0:2.0.1.0-9.2.1


Complete!
```

See the following example for installing the RPMs from local bootflash:

```
sudo yum install /bootflash/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm
```

```
Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo
```

```
                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
Setting up Install Process
Examining /bootflash/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm: vxlan-2.0.1.0-9.2.1.lib32_n9000
Marking /bootflash/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm as an update to
vxlan-2.0.0.0-9.2.1.lib32_n9000
Resolving Dependencies
--> Running transaction check
---> Package vxlan.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package vxlan.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package                                  Arch
Version                                                  Repository
                                       Size
================================================================================
Updating:
 vxlan                                    lib32_n9000
2.0.1.0-9.2.1                                    /vxlan-2.0.1.0-9.2.1.lib32_n9000
                             6.4 M

Transaction Summary
================================================================================
Upgrade       1 Package

Total size: 6.4 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Updating   : vxlan-2.0.1.0-9.2.1.lib32_n9000

                                    1/2
starting pre-install package version mgmt for vxlan
pre-install for vxlan complete
starting post-install package version mgmt for vxlan
post-install for vxlan complete
  Cleanup    : vxlan-2.0.0.0-9.2.1.lib32_n9000

                                    2/2

Updated:
  vxlan.lib32_n9000 0:2.0.1.0-9.2.1



Complete!
```

See the following example for installing the RPM if it is available in a repository:

```
yum install eigrp
```

Upgrading the RPMs

See the following example for upgrading the RPMs from a remote server (that is reachable in the network):

```
bash-4.3# yum upgrade
http://10.0.0.2/modularity/rpms/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo
                                                    | 1.1 kB     00:00 ...
localdb
                                                    |  951 B     00:00 ...
patching
                                                    |  951 B     00:00 ...
thirdparty
                                                    |  951 B     00:00 ...
Setting up Upgrade Process
vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm
                                                | 1.6 MB     00:00
Examining /var/tmp/yum-root-RaANgb/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm:
vxlan-2.0.1.0-9.2.1.lib32_n9000
Marking /var/tmp/yum-root-RaANgb/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm as an update to
vxlan-2.0.0.0-9.2.1.lib32_n9000
Resolving Dependencies
--> Running transaction check
---> Package vxlan.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package vxlan.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================================================================

 Package                    Arch                              Version
           Repository                                       Size
================================================================================================================================
Updating:
vxlan                      lib32_n9000                       2.0.1.0-9.2.1
     /vxlan-2.0.1.0-9.2.1.lib32_n9000                       6.4 M
Transaction Summary
================================================================================================================================
Upgrade       1 Package

Total size: 6.4 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
** Found 1 pre-existing rpmdb problem(s), 'yum check' output follows:
busybox-1.23.2-r0.0.x86_64 has missing requires of busybox-syslog
  Updating   : vxlan-2.0.1.0-9.2.1.lib32_n9000
                                                                                1/2
starting pre-install package version mgmt for vxlan
pre-install for vxlan complete
starting post-install package version mgmt for vxlan
```

```
post-install for vxlan complete
  Cleanup    : vxlan-2.0.0.0-9.2.1.lib32_n9000
                                                                          2/2

Updated:
  vxlan.lib32_n9000 0:2.0.1.0-9.2.1


Complete!
```

See the following example for upgrading the RPMs from local bootflash:

sudo yum upgrade /bootflash/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm

```
Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo

                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
Setting up Upgrade Process
Examining /bootflash/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm: vxlan-2.0.1.0-9.2.1.lib32_n9000
Marking /bootflash/vxlan-2.0.1.0-9.2.1.lib32_n9000.rpm as an update to
vxlan-2.0.0.0-9.2.1.lib32_n9000
Resolving Dependencies
--> Running transaction check
---> Package vxlan.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package vxlan.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package                                  Arch
Version                                          Repository
                                  Size
================================================================================
Updating:
vxlan                                    lib32_n9000
2.0.1.0-9.2.1                                    /vxlan-2.0.1.0-9.2.1.lib32_n9000
                             6.4 M

