Cisco Nexus 9000 Series NX-OS Fundamentals Configuration Guide, Release 10.4(x)

First Published: 2023-08-18

Last Modified: 2024-03-29

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CONTENTS

Preface

This preface includes the following sections:

Audience

This publication is for network administrators who install, configure, and maintain Cisco Nexus switches.

Document Conventions

Command descriptions use the following conventions:

Convention	Description
bold	Bold text indicates the commands and keywords that you enter literally as shown.
Italic	Italic text indicates arguments for which you supply the values.
[x]	Square brackets enclose an optional element (keyword or argument).
[x | y]	Square brackets enclosing keywords or arguments that are separated by a vertical bar indicate an optional choice.
{x | y}	Braces enclosing keywords or arguments that are separated by a vertical bar indicate a required choice.
[x {y | z}]	Nested set of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.

Convention	Description
`variable`	Indicates a variable for which you supply values, in context where italics cannot be used.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string includes the quotation marks.

Examples use the following conventions:

Convention	Description
`screen font`	Terminal sessions and information the switch displays are in screen font.
`boldface screen font`	Information that you must enter is in boldface screen font.
italic screen font	Arguments for which you supply values are in italic screen font.
< >	Nonprinting characters, such as passwords, are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Related Documentation for Cisco Nexus 9000 Series Switches

The entire Cisco Nexus 9000 Series switch documentation set is available at the following URL:

http://www.cisco.com/en/US/products/ps13386/tsd_products_support_series_home.html

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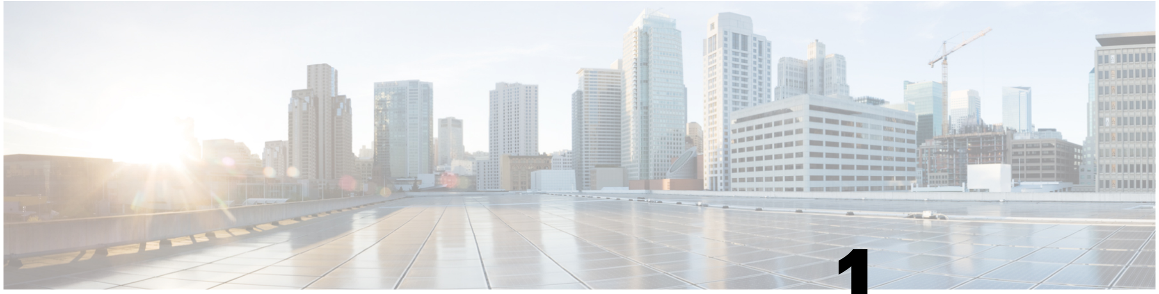
Cisco Bug Search Tool

Cisco Bug Search Tool (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.



CHAPTER 1

New and Changed Information

New and Changed Information

Table 1: New and Changed Features

Feature	Description	Changed in Release	Where Documented
Remove POAP skip option	For the security enhancements, the skip option is disabled.	10.4(3)F	Guidelines and Limitations for POAP, on page 44
TLS v1.3	Added Transport Layer Security protocol version 1.3 support for Cisco Nexus applications.	10.4(3)F	Copying Files Using HTTP or HTTPS, on page 128
Show tech infra - performance and debuggability improvements	Support is added to view blocked-commands file.	10.4(3)F	Enable or Disable Tech-Support Command, on page 137 Displaying Tech-support Blocked CLIs, on page 138
RFC8040	Added support for RFC8040.	10.4(3)F	Supported Standards, on page 10
Secure POAP - CA group bundle	Added support for POAP on Cisco Nexus 9804 platform switches, and Cisco Nexus X98900CD-A and X9836DM-A line cards.	10.4(1)F	Secure Download of POAP Script, on page 26 Guidelines and Limitations for POAP, on page 44

CHAPTER 2

Overview

This chapter contains the following sections:

Licensing Requirements

For a complete explanation of Cisco NX-OS licensing recommendations and how to obtain and apply licenses, see the *Cisco NX-OS Licensing Guide* and the *Cisco NX-OS Licensing Options Guide*.

Supported Platforms

Starting with Cisco NX-OS release 7.0(3)I7(1), use the Nexus Switch Platform Support Matrix to know from which Cisco NX-OS releases various Cisco Nexus 9000 and 3000 switches support a selected feature.

Software Image

The Cisco NX-OS software consists of one NXOS software image. This image runs on all Cisco Nexus 3400 Series switches.

Software Compatibility

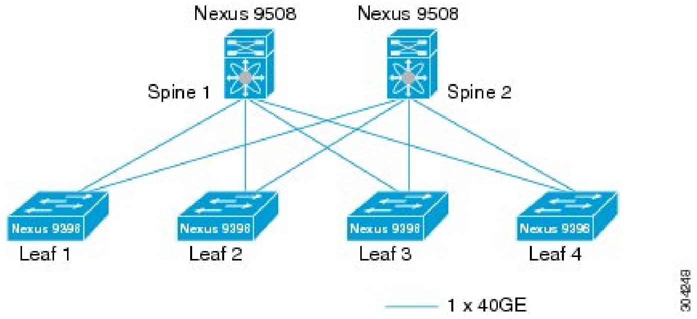
The Cisco NX-OS software interoperates with Cisco products that run any variant of the Cisco IOS software. The Cisco NX-OS software also interoperates with any networking operating system that conforms to the IEEE and RFC compliance standards.

Spine/Leaf Topology

The Cisco Nexus 9000 Series switches support a two-tier spine/leaf topology.

Figure 1: Spine/Leaf Topology

This figure shows an example of a spine/leaf topology with four leaf switches (Cisco Nexus 9396 or 93128) connecting into two spine switches (Cisco Nexus 9508) and two 40G Ethernet uplinks from each leaf to each spine.



Modular Software Design

The Cisco NX-OS software supports distributed multithreaded processing on symmetric multiprocessors (SMPs), multi-core CPUs, and distributed data module processors. The Cisco NX-OS software offloads computationally intensive tasks, such as hardware table programming, to dedicated processors distributed across the data modules. The modular processes are created on demand, each in a separate protected memory space. Processes are started and system resources are allocated only when you enable a feature. A real-time preemptive scheduler helps to ensure the timely processing of critical functions.

Serviceability

The Cisco NX-OS software has serviceability functions that allow the device to respond to network trends and events. These features help you with network planning and improving response times.

Switched Port Analyzer

The Switched Port Analyzer (SPAN) feature allows you to analyze all traffic between ports (called the SPAN source ports) by nonintrusively directing the SPAN session traffic to a SPAN destination port that has an external analyzer attached to it. For more information about SPAN, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Ethanalyzer

Ethanalyzer is a Cisco NX-OS protocol analyzer tool based on the Wireshark (formerly Ethereal) open source code. Ethanalyzer is a command-line version of Wireshark for capturing and decoding packets. You can use Ethanalyzer to troubleshoot your network and analyze the control-plane traffic. For more information about Ethanalyzer, see the *Cisco Nexus 9000 Series NX-OS Troubleshooting Guide*.

Smart Call Home

The Call Home feature continuously monitors hardware and software components to provide e-mail-based notification of critical system events. A versatile range of message formats is available for optimal compatibility with pager services, standard e-mail, and XML-based automated parsing applications. It offers alert grouping capabilities and customizable destination profiles. You can use this feature, for example, to directly page a network support engineer, send an e-mail message to a network operations center (NOC), and employ Cisco AutoNotify services to directly generate a case with the Cisco Technical Assistance Center (TAC). For more information about Smart Call Home, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Online Diagnostics

Cisco generic online diagnostics (GOLD) verify that hardware and internal data paths are operating as designed. Boot-time diagnostics, continuous monitoring, and on-demand and scheduled tests are part of the Cisco GOLD feature set. GOLD allows rapid fault isolation and continuous system monitoring. For information about configuring GOLD, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Embedded Event Manager

Cisco Embedded Event Manager (EEM) is a device and system management feature that helps you to customize behavior based on network events as they happen. For information about configuring EEM, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Manageability

This section describes the manageability features for the Cisco Nexus 9000 Series switches.

Simple Network Management Protocol

The Cisco NX-OS software is compliant with Simple Network Management Protocol (SNMP) version 1, version 2, and version 3. A large number of MIBs is supported. For more information about SNMP, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Configuration Verification and Rollback

The Cisco NX-OS software allows you to verify the consistency of a configuration and the availability of necessary hardware resources prior to committing the configuration. You can preconfigure a device and apply the verified configuration at a later time. Configurations also include checkpoints that allow you to roll back to a known good configuration as needed. For more information about rollbacks, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Role-Based Access Control

With role-based access control (RBAC), you can limit access to device operations by assigning roles to users. You can customize access and restrict it to the users who require it. For more information about RBAC, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Cisco NX-OS Device Configuration Methods

You can use these methods to configure Cisco NX-OS devices:

- The CLI from a Secure Shell (SSH) session, a Telnet session, or the console port. SSH provides a secure connection to the device. The CLI configuration guides are organized by feature. For more information, see the Cisco NX-OS configuration guides. For more information about SSH and Telnet, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.
- The XML management interface, which is a programmatic method based on the NETCONF protocol that complements the CLI. For more information, see the *Cisco NX-OS XML Interface User Guide*.
- The Cisco Data Center Network Management (DCNM) client, which runs on your local PC and uses web services on the Cisco DCNM server. The Cisco DCNM server configures the device over the XML management interface. For more information about the Cisco DCNM client, see the *Cisco DCNM Fundamentals Guide*.

Programmability

This section describes the programmability features for the Cisco Nexus 9000 Series switches.

Python API

Python is an easy-to-learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms. The Python interpreter and the extensive standard library are freely available in source or binary form for all major platforms from the Python website: http://www.python.org/. The Python scripting capability gives programmatic access to the CLI to perform various tasks and Power-On Auto Provisioning (POAP) or Embedded Event Manager (EEM) actions. For more information about the Python API and Python scripting, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.

Tcl

Tool Command Language (Tcl) is a scripting language. With Tcl, you gain more flexibility in your use of the CLI commands on the device. You can use Tcl to extract certain values in the output of a **show** command, perform switch configurations, run Cisco NX-OS commands in a loop, or define EEM policies in a script.

Cisco NX-API

The Cisco NX-API provides web-based programmatic access to the Cisco Nexus 9000 Series switches. This support is delivered through the NX-API open-source web server. The Cisco NX-API exposes the complete configuration and management capabilities of the command-line interface (CLI) through web-based APIs. You can configure the switch to publish the output of the API calls in either XML or JSON format. For more information about the Cisco NX-API, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.

Note NX-API performs authentication through a programmable authentication module (PAM) on the switch. Use cookies to reduce the number of PAM authentications and thus reduce the load on PAM.

Bash Shell

The Cisco Nexus 9000 Series switches support direct Linux shell access. With Linux shell support, you can access the Linux system on the switch in order to use Linux commands and manage the underlying system. For more information about Bash shell support, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.

Broadcom Shell

The Cisco Nexus 9000 Series switch front-panel and fabric module line cards contain several Broadcom ASICs. You can use the CLI to access the command-line shell (bcm shell) for these ASICs. The benefit of using this method to access the bcm shell is that you can use Cisco NX-OS command extensions such as **pipe include** and **redirect output to file** to manage the output. In addition, the activity is recorded in the system accounting log for audit purposes, unlike commands entered directly from the bcm shell, which are not recorded in the accounting log. For more information about Broadcom shell support, see the *Cisco Nexus 9000 Series NX-OS Programmability Guide*.

Caution Use Broadcom shell commands with caution and only under the direct supervision or request of Cisco Support personnel.

Traffic Routing, Forwarding, and Management

This section describes the traffic routing, forwarding, and management features supported by the Cisco NX-OS software.

Ethernet Switching

The Cisco NX-OS software supports high-density, high-performance Ethernet systems and provides the following Ethernet switching features:

- IEEE 802.1D-2004 Rapid and Multiple Spanning Tree Protocols (802.1w and 802.1s)
- IEEE 802.1Q VLANs and trunks

- IEEE 802.3ad link aggregation
- Unidirectional Link Detection (UDLD) in aggressive and standard modes

For more information, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide* and the *Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide*.

IP Routing

The Cisco NX-OS software supports IP version 4 (IPv4) and IP version 6 (IPv6) and the following routing protocols:

- Open Shortest Path First (OSPF) Protocol Versions 2 (IPv4) and 3 (IPv6)
- Intermediate System-to-Intermediate System (IS-IS) Protocol (IPv4 and IPv6)
- Border Gateway Protocol (BGP) (IPv4 and IPv6)
- Enhanced Interior Gateway Routing Protocol (EIGRP) (IPv4 only)
- Routing Information Protocol Version 2 (RIPv2) (IPv4 only)

The Cisco NX-OS software implementations of these protocols are fully compliant with the latest standards and include 4-byte autonomous system numbers (ASNs) and incremental shortest path first (SPF). All unicast protocols support Non-Stop Forwarding Graceful Restart (NSF-GR). All protocols support all interface types, including Ethernet interfaces, VLAN interfaces, subinterfaces, port channels, and loopback interfaces.

For more information, see the *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*.

IP Services

The following IP services are available in the Cisco NX-OS software:

- Virtual routing and forwarding (VRF)
- Dynamic Host Configuration Protocol (DHCP) helper
- Hot Standby Router Protocol (HSRP)
- Enhanced object tracking
- Policy-based routing (PBR)
- Unicast graceful restart for all protocols in IPv4 unicast graceful restart for OPSFv3 in IPv6

For more information, see the *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*.

IP Multicast

The Cisco NX-OS software includes the following multicast protocols and functions:

- Protocol Independent Multicast (PIM) Version 2 (PIMv2)
- PIM sparse mode (Any-Source Multicast [ASM] for IPv4)
- Anycast rendezvous point (Anycast-RP)

- Multicast NSF for IPv4
- RP-Discovery using bootstrap router (BSR) (Auto-RP and static)
- Internet Group Management Protocol (IGMP) Versions 1, 2, and 3 router role
- IGMPv2 host mode
- IGMP snooping
- Multicast Source Discovery Protocol (MSDP) (for IPv4)

Note The Cisco NX-OS software does not support PIM dense mode.

For more information, see the *Cisco Nexus 9000 Series NX-OS Multicast Routing Configuration Guide*.

Quality of Service

The Cisco NX-OS software supports quality of service (QoS) functions for classification, marking, queuing, policing, and scheduling. Modular QoS CLI (MQC) supports all QoS features. You can use MQC to provide uniform configurations across various Cisco platforms. For more information, see the *Cisco Nexus 9000 Series NX-OS Quality of Service Configuration Guide*.

Network Security Features

The Cisco NX-OS software includes the following security features:

- Control Plane Policing (CoPP)
- Message-digest algorithm 5 (MD5) routing protocol authentication
- Authentication, authorization, and accounting (AAA)
- RADIUS and TACACS+
- SSH Protocol Version 2
- SNMPv3
- Policies based on MAC and IPv4 addresses supported by named ACLs (port-based ACLs [PACLs], VLAN-based ACLs [VACLs], and router-based ACLs [RACLs])
- Traffic storm control (unicast, multicast, and broadcast)

For more information, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Supported Standards

This table lists the IEEE compliance standards.

Table 2: IEEE Compliance Standards

Standard	Description
802.1D	MAC Bridges
802.1p	Class of Service Tagging for Ethernet frames
802.1Q	VLAN Tagging
802.1s	Multiple Spanning Tree Protocol
802.1w	Rapid Spanning Tree Protocol
802.3ab	1000Base-T (10/100/1000 Ethernet over copper)
802.3ad	Link aggregation with LACP
802.3ae	10-Gigabit Ethernet

This table lists the RFC compliance standards. For information on each RFC, see www.ietf.org.

Table 3: RFC Compliance Standards

Standard	Description
BGP	
RFC 1997	*BGP Communities Attribute*
RFC 2385	*Protection of BGP Sessions via the TCP MD5 Signature Option*
RFC 2439	*BGP Route flap damping*
RFC 2519	*A Framework for Inter-Domain Route Aggregation*
RFC 2545	*Use of BGP-4 Multiprotocol Extensions for IPv6 Inter-Domain Routing*
RFC 2858	*Multiprotocol Extensions for BGP-4*
RFC 2918	*Route Refresh Capability for BGP-4*
RFC 3065	*Autonomous System Confederations for BGP*

Standard	Description
RFC 3392	*Capabilities Advertisement with BGP-4*
RFC 4271	*BGP version 4*
RFC 4273	*BGP4 MIB - Definitions of Managed Objects for BGP-4*
RFC 4456	*BGP Route Reflection: An Alternative to Full Mesh Internal BGP (IBGP)*
RFC 4486	*Subcodes for BGP cease notification message*
RFC 4724	*Graceful Restart Mechanism for BGP*
RFC 4893	*BGP Support for Four-octet AS Number Space*
RFC 5004	*Avoid BGP Best Path Transitions from One External to Another*
RFC 5396	*Textual Representation of Autonomous System (AS) Numbers* **Note** RFC 5396 is partially supported. The asplain and asdot notations are supported, but the asdot+ notation is not.
RFC 5549	*Advertising IPv4 Network Layer Reachability Information with an IPv6 Next Hop*
RFC 5668	*4-Octet AS Specific BGP Extended Community*
ietf-draft	Bestpath transition avoidance (draft-ietf-idr-avoid-transition-05.txt)
ietf-draft	Peer table objects (draft-ietf-idr-bgp4-mib-15.txt)
ietf-draft	Dynamic Capability (draft-ietf-idr-dynamic-cap-03.txt)
IP Multicast	

Standard	Description
RFC 2236	*Internet Group Management Protocol, Version 2*
RFC 3376	*Internet Group Management Protocol, Version 3*
RFC 3446	*Anycast Rendezvous Point (RP) mechanism using Protocol Independent Multicast (PIM) and Multicast Source Discovery Protocol (MSDP)*
RFC 3569	*An Overview of Source-Specific Multicast (SSM)*
RFC 3618	*Multicast Source Discovery Protocol (MSDP)*
RFC 4601	*Protocol Independent Multicast - Sparse Mode (PIM-SM): Protocol Specification (Revised)*
RFC 4607	*Source-Specific Multicast for IP*
RFC 4610	*Anycast-RP Using Protocol Independent Multicast (PIM)*
RFC 6187	*X.509v3 Certificates for Secure Shell Authentication*
ietf-draft	Mtrace server functionality, to process mtrace-requests, draft-ietf-idmr-traceroute-ipm-07.txt
IP Services	
RFC 768	*UDP*
RFC 783	*TFTP*
RFC 791	*IP*
RFC 792	*ICMP*
RFC 793	*TCP*
RFC 826	*ARP*
RFC 854	*Telnet*
RFC 959	*FTP*
RFC 1027	*Proxy ARP*

Standard	Description
RFC 8573	*NTP security is enhanced with the AES128CMAC authentication mechanism*
RFC 7822	*NTP v4*
RFC 1305	*NTP v3*
RFC 1519	*CIDR*
RFC 1542	*BootP relay*
RFC 1591	*DNS client*
RFC 1812	*IPv4 routers*
RFC 2131	*DHCP Helper*
RFC 2338	*VRRP*
IS-IS	
RFC 1142 (OSI 10589)	*OSI 10589 Intermediate system to intermediate system intra-domain routing exchange protocol*
RFC 1195	*Use of OSI IS-IS for routing in TCP/IP and dual environment*
RFC 2763	*Dynamic Hostname Exchange Mechanism for IS-IS*
RFC 2966	*Domain-wide Prefix Distribution with Two-Level IS-IS*
RFC 2973	*IS-IS Mesh Groups*
RFC 3277	*IS-IS Transient Blackhole Avoidance*
RFC 3373	*Three-Way Handshake for IS-IS Point-to-Point Adjacencies*
RFC 3567	*IS-IS Cryptographic Authentication*
RFC 3847	*Restart Signaling for IS-IS*
ietf-draft	Internet Draft Point-to-point operation over LAN in link-state routing protocols (draft-ietf-isis-igp-p2p-over-lan-06.txt)
OSPF	

Standard	Description
RFC 2328	*OSPF Version 2*
RFC 2370	*OSPF Opaque LSA Option*
RFC 2740	*OSPF for IPv6 (OSPF version 3)*
RFC 3101	*OSPF Not-So-Stubby-Area (NSSA) Option*
RFC 3137	*OSPF Stub Router Advertisement*
RFC 3509	*Alternative Implementations of OSPF Area Border Routers*
RFC 3623	*Graceful OSPF Restart*
RFC 4750	*OSPF Version 2 MIB*
Per-Hop Behavior (PHB)	
RFC 2597	*Assured Forwarding PHB Group*
RFC 3246	*An Expedited Forwarding PHB*
RIP	
RFC 1724	*RIPv2 MIB extension*
RFC 2082	*RIPv2 MD5 Authentication*
RFC 2453	*RIP Version 2*
SNMP	
RFC 2579	*Textual Conventions for SMIv2*
RFC 2819	*Remote Network Monitoring Management Information Base*
RFC 2863	*The Interfaces Group MIB*
RFC 3164	*The BSD syslog Protocol*
RFC 3176	*InMon Corporation's sFlow: A Method for Monitoring Traffic in Switched and Routed Networks*
RFC 3411 and RFC 3418	*An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks*
RFC 3413	*Simple Network Management Protocol (SNMP) Applications*

Standard	Description
RFC 3417	*Transport Mappings for the Simple Network Management Protocol (SNMP)*
Programmability	
RFC 8040	*RESTCONF Protocol*

CHAPTER 3

Using the Cisco NX-OS Setup Utility

This chapter contains the following sections:

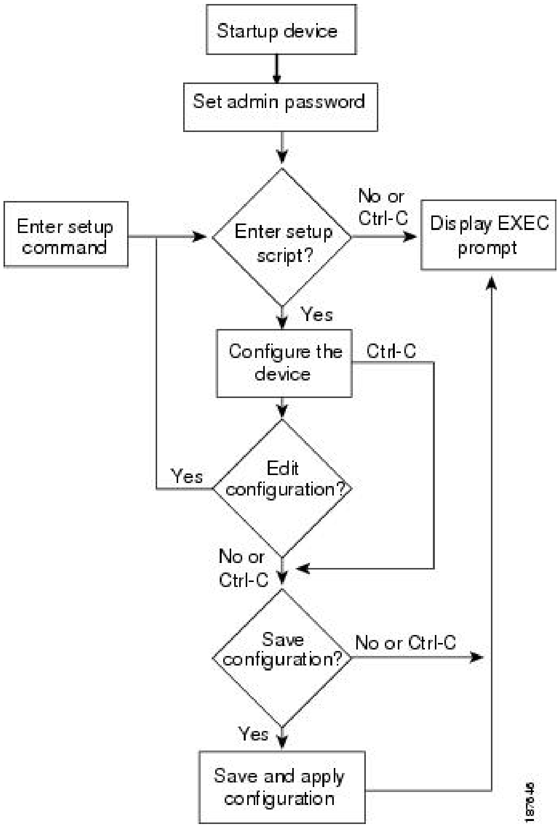
About the Cisco NX-OS Setup Utility

The Cisco NX-OS setup utility is an interactive command-line interface (CLI) mode that guides you through a basic (also called a startup) configuration of the system. The setup utility allows you to configure only enough connectivity for system management.

The setup utility allows you to build an initial configuration file using the System Configuration Dialog. The setup starts automatically when a device has no configuration file in NVRAM. The dialog guides you through initial configuration. After the file is created, you can use the CLI to perform additional configuration.

You can press **Ctrl-C** at any prompt to skip the remaining configuration options and proceed with what you have configured up to that point, except for the administrator password. If you want to skip answers to any questions, press **Enter**. If a default answer is not available (for example, the device hostname), the device uses what was previously configured and skips to the next question.

Figure 2: Setup Script Flow



This figure shows how to enter and exit the setup script.

You use the setup utility mainly for configuring the system initially, when no configuration is present. However, you can use the setup utility at any time for basic device configuration. The setup utility keeps the configured values when you skip steps in the script. For example, if you have already configured the mgmt0 interface, the setup utility does not change that configuration if you skip that step. However, if there is a default value for the step, the setup utility changes to the configuration using that default, not the configured value. Be sure to carefully check the configuration changes before you save the configuration.

Note Be sure to configure the IPv4 route, the default network IPv4 address, and the default gateway IPv4 address to enable SNMP access. If you enable IPv4 routing, the device uses the IPv4 route and the default network IPv4 address. If IPv4 routing is disabled, the device uses the default gateway IPv4 address.

Note The setup script only supports IPv4.

Prerequisites for the Setup Utility

The setup utility has the following prerequisites:

- Have a password strategy for your network environment.
- Connect the console port on the supervisor module to the network. If you have dual supervisor modules, connect the console ports on both supervisor modules to the network.
- Connect the Ethernet management port on the supervisor module to the network. If you have dual supervisor modules, connect the Ethernet management ports on both supervisor modules to the network.

Setting Up Your Cisco NX-OS Device

To configure basic management of the Cisco NX-OS device using the setup utility, follow these steps:

Step 1 Power on the device.

Step 2 Enable or disable password-strength checking.

A strong password has the following characteristics:

- At least eight characters long
- Does not contain many consecutive characters (such as "abcd")
- Does not contain many repeating characters (such as "aaabbb")
- Does not contain dictionary words
- Does not contain proper names
- Contains both uppercase and lowercase characters
- Contains numbers

Example:

```
         ---- System Admin Account Setup ----

Do you want to enforce secure password standard (yes/no) [y]: y
```

Step 3 Enter the new password for the administrator.

Note If a password is trivial (such as a short, easy-to-decipher password), your password configuration is rejected. Passwords are case sensitive. Be sure to configure a strong password that has at least eight characters, both uppercase and lowercase letters, and numbers.

Example:

```
Enter the password for "admin": <password>

Confirm the password for "admin": <password>

---- Basic System Configuration Dialog ----

This setup utility will guide you through the basic configuration of
the system. Setup configures only enough connectivity for management
of the system.
```

```
Please register Cisco Nexus 9000 Family devices promptly with your
supplier. Failure to register may affect response times for initial
service calls. Nexus devices must be registered to receive
entitled support services.

Press Enter at anytime to skip a dialog. Use ctrl-c at anytime
to skip the remaining dialogs.
```

Step 4 Enter the setup mode by entering **`yes`**.

Example:

```
Would you like to enter the basic configuration dialog (yes/no): yes
```

Step 5 Create additional accounts by entering **`yes`** (**`no`** is the default).

Example:

```
  Create another login account (yes/no) [n]:yes
```

a) Enter the user login ID.

Example:

```
Enter the User login Id : user_login
```

Caution Usernames must begin with an alphanumeric character and can contain only these special characters: (+ = . _ \ -). The # and ! symbols are not supported. If the username contains characters that are not allowed, the specified user is unable to log in.

b) Enter the user password.

Example:

```
Enter the password for "user1": user_password
Confirm the password for "user1": user_password
```

c) Enter the default user role.

Example:

```
Enter the user role (network-operator|network-admin) [network-operator]: default_user_role
```

For information on the default user roles, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Step 6 Configure an SNMP community string by entering **`yes`**.

Example:

```
Configure read-only SNMP community string (yes/no) [n]: yes
SNMP community string : snmp_community_string
```

For information on SNMP, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Step 7 Enter a name for the device (the default name is switch).

Example:

```
Enter the switch name: switch_name
```

Step 8 Configure out-of-band management by entering **yes**. You can then enter the mgmt0 IPv4 address and subnet mask.

Note You can only configure IPv4 address in the setup utility. For information on configuring IPv6, see the *Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*.

Example:

```
Continue with Out-of-band (mgmt0) management configuration? [yes/no]: yes
Mgmt0 IPv4 address: mgmt0_ip_address
Mgmt0 IPv4 netmask: mgmt0_subnet_mask
```

Step 9 Configure the IPv4 default gateway (recommended) by entering **yes**. You can then enter its IP address.

Example:

```
Configure the default-gateway: (yes/no) [y]: yes
IPv4 address of the default-gateway: default_gateway
```

Step 10 Configure advanced IP options such as the static routes, default network, DNS, and domain name by entering **yes**.

Example:

```
Configure Advanced IP options (yes/no)? [n]: yes
```

Step 11 Configure a static route (recommended) by entering **yes**. You can then enter its destination prefix, destination prefix mask, and next hop IP address.

Example:

```
Configure static route: (yes/no) [y]: yes
Destination prefix: dest_prefix
Destination prefix mask: dest_mask
Next hop ip address: next_hop_address
```

Step 12 Configure the default network (recommended) by entering **yes**. You can then enter its IPv4 address.

Note The default network IPv4 address is the same as the destination prefix in the static route configuration.

Example:

```
Configure the default network: (yes/no) [y]: yes
Default network IP address [dest_prefix]: dest_prefix
```

Step 13 Configure the DNS IPv4 address by entering **yes**. You can then enter the address.

Example:

```
Configure the DNS IP address? (yes/no) [y]: yes
DNS IP address: ipv4_address
```

Step 14 Configure the default domain name by entering **yes**. You can then enter the name.

Example:

```
Configure the DNS IP address? (yes/no) [y]: yes
DNS IP address: ipv4_address
```

Step 15 Enable the Telnet service by entering **yes**.

Example:

```
Enable the telnet service? (yes/no) [y]: yes
```

Step 16 Enable the SSH service by entering **yes**. You can then enter the key type and number of key bits. For more information, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Example:

```
Enable the ssh service? (yes/no) [y]: yes
Type of ssh key you would like to generate (dsa/rsa) : key_type
Number of  key bits <768-2048> : number_of_bits
```

Step 17 Configure the NTP server by entering **yes**. You can then enter its IP address. For more information, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

Example:

```
Configure NTP server? (yes/no) [n]: yes
NTP server IP address: ntp_server_IP_address
```

Step 18 Specify a default interface layer (L2 or L3).

Example:

```
Configure default interface layer (L3/L2) [L3]: interface_layer
```

Step 19 Enter the default switchport interface state (shutdown or no shutdown). A shutdown interface is in an administratively down state. For more information, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide*.

Example:

```
Configure default switchport interface state (shut/noshut) [shut]: default_state
```

Step 20 Enter yes (no is the default) to configure basic Fibre Channel configurations.

Example:

```
Enter basic FC configurations (yes/no) [n]: yes
```

Step 21 Enter shut (noshut is the default) to configure the default Fibre Channel switch port interface to the shut (disabled) state.

Example:

```
Configure default physical FC switchport interface state (shut/noshut) [noshut]: shut
```

Step 22 Enter on (on is the default) to configure the switch port trunk mode

Example:

```
Configure default physical FC switchport trunk mode (on/off/auto) [on]: on
```

Step 23 Enter permit (deny is the default) to permit a default zone policy configuration.

Example:

```
Configure default zone policy (permit/deny) [deny]: permit
```

Permits traffic flow to all members of the default zone.

Example:

Note If you are executing the setup script after entering a write erase command, you explicitly must change the default zone policy to permit for VSAN 1 after finishing the script using the following command:

```
switch(config)# zone default-zone permit vsan 1
```

Step 24 Enter yes (no is the default) to enable a full zone set distribution.

Example:

```
Enable full zoneset distribution (yes/no) [n]: yes
```

Step 25 Enter the best practices profile for control plane policing (CoPP). For more information, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Example:

```
Configure best practices CoPP profile (strict/moderate/lenient/none) [strict]: moderate
```

The system now summarizes the complete configuration and asks if you want to edit it.

Step 26 Continue to the next step by entering `no`. If you enter `yes`, the setup utility returns to the beginning of the setup and repeats each step.

Example:

```
Would you like to edit the configuration? (yes/no) [y]: yes
```

Step 27 Use and save this configuration by entering `yes`. If you do not save the configuration at this point, none of your changes are part of the configuration the next time the device reboots. Enter `yes` to save the new configuration. This step ensures that the boot variables for the nx-os image are also automatically configured.

Example:

```
Use this configuration and save it? (yes/no) [y]: yes
```

Caution If you do not save the configuration at this point, none of your changes are part of the configuration the next time that the device reboots. Enter **yes** to save the new configuration to ensure that the boot variables for the nx-os image are also automatically configured.

