

Cisco 3G HWIC

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Hardware and Bring-Up

- Q. Can I insert the Cisco® Third-Generation High-Speed WAN Interface Card (3G HWIC) with the router powered on?**
- A. No. Ensure that the router is powered off before you insert the HWIC. Cisco HWICs do not support online insertion and removal (OIR).
- Q. I plugged in the Cisco 3G HWIC wireless WAN (WWAN) module. When I use a show run command, I do not see the cellular interface in the configuration. I also see the following message:**

```
WIC Slot 1:
Unknown WAN daughter card
WIC module not supported/disabled in this slot
```

- A. Make sure you are using the correct version of Cisco IOS® Software. The 3G WWAN HWIC is supported on Cisco IOS Software Release 12.4(15)T and later.
- Q. How do I find out the emergency service number (ESN) of my card?**
- A. ESN numbers should be printed on the box that the HWIC ships in. You can also get the number by using the show cellular x/x/x hardware command through the Cisco IOS Software command-line interface (CLI).

Cisco IOS Software and Modem Firmware

- Q. Can I insert my HWIC in a network module that has a HWIC carrier card?**
- A. No. The HWIC carrier slot on a network module does not support the 3G HWIC card.
- Q. Can I upgrade the modem firmware? If so, how and where can I find information about the latest firmware supported?**
- A. Yes, you can upgrade the modem firmware.

Please refer to the following documentations on Cisco.com for instructions about how to obtain and upgrade the latest firmware versions:

- http://www.cisco.com/en/US/products/hw/routers/networking_solutions_products_generic_content0900aecd80601f7e.html
- http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00807ec85b.html#wp1161402

Note: For the Cisco 1841 Integrated Services Router, please make sure you are using Cisco IOS Software Release 12.4(15)T1 or later.

Management and Diagnostics

- Q. What is the diagnostics port on the HWIC used for, and how do I enable it?**
- A. The 3G WWAN HWIC has an RJ-45 port on the faceplate for diagnostics; it uses the standard Cisco console cable to connect to a PC with the diagnostics tool. You can enable the diagnostics port with the following command:

```
test cell-hwic 0/0/0 dm-port on
```

This command is useful for debugging protocol-level problems on the modem. Examples of

such third-party diagnostics tools are CDMA Air Interface Tester (CAIT) from Qualcomm and Universal Diagnostic Monitor (UDM) from Spirent.

Q. Can I access the diagnostic port remotely over the network?

A. No, not in the current phase. Future plans include making the diagnostic capability available remotely over the network.

Q. When I issue the command `test cell-hwic 0/0/0 dm-port on`, it returns an error. What should I do?

A. The test commands are hidden commands. You need to enable service internal in the global configuration mode to issue any test command.

Note: You need to enable **service internal** before issuing any **test** commands.

Q. How do I verify my modem lock status?

A. The following command displays the modem lock state on a 3G HWIC:

```
show cellular <slot/wic_slot/port> security
```

A brief description of the fields for the 3G HWIC Code Division Multiple Access (CDMA) WWAN module (HWIC-3G-CDMA) follows:

- Modem PIN Security: UNLOCKED
- Power-Up Lock: DISABLED
- Field Description
- Modem PIN Security: If the modem is locked, no calls can be made without unlocking
- Power-Up Lock: Indicates whether the modem will be locked on power-up

A brief description of the fields for the 3G HWIC Global System for Mobile Communications module (HWIC-3G-GSM) follows:

```
Card Holder Verification (CHV1)= DISABLED SIM Status = OK SIM User  
Operation Required = None; Number of Retries remaining = 3
```

- Field Description
- Card Holder Verification (CHV1): If ENABLED, access to the SIM is restricted; for the 3G HWIC, it is always DISABLED
- SIM Status: Indicates whether the SIM is present or removed from the SIM socket
- SIM User Operation Required: If the SIM is protected (for example, because CHV1 is enabled), it indicates the type of user operation required
- Number of Retried Remaining: Indicates the number of attempts remaining in case the SIM is locked; if the number of retries becomes zero, the SIM is blocked and becomes an unusable spare

Antenna and Diversity

Q. Why are there two antenna connectors on the 3G wireless HWIC CDMA module (HWIC-3G-CDMA), but only one on the 3G HWIC GSM module (HWIC-3G-GSM) for Cisco 1800, 2800, and 3800 Series Integrated Services Routers?

A. On the 3G HWIC CDMA version, the two antenna connectors provide diversity, allowing for stronger signal reception in areas where a signal might be poor or otherwise degraded. As a parallel example, most wireless LAN cards use diversity antennas to offer the PC client the strongest possible signal. Diversity also allows you to orient one antenna at one angle or direction and the other at another angle or direction to help improve signal reception.

The diversity feature is not supported on the 3G HWIC GSM module at this time.

