Verify Virtual Machines in eXR

Contents

Introduction

This document describes the virtualization architecture of Cisco devices running Enhanced XR (eXR) software.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document applies to any XR platform running eXR software.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background Information

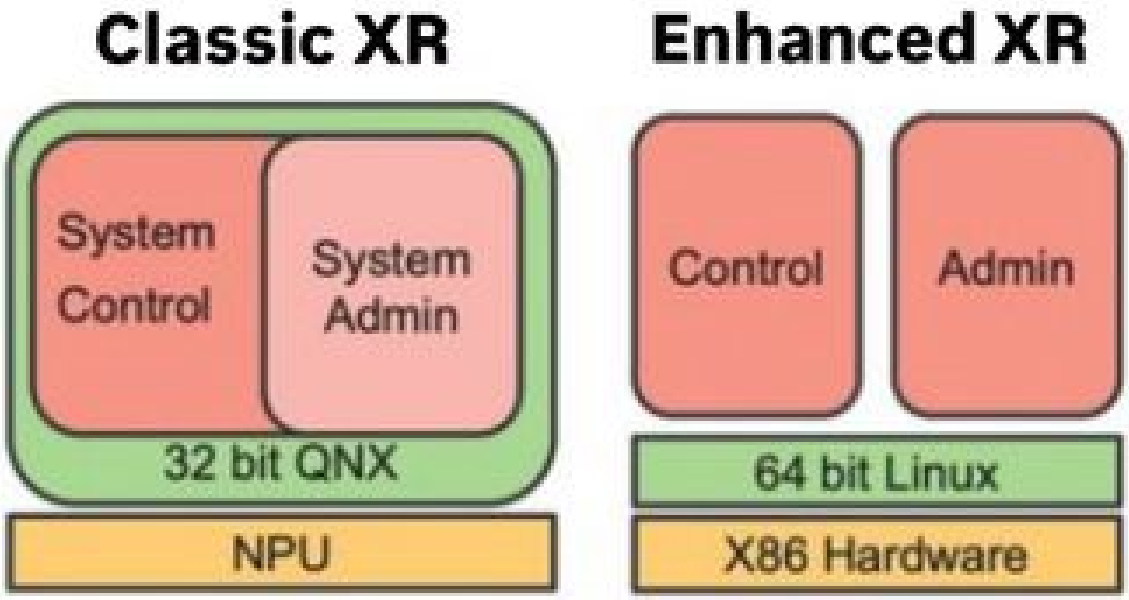
eXR represents the next evolutionary step in the development of Cisco IOS® XR, designed to meet the demands of modern network environments. It is specifically tailored to deliver the advanced capabilities of IOS XR to Web-scale Operators, and cloud-focused customers, enabling them to achieve high scalability, fault isolation, and operational efficiency in highly dynamic and distributed network architectures.

eXR, a 64-bit architecture, marks a significant advancement over the 32-bit cXR platform. Built on a 64-bit Linux foundation, eXR introduces a modernized design with several key enhancements:

- 64-Bit Linux Kernel: eXR leverages the power of a 64-bit Linux kernel, enabling better performance,

scalability, and support for modern hardware architectures.

- Separation of Planes:
  Sysadmin VM and XR VM are cleanly separated, providing enhanced fault isolation and operational reliability.
  This separation ensures that issues in one plane do not affect the functionality or performance of the other.
- Virtual Machine (VM) Architecture:
  eXR utilizes Linux-based Virtual Machines (VMs) for both the Admin and Routing planes.
  This architecture enables features like VM reload support, allowing individual VMs to be restarted without impacting the entire system.



Virtual Machines

The ASR9K platform utilizes Virtual Machines (VMs) for its virtualization architecture, while the NCS5000 and NCS5500 platforms leverage Linux Containers (LXCs). Despite the difference in their underlying technologies, both VMs and LXCs deliver equivalent functionalities, ensuring consistent performance and capabilities across these platforms.

