The bridge to possible

Migrating from Cisco Catalyst 4500E to 9400 Series Switches

Contents

Introduction

The new Cisco® Catalyst® 9000 switching platform is the next generation in the legendary Cisco Catalyst family of enterprise LAN access, aggregation, and core switches. Within the Cisco Catalyst 9000 switching family, the 9400 Series switches are Cisco's leading modular enterprise switching access platform, built for security, Internet of Things (IoT), and cloud.

Purpose of this guide

This document is intended to help network planners and engineers who are familiar with the Cisco Catalyst 4500E Series in deploying Cisco Catalyst 9400 Series Switches in the enterprise networking environment (Figure 1).

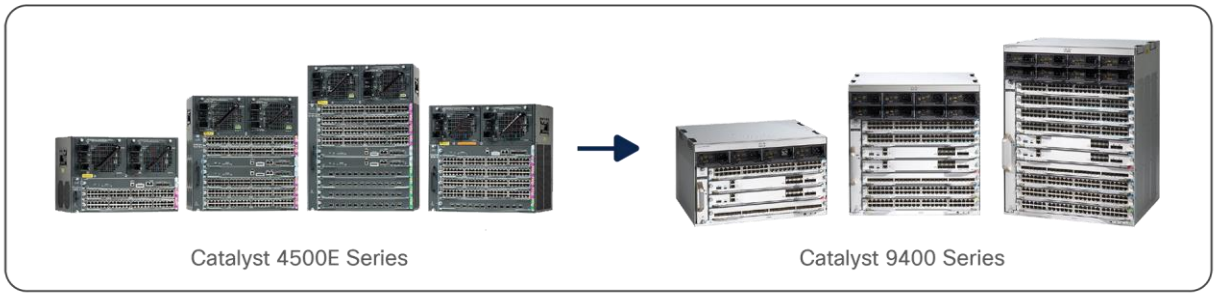

Figure 1.
Cisco Catalyst 4500E Series to Cisco Catalyst 9400 Series

Why migrate?

The Cisco Catalyst 9400 Series Switches are Cisco's leading modular enterprise switching access platform, built for security, IoT, and cloud. These switches form the foundational building block for Software-Defined Access (SD-Access) – Cisco's leading enterprise architecture. The platform provides unparalleled investment protection with a chassis architecture that can support up to 9 Tbps of system bandwidth and unmatched power delivery for high-density IEEE 802.3BT (60W and 90W Power over Ethernet [PoE]). Redundancy is now the norm across the portfolio. The 9400 Series delivers state-of-the-art High Availability with capabilities such as uplink resiliency and N+1/N+N redundancy for power supplies. The platform is enterprise optimized with an innovative dual-serviceable fan tray design and side-to-side airflow and is closet friendly with ~16-inch depth. A single system can scale up to 384 access ports with your choice of 10G, 5G, and 2.5G multigigabit copper, 1G copper, Cisco UPOE+, Cisco UPOE and PoE+ options and up to 384 ports of 10G Fiber and 1G Fiber options. The platform also supports advanced routing and infrastructure services, SD-Access capabilities, and network system virtualization. These features enable optional placement of the platform in the core and aggregation layers of small to medium-sized campus environments.

The Cisco Catalyst 9400 Series offers an industry-leading supervisor engine built for secure networks, IoT applications, next-generation mobility, and cloud adoption. Supervisor Engines are built with the latest Cisco Unified Access® Data Plane ASICs (UADP 3.0 on Supervisor 2/2XL and UADP 2.0XL on Supervisor 1/XL/XL-Y) future-proofed for next-generation technologies with its programmable pipeline, micro engine capabilities, and template-based configurable allocation of Layer 2, Layer 3, forwarding, Access Control Lists (ACLs), and Quality of Service (QoS) entries.

Migration overview

The Cisco Catalyst 9400 Series Switches retain the same centralized architecture as the 4500E Series, but with many new capabilities. This guide lists the different considerations when migrating from the 4500E Series to the 9400 Series.

Chassis hardware

Table 1. Compares the chassis available on the Cisco Catalyst 4500E and 9400 Series.

