Bring-up the Router

After installing the hardware, boot the router. Connect to the XR console port and power on the router. The router completes the boot process using the pre-installed operating system (OS) image. If no image is available within the router, the router can be booted using PXE boot or an external bootable USB drive.

After booting is complete, create the root username and password, and then use it to log on to the XR console and get the router prompt. The first user created in XR console is synchronized to the System Admin console. From the XR console, access the System Admin console to configure system administration settings.

For more information about completing the hardware installation, see Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide.

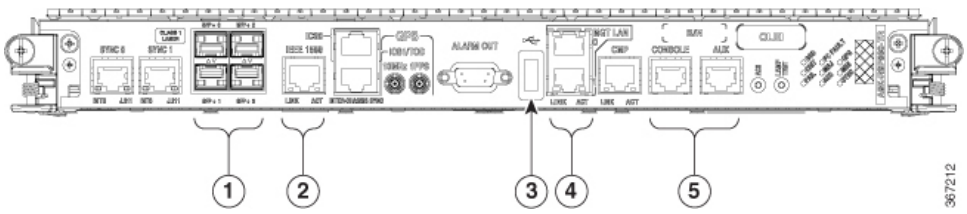
In a large-scale environment, to provision routers remotely without any manually intervention, we recommend you to use Zero Touch Provisioning (ZTP). See Deploy Router Using Classic ZTP.

- Boot the Router, on page 1
- Boot the Router Using USB, on page 2
- Boot the Router Using iPXE, on page 4
- Setup Root User Credentials, on page 7
- Access the System Admin Console, on page 8
- Configure the Management Port, on page 9
- Perform Clock Synchronization with NTP Server, on page 11

Boot the Router

Use the console port on the Route Processor (RP) to connect to a new router. The console port connect to the XR console by default. If necessary, subsequent connections can be established through the management port, after it is configured.

Figure 1: Route Processor Front Panel View



1	SFP/SFP+ ports

2	Service LAN port
3	External USB port
4	Management LAN ports
5	Console and Auxiliary (AUX) ports

Procedure

Step 1 Connect a terminal to the console port of the RP

Step 2 Start the terminal emulation program on your workstation.

In the **COM1 Properties** window, select the **Port Settings** tab, and enter the following settings:

The baud rate is set by default and cannot be changed.

For chassis with RSP4 and RP2 cards, the console settings are baud rate 9600 bps, no parity, 1 stop bits and 8 data bits. The user can change this baud rate. For next generation RP3 and RSP5 cards, the console settings are baud rate 115200 bps, no parity, 1 stop bits and 8 data bits.

Step 3 Power on the router.

Connect the power cord to Power Module. Turn on the router by switching the power switch to the "ON" position. The power switch is usually located near the power module. The router boots up. The boot process details are displayed on the console screen of the terminal emulation program.

Step 4 Press **Enter**.

The boot process is complete when the system prompts to enter the root-system username. If the prompt does not appear, wait for a while to give the router more time to complete the initial boot procedure, then press **Enter**.

Important If the boot process fails, it may be because the preinstalled image on the router is corrupt. In this case, the router can be booted using an external bootable USB drive.

Note We recommended that you check the `md5sum` of the image after copying from source location to the server from where router boots up with new version. This ensures that if `md5sum` mismatch is observed, you can remove the corrupted file and ensure that a working copy of the image file is available for setup to begin.

What to do next

Specify the root username and password. For more information, see Setup Root User Credentials, on page 7.

Boot the Router Using USB

The bootable USB drive is used to re-image the router for the purpose of system upgrade, password recovery or boot the router in case of boot failure. The USB on router is mounted as disk 2.

Before you begin

Ensure you have completed the following prerequisites:

- You have access to a USB drive with a storage capacity that is between 8GB (min) and 32 GB (max). USB 2.0 and USB 3.0 are supported.
- Copy the compressed boot file from the Software Download Center to your local machine. The file name for the compressed boot file is in the format asr9k-x64-usb_boot-<release_number>.zip.

