



Zero-Touch Provisioning

To address network provisioning challenges, Cisco introduces a zero-touch provisioning model. This module describes the Zero-Touch Provisioning feature.



Note The Zero-Touch Provisioning feature is enabled automatically; no configuration is required.

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Information About Zero-Touch Provisioning

Zero-Touch Provisioning Overview

Zero-Touch Provisioning provides open bootstrap interfaces to automate network device provisioning in heterogeneous network environments.

When a device that supports Zero-Touch Provisioning boots up, and does not find the startup configuration (during initial installation), the device enters the Zero-Touch Provisioning mode. The device searches for a Dynamic Host Control Protocol (DHCP) server, bootstraps itself with its interface IP address, gateway, and Domain Name System (DNS) server IP address, and enables Guest Shell. The device then obtains the IP address or URL of an HTTP/TFTP server, and downloads the Python script from an HTTP/TFTP server to configure the device.

Guest Shell provides the environment for the Python script to run. Guest Shell executes the downloaded Python script and applies an initial configuration to the device.

After initial provisioning is complete, Guest Shell remains enabled. For more information, see the *Guest Shell* chapter.



Note In case Zero-Touch Provisioning fails, the device falls back to AutoInstall to load configuration files. For more information, see [Using AutoInstall and Setup](#).

DHCP Server Configuration for Zero-Touch Provisioning

In Zero-Touch Provisioning, a DHCP server must be running on the same network as the new device that is being provisioned. Zero-Touch Provisioning is supported on both management ports and in-band ports.

When the new device is switched on, it retrieves the IP address information of the HTTP/TFTP server where the Python script resides, and the folder path of the Python script from the DHCP server. For more information on Python Scripts, see the *Python API* and *Python CLI Module* chapters.

The DHCP server responds to DHCP discovery events with the following options:

- Option 150—(Optional) Contains a list of IP addresses that points to the HTTP/TFTP server on the management network that hosts the Python scripts to be run.
- Option 67—Contains the Python script file path on the HTTP/TFTP server.

After receiving these DHCP options, the device connects to the HTTP/TFTP server, and downloads the Python script. The device, at this point does not have any route to reach the HTTP/TFTP server, so it uses the default route provided by the DHCP server.

DHCPv6 Support

In Cisco IOS XE Fuji 16.9.1, Dynamic Host Control Protocol Version 6 (DHCPv6) support is added to the Zero-touch provisioning feature. DHCPv6 is enabled by default, and will work on any device that boots without a startup configuration.



Note DHCPv6 is only supported on Catalyst 9300 and 9500 Series Switches.

DHCPv6 is supported by both TFTP and HTTP download of Python scripts. If the HTTP or TFTP download of Python scripts fail, the device will revert to the start (without any configuration). For both DHCPv4, and DHCPv6 to work, the correct HTTP file path must be available in the DHCP configuration.

There can be scenarios where the same interface can have both IPv4 and IPv6 addresses, or two different interfaces in the network - one can receive IPv4 traffic and the other IPv6 traffic. We recommend that you use either the DHCPv4 or DHCPv6 option in your deployment.

The following is a sample DHCPv4: /etc/dhcp/dhcpd.conf:

```
host <hostname> {
    hardware ethernet xx:xx:xx:xx:xx:xx;
    option dhcp-client-identifier "xxxxxxxxxxxxxxxx";
    option host-name "<hostname>".
    option log-servers x.x.x.x;
    fixed-address x.x.x.x;
    if option vendor-class-identifier = "." {
        option vendor-class-identifier ".";
        if exists user-class and option user-class = "iPXE" {
            filename "http://x.x.x.x/.../<image>";
        } else {
            filename "http://x.x.x.x/.../<script-name>";
        }
    }
}
```

The following is a sample ISC DHCPv6 server configuration:

```
option dhcp6.bootfile-url "http://[2001:DB8::21]/sample_day0_script.py";
```

Sample Zero-Touch Provisioning Configurations

Sample DHCP Server Configuration on a Management Port Using TFTP Copy

The following is a sample DHCP server configuration using TFTP copy, when connected via the management port on a device:

```
Device> enable
Device# configure terminal
Device(config)# ip dhcp excluded-address 10.1.1.1
Device(config)# ip dhcp excluded-address vrf Mgmt-vrf 10.1.1.1 10.1.1.10
Device(config)# ip dhcp pool pnp_device_pool
Device(config-dhcp)# vrf Mgmt-vrf
Device(config-dhcp)# network 10.1.1.0 255.255.255.0
Device(config-dhcp)# default-router 10.1.1.1
Device(config-dhcp)# option 150 ip 203.0.113.254
Device(config-dhcp)# option 67 ascii /sample_python_dir/python_script.py
Device(config-dhcp)# exit
Device(config)# interface gigabitethernet 1/0/2
Device(config-if)# no ip dhcp client request tftp-server-address
Device(config-if)# end
```

Sample DHCP Server Configuration on a Management Port Using HTTP Copy

The following is a sample DHCP server configuration using HTTP copy, when connected via the management port on a device:

```
Device> enable
Device# configure terminal
Device(config)# ip dhcp pool pnp_device_pool
Device(config-dhcp)# vrf Mgmt-vrf
Device(config-dhcp)# network 10.1.1.0 255.255.255.0
Device(config-dhcp)# default-router 10.1.1.1
Device(config-dhcp)# option 67 ascii http://198.51.100.1:8000/sample_python_2.py
Device(config-dhcp)# end
```

