



Difference Between Cisco IOS XR 32-bit and 64-bit OS

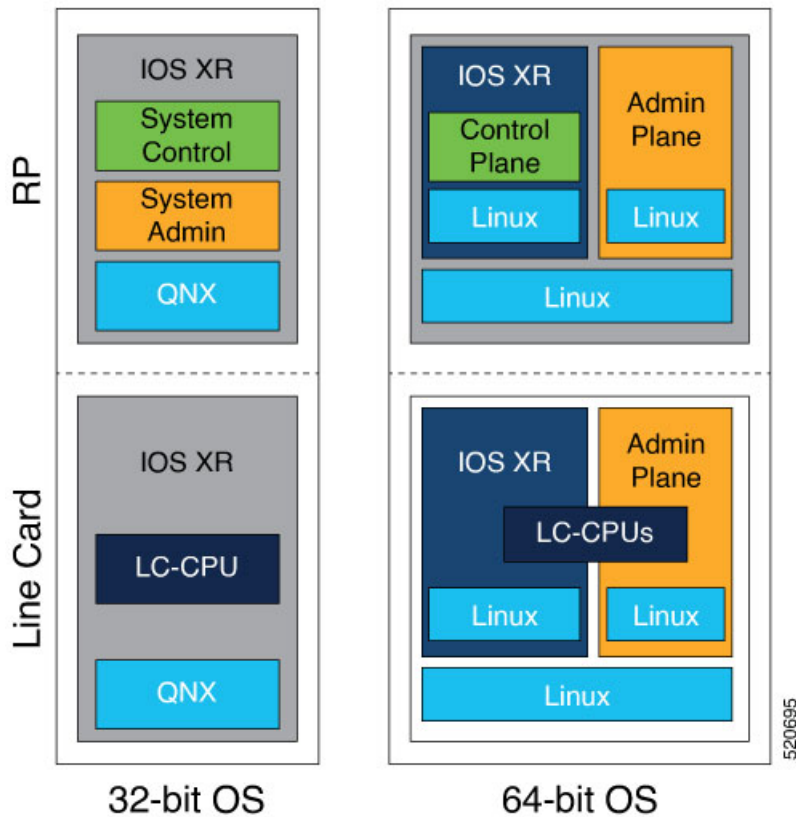
This section provides the differences between Cisco IOS XR 32-bit and 64-bit operating system on the ASR 9000 series routers.

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Architectural Difference Between 32-bit and 64-bit OS

The following image shows the architectural difference between 32-bit and 64-bit OS.

Figure 1: Architectural Difference Between 32-bit and 64-bit OS

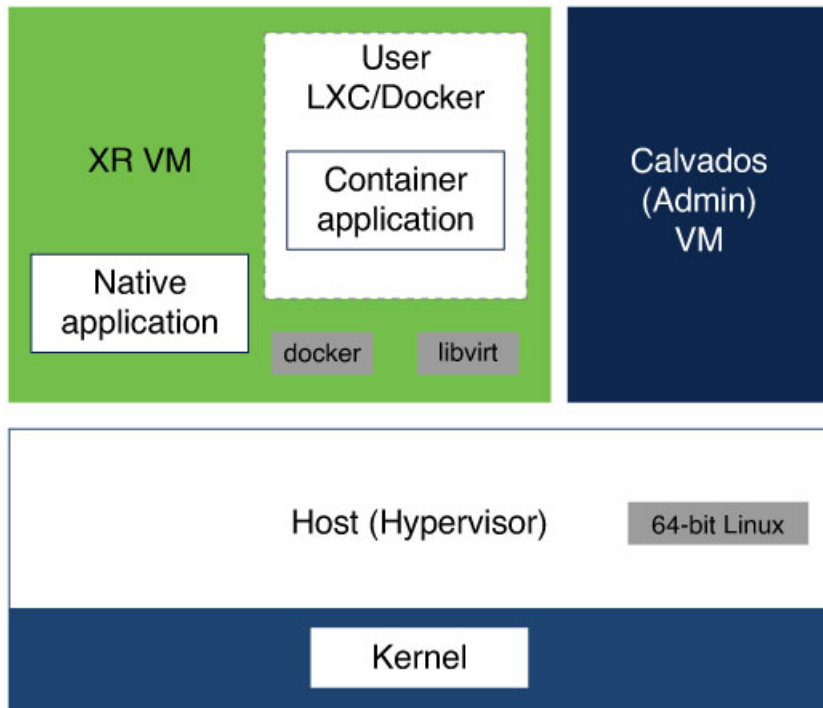


Understanding the IOS XR 64-bit Architecture

IOS XR 64-bit OS runs in two variants:

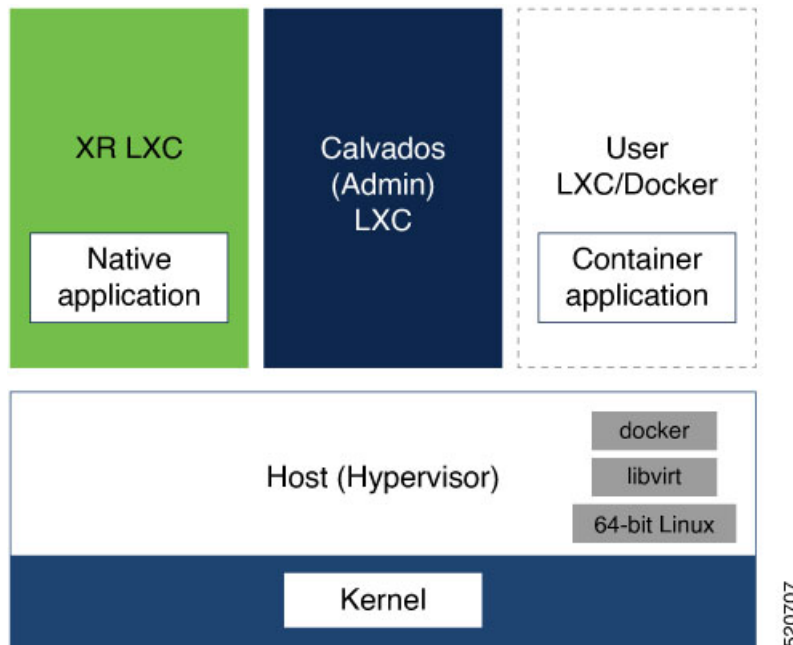
- VM-based 64-bit software:
 - Supported platforms: ASR 9000, NCS 6000
 - VM OS is separate from Host OS.

Figure 2: VM-based 64-bit OS Architecture



- Container-based 64-bit software:
 - Supported platforms: NCS 5500, NCS 5000
 - Container (LXC) OS shares the same kernel as the Host OS
 - Light-weight architecture

Figure 3: LXC-based 64-bit OS Architecture



The architecture includes the following common components:

- **Host (Hypervisor):** The host is the underlying 64-bit operating system that acts as the hypervisor. The XR VM/LXC and the Admin VM/LXC spawn on the hypervisor. It also runs the container/VM daemons like `libvirt` and `docker` to spawn the XR and Calvados instances.
- **XR VM:** The IOS XR control plane processes run within an isolated VM/LXC. This VM/LXC contains the IOS XR control plane processes (protocol stacks such as BGP, ISIS, OSPF, internal database, APIs, and so on). The XR VM brings its own kernel and runs the `libvirt` daemon and the `docker` daemon inside the XR VM. The `User LXC/Docker` containers are spawned inside XR VM unlike LXC-based platforms where the user containers are spawned on the Host kernel.
- **Admin VM:** Admin VM/LXC, called Calvados, is the first instance that comes up once the Host layer is up. The admin VM/LXC therefore helps handle the lifecycle of the XR VM/LXC. The primary purpose of Calvados is to enable multi-tenancy on the same router by spawning multiple IOS XR instances. These instances act as separate logical routers (secure domain routers (SDRs)).

For more information, see the [Data Sheet](#). For blogs and tutorials, see [xrdocs.io](#).

Operational Differences Between 32-bit and 64-bit OS on ASR 9000 Series Routers

This section outlines the architectural and operational differences between 32-bit and 64-bit routers at a high level.