Transaction Summary
================================================================================
Upgrade       1 Package

Total size: 6.4 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
```

```
  Updating   : vxlan-2.0.1.0-9.2.1.lib32_n9000

                                    1/2
starting pre-install package version mgmt for vxlan
pre-install for vxlan complete
starting post-install package version mgmt for vxlan
post-install for vxlan complete
  Cleanup    : vxlan-2.0.0.0-9.2.1.lib32_n9000

                                    2/2

Updated:
  vxlan.lib32_n9000 0:2.0.1.0-9.2.1



Complete!
```

See the following example for upgrading the RPMs if it is available in any repository:

```
yum upgrade eigrp
```

Downgrading the RPMs

See the following example for downgrading the RPMs from a remote server (that is reachable in the network):

```
sudo yum
 downgrade vxlan-2.0.0.0-9.2.1.lib32_n9000

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
Setting up Downgrade Process
groups-repo

                     | 1.1 kB     00:00 ...
localdb

                     |  951 B     00:00 ...
localdb/primary

                     | 1.3 kB     00:00 ...
localdb

                                      2/2
patching

                     |  951 B     00:00 ...
thirdparty

                     |  951 B     00:00 ...
Resolving Dependencies
--> Running transaction check
---> Package vxlan.lib32_n9000 0:2.0.0.0-9.2.1 will be a downgrade
---> Package vxlan.lib32_n9000 0:2.0.1.0-9.2.1 will be erased
--> Finished Dependency Resolution

Dependencies Resolved
```

```
 Package                                          Arch
            Version                                                  Repository
                                  Size
================================================================================
Downgrading:
vxlan                                          lib32_n9000
            2.0.0.0-9.2.1                                            groups-repo
                                 1.6 M
Transaction Summary
================================================================================
Downgrade     1 Package

Total download size: 1.6 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : vxlan-2.0.0.0-9.2.1.lib32_n9000

                                   1/2
starting pre-install package version mgmt for vxlan
pre-install for vxlan complete
starting post-install package version mgmt for vxlan
post-install for vxlan complete
  Cleanup    : vxlan-2.0.1.0-9.2.1.lib32_n9000

                                   2/2

Removed:
  vxlan.lib32_n9000 0:2.0.1.0-9.2.1



Installed:
  vxlan.lib32_n9000 0:2.0.0.0-9.2.1



Complete!
```

See the following example for downgrading the RPMs from local bootflash:

```
yum downgrade /bootflash/eigrp-2.0.0-9.2.1.lib32_n9000.rpm
```

See the following example for downgrading the RPMs if it is available in any repository:

```
yum downgrade eigrp
```

Deleting the RPMs

Deleting the RPMs de-installs the RPMs and removes any configuration CLI of the feature. Use the **yum erase** <*rpm*> command to delete the RPMs.

```
bash-4.2# sudo yum erase vxlan

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
```

```
protect-packages
Setting up Remove Process
Resolving Dependencies
--> Running transaction check
---> Package vxlan.lib32_n9000 0:2.0.1.0-9.2.1 will be erased
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package                  Arch                                          Version
                                Repository                                    Size
================================================================================
Removing:
 vxlan                    lib32_n9000                                   2.0.1.0-9.2.1
                                @/vxlan-2.0.1.0-9.2.1.lib32_n9000             6.4 M
Transaction Summary
================================================================================
Remove        1 Package

Installed size: 6.4 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Erasing    : vxlan-2.0.1.0-9.2.1.lib32_n9000

                                  1/1
starting pre-remove package version mgmt for vxlan
pre-remove for vxlan complete

Removed:
  vxlan.lib32_n9000 0:2.0.1.0-9.2.1


Complete!
```

Support for YUM Groups

The support for YUM groups is part of the package management. It simplifies the management of the packages for the administrators and it provides greater flexibility.

The administrators can group a list of packages (RPMs) into a logical group and they can perform various operations. YUM supports the following group commands:

- grouplist
- groupinfo
- groupinstall
- groupremove
- groupupdate

YUM groups can be broadly classified as L2, L3, routing, and management.

Using the grouplist Command

In Linux, number of packages are bundled to particular group. Instead of installing individual packages with yum, you can install particular group that will install all the related packages that belongs to the group. For example to list all the available groups, use the **yum grouplist** command:

```
bash-4.2# sudo yum grouplist

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
Setting up Group Process
groups-repo

                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
groups-repo/group

                      | 1.6 kB     00:00 ...
Installed Groups:
   L2
   L3
   management
Available Groups:
   routing
Done

bash-4.3$
```

Using the groupmembers Command

Use **yum groupinfo** command to display the description and the contents of a package group. The command lists out the feature members of the group.