Q. When should I use a diversity antenna?

A. If the output of the show cellular x/x/x radio command indicates high ECIO values and a low C/I ratio and you are experiencing poor throughput, you should consider using a diversity antenna. For example:

```
1xRTT related info
-----
Current RSSI = -52 dBm, ECIO = -7 dBm
Current Channel Number = 507
Current Channel State = Acquired
Current Band Class = Band Class 1
HDR (1xEVDO) related info
-----
Current RSSI = -51 dBm, ECIO = -6 dBm
Current Channel Number = 325
Current Band Class = Band Class 1
Sector ID (Hex) = 0080:0580:0000:0000:000A:CCF3:0500:A201
Subnet Mask = 104, Color Code = 24, PN Offset = 72
Rx gain control(Main) = -49 dBm, Diversity = -103 dBm
Tx total power = -35 dBm, Tx gain adjust = -1280 dBm
Carrier to interference (C/I) ratio = 3
```

The C/I ratio should be as high as possible and the ECIO value as low as possible. Lab tests have indicated $ECIO \leq -2$ dB. If you observed a value of -7 or something similar, you might have a very noisy environment, which may in turn cause retransmissions of the packets, lower throughput, call drops, etc. Cisco does not determine acceptable values; cellular carriers determine these values. In such a site with such a situation, you need to conduct a survey to determine how to achieve better signal characteristics.

Q. What advantages does the diversity antenna offer?

A. Diversity provides relief to a wireless network in a multipath scenario. Diversity antennas are physically separated from the radio and each other to ensure that one encounters less multipath propagation effects than the other. Dual antennas typically ensure that if one antenna is in an RF null then the other is not, providing better performance in multipath environments.

Multipath is a form of RF interference that occurs when a radio signal has more than one path between the receiver and the transmitter. This situation occurs in cells with metallic or other

RF-reflective surfaces, such as furniture, walls, or coated glass. The diversity antenna ports are designed for spatial diversity, and the radio checks the other antenna only when it encounters errors.

Q. Does the diversity antenna support both uplink and downlink?

A. The diversity antenna supports only downlink; the main antenna supports both uplink and downlink.

Q. When I use the `sh cellular x/x/x radio` command, I get the following message under HDR (1 x EVDO)-related information:

```
Rx gain control(Main)= -0 dbm, Diversity = Unavailable
```

Q. Does this message mean that the diversity antenna is disabled? If so, how do I enable it?

A. Antenna diversity should be enabled by default. The code base uses the diversity RF path only when in active traffic. This message indicates that you need to test the antenna while a call is in progress.

Features and Functions

Q. Is quality of service (QoS) supported with the 3G HWIC wireless cards?

A. QoS is supported on the router itself; none of the service providers support QoS on their current wireless networks.

Q. Do I always need to configure dial-on-demand routing (DDR)?

A. The 3G HWIC WWAN cellular interface is a DDR interface; that is, the connection is set up only when there is associated traffic. So you have to configure the dialer group and Chat script whether the cellular interface is being used as a primary or backup.

Q. Can I configure the 3G HWIC WWAN cellular interface as the primary interface and configure another interface as a backup to the cellular interface?

A. No. The 3G HWIC interface is an asynchronous serial, DDR interface. You cannot configure another interface as the backup interface to any DDR interface because the DDR interfaces themselves are designed to function primarily as backup interfaces.

Account Activation and Provisioning

Q. Is the account information of the Cisco 3G HWIC saved on Cisco IOS Software? If I remove an existing Cisco 3G HWIC connected to the Sprint network and replace it with another HWIC, will it retain the same values?

A. No. The account information for each modem is stored on the modem NVRAM for a Cisco 3G HWIC CDMA module (3G-HWIC-CDMA) and on the subscriber identity module (SIM) card for the Cisco 3G HWIC GSM module (3G-HWIC-GSM), not on the Cisco IOS Software.

Each modem on the 3G wireless HWIC is uniquely provisioned using the ESN numbers. You need to activate the new card with your service provider, and your service provider needs to move your account information to the new ESN.

Q. The Single-Carrier Radio Transmission Technology (1xRTT) LED is glowing on my 3G wireless HWIC (HWIC-3G-CDMA). I have not yet activated the card. Does the glowing LED mean that the card is already activated and ready to use?

A. Active service and activation are two different things. A glowing active service LED indicates the current service that is in that area, but does not indicate that the card is activated.

Q. Do I need to configure ppp chap password 0 cisco while connecting my 3G wireless HWIC (HWIC-3G-CDMA) to the network?

A. No. You do not need to configure ppp chap password 0 cisco while connecting to the CDMA network. If configured, the modem ignores the Challenge Handshake Authentication Protocol (CHAP) authentication response from the cellular interface.

Q. For the 3G HWIC GSM module (HWIC-3G-GSM), is it compulsory to specify Point-to-Point Protocol (PPP) authentication username and password details in order to successfully establish the data connection?

