# Cisco 4G LTE and Cisco 4G LTE-Advanced Network Interface Module Software Configuration Guide

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This document provides an overview of the software features and configuration information for Cisco 4G LTE and Cisco 4G LTE-Advanced Network Interface Modules (NIMs) on the Cisco 4000 Series Integrated Services Router (ISR). Sections that are specific to a Cisco 4G LTE NIM will be appropriately noted with SKU and modem type.

For further information Cisco 4G LTE NIM SKUs, faceplates, and LED descriptions, see the C*isco 4G LTE and Cisco 4G LTE-Advanced Network Interface Module (NIM) Installation Guide*.

## Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, see Cisco 4G LTE NIM Features, page 6.

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

## Contents

# Overview of Cisco 4G LTE NIM

Cisco 4G LTE NIM addresses the modular 4G LTE cellular connectivity on the Cisco 4000 Series ISRs. This is the first wireless NIM, though it is not the first wireless module in the ISR product line. The closest modular card to Cisco 4G LTE NIM is the Cisco EHWIC 4G LTE, which accepts a single LTE modem. Cisco 4G LTE NIM is feature-compatible with Cisco EHWIC 4G LTE.

Cisco 4G LTE NIMs support the following 4G/3G modes:

- **4G LTE**—4G LTE mobile specification provides multi-megabit bandwidth, more efficient radio network, latency reduction, and improved mobility. LTE solutions target new cellular networks. These networks initially support up to 100 Mb/s peak rates in the downlink and up to 50 Mb/s peak rates in the uplink. The throughput of these networks is higher than the existing 3G networks
- **3G Evolution High-Speed Packet Access (HSPA/HSPA+)**—HSPA is a UMTS-based 3G network. It supports High-Speed Downlink Packet Access (HSDPA) and High-Speed Uplink Packet Access (HSUPA) data for improved download and upload speeds. Evolution High-Speed Packet Access (HSPA+) supports Multiple Input/Multiple Output (MIMO) antenna capability.
- **3G Evolution-Data Optimized (EVDO or DOrA) Mode**—EVDO is a 3G telecommunications standard for the wireless transmission of data through radio signals, typically for broadband Internet access. DOrA refers to EVDO Rev-A. EVDO uses multiplexing techniques including Code Division Multiple Access (CDMA), as well as Time Division Multiple Access (TDMA), to maximize both individual users' throughput and the overall system throughput.

Table 1 describes the Cisco 4G LTE NIM SKUs.

**Table 1 Cisco 4G LTE NIM SKUs**

| Cisco 4G LTE NIM SKUs | Description | Mode | Operating Region | Band |
|---|---|---|---|---|
| NIM-4G-LTE-GA<br>NIM-4G-LTE-GA= (Spare)<br>NIM-4G-LTE-GA+ += (TAA Spare) | Cisco LTE 2.0 4G NIM for global Wireless networks (Europe, Australia and so on).<br><br>This SKU is based on Sierra Wireless MC7304 modem. | ■ LTE<br><br>■ HSPA+/UMTS | Global | 800 MHz, 900 MHz. 1800 MHz, 2100 MHz, 2600 MHz<br><br>850 MHz, 900 MHz, 1900 MHz, 2100 MHz |
| NIM-4G-LTE-NA<br>NIM-4G-LTE-NA= (Spare)<br>NIM-4G-LTE-NA+ += (TAA Spare) | Cisco LTE 2.0 4G NIM for wireless networks in North America (AT& T and Canada).<br><br>This SKU is based on Sierra Wireless MC7354 modem. | ■ LTE<br><br>■ HSPA+, UMTS | North America (AT&T and Canada) | 700 MHz. 1900 MHz, AWS<br><br>850 MHz, 900 MHz, 1900 MHz |
| NIM-4G-LTE-VZ<br>NIM-4G-LTE-VZ= (Spare)<br>NIM-4G-LTE-VZ++ = (TAA Spare) | Cisco LTE 2.0 4G NIM for Verizon wireless networks.<br><br>This SKU is based on Sierra Wireless MC7350 modem. | ■ LTE<br><br>■ EVDO Rev-A/ 1xRTT | North America (Verizon) | AWS, 700 MHz<br><br>0, 1, 10 |
| NIM-4G-LTE-ST<br>NIM-4G-LTE-ST= (Spare)<br>NIM-4G-LTE-ST++ = (TAA Spare) | Cisco LTE 2.0 4G NIM for Sprint wireless networks.<br><br>This SKU is based on Sierra Wireless MC7350 modem. | ■ LTE<br><br>■ EVDO Rev-A/ 1xRTT | North America (Sprint) | PCS 1900 MHz<br><br>0, 1, 10 |

**Table 1 Cisco 4G LTE NIM SKUs (continued)**

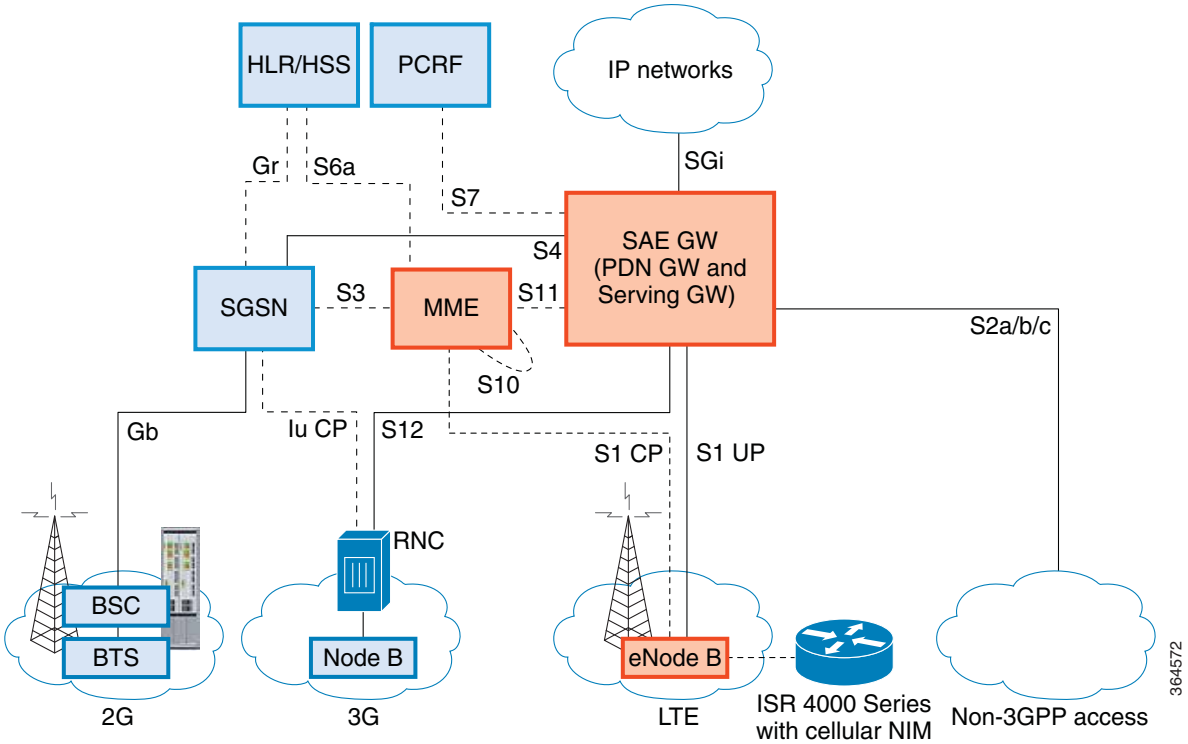
| Cisco 4G LTE NIM SKUs | Description | Mode | Operating Region | Band |
|---|---|---|---|---|
| NIM-4G-LTE-LA | Cisco 4G LTE NIM module (LTE 2.5) for LATAM/APAC carriers.<br><br>This SKU is based on Sierra Wireless MC7430 modem. | ■ LTE: FDD<br>■ LTE: TDD<br>■ DC-HSPA+, HSPA+, HSPA, UMTS<br>■ TD-SCDMA | Latin America, Asia-Pacific | LTE bands 1, 3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, and 41<br><br>FDD LTE 700 MHz (band 28), 850 MHz (band 5 CLR), 850 MHz (bands 18 and 19 Low), 900 MHz (band 8), 1500 MHz (band 21), 1800 MHz (band 3), 2100 MHz (band 1), or 2600 MHz (band 7)<br><br>TDD LTE 1900 MHz (band 39), 2300 MHz (band 40), 2500 MHz (band 41), or 2600 MHz (band 38) |
| NIM-LTEA-LA | Cisco 4G LTE-Advanced NIM module (LTE3.0) for LATAM/APAC carriers.<br><br>This SKU is based on Sierra Wireless EM7430 modem. | ■ LTE: FDD<br>■ LTE: TDD<br>■ DC-HSPA+,HSPA+, HSPA,UMTS | Latin America, Asia-Pacific | LTE bands 1, 3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, and 41<br><br>FDD LTE 700 MHz (band 28), 850 MHz (band 5 CLR), 850 MHz (bands 18 and 19 Low), 900 MHz (band 8), 1500 MHz (band 21), 1800 MHz (band 3), 2100 MHz (band 1), or 2600 MHz (band 7)<br><br>TDD LTE 1900 MHz (band 39), 2300 MHz (band 40), 2500 MHz (band 41), or 2600 MHz (band 38)<br><br>Carrier aggregation band combinations:<br><br>1+(8,18,19,21); 3+(5,7,19,28); 7+(5,7,28); 19+21, 38+38, 39+39,40+40, and 41+41 |

**Table 1 Cisco 4G LTE NIM SKUs (continued)**

| Cisco 4G LTE NIM SKUs | Description | Mode | Operating Region | Band |
|---|---|---|---|---|
| NIM-LTEA-EA | Cisco 4G LTE-Advanced NIM module (LTE3.0) for EU/NA carriers.<br><br>This SKU is based on Sierra Wireless EM7455 modem. | ■ LTE: FDD<br>■ LTE: TDD<br>■ DC-HSPA+,HSPA+, HSPA,UMTS | European Union, North America | LTE bands 1-5, 7, 12, 13, 20, 25, 26, 29, 30, and 41<br><br>FDD LTE 700 MHz (band 12), 700 MHz (band 29), 800 MHz (band 20), 850 MHz (band 5 CLR), 850 MHz (band 26 Low), 900 MHz (band 8), 1800 MHz (band 3), 1900 MHz (band 2), 1900 MHz (PCS band 25), 1700 MHz and 2100 MHz (band 4 AWS), 2100 MHz (band 1), 2300 MHz (band 30), or 2600 MHz (band 7)<br><br>TDD LTE 2500 MHz (band 41)<br><br>Carrier aggregation band combinations:<br><br>1+8; 2+(2,5,12,13,29); 3+(7,20); 4+(4,5,12,13,29); 7+(7,20); 12+30, 5+30, and 41+41 |

Figure 1 explains the Cisco 4G LTE NIM packet core network architecture.

**Figure 1 Cisco 4G LTE NIM Packet Core Network Architecture**



| | |
|---|---|
| Gateways | The Serving Gateway (SGW) routes and forwards user data packets, while also acting as the mobility anchor for the user plane, and is the anchor for mobility between LTE and other 3GPP technologies. The Packet Data Network (PDN) Gateway (PGW) provides connectivity from the User Equipment (UE) to external packet data networks by being the point of exit and entry of traffic for the UE.<br><br>A UE may have simultaneous connectivity with more than one PGW for accessing multiple PDNs. The PGW performs policy enforcement, packet filtering for each user, charging support, lawful interception, and packet screening. Another key role of the PGW is to act as the anchor for mobility between 3GPP and non-3GPP technologies such as WiMAX and 3GPP2 (CDMA 1X and EvDO).<br><br>The System Architecture Evolution GW (SAE GW) is the entity that covers the PGW and SGW functionality in the Evolved Packet Core (EPC). |
| RNC | The Radio Network Controller (RNC) is responsible for controlling the Radio Access Network (RAN) that are connected to it. The RNC carries out radio resource management and some of the mobility management functions and is the point where encryption is done before user data is sent to and from the mobile. The RNC connects to the Circuit-Switched Core Network through the Media Gateway (MGW). |
| BTS | Base Transceiver Station. |
| BSC | Base Station Controller. |
| SGSN | Service GPRS Support Node. |

# Prerequisites for Configuring Cisco 4G LTE NIM

- If the signal is not good at the router, use the Cisco offered antenna accessories and extension cables to place the antenna away from router in a better coverage area.
- You must have 4G LTE NIM network coverage where your router is physically placed. For a complete list of supported carriers, see the product data sheet http://www.cisco.com/c/en/us/products/collateral/routers/4000-series-integrated-services-routers-isr/datasheet-C78-734341.html.
- You must subscribe to a service plan with a wireless service provider and obtain a Subscriber Identity Module (SIM) card.
- You must install the SIM card before configuring the Cisco 4G LTE NIM or Cisco 4000 series router. For instructions on how to install the SIM card, see the Configuring a SIM for Data Calls, page 23 for more information.
- The standalone antenna that supports GPS capabilities must be installed for the GPS feature to work. See the *Cisco 4G Indoor/Outdoor Active GPS Antenna (GPS-ACT-ANTM-SMA)* document for installation information.

# Restrictions for Configuring Cisco 4G LTE NIM

Follow these restrictions and usage guideline while configuring Cisco 4G LTE NIM:

- Currently, cellular networks support only user initiated bearer establishment.
- Due to the shared nature of wireless communications, the experienced throughput varies depending on the number of active users or congestion in a given network.
- Cellular networks have higher latency compared to wired networks. Latency rates depend on the technology and carrier. Latency also depends on the signal conditions and can be higher because of network congestion.
- Public Land Mobile Network (PLMN) selection feature is not supported.
- Any restrictions that are part of the terms of service from your carrier.
- SMS—Only one text message up to 160 characters to one recipient at a time is supported. Larger texts are automatically truncated to the proper size before being sent.
- It is strongly recommended that you configure SNMP V3 with authentication/privacy when implementing SNMP SET operation.

# Features not supported in Cisco 4G LTE NIM

Cisco 4G LTE NIMs do not support the following Cisco IOS features:

- TTY support/ Line
- NEMO
- Chat scripts
- External Dialer

# Cisco 4G LTE NIM Features

Cisco 4G LTE NIMs support the following major features:

- Global Positioning System (GPS) and National Marine Electronics Association (NMEA) streaming

- Short Message Service (SMS)
- 3G/4G Simple Network Management Protocol (SNMP) MIB
- Virtual diagnostic monitoring
- Mobile Equipment Personalization (MEP) lock and unlock capabilities
- SIM lock and unlock capabilities

## 4G GPS and NMEA

Effective with Cisco IOS Release 15.3(3)M and later releases, the Global Positioning System (GPS) feature is enabled by default on the supported 4G LTE ISRs and Cisco 4G LTE NIMs to provide the geographical location. Both GPS and NMEA features must be configured for GPS coordinates to be obtained.