Additional References for the Setup Utility

This section includes additional information related to using the setup utility.

Related Documents for the Setup Utility

Related Topic	Document Title
Licensing	*Cisco NX-OS Licensing Guide*
SSH and Telnet	*Cisco Nexus 9000 Series NX-OS Security Configuration Guide*
User roles	*Cisco Nexus 9000 Series NX-OS Security Configuration Guide*
IPv4 and IPv6	*Cisco Nexus 9000 Series NX-OS Unicast Routing Configuration Guide*
SNMP and NTP	*Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*

CHAPTER 4

Using PowerOn Auto Provisioning

This chapter contains the following sections:

About PowerOn Auto Provisioning

PowerOn Auto Provisioning (POAP) automates the process of upgrading software images and installing configuration files on devices that are being deployed in the network for the first time.

When a device with the POAP feature boots and does not find the startup configuration, the device enters POAP mode, locates a DHCP server, and bootstraps itself with its interface IP address, gateway, and DNS server IP addresses. The device also obtains the IP address of a TFTP server and downloads a configuration script that enables the switch to download and install the appropriate software image and configuration file.

Note The DHCP information is used only during the POAP process.

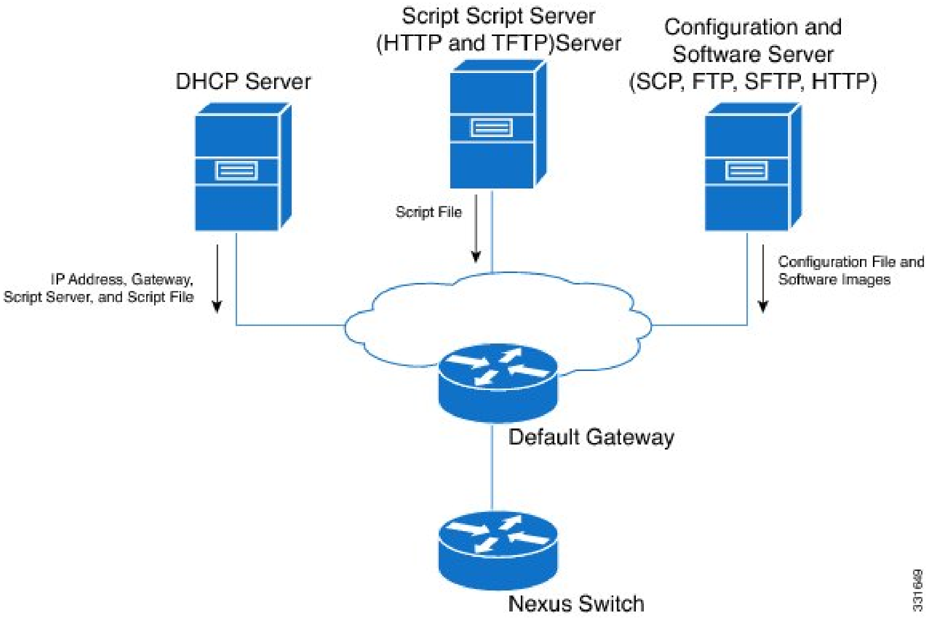
Network Requirements for POAP

POAP requires the following network infrastructure:

- A DHCP server to bootstrap the interface IP address, gateway address, and Domain Name System (DNS) server.
- A TFTP server that contains the configuration script used to automate the software image installation and configuration process.
- One or more servers that contains the desired software images and configuration files.

- If you use USB, then no DHCP server or TFTP server are required for POAP.

Figure 3: POAP Network Infrastructure



Secure Download of POAP Script

Beginning with Cisco NX-OS Release 10.2(3)F, you have the option of securely downloading the POAP script. When a device with the POAP feature boots and does not find the startup configuration, the device enters POAP mode, locates a DHCP server, and bootstraps itself with its interface IP address, gateway, and DNS server IP addresses. The device also obtains the IP address of an HTTPS server and downloads POAP script securely. The script enables the switch to download and install the appropriate software image and configuration file.

To download the POAP script securely, you need to select specific POAP options. Until Cisco NX-OS Release 10.2(3)F, POAP used options 66 and 67 for IPv4, and options 77 and 15 for IPv6 to extract the booting script information. However, the transfer of the script uses http, and is not very secure. Beginning with Cisco NX-OS Release 10.2(3)F, option 43 specifies the secure POAP related provisioning script information for IPv4 and option 17 specifies the same for IPv6. Additionally, these options allow the POAP to reach the file server in a secure manner. The POAP options 66, 67, 77, and 15 continue to be supported in Cisco NX-OS Release10.2(3)F. Furthermore, if you are using option 43 or 17, you can use the earlier options as fallback options, if required. From Cisco NX-OS Release 10.4(1)F, you can use Root-CA bundles instead of single .pem certificate for Secure POAP.

Note The maximum character length is 512 bytes for both option 43 and option 17.

The sub-options available for option 43 and option 17 are discussed in the following sections:

- Option 43 - IPv4
- Option 17 - IPv6

IPv4

Option 43 has the following sub-options for IPv4:

- option space poap length width 2;
- option poap.version code 1 = unsigned integer 8;

Note This sub-option is mandatory.

- option poap.ca_list code 50 = text;
- option poap.url code 2 = text;

Note This sub-option is mandatory.

- option poap.debug code 51 = unsigned integer 8;
- option poap.ntp code 3 = ip-address;

Note This sub-option is only supported for IPv4 (Option 43).

- option poap.flag code 52 = unsigned integer 8;

Note Flag is used to skip server certificate validation in the client.

Sample configuration for IPv4 is as follows:

```
host dhclient-n9kv {
hardware ethernet 00:50:56:85:c5:30;
fixed-address 3.3.3.1;
default-lease-time 3600;
option broadcast-address 192.168.1.255;
#option log-servers 1.1.1.1;
max-lease-time 3600;
option subnet-mask 255.255.255.0;
option routers 10.77.143.1;
#option domain-name-servers 1.1.1.1;
          vendor-option-space poap;
option poap.version 1;
option poap.ca_list "https://<ip>/poap/ca_file1.pem, https://<ip>/poap/ca_file2.pem";
option poap.url "https://<url>/poap.py";
option poap.debug 1;
option poap.ntp 10.1.1.39;
option poap.flag 0;
  }
```

IPv6

Option 17 has the following sub-options for IPv6:

- option space poap_v6 length width 2;
- option poap_v6.version code 1 = unsigned integer 8;

Note This sub-option is mandatory.

- option poap_v6.ca_list code 50 = text;
- option poap_v6.url code 3 = text;

Note This sub-option is mandatory.

- option poap_v6.debug code 51 = unsigned integer 8;
- option vsio.poap_v6 code 9 = encapsulate poap_v6;

Sample configuration for IPv6 is as follows:

```
 option dhcp6.next-hop-rt-prefix code 242 = { ip6-address, unsigned integer 16,
unsigned integer 16, unsigned integer 32, unsigned integer 8, unsigned integer 8, ip6-address
 };
 option dhcp6.bootfile-url code 59 = string;

 default-lease-time 3600;
 max-lease-time 3600;
 log-facility local7;
 subnet6 2003::/64 {

   # This statement configures actual values to be sent
 # RTPREFIX option code = 243, RTPREFIX length = 22
 # Ignore value 22. It is something related to option-size RT_PREFIX option length.
 # lifetime = 9000 seconds
 # route ETH1_IPV6_GW/64
 # metric 1
 option dhcp6.next-hop-rt-prefix 2003::2222 243 22 9000 0 1 ::;
 #ipv6 ::/0 2003::2222
 #Another example - support not there in NXOS - CSCvs05271:
 #option dhcp6.next-hop-rt-prefix 2003::2222 243 22 9000 112 1 2003::1:2:3:4:5:0;
 #ipv6 2003::1:2:3:4:5:0/112 2003::2222

   # Additional options
 #option dhcp6.name-servers fec0:0:0:1::1;
 #option dhcp6.domain-search "domain.example";


 range6 2003::b:1111 2003::b:9999;
 option dhcp6.bootfile-url "tftp://2003::1111/poap_github_v6.py";
 vendor-option-space poap_v6;
 option poap_v6.version 1;
 option poap_v6.ca_list "https://<ip>/new_ca.pem,https://<ip>/another_ca.pem";
 option poap_v6.url "https://<ip>/poap_github_v4.py";
option poap_v6.debug 1;
  }
```

Network Requirements for Secure POAP

Secure POAP requires the following network infrastructure:

- A DHCP server to bootstrap the interface IP address, gateway address, and Domain Name System (DNS) server.
- An HTTPS server that contains the POAP script used for software image installation and configuration process.

Note

- If the HTTPS server runs on a non-SUDI device, a physical USB drive with the CA certificates of the file-server is required.
- In case of secure download of POAP script, the TFTP server is replaced with the HTTPS server. Hence, when you read the content related to the TFTP server in this chapter, remember to read the TFTP server as the HTTPS server.

- One or more servers that contain the desired software images and configuration files.

Deployment Scenarios

Cisco devices have a unique identifier known as the Secure Unique Device Identifier (SUDI). The hardware SUDI can be used for authentication, as it can be used for asymmetric key operations such as encryption, decryption, signing, and verifying that allow passage of the data to be operated upon. All non-Cisco devices are classified as non-SUDI devices. For a non-SUDI device, the root-CA bundle is required to authenticate the file server. However, the file server can be hosted on either a SUDI or a non-SUDI device.

Based on all these capabilities, you can use one of the following deployment scenarios to download the POAP script in a secure way:

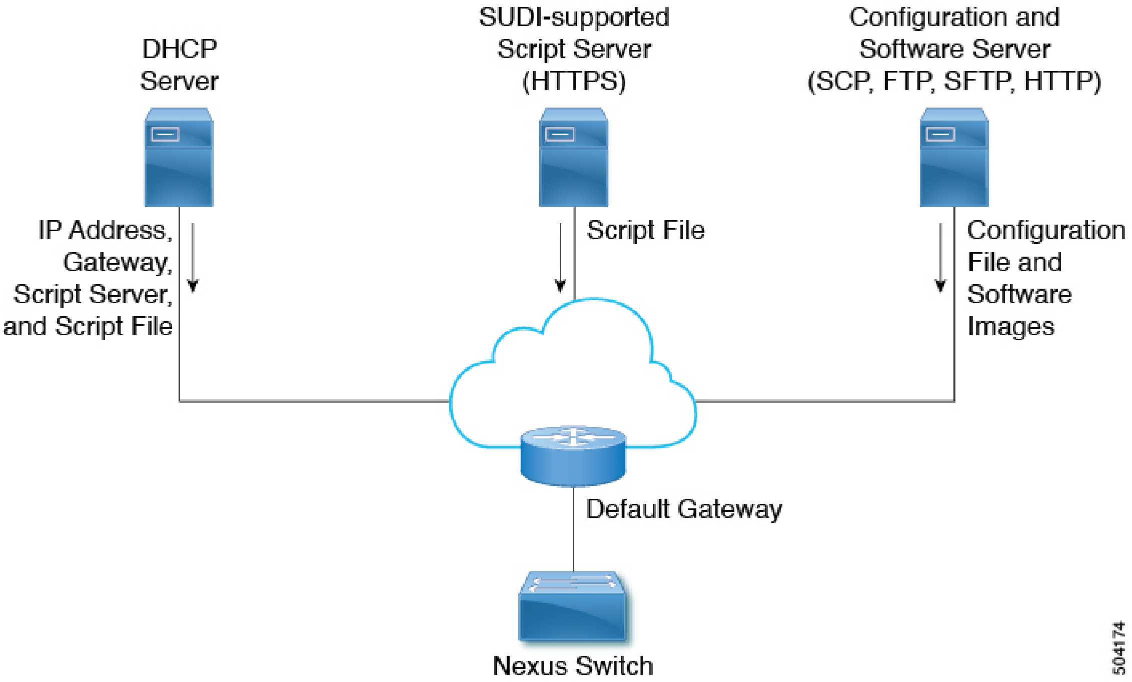
- SUDI Supported Device as File Server
- Non-SUDI Supported Device as a File Server

SUDI Supported Device as File Server

The SUDI supported devices are Cisco devices. Unlike the earlier implementation, the DHCP server now provides a https location rather than http/tftp. In this scenario, only the DHCP server and the SUDI supported script server (HTTPS server) are required, other than one or more servers that contain the required software images and configuration files.

Note SUDI only supports TLSv1.2 or below. Also, the SUDI solution only considers secure download using https, but not sftp.

Figure 4: SUDI Supported Device as File Server Infrastructure


DHCP Server
SUDI-supported Script Server (HTTPS)
Configuration and Software Server (SCP, FTP, SFTP, HTTP)
IP Address, Gateway, Script Server, and Script File
Script File
Configuration File and Software Images
Default Gateway
Nexus Switch
504174

The workflow for SUDI supported devices is as follows:

- Booting device is SUDI capable and has the needed trust store to verify a SUDI certificate
- Booting device sends out DHCP discover
- DHCP server responds to booting device with https server details
- Device establishes the secure channel using standard SSL APIs
- Authentication is done by verifying SUDI on both sides
- Downloads **poap.py**

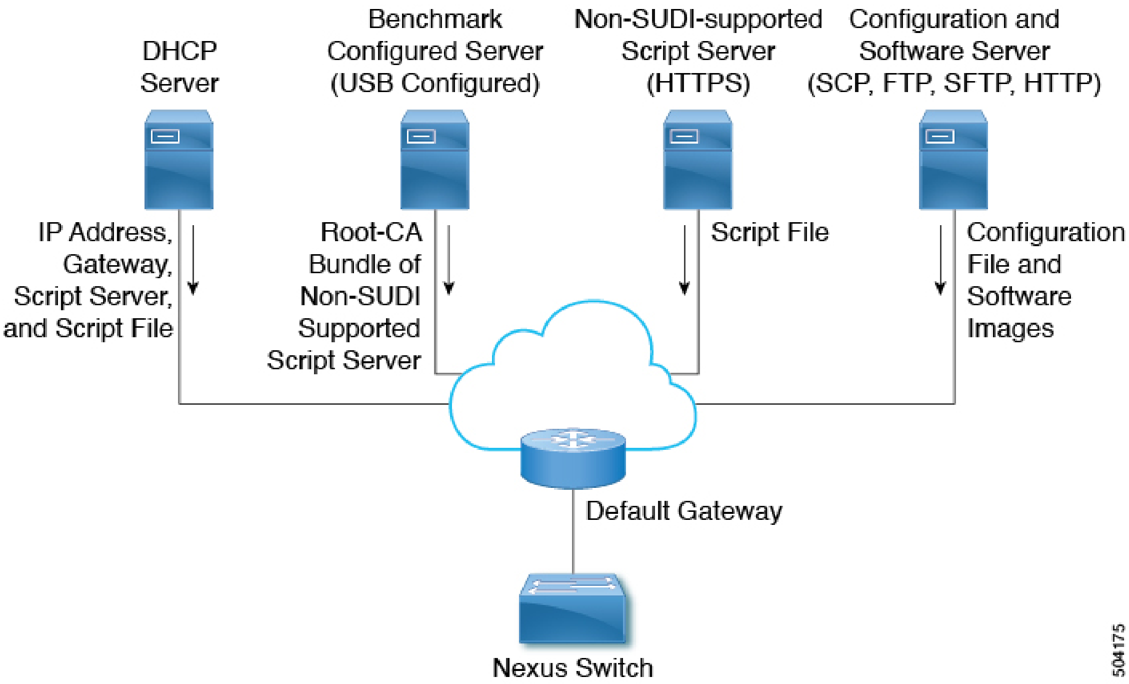
Non-SUDI Supported Device as a File Server

In this scenario, the Root-CA bundle must be installed in the booting device. The Root-CA bundle is required for authentication. Here, the DHCP server, intermediate device, and non-SUDI supported script server (HTTPS server) are required, other than one or more servers that contain the required software images and configuration files.

The DHCP offer has the details of intermediate server that has the Root-CA bundle available. The intermediate device should support SUDI. The booting device uses the intermediate device to download the Root-CA bundle, install it, and then communicate with the file server. The intermediate devices should be provisioned first.

Note The intermediate device requires that you provide the Root-CA bundle manually. For more information, see Bench Configured Device Hosting Root-CA Bundle.

Figure 5: Non-SUDI Supported Device as File Server Infrastructure


DHCP Server
Benchmark Configured Server (USB Configured)
Non-SUDI-supported Script Server (HTTPS)
Configuration and Software Server (SCP, FTP, SFTP, HTTP)
IP Address, Gateway, Script Server, and Script File
Root-CA Bundle of Non-SUDI Supported Script Server
Script File
Configuration File and Software Images
Default Gateway
Nexus Switch
504175

The workflow for non-SUDI supported devices is as follows:

- Booting device is SUDI capable and has the needed trust store to verify a SUDI certificate
- Intermediate device that hosts a server with Root-CA bundle is also SUDI capable
- Booting device sends out DHCP discover
- DHCP server responds to booting device with https server details and Root-CA server details
- Booting device reaches to intermediate device, gets the CA bundle, adds it to the trust store
- Booting device reaches the file server to download **poap.py**

Bench Configured Device Hosting Root-CA Bundle

A bench configured device requires manual intervention during bootup to install the Root-CA bundle by inserting a USB drive.

The workflow is as follows:

- Devices acting as intermediate devices, should be supplied with a USB drive during bootup.
- This USB drive will have **poap_usb.py** and Root-CA bundle.
- The **poap_usb.py** file in the USB copies Root-CA to the device, adds Root-CA to trust store, and returns a failure to POAP to trigger DHCP discover.

Note

- The required script is available as a template in GitHub.
- To change port on the Bench Configured Device, use the **file-server** *<port-number>* command. Avoid using standard ports such as port 80 (http) and port 443 (https).

- The DHCP discover phase helps in provisioning the device.
- When the device boots up after provisioning, it has an additional server that hosts the Root-CA bundle.

Secure POAP on a Device Shipped with Old Image

Support for secure POAP will be available only for devices that are shipped with image that has secure POAP feature.

If the device does not have the secure POAP feature, then use the legacy DHCP options to move the device to a later version of the image that supports secure POAP. Then these devices can be reloaded and use the secure POAP feature.

Troubleshooting Secure POAP

Perform the following steps to collect debugging information regarding secure POAP:

1. Set the debug option for IPv4 in option 43 to 1 and for IPv6 in option 17.

   The debug option enables additional logs.

2. Allow the switch to run one cycle of POAP.
3. Abort POAP.
4. When the system boots up, run the **show tech-support poap** command.

   This command displays POAP status and configuration.

Disabling POAP

POAP is enabled when there is no configuration in the system. It runs as a part of bootup. However, you can bypass POAP enablement during initial setup. If you want to disable POAP permanently (even when there is no configuration in the system), you can use the 'system no poap' command. This command ensures that POAP is not started during the next boot (even if there is no configuration). To enable POAP, use the 'system poap' command or the 'write erase poap' command. The 'write erase poap' command erases the POAP flag and enables POAP.

- Example: Disabling POAP

```
switch# system no poap
switch# sh boot
Current Boot Variables:
 sup-1
NXOS variable = bootflash:/nxos.9.2.1.125.bin
Boot POAP Disabled
```

```
POAP permanently disabled using 'system no poap'


Boot Variables on next reload:

sup-1
NXOS variable = bootflash:/nxos.9.2.1.125.bin
Boot POAP Disabled

POAP permanently disabled using 'system no poap'


switch# sh system poap
System-wide POAP is disabled  using exec command 'system no poap'
POAP will be bypassed on write-erase reload.
(Perpetual POAP cannot be enabled when system-wide POAP is disabled)
```

- Example: Enabling POAP

```
switch# system poap

switch# sh system poap

System-wide POAP is enabled
```

- Example: Erase POAP

```
switch# write erase poap
This command will erase the system wide POAP disable flag only if it is set.
Do you wish to proceed anyway? (y/n)   [n] y
System wide POAP disable flag erased.

switch# sh system poap
System-wide POAP is enabled
```

POAP Configuration Script

The reference script supplied by Cisco supports the following functionality:

- Retrieves the switch-specific identifier, for example, the serial number.
- Downloads the nx-os software image if the files do not already exist on the switch. The nx-os image is installed on the switch and is used at the next reboot.
- Schedules the downloaded configuration to be applied at the next switch reboot.
- Stores the configuration as the startup configuration.

Cisco has sample configuration scripts that were developed using the Python programming language and Tool Command Language (Tcl). You can customize one of these scripts to meet the requirements of your network environment. You can access the Python script to perform POAP on the Cisco Nexus 9000 Series switch at this link: https://github.com/datacenter/nexus9000/tree/master/nx-os/poap.

The Python programming language uses two APIs that can execute CLI commands. These APIs are described in the following table. The arguments for these APIs are strings of the CLI commands.

API	Description
cli()	Returns the raw output of CLI commands, including the control/special characters.
clid()	For CLI commands that support XML, this API puts the command output in a Python dictionary. This API can be useful to help search the output of **show** commands.

POAP Configuration Script

We provide a sample configuration script that is developed using the Python programming language. We recommend using the provided script and modifying it to meet the requirements of your network environment.

The POAP script can be found at https://github.com/datacenter/nexus9000/blob/master/nx-os/poap/poap.py.

To modify the script using Python, see the *Cisco NX-OS Python API Reference Guide* for your platform.

Using the POAP Script and POAP Script Options

Before using the POAP script, perform the following actions:

1. Edit the options dictionary at the top of the script to ensure that all relevant options for your setup are included in the script. Do not change the defaults (in the default options function) directly.
2. Update the MD5 checksum of the POAP script as shown using shell commands.

   ```
   f=poap_nexus_script.py ; cat $f | sed '/^#md5sum/d' > $f.md5 ; sed -i
   "s/^#md5sum=.*/#md5sum=\"$(md5sum $f.md5 | sed 's/ .*//')\"/" $f
   ```

3. If the device has a startup configuration, perform a write erase and reload the device.

The following POAP script options can be specified to alter the POAP script behavior. When you download files from a server, the hostname, username, and password options are required. For every mode except personality, the target_system_image is also required. Required parameters are enforced by the script, and the script aborts if the required parameters are not present. Every option except hostname, username, and password has a default option. If you do not specify the option in the options dictionary, the default is used.

- **`username`**

  The username to use when downloading files from the server.

- **`password`**

  The password to use when downloading files from the server.

- **`hostname`**

  The name or address of the server from which to download files.

- **`mode`**

  The default is **`serial_number`**.

  Use one of the following options:

- **`personality`**

  A method to restore the switch from a tarball.

- **`serial_number`**

  The serial number of the switch to determine the configuration filename. The format for the serial number in the configuration file is conf.*serialnumber*. Example: conf.FOC123456

- **`hostname`**

  The hostname as received in the DHCP options to determine the configuration filename. The format for the hostname in the configuration file is conf_*hostname*.cfg. Example: conf_3164-RS.cfg

- **`mac`**

  The interface MAC address to determine the configuration filename. The format for the hostname in the configuration file is conf_*macaddress*.cfg. Example: conf_7426CC5C9180.cfg

- **`raw`**

  The configuration filename is used exactly as provided in the options. The filename is not altered in any way.

- **`location`**

  The CDP neighbors are used to determine the configuration filename. The format for the location in the configuration file is conf_*host_intf*.cfg, where *host* is the host connected to the device over the POAP interface, and *intf* is the remote interface to which the POAP interface is connected. Example: conf_remote-switch_Eth1_8.cfg

- **`required_space`**

  The required space in KB for that particular iteration of POAP. The default is 100,000. For multi-step upgrades, specify the size of the last image in the upgrade path of the target image.

- **`transfer_protocol`**

  Any transfer protocol such as http, https, ftp, scp, sftp, or tftp that is supported by VSH. The default is scp.

- **`config_path`**

  The path to the configuration file on the server. Example: /tftpboot. The default is /var/lib/tftpboot.

- **`target_system_image`**

  The name of the image to download from the remote server. This is the image you get after POAP completes. This option is a required parameter for every mode except personality. The default is "".

- **`target_image_path`**

  The path to the image on the server. Example: /tftpboot. The default is /var/lib/tftpboot.

- **`destination_path`**

  The path to which to download images and MD5 sums. The default is /bootflash.

- **`destination_system_image`**

  The name for the destination image filename. If not specified, the default will be the target_system_image name.

- **`user_app_path`**

  The path on the server where the user scripts, agents, and user data are located. The default is /var/lib/tftpboot.

- **`disable_md5`**

  This is True if MD5 checking should be disabled. The default is False.

- **`midway_system_image`**

  The name of the image to use for the midway system upgrade. By default, the POAP script finds the name of any required midway images in the upgrade path and uses them. Set this option if you prefer to pick a different midway image for a two-step upgrade. The default is "".

- **`source_config_file`**

  The name of the configuration file when raw mode is used. The default is poap.cfg.

- **`vrf`**

  The VRF to use for downloads and so on. The VRF is automatically set by the POAP process. The default is the POAP_VRF environment variable.

- **`destination_config`**

  The name to use for the downloaded configuration. The default is poap_replay.cfg.

- **`split_config_first`**

  The name to use for the first configuration portion if the configuration needs to be split. It is applicable only when the configuration requires a reload to take effect. The default is poap_1.cfg.

- **`split_config_second`**

  The name to use for the second configuration portion if the configuration is split. The default is poap_2.cfg.

- **`timeout_config`**

  The timeout in seconds for copying the configuration file. The default is 120. For non-legacy images, this option is not used, and the POAP process times out. For legacy images, FTP uses this timeout for the login process and not for the copy process, while scp and other protocols use this timeout for the copy process.

- **`timeout_copy_system`**

  The timeout in seconds for copying the system image. The default is 2100. For non-legacy images, this option is not used, and the POAP process times out. For legacy images, FTP uses this timeout for the login process and not for the copy process, while scp and other protocols use this timeout for the copy process.

- **`timeout_copy_personality`**

  The timeout in seconds for copying the personality tarball. The default is 900. For non-legacy images, this option is not used, and the POAP process times out. For legacy images, FTP uses this timeout for the login process and not for the copy process, while scp and other protocols use this timeout for the copy process.

- **`timeout_copy_user`**

The timeout in seconds for copying any user scripts and agents. The default is 900. For non-legacy images, this option is not used, and the POAP process times out. For legacy images, FTP uses this timeout for the login process and not for the copy process, while scp and other protocols use this timeout for the copy process.

- **`personality_path`**

  The remote path from which to download the personality tarball. Once the tarball is downloaded and the personality process is started, the personality will download all files in the future from locations specified inside the tarball configuration. The default is /var/lib/tftpboot.

- **`source_tarball`**

  The name of the personality tarball to download. The default is personality.tar.

- **`destination_tarball`**

  The name for the downloaded personality tarball after it is downloaded. The default is personality.tar.

Setting up the DHCP Server without DNS for POAP

Beginning with Cisco NX-OS Release 7.0(3)I6(1), the tftp-server-name can be used without the DNS option. To enable POAP functionality without DNS on earlier releases, a custom option of 150 must be used to specify the tftp-server-address.

To use the tftp-server-address option, specify the following at the start of your dhcpd.conf file.

```
option tftp-server-address code 150 = ip-address;
```

For example:

```
host MyDevice {
    option dhcp-client-identifier "\000SAL12345678";
    fixed-address 2.1.1.10;
    option routers 2.1.1.1;
    option host-name "MyDevice";
    option bootfile-name "poap_nexus_script.py";
    option tftp-server-address 2.1.1.1;
}
```

The below example shows Configuring DHCPv6 for POAP over IPv6:

```
default-lease-time 3600;
max-lease-time 3600;
log-facility local7;
subnet6 2003::/64 {

        # This statement configures actual values to be sent
        # RTPREFIX option code = 243, RTPREFIX length = 22
        # Ignore value 22. It is something related to option-size RT_PREFIX option length.
        # lifetime = 9000 seconds
        # route ETH1_IPV6_GW/64
        # metric 1
        option dhcp6.next-hop-rt-prefix 2003::2222 243 22 9000 0 1 ::;
        #ipv6 ::/0 2003::2222
        #Another example - support not there in NXOS - CSCvs05271:
        #option dhcp6.next-hop-rt-prefix 2003::2222 243 22 9000 112 1 2003::1:2:3:4:5:0;
        #ipv6 2003::1:2:3:4:5:0/112 2003::2222

        # Additional options
        #option dhcp6.name-servers fec0:0:0:1::1;
```

```
#option dhcp6.domain-search "domain.example";

range6 2003::b:1111 2003::b:9999;
#range6 2003::c:2222 2003::c:2222;
option dhcp6.bootfile-url "tftp://2003::1111/poap_github_v6.py";
```

Downloading and Using User Data, Agents, and Scripts as part of POAP

Under the options dictionary, you can find the **download_scripts_and_agents** function. If you choose to download user scripts and data, uncomment the first **poap_log** line and then use a series of **download_user_app** function calls to download each application. Since older Cisco NX-OS versions do not support recursive copy of directories, such directories must be put into a tarball (TAR archive) and then unpacked once on the switch. The parameters for the **download_scripts_and_agents** function are as follows:

- **source_path** - The path to where the file or tarball is located. This is a required parameter. Example: /var/lib/tftpboot.
- **source_file** - The name of the file to download. This is a required parameter. Example: agents.tar, script.py, and so on.
- **dest_path** - The location to download the file on the switch. Any directories that do not exist earlier will be created. This is an optional parameter. The default is /bootflash.
- **dest_file** - The name to give the downloaded file. This is an optional parameter. The default is unchanged source_file.
- **unpack** - Indicates whether a tarball exists for unpacking. Unpacking is done with **tar -xf** *tarfile* **-C /bootflash**. This is an optional parameter. The default is False.
- **delete_after_unpack** - Indicates whether to delete the downloaded tarball after unpack is successful. There is no effect if unpack is False. The default is False.

Using the download functionality, you can download all the agents and files needed to run POAP. To start the agents, you should have the configuration present in the running configuration downloaded by POAP. Then the agents, scheduler, and cron entry, along with EEM, can be used.

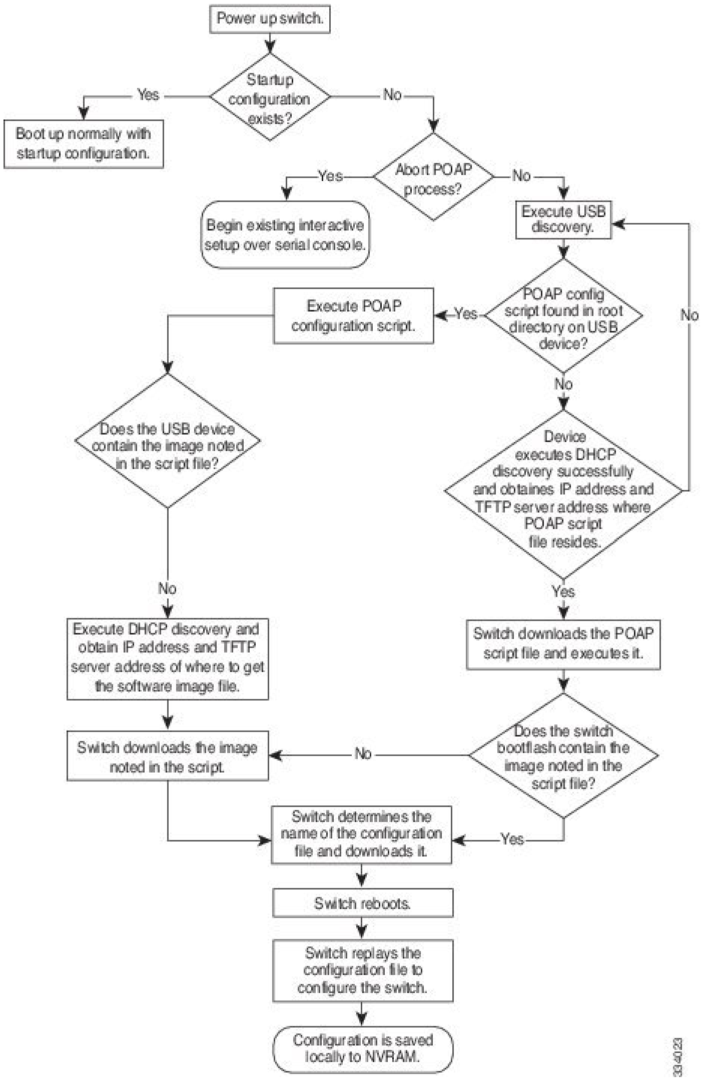
POAP Process

The POAP process has the following phases:

1. Power up
2. USB discovery
3. DHCP discovery
4. Script execution
5. Post-installation reload

Within these phases, other process and decision points occur. The following illustration shows a flow diagram of the POAP process.