A. If your 3G service does not require username and password, you can leave those variables blank in the GSM profile. However, on the cellular interface, you still need to configure a dummy CHAP host name and password.

Account Activation and Provisioning for Modems over the Sprint Network

Q. What activation mode do I need to use to activate my 3G wireless HWIC (HWIC-3G-CDMA-S) modem over the Sprint network?

A. This modem uses manual activation and Identifiers for Organizations for Telecommunications Addressing (IOTA) for activation.

Q. What information do I need prior to activating my 3G wireless HWIC (HWIC-3G-CDMA-S) on a Sprint network?

A. The following information is required to activate the 3G HWIC on the Sprint network:

- MDN/MIN: Mobile directory number/mobile identification number: 10-digit mobile directory number
- MSID: Mobile Station Identifier: Ten-digit mobile identity number
- SID: System ID
- NID: Network ID
- MSL: Master Subsidy Lock (activation code)

Q. Where do I get these numbers?

A. The MDN/MIN, MSID, and MSL are provided by Sprint, a board support package (BSP), or the customer. The show cellular 0/x/0 network Cisco IOS Software command provides the SID and NID.

Q. How often do I need to run the cellular [Interface] cdma activate manual [MDN] [MSID] [SID] [NID] [Activation code] command on my HWIC?

A. This command is used to activate the modem the first time and needs to be run only once.

Q. I have a 3G wireless HWIC (HWIC-3G-CDMA-S) that appears to attempt addressing with IOTA for 6 minutes and then fails because of "session timeout". I also see the following in the logs:

IOTA Status Message Received. Event: IOTA Start, Result:

SUCCESS.....

IOTA Status Message Received. Event: IOTA End, Result: FAILED"

- A. This message indicates that IOTA was successfully initiated, but then servers at Sprint's end probably did not respond, so IOTA terminated. Make sure you have typed the right MIN/MDN and MSID fields in the activate command and confirm with Sprint that the account is set up correctly in Sprint databases.

Q. I have activated my card manually, but will be moving the card to a new geographic location. If I need to update the Mobile IP (MIP) parameters, do I need to go through the entire activation process again?

- A. No. Use the following IOTA command to reset the MIP parameters:

```
cellular x/x/x cdma activate iota.
```

Q. I see two profiles created when I issue a show cellular profile command on my 3G wireless HWIC (HWIC-3G-CDMA-S) connected to the Sprint network. Why do I see two profiles, and what are the differences?

- A. Profiles 0 and 1 exist by default, but the values populated in some of the fields for profile 0 are preprovisioned during manufacturing. Because customers cannot use these preprovisioned values to activate their modems, you need to get those values from your service provider. Profile 0 is the default profile used during IOTA. When activation is successful, the provider populates the values for profile 1. Profile 1 is used for data communication, and there is no need to configure another profile.

Note: If manual activation succeeded but IOTA failed, the values in profile 1 will not be populated. It is only during IOTA that the values are populated in profile 1.

Q. How are the SID and NID assigned? Are these values picked up by the modem when it starts talking to the network, or do they need to be input every time a call is made?

- A. The modem picks up these values when it attaches to the network. You need to input the values only one time with the activation command. You can find the current SID and NID by using the show cellular network command.

Q. Are the SID and NID geographically dependent? If I bring 100 3G HWICs into a central site and configure them with the same SID and NID before shipping them around the country, will this configuration affect the performance of the 3G HWICs? Will I need to change these values based on where they are deployed?

- A. You do not have to change the SID and NID values if you ship the modem to a different location from where it was activated. However, you should run IOTA by issuing the cellular x/yz cdma activate iota command at the new location. Running IOTA is not mandatory, but it updates the MIP data profile and improves performance of the 3G HWIC.

Q. I am trying to manually activate my modem card using the command cellular [Interface] cdma activate manual [MDN] [IMSI] [SID] [NID] [activation code], but the activation seems to be failing.

- A. Most probably the activation code is wrong. Please call Sprint or your service provider and ensure that you have the right activation code.

- Q. Can I use MIN and MSID interchangeably while trying to activate the 3G HWIC over the Sprint network using the following command: `cellular slot/wic_slot/port cdma activate manual mdn msid/min sid nid msl`? For example, I received the following parameters for a card:**

MIN/PTN: 9136874229

MSID: 9133146581

MSL: 924271

- A.** MIN is a representation of MSID. MIN and MDN are not the same. MDN represents a dialable number, but MIN is not necessarily one. In the new era of wireless local number portability, MDN and MIN have diverged significantly in recent years.

- Q. I get the "UNABLE TO CONFIGURE MDN, Modem cannot be activated" error while trying to activate the modem as follows. What is causing the error?**

```
*Jul 7 16:17:43.411: %HWIC_CELL-1-MGMT_ERROR: [Cellular0/1/0] Error
response (0x1038) received from modem (err3:invalid operation type).
Unable to configure MDN
Modem Could not be activated
```

- A.** The modem gives this error when you enter a typographical error or you have the wrong MSL. Make sure there is no typographical error and verify the MSL with your service provider.