Sample DHCP Server Configuration on an In-Band Port Using TFTP Copy

The following is a sample DHCP server configuration using TFTP copy, when connected via the in-band port on a device:

```
Device> enable
Device# configure terminal
Device(config)# ip dhcp excluded-address 10.1.1.1
Device(config)# ip dhcp pool pnp_device_pool
Device(config-dhcp)# network 10.1.1.0 255.255.255.0
```

```

Device(config-dhcp)# default-router 10.1.1.1
Device(config-dhcp)# option 150 ip 203.0.113.254
Device(config-dhcp)# option 67 ascii /sample_python_dir/python_script.py
Device(config-dhcp)# exit
Device(config)# interface gigabitethernet 1/0/2
Device(config-if)# no ip dhcp client request tftp-server-address
Device(config-if)# end

```

Sample DHCP Server Configuration on an In-Band Port Using HTTP Copy

The following is a sample DHCP server configuration using HTTP copy, when connected via the in-band port on a device:

```

Device> enable
Device# configure terminal
Device(config)# ip dhcp excluded-address 10.1.1.1
Device(config)# ip dhcp pool pnp_device_pool
Device(config-dhcp)# network 10.1.1.0 255.255.255.0
Device(config-dhcp)# default-router 10.1.1.1
Device(config-dhcp)# option 67 ascii http://192.0.2.1:8000/sample_python_2.py
Device(config-dhcp)# end

```

Sample DHCP Server Configuration on a Linux Ubuntu Device

The following sample DHCP server configuration displays that the server is either connected to the management port or in-band port on a device, and a Python script is copied from a TFTP server.

```

root@ubuntu-server:/etc/dhcp# more dhcpd.conf
subnet 10.1.1.0 netmask 255.255.255.0 {
  range 10.1.1.2 10.1.1.255;
  host 3850 {
    fixed-address 10.1.1.246 ;
    hardware ethernet CC:D8:C1:85:6F:00;
    option bootfile-name !<opt 67> "/python_dir/python_script.py";
    option tftp-server-name !<opt 150> "203.0.113.254";
  }
}

```

The following sample DHCP configuration shows that a Python script is copied from an HTTP server to the device:

```

Day0_with_mgmt_port_http
-----
subnet 192.168.1.0 netmask 255.255.255.0 {
  range 192.168.1.2 192.168.1.255;
  host C2-3850 {
    fixed-address 192.168.1.246 ;
    hardware ethernet CC:D8:C1:85:6F:00;
    option bootfile-name "http://192.168.1.46/sample_python_2.py";
  }
}

```

```
}
```

Once the DHCP server is running, boot a management-network connected device, and the rest of the configuration is automatic.

Sample DHCPv6 Server Configuration on a Management Port Using TFTP Copy

The following is a sample DHCPv6 server configuration using TFTP copy, when connected via the management port on a device:

```
Device> enable
Device# configure terminal
Device(config)# ipv6 dhcp pool ztp
Device(config-dhcpv6)# address prefix 2001:DB8::1/64
Device(config-dhcpv6)# domain-name cisco.com
Device(config-dhcpv6)# bootfile-url tftp://[2001:db8::46]/sample_day0_script.py
Device(config-dhcpv6)# exit
Device(config)# interface vlan 20
Device(config-if)# ipv6 dhcp server ztp
Device(config-if)# end
```

Sample Python Provisioning Script

The following is a sample Python script can be used from either an HTTP or a TFTP server:

```
print "\n\n *** Sample ZTP Day0 Python Script *** \n\n"

# Importing cli module
import cli

print "\n\n *** Executing show platform *** \n\n"
cli_command = "show platform"
cli.execute(cli_command)

print "\n\n *** Executing show version *** \n\n"
cli_command = "show version"
cli.execute(cli_command)

print "\n\n *** Configuring a Loopback Interface *** \n\n"
cli.configure(["interface loop 100", "ip address 10.10.10.10 255.255.255.255", "end"])

print "\n\n *** Executing show ip interface brief *** \n\n"
cli_command = "sh ip int brief"
cli.execute(cli_command)

print "\n\n *** ZTP Day0 Python Script Execution Complete *** \n\n"
```

Boot Log for Cisco 4000 Series Integrated Services Routers

The following sample Zero-Touch Provisioning boot log displays that Guest Shell is successfully enabled, the Python script is downloaded to the Guest Shell, and the Guest Shell executes the downloaded Python script and configures the device for Day Zero.

```
% failed to initialize nvram
! <This message indicates that the startup configuration
is absent on the device. This is the first indication that the Day Zero work flow is
going to start.>
```

```
This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.
```

```
A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wvl/export/crypto/tool/stqrg.html
```

```
If you require further assistance please contact us by sending email to
export@cisco.com.
```

```
cisco ISR4451-X/K9 (2RU) processor with 7941237K/6147K bytes of memory.
Processor board ID FJC1950D091
4 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
16777216K bytes of physical memory.
7341807K bytes of flash memory at bootflash:.
0K bytes of WebUI ODM Files at webui:.
```

```
%INIT: waited 0 seconds for NVRAM to be available
```

```
--- System Configuration Dialog ---
```

```
Would you like to enter the initial configuration dialog? [yes/no]: %
!!<DO NOT TOUCH. This is Zero-Touch Provisioning>>
Generating 2048 bit RSA keys, keys will be non-exportable...
[OK] (elapsed time was 1 seconds)
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
Guestshell enabled successfully
```

```
*** Sample ZTP Day0 Python Script ***
```

```
*** Configuring a Loopback Interface ***
```

```
Line 1 SUCCESS: interface loop 100
Line 2 SUCCESS: ip address 10.10.10.10 255.255.255.255
Line 3 SUCCESS: end
```

```
*** Executing show ip interface brief ***
```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0/0	unassigned	YES	unset	down	down
GigabitEthernet0/0/1	unassigned	YES	unset	down	down
GigabitEthernet0/0/2	unassigned	YES	unset	down	down
GigabitEthernet0/0/3	192.168.1.246	YES	DHCP	up	up
GigabitEthernet0	192.168.1.246	YES	DHCP	up	up
Loopback100	10.10.10.10	YES	TFTP	up	up

```
*** ZTP Day0 Python Script Execution Complete ***
```

```
Press RETURN to get started!
```