Procedure

Step 1 Create a bootable USB 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.

a) 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.
b) Copy the `asr9k-x64-usb_boot-<release_number>.zip` compressed boot file to the USB drive.
c) Verify that the copy operation is successful. To verify, compare the file size at source and destination. Additionally, verify the MD5 checksum value.
d) Extract the content of the compressed boot file by unzipping it inside the USB drive. This converts the USB drive to a bootable drive.
e) Eject the USB drive from your local machine.

Step 2 Insert the USB on the active RP, and reload or reset the power of the router.

Note Use this procedure only on active RP; the standby RP must either be removed from the chassis, or stopped at the boot menu. After the active RP is installed with images from USB, boot the standby RP.

Step 3 On active XR console, press `CTRL-C` to view BIOS menu. From the menu, select `IOS-XR 64 bit Local boot using front panel USB media`.

```
Got EMT Mode as Disk Boot
Set OS type None, Received OS type=0
Got Boot Mode as Disk Boot

Booting IOS-XR 64 bit Boot previously installed image - Press Ctrl-c to stop
 .
Please select the operating system and the boot device:
     1) Boot to ROMMON
     2) IOS-XR 64 bit Boot previously installed image
     3) IOS-XR 64 bit Mgmt Network boot using DHCP server
     4) IOS-XR 64 bit Mgmt Network boot using local settings (iPXE)
     (Press 'p' for more option)
Selection [1/2/3/4]: p
Please select the operating system and the boot device:
     1) Boot to ROMMON
     2) IOS-XR 64 bit Boot previously installed image
     3) IOS-XR 64 bit Mgmt Network boot using DHCP server
     4) IOS-XR 64 bit Mgmt Network boot using local settings (iPXE)
     5) IOS-XR 64 bit Internal network boot from RSP/RP
     6) IOS-XR 64 bit Local boot using embedded USB media
     7) IOS-XR 64 bit Local boot using front panel USB media
     8) Change baud rate and continue booting
Selection [1/2/3/4/5/6/7/8]: 7
Selected IOS-XR 64 bit Local boot using front panel USB media, Continue ? Y/N: y

Set CBC OS type IOS-XR 64 bit, EMT USB Boot to CBC
Sending boot success notification

Selected boot option - EFI USB Device 1 (SanDisk Cruzer)
Verifying image signature...
Image signature verified successfully
Image Verification Passed
```

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If active and standby RPs are not stopped at the boot menu, the previously used boot option is used. If the system is inactive in the boot menu for 30 minutes, the system resets automatically.

Step 4 If standby RP is present and it was stopped in step 2, boot the standby RP after the active RP starts to boot. From the boot options select `IOS-XR 64 bit Internal network boot from RSP/RP`.

Example:

```
Please select the operating system and the boot device:
     1) IOS-XR (32 bit Classic XR)
     2) IOS-XR 64 bit Boot previously installed image
     3) IOS-XR 64 bit Mgmt Network boot using DHCP server
     4) IOS-XR 64 bit Mgmt Network boot using local settings (iPXE)
     5) IOS-XR 64 bit Internal network boot from RSP/RP
     6) IOS-XR 64 bit Local boot using embedded USB media
     7) IOS-XR 64 bit Local boot using front panel USB media
Selection [1/2/3/4/5/6/7]:
```

Select option 5 and proceed with the boot up. After the router boots up, specify the root username and password.

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 bootstraps within 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.

Note PID and serial number is supported only if iPXE is invoked using the command (admin) hw-module location all bootmedia network reload all. If iPXE is selected manually from BIOS, PID and serial number is not supported.

Note **Cisco ASR 9901** — By default, iPXE uses the previous attempted boot method on the next reload. If the Network option was previously used, the iPXE register will be set to 1 (IPXE_PREF=1). To boot an Cisco ASR 9901 router via DHCP on the next reload, you must set the IPXE_PREF settings to 0 (IPXE_PREF=0).

