



## Configuring 4G Wireless WAN

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This chapter provides information about configuring the 4G Wireless WAN interface on Cisco 900 Series ISRs and contains the following sections:

- [Overview of 4G LTE, page 95](#)
- [Cisco 4G LTE Features, page 97](#)
- [Prerequisites for Configuring Cisco 4G LTE, page 98](#)
- [Restrictions for Configuring Cisco 4G LTE, page 98](#)
- [How to Configure Cisco 4G LTE, page 98](#)
- [SNMP MIBs, page 121](#)
- [Troubleshooting, page 122](#)

### Overview of 4G LTE

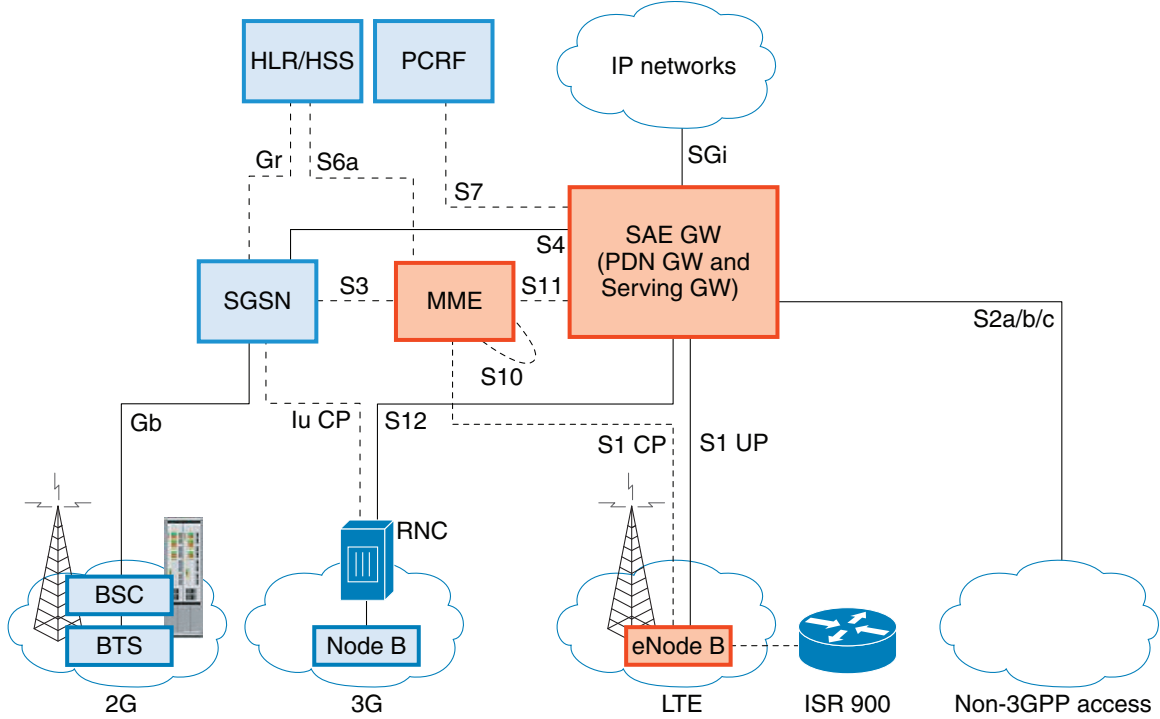
Cisco 900 series routers support Wireless WAN (WWAN). The WWAN SKUs operate over Fourth-Generation Long-Term Evolution (4G LTE) cellular networks and Third-Generation (3G) cellular networks. The Cisco 900 series routers offer a highly secure, simplified, and cost-effective WAN alternative to DSL or Frame Relay. In areas where terrestrial broadband services (cable, DSL, or T1) are not available or are expensive, 4G LTE WWAN connectivity can be a viable alternative.

Cisco 900 series routers 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 97Mb/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.

[Figure 1](#) explains the 4G LTE packet core network architecture.

Figure 1 4G LTE Packet Core Network Architecture



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

<b>HLR</b>	Home Location Register.
<b>BTS</b>	Base Transceiver Station.
<b>BSC</b>	Base Station Controller.
<b>SGSN</b>	Service GPRS Support Node.

## Cisco 4G LTE Features

Cisco 4G LTE WWAN supports the following major features:

- 3G/4G Simple Network Management Protocol (SNMP) MIB
- Auto-switch failover between primary and backup link
- SIM lock and unlock capabilities
- PLMN Search
- Short Message Service (SMS)
- 3G backward compatible
- IPv4 and IPv6 addressing
- Auto SIM Firmware Switching
- Call History
- Cellular Backoff
- Modem reset, modem power cycle, radio on/off
- Modem crashdump collection
- Dialer
- DM Logging
- External Micro USB
- Firmware Upgrade
- Link Recovery
- Modem LED
- Multiple Profile
- PnP LTE WebUI Integration
- SIM OIR
- DMVPN
- CAT

The following features are not supported:

- Dying Gasp
- MEP
- Multiple PDN Context
- LTE Module OIR
- GPS and NMEA

- Dual SIM
- QoS
- NAS Message (SVB)
- Dual Modems
- 2K MTU
- Carrier Aggregation
- FOTA (Firmware Over-The-Air)
- CAT6

## Prerequisites for Configuring Cisco 4G LTE

- You must have 4G LTE network coverage where your router is physically placed. For a complete list of supported carriers, see the product data sheet.
- You must subscribe to a service plan with a wireless service provider and obtain a Subscriber Identity Module (SIM) card.
- You must install the SIM card before configuring the 4G LTE Wireless WAN Module. For instructions on how to install the SIM card, see the [Configuring a SIM for Data Calls, page 101](#) for more information.