Active GPS is supported on the SubMiniature version A (SMA) port. Active GPS antenna is supported only in the standalone mode. An Active GPS antenna includes a built-in Low-Noise Amplifier that provides sufficient gain to overcome coaxial cable losses while providing the proper signal level to the GPS receiver. Active GPS antennae require power from the GPS receiver SMA port to operate. See the "Example: Connecting to a Server Hosting a GPS Application" section on page 7 for more information.

National Marine Electronics Association (NMEA) streams GPS data either from a 4G LTE NIM through a virtual COM port and a TCP/IP Ethernet connection to any marine device (such as a Windows-based PC) that runs a commercially available GPS-based application.

The following GPS and NMEA features are supported on the Cisco 4G LTE NIMs. Objects in the CISCO-WAN-3G-MIB supports GPS and NMEA features.

**Note:** Assisted GPS mode is not supported.

- GPS standalone mode (satellite-based GPS).
- Cisco IOS CLI display coordinates.
- Virtual and physical serial ports can export NMEA-formatted GPS data.
- External application displays router map location.
- The Cisco 4G LTE NIMs only support NMEA over IP.

For instructions on setting up the GPS antenna, see the *Cisco 4G Indoor/Outdoor Active GPS Antenna (GPS-ACT-ANTM-SMA)* document.

### Example: Connecting to a Server Hosting a GPS Application

You can feed the NMEA data to a remote server that hosts the GPS application. The server can be connected to the router either directly using an Ethernet cable or through a LAN or WAN network. If the application supports serial port, run a serial port emulation program to create a virtual serial port over the LAN or WAN connection.

**Note:** Microsoft Streets & Trips is a licensed software that you can download from the Microsoft website.

To connect a Cisco 4G LTE NIM through IP to a PC running Microsoft Streets & Trips, perform the following steps:

1. Connect the PC to the router using an Ethernet cable.
2. Ensure that the PC and router can ping.
3. Launch the serial port redirector on the PC.

4. Create a virtual serial port that connects to the NMEA port on the router.
5. Launch **Microsoft Streets & Trips** on your PC.
6. Select the **GPS Menu**.
7. Click **Start Tracking**.
8. If you have acquired a location fix from the **show cellular gps** command output on the router, the current location is plotted on the graph, and a reddish brown dotted cursor with a circle around it is seen on the map.

   **Note:** If you have not acquired a location fix, the Microsoft application times out and disconnects.

## Dual SIM Card

Dual SIM card allows SIMs to be active in either slot. Dual SIM card is supported only on NIM-LTEA-LA (EM7430) and NIM-LTEA-EA (EM74550).

SIM card primary slot is selected when router boots up or when NIM reloads. The default slot is 0. If SIM card is not present in the primary slot, select the alternative slot if SIM card is present.

```
controller cellular 0/x/0
      lte sim primary slot <slot#>
```

If the active SIM card loses connectivity to the network a failover to the alternative SIM card slot occurs.

## Auto SIM

Auto-SIM is supported in Sierra wireless firmware Ver 02.20.03.

A new CLI is added in the cellular controller to enable/disable Auto-SIM.

The modem in Auto-SIM mode selects the right carrier firmware after a SIM slot switch and an automatic modem reset. Auto-SIM is supported on the MC7455, MC7430, EM7430, and EM7455 modems. During bootup, if the Auto-SIM configuration on the modem doesn't match to the IOS configuration, the corresponding Auto-SIM or manual mode is pushed to the modem.

After an Auto-SIM configuration change, the modem is automatically reset. Once it is up, issue a modem power-cycle for auto-sim to take effect. The default is "auto-sim" enabled.

Enable Auto-SIM:

```
router(config)#controller cellular <slot>
router(config-controller)#lte firmware auto-sim  #default is auto-sim enabled
```

**Note**: After enabling auto-sim, wait for 5 minutes until the radio comes up. Once the radio is up, issue a modem power-cycle and wait for 3 minutes for the radio to come up again. Modem Power-Cycle is mandatory for auto-sim configuration to take effect.

Disable Auto-SIM:

```
router(config)#controller cellular <slot>
router(config-controller)#no lte firmware auto-sim
```

**Note**: After disabling auto-sim, wait for 5 minutes until the radio comes up. Once the radio is up, issue a modem power-cycle and wait for 3 minutes for the radio to come up again. Modem Power-Cycle is mandatory for auto-sim configuration to take effect.

If Auto-SIM is disabled and the modem is in manual mode, select a carrier with a new exec CLI:

```
router#cellular lte firmware-activate <firmware-index>
```

The following CLI shows the firmware-index of the carrier in the modem:

```
router#show cellular <slot> firmware
```

# Dying-Gasp

The hardware/software feature is supported on only NIM-LTEA-LA (EM7430) and NIM-LTEA-EA (EM74550). An additional daughter card is attached to NIM; this daughter card which can provide standby power to modem for 600 ms. Dying-Gasp SMS and destination is preconfigured through the CLI. On detecting power loss to NIM, the modem is triggered to send preconfigured SMS.

## Triggers

- Router power loss
- Module Reload
- Module stop or Router crash

## Configuring Dying-Gasp

### DETAILED STEPS

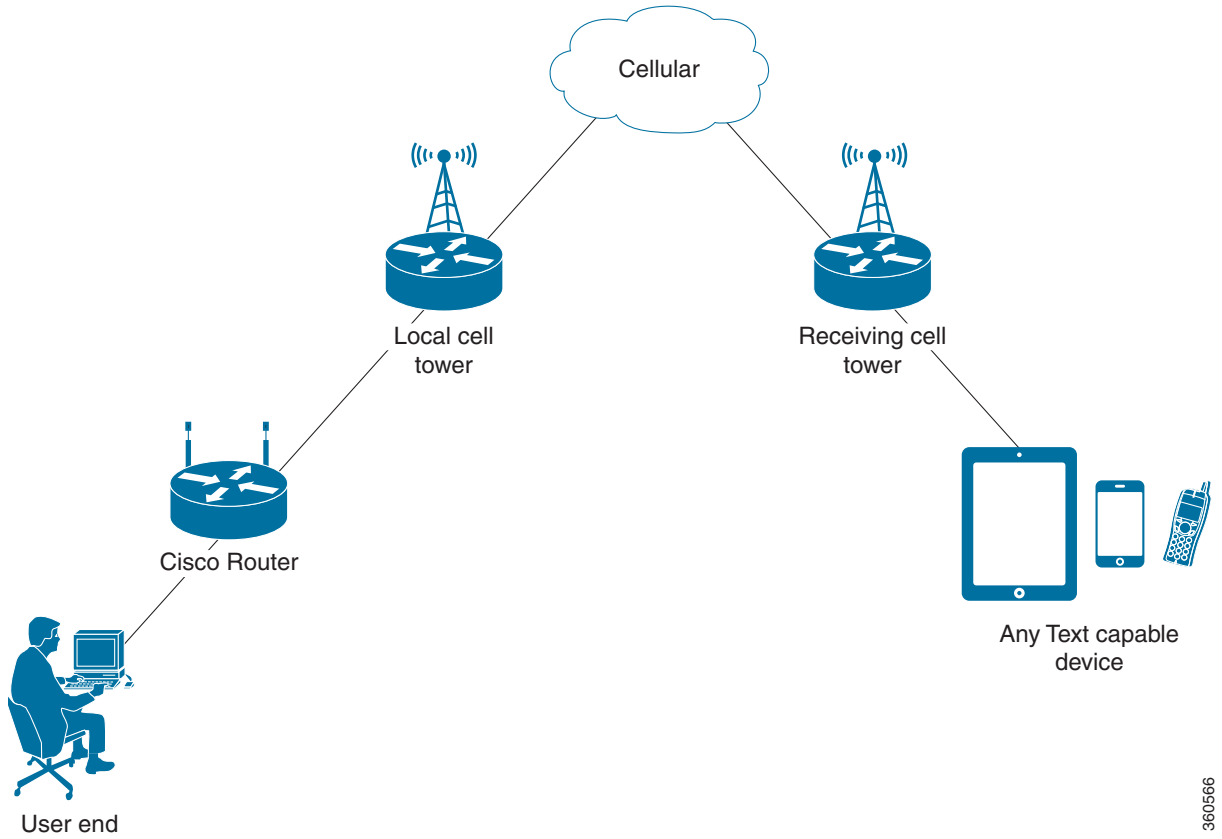
| | Command or Action | Purpose |
|---|---|---|
| **1.** | **configure terminal**<br><br>**Example**<br>`Router# configure terminal` | Enters global configuration mode. |
| **2.** | **controller cellular** *Cellular-Interface-Number*<br><br>**Example**<br>`Router(config)# controller Cellular 1` | Enters controller mode for an interface. |
| **3.** | **lte dying-gasp sms send** *destination-number sms-message*<br><br>**Example**<br>`Router(config-controller)# lte dying-gasp sms send [destination-number] [sms-message]` | Enables dying-gasp on the NIM.<br><br>*sms-message*—Maximum number of characters is 160.<br><br>destination-number is destination phone number<br><br>To disable dying-gasp use the "no" form of the command. For example:<br>`no lte dying-gasp sms send [destination-number] [sms-message]` |
| **4.** | **show cell** *Int/SubInt/Port dying-gasp*<br><br>**Example:**<br>`#show cell 0/1/0 dying-gasp`<br>`==========`<br>`Dying-Gasp Information`<br>`==========`<br>`Dying-Gasp Detach: Enabled`<br>`SMS: Enabled`<br>`SMS Message = testing for dg`<br>`Destination Number = 1234567891` | **Note:** Reset the modem in order for changes to take effect. |

# Short Message Service (SMS) Capabilities

Cisco 4G LTE NIMs support receiving, transmitting, archiving, and deleting of SMS messages. This support includes the ability to view up to 25 received texts, and archive more messages in a custom file location. SMS is supported on multiple carriers. Cisco 4G LTE NIMs also have the capability to revert from LTE SMS to 3G and 2G SMS technology if necessary.

A sending device behind a Cisco 4G LTE NIM transmits an SMS text message over the 4G cellular link through cellular towers until it the message reaches the recipient's router, which then notifies the recipient device, such as a cell phone. The receiving device uses the same process to return a reply to the sending device. Figure 2 describes the flow from a mobile device to a sending device. For SMS transmission to work, end users must have a text-capable device, and optionally, a text plan. If end users do not have a text plan, standard SMS rates apply to their text transmissions.

**Figure 2 SMS Network**




# Using a SIM Card

Cisco 4G LTE NIMs needs an active SIM card provided by a service provider. The SIM cards are usually provided in an unlocked state so that it can be used without a Personal Identification Number (PIN). If the SIM is unlocked, it can be inserted into a 4G LTE NIM and used without an authorization code.

The SIM can be initially locked with a PIN code (4 to 8 digits s long) defined by the service provider. Contact your service provider for the PIN code.

The SIM-Lock feature allows a SIM to be locked or unlocked with a PIN code so that it is used only in an authorized device. Perform the SIM lock and unlock procedures using the Cisco IOS CLI through a console or Telnet/SSH to the ISR.

After the SIM is locked, it cannot initiate a call unless authentication is done using the same PIN. Authentication is done automatically by Cisco IOS through configuration of the PIN. This mandatory configuration for automatic SIM authentication is done using the Cisco IOS CLI as part of the router startup configuration.

After the Cisco IOS configuration is in place, the ISR can initiate an LTE connection. The ISR uses the configured PIN to authenticate prior to the LTE connection. If the Cisco IOS PIN configuration is missing or if the PIN is incorrect, the SIM authentication will fail and the connection will not be initiated.

If the locked SIM is moved to a different ISR or to another device, or if the 4G LTE NIM in which the locked SIM resides is moved to a different 4G LTE NIM slot in the same ISR, the ISR configuration should be changed. The configuration is associated with the cellular controller that is specific to an ISR 4G LTE NIM slot number. This will ensure that the SIM card will not be used in any unauthorized device, or, if there are multiple 4G LTE NIMs in a single ISR, that the appropriate PIN is applied to each 4G LTE SIM. An authentication command (with the same PIN used to lock the SIM) must be defined on the new device or on the new cellular controller slot to successfully initiate the LTE connection.

The following procedures are used to configure a SIM:

- Locking and Unlocking a SIM Card Using a PIN Code, page 23
- Applying a Modem Profile in a SIM Configuration, page 26

**Caution: It is very important to use the correct PIN after it is configured. The SIM card will be blocked if the wrong PIN is entered three consecutive times on a locked SIM during authentication or when trying to unlock a locked SIM.**

You can unblock a blocked SIM card using the PUK code. Contact your service provider for the PUK code.

Use the **cellular** *<slot>* **lte sim unblock** *<PUK code> <new PIN code>* command to unblock the SIM.

# Data Account Provisioning

One or more modem data profiles can be created to provision a modem on a 4G LTE NIM. An active wireless account with a service provider with one or more (dual) SIM cards must be installed. The modem data profile is pre-configured on the modem.

The following tasks are used to verify the signal strength and service availability of the modem and to create, modify, and delete modem data profiles:

- Verifying Modem Signal Strength and Service Availability, page 13
- Guidelines for Creating, Modifying, or Deleting Modem Data Profiles, page 15

## IP Multimedia Subsystem Profiles

IP Multimedia Subsystem (IMS) profiles establish a session, and are a part of the modem configuration and are stored in the modem's NVRAM. An IMS network is an access-independent and standard-based IP connectivity service that enables different types of multimedia services to end users using common Internet-based protocols. See “Guidelines for Creating, Modifying, or Deleting Modem Data Profiles” section on page 15, for more information.

# Cisco 4G LTE NIM LEDs

Table 2 describes the LED behavior in NIM-4G-LTE-LA (MC7430).

