Cisco 4G LTE-Advanced Configuration

This section contains the following topics:

- Cisco Fourth-Generation LTE Advanced on the Cisco IR1101 Series Integrated Services Router, on page 1

Cisco Fourth-Generation LTE Advanced on the Cisco IR1101 Series Integrated Services Router


The IR1101 offers LTE support through the use of Pluggable Modules. You can find a list of the supported Pluggable Modules in the IR1101 Industrial Integrated Services Router Hardware Installation Guide.

Cisco LTE Pluggable Module 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.

It is important to understand the architecture of the IR1101 series and the relationship between Modems, SIMs, Interface and Controller. The following table helps to illustrate these relationships.

<table>
<thead>
<tr>
<th>Router</th>
<th>Controller</th>
<th>SIM</th>
<th>Modem SubSlot</th>
<th>PDN Interface</th>
<th>Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR1101</td>
<td>0/1/0</td>
<td>0/1</td>
<td>0/1</td>
<td>Cellular 0/1/0</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cellular 0/1/1</td>
<td></td>
</tr>
</tbody>
</table>
Prerequisites for Configuring Cisco 4G LTE Advanced

- 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. Please refer to the RSSI/SNT values as displayed through `show cellular 0/1/0 all` or the LED of the pluggable modem.

- You must have 4G LTE network coverage where your router is physically placed. For a complete list of supported carriers.

- You must subscribe to a service plan with a wireless service provider and obtain a Subscriber Identity Module (SIM) card. Only micro SIM is supported.

- You must install the SIM card before configuring the 4G LTE or router.

- The standalone antenna that supports GPS capabilities must be installed for the GPS feature to work.

Restrictions for Configuring Cisco 4G LTE Advanced

- 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 bandwidth is asymmetric with the downlink data rate being greater than the uplink data rate.

- 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.

- CDMA-EVDO, CDMA-1xRTT, and GPRS technology modes are 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.

Features not Supported in 4G LTE Advanced

The following features are not supported on Cisco 4G LTE Advanced on the IR1101, when compared to Classic IOS:

• TTY support or Line

• Chat script/dialer string

• DM log output to USB flash is not supported.

4G LTE-Advanced LEDs

LED status can be obtained through the show led CLI, or visually on the pluggable modem card. The following is an example of the show led CLI:

IR1101#show led

SYSTEM LED : Green

Custom LED : Off

VPN LED : Off

ALARM LED : Off

GigabitEthernet0/0/0 LED : On
FastEthernet0/0/1 LED : Off
FastEthernet0/0/2 LED : Off
FastEthernet0/0/3 LED : Off
FastEthernet0/0/4 LED : Off

LTE module Enable LED : Green
LTE module SIM 0 LED : Green
LTE module SIM 1 LED : Off
LTE module GPS LED : Green
LTE module RSSI 0 LED : On
LTE module RSSI 1 LED : On
LTE module RSSI 2 LED : On
LTE module RSSI 3 LED : Off

The following table describes the LED behavior in 4G LTE-Advanced.
### Table 1: 4G LTE-Advanced LED Indicators

<table>
<thead>
<tr>
<th>LED</th>
<th>Color/Bar and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE SIM(0) &amp; SIM(1)</td>
<td>Green (Solid)  Modem up, SIM installed and active</td>
</tr>
<tr>
<td></td>
<td>Green Blink        LTE data activity</td>
</tr>
<tr>
<td></td>
<td>Off                Modem not up; or modem up and no SIM</td>
</tr>
<tr>
<td></td>
<td>Amber (Solid)      Modem up, SIM installed but not active</td>
</tr>
<tr>
<td>EN</td>
<td>Off                Pluggable is powered off.</td>
</tr>
<tr>
<td></td>
<td>Amber (Solid)      Module power is on, but the module is not functioning correctly.</td>
</tr>
<tr>
<td></td>
<td>Green (Solid)      Module power is on</td>
</tr>
<tr>
<td>RSSI - Uses Bars for LED Indication</td>
<td>Four Bar  High RSSI &gt;= -69dBm</td>
</tr>
<tr>
<td></td>
<td>Three Bar          Medium RSSI, -89dBm &lt;&gt; -70dBm</td>
</tr>
<tr>
<td></td>
<td>Two Bar            Low RSSI, -99dBm &lt;&gt; -90dBm</td>
</tr>
<tr>
<td></td>
<td>One Bar            RSSI &lt;= -100dBm</td>
</tr>
<tr>
<td></td>
<td>0 or No Bar        No Service</td>
</tr>
<tr>
<td>GPS</td>
<td>Green (Solid)      GPS coordinates are obtained.</td>
</tr>
<tr>
<td></td>
<td>Off                GPS is disabled, GPS is enabled without GPS mode and NMEA configuration, or GPS is acquiring</td>
</tr>
</tbody>
</table>

### Cisco 4G LTE-Advanced Features

Cisco 4G LTE-Advanced supports the following major features:

- Global Navigation Satellite System (GNSS) (requires a GNSS compliant antenna) and National Marine Electronics Association (NMEA) streaming.
- Short Message Service (SMS)
- 3G/4G Simple Network Management Protocol (SNMP) MIB
- SIM lock and unlock capabilities
- Dual SIM (single SIM on the P-LTE-VZ pluggable)
- Auto SIM
- NeMo
Mobile Network IPv6
• Public Land Mobile Network (PLMN) selection
• IPv6
• Multiple PDN
• LTE Link Recovery

4G GNSS and NMEA

Active GNSS is supported on the SubMiniature version A (SMA) port. Active GNSS antenna is supported only in the standalone mode. An Active GNSS 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 GNSS receiver. Active GNSS antennae require power from the GNSS receiver SMA port to operate.

National Marine Electronics Association (NMEA) streams GNSS data either from a 4G LTE 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 GNSS-based application.

The following GNSS and NMEA features are supported on the Cisco 4G LTE-Advanced:

• GNSS standalone mode (satellite-based GNSS)
• Cisco IOS-XE CLI display coordinates.
• External application displays router map location
• Objects in the CISCO-WAN-3G-MIB supports GNSS and NMEA features
• The Cisco 4G LTE-Advanced only support NMEA over IP and uses show commands in the platform

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Note

Assisted GNSS mode is not supported.

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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.

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Note

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

To connect a Cisco 4G LTE-Advanced 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 0/1/0 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.

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

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**Dual SIM Card**

**Note**
The P-LTE-VZ pluggable which supports Verizon is a single SIM.

- 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.

```bash
controller cellular 0/1/0
lte sim primary slot <slot#>
```

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

- By default the failover timer is two minutes. The failover timer can be set from 1 to 7 minutes.

```bash
controller cellular 0/1/0
lte failovertimer <3-7>
```

- You can also manually switch the SIM slot via the command line interface.

```bash
cellular 0/1/0 lte sim activate slot <0-1>
```

---

**Auto SIM**

The Auto SIM feature detects the SIM and loads the corresponding firmware. For example, if an AT&T SIM is detected, the modem loads the AT&T firmware.

When Auto-SIM is enabled, it is said to be in Auto-SIM mode and when disabled, it is known as Manual mode. In Auto-SIM mode, the modem selects the right carrier firmware from the list of firmware's available. When in manual mode, you can select the firmware manually. Modem resets every time you make a config change from Auto-SIM enabled to disabled or vice-versa.

The P-LTE-US and P-LTE-GB pluggable modules on the IR1101 support Auto SIM.

**Note**
Auto SIM is always enabled by default.
Enable Auto SIM

**SUMMARY STEPS**

1. `configure terminal`
2. Cellular `slots/sub-slots/interface lte firmware-activate firmware-index`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** configure terminal  
  Example:  
  Router# configure terminal | Enters configuration mode. |
| **Step 2** Cellular `slots/sub-slots/interface lte firmware-activate firmware-index`  
  Example:  
  Router(config)# cellular 0/1/0 lte firmware-activate 1 | Activates the firmware index.  
  Note For the 4G LTE Advanced, the `unit` argument identifies the slot, subslot, and the interface separated by slashes (0/1/0). |

**Example: List the firmware when Auto-SIM is Enabled**

```
Device# show cellular 0/1/0  
firmware Idx Carrier FwVersion PriVersion Status  
1 ATT 02.28.00.00 002.035_000 Inactive  
2 GENERIC 02.28.00.00 002.035_000 Active  
3 ROGERS 02.28.00.00 001.012_000 Inactive  
4 SPRINT 02.14.03.02 002.012_000 Inactive  
5 VERIZON 02.28.00.00 002.042_000 Inactive
```

Firmware Activation mode = AUTO

Disable Auto SIM

**SUMMARY STEPS**

1. `configure terminal`
2. `controller cellular slots/sub-slots/interface`
3. `no lte firmware auto-sim`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** configure terminal  
  Example:  
  Router# configure terminal | Enters configuration mode. |
### Command or Action

<table>
<thead>
<tr>
<th>Step 2</th>
<th>controller cellular slots/sub-slots/interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Router(config)# controller cellular 0/1/0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3</th>
<th>no lte firmware auto-sim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>Router(config-if)# no lte firmware auto-sim</td>
</tr>
</tbody>
</table>

#### Example: List the firmware when Auto-SIM is Disabled

```
Device# show cellular 0/1/0 firmware
Idx Carrier FWVersion PriVersion Status
1 ATT 02.28.00.00 002.035_000 Active
2 GENERIC 02.28.00.00 002.035_000 Inactive
3 ROGERS 02.28.00.00 001.012_000 Inactive
4 SPRINT 02.14.03.02 002.012_000 Inactive
5 VERIZON 02.28.00.00 002.042_000 Inactive
```

**Firmware Activation mode = Manual**

### Using a SIM Card

Cisco 4G LTE-Advanced 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-Advanced and used without an authorization code.

The SIM can be initially locked with a PIN code (4 to 8 digits 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-Advanced in which the locked SIM resides is moved to a different 4G LTE-Advanced 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-Advanced slot number. This will ensure that the SIM card will not be used in any unauthorized device, or, if there are multiple 4G LTE-Advanced in a single ISR, that the appropriate PIN is applied to each 4G LTE-Advanced 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:

**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.

### Changing the PIN

Ensure to enter the correct PIN, the SIM card gets blocked if the wrong PIN is entered three consecutive times.