## Restrictions for Configuring Cisco 4G LTE

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

- Currently, cellular networks support only user initiated bearer establishment.
- Due to the shared nature of wireless communications, the experienced throughput varies depending on the number of active users or congestion in a given network.
- Cellular networks have higher latency compared to wired networks. Latency rates depend on the technology and carrier. Latency may be higher because of network congestion. Latency also depends on the signal conditions and can be higher because of network congestion.
- Any restrictions that are part of the terms of service from your carrier.
- For the router that runs the SNMP agent, you must configure appropriate access control (for example, SNMP-server community) using the Cisco IOS CLI for the NMS and agent to work properly.
- It is strongly recommended that you configure SNMP V3 with authentication/privacy when implementing SNMP SET operation.

## How to Configure Cisco 4G LTE

This section explains how to configure 4G LTE on a Cisco 900 Series Router.

- [Verifying Modem Signal Strength and Service Availability, page 99](#)
- [Creating, Modifying, or Deleting Modem Data Profiles, page 99](#)

- [Configuring a SIM for Data Calls, page 101](#)
- [Data Call Setup, page 103](#)
- [Configuring 4G SMS Messaging, page 105](#)
- [Enabling Modem Crashdump Collection, page 107](#)
- [Displaying Modem Log Error and Dump Information, page 108](#)

## Verifying Modem Signal Strength and Service Availability

Use the following show commands to verify the modem signal strength and service availability:

- `show cellular unit network`
- `show cellular unit radio`
- `show cellular unit profile`
- `show cellular unit security`
- `show cellular unit all`

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

## Creating, Modifying, or Deleting Modem Data Profiles

You can create multiple profiles on a 4G LTE SKU. The following are the default Internet profile numbers for some of the modems:

- WP7607—Profile 1

- WP7608—Profile 1
- WP7609—Profile 1 for attach and Profile 3 for data profile

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

Follow these guidelines while you configure a data profile:

- In most cases, you do not have to make any profile-related changes if your modem comes with a data profile.
- If any profile parameter changes are required for a connection type, the changes will most likely be carried out in the default profiles.
- To configure different profile types and use them for a different connection, you can create separate profiles with different parameters (for instance, APN names). Note that only one profile is active at a given time.
- Use the **cellular 0 lte profile create 1 APN-name none ipv4v6** to create or modify profiles.
- Use the **cellular 0 lte profile delete 1 APN-name none ipv4v6** or **cellular 0 lte profile delete 1** to delete a profile.
- Use the **show cellular <> profile** command to view the data profile. An asterisk(\*) is displayed against the data 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 attach-profile number** command to change the default profile.

## Configuration Examples

This example shows how to change a default profile:

```
router(config-controller)# lte sim data-profile 2 attach-profile 1
router(config-controller)# end
router#
router# sh run
Building configuration...
controller Cellular 0
  lte sim profile 2

router# ping 8.8.4.4 rep 10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.192.187.254, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 44/69/106 ms
Viper-19#
```

This example shows the output of the **show cellular** command:

```
router# show cellular 0 profile
Profile 1 = ACTIVE* **
-----
PDP Type = IPv4v6
PDP address = 29.29.29.73
PDP IPV6 address = 2001:2678:2680:6E88:4DCC:F4F5:B936:C7EF/64 Scope: Global
Access Point Name (APN) = broadband
Authentication = None
Username:
Password:
Primary DNS address = 8.0.0.8
```

```
Secondary DNS address = 8.8.4.4
Primary DNS IPV6 address = 2006:4888:4888:0:0:0:0:8899
Secondary DNS IPV6 address = 2002:8888:9999:0:0:0:0:7722
```

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

## Configuring a SIM for Data Calls

- [Locking and Unlocking a SIM Card Using a PIN Code, page 101](#)
- [Changing the PIN Code, page 101](#)
- [Verifying the Security Information of a Modem, page 101](#)
- [Configuring Automatic Authentication for a Locked SIM, page 101](#)
- [Configuring an Encrypted PIN for a SIM, page 102](#)
- [Applying a Modem Profile in a SIM Configuration, page 102](#)
- [Data Call Setup, page 103](#)

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

Use the `cellular unit lte sim {lock | unlock} pin` command to lock or unlock a SIM card given by your service provider.



### Caution

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

This example shows how to lock a SIM using the PIN code:

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

## Changing the PIN Code

Use the `cellular unit lte sim change-pin pin new-pin` command to change the PIN code of a SIM. This example shows how to change the PIN code:

```
Router# cellular 0 lte sim change-pin 1111 1234
```

## Verifying the Security Information of a Modem

Use the `show cellular unit security` command to verify the security information of the modem. This example shows how to verify the security information:

```
Router# show cellular 0 security
```

## Configuring Automatic Authentication for a Locked SIM

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

**Caution**

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

**Note**

Follow these procedures when using an unencrypted Level 0 PIN to configure CHV1. For instructions on how to configure CHV1 using an encrypted Level 7 PIN, see the [Configuring an Encrypted PIN for a SIM, page 102](#).

