

Cisco 3G Wireless WAN Enhanced High-Speed WAN Interface Cards for Cisco Integrated Services Routers Generation 2 Q&A

- Q.** What is 3G? What are the 3G standards groups?
- A.** Third-generation (3G) is the term for the latest generation of mobile services, which provide advanced voice communications and high-speed data connectivity, including access to the Internet, mobile data applications, and multimedia content. The International Telecommunications Union (ITU), working with industry-standards groups from around the world, has defined the technical requirements and standards as well as the spectrum for 3G systems under the International Mobile Telecommunications-2000 (IMT-2000) program. The ITU requires that IMT-2000 (3G) networks deliver (among other capabilities) improved system capacity and spectrum efficiency over second-generation (2G) systems and that they support data services at minimum transmission rates of 144 kbps in mobile (outdoor) and 2 Mbps in fixed (indoor) environments.
- Q.** What is the difference between EVDO and HSPA?
- A.** Evolution-Data Optimized (EVDO) and high-speed packet access (HSPA) are parallel 3G data standards in the Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) environments. EVDO evolved from the Code Division Multiple Access 2000 (CDMA2000) standards, whereas HSPA evolved from the Universal Mobile Telecommunication System (UMTS) standard that was developed for the countries using Global System for Mobile Communications (GSM) technology.
- Q.** What are the associated theoretical speeds with the different 3G technologies?
- A.** With 3G HSPA one can get 7.2 Mbps down/5.7 Mbps up. With HSPA+ (also called 3.7G technologies) one can get 21 Mbps down/5.7 Mbps up. The EVDO-RevA can support 3.1 Mbps down/ 1.8 Mbps up.
- Q.** Does the Cisco 3G Enhanced High-Speed WAN Interface Card (EHWIC) support Mobile IP (MIP), or Simple IP only?
- A.** The CDMA 3G EHWIC SKUs support MIP on the modem. Depending upon the configuration on the carrier network, it could be set to either MIP only or MIP preferred mode. In the MIP preferred mode, when MIP fails, the modem falls back to Simple IP. The GSM 3G wireless WAN (WWAN) SKUs do not have a Mobile IP stack.
- Q.** How does the modem select the service to which to attach? Does it switch to a better service when one is available?
- A.** Yes. For GSM networks, the modem always looks for HSPA/HSPA+ as the first choice. If HSPA/HSPA+ is not available, the modem downshifts to the next best available radio network; that is, Universal Mobile Telecommunications Service (UMTS) to Enhanced Data rates for GSM Evolution (EDGE) and finally to General Packet Radio Service (GPRS). If you have only EDGE service, the modem continues to scan in the background for UMTS or HSPA service. If the UMTS or HSPA service becomes available, the modem automatically switches to that service. For CDMA networks, the modem always looks for EVDO Rev A first, then Rev 0, and then 1xRTT.

Q. What factors affect throughput on the 3G WWAN?

A. Several factors can affect throughput and performance. Some examples include:

- **Congestion**—3G WWAN data services use a shared wireless medium. Therefore, the number of active users in a cell site affects throughput
- **Coverage**—The distance from the cell tower affects throughput. The further you are located from the cell tower, the lower the achievable throughput. A site survey is recommended as part of the installation process to help ensure adequate network coverage
- **Interference**—RF noise from nearby devices can inhibit performance

Q. Are the Cisco® 3G WWAN interfaces suitable for use as primary links?

A. The 3G wireless standards for data rate and latency performance have continuously improved. Today, both EVDO or Evolution-Data only EVDO and HSPA services offer fractional T1 data rates and latency below 100 milliseconds (ms). For sites and applications that have low and intermittent data usage (such as bank ATMs, kiosks, and gas stations), Cisco 3G WWAN interface may be suitable.

Q. Can I run voice-over-IP (VoIP) traffic over Cisco 3G WWAN EHWICs?

A. Yes, it is recommended to use the latest 3G technology—EVDO Rev A and HSPA+/HSPA—to run VoIP over a 3G link.

Q. Is latency a problem with the Cisco 3G solution?

A. Latencies vary by technology. Depending on the service available in your area and the applications you are running over your link, latency may be a concern. The most advanced technologies support latencies of less than 100 m.