Category	IOS XR 32-bit OS	IOS XR 64-bit OS
Kernel	QNX	Linux

Category	IOS XR 32-bit OS	IOS XR 64-bit OS
Control plane	The IOS XR control plane and feature configurations are unchanged.	
Virtualization	No virtualization All applications run as different processes.	Two VMs: Sysadmin VM and XR VM on isolated RP/LC CPU.
Management LAN0	Visible in XR plane to perform management services.	Visible in XR VM to perform management services.
Management LAN1		Visible in Sysadmin VM to perform file transfer (install and file copy).
Console and Aux ports	-	Console port directs to the XR VM. Aux port directs to the Sysadmin VM.
Software packaging	<ul style="list-style-type: none"> • PIE-based packages. • Special VM image for fresh installation (Turboboot). 	<ul style="list-style-type: none"> • ISO/RPM based packages. • ISO image for bootup and fresh installation. • Flexible Golden ISO (GISO) image. • Offline RPM-based package management.
Boot facility	<ul style="list-style-type: none"> • Install CLI-based boot • ROMMON: TFTP network boot • USB boot 	<ul style="list-style-type: none"> • Boot directly from ISO using: <ul style="list-style-type: none"> • Local settings • DHCP • USB • Install CLI using TFTP/FTP/SFTP/HTTP/HTTPS • ZTP support
File check system	Run the fsck command to check the status of the file system.	The file system is checked automatically during the bootup process, eliminating the need to run the command manually.

Category	IOS XR 32-bit OS	IOS XR 64-bit OS
Chassis reload	<p>No VMs. The reload happens at hardware module (each RSP/RP/LC) or at entire chassis level.</p> <ul style="list-style-type: none"> • Run the reload command from XR mode to reload the corresponding RSP/RP node. • Run the reload command from admin mode to reload the the specified hardware module. • Run the reload location all command from admin Exec prompt to reload the entire chassis. • Run the hw-module location <location> reload command from admin mode to reload a specific module. 	<p>2 VMs on each of the RSP/RP/LC CPU. The reload happens at VM (admin/XR), hardware module or at entire chassis level.</p> <ul style="list-style-type: none"> • Run the reload command from XR mode to reload the XR VM. • Run the reload command from admin mode to reload the the VMs (admin VM, XR VM or all VMs). • Run the hw-module location all reload command or reload rack 0 command from admin Exec prompt to reload the entire chassis. The reload location all command reloads only the VMs. • Run the hw-module location <location> reload command from admin mode to reload a specific module or the entire chassis.
Applications	NA	Third-party applications can be hosted on XR VM, which use the kernel stack for northbound communication.
FPD	<p>FPD upgrade performed in Sysadmin plane.</p> <p>Run fpd auto-upgrade command and fpd auto-reload command from Sysadmin plane.</p>	<p>FPD upgrade performed in XR VM.</p> <p>Run fpd auto-upgrade enable command and fpd auto-reload enable command from XR VM.</p> <p>To disable the FPD upgrade, use disable keyword in these commands.</p>
Clock	Daylight saving (DST) must be configured explicitly.	DST changes are embeded into a timezone file, and is adjusted automatically.
Fabric mode	Default (1024 VQIs)	High-bandwidth (2048 VQIs)

Category	IOS XR 32-bit OS	IOS XR 64-bit OS
Attach to LC console	Run run attachCon <lc_node> from XR plane.	Login to Sysadmin VM on RP/RSP where XR is active. Run run chvrf 0 attachCon 0/1 from Sysadmin VM.
Internal copy	Storage device is common between the admin and xr plane. No copy commands are required.	Login to LC XR or Sysadmin VM and copy using scp command. copy from LC to RSP: <code>run scp lc0_xr:/filename /harddisk:/</code> Copy from Sysadmin to XR VM: <code>copy harddisk:/ location 0/RSP0 harddisk:/ location 0/RSP0/CPU0/VM1</code>
Reboot history	Both XR and admin planes provide reboot history of nodes.	XR VM provides details about VM reboot history. Sysadmin VM provides details about both the VM and the card-level reboot history.
Default console settings	<ul style="list-style-type: none"> • 9600 bps • 8 data bits • No parity • 2 stop bits 	<ul style="list-style-type: none"> • 9600 bps • 8 data bits • No parity • 1 stop bits
CLI changes	Admin CLI changes: Configuration, Exec and Show commands XR Exec and Show command CLI changes: No major changes in configuration CLIs.	

