

Disaster Recovery

Note This document is applicable only for the following variants of the Cisco NCS 540 router variants:

- N540-ACC-SYS
- N540X-ACC-SYS
- N540-24Z8Q2C-SYS

For information on booting the other Cisco NCS 540 router variants using iPXE or USB drive, see the *Setup Cisco NCS 540 Series Routers with XR7 OS* chapter.

The topics covered in this chapter are:

- Boot using USB Drive, on page 1
- Boot the Router Using iPXE, on page 4

Boot using USB Drive

The bootable USB drive is used to re-image the router for the purpose of system upgrade or boot the router in case of boot failure. The bootable USB drive can be created using a compressed boot file.

Create a Bootable USB Drive Using Compressed Boot File

A bootable USB drive is created by copying a compressed boot file into a USB drive. The USB drive becomes bootable after the contents of the compressed file are extracted.

Note In case of failure to read or boot from USB drive, ensure that the drive is inserted correctly. If the drive is inserted correctly and still fails to read from USB drive, check the contents of the USB on another system.

This task can be completed using Windows, Linux, or MAC operating systems available on your local machine. The exact operation to be performed for each generic step outlined here depends on the operating system in use.

Before you begin

- You have access to a USB drive with a storage capacity that is between 8GB (min) and 64GB (max). USB 2.0 and USB 3.0 are supported.

Caution We recommend that you do not use Kingston USB 3.0 memory cards with 64GB storage capacity as this might cause a hardware error.

- Copy the compressed boot file from the software download page at cisco.com to your local machine. The file name for the compressed boot file is in the format *ncs540-usb-boot-<release_number_zip>*.

Procedure

Step 1 Connect the USB drive to your local machine and format it with FAT32 or MS-DOS file system using the Windows Operating System or Apple MAC Disk Utility.

Step 2 Copy the compressed boot file to the USB drive.

Step 3 Verify that the copy operation is successful. To verify, compare the file size at source and destination. Additionally, verify the MD5 checksum value.

Step 4 Extract the content of the compressed boot file by unzipping it inside the USB drive. This converts the USB drive to a bootable drive.

Note
The content of the zipped file ("EFI" and "boot" directories) should be extracted directly into root of the USB drive. If the unzipping application places the extracted files in a new folder, move the "EFI" and "boot" directories to root of the USB drive.

Step 5 Eject the USB drive from your local machine.

What to do next

Use the bootable USB drive to boot the router or upgrade its image.

Boot the Router Using the Bootable USB Drive

Before you begin

The router can be booted using an external bootable USB drive. This might be required when the router is unable to boot from the installed image. A boot failure may happen when the image gets corrupted. During the USB boot process, the router gets reimaged with the version available on the USB drive.

Create a bootable USB drive. See Create a Bootable USB Drive Using Compressed Boot File.

Procedure

Step 1 Plug in the bootable USB drive with the required image to an Active RP USB port on the router.

Step 2 Use one of the two methods to boot the router from the USB:

- Method 1

  Perform the following steps when you are unable to access the router console:

  a. As the router reloads, you must press the ESC key to enter the **Boot Manager** window. A message, **Esc is pressed. Go to boot options.** is displayed.

  b. In the next screen, select **Boot Manager**.

  c. In the **Boot Manager** screen, select the USB drive from the list of boot devices and press **Enter**.

```
Cisco BIOS Setup Utility - Copyright (C) 2019 Cisco Systems, Inc

Boot Override
UEFI: Micron_M600_MTFDDAT064MBF, Partition 4
UEFI: Built-in iPXE
URFI: Built-in Shell
URFI: Built-in Grub
EFI USB Device (Sandisk)
UEFI: IPv4 0 Intel® I210 Gigabit Network Con
UEFI: IPv4 0 Intel® Ethernet Connection x552
UEFI: IPv4 1 Intel® Ethernet Connection x552
UEFI: IPv4 2 Intel® Ethernet Connection x552
UEFI: IPv4 3 Intel® Ethernet Connection x552
```

  The router boots the image from the USB drive, and installs the image onto the hard disk. The router boots from the hard disk after the installation is successful.