- Q. I get the following error message when I try to activate the modem. What is causing this error?**

```
*Jul 26 23:03:12: %HWIC_CELL-1-MGMT_ERROR: [Cellular0/1/0] Error
response (0x1039)
received from modem (err12:Bad NV write).
Unable to configure MSID
Modem Could not be activated
```

- A.** The error is given out generally when MSL (activation code: Last parameter) is incorrect. Make sure there is no typographical error and that you have the correct MSL from your service provider.

- Q. How do I verify that my manual activation was successful?**

- A.** You can verify if the activation was successful in several ways:
- Console logs on the router indicate that the activation process was completed and successful.
 - You can issue the `show cellular x/x/x profile` command and see if there are two profiles. If the activation was successful, two profiles will be created: "Profile 0" and "Profile 1", with "Data Profile 1 showing Activated" and appropriate values populated.

- Q. Will running IOTA update my Preferred Roaming List (PRL)?**

- A.** No. IOTA does not update the PRL, it updates Mobile IP Profile 1 in the device with the parameters to connect to the Sprint network. You can update PRL only with a firmware update.

Account Activation and Provisioning for Modems over the Verizon Network

Q. What activation mode do I need to use to activate my 3G HWIC modem over the Verizon network?

A. The HWIC-3G-CDMA-V modem uses only over-the-air service provisioning (OTASP) for activation. Manual activation is applicable only for modem activation over the Sprint network for these cards.

Q. I have followed the instructions to activate the 3G CDMA modem (HWIC-3G-CDMA-V) over the Verizon network using OTASP but constantly fail. What could I be going wrong?

A. Verify that each of the following conditions is met:

- Verify that you have a valid signal.
- Make sure you have a valid account from Verizon, the modem ESN number is already present in the Verizon database, and Verizon has enabled the account on its side.
- Make sure the modem is not set to evolution data only (EVDO). Because OTASP requires 1xRTT service (it is a voice call service option), you must have the modem in hybrid mode. If it is not in hybrid mode, then the OTASP calls will not succeed.

Q. What information gets downloaded onto the modem after the OTASP activation is successful?

A. After successful completion of OTASP, Cisco IOS Software calls functions to update the NAM (account information) and data profiles. After successful OTASP, the show cellular profile command will show the correct activation date (the date on which OTASP was run most recently) and the MDN and MIN assigned to the phone. These values are downloaded over the air during an OTASP call. In some cases, during OTASP, the latest PRL is also downloaded.

However, not all the parameters in a data profile are updated during an OTASP call. In fact, most of them are updated after the first data call. Therefore, the software updates the data profile after the first data call disconnect is received (if the total call duration is zero). The data profile is also updated after modem reset.

Q. I went through the procedure to activate the 3G HWIC CDMA modem (HWIC-3G-CDMA-V) using OTASP over the Verizon network and it appeared to be successful, but the modem does not appear to be activated.

A. Running OTASP successfully involves two requirements:

- 1xRTT service must be available.
- The modem must be on the Verizon network (not roaming).

Ensure that both conditions are met and if they are, try the activation command again. You should see an "OTASP successful" message if the activation was successful.

Q. I have a customer who is trying to activate the 3G HWIC CDMA modem over the Verizon network (HWIC-3G-CDMA-V) using OTASP but is getting the following error:

```
ROUTER#cellular 0/2/0 cdma activate otasp 4023327660
Beginning OTASP activation
OTASP number is 4023327660
*Jun 14 19:44:36: %HWIC_CELL-1-MGMT_ERROR: [Cellular0/2/0] Error
response (0x300 7) received from modem (err13:Cannot originate a
```

```

call).
OTASP activation Failed
SIDHQ-2811-Western#
*Jun 14 19:44:42: %HWIC_CELL-1-MODEM_ACK_FAIL: [Cellular0/2/0] Modem
Ack not received.
ROUTER#

```

- A. The OTASP number is wrong. The OTASP number is generally *22899, so you should enter the command as follows

```
ROUTER#cellular 0/2/0 cdma activate otasp *22899
```

Account Activation and Provisioning on 3G Wireless HWIC GSM Modem

Q. What information do I need before activating my 3G wireless HWIC GSM modem (HWIC-3G-GSM)?

- A. You need to get the following information from your service provider to activate the modem:
- APN: Access point name
 - Authentication type: Password Authentication Protocol (PAP) or CHAP
 - Username and password

Q. For the 3G wireless HWIC GSM modem (HWIC-3G-GSM), where can I find the commands related to personal identification number (PIN) unlock-related commands? Is the GSM/UMTS SIM card PIN-unlocked command a hidden command?