**SUMMARY STEPS**

1. `cellular slots subslots interface lte sim change-pin current-pin new-pin`

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Locks or unlocks the SIM card using a PIN code.</td>
</tr>
<tr>
<td><code>cellular slots subslots interface lte sim change-pin current-pin new-pin</code></td>
<td>Note</td>
</tr>
<tr>
<td><code>pin</code></td>
<td><strong>Note</strong></td>
</tr>
<tr>
<td><code>Router# cellular 0/1/0 lte sim lock 1111 1234</code></td>
<td>Note</td>
</tr>
</tbody>
</table>

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

Perform this task to lock or unlock a SIM card given by your service provider. Make sure you enter the correct PIN, the SIM card gets blocked if the wrong PIN is entered three consecutive times.

**Procedure**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Locks or unlocks the SIM card using a PIN code.</td>
</tr>
<tr>
<td>`cellular unit lte sim {lock</td>
<td>unlock} pin`</td>
</tr>
<tr>
<td><code>Router# cellular 0/1/0 lte sim lock 1111</code></td>
<td><strong>Note</strong></td>
</tr>
</tbody>
</table>

### Configure CHV1 for Unencrypted Levels

Use either of these commands:

- `lte sim authenticate 0 pin`
- `lte sim authenticate 0 pin slot {0 | 1}`
Configure CHV1 for Unencrypted Level7

To configure an encrypted PIN, the scrambled value of the PIN must be obtained. To get the scrambled Level7 PIN and to configure the SIM CHV1 code for verification using this encrypted PIN, enter the following commands in the EXEC mode. 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. A SIM should be locked for SIM authentication to work.

### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td><code>cellular slots subslots interface</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>Example:</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>Router(config)# controller cellular 0/1/0</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>lte sim authenticate 7 1111 slot 0</code></td>
<td>Enables password encryption.</td>
</tr>
</tbody>
</table>

**Note**

#### Configure CHV1 for Unencrypted Level7

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2</strong></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td><code>username privilege var password pin</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>Example:</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>Router(config)# username SIM privilege 0 password 1111</code></td>
<td>Enables password encryption.</td>
</tr>
</tbody>
</table>

**Note**

- name - specifies the username, `pin`—A 4 to 8 digits PIN code.

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 3</strong></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td>`do show run</td>
<td>i name`</td>
</tr>
<tr>
<td><code>Example:</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td>`Router(config)# do show run</td>
<td>i SIM`</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 4</strong></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td><code>username privilege 0 password pin</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>Example:</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><code>Router(config)# controller cellular 0/1/0</code></td>
<td>Enables password encryption.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 5</strong></td>
<td><strong>Purpose</strong></td>
</tr>
<tr>
<td><code>lte sim authenticate 7 pin OR lte sim authenticate 7 pin</code></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td>`slot {0</td>
<td>1}`</td>
</tr>
<tr>
<td><code>Example:</code></td>
<td>Enables password encryption.</td>
</tr>
</tbody>
</table>
### Purpose

**Command or Action**  
`Device(config-controller)# lte sim authenticate 7 055A575E70`  
**Purpose**  
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.  
**Note**  
The slot keyword and its options are available only on platforms that supports Dual-SIM feature.

#### Step 6  
**exit**  
**Example:**  
`Router(config-controller)# exit`  
(Optional) Exits the cellular controller configuration mode.

#### Step 7  
**no username**  
**name**  
**Example:**  
`Router(config-controller)# no username SIM`  
(Optional) Removes the username and password created in Step 3.

#### Step 8  
**no service password-encryption**  
**name**  
**Example:**  
`Router(config-controller)# no service password-encryption`  
(Optional) Removes the username and password created in Step 3.

### Short Message Service (SMS) Capabilities

Cisco 4G LTE-Advanced 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-Advanced also have the capability to revert from LTE SMS to 3G technology if necessary.

A sending device behind a Cisco 4G LTE-Advanced 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. The following figure 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.
Data Account Provisioning

One or more modem data profiles can be created to provision a modem on a 4G LTE SKU. 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:

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.

Configuring Cisco 4G LTE Advanced

For 4G-LTE-Advanced, the numbering for slot 0, module 0, and port 0 is 0/1/0 for all commands.
Verifying Modem Signal Strength and Service Availability

For the 4G LTE Advanced, the unit argument identifies the router slot, module slot, and port separated by slashes (0/1/0).

Procedure

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

Guidelines for Creating, Modifying, or Deleting Modem Data Profiles

Customized profiles (Access Point Name(APN) in mobile networks) can be created and used on Cisco 4G LTE Advanced SKU’s. Maximum number of profiles that can be created are 16.

Cisco SKU’s shipping with specific carrier provisioning file (Can be found in Carrier label under "show cellular <slot> hardware"), default profiles are already populated and can be deployed readily.

In all other cases where profile configurations are not available, separate profiles should be created with required parameters.

You can create multiple profiles on Cisco 4G LTE Advanced. The following are the default internet profile numbers for the modems:

<table>
<thead>
<tr>
<th>Modem</th>
<th>Profile Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP7607 (Global)</td>
<td>Profile 1</td>
</tr>
</tbody>
</table>
Follow these guidelines when you configure a data profile using EXEC mode or Config mode:

- 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 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 0/1/0`.

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

Customized profiles (Access Point Name(APN) in mobile networks) can be created and used on Cisco 4G LTE Advanced SKU’s. Maximum number of profiles that can be created are 16.

Cisco SKU's shipping with specific carrier provisioning file (can be found in carrier label under `show cellular slot hardware`, default profiles are already populated and can be deployed readily.

**Note**

For the 4G LTE Advanced, the `unit` argument identifies the router slot, module slot, and port separated by slashes (0/1/0).

### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Creates, modifies, or deletes a modem data profile in the privileged EXEC mode.</td>
</tr>
<tr>
<td>`cellular unit &lt;unit&gt; lte profile [create</td>
<td>delete] profile-number [apn [authentication [username password [bearer-type]]]]`</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
</tbody>
</table>
| `Router# cellular 0/1/0 lte profile create 2 apn.com pap username pwd ipv4` | • The `profile-number` argument specifies the profile number created for the modem.  
• (Optional) The `apn` argument specifies an Access Point Name (APN). An APN is provided by your service provider. Only a single APN can be specified for a single profile.  
• (Optional) The `authentication` parameter specifies the authentication type used. Acceptable parameters are `chap`, `none` (no authentication), `pap`, and `pap_chap` (PAP or CHAP authentication). |
Creating, Modifying, or Deleting Data Profiles Using EXEC Mode

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>• (Optional) The <em>username</em> and <em>password</em> arguments are given by a service provider. These are mandatory when an authentication type other than <em>none</em> is used.</td>
<td></td>
</tr>
<tr>
<td>• (Optional) The <em>PDN</em> type parameter specifies the type of packet data session established with mobile network using this profile. Acceptable parameters are: <em>ipv4</em>, <em>ipv6</em> and <em>ipv4v6</em> (IPv4 and IPv6).</td>
<td></td>
</tr>
</tbody>
</table>

The *show cellular* *slot* profile displays configured profile list.

**Note**

Single asterisk(*) displayed against data profile.

Double asterisk(**) displayed against attached profile.

---

**Example**

```
router# show cellular 0/1/0 profile
Profile 1 = INACTIVE **
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwims
Authentication = None

Profile 2 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwadmin
Authentication = None

Profile 3 = ACTIVE*
--------
PDP Type = IPv4v6
PDP address = 100.119.136.44
PDP IPV6 address = 2600:1010:B00E:1E11:192D:3E20:199B:3A70/64 Scope: Global
Access Point Name (APN) = VZWINTERNET
Authentication = None
Primary DNS address = 198.224.173.135
Secondary DNS address = 198.224.174.135
Primary DNS IPV6 address = 2001:4888:68:FF00:608:D:0:0
Secondary DNS IPV6 address = 2001:4888:61:FF00:604:D:0:0

Profile 4 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwapp
Authentication = None

Profile 5 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzw800
Authentication = None

Profile 6 = INACTIVE
--------
```
PDP Type = IPv4v6
Access Point Name (APN) = CISCO.GW4.VZWENTP
Authentication = None

* - Default profile
** - LTE attach profile

If data and attach profile bindings need modification, use the controller cellular slot.

```
router(config-controller)# lte sim data-profile 3 attach-profile 2 slot <unit>
```

```
Device #show cellular 0/1/0 profile
Profile 1 = INACTIVE

PDP Type = IPv4v6
Access Point Name (APN) = test
Authentication = None

Profile 2 = INACTIVE **

PDP Type = IPv4
Access Point Name (APN) = internet
Authentication = PAP or CHAP
Username = user@solution.com
Password = cisco

Profile 3 = INACTIVE*

PDP Type = IPv4v6
Access Point Name (APN) = basic
Authentication = None

* - Default profile
** - LTE attach profile
Configured default profile for active SIM 0 is profile 2.
```

### Configuration Examples

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

```
router(config-controller)# lte sim data-profile 2 attach-profile 1 slot <unit>
```

The following example shows the output of the `show cellular` command for Verizon network service:

```
router# show cellular 0/1/0 profile
Profile 1 = INACTIVE **

PDP Type = IPv4v6
Access Point Name (APN) = vzwims
Authentication = None

Profile 2 = INACTIVE

PDP Type = IPv4v6
Access Point Name (APN) = vzwadmin
Authentication = None

Profile 3 = ACTIVE*
```
**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.

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.

For the 4G LTE Advanced, the `unit` argument identifies the router slot, module slot, and port separated by slashes (0/1/0).

**Procedure**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>`cellular unit lte sim {lock</td>
<td>unlock} pin`</td>
</tr>
</tbody>
</table>

*Example:*

```
Router# cellular 0/1/0 lte sim lock 1111
```

**Changing the PIN Code**

Perform this task to change the PIN code of a SIM.
For the 4G LTE Advanced, the \textit{unit} argument identifies the router slot, module slot, and port separated by slashes (0/1/0).