Product Overview

Q. What are the available models for the integrated 3G Wireless WAN Enhanced High-Speed WAN Interface Cards for Cisco Integrated Services Routers Generation 2 (3G WWAN EHWIC for Cisco ISR G2)?

A. Table 1 outlines the available part numbers for the Cisco 3G WWAN EHWIC for Cisco ISR G2.

Table 1. Part Numbers

Part Number	Description
EHWIC-3G-HSPA-U EHWIC-3G-HSPA-U= (Spare)	3G HSPA Wireless WAN EHWIC Supporting GPRS/EDGE/UMTS/HSDPA/HSUPA (Global SKU)
EHWIC-3G-EVDO-V EHWIC-3G-EVDO-V= (Spare)	3G EV-DO Wireless WAN EHWIC Supporting 1xRTT, EV-DO Rev A/Rev 0 (Verizon SKU)
EHWIC-3G-EVDO-S EHWIC-3G-EVDO-S= (Spare)	3G EV-DO Wireless WAN EHWIC Supporting 1xRTT, EV-DO Rev A/Rev 0 (Sprint SKU)
EHWIC-3G-EVDO-B EHWIC-3G-EVDO-B= (Spare)	3G EV-DO Wireless WAN EHWIC Supporting 1xRTT, EV-DO Rev A/Rev 0 (BSNL SKU)*
EHWIC-3G-HSPA+7	3.7G HSPA+ Release 7 EHWIC w/ SMS/GPS (MC8705)(non-US)
EHWIC-3G-HSPA+7-A	3.7G HSPA+ Release 7 EHWIC w/ SMS/GPS (MC8705) (AT&T)

Q. For what platforms are the EHWICs supported? What platform bundles are supported?

A. The EHWICs are supported for the Cisco 1900,2900, and 3900 Series ISR platforms. For the Cisco 800 Series Routers the 3G functionality is embedded in the platform. 3G EHWIC bundles are supported for the 1900 platforms mentioned below. Table 2 lists the product bundles for the Cisco 1900 Series ISRs.

Table 2. Cisco 1900 Series ISR Bundles

Part Number	Description
C1921-3G-U-K9	CISCO1921 Bundle with EHWIC-3G-HSPA-U, Universal Base, 256FL/512DR
C1921-3G-G-K9	CISCO1921 Bundle with HWIC-3G-HSPA-G, Universal Base, 256FL/512DR
C1921-3G-V-K9	CISCO1921 Bundle with EHWIC-3G-EVDO-V, Universal Base, 256FL/512DR
C1921-3G-S-K9	CISCO1921 Bundle with EHWIC-3G-EVDO-S, Universal Base, 256FL/512DR
C1921-3G-U-SEC/K9	CISCO1921 Bundle with EHWIC-3G-HSPA-U, Universal Base, 256FL/512DR, Adv Security
C1921-3G-G-SEC/K9	CISCO1921 Bundle with HWIC-3G-HSPA-G, Universal Base, 256FL/512DR, Adv Security
C1921-3G-V-SEC/K9	CISCO1921 Bundle with EHWIC-3G-EVDO-V, 256FL/512DR, Adv Security
C1921-3G-V-SEC/K9	CISCO1921 Bundle with EHWIC-3G-EVDO-S, 256FL/512DR, Adv Security

Q. What accessories are orderable?

A. Table 3 highlights the accessories that are orderable.

Table 3. Accessories

Part Number	Description
3G-ANTM1919D 3G-ANTM1919D= (Spare)	Multi-Band Swivel Mount Dipole Antenna-Faceplate Mount
3G-ANTM1916-CM 3G-ANTM1916-CM= (Spare)	Multi-Band Omnidirectional Antenna-Ceiling Mount
3G-AE010-R 3G-AE010-R= (Spare)	Single Unit Antenna Extension Base (10-ft cable included)
3G-AE015-R 3G-AE015-R= (Spare)	Single Unit Antenna Extension Base (15-ft cable included)
3G-CAB-ULL-50 3G-CAB-ULL-50= (Spare)	50-ft (15m) Ultra Low Loss LMR 400 Cable with TNC Connector
3G-CAB-ULL-20 3G-CAB-ULL-20= (Spare)	20-ft (6m) Ultra Low Loss LMR 400 Cable with TNC Connector
3G-ACC-OUT-LA 3G-ACC-OUT-LA= (Spare)	3G Outdoor Antenna Lightning Arrestor
3G-ANT-OUT-LP 3G-ANT-OUT-LP= (Spare)	Multi-Band Outdoor Low Profile Antenna with 15ft cable
3G-ANT-OUT-COMBO 3G-ANT-OUT-COMBO= (Spare)	Multi-Band Outdoor Omnidirectional Antenna Mast/Wall Mount and 3G Outdoor Antenna Lightning Arrestor (3G-ACC-OUT-LA)
3G-CAB-LMR240-25 3G-CAB-LMR240-25= (Spare)	25-ft (7.5 m) Low Loss LMR 240 Cable with TNC Connector
3G-CAB-LMR240-50 3G-CAB-LMR240-50= (Spare)	50-ft (15 m) Low Loss LMR 240 Cable with TNC Connector
3G-CAB-LMR240-75 3G-CAB-LMR240-75= (Spare)	75-ft (23 m) Low Loss LMR 240 Cable with TNC Connector

