Cellular Interface Modules

This chapter provides configuration details for the cellular interface modules used in the IR800 series routers. It is important to understand the architecture of the IR800 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 Slot</th>
<th>Modem Slot</th>
<th>PDN Interface</th>
<th>Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR829</td>
<td>0</td>
<td>0/1</td>
<td>0</td>
<td>Cellular 0</td>
<td>3</td>
</tr>
<tr>
<td>IR829</td>
<td>0</td>
<td>0/1</td>
<td>0</td>
<td>Cellular 1</td>
<td>8</td>
</tr>
<tr>
<td>IR829 (dual modem) *</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Cellular 0/0</td>
<td>3</td>
</tr>
<tr>
<td>IR829 (dual modem) *</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>Cellular 0/1</td>
<td>8</td>
</tr>
<tr>
<td>IR829 (dual modem) *</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Cellular 1/0</td>
<td>9</td>
</tr>
<tr>
<td>IR829 (dual modem) *</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Cellular 1/1</td>
<td>15</td>
</tr>
<tr>
<td>IR809</td>
<td>0</td>
<td>0/1</td>
<td>0</td>
<td>Cellular 0</td>
<td>3</td>
</tr>
<tr>
<td>IR809</td>
<td>0</td>
<td>0/1</td>
<td>0</td>
<td>Cellular 1</td>
<td>8</td>
</tr>
</tbody>
</table>

Check the [Product Marketing Data Sheet](#) for updated modem information.

With the introduction of the next generation SKUs, some functionality has changed. Refer to the following table for details.

<table>
<thead>
<tr>
<th>Description</th>
<th>IR829GW-[LA/GA/NA/VZ]-*K9</th>
<th>IR829-2LTE-EA-*K9</th>
</tr>
</thead>
<tbody>
<tr>
<td>North American</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>APJC</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Description</td>
<td>IR829GW-[LA/GA/NA/VZ]-*K9</td>
<td>IR829-2LTE-EA-*K9</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>EMER</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>EMEA</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2G Support</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>3G Support</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>LTE Support</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>GPS</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td></td>
<td>Only available from the first LTE Modem.</td>
</tr>
<tr>
<td>Wi-Fi (2.4/5 GHZ)</td>
<td>2.4 GHz and 5GHz use separate antenna connector</td>
<td>2.4 GHz + 5GHz coexist on the same antenna connector</td>
</tr>
<tr>
<td>Dual SIM</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Band 30</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>LTE category supported</td>
<td>cat4</td>
<td>cat4</td>
</tr>
</tbody>
</table>

This chapter contains the following sections:

- Cellular Interface, on page 2
- Radio Frequency Band Select, on page 15
- Low Power Mode, on page 16
- Enhancement to Modem Crash Action, on page 16
- IR800 Cellular Technology Selection, on page 17
- GPS, on page 20
- Troubleshooting the Cellular Interface, on page 23

### Cellular Interface

The Cisco IR800 series Industrial routers use the Sierra Wireless MC73XX and MC74XX series modems supporting MIMO on LTE. WCDMA UMTS HSPA DC-HSPA+ is diversity only, without MIMO.

Installation of the SIM card(s) and antennas is covered in the respective Hardware Installation Guides under the Cisco 800 Series Industrial Integrated Services Routers page:


The software download page can be found here:


The Firmware Upgrade Guide for Cellular Modems can be found here:


Cisco 4G LTE Software Installation Guide
After installing the SIM card(s) and antennas, check the cellular hardware, radio, network and SIM (Unlock SIM card if necessary).

4G LTE Dual SIM

Dual Subscriber Identity Module (SIM) provides reliability and multihoming capabilities over LTE and HSPA-based networks. With two LTE modems, the IR829 enables concurrent connectivity to two cellular networks for high reliability, enhanced data throughputs, load balancing and differentiated services.

Note

Dual SIM active/backup mode is supported only on single LTE models of the IR829.

The following features are provided:

- The two SIMs operate in active/backup mode on the single LTE models of the IR829, and active/active mode with each of the two SIMs assigned to a specific cellular radio on the dual LTE models. Both mobile provider networks must be supported by the given IR829 SKU, and it must be in an applicable region.
- By default, SIM slot 0 is the primary, and SIM slot 1 is the backup. Behavior may be changed using the `lte sim primary` command.
- Profiles for each SIM are assigned by using the `lte sim profile` command. Each SIM has an associated Internet profile and an IMS profile in the CLI.
- Dual-SIM behavior is managed under Cellular 0 CLI configuration.
- The fail over occurs when there is no signal from the current carrier, and generally happens depending on the fail over timer value that is set. The default value is 5 minutes. The range is from 0-7 minutes.
- Dual active LTE radios providing Multi-carrier support for active and backup use cases. Newer cellular modems have been added (MC74xx) with FDD/TDD LTE on LA and EA 829 models.

Note

The 7455 modems do not support dual SIM capabilities.

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

Auto-SIM is supported in Sierra wireless firmware Version 02.20.03. A new CLI is added in the cellular controller to enable/disable Auto-SIM. The modem in Auto-SIM mode selects the right carrier firmware after a SIM slot switch and an automatic modem reset. Auto-SIM is supported on the MC7455, MC7430, EM7430,
and EM7455 modems. During bootup, if the Auto-SIM configuration on the modem doesn’t match to the IOS configuration, the corresponding Auto-SIM or manual mode is pushed to the modem.

After an Auto-SIM configuration change, the modem is automatically reset; the default is “auto-sim” enabled.