**Note**

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

This example shows how to configure an automatic authentication for a locked SIM:

```
Router# configure terminal
Router(config)# controller cellular 0
Router(config-controller)# lte sim authenticate 0 1111
```

## Configuring an Encrypted PIN for a SIM

To configure an encrypted PIN, the scrambled value of the PIN must be obtained. This example shows how to get the scrambled Level 7 PIN and configure the SIM CHV1 code for verification using the encrypted PIN:

```
Router# configure terminal
Router(config)# service password-encryption
Router(config)# username SIM privilege 0 password 1111
Router(config)# do show run | i SIM
Router(config)# controller cellular 0
Router(config-controller)# lte sim authenticate 7 055A575E70
Router(config-controller)# exit
```

**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.

## Applying a Modem Profile in a SIM Configuration

This example shows how to apply a modem profile:

```
Router# configure terminal
Router(config)# controller cellular 0
Router(config-controller)# lte sim data-profile 2 attach-profile 2
```

For more information, see [SIM Configuration: Examples, page 112](#)



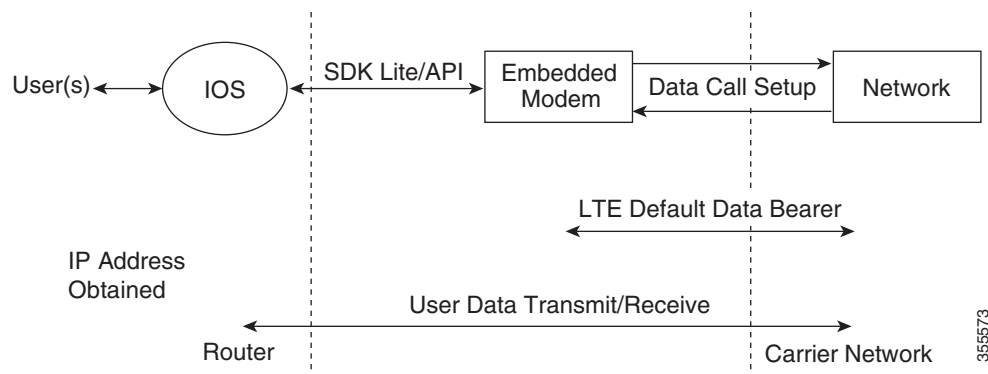
## Data Call Setup

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

- [Configuring the Cellular Interface](#), page 103
- [Configuring DDR](#), page 104
- [Configuring DDR Backup](#), page 104

Figure 2 shows a typical data call setup.

**Figure 2 Data Call Setup with WIM-LTE**



## Configuring the Cellular Interface

This example shows how to configure cellular interface:

```
Router# configure terminal
Router(config)# interface cellular 0
Router(config-if)# ip address negotiated
Router(config-if)# encapsulation slip
Router(config-if)# dialer in-band
Router(config-if)# dialer string lte
Router(config-if)# dialer-group 1
Router(config-if)# exit
Router(config)# chat-script lte"" "AT!CALL" TIMEOUT 60 "OK"
Router(config)# ip route 209.165.200.225 255.255.255.224 cellular 0
Router(config)# dialer-list 1 protocol ip list 1
Router(config)# line 3
Router(config-line)# script dialer lte
```

## Configuring DDR

This example shows how to configure DDR:

```
Router# configure terminal
Router(config)# interface cellular 0
Router(config-if)# ip address negotiated
Router(config-if)# encapsulation slip
Router(config-if)# dialer in-band
Router(config-if)# dialer pool-member 1
Router(config-if)# interface dialer 1
Router(config-if)# ip address negotiated
Router(config-if)# encapsulation slip
Router(config-if)# dialer pool 1
Router(config-if)# dialer idle-timeout 30
Router(config-if)# dialer string lte
Router(config-if)# dialer-group 1
Router(config-if)# exit
Router(config)# dialer-list 1 protocol ip list 1
Router(config)# access-list 1 permit any
Router(config)# line 3
Router(config-line)# script dialer lte
Router(config-line)# exit
Router(config)# chat-script lte"" "AT!CALL" TIMEOUT 60 "OK"
```

## Configuring DDR Backup

To monitor the primary connection and initiate the backup connection when needed, the router can use one of the following methods:

- Backup Interface—The backup interface that stays in standby mode until the primary interface line protocol is detected as down and then is brought up.
- Floating Static Route—The route through the backup interface has an administrative distance that is greater than the administrative distance of the primary connection route and therefore would not be in the routing table until the primary interface goes down.
- Dialer Watch—Dialer watch is a backup feature that integrates dial backup with routing capabilities.

## Configuring Interfaces to Use a Backup Interface



### Note

You cannot configure a backup interface for the cellular interface and any other asynchronous serial interface.