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
2 line card slots	WS-C4503-E • Single slot for Supervisor • 12.25x17.31x12.50 in. (7RU)	C9404R • Two slots for Supervisor • 10.47x17.30x16.30 in (6RU)
5 line card slots	WS-C4506-E • Single slot for Supervisor • 17.38x17.31x12.50 in. (10RU) WS-C4507+R • Two slots for Supervisor • 19.19x17.31x12.50 in. (11RU)	C9407R • Two slots for Supervisor • 17.41x17.30x16.30 in. (10RU)
8 line card slots	WS-C4510R+E • Two slots for Supervisor • 24.35x17.31x12.50 in. (14RU)	C9410R • Two slots for Supervisor • 22.61x17.30x16.30 in. (13RU)

Supervisor hardware

The Cisco Catalyst 9400 Supervisor Engines are based on Cisco's UADP ASIC architecture an x86 CPU architecture. Supervisor Engines also provide options for additional internal and external storage, which enables the device to host containers and run third-party applications and scripts natively within the switch. Table 2 compares the hardware of the 4500E and 9400 Series.

Table 2. Hardware comparison

		Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
	Sup9E	**Sup1/XL/XL-Y**	**Sup2/XL**
CPU	Quad core 2.2 GHz	Quad core x86 2.4 GHz	8-core x86 2.4GHz
SDRAM	4 GB	16 GB	16 GB
Internal flash	16 GB	16 GB	16 GB
External storage	2 GB SD memory card 4 GB USB	120 GB USB	120 GB USB
Internal storage	Not available	240 GB, 480 GB, or 960 GB	240, 480, or 960 GB

System default behaviors

The system default behaviors on the Cisco Catalyst 9400 Series are very similar to those of the 4500E Series. For example, interfaces are default in Layer 2 switch port mode, IP routing is enabled, the management interface is in a dedicated Virtual Routing and Forwarding (VRF) instance, and so on. However, there are also some differences.

Control Plane Policing (CoPP): CoPP is enabled on the Cisco Catalyst 9400 Series, with default policing rates for different classes of traffic. These policing rates are optimized for a typical campus environment. The policing rates can be changed or disabled to meet the requirements of different application environments. On the Cisco Catalyst 4500E, CoPP is not enabled by default, but the system provides a macro to create the different classes, and the user can specify the policing rate for different classes.

Link-status logging: The logging for link-status changes is on by default with the Cisco Catalyst 9400 Series, and the behavior can be changed per interface in the configuration. On the 4500E Series, the logging for link-status changes is off by default and can be changed globally. See Table 3.

Table 3. Hardware comparison

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Default	Off for all ports	On for all ports
Configuration	Per system C4500(config)#logging event link-status global C4500(config)#no logging event link-status global	Per interface C9400(config)#int gi 1/0/1 C9400(config-if)#no logging event link-status C9400(config-if)#logging event link-status

Power redundancy

The Cisco Catalyst 9400 Series provides eight slots for the power supply in the 9407R and 9410R models, compared to two slots in the 4500E Series. Those eight power supply slots can be operated in the following three modes:

1. **Combined mode:** This is the default mode. All power supply modules in the system are active and sharing power.
2. **N+1 redundant mode:** N is the number of active power supply modules, and there is one power supply module in standby mode. If any one of the active power supply modules fails, the standby power supply becomes active.
3. **N+N redundant mode:** In this mode, the system is configured with an equal number of active and standby power supply modules.

Table 4 compares the power capabilities of the Cisco Catalyst 4500E Series with those of the 9400 Series.

Table 4. Power comparison

	Catalyst 4500E	Catalyst 9400
Number of power supply slots	2 with all the 4500E Series chassis	4 With C9404R 8 with C9410R 8 with C9407R
Power supplies	1. 1000W AC 2. 1300W AC 3. 1500W AC 4. 1400W DC 5. 2800W AC 6. 4200W AC 7. 6000W AC 9000W AC	3200W AC • 3200W @ 240VAC • 1570W @ 120VAC 2100W AC • 2112W @ 240VAC • 950W @ 120VAC 3200W DC
System power and PoE power	Each power supply has a fixed amount for the system and a fixed amount for PoE	Flexible allocation of power for system and PoE
Branch circuit requirement	Multiple power supplies ranging from 1000W to 9000W are available for the 4500E Series. The current requirement on those power supplies range from 5A to 16A.	3200W AC – 16 A 2100W AC – 11A
Power redundancy	Combined Redundant	Combined Redundant: N+1; N+N

For more details on power redundancy, please see the Environmental Monitoring and Power Management chapter of the System Management Configuration Guide.