From the system admin console, enter the **run chvrf 0 ssh rp0_admin /opt/cisco/calvados/bin/nvram_dump -s IPXE_PREF=0** command twice. After entering this command the first time, the host is added to the known list of hosts.

```
sysadmin-vm:0_RP0# run chvrf 0 ssh rp0_admin /opt/cisco/calvados/bin/nvram_dump -s IPXE_PREF=0
Sat May  2  10:39:52.740 UTC+00:00
Warning: Permanently added 'rp0_admin' (ECDSA) to the list of known hosts.
sysadmin-vm:0_RP0# run chvrf 0 ssh rp0_admin /opt/cisco/calvados/bin/nvram_dump -s IPXE_PREF=0
Sat May  2  10:39:54.995 UTC+00:00
sysadmin-vm:0_RP0# hw-module location all bootmedia network reload
```

iPXE boot can be performed during the following scenarios:

- migration from 32-bit to 64-bit using migration script
- recover password
- boot-up failure with 64-bit image

Before you begin

Take a backup of configuration to a TFP or FTP path to load the configuration back after the iPXE boot.

Procedure

Step 1 Login to the system admin console.

Example:

```
sysadmin-vm:0_RSP0# hw-module location all reload
Tue Mar  6  08:12:47.605 UTC
Reload hardware module ? [no,yes] yes
result Card graceful reload request on all acknowledged.
sysadmin-vm:0_RSP0#
```

Step 2 If the router is unable to boot, press Ctrl +C to stop the boot process when the following information is displayed.

Note Use this procedure only on active RP; the standby RP must either be removed from the chassis, or stopped at the boot menu. After the active RP is installed with images from iPXE boot, boot the standby RP.

Example:

```
System Bootstrap, Version 10.57 [ASR9K x86 ROMMON],
Copyright (c) 1994-2018 by Cisco Systems, Inc.
Compiled on Mon 01/09/2017 17:15:01.98
BOARD_TYPE             : 0x100317
Rommon                 : 10.57 (Primary)
Board Revision         : 4
PCH EEPROM             : 3.4
IPU FPGA(PL)           : 0.40.0 (Backup)
IPU INIT(HW_FPD)       : 0.30.0
IPU FSBL(BOOT.BIN)     : 1.19.0
IPU LINUX(IMAGE.FPD)   : 1.21.0
OPTIMUS FPGA           : 0.12.0
OMEGA FPGA             : 0.13.0
ALPHA FPGA             : 0.14.0
CHA FPGA               : 0.5.1
CBC0                   : Part 1=34.38, Part 2=34.38, Act Part=2
Product Number         : A9K-RSP880-SE
Chassis                : ASR-9904-AC
Chassis Serial Number  : FOX1936GBDD
Slot Number            : 1
Pxe Mac Address LAN 0  : 70:e4:22:06:13:40
Pxe Mac Address LAN 1  : 70:e4:22:06:13:41
============================================================
Got EMT Mode as 3
Got Boot Mode as 0
Booting IOS-XR (32 bit Classic XR) - Press Ctrl-c to stop
```

Step 3 Choose option 4 for iPXE boot.

Example:

```
Please select the operating system and the boot device:
     1) IOS-XR (32 bit Classic XR)
     2) IOS-XR 64 bit Boot previously installed image
     3) IOS-XR 64 bit Mgmt Network boot using DHCP server
     4) IOS-XR 64 bit Mgmt Network boot using local settings (iPXE)
     5) IOS-XR 64 bit Internal network boot from RSP/RP
     6) IOS-XR 64 bit Local boot using embedded USB media
     7) IOS-XR 64 bit Local boot using front panel USB media
Selection [1/2/3/4/5/6/7]:
```

Step 4 Manually update iPXE ROMMON details before booting using FTP or TFTP.

Note If you are using an iPXE server, skip Step4 and proceed to Steps5 and 6.

Example:

```
iPXE>set cisco/cisco-server-url:string tftp://<path>/asr9k-mini-x64.iso
iPXE>set cisco/cisco-ipv4-address:string 1.3.24.202
iPXE>set cisco/cisco-netmask-address:str 255.255.0.0
iPXE>set cisco/cisco-gateway-address:str 1.3.0.1
```

Step 5 Open the connected management port (0/1).

