Upgrade Cisco Router and PIM Modules Firmware

Contents

Introduction

This document describes the process of upgrading Cisco Cellular compatible routers and PIM Modules P-5GS6-GL, P-5GS6-R16SA-GL and their modem firmwares.

Prerequisites

Basic understanding of Cisco 5G portfolio and Cisco IOS® XE upgrade process.

Requirements

Cisco recommends you have knowledge of:

- Cisco Routers upgrade steps and operations.
- 5G PIM Modules operations and configuration.

Components Used

- Cisco C1101-4PLTEP (17.12.3)
- P-5GS6-R16SA-GL
- P-5GS6-GL

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Background information

The 5G Sub-6 GHz Pluggable Interface Modules offer 5G capability to Cisco Routers family. The product IDs for the pluggable modules are P-5GS6-GL and P-5GS6-R16SA. The P-5GS6-GL uses the FN980 Telit modem, and P-5GS6-R16SA uses the EM9293 Seirra Wireless modem. For IR Rugged Series Router,Cisco IOS XE release 17.7.1 is the first software release to provide support for the P-5GS6-GL, where as Cisco IOS XE release 17.13.1 is the first software release to provide support for the P-5GS6-R16SA. For Cisco ISR 1000 series, 8200 and 8300 series edge platform, Cisco IOS XE release 17.9.2a is the first software release to provide support for the P-5GS6-GL, where as Cisco IOS XE release 17.12.1a is the first software release to provide support for the P-5GS6-R16SA.

Upgrades

This document describes the steps to upgrade Cisco Routers, the the PIM Modules Modems, CG522-E OS and its Modem.

Cisco Routers Upgrade

Cisco Routers are operating in either **Bundle Mode** or **Install Mode**, **Bundle Mode** refers to the router, which boots from the software .bin file directly. **Install Mode** means all the packages files are fully extracted and the router goes through the list to boot the different packages in order.

Upgrading a Router in install mode

1. Make sure the new image is transferred into the routers storage or the router can reach an external storage where the image is stored via TFTP, FTP, SFTP or SCP.

2. Start the upgrade process using the command:

<#root>

```
install add file bootflash:<image_name> activate commit
```

Example:

<#root>

```
Router# install add file bootflash:c8000be-universalk9.BLD_V177_THROTTLE_LATEST_20211021_031123_V17_7_0_
```

At the end a log message similar to this is presented:

<#root>

```
SUCCESS: install_add_activate_commit  Thu Oct 28 22:07:22 UTC 2021
```

This indicates that the add, activate and commit procedures were performed successfully.

3. Then a router reload is inittiated, it boots up with the new image.

4. To verify that the new image has been succesfully unstalled this command can be used:

```
<#root>

ROUTER#

 show version

Cisco IOS XE Software, Version

17.07.01

Cisco IOS Software [Bengaluru], c8000be Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version 17.7.1, RELE
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2021 by Cisco Systems, Inc.
Compiled Sat 21-Aug-21 03:27 by mcpre
------[further output has been omitted]------
```

For more details, refer to the configuration guide [Cisco 1000 Series Software Configuration Guide, Cisco IOS XE 17 - Installing the Software using install Commands [Cisco 1000 Series Integrated Services Routers] - Cisco](#)

Cisco PIM Modules Modem Upgrade

Modem upgrades consists of three elements, one **.cwe** file which contains the version of the modem itself, and two **.nvu** files OEM PRI and Carrier PRI. OEM PRI (Original Equipment Manufacturer Primary Rate Interface) which is responsible for the internal comunication and is tailored by the modem vendor, Carrier PRI (Carrier-Provided Primary Rate Interface) which is provided directly by telecom carriers or service providers to end users or enterprises in order to be able to access a given cellular service. For **FN980** (P-5GS6-GL Modem) the firmware image is contained in one **.bin** file. For **EM9293** (P-5GS6-R16SA-GL Modem) the firmware image is contained in two types of files: **.cwe** (based firware file) and **.nvu** (carrier PRI file and OEM PRI file). To upgrade all 3 versions on the EM9293 the firmware upgrade needs to be performed 2 separate times. This is explained in more detail under **EM9293 Upgrade** section..