Figure 6: POAP Process


Power up switch.
Startup configuration exists?
Yes
No
Boot up normally with startup configuration.
Abort POAP process?
Yes
No
Begin existing interactive setup over serial console.
Execute USB discovery.
POAP config script found in root directory on USB device?
Yes
No
Execute POAP configuration script.
No
Does the USB device contain the image noted in the script file?
Device executes DHCP discovery successfully and obtaines IP address and TFTP server address where POAP script file resides.
No
Yes
Execute DHCP discovery and obtain IP address and TFTP server address of where to get the software image file.
Switch downloads the POAP script file and executes it.
Switch downloads the image noted in the script.
No
Does the switch bootflash contain the image noted in the script file?
Switch determines the name of the configuration file and downloads it.
Yes
Switch reboots.
Switch replays the configuration file to configure the switch.
Configuration is saved locally to NVRAM.
334023

Power-Up Phase

When you powerup the device for the first time, it loads the software image that is installed at manufacturing and tries to find a configuration file from which to boot. When a configuration file is not found, POAP mode starts.

During startup, a prompt appears asking if you want to abort POAP and continue with a normal setup. You can choose to exit or continue with POAP.

Note No user intervention is required for POAP to continue. The prompt that asks if you want to abort POAP remains available until the POAP process is complete.

If you exit POAP mode, you enter the normal interactive setup script. If you continue in POAP mode, all the front-panel interfaces are set up in the default configuration.

USB Discovery Phase

When POAP starts, the process searches the root directory of all accessible USB devices for the POAP script file (the Python script file, poap_script.py), configuration files, and system and kickstart images.

If the script file is found on a USB device, POAP begins running the script. If the script file is not found on the USB device, POAP executes DHCP discovery. (When failures occur, the POAP process alternates between USB discovery and DHCP discovery, until POAP succeeds or you manually abort the POAP process.)

If the software image and switch configuration files specified in the configuration script are present, POAP uses those files to install the software and configure the switch. If the software image and switch configuration files are not on the USB device, POAP does some cleanup and starts DHCP phase from the beginning.

DHCP Discovery Phase

The switch sends out DHCP discover messages on the front-panel interfaces or the MGMT interface that solicit DHCP offers from the DHCP server or servers. (See the following figure.) The DHCP client on the Cisco Nexus switch uses the switch serial number in the client-identifier option to identify itself to the DHCP server. The DHCP server can use this identifier to send information, such as the IP address and script filename, back to the DHCP client.

POAP requires a minimum DHCP lease period of 3600 seconds (1 hour). POAP checks the DHCP lease period. If the DHCP lease period is set to less than 3600 seconds (1 hour), POAP does not complete the DHCP negotiation.

The DHCP discover message also solicits the following options from the DHCP server:

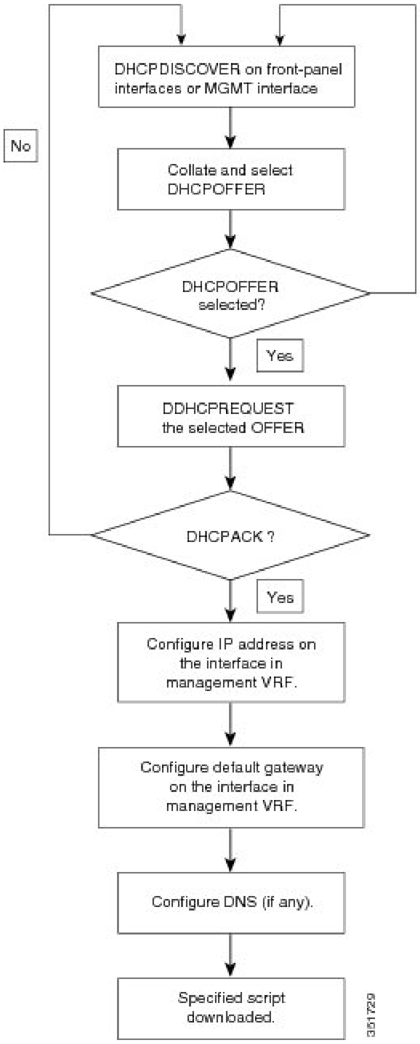
- TFTP server name or TFTP server address—The DHCP server relays the TFTP server name or TFTP server address to the DHCP client. The DHCP client uses this information to contact the TFTP server to obtain the script file.

- Bootfile name—The DHCP server relays the bootfile name to the DHCP client. The bootfile name includes the complete path to the bootfile on the TFTP server. The DHCP client uses this information to download the script file.

When multiple DHCP offers that meet the requirement are received, the one arriving first is honored and the POAP process moves to next stage. The device completes the DHCP negotiation (request and acknowledgment) with the selected DHCP server, and the DHCP server assigns an IP address to the switch. If a failure occurs in any of the subsequent steps in the POAP process, the IP address is released back to the DHCP server.

If no DHCP offers meet the requirements, the switch does not complete the DHCP negotiation (request and acknowledgment) and an IP address is not assigned.

Figure 7: DHCP Discovery Process


DHCPDISCOVER on front-panel interfaces or MGMT interface
No
No
Collate and select DHCPOFFER
DHCPOFFER selected?
Yes
DDHCPREQUEST the selected OFFER
DHCPACK ?
Yes
Configure IP address on the interface in management VRF.
Configure default gateway on the interface in management VRF.
Configure DNS (if any).
Specified script downloaded.
351729

POAP Dynamic Breakout

Beginning with Cisco NX-OS Release 7.0(3)I4(1), POAP dynamically breaks out ports in an effort to detect a DHCP server behind one of the broken-out ports. Previously, the DHCP server used for POAP had to be directly connected to a normal cable because breakout cables were not supported.

POAP determines which breakout map (for example, 10gx4, 50gx2, 25gx4, or 10gx2) will bring up the link connected to the DHCP server. If breakout is not supported on any of the ports, POAP skips the dynamic breakout process. After the breakout loop completes, POAP proceeds with the DHCP discovery phase as normal.

Note For more information on dynamic breakout, see the interfaces configuration guide for your device.

Script Execution Phase

After the device bootstraps itself using the information in the DHCP acknowledgement, the script file is downloaded from the TFTP server.

The switch runs the configuration script, which downloads and installs the software image and downloads a switch-specific configuration file.

However, the configuration file is not applied to the switch at this point, because the software image that currently runs on the switch might not support all of the commands in the configuration file. After the switch reboots, it begins running the new software image, if an image was installed. At that point, the configuration is applied to the switch.

Note If the switch loses connectivity, the script stops, and the switch reloads its original software images and bootup variables.

Post-Installation Reload Phase

The switch restarts and applies (replays) the configuration on the upgraded software image. Afterward, the switch copies the running configuration to the startup configuration.

POAPv3

PowerOn Auto Provisioning version 3 (POAPv3) is introduced in Cisco NX-OS Release 9.3(5). With this feature you can install license, RPM, and certificate through POAP.

Perform the following steps to install license or RPM or certificate through POAP.

1. Create a folder on the POAP server with serial number of the box as the name.
2. Create .yaml or .yml file with files to be installed. Make sure the file name is in <serial-number>.yaml or <serial-number>.yml format.
3. Create MD5 checksum for the .yaml or .yml file.
4. Make sure the format of the .yaml file should be similar to the below format:

```
Version : 1

Target-image : nxos.9.3.4.bin

Description : Yaml for box XYZ12345 poap provisioning. N9k Leaf mode box

License : [license1.lic, XYZ12345/license2.lic, folder1/license3.lic]

RPM :

  - rpm1.rpm

  - patches/reload/rpm2-reload.rpm

  - rpm3.rpm

Certificate : [ssh1.pub, XYZ12345/ssh2key.pub]
```

```
Trustpoint :

    CA1 :

        cert_1.p12 : password1 (priv_key_passphrase)

        XYZ12345/CA1/cert_2.pfx : password2

    CA2 :

        CA2/XYZ12345/cert_3.p12 : password3
```

5. Note that the yaml keywords must match the format shown in above example.
6. Place all files in appropriate path.
7. Update the POAP script with install_path variable as the path where folder with the serial number as name is placed.

The following list provides the guidelines and limitations related to POAPv3:

- YAML is a human friendly data serialization standard for all programming languages. YAML stands for YAML Ain't Markup Language, and this file format technology is used in documents. These documents are saved in plain text format and are appended with the . yml extension. YAML is the file format and .yml is the file extension.
- YAML is a superset of JSON and the YAML parser understands JSON. YAML file formats are used for configuration management because it is easy to read and comments are useful.
- The Target_image mentioned in yaml should be kept only in the target_system_image path mentioned within POAP script. Relative path is not supported for the Target_image in yaml file.
- Both .yaml and .yml extensions are supported. You have an option to choose to use any of these extensions. If you don’t choose any option, the <serial>.yaml extension will be tried first and if it fails the <serial>.yml is considered.
- The MD5 files of yaml/yml is required similar to the configuration file. But if the disable_md5 is ‘True’ then the MD5 files of yaml/yml are not required.
- Although 'install_path' is set in the POAP script file if no yaml file for device is found, then POAP workflow will proceed with the legacy path, i.e., without any installation of RPMs, licenses and certificates.
- Install reset is highly preferred over write erase if PoAP with RPM installation is done in scenarios apart from Day-0.
- ISSU is the new default for moving to new image via PoAP. Note that you need to use "use_nxos_boot": True, if legacy boot nxos <> is required.
- The Filetype checks for .pfx,.p12 in trustpoints; .lic in license; and .rpm in rpms and aborts the current POAP if the checks/fileformats are not honoured.
- In case of .rpm, you need to provide the original file name in the yaml file.

  For example: if you renamed customCliGoApp-1.0-1.7.5.x86_64.rpm to custom.rpm then PoAP will bail out indicating the name mismatch.

  To get the original name of rpm:

  ```
  bash-4.3$ rpm -qp --qf '%{NAME}-%{VERSION}-%{RELEASE}.%{ARCH}.rpm' custom.rpm
  customCliGoApp-1.0-1.7.5.x86_64.rpm
  bash-4.3$
  ```

- Once ISSU via POAP begins, abort of PoAP will be blocked. If ISSU fails for some reason, then abort capability will be re-enabled.

Guidelines and Limitations for POAP

POAP configuration guidelines and limitations are as follows:

- The bootflash:poap_retry_debugs.log is a file populated by POAP-PNP for internal purposes only. This file has no relevance in case of any POAP failures.
- Due to limitations in Syslog, securePOAP pem file name characters length is limited to 230 characters, though secure POAP supports 256 characters length for a pem file name.
- The switch software image must support POAP for this feature to function.
- POAP does not support provisioning of the switch after it has been configured and is operational. Only auto-provisioning of a switch with no startup configuration is supported.
- The **https_ignore_certificate** option should be turned on to use the **ignore-certificate** keyword with https protocol in POAP. This would enable you to successfully perform HTTPS transfer in the POAP script and without this option https as protocol cannot work with POAP.
- For those who uses HTTP/HTTPS servers for Day 0 provisioning, provisioning instructions will be given based on the MAC information and other related details in the HTTP header. POAP uses these details from HTTP GET headers so that the correct provisioning script is identified and used. This was available for other vendors (and other Cisco OSs).These additional information will be available in HTTP get headers from Cisco NX-OS Release 10.2(1) for Cisco Nexus 9000. This feature will be available by default for POAP and non-POAP HTTP get operations.
- When you use copy http/https GET commands, the following fields are shared as part of the HTTP header:

```
Host: IP address
User-Agent: cisco-nxos
X-Vendor-SystemMAC: System MAC
X-Vendor-ModelName: Switch-Model
X-Vendor-Serial: Serial_Num
X-Vendor-HardwareVersion: Hardwareversion
X-Vendor-SoftwareVersion: sw_version
X-Vendor-Architecture: Architecture
```

- If you use POAP to bootstrap a Cisco Nexus device that is a part of a virtual port channel (vPC) pair using static port channels on the vPC links, the Cisco Nexus device activates all of its links when POAP starts up. The dually connected device at the end of the vPC links might start sending some or all of its traffic to the port-channel member links that are connected to the Cisco Nexus device, which causes traffic to get lost.

  To work around this issue, you can configure Link Aggregation Control Protocol (LACP) on the vPC links so that the links do not incorrectly start forwarding traffic to the Cisco Nexus device that is being bootstrapped using POAP.
- If you use POAP to bootstrap a Cisco Nexus device that is connected downstream to a Cisco Nexus 9000 Series switch through a LACP port channel, the Cisco Nexus 9000 Series switch defaults to suspend its member port if it cannot bundle it as a part of a port channel. To work around this issue, configure the

Cisco Nexus 9000 Series switch to not suspend its member ports by using the **no lacp suspend-individual** command from interface configuration mode.

- Important POAP updates are logged in the syslog and are available from the serial console.
- Critical POAP errors are logged to the bootflash. The filename format is *date-time*_poap_*PID*_[init,1,2].log, where *date-time* is in the YYYYMMDD_hhmmss format and *PID* is the process ID.
- You can bypass the password and the basic POAP configuration by using the **skip** option at the POAP prompt. When you use the **skip** option, no password is configured for the admin user. The **copy running-config startup-config** command is blocked until a valid password is set for the admin user.
- If the **boot poap enable** command (perpetual POAP) is enabled on the switch, on a reload, a POAP boot is triggered even if there is a startup configuration present. If you do not want to use POAP in this scenario, remove the boot poap enable configuration by using the **no boot poap enable** command.
- Script logs are saved in the bootflash directory. The filename format is *date-time*_poap_*PID*_script.log, where *date-time* is in the YYYYMMDD_hhmmss format and *PID* is the process ID.

  You can configure the format of the script log file. Script file log formats are specified in the script. The template of the script log file has a default format; however, you can choose a different format for the script execution log file.
- The POAP feature does not require a license and is enabled by default. However for the POAP feature to function, appropriate licenses must be installed on the devices in the network before the deployment of the network.
- USB support for POAP enables checking a USB device containing the configuration script file in POAP mode. This feature is supported on the Nexus 9300-EX, -FX, -FX2, -FX3, and Nexus 9200-X, -FX2 switches.
- POAP DHCP transaction may fail if the device receives high traffic rate. This issue happens when POAP uses a front panel. To avoid this issue, make sure POAP uses a management port.
- Beginning with NX-OS 7.0(3)I7(4), RFC 3004 (User Class Option for DHCP) is supported. This enables POAP to support user-class option 77 for DHCPv4 and user-class option 15 for DHCPv6. The text displayed for the user class option for both DHCPv4 and DHCPv6 is "Cisco-POAP".
  - With RFC 3004 (User Class Option for DHCP) support, POAP over IPv6 is supported on Nexus 9000 switches.
    - Beginning with NX-OS 9.2(2), POAP over IPv6 is supported on Nexus 9504 and Nexus 9508 switches with –R line cards.

    The POAP over IPv6 feature enables the POAP process to use IPv6 when IPv4 fails. The feature is designed to cycle between IPv4 and IPv6 protocols when a connection failure occurs.
- For secure POAP, ensure that DHCP snooping is enabled.
- To support POAP, set firewall rules to block unintended or malicious DHCP servers.
- To maintain system security and make POAP more secure, configure the following:
  - Enable DHCP snooping.
  - Set firewall rules to block unintended or malicious DHCP servers.

- POAP is supported on both MGMT ports and in-band ports.
- Beginning with Cisco NX-OS Release 10.2(3)F, the Hardware SUDI for POAP/HTTPS feature provides an option to securely download the POAP script.
- To collect the debugging information on POAP, use the **show tech-support poap** command, post abort of POAP.
- Beginning with Cisco NX-OS Release 10.3(1)F, POAP is supported on Cisco Nexus X9836DM-A line card of the Cisco Nexus 9808 platform switches.
  - Beginning with Cisco NX-OS Release 10.4(1)F, POAP is supported on Cisco Nexus X98900CD-A line card of Cisco Nexus 9808 switches.
- Beginning with Cisco NX-OS Release 10.4(1)F, POAP is supported on the Cisco Nexus 9804 platform switches, and Cisco Nexus X98900CD-A and X9836DM-A line cards.
- Beginning with Cisco NX-OS Release 10.4(3)F, for the security enhancements, the skip option is disabled. You must enter a valid password to access the box irrespective of whether the POAP process has been stopped or not.

Setting Up the Network Environment to Use POAP

Step 1 Modify the basic configuration script provided by Cisco or create your own script. For information, see the *Python Scripting and API Configuration Guide*.

Step 2 Every time you make a change to the configuration script, ensure that you recalculate the MD5 checksum by running **# f=poap_nexus_script.py ; cat $f | sed '/^#md5sum/d' > $f.md5 ; sed -i "s/^#md5sum=.*/#md5sum=\"$(md5sum $f.md5 | sed 's/ .*//')\"/" $f** using a bash shell. For more information, see the *Python API Reference Guide*.

Step 3 (Optional) Put the POAP script and any other desired software image and switch configuration files on a USB device accessible to the switch.

Step 4 Deploy a DHCP server and configure it with the interface, gateway, and TFTP server IP addresses and a bootfile with the path and name of the configuration script file. (This information is provided to the switch when it first boots.) You do not need to deploy a DHCP server if all software image and switch configuration files are on the USB device.

Step 5 Deploy a TFTP or HTTP server to host the configuration script. In order to trigger the HTTP request to the server, prefix HTTP:// to the TFTP server name. HTTPS is not supported.

Step 6 Add the URL portion into the TFTP script name to show correct path to the file name.

Step 7 Deploy one or more servers to host the software images and configuration files.

Configuring a Switch Using POAP

Before you begin

Make sure that the network environment is set up to use POAP.

Step 1 Install the switch in the network.

Step 2 Power on the switch.

If no configuration file is found, the switch boots in POAP mode and displays a prompt that asks if you want to abort POAP and continue with a normal setup.

No entry is required to continue to boot in POAP mode.

Step 3 (Optional) If you want to exit POAP mode and enter the normal interactive setup script, enter **y** (yes).

The switch boots, and the POAP process begins.

What to do next

Verify the configuration.

Creating md5 Files

Every time you make a change to the configuration script, ensure that you recalculate the MD5 checksum by running # f=poap_fabric.py ; cat $f | sed '/^#md5sum/d' > $f.md5 ; sed -i "s/^#md5sum=.*/#md5sum=\"$(md5sum $f.md5 | sed 's/ .*//')\"/" $f using a bash shell.

This procedure replaces md5sum in `poap_fabric.py` with a new value if there was any change in that file.

Note Steps 1-4 and 7-8 are needed only if you are using the BASH shell. If you have access to any other Linux server, these steps are not required.

Before you begin

Access to the BASH shell.

Procedure

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**feature bash-shell** **Example:** `switch(config)# feature bash-shell`	Enable BASH shell feature.

	Command or Action	Purpose
Step 3	**exit** **Example:** `switch(config)# exit`	Exit configuration mode.
Step 4	**run bash** **Example:** `switch# run bash`	Open Linux BASH.

Step 5	**md5sum /bootflash/nxos.***release_number***.bin** > **/bootflash/nxos.***release_number***.bin.md5**
	Example:
	`bash-4.2$ md5sum /bootflash/nxos.7.0.3.I6.1.bin >`
	` /bootflash/nxos.7.0.3.I6.1.bin.md5`
		Creates md5sum for the `.bin` file.

Step 6	**md5sum /bootflash/poap.cfg** > **/bootflash/poap.cfg.md5**
	Example:
	`bash-4.2$ md5sum /bootflash/poap.cfg >`
	`/bootflash/poap.cfg.md5`
		Creates md5sum for the `.cfg` file.

Step 7	**exit** **Example:** `switch(config)# exit`	Exit the BASH shell.

Step 8	**dir | i .md5**
	Example:
	`switch# dir | i .md5`
	`   65  Jun 09 12:38:48 2017`
	`nxos.7.0.3.I6.1.bin.md5`
	`   54  Jun 09 12:39:36 2017  poap.cfg.md5`
	`67299  Jun 09 12:48:58 2017  poap.py.md5`
		Display the .md5 files.

Step 9	**copy bootflash:poap.cfg.md5 scp://***ip_address***/**
	Example:
	`copy bootflash:poap.cfg.md5 scp://10.1.100.3/`
	`Enter vrf (If no input, current vrf 'default' is`
	`considered): management`
	`Enter username: root`
	`root@10.1.100.3's password:`
	`poap.cfg.md5                                 100%`
	`   54     0.1KB/s   00:00`
	`Copy complete.`
		Uploads the files to the Configuration and Software Server.

Verifying the Device Configuration

To verify the configuration, use one of the following commands:

Command	Purpose
show running-config [**[exclude]** *command*] **[sanitized]**	Displays the contents of the currently running configuration or a subset of that configuration, use the **show running-config** command in the appropriate mode. : • **exclude**: (Optional) Excludes a specific configuration from the display. Use the **exclude** keyword followed by a *command* argument to exclude a specific configuration from the display. • *command*: (Optional) Displays only a single command or a subset of commands available under a specified command mode. • **sanitized**: (Optional) Displays a sanitized configuration for safe distribution and analysis. Beginning with Cisco NX-OS Release 10.3(2)F, **sanitized** keyword is supported on Cisco Nexus 9000 series switches.
show startup-config	Displays the startup configuration.
show time-stamp running-config last-changed	Displays the timestamp when the running configuration was last changed.

The following example shows sample output of **show running-config** command with the **sanitized** keyword. The sanitized configuration is used to share a configuration without exposing some configuration details.

This option masks the sensitive words in running configuration output with <removed> keyword.

```
switch# show running-config sanitized

!Command: show running-config sanitized
!Running configuration last done at: Wed Oct 12 09:14:54 2022
!Time: Wed Oct 12 13:52:55 2022

version 10.3(2) Bios:version 07.69

username admin password 5 <removed> role network-admin

copp profile strict
snmp-server user admin network-admin auth md5 <removed> priv aes-128 <removed> localizedV2key
rmon event 1 log trap <removed> description FATAL(1) owner PMON@FATAL
rmon event 2 log trap <removed> description CRITICAL(2) owner PMON@CRITICAL
rmon event 3 log trap <removed> description ERROR(3) owner PMON@ERROR
rmon event 4 log trap <removed> description WARNING(4) owner PMON@WARNING
rmon event 5 log trap <removed> description INFORMATION(5) owner PMON@INFO
--More--
```

Troubleshooting for POAP

The following is a list of known issues and suggestions while using POAP:

- Issue: POAP script execution fails immediately with no syslogs or output except for a "Script execution failed" statement.

Suggestion: Use the **python** *script-name* command on the server and make sure there are no syntax errors. The options dictionary is a Python dictionary so each entry must be comma separated and have the key or option and the value separated by a colon.

- Issue: A TypeError exception occurs at various places depending on the incorrectly used option.

  Suggestion: Some options use integers (for example, timeouts and other numeric values). Check the options dictionary for numeric values that are enclosed in quotes. Refer to the options list for the correct usage.

- Issue: POAP over USB is not finding the files that are present.

  Suggestion: Some devices have two USB slots. If you are using USB slot 2, you need to specify that as an option.

- Issue: Any issue with POAP.

  Suggestion: Abort POAP, and when the system boots up, run the **show tech-support poap** command, which displays POAP status and configuration.

Managing the POAP Personality

POAP Personality

The POAP personality feature, which is introduced in Cisco NX-OS Release 7.0(3)I4(1), enables user data, Cisco NX-OS and third-party patches, and configuration files to be backed up and restored. In previous releases, POAP can restore only the configuration.

The POAP personality is defined by tracked files on the switch. The configuration and package list in the personality file are ASCII files.

Binary versions are recorded in the personality file, but the actual binary files are not included. Because binary files are typically large, they are accessed from a specified repository.

The personality file is a .tar file, which would typically be extracted into a temporary folder. Here is an example:

```
switch# dir bootflash: 042516182843personality # timestamp name
46985 Dec 06 23:12:56 2015 running-config  Same as "show running-configuration" command.
20512 Dec 06 23:12:56 2015 host-package-list  Package/Patches list
58056 Dec 06 23:12:56 2015 data.tar  User Data
25    Dec 06 23:12:56 2015 IMAGEFILE  Tracked image metadata
```

Backing Up the POAP Personality

You can create a backup of the POAP personality either locally on the switch or remotely on the server. The personality backup taken from the switch should be restored only on a switch of the same model.

Note If you are using the Cisco scheduler feature for backups, you can configure it to also back up the POAP personality, as shown in the following example. For more information on the scheduler, see the *Cisco Nexus 9000 Series NX-OS System Management Configuration Guide*.

```
switch(config)# scheduler schedule name weeklybkup
switch(config-schedule)# time weekly mon:07:00
switch(config-schedule)# job name personalitybkup
switch(config-schedule)# exit
switch(config)# scheduler job name personalitybkup
switch(config-job)# personality backup bootflash:/personality-file ; copy
bootflash:/personality-file tftp://10.1.1.1/ vrf management
```

SUMMARY STEPS

1. **personality backup** [**bootflash:***uri* | **scp:***uri*]

DETAILED STEPS

	Command or Action	Purpose

Step 1	Required: **personality backup** [**bootflash:***uri* | **scp:***uri*]
	Example:
	`switch# personality backup bootflash:personality1.tar`
	Example:
	`switch# personality backup scp://root@2.1.1.1/var/lib/tftpboot/backup.tar`
		Creates a backup of the POAP personality.

Configuring the POAP Personality

You can specify whether the POAP personality should be derived from the running state of the system or the committed (startup) state.

SUMMARY STEPS

1. **configure terminal**
2. **personality**
3. **track** [**running-state** | **startup-state** | **data** *local-directories-or-files*]
4. **binary-location** *source-uri-folder*

DETAILED STEPS

	Command or Action	Purpose

Step 1	Required: **configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

	Command or Action	Purpose

Step 2	Required: **personality**
	Example:
	`switch# personality`
	`switch(config-personality)#`
		Enters personality configuration mode.

Step 3	Required: **track** [**running-state** | **startup-state** | **data** *local-directories-or-files*]
	Example:
	`switch(config-personality)# track data bootflash:myfile1`
	Example:
	`switch(config-personality)# track data bootflash:user_scripts/*.py`
	Example:
	`switch(config-personality)# track data bootflash:basedir/*/backup_data`
		Specifies how the POAP personality is derived. The following options are available:
		• **running-state**—Captures the following information: the running configuration (as shown in the **show running-config** command), active Cisco NX-OS patches and third-party packages in the host system, and the image name (as shown in the **show version** command). This is the default option.
		• **startup-state**—Captures the following information: the startup configuration (as shown in the **show startup-config** command), committed Cisco NX-OS patches and third-party packages in the host system, and the image name (as shown in the **show version** command).
		• **data** *local-directories-or-files*—Specifies a directory or file to be backed up. You can enter this command multiple times to back up multiple directories and files. UNIX-style wildcard characters are supported. In the example, one folder and two directories are specified.
		Note Do not use this command to backup binary files in the bootflash and do not point to the entire bootflash.
		Note Guest Shell packages are not tracked.
		Note Signed RPMs (which require a key) are not supported. The POAP personality feature does not work with signed RPMs.

Step 4	Required: **binary-location** *source-uri-folder* **Example:** `switch(config-personality)# binary-location scp://remote-dir1/nxos_patches/`	Specifies the local or remote directory from which to pick up binary files when the POAP personality is restored. You can enter this command multiple times (in order of priority) to specify multiple locations.

Restoring the POAP Personality

During the POAP script execution phase, the personality module in the script restores the POAP personality, provided that the currently booted switch image is Cisco NX-OS Release 7.0(3)I4(1) or later. If necessary, upgrade the switch to the correct software image.

Note A personality restore is done with the same software image used for the personality backup. Upgrading to a newer image is not supported through the POAP personality feature. To upgrade to a newer image, use the regular POAP script.

Note If the personality script fails to execute for any reason (such as not enough space in the bootflash or a script execution failure), the POAP process returns to the DHCP discovery phase.

The restore process performs the following actions:

1. Untars and unzips the personality file in the bootflash.
2. Validates the personality file.
3. Reads the configuration and package list files from the personality file to make a list of the binaries to be downloaded.
4. If the current image or patches are not the same as specified in the personality file, downloads the binaries to the bootflash (if not present) and reboots with the correct image and then applies the packages or patches.
5. Unzips or untars the user data files relative to "/".
6. Copies the configuration file in the POAP personality to the startup configuration.
7. Reboots the switch.

POAP Personality Sample Script

The following sample POAP script (poap.py) includes the personality feature:

```
#md5sum="b00a7fffb305d13a1e02cd0d342afca3"
# The above is the (embedded) md5sum of this file taken without this line, # can be # created
 this way:
# f=poap.py ; cat $f | sed '/^#md5sum/d' > $f.md5 ; sed -i "s/^#md5sum=.*/#md5sum=$(md5sum
 $f.md5 | sed 's/ .*//')/" $f # This way this script's integrity can be checked in case you
 do not trust # tftp's ip checksum. This integrity check is done by /isan/bin/poap.bin).
# The integrity of the files downloaded later (images, config) is checked # by downloading
 the corresponding file with the .md5 extension and is # done by this script itself.

from poap.personality import POAPPersonality import os

# Location to download system image files, checksums, etc.
download_path = "/var/lib/tftpboot"
# The path to the personality tarball used for restoration personality_tarball =
"/var/lib/tftpboot/foo.tar"
# The protocol to use to download images/config protocol = "scp"
# The username to download images, the personality tarball, and the # patches and RPMs
during restoration username = "root"
# The password for the above username
password = "passwd754"
# The hostname or IP address of the file server server = "2.1.1.1"

# The VRF to use for downloading and restoration vrf = "default"
if os.environ.has_key('POAP_VRF'):
    vrf = os.environ['POAP_VRF']
```

```
# Initialize housekeeping stuff (logs, temp dirs, etc.) p = POAPPersonality(download_path,
 personality_tarball, protocol, username, password, server, vrf)

p.get_personality()
p.apply_personality()

sys.exit(0)
```

CHAPTER 5

Using Network Plug and Play

This chapter contains the following sections:

About Network Plug and Play

Network Plug and Play (PnP) is a software application that runs on a Cisco Nexus 9500 Series Switch (specifically, N9K-C9504, N9K-C9508, and N9K-C9516). The PnP feature provides a simple, secure, unified, and integrated offering to make a new branch or campus rollouts much easier, or for provisioning updates to an existing or a new network. This feature provides a unified approach to provision networks comprising multiple devices with a near-zero-touch deployment experience.

Simplified deployment reduces the cost and complexity and increases the speed and security of the deployments. The PnP feature helps simplify the deployment of any Cisco device by automating the following deployment-related operational tasks:

- Establishing initial network connectivity for a device.
- Delivering device configuration to the controller.
- Delivering software and firmware images to the controller.
- Provisioning local credentials of a switch.
- Notifying other management systems about deployment-related events.

The PnP is a client-server based model. The client (agent) runs on a Cisco Nexus 9500 Series Switch and the server (controller) runs on the Cisco DNA Controller.

PnP uses a secure connection to communicate between the agent and the controller. This communication is encrypted.

For information on configuring and managing the needed security certificate(s) for PnP functionality, see the Cisco Digital Network Architecture Center Security Best Practices Guide.