Example:

```
iPXE>ifclose net0
iPXE>ifclose net1
iPXE>ifopen net1
```

where net0 and net1 represents management port0 and port1 respectively.

Step 6 Boot the required image from FTP or TFTP location.

Example:

```
iPXE>
iPXE> ifopen net0:
iPXE> boot tftp://<path>/asr9k-mini-x64-<release-number>.iso
tftp://<path>/asr9k-mini-x64-<release-number>.iso...  0%
Booting iso-image@0x83c525000(1135456256), bzImage@0x83c55f000(4526671)

.......BIOS CODE SIGN ENTRY ...
```

Step 7 After the active RP is up and running, boot the standby RP. From the boot options select `IOS-XR 64 bit Internal network boot from RSP/RP`.

Example:

```
Please select the operating system and the boot device:
     1) IOS-XR (32 bit Classic XR)
     2) IOS-XR 64 bit Boot previously installed image
     3) IOS-XR 64 bit Mgmt Network boot using DHCP server
     4) IOS-XR 64 bit Mgmt Network boot using local settings (iPXE)
     5) IOS-XR 64 bit Internal network boot from RSP/RP
     6) IOS-XR 64 bit Local boot using embedded USB media
     7) IOS-XR 64 bit Local boot using front panel USB media
Selection [1/2/3/4/5/6/7]:
```

Setup Root User Credentials

When you boot the router for the first time, the system prompts you to configure root credentials (username and password). These credentials have been set up for the root user on the XR console (root-lr), the System Admin VM (root-system), and for disaster recovery purposes.

Procedure

Step 1 **Enter root-system username:** *username*

Enter the username of the root user. The character limit is 1023. In this example, the name of the root user is "root".

Important The specified username is mapped to the "root-lr" group on the XR console. It is also mapped as the "root-system" user on the System Admin console.

When starting the router for the first time, or after resetting the router's operating system to its default state, the router does not have any user configuration. In such cases, the router prompts you to specify the "root-system username". However, if the router has been configured previously, the router prompts you to enter the "username", as described in Step 4.

Step 2 **Enter secret:** *password*

Enter the password for the root user. The character range of the password is from 6 through 253 characters. The password that you type is not displayed on the CLI for security reasons.

The root-system username and password must be safeguarded as they have superuser privileges. They are used to access the complete router configuration.

Step 3 **Enter secret again:** *password*

Reenter the password for the root-system user. The password that you type is not displayed on the CLI for security reasons.

Step 4 **Username:** *username*

Enter the root-system username to login to the XR VM console.

Step 5 **Password:** *password*

Enter the password of the root-system user. The correct password displays the router prompt. You are now logged into the XR VM console.

Step 6 (Optional) **show run username**

Displays user details.

```
username root
 group root-lr
 group cisco-support
 secret 5 $1$NBg7$fHs1inKPZVvzqxMv775UE/
!
```

What to do next

- Configure routing functions from the XR console.
- Configure system administration settings from the System Admin prompt. The System Admin prompt is displayed on accessing the System Admin console. For details on how to get the System Admin prompt, see Access the System Admin Console, on page 8.

Access the System Admin Console

You must log in to the System Admin console through the XR console to perform all system administration and hardware management setup.

Procedure

Step 1 Log in to the XR console as the root user.

Step 2 (Optional) Disable the login banner on console port when accessing the System Admin mode from XR mode.

a) **configure**

b) **service sysadmin-login-banner disable**

Example:

```
RP/0/RSP0/CPU0:router(config)#service sysadmin-login-banner disable
```

Disable the login banner on console port in System Admin mode.

c) **commit**
d) **end**

Step 3 **admin**

Example:

The login banner is enabled by default. The following example shows the command output with the login banner enabled:

```
RP/0/RSP0/CPU0:router#admin

Mon May 22 06:57:29.350 UTC

root connected from 127.0.0.1 using console on host
sysadmin-vm:0_RP0# exit
Mon May  22 06:57:32.360 UTC
```

The following example shows the command output with the login banner disabled:

```
RP/0/RP0/CPU0:router#admin
Thu Mar 01:07:14.509 UTC
sysadmin-vm:0_RP0# exit
```

Step 4 (Optional) **exit**

Return to the XR mode from the System Admin mode.