1. Identify the modem model and running firmware with the command:

```
<#root>

show cellular <interface_number> hardware
```

Example:

```
<#root>

ISR2#

show cellular 0/2/0 hardware

Modem Firmware Version =

M0H.030202
```

```
Host Firmware Version = AOH.000302

Device Model ID =

FN980


International Mobile Subscriber Identity (IMSI) = 268011202523393

International Mobile Equipment Identity (IMEI) = 351533923179472

Integrated Circuit Card ID (ICCID) = 8935101812338223816

Mobile Subscriber Integrated Services

Digital Network-Number (MSISDN) =

Modem Status = Modem Online

Current Modem Temperature = 46 deg C

PRI version = 1080-115, Carrier = Generic GCF

OEM PRI version = 1080-115
```
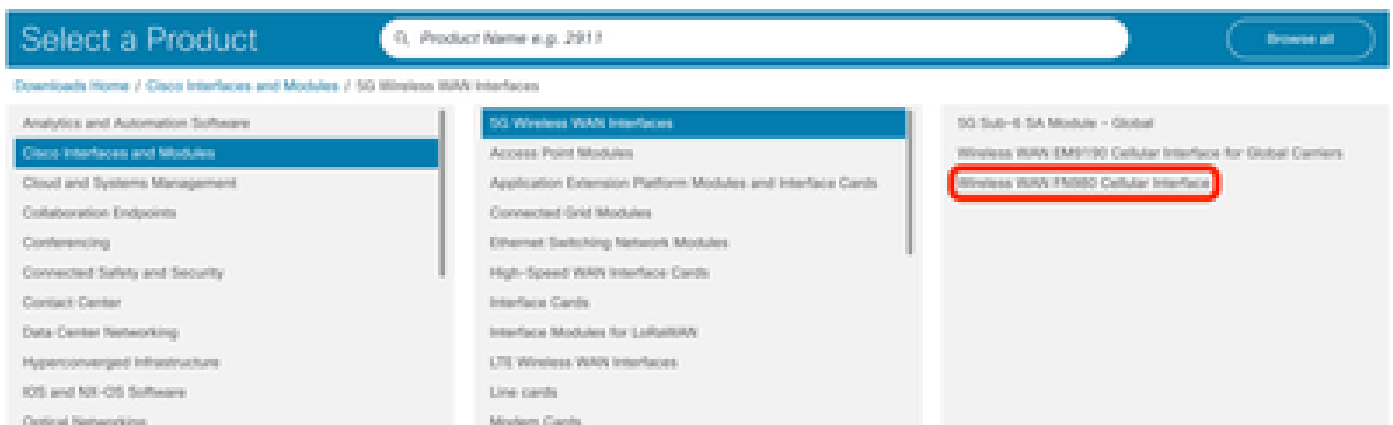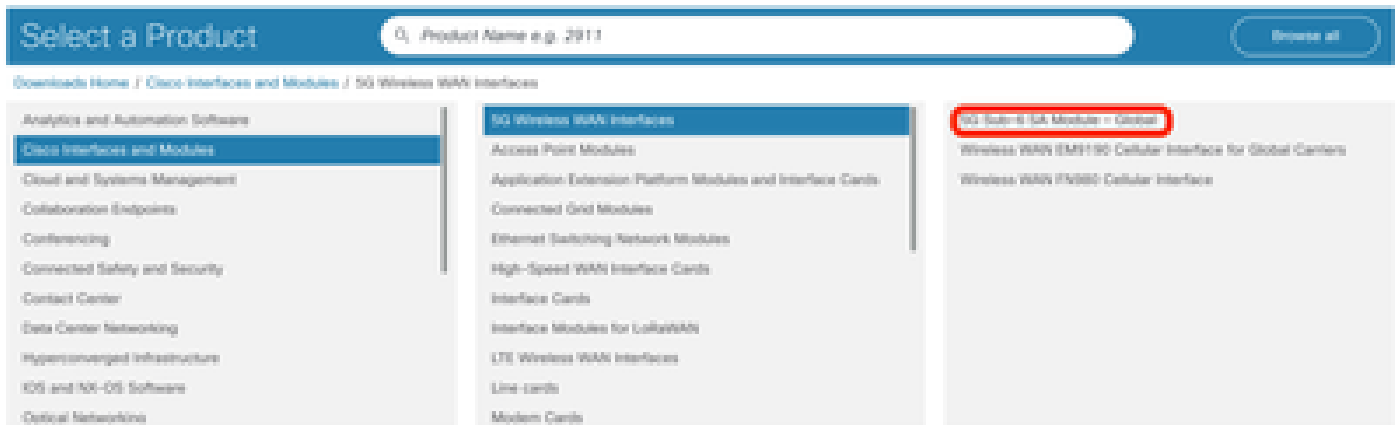
2. Download the correct file from software.cisco.com.