Enable Auto-SIM:

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

**Note**

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

Disable Auto-SIM:

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

**Note**

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

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

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

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

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

For additional information, see the following guide: https://www.cisco.com/c/en/us/td/docs/routers/access/interfaces/NIM/software/configuration/guide/4GLTENIM_SW.html

**Dual Radio Configuration and Single Radio Configuration**

The following examples are of an IR800 cellular configuration using dual modems. A single modem example will look much the same, without the *Cellular1/0* and *Cellular1/1* entries.

```
DUAL-Modem> enable
DUAL-Modem# show ip int brief
 Interface       IP-Address   OK? Method Status          Protocol
 GigabitEthernet0 unassigned YES NVRAM administratively down down
 GigabitEthernet1 unassigned YES unset  down               down
 GigabitEthernet2 unassigned YES unset  down               down
 GigabitEthernet3 unassigned YES unset  down               down
 GigabitEthernet4 unassigned YES unset  down               down
 Wlan-GigabitEthernet0 unassigned YES unset  up               up
 Async0          unassigned YES unset  up               down
 Async1          unassigned YES unset  up               down
 GigabitEthernet5 unassigned YES NVRAM administratively down down
 Cellular0/0     192.168.43.237 YES IPCP  up               up
 Cellular1/0     10.61.25.231  YES IPCP  up               up
 Second Modem
 Cellular0/1     unassigned  YES TFTP  down               down
```
Cellular1/1  unassigned  YES  TFTP  down  down
Second Modem
Vlan1  unassigned  YES  unset  up  up
wlan-ap0  unassigned  YES  NVRAM  up  up
DUAL-Modem# show running-config

Building configuration...
Current configuration : 4021 bytes
!
! Last configuration change at 18:31:06 UTC Mon Oct 24 2016
!
version 15.6
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
service internal
!
hostname DUAL-Modem
!
boot-start-marker
boot system flash:/ir800-universalk9-mz.SPA.156-3.M0a
boot-end-marker
!
no aaa new-model
ethernet lmi ce
service-module wlan-ap 0 bootimage autonomous
!
ignition off-timer 900
!
ignition undervoltage threshold 9
!
no ignition enable
!
no ip domain lookup
ip inspect WAAS flush-timeout 10
ip cef
no ipv6 cef
!
multilink bundle-name authenticated
!
chat-script lte "" "AT!CALL" TIMEOUT 20 "OK"
!
license udi pid IR829-2LTE-EA-BK9 an FGL2032219N
!
redundancy
notification-timer 120000
controller Cellular 0
lte sim data-profile 3 attach-profile 1

#When using Verizon, use data profile 3 and attach to profile 1
#When using AT&T, use data profile 1 and attach to profile 1

lte modem link-recovery rssi onset-threshold -110
lte modem link-recovery monitor-timer 20
lte modem link-recovery wait-timer 10
lte modem link-recovery debounce-count 6
!
controller Cellular 1
lte modem link-recovery rssi onset-threshold -110
lte modem link-recovery monitor-timer 20
lte modem link-recovery wait-timer 10
lte modem link-recovery debounce-count 6
interface GigabitEthernet0
no ip address
shutdown
!
interface GigabitEthernet1
no ip address
!
interface GigabitEthernet2
no ip address
!
interface GigabitEthernet3
no ip address
!
interface GigabitEthernet4
no ip address
!
interface Wlan-GigabitEthernet0
no ip address
!
interface GigabitEthernet5
no ip address
shutdown
duplex auto
speed auto
!
interface Cellular0/0
  #Both interfaces need to be configured in the IOS software
ip address negotiated
ip virtual-reassembly in
encapsulation slip
load-interval 30
dialer in-band
dialer string lte
dialer-group 1
no peer default ip address
async mode interactive
routing dynamic
!
interface Cellular1/0
  #Both interfaces need to be configured in the IOS software
ip address negotiated
ip virtual-reassembly in
encapsulation slip
load-interval 30
dialer in-band
dialer string lte
dialer-group 1
no peer default ip address
async mode interactive
routing dynamic
!
interface Cellular0/1
no ip address
encapsulation slip
!
interface Cellular1/1
no ip address
encapsulation slip
!
interface wlan-ap0
no ip address
!
interface Vlan1
no ip address
!
interface Async0
no ip address
encapsulation scada
!
interface Async1
no ip address
encapsulation scada
!
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 Cellular1/0
ip route 8.8.8.8 255.255.255.255 Cellular0/0
!
Route values added
!
dialer-list 1 protocol ip permit
ipv6 ioam timestamp
!
access-list 1 permit any
!
control-plane
!
!
line con 0
stopbits 1
line 1 2
stopbits 1
line 3
script dialer lte
no exec
transport preferred lat pad telnet rlogin lapb-ta mop udptn v120 ssh
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
rxspeed 150000000
txspeed 50000000
line 4
no activation-character
no exec
transport preferred none
transport input all
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
line 8
script dialer lte
no exec
transport preferred lat pad telnet rlogin lapb-ta mop udptn v120 ssh
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
rxspeed 150000000
txspeed 50000000
line 9
script dialer lte
no exec
transport preferred lat pad telnet rlogin lapb-ta mop udptn v120 ssh
transport input all
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
rxspeed 236800
txspeed 118000
line 15
no exec
transport preferred lat pad telnet rlogin lapb-ta mop udptn v120 ssh
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
rxspeed 236800
txspeed 118000
line 1/3 1/6
transport preferred none
transport output none
stopbits 1
line vty 0 4
login
transport input none
no scheduler max-task-time
!!
End

Test the modem configuration with a ping command:

DUAL-Modem# ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 30/88/292 ms
DUAL-Modem#

The following two examples show a Verizon profile followed by an AT&T profile.