```
bash-4.2# sudo yum groupinfo l2


Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
Setting up Group Process
groups-repo

                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
```

```
Group: L2
 Mandatory Packages:
   lacp
   lldp
   svi
   vtp
```

Using the groupinstall Command

This command is for both install and upgrade of the members RPM. If the member is not installed, it will install the highest version available. If the member is already installed and higher RPM is available, it will upgrade that member.

```
bash-4.2# sudo yum groupinstall routing

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo

                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
Setting up Group Process
Package ospf-2.0.0.0-9.2.1.lib32_n9000 already installed and latest version
Resolving Dependencies
--> Running transaction check
---> Package bgp.lib32_n9000 0:2.0.0.0-9.2.1 will be installed
---> Package eigrp.lib32_n9000 0:2.0.0.0-9.2.1 will be installed
---> Package isis.lib32_n9000 0:2.0.0.0-9.2.1 will be installed
---> Package rip.lib32_n9000 0:2.0.0.0-9.2.1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package                Arch                                        Version
                                          Repository                    Size
================================================================================
Installing:
 bgp                    lib32_n9000                                  2.0.0.0-9.2.1
                                        groups-repo                   2.4 M
 eigrp                  lib32_n9000                                  2.0.0.0-9.2.1
                                        groups-repo                   428 k
 isis                   lib32_n9000                                  2.0.0.0-9.2.1
                                        groups-repo                   1.2 M
 rip                    lib32_n9000                                  2.0.0.0-9.2.1
                                        groups-repo                   214 k
Transaction Summary
================================================================================
Install       4 Packages

Total download size: 4.2 M
```

```
Installed size: 19 M
Is this ok [y/N]: y
Downloading Packages:
--------------------------------------------------------------------------------
Total

            132 MB/s | 4.2 MB     00:00
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : rip-2.0.0.0-9.2.1.lib32_n9000

                                    1/4
starting pre-install package version mgmt for rip
pre-install for rip complete
starting post-install package version mgmt for rip
post-install for rip complete
  Installing : isis-2.0.0.0-9.2.1.lib32_n9000

                                    2/4
starting pre-install package version mgmt for isis
pre-install for isis complete
starting post-install package version mgmt for isis
post-install for isis complete
  Installing : eigrp-2.0.0.0-9.2.1.lib32_n9000

                                    3/4
starting pre-install package version mgmt for eigrp
pre-install for eigrp complete
starting post-install package version mgmt for eigrp
post-install for eigrp complete
  Installing : bgp-2.0.0.0-9.2.1.lib32_n9000

                                    4/4
starting pre-install package version mgmt for bgp
pre-install for bgp complete
starting post-install package version mgmt for bgp
post-install for bgp complete

Installed:
  bgp.lib32_n9000 0:2.0.0.0-9.2.1                   eigrp.lib32_n9000 0:2.0.0.0-9.2.1
             isis.lib32_n9000 0:2.0.0.0-9.2.1                   rip.lib32_n9000
0:2.0.0.0-9.2.1

Complete!
```

Using the groupupdate Command

Use the **yum groupupdate** command to update any existing installed group packages.