For this example:

If the model is EM9293, the files must be downloaded from the section below:

Depending on the modem model the next upgrade steps are followed in the section "FN980 Upgrade" or "EM9293 Upgrade".

FN980 Upgrade

1. Create a folder in flash with a name different from **firmware** or **fw**:

<#root>

mk_dir firm_new

Example:

<#root>

ISR2#

mkdir firm_new

Create directory filename [firm_new]?

Created dir bootflash:/firm_new

2. Move the firmware file to the folder created in the previous step.

3. Upgrade the firmware using the command:

<#root>

microcode reload cellular <slot> <NIM_slot> modem-provision <directory_path>

Example:

<#root>

```
ISR2#

microcode reload cellular 0 2 modem-provision bootflash:/firm_new/<file>
```

EM9293 Upgrade

For EM9293 modems, there are 3 files for firmware upgrade available:

1. CWE (based firmware file)
2. NVU (carrier PRI file)
3. NVU (OEM PRI file)

Example:

NVU (OEM PRI file)

Example:

Software Download

Select a Software Type

Cellular Modem Firmware

Cellular OEM PRI Firmware

Software Download

	5G Sub-6 SA Module - Global	
Q Search...	Release EM9293_001.002	Related Links and Documentation
Expand All Collapse All	🔒 My Notifications	Firmware Upgrade Guide
Latest Release ⌄		
EM9293_001.002		
All Release ⌄	File Information	Release Date	Size
EM9293_001.002 ❯	This OEM PRI file is only for EM9293 modem. It is compatible with modem firmware 02.13.08.00 and above. EM9293_1105171_02.13.08.00_Cisco_001.002 Advisories ☐	02-Jun-2024	0.03 MB

To update all 3 versions (based firmware, carrier PRI, and OEM PRI), firmware upgrade process needs to be performed 2 separate times:

- 1st time with .CWE (based firmware file) and .NVU (carrier PRI file) in 1 folder.
- 2nd time with .NVU (OEM PRI file) in 1 folder.

1. Upgrade the router to the latest Cisco IOS XE version.

2. Download the .cwe and the .nvu files

3. Create 2 folders in the router bootflash for each firmware upgrade process:

<#root>

Router#

mkdir bootflash:fw_vzw_em7455

Create directory filename [fw_vzw_em7455]?

Created dir bootflash:/fw_vzw_em7455

Router#

mkdir bootflash:oem_pri_em7455

```
Create directory filename [oem_pri_em7455]?

Created dir bootflash:/oem_pri_em7455
```

4. Copy the downloaded filed to the newly created folders:

```
<#root>

Router#

copy usb0:/7455_fw/74xx_02.33.03.00.cwe bootflash:/fw_vzw_em7455/


Destination filename [/fw_vzw_em7455/74xx_02.33.03.00.cwe]?
Copy in
progress...CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC CCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC CCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC CCCCCCCCCCCCCCCCCCCCCCCC
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CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC CCCCCCCCCCCCCCCCCCCCCCCC
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC CCCCCCCCCCCCCCCCCCCCCCCC
64426341 bytes copied in 3.520 secs (18302938 bytes/sec)
Router#
Router#
Router#

copy usb0:/7455_fw/7455_02.33.03.00_VERIZON_002.079_001.nvu bootflash:/fw_vzw_em7455/


Destination filename [/fw_vzw_em7455/7455_02.33.03.00_VERIZON_002.079_001.nvu]?
Copy in progress...C 17447 bytes copied in 0.024 secs (726958 bytes/sec)
Router#
Router#
Router#

copy usb0:/7455_oem_pri/EM7455_1102526_02.33.03.00_00_Cisco_000.016_000.nvu bootflash:/oem_pri_em7455/


Destination filename [/oem_pri_em7455/EM7455_1102526_02.33.03.00_00_Cisco_000.016_000.nvu]?
Copy in progress...C
18051 bytes copied in 0.028 secs (644679 bytes/sec)
Router#
```