This example shows how to configure an interface as a backup interface:

```
Router# configure terminal
Router(config)# interface atm 0
Router(config-if)# backup interface cellular 0
Router(config-if)# backup delay 0 10
```

## AutoSim and Firmware Based Switching

The advantages of the AutoSim feature are:

- Ease of Ordering Carrier Specific SKUs
- Quicker failover times in dual-sim deployments

- Ease of switchover from other service providers to Telstra network

The modem in Auto-SIM mode selects the right carrier firmware after a SIM slot switch and an automatic modem reset. Auto-SIM is supported on the WP7607, WP7608, and WP7609 modems. During bootup, if the Auto-SIM configuration on the modem doesn't match the IOS configuration, the corresponding Auto-SIM or manual mode is pushed to the modem.

The modem automatically resets after an Auto-SIM configuration change. The default is 'auto-sim' enabled.

This example shows how to enable Auto-SIM:

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



#### Note

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

This example shows how to disable Auto-SIM:

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

## Configuring 4G SMS Messaging

This example shows how to specify 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:

```
Router# configure terminal
Router(config)# controller cellular 0
Router(config-controller)# lte sms archive path
ftp://username:password@172.25.211.175/SMS-LTE
Router# end
```

This example shows how to display the message contents of the incoming texts received by a modem:

```
Router# cellular 0 lte sms view summary

ID FROM YY/MM/DD HR:MN:SC SIZE CONTENT
0 4442235525 12/05/29 10:50:13 137 Your entry last month has...
2 5553337777 13/08/01 10:24:56 5 First
3 5553337777 13/08/01 10:25:02 6 Second
```

This example shows how to display all the information in the text messages sent and received. The message information includes text messages sent successfully, received, archived, and messages pending to be sent. The LTE-specific information on errors, in case of a FAILED attempt, may also be displayed:

```
Router# show cellular 0 sms
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

```

This example shows how to enable a user to send a 4G LTE band SMS message to other valid recipients, provided they have a text message plan:

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

## Upgrading Modem Firmware

To upgrade the modem firmware, perform these steps:

- 
- Step 1** Go to the Cisco Software Download website at: <https://software.cisco.com/download/home>
  - Step 2** On the download page, search ‘**900 series integrated services router**’, and select ‘**900 integrated services router**’ from the filtered list.
  - Step 3** Select **Routers > 900 Series Integrated Routers > 900 Integrated Services Router**
  - Step 4** Select the release from the left pane. Available firmwares will be listed on the right pane.
  - Step 5** Select and download the appropriate firmware.
  - Step 6** Create a directory in the router flash to store the modem firmware.
  - Step 7** Copy the firmware to the flash directory.

- Step 8** Use the following command to initiate the upgrade process:

```
Router# microcode reload cellular 0 lte modem-provision flash:firmware directory
```

- Step 9** Verify the upgrade:

```

Router# show cellular 0 hardware

Modem Firmware Version = SWI9X07Y_02.18.05.00 000
Modem Firmware built = 2018/07/19 17:40:21
Device Model ID: WP7608
International Mobile Subscriber Identity (IMSI) = 123456000009205
International Mobile Equipment Identity (IMEI) = 354365090106005
Integrated Circuit Card ID (ICCID) = 8952530076180099205
Mobile Subscriber Integrated Services
Digital Network-Number (MSISDN) =
Factory Serial Number (FSN) = XG814285250410
Modem Status = Online

```

```
Current Modem Temperature = 42 deg C
PRI SKU ID = 1103787, PRI version = 002.041_002, Carrier = Generic
OEM PRI version = 001.004
```

## Configuring Modem DM Log Collection

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

This example shows how to enable DM log collection:

```
Router(config-controller)# lte modem dm-log enable
```

This example shows how to specify the maximum log file size:

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

This example shows how to specify the filter file:

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

This example shows how to specify the path where the DM log output files will be stored:

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

This example shows how to enable DM log rotation:

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

This example shows how to specify the maximum log size:

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

For sample output, see [Example: Sample Output for the show cellular logs modem-crashdump Command, page 117](#)

## 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.

### Prerequisites

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

- The modem needs to be provisioned for modem crashdump collection—it needs to be configured to operate in test mode. It also requires a debug bootloader installed. Contact Cisco TAC for details.

- The modem should be in crash state. Run tests that will result in modem firmware crash. A “MODEM\_DOWN” message on the router console or syslog is indicative of modem firmware crash.

**Note**

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

This example shows how to pre-configure the modem to stay in memdump mode after a crash:

```
Router# configure terminal
Router(config)# controller cellular 0
Router(config-controller)#lte modem crash-action boot-and-hold
Router(config-controller)#end
```

This example shows how to disable crashdump log collection:

```
Router# configure terminal
Router(config)# service internal
Router(config)# end
Router(config)# test cell-host 0 modem-crashdump off
```

This example shows how to enable crashdump log collection with the logs stored on an FTP server:

```
Router# configure terminal
Router(config)# service internal
Router(config)# end
Router(config)# test cell-host 0 modem-crashdump on ftp://@172.25.211.175/
```

## Displaying Modem Log Error and Dump Information

Use the following command to obtain the log error and dump information:

- `show cellular unit log error`

	Command or Action	Purpose
Step 1	<code>show cellular unit log error</code>  <b>Example:</b> Router# show cellular 0 log error	Shows modem log error and dump information.  For sample output, see <a href="#">Example: Sample Output for the show cellular log error Command, page 117</a>