**Procedure**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 \texttt{cellular unit lte sim change-pin pin new-pin}</td>
<td>Changes the assigned PIN code. SIM should be in locked state when the PIN is being changed.</td>
</tr>
<tr>
<td>Example: \texttt{Router# cellular 0/1/0 lte sim change-pin 1111 1234}</td>
<td></td>
</tr>
</tbody>
</table>

**Verifying the Security Information of a Modem**

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

**Note**

For the 4G LTE Advanced, the \textit{unit} argument identifies the router slot, module slot, and port separated by slashes (0/1/0).

**Procedure**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 \texttt{show cellular unit security}</td>
<td>Shows the security information of the modem, including the SIM lock status.</td>
</tr>
<tr>
<td>Example: \texttt{Router# show cellular 0/1/0 security}</td>
<td></td>
</tr>
</tbody>
</table>

**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.

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.

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, on page 19.

A SIM should be locked for SIM authentication to work. To verify the SIM’s status, use the \texttt{show cellular unit security} command.

For the 4G LTE Advanced, the \textit{unit} argument identifies the router slot, module slot, and port separated by slashes (0/1/0).
### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><code>configure terminal</code></td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td><code>Router# configure terminal</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>Enters the cellular controller configuration mode.</td>
</tr>
<tr>
<td><code>controller cellular unit</code></td>
<td></td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td><code>Router(config)# controller cellular 0/1/0</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>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.</td>
</tr>
<tr>
<td><code>lte sim authenticate 0 pin</code></td>
<td></td>
</tr>
</tbody>
</table>

**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, on page 19.

### 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 4G LTE SKU, the `unit` argument identifies the router slot, module 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

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>configure terminal</td>
</tr>
<tr>
<td>Example:</td>
<td>Router# configure terminal</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>service password-encryption</td>
</tr>
<tr>
<td>Example:</td>
<td>Router(config)# service password-encryption</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Enables password encryption.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>username name privilege 0 password pin</td>
</tr>
<tr>
<td>Example:</td>
<td>Router(config)# username SIM privilege 0 password 1111</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Creates username and password.</td>
</tr>
<tr>
<td></td>
<td>• name—Specifies the username.</td>
</tr>
<tr>
<td></td>
<td>• pin—Specifies the four- to eight-digit PIN code.</td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td>do show run</td>
</tr>
<tr>
<td>Example:</td>
<td>Router(config)# do show run</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Shows the username configuration line with the encrypted level 7 PIN for the username created in Step 3 (user “SIM” in the example shown).</td>
</tr>
<tr>
<td></td>
<td>Copy the scrambled password for use in Step 6 (as the PIN).</td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td>controller cellular unit</td>
</tr>
<tr>
<td>Example:</td>
<td>Router(config)# controller cellular 0/1/0</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Enters the cellular controller configuration mode.</td>
</tr>
<tr>
<td><strong>Step 6</strong></td>
<td>lte sim authenticate {0</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Authenticates the SIM CHV1 code by using the encrypted keyword 7 and the scrambled PIN from Step 4. 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.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1**
| configure terminal
| Example: Router# configure terminal |
| **Step 2**
| controller cellular unit
| Example: Router(config)# controller cellular 0/1/0 |
| **Step 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. The attach profile is the profile used by the modem to attach to the LTE network. 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:

---

**Applying a Modem Profile in a SIM Configuration**

Purpose

Command or Action

Step 7

exit
Example:

Router(config-controller)# exit

(Optional) Exits the cellular controller configuration mode.

Step 8

no username name
Example:

Router(config)# no username SIM

(Optional) Removes the username and password created in Step 3.

Step 9

no service password-encryption
Example:

Router(config)# no service password-encryption

(Optional) Disables password encryption.
Configuring the Cellular Interface

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

For the 4G LTE Advanced, the unit argument identifies the router slot, module slot, and port separated by slashes (0/1/0).

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.

SUMMARY STEPS

1. configure terminal
2. interface cellular unit
3. ip address negotiated
4. dialer in-band
5. dialer watch-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

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>interface cellular unit</td>
<td>Specifies the cellular interface.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config)# interface cellular 0/1/0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ip address negotiated</td>
<td>Specifies that the IP address for a particular interface is dynamically obtained.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-if)# ip address negotiated</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>dialer in-band</td>
<td>Enables DDR and configures the specified serial interface to use in-band dialing.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-if)# dialer in-band</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>dialer watch-group group-number</td>
<td>Specifies the number of the dialer access group to which the specific interface belongs.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-if)# dialer watch-group 1</td>
<td></td>
</tr>
</tbody>
</table>
**Step 6**

**Command or Action**

`exit`

**Example:**

Router(config-if)# exit

**Purpose**

Enters the global configuration mode.

---

**Step 7**

**Command or Action**

`ip route network-number network-mask {ip-address | interface} [administrative distance] [name name]`

**Example:**

Router(config)# ip route 209.165.200.225 255.255.255.224 cellular 0/1/0

**Purpose**

Establishes a floating static route with the configured administrative distance through the specified interface.

**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.

---

**Step 8**

**Command or Action**

`dialer-list dialer-group protocol protocol-name {permit | deny | list access-list-number | access-group}`

**Example:**

Router(config)# dialer-list 1 protocol ip list 1

**Purpose**

Creates a dialer list for traffic of interest and permits access to an entire protocol.

---

**Configure Cellular Interface with dialer watch-group**

To configure the cellular interface with dialer watch-group, enter the following commands starting in EXEC mode.

**Note**

For the 4G LTE Advanced, the `unit` argument identifies the router slot, module 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. ip address negotiated
6. dialer idle-timeout seconds
7. dialer watch-group group-number
8. exit
9. dialer-list dialer-group protocol protocol-name {permit | deny | list access-list-number | access-group}
10. access-list access-list-number permit ip-source-address
11. dialer watch-list watch-group number ip ip mask
12. dialer watch-list watch-group number delay route-check initial-time in seconds
13. dialer watch-list watch-group number delay connected seconds
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td><code>configure terminal</code></td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router# configure terminal</code></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td><code>interface cellular unit</code></td>
<td>Specifies the cellular interface.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config)# interface cellular 0/1/0</code></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td><code>ip address negotiated</code></td>
<td>Specifies that the IP address for a particular interface is dynamically obtained.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# ip address negotiated</code></td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td><code>dialer in-band</code></td>
<td>Enables DDR and configures the specified serial interface to use in-band dialing.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# dialer in-band</code></td>
<td></td>
</tr>
<tr>
<td>Step 5</td>
<td><code>ip address negotiated</code></td>
<td>Specifies that the IP address for a particular interface is dynamically obtained.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# ip address negotiated</code></td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td><code>dialer idle-timeout seconds</code></td>
<td>Specifies the duration of idle time, in seconds, after which a line has no outbound traffic.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td>“0” second means no idle timeout. The default idle timeout is 120 seconds if there is no idle timer specified.</td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# dialer idle-timeout 30</code></td>
<td></td>
</tr>
<tr>
<td>Step 7</td>
<td><code>dialer watch-group group-number</code></td>
<td>Enables Dialer Watch on the specific interface.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config)# dialer watch-group 1</code></td>
<td></td>
</tr>
<tr>
<td>Step 8</td>
<td><code>exit</code></td>
<td>Enters the global configuration mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config-if)# exit</code></td>
<td></td>
</tr>
<tr>
<td>Step 9</td>
<td>`dialer-list dialer-group protocol protocol-name {permit</td>
<td>deny</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><code>Router(config)# dialer-list 1 protocol ip list 1</code></td>
<td></td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Step 10</strong> access-list access-list-number permit ip-source-address</td>
<td>Defines traffic of interest.</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router(config)# access-list 1 permit any</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 11</strong> dialer watch-list watch-group number ip ip mask</td>
<td>Defines traffic of interest.</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router(config)# dialer watch-list 1 ip 5.6.7.8 255.255.255</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 12</strong> dialer watch-list watch-group number delay route-check initial time in seconds</td>
<td>Defines traffic of interest.</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router(config)# dialer watch-list 1 delay route-check initial 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 13</strong> dialer watch-list watch-group number delay connected seconds</td>
<td>Defines traffic of interest.</td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Router(config)# dialer watch-list 1 delay connect 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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 Advanced.

**Note**

For a 4G LTE-Advanced, the *unit* argument identifies the router slot, module slot, and the port, and is separated by slashes (0/1/0).

**SUMMARY STEPS**

1. configure terminal
2. controller cellular *unit*
3. lte gps enable
4. lte gps mode standalone
5. lte gps nmea {ip | udp [source address][destination address][destination port] }
6. end
7. test cellular *unit* modem-power-cycle
8. show cellular *unit* gps
9. show cellular *unit* gps detail
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>configure terminal</td>
<td>Enters the configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td>controller cellular unit</td>
<td>Enters the controller cellular configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config)# controller cellular 0/1/0</td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td>lte gps enable</td>
<td>(Optional) GPS is enabled by default. Use this command to enable the GPS feature if GPS has been disabled for any reason.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-controller)# lte gps enable</td>
<td></td>
</tr>
<tr>
<td>Step 4</td>
<td>lte gps mode standalone</td>
<td>Enables the standalone GPS mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-controller)# lte gps mode standalone</td>
<td></td>
</tr>
<tr>
<td>Step 5</td>
<td>lte gps nmea {ip</td>
<td>udp [source address][destination address][destination port]}</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-controller)# lte gps nmea ip or Router(config-controller)# lte gps nmea</td>
<td></td>
</tr>
<tr>
<td>Step 6</td>
<td>end</td>
<td>Exits the controller configuration mode and returns to the privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router(config-controller)# end</td>
<td></td>
</tr>
<tr>
<td>Step 7</td>
<td>test cellular unit modem-power-cycle</td>
<td>GPS can take effect only after modem power cycle.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router# test cellular 0/1/0 modem-power-cycle</td>
<td></td>
</tr>
<tr>
<td>Step 8</td>
<td>show cellular unit gps</td>
<td>Displays a summary of the following GPS data:</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td>Router# show cellular 0/1/0 gps</td>
<td></td>
</tr>
<tr>
<td>- GPS Feature = enabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- GPS Mode Configured = standalone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- GPS Port Selected = Dedicated GPS port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- GPS Status = GPS coordinates acquired</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Last Location Fix Error = Offline [0x0]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Latitude = 37 Deg 25 Min 4.8915 Sec North</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Longitude = 121 Deg 55 Min 8.5627 Sec West</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Timestamp (GMT) = Wed Nov 7 21:54:18 2018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Fix type index = 0, Height = 8 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Satellite Info</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Command or Action</td>
<td>Purpose</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td></td>
</tr>
<tr>
<td>Satellite #1, elevation 45, azimuth 303, SNR 20 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #3, elevation 15, azimuth 296, SNR 21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #8, elevation 9, azimuth 227, SNR 27 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #11, elevation 41, azimuth 270, SNR 27 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #18, elevation 64, azimuth 258, SNR 29 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #22, elevation 35, azimuth 303, SNR 22 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #31, elevation 51, azimuth 140, SNR 24 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #32, elevation 46, azimuth 43, SNR 22 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #10, elevation 25, azimuth 97, SNR 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satellite #14, elevation 68, azimuth 26, SNR 0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Satellite Info

Disables detailed GPS data.