**Table 2 Cisco 4G LTE NIM-4G-LTE-LA (MC7430) LED Description**

| LED | Color | Description |
|---|---|---|
| EN | Green (solid) | Indicates powered on status and functioning normally. |
| | Amber (solid) | Indicates module has some type of failure. |
| | Off | Indicates module does not have power. |

**Table 2 Cisco 4G LTE NIM-4G-LTE-LA (MC7430) LED Description (continued)**

| LED | Color | Description |
|---|---|---|
| WWAN | Green (solid) | Indicates the modem is powered, associated, and authenticated but not receiving or transmitting data. |
| | Green (slow blinking) | Indicates the modem is powered, but not associated or authenticated; still searching for service. |
| | Green (fast blinking) | Indicates the modem is powered and is transmitting or receiving. |
| | Amber (solid) | Indicates the modem is reserved for future use. |
| | Off | Indicates the modem is in reset mode. |
| RSSI | Green (solid) | Indicates a high RSSI (greater than –69 dBm). |
| | Blue (solid) | Indicates medium RSSI (–89 to –69dBm). |
| | Amber (solid) | Indicates low RSSI (–99 to –89dBm). |
| | Amber (blink) | Indicates RSSI is below –100dBm. |
| | Off | Indicates no service detected. |
| SERVICE | Green (solid) | Indicates 4G service is enabled (LTE). |
| | Blue (solid) | Indicates 3G service is enabled, e.g. EDVO, HSPA+. |
| | Amber (solid) | Indicates 2G service is enabled, e.g. 1xRTT, EDGE. |
| | Off | Indicates no service detected. |
| GPS | Green (solid) | Indicates GPS service is enabled. |
| | Off | Indicates the GPS is not active or not detected. |

Table 3 describes the LED behavior in NIM-LTEA-LA (EM7430) and NIM-LTEA-EA (EM7455).

**Table 3 NIM-LTEA-LA (EM7430) and NIM-LTEA-EA (EM7455) LED Description**

| LED | Color | Description |
|---|---|---|
| EN | Green (solid) | Indicates powered on status and functioning normally. |
| | Amber (solid) | Indicates module has some type of failure. |
| | Off | Indicates module does not have power. |
| SIM0 and SIM1 (LED) | Green (solid) | Indicates the modem is powered, associated, and authenticated but not receiving or transmitting data. |
| | Green (slow blinking, On 5sec, Off 200ms) | Indicates the modem is powered, but not associated or authenticated; still searching for service. |
| | Green (fast blinking, On 400ms, Off 100ms) | Indicates the modem is powered and is transmitting or receiving. |
| | Green (fast blinking, On 500ms, Off 500ms) | Indicates the modem is in low power mode. Modem radio is Off. |
| | Green (very slow blinking, On 500ms, Off 500ms, On 500ms, Off 500ms, Off 30ms | Indicates the modem is receiving power, associated, and authenticated on a roaming network. |
| | Off | Indicates the modem is in reset mode. |
| RSSI | Green (one solid) | Indicates RSSI is under –100dBm. |
| | Green (two solid) | Indicates low RSSI (–99 to –89dBm). |
| | Green (three solid) | Indicates medium RSSI (–89 to –69dBm). |
| | Green (four solid) | Indicates high RSSI (greater than –69dBm). |
| | Off | Indicates no service detected. |

**Table 3 NIM-LTEA-LA (EM7430) and NIM-LTEA-EA (EM7455) LED Description (continued)**

| LED | Color | Description |
|---|---|---|
| SERVICE | Green (solid) | Indicates 4G service is enabled (LTE). |
| | Blue (solid) | Indicates 3G service is enabled, e.g. EDVO, HSPA+. |
| | Amber (solid) | Indicates 2G service is enabled, e.g. 1xRTT, EDGE. |
| | Off | Indicates no service detected. |
| GPS | Green (solid) | Indicates GPS service is enabled. |
| | Off | Indicates the GPS is not active or not detected. |

# Configuring Cisco 4G LTE NIM

**Note:** For Cisco 4G LTE NIMs, the numbering for slot 0, wic 0, and port 0 is 0/1/0 for all commands.



## Verifying Modem Signal Strength and Service Availability

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **show cellular** *unit* **network**
2. **show cellular** *unit* **radio**
3. **show cellular** *unit* **profile**
4. **show cellular** *unit* **security**
5. **show cellular** *unit* **all**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **1.** | **show cellular** *unit* **network**<br><br>**Example**<br>`Router# show cellular 0/1/0 network` | Displays information about the carrier network, cell site, and available service. |
| **2.** | **show cellular** *unit* **radio**<br><br>**Example**<br>`Router# show cellular 0/1/0 radio` | Shows the radio signal strength.<br><br>**Note:** The RSSI should be better than -90 dBm for steady and reliable connection. |
| **3.** | **show cellular** *unit* **profile**<br><br>**Example**<br>`Router# show cellular 0/1/0 profile` | Shows information about the modem data profiles created. |
| **4.** | **show cellular** *unit* **security**<br><br>**Example**<br>`Router# show cellular 0/1/0 security` | Shows the security information for the modem, such as SIM and modem lock status. |
| **5.** | **show cellular** *unit* **all**<br><br>**Example**<br>`Router# show cellular 0/1/0 all` | Shows consolidated information about the modem, profiles created, radio signal strength, network security, and so on. |

# Guidelines for Creating, Modifying, or Deleting Modem Data Profiles

You can create multiple profiles on Cisco 4G LTE NIMs. We support only 7300 based modems for the Cisco 4G LTE NIMs. The following are the default Internet profile numbers for some of the modems:

- EM7430 – Profile 1
- EM7455 (Verizon or Sprint) – Both Profile 1 and Profile 3
- EM7455 (AT&T or other SP's) – Profile 1

Follow these guidelines when you configure a data profile using exec mode or config mode:

- In most cases, you do not have to make any profile-related changes if your modem comes with a data profile, for instance, AT&T, Sprint and Verizon.
- If any profile parameter changes are required for a connection type, the changes will most likely be carried out in the default profiles.
- To configure different profile types and use them for a different connection, you can create separate profiles with different parameters (for instance, APN names). Note that only one profile is active at a given time.
- Use the **show cellular <unit> profile** command to view the data profile. An asterisk(*) symbol is displayed against the data profile. Double asterisk(**) symbol is displayed against the attach profile.
- The data profile is used to set up a data call. If you want to use a different profile, that profile needs to be made the default one. Use the **lte sim data-profile** *number* command to change the default profile under controller cellular 0/2/0.

For information on supported modems on each SKU, see Table 1, Table 2, Table 3 and Table 4.

## Creating, Modifying, or Deleting Data Profiles Using EXEC Mode

**Note:** For the 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **cellular** *unit* **lte profile** *[***create** | **delete***] profile-number [apn [authentication [username password [bearer-type]]]]*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **cellular** *unit* **lte profile** *[***create** *\|* **delete***]* *profile-number [apn [authentication [username password [bearer-type]]]]*<br><br>**Example**<br>`Router# cellular 0/1/0 lte profile create 2 apn.com pap username pwd ipv4` | Creates, modifies, or deletes a modem data profile in the privileged EXEC mode.<br>■ The *profile-number* argument specifies the profile number created for the modem. The maximum number of profiles that can be created for each modem is given as follows:<br>– EM7455 – Up to 16 profiles<br>– EM7430 – Up to 16 profiles<br>■ (Optional) The *apn* argument specifies an Access Point Name (APN) in the profile. An APN is provided by your service provider. Only a single APN can be specified in a single profile.<br>■ (Optional) The *authentication* parameter specifies the authentication type used. Acceptable parameters are **chap**, **none** (no authentication), **pap**, and **pap_chap** (PAP or CHAP authentication).<br>■ (Optional) The *username* and *password* arguments are given by a service provider.<br>■ (Optional) The *bearer-type* parameter specifies **the type of data payload exchanged over the air link when the packet data session is established with this profile. Acceptable data type parameters are: ipv4**, **ipv6**, and **ipv4v6** (IPv4 and IPv6). |

## Creating, Modifying, or Deleting Data Profiles Using Configuration Mode

**Note:** For the 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **profile id** *id* **apn** *apn name [authentication [username password ]* **pdn-type** [*pdn-type [no-overwrite]]]]*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **profile id** *id* **apn** *apn name [authentication [username password ]* **pdn-type** [*pdn-type [no-overwrite]]]]*<br><br>**Example**<br>`Router(config-controller) profile id 1`<br>`apn apn_internet authentication none`<br>`pdn-type ipv4 no-overwrite` | Configures cellular profile in the configuration mode.<br>■ The id argument specifies the profile number created for the modem. The maximum number of profiles that can be created for each modem is given as follows:<br>■ EM7455 – Up to 16 profiles<br>■ EM7430 – Up to 16 profiles<br>■ (Optional) The apn argument specifies an Access Point Name (APN) in the profile. An APN is provided by your service provider. Only a single APN can be specified in a single profile.<br>■ (Optional) The authentication parameter specifies the authentication type used. Acceptable parameters are chap, none (no authentication), pap, and pap_chap (PAP or CHAP authentication).<br>■ (Optional) The username and password arguments are given by a service provider. These are mandatory when an authentication type is used other than none.<br>■ (Optional) The pdn-type parameter specifies **the type of packet data session established with mobile network using this profile. Acceptable parameters are: ipv4, ipv6**, and ipv4v6 (IPv4 and IPv6).<br>■ (Optional) No-overwrite action to be taken when a profile already exists in modem for the profile id. If there is a profile already existing in modem for this profile id and no-overwrite option is specified, this configuration will not overwrite existing profile. Default is overwrite. |

## Configuration Examples

The following example shows how to change a default profile on Cisco 4G LTE NIM:

```
router(config-controller)# lte sim data-profile 2 attach-profile 1
router(config-controller)# end
router#
router# sh run
Building configuration...
controller Cellular 0/1/0
 lte sim profile 2
router# ping 8.8.4.4 rep 10
Type escape sequence to abort.
Sending 10, 100-byte ICMP Echos to 8.8.4.4, timeout is 2 seconds:
!!!!!!!!!!
Success rate is 100 percent (10/10), round-trip min/avg/max = 284/364/600 ms
```

```
router#
```

The following example shows the output of the **show cellular** command:

```
router# show cellular 0/2/0 profile
Profile 1 = INACTIVE
--------
PDP Type = IPv4
Access Point Name (APN) = Broadband
Authentication = None

Profile 2 = INACTIVE
--------

Profile 16 = ACTIVE* **
--------
PDP Type = IPv4
PDP address = 10.207.206.25
Access Point Name (APN) = Broadband
Authentication = None
        Primary DNS address = 172.26.38.1
        Secondary DNS address = 172.26.38.2

  * - Default profile
 ** - LTE attach profile
 ** - LTE attach profile
```

The following example shows the output of the **show cellular** command before you enable the debug command:

```
router# show cellular 0/1/0 profile
Profile 1 = INACTIVE **
--------
PDP Type = IPv6
Access Point Name (APN) = vzwims
Profile 2 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwadmin
Profile 3 = ACTIVE*
--------
PDP Type = IPv4v6
PDP address = 10.187.130.3
Access Point Name (APN) = VZWINTERNET
        Primary DNS address = 198.224.173.135
        Secondary DNS address = 198.224.174.135
Profile 4 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwapp

  * - Default profile    /* Note
 ** - LTE attach profile  /* note
```

The following example shows the output of the **show cellular** command after you enable the debug command:

```
router# debug cellular 0/1/0 messages profile
PROFILE_3GPP2 debugging is on
router#
router #show cellular 0/1/0 profile
Profile 1 = INACTIVE **
--------
PDP Type = IPv6
Access Point Name (APN) = vzwims
Profile 2 = INACTIVE
--------
```

```
PDP Type = IPv4v6
Access Point Name (APN) = vzwadmin
Profile 3 = ACTIVE*
--------
PDP Type = IPv4v6
PDP address = 10.187.130.3
Access Point Name (APN) = VZWINTERNET
        Primary DNS address = 198.224.173.135
        Secondary DNS address = 198.224.174.135
Profile 4 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwapp

3GPP2 Profiles:
==============
Profile 1 = INACTIVE
--------
PDN Type = IPv6
Access Point Name (APN) = vzwims
Profile 2 = INACTIVE
--------
PDN Type = IPv4v6
Access Point Name (APN) = vzwadmin
Profile 3 = INACTIVE*
--------
PDN Type = IPv4v6
Access Point Name (APN) = VZWINTERNET
Profile 4 = INACTIVE
--------
PDN Type = IPv4v6
Access Point Name (APN) = vzwapp

Profile 5 = INACTIVE
--------
PDN Type = IPv4v6
Access Point Name (APN) =
Profile 6 = INACTIVE
--------
PDN Type = IPv4v6
Access Point Name (APN) =
  * - Default profile
 ** - LTE attach profile
```

## Configuration Example

Example Configuration under Controller Cellular

router(config-controller)# **profile id 1 apn apn_internet authentication none pdn-type ipv4 no-overwrite**

**Controller Cellular Running Configuration**

```
router(config-controller)# profile id 1 apn apn_internet authentication none pdn-type ipv4 no-overwrite
Controller Cellular Running Configuration
Router #show running-config controller cellular <slot>
Building configuration...
Current configuration : 330 bytes
!
controller Cellular 0/2/0
```

```
profile id 1 apn apn_internet authentication none pdn-type ipv4 no-overwrite
end
** This will override exec mode profile configuration
** If for a profile ID, configuration CLI exists, exec mode configuration cannot be
performed.
Router #show cellular <slot> profile 5
Profile 5 = INACTIVE
 --------
PDP Type = IPv4
  Access Point Name (APN) = apn_old
 Authentication = None
TSN1#cellular <slot> lte profile create 5 apn_new

Warning: You are attempting to create Profile 5
 Profile 5 was configured through controller configuration 'profile id <profile #>'
Please execute command under controller configuration using '[no] profile id <profile #>'
for profile 5 to create
Profile 5 NOT written to modem
** As part of this enhancement, any attach and/or data profile changes will immediately
trigger a connection reset and take effect. Below warning message will be displayed.
Warning: You are attempting to modify the data/attach profile.
Connection will be reset
```

# Multiple PDN Contexts

This feature enables router to connect to multiple (currently two) packet data networks. This allows users to enable different features independently on each PDN. For instance, the first PDN can be used for public Internet access and the second one for VPN connectivity; each PDN has its own set of IP addresses and QoS characteristics.

During the initialization of the router, two cellular interfaces corresponding to the two PDNs are created:

cellular 0/x/0 and cellular 0/x/1

These interfaces can be viewed as two logical interfaces using the same radio resources.

Here onwards, the interface cellular 0/x/0 is referred as the first PDN, and cellular 0/x/1 as the second PDN.

The first step, in bringing up the two PDNs, is applying the configuration on both the cellular interfaces and their corresponding lines, in order to make two simultaneous data calls.

The next step is associating the data-bearer profile with its corresponding cellular interface or PDN. It is sufficient to associate the profile for just the first PDN under the controller cellular configuration. Note that the second PDN assumes a profile that is just one above the profile used for the first PDN. For example, if the first PDN uses profile 1, the second PDN uses profile 2 automatically when the call is initiated for the second one.

After the interesting traffic is routed through these cellular interfaces, data calls are initiated and each interface is assigned its own IP and DNS addresses provided by the cellular network. Note that both PDNs share radio resources. Therefore, any throughput measurement needs to take into account the aggregate throughput on both PDNs, instead of just one.