## Configuration Examples for 4G LTE

- [Example: Basic Cellular Interface Configuration, page 109](#)
- [Cellular Interface Configuration for Always-On Connection, page 109](#)
- [4G-LTE Wireless WAN as Backup with NAT and IPSec, page 110](#)
- [SIM Configuration: Examples, page 112](#)
- [Configuration Examples for 4G Serviceability Enhancement, page 116](#)

## Example: Basic Cellular Interface Configuration

This 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
chat-script lte "" "AT!CALL" TIMEOUT 20 "OK"

interface Cellular0
ip address negotiated
encapsulation slip
dialer in-band
dialer string lte
dialer-group 1
async mode interactive

ip route 172.22.1.10 255.255.255.255 cellular 0

dialer-list 1 protocol ip permit

line 3
script dialer lte
modem InOut
```

## Cellular Interface Configuration for Always-On Connection

This section provides the following configuration examples:

- [Dialer-Watch Configuration without External Dialer Interface, page 109](#)
- [Dialer-Persistent Configuration with External Dialer Interface, page 110](#)

### Dialer-Watch Configuration without External Dialer Interface

This example shows how to configure dialer-watch without external dialer interface. The bold text is used to indicate important commands that are specific to dialer-watch.

```
chat-script lte "" "AT!CALL" TIMEOUT 20 "OK"

interface Cellular0
ip address negotiated
encapsulation slip
dialer in-band
dialer string LTE
dialer watch-group 1
async mode interactive
!
dialer watch-list 1 ip 5.6.7.8 0.0.0.0
dialer watch-list 1 delay route-check initial 60
dialer watch-list 1 delay connect 1
!
ip route 0.0.0.0 0.0.0.0 cellular 0
line 3
script dialer LTE
modem InOut
no exec
transport input all
transport output all
```

## Dialer-Persistent Configuration with External Dialer Interface

This example shows how to configure dialer-persistent with external dialer interface. The bold text is used to indicate important commands that are specific to dialer-persistent.

```
chat-script lte "" "AT!CALL" TIMEOUT 20 "OK"

interface Cellular0
 ip address negotiated
 encapsulation slip
 dialer in-band
 dialer pool-member 1
 async mode interactive
 routing dynamic

interface Dialer1
 ip address negotiated
 encapsulation slip
 dialer pool 1
 dialer idle-timeout 0
 dialer string lte
 dialer persistent
 dialer-group 1
!

dialer-list 1 protocol ip permit
ip route 0.0.0.0 0.0.0.0 dialer 1

line 3
 script dialer lte
 modem InOut
 no exec
 transport input all
 transport output all
```

## 4G-LTE Wireless WAN as Backup with NAT and IPSec

This example shows how to configure the 4G-LTE wireless WAN on the router as backup with NAT and IPSec:



### Note

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

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

crypto isakmp policy 1
 encr 3des
 authentication pre-share
crypto isakmp key address a.b.c.d
!
```



```

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

interface Vlan104
  description used as default gateway address for DHCP clients
  ip address 10.4.0.254 255.255.0.0
  ip nat inside
  ip virtual-reassembly
!
interface Dialer2
  ip address negotiated
  ip mtu 1492
  ip nat outside
  ip virtual-reassembly
  encapsulation ppp
  load-interval 30
  dialer pool 2
  dialer-group 2
  ppp authentication chap callin
  ppp chap hostname cisco@dsl.com
  ppp chap password 0 cisco
  ppp ipcp dns request
  crypto map gsm1
!
ip local policy route-map track-primary-if
ip route 0.0.0.0 0.0.0.0 Dialer2 track 234
ip route 0.0.0.0 0.0.0.0 Cellular0/3/0 254
!

```

```

!
ip nat inside source route-map nat2cell interface Cellular0/3/0 overload
ip nat inside source route-map nat2dsl interface Dialer2 overload
!
ip sla 1
  icmp-echo 2.2.2.2 source-interface Dialer2
  timeout 1000
  frequency 2
ip sla schedule 1 life forever start-time now
access-list 1 permit any
access-list 101 deny ip 10.4.0.0 0.0.255.255 10.0.0.0 0.255.255.255
access-list 101 permit ip 10.4.0.0 0.0.255.255 any
access-list 102 permit icmp any host 2.2.2.2
access-list 103 permit ip 10.4.0.0 0.0.255.255 10.0.0.0 0.255.255.255
dialer-list 1 protocol ip list 1
dialer-list 2 protocol ip permit
!
!
route-map track-primary-if permit 10
  match ip address 102
  set interface Dialer2
!
route-map nat2dsl permit 10
  match ip address 101
  match interface Dialer2
!
route-map nat2cell permit 10
  match ip address 101
  match interface Cellular0/3/0
!
line 3
  exec-timeout 0 0
  script dialer lte
  login
  modem InOut

```

**Note**


---

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

---

## SIM Configuration: Examples

- [Locking the SIM Card: Example, page 112](#)
- [Unlocking the SIM Card: Example, page 113](#)
- [Automatic SIM Authentication: Example, page 113](#)
- [Changing the PIN Code: Example, page 114](#)
- [Configuring an Encrypted PIN: Example, page 116](#)