ROMMON and config-register

The Cisco Catalyst 9400 Series uses the x86 CPU architecture to enable hosting containers and third-party applications. With this change, there are also changes in the ROMMON.

Prompts and file system

In ROMMON, the prompt on the Cisco Catalyst 9400 Series is “switch:” and the “flash:” is the memory partition for local storage. On the Cisco Catalyst 4500E Series, the prompt is “rommon>” and the “bootflash:” is the memory partition for local storage. Table 5 shows outputs in ROMMON from the 4500E and 9400 Series.

Table 5. ROMMON outputs

Cisco Catalyst 4500E Series

```
rommon 1 >dir bootflash:

Date          Time    Attribute  Size         Name
==========    =====   =========  ========     ====================
2018/04/18    23:05   drwxrwxrwx       4096    pxe
2016/04/18    13:43   -rw-rw-rw- 489345284    cat4500es8-universalk9.SPA.03.08.00.E.152-4.E.bin
2018/01/03    17:51   drwxrwxrwx       4096    scripts
2018/04/26    03:30   -rw-rw-rw-      15692    R1-C4510RE.cfg
2016/04/18    14:06   -rw-rw-rw-       7812    startup-config.converted_vs-20160418-140447
```

Cisco Catalyst 9400 Series

```
switch: dir flash:

Size        Attributes  Name
------------------------------------------------------------
596369748   -rw-        cat9k_iosxe.16.06.02.SPA.bin
856         -rw-        vlan.dat
7517        -rw-        packages.conf
5186504     -rw-        cat9k-cc_srdriver.16.06.02.SPA.pkg
76649412    -rw-        cat9k-espbase.16.06.02.SPA.pkg
1536964     -rw-        cat9k-guestshell.16.06.02.SPA.pkg
380625856   -rw-        cat9k-rpbase.16.06.02.SPA.pkg
29580684    -rw-        cat9k-rpboot.16.06.02.SPA.pkg
27612100    -rw-        cat9k-sipbase.16.06.02.SPA.pkg
```

The Cisco Catalyst 4500E Series uses the traditional “config-register” command in both Cisco IOS and ROMMON to control the booting behavior. The Cisco Catalyst 9400 Series uses a parallel set of commands in Cisco IOS XE Software, which creates the equivalent ROMMON variables. See Table 6.

Table 6. Boot variables

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Default	Confreg 0x???Y Autoboot if Y!=0	[no] boot manual
ROMMON	Confreg 0x???Y Autoboot if Y!=0	MANUAL_BOOT=[no | yes]

Baud rate

Table 7. Setting the baud rate

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Cisco IOS Software	Confreg 0x???? Or Line con 0 Speed 9600	Line con 0 Speed 9600
ROMMON	Confreg Use the interactive prompt to set the baud rate	BAUD=9600

“Break” processing

At the beginning of the bootup process, the user can use Ctrl+C to break out of the booting process and drop the system back into ROMMON if the break sequence is enabled. See Table 8.

Table 8. “Break” processing

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Cisco IOS Software	Confreg 0x????	[no] boot enable-break
ROMMON	Confreg Use the interactive prompt to enable/disable break	ENABLE_BREAK=[no | yes]

Table 9. Ignoring the startup configuration

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Cisco IOS Software	Confreg 0x8000 or 0x0040	C9400(config)#system ignore startup-config C9400(config)#no system ignore startup-config
ROMMON	Confreg Use the interactive prompt to enable/disable ignore startup configuration	SWITCH_IGNORE_STARTUP_CFG=1

Operations

Interface reference

The Cisco Catalyst 4500E Series has two level of interface numbering:

```
interface <Type><Slot#>/<Port#>
```

The 9400 Series has three levels:

```
interface <Type><Slot#>/<Bay#>/<Port#>
```

As of release 16.6.2, the bay number is unused and is always 0. For example, Gigabit Ethernet port 1 on slot 1 is referenced as gi1/1 with the 4500E Series and as gi1/0/1 with the 9400 Series. See Table 10.