## Configuration Examples

The following example shows how to configure multiple PDN on Cisco 4G LTE NIM:

```
interface Cellular0/1/0
ip address negotiated
dialer in-band
dialer idle-timeout 0
dialer-group 1
ipv6 enable
pulse-time 1
!
```

```
interface Cellular0/1/1
ip address negotiated
dialer in-band
dialer idle-timeout 0
dialer-group 1
!
ip route 141.141.141.141 255.255.255.255 Cellular0/1/0
ip route 192.169.187.254 255.255.255.255 Cellular0/1/1
!
```

The following show commands can be used to verify the status of the multiple PDN calls:

```
C800-router#sh cellular 0/1/0 profile
Profile 1 = ACTIVE* **
--------
PDP Type = IPv4
PDP address = 21.21.21.204
Access Point Name (APN) = basic
Authentication = None
Primary DNS address = 171.70.168.183
Secondary DNS address = 173.36.131.10
Profile 2 = ACTIVE
--------
PDP Type = IPv4
PDP address = 22.22.22.111
Access Point Name (APN) = mpdn
Authentication = None
Primary DNS address = 171.70.168.183
Secondary DNS address = 173.36.131.10
Profile 3 = INACTIVE
--------PDP Type = IPv4
Access Point Name (APN) = aaaauth
Authentication = None
Profile 4 = INACTIVE
--------
PDP Type = IPv4
Access Point Name (APN) = basic2
Authentication = None
* - Default profile
** - LTE attach profile
Configured default profile for active SIM 0 is profile 1.
Configured default profile for active SIM 0 is profile 1.

Router#show cellular 0/1/0 connection
Profile 1, Packet Session Status = INACTIVE
Profile 2, Packet Session Status = INACTIVE
Profile 3, Packet Session Status = INACTIVE
Profile 4, Packet Session Status = INACTIVE
Profile 5, Packet Session Status = INACTIVE
Profile 6, Packet Session Status = INACTIVE
Profile 7, Packet Session Status = INACTIVE
Profile 8, Packet Session Status = INACTIVE
Profile 9, Packet Session Status = INACTIVE
Profile 10, Packet Session Status = INACTIVE
Profile 11, Packet Session Status = INACTIVE
Profile 12, Packet Session Status = INACTIVE
Profile 13, Packet Session Status = INACTIVE
Profile 14, Packet Session Status = INACTIVE
Profile 15, Packet Session Status = INACTIVE
Profile 16, Packet Session Status = ACTIVE
        Cellular0/2/0:
        Data Transmitted = 4070941 bytes, Received = 178728669 bytes
        IP address = 10.207.206.25
        Primary DNS address = 172.26.38.1
        Secondary DNS address = 172.26.38.2
```

```
Router#

Router#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   10.1.0.254      YES NVRAM  up                    up
GigabitEthernet0/0/1   172.19.151.180  YES TFTP   administratively down down
Cellular0/1/0          10.207.206.25   YES IPCP   up                    up
Cellular0/1/1          unassigned      YES NVRAM  administratively down down
GigabitEthernet0       unassigned      YES NVRAM  up                    up
Tunnel1                80.1.1.1        YES NVRAM  up                    down
Vlan1                  unassigned      YES NVRAM  up                    down
Router#

Router#show ip dns view
DNS View default parameters:
DNS Resolver settings:
  Domain lookup is enabled
  Default domain name:
  Domain search list:
  Domain name-servers:
    8.8.8.8
    172.26.38.1
    172.26.38.2
DNS Server settings:
  Forwarding of queries is enabled
  Forwarder addresses:
Router#

C800-router#sh cellular 0 connection
Profile 1, Packet Session Status = ACTIVE
Cellular0:
Data Transmitted = 600 bytes, Received = 500 bytes
IP address = 21.21.21.204
Primary DNS address = 171.70.168.183
Secondary DNS address = 173.36.131.10
Profile 2, Packet Session Status = ACTIVE
Cellular1:
Data Transmitted = 1800 bytes, Received = 1800 bytes
IP address = 22.22.22.111
Primary DNS address = 171.70.168.183
Secondary DNS address = 173.36.131.10
Profile 3, Packet Session Status = INACTIVE
Profile 4, Packet Session Status = INACTIVE
Profile 5, Packet Session Status = INACTIVE
Profile 6, Packet Session Status = INACTIVE
Profile 7, Packet Session Status = INACTIVE
Profile 8, Packet Session Status = INACTIVE
Profile 9, Packet Session Status = INACTIVE
Profile 10, Packet Session Status = INACTIVE
Profile 11, Packet Session Status = INACTIVE
Profile 12, Packet Session Status = INACTIVE
Profile 13, Packet Session Status = INACTIVE
Profile 14, Packet Session Status = INACTIVE
Profile 15, Packet Session Status = INACTIVE
Profile 16, Packet Session Status = INACTIVE

C800-router#sh ip interface brief
Interface              IP-Address      OK? Method Status          Protocol
Cellular0                21.21.21.204   YES IPCP   up              up
Cellular1                22.22.22.111   YES IPCP   up              up
FastEthernet0        unassigned      YES unset  up              up
FastEthernet1        unassigned      YES unset  down            down
FastEthernet2        unassigned      YES unset  down            down
FastEthernet3        unassigned      YES unset  down            down
GigabitEthernet0    unassigned     YES NVRAM  down        down
```

```
Loopback0              1.1.1.1             YES NVRAM  up             up
Serial0                unassigned          YES NVRAM  administratively down down
Vlan1                  5.13.1.22           YES NVRAM  up             up
Vlan2                  72.119.152.9 YES NVRAM  down           down
```

# Configuring a SIM for Data Calls



## Locking and Unlocking a SIM Card Using a PIN Code

Perform this task to lock or unlock a SIM card given by your service provider.

**Caution: The SIM card gets blocked if the wrong PIN is entered three consecutive times. Make sure you enter the correct PIN the SIM is configured with. If your SIM card gets blocked, contact your service provider for a PUK code. Using the PUK code, you can unblock the SIM card.**

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **cellular** *unit* **lte sim** {**lock** | **unlock**} *pin*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **cellular** *unit* **lte sim** {**lock** \| **unlock**} *pin*<br><br>**Example**<br>`Router# cellular 0/1/0 lte sim lock 1111` | Locks or unlocks the SIM card using a PIN code.<br><br>■ *pin*—A code (4 to 8 digits long) provided by your carrier to lock or unlock the SIM card. |

## Changing the PIN Code

Perform this task to change the PIN code of a SIM.

**Note:** For the 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **cellular** *unit* **lte sim change-pin** *pin new-pin*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **cellular** *unit* **lte sim change-pin** *pin new-pin*<br><br>**Example**<br>`Router# cellular 0/1/0 lte sim change-pin 1111 1234` | Changes the assigned PIN code. SIM should be in locked state when the PIN is being changed. |

## Verifying the Security Information of a Modem

Perform this task to verify the security information of a modem.

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **show cellular** *unit* **security**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **show cellular** *unit* **security**<br><br>**Example**<br>`Router# show cellular 0/1/0 security` | Shows the security information of the modem, including the SIM lock status. |

## Configuring Automatic Authentication for a Locked SIM

An unencrypted PIN can be configured to activate the Card Holder Verification (CHV1) code that authenticates a modem.

**Caution: The SIM card gets blocked if the wrong PIN is entered three consecutive times. Make sure you enter the correct PIN the SIM is configured with. If your SIM card gets blocked, contact your service provider for a PUK code.**

**Note:** Follow these procedures when using an unencrypted Level 0 PIN to configure CHV1. For instructions on how to configure CHV1 using an encrypted Level 7 PIN, see the "Configuring an Encrypted PIN for a SIM" section on page 25.

**Note:** A SIM should be locked for SIM authentication to work. To verify the SIM's status, use the **show cellular** *unit* **security** command.

**Note:** For the 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **configure terminal**
2. **controller cellular** *unit*
3. **lte sim authenticate 0** *pin*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example**<br>`Router# configure terminal` | Enters global configuration mode. |
| 2. | **controller cellular** *unit*<br><br>**Example**<br>`Router(config)# controller cellular 0//1/0` | Enters the cellular controller configuration mode. |
| 3. | **lte sim authenticate 0** *pin* | Authenticates the SIM CHV1 code by using an unencrypted (**0**) keyword and PIN. This PIN is sent to the modem for authentication with each subsequent LTE connection. If authentication passes based on the configured PIN, the data call is allowed. If authentication fails, the modem does not initiate the data call.<br><br>**Note:** This command is valid only when an unencrypted PIN is used. To configure CHV1 code using an encrypted PIN, see the "Configuring an Encrypted PIN for a SIM" section on page 25. |

## Configuring an Encrypted PIN for a SIM

To configure an encrypted PIN, the scrambled value of the PIN must be obtained. To get the scrambled Level 7 PIN and to configure the SIM CHV1 code for verification using this encrypted PIN, enter the following commands in the EXEC mode.

**Note:** When obtaining the encrypted PIN for a SIM, a username and password are created by configuring password encryption, defining the username and associated password, copying the resulting scrambled password, and using this scrambled password in the SIM authentication command. After the scrambled PIN has been obtained and used in SIM authentication, the username created can be deleted from the Cisco IOS configuration.

**Note:** A SIM should be locked for SIM authentication to work. To verify the SIM's status, use the **show cellular** *unit* **security** command.

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **configure terminal**
2. **service password-encryption**
3. **username** *name* **privilege 0 password** *pin*
4. **do show run | i** *name*
5. **controller cellular** *unit*
6. **lte sim authenticate** {**0** | **7**} *pin*
7. **exit**
8. **no username** *name*

9. **no service password-encryption**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example**<br>`Router# configure terminal` | Enters global configuration mode. |
| 2. | **service password-encryption**<br><br>**Example**<br>`Router(config)# service password-encryption` | Enables password encryption. |
| 3. | **username** *name* **privilege 0 password** *pin*<br><br>**Example**<br>`Router(config)# username SIM privilege 0 password 1111` | Creates username and password.<br><br>■ *name*–Specifies the username.<br><br>■ *pin*–Specifies the four- to eight-digit PIN code. |
| 4. | **do show run \| i** *name*<br><br>**Example**<br>`Router(config)# do show run \| i SIM` | Shows the username configuration line with the encrypted level 7 PIN for the username (user "SIM" in the example shown).<br><br>Copy the scrambled password (as the PIN). |
| 5. | **controller cellular** *unit*<br><br>**Example**<br>`Router(config)# controller cellular 0/1/0` | Enters the cellular controller configuration mode. |
| 6. | **lte sim authenticate** {**0** \| **7**} *pin* | Authenticates the SIM CHV1 code by using the encrypted keyword **7** and the scrambled PIN. The PIN is sent to the modem for authentication with each subsequent LTE connection. If authentication passes based on the configured PIN, the data call is allowed. If authentication fails, the modem does not initiate the data call. |
| 7. | **exit**<br><br>**Example**<br>`Router(config-controller)# exit` | (Optional) Exits the cellular controller configuration mode. |
| 8. | **no username** *name*<br><br>**Example**<br>`Router(config)# no username SIM` | (Optional) Removes the username and password. |
| 9. | **no service password-encryption**<br><br>**Example**<br>`Router(config)# no service password-encryption` | (Optional) Disables password encryption. |

## Applying a Modem Profile in a SIM Configuration

### SUMMARY STEPS

1. **configure terminal**
2. **controller cellular** *unit*
3. **lte sim data-profile** *number* **attach-profile** *number*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example**<br>`Router# configure terminal` | Enters the global configuration mode. |
| 2. | **controller cellular** *unit*<br><br>**Example**<br>`Router(config)# controller cellular 0/1/0` | Enters the cellular controller configuration mode. |
| 3. | **lte sim data-profile** *number* **attach-profile** *number* | Applies the configured profile number to the SIM and its slot number. The default (primary) slot is 0.<br><br>The **attach profile** is the profile used by the modem to attach to the LTE network.<br><br>The **data profile** is the profile used to send and receive data over the cellular network. |

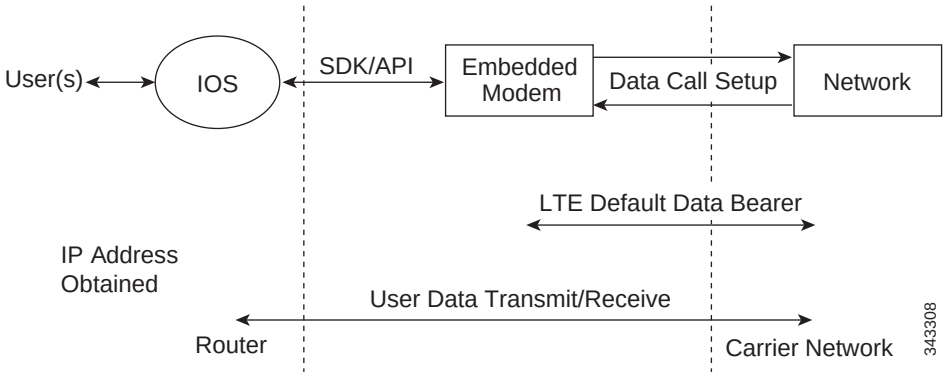
## Data Call Setup

To set up a data call, use the following procedures:

- Configuring the Cellular Interface, page 27
- Configuring DDR, page 29

Figure 3 shows a typical data call setup.

**Figure 3 Data Call Setup with Cisco 4G LTE NIM**




## Configuring the Cellular Interface

To configure the cellular interface, enter the following commands starting in EXEC mode.

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **configure terminal**

2. **interface cellular** *unit*
3. **ip address negotiated**
4. **dialer in-band**
5. **dialer-group** *group-number*
6. **exit**
7. **ip route** *network-number network-mask* {*ip-address* | *interface*} [*administrative distance*] [**name** *name*]
8. **dialer-list** *dialer-group* **protocol** *protocol-name* {**permit** | **deny** | **list** *access-list-number* | **access-group**}

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example**<br>`Router# configure terminal` | Enters global configuration mode. |
| 2. | **interface cellular** *unit*<br><br>**Example**<br>`Router(config)# interface cellular 0/1/0` | Specifies the cellular interface. |
| 3. | **ip address negotiated**<br><br>**Example**<br>`Router(config-if)# ip address negotiated` | Specifies that the IP address for a particular interface is dynamically obtained. |
| 4. | **dialer in-band**<br><br>**Example**<br>`Router(config-if)# dialer in-band` | Enables DDR and configures the specified serial interface to use in-band dialing. |
| 5. | **dialer-group** *group-number*<br><br>**Example**<br>`Router(config-if)# dialer-group 1` | Specifies the number of the dialer access group to which the specific interface belongs. |
| 6. | **exit**<br><br>**Example**<br>`Router(config-if)# exit` | Enters the global configuration mode. |
| 7. | **ip route** *network-number network-mask* {*ip-address* \| *interface*} [*administrative distance*] [**name** *name*]<br><br>**Example**<br>`Router(config)# ip route 209.165.200.225 255.255.255.224 cellular 0/1/0` | Establishes a floating static route with the configured administrative distance through the specified interface.<br><br>**Note:** A higher administrative distance should be configured for the route through the backup interface so that it is used only when the primary interface is down. |
| 8. | **dialer-list** *dialer-group* **protocol** *protocol-name* {**permit** \| **deny** \| **list** *access-list-number* \| **access-group**}<br><br>**Example**<br>`Router(config)# dialer-list 1 protocol ip list 1` | Creates a dialer list for traffic of interest and permits access to an entire protocol. |

**Note:** If a tunnel interface is configured with **ip unnumbered cellular 0/1/0**, it is necessary to configure the actual static IP address under the cellular interface, in place of **ip address negotiated**.