```
bash-4.3# yum groupupdate routing

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo

                     | 1.1 kB     00:00 ...
localdb
```

```
                    |  951 B     00:00 ...
localdb/primary

                    | 1.9 kB     00:00 ...
localdb

                                       6/6
patching

                    |  951 B     00:00 ...
thirdparty

                    |  951 B     00:00 ...
Setting up Group Process
Resolving Dependencies
--> Running transaction check
---> Package bgp.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package bgp.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
---> Package eigrp.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package eigrp.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
---> Package isis.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package isis.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
---> Package ospf.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package ospf.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
---> Package rip.lib32_n9000 0:2.0.0.0-9.2.1 will be updated
---> Package rip.lib32_n9000 0:2.0.1.0-9.2.1 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package                    Arch                                          Version
                                                Repository              Size
================================================================================
Updating:
 bgp                     lib32_n9000                                   2.0.1.0-9.2.1
                                                localdb                 2.4 M
 eigrp                   lib32_n9000                                   2.0.1.0-9.2.1
                                                locald                  428 k
 isis                    lib32_n9000                                   2.0.1.0-9.2.1
                                                local                   1.2 M
 ospf                    lib32_n9000                                   2.0.1.0-9.2.1
                                                localdb                 2.8 M
 rip                     lib32_n9000                                   2.0.1.0-9.2.1
                                                localdb                 214 k
Transaction Summary
================================================================================
Upgrade       5 Packages

Total download size: 7.0 M
Is this ok [y/N]: y
Downloading Packages:
--------------------------------------------------------------------------------
Total

            269 MB/s | 7.0 MB     00:00
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Updating   : eigrp-2.0.1.0-9.2.1.lib32_n9000

                                   1/10
```

```
starting pre-install package version mgmt for eigrp
pre-install for eigrp complete
starting post-install package version mgmt for eigrp
post-install for eigrp complete
  Updating   : ospf-2.0.1.0-9.2.1.lib32_n9000

                                  2/10
starting pre-install package version mgmt for ospf
pre-install for ospf complete
starting post-install package version mgmt for ospf
post-install for ospf complete
  Updating   : rip-2.0.1.0-9.2.1.lib32_n9000

                                  3/10
starting pre-install package version mgmt for rip
pre-install for rip complete
starting post-install package version mgmt for rip
post-install for rip complete
  Updating   : isis-2.0.1.0-9.2.1.lib32_n9000

                                  4/10
starting pre-install package version mgmt for isis
pre-install for isis complete
starting post-install package version mgmt for isis
post-install for isis complete
  Updating   : bgp-2.0.1.0-9.2.1.lib32_n9000

                                  5/10
starting pre-install package version mgmt for bgp
pre-install for bgp complete
starting post-install package version mgmt for bgp
post-install for bgp complete
  Cleanup    : bgp-2.0.0.0-9.2.1.lib32_n9000

                                  6/10
  Cleanup    : isis-2.0.0.0-9.2.1.lib32_n9000

                                  7/10
  Cleanup    : rip-2.0.0.0-9.2.1.lib32_n9000

                                  8/10
  Cleanup    : ospf-2.0.0.0-9.2.1.lib32_n9000

                                  9/10
  Cleanup    : eigrp-2.0.0.0-9.2.1.lib32_n9000

                                 10/10

Updated:
  bgp.lib32_n9000 0:2.0.1.0-9.2.1       eigrp.lib32_n9000 0:2.0.1.0-9.2.1
isis.lib32_n9000 0:2.0.1.0-9.2.1      ospf.lib32_n9000 0:2.0.1.0-9.2.1      rip.lib32_n9000
 0:2.0.1.0-9.2.1

Complete!
```

Using the grouperase Command

Use the **yum grouperase** command to delete the groups or all the RPM members of the group.

```
bash-4.3$ sudo yum grouperase routing

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
```

```
Setting up Group Process
groups-repo

                     | 1.1 kB     00:00 ...
localdb

                     |  951 B     00:00 ...
patching

                     |  951 B     00:00 ...
thirdparty

                     |  951 B     00:00 ...
Resolving Dependencies
--> Running transaction check
---> Package bgp.lib32_n9000 0:2.0.0.0-9.2.1 will be erased
---> Package eigrp.lib32_n9000 0:2.0.0.0-9.2.1 will be erased
---> Package isis.lib32_n9000 0:2.0.0.0-9.2.1 will be erased
---> Package ospf.lib32_n9000 0:2.0.0.0-9.2.1 will be erased
---> Package rip.lib32_n9000 0:2.0.0.0-9.2.1 will be erased
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================