Verizon Profile

DUAL-Modem# show cellular 0/0 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*
Profile 3 is used for Verizon
--------
PDP Type = IPv4v6
PDP address = 166.140.43.237
Access Point Name (APN) = we01.VZWSTATIC
Authentication = None
  Primary DNS address = 198.224.173.135
  Secondary DNS address = 198.224.174.135
Profile 4 = INACTIVE
--------
PDP Type = IPv4v6
Access Point Name (APN) = vzwapp
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) = vzwenterprise
Authentication = None

* - Default profile
** - LTE attach profile

AT&T Profile

DUAL-Modem# show cellular 1/0 profile

Profile 1 = ACTIVE* **
Profile 1 is used for AT&T

PDP Type = IPv4
PDP address = 10.61.25.231
Access Point Name (APN) = m2m.com.attz
Authentication = None
Primary DNS address = 8.8.8.8
Secondary DNS address = 8.8.4.4

* - Default profile
** - LTE attach profile

DUAL-Modem# show cellular 0/0 hardware

Modem Firmware Version = SWX9X3OC_02.20.03.00
Modem Firmware built = 2016/06/30 10:54:05
Hardware Version = 1.0
Device Model ID: MC7455MOBILE
International Mobile Subscriber Identity (IMSI) = 311480166946902
International Mobile Equipment Identity (IMEI) = 352009080050110
Integrated Circuit Card ID (ICCID) = 891480000165326375
Mobile Subscriber Integrated Services Digital Network-Number (MSISDN) = 6692200807
Modem Status = Online
Current Modem Temperature = 34 deg C
PRI SKU ID = 1103084, PRI version = 002.024, Carrier = Verizon
Carrier identified as Verizon
OEM PRI version = 000.001

Creating a Cellular Profile for Verizon.

DUAL-Modem# cellular 0/0 lte profile create 3 we01.VZWSTATIC
Warning: You are attempting to modify a currently ACTIVE data profile.

This is not recommended and may affect the connection state
PDP Type = IPv4v6
Access Point Name (APN) = we01.VZWSTATIC
Authentication = NONE
Profile 3 already exists with above parameters. Do you want to overwrite? [confirm] <return>
Profile 3 will be overwritten with the following values:
PDP type = IPv4
APN = we01.VZWSTATIC
Authentication = NONE
Are you sure? [confirm] <return>
Profile 3 written to modem
DUAL-Modem#
Enter configuration commands, one per line. End with CNTL/Z.

DUAL-Modem(config)# controller cellular 0
DUAL-Modem(config-controller)# lte sim data-profile 3 attach-profile 1
DUAL-Modem(config-controller)#
DUAL-Modem# conf t
Enter configuration commands, one per line. End with CNTL/Z.
DUAL-Modem(config)# controller cellular 0
DUAL-Modem(config-controller)# lte sim data-profile 3 attach-profile 1
DUAL-Modem(config-controller)# end
DUAL-Modem# show

-Oct 24 19:43:44.841: %SYS-5-CONFIG_I: Configured from console by consolecell
DUAL-Modem# show cellular 1/0 profile
Profile 1 = ACTIVE* **
---------
PDP Type = IPv4
PDP address = 10.61.185.213
Access Point Name (APN) = m2m.com.attz
Authentication = None
  Primary DNS address = 8.8.8.8
  Secondary DNS address = 8.8.4.4
* - Default profile
** - LTE attach profile

Creating a Cellular Profile for AT&T

DUAL-Modem# cellular 1/0 lte profil create 1 m2m.com.attz
Warning: You are attempting to modify a currently ACTIVE data profile.

This is not recommended and may affect the connection state
PDP Type = IPv4
Access Point Name (APN) = m2m.com.attz
Authentication = NONE
Profile 1 already exists with above parameters. Do you want to overwrite? [confirm] <return>
Profile 1 will be overwritten with the following values:
PDP type = IPv4
APN = m2m.com.attz
Authentication = NONE
Are you sure? [confirm] <return>
Profile 1 written to modem
DUAL-Modem# conf t
Enter configuration commands, one per line. End with CNTL/Z.
DUAL-Modem(config)# controller cellular 1
DUAL-Modem(config-controller)# lte sim data-profile 1 attach-profile 1

Note: Please issue a modem reset for the modified attach-profile to take effect.
DUAL-Modem(config-controller)# end
DUAL-Modem#

Controller Cellular 0 and NAT Configuration

Controller Cellular 0 is configured with default parameters. If a profile different from Profile 1 is set-up, it must be attached to controller cellular 0.

If the SIM in slot #1 must be used as primary, it is done under controller cellular 0

Procedure

Step 1   Show the controller cellular 0
Example:

IR800#show run | begin controller
controller Cellular 0
lte sim data-profile 1 attach-profile 1 slot 0 !
Value set-up for configuration example
lte sim max-retry 0
lte failovertimer 0
lte modem link-recovery rssi onset-threshold -110
lte modem link-recovery monitor-timer 20
lte modem link-recovery wait-timer 10
lte modem link-recovery debounce-count 6
!

Step 2 If the cellular interface obtains an IPv4 private address, NAT should be configured.

Example:

IR800#conf term
Enter configuration commands, one per line. End with CNTL/Z.
IR800(config)#inter cellular 0
IR800(config-if)#ip nat outside
IR800(config)#inter vlan 4
IR800(config-if)#ip nat inside
IR800(config)#access-list 10 permit 10.20.20.0 0.0.0.255
!
IPv4 subnet to be NATed
IR800(config)# ip nat inside source list 10 interface Cellular0 overload
!
NAT interface association

Step 3 Once the Cellular configuration is done, ping a well-known IP address to test the connectivity.