The PnP agent converge solutions that exist in a network into a unified agent and adds additional functionality to enhance the current solutions. The main objectives of the PnP agent is to provide consistent Day 0 deployment solution for all the deployment scenarios.

Features Provided by the Network Plug and Play (PnP) Agent

Day 0 Provisioning

Day 0 bootstrapping includes the configuration, image, and other files. When a device is powered on for the first time, the PnP discovery process, which is embedded in the device, gets enabled in the absence of a startup configuration file and attempts to discover the address of the PnP controller or server. The PnP agent uses methods such as DHCP, Domain Name System (DNS), and others to acquire the desired IP address of the PnP server.

When the PnP agent successfully acquires the IP address, it initiates a long-term, bidirectional Layer 3 connection with the server and waits for a message from the server. The PnP server application sends messages to the corresponding agent, requesting for information about the devices and the services to be performed on the device.

The agent running on the Cisco Nexus 9500 Series switch then configures the IP address on receiving the DHCP acknowledgment and establishes a secure channel with the controller to provision the configurations. The switch then upgrades the image and applies the configurations.

Discovery Methods

A PnP agent discovers the PnP controller or server using one of the following methods:

- DHCP-based discovery
- DNS-based discovery
- PnP connect

After the discovery, the PnP agent writes the discovered information into a file, which is then used to handshake with the PnP server (DNA controller/DNA-C).

The following tasks are carried out by the agent in the PnP discovery phase:

- Brings up all the interfaces.
- Sends a DHCP request in parallel for all the interfaces.
- On receiving a DHCP reply, configures the IP address and mask, default route, DNS server, domain name, and writes the PnP server IP in a lease-parsing file. Note that there is no DHCP client in Cisco Nexus Switches and static configuration is required.
- Brings down all the interfaces.

Note POAP is the first order of choice for Day 0 provisioning. Only when there is no valid POAP offer, PnP discovery is attempted. Also, PnP is supported only on Cisco Nexus 9000 EoR models N9K-C9504, N9K-C9508, and N9K-C9516. PnP is not supported on Cisco Nexus 9000 ToRs.

DHCP-Based Discovery

When the switch is powered on and if there is no startup configuration, the PnP starts with DHCP discovery. DHCP discovery obtains the PnP server connectivity details.

The PnP agent configures the following:

- IP address
- Netmask
- Default gateway
- DNS server

- Domain name

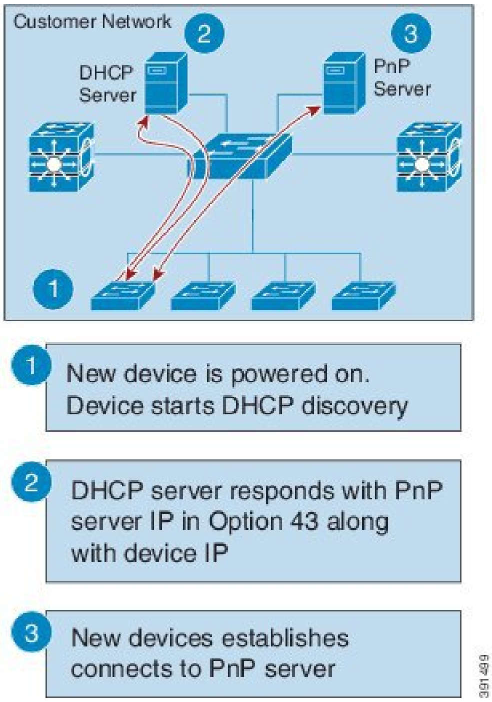
If the agent configuration fails, you should manually intervene and configure the switch.

DHCP discovery has the following flow:

- Power on the switch.
- Switch will boot up, the PnP process will be started, as there is no configuration present.
- Start DHCP discovery.
- DHCP Server replies with the PnP server configuration.
- PnP agent handshakes with the PnP server.
- Download the image, install, and reload.
- Download and apply the configuration from the controller.

A device with no startup configuration in the NV-RAM triggers the day 0 provisioning and goes through the POAP process (as detailed in m_using_poweron_auto_provisioning_92x.ditamap#id_70221). When there is no valid POAP offer, the PnP agent is initiated. The DHCP server can be configured to insert additional information using vendor-specific Option 43. Upon receiving Option 60 from the device with the string (cisco pnp), to pass on the IP address or hostname of the PnP server to the requesting device. When the DHCP response is received by the device, the PnP agent extracts the Option 43 from the response to get the IP address or the hostname of the PnP server. The PnP agent then uses this IP address or hostname to communicate with the PnP server.

Figure 8: DHCP Discovery Process for PnP Server



1 New device is powered on. Device starts DHCP discovery

2 DHCP server responds with PnP server IP in Option 43 along with device IP

3 New devices establishes connects to PnP server

DNS-Based Discovery

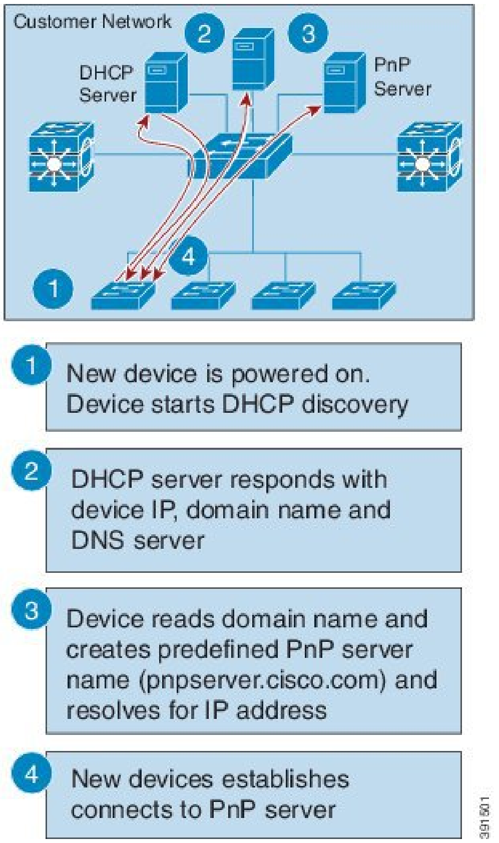
When the DHCP discovery fails to get the PnP server, the agent falls back to DNS-based discovery. To start the DNS-based discovery, the following information is required from DHCP:

- IP address and netmask
- Default gateway

- DNS server IP
- Domain name

The agent obtains the domain name of the customer network from the DHCP response and constructs the fully qualified domain name (FQDN). The following FQDN is constructed by the PnP agent using a preset deployment server name and the domain name information for the DHCP response. The agent then looks up the local name server and tries to resolve the IP address for the above FQDN.

Figure 9: DNS Lookup for pnpserver.[domainname].com



1 New device is powered on. Device starts DHCP discovery

2 DHCP server responds with device IP, domain name and DNS server

3 Device reads domain name and creates predefined PnP server name (pnpserver.cisco.com) and resolves for IP address

4 New devices establishes connects to PnP server

Note The device reads domain name and creates predefined PnP server name as pnpserver.[domain name].com, for example; pnpserver.cisco.com.

Plug and Play Connect

When the DHCP and the DNS discovery fail, the PnP agent discovers and communicates with Cisco Cloud-based deployment service for initial deployment. The PnP agent directly opens an HTTPS channel using the Python library, which internally invokes OpenSSL to talk with cloud for configuration.

Cisco Power On Auto Provisioning

Cisco Power On Auto Provisioning (PoAP) communicates with the DHCP and TFTP servers to download the image and configurations. With the introduction of the PnP feature, PnP and PoAP coexist together in a Cisco Nexus 9500 Series Switch. PoAP and PnP interworking has the following processes:

- PoAP starts first when no start-up configuration is present in the system.
- PnP starts later if PoAP does not get provisioned.
- PoAP and PnP discover the controller alternatively.
- The controller discovery process continues until a controller or until the admin aborts auto provision.
- The process (POAP or PnP) that finds the controller continues provisioning and the other process that does not find the controller is notified and eventually terminated.

Services and Capabilities of the Network Plug and Play Agent

The PnP agent performs the following tasks:

- Backoff
- Capability
- CLI execution
- Configuration upgrade
- Device information
- Certificate install
- Image install
- Redirection

Note The PnP controller or server provides an optional checksum tag to be used in the image installation and configuration upgrade service requests by the PnP agent. When the checksum is provided in a request, the image install process compares the checksum against the current running image checksum.

If the checksums are same, the image being installed or upgraded is the same as the current image running on the device. The image install process will not perform any other operation in this scenario.

If the checksums are not the same, the new image will be copied to the local file system, and the checksum will be calculated again and compared with the checksum provided in the request. If they are the same, the image install process continues to install the new image or upgrade the device to the new image. If the checksums are not the same, the process exits with an error.

Backoff

A Cisco NX-OS device that supports PnP protocol, which uses HTTP transport, requires the PnP agent to send the work request to the PnP server continuously. If the PnP server does not have any scheduled or outstanding PnP service for the PnP agent to execute, the continuous no-operation work requests exhaust both the network bandwidth and the device resources. This PnP backoff service allows the PnP server to inform the PnP agent to rest for the specified time and call back later.

Capability

Capability service request is sent by the PnP server to the PnP agent on a device to query the supported services by the agent. The server then sends an inventory service request to query the device's inventory information; and then sends an image installation request to download an image and install it. After getting the response from the agent, the list of supported PnP services and features are enlisted and returned back to the Server.

CLI Execution

Cisco NX-OS supports two modes of command execution, privileged EXEC mode and global configuration mode. Most of the EXEC commands are one-time commands, such as **show** commands, which show the current configuration status, and clear commands, which clear counters or interfaces. The EXEC commands are not saved when a device reboots. Configuration mode commands allow user to make changes to the running configuration. If you save the configuration, these commands are saved when a device reboots.

Configuration Upgrade

Two types of configuration upgrades takes place in a Cisco device—copying new configuration files to the startup configuration and copying new configuration files to the running configuration.

Copying new configuration files to the startup configuration—A new configuration file is copied from the file server to the device using the **copy** command, and the file check task is performed to check the validity of the file. If the file is valid, the file is copied to the startup configuration. The previous configuration file is backed up if enough disk space is available. The new configuration comes into effect when the device reloads again.

Copying new configuration files to the running configuration—A new configuration file is copied from the file server to the device using the **copy** command or **configure replace** command. Replace and rollback of configuration files may leave the system in an unstable state if rollback is performed inefficiently. Therefore, configuration upgrade by copying the files is preferred.

Device Information

The PnP agent provides the capability to extract device inventory and other important information to the PnP server on request. The following device-profile request types are supported:

- all—Returns complete inventory information, which includes unique device identifier (UDI), image, hardware, and file system inventory data.
- filesystem—Returns file system inventory information, which includes file system name and type, local size (in bytes), free size (in bytes), read flag, and write flag.
- hardware—Returns hardware inventory information, which includes hostname, vendor string, platform name, processor type, hardware revision, main memory size, I/O memory size, board ID, board rework ID, processor revision, mid-plane revision, and location.
- image—Returns image inventory information, which includes version string, image name, boot variable, return to ROMMON reason, bootloader variable, configuration register, configuration register on next boot, and configuration variables.
- UDI—Returns the device UDI.

Certificate Install

Certificate install is a security service through which a PnP server requests the PnP agent on a device for trust pool or trust point certificate installation or uninstallation. This service also specifies the agent about the primary and backup servers for reconnection. The following prerequisites are required for a successful certificate installation:

- The server from which the certificate or trust pool bundle needs to be downloaded should be reachable.
- There should not be any permission issues to download the certificate or the bundle.
- The PKI API should be available and accessible for the PnP agent so that the agent could call to download and install the certificate or the bundle.
- There is enough memory on the device to save the downloaded certificate or bundle.

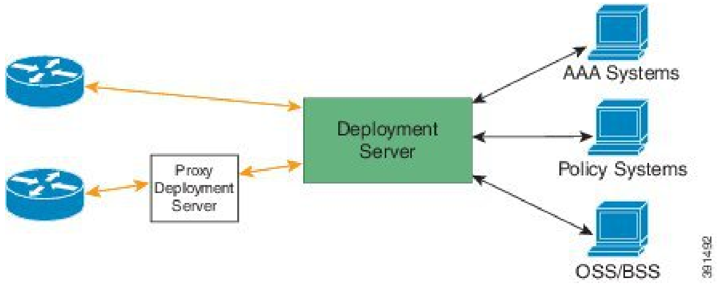
PnP Agent

The PnP agent is an embedded software component that is present in all Cisco network devices that support simplified deployment architecture. The PnP agent understands and interacts only with a PnP server. The PnP agent first tries to discover a PnP server, with which it can communicate. After a server is found and connection established, the agent performs deployment-related activities such as configuration, image and file updates by communicating with the server. It also notifies the server of all interesting deployment-related events such as out-of-band configuration changes and new device connections on an interface.

PnP Server

The PnP server is a central server that encodes the logic of managing and distributing deployment information (images, configurations, files, and licenses) for the devices being deployed. The server communicates with the agent on the device that supports the simplified deployment process using a specific deployment protocol.

Figure 10: Simplified Deployment Server



The PnP server also communicates with proxy servers such as deployment applications on smart phones and PCs, or other PnP agents acting as Neighbor Assisted Provisioning Protocol (NAPP) servers, and other types of proxy deployment servers such as VPN gateways.

The PnP server can redirect the PnP agent to another deployment server. A common example of redirection is a PnP server redirecting a device to communicate with it directly after sending the bootstrap configuration through a NAPP server. A PnP server can be hosted by an enterprise. This solution allows for a cloud-based deployment service provided by Cisco. In this case, a device discovers and communicates with Cisco cloud-based deployment service for initial deployment. After that, it can be redirected to the customer's deployment server.

In addition to communicating with the devices, the server interfaces with a variety of external systems such as authentication, authorizing, and accounting (AAA) systems, provisioning systems, and other management applications.

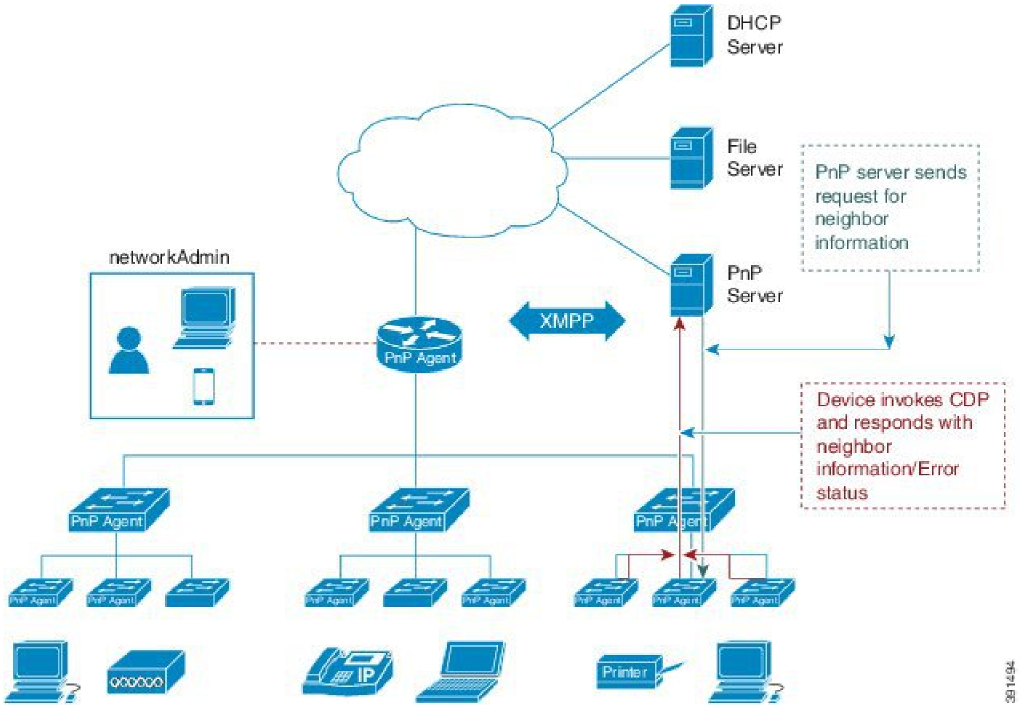
PnP Agent Deployment

The following steps indicate the PnP agent deployment procedure on Cisco devices:

1. A Cisco device with a PnP agent contacts the PnP server, requesting for a task, that is, the PnP agent sends UDI along with a request for work.
2. If the PnP server has a task for the device, for example, image installation, configuration, upgrade, and so on, it sends a work request.
3. After the PnP agent receives the work request, it executes the task and sends back a reply to the PnP server about the task status, that is whether it is successful or if an error has occurred, and the corresponding information that is requested.

PnP Agent Network Topology

Figure 11: Network Topology of Cisco PnP Agent Deployment


DHCP Server
File Server
PnP Server
PnP server sends request for neighbor information
networkAdmin
XMPP
PnP Agent
Device invokes CDP and responds with neighbor information/Error status
PnP Agent
PnP Agent
PnP Agent
IP
Printer
391494

PnP Agent Initialization

The PnP agent is enabled by default, but can be initiated on a device when the startup configuration is not available.

Absence of Startup Configuration

New Cisco devices are shipped to customers with no startup configuration file in the NVRAM of the devices. When a new device is connected to a network and powered on, the absence of a startup configuration file on the device automatically triggers the PnP agent to discover the PnP server IP address.

CLI Configuration for the PnP Agent

PnP supports devices that are using VLAN 1 by default.

Guidelines and Limitations for Network Plug and Play

Network Plug and Play (PnP) guidelines and limitations are as follows:

- Beginning with NX-OS 9.2(3), PnP is supported on the management port of Cisco Nexus 9500 platform switches.
- PnP runs on both the in-band and the management interfaces. In-band is supported only on FX-series line cards (specifically N9K-X9736C-FX for PnP).
- The PnP deployment method depends on the discovery process that is required for finding the PnP controller or server.
- The discovery mechanism must be deployed, either as a DHCP server discovery process or a Domain Name Server (DNS) discovery process, before launching PnP.

- Configure the DHCP server or the DNS server before deploying PnP.
- The PnP server must communicate with the PnP agent.
- PnP connect does not require a DHCP or DNS configuration.
- IPv6 support for PnP is not available for Cisco Nexus 9500 Series devices.

Cisco DNA Center Support

The following guidelines and limitations are specific for PnP connectivity to the Cisco DNA Center:

- Cisco DNA Center supports the following functionality on the Cisco Nexus 9504, Cisco Nexus 9508, and Cisco Nexus 9516 switches:
    - Discovery
    - Inventory
    - Topology
    - Template Programmer
    - Software Image Management
    - Basic Monitoring
- The following PnP guidelines and limitations are only for the Cisco DNA Center version 1.2.6 and earlier:
    - The startup configuration that is provided during plug and play must ensure that the connectivity for the interface that is connected to the Cisco DNA Center remains intact.
    - The system image .bin and startup configuration must be uploaded to the Cisco DNA Center.
    - The bootflash must have enough space to download the image and configurations from the Cisco DNA Center.

      Click here for the user documentation for the Cisco DNA Center.

Troubleshooting Examples for Network Plug and Play

Example: Troubleshooting PnP

The following examples shows the PnP troubleshooting command outputs:

```
Switch# show pnp status
PnP Agent is running
server-connection
    status: Success
    time: 08:41:26 Jan 11
interface-info
    status: Success
    time: 08:34:00 Jan 11
device-info
    status: Success
    time: 08:33:46 Jan 11
config-upgrade
    status: Success
    time: 08:31:36 Jan 11
capability
    status: Success
    time: 08:33:50 Jan 11
backoff
    status: Success
    time: 08:41:26 Jan 11
topology
    status: Success
    time: 08:33:54 Jan 11


Switch# show pnp version
PnP Agent Version Summary

PnP Agent: 1.6.0
Platform Name: nxos
PnP Platform: 1.5.0.rc2


Switch# show pnp profiles
Created by              UDI
DHCP Discovery  PID:N9K-C9504,VID:V01,SN:FOX1813GCZ8

     Primary transport: https
     Address: 10.105.194.248
     Port: 443
     CA file: /etc/pnp/certs/trustpoint/pnplabel

     Work-Request Tracking:
         Pending-WR: Correlator=
Cisco-PnP-POSIX-nxos-1.6.0-21-589a466a-0d88-427b-a17e-69afb7d0a226-1
         Last-WR:    Correlator=
Cisco-PnP-POSIX-nxos-1.6.0-20-ab225de4-b0ef-46c5-9c4f-e3bd9f7c6b87-1
     PnP Response Tracking:
         Last-PR:    Correlator=
Cisco-PnP-POSIX-nxos-1.6.0-20-ab225de4-b0ef-46c5-9c4f-e3bd9f7c6b87-1


Switch# show pnp lease
{
    "lease": {
         "uptime": "Fri Jan 11 05:32:17 2019",
        "intf": "Vlan1",
         "ip_addr": "10.77.143.239",
         "mask": "255.255.255.0",
         "gw": "10.77.143.1",
         "domain": "",
         "opt_43": "5A1D;B2;K4;I10.105.194.248;J80",
         "lease": "3600",
         "server": "10.77.143.231",
         "vrf": "1"
     }
}


Switch# show pnp internal trace

1) Event:E_DEBUG, length:49, at 907122 usecs after Fri Jan 11 08:30:44 2019
    [104] pnp_ascii_gen: ascii gen completed rcode[0]

2) Event:E_DEBUG, length:16, at 907094 usecs after Fri Jan 11 08:30:44 2019
    [104] pss type: 5

3) Event:E_DEBUG, length:31, at 907069 usecs after Fri Jan 11 08:30:44 2019
    [104] Entering pnp_ascii_gen_cfg
```

```
4) Event:E_DEBUG, length:22, at 907061 usecs after Fri Jan 11 08:30:44 2019
    [104] Calling Ascii gen

5) Event:E_DEBUG, length:16, at 907051 usecs after Fri Jan 11 08:30:44 2019
    [104] pss type: 2

6) Event:E_DEBUG, length:49, at 907018 usecs after Fri Jan 11 08:30:44 2019
    [104] pnp_ascii_gen: fu_num_acfg_pss_entries[0x2]

7) Event:E_DEBUG, length:49, at 973813 usecs after Fri Jan 11 08:29:51 2019
    [104] pnp_ascii_gen: ascii gen completed rcode[0]

8) Event:E_DEBUG, length:16, at 973787 usecs after Fri Jan 11 08:29:51 2019
    [104] pss type: 5

9) Event:E_DEBUG, length:31, at 973760 usecs after Fri Jan 11 08:29:51 2019
    [104] Entering pnp_ascii_gen_cfg

10) Event:E_DEBUG, length:22, at 973751 usecs after Fri Jan 11 08:29:51 2019
    [104] Calling Ascii gen

11) Event:E_DEBUG, length:16, at 973742 usecs after Fri Jan 11 08:29:51 2019
    [104] pss type: 2

12) Event:E_DEBUG, length:49, at 973707 usecs after Fri Jan 11 08:29:51 2019
    [104] pnp_ascii_gen: fu_num_acfg_pss_entries[0x2]

13) Event:E_DEBUG, length:35, at 535794 usecs after Fri Jan 11 08:04:15 2019
    [104]  pnp_pi_spawn_finalize pid 690

14) Event:E_DEBUG, length:41, at 228291 usecs after Fri Jan 11 08:04:13 2019
    [104] + pnp_pi_spawn child_pid: 0xdd526da0

15) Event:E_DEBUG, length:76, at 132853 usecs after Fri Jan 11 08:03:26 2019
    [104] Rx: Direction: PnP PI -> PnP PD, Type: Device Provisioned, Cfg: Present

16) Event:E_DEBUG, length:35, at 440380 usecs after Fri Jan 11 08:03:18 2019
    [104] !!! ACKED Unconfigure Ret:1!!!

17) Event:E_DEBUG, length:61, at 440347 usecs after Fri Jan 11 08:03:18 2019
    [104] Tx: Direction: Max, Type: DHCP Unconfigure Done, Len: 16

18) Event:E_DEBUG, length:35, at 440331 usecs after Fri Jan 11 08:03:18 2019
    [102] Unknown timer cancel requested

19) Event:E_DEBUG, length:35, at 440311 usecs after Fri Jan 11 08:03:18 2019
    [104] pnp_pss_runtime_commit success

20) Event:E_DEBUG, length:57, at 440103 usecs after Fri Jan 11 08:03:18 2019
    [104] pnp_pss_runtime_commit: Stored values in runtime PSS

21) Event:E_DEBUG, length:23, at 440051 usecs after Fri Jan 11 08:03:18 2019
    [104] - pnp_vsh_halt:206

22) Event:E_DEBUG, length:17, at 950291 usecs after Fri Jan 11 08:03:15 2019
    [104] Adding "end"

23) Event:E_DEBUG, length:58, at 950269 usecs after Fri Jan 11 08:03:15 2019
    [104] Adding "configure terminal ; no clock protocol none "

24) Event:E_DEBUG, length:33, at 945994 usecs after Fri Jan 11 08:03:15 2019
    [104] - pnp_vsh_config_l3_intf:788
```

```
25) Event:E_DEBUG, length:29, at 945979 usecs after Fri Jan 11 08:03:15 2019
    [104] + pnp_vsh_config_l3_intf

26) Event:E_DEBUG, length:39, at 945963 usecs after Fri Jan 11 08:03:15 2019
    [104] Adding "no feature interface-vlan"

27) Event:E_DEBUG, length:32, at 945932 usecs after Fri Jan 11 08:03:15 2019
    [104] Adding "configure terminal"

28) Event:E_DEBUG, length:40, at 945886 usecs after Fri Jan 11 08:03:15 2019
    [104] Got Semaphore, vsh halt continue...

29) Event:E_DEBUG, length:46, at 945870 usecs after Fri Jan 11 08:03:15 2019
    [104] sem_timedwait Success, Start VSH clean up

30) Event:E_DEBUG, length:19, at 945843 usecs after Fri Jan 11 08:03:15 2019
    [104] + pnp_vsh_halt

31) Event:E_DEBUG, length:35, at 945831 usecs after Fri Jan 11 08:03:15 2019
    [104] pnp_pss_runtime_commit success

32) Event:E_DEBUG, length:57, at 945643 usecs after Fri Jan 11 08:03:15 2019
    [104] pnp_pss_runtime_commit: Stored values in runtime PSS

33) Event:E_DEBUG, length:33, at 945607 usecs after Fri Jan 11 08:03:15 2019
    [104] !!! Received Unconfigure !!!

34) Event:E_DEBUG, length:74, at 945578 usecs after Fri Jan 11 08:03:15 2019
    [104] Rx: Direction: PnP PI -> PnP PD, Type: DHCP Unconfigure, Cfg: Present

35) Event:E_DEBUG, length:49, at 789616 usecs after Fri Jan 11 08:01:52 2019
    [104] pnp_ascii_gen: ascii gen completed rcode[0]

36) Event:E_DEBUG, length:16, at 789579 usecs after Fri Jan 11 08:01:52 2019
    [104] pss type: 5

37) Event:E_DEBUG, length:31, at 789522 usecs after Fri Jan 11 08:01:52 2019
    [104] Entering pnp_ascii_gen_cfg

38) Event:E_DEBUG, length:22, at 789514 usecs after Fri Jan 11 08:01:52 2019
    [104] Calling Ascii gen

39) Event:E_DEBUG, length:16, at 789506 usecs after Fri Jan 11 08:01:52 2019
    [104] pss type: 2

40) Event:E_DEBUG, length:49, at 789489 usecs after Fri Jan 11 08:01:52 2019
    [104] pnp_ascii_gen: fu_num_acfg_pss_entries[0x2]

41) Event:E_DEBUG, length:35, at 789365 usecs after Fri Jan 11 08:01:52 2019
    [104] pnp_pss_runtime_commit success

42) Event:E_DEBUG, length:57, at 789135 usecs after Fri Jan 11 08:01:52 2019
    [104] pnp_pss_runtime_commit: Stored values in runtime PSS

43) Event:E_DEBUG, length:26, at 789096 usecs after Fri Jan 11 08:01:52 2019
    [104] Phase Init -> Monitor

44) Event:E_DEBUG, length:35, at 788967 usecs after Fri Jan 11 08:01:52 2019
    [104]  pnp_pi_spawn_finalize pid 1c9

45) Event:E_DEBUG, length:41, at 831561 usecs after Fri Jan 11 08:01:49 2019
    [104] + pnp_pi_spawn child_pid: 0xffff7e28

46) Event:E_DEBUG, length:45, at 831550 usecs after Fri Jan 11 08:01:49 2019
```

```
    [104] Have startup config, Starting PnP PI....

47) Event:E_DEBUG, length:40, at 831538 usecs after Fri Jan 11 08:01:49 2019
    [104] Posix log directory creation failed

48) Event:E_DEBUG, length:50, at 831479 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_fire_event: PNP_EVENT_HAVE_STARTUP_CONFIG

49) Event:E_DEBUG, length:35, at 831465 usecs after Fri Jan 11 08:01:49 2019
    [104] Inside : pnp_other_msg_handler

50) Event:E_DEBUG, length:80, at 831437 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_get_data_from_queue: dequeued event 0x1102e0cc 25/cat 11 from pending Q

51) Event:E_DEBUG, length:50, at 831368 usecs after Fri Jan 11 08:01:49 2019
    [104] Injecting Event PNP_EVENT_HAVE_STARTUP_CONFIG

52) Event:E_DEBUG, length:59, at 831303 usecs after Fri Jan 11 08:01:49 2019
    [104] Have Startup Config, move the process state to monitor

53) Event:E_DEBUG, length:57, at 799379 usecs after Fri Jan 11 08:01:49 2019
    [104] Accelerating PnP, Break Point: Break Point PoAP Init

54) Event:E_DEBUG, length:35, at 799334 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_pss_runtime_commit success

55) Event:E_DEBUG, length:57, at 799239 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_pss_runtime_commit: Stored values in runtime PSS

56) Event:E_DEBUG, length:23, at 799226 usecs after Fri Jan 11 08:01:49 2019
    [104] Phase None -> Init

57) Event:E_DEBUG, length:53, at 799200 usecs after Fri Jan 11 08:01:49 2019
    [104] Initilizing PnP-agent State machine curr_state 3

58) Event:E_DEBUG, length:35, at 799188 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_pss_runtime_commit success

59) Event:E_DEBUG, length:57, at 799070 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_pss_runtime_commit: Stored values in runtime PSS

60) Event:E_DEBUG, length:26, at 798965 usecs after Fri Jan 11 08:01:49 2019
    [104] !!! Box is Online !!!

61) Event:E_DEBUG, length:35, at 798954 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_pss_runtime_commit success

62) Event:E_DEBUG, length:57, at 798770 usecs after Fri Jan 11 08:01:49 2019
    [104] pnp_pss_runtime_commit: Stored values in runtime PSS

63) Event:E_DEBUG, length:70, at 370297 usecs after Fri Jan 11 07:55:41 2019
    [102] pnp_demux_mts(463): (Warning) unexpected mts msg (opcode - 7655)

64) Event:E_DEBUG, length:41, at 092701 usecs after Fri Jan 11 07:55:33 2019
    [104] PnP Init Internal subsystem, Done!!!

65) Event:E_DEBUG, length:32, at 089920 usecs after Fri Jan 11 07:55:33 2019
    [104] PnP Init Internal subsystem

Switch# show pnp posix_pi configs

/isan/etc/pnp/platform_config.cfg:

/isan/etc/pnp/file_paths.cfg:
```

```
/isan/etc/pnp/pnp_config.cfg:

/isan/etc/pnp/policy_discovery.conf:

/isan/etc/pnp/certs/platform.json:

/isan/etc/pnp/certs/pnp_status.json:

/isan/etc/pnp/certs/job_status.json:
```

CHAPTER 6

Understanding the Command-Line Interface

This chapter contains the following sections:

About the CLI Prompt

Once you have successfully accessed the device, the CLI prompt displays in the terminal window of your console port or remote workstation as shown in the following example:

```
User Access Verification
login: admin
Password:<password>
Cisco Nexus Operating System (NX-OS) Software
TAC support: http://www.cisco.com/tac
```

```
Copyright (c) 2002-2013, Cisco Systems, Inc. All rights reserved.
The copyrights to certain works contained in this software are
owned by other third parties and used and distributed under
license. Certain components of this software are licensed under
the GNU General Public License (GPL) version 2.0 or the GNU
Lesser General Public License (LGPL) Version 2.1. A copy of each
such license is available at
http://www.opensource.org/licenses/gpl-2.0.php and
http://www.opensource.org/licenses/lgpl-2.1.php
switch#
```

You can change the default device hostname.