 Package             Arch                                          Version
                                        Repository                   Size
================================================================================
Removing:
 bgp                 lib32_n9000                                   2.0.0.0-9.2.1
                                        @groups-repo                 11 M
 eigrp               lib32_n9000                                   2.0.0.0-9.2.1
                                        @groups-repo                2.0 M
 isis                lib32_n9000                                   2.0.0.0-9.2.1
                                        @groups-repo                5.7 M
 ospf                lib32_n9000                                   2.0.0.0-9.2.1
                                        @groups-repo                15 M
 rip                 lib32_n9000                                   2.0.0.0-9.2.1
                                        @groups-repo                1.0 M

Transaction Summary
================================================================================
Remove        5 Packages

Installed size: 34 M
Is this ok [y/N]: y
Downloading Packages:
Running Transaction Check
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Erasing    : isis-2.0.0.0-9.2.1.lib32_n9000

                                    1/5
starting pre-remove package version mgmt for isis
pre-remove for isis complete
  Erasing    : ospf-2.0.0.0-9.2.1.lib32_n9000

                                    2/5
starting post-remove package version mgmt for isis
post-remove for isis complete
starting pre-remove package version mgmt for ospf
pre-remove for ospf complete
```

```
  Erasing    : eigrp-2.0.0.0-9.2.1.lib32_n9000

                                     3/5
starting post-remove package version mgmt for ospf
post-remove for ospf complete
starting pre-remove package version mgmt for eigrp
pre-remove for eigrp complete
  Erasing    : rip-2.0.0.0-9.2.1.lib32_n9000

                                     4/5
starting post-remove package version mgmt for eigrp
post-remove for eigrp complete
starting pre-remove package version mgmt for rip
pre-remove for rip complete
  Erasing    : bgp-2.0.0.0-9.2.1.lib32_n9000

                                     5/5
starting post-remove package version mgmt for rip
post-remove for rip complete
starting pre-remove package version mgmt for bgp
pre-remove for bgp complete

Removed:
  bgp.lib32_n9000 0:2.0.0.0-9.2.1       eigrp.lib32_n9000 0:2.0.0.0-9.2.1
isis.lib32_n9000 0:2.0.0.0-9.2.1      ospf.lib32_n9000 0:2.0.0.0-9.2.1      rip.lib32_n9000
 0:2.0.0.0-9.2.1

Complete!
```

Finding Repositories

This command lists the repositories that the switch has along with the number of RPMs it has to those repositories.

```
bash-4.3# yum repolist all

Loaded plugins: downloadonly, importpubkey, localrpmDB, patchaction, patching,
protect-packages
groups-repo

                      | 1.1 kB     00:00 ...
localdb

                      |  951 B     00:00 ...
patching

                      |  951 B     00:00 ...
thirdparty

                      |  951 B     00:00 ...
repo id
          repo name
                                   status
groups-repo
          Groups-RPM Database
                                   enabled: 37
localdb
          Local RPM Database
                                   enabled:  6
patching
          Patch-RPM Database
```

```
                                enabled:  0
thirdparty
          Thirdparty RPM Database
                                enabled:  0
open-nxos
          open-nxos
                                disabled
repolist: 43
```

Finding the Installed YUM Version

See the following example for listing the installed YUM version:

```
yum --version
```

```
3.4.3
  Installed: rpm-5.4.14-r0.0.x86_64 at 2018-06-02 13:04
  Built    : Wind River <info@windriver.com> at 2018-04-27 08:36
  Committed: Wind River <info@windriver.com> at 2018-04-27