Example:

IR800#ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 340/472/740 ms
IR800#

Step 4 Attached Cellular 0 profile must become “active” and “connection” shows IP address and traffic.

Example:

IR800#show cellular 0 profile
Profile 1 = ACTIVE* **
--------
PDP Type = IPv4
PDP address = 10.60.159.255
Access Point Name (APN) = LTE
Authentication = None
Primary DNS address = 212.27.40.240
Secondary DNS address = 212.27.40.241
* = Default profile
** = LTE attach profile
Configured default profile for active SIM 0 is profile 1.
IR800#show cellular 0 connection
Profile 1, Packet Session Status = ACTIVE
Cellular0:
Data Transmitted = 700 bytes, Received = 600 bytes
IP address = 10.60.159.255
Primary DNS address = 212.27.40.240
Secondary DNS address = 212.27.40.241
Profile 2, Packet Session Status = INACTIVE

What to do next
Use the show interface cellular 0 command to display the negotiated IP address if operational.

```
IR800# show interfaces cellular 0
Cellular0 is up, line protocol is up
Hardware is 4G WWAN Modem - Global (Europe & Australia) Multimode LTE/DC-HSPA+/HSPA+/HSPA/U

Internet address is 10.123.161.59/32
MTU 1500 bytes, BW 384 Kbit/sec, DLY 100000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation SLIP, loopback not set
Keepalive not supported
Last input 00:22:41, output never, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/10 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
12 packets input, 1128 bytes, 0 no buffer
Received 0 broadcasts (0 IP multicasts)
0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
51 packets output, 3364 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets
0 unknown protocol drops
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up
```

If the negotiated IP address is not operational:

```
IR800# show interfaces cellular 0
Cellular0 is up (spoofing), line protocol is up (spoofing)
Hardware is 4G WWAN Modem - Global (Europe & Australia) Multimode LTE/DC-HSPA+/HSPA+/HSPA/U

Internet address will be assigned dynamically by the network
```

Other Useful Commands

```
IR800# show cell 0 hardware
Modem Firmware Version = SWI9X15C_05.05.58.00
Modem Firmware built = 2015/03/04 21:30:23
Hardware Version = 1.0
Device Model ID: MC7304
Package Identifier ID: 1102029_9903299_MC7304_05.05.58.00_00_Cisco_005.010_000
International Mobile Subscriber Identity (IMSI) = 208150103324395
International Mobile Equipment Identity (IMEI) = 352761060206340
```
Integrated Circuit Card ID (ICCID) = 8933150112100222053
Mobile Subscriber Integrated Services
Digital Network-Number (MSISDN) = 33695764790
Current Modem Temperature = 47 deg C
PRI SKU ID = 9903299, PRI version = 05.10, Carrier = 1

IR800# show cell 0 security
Active SIM = 0
SIM slot #0 active
SIM switchover attempts = 0
Card Holder Verification (CHV1) = Disabled
SIM Status = OK
SIM User Operation Required = None
Number of CHV1 Retries remaining = 3

IR800# cellular 0 lte sim unlock XXXX
        !
        XXXX = PIN code

IR800# show cell 0 radio
Radio power mode = ON
Channel Number = 3037
Current Band = Unknown
Current RSSI(RSCP) = -99 dBm
Current ECIO = -10 dBm
Radio Access Technology(RAT) Preference = AUTO
Radio Access Technology(RAT) Selected = UMTS (UMTS/WCDMA)

IR800# show cell 0 network
Current Service Status = Normal
Current Service = Packet switched
Current Roaming Status = Home
Network Selection Mode = Automatic
Network = LTE
Mobile Country Code (MCC) = 208
Mobile Network Code (MNC) = 15
Packet switch domain(PS) state = Attached
Location Area Code (LAC) = 3910
Cell ID = 222094374

IR800# show cell 0 all

---

**Note**
The output to the `show cell 0 all` command is extensive, and omitted from this guide for brevity.

---

**Accessing 4G Modem AT Commands**

---

**Note**
A password must be added to the line configuration for security.

Get the line number associated to Cellular 0:

IR800#show line

<table>
<thead>
<tr>
<th>Tty</th>
<th>Line</th>
<th>Typ</th>
<th>Tx/Rx</th>
<th>A Modem</th>
<th>Roty</th>
<th>AccCO</th>
<th>AccCI</th>
<th>Uses</th>
<th>Noise</th>
<th>Overruns</th>
<th>In</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>3</td>
<td>TTY</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>0</td>
<td>4/0</td>
<td>Ce0</td>
</tr>
</tbody>
</table>
Use one of the IR800 IP address along with 2000 + line number (2003)

IR800#10.15.15.1 2003
Trying 10.15.15.1, 2003 ... Open

Execute the 4G modem AT commands, for example AT!GSTATUS?:

```
AT!GSTATUS?
!GSTATUS:
Current Time: 213353 Temperature: 38
Bootup Time: 0 Mode: ONLINE
System mode: WCDMA PS state: Attached
WCDMA band: WCDMA 900
WCDMA channel: 3037
GMM (PS) state:REGISTERED NORMAL SERVICE
MM (CS) state: IDLE NORMAL SERVICE
WCDMA L1 state:L1M_PCH_SLEEP LAC: 0F46 (3910)
RRC state: DISCONNECTED Cell ID: 0D3CE428 (222094376)
RxM RSSI C0: -90 RxD RSSI C0: -106
RxM RSSI C1: -106 RxD RSSI C1: -106
```

Disconnect using “SHIFT+CONTROL+6+x”, then confirm:

```
IR800#disc
Closing connection to 10.2.2.2 [confirm]
```

**Checking 4G Modem Firmware through AT Commands**

To check the IR800 4G modem firmware, execute the 4G modem AT commands after connecting to the modem. The following example is for an IR809G-LTE-GA-K9 loaded with FW-MC7304-LTE-GB Global firmware.