Virtual Machines (VMs) are deployed across all Route Processors (RPs) and Line Cards (LCs) to support a modular and efficient virtualization architecture. Each node operates with two VMs:

- Each node runs:
  - 1 SysAdmin VM (Calvados)
  - 1 XR VM (Default-SDR)

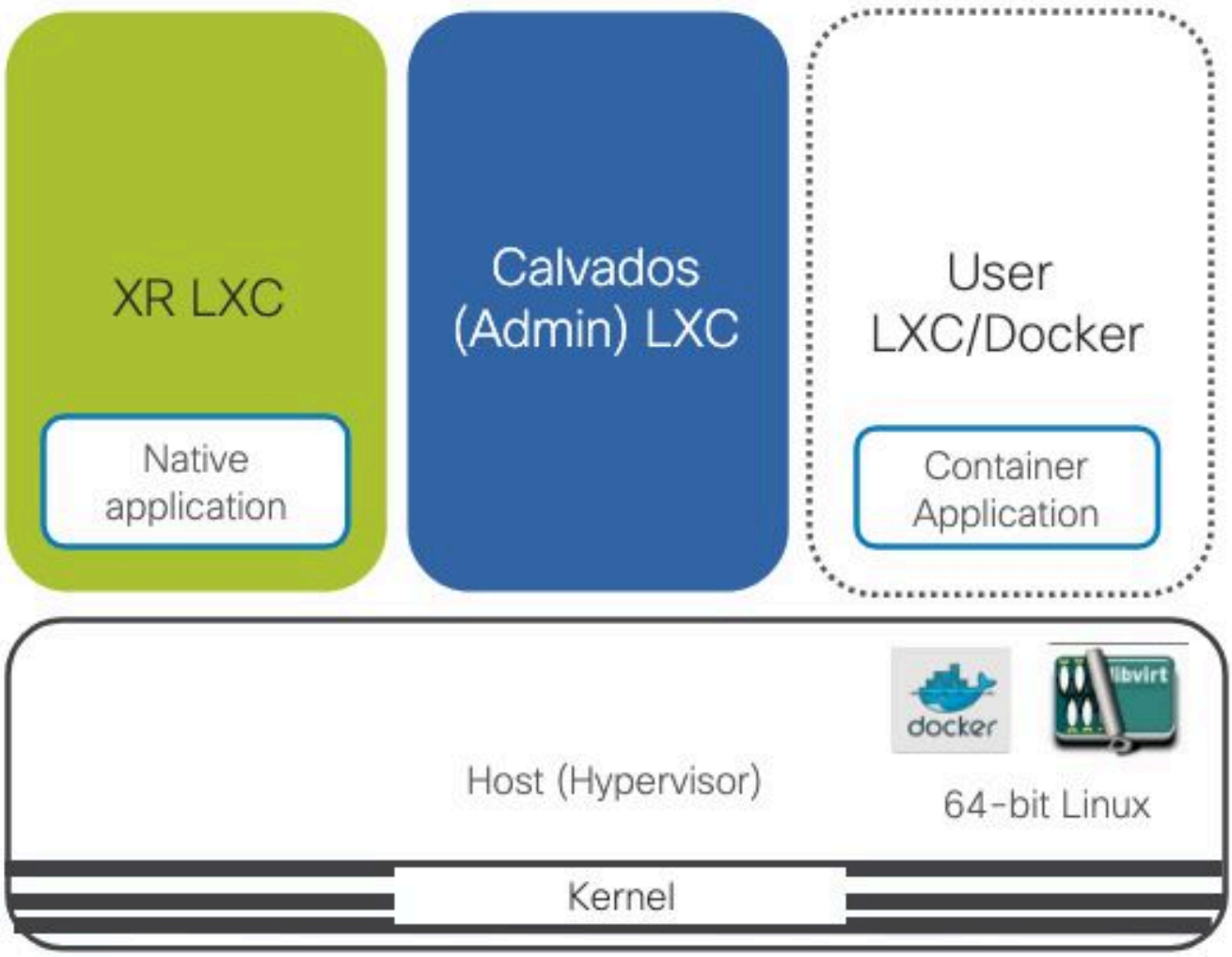
1 - SysAdmin VM:

- Helps in Control Plane, managing hardware-level operations and system access.
- Provides a dedicated plane for hardware management and administrative access.