5. Verify the files were correcly copied to the newly created folders:

```
<#root>

Router#

dir bootflash:fw_vzw_em7455


Directory of bootflash:/fw_vzw_em7455/

146884 -rw- 17447 Oct 27 2021 04:48:09 +00:00 7455_02.33.03.00_VERIZON_002.079_001.nvu
```

```
106090 -rw- 64426341 Oct 27 2021 04:46:21 +00:00 74xx_02.33.03.00.cwe

2908606464 bytes total (201584640 bytes free)
Router#
Router#
Router#
```

dir bootflash:oem_pri_em7455

```
Directory of bootflash:/oem_pri_em7455/

155047 -rw- 18051 Oct 27 2021 04:52:38 +00:00 EM7455_1102526_02.33.03.00_00_Cisco_000.016_000.nvu

2908606464 bytes total (201584640 bytes free)
Router#
```

6. Verify current firmware, carrier PRI, and OEM PRI versions:

<#root>

Router#

show cellular 0/2/0 hardware

```
Modem Firmware Version =
```

SWI9X30C_02.30.01.01

```
Device Model ID = EM7455 International Mobile Subscriber Identity (IMSI) = 311480371731931
International Mobile Equipment Identity (IMEI) = 356129073232008
Integrated Circuit Card ID (ICCID) = 89148000003650136091
Mobile Subscriber Integrated Services
Digital Network-Number (MSISDN) = 4086098674
Factory Serial Number (FSN) = LF103794050210
Modem Status = Modem Online
Current Modem Temperature = 36 deg C
PRI SKU ID = 1102526, PRI version = 002.052_003, Carrier = VERIZON
OEM PRI version = 000.012
Router#
Router#
Router#show cellular 0/2/0 firmware
Idx Carrier FwVersion PriVersion Status
1 ATT 02.32.08.00 002.067_001 Inactive
2 BELL 02.24.05.06 001.005_000 Inactive
3 GENERIC 02.30.01.01 002.045_001 Inactive
4 ROGERS 02.30.01.01 001.023_000 Inactive
5 SPRINT 02.30.01.01 002.045_000 Inactive
6 TELUS 02.30.01.01 001.023_000 Inactive
7 US-Cellular 02.30.01.01 000.020_000 Inactive
8
```

VERIZON 02.30.01.01 002.052_003 Active

```
9 VODAFONE 02.24.03.00 001.001_000 Inactive

Firmware Activation mode = AUTO
Router#
```

7. Initiate modem firware upgrade using the microcode reload command:

<#root>

microcode reload cellular 0 2 modem-provision bootflash:<path for firmware>

Upgrading the firmware and carrier PRI:

<#root>

Router#

microcode reload cellular 0 2 modem-provision bootflash:fw_vzw_em7455

```
Reload microcode? [confirm]
Log status of firmware download in router flash?[confirm]
Firmware download status will be logged in bootflash:fwlogfile
Microcode Reload Process launched for cwan slot/bay =0/2; hw type=0x102download option = 0

Router#
****************************************************
The interface will be Shut Down for Firmware Upgrade
This will terminate any active data connections.
*******************************************************Success !! send FW Upgrade command to card ********
Modem will be upgraded!
Upgrade process will take up to 15 minutes. During this time the modem will be unusable.
Please do not remove power or reload the router during the upgrade process.
**************************
*Oct 27 05:01:56.150: %LINK-5-CHANGED: Interface Cellular0/2/0, changed state to administratively down
*Oct 27 05:01:56.155: %LINK-5-CHANGED: Interface Cellular0/2/1, changed state to administratively down
-----------------------------
FIRMWARE INFO BEFORE UPGRADE:
Modem Device ID: EM7455 MODEM F/W Boot Version: SWI9X30C_02.30.01.01
Modem F/W App Version: SWI9X30C_02.30.01.01 Modem SKU ID: 1102526
Modem Package Identifier:
Modem PRI Ver: 000.012 Modem Carrier Name: VERIZON
Modem Carrier Revision: 002.052_003
-----------------------------
FW_UPGRADE: Modem needs CWE, PRI
*Oct 27 05:02:20.571: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[unbind] State[1]
*Oct 27 05:02:21.577: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[remove] State[0]
FW_UPGRADE: Upgrade begin at Wed Oct 27 05:02:24 2021
FW_UPGRADE: Upgrade end at Wed Oct 27 05:03:35 2021
FW_UPGRADE: Firmware upgrade success.....
FW_UPGRADE: Waiting for modem to become online
*Oct 27 05:03:35.331: %IOSXE-3-PLATFORM: R0/0: kernel: GobiSerial driver ttyUSB0: usb_serial_generic_su
*Oct 27 05:03:35.331: %IOSXE-3-PLATFORM: R0/0: kernel: GobiSerial driver ttyUSB0: usb_serial_generic_su
*Oct 27 05:03:45.785: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[add] State[1]
*Oct 27 05:03:45.927: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[bind] State[1]
-----------------------------
FIRMWARE INFO AFTER UPGRADE:
Modem Device ID: EM7455 MODEM F/W Boot Version: SWI9X30C_02.33.03.00
Modem F/W App Version: SWI9X30C_02.33.03.00 Modem SKU ID: 1102526
Modem Package Identifier:
Modem PRI Ver: 000.012 Modem Carrier Name: VERIZON
Modem Carrier Revision: 002.079_001
```

```
------------------------------
F/W Upgrade: Firmware Upgrade has Completed Successfully
*Oct 27 05:05:56.936: %CELLWAN-2-MODEM_UP: Modem in slot 0/2 is now UP
*Oct 27 05:05:57.141: %CELLWAN-2-MODEM_RADIO: Cellular0/2/0 Modem radio has been turned on
*Oct 27 05:05:57.152: %CELLWAN-5-FIRMWARE_SWITCH: Firmware switchover initiated for modem in slot 0/2
*Oct 27 05:06:03.152: %CELLWAN-4-MODEM_RESTART_IND: Cellular0/2/0 Modem restart reason: Request Modem R
*Oct 27 05:06:23.214: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[unbind] State[1]
*Oct 27 05:06:24.230: %CELLWAN-2-MODEM_DOWN: Modem in slot 0/2 is DOWN
*Oct 27 05:06:24.223: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[remove] State[2]
*Oct 27 05:06:30.672: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[add] State[1]
*Oct 27 05:06:30.846: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[bind] State[1]
*Oct 27 05:08:41.959: %CELLWAN-2-MODEM_UP: Modem in slot 0/2 is now UP
*Oct 27 05:08:42.162: %CELLWAN-2-MODEM_RADIO: Cellular0/2/0 Modem radio has been turned on
*Oct 27 05:08:44.159: %LINK-3-UPDOWN: Interface Cellular0/2/0, changed state to down
*Oct 27 05:08:44.163: %LINK-3-UPDOWN: Interface Cellular0/2/1, changed state to down
*Oct 27 05:09:09.216: %LINK-3-UPDOWN: Interface Cellular0/2/0, changed state to up
*Oct 27 05:09:10.216: %LINEPROTO-5-UPDOWN: Line protocol on Interface Cellular0/2/0, changed state to up
Router#
```