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the IR809, the PRI SKU ID= 9903299 is not representative of the GB firmware</td>
</tr>
</tbody>
</table>

```
at!priid?
PRI Part Number: 9903299
Revision: 05.10
Carrier PRI: 9999999_9902674_SWI9X15C_05.05.58.00_00_GENEU-4G_005.026_000
OK
```

```
at!package?
1102029_9903299_MC7304_05.05.58.00_00_Cisco_005.010_000
```

```
at!gobimpref?
!GOBIIMPFREF:
preferred fw version: 05.05.58.00
preferred carrier name: GENEU-4G
preferred config name: GENEU-4G_005.026_000
current fw version: 05.05.58.00
current carrier name: GENEU-4G
current config name: GENEU-4G_005.026_000
```
Radio Frequency Band Select

This new feature allows the user to configure and lock down the modem to a specific RF band, or set of bands. The preference can be set to be equal to, or a sub-set of the capability supported by the modem/carrier combination.

The following examples show the controller configuration commands:

```
router# conf t
Enter configuration commands, one per line. End with CNTL/Z.
router(config)#controller cell interface number

router(config-controller)#lte modem ?
  band-select Modem band select
  dm-log Modem DM logging configuration
  fota-poll-timer Set poll timer for AVMS to do Firmware upgrade over the air
  link-recovery Cellular Link Recovery
  mtu Modem mtu
  nas-log Modem NAS logging configuration

router(config-controller)#lte modem band-select ?
  all-lte-only Choose all LTE bands only
  all-nonlte-only Choose all non-LTE bands only
  band-indices Specify the lte and non-lte band indices

router(config-controller)#lte modem band-select band-indices ?
  WORD Band index(es) in string format "<band index#>, <band index#>, ...
  (supported band indices are listed under 'show cellular radio band'.)

router(config-controller)#lte modem band-select band-indices "2 4 5" ?
  slot primary SIM slot

router(config-controller)#lte modem band-select band-indices "2 4 5" slot ?
  <0-1> Slot number

router(config-controller)#lte modem band-select band-indices "2 4 5" slot 0

router#show run | sec controller
controller Cellular 0
lte sim max-retry 0
lte failovertimer 4
lte modem dm-log rotation
lte modem link-recovery disable
lte modem band-select band-indices "2,4,5" slot 0
```

The following examples show the controller show commands:

```
router#show cellular interface number radio ?
  band Show Radio band settings
  history Show Radio history in graph format
  | Output modifiers
  <cr> <cr>

router#show cellular interface number radio band
```
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

IR807# show run | sec controller
controller Cellular 0
no lte gps enable
lte modem crash-action boot-and-hold
lte modem fota-poll-timer 15
lte modem mtu 1700
lte modem link-recovery disable
IR800#

**Low Power Mode**

This feature provides the reason for the modem going into a low power mode if the situation ever occurs. It uses the device power control information provided by the modem. A new CLI has been implemented `show cellular <interface> radio details`.

```
router# show cellular <interface number> radio

Radio power mode = OFF, Reason = User Request
Channel Number = 0
Current Band = Unknown
Current RSSI = -128 dBm
Current ECIO = -2 dBm
Radio Access Technology(RAT) Preference = AUTO
Radio Access Technology(RAT) Selected = AUTO
```

```
router# show cellular <interface number> radio details

Radio turned off under cellular controller configuration.
router#
```

**Note:** In the above `show cellular <interface number> radio` output, the Radio power mode shows OFF because the user has turned the radio off by choice. In all other cases, when the radio goes to Low Power mode, you will see the display Radio power mode = **low power**.

**Enhancement to Modem Crash Action**

If the modem corresponding to the cellular interface crashes, the modem will reset itself and come back up. However, in order to debug the cause of the crash, a full crash dump can be captured on the modem. The steps to capture the crashdump are outlined in:
A new CLI has been added to set the crash action on the modem upon a crash. The CLI is `lte modem crash-action ?`. The device can be set to either reset, or to boot and hold.

The following example shows the new functionality of the configuration CLI:

```
Router(config-controller)#lte modem crash-action ?
  boot-and-hold → Remain in crash state
  reset → reset the modem on crash
```

This CLI will set the flag to either 1 or 0 for reset and boot and hold respectively. This is the same as AT command `at!eroption= 0 / 1`

The following example shows the new functionality of the exec CLI:

```
router#show cellular <your interface> logs modem-crash-action
Current modem crash action: Reset
```

This CLI will show the current state the modem is set to. This is the same as AT command `at!eroption=?`.

### IR800 Cellular Technology Selection

The cellular interface supports a seamless hand off between LTE and 3G networks when the LTE cell becomes weak in certain spots and vice versa. But it may also be disable to lock the cellular interface in a given technology, for example, LTE.

The cellular interface supports 3G and 2.5G technologies. The IOS CLI can be used to select a particular technology that is most desirable in your local zone.