CLI Differences Between 32-bit And 64-bit OS on ASR 9000 Series Routers

The following table shows the CLI usage for few commonly used commands and differences between 32-bit and 64-bit OS:

IOS XR 32-bit OS	IOS XR 64-bit OS
show platform	show platform—sysadmin show platform vm—XR show sdr—Sysadmin provides information about VMs show vm—Sysadmin provides health of the VMs
show hw-module fpd location all	show hw-module fpd

IOS XR 32-bit OS	IOS XR 64-bit OS
N/A	show hw-module location <slot> fpd <fpd name>
admin upgrade hw-module fpd all force location all	upgrade hw-module location all fpd all force admin upgrade hw-module location all fpd all force
show version show version brief	show version
admin show diag <slot> eeprom-info	admin show diag detail location <slot>
show inventory	show inventory
admin show inventory	admin show inventory
admin show fpd package	admin show fpd package in Sysadmin mode show fpd package in XR mode
admin show led	admin show led
admin show environment alarms	admin show alarm
show environment table	show environment temperatures
show install summary	N/A
admin show environment fan	admin show environment fans
admin show environment voltages	admin show environment voltages
admin show environment altitude	admin show environment altitude
admin show environment power	admin show env power-supply
show environment all	show environment all
admin show dsc	NA
admin reload location all	admin hw-module location all reload
show redundancy in admin mode	NA
fsck filesystem:	NA
show process cpu run top_procs	show process cpu run top
show pfm location <location-id>	show alarms brief card/system active/suppressed/history show pfm location <location-id> admin show alarms

The following section shows the difference in output for few commands in 32-bit and 64-bit OS:

show platform

32-bit:

```
Router#show platform
Node           Type                               State      Config State
-----
0/RSP1/CPU0   A9K-RSP880-SE(Active)             IOS XR RUN PWR,NSHUT,MON
0/0/CPU0      A9K-400G-DWDM-TR                   IOS XR RUN PWR,NSHUT,MON
0/1/CPU0      A9K-8X100GE-L-SE                   UNPOWERED PWR,NSHUT,MON
```

64-bit:

```
Router#show platform
Node           Type                               State      Config state
-----
0/RSP0/CPU0   A9K-RSP880-SE(Active)             IOS XR RUN NSHUT
0/RSP1/CPU0   A9K-RSP880-SE(Standby)            IOS XR RUN NSHUT
0/FT0         ASR-9904-FAN                       OPERATIONAL NSHUT
0/0/CPU0      A99-8X100GE-SE                     IOS XR RUN NSHUT
0/1/CPU0      A99-8X100GE-SE                     IOS XR RUN NSHUT
0/PT0        A9K-AC-PEM-V2                       OPERATIONAL NSHUT
```

admin show platform

32-bit:

```
Router#show platform
Node           Type                               State      Config State
-----
0/RSP1/CPU0   A9K-RSP880-SE(Active)             IOS XR RUN PWR,NSHUT,MON
0/FT0/SP      ASR-9904-FAN                       READY
0/0/CPU0      A9K-400G-DWDM-TR                   IOS XR RUN PWR,NSHUT,MON
0/1/CPU0      A9K-8X100GE-L-SE                   UNPOWERED PWR,NSHUT,MON
0/PS0/M0/SP   PWR-3KW-AC-V2                       FAILED     PWR,NSHUT,MON
0/PS0/M1/SP   PWR-3KW-AC-V2                       READY     PWR,NSHUT,MON
```

64-bit:

```
Router#admin show platform
Location  Card Type                               HW State      SW State      Config State
-----
0/0       A99-8X100GE-SE                         OPERATIONAL   OPERATIONAL   NSHUT
0/1       A99-8X100GE-SE                         OPERATIONAL   OPERATIONAL   NSHUT
0/RSP0    A9K-RSP880-SE                           OPERATIONAL   OPERATIONAL   NSHUT
0/RSP1    A9K-RSP880-SE                           OPERATIONAL   OPERATIONAL   NSHUT
0/FT0     ASR-9904-FAN                             OPERATIONAL   N/A           NSHUT
0/PT0     A9K-AC-PEM-V2                           OPERATIONAL   N/A           NSHUT
```

show install

32-bit:



Note The command **show install summary** is supported only in 32-bit OS.

```
Router#show install ?
  active      Show the active package information
  audit       Audit installed packages
```

auto-abort-timer	Show auto-abort-timer value
boot-options	Show boot options
committed	Show the committed package information
compression	Show Install File Compression information(cisco-support)
events	Show key events from the install history
inactive	Show inactive package information
log	Show log file
package	Name of the package
pie-info	Show information in a PIE file
request	Show current request
rollback	Show package information for a rollback point
sp-desc	Show description of the Service Pack
summary	Show summary information
superseded	Show superseded packages
which	Show the origin of a named process, component or package

64-bit:

```
Router#show install ?
  active          Show active package(s) installed(cisco-support)
  committed       Show committed package(s) information(cisco-support)
  inactive        Show inactive package(s) information(cisco-support)
  issu            Show ISSU information(cisco-support)
  log             Show log file(cisco-support)
  package         Show information for package(s) in repository(cisco-support)
  prepare         Show prepared package(s) ready for activation(cisco-support)
  repository      Show SDR software repository(cisco-support)
  request         Show current request(cisco-support)
  superseded      Show superseded package(s) (cisco-support)
  which          Show information about an installed file(cisco-support)
```

show install active/inactive/committed**32-bit:**

```
Router#show install active summary
Default Profile:
SDRs:
Owner
Active Packages:
  disk0:asr9k-mini-px-<version>
  disk0:asr9k-mpls-px-<version>
  disk0:asr9k-mcast-px-<version>
  disk0:asr9k-mgbl-px-<version>
  disk0:asr9k-fpd-px-<version>
  disk0:asr9k-optic-px-<version>
  disk0:asr9k-k9sec-px-<version>
```

64-bit:

```
Router#show install active summary
Active Packages: 8
  asr9k-xr-<version> version=x.x.xx [Boot image]
  asr9k-m2m-x64-<version>
  asr9k-optic-x64-<version>
  asr9k-mcast-x64-<version>
  asr9k-9000v-nV-x64-<version>
  asr9k-mpls-x64-<version>
  asr9k-mpls-te-rsvp-x64-<version>
  asr9k-eigrp-x64-<version>
```

admin show install active/inactive/committed**32-bit:**

```
Router#admin show install active summary
Default Profile:
  SDRs:
  Owner
  Active Packages:
    disk0:asr9k-mini-px-<version>
    disk0:asr9k-mpis-px-<version>
    disk0:asr9k-mcast-px-<version>
    disk0:asr9k-mgbl-px-<version>
    disk0:asr9k-fpd-px-<version>
    disk0:asr9k-optic-px-<version>
    disk0:asr9k-k9sec-px-<version>
```

64-bit:

```
Router#admin show install active summary
  Active Packages: 1
  asr9k-sysadmin-<version> version=x.x.xx [Boot image]
```

fsck**32-bit:**

```
Router#fsck ?
disk0:      Name of the flash device
disk0a:     Name of the flash device
disk1:      Name of the flash device
diskla:     Name of the flash device
harddisk:   Name of the flash device
harddiska:  Name of the flash device
harddiskb:  Name of the flash device
lcdisk0:    Name of the flash device
lcdisk0a:   Name of the flash device
```

```
Router#fsck disk0:
FSCK results for partition /disk0: on node 0/RSP0/CPU0.
=====
```

64-bit:

In the 32-bit OS, all activities pertain to either `/disk0:` or `/harddisk:` partitions. On the contrary, the 64-bit OS uses the Linux volume management to carve physical devices into logical volumes. This is needed to create dedicated and protected storage volumes for host OS, admin and XR VMs. The logical volumes also provide for more compartmentalized system and ISSU upgrades.



Note It is not recommended to run `fsck` command on Linux-based 64-bit OS. The `fsck` activities are performed automatically during bootup, and does not require manual inspection using `fsck` command in 64-bit OS.