**Step 9**

**show cellular unit gps detail**

**Example:**

```bash
Router# show cellular 0/1/0 gps detail
GPS Feature = enabled
GPS Mode Configured = standalone
GPS Port Selected = Dedicated GPS port
GPS Status = GPS coordinates acquired
Last Location Fix Error = Offline [0x0]
Latitude = 37 Deg 25 Min 4.9282 Sec North
Longitude = 121 Deg 55 Min 8.5209 Sec West
Timestamp (GMT) = Wed Nov 7 21:53:52 2018
Fix type index = 0, Height = 7 m
HDOP = 1.5, GPS Mode Used = standalone
```

Satellite Info

---

For an 4G LTE Advanced, the *unit* argument identifies the router slot, module 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

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure terminal</td>
<td>Enters the configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> controller cellular unit</td>
<td>Enters the controller cellular configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# controller cellular 0/1/0</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> lte sms archive path FTP-URL</td>
<td>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: ftp://172.25.211.175/SMS-LTE/outbox, ftp://172.25.211.175/SMS-LTE/inbox</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-controller)# lte sms archive path ftp://username:password@172.25.211.175/SMS-LTE</td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong> cellular unit lte sms view { all</td>
<td>ID</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# cellular 0/1/0 lte sms view summary</td>
<td></td>
</tr>
<tr>
<td>ID FROM YY/MM/DD HR:MN:SC SIZE CONTENT</td>
<td></td>
</tr>
<tr>
<td>0 4442235525 12/05/29 10:50:13 137 Your entry last month has...</td>
<td></td>
</tr>
<tr>
<td>2 5553337777 13/08/01 10:24:56 5 First</td>
<td></td>
</tr>
<tr>
<td>3 5553337777 13/08/01 10:25:02 6 Second</td>
<td>• <strong>all</strong>—Displays the message contents of up to 255 incoming text messages received by the modem.</td>
</tr>
<tr>
<td><strong>Step 5</strong> end</td>
<td>Exits the configuration mode and returns to the privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# end</td>
<td></td>
</tr>
<tr>
<td><strong>Step 6</strong> show cellular unit sms</td>
<td>Displays all the information in the text messages sent and received. Message information includes text messages sent successfully, received, archived, and messages pending to</td>
</tr>
</tbody>
</table>
### Command or Action

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>Router# show cellular 0/1/0 sms</code></td>
<td>be sent. LTE-specific information on errors in case of a FAILED attempt may also be displayed.</td>
</tr>
</tbody>
</table>

#### Incoming Message Information

- SMS stored in modem = 20
- SMS archived since booting up = 0
- Total SMS deleted since booting up = 0
- Storage records allocated = 25
- Storage records used = 20
- Number of callbacks triggered by SMS = 0
- Number of successful archive since booting up = 0
- Number of failed archive since booting up = 0

#### Outgoing Message Information

- Total SMS sent successfully = 0
- Total SMS send failure = 0
- Number of outgoing SMS pending = 0
- Number of successful archive since booting up = 0
- Number of failed archive since booting up = 0
- Last Outgoing SMS Status = SUCCESS
- Copy-to-SIM Status = 0x0
- Send-to-Network Status = 0x0
- Report-Outgoing-Message-Number:
  - Reference Number = 0
  - Result Code = 0x0
  - Diag Code = 0x0 0x0 0x0 0x0 0x0
- SMS Archive URL = ftp://lab:lab@1.3.150.1/outbox

### Step 7

**cellular unit lte sms send number**

**Example:**

```
Router# cellular 0/1/0 lte sms send 15554443333 <sms text>
```

**Note**

10-digit or 11-digit (phone) numbers are the proper numerical format for sending a text. For example, 1########### or 1#####. Seven digits are not supported.

### Step 8

**cellular unit lte sms delete [ all | id ]**

**Example:**

```
Router# cellular 0/1/0 lte sms delete [ all | id ]
```

(Optional) Deletes one message ID or all of the stored messages from memory.

### Configuring Modem DM Log Collection

Diagnostic Monitor (DM) Log is a modem's feature that captures data transactions between the modem and the network over the radio frequency interface. This feature is a useful tool for troubleshooting 3G and 4G data connectivity or performance issues.

Once a DM log file is captured, diagnostic software tools, such as Sierra Wireless SwiLog and Qualcomm QXDM, can be used to decode the DM log file to understand the issues. A member of Cisco TAC can help with decoding the DM log files.

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

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
</table>
| **Step 1** | configure terminal | Enters global configuration mode.  
**Example:**  
Router# configure terminal |
| **Step 2** | controller cellular slot | Enters cellular controller configuration mode.  
**Example:**  
Router(config)# controller cellular 0/1/0 |
| **Step 3** | lte modem dm-log {autosop [link-down | timer time] | enable | filesize size | filter | bootflash:file | flash:file} rotation | size log-size} | Configures DM logging for LTE modem.  
**Example:**  
Router(config-controller)# lte modem dm-log enable  
- **autosop**—Automatically stops DM log capturing based on:  
  - **link-down**—cellular interface link down event  
  - **timer timer**—amount of time in minutes  
- **enable**—Starts DM log capturing.  
- **filesize size**—Specifies the maximum log file size, in MB for each DM log file before creating another DM log file. Range is from 1 to 64. Default is 20.  
- **filter location:filename**—Specifies the DM log filter to use from the following locations:  
  - bootflash:file  
  - flash:file  
  **Note** Bootflash and flash are the only valid locationsto store the DM log filter file.  
  **Note** If the DM log filter file is not specified, the generic filter file, which comes with the router will be used.  
  **Note** The DM log filter file needs to be in .sqf format.  
- **rotation**—Enables continuous DM log capturing by replacing the oldest DM log files with the latest.  
- **size log-size**—Specifies the maximum total size in MB of all DM log files that can be allowed in the bootflash or flash before modem stops capturing DM log files. If rotation is enabled, the oldest DM files is replaced with the latest DM file to meet this size configuration.
<table>
<thead>
<tr>
<th>Step 4</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>end</td>
<td>Returns to privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-controller)# end</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 5</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>show cellular</strong> unit logs dm-log</td>
<td>(Optional) Displays DM log configuration and statistics.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router# show cellular 0/1/0 logs dm-log</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrated DM logging is on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>output path = Utility Flash</td>
<td></td>
</tr>
<tr>
<td></td>
<td>filter = MC74xx generic - V11026_Generic_GSM_WCDMA_LTE_IP-no-data-packets.sqf</td>
<td></td>
</tr>
<tr>
<td></td>
<td>maximum log size = 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>maximum file size = 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>log rotation = disabled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>33 packets sent to the modem, 4663 bytes, 0 errors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28521 packets received from the modem, 13500758 bytes, 0 input drops</td>
<td></td>
</tr>
<tr>
<td></td>
<td>28521 packets stored in utility flash, 13500758 bytes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>current file size = 13500758</td>
<td></td>
</tr>
<tr>
<td></td>
<td>current log size = 13500758</td>
<td></td>
</tr>
<tr>
<td></td>
<td>total log size = 13500758</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utility Flash DM log files = (1) files</td>
<td></td>
</tr>
</tbody>
</table>

**Example**

The following example shows how to:

- Specifies the maximum size of all DM log files that can be stored in bootflash or flash to 512 MB
- Specifies the maximum size of each DM log file to 32 MB
- Uses MC7xxx_GPS_Log.sqf DM log filter in the flash
- Enable rotation
- Enables DM log capturing

Router(config-controller)# controller cell 0/1/0
Router(config-controller)# lte modem dm-log filesize 512

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

Router(config-controller)# controller cell 0/1/0
Router(config-controller)# lte modem dm-log filter flash:MC7xxx_GPS_Log.sqf

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

Router(config-controller)# controller cell 0/1/0
Router(config-controller)# lte modem dm-log rotation

The following example shows how to specify the maximum log size for LTE:
The following example shows how to enable DM log rotation for LTE:

```
Router(config-controller)# controller cell 0/1/0
Router(config-controller)# lte modem dm-log enable
```

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

```
Router(config-controller)# controller cell 0/1/0
Router(config-controller)# lte modem dm-log size 1024
```

The following example shows what was configured on the router for DM log feature:

```
Router#show running-config | section controller
controller Cellular 0/1/0
 lte modem dm-log filter flash:MC7xxx_GPS_Log.sqf
 lte modem dm-log size 512
 lte modem dm-log filesize 32
 lte modem dm-log rotation
 lte modem dm-log enable
 lte modem dm-log size 1024
```

The following displays DM log configuration and statistics

```
Router#show cellular 0/1/0 logs dm-log
Integrated DM logging is on
output path = Utility Flash
filter = flash:MC7xxx_GPS_Log.sqf
maximum log size = 536870912
maximum file size = 33554432
log rotation = enabled

32 packets sent to the modem, 3879 bytes, 0 errors
158324 packets received from the modem, 75971279 bytes, 0 input drops
158324 packets stored in utility flash, 75971279 bytes

current file size = 8863042
current log size = 75971279
total log size = 75971279
Utility Flash DM log files = (3) files
```

The following shows the DM log files created:

```
Router#dir flash:dmlog*
Directory of bootflash:/dmlog*
...
Directory of bootflash:/
```

```
  27 -rw- 33554069 Jun 7 2018 18:08:46 -08:00 dmlog-slot2-20180607-180628.bin
  28 -rw- 33554168 Jun 7 2018 18:11:25 -08:00 dmlog-slot2-20180607-180846.bin
  29 -rw- 14188544 Jun 7 2018 18:12:37 -08:00 dmlog-slot2-20180607-181125.bin
```

2885718016 bytes total (521891840 bytes free)

```
lte modem dm-log size 1024
```

The following shows how to disable/stop DM log capturing:

```
Router(config)#controller cellular 0/1/0
Router(config-controller)#no lte modem dm-log enable
Router(config-controller)#end
```
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.