Use the cellular 0 lte technology command:

```
IR829# cellular 0 lte technology ?
  !
  Blue
  values available on Global SKU
  auto Automatic LTE Technology Selection
  cdma-1xrtt CDMA 1xRTT
  cdma-evdo CDMA EVDO Rev A
  cdma-hybrid HYBRID CDMA
  gsm GSM
  lte LTE
  umts UMTS
```

**Note** The default technology type selection is `auto`, and it is recommended to be used at all times. Although `gsm` and `umts` are part of the selection, the modem firmware does not support them on gsm/umts network. They will be used as `lte` selection on a Verizon network.
Show the completed configuration: (output edited for brevity)

IR800#show run
Building configuration...
Current configuration : 4365 bytes
!
! Last configuration change at 09:53:09 UTC Sat Oct 10 2015 by cisco
!
version 15.5
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname IR800
!
boot-start-marker
boot system flash:/ir800-universalk9-mz.SPA.155-3.M0a
boot-end-marker
!
enable password cisco
!
aaa new-model

aaa session-id common
ethernet lmi ce
!
ip dhcp pool GuestOS
network 10.16.16.0 255.255.255.0
default-router 10.16.16.1
dns-server 8.8.8.8
!
ip domain name local.cisco.com
ip cef
ipv6 unicast-routing
ipv6 cef
!
multilink bundle-name authenticated
!
chat-script LTE "" ""AT!CALL" TIMEOUT 20 "OK"
!
license udi pid IR809G-LTE-GA-K9 sn JMX1915X00Q
license accept end user agreement
license boot module ir800 technology-package securityk9
license boot module ir800 technology-package datak9
!
username cisco password 0 cisco
!
redundancy
!
controller Cellular 0
lte sim data-profile 1 attach-profile 1 slot 0
lte sim max-retry 0
lte failovertimer 0
lte modem link-recovery rssi onset-threshold -110
lte modem link-recovery monitor-timer 20
lte modem link-recovery wait-timer 10
lte modem link-recovery debounce-count 6
!
interface GigabitEthernet0
description backhaul
ip address dhcp
duplex auto
speed auto
ipv6 address autoconfig default
!
interface GigabitEthernet1
no ip address
shutdown
duplex auto
speed auto
!
interface GigabitEthernet2
ip address 10.16.16.1 255.255.255.0
duplex auto
speed auto
ipv6 address autoconfig
!
interface Cellular0
ip address negotiated
capsulation slip
dialer in-band
dialer idle-timeout 0
dialer string LTE
dialer-group 1
async mode interactive
!
interface Cellular1
no ip address
capsulation slip
!
interface Async0
no ip address
capsulation scada
!
interface Async1
no ip address
capsulation scada
!
interface Async2
no ip address
capsulation scada
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 Cellular0
ip ssh time-out 60
!
dialer-list 1 protocol ip permit
!
control-plane
!
line con 0
  stopbits 1
line 1 2
  stopbits 1
line 3
  script dialer LTE
    modem InOut
    no exec
transport preferred lat pad telnet rlogin lapb-ta mop udptn v120 ssh
transport input telnet
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
speed 384000
line 8
  script dialer LTE
    modem InOut
    no exec
transport preferred lat pad telnet rlogin lapb-ta mop udptn v120 ssh
transport output lat pad telnet rlogin lapb-ta mop udptn v120 ssh
speed 384000
line 1/3 1/6
transport preferred none
transport output none
stopbits 1
line vty 0 4
password cisco
transport input telnet ssh
!
no scheduler max-task-time
!
end
IR800#

GPS

The IR800 series can be configured to enable real-time location tracking of remote assets and geo-fence when used with IOT Field Network Director. Field Network Director receives GPS data directly from IOS, not NMEA.

Key Points:

• GPS must be configured under controller cellular 0.

• GPS can be assigned to Cellular AUX antenna.

• GPS data can be seen locally, or data stream can be forwarded to applications, i.e. RUBAN.

Note

On the IR829 dual-LTE model, GPS can only be configured on cellular 0/0.

For information about the GPS LED indications and locations of the GPS connectors, see IR829 Product Overview and IR809 Product Overview.

To configure GPS on the IR800 series, refer to the following examples.

IR829# conf term
IR829(config)#controller cellular 0
IR829(config-controller)#lte gps ?
enable enable GPS feature
mode select GPS mode
nmea enable NMEA data
IR829(config-controller)#lte gps mode standalone
IR829(config-controller)#lte gps nmea ip
IR829#show cellular 0 gps

GPS Info
--------------
GPS Feature: enabled
GPS Port Selected: Dedicated GPS port
GPS State: GPS enabled
GPS Mode Configured: standalone
Latitude: 48 Deg 38 Min 31.2114 Sec North
Longitude: 2 Deg 13 Min 47.3992 Sec East
Timestamp (GMT): Wed Jul 22 08:05:28 2015
Fix type index: 0, Height: 94 m
Satellite Info
----------------
Satellite #14, elevation 28, azimuth 310, SNR 31 *
Satellite #15, elevation 22, azimuth 171, SNR 39 *
Satellite #17, elevation 25, azimuth 45, SNR 34 *
Satellite #18, elevation 8, azimuth 248, SNR 25
Satellite #22, elevation 12, azimuth 281, SNR 24
Satellite #24, elevation 78, azimuth 90, SNR 35 *
Satellite #25, elevation 23, azimuth 241, SNR 27
Satellite #1, elevation 0, azimuth 0, SNR 0
Satellite #2, elevation 0, azimuth 0, SNR 0
Satellite #6, elevation 6, azimuth 85, SNR 0
Satellite #12, elevation 62, azimuth 241, SNR 0
Satellite #26, elevation 0, azimuth 0, SNR 0
Satellite #29, elevation 0, azimuth 0, SNR 0
IR829#

You can also configure IOS so that GPS can be streamed to another destination (port or address).