- Method 2

  USB based image boot can also be used when the router needs to be clean booted with a new image version.

  a. At the **Sysadmin VM** prompt, execute the **hw-module location all bootmedia usb reload** command.

  The router boots the image from the USB drive, and installs the image onto the hard disk. After image installation is successful, the router automatically boots from this newly installed image on the hard disk.

  Note
  Clean boot results in previous logs, image, and config being removed. No user intervention is required for selecting the USB boot device during the boot to initiate the USB based recovery.

Step 3 After the booting is completed, specify the root-system **username** and **password**.

What to do next

During the reimage process, the system installs only the base XR package by default. To enable additional features, install any optional RPM packages separately after the reimage.

Boot the Router Using iPXE

iPXE is a pre-boot execution environment that is included in the network card of the management interfaces and works at the system firmware (UEFI) level of the router. iPXE is used to re-image the system, and boot the router in case of boot failure or in the absence of a valid bootable partition. iPXE downloads the ISO image, proceeds with the installation of the image, and finally bootstraps inside the new installation.

iPXE acts as a boot loader and provides the flexibility to choose the image that the system will boot based on the Platform Identifier (PID), the Serial Number, or the management mac-address. iPXE must be defined in the DHCP server configuration file.

Zero Touch Provisioning

Zero Touch Provisioning (ZTP) helps in auto provisioning after the software installation of the router using iPXE.

ZTP auto provisioning involves:

- **Configuration:** Downloads and executes the configuration file. The first line of the file must contain `!! IOS XR` for ZTP to process the file as a configuration.
- **Script:** Downloads and executes the script files. The script files include a programmatic approach to complete a task. For example, scripts created using IOS XR commands to perform patch upgrades. The first line of the file must contain `#! /bin/bash` or `#! /bin/sh` for ZTP to process the file as a script.

Setup DHCP Server

A DHCP server must be configured for IPv4, IPv6 or both communication protocols. The following example shows ISC-DHCP server running on Linux system.

Before you begin

- Consult your network administrator or system planner to procure IP addresses and a subnet mask for the management interface.
- Physical port Ethernet 0 on RP is the management port. Ensure that the port is connected to management network.
- Enable firewall to allow the server to process DHCP packets.
- For DHCPv6, a Routing advertisement (RA) message must be sent to all nodes in the network that indicates which method to use to obtain the IPv6 address. Configure Router-advertise-daemon (radvd, install using yum install radvd) to allow the client to send DHCP request. For example:

```
interface eth3
{
        AdvSendAdvert on;
        MinRtrAdvInterval 60;
```

```
        MaxRtrAdvInterval 180;
        AdvManagedFlag on;
        AdvOtherConfigFlag on;
        prefix 2001:1851:c622:1::/64
        {
                AdvOnLink on;
                AdvAutonomous on;
                AdvRouterAddr off;
        };
};
```

- The HTTP server can be in the same server as that of the DHCP server, or can be on a different server. After the IP address is assigned from DHCP server, the router must connect to the HTTP server to download the image.

Procedure

Step 1 Create the `dhcpd.conf` file (for IPv4, IPv6 or both communication protocols), `dhcpv6.conf` file (for IPv6) or both in the `/etc/` or `/etc/dhcp` directory. This configuration file stores the network information such as the path to the script, location of the ISO install file, location of the provisioning configuration file, serial number, MAC address of the router.

Step 2 Test the server once the DHCP server is running. For example, for IPv4:

- Use MAC address of the router:

  Note
  Using the `host` statement provides a fixed address that is used for DNS, however, verify that option `77` is set to iPXE in the request. This option is used to provide the bootfile to the system when required.

  Ensure that the above configuration is successful.
- Use serial number of the router: The serial number of the router is derived from the BIOS and is used as an identifier.