The Day Zero provisioning is complete, and the IOS prompt is accessible.

Boot Log for Cisco Catalyst 9000 Series Switches

The following sections displays sample Zero-Touch Provisioning boot logs. These logs shows that Guest Shell is successfully enabled, the Python script is downloaded to the Guest Shell, and the Guest Shell executes the downloaded Python script and configures the device for Day Zero.

```
% Checking backup nvram
% No config present. Using default config
```

```
FIPS: Flash Key Check : Begin
FIPS: Flash Key Check : End, Not Found, FIPS Mode Not Enabled
```

```
! <This message indicates that the startup configuration
is absent on the device. This is the first indication that the Day Zero
work flow is
going to start.>
```

Cisco IOS XE Everest 16.6.x to Cisco IOS XE Fuji 16.8.x

This section displays the sample boot logs before the .py script is run:

```
Press RETURN to get started!
```

```
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
```

The process for the command is not responding or is otherwise unavailable

*** Sample ZTP Day0 Python Script ***

...

*** ZTP Day0 Python Script Execution Complete ***

The section shows how to configure the device for Day Zero provisioning:

Initializing Hardware...

System Bootstrap, Version 17.2.1r[FC1], RELEASE SOFTWARE (P)
Compiled Thu 02/20/2020 23:47:51.50 by rel

Current ROMMON image : Primary
Last reset cause : SoftwareReload
C9300-48UXM platform with 8388608 Kbytes of main memory

Preparing to autoboot. [Press Ctrl-C to interrupt] 0
boot: attempting to boot from [flash:cat9k_iosxe.16.06.05.SPA.bin]
boot: reading file cat9k_iosxe.16.06.05.SPA.bin

#####

Both links down, not waiting for other switches
Switch number is 1

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Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE),
Version 16.6.5, RELEASE SOFTWARE (fc3)
Technical Support: <http://www.cisco.com/techsupport>
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```
% Checking backup nvram
% No config present. Using default config
```

```
FIPS: Flash Key Check : Begin
FIPS: Flash Key Check : End, Not Found, FIPS Mode Not Enabled
```

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at: <http://www.cisco.com/wl/export/crypto/tool/stqrg.html>

If you require further assistance please contact us by sending email to export@cisco.com.

```
cisco C9300-48UXM (X86) processor with 1392780K/6147K bytes of memory.
Processor board ID FCW2144L045
2048K bytes of non-volatile configuration memory.
8388608K bytes of physical memory.
1638400K bytes of Crash Files at crashinfo:.
11264000K bytes of Flash at flash:.
0K bytes of WebUI ODM Files at webui:.
```

```
Base Ethernet MAC Address      : ec:1d:8b:0a:68:00
Motherboard Assembly Number    : 73-17959-06
Motherboard Serial Number      : FOC21418FPQ
Model Revision Number          : B0
Motherboard Revision Number    : A0
Model Number                   : C9300-48UXM
System Serial Number           : FCW2144L045
```

```
%INIT: waited 0 seconds for NVRAM to be available
```

```
SETUP: new interface Vlan1 placed in "shutdown" state
```

```
Press RETURN to get started!
```

```
*Sep  4 20:35:07.330: %SMART_LIC-6-AGENT_READY: Smart Agent for Licensing is initialized
*Sep  4 20:35:07.493: %IOSXE_RP_NV-3-NV_ACCESS_FAIL: Initial read of NVRAM contents failed
*Sep  4 20:35:07.551: %IOSXE_RP_NV-3-BACKUP_NV_ACCESS_FAIL: Initial read of backup NVRAM
contents failed
*Sep  4 20:35:10.932: dev_pluggable_optics_selftest attribute table internally inconsistent
@ 0x1D4
*Sep  4 20:35:13.406: %CRYPTO-4-AUDITWARN: Encryption audit check could not be performed
*Sep  4 20:35:13.480: %SPANTREE-5-EXTENDED_SYSID: Extended SysId enabled for type vlan
*Sep  4 20:35:13.715: %LINK-3-UPDOWN: Interface Lsmpi18/3, changed state to up
*Sep  4 20:35:13.724: %LINK-3-UPDOWN: Interface EOBC18/1, changed state to up
*Sep  4 20:35:13.724: %LINEPROTO-5-UPDOWN: Line protocol on Interface LI-Null0, changed
state to up
*Sep  4 20:35:13.724: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to down
*Sep  4 20:35:13.725: %LINK-3-UPDOWN: Interface LIIN18/2, changed state to up
*Sep  4 20:35:13.749: WCM-PKI-SHIM: buffer allocation failed for SUDI support check
*Sep  4 20:35:13.749: PKI/SSL unable to send Sudi support to WCM
```