For example:

IR829# conf t
Enter configuration commands, one per line. End with CNTL/Z.
IR829(config)# controller cellular 0
IR829(config-controller)# lte gps nmea ?
  ip  NMEA over IP interface
  serial  NMEA over serial interface
IR829(config-controller)# lte gps nmea ip ?
  udp  UDP Transport
<cr>
IR829(config-controller)# lte gps nmea ip udp ?
  A.B.C.D Source address
IR829(config-controller)# lte gps nmea ip udp 10.3.4.5 ?
  A.B.C.D Destination address
IR829(config-controller)# lte gps nmea ip udp 10.1.1.1 10.3.4.5 ?
  <0-65535> Destination port
IR829(config-controller)# lte gps nmea ip udp 10.1.1.1 10.3.4.5 3456
Cellular Modem in HWIC slot 0/0 is still in reset, we recommend to re-execute this cmd after
60 seconds
IR829(config-controller)#

The Command Line Interface for the gyroscope feature has been changed in IOS Release 15-7-3M1 in order
to be compatible with the CCP Express NMS. The old CLI format was:

IR829(config)# gyroscope-reading frequency ?
  1/min Reading 1 times per minute
  1/sec Reading 1 time per second (default value)
  10/min Reading 10 times per minute

From this release going forward, the format has been modified to:

IR829(config)# gyroscope-reading frequency ?
  one/min Reading 1 times per minute
  one/sec Reading 1 time per second (default value)
  ten/min Reading 10 times per minute

After upgrading to this release, the router will have to be reconfigured.
GPS NMEA Multiple Stream

Feature is new for release 15.8(3)M1 and applies to the IR809 and IR829.

Previous versions of IOS only allowed for a GPS NMEA Stream for one device. This release has support for up to 6 devices at one time. The existing CLI `lte gps nmea ip udp <src ip> <dest ip> <dest portno>` under controller configuration has been enhanced.

Setting up the Configuration

To Enable GPS NMEA Multiple Stream:

```
Router# config t
Router(config)# controller cellular <Cellular Interface Number>
Router(config-controller)# lte gps nmea ip udp <source ip> <destination ip> <destination port> stream <1-6>
```

To Disable GPS NMEA Multiple Stream:

```
Router(config-controller)# no lte gps nmea ip udp <source ip> <destination ip> <destination port> stream <1-6>
```

Examples for Enabling/Disabling GPS NMEA Multiple Stream

Enable Example:

```
Router#(config-controller)# lte gps nmea ip udp 10.0.0.1 10.0.0.11 2020 ? stream GPS NMEA multiple stream support
Router#(config-controller)# lte gps nmea ip udp 10.0.0.1 10.0.0.11 2020 stream <1-6> Stream Number
Router#(config-controller)# lte gps nmea ip udp 10.0.0.1 10.0.0.11 2020 stream 6
```

Disable Example:

```
Router#(config-controller)# no lte gps nmea ip udp 10.0.0.1 10.0.0.11 2020 stream 6
```

GPS Multiple NMEA Stream Information

Use the show controller and show run configuration CLIs:

```
Router#sh cont cel 0 | inc NMEA
NMEA Stream no: 1 Configured
NMEA Stream no: 2 Configured
NMEA Stream no: 3 Not Configured
NMEA Stream no: 4 Configured
NMEA Stream no: 5 Configured
NMEA Stream no: 6 Not Configured
Router#sh run | sec cont controller Cellular 0
```
Warning Messages

If the destination ip address and port number already exists:

Router#sh run | sec cont
controller Cellular 0
lte gps mode standalone
lte gps nmea ip udp 10.10.0.1 10.10.0.10 2067 stream 1
Router(config-controller)#lte gps nmea ip udp 10.10.0.1 10.10.0.10 2067 stream 5
Destination ip address 10.10.0.10 and destination port number 2067 is already exists for the stream no:1.

Please use different destination ip address and port number.

If the stream number already exists:

Router#sh run | sec cont
controller Cellular 0
lte gps mode standalone
lte gps nmea ip udp 10.10.0.1 10.10.0.10 2067 stream 1
Router(config-controller)#lte gps nmea ip udp 20.20.0.1 20.20.0.10 2057 stream 1
Stream number 1 is already active.

Please remove stream number configuration before creating it with different destination ip address and port number.

Troubleshooting the Cellular Interface

These procedures are to capture information to share with support in order to assist them in helping to troubleshoot an issue with the cellular interface. In order to capture logs, DM logs must be enabled. Refer to the following: https://www.cisco.com/c/en/us/td/docs/routers/access/800/819/user-guide/3G4G-enhancements-userguide.html#pgfId-1063363

The following are steps to capture Linux logs for the cellular interface.

Procedure

Step 1 Set up the fetch command.

Example:

```bash
# conf t
# service internal
# exit
# vds fetch-log
```

These steps will generate a directory on flash:vds-log.