2 - XR VM:

- Helps in Data Plane, handling routing protocols and forwarding operations.

- Offers a separate plane for managing routing protocols and network configurations



Cisco IOS eXR Architecture.

Virtual Machines Verification

The status of each Virtual Machine (VM) can be thoroughly checked and monitored using these commands:

```
RP/0/RSP0/CPU0:router#admin
sysadmin-vm:0_RSP0# show vm
Location: 0/3
Id                Status        IP Address       HB Sent/Recv
--------------------------------------------------------------
sysadmin          running       192.0.2.1        NA/NA
default-sdr       running       192.0.2.3        231194/231194

Location: 0/RSP0
Id                Status        IP Address       HB Sent/Recv
--------------------------------------------------------------
sysadmin          running       192.0.0.1        NA/NA
default-sdr       running       192.0.0.4        4623686/4623686

Location: 0/RSP1
Id                Status        IP Address       HB Sent/Recv
--------------------------------------------------------------
```

```
sysadmin          running       192.0.0.6        NA/NA
default-sdr       running       192.0.0.5        4623453/4623450
sysadmin-vm:0_RSP0# exit
RP/0/RSP0/CPU0:router#show platform vm
Node name       Node type       Partner name    SW status       IP address
--------------- --------------- --------------- --------------- ---------------
0/RSP0/CPU0     RP (ACTIVE)     0/RSP1/CPU0     FINAL Band      192.0.0.4
0/RSP1/CPU0     RP (STANDBY)    0/RSP0/CPU0     FINAL Band      192.0.0.5
0/3/CPU0        LC (ACTIVE)     NONE            FINAL Band      192.0.2.3

RP/0/RSP0/CPU0:router#
```

In IOS XR, the status "RUN" displayed for the Route Processor (RP) or Line Card (LC) signifies that the XR Virtual Machine (XR VM) is active and the IOS XR software is fully operational.

Additionally, the HW state (OPERATIONAL) indicates that the hardware is powered on and functioning correctly, while the SW state (OPERATIONAL) confirms that the Sysadmin Virtual Machine (Sysadmin VM) is up, running, and managing the system as expected.