```

*Sep 4 20:35:14.622: %IOSXE_MGMTVRF-6-CREATE_SUCCESS_INFO: Management vrf Mgmt-vrf created
with ID 1,
  ipv4 table-id 0x1, ipv6 table-id 0x1E000001
*Sep 4 20:34:42.022: %STACKMGR-6-STACK_LINK_CHANGE: Switch 1 R0/0: stack_mgr: Stack port
1 on Switch 1 is nocable
*Sep 4 20:34:42.022: %STACKMGR-6-STACK_LINK_CHANGE: Switch 1 R0/0: stack_mgr: Stack port
2 on Switch 1 is down
*Sep 4 20:34:42.022: %STACKMGR-6-STACK_LINK_CHANGE: Switch 1 R0/0: stack_mgr: Stack port
2 on Switch 1 is nocable
*Sep 4 20:34:42.022: %STACKMGR-6-SWITCH_ADDED: Switch 1 R0/0: stack_mgr: Switch 1 has
been added to the stack.
*Sep 4 20:34:42.022: %STACKMGR-6-SWITCH_ADDED: Switch 1 R0/0: stack_mgr: Switch 1 has
been added to the stack.
*Sep 4 20:34:42.022: %STACKMGR-6-SWITCH_ADDED: Switch 1 R0/0: stack_mgr: Switch 1 has
been added to the stack.
*Sep 4 20:34:42.022: %STACKMGR-6-ACTIVE_ELECTED: Switch 1 R0/0: stack_mgr: Switch 1 has
been elected ACTIVE.
*Sep 4 20:35:14.728: %LINEPROTO-5-UPDOWN: Line protocol on Interface Lsmpil8/3, changed
state to up
*Sep 4 20:35:14.728: %LINEPROTO-5-UPDOWN: Line protocol on Interface EOBC18/1, changed
state to up
*Sep 4 20:35:15.506: %HMANRP-6-HMAN_IOS_CHANNEL_INFO: HMAN-IOS channel event for switch
1: EMP_RELAY: Channel UP!
*Sep 4 20:35:15.510: %LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state
to down
*Sep 4 20:35:34.501: %LINK-5-CHANGED: Interface Vlan1, changed state to administratively
down
*Sep 4 20:35:34.717: %SYS-5-RESTART: System restarted --
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 16.6.5,
RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Mon 10-Dec-18 12:52 by mcpre
*Sep 4 20:35:34.796: %LINK-3-UPDOWN: Interface GigabitEthernet0/0, changed state to up
*Sep 4 20:35:35.266: %SYS-6-BOOTTIME: Time taken to reboot after reload = 283 seconds
*Sep 4 20:35:35.796: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0,
changed state to up
*Sep 4 20:35:36.607: %LINK-3-UPDOWN: Interface GigabitEthernet1/1/1, changed state to down
*Sep 4 20:35:36.607: %LINK-3-UPDOWN: Interface GigabitEthernet1/1/2, changed state to down
*Sep 4 20:35:36.607: %LINK-3-UPDOWN: Interface GigabitEthernet1/1/3, changed state to down
*Sep 4 20:35:36.608: %LINK-3-UPDOWN: Interface GigabitEthernet1/1/4, changed state to down
*Sep 4 20:35:36.608: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/1, changed state to
down
*Sep 4 20:35:36.608: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/2, changed state to
down
*Sep 4 20:35:36.608: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/3, changed state to
down
*Sep 4 20:35:36.608: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/4, changed state to
down
*Sep 4 20:35:36.608: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/5, changed state to
down
*Sep 4 20:35:36.609: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/6, changed state to
down
*Sep 4 20:35:36.609: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/7, changed state to
down
*Sep 4 20:35:36.609: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/1/8, changed state to
down
*Sep 4 20:35:36.609: %LINK-3-UPDOWN: Interface FortyGigabitEthernet1/1/1, changed state
to down
*Sep 4 20:35:36.609: %LINK-3-UPDOWN: Interface FortyGigabitEthernet1/1/2, changed state
to down
*Sep 4 20:35:37.607: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/1/1,
changed state to down
*Sep 4 20:35:37.608: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/1/2,

```

```
changed state to down
*Sep 4 20:35:37.608: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/1/3,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet1/1/4,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet1/1/1,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet1/1/2,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet1/1/3,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet1/1/4,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet1/1/5,
changed state to down
*Sep 4 20:35:37.609: %LINEPROTO-5-UPDOWN: Line protocol on Interface TenGigabitEthernet1/1/6,
changed state to down
*Sep 4 20:35:43.511: AUTOINSTALL: Obtain tftp server address (opt 150) 159.14.27.2
*Sep 4 20:35:43.511: PNPA: Setting autoinstall complete to true for 159.14.27.2
*Sep 4 20:35:57.673: %PLATFORM_PM-6-FRULINK_INSERTED: 8x10G uplink module inserted in the
switch 1 slot 1
*Sep 4 20:36:19.562: [IOX DEBUG] Guestshell start API is being invoked

*Sep 4 20:36:19.562: [IOX DEBUG] provided idb is mgmt interface

*Sep 4 20:36:19.562: [IOX DEBUG] Setting up guestshell to use mgmt-intf

*Sep 4 20:36:19.562: [IOX DEBUG] Setting up chasfs for iox related activity

*Sep 4 20:36:19.562: [IOX DEBUG] Setting up for iox pre-clean activity if needed

*Sep 4 20:36:19.562: [IOX DEBUG] Waiting for iox pre-clean setup to take affect

*Sep 4 20:36:19.562: [IOX DEBUG] Waited for 1 sec(s) for iox pre-clean setup to take affect