### Locking the SIM Card: Example

This 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# show cellular 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 lte sim lock 1111
!!!WARNING: SIM will be locked with pin=1111(4).
Do not enter new PIN to lock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
Apr 26 19:35:28.339: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN
Apr 26 19:35:59.967: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP
Router#
Router# sh cellular 0 security
Card Holder Verification (CHV1) = Enabled
SIM Status = Locked
SIM User Operation Required = Enter CHV1
Number of CHV1 Retries remaining = 3
Router#
!
!   SIM is in locked state.
!

```

## Unlocking the SIM Card: Example

This 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# show cellular 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 lte sim unlock 1111
!!!WARNING: SIM will be unlocked with pin=1111(4).
Do not enter new PIN to unlock SIM. Enter PIN that the SIM is configured with.
Call will be disconnected!!!
Are you sure you want to proceed?[confirm]
Router#
Router# sh cellular 0 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: Example

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

```

## Changing the PIN Code: Example

This 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# show cellular 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 lte sim lock 1111  
!!!WARNING: SIM will be locked with pin=1111(4).  
Do not enter new PIN to lock SIM. Enter PIN that the SIM is configured with.  
Call will be disconnected!!!  
Are you sure you want to proceed?[confirm]  
Router#  
Apr 26 21:58:11.903: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN  
Apr 26 21:58:43.775: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP  
Router#  
Router# sh cellular 0 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 lte sim change-pin 1111 0000  
!!!WARNING: SIM PIN will be changed from:1111(4) to:0000(4)  
Call will be disconnected. If old PIN is entered incorrectly in 3 attempt(s), SIM will be  
blocked!!!  
Are you sure you want to proceed?[confirm]  
Resetting modem, please wait...  
  
CHV1 code change has been completed. Please enter the new PIN in controller configuration  
for verification  
Router#  
Apr 26 21:59:16.735: %CELLWAN-2-MODEM_DOWN: Modem in HWIC slot 0/0 is DOWN  
Apr 26 21:59:48.387: %CELLWAN-2-MODEM_UP: Modem in HWIC slot 0/0 is now UP  
Router#  
Router#  
Router# sh cellular 0 security  
Card Holder Verification (CHV1) = Enabled  
SIM Status = Locked  
SIM User Operation Required = Enter CHV1  
Number of CHV1 Retries remaining = 3  
Router#  
!  
!  SIM stays in locked state, as expected, but with new PIN.  
!  
Router# cellular 0 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 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: Example

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

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# service password-encryption
Router(config)# username SIM privilege 0 password 1111
Router(config)# do sh run | i SIM
username SIM privilege 0 password 7 055A575E70.
!
! Copy the encrypted level 7 PIN. Use this scrambled PIN in the SIM authentication
! command.
!
Router(config)#
Router(config)# controller cellular 0
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
```

## Configuration Examples for 4G Serviceability Enhancement

This section contains the following subsections:

- [Example: Sample Output for the show cellular logs dm-log Command, page 116](#)
- [Example: Sample Output for the show cellular logs modem-crashdump Command, page 117](#)
- [Example: Sample Output for the show cellular log error Command, page 117](#)
- [Example: Sample Output for the test cellular modem-error-clear Command, page 117](#)

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

This example shows a sample output of the **show cellular logs dm-log** command:

```
Router# show cellular 0 logs dm-log
Integrated DM logging is on
output path = flash:
filter = MC74xx generic - GSM_GPRS_EDGE_WCDMA_LTE_EVDO.sqf
maximum log size = 67108864
maximum file size = 20971520
log rotation = disabled

33 packets sent to the modem, 4663 bytes, 0 errors
262 packets received from the modem, 374428 bytes, 0 input drops
262 packets stored in file system, 374428 bytes, 0 errors, 0 aborts
1 max rcv queue size

current file size = 374428
current log size = 374428
total log size = 374428
DM log files: (1 files)
flash:dmlog19560707-032507.bin size 374428
```

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

This example shows a sample output of the **show cellular logs modem-crashdump** command:

```
Router# show cellular 0 logs modem-crashdump
Modem crashdump logging: off
Progress = 100%
Last known State = Getting memory chunks
Total consecutive NAKs = 0
Number of retries = 0
Memory Region Info:
1: Full SDRAM [Base:0x0, Length:0x2000000]
2: MDSP RAM A region [Base:0x91000000, Length:0x8000]
3: MDSP RAM B region [Base:0x91200000, Length:0x8000]
4: MDSP RAM C region [Base:0x91400000, Length:0xC000]
5: MDSP Register region [Base:0x91C00000, Length:0x28]
6: ADSP RAM A region [Base:0x70000000, Length:0x10000]
7: ADSP RAM B region [Base:0x70200000, Length:0x10000]
8: ADSP RAM C region [Base:0x70400000, Length:0xC000]
9: ADSP RAM I region [Base:0x70800000, Length:0x18000]
10: CMM Script [Base:0x6A350, Length:0x310]
Router#
```

## Example: Sample Output for the show cellular log error Command

This example shows a sample output of the **show cellular log error** command:

```
Router# show cellular 0 log error
Cached info is displayed

at!err

00 4E hsu_conf_sel_nv 00536
01 9B uim 08280
02 FF rrcllpcie 15762
03 FF rrccspfscan 02169
04 4E dsatact 00696
05 4E dsatcmdp 01841
06 4D gsdi_convert 01526
07 04 rrccsputil 18579
08 02 cmss 03459
09 2D tmc 03825

OK

at!gcdump

No crash data available

OK
```

## Example: Sample Output for the test cellular modem-error-clear Command

This example shows a sample output of the **test cellular modem-error-clear** command:

```
Router# test cellular 0 modem-error-clear
Cellular0/1/0 Dump/Error info before clear command

at!err

00 4E hsu_conf_sel_nv 00536
```

```

01  9C uim                08280
02  FF rrcllpcie         15762
03  FF rrcspfscan       02169
04  4E dsatact          00696
05  4E dsatcmdp         01841
06  4E gsdi_convert     01526
07  04 rrcsputil        18579
08  02 cmss              03459
09  2D tmc               03825

```

```
OK
```

```
at!gcdump
```

```
No crash data available
```

```
OK
```

```
Cellular0/1/0 Dump/Error registers cleared
```

```
Router#
```

## PLMN Search and Selection

This feature allows you to search for available Public Land Mobile Network (PLMN) and connect to one of the PLMN.

### Restrictions

This restrictions apply for PLMN search and selection:

- Support in Cisco LTE 2.0 and WP76XX modem series and above.
- You have to verify whether your cellular service supports roaming or not.
- You have to use a SIM card that supports roaming.
- This feature is not supported on 4G+WiFi platforms.
- Supported firmware version is 02.18.05.00 or later.

### Commands

Use the following commands for PLMN feature:

- **cellular <unit> lte plmn search**
- **cellular <unit> lte plmn select <mode> <mcc> <mnc> <rat> <duration>**
- **show cellular <unit> network**

### Searching the Network

You can use the **cellular 0 lte plmn search** command to search for available PLMNs. This example shows how to search for networks:

```
router#cellular 0 lte plmn search
Searching for available PLMNs.This may take up to 3 minutes.
```



Please wait.....  
 PLMN search done. Please use "show cellular 0 network" to see available PLMNS

After the search, use the **show cellular 0 network** command to see the available networks:

```
router#show cellular 0 network
Current System Time = Fri Sep 18 18:49:24 2015
Current Service Status = Normal
Current Service = Packet switched
Current Roaming Status = Roaming
Network Selection Mode = Manual
Network = 02 - UK
Mobile Country Code (MCC) = 234
Mobile Network Code (MNC) = 10
Packet switch domain(PS) state = Attached
Location Area Code (LAC) = 4931
Cell ID = 34319
Available PLMNs:
Idx MCC MNC RAT Desc
1 234 10 umts 02 - UK
2 234 10 gsm 02 - UK
3 234 20 umts 3 UK
4 234 30 umts EE
5 234 15 gsm voda UK
6 234 33 gsm EE
7 234 20 lte 3 UK
8 234 30 gsm EE
9 234 15 umts voda UK
10 234 30 lte EE
11 234 10 lte 02 - UK
12 234 15 lte voda UK
```

## Selecting the Network

There are three ways you can select an available network: Auto mode, Force Mode, and Manual mode. In Auto mode, your router will connect automatically to a network preferred by the SIM. In Force mode, the router is forced to select an available or known network without performing a network search. If a network is not available or the router is unable to attach to a network, then the router will remain in a 'Not attached' state. You can use the **cellular x lte plmn select auto** command to attach the router to a network preferred by the SIM. In Manual mode, you can select an available network from your search result.

This example shows how to select a network manually:

```
router#cellular 0 lte plmn select manual ?
<0-999> Mobile Country Code (MCC)

router#cellular 0 lte plmn select manual 234 ?
<0-999> Mobile Network Code (MNC)

router#cellular 0 lte plmn select manual 234 10 ?
gsm GSM
lte LTE
umts UMTS

router#cellular 0 lte plmn select manual 234 10 gsm ?
permanent PERMANENT
power-cycle POWER_CYCLE

router#cellular 0 lte plmn select manual 234 10 gsm power-cycle ?

<cr>
```

```
router#cellular 0 lte plmn select manual 234 10 gsm power-cycle
```

This example shows how to force a network selection:

```
router#cellular 0 lte plmn select force ?
<0-999> Mobile Country Code (MCC)

router#cellular 0 lte plmn select force 310 ?
<0-999> Mobile Network Code (MNC)

router#cellular 0 lte plmn select force 310 410 ?
<2-3> MNC Digits Ex 23 means 2 Digits, 023 Means 3 Digits

router#cellular 0 lte plmn select force 310 410 2 ?
gsm GSM
lte LTE
umts UMTS

router#cellular 0 lte plmn select force 310 410 2 lte ?
permanent PERMANENT
power-cycle POWER_CYCLE

Router#cellular 0 lte plmn select force 310 410 2 lte power-cycle ?
<cr>

Router#cellular 0 lte plmn select force 310 410 2 lte power-cycle
```

## Verifying PLMN Selection

Use **show cellular 0 network** command to verify the PLMN selection:

```
router#show cellular 0 network
Current System Time = Fri Sep 18 18:53:25 2015
Current Service Status = Normal
Current Service = Packet switched
Current Roaming Status = Roaming
Network Selection Mode = Manual
Network = 02 - UK
Mobile Country Code (MCC) = 234
Mobile Network Code (MNC) = 10
Packet switch domain(PS) state = Attached
Location Area Code (LAC) = 4931
Cell ID = 34319
Available PLMNs:
Idx MCC MNC RAT Desc
1 234 10 umts O2 - UK
2 234 10 gsm O2 - UK
3 234 20 umts 3 UK
4 234 30 umts EE
5 234 15 gsm voda UK
6 234 33 gsm EE
7 234 20 lte 3 UK
8 234 30 gsm EE
9 234 15 umts voda UK
10 234 30 lte EE
11 234 10 lte O2 - UK
12 234 15 lte voda UK

router#show cellular 0 radio
Radio power mode = ON
Channel Number = 122
```

```

Current Band = GSM 900 Extended
Current RSSI = -48 dBm
Current ECIO = -127 dBm
Radio Access Technology(RAT) Preference = GSM
Radio Access Technology(RAT) Selected = EDGE

```

**Note**

Some networks may not allow the router to connect. In such cases, you have to choose a different network.

**Note**

Restart your modem if the router is not able to connect to any network.

## SNMP MIBs

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

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

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

- ciscoWan3gMIB(661)
- ciscoWan3gMIBNotifs(0)
- ciscoWan3gMIBObjects(1)
- c3gWanCommonTable(1)
- c3gWanGsm(3)
- c3gGsmIdentityTable(1)
- c3gGsmNetworkTable(2)
- c3gGsmPdpProfile(3)
- c3gGsmPdpProfileTable(1)
- c3gGsmPacketSessionTable(2)
- c3gGsmRadio(4)
- c3gGsmRadioTable(1)
- c3gGsmSecurity(5)
- c3gGsmSecurityTable(1)

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

### SNMP 4G LTE Configuration: Example

This example describes how to configure SNMP capability on the router:

```

snmp-server group neomobilityTeam v3 auth notify 3gView
snmp-server view 3gView ciscoWan3gMIB included

```

```
snmp-server community neomobility-test RW
snmp-server community public RW
snmp-server enable traps c3g
snmp-server host 172.19.153.53 neomobility c3g
snmp-server host 172.19.152.77 public c3g
snmp-server host 172.19.152.77 public udp-port 6059
```

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

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

## Troubleshooting

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

- [Verifying Data Call Setup, page 122](#)
- [Checking Signal Strength, page 123](#)
- [Verifying Service Availability, page 123](#)
- [Successful Call Setup, page 124](#)
- [, page 125](#)

## Verifying Data Call Setup

To verify the data call setup, follow these steps:

- 
- Step 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.
- Step 2** If the ping fails, debug the failure by using the following **debug** and **show** commands:
- **debug chat**
  - **debug modem**
  - **debug dialer**
  - **show cellular all**
  - **show interface cellular**
  - **show running-config**
  - **show ip route**
- Step 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:

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

## Verifying Service Availability

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

```
Router# show cellular 0 all

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

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

Data Connection Information
=====

Profile 1, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 2, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 3, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 4, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 5, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 6, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 7, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 8, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 9, Packet Session Status = INACTIVE
    Inactivity Reason = Normal inactivate state
Profile 10, Packet Session Status = INACTIVE
```

```

        Inactivity Reason = Normal inactivate state
Profile 11, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 12, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 13, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 14, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 15, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state
Profile 16, Packet Session Status = INACTIVE
        Inactivity Reason = Normal inactivate state

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

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

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

```

## Successful Call Setup

This example shows a sample output when a call is set up using a chat script. It shows a received IP address from the network. Call setup is successful and data path is open.

```

debug modem
debug chat

Router#
Aug 25 18:46:59.604: CHAT0: Attempting async line dialer script
Aug 25 18:46:59.604: CHAT0: Dialing using Modem script: lte & System script: none
Aug 25 18:46:59.604: CHAT0: process started
Aug 25 18:46:59.604: CHAT0: Asserting DTR
Aug 25 18:46:59.604: CHAT0: Chat script lte started
Aug 25 18:46:59.604: CHAT0: Sending string: AT!CALL
Aug 25 18:46:59.604: CHAT0: Expecting string: OK

```

```
Aug 25 18:47:00.641: CHAT0: Completed match for expect: OK
Aug 25 18:47:00.641: CHAT0: Chat script lte finished, status = Success
Aug 25 18:47:00.641: TTY0: no timer type 1 to destroy
Aug 25 18:47:00.641: TTY0: no timer type 0 to destroy
Aug 25 18:47:00.641: TTY0: no timer type 2 to destroy
Aug 25 18:47:02.642: %LINK-3-UPDOWN: Interface Cellular0, changed state to up
Aug 25 18:47:02.642: %DIALER-6-BIND: Interface Ce0 bound to profile Di1
Aug 25 18:47:03.642: %LINEPROTO-5-UPDOWN: Line protocol on Interface Cellular0, changed
state to up (69.78.96.14) [OK]
```