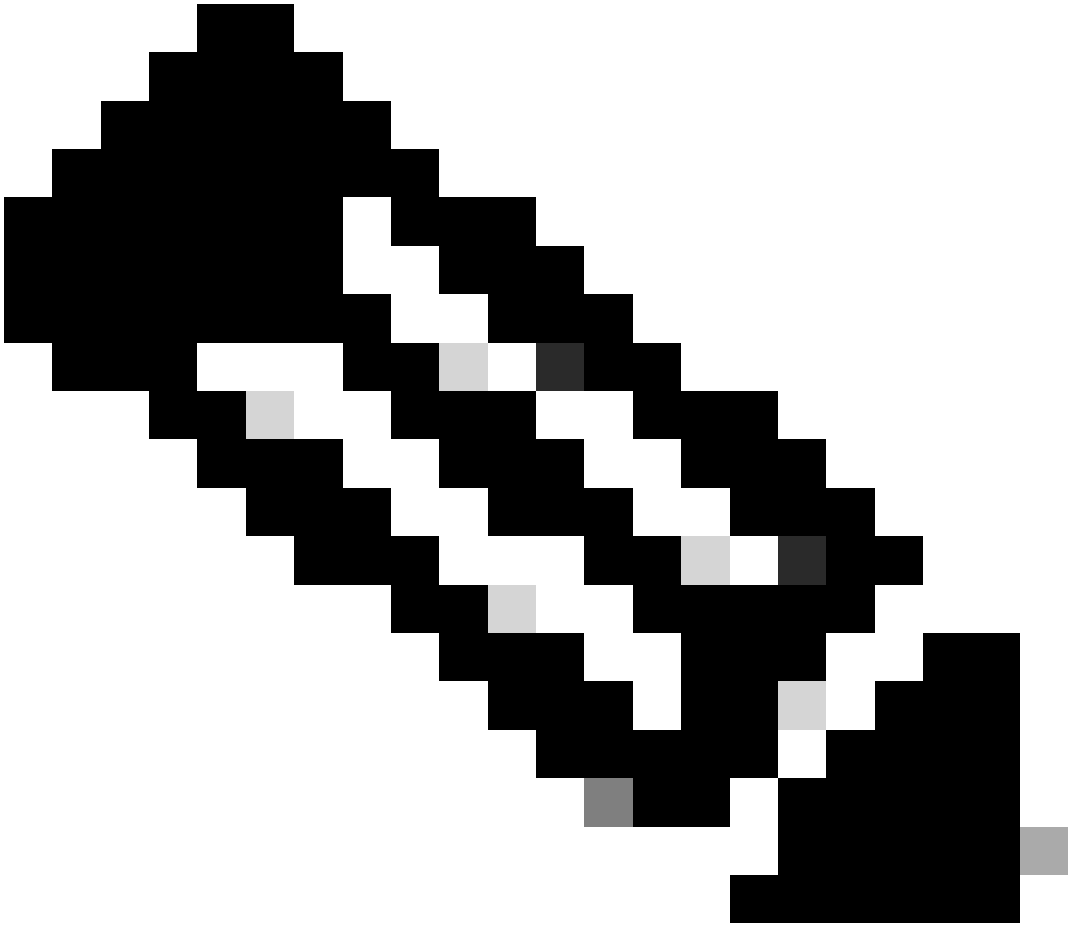
Validate the state of Virtual Machines (VMs) by using the commands **show platform** and **admin show platform**.

```
RP/0/RSP0/CPU0:router#show platform
Node               Type                       State             Config state
--------------------------------------------------------------------------------
0/RSP0/CPU0        A9K-RSP5-SE(Active)        IOS XR RUN        NSHUT
0/RSP1/CPU0        A9K-RSP5-SE(Standby)       IOS XR RUN        NSHUT
0/3/CPU0           A9K-4HG-FLEX-SE            IOS XR RUN        NSHUT

RP/0/RSP0/CPU0:router#admin show platform
Location  Card Type               HW State      SW State      Config State
------------------------------------------------------------------------------
0/RSP0    A9K-RSP5-SE             OPERATIONAL   OPERATIONAL   NSHUT
0/RSP1    A9K-RSP5-SE             OPERATIONAL   OPERATIONAL   NSHUT
0/3       A9K-4HG-FLEX-SE         OPERATIONAL   OPERATIONAL   NSHUT
RP/0/RSP0/CPU0:router#
```

eXR VM Access

For troubleshooting purposes, it is possible to establish connections to the various VM card locations, allowing direct access to individual components.



Note: Commands were executed on an NCS5500 device within a controlled lab environment for testing and validation purposes.

To connect from XR VM to another XR VM location:

Example: attach location x/y/CPU0

```
RP/0/RP0/CPU0:NCS-5500#attach location 0/1/CPU0
export PS1='#'
[xr-vm_node0_1_CPU0:~]$export PS1='#'
#
```

To access the SysAdmin VM from the active XR VM, simply enter the command **admin**:

Example: admin

```
RP/0/RP0/CPU0:NCS-5500#admin
sysadmin-vm:0_RP1#
```

To connect from SysAdmin VM to another SysAdmin VM location:

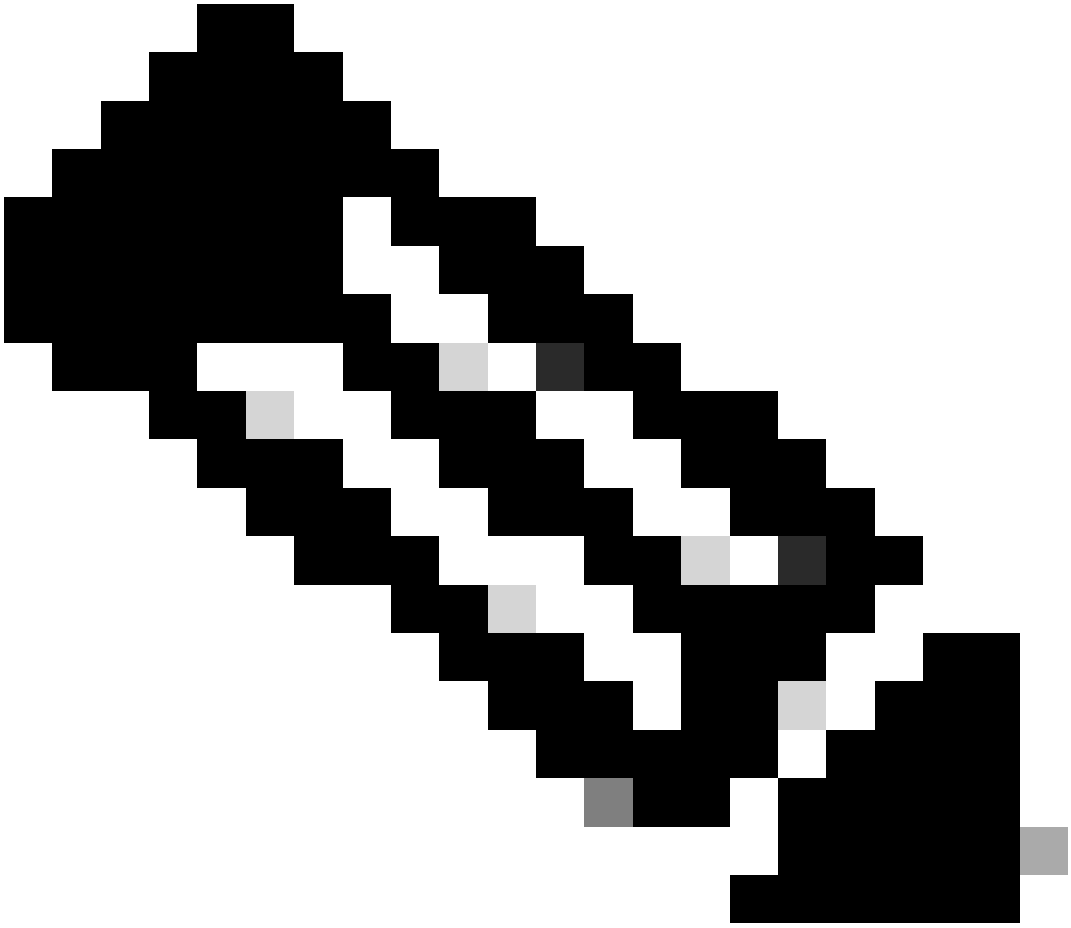
Example: (admin) attach location x/y

```
sysadmin-vm:0_RP1# attach location 0/3
[sysadmin-vm:0_3:~]$
```

Access to HOST OS Linux:

Example: ssh 10.0.2.16

```
sysadmin-vm:0_RP1# attach location 0/RP0
[sysadmin-vm:0_RP0:~]$ ssh 10.0.2.16
[host:0_RP0:~]$
```