*Sep 4 20:36:19.562: [IOX DEBUG] Auto-configuring iox feature

*Sep 4 20:36:19.563: [IOX DEBUG] Waiting for CAF and ioxman to be up, in that order

*Sep 4 20:36:20.076: %UICFGEXP-6-SERVER_NOTIFIED_START: Switch 1 R0/0: psd: Server iox
has been notified to start
*Sep 4 20:36:23.564: [IOX DEBUG] Waiting for another 5 secs

*Sep 4 20:36:28.564: [IOX DEBUG] Waiting for another 5 secs
The process for the command is not responding or is otherwise unavailable

*Sep 4 20:36:33.564: [IOX DEBUG] Waiting for another 5 secs
The process for the command is not responding or is otherwise unavailable

*Sep 4 20:36:34.564: [IOX DEBUG] Waited for 16 sec(s) for CAF and ioxman to come up

*Sep 4 20:36:34.564: [IOX DEBUG] Validating if CAF and ioxman are running

*Sep 4 20:36:34.564: [IOX DEBUG] CAF and ioxman are up and running

*Sep 4 20:36:34.564: [IOX DEBUG] Building the simple mgmt-intf enable command string

*Sep 4 20:36:34.564: [IOX DEBUG] Enable command is: request platform software iox-manager

app-hosting guestshell enable

*Sep 4 20:36:34.564: [IOX DEBUG] Issuing guestshell enable command and waiting for it to
be up
The process for the command is not responding or is otherwise unavailable
```

```

The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable

*Sep  4 20:36:38.578: [IOX DEBUG] Waiting for another 5 secs
The process for the command is not responding or is otherwise unavailable

*Sep  4 20:36:39.416: %LINK-3-UPDOWN: Interface TenGigabitEthernet1/0/48, changed state to
up
*Sep  4 20:36:40.416: %LINEPROTO-5-UPDOWN: Line protocol on Interface
TenGigabitEthernet1/0/48,
changed state to upThe process for the command is not responding or is otherwise
unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable

*Sep  4 20:36:43.586: [IOX DEBUG] Waiting for another 5 secs
Guestshell enabled successfully

*Sep  4 20:37:45.321: [IOX DEBUG] Checking for guestshell mount path

*Sep  4 20:37:45.321: [IOX DEBUG] Validating if guestshell is ready for use

*Sep  4 20:37:45.321: [IOX DEBUG] Guestshell enabled successfully

*** Sample ZTP Day0 Python Script ***

*** Executing show platform ***

Switch  Ports      Model              Serial No.   MAC address   Hw Ver.      Sw Ver.
-----  -
1         62      C9300-48UXM       FCW2144L045  ec1d.8b0a.6800 V01          16.6.5

Switch/Stack Mac Address : ec1d.8b0a.6800 - Local Mac Address
Mac persistency wait time: Indefinite

Switch#  Role      Priority    Current
-----  -
*1       Active    1           Ready

*** Executing show version ***

Cisco IOS XE Software, Version 16.06.05
Cisco IOS Software [Everest], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 16.6.5,
RELEASE SOFTWARE (fc3)
Technical Support: http://www.cisco.com/techsupport
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Compiled Mon 10-Dec-18 12:52 by mcpre
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documentation or "License Notice" file accompanying the IOS-XE software,
or the applicable URL provided on the flyer accompanying the IOS-XE
software.

```

```

ROM: IOS-XE ROMMON
BOOTLDR: System Bootstrap, Version 17.2.1r[FC1], RELEASE SOFTWARE (P)
Switch uptime is 2 minutes
Uptime for this control processor is 4 minutes
System returned to ROM by Reload Command
System image file is "flash:cat9k_iosxe.16.06.05.SPA.bin"
Last reload reason: Reload Command
This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.
A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to
export@cisco.com.
Technology Package License Information:

```

```

-----
Technology-package           Technology-package
Current           Type           Next reboot
-----
network-advantage   Permanent       network-advantage
cisco C9300-48UXM (X86) processor with 1392780K/6147K bytes of memory.
Processor board ID FCW2144L045
36 Ethernet interfaces
1 Virtual Ethernet interface
4 Gigabit Ethernet interfaces
20 Ten Gigabit Ethernet interfaces
2 Forty Gigabit Ethernet interfaces
2048K bytes of non-volatile configuration memory.
8388608K bytes of physical memory.
1638400K bytes of Crash Files at crashinfo:.
11264000K bytes of Flash at flash:.
0K bytes of WebUI ODM Files at webui:.
Base Ethernet MAC Address       : ec:1d:8b:0a:68:00
Motherboard Assembly Number     : 73-17959-06
Motherboard Serial Number       : FOC21418FPQ
Model Revision Number           : B0
Motherboard Revision Number     : A0
Model Number                    : C9300-48UXM
System Serial Number            : FCW2144L045
Switch Ports Model              SW Version   SW Image     Mode
-----
*   1 62   C9300-48UXM   16.6.5      CAT9K_IOSXE  BUNDLE
Configuration register is 0x102

```

```

*** Configuring a Loopback Interface ***

```

```

Line 1 SUCCESS: interface loop 100
Line 2 SUCCESS: ip address 10.10.10.10 255.255.255.255
Line 3 SUCCESS: end

```