From the CLI prompt, you can do the following:

- Use CLI commands for configuring features
- Access the command history
- Use command parsing functions

Note In normal operation, usernames are case sensitive. However, when you are connected to the device through its console port, you can enter a login username in all uppercase letters regardless of how the username was defined. As long as you provide the correct password, the device logs you in.

Command Modes

This section describes command modes in the Cisco NX-OS CLI.

EXEC Command Mode

When you first log in, the Cisco NX-OS software places you in EXEC mode. The commands available in EXEC mode include the **show** commands that display the device status and configuration information, the **clear** commands, and other commands that perform actions that you do not save in the device configuration.

Global Configuration Command Mode

Global configuration mode provides access to the broadest range of commands. The term indicates characteristics or features that affect the device as a whole. You can enter commands in global configuration mode to configure your device globally or to enter more specific configuration modes to configure specific elements such as interfaces or protocols.

SUMMARY STEPS

1. **configure terminal**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.
		Note The CLI prompt changes to indicate that you are in global configuration mode.

Interface Configuration Command Mode

One example of a specific configuration mode that you enter from global configuration mode is interface configuration mode. To configure interfaces on your device, you must specify the interface and enter interface configuration mode.

You must enable many features on a per-interface basis. Interface configuration commands modify the operation of the interfaces on the device, such as Ethernet interfaces or management interfaces (mgmt 0).

For more information about configuring interfaces, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide*.

SUMMARY STEPS

1. **configure terminal**
2. **interface** *type number*

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface** *type number*
	Example:
	`switch(config)# interface ethernet 2/2`
	`switch(config-if)#`
		Specifies the interface that you want to configure.
		The CLI places you into interface configuration mode for the specified interface.
		Note The CLI prompt changes to indicate that you are in interface configuration mode.

Subinterface Configuration Command Mode

From global configuration mode, you can access a configuration submode for configuring VLAN interfaces called subinterfaces. In subinterface configuration mode, you can configure multiple virtual interfaces on a single physical interface. Subinterfaces appear to a protocol as distinct physical interfaces.

Subinterfaces also allow multiple encapsulations for a protocol on a single interface. For example, you can configure IEEE 802.1Q encapsulation to associate a subinterface with a VLAN.

For more information about configuring subinterfaces, see the *Cisco Nexus 9000 Series NX-OS Interfaces Configuration Guide*.

SUMMARY STEPS

1. **configure terminal**
2. **interface** *type number***.***subint*

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**interface** *type number***.***subint*
	Example:
	`switch(config)# interface ethernet 2/2.1`
	`switch(config-subif)#`
		Specifies the VLAN interface to be configured.
		The CLI places you into a subinterface configuration mode for the specified VLAN interface.
		Note The CLI prompt changes to indicate that you are in subinterface configuration mode.

Saving and Restoring a Command Mode

The Cisco NX-OS software allows you to save the current command mode, configure a feature, and then restore the previous command mode. The **push** command saves the command mode, and the **pop** command restores the command mode.

The following example shows how to save and restore a command mode:

```
switch# configure terminal
switch(config)# event manager applet test
switch(config-applet)# push
switch(config-applet)# configure terminal
switch(config)# username testuser password newtest
switch(config)# pop
switch(config-applet)#
```

Exiting a Configuration Command Mode

SUMMARY STEPS

1. **exit**
2. **end**
3. (Optional) **Ctrl-Z**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**exit**
	Example:
	`switch(config-if)# exit`
	`switch(config)#`
		Exits from the current configuration command mode and returns to the previous configuration command mode.

Step 2	**end**
	Example:
	`switch(config-if)# end`
	`switch#`
		Exits from the current configuration command mode and returns to EXEC mode.

Step 3	(Optional) **Ctrl-Z**
	Example:
	`switch(config-if)# ^Z`
	`switch#`
		Exits the current configuration command mode and returns to EXEC mode.
		Caution If you press **Ctrl-Z** at the end of a command line in which a valid command has been typed, the CLI adds the command to the running configuration file. In most cases, you should exit a configuration mode using the **exit** or **end** command.

Command Mode Summary

This table summarizes information about the main command modes.

Table 4: Command Mode Summary

Mode	Access Method	Prompt	Exit Method
EXEC	From the login prompt, enter your username and password.	`switch#`	To exit to the login prompt, use the **exit** command.
Global configuration	From EXEC mode, use the **configure terminal** command.	`switch(config)#`	To exit to EXEC mode, use the **end** or **exit** command or press **Ctrl-Z**.
Interface configuration	From global configuration mode, specify an interface with an **interface** command.	`switch(config-if)#`	To exit to global configuration mode, use the **exit** command. To exit to EXEC mode, use the **exit** command or press **Ctrl-Z**.
Subinterface configuration	From global configuration mode, specify a subinterface with an **interface** command.	`switch(config-subif)#`	To exit to global configuration mode, use the **exit** command. To exit to EXEC mode, use the **end** command or press **Ctrl-Z**.

Mode	Access Method	Prompt	Exit Method
VRF configuration	From global configuration mode, use the **vrf** command and specify a routing protocol.	`switch(config-vrf)#`	To exit to global configuration mode, use the **exit** command. To exit to EXEC mode, use the **end** command or press **Ctrl-Z**.
EXEC for a nondefault VRF	From EXEC mode, use the **routing-context vrf** command and specify a VRF.	`switch-red#`	To exit to the default VRF, use the **routing-context vrf default** command.

Special Characters

This table lists the characters that have special meaning in Cisco NX-OS text strings and should be used only in regular expressions or other special contexts.

Table 5: Special Characters

Character	Description
%	Percent
#	Pound, hash, or number
...	Ellipsis
|	Vertical bar
< >	Less than or greater than
[ ]	Brackets
{ }	Braces

Keystroke Shortcuts

This table lists command key combinations that can be used in both EXEC and configuration modes.

Table 6: Keystroke Shortcuts

Keystrokes	Description
Ctrl-A	Moves the cursor to the beginning of the line.
Ctrl-B	Moves the cursor one character to the left. When you enter a command that extends beyond a single line, you can press the **Left Arrow** or **Ctrl-B** keys repeatedly to scroll back toward the system prompt and verify the beginning of the command entry, or you can press the **Ctrl-A** key combination.

Keystrokes	Description
Ctrl-C	Cancels the command and returns to the command prompt.
Ctrl-D	Deletes the character at the cursor.
Ctrl-E	Moves the cursor to the end of the line.
Ctrl-F	Moves the cursor one character to the right.
Ctrl-G	Exits to the previous command mode without removing the command string.
Ctrl-K	Deletes all characters from the cursor to the end of the command line.
Ctrl-L	Redisplays the current command line.
Ctrl-N	Displays the next command in the command history.
Ctrl-O	Clears the terminal screen.
Ctrl-P	Displays the previous command in the command history.
Ctrl-R	Redisplays the current command line.
Ctrl-T	Transposes the character under the cursor with the character located to the right of the cursor. The cursor is then moved to the right one character.
Ctrl-U	Deletes all characters from the cursor to the beginning of the command line.
Ctrl-V	Removes any special meaning for the following keystroke. For example, press **Ctrl-V** before entering a question mark (?) in a regular expression.
Ctrl-W	Deletes the word to the left of the cursor.
Ctrl-X, H	Lists the history of commands you have entered. When using this key combination, press and release the **Ctrl** and **X** keys together before pressing **H**.
Ctrl-Y	Recalls the most recent entry in the buffer (press keys simultaneously).
Ctrl-Z	Ends a configuration session, and returns you to EXEC mode. When used at the end of a command line in which a valid command has been typed, the resulting configuration is first added to the running configuration file.
Up arrow key	Displays the previous command in the command history.
Down arrow key	Displays the next command in the command history.
Right arrow key Left arrow key	Moves your cursor through the command string, either forward or backward, allowing you to edit the current command.
?	Displays a list of available commands.

Keystrokes	Description
Tab	Completes the word for you after you enter the first characters of the word and then press the **Tab** key. All options that match are presented. Use tabs to complete the following items: • Command names • Scheme names in the file system • Server names in the file system • Filenames in the file system **Example:** switch(config)# **xm<Tab>** switch(config)# **xml<Tab>** switch(config)# **xml server**
	Example: switch(config)# **c<Tab>** callhome class-map clock cdp cli control-plane switch(config)# **cl<Tab>** class-map cli clock switch(config)# **cla<Tab>** switch(config)# **class-map**
	Example: switch# **cd bootflash:<Tab>** bootflash:/// bootflash://sup-1/ bootflash://sup-active/ bootflash://sup-local/ bootflash://module-27/ bootflash://module-28/
	Example: switch# **cd bootflash://mo<Tab>** bootflash://module-27/ bootflash://module-28/ switch# **cd bootflash://module-2** **Note** You cannot access remote machines using the **cd** command. If you are on slot 27 and enter the **cd bootflash://module-28** command, the following message appears: "Changing directory to a non-local server is not allowed."

Abbreviating Commands

You can abbreviate commands and keywords by entering the first few characters of a command. The abbreviation must include sufficient characters to make it unique from other commands or keywords. If you are having trouble entering a command, check the system prompt and enter the question mark (?) for a list of available commands. You might be in the wrong command mode or using incorrect syntax.

This table lists examples of command abbreviations.

Table 7: Examples of Command Abbreviations

Command	Abbreviation
configure terminal	**conf t**
copy running-config startup-config	**copy run start**
interface ethernet 1/2	**int e 1/2**
show running-config	**sh run**

Completing a Partial Command Name

If you cannot remember a complete command name or if you want to reduce the amount of typing you have to perform, enter the first few letters of the command, and then press the **Tab** key. The command line parser will complete the command if the string entered is unique to the command mode. If your keyboard does not have a **Tab** key, press **Ctrl-I** instead.

The CLI recognizes a command once you have entered enough characters to make the command unique. For example, if you enter **conf** in EXEC mode, the CLI will be able to associate your entry with the **configure** command, because only the **configure** command begins with **conf**.

In the following example, the CLI recognizes the unique string for **conf** in EXEC mode when you press the **Tab** key:

```
switch# conf<Tab>
switch# configure
```

When you use the command completion feature, the CLI displays the full command name. The CLI does not execute the command until you press the **Return** or **Enter** key. This feature allows you to modify the command if the full command was not what you intended by the abbreviation. If you enter a set of characters that could indicate more than one command, a list of matching commands displays.

For example, entering **co<Tab>** lists all commands available in EXEC mode beginning with **co**:

```
switch# co<Tab>
configure   copy
switch# co
```

Note that the characters you entered appear at the prompt again to allow you to complete the command entry.

Identifying Your Location in the Command Hierarchy

Some features have a configuration submode hierarchy nested more than one level. In these cases, you can display information about your present working context (PWC).

SUMMARY STEPS

1. **where detail**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**where detail**
	Example:
	`switch# configure terminal`
	`switch(config)# interface mgmt0`
	`switch(config-if)# where detail`
	`mode:                conf`
	`                         interface mgmt0`
	`  username:            admin`
	
	`  routing-context vrf: default`
		Displays the PWC.

Using the no Form of a Command

Almost every configuration command has a **no** form that can be used to disable a feature, revert to a default value, or remove a configuration.

This example shows how to disable a feature:

```
switch# configure terminal
switch(config)# feature tacacs+
switch(config)# no feature tacacs+
```

This example shows how to revert to the default value for a feature:

```
switch# configure terminal
switch(config)# banner motd #Welcome to the switch#
switch(config)# show banner motd
Welcome to the switch

switch(config)# no banner motd
switch(config)# show banner motd
User Access Verification
```

This example shows how to remove the configuration for a feature:

```
switch# configure terminal
switch(config)# radius-server host 10.10.2.2
switch(config)# show radius-server
retransmission count:0
timeout value:1
```

```
deadtime value:1
total number of servers:1

following RADIUS servers are configured:
        10.10.1.1:
                available for authentication on port:1812
                available for accounting on port:1813
        10.10.2.2:
                available for authentication on port:1812
                available for accounting on port:1813

switch(config)# no radius-server host 10.10.2.2
switch(config)# show radius-server
retransmission count:0
timeout value:1
deadtime value:1
total number of servers:1

following RADIUS servers are configured:
        10.10.1.1:
                available for authentication on port:1812
                available for accounting on port:1813
```

This example shows how to use the **no** form of a command in EXEC mode:

```
switch# cli var name testinterface ethernet1/2
switch# show cli variables
SWITCHNAME="switch"
TIMESTAMP="2013-05-12-13.43.13"
testinterface="ethernet1/2"

switch# cli no var name testinterface
switch# show cli variables
SWITCHNAME="switch"
TIMESTAMP="2013-05-12-13.43.13"
```

Configuring CLI Variables

This section describes CLI variables in the Cisco NX-OS CLI.

About CLI Variables

The Cisco NX-OS software supports the definition and use of variables in CLI commands.

You can refer to CLI variables in the following ways:

- Entered directly on the command line.
- Passed to a script initiated using the **run-script** command. The variables defined in the parent shell are available for use in the child **run-script** command process.

CLI variables have the following characteristics:

- Cannot have nested references through another variable
- Can persist across switch reloads or exist only for the current session

Cisco NX-OS supports one predefined variable: TIMESTAMP. This variable refers to the current time when the command executes in the format YYYY-MM-DD-HH.MM.SS.

Note The TIMESTAMP variable name is case sensitive. All letters must be uppercase.

Configuring CLI Session-Only Variables

You can define CLI session variables to persist only for the duration of your CLI session. These variables are useful for scripts that you execute periodically. You can reference the variable by enclosing the name in parentheses and preceding it with a dollar sign ($), for example $(*variable-name*).

SUMMARY STEPS

1. **cli var name** *variable-name variable-text*
2. (Optional) **show cli variables**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**cli var name** *variable-name variable-text* **Example:** `switch# cli var name testinterface ethernet 2/1`	Configures the CLI session variable. The *variable-name* argument is alphanumeric, case sensitive, and has a maximum length of 31 characters. The *variable-text* argument is alphanumeric, case sensitive, can contain spaces, and has a maximum length of 200 characters. **Note** Beginning with Cisco NX-OS Release 7.0(3)I4(1), variables can include hyphens (-) and underscores (_).
Step 2	(Optional) **show cli variables** **Example:** `switch# show cli variables`	Displays the CLI variable configuration.

Configuring Persistent CLI Variables

You can configure CLI variables that persist across CLI sessions and device reloads.

SUMMARY STEPS

1. **configure terminal**
2. **cli var name** *variable-name variable-text*
3. **exit**
4. (Optional) **show cli variables**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**cli var name** *variable-name variable-text* **Example:** `switch(config)# cli var name testinterface ethernet 2/1`	Configures the CLI persistent variable. The variable name is a case-sensitive, alphanumeric string and must begin with an alphabetic character. The maximum length is 31 characters. **Note** Beginning with Cisco NX-OS Release 7.0(3)I4(1), variables can include hyphens (-) and underscores (_).

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits global configuration mode.

Step 4	(Optional) **show cli variables** **Example:** `switch# show cli variables`	Displays the CLI variable configuration.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Command Aliases

This section provides information about command aliases.

About Command Aliases

You can define command aliases to replace frequently used commands. The command aliases can represent all or part of the command syntax.

Command alias support has the following characteristics:

- Command aliases are global for all user sessions.
- Command aliases persist across reboots if you save them to the startup configuration.
- Command alias translation always takes precedence over any keyword in any configuration mode or submode.
- Command alias configuration takes effect for other user sessions immediately.

- The Cisco NX-OS software provides one default alias, **alias**, which is the equivalent to the **show cli alias** command that displays all user-defined aliases.
- You cannot delete or change the default command alias **alias**.
- You can nest aliases to a maximum depth of 1. One command alias can refer to another command alias that must refer to a valid command, not to another command alias.
- A command alias always replaces the first command keyword on the command line.
- You can define command aliases for commands in any command mode.
- If you reference a CLI variable in a command alias, the current value of the variable appears in the alias, not the variable reference.
- You can use command aliases for **show** command searching and filtering.

Defining Command Aliases

You can define command aliases for commonly used commands.

SUMMARY STEPS

1. **configure terminal**
2. **cli alias name** *alias-name alias-text*
3. **exit**
4. (Optional) **alias**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**cli alias name** *alias-name alias-text* **Example:** `switch(config)# cli alias name ethint interface ethernet`	Configures the command alias. The alias name is an alphanumeric string that is not case sensitive and must begin with an alphabetic character. The maximum length is 30 characters.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits global configuration mode.

Step 4	(Optional) **alias** **Example:** `switch# alias`	Displays the command alias configuration.

	Command or Action	Purpose
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring Command Aliases for a User Session

You can create a command alias for the current user session that is not available to any other user on the Cisco NX-OS device. You can also save the command alias for future use by the current user account.

SUMMARY STEPS

1. **terminal alias** [**persist**] *alias-name command-string*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**terminal alias** [**persist**] *alias-name command-string* **Example:** `switch# terminal alias shintbr show interface brief`	Configures a command alias for the current user session. Use the **persist** keyword to save the alias for future use by the user account. **Note** Do not abbreviate the **persist** keyword.

Command Scripts

This section describes how you can create scripts of commands to perform multiple tasks.

Running a Command Script

You can create a list of commands in a file and execute them from the CLI. You can use CLI variables in the command script.

Note You cannot create the script files at the CLI prompt. You can create the script file on a remote device and copy it to the bootflash: or volatile: directory on the Cisco NX-OS device.

SUMMARY STEPS

1. **run-script** [**bootflash:** | **volatile:**] *filename*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**run-script** [**bootflash:** | **volatile:**] *filename* **Example:** `switch# run-script testfile`	Executes the commands in the file on the default directory.

Echoing Information to the Terminal

You can echo information to the terminal, which is particularly useful from a command script. You can reference CLI variables and use formatting options in the echoed text.

This table lists the formatting options that you can insert in the text.

Table 8: Formatting Options for the echo Command

Formatting Option	Description
\b	Inserts back spaces.
\c	Removes the new line character at the end of the text string.
\f	Inserts a form feed character.
\n	Inserts a new line character.
\r	Returns to the beginning of the text line.
\t	Inserts a horizontal tab character.
\v	Inserts a vertical tab character.
\\	Displays a backslash character.
\nnn	Displays the corresponding ASCII octal character.

SUMMARY STEPS

1. **echo** [**backslash-interpret**] [*text*]

DETAILED STEPS

	Command or Action	Purpose

Step 1	**echo** [**backslash-interpret**] [*text*]
	Example:
	`switch# echo This is a test.`
	`This is a test.`
		The **backslash-interpret** keyword indicates that the text string contains formatting options. The *text* argument is alphanumeric, case sensitive, and can contain blanks. The maximum length is 200 characters. The default is a blank line.

Delaying Command Action

You can delay a command action for a period of time, which is particularly useful within a command script.

SUMMARY STEPS

1. **sleep** *seconds*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**sleep** *seconds* **Example:** `switch# sleep 30`	Causes a delay for a number of seconds. The range is from 0 to 2147483647.

Context-Sensitive Help

The Cisco NX-OS software provides context-sensitive help in the CLI. You can use a question mark (?) at any point in a command to list the valid input options.

CLI uses the caret (^) symbol to isolate input errors. The ^ symbol appears at the point in the command string where you have entered an incorrect command, keyword, or argument.

This table shows example outputs of context sensitive help.

Table 9: Context-Sensitive Help Example

Example Outputs	Description

`switch# clock ?`
`  set  HH:MM:SS Current Time`
`switch# clock`
	Displays the command syntax for the **clock** command in EXEC mode.
	The switch output shows that the **set** keyword is required for using the **clock** command.

`switch# clock set ?`
`  WORD  HH:MM:SS Current Time`
`switch# clock set`
	Displays the command syntax for setting the time.
	The help output shows that the current time is required for setting the clock and how to format the time.

`switch# clock set 13:32:00<CR>`
`% Incomplete command`
`switch#`
	Adds the current time.
	The CLI indicates the command is incomplete.

`switch# <Ctrl-P>`
`switch# clock set 13:32:00`
	Displays the previous command that you entered.

`switch# clock set 13:32:00 ?`
`  <1-31>     Day of the month`
`switch# clock set 13:32:00`
	Displays the additional arguments for the **clock set** command.

<table>
<tr><th>Example Outputs</th><th>Description</th></tr>
<tr><td><pre>
switch# clock set 13:32:00 18 ?
  April   Month of the year
  August   Month of the year
  December   Month of the year
  February   Month of the year
  January   Month of the year
  July   Month of the year
  June   Month of the year
  March   Month of the year
  May   Month of the year
  November   Month of the year
  October   Month of the year
  September Month of the year
switch# clock set 13:32:00 18
</pre></td><td>Displays the additional arguments for the <b>clock set</b> command.</td></tr>
<tr><td><pre>
switch# clock set 13:32:00 18 April 13<CR>
% Invalid input detected at '^' marker.
</pre></td><td>Adds the date to the clock setting.
The CLI indicates an error with the caret symbol (^) at 13.</td></tr>
<tr><td><pre>
switch# clock set 13:32:00 18 April ?
  <2000-2030> Enter the year (no abbreviation)

switch# clock set 13:32:00 18 April
</pre></td><td>Displays the correct arguments for the year.</td></tr>
<tr><td><pre>
switch# clock set 13:32:00 18 April 2013<CR>
switch#
</pre></td><td>Enters the correct syntax for the <b>clock set</b> command.</td></tr>
</table>

Understanding Regular Expressions

The Cisco NX-OS software supports regular expressions for searching and filtering in CLI output, such as the **show** commands. Regular expressions are case sensitive and allow for complex matching requirements.

Special Characters

You can also use other keyboard characters (such as ! or ~) as single-character patterns, but certain keyboard characters have special meanings when used in regular expressions.

This table lists the keyboard characters that have special meanings.

Table 10: Special Characters with Special Meaning

Character	Special Meaning
.	Matches any single character, including white space.
*	Matches 0 or more sequences of the pattern.
+	Matches 1 or more sequences of the pattern.
?	Matches 0 or 1 occurrences of the pattern.

Character	Special Meaning
^	Matches the beginning of the string.
$	Matches the end of the string.
_ (underscore)	Matches a comma (,), left brace ({), right brace (}), left parenthesis (( ), right parenthesis ( )), the beginning of the string, the end of the string, or a space. **Note** The underscore is only treated as a regular expression for BGP-related commands

To use these special characters as single-character patterns, remove the special meaning by preceding each character with a backslash (\). This example contains single-character patterns that match a dollar sign ($), an underscore (_), and a plus sign (+), respectively:

\$ _ \+

Multiple-Character Patterns

You can also specify a pattern that contains multiple characters by joining letters, digits, or keyboard characters that do not have special meanings. For example, a4% is a multiple-character regular expression.

With multiple-character patterns, the order is important. The regular expression **a4%** matches the character a followed by a 4 followed by a percent sign (%). If the string does not have a4%, in that order, pattern matching fails. The multiple-character regular expression **a.** (the character a followed by a period) uses the special meaning of the period character to match the letter a followed by any single character. With this example, the strings ab, a!, or a2 are all valid matches for the regular expression.

You can remove the special meaning of a special character by inserting a backslash before it. For example, when the expression **a\.** is used in the command syntax, only the string a. will be matched.

Anchoring

You can match a regular expression pattern against the beginning or the end of the string by anchoring these regular expressions to a portion of the string using the special characters.

This table lists the special characters that you can use for anchoring.

Table 11: Special Characters Used for Anchoring

Character	Description
^	Matches the beginning of the string.
$	Matches the end of the string.

For example, the regular expression **^con** matches any string that starts with **con**, and **sole$** matches any string that ends with **sole**.

Note The ^ symbol can also be used to indicate the logical function "not" when used in a bracketed range. For example, the expression **`[^abcd]`** indicates a range that matches any single letter, as long as it is not a, b, c, or d.

Searching and Filtering show Command Output

Often, the output from **show**commands can be lengthy and cumbersome. The Cisco NX-OS software provides the means to search and filter the output so that you can easily locate information. The searching and filtering options follow a pipe character (|) at the end of the **show** command. You can display the options using the CLI context-sensitive help facility:

```
switch# show running-config | ?
  cut      Print selected parts of lines.
  diff     Show difference between current and previous invocation (creates temp files:
           remove them with 'diff-clean' command and don't use it on commands with big
           outputs, like 'show tech'!)
  egrep    Egrep - print lines matching a pattern
  grep     Grep - print lines matching a pattern
  head     Display first lines
  human    Output in human format
  last     Display last lines
  less     Filter for paging
  no-more  Turn-off pagination for command output
  perl     Use perl script to filter output
  section  Show lines that include the pattern as well as the subsequent lines that are
           more indented than matching line
  sed      Stream Editor
  sort     Stream Sorter
  sscp     Stream SCP (secure copy)
  tr       Translate, squeeze, and/or delete characters
  uniq     Discard all but one of successive identical lines
  vsh      The shell that understands cli command
  wc       Count words, lines, characters
  xml      Output in xml format (according to .xsd definitions)
  begin    Begin with the line that matches
  count    Count number of lines
  end      End with the line that matches
  exclude  Exclude lines that match
  include  Include lines that match
```

Filtering and Searching Keywords

The Cisco NX-OS CLI provides a set of keywords that you can use with the **show** commands to search and filter the command output.

This table lists the keywords for filtering and searching the CLI output.

Table 12: Filtering and Searching Keywords

Keyword Syntax	Description

begin *string*
Example:
`show version | begin Hardware`
	Starts displaying at the line that contains the text that matches the search string. The search string is case sensitive.

count **Example:** `show running-config | count`	Displays the number of lines in the command output.

cut [**-d** *character*] {**-b** | **-c** | **-f** | **-s**}
Example:
`show file testoutput | cut -b 1-10`
	Displays only part of the output lines. You can display a number of bytes (**-b**), characters (**-vcut** [**-d** *character*] {**-b** | **-c** | **-f** | **-s**}), or fields (**-f**). You can also use the **-d** keyword to define a field delimiter other than the tag character default. The **-s** keyword suppresses the display of the line that does not contain the delimiter.

end *string*
Example:
`show running-config | end interface`
	Displays all lines up to the last occurrence of the search string.

exclude *string* **Example:** `show interface brief | exclude down`	Displays all lines that do not include the search string. The search string is case sensitive.
head [**lines** *lines*] **Example:** `show logging logfile | head lines 50`	Displays the beginning of the output for the number of lines specified. The default number of lines is 10.
human **Example:** `show version | human`	Displays the output in normal format if you have previously set the output format to XML using the **terminal output xml** command.
include *string* **Example:** `show interface brief | include up`	Displays all lines that include the search string. The search string is case sensitive.
last [*lines*] **Example:** `show logging logfile | last 50`	Displays the end of the output for the number of lines specified. The default number of lines is 10.

Keyword Syntax	Description
no-more **Example:** `show interface brief | no-more`	Displays all the output without stopping at the end of the screen with the `--More--` prompt.
sscp *SSH-connection-name filename* **Example:** `show version | sscp MyConnection show_version_output`	Redirects the output using streaming secure copy (sscp) to a named SSH connection. You can create the SSH named connection using the **ssh name** command.
wc [**bytes** | **lines** | **words**] **Example:** `show file testoutput | wc bytes`	Displays counts of characters, lines, or words. The default is to display the number of lines, words, and characters.
xml **Example:** `show version | xml`	Displays the output in XML format.

diff Utility

You can compare the output from a **show** command with the output from the previous invocation of that command.

diff-clean [**all-sessions**] [**all-users**]

This table describes the keywords for the diff utility.

Keyword	Description
all-sessions	Removes diff temporary files from all sessions (past and present sessions) of the current user.
all-users	Removes diff temporary files from all sessions (past and present sessions) of all users.

The Cisco NX-OS software creates temporary files for the most current output for a **show** command for all current and previous users sessions. You can remove these temporary files using the **diff-clean** command.

diff-clean [**all-sessions** | **all-users**]

By default, the **diff-clean** command removes the temporary files for the current user's active session. The **all-sessions** keyword removes temporary files for all past and present sessions for the current user. The **all-users** keyword removes temporary files for all past and present sessions for the all users.

grep and egrep Utilities

You can use the Global Regular Expression Print (grep) and Extended grep (egrep) command-line utilities to filter the **show** command output.

The grep and egrep syntax is as follows:

{**grep** | **egrep**} [**count**] [**ignore-case**] [**invert-match**] [**line-exp**] [**line-number**] [**next** *lines*] [**prev** *lines*] [**word-exp**] *expression*}]

This table lists the **grep** and **egrep** parameters.

Table 13: grep and egrep Parameters

Parameter	Description
count	Displays only the total count of matched lines.
ignore-case	Specifies to ignore the case difference in matched lines.
invert-match	Displays lines that do not match the expression.
line-exp	Displays only lines that match a complete line.
line-number	Specifies to display the line number before each matched line.
next *lines*	Specifies the number of lines to display after a matched line. The default is 0. The range is from 1 to 999.
prev *lines*	Specifies the number of lines to display before a matched line. The default is 0. The range is from 1 to 999.
word-exp	Displays only lines that match a complete word.
expression	Specifies a regular expression for searching the output.

less Utility

You can use the less utility to display the contents of the **show** command output one screen at a time. You can enter **less** commands at the : prompt. To display all **less** commands you can use, enter **h** at the : prompt.

Mini AWK Utility

AWK is a simple but powerful utility to summarize text output. You can use this utility after a pipe (|) to further process the text output of a command. Cisco NX-OS supports a mini AWK, which takes an inline program as an argument.

This example shows how the mini AWK utility can be used to summarize the text output of the **show ip route summary vrf all** command:

```
switch# show ip route summary vrf all | grep "Total number of routes"
Total number of routes: 3
Total number of routes: 10

switch# show ip route summary vrf all | grep "Total number of routes" | awk '{ x = x + $5}
 END { print x }'
13
```

sed Utility

You can use the Stream Editor (sed) utility to filter and manipulate the **show** command output as follows:

sed *command*

The *command* argument contains sed utility commands.

sort Utility

You can use the sort utility to filter **show** command output.

The sort utility syntax is as follows:

sort [**-M**] [**-b**] [**-d**] [**-f**] [**-g**] [**-i**] [**-k** *field-number*[**.***char-position*][*ordering*]] [**-n**] [**-r**] [**-t** *delimiter*] [**-u**]

This table describes the sort utiliity parameters.

Table 14: sort Utility Parameters

Parameter	Description
-M	Sorts by month.
-b	Ignores leading blanks (space characters). The default sort includes the leading blanks.
-d	Sorts by comparing only blanks and alphanumeric characters. The default sort includes all characters.
-f	Folds lowercase characters into uppercase characters.
-g	Sorts by comparing a general numeric value.
-i	Sorts only using printable characters. The default sort includes nonprintable characters.
-k *field-number*[**.***char-position*][*ordering*]	Sorts according to a key value. There is no default key value.
-n	Sorts according to a numeric string value.
-r	Reverses order of the sort results. The default sort output is in ascending order.
-t *delimiter*	Sorts using a specified delimiter. The default delimiter is the space character.
-u	Removes duplicate lines from the sort results. The sort output displays the duplicate lines.

Searching and Filtering from the --More-- Prompt

You can search and filter output from `--More--` prompts in the **show** command output.

This table describes the `--More--` prompt commands.