Step 3 Restart DHCP.

```
killall dhcpd
/usr/sbin/dhcpd -f -q -4 -pf /run/dhcp-server/dhcpd.pid
-cf /etc/dhcp/dhcpd.conf ztp-mgmt &
```

Example

The example shows a sample `dhcpd.conf` file:

```
allow bootp;
allow booting;
ddns-update-style interim;
option domain-name "cisco.com";
option time-offset -8;
ignore client-updates;
default-lease-time 21600;
max-lease-time 43200;
option domain-name-servers <ip-address-server1>, <ip-address-server2>;
log-facility local0;
```

```
 :
subnet <subnet> netmask <netmask> {
  option routers <ip-address>;
  option subnet-mask <subnet-mask>;
  next-server <server-addr>;
}
  :
host <hostname> {
  hardware ethernet e4:c7:22:be:10:ba;
  fixed-address <address>;
  filename "http://<address>/<path>/<image.bin>";
}
```

The example shows a sample `dhcpd6.conf` file:

```
option dhcp6.name-servers <ip-address-server>;
option dhcp6.domain-search "cisco.com";
dhcpv6-lease-file-name "/var/db/dhcpd6.leases";
option dhcp6.info-refresh-time 21600;
option dhcp6.bootfile-url code 59 = string;
subnet6 <subnet> netmask <netmask> {
       range6 2001:1851:c622:1::2 2001:1851:c622:1::9;
        option dhcp6.bootfile-url "http://<address>/<path>/<image.bin>";
```

What to do next

Invoke ZTP.

Invoke ZTP

ZTP runs within the XR namespace, and within the global VPN routing/forwarding (VRF) namespace for management interfaces and line card interfaces.

Before you begin

Ensure that a DHCP server is setup. For more information, see Setup DHCP Server, on page 4.

Procedure

Edit the dhcpd.conf file to utilize the capabilities of ZTP.

The following example shows a sample DHCP server configuration including iPXE and ZTP:

```
host <host-name>
{
hardware ethernet <router-serial-number or mac-id>;
fixed-address <ip-address>;
  if exists user-class and option user-class = "iPXE" {
  # Image request, so provide ISO image
  filename "http://<ip-address>/<directory>/";
  } else
{
  # Auto-provision request, so provide ZTP script or configuration
  filename "http://<ip-address>/<script-directory-path>/";
  #filename "http://<ip-address>/<script-directory-path>/
```

```
  }
}
```

Note
Either the ZTP .script file or the .cfg file can be provided at a time for auto-provisioning.

With this configuration, the system boots using during installation, and then download and execute when XR VM is up.

Invoke ZTP Manually

ZTP can also be invoked manually with the modified one touch provisioning approach. The process involves:

Before you begin

A configuration file can be used to specify a list of interfaces that will be brought up in XR and DHCP will be invoked on. /pkg/etc/ztp.config is a platform specific file that allows the platform to specify which if any additional interfaces will be used.

```
#
# List all the interfaces that ZTP will consider running on. ZTP will attempt
# to bring these interfaces. At which point dhclient will be able to use them.
#
# Platforms may add dynamically to this list.
#
#ZTP_DHCLIENT_INTERFACES=" \
#    Gi0_0_0_0 \
#"
...
```

Procedure

Step 1 Boot the router.

Step 2 Login manually.

Step 3 Enable interfaces.

Step 4 Invoke a new ZTP DHCP session manually using the **ztp initiate** command.

```
Router#ztp initiate
```

For example, to send DHCP requests on the GigabitEthernet interface 0/0/0/0, run the command:

```
Router#ztp initiate debug verbose interface GigabitEthernet0/0/0/0
```

ZTP will run on the management port by default unless the platform has configured otherwise. The logs will be logged in `/disk0:/ztp/ztp/log` location.

Note
To configure a 40G interface into 4 separate 10G interfaces, use the **ztp breakout nosignal-stay-in-breakout-mode** command.