## Configuring DDR

To configure DDR for the cellular interface, enter the following commands starting in EXEC mode.

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and port separated by slashes (0/1/0).

### SUMMARY STEPS

1. **configure terminal**
2. **interface cellular** *unit*
3. **ip address negotiated**
4. **dialer in-band**
5. dialer pool-member *number*
6. **ip address negotiated**
7. dialer pool *number*
8. **dialer idle-timeout** *seconds*
9. **dialer-group** *group-number*
10. **exit**
11. **dialer-list** *dialer-group* **protocol** *protocol-name* {**permit** | **deny** | **list** *access-list-number* | **access-group**}
12. **access-list** *access-list-number* **permit** *ip-source-address*

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example**<br>`Router# configure terminal` | Enters global configuration mode. |
| 2. | **interface cellular** *unit*<br><br>**Example**<br>`Router(config)# interface cellular 0/1/0` | Specifies the cellular interface. |
| 3. | **ip address negotiated**<br><br>**Example**<br>`Router(config-if)# ip address negotiated` | Specifies that the IP address for a particular interface is dynamically obtained. |
| 4. | **dialer in-band**<br><br>**Example**<br>`Router(config-if)# dialer in-band` | Enables DDR and configures the specified serial interface to use in-band dialing. |

| | Command or Action | Purpose |
|---|---|---|
| 5. | **dialer pool-member** *number*<br><br>**Example:**<br>`Router(config-if)# dialer pool-member 1` | Specifies the number of a dialer profile's dialing pool to which the specific interface belongs. |
| 6. | **ip address negotiated**<br><br>**Example:**<br>`Router(config-if)# ip address negotiated` | Specifies that the IP address for a particular interface is dynamically obtained. |
| 7. | **dialer pool** *number*<br><br>**Example:**<br>`Router(config-if)# dialer pool 1` | Specifies the number of a dialing pool that the dialer interface can use to connect to a specific destination subnetwork. |
| 8. | **dialer idle-timeout** *seconds*<br><br>**Example:**<br>`Router(config-if)# dialer idle-timeout 30` | Specifies the duration of idle time, in seconds, after which a line will be disconnected. |
| 9. | **dialer-group** *group-number*<br><br>**Example:**<br>`Router(config-if)# dialer-group 1` | Specifies the number of the dialer access group to which the specific interface belongs. |
| 10. | **exit**<br><br>**Example:**<br>`Router(config-if)# exit` | Enters the global configuration mode. |
| 11. | **dialer-list** *dialer-group* **protocol** *protocol-name* {**permit** \| **deny** \| **list** *access-list-number* \| **access-group**}<br><br>**Example:**<br>`Router(config)# dialer-list 1 protocol ip list 1` | Creates a dialer list for traffic of interest and permits access to an entire protocol. |
| 12. | **access-list** *access-list-number* **permit** *ip-source-address*<br><br>**Example:**<br>`Router(config)# access-list 1 permit any` | Defines traffic of interest. |

# Enabling 4G GPS and NMEA Data Streaming

GPS NMEA data streaming to external NMEA 2.0-compliant GPS plotter applications can be enabled on Cisco 4G LTE NIMs.

**Note:** For the Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and the port, and is separated by slashes (0/1/0).

## SUMMARY STEPS

1. **configure terminal**
2. **controller cellular** *unit*

3. **(Optional) lte gps enable**
4. **lte gps mode standalone**
5. **lte gps nmea {ip | udp [***source address***][***destination address***][***destination port***]}**
   **or**
   **lte gps nmea**
6. **end**
7. **show cellular** *unit* **gps**
8. **show cellular *unit* gps detail**
9. **show running**

## DETAILED STEPS

| | Command | Description |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters the configuration mode. |
| 2. | **controller cellular** *unit*<br><br>**Example:**<br>`Router(config)# controller cellular 0/1/0` | Enters the controller cellular configuration mode. |
| 3. | `lte gps enable`<br><br>**Example:**<br>`Router(config-controller)# lte gps enable` | (Optional) GPS is enabled by default. Use this command to enable the GPS feature if GPS has been disabled for any reason. |
| 4. | `lte gps mode` **standalone**<br><br>**Example:**<br>`Router(config-controller)# lte gps mode standalone` | Enables the standalone GPS mode. |
| 5. | **lte gps nmea {ip** \| **udp** *[source address][destination address][destination port]***}**<br>**or**<br>**lte gps nmea**<br><br>**Example:**<br>`Router(config-controller)# lte gps nmea ip` | Enables NMEA.<br><br>Cisco 4G LTE 4G LTE NIMs support only IP NMEA. Therefore, the IP interface and serial interface options are unavailable. |
| 6. | `end`<br><br>**Example:**<br>`Router(config-controller)# end` | Exits the controller configuration mode and returns to the privileged EXEC mode. |

| | Command | Description |
|---|---|---|
| **7.** | **show cellular** *unit* **gps**<br><br>**Example:**<br>`Router# show cellular 0/1/0 gps`<br><br>`GPS Info`<br>`-------------`<br>`GPS Feature: enabled`<br>`GPS Port Selected: DIV port`<br>`GPS State: GPS enabled`<br>`GPS Mode Configured: standalone`<br>`Last Location Fix Error: Offline [0x0]`<br>`GPS Error Count: 13`<br>`Latitude: 37 Deg 24 Min 58 Sec North`<br>`Longitude: 121 Deg 55 Min 7 Sec West`<br>`Timestamp (GMT): Thu Aug 15 14:23:35 2013`<br><br>`Fix type index: 0, Height: 15 m` | Displays a summary of the following GPS data:<br><br>■ GPS state information (GPS disabled, GPS acquiring, GPS enabled)<br><br>■ GPS mode configured (standalone)<br><br>■ GPS location and timestamp information<br><br>■ GPS satellite information<br><br>■ GPS feature (enabled or disabled)<br><br>■ GPS port selected (Dedicated GPS and GPS port with voltage-no-bias) |
| **8.** | **show cellular** ***unit*** **gps detail**<br><br>**Example:**<br>`Router# show cellular 0 gps detail`<br>`GPS Info`<br>`-------------`<br>`GPS Feature: enabled`<br>`GPS Port Selected: DIV port`<br>`GPS State: GPS enabled`<br>`GPS Mode Configured: standalone`<br>`Last Location Fix Error: Offline [0x0]`<br>`GPS Error Count: 71`<br>`Latitude: 37 Deg 24 Min 58 Sec North`<br>`Longitude: 121 Deg 55 Min 7 Sec West`<br>`Timestamp (GMT): Fri Aug 16 10:46:25 2013`<br><br>`Fix type index: 0, Height: 20 m`<br>`HDOP: 0.8, GPS Mode Used: standalone`<br><br>`Satellite Info`<br>`----------------`<br>`Satellite #1, elevation 18, azimuth 52, SNR 30 *`<br>`Satellite #4, elevation 13, azimuth 165, SNR 29 *`<br>`Satellite #7, elevation 3, azimuth 133, SNR 22`<br>`Satellite #8, elevation 33, azimuth 126, SNR 29 *`<br>`Satellite #9, elevation 33, azimuth 133, SNR 0 *`<br>`Satellite #11, elevation 4, azimuth 39, SNR 0`<br>`Satellite #15, elevation 29, azimuth 284, SNR 0 *`<br>`Satellite #17, elevation 84, azimuth 118, SNR 0 *`<br>`Satellite #26, elevation 38, azimuth 224, SNR 0` | Displays detailed GPS data. |
| **9.** | `show running config`<br><br>**Example:**<br>`Router# show running config`<br><br>`!`<br>`controller Cellular 0/1/0`<br>` lte gps mode standalone`<br>` lte gps nmea ip`<br>`!` | Shows the output of the configuration. |

# Configuring 4G SMS Messaging

**Note:** In the context of an Cisco 4G LTE NIM, the *unit* argument identifies the router slot, WIC slot, and the port, and is separated by slashes (0/1/0).

## SUMMARY STEPS

1. **configure terminal**
2. **controller cellular** *unit*
3. **lte sms archive path** *FTP-URL*
4. **cellular** *unit* **lte sms view** *{***all** | *ID* | **summary***}*
5. **end**
6. **show cellular** *unit* **sms**
7. **cellular** *unit* **lte sms send** *number*
8. **cellular** *unit* **lte sms delete** [**all** | *id*]

## DETAILED STEPS

| | Command | Description |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters the configuration mode. |
| 2. | **controller cellular** *unit*<br><br>**Example:**<br>`Router(config)# controller cellular 0/1/0` | Enters the controller cellular configuration mode. |
| 3. | **lte sms archive path** *FTP-URL*<br><br>**Example:**<br>`Router(config-controller)# lte sms archive path ftp://username:password@172.25.211.175/SMS-LTE` | Specifies an FTP server folder path to send all the incoming and outgoing SMS messages. After the folder path is identified, it is appended automatically with outbox and inbox folders for the path to which SMS messages are sent and received, for example:<br><br>ftp://172.25.211.175/SMS-LTE/outbox<br><br>ftp://172.25.211.175/SMS-LTE/inbox |
| 4. | **cellular** *unit* **lte sms view** *{***all** | *ID* | **summary***}*<br><br>**Example:**<br>`Router# cellular 0/1/0 lte sms view summary`<br><br>`ID FROM YY/MM/DD HR:MN:SC SIZE CONTENT`<br>`0 4442235525 12/05/29 10:50:13 137 Your entry last month has...`<br>`2 5553337777 13/08/01 10:24:56 5 First`<br>`3 5553337777 13/08/01 10:25:02 6 Second` | Displays the message contents of incoming texts received by a modem.<br><br>■ **all**–Displays the message contents of up to 255 incoming text messages received by the modem.<br><br>■ *ID*–Displays the message contents for a specified ID (0-255) of an incoming text message.<br><br>■ **summary**–Displays a summary of the incoming text messages received by the modem. |

| | Command | Description |
|---|---|---|
| **5.** | **end**<br><br>**Example:**<br>`Router(config)# end` | Exits the configuration mode and returns to the privileged EXEC mode. |
| **6.** | **show cellular** *unit* **sms**<br><br>**Example:**<br>`Router# show cellular 0/1/0 sms`<br>`Incoming Message Information`<br>`----------`<br>`SMS stored in modem = 20`<br>`SMS archived since booting up = 0`<br>`Total SMS deleted since booting up = 0`<br>`Storage records allocated = 25`<br>`Storage records used = 20`<br>`Number of callbacks triggered by SMS = 0`<br>`Number of successful archive since booting up = 0`<br>`Number of failed archive since booting up = 0`<br><br>`Outgoing Message Information`<br>`----------`<br>`Total SMS sent successfully = 0`<br>`Total SMS send failure = 0`<br>`Number of outgoing SMS pending = 0`<br>`Number of successful archive since booting up = 0`<br>`Number of failed archive since booting up = 0`<br>`Last Outgoing SMS Status = SUCCESS`<br>`Copy-to-SIM Status = 0x0`<br>`Send-to-Network Status = 0x0`<br>`Report-Outgoing-Message-Number:`<br>`Reference Number = 0`<br>`Result Code = 0x0`<br>`Diag Code = 0x0 0x0 0x0 0x0 0x0`<br><br>`SMS Archive URL = ftp://lab:lab@1.3.150.1/outbox` | Displays all the information in the text messages sent and received. Message information includes text messages sent successfully, received, archived, and messages pending to be sent. LTE-specific information on errors in case of a FAILED attempt may also be displayed. |
| **7.** | **cellular** *unit* **lte sms send** *number*<br><br>**Example:**<br>`Router# cellular 0/1/0 lte sms send 15554443333` | Enables a user to send a 4G LTE band SMS message to other valid recipients, provided they have a text message plan. The *number* argument is the telephone number of the SMS message recipient.<br><br>10-digit or 11-digit (phone) numbers are the proper numerical format for sending a text. For example, ########## or 1##########. Seven digits are not supported. |
| **8.** | **cellular** *unit* **lte sms delete** [**all** \| *id*]<br><br>**Example:**<br>`Router# cellular 0/1/0 lte sms delete all` | (Optional) Deletes one message ID or all of the stored messages from memory. |

# Configuring Modem DM Log Collection

Diagnostic Monitor (DM) is a Qualcomm proprietary protocol. Diagnostic software tools, such as Sierra Wireless SwiLog and Qualcomm QXDM, are based on DM protocol. These tools can be used to capture data transactions between the modem and the network over the RF interface, which makes them useful tools for troubleshooting 3G and 4G data connectivity or performance issues.

To configure DM log collection, enter the following commands, starting in privileged EXEC mode.