- A. The SIM lock command is available with Cisco IOS Software Release 12.4(15)T1 and later.

```

SIM Lock/Unlock:
=====
cellular x/x/x gsm sim [lock | unlock] <pin>
Band Selection:
=====
cellular x/x/x gsm band <number>

```

Q. How many profiles can I configure for my GSM modem, and how many are active at any given time?

- A. You can configure up to 16 profiles, but you can use only one at a given time; you can configure these profiles by changing the CHAT script:

```
chat-script gsm "" "ATDT*98*2#" TIMEOUT 60 "CONNECT"
```

The number "2" in this command indicates that profile 2 is active.

Q. What is the command to lock or unlock the SIM on my 3G wireless HWIC (HWIC-3G-GSM)?

- A. The cellular GSM SIM lock or unlock command follows:

```
cellular <unit> gsm sim <lock | unlock> <pin>
```

Network and Associated Services

Q. For the 3G Wireless HWIC (HWIC-3G-CDMA), will Rev A be enabled on my modem if I upgrade the Cisco IOS Software image to Release 12.4(15)T?

A. No. If the modem is not enabled for Rev A, upgrading the Cisco IOS Software image will not enable Rev A. You can enable Rev A by using the following command on the CLI: test cellular x/x/x cdma rev-a enable.

Q. How do I enable Rev A on my modem?

A. Rev A should be enabled by default, but if it is not, you can enable it with the following commands:

```
service internal
test cellular x/x/x cdma rev-a enable
```

Q. How do I verify if Rev A is enabled after I issue the test command?

A. Check the output of the show cellular x/x/x network command.

```
Network Information
=====
Current Service = 1xEVDO (Rev A) and 1xRTT
Current Roaming Status(1xRTT) = HOME, (HDR) = HOME
```

Q. Will the 3G wireless HWIC (HWIC-3G-CDMA) cycle between EVDO and 1XRTT? For example, if the card is in 1XRTT mode and is moved to a location with an EVDO carrier that offers a better RF signal level, will the card switch to EVDO or do I need to switch it manually?

A. The modem looks for EVDO as a first choice. If EVDO Rev A is not available, the 3G HWIC downshifts to the best radio network available. In other words, it attempts to connect to the best service available on the operator's network. If EVDO Rev A is not available, the 3G HWIC negotiates for EVDO Rev 0, and if that is not available, 1xRTT.

Q. For the 3G Wireless HWIC (HWIC-3G-GSM), will the modem cycle between high-speed downlink packet access (HSDPA) and Universal Mobile Telecommunications Service (UMTS)?

A. Yes. The modem always looks for HSDPA as the first choice. If HSDPA is not available, the modem downshifts to the next best available radio network; that is, UMTS to Enhanced Data Rates for GSM Evolution (EDGE) and finally to General Packet Radio Service (GPRS).

Q. I have a 3G wireless HWIC modem connected over the Verizon network (HWIC-3G-CDMA-V). The first connection is fine, but the subsequent attempts fail. Something in the network is stopping authentication immediately following a disconnect. I see both the EVDO and the 1xRTT signals, and the received signal strength indication (RSSI) indicates high values for both.

A. Using debugs, verify if there are any PPP authentication failures and a Mobile IP (MIP)-to-Simple IP (SIP) failover. Cisco recommends a Dynamic Mobile IP Key Update (DMU) key reset

using OTASP activation one more time.

Q. What is DMU?

- A. Dynamic Mobile IP Key Update is a technique Verizon Wireless uses to distribute keys to a mobile device the first time it is activated. DMU is described in RFC 4784.

Q. My customer wants to know how to definitively determine which service is being used, EVDO or 1xRTT, when the call is active.

- A. After a data connection is set up, you can verify from looking at the output of the show cellular connection command. The current call state would tell if it is a 1xRTT or EVDO (HDR) call.

```
Router#show cellular 0/0/0 connection
Phone number of outgoing call = #777
HDR AT State = Connected, HDR Session State = Open
HDR Session Info:
UATI (Hex) = 0080:0580:0000:0001:080A:CCC5:45C2:3B47
Color Code = 237, RATI = 0xB29DCCDD
Session duration = 624 msecs, Session start = 2624229538 msecs
Session end = 2624230592 msecs, Authentication Status =
Authentication disabled
HDR DRC Value = 2, DRC Cover = 0, RRI = 9.6 kbps
Current Transmitted = 11202 bytes, Received = 10203 bytes
Total Transmitted = 28801 KB, Received = 28192 KB
Current Call Status = CONNECTED Privacy Mode = OFF, Service Option =
33023
Current Call Duration = 1288 secs
Total Call Duration = 3216600 seconds
Current Call State = AT Packet Call
Last Call Disconnect Reason = Base station release (No reason)
Last Connection Error = None
HDR DDTM (Data Dedicated Transmission Mode) Preference = Off
Mobile IP Error Code (RFC-2002) = 0 (Registration accepted)
Router#
```

Q. My laptop is running an EVDO Rev A connection card with a signal of -92 dBm. Why would the signal be so much worse with the 3G HWIC WWAN card: it is -125 dBm?