Table 15: --More-- Prompt Commands

Commands	Description
[*lines*]<space>	Displays output lines for either the specified number of lines or the current screen size.
[*lines*]**z**	Displays output lines for either the specified number of lines or the current screen size. If you use the *lines* argument, that value becomes the new default screen size.
[*lines*]<return>	Displays output lines for either the specified number of lines or the current default number of lines. The initial default is 1 line. If you use the optional *lines* argument, that value becomes the new default number of lines to display for this command.
[*lines*]**d** or [*lines*]Ctrl+shift+D	Scrolls through output lines for either the specified number of lines or the current default number of lines. The initial default is 11 lines. If you use the optional *lines* argument, that value becomes the new default number of lines to display for this command.
q or **Q** or Ctrl-C	Exits the `--More--` prompt.
[*lines*]**s**	Skips forward in the output for either the specified number of lines or the current default number of lines and displays a screen of lines. The default is 1 line.
[*lines*]**f**	Skips forward in the output for either the specified number of screens or the current default number of screens and displays a screen of lines. The default is 1 screen.
=	Displays the current line number.
[*count*]/*expression*	Skips to the line that matches the regular expression and displays a screen of output lines. Use the optional *count* argument to search for lines with multiple occurrences of the expression. This command sets the current regular expression that you can use in other commands.
[*count*]**n**	Skips to the next line that matches the current regular expression and displays a screen of output lines. Use the optional *count* argument to skip past matches.
{**!** | **:!**[*shell-cmd*]}	Executes the command specified in the *shell-cmd* argument in a subshell.
.	Repeats the previous command.

Using the Command History

The Cisco NX-OS software CLI allows you to access the command history for the current user session. You can recall and reissue commands, with or without modification. You can also clear the command history.

Recalling a Command

You can recall a command in the command history to optionally modify and enter again.

This example shows how to recall a command and reenter it:

```
switch(config)# show cli history
0  11:04:07   configure terminal
1  11:04:28   show interface ethernet 2/24
2  11:04:39     interface ethernet 2/24
3  11:05:13       no shutdown
4  11:05:19     exit
5  11:05:25   show cli history
switch(config)# !1
switch(config)# show interface ethernet 2/24
```

You can also use the **Ctrl-P** and **Ctrl-N** keystroke shortcuts to recall commands.

Controlling CLI History Recall

You can control the commands that you recall from the CLI history using the **Ctrl-P** and **Ctrl-N** keystroke shortcuts. Cisco NX-OS software recalls all commands from the current command mode and higher command modes. For example, if you are working in global configuration mode, the command recall keystroke shortcuts recall both EXEC mode and global configuration mode commands.

Configuring the CLI Edit Mode

You can recall commands from the CLI history using the **Ctrl-P** and **Ctrl-N** keystroke shortcuts and edit them before reissuing them. The default edit mode is emacs. You can change the edit mode to vi.

SUMMARY STEPS

1. [**no**] **terminal edit-mode vi** [**persist**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	[**no**] **terminal edit-mode vi** [**persist**] **Example:** `switch# terminal edit-mode vi`	Changes the CLI edit mode to vi for the user session. The **persist** keyword makes the setting persistent across sessions for the current username. Use the **no** to revert to using emacs.

Displaying the Command History

You can display the command history using the **show cli history** command.

The **show cli history** command has the following syntax:

show cli history [*lines*] [**config-mode** | **exec-mode** | **this-mode-only**] [**unformatted**]

By default, the number of lines displayed is 12 and the output includes the command number and timestamp.

This example shows how to display the default number of lines of the command history:

```
switch# show cli history
```

This example shows how to display 20 lines of the command history:

```
switch# show cli history 20
```

This example shows how to display only the configuration commands in the command history:

```
switch(config)# show cli history config-mode
```

This example shows how to display only the EXEC commands in the command history:

```
switch(config)# show cli history exec-mode
```

This example shows how to display only the commands in the command history for the current command mode:

```
switch(config-if)# show cli history this-mode-only
```

This example shows how to display only the commands in the command history without the command number and timestamp:

```
switch(config)# show cli history unformatted
```

Enabling or Disabling the CLI Confirmation Prompts

For many features, the Cisco NX-OS software displays prompts on the CLI that ask for confirmation before continuing. You can enable or disable these prompts. The default is enabled.

SUMMARY STEPS

1. [**no**] **terminal dont-ask** [**persist**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	[**no**] **terminal dont-ask** [**persist**] **Example:** `switch# terminal dont-ask`	Disables the CLI confirmation prompt. The **persist** keyword makes the setting persistent across sessions for the current username. The default is enabled. Use the **no** form of the command to enable the CLI confirmation prompts.

Setting CLI Display Colors

You can change the CLI colors to display as follows:

- The prompt displays in green if the previous command succeeded.
- The prompt displays in red of the previous command failed.
- The user input displays in blue.
- The command output displays in the default color.

The default colors are sent by the terminal emulator software.

SUMMARY STEPS

1. **terminal color** [**evening**] [**persist**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**terminal color** [**evening**] [**persist**] **Example:** `switch# terminal color`	Sets the CLI display colors for the terminal session. The **evening** keyword is not supported. The **persist** keyword makes the setting persistent across sessions for the current username. The default setting is not persistent.

Sending Commands to Modules

You can send commands directly to modules from the supervisor module session using the **slot** command.

The **slot** has the following syntax:

slot *slot-number* [**quoted**] *command-string*

By default, the keyword and arguments in the *command-string* argument are separated by a space. To send more than one command to a module, separate the commands with a space character, a semicolon character (;), and a space character.

The **quoted** keyword indicates that the command string begins and ends with double quotation marks ("). Use this keyword when you want to redirect the module command output to a filtering utility, such as diff, that is supported only on the supervisor module session.

This example shows how to display and filter module information:

```
switch# slot 27 show version | grep lc
```

This example shows how to filter module information on the supervisor module session:

```
switch# slot 27 quoted "show version" | diff
switch# slot 28 quoted "show version" | diff -c
*** /volatile/vsh_diff_1_root_8430_slot__quoted_show_version.old       Wed Apr 29 20:10:41
 2013
--- -   Wed Apr 29 20:10:41 2013
***************
```

```
*** 1,5 ****
! RAM 1036860 kB
! lc27
  Software
    BIOS:      version 6.20
    system:    version 6.1(2)I1(1) [build 6.1(2)]
--- 1,5 ----
! RAM 516692 kB
! lc28
  Software
    BIOS:      version 6.20
    system:    version 6.1(2)I1(1) [build 6.1(2)]
***************
*** 12,16 ****
  Hardware
      bootflash: 0 blocks (block size 512b)

!    uptime is 0 days 1 hours 45 minute(s) 34 second(s)

--- 12,16 ----
  Hardware
      bootflash: 0 blocks (block size 512b)

!    uptime is 0 days 1 hours 45 minute(s) 42 second(s)
```

Sending Command Output in Email

You can use the CLI to send the output of a **show** command to an email address using the pipe operator (|).

Note The email configuration remains persistent for all **show** command output until it is reconfigured.

When you upgrade from a release before Cisco NX-OS Release 9.3(3) to Cisco NX-OS Release 9.3(3) or later releases, email configuration will be missing. This is due to enabling DME functionality for this feature. To resolve this, you need to execute "no email" and reapply the entire email configuration.

SUMMARY STEPS

1. **configure terminal**
2. **email**
3. **smtp-host** *ip-address* **smtp-port** *port*
4. **vrf management**
5. **from** *email-address*
6. **reply-to** *email-address*
7. **exit**
8. **exit**
9. **show email**
10. *show-command* **| email subject** *subject email-address*

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**email**
	Example:
	`switch(config)# email`
	`switch(config-email)#`
		Enters email configuration mode.

Step 3	**smtp-host** *ip-address* **smtp-port** *port*
	Example:
	`switch(config-email)# smtp-host 198.51.100.1`
	`smtp-port 25`
		Specifies the SMTP host IP address and the SMTP port number.

Step 4	**vrf management** **Example:** `switch(config-email)# vrf management`	Specifies a VRF for the email transmission.

Step 5	**from** *email-address*
	Example:
	`switch(config-email)# from admin@Mycompany.com`
		Specifies the sender's email address.

Step 6	**reply-to** *email-address* **Example:** `switch(config-email)# reply-to admin@Mycompany.com`	Specifies the recipient's email address.

Step 7	**exit**
	Example:
	`switch(config-email)# exit`
	`switch(config)#`
		Exits email configuration mode.

Step 8	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits global configuration mode.

Step 9	**show email** **Example:** `switch# show email`	Displays the email configuration.
Step 10	*show-command* **| email subject** *subject email-address* **Example:**	Uses the pipe operator (|) to send the output of the specified **show** command with a subject to an email address.

	Command or Action	Purpose

	`switch# show interface brief | email subject show-interface admin@Mycompany.com`
	`Email sent`	

BIOS Loader Prompt

When the supervisor modules power up, a specialized BIOS image automatically loads and tries to locate a valid nx-os image for booting the system. If a valid nx-os image is not found, the following BIOS loader prompt displays:

```
loader>
```

For information on how to load the Cisco NX-OS software from the `loader>` prompt, see the *Cisco Nexus 9000 Series NX-OS Troubleshooting Guide*.

Examples Using the CLI

This section includes examples of using the CLI.

Using the System-Defined Timestamp Variable

This example uses $(TIMESTAMP) when redirecting **show** command output to a file:

```
switch# show running-config > rcfg.$(TIMESTAMP)
Preparing to copy....done
switch# dir
       12667     May 01 12:27:59 2013  rcfg.2013-05-01-12.27.59

Usage for bootflash://sup-local
8192 bytes used
20963328 bytes free
20971520 bytes total
```

Using CLI Session Variables

You can reference a variable using the syntax **$(***variable-name***)**.

This example shows how to reference a user-defined CLI session variable:

```
switch# show interface $(testinterface)
Ethernet2/1 is down (Administratively down)
  Hardware is 10/100/1000 Ethernet, address is 0000.0000.0000 (bia 0019.076c.4dac)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA
  auto-duplex, auto-speed
  Beacon is turned off
  Auto-Negotiation is turned on
  Input flow-control is off, output flow-control is off
  Auto-mdix is turned on
  Switchport monitor is off
  Last clearing of "show interface" counters never
  5 minute input rate 0 bytes/sec, 0 packets/sec
  5 minute output rate 0 bytes/sec, 0 packets/sec
  L3 in Switched:
    ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
  L3 out Switched:
    ucast: 0 pkts, 0 bytes - mcast: 0 pkts, 0 bytes
  Rx
    0 input packets 0 unicast packets 0 multicast packets
    0 broadcast packets 0 jumbo packets 0 storm suppression packets
    0 bytes
  Tx
    0 output packets 0 multicast packets
    0 broadcast packets 0 jumbo packets
    0 bytes
    0 input error 0 short frame 0 watchdog
    0 no buffer 0 runt 0 CRC 0 ecc
    0 overrun  0 underrun 0 ignored 0 bad etype drop
    0 bad proto drop 0 if down drop 0 input with dribble
    0 input discard
    0 output error 0 collision 0 deferred
    0 late collision 0 lost carrier 0 no carrier
    0 babble
    0 Rx pause 0 Tx pause 0 reset
```

Defining Command Aliases

This example shows how to define command aliases:

```
cli alias name ethint interface ethernet
cli alias name shintbr show interface brief
cli alias name shintupbr shintbr | include up | include ethernet
```

This example shows how to use a command alias:

```
switch# configure terminal
switch(config)# ethint 2/3
switch(config-if)#
```

Running a Command Script

This example displays the CLI commands specified in the script file:

```
switch# show file testfile
configure terminal
interface ethernet 2/1
no shutdown
end
show interface ethernet 2/1
```

This example displays the **run-script** command execution output:

```
switch# run-script testfile
`configure terminal`
`interface ethernet 2/1`
`no shutdown`
`end`
`show interface ethernet 2/1 `
Ethernet2/1 is down (Link not connected)
  Hardware is 10/100/1000 Ethernet, address is 0019.076c.4dac (bia 0019.076c.4dac)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA
  Port mode is trunk
  auto-duplex, auto-speed
  Beacon is turned off
  Auto-Negotiation is turned on
  Input flow-control is off, output flow-control is off
  Auto-mdix is turned on
  Switchport monitor is off
  Last clearing of "show interface" counters 1d26.2uh
  5 minute input rate 0 bytes/sec, 0 packets/sec
  5 minute output rate 0 bytes/sec, 0 packets/sec
  Rx
    0 input packets 0 unicast packets 0 multicast packets
    0 broadcast packets 0 jumbo packets 0 storm suppression packets
    0 bytes
  Tx
    0 output packets 0 multicast packets
    0 broadcast packets 0 jumbo packets
    0 bytes
    0 input error 0 short frame 0 watchdog
    0 no buffer 0 runt 0 CRC 0 ecc
    0 overrun  0 underrun 0 ignored 0 bad etype drop
    0 bad proto drop 0 if down drop 0 input with dribble
    0 input discard
    0 output error 0 collision 0 deferred
    0 late collision 0 lost carrier 0 no carrier
    0 babble
    0 Rx pause 0 Tx pause 0 reset
```

Sending Command Output in Email

This example shows how to send the output of the **show interface brief** command to an email address using the pipe operator (|):

```
switch<config># email
switch(config-email)# smtp-host 198.51.100.1 smtp-port 25
switch(config-email)# vrf management
switch(config-email)# from admin@Mycompany.com
switch(config-email)# reply-to admin@Mycompany.com
switch(config-email)# exit
switch(config)# exit
switch# show email
SMTP host: 198.51.100.1
SMTP port: 25
Reply to: admin@Mycompany.com
From: admin@Mycompany.com
VRF: management
switch# show interface brief | email subject show-interface admin@Mycompany.com

Email sent
```

The email sent to admin@Mycompany.com with the subject "show-interface" shows the output of the command:

```
<snip>
---------------------------------------------------------------------
Ethernet  VLAN Type Mode   Status Reason             Speed     Port
Interface                                                      Ch #
---------------------------------------------------------------------
Eth1/1     --  eth  trunk  up     none                10G (D)   --
Eth1/2     --  eth  routed down   Link not connected  auto(D)   --
Eth1/3     --  eth  routed up     none                10G (D)   --
Eth1/4     --  eth  routed down   Link not connected  auto (D)  --
Eth1/5     --  eth  routed down   Link not connected  auto (D)  --
Eth1/6     --  eth  routed down   Link not connected  auto (D)  --
Eth1/7     --  eth  routed down   Link not connected  auto (D)  --
Eth1/8     --  eth  routed down   Link not connected  auto (D)  --
Eth1/9     --  eth  routed down   Link not connected  auto (D)  --
Eth1/10    --  eth  routed down   Link not connected  auto (D)  --
<snip>
```

CHAPTER 7

Configuring Terminal Settings and Sessions

This chapter contains the following sections:

About Terminal Settings and Sessions

This section includes information about terminal settings and sessions.

Terminal Session Settings

The Cisco NX-OS software features allow you to manage the following characteristics of terminals:

Terminal type
Name used by Telnet when communicating with remote hosts

Length
Number of lines of command output displayed before pausing

Width
Number of characters displayed before wrapping the line

Inactive session timeout
Number of minutes that a session remains inactive before the device terminates it

Console Port

The console port is an asynchronous serial port that allows you to connect to the device for initial configuration through a standard RS-232 port with an RJ-45 connector. Any device connected to this port must be capable of asynchronous transmission. You can configure the following parameters for the console port:

Data bits
Specifies the number of bits in an 8-bit byte that is used for data.

Inactive session timeout
Specifies the number of minutes a session can be inactive before it is terminated.

Parity
Specifies the odd or even parity for error detection.

Speed
Specifies the transmission speed for the connection.

Stop bits
Specifies the stop bits for an asynchronous line.

Configure your terminal emulator with 9600 baud, 8 data bits, 1 stop bit, and no parity.

Virtual Terminals

You can use virtual terminal lines to connect to your device. Secure Shell (SSH) and Telnet create virtual terminal sessions. You can configure an inactive session timeout and a maximum sessions limit for virtual terminals.

Default Settings for File System Parameters

This table lists the default settings for the file system parameters.

Table 16: Default File System Settings

Parameters	Default
Default filesystem	bootflash:

Configuring the Console Port

You can set the following characteristics for the console port:

- Data bits
- Inactive session timeout
- Parity
- Speed
- Stop bits

Before you begin

Log in to the console port.

SUMMARY STEPS

1. **configure terminal**
2. **line console**
3. **databits** *bits*
4. **exec-timeout** *minutes*
5. **parity** {**even** | **none** | **odd**}

6. **speed** {**300** | **1200** | **2400** | **4800** | **9600** | **38400** | **57600** | **115200**}
7. **stopbits** {**1** | **2**}
8. **exit**
9. (Optional) **show line console**
10. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**line console**
	Example:
	`switch# line console`
	`switch(config-console)#`
		Enters console configuration mode.

Step 3	**databits** *bits* **Example:** `switch(config-console)# databits 7`	Configures the number of data bits per byte. The range is from 5 to 8. The default is 8.
Step 4	**exec-timeout** *minutes* **Example:** `switch(config-console)# exec-timeout 30`	Configures the timeout for an inactive session. The range is from 0 to 525600 minutes (8760 hours). A value of 0 minutes disables the session timeout. The default is 30 minutes.

Step 5	**parity** {**even** | **none** | **odd**}
	Example:
	`switch(config-console)# parity even`
		Configures the parity. The default is **none**.

Step 6	**speed** {**300** | **1200** | **2400** | **4800** | **9600** | **38400** | **57600** | **115200**}
	Example:
	`switch(config-console)# speed 115200`
		Configures the transmit and receive speed. The default is 9600.

Step 7	**stopbits** {**1** | **2**}
	Example:
	`switch(config-console)# stopbits 2`
		Configures the stop bits. The default is 1.

Step 8	**exit**
	Example:
	`switch(config-console)# exit`
	`switch(config)#`
		Exits console configuration mode.

	Command or Action	Purpose
Step 9	(Optional) **show line console** **Example:** `switch(config)# show line console`	Displays the console settings.
Step 10	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring Virtual Terminals

This section describes how to configure virtual terminals on Cisco NX-OS devices.

Configuring the Inactive Session Timeout

You can configure a timeout for inactive virtual terminal sessions on the device.

SUMMARY STEPS

1. **configure terminal**
2. **line vty**
3. **exec-timeout** *minutes*
4. **exit**
5. (Optional) **show running-config all | begin vty**
6. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**line vty**
	Example:
	`switch# line vty`
	`switch(config-line)#`
		Enters line configuration mode.

Step 3	**exec-timeout** *minutes* **Example:** `switch(config-line)# exec-timeout 30`	Configures the inactive session timeout. The range is from 0 to 525600 minutes (8760 hours). A value of 0 minutes disables the timeout. The default value is 30.

	Command or Action	Purpose

Step 4	**exit**
	Example:
	`switch(config-line)# exit`
	`switch(config)#`
		Exits line configuration mode.

Step 5	(Optional) **show running-config all | begin vty** **Example:** `switch(config)# show running-config all | begin vty`	Displays the virtual terminal configuration.
Step 6	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring the Session Limit

You can limit the number of virtual terminal sessions on your device.

SUMMARY STEPS

1. **configure terminal**
2. **line vty**
3. **session-limit** *sessions*
4. **exit**
5. (Optional) **show running-config all | begin vty**
6. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**line vty**
	Example:
	`switch# line vty`
	`switch(config-line)#`
		Enters line configuration mode.

Step 3	**session-limit** *sessions* **Example:** `switch(config-line)# session-limit 10`	Configures the maximum number of virtual sessions for your device. The range is from 1 to 64. The default is 32.

	Command or Action	Purpose

Step 4	**exit**
	Example:
	`switch(config-line)# exit`
	`switch(config)#`
		Exits line configuration mode.

Step 5	(Optional) **show running-config all | begin vty** **Example:** `switch(config)# show running-config all | begin vty`	Displays the virtual terminal configuration.
Step 6	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Clearing Terminal Sessions

You can clear terminal sessions on your device.

SUMMARY STEPS

1. (Optional) **show users**
2. **clear line** *name*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **show users** **Example:** `switch# show users`	Displays the user sessions on the device.
Step 2	**clear line** *name* **Example:** `switch# clear line pts/0`	Clears a terminal session on a specific line. The line name is case sensitive.

Displaying Terminal and Session Information

To display terminal and session information, perform one of the following tasks:

Command	Purpose
show terminal	Displays terminal settings.
show line	Displays the COM1 and console ports settings.

Command	Purpose
show users	Displays virtual terminal sessions.
show running-config [**all**]	Displays the user account configuration in the running configuration. The **all** keyword displays the default values for the user accounts.

CHAPTER 8

Basic Device Management

This chapter contains the following sections:

About Basic Device Management

This section provides information about basic device management.

Device Hostname

You can change the device hostname displayed in the command prompt from the default (switch) to another character string. When you give the device a unique hostname, you can easily identify the device from the command-line interface (CLI) prompt.

Message-of-the-Day Banner

The message-of-the-day (MOTD) banner displays before the user login prompt on the device. This message can contain any information that you want to display for users of the device.

Device Clock

If you do not synchronize your device with a valid outside timing mechanism, such as an NTP clock source, you can manually set the clock time when your device boots.

Clock Manager

The Cisco NX-OS device might contain clocks of different types that might need to be synchronized. These clocks are a part of various components (such as the supervisor, line card processors, or line cards), and each might be using a different protocol.

The clock manager provides a way to synchronize these different clocks.

Time Zone and Summer Time (Daylight Saving Time)

You can configure the time zone and summer time (daylight saving time) setting for your device. These values offset the clock time from Coordinated Universal Time (UTC). UTC is International Atomic Time (TAI) with leap seconds added periodically to compensate for the Earth's slowing rotation. UTC was formerly called Greenwich Mean Time (GMT).

User Sessions

You can display the active user session on your device. You can also send messages to the user sessions. For more information about managing user sessions and accounts, see the *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Default Settings for Basic Device Parameters

This table lists the default settings for basic device parameters.

Table 17: Default Basic Device Parameters

Parameters	Default
MOTD banner text	User Access Verification
Clock time zone	UTC

Changing the Device Hostname

You can change the device hostname displayed in the command prompt from the default (switch) to another character string.

SUMMARY STEPS

1. **configure terminal**
2. {**hostname** | **switchname**} *name*
3. **exit**
4. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	{**hostname** | **switchname**} *name*
	Example:
	Using the **hostname** command:
	`switch(config)# hostname Engineering1`
	`Engineering1(config)#`
	Using the **switchname** command:
	`Engineering1(config)# switchname Engineering2`
	`Engineering2(config)#`
		Changes the device hostname. The *name* argument is alphanumeric and case sensitive. The default is switch.
		Note The **switchname** command performs the same function as the **hostname** command. Beginning with Cisco NX-OS Release 7.0(3)I7(3), a maximum length of 63 characters for the switchname is supported.

Step 3	**exit**
	Example:
	`Engineering2(config)# exit`
	`Engineering2#`
		Exits global configuration mode.

Step 4	(Optional) **copy running-config startup-config** **Example:** `Engineering2# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring the MOTD Banner

You can configure the MOTD to display before the login prompt on the terminal when a user logs in. The MOTD banner has the following characteristics:

- Maximum of 255 characters per line
- Maximum of 40 lines

SUMMARY STEPS

1. **configure terminal**
2. **banner motd** *delimiting-character message delimiting-character*
3. **exit**
4. (Optional) **show banner motd**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**banner motd** *delimiting-character message delimiting-character*
	Example:
	`switch(config)# banner motd #Welcome to the Switch#`
	`switch(config)#`
		Configures the MOTD banner. Do not use the *delimiting-character* in the *message* text.
		Note Do not use " or % as a delimiting character. Ensure that when you upgrade to higher releases for the limitation of this feature.
		Note Beginning from Cisco NX-OS Release 10.1(x), the following special characters (", %, >, <, ' ', (space), and ASCII characters < 0x15) are invalid as delimiting characters. If an existing MOTD banner with these delimiting characters is edited or a fresh banner is added with these delimiting characters, the banner is not configured to the running configuration.
		When you upgrade from an earlier release i.e, before 10.x releases to an existing 10.x releases, there is no impact on the configuration in the CLI and the configuration will be the same in the running configuration.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits global configuration mode.

Step 4	(Optional) **show banner motd** **Example:** `switch# show banner motd`	Displays the configured MOTD banner.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring the Time Zone

You can configure the time zone to offset the device clock time from UTC.

SUMMARY STEPS

1. **configure terminal**
2. **clock timezone** *zone-name offset-hours offset-minutes*
3. **exit**
4. (Optional) **show clock**
5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**clock timezone** *zone-name offset-hours offset-minutes* **Example:** `switch(config)# clock timezone EST -5 0`	Configures the time zone. The *zone-name* argument is a 3-character string for the time zone acronym (for example, PST or EST). The *offset-hours* argument is the offset from the UTC and the range is from –23 to 23 hours. The range for the *offset-minutes* argument is from 0 to 59 minutes.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits global configuration mode.

Step 4	(Optional) **show clock** **Example:** `switch# show clock`	Displays the time and time zone.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Configuring Summer Time (Daylight Saving Time)

You can configure when summer time, or daylight saving time, is in effect for the device and the offset in minutes.

SUMMARY STEPS

1. **configure terminal**
2. **clock summer-time** *zone-name start-week start-day start-month start-time end-week end-day end-month end-time offset-minutes*
3. **exit**
4. (Optional) **show clock detail**

5. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	**clock summer-time** *zone-name start-week start-day start-month start-time end-week end-day end-month end-time offset-minutes* **Example:** `switch(config)# clock summer-time PDT 1 Sunday March 02:00 1 Sunday November 02:00 60`	Configures summer time or daylight saving time. The *zone-name* argument is a three character string for the time zone acronym (for example, PST and EST). The values for the *start-day* and *end-day* arguments are **Monday**, **Tuesday**, **Wednesday**, **Thursday**, **Friday**, **Saturday**, and **Sunday**. The values for the *start-month* and *end-month* arguments are **January**, **February**, **March**, **April**, **May**, **June**, **July**, **August**, **September**, **October**, **November**, and **December**. The value for the *start-time* and *end-time* arguments are in the format *hh***:***mm*. The range for the *offset-minutes* argument is from 0 to 1440 minutes.

Step 3	**exit**
	Example:
	`switch(config)# exit`
	`switch#`
		Exits global configuration mode.

Step 4	(Optional) **show clock detail** **Example:** `switch(config)# show clock detail`	Displays the configured MOTD banner.
Step 5	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Manually Setting the Device Clock

You can set the clock manually if your device cannot access a remote time source.

Before you begin

Configure the time zone.

SUMMARY STEPS

1. **clock set** *time day month year*
2. (Optional) **show clock**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**clock set** *time day month year*
	Example:
	`switch# clock set 15:00:00 30 May 2013`
	`Fri May 30 15:14:00 PDT 2013`
		Configures the device clock.
		The format for the *time* argument is *hh***:***mm***:***ss*.
		The range for the *day* argument is from 1 to 31.
		The values for the *month* argument are **January**, **February**, **March**, **April**, **May**, **June**, **July**, **August**, **September**, **October**, **November**, and **December**.
		The range for the *year* argument is from 2000 to 2030.

Step 2	(Optional) **show clock** **Example:** `switch(config)# show clock`	Displays the current clock value.

Setting the Clock Manager

You can configure the clock manager to synchronize all the clocks of the components in the Cisco Nexus device.

SUMMARY STEPS

1. **clock protocol** *protocol*
2. (Optional) **show run clock_manager**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**clock protocol** *protocol* **Example:** `switch# clock protocol ntp`	Configures the clock manager. The values for the *protocol* argument are **ntp**, **ptp**, and **none**. The following describes the values: • **ntp**—Synchronizes clocks with Network Time Protocol (NTP). • **ptp**—Synchronizes clocks with Precision Time Protocol (PTP) as described by IEEE 1588. • **none**—Uses **clock set** *HH:MM:SS* to set the supervisor clock.

	Command or Action	Purpose
		Note When **none** is used, the clock must be configured. **Note** Once the protocol is configured, the clock must use that protocol.
Step 2	(Optional) **show run clock_manager** **Example:** `switch# show run clock_manager`	Displays the configuration of the clock manager.

Managing Users

You can display information about users logged into the device and send messages to those users.

Displaying Information about the User Sessions

You can display information about the user session on the device.

SUMMARY STEPS

1. **show users**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show users** **Example:** `switch# show users`	Displays the user sessions.

Sending a Message to Users

You can send a message to active users currently using the device CLI.

SUMMARY STEPS

1. (Optional) **show users**
2. **send** [**session** *line*] *message-text*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **show users** **Example:** `switch# show users`	Displays the active user sessions.
Step 2	**send** [**session** *line*] *message-text* **Example:** `switch# send Reloading the device is 10 minutes!`	Sends a message to all active users or to a specific user. The message can be up to 80 alphanumeric characters and is case sensitive.

Verifying the Device Configuration

To verify the configuration, use one of the following commands:

Command	Purpose
show running-config [**[exclude]** *command*] **[sanitized]**	Displays the contents of the currently running configuration or a subset of that configuration, use the **show running-config** command in the appropriate mode. : • **exclude**: (Optional) Excludes a specific configuration from the display. Use the **exclude** keyword followed by a *command* argument to exclude a specific configuration from the display. • *command*: (Optional) Displays only a single command or a subset of commands available under a specified command mode. • **sanitized**: (Optional) Displays a sanitized configuration for safe distribution and analysis. Beginning with Cisco NX-OS Release 10.3(2)F, **sanitized** keyword is supported on Cisco Nexus 9000 series switches.
show startup-config	Displays the startup configuration.
show time-stamp running-config last-changed	Displays the timestamp when the running configuration was last changed.

The following example shows sample output of **show running-config** command with the **sanitized** keyword. The sanitized configuration is used to share a configuration without exposing some configuration details.

This option masks the sensitive words in running configuration output with <removed> keyword.

```
switch# show running-config sanitized

!Command: show running-config sanitized
!Running configuration last done at: Wed Oct 12 09:14:54 2022
!Time: Wed Oct 12 13:52:55 2022

version 10.3(2) Bios:version 07.69
```

```
username admin password 5 <removed> role network-admin

copp profile strict
snmp-server user admin network-admin auth md5 <removed> priv aes-128 <removed> localizedV2key
rmon event 1 log trap <removed> description FATAL(1) owner PMON@FATAL
rmon event 2 log trap <removed> description CRITICAL(2) owner PMON@CRITICAL
rmon event 3 log trap <removed> description ERROR(3) owner PMON@ERROR
rmon event 4 log trap <removed> description WARNING(4) owner PMON@WARNING
rmon event 5 log trap <removed> description INFORMATION(5) owner PMON@INFO
--More--
```

CHAPTER 9

Using the Device File Systems, Directories, and Files

This chapter contains the following sections:

About the Device File Systems, Directories, and Files

This section describes file systems, directories, and files on the Cisco NX-OS device.

File Systems

The syntax for specifying a local file system is *filesystem***:**[//*modules*/].

This table describes file systems that you can reference on your device.

Table 18: File System Syntax Components

File System Name	Module	Description
bootflash	sup-active sup-local	Internal CompactFlash memory located on the active supervisor module used for storing image files, configuration files, and other miscellaneous files. The initial default directory is bootflash.
	sup-standby sup-remote	Internal CompactFlash memory located on the standby supervisor module used for storing image files, configuration files, and other miscellaneous files.
volatile	—	Volatile random-access memory (VRAM) located on a supervisor module used for temporary or pending changes.
log	—	Memory on the active supervisor that stores logging file statistics.
system	—	Memory on a supervisor module used for storing the running-configuration file.
debug	—	Memory on a supervisor module used for debug logs.

Directories

You can create directories on bootflash: and external flash memory (usb1: and usb2:). You can navigate through these directories and use them for files.

Files

You create and access files on bootflash:, volatile:, usb1:, and usb2: filesystems. You can only access files on the system: filesystem. You can use the log: filesystem for debug log files.