```

*** Executing show ip interface brief ***

```

```

Interface           IP-Address      OK? Method Status          Protocol
Vlan1               unassigned     YES unset  administratively down  down
GigabitEthernet0/0  10.127.128.3   YES DHCP    up              up

```

Tw1/0/1	unassigned	YES	unset	down	down
Tw1/0/2	unassigned	YES	unset	down	down
Tw1/0/3	unassigned	YES	unset	down	down
Tw1/0/4	unassigned	YES	unset	down	down
Tw1/0/5	unassigned	YES	unset	down	down
Tw1/0/6	unassigned	YES	unset	down	down
Tw1/0/7	unassigned	YES	unset	down	down
Tw1/0/8	unassigned	YES	unset	down	down
Tw1/0/9	unassigned	YES	unset	down	down
Tw1/0/10	unassigned	YES	unset	down	down
Tw1/0/11	unassigned	YES	unset	down	down
Tw1/0/12	unassigned	YES	unset	down	down
Tw1/0/13	unassigned	YES	unset	down	down
Tw1/0/14	unassigned	YES	unset	down	down
Tw1/0/15	unassigned	YES	unset	down	down
Tw1/0/16	unassigned	YES	unset	down	down
Tw1/0/17	unassigned	YES	unset	down	down
Tw1/0/18	unassigned	YES	unset	down	down
Tw1/0/19	unassigned	YES	unset	down	down
Tw1/0/20	unassigned	YES	unset	down	down
Tw1/0/21	unassigned	YES	unset	down	down
Tw1/0/22	unassigned	YES	unset	down	down
Tw1/0/23	unassigned	YES	unset	down	down
Tw1/0/24	unassigned	YES	unset	down	down
Tw1/0/25	unassigned	YES	unset	down	down
Tw1/0/26	unassigned	YES	unset	down	down
Tw1/0/27	unassigned	YES	unset	down	down
Tw1/0/28	unassigned	YES	unset	down	down
Tw1/0/29	unassigned	YES	unset	down	down
Tw1/0/30	unassigned	YES	unset	down	down
Tw1/0/31	unassigned	YES	unset	down	down
Tw1/0/32	unassigned	YES	unset	down	down
Tw1/0/33	unassigned	YES	unset	down	down
Tw1/0/34	unassigned	YES	unset	down	down
Tw1/0/35	unassigned	YES	unset	down	down
Tw1/0/36	unassigned	YES	unset	down	down
Te1/0/37	unassigned	YES	unset	down	down
Te1/0/38	unassigned	YES	unset	down	down
Te1/0/39	unassigned	YES	unset	down	down
Te1/0/40	unassigned	YES	unset	down	down
Te1/0/41	unassigned	YES	unset	down	down
Te1/0/42	unassigned	YES	unset	down	down
Te1/0/43	unassigned	YES	unset	down	down
Te1/0/44	unassigned	YES	unset	down	down
Te1/0/45	unassigned	YES	unset	down	down
Te1/0/46	unassigned	YES	unset	down	down
Te1/0/47	unassigned	YES	unset	down	down
Te1/0/48	unassigned	YES	unset	up	up
GigabitEthernet1/1/1	unassigned	YES	unset	down	down
GigabitEthernet1/1/2	unassigned	YES	unset	down	down
GigabitEthernet1/1/3	unassigned	YES	unset	down	down
GigabitEthernet1/1/4	unassigned	YES	unset	down	down
Te1/1/1	unassigned	YES	unset	down	down
Te1/1/2	unassigned	YES	unset	down	down
Te1/1/3	unassigned	YES	unset	down	down
Te1/1/4	unassigned	YES	unset	down	down
Te1/1/5	unassigned	YES	unset	down	down
Te1/1/6	unassigned	YES	unset	down	down
Te1/1/7	unassigned	YES	unset	down	down
Te1/1/8	unassigned	YES	unset	down	down
Fo1/1/1	unassigned	YES	unset	down	down
Fo1/1/2	unassigned	YES	unset	down	down
Loopback100	10.10.10.10	YES	TFTP	up	up

```
*** Configuring username, password, SSH ***
```

```
Line 1 SUCCESS: username cisco privilege 15 password cisco
Line 2 SUCCESS: ip domain name domain
Line 3 SUCCESS: line vty 0 15
Line 4 SUCCESS: login local
Line 5 SUCCESS: transport input all
Line 6 SUCCESS: end
```

```
*** ZTP Day0 Python Script Execution Complete ***
```

Cisco IOS XE Fuji 16.9.x to Cisco IOS XE Gibraltar 16.11.x

This section displays the sample boot logs before the .py script is run:

```
--- System Configuration Dialog ---
```

```
Would you like to enter the initial configuration dialog? [yes/no]: The process for the
command is not
responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
The process for the command is not responding or is otherwise unavailable
guestshell installed successfully
Current state is: DEPLOYED
guestshell activated successfully
Current state is: ACTIVATED
guestshell started successfully
Current state is: RUNNING
Guestshell enabled successfully
```

The section shows how to configure the device for Day Zero provisioning:

```
Both links down, not waiting for other switches
Switch number is 1
```

```
Restricted Rights Legend
```

```
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Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
Software clause at DFARS sec. 252.227-7013.
```