  Installed: yum-3.4.3-r9.0.x86_64 at 2018-06-02 13:05
  Built    : Wind River <info@windriver.com> at 2018-04-27 08:36
  Committed: Wind River <info@windriver.com> at 2018-04-27
```

Mapping the NX-OS CLI to the YUM Commands

See the following table for mapping the NX-OS CLI to the YUM commands:

Table 4: Patching Command Reference

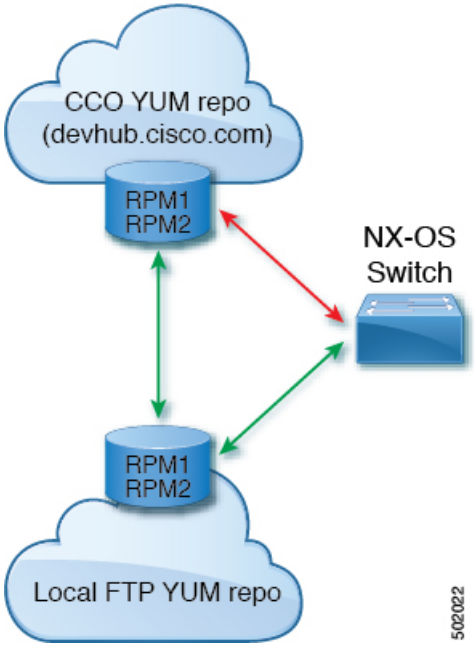
NX-OS CLI Commands	YUM Commands
show install inactive	**yum list --patch-only available**
show install active	**yum list --patch-only installed**
show install committed	**yum list --patch-only committed**
show install packages	**yum list --patch-only**
show install pkg-info	**yum info --patch-only**
show install log	**yum history --show-patch-log** where log_cmd: • opid= - Log that is specific to an operation ID. • last - Shows the latest operation log. • reverse – Shows the log in reverse order. • detail – Show detailed log. • from= - Shows logging from a specific operation ID.

NX-OS CLI Commands	YUM Commands
clear install log	**yum history --clear-patch-log=** where clear_log_cmd: • all - Clears the complete log. • - Clears the logs above this operation ID.
install add	**yum install --add bootflash:/**
install remove	**yum install --remove**
install remove inactive	**yum install --remove all**
install activate	**yum install --no-persist --nocommit** **Note** By default, all packages are activated and committed.
install deactivate	**yum erase --nocommit** **Note** By default, all packages are de-activated and committed.
install commit	**yum install --commit**
Install commit	**yum install --commit all**

Configuring an FTP server and Setting up a Local FTP YUM Repository

For setting up a local FTP YUM repository, you have to first create an FTP server, create a local FTP YUM repository, and configure the Cisco NX-OS switch to reach the FTP server as outlined in the following illustration.

Figure 2: Configuring an FTP server and Setting up a Local FTP YUM Repository



Note For Cisco NX-OS Release 10.1(1), visit https://devhub.cisco.com/artifactory/open-nxos/10.1.1/ for Cisco **open-nxos** repository.

Creating an FTP Server on Red Hat Enterprise Linux 7 (RHEL7) Virtual Machine

Complete the following steps to create an FTP server on Red Hat Enterprise Linux 7 (RHEL7) Virtual Machine (VM):

SUMMARY STEPS

1. **yum install vsftpd**
2. **systemctl start vsftpd**
3. **systemctl status vsftpd**
4. **firewall-cmd --zone=public --permanent --add-port=21/tcp**
5. **firewall-cmd --zone=public --permanent --add-service=ftp**
6. **firewall-cmd --reload**
7. **wget ftp://** *<ip of FTP server> /test.txt*

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**yum install vsftpd**	Installs vsftpd, an FTP server.
Step 2	**systemctl start vsftpd**	Starts the FTP Server.
Step 3	**systemctl status vsftpd**	Checks the status of the FTP Server.
Step 4	**firewall-cmd --zone=public --permanent --add-port=21/tcp**	Allows access to the FTP services from the external systems and opens port 21.
Step 5	**firewall-cmd --zone=public --permanent --add-service=ftp**	Adds the FTP service.
Step 6	**firewall-cmd --reload**	Reloads the server.
Step 7	**wget ftp://** *<ip of FTP server> /test.txt*	Hosts a file in the FTP server (for example, test.txt) and attempts Wget of that file. **Note** Note that **/var/ftp/** is the default home directory of the FTP server.

Creating a Local FTP YUM Repository

Complete the following steps to synchronize the external repository RPMs to the FTP server and create a local FTP YUM repository:

SUMMARY STEPS

1. **cat /etc/yum.repos.d/local.repo**
2. **yum repolist**
3. **nohup reposync -r** *<repo-name mentioned in the local.repo>* **-p** *<directory path to sync>***&**
4. **tail -f nouhup.out**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**cat /etc/yum.repos.d/local.repo** **Example:** `bash-4.3#cat /etc/yum.repos.d/local.repo` `[localrepo]` `name=localrepo`	Creates a repository file under **/etc/yum.repos.d/**, for example, creates **local.repo** repository and adds the base URL.

	Command or Action	Purpose
	baseurl= https://devhub.cisco.com/artifactory/open-nxos/7.0-3-I2-1/x86_64/ enabled=1 gpgcheck=0 sslverify=0	
Step 2	**yum repolist** **Example:** bash-4.3# yum repolist Loaded plugins: fastestmirror, langpacks Loading mirror speeds from cached hostfile * base: mirror.dhakacom.com * extras: mirror.dhakacom.com * updates: mirror.dhakacom.com repo id repo name status base/7/x86_64 CentOS-7 - Base 9,911 extras/7/x86_64 CentOS-7 - Extras 313 localrepo localrepo 687 updates/7/x86_64 CentOS-7 - Updates 711 repolist: 11,622	Checks the reachability of the repository.
Step 3	**nohup reposync -r** <*repo-name mentioned in the local.repo*> **-p** <*directory path to sync*>**&** **Example:** nohup reposync -r localrepo -p /var/ftp/ & This command creates a directory with the name **local.repo** inside **/var/ftp/** and downloads all the packages from **devhub.cisco.com** to the directory.	Synchronizes all the packages from the external repository to the FTP server home directory.
Step 4	**tail -f nouhup.out**	Checks the status of the synchronization.

Configuring a Switch to Reach an FTP Server

Complete the following steps to configure a switch to reach an FTP server:

SUMMARY STEPS

1. **run bash sudo su**
2. **ip netns exec management ping** <*ip_address*>
3. **cat /etc/yum/repos.d/ftp.repo**
4. **ip netns exec management bash**
5. **yum repolist**
6. **yum list available**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**run bash sudo su**	Logs in as a sudo user.
Step 2	**ip netns exec management ping** <*ip_address*>	Checks the reachability of the FTP server address from the switch using the **ping** command.
Step 3	**cat /etc/yum/repos.d/ftp.repo** **Example:** `bash-4.3# cat /etc/yum/repos.d/ftp.repo` `[ftp]` `name=ftp` `baseurl=ftp://198.51.100.1/localrepo/` `enabled=1` `gpgcheck=0` `sslverify=0`	Creates a repository file on the switch with the FTP server address as the URL.
Step 4	**ip netns exec management bash**	Uses the Bash shell prompt.
Step 5	**yum repolist** **Example:** `bash-4.3# yum repolist` `Loaded plugins: downloadonly, importpubkey,` `localrpmDB, patchaction, patching,` `: protect-packages` `groups-repo | 1.1 kB 00:00 ...` `localdb | 951 B 00:00 ...` `patching | 951 B 00:00 ...` `thirdparty | 951 B 00:00 ...` `thirdparty/primary | 758 B 00:00 ...` `thirdparty 1/1` `repo id repo name status` `groups-repo Groups-RPM Database 37` `localdb Local RPM Database 0` `patching Patch-RPM Database 0` `thirdparty Thirdparty RPM Database 1` `ftp ftp 686` `repolist: 724`	Checks the reachability of newly created repository.
Step 6	**yum list available**	Lists the available packages in the new repository.

Creating User Roles for Install Operation

The **install** command is only available to the users of admin role. The **install** command can be available to a user by RBAC. See *Guidelines and Limitations for User Accounts and RBAC* for the same in the *Cisco Nexus 3600 NX-OS Security Configuration Guide*.