You can download files, such as the nx-os image file, from remote servers using FTP, Secure Copy (SCP), Secure Shell FTP (SFTP), and TFTP. You can also copy files from an external server to the device, because the device can act as an SCP server.

Guidelines and Limitations

Guidelines and limitations for device file systems, directories, and files are as follows:

- The **show tech-support details** command cannot be terminated using Ctrl+Z. Instead, use Ctrl+C to terminate the command.
- Utilize a user with the "network-admin" role to make changes to files in the bootflash.

Default Settings for File System Parameters

This table lists the default settings for the file system parameters.

Table 19: Default File System Settings

Parameters	Default
Default filesystem	bootflash:

Configuring the FTP, HTTP, or TFTP Source Interface

You can configure the source interface for the File Transfer Protocol (FTP), Hypertext Transfer Protocol (HTTP), or Trivial File Transfer Protocol (TFTP). This configuration allows you to use the IP address associated with the configured source interface when copy packets are transferred.

SUMMARY STEPS

1. **configure terminal**
2. [**no**] **ip** {**ftp** | **http** | **tftp**} **source-interface** {**ethernet** *slot*/*port* | **loopback** *number*}
3. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**configure terminal**
	Example:
	`switch# configure terminal`
	`switch(config)#`
		Enters global configuration mode.

Step 2	[**no**] **ip** {**ftp** | **http** | **tftp**} **source-interface** {**ethernet** *slot*/*port* | **loopback** *number*}
	Example:
	`switch(config)# ip tftp source-interface ethernet 2/1`
		Configures the source interface for all FTP, HTTP, or TFTP packets.

	Command or Action	Purpose
Step 3	(Optional) **copy running-config startup-config** **Example:** `switch(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Working with Directories

This section describes how to work with directories on the Cisco NX-OS device.

Identifying the Current Directory

You can display the directory name of your current directory.

SUMMARY STEPS

1. **pwd**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**pwd** **Example:** `switch# pwd`	Displays the name of your current directory.

Changing the Current Directory

You can change the current directory for file system operations. The initial default directory is bootflash:.

SUMMARY STEPS

1. (Optional) **pwd**
2. **cd** {*directory* \| *filesystem***:**[//*module*/][*directory*]}

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.

Step 2	**cd** {*directory* | *filesystem***:**[//*module*/][*directory*]}
	Example:
	`switch# cd usb1:`
		Changes to a new current directory. The file system, module, and directory names are case sensitive.

Creating a Directory

You can create directories in the bootflash: and flash device file systems.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **cd** {*directory* | *filesystem***:**[//*module*/][*directory*]}
3. **mkdir** [*filesystem***:**[//*module*/]]*directory*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.

Step 2	(Optional) **cd** {*directory* | *filesystem***:**[//*module*/][*directory*]}
	Example:
	`switch# cd slot0:`
		Changes to a new current directory. The file system, module, and directory names are case sensitive.

Step 3	**mkdir** [*filesystem***:**[//*module*/]]*directory* **Example:** `switch# mkdir test`	Creates a new directory. The *filesystem* argument is case sensitive. The *directory* argument is alphanumeric, case sensitive, and has a maximum of 64 characters.

Displaying Directory Contents

You can display the contents of a directory.

SUMMARY STEPS

1. **dir** [*directory* | *filesystem***:**[//*module*/][*directory*]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**dir** [*directory* | *filesystem***:**[//*module*/][*directory*]] **Example:** `switch# dir bootflash:test`	Displays the directory contents. The default is the current working directory. The file system and directory names are case sensitive.

Deleting a Directory

You can remove directories from the file systems on your device.

Before you begin

Ensure that the directory is empty before you try to delete it.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **dir** [*filesystem* **:**[*//module/*][*directory*]]
3. **rmdir** [*filesystem* **:**[*//module/*]]*directory*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.
Step 2	(Optional) **dir** [*filesystem* **:**[*//module/*][*directory*]] **Example:** `switch# dir bootflash:test`	Displays the contents of the current directory. The file system, module, and directory names are case sensitive. If the directory is not empty, you must delete all the files before you can delete the directory.
Step 3	**rmdir** [*filesystem* **:**[*//module/*]]*directory* **Example:** `switch# rmdir test`	Deletes a directory. The file system and directory name are case sensitive.

Accessing Directories on the Standby Supervisor Module

You can access all file systems on the standby supervisor module (remote) from a session on the active supervisor module. This feature is useful when copying files to the active supervisor modules requires similar files to exist on the standby supervisor module. To access the file systems on the standby supervisor module from a session on the active supervisor module, you specify the standby supervisor module in the path to the file using either *filesystem***://sup-remote/** or *filesystem***://sup-standby/**.

Working with Files

This section describes how to work with files on the Cisco NX-OS device.

Moving Files

You can move a file from one directory to another directory.

⚠ **Caution** If a file with the same name already exists in the destination directory, that file is overwritten by the moved file.

You can use the **move** command to rename a file by moving the file within the same directory.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **dir** [*filesystem***:**[*//module/*][*directory*]]
3. **move** [*filesystem***:**[*//module/*][*directory /*] | *directory/*]*source-filename* {{*filesystem***:**[*//module/*][*directory /*] | *directory/*}[*target-filename*] | *target-filename*}

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.
Step 2	(Optional) **dir** [*filesystem***:**[*//module/*][*directory*]] **Example:** `switch# dir bootflash`	Displays the contents of the current directory. The file system and directory name are case sensitive.

Step 3	**move** [*filesystem***:**[*//module/*][*directory /*] | *directory/*]*source-filename* {{*filesystem***:**[*//module/*][*directory /*] | *directory/*}[*target-filename*] | *target-filename*}
	Example:
	`switch# move test old_tests/test1`
		Moves a file.
		The file system, module, and directory names are case sensitive.
		The *target-filename* argument is alphanumeric, case sensitive, and has a maximum of 64 characters. If the *target-filename* argument is not specified, the filename defaults to the *source-filename* argument value.

Copying Files

You can make copies of files, either within the same directory or on another directory. For more information, see the *Cisco Nexus 9000 Series NX-OS Troubleshooting Guide*.

Note Use the **dir** command to ensure that enough space is available in the target file system. If enough space is not available, use the **delete** command to remove unneeded files.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **dir** [*filesystem***:**[*//module/*][*directory*]]
3. **copy** [*filesystem***:**[*//module/*][*directory/*] | *directory/*]*source-filename* | {*filesystem***:**[*//module/*][*directory/*] | *directory/*}[*target-filename*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.
Step 2	(Optional) **dir** [*filesystem*:[//*module*/][*directory*]] **Example:** `switch# dir bootflash`	Displays the contents of the current directory. The file system and directory name are case sensitive.
Step 3	**copy** [*filesystem*:[//*module*/][*directory/*] | *directory/*]*source-filename* | {*filesystem*:[//*module*/][*directory/*] | *directory/*}[*target-filename*] **Example:** `switch# copy test old_tests/test1`	Copies a file. The file system, module, and directory names are case sensitive. The *source-filename* argument is alphanumeric, case sensitive, and has a maximum of 64 characters. If the *target-filename* argument is not specified, the filename defaults to the *source-filename* argument value.

Copying Files Using HTTP or HTTPS

You can make copies of files from remote server to local device using HTTP or HTTPS.

Note Beginning with Cisco NX-OS Release 10.4(3)F, the **copy http** or **copy https** command supports TLS version 1.3 and 1.2 on Cisco Nexus switches.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **dir** [*filesystem*:[//*module*/][*directory*]]
3. **copy https://** *username*:*password*@*directory*/*filename* **bootflash: vrf management**
4. **copy http://** *directory*/*filename* **bootflash: vrf management**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.
Step 2	(Optional) **dir** [*filesystem*:[//*module*/][*directory*]] **Example:** `switch# dir bootflash`	Displays the contents of the current directory. The file system and directory name are case sensitive.

	Command or Action	Purpose
Step 3	**copy https://** *username*:*password*@*directory*/*filename* **bootflash: vrf management** **Example:** `switch(config)# copy https://username1:pwd1@192.168.0.1/test.txt bootflash: vrf management`	Copies the specified files from remote server to local device using **https** option.
Step 4	**copy http://** *directory*/*filename* **bootflash: vrf management** **Example:** `switch(config)# copy http://192.168.0.1/test.txt bootflash: vrf management`	Copies the specified files from remote server to local device using **http** option.

Deleting Files

You can delete a file from a directory.

SUMMARY STEPS

1. (Optional) **dir** [*filesystem*:[//*module*/][*directory*]]
2. **delete** {*filesystem*:[//*module*/][*directory*/] | *directory*/}*filename*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **dir** [*filesystem*:[//*module*/][*directory*]] **Example:** `switch# dir bootflash:`	Displays the contents of the current directory. The file system and directory name are case sensitive.
Step 2	**delete** {*filesystem*:[//*module*/][*directory*/] | *directory*/}*filename* **Example:** `switch# delete bootflash:old_config.cfg`	Deletes a file. The file system, module, and directory names are case sensitive. The *source-filename* argument is case sensitive. **Caution** If you specify a directory, the **delete** command deletes the entire directory and all its contents.

Displaying File Contents

You can display the contents of a file.

SUMMARY STEPS

1. **show file** [*filesystem*:[//*module*/]][*directory*/]*filename*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**show file** [*filesystem*:[//*module*/]][*directory*/]*filename* **Example:** `switch# show file bootflash:test-results`	Displays the file contents.

Displaying File Checksums

You can display checksums to check the file integrity.

SUMMARY STEPS

1. **show file** [*filesystem*:[//*module*/]][*directory*/]*filename* {**cksum** \| **md5sum**}

DETAILED STEPS

	Command or Action	Purpose

Step 1	**show file** [*filesystem*:[//*module*/]][*directory*/]*filename* {**cksum** | **md5sum**}
	Example:
	`switch# show file bootflash:trunks2.cfg cksum`
		Displays the checksum or MD5 checksum of the file.

Compressing and Uncompressing Files

You can compress and uncompress files on your device using Lempel-Ziv 1977 (LZ77) coding.

SUMMARY STEPS

1. (Optional) **dir** [*filesystem*:[//*module*/]*directory*]]
2. **gzip** [*filesystem*:[//*module*/][*directory*/] | *directory*/]*filename*
3. **gunzip** [*filesystem*:[//*module*/][*directory*/] | *directory*/]*filename* **.gz**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **dir** [*filesystem*:[//*module*/]*directory*]] **Example:** `switch# dir bootflash:`	Displays the contents of the current directory. The file system and directory name are case sensitive.
Step 2	**gzip** [*filesystem*:[//*module*/][*directory*/] | *directory*/]*filename* **Example:** `switch# gzip show_tech`	Compresses a file. After the file is compressed, it has a .gz suffix.

	Command or Action	Purpose
Step 3	**gunzip** [*filesystem*:[//*module*/][*directory*/] | *directory*/]*filename* **.gz** **Example:** `switch# gunzip show_tech.gz`	Uncompresses a file. The file to uncompress must have the .gz suffix. After the file is uncompressed, it does not have the .gz suffix.

Displaying the Last Lines in a File

You can display the last lines of a file.

SUMMARY STEPS

1. **tail** [*filesystem*:[//*module*/]][*directory*/]*filename* [*lines*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**tail** [*filesystem*:[//*module*/]][*directory*/]*filename* [*lines*] **Example:** `switch# tail ospf-gr.conf`	Displays the last lines of a file. The default number of lines is 10. The range is from 0 to 80 lines.

Redirecting show Command Output to a File

You can redirect **show** command output to a file on bootflash:, volatile:, or a remote server. You can also specify the format for the command output.

SUMMARY STEPS

1. (Optional) **terminal redirection-mode** {**ascii** | **zipped**}
2. *show-command* > [*filesystem*:[//*module*/][*directory*] | [directory /]]*filename*

DETAILED STEPS

	Command or Action	Purpose

Step 1	(Optional) **terminal redirection-mode** {**ascii** | **zipped**}
	Example:
	`switch# terminal redirection-mode zipped`
		Sets the redirection mode for the **show** command output for the user session. The default mode is **ascii**.

Step 2	*show-command* > [*filesystem*:[//*module*/][*directory*] | [directory /]]*filename* **Example:** `switch# show tech-support > bootflash:techinfo`	Redirects the output from a **show** command to a file.

Finding Files

You can find the files in the current working directory and its subdirectories that have names that begin with a specific character string.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **cd** {*filesystem***:**[*//module/*][*directory*] | *directory*}
3. **find** *filename-prefix*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.

Step 2	(Optional) **cd** {*filesystem***:**[*//module/*][*directory*] | *directory*}
	Example:
	`switch# cd bootflash:test_scripts`
		Changes the default directory.

Step 3	**find** *filename-prefix* **Example:** `switch# find bgp_script`	Finds all filenames in the default directory and in its subdirectories beginning with the filename prefix. The filename prefix is case sensitive.

Formatting the Bootflash

Use the **format bootflash:** CLI command to format the onboard flash memory (bootflash:). If the command errors out due to the `Deactivate all virtual-services and try again` error message, destroy the Guest Shell using the **guestshell destroy** CLI command and rerun the **format bootflash:** command, for example,

```
switch# sh virtual-service list
Virtual Service List:

Name                    Status             Package Name
-----------------------------------------------------------------------
guestshell+             Activated          guestshell.ova

switch#

switch# guestshell destroy
You are about to destroy the guest shell and all of its contents.  Be sure to save your
work. Are you sure you want to continue? (y/n) [n] y

switch# 2018 Jan 17 18:42:24 switch %$ VDC-1 %$ %VMAN-2-ACTIVATION_STATE: Deactivating
virtual service 'guestshell+'
```

```
switch#format bootflash:
```

Working with Archive Files

The Cisco NX-OS software supports archive files. You can create an archive file, append files to an existing archive file, extract files from an archive file, and list the files in an archive file.

Creating an Archive File

You can create an archive file and add files to it. You can specify the following compression types:

- bzip2
- gzip
- Uncompressed

The default is gzip.

SUMMARY STEPS

1. **tar create** {**bootflash:** | **volatile:**}*archive-filename* [**absolute**] [**bz2-compress**] [**gz-compress**] [**remove**] [**uncompressed**] [**verbose**] *filename-list*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**tar create** {**bootflash:** | **volatile:**}*archive-filename* [**absolute**] [**bz2-compress**] [**gz-compress**] [**remove**] [**uncompressed**] [**verbose**] *filename-list* **Example:** `switch# tar create bootflash:config-archive gz-compress bootflash:config-file`	Creates an archive file and adds files to it. The filename is alphanumeric, not case sensitive, and has a maximum length of 240 characters. The **absolute** keyword specifies that the leading backslash characters (\) should not be removed from the names of the files added to the archive file. By default, the leading backslash characters are removed. The **bz2-compress**, **gz-compress**, and **uncompressed** keywords determine the compression utility used when files are added, or later appended, to the archive and the decompression utility to use when extracting the files. If you do not specify an extension for the archive file, the defaults are as follows: • For **bz2-compress**, the extension is .tar.bz2. • For **gz-compress**, the extension is .tar.gz. • For **uncompressed**, the extension is .tar. The **remove** keyword specifies that the Cisco NX-OS software should delete the files from the file system after

	Command or Action	Purpose
		adding them to the archive. By default, the files are not deleted. The **verbose** keyword specifies that the Cisco NX-OS software should list the files as they are added to the archive. By default, the files are listed as they are added.

Appending Files to an Archive File

You can append files to an existing archive file on your device.

Before you begin

You have created an archive file on your device.

SUMMARY STEPS

1. **tar append** {**bootflash:** | **volatile:**}*archive-filename* [**absolute**] [**remove**] [**verbose**] *filename-list*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**tar append** {**bootflash:** | **volatile:**}*archive-filename* [**absolute**] [**remove**] [**verbose**] *filename-list*	Adds files to an existing archive file. The archive filename is not case sensitive. The **absolute** keyword specifies that the leading backslash characters (\) should not be removed from the names of the files added to the archive file. By default, the leading backslash characters are removed. The **remove** keyword specifies that the Cisco NX-OS software should delete the files from the filesystem after adding them to the archive. By default, the files are not deleted. The **verbose** keyword specifies that the Cisco NX-OS software should list the files as they are added to the archive. By default, the files are listed as they are added.

Example

This example shows how to append a file to an existing archive file:

```
switch# tar append bootflash:config-archive.tar.gz bootflash:new-config
```

Extracting Files from an Archive File

You can extract files to an existing archive file on your device.

Before you begin

You have created an archive file on your device.

SUMMARY STEPS

1. **tar extract** {**bootflash:** | **volatile:**}*archive-filename* [**keep-old**] [**screen**] [**to** {**bootflash:** | **volatile:**}[/*directory-name*]] [**verbose**]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**tar extract** {**bootflash:** | **volatile:**}*archive-filename* [**keep-old**] [**screen**] [**to** {**bootflash:** | **volatile:**}[/*directory-name*]] [**verbose**] **Example:** `switch# tar extract bootflash:config-archive.tar.gz`	Extracts files from an existing archive file. The archive filename is not case sensitive. The **keep-old** keyword indicates that the Cisco NX-OS software should not overwrite files with the same name as the files being extracted. The **screen** keyword indicates that the Cisco NX-OS software should not overwrite files with the same name as the files being extracted. The **to** keyword specifies the target filesystem. You can include a directory name. The directory name is alphanumeric, case sensitive, and has a maximum length of 240 characters. The **verbose** keyword specifies that the Cisco NX-OS software should display the names of the files as they are extracted.

Displaying the Filenames in an Archive File

You can display the names of the files in an archive files using the **tar list** command.

tar list {**bootflash:** | **volatile:**}*archive-filename*

The archive filename is not case sensitive.

```
switch# tar list bootflash:config-archive.tar.gz
config-file
new-config
```

SSD Re-partitioning

Perform the following step to increase the configuration storage space. This also increases the size of logflash storage. This configuration takes effect after a system reload, and the additional cfg and logflash storage space will come at the expense of bootflash, which will decrease in size. Ensure that all the software images, configurations, and personal data are backed up before performing the SSD re-partitioning.

Extended partitioning scheme is not support for platforms with a 64GB SSD.

SUMMARY STEPS

1. **system flash sda resize**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**system flash sda resize**
	Example:
	`switch# system flash sda resize ?`
	`  <CR>`
	`  extended  Cfg=1GB, logflash=39GB`
	`  standard  Cfg=64MB, logflash=4|8GB`
		Resize persistent storage to new scheme.

Example

Following is an example for standard resize:

```
switch# system flash sda resize extended

!!!! WARNING !!!!

      Attempts will be made to preserve drive contents during
      the resize operation, but risk of data loss does exist.
      Backing up of bootflash, logflash, and running configuration
      is recommended prior to proceeding.

!!!! WARNING !!!!


current scheme is
sda           8:0    0 119.2G  0 disk
|-sda1        8:1    0   512M  0 part
|-sda2        8:2    0    32M  0 part /mnt/plog
|-sda3        8:3    0   128M  0 part /mnt/pss
|-sda4        8:4    0 110.5G  0 part /bootflash
|-sda5        8:5    0    64M  0 part /mnt/cfg/0
|-sda6        8:6    0    64M  0 part /mnt/cfg/1
`-sda7        8:7    0     8G  0 part /logflash


 target scheme is
sda           8:0    0 120GB|250GB  0 disk
|-sda1        8:1    0   512M       0 part
|-sda2        8:2    0    32M       0 part /mnt/plog
|-sda3        8:3    0   128M       0 part /mnt/pss
|-sda4        8:4    0    rem       0 part /bootflash
|-sda5        8:5    0   1.0G       0 part /mnt/cfg/0
|-sda6        8:6    0   1.0G       0 part /mnt/cfg/1
|_sda7        8:7    0    39G       0 part /logflash

Continue? (y/n)  [n] y
  A module reload is required for the resize operation to proceed
  Please, do not power off the module during this process.
```

Following is an example for extended resize:

```
switch# system flash sda resize extended

!!!! WARNING !!!!

      Attempts will be made to preserve drive contents during
      the resize operation, but risk of data loss does exist.
      Backing up of bootflash, logflash, and running configuration
      is recommended prior to proceeding.

!!!! WARNING !!!!


current scheme is
sda           8:0    0 119.2G  0 disk
|-sda1        8:1    0   512M  0 part
|-sda2        8:2    0    32M  0 part /mnt/plog
|-sda3        8:3    0   128M  0 part /mnt/pss
|-sda4        8:4    0 110.5G  0 part /bootflash
|-sda5        8:5    0    64M  0 part /mnt/cfg/0
|-sda6        8:6    0    64M  0 part /mnt/cfg/1
`-sda7        8:7    0     8G  0 part /logflash


 target scheme is
sda           8:0    0 120GB|250GB  0 disk
|-sda1        8:1    0   512M       0 part
|-sda2        8:2    0    32M       0 part /mnt/plog
|-sda3        8:3    0   128M       0 part /mnt/pss
|-sda4        8:4    0    rem       0 part /bootflash
|-sda5        8:5    0   1.0G       0 part /mnt/cfg/0
|-sda6        8:6    0   1.0G       0 part /mnt/cfg/1
|_sda7        8:7    0    39G       0 part /logflash

Continue? (y/n)  [n] y
  A module reload is required for the resize operation to proceed
  Please, do not power off the module during this process.
```

Enable or Disable Tech-Support Command

Follow the steps to enable or disable tech-support command.

SUMMARY STEPS

1. **system tech-support blocked-commands sample_list**
2. **clear system tech-support blocked-commands**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**system tech-support blocked-commands sample_list**
	Example:
	`switch# system tech-support blocked-commands sample_list`
	`Successfully enabled tech-support blocked commands list`
		Enables tech-support blocked commands list.
		This command blocks the execution of show commands listed in **sample_list** from **show tech-support details [time-optimized]**, **show tech-support all [time- optimized]**, and **show tech-support commands**. The listed commands

	Command or Action	Purpose
		would not be executed and skipped for the above show-tech commands.

Step 2	**clear system tech-support blocked-commands**
	Example:
	`switch# clear system tech-support blocked-commands`
	`Successfully cleared tech-support blocked commands list`
		Clears tech -support blocked commands list.

Displaying Tech-support Blocked CLIs

You can find the status of tech support **blocked-commands** list using the following commands.

SUMMARY STEPS

1. **show system tech-support blocked-commands status**
2. **run bash cat /bootflash/sample_list**

DETAILED STEPS

	Command or Action	Purpose

Step 1	**show system tech-support blocked-commands status**
	Example:
	`switch# show system tech-support blocked-commands status`
	`Tech-support blocked commands list status: Disabled`
	`switch# show system tech-support blocked-commands status`
	`Tech-support blocked commands list status: Enabled`
	`Blocked command file: /bootflash/sample_list`
	`Last modified time: Thu Dec 7 07:03:02 2023`
		Displays the status of tech support blocked commands list.
		If the command list is enabled, it shows the file name

Step 2	**run bash cat /bootflash/sample_list**
	Example:
	`switch# run bash cat /bootflash/sample_list`
	`show version`
	`show inventory`
	`show module`
	`show tech-support snmp`
		Displays the blocked-commands file.
		• The maximum length of the file can me 128.
		• This is EXEC mode command but the **blocked-commands** would be effective as long as the file is kept at */bootflash* and would persist across all the reloads.
		• If the file is removed, **blocked-commands** would be enabled but not effective as the file is removed.
		• This file needs read permission.

Examples of Using the File System

This section includes examples of how to use the file system on the Cisco NX-OS device.

Accessing Directories on Standby Supervisor Modules

This example shows how to list the files on the standby supervisor module:

```
switch# dir bootflash://sup-remote
       4096    Oct 03 23:55:55 2013  .patch/
...
      16384    Jan 01 13:23:30 2011  lost+found/
  297054208    Oct 21 18:55:36 2013  n9000-dk9.6.1.2.I1.1.bin
...

Usage for bootflash://sup-remote
1903616000 bytes used
19234234368 bytes free
21137850368 bytes total
```

This example shows how to delete a file on the standby supervisor module:

```
switch# delete bootflash://sup-remote/aOldConfig.txt
```

Moving Files

This example shows how to move a file on an external flash device:

```
switch# move usb1:samplefile usb1:mystorage/samplefile
```

This example shows how to move a file in the default file system:

```
switch# move samplefile mystorage/samplefile
```

Copying Files

This example shows how to copy the file called samplefile from the root directory of the usb1: file system to the mystorage directory:

```
switch# copy usb1:samplefile usb1:mystorage/samplefile
```

This example shows how to copy a file from the current directory level:

```
switch# copy samplefile mystorage/samplefile
```

This example shows how to copy a file from the active supervisor module bootflash to the standby supervisor module bootflash:

```
switch# copy bootflash:nx-os-image bootflash://sup-2/nx-os-image
```

This example shows how to overwrite the contents of an existing configuration in NVRAM:

```
switch# copy nvram:snapshot-config nvram:startup-config

Warning: this command is going to overwrite your current startup-config:
Do you wish to continue? {y/n} [y] y
```

You can also use the **copy** command to upload and download files from the bootflash: file system to or from a FTP, TFTP, SFTP, or SCP server.

Deleting a Directory

You can remove directories from the file systems on your device.

Before you begin

Ensure that the directory is empty before you try to delete it.

SUMMARY STEPS

1. (Optional) **pwd**
2. (Optional) **dir** [*filesystem* **:**[*//module/*][*directory*]]
3. **rmdir** [*filesystem* **:**[*//module/*]]*directory*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **pwd** **Example:** `switch# pwd`	Displays the name of your current default directory.
Step 2	(Optional) **dir** [*filesystem* **:**[*//module/*][*directory*]] **Example:** `switch# dir bootflash:test`	Displays the contents of the current directory. The file system, module, and directory names are case sensitive. If the directory is not empty, you must delete all the files before you can delete the directory.
Step 3	**rmdir** [*filesystem* **:**[*//module/*]]*directory* **Example:** `switch# rmdir test`	Deletes a directory. The file system and directory name are case sensitive.

Displaying File Contents

This example shows how to display the contents of a file on an external flash device:

```
switch# show file usb1:test
configure terminal
interface ethernet 1/1
```

```
no shutdown
end
show interface ethernet 1/1
```

This example shows how to display the contents of a file that resides in the current directory:

```
switch# show file myfile
```

Displaying File Checksums

This example shows how to display the checksum of a file:

```
switch# show file bootflash:trunks2.cfg cksum
583547619
```

This example shows how to display the MD5 checksum of a file:

```
switch# show file bootflash:trunks2.cfg md5sum
3b94707198aabefcf46459de10c9281c
```

Compressing and Uncompressing Files

This example shows how to compress a file:

```
switch# dir
    1525859     Jul 04 00:51:03 2013 Samplefile
...
switch# gzip volatile:Samplefile
switch# dir
     266069     Jul 04 00:51:03 2013 Samplefile.gz
...
```

This example shows how to uncompress a compressed file:

```
switch# dir
     266069     Jul 04 00:51:03 2013 Samplefile.gz
...
switch# gunzip samplefile
switch# dir
    1525859     Jul 04 00:51:03 2013 Samplefile
...
```

Redirecting show Command Output

This example shows how to direct the output to a file on the bootflash: file system:

```
switch# show interface > bootflash:switch1-intf.cfg
```

This example shows how to direct the output to a file on external flash memory:

```
switch# show interface > usb1:switch-intf.cfg
```

This example shows how to direct the output to a file on a TFTP server:

```
switch# show interface > tftp://10.10.1.1/home/configs/switch-intf.cfg
Preparing to copy...done
```

This example shows how to direct the output of the **show tech-support** command to a file:

```
switch# show tech-support > Samplefile
Building Configuration ...
switch# dir
    1525859     Jul 04 00:51:03 2013 Samplefile
Usage for volatile://
    1527808 bytes used
   19443712 bytes free
   20971520 bytes total
```

Finding Files

This example shows how to find a file in the current default directory:

```
switch# find smm_shm.cfg
/usr/bin/find: ./lost+found: Permission denied
./smm_shm.cfg
./newer-fs/isan/etc/routing-sw/smm_shm.cfg
./newer-fs/isan/etc/smm_shm.cfg
```

CHAPTER 10

Working with Configuration Files

This chapter contains the following sections:

About Configuration Files

Configuration files contain the Cisco NX-OS software commands used to configure the features on a Cisco NX-OS device. Commands are parsed (translated and executed) by the Cisco NX-OS software when the system is booted (from the startup-config file) or when you enter commands at the CLI in a configuration mode.

To change the startup configuration file, you can either save the running-configuration file to the startup configuration using the **copy running-config startup-config** command or copy a configuration file from a file server to the startup configuration.

Types of Configuration Files

The Cisco NX-OS software has two types of configuration files, running configuration and startup configuration. The device uses the startup configuration (startup-config) during device startup to configure the software features. The running configuration (running-config) contains the current changes that you make to the startup-configuration file. The two configuration files can be different. You might want to change the device configuration for a short time period rather than permanently. In this case, you would change the running configuration by using commands in global configuration mode but not save the changes to the startup configuration.

To change the running configuration, use the **configure terminal** command to enter global configuration mode. As you use the Cisco NX-OS configuration modes, commands generally are executed immediately and are saved to the running configuration file either immediately after you enter them or when you exit a configuration mode.

To change the startup-configuration file, you can either save the running configuration file to the startup configuration or download a configuration file from a file server to the startup configuration.

Related Topics

Saving the Running Configuration to the Startup Configuration, on page 144
Downloading the Startup Configuration From a Remote Server, on page 146

Guidelines and Limitations for Configuration Files

Configuration file guidelines and limitations are as follows:

- Beginning with NX-OS 7.0(3)I7(4), the **reload timer** command is supported to enable a reboot after a delay of 5 -60 seconds.

Managing Configuration Files

This section describes how to manage configuration files.

Saving the Running Configuration to the Startup Configuration

You can save the running configuration to the startup configuration to save your changes for the next time you that reload the device.

SUMMARY STEPS

1. (Optional) **show running-config**
2. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **show running-config** **Example:** `switch# show running-config`	Displays the running configuration.
Step 2	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Copying a Configuration File to a Remote Server

You can copy a configuration file stored in the internal memory to a remote server as a backup or to use for configuring other Cisco NX-OS devices.

SUMMARY STEPS

1. **copy running-config** *scheme*://*server*/[*url* /]*filename*
2. **copy startup-config** *scheme*://*server*/[*url* /]*filename*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**copy running-config** *scheme***://***server***/**[*url* **/**]*filename* **Example:** `switch# copy running-config tftp://10.10.1.1/sw1-run-config.bak`	Copies the running-configuration file to a remote server. For the *scheme* argument, you can enter **tftp:**, **ftp:**, **scp:**, or **sftp:**. The *server* argument is the address or name of the remote server, and the *url* argument is the path to the source file on the remote server. The *server*, *url*, and *filename* arguments are case sensitive.
Step 2	**copy startup-config** *scheme***://***server***/**[*url* **/**]*filename* **Example:** `switch# copy startup-config tftp://10.10.1.1/sw1-start-config.bak`	Copies the startup-configuration file to a remote server. For the *scheme* argument, you can enter **tftp:**, **ftp:**, **scp:**, or **sftp:**. The *server* argument is the address or name of the remote server, and the *url* argument is the path to the source file on the remote server. The *server*, *url*, and *filename* arguments are case sensitive.

Example

This example shows how to copy the configuration file to a remote server:

```
switch# copy running-config
tftp://10.10.1.1/sw1-run-config.bak
switch# copy startup-config
tftp://10.10.1.1/sw1-start-config.bak
```

Downloading the Running Configuration From a Remote Server

You can configure your Cisco NX-OS device by using configuration files that you created on another Cisco NX-OS device and uploaded to a remote server. You then download the file from the remote server to your device using TFTP, FTP, Secure Copy (SCP), or Secure Shell FTP (SFTP) to the running configuration.

Before you begin

Ensure that the configuration file that you want to download is in the correct directory on the remote server.

Ensure that the permissions on the file are set correctly. Permissions on the file should be set to world-read.