```
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706
```

```
Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 16.9.4, RELEASE
SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
```

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 Compiled Thu 22-Aug-19 18:14 by mcpre

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% Checking backup nvram
 % No config present. Using default config

FIPS: Flash Key Check : Key Not Found, FIPS Mode Not Enabled
 cisco C9300-48UXM (X86) processor with 1419044K/6147K bytes of memory.
 Processor board ID FCW2144L045
 2048K bytes of non-volatile configuration memory.
 8388608K bytes of physical memory.
 1638400K bytes of Crash Files at crashinfo:.
 11264000K bytes of Flash at flash:.
 0K bytes of WebUI ODM Files at webui:.

Base Ethernet MAC Address : ec:1d:8b:0a:68:00
 Motherboard Assembly Number : 73-17959-06
 Motherboard Serial Number : FOC21418FPQ
 Model Revision Number : B0
 Motherboard Revision Number : A0
 Model Number : C9300-48UXM
 System Serial Number : FCW2144L045

%INIT: waited 0 seconds for NVRAM to be available

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: The process for the command is not

responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

The process for the command is not responding or is otherwise unavailable

*** Executing show platform ***

Switch	Ports	Model	Serial No.	MAC address	Hw Ver.	Sw Ver.
1	64	C9300-48UXM	FCW2144L045	ec1d.8b0a.6800	V01	16.9.4

Switch/Stack Mac Address : ec1d.8b0a.6800 - Local Mac Address
Mac persistency wait time: Indefinite

Switch#	Role	Priority	Current State
*1	Active	1	Ready

*** Executing show version ***

Cisco IOS XE Software, Version 16.09.04
Cisco IOS Software [Fuji], Catalyst L3 Switch Software (CAT9K_IOSXE), Version 16.9.4, RELEASE SOFTWARE (fc2)

Technical Support: <http://www.cisco.com/techsupport>

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ROM: IOS-XE ROMMON

BOOTLDR: System Bootstrap, Version 17.2.1r[FC1], RELEASE SOFTWARE (P)

Switch uptime is 4 minutes

Uptime for this control processor is 5 minutes

System returned to ROM by Reload Command

System image file is "flash:cat9k_iosxe.16.09.04.SPA.bin"

Last reload reason: Reload Command

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Technology Package License Information:

Technology-package	Type	Technology-package
Current		Next reboot
network-advantage	Smart License	network-advantage
None	Subscription Smart License	None
Smart Licensing Status: UNREGISTERED/EVAL EXPIRED		
cisco C9300-48UXM (X86) processor with 1419044K/6147K bytes of memory.		
Processor board ID FCW2144L045		
36 Ethernet interfaces		

```

1 Virtual Ethernet interface
4 Gigabit Ethernet interfaces
20 Ten Gigabit Ethernet interfaces
2 TwentyFive Gigabit Ethernet interfaces
2 Forty Gigabit Ethernet interfaces
2048K bytes of non-volatile configuration memory.
8388608K bytes of physical memory.
1638400K bytes of Crash Files at crashinfo:.
11264000K bytes of Flash at flash:.
0K bytes of WebUI ODM Files at webui:.
Base Ethernet MAC Address      : ec:1d:8b:0a:68:00
Motherboard Assembly Number    : 73-17959-06
Motherboard Serial Number      : FOC21418FPQ
Model Revision Number          : B0
Motherboard Revision Number    : A0
Model Number                   : C9300-48UXM
System Serial Number           : FCW2144L045
Switch Ports Model              SW Version      SW Image        Mode
-----
* 1 64 C9300-48UXM 16.9.4         CAT9K_IOSXE    BUNDLE
Configuration register is 0x102

```

*** Configuring a Loopback Interface ***

```

Line 1 SUCCESS: interface loop 100
Line 2 SUCCESS: ip address 10.10.10.10 255.255.255.255
Line 3 SUCCESS: end

```

*** Executing show ip interface brief ***

```

Any interface listed with OK? value "NO" does not have a valid configuration
Interface          IP-Address      OK? Method Status      Protocol
Vlan1              unassigned     NO  unset  up          up
GigabitEthernet0/0 10.127.128.5   YES DHCP  up          up
Tw1/0/1            unassigned     YES unset  down        down
Tw1/0/2            unassigned     YES unset  down        down
Tw1/0/3            unassigned     YES unset  down        down
Tw1/0/4            unassigned     YES unset  down        down
Tw1/0/5            unassigned     YES unset  down        down
Tw1/0/6            unassigned     YES unset  down        down
Tw1/0/7            unassigned     YES unset  down        down
Tw1/0/8            unassigned     YES unset  down        down
Tw1/0/9            unassigned     YES unset  down        down
Tw1/0/10           unassigned     YES unset  down        down
Tw1/0/11           unassigned     YES unset  down        down
Tw1/0/12           unassigned     YES unset  down        down
Tw1/0/13           unassigned     YES unset  down        down
Tw1/0/14           unassigned     YES unset  down        down
Tw1/0/15           unassigned     YES unset  down        down
Tw1/0/16           unassigned     YES unset  down        down
Tw1/0/17           unassigned     YES unset  down        down
Tw1/0/18           unassigned     YES unset  down        down
Tw1/0/19           unassigned     YES unset  down        down
Tw1/0/20           unassigned     YES unset  down        down
Tw1/0/21           unassigned     YES unset  down        down
Tw1/0/22           unassigned     YES unset  down        down
Tw1/0/23           unassigned     YES unset  down        down
Tw1/0/24           unassigned     YES unset  down        down
Tw1/0/25           unassigned     YES unset  down        down
Tw1/0/26           unassigned     YES unset  down        down

```