Table 10. Interface numbering

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Gigabit Ethernet	GigabitEthernet1/1	GigabitEthernet1/0/1
TenGigabit Ethernet	TenGigabitEthernet1/1	Te1/0/1
FortyGigabit Ethernet	FortyGigabitEthernet5/1	Fo5/0/8

Management interface

The management interface on the Cisco Catalyst 9400 Series is Gigabit Ethernet, which is much more capable than the Fast Ethernet on the 4500E Series. The management port on both platforms has its own VRF for separation of management traffic from normal data traffic. However, the name of the VRF for the management port is different between the 9400 Series and 4500E Series. Note also that the names of the VRFs are case sensitive. Table 11 lists the management port differences between the two platforms.

Table 11. Management interface and VRF

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Interface	FastEthernet1	GigabitEthernet 0/0
VRF	mgmtVrf	Mgmt-vrf

Software features

For details on the software features supported on the Cisco Catalyst 9400 Series, please use the feature navigator on Cisco.com. Some of the features behave differently on the 9400 Series compared to the 4500E Series. Following are some of these differences.

System MTU

On the Cisco Catalyst 9400 Series, the global command “system mtu <1500-9216>” changes the MTU on all the interfaces within the system. On the Cisco Catalyst 4500E Series, the global command “system mtu <1500-1552>” sets the global baby giant MTU for all interfaces. Both C9400 and 4500E Series also support per-interface MTU. The per-interface MTU command takes precedence. See Table 12.

Table 12. Setting the system MTU

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
“system mtu <>”	Changes MTU on all interfaces	Changes MTU on all interfaces
System MTU value	1500 to 1552	1500 to 9216
Interface-level MTU	• Range “1500 to 9198” • Takes precedence over system MTU	• Range “1500 to 9216” • Takes precedence over system MTU

Host tracking feature

The Cisco Catalyst 4500E Series supports IP Device Tracking (IPDT) for keeping track of connected hosts (association of MAC and IP addresses). In the Cisco Catalyst 9400 Series with the latest Cisco IOS XE release, the new Switch Integrated Security Features (SISF)-based IP device-tracking feature acts as a container policy that enables snooping and device-tracking features available with First Hop Security (FHS) in both IPv4 and IPv6, using IP-agnostic CLI commands. See Appendix A for more information on migrating from the IPDT CLI configuration to the new SISF-based device-tracking CLI configuration.

Flexible NetFlow

Both the Cisco Catalyst 9400 Series and the Cisco Catalyst 4500E Series support Flexible NetFlow. Beside the scalability differences, there are a few configuration differences. They are listed in Table 13.

Table 13. Flexible NetFlow differences

	Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
Timestamp	Use system uptime	Use absolute time [0 is at time 00:00:00 January 1, 1970]
NetFlow on port-channel	Configuration under port-channel	Configuration under member of port-channel
Bridged traffic	Apply the flow monitor to the Layer 2 interface with keyword “layer2-switched”	Apply the flow monitor to a VLAN

Quality of Service (QoS)

The ASICs that power the Cisco Catalyst 4500E and 9400 Series are different, so there are some differences in QoS behaviors, as described below.

Per-port per-VLAN QoS policy

The Cisco Catalyst 4500E Series provides the ability to configure service policy per VLAN under the trunk interface. The Cisco Catalyst 9400 Series supports this with the use of Hierarchical QoS. In this case, the parent policy consists of two different VLAN policies. Table 14 contains the per-port per- VLAN QoS configuration for both the 4500E and 9400 Series.