Ensure that your device has a route to the remote server. Your device and the remote server must be in the same subnetwork if you do not have a router or a default gateway to route traffic between subnets.

Check connectivity to the remote server using the **ping** or **ping6** command.

SUMMARY STEPS

1. **copy** *scheme***://***server***/**[*url***/**]*filename* **running-config**
2. (Optional) **show running-config**
3. (Optional) **copy running-config startup-config**

4. (Optional) **show startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**copy** *scheme*://*server*/[*url*/]*filename* **running-config** **Example:** `switch# copy tftp://10.10.1.1/my-config running-config`	Downloads the running-configuration file from a remote server. For the *scheme* argument, you can enter **tftp:**, **ftp:**, **scp:**, or **sftp:**. The *server* argument is the address or name of the remote server, and the *url* argument is the path to the source file on the remote server. The *server*, *url*, and *filename* arguments are case sensitive.
Step 2	(Optional) **show running-config** **Example:** `switch# show running-config`	Displays the running configuration.
Step 3	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.
Step 4	(Optional) **show startup-config** **Example:** `switch# show startup-config`	Displays the startup configuration.

Related Topics

Copying Files, on page 139

Downloading the Startup Configuration From a Remote Server

You can configure your Cisco NX-OS device by using configuration files that you created on another Cisco NX-OS device and uploaded to a remote server. You then download the file from the remote server to your device using TFTP, FTP, Secure Copy (SCP), or Secure Shell FTP (SFTP) to the startup configuration.

Caution This procedure disrupts all traffic on the Cisco NX-OS device.

Before you begin

Log in to a session on the console port.

Ensure that the configuration file that you want to download is in the correct directory on the remote server.

Ensure that the permissions on the file are set correctly. Permissions on the file should be set to world-read.

Ensure that your device has a route to the remote server. Your device and the remote server must be in the same subnetwork if you do not have a router or a default gateway to route traffic between subnets.

Check connectivity to the remote server using the **ping** or **ping6** command.

SUMMARY STEPS

1. **write erase**
2. **reload**
3. **copy** *scheme*:**//***server*/[*url* /]*filename* **running-config**
4. **copy running-config startup-config**
5. (Optional) **show startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**write erase** **Example:** `switch# write erase`	Erases the startup configuration file.

Step 2	**reload**
	Example:
	`switch# reload`
	`This command will reboot the system. (y/n)?  [n] y`
	`...`
	`Enter the password for "admin": <password>`
	`Confirm the password for "admin": <password>`
	`...`
	`Would you like to enter the basic configuration dialog (yes/no): n`
	`switch#`
		Reloads the Cisco NX-OS device.
		Note Do not use the setup utility to configure the device.

Step 3	**copy** *scheme*:**//***server*/[*url* /]*filename* **running-config** **Example:** `switch# copy tftp://10.10.1.1/my-config running-config`	Downloads the running configuration file from a remote server. For the *scheme* argument, you can enter **tftp:**, **ftp:**, **scp:**, or **sftp:**. The *server* argument is the address or name of the remote server, and the *url* argument is the path to the source file on the remote server. The *server*, *url*, and *filename* arguments are case sensitive.
Step 4	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Saves the running configuration file to the startup configuration file.
Step 5	(Optional) **show startup-config** **Example:** `switch# show startup-config`	Displays the running configuration.

Related Topics

Copying Files, on page 139

Copying Configuration Files to an External Flash Memory Device

You can copy configuration files to an external flash memory device as a backup for later use.

Before you begin

Insert the external Flash memory device into the active supervisor module.

SUMMARY STEPS

1. (Optional) **dir** {**usb1:** | **usb2:**}[*directory/*]
2. **copy running-config** {**usb1:** | **usb2:**}[*directory/*]*filename*
3. **copy startup-config** {**usb1:** | **usb2:**}[*directory/*]*filename*

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **dir** {**usb1:** | **usb2:**}[*directory/*] **Example:** `switch# dir usb1:`	Displays the files on the external flash memory device.
Step 2	**copy running-config** {**usb1:** | **usb2:**}[*directory/*]*filename* **Example:** `switch# copy running-config usb1:dsn-running-config.cfg`	Copies the running configuration to an external flash memory device. The *filename* argument is case sensitive.
Step 3	**copy startup-config** {**usb1:** | **usb2:**}[*directory/*]*filename* **Example:** `switch# copy startup-config usb1:dsn-startup-config.cfg`	Copies the startup configuration to an external flash memory device. The *filename* argument is case sensitive.

Related Topics

Copying Files, on page 139

Copying the Running Configuration from an External Flash Memory Device

You can configure your device by copying configuration files created on another Cisco NX-OS device and saved to an external flash memory device.

Before you begin

Insert the external flash memory device into the active supervisor module.

SUMMARY STEPS

1. (Optional) **dir** {**usb1:** | **usb2:**}[*directory/*]
2. **copy** {**usb1:** | **usb2:**}[*directory/*]*filename* **running-config**
3. (Optional) **show running-config**
4. (Optional) **copy running-config startup-config**

5. (Optional) **show startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **dir** {**usb1:** | **usb2:**}[*directory/*] **Example:** `switch# dir usb1:`	Displays the files on the external flash memory device.
Step 2	**copy** {**usb1:** | **usb2:**}[*directory/*]*filename* **running-config** **Example:** `switch# copy usb1:dsn-config.cfg running-config`	Copies the running configuration from an external flash memory device. The *filename* argument is case sensitive.
Step 3	(Optional) **show running-config** **Example:** `switch# show running-config`	Displays the running configuration.
Step 4	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.
Step 5	(Optional) **show startup-config** **Example:** `switch# show startup-config`	Displays the startup configuration.

Related Topics

Copying Files, on page 139

Copying the Startup Configuration From an External Flash Memory Device

You can recover the startup configuration on your device by downloading a new startup configuration file saved on an external flash memory device.

Before you begin

Insert the external flash memory device into the active supervisor module.

SUMMARY STEPS

1. (Optional) **dir** {**usb1:** | **usb2:**}[*directory/*]
2. **copy** {**usb1:** | **usb2:**}[*directory /*]*filename* **startup-config**
3. (Optional) **show startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **dir** {**usb1:** | **usb2:**}[*directory/*] **Example:** `switch# dir usb1:`	Displays the files on the external flash memory device.
Step 2	**copy** {**usb1:** | **usb2:**}[*directory* /]*filename* **startup-config** **Example:** `switch# copy usb1:dsn-config.cfg startup-config`	Copies the startup configuration from an external flash memory device. The *filename* argument is case sensitive.
Step 3	(Optional) **show startup-config** **Example:** `switch# show startup-config`	Displays the startup configuration.

Related Topics

Copying Files, on page 139

Copying Configuration Files to an Internal File System

You can copy configuration files to the internal memory as a backup for later use.

SUMMARY STEPS

1. **copy running-config** [*filesystem***:**][*directory/*] | [*directory/*]*filename*
2. **copy startup-config** [*filesystem***:**][*directory/*] | [*directory/*]*filename*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**copy running-config** [*filesystem***:**][*directory/*] | [*directory/*]*filename* **Example:** `switch# copy running-config bootflash:sw1-run-config.bak`	Copies the running-configuration file to internal memory. The *filesystem*, *directory*, and *filename* arguments are case sensitive.
Step 2	**copy startup-config** [*filesystem***:**][*directory/*] | [*directory/*]*filename* **Example:** `switch# copy startup-config bootflash:sw1-start-config.bak`	Copies the startup-configuration file to internal memory. The *filesystem*, *directory*, and *filename* arguments are case sensitive.

Related Topics

Copying Files, on page 127

Rolling Back to a Previous Configuration

Problems, such as memory corruption, can occur that make it necessary for you to recover your configuration from a backed up version.

Note Each time that you enter a **copy running-config startup-config** command, a binary file is created and the ASCII file is updated. A valid binary configuration file reduces the overall boot time significantly. A binary file cannot be uploaded, but its contents can be used to overwrite the existing startup configuration. The **write erase** command clears the binary file.

SUMMARY STEPS

1. **write erase**
2. **reload**
3. **copy** *configuration-file* **running-configuration**
4. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**write erase** **Example:** `switch# write erase`	Clears the current configuration of the switch.
Step 2	**reload** **Example:** `switch# reload`	Restarts the device. You will be prompted to provide an nx-os image file for the device to boot and run.
Step 3	**copy** *configuration-file* **running-configuration** **Example:** `switch# copy bootflash:start-config.bak running-configuration`	Copies a previously saved configuration file to the running configuration. **Note** The *configuration-file* filename argument is case sensitive.
Step 4	**copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the start-up configuration.

Removing the Configuration for a Missing Module

When you remove an I/O module from the chassis, you can also remove the configuration for that module from the running configuration.

Note You can only remove the configuration for an empty slot in the chassis.

Before you begin

Remove the I/O module from the chassis.

SUMMARY STEPS

1. (Optional) **show hardware**
2. **purge module** *slot* **running-config**
3. (Optional) **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **show hardware** **Example:** `switch# show hardware`	Displays the installed hardware for the device.
Step 2	**purge module** *slot* **running-config** **Example:** `switch# purge module 3 running-config`	Removes the configuration for a missing module from the running configuration.
Step 3	(Optional) **copy running-config startup-config** **Example:** `switch# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Erasing a Configuration

You can erase the configuration on your device to return to the configuration defaults. "Configuration" refers to the startup configuration as seen in 'show startup'. No other internal application or process states are cleared.

Erase configuration feature is supported on the Nexus 9200-X, Nexus 9300-EX, -FX, -FX2, -FX3, and Nexus 9500 series switches.

You can erase the following configuration files saved in the persistent memory on the device:

- Startup
- Boot
- Debug

The **write erase** command erases the entire startup configuration, except for the following:

- Boot variable definitions
- The IPv4 and IPv6 configuration on the mgmt0 interface, including the following:

- Address
- Subnet mask
- Default Gateway/Route in the management VRF

To remove the boot variable definitions and the IPv4/IPv6 configuration on the mgmt0 interface, use the **write erase boot** command. To remove all application persistency files such as patch rpms, third party rpms, application configuration in /etc directory other than configuration, use 'install reset'. This command was added as of the 7.0(3)I6(1) release.

Note When there are multiple IPv6 default routes present in the management VRF, the default route that is displayed first in the **show ipv6 static-route** command for the management VRF just before using ‘copy r s’ gets restored after the **write erase** and **reload**.

Note After you enter the **write erase** command, you must reload the ASCII configuration twice to apply the breakout configuration.

SUMMARY STEPS

1. **write erase** [**boot** | **debug**]

DETAILED STEPS

	Command or Action	Purpose

Step 1	**write erase** [**boot** | **debug**]
	Example:
	`switch# write erase`
	`Warning: This command will erase the startup-configuration.`
	`Do you wish to proceed anyway? (y/n)  [n] y`
		Erases configurations in persistent memory. The default action erases the startup configuration.
		The **boot** option erases the boot variable definitions and the IPv4 configuration on the mgmt0 interface.
		The **debug** option erases the debugging configuration.
		Note When you configure multiple IPv6 addresses on mgmt0 interface, the IPv6 address that is displayed first before the usage of ‘copy r s’ in the **show ipv6 interface <intf>** command gets restored on **write erase** and **reload**.
		Note The running-configuration file is not affected by this command.

Clearing Inactive Configurations

You can clear inactive QoS and/or ACL configurations.

SUMMARY STEPS

1. (Optional) **show running-config** *type* **inactive-if-config**
2. **clear inactive-config** *policy*
3. (Optional) **show inactive-if-config log**

DETAILED STEPS

	Command or Action	Purpose
Step 1	(Optional) **show running-config** *type* **inactive-if-config** **Example:** `# show running-config ipqos inactive-if-config`	Displays any inactive access control list (ACL) or quality of service (QoS) configurations. The values for the *type* argument are **aclmgr** and **ipqos**. • **aclmgr**—Displays any inactive configurations for aclmgr. • **ipqos**—Displays any inactive configurations for qosmgr.

Step 2	**clear inactive-config** *policy*
	Example:
	`# clear inactive-config qos`
	`clear qos inactive config`
	`Inactive if config for QoS manager is saved`
	`at/bootflash/qos_inactive_if_config.cfg for vdc`
	`default`
	`you can see the log file @ show inactive-if-config`
	` log`
		Clears inactive configurations.
		The values for the *policy* argument are **qos** and **acl**.
		The following describes the values:
		• **qos**—Clears inactive QoS configurations.
		• **acl**—Clears inactive ACL configurations.
		• **acl qos**—Clears inactive ACL configurations and inactive QoS configurations.

Step 3	(Optional) **show inactive-if-config log** **Example:** `# show inactive-if-config log`	Displays the commands that were used to clear the inactive configurations.

Configuration Archive and Configuration Log

This section contains information on configuration archive and configuration log.

Information About Configuration Archive

The configuration archive is intended to provide a mechanism to store, organize, and manage an archive of the configuration files to enhance the configuration rollback capability provided by the **configure replace** command. Before configuration archiving was introduced, you could save copies of the running configuration using the **copy running-config** *destination-url* command, storing the replacement file either locally or remotely. However, this method lacked any automated file management. The configuration replace and configuration rollback provides the capability to automatically save copies of the running configuration to the configuration archive. These archived files serve as checkpoint configuration references and can be used by the **configure replace** command to revert to the previous configuration states.

The **archive config** command allows you to save configurations in the configuration archive using a standard location and filename prefix that is automatically appended with an incremental version number (and optional timestamp) as each consecutive file is saved. This functionality provides a means for consistent identification of saved configuration files. You can specify how many versions of the running configuration are kept in the archive. After the maximum number of files are saved in the archive, the oldest file is automatically deleted when the next, most recent file is saved. The **show archive** command displays information for all configuration files saved in the configuration archive.

The configuration archive, wherein the configuration files are stored and are available for use with the **configure replace** command, can be located on the following file systems: bootflash, FTP, and TFTP.

Note The TFTP and FTP for this feature use VRF management.

Configuring the Characteristics of the Configuration Archive

Before using the **archive config** command, the configuration archive must be configured. Complete the following steps to configure the characteristics of the configuration archive:

SUMMARY STEPS

1. **configure terminal**
2. **archive**
3. **path** *url*
4. **maximum** *number*
5. **time-period** *minutes*
6. **write-memory**
7. **archive config**
8. (Optional) **show archive log config all**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal** **Example:** `switch# configure terminal`	Enters the global configuration mode.
Step 2	**archive** **Example:** `switch(config)# archive`	Enters the archive configuration mode. **Note** This command does not apply to Cisco Nexus 9300-EX, -FX, and -R Series switches.
Step 3	**path** *url* **Example:**	Specifies the location and the filename prefix for the files in the configuration archive.

	Command or Action	Purpose
	`switch(config-archive)# path bootflash:myconfig`	• Depending on your hardware platform, the name of your file system can be different than the one displayed in the example. **Note** If a directory is specified in the path instead of the file, the directory name must be followed by a forward slash as follows: path flash:/*directory*/. The forward slash is not necessary after a filename; it is necessary only when specifying a directory.
Step 4	**maximum** *number* **Example:** `switch(config-archive)# maximum 14`	(Optional) Sets the maximum number of archive files of the running configuration to be saved in the configuration archive. • The *number* is the maximum number of the archive files of the running configuration that can be saved in the configuration archive. The range is 1 to 14. The default is 10. **Note** Before using this command, you must configure the **path** to specify the location and filename prefix for the files in the configuration archive.
Step 5	**time-period** *minutes* **Example:** `switch(config-archive)# time-period 10`	(Optional) Sets the time increment for automatically saving an archive file of the current running configuration in the configuration archive. • The *minutes* argument specifies how often, in minutes, to automatically save an archive file of the current running configuration in the configuration archive. **Note** Before using this command, you must configure the **path** command to specify the location and filename prefix for the files in the configuration archive.
Step 6	**write-memory** **Example:** `switch(config-archive)# write-memory`	Enables the command. It is disabled by default. Entering this command causes an archive to occur when the command **copy r s** is performed.
Step 7	**archive config** **Example:** `switch(config-archive)# archive config`	Saves the current running configuration file to the configuration archive. **Note** You must configure the **path** before using the **archive config** command.

	Command or Action	Purpose
Step 8	(Optional) **show archive log config all** **Example:** `switch# show archive log config all`	Displays the configuration log entries for all the users.

Information About Configuration Log

The configuration change logging tracks the changes that are made to the running configuration by using the data in the accounting log. This configuration log tracks the changes that are initiated only through the CLI. Only complete commands that result in the invocation of action routines are logged. The following types of entries are not logged:

- Commands that result in a syntax error message
- Partial commands that invoke the device help system

The configuration log tracks the changes that are initiated only through the CLI. For each configuration command that is executed, the following information is logged:

- A configuration change sequence number
- The line from which the command was executed
- The name of the user that executed the command
- The command that was executed

You can display the information from the configuration log by using the **show archive log config all** command

For each configuration command that is executed, the following information is logged:

- The command that was executed
- The name of the user that executed the command
- A configuration change sequence number

You can display the information from the configuration log by using the **show archive log config** command.

Displaying Configuration Log Entries

To display the configuration log entries, the configuration change logging provides the **show archive log config all** command.

SUMMARY STEPS

1. switch# **show archive log config all**
2. switch# **show archive log config user** *username*
3. switch# **show archive log config user** *username* **first-index** *start-number* [**last-index** *end-number*]

DETAILED STEPS

Step 1 switch# **show archive log config all**

Displays the configuration log entries for all users

Example:

```
switch# show archive log config all

INDEX   LINE                    USER          LOGGED COMMAND
1       console0                user01       | logging console 1
2       console0                user01       | logging monitor 2
3       console0                user02       | system default switchport shutdown
4       console0                user02       | interface mgmt0
5       console0                user02       |  no shutdown
```

Step 2 switch# **show archive log config user** *username*

Displays the configuration log entries for the specified username.

Example:

The following example displays the configuration log entries for a specified username.

```
switch# show archive log config user user02

INDEX   LINE                    USER          LOGGED COMMAND
3       console0                user02       | system default switchport shutdown
4       console0                user02       | interface mgmt0
5       console0                user02       |  no shutdown
```

Step 3 switch# **show archive log config user** *username* **first-index** *start-number* [**last-index** *end-number*]

Displays the configuration log entries by the index numbers. If you specify a number for the optional last-index, all the log entries with the index numbers in the range from the value entered for the start-number through the end-number for the specified user are displayed.

Example:

The following example displays the configuration log entry numbers 4 and 5 for a user with the username, user02. The range for the first-index and last-index is 1 to 2000000000.

```
switch# show archive log config user user02  first-index 4 last-index 5
Last Log cleared/wrapped time is : Wed Oct 19 00:53:08 2016


INDEX   LINE                    USER          LOGGED COMMAND
4       console0                user02       | interface mgmt0
5       console0                user02       |  no shutdown
```

Verifying the Device Configuration

To verify the configuration, use one of the following commands:

Command	Purpose
show running-config [**[exclude]** *command*] **[sanitized]**	Displays the contents of the currently running configuration or a subset of that configuration, use the **show running-config** command in the appropriate mode. : • **exclude**: (Optional) Excludes a specific configuration from the display. Use the **exclude** keyword followed by a *command* argument to exclude a specific configuration from the display. • *command*: (Optional) Displays only a single command or a subset of commands available under a specified command mode. • **sanitized**: (Optional) Displays a sanitized configuration for safe distribution and analysis. Beginning with Cisco NX-OS Release 10.3(2)F, **sanitized** keyword is supported on Cisco Nexus 9000 series switches.
show startup-config	Displays the startup configuration.
show time-stamp running-config last-changed	Displays the timestamp when the running configuration was last changed.

The following example shows sample output of **show running-config** command with the **sanitized** keyword. The sanitized configuration is used to share a configuration without exposing some configuration details.

This option masks the sensitive words in running configuration output with <removed> keyword.

```
switch# show running-config sanitized

!Command: show running-config sanitized
!Running configuration last done at: Wed Oct 12 09:14:54 2022
!Time: Wed Oct 12 13:52:55 2022

version 10.3(2) Bios:version 07.69

username admin password 5 <removed> role network-admin

copp profile strict
snmp-server user admin network-admin auth md5 <removed> priv aes-128 <removed> localizedV2key
rmon event 1 log trap <removed> description FATAL(1) owner PMON@FATAL
rmon event 2 log trap <removed> description CRITICAL(2) owner PMON@CRITICAL
rmon event 3 log trap <removed> description ERROR(3) owner PMON@ERROR
rmon event 4 log trap <removed> description WARNING(4) owner PMON@WARNING
rmon event 5 log trap <removed> description INFORMATION(5) owner PMON@INFO
--More--
```

Examples of Working with Configuration Files

This section includes examples of working with configuration files.

Copying Configuration Files

This example shows how to overwrite the contents of an existing configuration in NVRAM:

```
switch# copy nvram:snapshot-config nvram:startup-config
Warning: this command is going to overwrite your current startup-config.
Do you wish to continue? {y/n} [y] y
```

Note This command does not apply to Cisco Nexus 9300-EX Series switches.

This example shows how to copy a running configuration to the bootflash: file system:

```
switch# copy system:running-config bootflash:my-config
```

Backing Up Configuration Files

This example shows how to back up the startup configuration to the bootflash: file system (ASCII file):

```
switch# copy startup-config bootflash:my-config
```

This example shows how to back up the startup configuration to the TFTP server (ASCII file):

```
switch# copy startup-config tftp://172.16.10.100/my-config
```

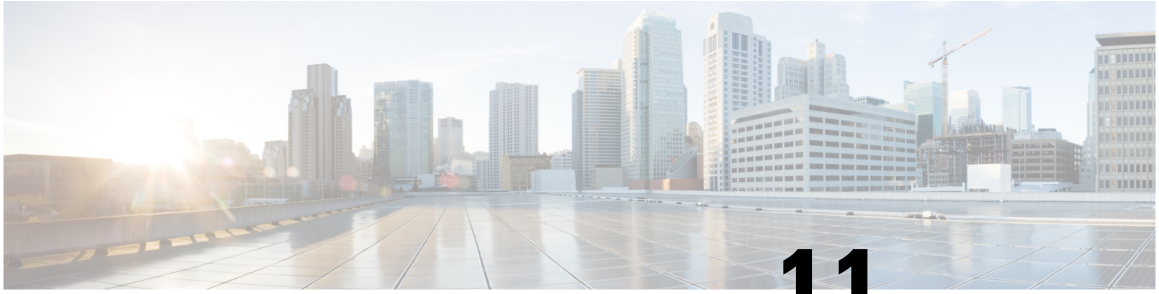
This example shows how to back up the running configuration to the bootflash: file system (ASCII file):

```
switch# copy running-config bootflash:my-config
```

Rolling Back to a Previous Configuration

To roll back your configuration to a snapshot copy of a previously saved configuration, you need to perform the following steps:

1. Clear the current running image with the **write erase** command.
2. Restart the device with the **reload** command.
3. Copy the previously saved configuration file to the running configuration with the **copy** *configuration-file* **running-configuration** command.
4. Copy the running configuration to the start-up configuration with the **copy running-config startup-config** command.



CHAPTER 11

Nexus Switch Intersight Device Connector

This chapter contains the following sections:

NexusSwitch Intersight Device Connector Overview

Devices are connected to the Intersight portal through a NexusSwitch Intersight Device Connector (NXDC) that is embedded in the Cisco NX-OS image of each system.

Beginning with Cisco NX-OS Release 10.2(3)F, the Device Connector on NX-OS feature is supported which provides a secure way for the connected devices to send information and receive control instructions from the Cisco Intersight portal, using a secure Internet connection.

The Cisco Nexus switch must properly resolve svc.intersight.com and allow outbound initiated HTTPS connections on port 443. To resolve svc.intersight.com, you must configure DNS on the Cisco Nexus devices. If a proxy is required for an HTTPS connection to svc.intersight.com, the proxy can be configured in the NXDC user interface. For proxy configuration, refer to Configuring NXDC, on page 162.

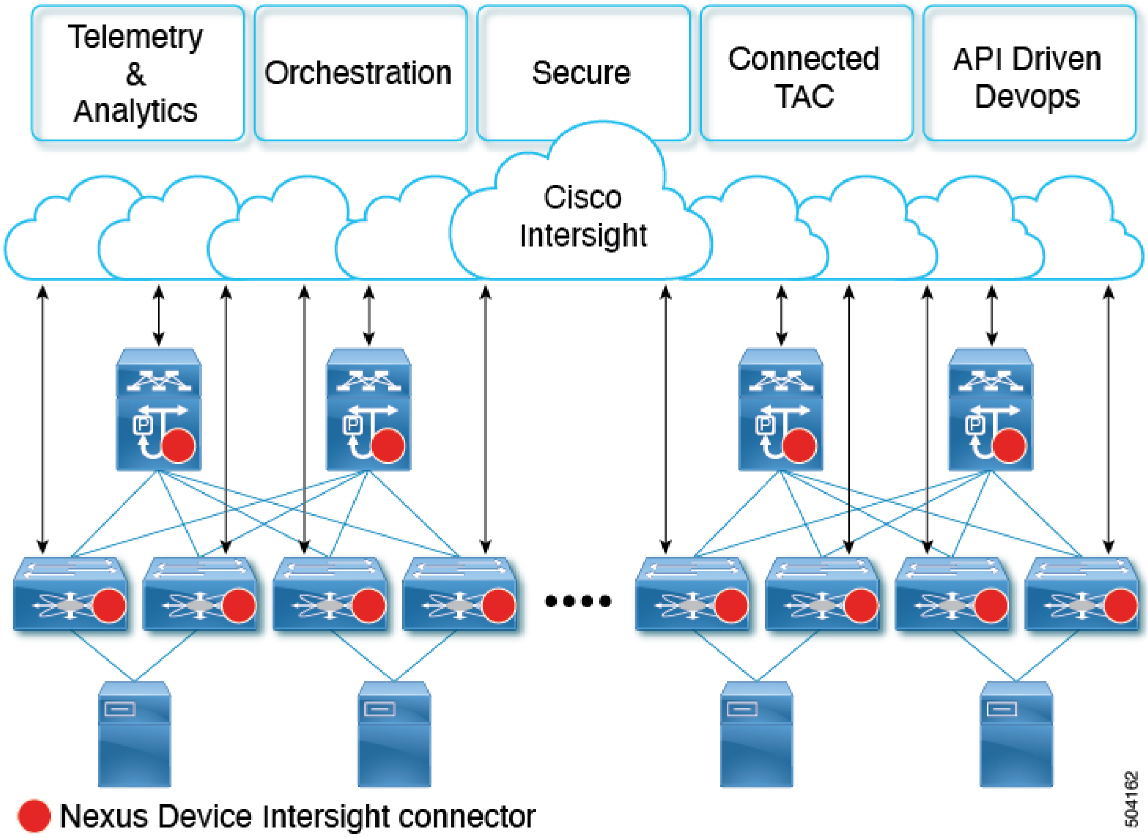
The NXDC is enabled by default on all Cisco Nexus series switches and it starts at boot by default, and attempts to connect to the cloud service. Once a secure connection has been established and the device connector is registered with the Intersight service, the device connector collects detailed inventory, health status and sends the adoption telemetry data to the Intersight database. Inventory is refreshed once in a day.

The NXDC supports the AutoUpdate feature where it gets automatically updated to the latest version through a refresh by the Intersight service when you connect to Intersight.

The NXDC also supports the connected TAC feature to collect tech-support data from device.

The NXDC feature integration was done to resolve the unmanaged switches with the following capabilities:

- It provides fast and quick solution to gather basic data from unmanaged switches.
- It stores private and organized data of all devices in a single location.
- It manages the data securely in the cloud.
- It is flexible for future extensions and upgradability.



● Nexus Device Intersight connector

Configuring NXDC

To configure NXDC, follow the below steps:

Note By default the NXDC feature is enabled.

SUMMARY STEPS

1. **no feature intersight**
2. **install deactivate** <*intersight rpm*>
3. **intersight proxy** <*proxy-name*> **port** <*proxy-port*>
4. **intersight use-vrf** <*vrf-name*>
5. **intersight connection** <*name*>
6. **intersight trustpoint** <*trustpoint-label*> *[host-name]*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**no feature intersight** **Example:** `switch(config)# no feature intersight`	Disables the intersight process and removes all NXDC configuration and logs store.

Step 2	**install deactivate** *<intersight rpm>*
	Example:
	`switch(config)# show install active | i intersight`
	`intersight_64-1.0.0.0-10.2.3.lib32_64_n9000`
	`switch(config)# install deactivate`
	`intersight_64-1.0.0.0-10.2.3.lib32_64_n9000`
		Disables intersight to not run automatically on bootup.

Step 3	**intersight proxy** *<proxy-name>* **port** *<proxy-port>*
	Example:
	`switch(config)# intersight proxy`
	`proxy.esl.cisco.com port 8080`
		Configures the proxy server for intersight connection.
		• *proxy-name*: IPv4 or IPv6 address or DNS name of proxy server.
		• *proxy-port*: Proxy port number. The range is 1-65535. The default value is 8080.
		Note If Proxy is enabled with the smart license configuration on Cisco Nexus switches, the NXDC inherits this configuration and attempts to connect with Cisco Intersight Cloud.

Step 4	**intersight use-vrf** *<vrf-name>* **Example:** `switch(config)# intersight use-vrf blue`	Modifies the vrf of NXDC, if connectivity is via specified vrf. **Note** By default intersight is started in management vrf/namespace.

Step 5	**intersight connection** *<name>*
	Example:
	`switch(config)# intersight connection`
	`qaconnect.starshipcloud.com`
		Sets the DNS name for intersight connection. It can be used to change from intersight to NDSaaS.
		• *name*: Name value is string. The maximum size is 128.

Step 6	**intersight trustpoint** *<trustpoint-label> [host-name]* **Example:** `switch(config)# intersight trustpoint test test`	Configures certificates for intersight connection. *trustpoint-label*: Crypto ca truspoint label. For more information refer to *Cisco Nexus 9000 Series NX-OS Security Configuration Guide*.

Verifying NXDC

To verify the NXDC configuration, use the following Bash commands:

Note The feature Bash must be enabled.

Command	Purpose
run bash exec ip netns exec <vrf-name> curl http://localhost:8889/Systems	Displays the device connector system info.
run bash exec ip netns exec <vrf-name> curl http://localhost:8889/DeviceConfigurations	Displays the device configuration.
run bash ip netns exec <vrf-name> curl http://localhost:8889/DeviceConnections	Displays the device connections.
run bash ip netns exec <vrf-name> curl http://localhost:8889/DeviceIdentifiers	Displays the device ID. **Note** You can obtain device ID using the following show command: • **show inventory chassis**
run bash ip netns exec <vrf-name> curl http://localhost:8889/SecurityTokens	Displays the security tokens.
run bash ip netns exec <vrf-name> curl http://localhost:8889/HttpProxies	Displays the HTTP proxy info.

`switch# show system device-connector`
`claim-info  Device Identifier and Security token`
`log         Log file contents`
	Displays the information to view claim status, logs.

`switch# show system device-connector log`
`cnmi        CNMI logs`
`compliance  Config compliance logs`
`dc          Device connector logs`
`dcgrpc      GRPC server logs`
`nae         Nae logs`
`sim         SIM Agent logs`
	Displays the information to view log level and log type of messages.

The show commands can be run using NX-API, if Payload type is set to bash.

Example:

```
payload={
  "ins_api": {
    "version": "1.0",
    "type": "bash",
    "chunk": "0",
    "sid": "sid",
    "input": "ip netns exec management curl http://localhost:8889/HttpProxies",
    "output_format": "json"
  }
}
```

Result:

```
{
  "ins_api": {
    "version": "1.0",
    "sid": "eoc",
    "type": "bash",
    "outputs": {
      "output": {
       "body": "[\n  {\n    \"ProxyHost\": \"\",\n    \"ProxyPort\": 0,\n    \"Preference\":
 0,\n    \"ProxyType\": \"Disabled\"\n  }\n]",
        "code": "200",
        "msg": "Success"
      }
    }
  }
}
```

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