```

Tw1/0/27          unassigned      YES unset  down      down
Tw1/0/28          unassigned      YES unset  down      down
Tw1/0/29          unassigned      YES unset  down      down
Tw1/0/30          unassigned      YES unset  down      down
Tw1/0/31          unassigned      YES unset  down      down
Tw1/0/32          unassigned      YES unset  down      down
Tw1/0/33          unassigned      YES unset  down      down
Tw1/0/34          unassigned      YES unset  down      down
Tw1/0/35          unassigned      YES unset  down      down
Tw1/0/36          unassigned      YES unset  down      down
Tel1/0/37         unassigned      YES unset  down      down
Tel1/0/38         unassigned      YES unset  down      down
Tel1/0/39         unassigned      YES unset  down      down
Tel1/0/40         unassigned      YES unset  down      down
Tel1/0/41         unassigned      YES unset  down      down
Tel1/0/42         unassigned      YES unset  down      down
Tel1/0/43         unassigned      YES unset  down      down
Tel1/0/44         unassigned      YES unset  down      down
Tel1/0/45         unassigned      YES unset  down      down
Tel1/0/46         unassigned      YES unset  down      down
Tel1/0/47         unassigned      YES unset  down      down
Tel1/0/48         unassigned      YES unset  up        up
GigabitEthernet1/1/1 unassigned      YES unset  down      down
GigabitEthernet1/1/2 unassigned      YES unset  down      down
GigabitEthernet1/1/3 unassigned      YES unset  down      down
GigabitEthernet1/1/4 unassigned      YES unset  down      down
Tel1/1/1          unassigned      YES unset  down      down
Tel1/1/2          unassigned      YES unset  down      down
Tel1/1/3          unassigned      YES unset  down      down
Tel1/1/4          unassigned      YES unset  down      down
Tel1/1/5          unassigned      YES unset  down      down
Tel1/1/6          unassigned      YES unset  down      down
Tel1/1/7          unassigned      YES unset  down      down
Tel1/1/8          unassigned      YES unset  down      down
Fo1/1/1           unassigned      YES unset  down      down
Fo1/1/2           unassigned      YES unset  down      down
TwentyFiveGigE1/1/1 unassigned      YES unset  down      down
TwentyFiveGigE1/1/2 unassigned      YES unset  down      down
Loopback100      10.10.10.10    YES TFTP   up        up

```

*** Configuring username, password, SSH ***

```

Line 1 SUCCESS: username cisco privilege 15 password cisco
**CLI Line # 1: WARNING: Command has been added to the configuration using a type 0 password.

```

```

However, type 0 passwords will soon be deprecated. Migrate to a supported password type
Line 2 SUCCESS: ip domain name domain
Line 3 SUCCESS: line vty 0 15
Line 4 SUCCESS: login local
Line 5 SUCCESS: transport input all
Line 6 SUCCESS: end

```

*** ZTP Day0 Python Script Execution Complete ***

Press RETURN to get started!

Feature Information for Zero-Touch Provisioning

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for Zero-Touch Provisioning

Feature Name	Release	Feature Information
Zero-Touch Provisioning	Cisco IOS XE Everest 16.5.1a Cisco IOS XE Everest 16.5.1b Cisco IOS XE Fuji 16.7.1 Cisco IOS XE Fuji 16.8.2	<p>To address network provisioning challenges, Cisco introduces a zero-touch provisioning model.</p> <p>In Cisco IOS XE Everest 16.5.1a, this feature was implemented on the following platforms:</p> <ul style="list-style-type: none"> • Cisco Catalyst 3650 Series Switches • Cisco Catalyst 3850 Series Switches • Cisco Catalyst 9300 Series Switches • Cisco Catalyst 9500 Series Switches <p>In Cisco IOS XE Everest 16.5.1b, this feature was implemented on the following platform:</p> <ul style="list-style-type: none"> • Cisco 4000 Series Integrated Services Router models with a minimum of 8 GB RAM to support Guest Shell. <p>In Cisco IOS XE Fuji 16.7.1, this feature was implemented on the following platform:</p> <ul style="list-style-type: none"> • Cisco ASR 1000 Aggregation Services Routers (ASR1001-X, ASR1001-HX, ASR1002-X, ASR1002-HX) <p>In Cisco IOS XE Fuji 16.8.2, this feature was implemented on the following platform:</p> <ul style="list-style-type: none"> • Cisco ASR 1000 Series Aggregation Services Routers (ASR1004, ASR1006, ASR1006-X, ASR1009-X, ASR1013)

Feature Name	Release	Feature Information
Zero-Touch Provisioning: HTTP Download	Cisco IOS XE Fuji 16.8.1 Cisco IOS XE Fuji 16.8.1a	<p>Zero-Touch Provisioning supports HTTP and TFTP file download.</p> <p>In Cisco IOS XE Everest 16.8.1, this feature was implemented on the following platforms:</p> <ul style="list-style-type: none"> • Cisco 4000 Series Integrated Services Routers • Cisco Catalyst 3650 Series Switches • Cisco Catalyst 3850 Series Switches • Cisco Catalyst 9300 Series Switches • Cisco Catalyst 9500 Series Switches <p>In Cisco IOS XE Fuji 16.8.1a, this feature was implemented on Cisco Catalyst 9500-High Performance Series Switches</p>
DHCPv6 Support for Zero-Touch Provisioning	Cisco IOS XE Fuji 16.9.1	<p>In Cisco IOS XE Fuji 16.9.1, this feature was implemented on the following platforms</p> <ul style="list-style-type: none"> • Cisco Catalyst 9300 Series Switches • Cisco Catalyst 9500 Series Switches