- A. This reading (-125 dBm) means there is no signal, so the modem is not seeing the EVDO service. Verify with the show cellular all command that the modem can see the EVDO signal. Also verify that an antenna is connected to the main antenna input of the 3G HWIC.

Q. What is the difference between the following two commands?

```
cellular 0/1/0 gsm band gsm-all-bands
cellular 0/1/0 gsm band auto-band
```

- A. The gsm-all-bands command connects only to a 2G service (no wideband CDMA [WCDMA]). The auto-band command is the default setting in the modem; with this configuration the modem connects to 3G service if available.

Setting Up a Data Call and Troubleshooting Call Connectivity Failures

Q. I am experiencing ping and connectivity failures. What could be wrong?

A. Verify the following:

- Do you have a valid signal?
- Did you verify with your service provider that you have the right account information?
- Is the modem activated?
- Does the modem get an IP address?
- Are your dialer and cellular configurations in place? Verify that all the related configurations are in place as documented in the following links:
 - http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00807ec85b.html: For CDMA
 - http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a0080802d77.html: For GSM
- If you have all the configurations in place, enable the following debugs and verify:
 - debug modem
 - debug dialer
 - debug chat
 - debug ppp negotiation
 - debug ppp error
 - debug ppp event

Note: This debug requires you to have **enable service internal** enabled.)

Q. My customer is experiencing low throughput on the 3G HWIC (HWIC-3G-CDMA).

A. Verify the following:

- Verify if the customer is using the latest IOS image, 12.4(15)T or later.
- Verify with the show cellular x/x/x hardware command that the customer is running the latest version of firmware and PRL.

Note: You can find the latest PRL and firmware versions at the following link

http://www.cisco.com/en/US/products/hw/routers/networking_solutions_products_generic_content0900aecd80601f7e.html.

- Verify with the show cellular x/x/x all command that the modem is connected to the network and there is a valid signal.
- Verify if Rev A is enabled. Rev A should be enabled by default on all the modems. Issue the show cellular x/x/x network command and check the current service. If it shows "Current Service=1xEV-DO (rev A) and 1xRTT", then the Rev A is enabled.

If it is not, you can enable Rev A by using the following command on the CLI:

```
test cellular x/x/x cdma rev-a enable
```

Note: Ensure that **service internal** is enabled before executing **test** commands.

- Ask the customer to verify with the provider that EVDO service is available in the area.
- Verify the RSSI, C/I, and ECIO values with the show cellular x/x/x radio command for both EVDO and 1xRTT.

RSSI values should be typically between -60 and -90 dBm, which indicates good coverage. The C/I ratio should be as high as possible and ECIO values as low as possible. Lab tests show ECIO equal to or less than -2 dB and throughput is beyond 800K down link.

Customers observing higher values might have a very noisy environment. This noise may cause retransmissions of the packets, lower throughput, call drops, etc. Cisco does not determine acceptable values; cellular carriers determine these values.

- Use a diversity antenna.
A diversity antenna might improve throughput performance because with diversity antennas one antenna encounters less multipath propagation effects than the other. Note that the diversity feature offers improvement only in the DL path and the feature activates with active traffic.
- Use another Cisco supported antenna with extension cables (a dipole antenna with 15-foot extension or an omnidirectional antenna with 20- or 50-foot extension cables).
- A site survey would help to determine how to achieve better signal characteristics.

Q. I have the cellular HWIC activated, but it appears that the interesting traffic is not able to activate the dialer. When trying to ping anything, the router displays the following response: "% unrecognized host or address, or protocol not running".

A. Verify that the following is configured:

```
dialer-list 1 protocol ip permit
```

Q. What configurations do I need to request for Domain Name System (DNS) server addresses as part of IP Control Protocol (IPCP) negotiations?

A. The command ppp ipcp dns request under the cellular interface, as shown in the following configuration, updates the name-server database on the router.

```
interface Cellular0/3/0
ip address negotiated
encapsulation ppp
dialer in-band
dialer string gsm
dialer-group 1
async mode interactive
ppp chap hostname Cisco
ppp chap password 0 Cisco
ppp ipcp dns request
```

Q. When I issue the show ip route command and during PPP negotiations, I see two routes installed in the routing table (refer to the following configuration). Why do I see two routes, and will that cause any problems?

```
Router#show ip route
```

Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
 D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
 N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
 E1 - OSPF external type 1, E2 - OSPF external type 2
 i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
 ia - IS-IS inter area, * - candidate default, U - per-user static
 route
 o - ODR, P - periodic downloaded static route
 Gateway of last resort is 0.0.0.0 to network 0.0.0.0
 66.0.0.0/32 is subnetted, 1 subnets
 C 66.174.50.7 is directly connected, Cellular0/2/0
 10.0.0.0/24 is subnetted, 1 subnets
 C 10.242.5.0 is directly connected, FastEthernet0/0
 166.159.0.0/32 is subnetted, 1 subnets
 C 166.159.147.238 is directly connected, Cellular0/2/0
 S* 0.0.0.0/0 is directly connected, Cellular0/2/0

- A. Typically, on a point-to-point interface both IP addresses are on the same interface. However, some service providers assign IP addresses that are in different subnets, and both IP addresses are negotiated using IPCP. Normally both IP addresses belong to the same subnet, but because the IP addresses negotiated belong to two different subnets, both routes need to be installed in the routing table. This behavior is the right behavior; otherwise, the router cannot forward packets.
- Q. **My customer has the link up as the primary connection. The customer can pass traffic through the primary connection, but cannot ping or perform Telnet into the router over the Internet from another location.**
- A. The ping problem might be due to the fact that the IP address obtained from the provider is a dynamic address and within the provider pool. Hence a ping to this interface might be failing because of the policies set by the service provider. The workaround is to request a static public IP address that is dedicated to your customer; this workaround, however, costs a bit more.
- Q. **My customer has problems when trying to ping with a domain name, but does not have problems pinging with IP addresses.**
- A. Add the following CLI under the cellular interface:

```
ppp ipcp dns request
interface Cellular0/3/0
ip address negotiated
encapsulation ppp
dialer in-band
dialer string gsm
dialer-group 1
async mode interactive
ppp chap hostname Cisco
ppp chap password 0 Cisco
ppp ipcp dns request
```

Q. What is the command to show whether I have obtained an IP address?

A. The command is `show interface cellular x/x/x`.

Q. Can I configure a static IP address under my cellular interface or does the IP address always have to be negotiated?

A. It is highly recommended that the IP address always be configured as ip address negotiated, even when a fixed (persistent) IP address is required. The cellular interface is spoofed as up/up (status/protocol states), regardless of whether or not the PPP is established. If this interface is configured with a specific IP address (instead of ip address negotiated), and if the PPP is not yet established, the routing table interprets a valid route available through the cellular interface. This problem is avoided by assigning a negotiated IP address. The configuration given previously is particularly important when using the cellular interface as a backup interface.

Q. I am trying to bring up a 3G HWIC (HWIC-3G-GSM), but is always stuck at the IPCP stage.

A. Verify the following:

- Verify that you have an active signal.
- Check to see if your SIM card is activated.
- Verify the APN, authentication, and username and password provided by your service provider.

Q. The cellular interface on the 3G HWIC (HWIC-3G-GSM) continuously enters into the shutdown status. Also the profile is not activating, even if the cellular interface comes up for some time. What is wrong?

A. The profile does not become active until you are fully connected to the network. Verify that the profile number in the CHAT script:

`chat-script gsm "" "ATDT*98*1#" TIMEOUT 60`, which is "1" in this case, corresponds to the profile number configured for the cellular interface.

Also verify the dialer and cellular configurations as indicated in the configuration guides http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a0080802d77.html

Q. On a 3G HWIC (HWIC-3G-GSM), the interface on the router comes up but then resets almost instantaneously when the ping stops. The debug ppp debug command output indicates what I think is a successful authentication, but it appears that the IP address is not being passed to the router even though the addresses of the DNS servers are being pulled.

A. Verify that the username, password, and host name credentials under the `show cellular x/x/x` command output and the cellular profile match.

Q. My customer with a 3G wireless HWIC (HWIC-3G-GSM) is reporting a problem pinging or getting pinged.

A. Verify that the syntax for the CHAT script is correct and is as follows:

```
chat-script gsm "" "ATDT*98*1#" TIMEOUT 60
```

where "1" in this case corresponds to the profile number configured for the cellular interface.

Q. I have a 3G HWIC with CDMA that is now activated with Rev A, but has problem pinging or being pinged.

A. Make sure the syntax for the CHAT script is correct, as follows:

```
chat-script cdma "" "ATDT#777" TIMEOUT 60 "CONNECT."
```

Q. Activation is successful but I am experiencing data connectivity failures, interface flapping, reset, etc. What is wrong?

A. The service provider drops the connection if the traffic is not sourced from the IP address the provider assigned to the cellular interface; the command is source ip validation. To avoid this occurrence, ensure that the LAN traffic going over the cellular interface is restricted by using access lists, Network Address Translation (NAT), or generic routing encapsulation (GRE).

To determine if the interface flapping and connectivity problems are caused by source IP validation, enable the following debugs:

- debug dialer
- debug chat
- debug ppp negotiation
- debug ppp error
- debug ppp event

Note: This debug requires that you have **enable service internal** enabled.)