## SUMMARY STEPS

1. **configure terminal**
2. **controller cellular** *slot/wic*
3. {**lte**} **modem dm-log** {**enable** | **filesize** *size* | **filter** *location*:*filename* | **output path** *URL* | **rotation** | **size** *log-size*}
4. **end**
5. **show cellular** *unit* **logs dm-log**

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **configure terminal**<br><br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| 2. | **controller cellular** *slot/wic*<br><br>**Example:**<br>`Router(config)# controller cellular 0/1/0` | Enters cellular controller configuration mode. |
| 3. | {**lte**} **modem dm-log** {**enable** \| **filesize** *size* \| **filter** *location*:*filename* \| **output path** *URL* \| **rotation** \| **size** *log-size*}<br><br>**Example:**<br>`Router(config-controller)# lte modem dm-log enable` | Configures DM logging for CDMA, GSM, or LTE modem.<br>■ **enable**—Enables DM logging.<br>■ **filesize** *size*—Specifies the maximum log file size, in MB. Range is from 1 to 64. Default is 20.<br>■ **filter** *location*:*filename*—Specifies the DM log filter file location and filename. The following are the valid values for the *location* parameter: **flash0**, **flash1**, **flash**, **usbflash**, **usbflash0**, or **usbflash1**.<br>**Note:** If the DM log filter file is not specified, the generic filter file, which comes with the diagnostic software tool, will be used.<br>**Note:** The DM log filter file should be in SQF format.<br>■ **output path** *URL*—Specifies the path where the DM logging output files will be stored. The default path is the router flash.<br>■ **rotation**—Enables log rotation.<br>**Note:** The **rotation** option is only supported if the log files are stored in the router flash or USB flash.<br>■ **size** *log-size*—Specifies the maximum log size, in MB. Range is from 0 to 1024. Default is 64. |

| | Command or Action | Purpose |
|---|---|---|
| **4.** | **end**<br><br>**Example:**<br>`Router(config-controller)# end` | Returns to privileged EXEC mode. |
| **5.** | **show cellular** *unit* **logs dm-log**<br><br>**Example:**<br>`Router# show cellular 0/1/0 logs dm-log` | (Optional) Displays DM log configuration and statistics.<br><br>■ *unit*—For HWIC, this is the router slot, WIC slot, and port separated by slashes (for example, 0/1/0). For fixed platform, this is the number 0. |

## Example

The following example shows how to specify the maximum log file size for CDMA:

```
Router(config-controller)# cdma modem dm-log filesize 8
```

The following example shows how to specify the filter file for GSM:

```
Router(config-controller)# gsm modem dm-log filter flash:SwiLogPlus_generic_filter_6.3.sqf
```

The following example shows how to specify the path where the DM log output files will be stored for LTE:

```
Router(config-controller)# lte modem dm-log output path ftp://@172.25.211.175/
```

The following example shows how to enable DM log rotation for CDMA:

```
Router(config-controller)# cdma modem dm-log rotation
```

The following example shows how to specify the maximum log size for GSM:

```
Router(config-controller)# gsm modem dm-log size 128
```

# Enabling Modem Crashdump Collection

Modem crashdump collection is useful in debugging firmware crash. To collect crash data, the modem has to be pre-configured so that it will stay in memdump mode after a crash. Memdump mode is a special boot-and-hold mode for the memdump utility to collect crash data.

For earlier releases the crashdump collection required the PC to be connected to the router using a USB cable or a special RJ45-USB cable on a non-HSPA+7 3G HWIC.

As part of the 3G and 4G serviceability enhancement, the crashdump collection utility is integrated into Cisco IOS.

To enable modem crashdump collection, perform the following steps.

**Note:** The integrated modem crashdump collection feature is supported only on 3G HSPA and 4G LTE based SKUs.

## Prerequisites

Ensure that the following prerequisites are met before attempting to enable crashdump logging:

- The modem needs to be provisioned for modem crashdump collection—it needs to be configured to operate in test mode. Contact Cisco TAC for details.
- The modem should be in crash state. Run tests that will result in modem firmware crash. A “MODEM_DOWN” message on the router console or syslog is indicative of modem firmware crash.

**Note:** After the modem firmware crashes, the modem is available for crashdump log collection only. Data calls cannot be made.

### SUMMARY STEPS

1. **test** {**cell-host** | **cell-cwan**} *unit* **modem-crashdump** {**on** *location* | **off**}

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | **test** {**cell-host** \| **cell-cwan**} *unit* **modem-crashdump** {**on** *location* \| **off**}<br><br>**Example:**<br>`Router# test cell-host 0/2/0 modem-crashdump on local_uf` | Enables or disables modem crashdump collection.<br>■ **cell-host**—Keyword for fixed platform.<br>■ **cell-cwan**—Keyword for F35 NIM on a modular platform.<br>■ *unit*—For NIM, this is the router slot, WIC slot, and port separated by slashes (for example, 0/2/0). For fixed platform, this is the number 0.<br>■ **on**—Enables crashdump log collection.<br>■ *location*—Specifies the destination URL where the modem crashdump logs will be stored.<br>■ **off**—Disables crashdump log collection. |

## Example

The following example shows how to disable crashdump log collection for NIM on a modular platform:

```
Router# test cell-cwan 0/2/0 modem-crashdump off
```

The following example shows how to enable crashdump log collection on a fixed platform with the logs stored on an FTP server:

```
Router# test cell-cwan 0/2/0 modem-crashdump on local_uf
```

# Displaying Modem Log Error and Dump Information

As part of the 3G serviceability enhancement in Cisco IOS Release 15.2(4)M2 and Cisco IOS Release 15.3(1)T, AT commands strings (**at!err** and **at!gcdump**) can be sent to the modem using Cisco IOS CLI rather than setting up a reverse telnet session to the cellular modem to obtain log error and dump information.

To obtain log error and dump information, perform the following steps.

**Note:** The modem log error and dump collection feature is supported only on 3G SKUs.

### SUMMARY STEPS

1. **show cellular** *unit* **log error**
2. **test cellular** *unit* **modem-error-clear**

### DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| **1.** | **show cellular** *unit* **log error**<br><br>**Example:**<br>`Router# show cellular 0/1/0 log error` | Shows modem log error and dump information. |
| **2.** | **test cellular** *unit* **modem-error-clear**<br><br>**Example:**<br>`Router# test cellular 0/1/0 modem-error-clear` | (Optional) Clears out the error and dump registers. By default, error and dump registers are not cleared out after a read. This command changes the operation so that registers are cleared once they are read. As a result, the AT command strings are changed to "**at!errclr=-1**" for CDMA and "**at!err=0**" for GSM modems. |

## Configuration Examples for Cisco 4G LTE NIM

The following example shows how to configure Cisco 4G LTE NIM:

```
Router#show run
Router#show running-config
Building configuration...

Current configuration : 2991 bytes
!
! Last configuration change at 21:31:48 UTC Mon May 18 2015
!
version 15.5
service timestamps debug datetime msec
service timestamps log datetime msec
service internal
no platform punt-keepalive disable-kernel-core
platform shell
!
hostname 43xx
!
boot-start-marker
boot system flash bootflash:isr4300-universalk9.2015-05-15_18.57_rxuan.SSA.bin
boot-end-marker
!
!
vrf definition Mgmt-intf
 !
 address-family ipv4
 exit-address-family
 --More--
 address-family ipv6
 exit-address-family
!
logging buffered 10000000
no logging console
enable password lab
!
no aaa new-model
!
!
!
!
!
!
!
```

```
!
!
!
!
!
!
ip host kawal 10.1.0.3
ip name-server 8.8.8.8

ip dhcp excluded-address 10.1.0.254
!
ip dhcp pool gsm105
 network 10.1.0.0 255.255.0.0
 default-router 10.1.0.254
 dns-server 173.36.131.10
!
!
!
!
!
!
!
!
!
!
subscriber templating
!
multilink bundle-name authenticated
 --More--
icense udi pid ISR4321/K9 sn FDO181701PZ
!
spanning-tree extend system-id
!
!
redundancy
 mode none
!
!
!
!
controller Cellular 0/2/0
 lte sim data-profile 16 attach-profile 16
 lte gps mode standalone
 lte gps nmea
 lte modem dm-log output local-uf
 lte modem dm-log filter flash:GSM_GPRS_EDGE_WCDMA_LTE_DATA_EVDO_SMS.sqf
 lte modem dm-log rotation
 lte modem link-recovery disable
 --More--

 nterface GigabitEthernet0/0/1
 ip address 172.19.151.180 255.255.255.0
 ip nat outside
 shutdown
 negotiation auto
!
interface Cellular0/2/0
 ip address negotiated
 ip nat outside
 dialer in-band
 dialer idle-timeout 0
 dialer watch-group 1
 dialer-group 1
```

```
 pulse-time 1
!
interface Cellular0/2/1
 no ip address
 shutdown
 dialer in-band
 pulse-time 1
!
interface GigabitEthernet0
 vrf forwarding Mgmt-intf
 no ip address
 negotiation auto
!
interface Vlan1
 no ip address
!
no ip nat service dns tcp
no ip nat service dns udp
ip nat inside source list 2 interface Cellular0/2/0 overload
ip forward-protocol nd
ip http server
no ip http secure-server
ip http max-connections 16
ip tftp source-interface GigabitEthernet0/0/1
ip dns server
ip route 0.0.0.0 0.0.0.0 Cellular0/2/0
ip route 0.0.0.0 0.0.0.0 GigabitEthernet0/0/1
ip route 223.255.254.252 255.255.255.255 1.3.0.1
ip route 223.255.254.254 255.255.255.255 1.3.0.1
!
!
access-list 2 permit 10.1.0.0 0.0.255.255
dialer watch-list 1 ip 8.8.8.8 255.255.255.255
dialer watch-list 2 ip 128.107.248.247 255.255.255.255
dialer-list 1 protocol ip permit
!
snmp-server community public RO
snmp-server community private RW
snmp-server community lab RW
snmp-server host 1.3.66.144 public
snmp-server manager
control-plane
!
!
line con 0
 exec-timeout 0 0
 stopbits 1
line aux 0
 exec-timeout 0 0
 stopbits 1
line vty 0 4
 login
 transport input all
!
!
end
```

# Verifying the Cisco 4G LTE NIM Configuration

You can verify the configuration by using the following show commands:


- show version, page 41
- show platform, page 42
- show interfaces, page 42


## show version

```
router#show version
Cisco IOS XE Software, Version
BLD_V155_2_S_XE315_THROTTLE_LATEST_20150426_100031-std
Cisco IOS Software, ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9-M),
Experimental Version 15.5(20150426:122654)
[v155_2_s_xe315_throttle-BLD-BLD_V155_2_S_XE315_THROTTLE_LATEST_20150426_10
0031-ios 191]
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accompanying the IOS-XE software, or the applicable URL provided on the flyer accompanying the IOS-XE
software.


ROM: IOS-XE ROMMON

jaller-o2 uptime is 8 minutes
Uptime for this control processor is 9 minutes System returned to ROM by reload System image file is
"bootflash:isr4400-universalk9.BLD_V155_2_S_XE315_THROTTLE_LATES"
Last reload reason: Reload Command



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------------------------------------------------------------------
Technology    Technology-package           Technology-package
              Current       Type           Next reboot
------------------------------------------------------------------
appx             None             None             None
```

```
uc              None            None            None
security        None            None            None
ipbase          ipbasek9        Permanent       ipbasek9

cisco ISR4451-X/K9 (2RU) processor with 1666170K/6147K bytes of memory.
Processor board ID FTX1803AJST
4 Gigabit Ethernet interfaces
1 Serial interface
3 Cellular interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
7393215K bytes of flash memory at bootflash:.

Configuration register is 0x2100

router#
```

## show platform

```
router# show platform software subslot 0/1/0 module firmware
Cisco Module Firmware, Linux Module Software

Microloader Info
---------------------------------
1
12-12-2014

Secure Boot Info
---------------------------------
Upgrade

Upgrade Info
---------------------------------
/shared_module_linux/10
Apr 21 2015

Golden Info
---------------------------------
/shared_module_linux/10
Apr 21 2015

Kernel distribution info
---------------------------------
Linux version 3.10.39+ (joaller@mcp-bld-lnx-214) (gcc version 4.6.4
20120731 (prerelease) (Linaro GCC branch-4.6.4. Marvell GCC
201301-1645.aee66e26) ) #1 Fri Apr 24 10:57:31 PDT 2015
```

## show interfaces

```
router#show interfaces Cellular 0/1/0
Cellular0/1/0 is up
  Hardware is 4G WWAN NIM - Verizon Multimode LTE/eHRPD/EVDO RevA/Rev0/1xRTT
  Internet address is 100.103.214.91/32
  MTU 1500 bytes, BW 1800 Kbit/sec, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
Keepalive not supported
  DTR is pulsed for 1 seconds on reset
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 1000 bits/sec, 1 packets/sec
  5 minute output rate 1000 bits/sec, 1 packets/sec
     9 packets input, 886 bytes, 0 no buffer
```

```
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     88 packets output, 9358 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 unknown protocol drops
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
router#
```

# Configuration Examples for 3G and 4G Serviceability Enhancement

This section contains the following subsections:



## Example: Sample Output for the show cellular logs dm-log Command

The following shows a sample output of the **show cellular logs dm-log** command:

```
Router# show cellular 0/1/0 logs dm-log
Integrated DM logging is on
output path = ftp://@172.25.211.175/
filter = generic
maximum log size = 67108864
maximum file size = 20971520
log rotation = disabled
7 packets sent to the modem, 3232 bytes, 0 errors
75 packets received from the modem, 57123 bytes, 0 input drops
75 packets stored in file system, 57123 bytes, 0 errors, 0 aborts
2 max rcv queue size
current file size = 57123
current log size = 57123
total log size = 57123
DM log files: (1 files)
    ftp://@172.25.211.175/dmlog20120712-173831slot1.bin
```

## Example: Sample Output for the show cellular logs modem-crashdump Command

The following shows a sample output of the **show cellular logs modem-crashdump** command:

```
Router# show cellular 0 logs modem-crashdump
Modem crashdump logging: off
Progress = 100%
Last known State = Getting memory chunks
Total consecutive NAKs = 0
Number of retries = 0
Memory Region Info:
1: Full SDRAM [Base:0x0, Length:0x2000000]
2: MDSP RAM A region [Base:0x91000000, Length:0x8000]
3: MDSP RAM B region [Base:0x91200000, Length:0x8000]
4: MDSP RAM C region [Base:0x91400000, Length:0xC000]
5: MDSP Register region [Base:0x91C00000, Length:0x28]
```

```
6: ADSP RAM A region [Base:0x70000000, Length:0x10000]
7: ADSP RAM B region [Base:0x70200000, Length:0x10000]
8: ADSP RAM C region [Base:0x70400000, Length:0xC000]
9: ADSP RAM I region [Base:0x70800000, Length:0x18000]
10: CMM Script [Base:0x6A350, Length:0x310]
Router#
```

# Configuration Examples for Cisco 4G LTE NIM



## Example: Basic Cellular Interface Configuration: Cisco 4G LTE NIM

The following example shows how to configure the cellular interface to be used as a primary and is configured as the default route:

```
Router# show running-config

interface Cellular 0/1/0
ip address negotiated
dialer in-band
dialer-group 1

ip route 172.22.1.10 255.255.255.255 cellular 0/1/0

dialer-list 1 protocol ip permit
```

## Example: GRE Tunnel over Cellular Interface Configuration

The following example shows how to configure the static IP address when a GRE tunnel interface is configured with **ip address unnumbered** *cellular interface*:

**Note:** The GRE tunnel configuration is supported only if the service providers provide a public IP address on the LTE interface.