Upgrading OEM PRI:

```
<#root>

Router#

microcode reload cellular 0 2 modem-provision bootflash:oem_pri_em7455


Reload microcode? [confirm]
Log status of firmware download in router flash?[confirm]
Firmware download status will be logged in bootflash:fwlogfile
Microcode Reload Process launched for cwan slot/bay =0/2; hw type=0x102download option = 0

Router#
****************************************************
The interface will be Shut Down for Firmware Upgrade
This will terminate any active data connections.
****************************************************Success !! send FW Upgrade command to card

*Oct 27 05:10:29.468: %LINK-3-UPDOWN: Interface Cellular0/2/0, changed state to down
*Oct 27 05:10:30.468: %LINEPROTO-5-UPDOWN: Line protocol on Interface Cellular0/2/0, changed state to d
**************************
Modem will be upgraded!
Upgrade process will take up to 15 minutes. During this time the modem will be unusable.
Please do not remove power or reload the router during the upgrade process.
**************************
*Oct 27 05:10:34.476: %LINK-5-CHANGED: Interface Cellular0/2/0, changed state to administratively down
*Oct 27 05:10:36.480: %LINK-5-CHANGED: Interface Cellular0/2/1, changed state to administratively down
------------------------------
FIRMWARE INFO BEFORE UPGRADE:
Modem Device ID: EM7455 MODEM F/W Boot Version: SWI9X30C_02.33.03.00
Modem F/W App Version: SWI9X30C_02.33.03.00 Modem SKU ID: 1102526
Modem Package Identifier:
Modem PRI Ver: 000.012 Modem Carrier Name: VERIZON
Modem Carrier Revision: 002.079_001
------------------------------
OEM PRI for SKU :1102526.
*Oct 27 05:10:55.092: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[unbind] State[1]
*Oct 27 05:10:56.094: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[remove] State[0]
FW_UPGRADE: Upgrade begin at Wed Oct 27 05:10:58 2021
```

```
FW_UPGRADE: Upgrade end at Wed Oct 27 05:11:00 2021
FW_UPGRADE: Firmware upgrade success.....
FW_UPGRADE: Waiting for modem to become online
*Oct 27 05:11:00.225: %IOSXE-3-PLATFORM: R0/0: kernel: GobiSerial driver ttyUSB0: usb_serial_generic_sul
*Oct 27 05:11:00.225: %IOSXE-3-PLATFORM: R0/0: kernel: GobiSerial driver ttyUSB0: usb_serial_generic_sul
*Oct 27 05:11:07.693: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[add] State[1]
*Oct 27 05:11:07.841: %IOSXE-3-PLATFORM: R0/0: ngiolite: WWAN modem Action:[bind] State[1]
----------------------------
FIRMWARE INFO AFTER UPGRADE:
Modem Device ID: EM7455 MODEM F/W Boot Version: SWI9X30C_02.33.03.00
Modem F/W App Version: SWI9X30C_02.33.03.00 Modem SKU ID: 1102526
Modem Package Identifier:
Modem PRI Ver: 000.016 Modem Carrier Name: VERIZON
Modem Carrier Revision: 002.079_001
----------------------------
F/W Upgrade: Firmware Upgrade has Completed Successfully
*Oct 27 05:13:18.936: %CELLWAN-2-MODEM_UP: Modem in slot 0/2 is now UP
*Oct 27 05:13:19.141: %CELLWAN-2-MODEM_RADIO: Cellular0/2/0 Modem radio has been turned on
*Oct 27 05:13:21.140: %LINK-3-UPDOWN: Interface Cellular0/2/0, changed state to down
*Oct 27 05:13:21.143: %LINK-3-UPDOWN: Interface Cellular0/2/1, changed state to down
Router#
```

8. Verify the modem formware, carrier PRI, and OEM PRI were upgraded successfully:

```
<#root>

Router#

show cellular 0/2/0 hardware


Modem Firmware Version =

SWI9X30C_02.33.03.00


Device Model ID = EM7455
International Mobile Subscriber Identity (IMSI) = 311480371731931
International Mobile Equipment Identity (IMEI) = 356129073232008
Integrated Circuit Card ID (ICCID) = 89148000003650136091
Mobile Subscriber Integrated Services
Digital Network-Number (MSISDN) = 4086098674
Factory Serial Number (FSN) = LF103794050210
Modem Status = Modem Online
Current Modem Temperature = 37 deg C
PRI SKU ID = 1102526, PRI version = 002.079_001, Carrier = VERIZON
OEM PRI version = 000.016
Router#
Router#
Router#show cellular 0/2/0 firmware
Idx Carrier FwVersion PriVersion Status
1 ATT 02.32.08.00 002.067_001 Inactive
2 GENERIC 02.30.01.01 002.045_001 Inactive
3 SPRINT 02.30.01.01 002.045_000 Inactive
4 VERIZON 02.33.03.00 002.079_001 Active
5 VODAFONE 02.24.03.00 001.001_000 Inactive

Firmware Activation mode = AUTO
Router#
```

Conclusion

It is recommended to always run the latest software release available for Cisco Router, and the latest modem firmware as it contains the latest PRI files required for the cellular carrier support.