If you see TERMREQ as shown in the following debugs, it implies that the service provider is terminating the call:

```
Jul 20 19:15:31 UTC: Ce0/0/0 LCP: I TERMREQ [Open] id 68 len 4
*Jul 20 19:15:31 UTC: Ce0/0/0 LCP: O TERMACK [Open] id 68 len 4
*Jul 20 19:15:31 UTC: Ce0/0/0 PPP: Sending Acct Event[Down] id[1A]
*Jul 20 19:15:31 UTC: Ce0/0/0 IPCP: State is Closed
```

To troubleshoot further, shut down all other interfaces except the cellular interface and issue a ping from the router. If the ping succeeds, reconfigure other interfaces one by one and verify what traffic escapes the access lists or NAT to cause the service provider to terminate the call.

Q. My cellular interface regularly bounces. When the cellular interface is temporarily up/up, I can get to the Internet. The bouncing then takes down the tunnel interfaces. If I shut the tunnel interfaces and turn off Simple Network Management Protocol (SNMP), Cisco Discovery Protocol, and Network Time Protocol (NTP), then the cellular interface does not bounce, and I still can access the Internet with no problem.

A. When traffic is not sourced from the IP address that the service provider assigns to the cellular interface and goes over the provider network, the connection is dropped (source IP validation). In addition, verify the following:

- Tunnels should be sourced from the cellular interface.
- A "default static route" with a higher metric than the wireline connection should be pointing to a tunnel interface that is pointing to the cellular interface as the source IP.
- The router should have a static route for the peer of that tunnel pointing to the cellular

interface.

- Use access list, NAT, or GRE to restrict local LAN traffic from traversing the WAN link.

Q. The card works for a few minutes and then it looks like the network requests a disconnect and drops the PPP session. I have verified that the proper phone number (MDN) and MSID are programmed.

A. Typically it happens if some IP addresses illegal for cellular networks are sent to the cellular interface. Please use the access list to restrict IP addresses and NAT.

Q. An installed card is having a problem with the interface recycling itself and in some instances losing the IP address, even without going down. It also takes a long time (minutes) to obtain a new IP address. We have a -72-dbm signal strength. What could be wrong?

A. Make sure you are using NAT or GRE for LAN traffic that goes over the 3G network.

Q. Is it a requirement to have another IP interface up along with the cellular interface? Ping is failing in my setup. For example, do I need to add IP on Fast Ethernet? If no IP address is associated to any physical interface, ip route 0.0.0.0 0.0.0.0 cellular 0/0/0 does not work. It will not route traffic to the cellular interface. Is this the correct behavior?

A. When no IP address is configured on any interface, the ping is not initiated because there is no source IP address to put in to the ICMP packets for ping. You can try Telnet or any other protocol to set up the call. To avoid this situation, you can configure a loopback interface with some private IP address. You do not have to configure Gigabit Ethernet, but in general the router has one LAN interface and one WAN interface in a normal scenario and customers will not have this problem.

Q. My customer initially had an IP Security (IPsec) tunnel to the host, but it kept dropping. The customer then configured a GRE tunnel to see if that kept the tunnel up. It did keep the tunnel up, but every 5 minutes the interface resets. What could be causing this problem?

A. Typically it happens because you send illegal IP addresses for the cellular network such as 10.x.x.x, and the firewall disconnects the call. To debug it, restrict the access list only to the IP addresses range that the network can use, and also use NAT.

Q. I understand the configuration is correct, but I don't understand why NAT is required if the customer's network is behind the tunnel. Isn't the LAN hidden behind the IPsec tunnel? Why would the tunnel be terminated by the network for an illegal address? I thought the network bit bucketed anything not originated from the assigned static IP address.

A. Even though the LAN traffic is hidden behind the tunnel, the cellular interface advertises some information that service providers do not recognize. Therefore, the service provider sends out a TERMREQ message and Cisco IOS Software acknowledges it and brings the interface down. At the same time, there is interesting traffic that keeps coming in and the Cisco IOS Software then tries to call out the cellular again-explaining why the interface comes up until the next TERMREQ is received.

Q. I have a host connected to a Cisco Catalyst® 2950 Switch connected to the router. I am unable to bring up the cellular interface automatically after the router reboot. I rebooted the router several times and the cellular interface did not come out of the "spoofing mode" by itself. The Dynamic Multipoint VPN (DMVPN) tunnels are down after the router reboot. The data traffic from my laptop should take the cellular interface out of spoofing mode. I have to ping the tunnel hub router IP address from my laptop to bring up the cellular interface and the DMVPN tunnels. I have to do it every time I reboot the 3G HWIC router.

A. Verify to ensure that:

- The IP address on the tunnel interface is static
- The access list used for dialer group has the headend tunnel interface IP address

The default route should not be configured through the cellular interface; it should be over the tunnel interface. The tunnel traffic is routed through the cellular interface and would in turn trigger call setup.



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