**Note:** For service providers using a private IP address, the point-to-point static GRE tunnel cannot be set up with a private IP address at one end and a public IP address on the other end.

```
interface Tunnel2
ip unnumbered <internal LAN interface GE0/0 etc.>
tunnel source Cellular0
tunnel destination a.b.c.d
interface Cellular0/1/0
ip address negotiated
no ip mroute-cache
dialer in-band
dialer-group 1
```

# Example: Cisco 4G LTE NIM as Backup with NAT and IPSec

The following example shows how to configure the Cisco 4G LTE NIM on the router as backup with NAT and IPSec:

**Note:** The receive and transmit speeds cannot be configured. The actual throughput depends on the cellular network service.

```
ip dhcp excluded-address 10.4.0.254
!
ip dhcp pool lan-pool
   network 10.4.0.0 255.255.0.0
   dns-server 10.4.0.254
   default-router 10.4.0.254
!
!
chat-script lte "" "AT!CALL" TIMEOUT 20 "OK"

crypto isakmp policy 1
 encr 3des
 authentication pre-share
crypto isakmp key  address a.b.c.d
!
!
crypto ipsec transform-set  ah-sha-hmac esp-3des
!
crypto map gsm1 10 ipsec-isakmp
 set peer a.b.c.d
 set transform-set
 match address 103
!
!
interface ATM0/1/0
 no ip address
 ip virtual-reassembly
 load-interval 30
 no atm ilmi-keepalive
 dsl operating-mode auto
!
interface ATM0/1/0.1 point-to-point
 backup interface Cellular0/3/0
 ip nat outside
 ip virtual-reassembly
 no snmp trap link-status
 pvc 0/35
  pppoe-client dial-pool-number 2
 !
!
interface Cellular0/3/0
 ip address negotiated
 ip nat outside
 ip virtual-reassembly
no ip mroute-cache
 dialer in-band
 dialer idle-timeout 0
dialer-group 1
 crypto map gsm1
!

interface Vlan104
 description used as default gateway address for DHCP clients
 ip address 10.4.0.254 255.255.0.0
 ip nat inside
 ip virtual-reassembly
!
```

```
ip address negotiated
 ip mtu 1492
 ip nat outside
 ip virtual-reassembly
 encapsulation ppp
 load-interval 30
 dialer pool 2
 dialer-group 2
 ppp authentication chap callin
 ppp chap hostname cisco@dsl.com
 ppp chap password 0 cisco
 ppp ipcp dns request
 crypto map gsm1
!
ip local policy route-map track-primary-if
ip route 0.0.0.0 0.0.0.0 Dialer2 track 234
ip route 0.0.0.0 0.0.0.0 Cellular0/3/0 254
!
!
ip nat inside source route-map nat2cell interface Cellular0/3/0 overload
ip nat inside source route-map nat2dsl overload
!
ip sla 1
 icmp-echo 2.2.2.2 source
 timeout 1000
 frequency 2
ip sla schedule 1 life forever start-time now
access-list 1 permit any
access-list 101 deny ip 10.4.0.0 0.0.255.255 10.0.0.0 0.255.255.255
access-list 101 permit ip 10.4.0.0 0.0.255.255 any
access-list 102 permit icmp any host 2.2.2.2
access-list 103 permit ip 10.4.0.0 0.0.255.255 10.0.0.0 0.255.255.255
dialer-list 1 protocol ip list 1
dialer-list 2 protocol ip permit
!
!
route-map track-primary-if permit 10
 match ip address 102
!
route-map nat2dsl permit 10
 match ip address 101
!
route-map nat2cell permit 10
 match ip address 101
 match interface Cellular0/3/0
!
exec-timeout 0 0
login
 modem InOut
```

**Note:** For service providers using a private IP address, use the **crypto ipsec transform-set esp** command (that is, esp-aes esp-sha256-hmac...).

## Example: SIM Configuration

This section provides the following configuration examples:

## Locking the SIM Card

The following example shows how to lock the SIM. The italicized text in this configuration example is used to indicate comments and are not be seen when a normal console output is viewed.

```
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in unlocked state.
!
Router# cellular 0/1/0 lte sim lock 1111
!!!WARNING: SIM will be locked with pin=1111(4).
Do not enter new PIN to lock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
Apr 26 19:35:28.339: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN
Apr 26 19:35:59.967: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP
Router#
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = Locked
SIM User Operation Required = Enter CHV1
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in locked state.
!
```

## Unlocking the SIM Card

The following example shows how to unlock the SIM. The italicized text throughout this configuration example is used to indicate comments and will not be seen when a normal console output is viewed.

```
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = Locked
SIM User Operation Required = Enter CHV1
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in locked state.
!

Router# cellular 0/1/0 lte sim unlock 1111
!!!WARNING: SIM will be unlocked with pin=1111(4).
Do not enter new PIN to unlock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3
```

```
Router#
!
!   SIM is in unlocked state.
!
```

## Automatic SIM Authentication

The following example shows how to configure automatic SIM authentication. The italicized text throughout this configuration example is used to indicate comments and will not be seen when a normal console output is viewed.

```
Router# show cellular 0/1/0 security
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in unlocked state.
!
Router# cellular 0/1/0 lte sim lock 1111
!!!WARNING: SIM will be locked with pin=1111(4).
Do not enter new PIN to lock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
Apr 26 21:22:34.555: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN
Apr 26 21:23:06.495: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP
Router#
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = Locked
SIM User Operation Required = Enter CHV1
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in locked state. SIM needs to be in locked state for SIM authentication to
!   work.
!
Router#
Router# conf term
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# controller cellular 0/1/0
Router(config-controller)# lte sim authenticate 0 1111
CHV1 configured and sent to modem for verification
Router(config-controller)# end
Router#
Apr 26 21:23:50.571: %SYS-5-CONFIG_I: Configured from console by console
Router#
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is now in locked state but it can be used for connectivity since authentication is
!   good. Authentication can be saved in the router configuration so that when you boot up
!   the router with the same locked SIM, connection can be established with the correct
!   Cisco IOS configuration.
!
```

## Changing the PIN Code

The following example shows how to change the assigned PIN code. The italicized text throughout this configuration example is used to indicate comments and will not be seen when a normal console output is viewed.

```
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in unlocked state.
!
Router#
Router# cellular 0/1/0 lte sim lock 1111
!!!WARNING: SIM will be locked with pin=1111(4).
Do not enter new PIN to lock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
Apr 26 21:58:11.903: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN
Apr 26 21:58:43.775: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP
Router#
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = Locked
SIM User Operation Required = Enter CHV1
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in locked state. SIM needs to be in locked state to change its PIN.
!
Router#
Router# cellular 0/1/0 lte sim change-pin 1111 0000
!!!WARNING: SIM PIN will be changed from:1111(4) to:0000(4)
Call will be disconnected. If old PIN is entered incorrectly in 3 attempt(s), SIM will be blocked!!!
Are you sure you want to proceed?[confirm]
Resetting modem, please wait...

CHV1 code change has been completed. Please enter the new PIN in controller configuration for
verfication
Router#
Apr 26 21:59:16.735: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN
Apr 26 21:59:48.387: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP
Router#
Router#
Router# sh cellular 0/1/0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = Locked
SIM User Operation Required = Enter CHV1
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM stays in locked state, as expected, but with new PIN.
!
Router# cellular 0/1/0 lte sim unlock 0000
!!!WARNING: SIM will be unlocked with pin=0000(4).
Do not enter new PIN to unlock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
```

```
Router# show cellular 0/1/0 security
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3
Router#
!
!   Unlock with new PIN is successful. Hence, changing PIN was successful.
!
```

## Configuring an Encrypted PIN

The following example shows how to configure automatic SIM authentication using an encrypted PIN. The italicized text throughout this configuration example is used to indicate comments and will not be seen when a normal console output is viewed.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# service password-encryption
Router(config)# username SIM privilege 0 password 1111
Router(config)# do sh run | i SIM
username SIM privilege 0 password 7 055A575E70.
!
!   Copy the encrypted level 7 PIN. Use this scrambled PIN in the SIM authentication
!   command.
!
Router(config)#
Router(config)# controller cellular 0//1/0
Router(config-controller)# lte sim authenticate 7 055A575E70
CHV1 configured and sent to modem for verification
Router(config-controller)# exit
Router(config)# no username SIM
Router(config)# end
May 14 20:20:52.603: %SYS-5-CONFIG_I: Configured from console by console
```

# Upgrading the Modem Firmware

Table 4 describes the Sierra Wireless modems that are supported on Cisco 4G LTE NIMs. The firmware for the modem is upgradable using Cisco IOS commands. The firmware is a Crossword Express (cwe) file and can be downloaded from the wireless software download page on Cisco.com.

**Note:** Firmware upgrade is supported on utility flash.

**Note:** Online Insertion and Removal of the Module (OIRM) is supported in IOS XE and was not supported in Classic IOS.

**Table 4 Cisco 4G LTE NIM Modem SKUs**

| SKU | Modem |
|---|---|
| ■ NIM-4G-LTE-VZ | MC7350 |
| ■ NIM-4G-LTE-ST | MC7350 |
| ■ NIM-4G-LTE-NA | MC7354 |
| ■ NIM-4G-LTE-GA | MC7304 |
| ■ NIM-4G-LTE-LA | MC7430 |
| ■ NIM-LTEA-LA | EM7430 |
| ■ NIM-LTEA-EA | EM7455 |

**Caution: Use only Cisco certified firmware. Using a firmware version not certified by Cisco may impact the wireless service provider network adversely.**

**Caution: Do not disconnect power or switch the router off during the firmware upgrade process. This may result in permanent modem failure.**

**Note:** Firmware downgrade is not supported.

# Upgrading the Modem Firmware Manually

Cisco recommends the manual upgrade process for the LTE modem firmware and IOS software image for all new deployments and the following existing deployments:

- LTE is not the primary ISR WAN interface.
- LTE is not the only ISR WAN interface.
- The network administrator has out-of-band or local access to the ISR.

**Note:** You can also remotely download firmware over the air by following the same steps listed below.

## SUMMARY STEPS

1. Go to the following Cisco web page to download the latest certified firmware for your carrier:

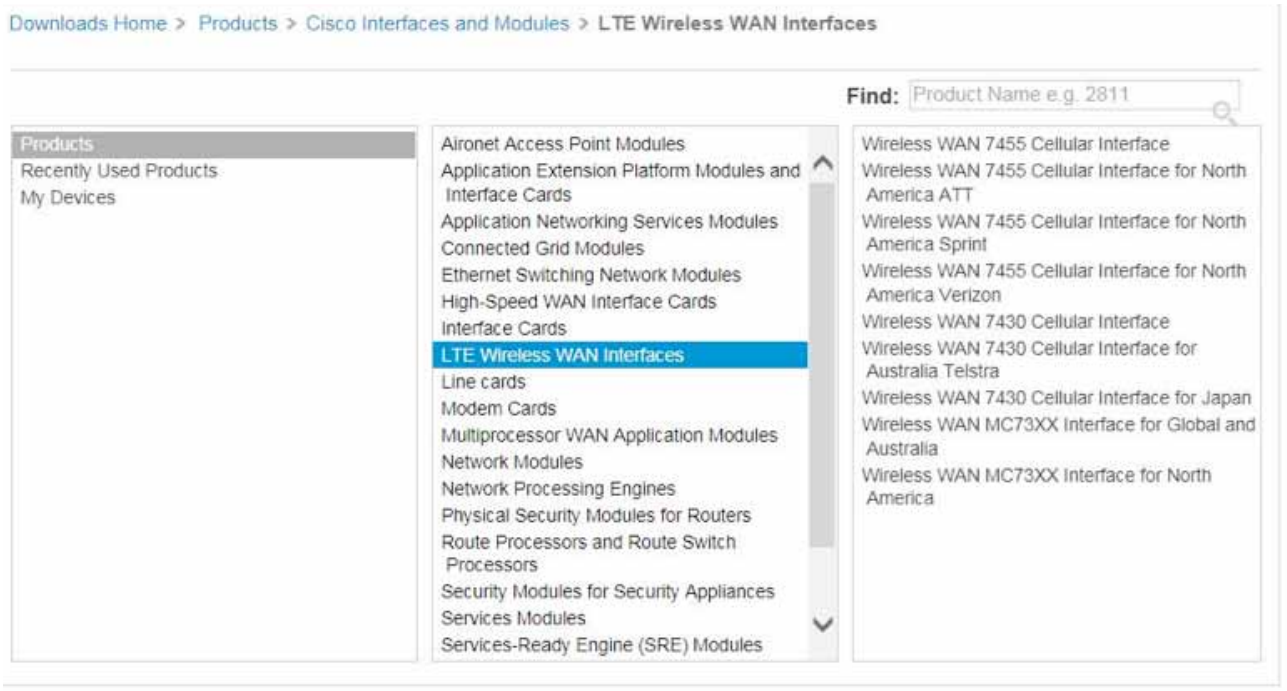
   http://software.cisco.com/download/navigator.html

   For remote download, you can transfer this using the 4G wireless link from Cisco.com onto flash.

2. On this page, select from the following options.
   **Products** -> **Cisco Interfaces and Modules** -> **Cisco High-Speed WAN Interface Cards**

3. After clicking on the **Cisco High-Speed WAN interface Cards** selection, a list of available cards displays in the third column as shown in Figure 4. Select your product in the third column and download the appropriate LTE firmware.

**Figure 4 Cisco Download Software Web Page**




4. Enable the logging console.
5. Initiate the firmware upgrade process.

   **Note:** For remote downloads, if wireless is your primary link, you will lose connectivity. Connectivity is restored after the download. If you have opted for logging in, the firmware log file will be available on flash with the download status.
6. Verify the upgrade process.
7. Reload the ISR to complete the upgrade process.

## DETAILED STEPS

| | Command or Action | Purpose |
|---|---|---|
| 1. | Go to the Cisco Wireless WAN software download website at:<br><br>http://software.cisco.com/download/navigator.html | Provides access to Cisco Wireless WAN software downloads. Select firmware for Cisco 4G.<br><br>**Note:** This website is only available to registered Cisco.com users. |
| 2. | On this page, select from the following options: **Products** -> **Cisco Interfaces and Modules** -> | After the **Cisco High-Speed WAN interface Cards** is selected, a list of available cards displays in the third column as shown in Figure 4. Select your product in the third column and download the appropriate LTE firmware. |
| 3. | Download the selected LTE firmware release. | Download the modem firmware file to flash memory on the router. |
| 4. | `terminal monitor`<br><br>**Example:**<br>`Router# terminal monitor` | Enables the logging console in privileged EXEC mode. |

| | Command or Action | Purpose |
|---|---|---|
| **5.** | **microcode reload cellular** *pa-bay slot* **modem-provision** [**flash**:*<filename>* \| *<filename>* **local**]<br><br>**Example:**<br>`Router# microcode reload cellular 0 1 modem-provision flash:<filename>.cwe`<br><br>`F/W Upgrade: Complete Successfully`<br><br>`or`<br><br>`Router# microcode reload cellular 0 1 modem-provision <filename>.cwe local`<br><br>`F/W Upgrade: Complete Successfully` | Initiates the firmware upgrade process.<br>■ *pa-bay*—Use 0 for 4G LTE NIM.<br>■ *slot*—For 4G LTE NIM, slot number, 0 to 3, where the 4G LTE NIM is plugged in.<br>■ For remote download, you can transfer this using the wireless link from Cisco.com onto flash. |
| **6.** | **show cellular** 0 **hardware**<br>Example:<br>`Router# show cellular 0 hardware`<br><br>`Modem Firmware Version = SWI9200X_03.05.10.02`<br>`Modem Firmware built = 2012/02/25 11:58:38` | Verifies the firmware upgrade process. |
| **7.** | **reload** | Reloads the IOS application software image to complete the firmware upgrade.<br><br>**Note:** Ensure that you are reloading an IOS software image that is 15.2(4)M3 or later. |

## MC7350 Manual Modem Firmware Upgrade: Example