To enable modem crashdump collection, perform the following steps.

Before you begin
The device will need to be in boot-and-hold mode.

Router# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller cel 0/1/0
Router(config-controller)# lte modem crash-action ?
boot-and-hold Remain in crash state
Router(config-controller)# lte modem crash-action boot-and-hold

This ensures that whenever the router crashes, it will stay in that state and will not try to recover. By default the crash-action is reset which means the modem will reset and try to recover itself whenever it crashes. The above boot-and-hold command is used to keep the modem in a crashed state so that you can capture crashdump using the following command:

Router# test cell-cwan 0/1/0 modem-crashdump ?
off Disable Modem firmware crash dump
on Enable Modem firmware crash dump

Router# test cell-cwan 0/1/0 modem-crashdump on
This will capture the crashdump and store it in flash.

Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 test { cell-cwan } unit modem-crashdump { on location</td>
<td>Enables or disables modem crashdump collection.</td>
</tr>
<tr>
<td></td>
<td>off }</td>
</tr>
<tr>
<td>* cell-host</td>
<td>— Keyword for fixed platform.</td>
</tr>
<tr>
<td>* cell-cwan</td>
<td>— Keyword for LTE on a modular inside platform.</td>
</tr>
<tr>
<td>* unit</td>
<td>— For LTE module, this is the router slot, module slot, and port separated by slashes (for example, 0/1/0). For fixed platform, this is the number 0.</td>
</tr>
<tr>
<td>* on</td>
<td></td>
</tr>
</tbody>
</table>
Displaying Modem Log Error and Dump Information

As part of the 3G serviceability enhancement, 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.

### Procedure

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong>  <code>show cellular unit log error</code></td>
<td>Shows modem log error and dump information.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td><code>Router# show cellular 0/1/0 log error</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong>  <code>test cellular unit modem-error-clear</code></td>
<td>(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.</td>
</tr>
<tr>
<td>Example:</td>
<td></td>
</tr>
<tr>
<td><code>Router# test cellular 0/1/0 modem-error-clear</code></td>
<td></td>
</tr>
</tbody>
</table>

### Verifying the 4G LTE Advanced Router Information

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

```
show version
```

```
Router# show version
Cisco IOS XE Software, Version 16.10.01
Cisco IOS Software, Version 16.10.1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
```
Copyright (c) 1986-2018 by Cisco Systems, Inc.
Compiled Fri 09-Nov-18 18:08 by mcpre

Cisco IOS-XE software, Copyright (c) 2005-2018 by cisco Systems, Inc.
All rights reserved. Certain components of Cisco IOS-XE software are
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GPL code under the terms of GPL Version 2.0. For more details, see the
documentation or "License Notice" file accompanying the IOS-XE software,
or the applicable URL provided on the flyer accompanying the IOS-XE
software.

ROM: IOS-XE ROMMON

Router uptime is 14 hours, 36 minutes
Uptime for this control processor is 14 hours, 37 minutes
System returned to ROM by reload
System restarted at 08:47:04 GMT Mon Nov 12 2018
System image file is "bootflash:ir1101-universalk9.16.10.01.SPA.bin"
Last reload reason: Reload Command

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

A summary of U.S. laws governing Cisco cryptographic products may be found at:

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

Technology Package License Information:

<table>
<thead>
<tr>
<th>Technology-package</th>
<th>Current Type</th>
<th>Next reboot</th>
</tr>
</thead>
<tbody>
<tr>
<td>network-essentials</td>
<td>Smart License</td>
<td>network-essentials</td>
</tr>
</tbody>
</table>

Smart Licensing Status: UNREGISTERED/EVAL MODE

cisco IR1101-K9 (ARM64) processor (revision 1.2 GHz) with 711861K/6147K bytes of memory.
Processor board ID FCW222700MY
3 Virtual Ethernet interfaces
4 FastEthernet interfaces
1 Gigabit Ethernet interface
1 Serial interface
1 terminal line
2 Cellular interfaces
32768K bytes of non-volatile configuration memory.
4038072K bytes of physical memory.
3110864K bytes of Bootflash at bootflash:
Configuring Cellular Modem Link Recovery

The cellular modem link recovery feature is disabled by default and it is recommended to enable the link recovery feature.

To enable or disable the cellular modem link recovery feature, if required, perform the following steps:

**SUMMARY STEPS**

1. configure terminal
2. controller cellular unit
3. {lte} modem link-recovery disable | no lte | modem link-recoverydisable}
4. end

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> controller cellular unit</td>
<td>Enters cellular controller configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# controller cellular 0/1/0</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> {lte modem link-recovery disable</td>
<td>no lte modem link-recovery disable}</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config-controller)# lte modem link-recovery disable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-controller)# no lte modem link-recovery disable</td>
</tr>
<tr>
<td></td>
<td>Device#show run</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong> Device#configure terminal Device(config)#controller Cellular 0/1/0 Device(config-controller)#lte modem link-recovery monitor-timer 30 Device(config-controller)#lte modem wait-timer 15 Device(config-controller)#lte modem debounce-count 8 Device(config-controller)#lte modem rssi onset-threshold -100</td>
</tr>
<tr>
<td><strong>Step 4</strong> end</td>
<td>Exits the configuration mode and returns to the privileged EXEC mode.</td>
</tr>
<tr>
<td><strong>Example:</strong> Router(config)# end</td>
<td></td>
</tr>
</tbody>
</table>

**Cellular Modem Link Recovery Parameters**

There are four configurable parameters to adjust the behavior of cellular link recovery. The default values optimized for the best performance of the feature and changing it is not recommended unless advised by Cisco.
The following table explains the link recovery parameters:

**Table 2: Link Recovery Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rssi onset-threshold</td>
<td>This parameter defines the RSSI value below which the link recovery feature triggers additional scrutiny to look for potential issues and take action if needed. The range of this parameter can be set from -90 dBm to -125 dBm. The recommended and default value is -110 dBm.</td>
</tr>
<tr>
<td>monitor-timer</td>
<td>This parameter determines how often link recovery looks for potential issues. The default value for this parameter is 20 seconds meaning that link recovery feature will be triggered every 20 seconds and look at certain parameters to determine if there is a potential issue. You can configure the monitor-timer range between 20 to 60 seconds. Increasing the monitor timer value above 20 seconds will increase the response time of the feature.</td>
</tr>
<tr>
<td>wait-timer and debounce-count</td>
<td>The wait-timer parameter is used in conjunction with the debounce-count parameter to perform more frequent, additional checks, once the link recovery feature has identified a potential issue that needs to be recovered from, with a modem power-cycle. The default value for wait-timer is 10 seconds and the default value for debounce-count is 6. With this setting, once link recovery has identified an inoperative modem state, it performs additional checks every 10 seconds, up to 6 times, to determine if the issue has been resolved without a modem power-cycle. Reducing the debounce-count and the wait-timer makes faster link recovery, while reducing them may increase the time for recovery. The configurable range for wait-timer is 5-60 seconds. The configurable range for debounce-count is 6-20 seconds.</td>
</tr>
</tbody>
</table>

**Verifying the Cellular Modem Link Recovery Configuration**

To determine if the cellular modem link recovery is enabled, use the `show controller cellularunit` command. In this example, the cellular modem link recovery feature related information is highlighted.

```
Router# show controller cellular 0/1/0 Interface Cellular0/1/0
LTE Module - Multimode LTE/DC-HSPA+/HSPA+/HSPA/UMTS/EDGE/GPRS unit 2

Cellular Modem Configuration
-------------------------------
Modem is recognized as valid
Power save mode is OFF
manufacture id = 0x00001199    product id = 0x000068C0
Sierra Wireless unknown modem
```
Modem Uplink Speed = 50000 kbit.
Modem Downlink Speed = 300000 kbit.

GPS Feature = enabled
GPS Status = NMEA Disabled
GPS Mode = not configured

Cellular Dual SIM details:
-----------------------------
SIM 0 is present
SIM 1 is not present
SIM 0 is active SIM

Module Reload Statistics
------------------------
Soft OIR reloads = 0
Hard OIR reloads = 0
------------------------

Modem Management Statistics
----------------------------
Modem resets = 1
Modem timeouts = 0
Link recovery is ON

Registration check is ON
RSSI threshold value is -110 dBm
Monitor Timer value is 20 seconds
Wait Timer value is 10 seconds
Debounce Count value is 6

Link recovery count is 0

When the cellular modem link recovery occurs and modem is power cycled, you can see the
%CELLWAN-2-MODEM_DOWN message on the console logs and additionally there is a
%CELLWAN-2-LINK_RECOVERY message which indicates that action has been taken by the cellular
modem link recovery feature.

Whenever the cellular modem link recovery has occurred, it updates the Modem timeouts counter under the
Modem Management Statistics section of the show controller cellular unit command output. Modem parameters
at the last timeout section has information that helps to identify the cause of the issue that triggered link
recovery

In the following example log, the messages, modem time out counter, and modem parameters at the last time
out are highlighted.