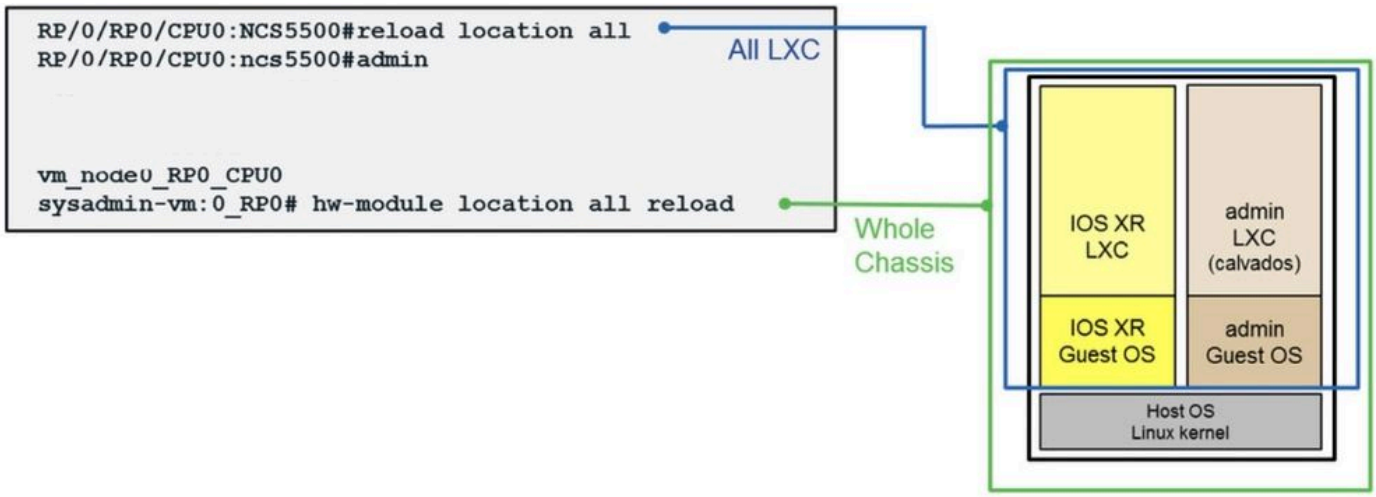


Note: To exit from any VM plane, simply type the **exit** command. This terminates the current session and returns you to the previous system level.

eXR VM Restart

In classic XR, the choice between the **reload** command and the **hw-module reload** command was largely inconsequential, as both achieved similar outcomes. However, in eXR, these commands serve distinct purposes and perform different actions:

- The reload command performs a fast software reload, restarting the Linux Containers (LXCs) while leaving the host operating system (OS) and Linux kernel unaffected. This results in a quicker, less disruptive software-level reset.
- The hw-module **reload** command initiates a full hardware reload, restarting the entire card, including the host OS and Linux kernel.



eXR VM File System

Within both the XR VM and the SysAdmin VM, it is possible to navigate through their various directories, such as harddisk: and disk0:

1- XR VM:

```
[xr-vm_node0_RP0_CPU0:~]$cd /
[xr-vm_node0_RP0_CPU0:/]$ls  -l
drwxr-xr-x.   14 root root   1720 Apr  9 11:40 dev
lrwxrwxrwx.    1 root root     13 Jan 11 13:53 disk0: -> /misc/scratch
lrwxrwxrwx.    1 root root     11 Jan 11 13:41 harddisk: -> /misc/disk1
<SNIP>
[xr-vm_node0_RP0_CPU0:/]$cd /misc/disk1
[xr-vm_node0_RP0_CPU0:/misc/disk1]$ls -l
-rwxr--r--. 1 root root 2249461760 Jan 11 13:25 NCS5500-iosxr-k9-7.11.2.tar
<SNIP>
[xr-vm_node0_RP0_CPU0:/]$exit

RP/0/RP0/CPU0:NCS-5500#dir harddisk: | in iosxr
Thu Jun 12 01:16:02.195 UTC
    87 -rwxr--r--. 1 2249461760 Jan 11 13:25 NCS5500-iosxr-k9-7.11.2.tar
RP/0/RP0/CPU0:NCS-5500#
```