```
Router# microcode reload cellular 0 0 modem-provision flash:MC7350_ATT_03.05.10.02_00.cwe
Reload microcode? [confirm] <hit enter key>
Log status of firmware download in router flash?[confirm] <hit enter key>
Firmware download status will be logged in flash:fwlogfile
Microcode Reload Process launched for Cellular 37946756; hw type = 0x6F3
Router#
**************************************************
 The interface will be Shut Down for Firmware Upgrade
 This will terminate any active data connections.
**************************************************
Modem radio has been turned off
**************************************************
 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.
**************************************************
Sending F/W[MC7300_ATT_03.05.10.02_00.cwe] to the card [41569157 bytes]:
Firmware file: MC7300_ATT_03.05.10.02_00.cwe sent to the card

The current modem F/W App Version: SWI9200X_01.00.03.01AP R2492 CARMD-EN-10526 2011/07/01 19:31:09
The current modem F/W Boot Version: SWI9200X_01.00.03.01BT R2492 CARMD-EN-10526 2011/07/01 19:28:52
The current modem Carrier String: 5
The current modem Router ID: MC7300
The current modem Package Identifier: MC7300_01.00.03.01_00_vzw_020.006_001
The current modem SKU ID: 1584083
FW UPgrade: In the progress.
*Feb 21 23:39:35.407: %CISCO800-2-MODEM_DOWN: Cellular0 modem is now DOWN.
```

```
F/W Upgrade: Complete Successfully
*Feb 21 23:42:00.475: %CISCO800-2-MODEM_UP: Cellular0 modem is now UP.
*Feb 21 23:42:00.475: %CISCO800-2-MODEM_DOWN: Cellular0 modem is now DOWN.
*Feb 21 23:42:05.475: %CISCO800-2-MODEM_UP: Cellular0 modem is now UP.
Modem radio has been turned on
Router#show cellular 0 hardware | incl Modem Firmware Version
Modem Firmware Version = SWI9200X_03.05.10.02
```

## Configuring dm-log to Utility Flash: Example

```
Router(config)#controller cell
Router(config)#controller cellular 0/2/0
Router(config-controller)#lte modem dm-log output local-uf
Router(config-controller)#
*May  8 17:57:09.905: %SYS-5-CONFIG_I: Configured from console by console
Router#
Router#

Router#show cellular 0/2/0 logs dm-log
Integrated DM logging is on
output path = Utility Flash
filter = flash:GSM_GPRS_EDGE_WCDMA_LTE_DATA_EVDO_SMS.sqf
maximum log size = 0
maximum file size = 0
log rotation = enabled

32 packets sent to the modem, 4046 bytes, 0 errors
0 packets received from the modem, 0 bytes, 0 input drops
0 packets stored in utility flash, 0 bytes

current file size = 0
current log size = 0
total log size = 49085085
Utility Flash DM log files: (4) files

dmlog20150428-175801.bin 20971433
dmlog20150428-181511.bin 20971271
dmlog20150428-183250.bin 7142381
dmlog20150508-184621.bin 114688

Router#
```

# SNMP MIBs

**Note:** It is recommended that you configure SNMP V3 with authentication/privacy when implementing SNMP SET operation.

The following Simple Management Network Protocol (SNMP) MIBs are supported on Cisco 4G LTE NIMs:

- IF-MIB
- ENTITY-MIB
- CISCO-WAN-3G-MIB

For the CISCO-WAN-3G-MIB, the following tables and sub-tables are supported for 3G and LTE technologies:

- ciscoWan3gMIB(661)
- ciscoWan3gMIBNotifs(0)
- ciscoWan3gMIBObjects(1)

- c3gWanCommonTable(1)
- c3gWanGsm(3)
- c3gGsmIdentityTable(1)
- c3gGsmNetworkTable(2)
- c3gGsmPdpProfile(3)
- c3gGsmPdpProfileTable(1)
- c3gGsmPacketSessionTable(2)
- c3gGsmRadio(4)
- c3gGsmRadioTable(1)
- c3gGsmSecurity(5)
- c3gGsmSecurityTable(1)

You can download the MIBs from the Cisco MIB Locator at http://www.cisco.com/go/mibs.

## SNMP Cisco 4G LTE NIM Configuration: Example

The following example describes how to configure SNMP capability on the router:

```
snmp-server group neomobilityTeam v3 auth notify 3gView
snmp-server view 3gView ciscoWan3gMIB included
snmp-server community neomobility-test RW
snmp-server community public RW
snmp-server enable traps c3g
snmp-server host 172.19.153.53 neomobility  c3g
snmp-server host 172.19.152.77 public  c3g
snmp-server host 172.19.152.77 public udp-port 6059
```

The following example describes how to configure an external host device to communicate with the router through SNMP:

```
setenv SR_MGR_CONF_DIR /users/<userid>/mibtest
setenv SR_UTIL_COMMUNITY neomobility-test
setenv SR_UTIL_SNMP_VERSION -v2c
setenv SR_TRAP_TEST_PORT 6059
```

# Troubleshooting

This section provides the necessary background information and resources available for troubleshooting the Cisco 4G LTE NIM.

- Modem Settings for North America and Carriers Operating on 700 MHz Band, page 59

## Verifying Data Call Setup

To verify the data call setup, follow these steps:

1. After you create a modem data profile using the **cellular profile create** command and configuring DDR on the cellular interface, send a ping from the router to a host across the wireless network.
2. If the ping fails, debug the failure by using the following **debug** and **show** commands:
   - **debug chat**
   - **debug modem**
   - **debug dialer**
   - **show cellular all**
   - **show interface cellular**
   - **show running-config**
   - **show ip route**
3. Save the output from these commands and contact your system administrator.

## Checking Signal Strength

If the Received Signal Strength Indication (RSSI) level is very low (for example, if it is less than -110 dBm), follow these steps:

1. Check the antenna connection. Make sure the TNC connector is correctly threaded and tightened.
2. If you are using a remote antenna, move the antenna cradle and check if the RSSI has improved.
3. Contact your wireless service provider to verify if there is service availability in your area.

## Verifying Service Availability

The following is a sample output for the **show cellular all** command for a scenario where the antenna is disconnected and a modem data profile has not been created. The errors in this case have been highlighted with >>>>>>>.

```
Router# show cellular 0/1/0 all

Hardware Information
====================
Modem Firmware Version = SWI9600M_01.00.09.03
Modem Firmware built = 2011/07/01 19:31:09
Hardware Version = 20460000
International Mobile Subscriber Identity (IMSI) = <specific sim number>
International Mobile Equipment Identity (IMEI) = <specific modem number>
Electronic Serial Number (ESN) = <specific ESN in Hex> [specific ESN in Dec]
Integrated Circuit Card ID (ICCID) = <specific ICCID number>
Mobile Subscriber International Subscriber
IDentity Number (MSISDN) = <specific phone number>


Profile Information
====================
 * - Default profile >>>>>>>> no profile here.
```

```
Data Connection Information
===========================

Profile 1, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 2, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 3, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 4, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 5, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 6, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 7, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 8, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 9, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 10, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 11, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 12, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 13, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 14, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 15, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 16, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state



Network Information
===================
Current Service Status = No service, Service Error = None    >>>>>>> no service means not connected to
the network.
Current Service = Packet Switched
Current Roaming Status = Home
Network Selection Mode = Automatic
Country = , Network =
Mobile Country Code (MCC) = 0
Mobile Network Code (MNC) = 0


Radio Information
=================
Radio power mode = Online
Current RSSI = -125 dBm        >>>>>>> either no antenna, or bad antenna or out of network.
Radio power mode = Online
LTE Technology Selected = LTE

Modem Security Information
==========================
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
```

```
Number of CHV1 Retries remaining = 3
```

## Successful Call Setup

The following is a sample output when a call is set up. It shows a received IP address from the network. Call setup is successful and data path is open.

```
debugs

debug dialer
debup cellular 0/1/0 messages callcontrol
```

## Modem Troubleshooting Using Integrated Modem DM Logging

As part of the 3G and 4G serviceability enhancement in Cisco IOS Release 15.2(4)M2 and Cisco IOS Release 15.3(1)T, DM log collection has been integrated into Cisco IOS, eliminating the need for an external PC and simplifying the DM log collection process. The lte modem dm-log command can be used in controller cellular configuration mode to configure integrated DM logging to monitor traffic on the modem. See the *Cisco 3G and 4G Serviceability Enhancement User Guide* for more information on configuring Integrated DM Logging parameters.

# Modem Settings for North America and Carriers Operating on 700 MHz Band

For HWIC-3G deployments in North America and for carriers operating in the 700 MHz band, the following changes to the modem settings are required to prevent long network attach times.

The output of **show cellular** *x/x/x* **all** command shows the following:

- Current RSSI is -125 dBM
- LTE Technology Preference = No preference specified (AUTO)

## Changing Modem Settings

To change the modem settings to force the modem to scan different technologies, use the following Cisco IOS command:

```
Router# cellular 0/1/0 lte technology ?
auto         Automatic LTE Technology Selection
cdma-1xrtt   CDMA 1xRTT
cdma-evdo    CDMA EVDO Rev A
cdma-hybrid  HYBRID CDMA
gsm          GSM
lte          LTE
umts         UMTS
```

## Electronic Serial Number (ESN)

The ESN number is located directly on the modem label in hexadecimal notation. It can also be retrieved using the Cisco IOS CLI using the **show cellular** *slot/port/hwic* **hardware** command.

The sample output below shows the ESN number:

```
Hardware Information
====================
Electronic Serial Number (ESN) = 0x603c9854 [09603971156]
Electronic Serial Number (ESN) = <specific ESN in hexadecimal> [specific ESN in decimal]
```

**Table 5 Notifications**

| Notifications | Details |
|---|---|
| ModemUpNotification | Modem successfully recognized |
| ModemDown | Crash or power-cycle |
| Change Notification | Notifies about changes in service objects related to this notification—previous service type to current service type |
| ConnectionStatus | Shows the connection status. Service type is included in this notification. |

# Additional References

## Related Documents

| Related Topic | Document Title |
|---|---|
| Hardware Overview and Installation | ■ *Cisco 4G LTE and Cisco 4G LTE-Advanced Network Interface Module Installation Guide*<br>http://www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/hardware/installation/guide/4GLTE_ADV_NIM_HIG |
| Supported Cisco antennas and cables | ■ *Installing Cisco Interface Cards in Cisco Access Routers*<br>http://www.cisco.com/en/US/docs/routers/access/interfaces/ic/hardware/installation/guide/inst_ic.html<br>■ *Cisco 4G/3G Omnidirectional Dipole Antenna (4G-LTE-ANTM-D)*<br>http://www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/4G3G_ant.html<br>■ *Cisco 4G Indoor Ceiling-Mount Omnidirectional Antenna (4G-ANTM-OM-CM)*<br>http://www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/antcm4gin.html<br>■ *Cisco Outdoor Omnidirectional Antenna for 2G/3G/4G Cellular (ANT-4G-OMNI-OUT-N)*<br>http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/Outdoor_Omni_for_2G_3G_4G_Cellular.html<br>■ *Cisco Integrated 4G Low-Profile Outdoor Saucer Antenna (ANT-4G-SR-OUT-TNC)*<br>http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/4G_LowProfile_Outdoor_Saucer.html<br>■ *Cisco Single-Port Antenna Stand for Multiband TNC Male-Terminated Portable Antenna (Cisco 4G-AE015-R, Cisco 4G-AE010-R)*<br>http://www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/4Gantex15-10r.html<br>■ *Cisco 4G Lightning Arrestor (4G-ACC-OUT-LA)*<br>http://www.cisco.com/en/US/docs/routers/access/wireless/hardware/notes/4Glar.html<br>■ *Lightning Arrestor for the Cisco 1240 Connected Grid Router*<br>http://www.cisco.com/en/US/docs/routers/connectedgrid/lightning_arrestor/Lightning_Arrestor_for_the_Cisco_1240_Connected_Grid_Router.html<br>Cisco 4G Indoor/Outdoor Active GPS Antenna (GPS-ACT-ANTM-SMA) |

| Related Topic | Document Title |
|---|---|
| Datasheet | ■ Modules data sheets for ISR4k http://www.cisco.com/c/en/us/products/routers/4000-series-integrated-services-routers-isr/datasheet-listing.html<br>■ LTE datasheet http://www.cisco.com/c/en/us/td/docs/routers/access/4400/roadmap/isr4400roadmap.html |
| ISR 4K | ■ Overview http://www.cisco.com/c/en/us/products/routers/4000-series-integrated-services-routers-isr/index.html<br>■ Roadmap http://www.cisco.com/c/en/us/td/docs/routers/access/4400/roadmap/isr4400roadmap.html<br>■ *Cisco 4000 Series ISRs Software Configuration Guide* http://www.cisco.com/c/en/us/td/docs/routers/access/4400/software/configuration/guide/isr4400swcfg.html<br>■ *Hardware Installation Guide for the Cisco 4000 Series Integrated Services Router* http://www.cisco.com/c/en/us/td/docs/routers/access/4400/hardware/installation/guide4400-4300/C4400_isr.html |

## MIBs

| MIB | MIBs Link |
|---|---|
| ■ IF-MIB<br>■ CISCO-ENTITY-VENDORTYPE-OID-MIB<br>■ CISCO-WAN-3G-MIB | To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs |

## RFCs

| RFC | Title |
|---|---|
| RFC 3025 | Mobile IP Vendor/Organization-Specific Extensions |

## Technical Assistance

| Description | Link |
|---|---|
| The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password. | http://www.cisco.com/cisco/web/support/index.html |