Step 2 Capture the logs.
**Example:**

```bash
IR800# vds fetch-log
fetch: 4gmodem.log
   Sending file modes: C0644 510 4gmodem.log
fetch: auth.log
   Sending file modes: C0640 162330 auth.log
fetch: auth.log.1
   Sending file modes: C0640 262215 auth.log.1
fetch: auth.log.2.gz
   Sending file modes: C0640 11297 auth.log.2.gz
fetch: auth.log.3.gz
   Sending file modes: C0640 11296 auth.log.3.gz
fetch: cwan_modem0.log
   Sending file modes: C0644 3875716 cwan_modem0.log
fetch: cwan_modem1.log
   Sending file modes: C0644 791629 cwan_modem1.log
fetch: daemon.log
   Sending file modes: C0640 1404 daemon.log
fetch: dmesg
   Sending file modes: C0644 0 dmesg
fetch: dmesg.0
   Sending file modes: C0644 0 dmesg.0
fetch: ios_cs_verify.log
   Sending file modes: C0644 1091 ios_cs_verify.log
fetch: ios_vds_com.log
   Sending file modes: C0644 219169 ios_vds_com.log
fetch: ios_vds_com.log.1
   Sending file modes: C0644 262207 ios_vds_com.log.1
fetch: ios_vds_com.log.2.gz
   Sending file modes: C0644 7859 ios_vds_com.log.2.gz
fetch: ios_vds_com.log.3.gz
   Sending file modes: C0644 7894 ios_vds_com.log.3.gz
fetch: kern.log
   Sending file modes: C0644 38608 kern.log
fetch: messages
   Sending file modes: C0640 174064 messages
fetch: messages.1
   Sending file modes: C0640 262364 messages.1
fetch: messages.2.gz
   Sending file modes: C0640 18434 messages.2.gz
fetch: messages.3.gz
   Sending file modes: C0640 25027 messages.3.gz
fetch: udev
   Sending file modes: C0644 124266 udev
fetch: vdscli-acpid.log
   Sending file modes: C0644 1091 vdscli-acpid.log
```

**Step 3**  
Stop the logging after 10 minutes.

**Step 4**  
View the flash directory, and you will see the vds-log directory.

**Example:**

```bash
IR800# dir flash:
Directory of flash:/
16 -rw- 660 Nov 11 2016 19:25:20 +00:00 vlan.dat
   1 drwx- 0 Jan  1 2014 16:27:44 +00:00 7455_02.18.02.00_Verizon_002.022_000
17 -rw- 160368465 Nov 11 2016 19:35:30 +00:00 ir800-universalk9-bundle.SPA.156-3.M0a
18 -rw- 63753008 Nov 11 2016 19:45:34 +00:00 ir800-universalk9-mz.SPA.156-3.M0a
19 -rw- 64381598 Nov 11 2016 19:50:24 +00:00 74XX_02.20.03.00.cwe
```
Step 5

The flash/vds-log directory contains the log files captured.

Example:

```plaintext
24 -rw- 510 Nov 16 2016 19:06:44 +00:00 4gmodem.log
25 -rw- 162330 Nov 16 2016 19:06:54 +00:00 auth.log
26 -rw- 26215 Nov 16 2016 19:07:04 +00:00 auth.log.1
27 -rw- 11297 Nov 16 2016 19:07:16 +00:00 auth.log.2.gz
28 -rw- 11296 Nov 16 2016 19:07:24 +00:00 auth.log.3.gz
29 -rw- 3875716 Nov 16 2016 19:07:42 +00:00 cwan_modem0.log
30 -rw- 791629 Nov 16 2016 19:07:54 +00:00 cwan_modem1.log
31 -rw- 1404 Nov 16 2016 19:08:04 +00:00 daemon.log
32 -rw- 13740 Nov 16 2016 19:08:14 +00:00 dmesg
33 -rw- 0 Nov 16 2016 19:08:24 +00:00 dmesg.0
34 -rw- 1091 Nov 16 2016 19:08:32 +00:00 ios_cs_verify.log
35 -rw- 219169 Nov 16 2016 19:08:42 +00:00 ios_vds_com.log
36 -rw- 262207 Nov 16 2016 19:08:54 +00:00 ios_vds_com.log.1
37 -rw- 7859 Nov 16 2016 19:09:04 +00:00 ios_vds_com.log.2.gz
38 -rw- 7894 Nov 16 2016 19:09:14 +00:00 ios_vds_com.log.3.gz
39 -rw- 38608 Nov 16 2016 19:09:24 +00:00 kern.log
40 -rw- 174064 Nov 16 2016 19:09:34 +00:00 messages
41 -rw- 262364 Nov 16 2016 19:09:44 +00:00 messages.1
42 -rw- 18434 Nov 16 2016 19:09:54 +00:00 messages.2.gz
43 -rw- 25027 Nov 16 2016 19:10:04 +00:00 messages.3.gz
44 -rw- 124266 Nov 16 2016 19:10:14 +00:00 udev
45 -rw- 292 Nov 16 2016 19:10:24 +00:00 vdscli-acpid.log
46 -rw- 909 Nov 16 2016 19:10:34 +00:00 vdscli-eventd.log
47 -rw- 467 Nov 16 2016 19:10:44 +00:00 vdscli-vdscli-bde-gos.log
48 -rw- 479 Nov 16 2016 19:10:54 +00:00 vdscli-vdscli-bde-ir800.log
49 -rw- 81 Nov 16 2016 19:11:04 +00:00 vdscli-wiredd.log
50 -rw- 140382 Nov 16 2016 19:11:14 +00:00 vdscli-wirelessd.log
51 -rw- 1192 Nov 16 2016 19:11:24 +00:00 vdscli.log
994918400 bytes total (34735718)
```

What to do next

Other command output that will be helpful to collect for your business unit contact:

```
# Show platform hypervisor
# Show platform led
# Show tech
# Show cellular 0/0 all
# Show controller 0/0
# Show interface cellular 0/0
# Show ip interface brief
# Show running-config
```