Configure the Management Port

To use the Management port for system management and remote communication, you must configure an IP address and a subnet mask for the management ethernet interface. To communicate with devices on other networks (such as remote management stations or TFTP servers), you need to configure a default (static) route for the router.

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 and Ethernet 1 on RP are the management ports. Ensure that the port is connected to management network.

SUMMARY STEPS

1. **configure**
2. **interface MgmtEth** *rack/slot/port*
3. **ipv4 address** *ipv4-address subnet-mask*
4. **ipv4 address** *ipv4 virtual address subnet-mask*
5. **no shutdown**
6. **exit**
7. **router static address-family ipv4 unicast** *0.0.0.0/0 default-gateway*
8. Use the **commit** or **end** command.

DETAILED STEPS

Procedure

Step 1 **configure**

Example:

```
RP/0/RSP0/CPU0:router# configure
```

Enters global configuration mode.

Step 2 **interface MgmtEth** *rack/slot/port*

Example:

```
RP/0/RSP0/CPU0:router(config)#interface mgmtEth 0/RP0/CPU0/0
```

Enters interface configuration mode for the management interface of the primary RP.

Step 3 **ipv4 address** *ipv4-address subnet-mask*

Example:

```
RP/0/RSP0/CPU0:router(config-if)#ipv4 address 10.1.1.1/8
```

Assigns an IP address and a subnet mask to the interface.

Step 4 **ipv4 address** *ipv4 virtual address subnet-mask*

Example:

```
RP/0/RSP0/CPU0:router(config-if)#ipv4 address 1.70.31.160 255.255.0.0
```

Assigns a virtual IP address and a subnet mask to the interface.

Step 5 **no shutdown**

Example:

```
RP/0/RSP0/CPU0:router(config-if)#no shutdown
```

Places the interface in an "up" state.

Step 6 **exit**

Example:

```
RP/0/RSP0/CPU0:router(config-if)#exit
```

Exits the Management interface configuration mode.

Step 7 **router static address-family ipv4 unicast** *0.0.0.0/0 default-gateway*

Example:

```
RP/0/RSP0/CPU0:router(config)#router static address-family ipv4 unicast 0.0.0.0/0 12.25.0.1
```

Specifies the IP address of the default-gateway to configure a static route; this is to be used for communications with devices on other networks.

Step 8 Use the **commit** or **end** command.

commit —Saves the configuration changes and remains within the configuration session.

end —Prompts user to take one of these actions:

- **Yes** — Saves configuration changes and exits the configuration session.
- **No** —Exits the configuration session without committing the configuration changes.
- **Cancel** —Remains in the configuration session, without committing the configuration changes.

What to do next

Connect to the management port to the ethernet network. With a terminal emulation program, establish a SSH or telnet connection to the management interface port using its IP address. Before establishing a telnet session, use the **telnet ipv4|ipv6 server max-servers** command in the XR Config mode, to set number of allowable telnet sessions to the router.

Perform Clock Synchronization with NTP Server

There are independent system clocks for the XR console and the System Admin console. To ensure that these clocks do not deviate from true time, they need to be synchronized with the clock of a NTP server. In this task you will configure a NTP server for the XR console. After the XR console clock is synchronized, the System Admin console clock will automatically synchronize with the XR console clock.

Before you begin

Configure and connect to the management port.

Procedure

Step 1 **configure**

Example:

```
RP/0/RSP0/CPU0:router# configure
```

Enters global configuration mode.

Step 2 **ntp server** *server_address*

Example:

```
RP/0/RSP0/CPU0:router(config)#ntp server 64.90.182.55
```

The XR console clock is configured to be synchronized with the specified sever.