Note

To enable dataport breakouts and invoke DHCP sessions on all dataport and line card interfaces that are detected, use the **ztp breakout** command.

```
Router#ztp breakout debug verbose
Router#ztp initiate dataport debug verbose
Invoke ZTP?(this may change your configuration) [confirm] [y/n]:
```

To override the prompt:

```
Router#ztp initiate noprompt
Invoke ZTP?(this may change your configuration) [confirm] [y/n]:

ZTP will now run in the background.
Please use "show logging" or look at /disk0:/ztp/ztp/log to check progress.
```

ZTP runs on the management interfaces that are `UP` by default.

Step 5 To terminate the ZTP session, use the **ztp terminate** command.

What to do next

Boot the router using iPXE.

Boot the Router Using iPXE

Before you use the iPXE boot, ensure that:

- DHCP server is set and is running.
- You have logged in to the System Admin console using the **admin** command.

Run the following command to invoke the iPXE boot process to reimage the router:

```
hw-module location all bootmedia network reload
```

Note For the following variants of Cisco NCS 540 series routers, use the **reload bootmedia network location all noprompt** command for iPXE boot process:

- N540-28Z4C-SYS-A/D
- N540X-16Z4G8Q2C-A/D
- N540-12Z20G-SYS-A/D
- N540X-12Z16G-SYS-A/D
- N540X-6Z18G-SYS-A/D
- N540X-8Z16G-SYS-A/D
- N540-FH-CSR-SY

Example:

```
sysadmin-vm:0_RP0# hw-module location all bootmedia network reload
Wed Dec 23 15:29:57.376 UTC
Reload hardware module ? [no,yes]
```

Note The following variants of Cisco NCS 540 series routers do not support the **sysadmin-vm:0_RP0** prompt:

- N540-28Z4C-SYS-A/D
- N540X-16Z4G8Q2C-A/D
- N540-12Z20G-SYS-A/D
- N540X-12Z16G-SYS-A/D
- N540X-6Z18G-SYS-A/D
- N540X-8Z16G-SYS-A/D
- N540-FH-CSR-SY

The following example shows the output of the command:

```
iPXE 1.0.0+ (3e573) -- Open Source Network Boot Firmware -- http://ipxe.org
Features: DNS HTTP TFTP VLAN EFI ISO9660 NBI Menu
Trying net0...
net0: c4:72:95:a6:14:e1 using dh8900cc on PCI01:00.1 (open)
[Link:up, TX:0 TXE:0 RX:0 RXE:0]
Configuring (net0 c4:72:95:a6:14:e1)..................... Ok << Talking to DHCP/PXE server to
 obtain network information
net0: 10.37.1.101/255.255.0.0 gw 10.37.1.0
net0: fe80::c672:95ff:fea6:14e1/64
net0: 2001:1800:5000:1:c672:95ff:fea6:14e1/64 gw fe80::20c:29ff:fefb:b9fe
net1: fe80::c672:95ff:fea6:14e3/64 (inaccessible)
Next server: 10.37.1.235
Filename: http://10.37.1.235/


http://10.37.1.235/ ... 58% << Downloading file as indicated by DHCP/PXE server to boot
install image
```

Disaster Recovery Using Manual iPXE Boot

Manually booting the system using iPXE can be used to reinstall a clean system in case of a corrupt install or recover lost password. However, all the disks will be wiped out and the configuration will be removed.

Procedure

Step 1 Use the arrow keys (up, down) to select **UEFI: Built-in EFI IPXE** to enable iPXE boot. The iPXE boot launches the auto boot.

To manually boot using iPXE, press **Ctrl-B** keys to reach the iPXE command line.

Step 2 Identify the management interface. If the management interface is connected properly and is UP, it displays `Link:up` in the following output:

Example:

Choose the net interface that shows `Link:up`. If there are multiple interfaces that show the status as UP, identify the management interface with MAC address.

iPXE also supports HTTP, TFTP and FTP. For more information, see https://ipxe.org/cmd.

After installing the mini ISO image, the system reboots. After successful reboot, specify the root username and password. Once you get back to the XR prompt, you can load the configuration and install remaining packages.