*Jul 19 17:15:18.980 PDT: %CELLWAN-2-LINK_RECOVERY: Cellular0/1/0: Cellular Modem has
been power cycled

Device#show controller Cellular 0/1/0
Interface Cellular0/1/0
LTE Module - Multimode LTE/DC-HSPA+/HSPA+/HSPA/UMTS/EDGE/GPRS unit 2

Cellular Modem Configuration
-----------------------------
Modem is recognized as valid
Power save mode is OFF
manufacture id = 0x00001199    product id = 0x000068C0
Sierra Wireless unknown modem
Modem Uplink Speed = 50000 kbit.
Modem Downlink Speed = 300000 kbit.

GPS Feature = enabled
GPS Status = NMEA Disabled
GPS Mode = not configured

Cellular Dual SIM details:
---------------------------
SIM 0 is present
SIM 1 is not present
SIM 0 is active SIM

Module Reload Statistics
------------------------
Soft OIR reloads = 0
Hard OIR reloads = 0
------------------------

Modem Management Statistics
---------------------------
Modem resets = 1
Modem user initiated resets = 0
Modem user initiated power-cycles = 0
Modem timeouts = 1

Modem parameters at the last timeout:
-----------------------------------
  LTE first time attach State was No
  Radio Interface Technology Mode was AUTO
  Operating Mode was Online
  RSSI was -0 dBm
  Packet switch domain status was Not Attached
  Registration state(EMM) was Not Registered
  Downlink traffic was not present

Link recovery is ON
Registration check is ON
RSSI threshold value is -110 dBm
Monitor Timer value is 20 seconds
Wait Timer value is 10 seconds
Debounce Count value is 6

Configuration Examples for 3G and 4G Serviceability Enhancement

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
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)
```

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 0/1/0 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 4G LTE Advanced

Example: Basic Cellular Interface Configuration: Cisco 4G LTE Advanced

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 Cellular0/1/0
description Basic-Config
ip address negotiated
load-interval 30
dialer in-band
dialer idle-timeout 0
dialer watch-group 1
pulse-time 1
ip virtual-reassembly
dialer watch-list 1 ip 5.6.7.8 255.255.255.255
dialer watch-list 1 delay route-check initial 60
dialer watch-list 1 delay connect 1
dialer-list 1 protocol ip permit
ip route 0.0.0.0 0.0.0.0 Cellular0/1/0

Configuration Examples for Cisco 4G LTE Advanced

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

! Last configuration change at 19:14:26 UTC Fri Oct 19 2018
! version 16.10
service timestamps debug datetime msec
service timestamps log datetime msec
service internal
service call-home
platform qfp utilization monitor load 80
no platform punt-keepalive disable-kernel-core
no platform punt-keepalive settings
hostname IR1101

boot-start-marker
boot system flash ir1101-universalk9.16.10.SSA.bin
boot-end-marker

no aaa new-model

call-home
If contact email address in call-home is configured as sch-smart-licensing@cisco.com
the email address configured in Cisco Smart License Portal will be used as contact email
address to send SCH notifications.

contact-email-addr sch-smart-licensing@cisco.com

profile "CiscoTAC-1"
  active
  destination transport-method http
  no destination transport-method email

ip admission watch-list expiry-time 0

login on-success log

!
crypto pki trustpoint TP-self-signed-2240381033
  enrollment selfsigned
  subject-name cn=IOS-Self-Signed-Certificate-2240381033
  revocation-check none
  rsakeypair TP-self-signed-2240381033

crypto pki trustpoint SLA-TrustPoint
  enrollment pkcs12
  revocation-check crl

!
crypto pki certificate chain TP-self-signed-2240381033
  certificate self-signed 01
  30820300 30820218 A0030201 02020101 300D0609 2A864886 F70D0101 05050030
  31312F30 2D603555 04031326 494F532D 53666D65 20536967 6865642D 43657274
  66696564 3174652D 32323430 33383130 3333301E 170D3138 30373131 32323035
  35315A17 0D333030 31303130 30303030 30303030 312F302D 06035504 03132649
  05366D65 3174652D 32323430 33383130 3333301E 170D3138 30373131 32323035
  35315A17 0D333030 31303130 30303030 30303030 312F302D 06035504 03132649
  4F532D53 65666D65 53686976 65642D44 35727469 66696361 74652D32 32343033
  38313033 33308201 22300006 92A86648 867F70D1 01010500 0382010F 00308201
  0A028201 01008C98 B656131D 393941CF C7FEAE8C C55B1356 02393121 371AB009
  BE4FBD67 47ED4252B F59222BD 4C0D4F7F2 390FEB7E C8EC2034 63EA8796 E91B796C
  36302BBA 20668862 774D131C C907AA3C 530A88BB 5AABBDBD 5F59951E 613B6EE4
  EC680F11 92D43A8 3C064FBA 76C2DFF5 2BA33F66 FD049C4F 2988B575 ADD89B98
  CDF19C6 6EB287D6 5EA29350 35A52089 7D8B436C 2040847E 671680C6 1FCD2B1B
  90067B65 E98BC80 1C20EF87 62999271 88D12026 178F908D 5A8C9DF1 8379598F
  109B52A7 5C8C71C9 05706526 44044193 1CCB6D90 65AF7CD5 D6404855 502BCB62
  822C580A 52697045 6AFAAA96 87828572 05F485E8 7A9F2E9D 4185DAD4 9393C05B
  D4770CB7 C3630203 01008C98 53305013 0F060355 1D130101 FF0E0530 303101FF
  301F6063 551D2304 18301680 142878CA B98BEFE1 3EC23015 83E0FE12 0CD474C6
  E1301D06 3551D00 01460414 2B78CAB9 B8EF613E C2301583 E0FE120C D474C6E1
  300D0669 2A864886 F70D0101 05050030 82010100 9F1269A8 349C8E9D E2801B79
  4F82F1ED 44F8E434 E62A43E2 F2089779 6F8B85D0 9420E8F8 FFF2F433 A0F7A08
  BE0F5218 BF9AF7EA 51566E7B 7D85417E CBDE865F 9C7B3E76 542DAB69 046DF4E4
  3406A83F 6CD2A6DD AC5BF38C 49CA9C59 5E5E0999 6A92122D 8B64412D 9972F8B9
  21818E67 E1EA4466 A52B216A DA22E7B6 968C116 0932EFE4 9A86FAD2 F394C361
  A7D4A982 9492B8B0 52CA0D33 763DCCCA E66893C2 2981015B F380E15D A8854BE9
  FA2F1E76 0C80853C E0C8BB86 B134A2CF 20046280 F908838D 51EF66A1 719D19E9

Cisco 4G LTE-Advanced Configuration
110ACDE3 D8772A6B 0BA457F3 76D3364A 594246E9 3EC92ADA 2D34DE52 F97588E8
E06027E 01BC2E1C 7375F6B3 584E740 BE2A54DE
quit
crypto pki certificate chain SLA-TrustPoint
certificate ca 01
  30820321 30820209 A0030201 02020101 300D0609 2A864886 F70D0101 0B050030
  32310E30 0C060355 040A1305 43697367 6F6E6720 526F6F74 20434131 1E170D31 33303533 30313394
  3834375A 170D3338 30353330 31393438 34375A03 32310E30 0C060355 040A1305 43697367
  6F6E6720 526F6F74 20434131 02010100 1E170D31 33303533 30313394
quit
!
license udi pid IR1101-K9 sn FCW2227XXXX
license boot level network-advantage
license smart transport callhome
diagnostic bootup level minimal
!
spanning-tree mode rapid-pvst
spanning-tree extend system-id
memory free low-watermark processor 50290
!
redundancy
!
controller Cellular 0/1/0
  lte sim data-profile 3 attach-profile 1 slot 0
  no lte firmware auto-sim
  lte gps mode standalone
  lte modem link-recovery disable
!
controller Cellular 0/3/0
  no lte firmware auto-sim
  lte gps mode standalone
  lte modem link-recovery disable
!
vlan internal allocation policy ascending
!
interface GigabitEthernet0/0/0
  ip address 175.1.1.1.1 255.255.255.0
!
interface FastEthernet0/0/1
  shutdown
interface FastEthernet0/0/2
  shutdown

interface FastEthernet0/0/3
  shutdown

interface FastEthernet0/0/4
  switchport access vlan 168
  switchport mode access

interface GigabitEthernet0/0/5

interface Cellular0/1/0
  ip address negotiated
  load-interval 30
  dialer in-band
  dialer idle-timeout 0
  dialer watch-group 1
  ipv6 enable
  pulse-time 1
  ip virtual-reassembly

interface Cellular0/1/1
  no ip address
  shutdown

interface Vlan1
  no ip address

interface Vlan168
  ip address 192.168.10.22 255.255.255.0

interface Async0/2/0
  no ip address
  encapsulation slip

ip default-gateway 172.27.138.129
ip forward-protocol nd

ip http server
ip http authentication local
ip http secure-server
ip route 0.0.0.0 0.0.0.0 Cellular0/1/0
ip route 172.27.0.0 255.255.0.0 172.27.138.129

access-list 1 permit any
access-list 2 permit any
dialer watch-list 1 ip 5.6.7.8 255.255.255.255
dialer watch-list 1 delay route-check initial 60
dialer watch-list 1 delay connect 1
dialer-list 1 protocol ip permit
dialer-list 1 protocol ipv6 permit
dialer-list 2 protocol ip permit
dialer-list 2 protocol ipv6 permit
ipv6 route ::/0 Cellular0/1/0

control-plane

line con 0
  exec-timeout 0 0
  transport input none
  stopbits 1
speed 115200
line 0/2/0
line vty 0 4
  password cisco
  login
  transport input all
  transport output all
!
end

**Cellular Back-off**

Cellular Backoff is a feature introduced in IOS which addresses the concerns about Cisco LTE router not performing backoff in error handling. When PDP Context activation is failing, modems may receive from a cellular service provider. As a result, when some specific error codes (for example: 29, 33) are received by the modem from a cellular network, the router’s IOS incrementally adds interval in sending PDP Context Activation requests and any IP traffic such as not to load service provider network with requests that are known to IOS as failing. Once PDP Context is established and IP traffic is successful, the Cellular Backoff is removed for normal operation.

This back-off implementation will be a generic design and will NOT be specific to a particular service provider. There will be NO IOS CLI command to disable this new feature either.

**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 Cellular0/1/0
tunnel destination a.b.c.d
interface Cellular0/1/0
  ip address negotiated
  no ip mroute-cache
dialer in-band
dialer-group 1
```