2- SysAdmin VM:

```
[sysadmin-vm:0_RP0:/]$ls -l
lrwxrwxrwx.    1 root root     12 Jan 11 13:51 config -> /misc/config
lrwxrwxrwx.    1 root root     13 Jan 11 13:51 disk0: -> /misc/scratch
lrwxrwxrwx.    1 root root     11 Jan 11 13:51 harddisk: -> /misc/disk1
<SNIP>
[sysadmin-vm:0_RP0:~]$cd /misc/scratch
[sysadmin-vm:0_RP0:/misc/scratch]$ls -l
total 688
--wS---r-t. 1 root root 154805 Jul 23  2024 calvados_log_aaad_0_0.out
--w----r-x. 1 root root 150475 Jul 10  2024 calvados_log_aaad_0_0.out.1.gz
--w----r-x. 1 root root 150439 Jul  7  2024 calvados_log_aaad_0_0.out.2.gz
```

```
[sysadmin-vm:0_RP0:/misc/scratch]$exit

sysadmin-vm:0_RP0# dir disk0: | in aaad_0_0
  36 --w----r-x. 1 150475 Jul 10  2024 calvados_log_aaad_0_0.out.1.gz
  13 --wS---r-t. 1 154805 Jul 23  2024 calvados_log_aaad_0_0.out
  42 --w----r-x. 1 150439 Jul  7  2024 calvados_log_aaad_0_0.out.2.gz
sysadmin-vm:0_RP0#
```

eXR VM Show Tech-support

Show tech-support files store in the XR VM in this location:

Example: dir harddisk:showtech

```
RP/0/RP0/CPU0:NCS-5500#dir harddisk:showtech
Directory of harddisk:showtech
915772 -rw-r--r--. 1 428689 Apr 11 03:58 showtech-shelf_mgr-admin-2025-Apr-11.033239.UTC.tgz
915835 drwxr-xr-x. 2 4096 May 15 04:28 showtech-NCS-5508-A-mpls-lsd-2025-May-15.042841.UTC
```

Show tech-support files store in the SysAdmin VM in this location:

Example: (admin) dir harddisk:/showtech

```
RP/0/RP0/CPU0:NCS-5500#admin
sysadmin-vm:0_RP0#  dir harddisk:/showtech
Wed Jun  11 23:27:36.164 UTC+00:00
total 1096
521219 -rw-r--r--. 1 1118635 Jun 11 22:40 showtech-fabric-admin-2025-Jun-11.223345.UTC.tgz
15620508 kbytes total (14757516 kbytes free)
sysadmin-vm:0_RP0#
```

Showtech collected in SysAdmin plane can be copy to XR plane :

Example: sysadmin-vm:0_RP0#copy <src file> <dest file> location <0/RP0/CPU0-default-sdr>

```
sysadmin-vm:0_RP0# show tech-support HBloss
Waiting for gathering to complete
....
Compressing show tech output
Show tech output available at /misc/disk1//showtech/showtech-HBloss-admin-2025-Jun-12.002004.UTC.tgz
++ Show tech end time: 2025-Jun-12.002028.UTC ++

sysadmin-vm:0_RP0# dir harddisk:/showtech
56 -rw-r--r--. 1 11411081 Jun 12 00:20 showtech-HBloss-admin-2025-Jun-12.002004.UTC.tgz
5827624 kbytes total (5007416 kbytes free)

sysadmin-vm:0_RP0#exit
RP/0/RP0/CPU0:NCS-5500#dir harddisk:/ | in HB
RP/0/RP0/CPU0:NCS-5500#
```

```
sysadmin-vm:0_RP0# copy harddisk:/showtech/showtech-HBloss-admin-2025-Jun-12.002004.UTC.tgz harddisk: l
Copying harddisk:/showtech/showtech-HBloss-admin-2025-Jun-12.002004.UTC.tgz to harddisk:
showtech-HBloss-admin-2025-Jun-12.002004.UTC.tgz
File copied successfully
sysadmin-vm:0_RP0# exit

RP/0/RP0/CPU0:NCS-5500#dir harddisk:/ | in HB
   107 -rw-r--r--. 1   11411081 Jun 12 00:22 showtech-HBloss-admin-2025-Jun-12.002004.UTC.tgz
RP/0/RP0/CPU0:NCS-5500#
```

Related Information

- Cisco Technical Support & Downloads
- Tech-Support Commands
- File System Commands on Cisco IOS XR Software