Table 14. Per-port per-VLAN configuration

Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series

Interface Gigabit 3/1
  switchport
  switchport trunk encapsulation dotlq
  switchport trunk allowed vlan 101-102
Vlan range 101
  Service-policy input P31_QoS
Vlan range 102
  Service-policy input P32_QoS
	class-map match-all vlan101
	 match vlan 101
	class-map match-all vlan102
	 match vlan 102
	policy-map parent
	 class vlan101
	  service-policy P31_QoS
	 class vlan102
	  service-policy P32_QoS
	interface GigabitEthernet1/0/1
	 switchport trunk allowed vlan 101,102
	 service-policy input parent

Congestion avoidance

The Cisco Catalyst 4500E Series supports Dynamic Buffer Limiting (DBL), and there are no user-configurable parameters. The Cisco Catalyst 9400 Series uses Weighted Random Early Detection (WRED), which randomly discards packets at specified queue thresholds. WRED gives the network operator much more control over the drop behavior. The following is an example of WRED configuration on the 9400 Series.

policy-map 2P6Q3T

class PRIORITY-QUEUE

priority level 1

class VIDEO-PRIORITY-QUEUE

priority level 2 class DATA-QUEUE

bandwidth remaining percent <number> queue-buffers ratio <number> random-detect dscp-based

random-detect dscp 10 percent 60 80

Table 15 lists other QoS differences between Supervisor Engine 9E on the Cisco Catalyst 4500E Series and Supervisor Engine-1/1XL on the Cisco Catalyst 9400 Series.

Table 15. QoS differences

	Cisco Catalyst 4500E Supervisor Engine 9E	Cisco Catalyst 9400 Supervisor Engine-1/1XL	Cisco Catalyst 9400 Supervisor Engine 2/2XL
Buffer	32 MB	96 MB	108 MB
Buffer sharing	All ports share the 32 MB memory.	Buffer sharing is within the ASIC. There are 3 ASICs in Supervisor Engine-1/1XL/1XL-Y and a 32 MB buffer per ASIC.	Buffer sharing is within the ASIC. There are 3 ASICs in Supervisor Engine- 2/2XL and a 36 MB buffer per ASIC.
Number of priority queues	0 to 1	0 to 2	0 to 2
Priority configuration in policy map	Priority	priority level 1 Or priority level 2	priority level 1 Or priority level 2
Microflow policing	Yes	No	No

Cisco Catalyst 4500E Series platform-specific commands

Table 16 lists commands that are specific to the Cisco Catalyst 4500E Series and are not available on the 9400 Series.

Table 16. Cisco Catalyst 4500E Series platform-specific commands

Cisco Catalyst 4500E Series	Cisco Catalyst 9400 Series
vlan internal allocation policy ascending	Not applicable
diagnostic fpga soft-error recover conservative	Not applicable
ntp update-calendar	Not applicable
ip device tracking	Please see Appendix A

Conclusion

The Cisco Catalyst 9400 Series Switches are Cisco's leading modular enterprise switching access platforms. They are the new generation of the access platform and provide many additional capabilities, making them well suited for enterprises looking to migrate from their existing Cisco Catalyst 4500E Series deployment.

Appendix A. IPDT/SISF

If your device has no legacy IP device tracking or IPv6 snooping configurations, you can use only the new SISF-based device-tracking commands for all your future configurations. The legacy IPDT commands and IPv6 snooping commands are not available.

IPDT, IPv6 snooping, and device-tracking CLI compatibility

Table 17 displays the new SISF-based device-tracking commands and the corresponding IPDT and IPv6 snooping commands. For details on SISF configuration, please refer to the configuration guide.

Table 17. Device-tracking and corresponding IPDT and IPv6 snooping commands

IPDT commands	SISF IPv6	SISF
IP Device Tracking (IPDT)	IPv6 snooping	SISF-based device tracking
ip device tracking probe count	Not supported	Not supported
ip device tracking probe delay	ipv6 neighbor binding reachable-lifetime	device-tracking policy reachable-lifetime
ip device tracking probe interval	ipv6 snooping tracking retry-interval	device-tracking policy retry-interval
ip device tracking probe use-svi	Accepted and interpreted as ip device tracking probe auto-source override	Accepted and interpreted as ip device tracking probe auto-source override
ip device tracking probe au-to-source fallback	Not supported	Not supported
ip device tracking probe au-to-source override	Not supported	Not supported
ip device tracking tracebuffer	Not supported	Not supported
ip device tracking maximum	ipv6 snooping policy <name> limit	device-tracking snooping policy <name> limit
ip device tracking probe count	Not supported	Not supported
ip device tracking probe interval	Not supported	Not supported
Clear ip device tracking all	Not supported	Not supported

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