**Example: 4G LTE Advanced as Backup with NAT and IPSec**

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

The receive and transmit speeds cannot be configured. The actual throughput depends on the cellular network service.
For service providers using a private IP address, use the `crypto ipsec transform-set esp` command (that is, esp-aes esp-sha256-hmac...).

```
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
!
! 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 interface Gi 0/0/0
   no ip address
   ip virtual-reassembly
   load-interval 30
   no atm ilmi-keepalive
   dsl operating-mode auto
!
backup interface Cellular0/1/0
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 nat outside
ip virtual-reassembly
no snmp trap link-status
pvc 0/35
   pppoe-client dial-pool-number 2
!
interface Cellular0/1/0
ip address negotiated
ip nat outside
ip virtual-reassembly
no ip mroute-cache
dialer in-band
dialer idle-timeout 0
dialer watch-group 1
crypto map gsm1
!
```
Cisco 4G LTE-Advanced Configuration

Example: SIM Configuration

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 NIM slot 0/2 is DOWN
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# 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# 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# configure terminal
```
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 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#
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 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]
Router# Resetting modem, please wait...
CHV1 code change has been completed. Please enter the new PIN in controller configuration for verification
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

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#
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]
Router# Resetting modem, please wait...
CHV1 code change has been completed. Please enter the new PIN in controller configuration for verification
Router#
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)# 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

The IR1101 uses Sierra Wireless modems that are supported on Cisco 4G LTE Advanced. The firmware for the modem is upgradeable 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.

Prior to performing the cellular modem firmware upgrade, make sure of the following:

- The "microcode reload ..." command is issued only from router's base directory.
- The modem firmware directory must contain the following:
  - Only the *.cwe file
  - Only the *.nvu file
  - Only a matching pair of *.cwe and *.nvu files for the exact same version
- The modem firmware directory MUST NOT contain any other files

Note

Firmware upgrade is supported on utility flash.
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.

📝 Note
Not all IR1101 cellular interfaces can support 2G (only P-LTE-GB), and may not support 3G (P-LTE-VZ).

Details about supported cellular pluggable module SKUs and modems can be found in the IR1101 Hardware Installation Guide here: https://www.cisco.com/c/en/us/td/docs/routers/access/1101/hardware/installation/guide/1101hwinst/pview.html#72641

You can determine which radio bands are supported by using the following command:

```
IR1101# show cellu 0/1/0 radio band
```

LTE bands supported by modem:
- Bands 1 3 7 8 20 28.
LTE band Preference settings for the active sim(slot 0):
- Bands 1 3 7 8 20 28.

Non-LTE bands supported by modem:
Index:
72 - GSM DCS band (1800)
73 - GSM Extended GSM (E-GSM) band (900)
87 - WCDMA (Europe, Japan, and China) 2100 band
114 - WCDMA Europe and Japan 900 band
Non-LTE band Preference settings for the active sim(slot 0):
Index:
72 - GSM DCS band (1800)
73 - GSM Extended GSM (E-GSM) band (900)
87 - WCDMA (Europe, Japan, and China) 2100 band
114 - WCDMA Europe and Japan 900 band

Band index reference list:
Indices 1-64 correspond to LTE bands 1-64.
Indices 65-128 correspond to Non-LTE bands.

```
IR1101#
```

**Upgrading the Modem Firmware Manually With CLI**

**SUMMARY STEPS**

2. On the Cisco Wireless WAN software page, go to Products -> Cisco Interfaces and Modules -> Cisco High-Speed WAN interface Cards and select your product from the list of available cards.
3. Select and download the appropriate firmware.
4. terminal monitor
5. microcode reload cellular pa-bay slot modem-provision [flash:<firmware_directory_name>]
6. show cellular 0/1/0 hardware

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Go to the Cisco Wireless WAN software download website at: <a href="http://software.cisco.com/download/navigator.html">http://software.cisco.com/download/navigator.html</a></td>
<td>Provides access to Cisco Wireless WAN software downloads page to select the firmware for Cisco 4G. Note This website is only available to registered Cisco.com users.</td>
</tr>
<tr>
<td>Step 2</td>
<td>On the Cisco Wireless WAN software page, go to Products -&gt; Cisco Interfaces and Modules -&gt; Cisco High-Speed WAN interface Cards and select your product from the list of available cards.</td>
<td>Select your product for firmware upgrade.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Select and download the appropriate firmware.</td>
<td>Download the modem firmware file to flash memory on the router.</td>
</tr>
</tbody>
</table>
| Step 4 | terminal monitor  
Example:  
Router# terminal monitor | Enables the logging console in privileged EXEC mode. |
| Step 5 | **microcode reload cellular** pa-bay slot modem-provision [flash:<firmware_directory_name>]  
Example:  
Router# microcode reload cellular 0 2 modem-provision bootflash:/<firmware_directory> | Initiates the firmware upgrade process. Note Modem firmware upgrade may take 10-15 mins from issuing the **microcode reload** command to the modem coming up. The router console will display ‘FW_UPGRADE: Firmware upgrade success.....’ message to indicate the firmware upgrade completed. The modem will reset itself and may take an additional 5 minutes to be up in-service.  
• pa-bay—Use 0 for 4G LTE Advanced.  
• slot—For 4G LTE Advanced, slot number, 0 to 3, where the 4G LTE Advanced is plugged in.  
• For remote download, you can transfer this using the wireless link from Cisco.com onto flash. |
| Step 6 | **show cellular 0/1/0 hardware** | Verifies the cellular modem type, model, carrier, firmware, PRI, SKU, IMEI and other modem details. |
Manual Modem Firmware Upgrade: Example

Router# sh cellu 0/1/0 hardware
Modem Firmware Version = SWI9X30C_02.20.03.00
Modem Firmware built = 2016/06/30 10:54:05
Hardware Version = 1.0
Device Model ID: EM7455
International Mobile Subscriber Identity (IMSI) = <imsi>
International Mobile Equipment Identity (IMEI) = <imei>
Integrated Circuit Card ID (ICCID) = <iccid>
Mobile Subscriber Integrated Services
Digital Network-Number (MSISDN) =
Modem Status = Modem Online
Current Modem Temperature = 44 deg C
PRI SKU ID = 1102526, PRI version = 002.020_000, Carrier = AT&T
OEM PRI version = 006
Router#cd fw_22_vzw
Router#dir
Directory of bootflash:/fw_22_vzw/
227586 -rw- 64389490 Jun 30 2000 10:21:29 +00:00 74XX_02.20.03.22.cwe
227587 -rw- 16951 Jun 30 2000 10:22:10 +00:00
7455_02.20.03.22_Verizon_002.026_000.nvu
6816092160 bytes total (5965422592 bytes free)
Router#cd
Router#microcode reload cellular 0 2 modem-provision bootflash:/fw_22_vzw/
Reload microcode? [confirm]
Log status of firmware download in router flash?[confirm]
Firmware download status will be logged in bootflash:fwlogfile
Microcode Reload Process launched for cwan slot/bay =0/2; hw type=0x102download option = 0
Router#Success !! send FW Upgrade command to card

*****************************************************
The interface will be Shut Down for Firmware Upgrade
This will terminate any active data connections.
*****************************************************
******************************************************************************
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.
******************************************************************************
*Jul 6 10:19:34:701: %LINK-5-CHANGED: Interface Cellular0/1/0, changed state to administratively down
*Jul 6 10:19:34:701: %LINK-5-CHANGED: Interface Cellular0/2/1, changed state to administratively down
******************************************************************************
FIRMWARE INFO BEFORE UPGRADE:
Modem Device ID: EM7455  MODEM F/W Boot Version: SWI9X30C_02.20.03.00
Modem F/W App Version: SWI9X30C_02.20.03.00  Modem SKU ID: 1102526
Modem Package Identifier:  Modem Carrier String: 4
Modem PRI Ver: 000.006  Modem Carrier Name: ATT
Modem Carrier Revision: 002.020_000
******************************************************************************
FW_UPGRADE: Modem needs CWE, PRI
*Jul 6 10:19:57.978: %CELLWAN-2-MODEM_DOWN: Modem in NIM slot 0/2 is DOWN
FW_UPGRADE: Upgrade begin at Thu Jul  6 10:20:01 2000
FW_UPGRADE: Firmware upgrade success....
FW_UPGRADE: Waiting for modem to become online
******************************************************************************
FIRMWARE INFO AFTER UPGRADE:
Modem Device ID: EM7455
Modem F/W Boot Version: SWI9X30C_02.20.03.22
Modem F/W App Version: SWI9X30C_02.20.03.22
Modem Package Identifier: Modem Carrier String: 5
Modem PRI Ver: 000.006 Modem Carrier Name: VERIZON
Modem Carrier Revision: 002.026_000

F/W Upgrade: Firmware Upgrade has Completed Successfully
*Jul 6 10:21:55.275: %CELLWAN-2-MODEM_RADIO: Cellular0/1/0 Modem radio has been turned on
*Jul 6 10:21:57.276: %LINK-3-UPDOWN: Interface Cellular0/1/0, changed state to down
*Jul 6 10:21:57.277: %LINK-3-UPDOWN: Interface Cellular0/2/1, changed state to down

Router# sh cellu 0/1/0 hardware
Modem Firmware Version = SWI9X30C_02.20.03.22
Modem Firmware built = 2016/10/11 16:03:14
Device Model ID: EM7455
International Mobile Subscriber Identity (IMSI) = <imsi>
International Mobile Equipment Identity (IMEI) = <imei>
Integrated Circuit Card ID (ICCID) = <iccid>
Mobile Subscriber Integrated Services Digital Network-Number (MSISDN) = <msisdn>
Modem Status = Modem Online
Current Modem Temperature = 0 deg C
PRI SKU ID = 1102526, PRI version = 002.026_000, Carrier = Verizon
OEM PRI version = 006

Configuring dm-log to Utility Flash: Example

Router(config)#controller cellular 0/1/0
Router(config-controller)#lte modem dm-log enable
Router(config-controller)#
*May 8 17:57:09.905: %SYS-5-CONFIG_I: Configured from console by console
Router# show cellular 0/1/0 log dm-log
Integrated DM logging is off
Output path = bootflash:
Filter Type = Default
Filter Name = v11026_Generic_GSM_WCDMA_LTE_IP-no-data-packets.sqf
Maximum log size = 0 MB
Maximum file size = 0 MB
Log rotation = Disabled

IR1101# show cellular 0/1/0 log dm-log details
Integrated DM logging is off
Output path = bootflash:
Filter Type = Default
Filter Name = v11026_Generic_GSM_WCDMA_LTE_IP-no-data-packets.sqf
Maximum log size = 0 MB
Maximum file size = 0 MB
Log rotation = Disabled

0 Packets sent to the modem, 0 Bytes, 0 Errors
0 Packets received from the modem, 0 Bytes, 0 Input drops
0 Packets stored in file system, 0 Bytes, 0 Errors, 0 Aborts
0 Max rcv queue size

Current file size = 0 MB
Current log size = 0 MB
Total log size = 0 MB
IR1101#
SNMP MIBs

A MIB (Management Information Base) is a database of the objects that can be managed on a device. The managed objects, or variables, can be set or read to provide information on the network devices and interfaces.

You can find complete information on MIBs and the MIB locator here: https://mibs.cloudapps.cisco.com/ITDIT/MIBS/servlet/index

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 Advanced:

- IF-MIB
- ENTITY-MIB
- CISCO-WAN-3G-MIB
- CISCO-WAN-CELL-EXT-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)

For the CISCO-WAN-CELL-EXT-MIB, the following tables and sub-tables are supported for LTE technology only:

- ciscoWanCellExtMIB(817)
SNMP 4G LTE Advanced Configuration: Example

The following example describes how to configure 3G 4G MIB trap on the router:

controller Cellular 0/1/0
lte event rssi onset mib-trap All-lte
lte event rssi onset threshold -100
lte event rssi abate mib-trap All-lte
lte event rssi abate threshold -90
lte event temperature onset mib-trap
lte event temperature onset threshold 55
lte event temperature abate mib-trap
lte event temperature abate threshold 50
lte event modem-state mib-trap all
lte event service mib-trap
lte event network mib-trap
lte event connection-status mib-trap All-lte
lte event rsrp onset mib-trap All-lte
lte event rsrp onset threshold -85
lte event rsrp abate mib-trap All-lte
lte event rsrp abate threshold -80
lte event rsrq onset mib-trap All-lte
lte event rsrq onset threshold -8
lte event rsrq abate mib-trap All-lte
lte event rsrq abate threshold -6

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 enable traps LTE
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 essential information and resources available for troubleshooting the Cisco 4G LTE Advanced feature.
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:
   
   3. `debug chat`
   4. `debug modem`
   5. `debug dialer`
   6. `show cellular all`
   7. `show controller cell0/1/0`
   8. `show interface cellular`
   9. `show running-config`
   10. `show ip route`
   11. `show platform`

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:

SUMMARY STEPS

1. Ensure at least one antenna is connected to the 'MAIN' RF port on the 4G module. Preferably both MAIN and DIV RF ports should be connected to antenna for better RF signal. Check to ensure the antenna are 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.

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Ensure at least one antenna is connected to the 'MAIN' RF port on the 4G module. Preferably both MAIN and DIV RF ports should be connected to antenna for better RF signal. Check to ensure the antenna are threaded and tightened.</td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
<td>If you are using a remote antenna, move the antenna cradle and check if the RSSI has improved.</td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td>Contact your wireless service provider to verify if there is service availability in your area.</td>
</tr>
</tbody>
</table>
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.

```
Router# show cellular 0/1/0 all
Hardware Information
-----------------------
Modem Firmware Version = SWI9X07Y_02.18.05.00
Device Model ID = WP7603
International Mobile Subscriber Identity (IMSI) = 001012345678901
International Mobile Equipment Identity (IMEI) = 359528080002501
Integrated Circuit Card ID (ICCID) = 8986000050200180722
Mobile Subscriber Integrated Services Digital Network-Number (MSISDN) =
Factory Serial Number (FSN) = U3734285450506
Modem Status = Modem Online
Current Modem Temperature = 49 deg C
PRI SKU ID = 1103507, PRI version = 002.041_002, Carrier = GENERIC
OEM PRI version = 002.000

Profile Information
---------------------
Profile 1 = ACTIVE* **
--------
PDP Type = IPv4v6
PDP address = 192.1.1.21
PDP IPV6 address = FC01:ABAB:CDCD:EFE0:7DC4:256:B64F:22F8/64 Scope: Global
Access Point Name (APN) = broadband
Authentication = None
Primary DNS address = 192.1.1.2
Primary DNS IPV6 address = FC01:CAFE:0:0:0:0:1
Secondary DNS IPV6 address = 0:0:0:0:0:0:0:0
* = Default profile
** = LTE attach profile

Configured default profile for active SIM 0 is profile 1.

Data Connection Information
-----------------------------
Profile 1, Packet Session Status = ACTIVE
Cellular0/1/0:
Data Packets Transmitted = 31546 , Received = 57008
Data Transmitted = 5049096 bytes, Received = 7702570 bytes
IP address = 192.1.1.21
IPV6 address = FC01:ABAB:CDCD:EFE0:7DC4:256:B64F:22F8/64 Scope = Global
Primary DNS address = 192.1.1.2
Primary DNS IPV6 address = FC01:CAFE:0:0:0:0:1
Secondary DNS IPV6 address = 0:0:0:0:0:0:0:0
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 = INACTIVE

Network Information
---------------------
Current System Time = Thu Jan 10 8:31:28 1980
Current Service Status = Normal
Current Service = Packet switched
Current Roaming Status = Home
Network Selection Mode = Automatic
Network = Test PLMN 1-1
Mobile Country Code (MCC) = 1
Mobile Network Code (MNC) = 1
Packet switch domain (PS) state = Attached
Registration state (EMM) = Registered
EMM Sub State = Normal Service
Tracking Area Code (TAC) = 1
Cell ID = 256
Negotiated network MTU = 1500

Radio Information
------------------
Radio power mode = online
LTE Rx Channel Number = 2175
LTE Tx Channel Number = 20175
LTE Band = 4
LTE Bandwidth = 20 MHz
Current RSSI = -68 dBm
Current RSRP = -102 dBm
Current RSRQ = -13 dB
Current SNR = 19.4 dB
Physical Cell Id = 0
Number of nearby cells = 1
Idx | PCI (Physical Cell Id)
-----------------------
1  | 0

Radio Access Technology (RAT) Preference = AUTO
Radio Access Technology (RAT) Selected = LTE

LTE bands supported by modem:
- Bands 2 4 5 12.
LTE band Preference settings for the active sim(slot 0):
- Bands 2 4 5 12.

Non-LTE bands supported by modem:
Index:
88 = WCDMA US PCS 1900 band
90 = WCDMA US 1700 band
91 = WCDMA US 850 band

Non-LTE band Preference settings for the active sim(slot 0):
Index:
88 = WCDMA US PCS 1900 band
90 = WCDMA US 1700 band
91 = WCDMA US 850 band

Band index reference list:
Indices 1-64 correspond to LTE bands 1-64.
Indices 65-128 correspond to Non-LTE bands.

Modem Security Information
-----------------------------------
Active SIM = 0
SIM switchover attempts = 0
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3

Cellular Firmware List
-----------------------------------
<table>
<thead>
<tr>
<th></th>
<th>Carrier</th>
<th>FwVersion</th>
<th>PriVersion</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ATT</td>
<td>02.18.04.00</td>
<td>002.039_000</td>
<td>Inactive</td>
</tr>
<tr>
<td>2</td>
<td>GENERIC</td>
<td>02.18.05.00</td>
<td>002.041_002</td>
<td>Active</td>
</tr>
<tr>
<td>3</td>
<td>VERIZON</td>
<td>02.17.01.00</td>
<td>002.036_000</td>
<td>Inactive</td>
</tr>
</tbody>
</table>

Firmware Activation mode = MANUAL

FOTA Information
-----------------------------------
FOTA server poll timer (mins) = Disable
FOTA server connection retry value = 0
FOTA status = Please re-configure FOTA poll timer

GPS Information
-----------------------------------
GPS Feature = enabled
GPS Mode Configured = not configured
GPS Status = NMEA Disabled

SMS Information
-----------------------------------
Incoming Message Information
-----------------------------------
SMS stored in modem = 7
SMS archived since booting up = 0
Total SMS deleted since booting up = 0
Storage records allocated = 25
Storage records used = 7
Number of callbacks triggered by SMS = 0
Number of successful archive since booting up = 0
Number of failed archive since booting up = 0

Outgoing Message Information
-----------------------------------
Total SMS sent successfully = 0
Total SMS send failure = 0
Number of outgoing SMS pending = 0
Number of successful archive since booting up = 0
Number of failed archive since booting up = 0
Last Outgoing SMS Status = SUCCESS
Copy-to-SIM Status = 0x0
Send-to-Network Status = 0x0
Report-Outgoing-Message-Number:
  Reference Number = 0
  Result Code = 0x0
  Diag Code = 0x0 0x0 0x0 0x0 0x0

SMS Archive URL =
Modem Crashdump Information

Modem crashdump logging - off

---

**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.

```
debug 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, 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 LTE-EA 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 0/1/0 all` command shows the following:

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

The following sections explain useful commands for changing modem settings:

**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
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/module 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]
```