Note: All 3G EHWICs (including spares) ship with one default dipole antenna 3G-ANTM1919D and 3G-AE010-R.

Q. What 3G modem is integrated with the Cisco 3G WWAN EHWICs?

A. The Cisco 3G WWAN EHWICs are available with the third-generation Partner Project (3GPP) standard based on Wideband Code Division Multiple Access (WCDMA) and the 3GPP2 standard based on CDMA2000

carriers as listed in Table 4. These 3G modems are backward-compatible to 2G technologies, namely EDGE and GPRS based on Global System for Mobile Communications (GSM) technology and 1xRTT based on narrowband CDMA technology. In addition, EHWICs support “HSPA Evolved” (or HSPA+) embedded modems based on 3GPP Release 7. Table 4 lists the modems available.

Table 4. Cisco 3G WWAN EHWICs Modems for HSPA+/HSPA and CDMA2000 Carriers

Part Number	Description
MC5728V	3G EV-DO Wireless WAN EHWIC supporting CDMA Rev A/Rev 0/1xRTT (Sprint, Verizon, and BSNL SKU)
MC8795V	3G HSPA Wireless WAN EHWIC supporting HSPA/UMTS/EDGE/GPRS (Global SKU)
MC8705	3G HSPA Wireless WAN EHWIC supporting supporting HSPA+/HSPA/UMTS/EDGE/GPRS (Global SKU and North American SKU)

Q. What technology is the Cisco modem based on?

A. The Sierra Wireless MC5728V modem is based on the Qualcomm QSC6085 chipset, which supports CDMA Rev A/Rev 0/1xRTT. It can support speeds up to 3.1-Mbps downlink and 1.8-Mbps uplink. The Sierra Wireless MC8795V modem is based on the Qualcomm MSM6290 chipset, which supports Quad-Band HSPA (850/900/1900/2100 MHz). It supports speeds up to 7.2-Mbps downlink and 2.0-Mbps uplink. It is also backward-compatible with GPRS/EDGE (850/900/1800/1900 MHz). The Sierra Wireless MC8705 modem is based on the Qualcomm MDM8200A chipset, which supports Quad-Band HSPA+ (850/900/1900/2100 MHz). It supports speeds up to 21.1-Mbps downlink and 5.76-Mbps uplink. It is also backward-compatible with GPRS/EDGE (850/900/1800/1900 MHz).

Q. Is the account information stored on Cisco IOS® Software?

A. No, the account information is stored on the non-volatile RAM (NVRAM) for the Cisco 3G CDMA modems and on the subscriber-identity-module (SIM) card for the Cisco 3G HSPA+/HSPA modems—not on Cisco IOS Software.

Each CDMA modem is uniquely provisioned using the electronic serial number (ESN). 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. What wireless standards are supported with the 3G modem for the Cisco WWAN EHWIC?

A. The following 2G and 3G wireless technologies are supported on the 3G modems. Performance numbers listed here are theoretical limits and may not be seen in production networks. Contact your preferred wireless carrier for expected performance rates.

EVDO (CDMA2000):

- CDMA 1xEV-DO Rev A (forward link up to 3.1 Mbps; reverse link up to 1.8 Mbps)
- CDMA 1xEV-DO Rev 0 (forward link up to 2.4 Mbps; reverse link up to 153.6 kbps)
- CDMA 1xRTT (forward link up to 153.6 kbps; reverse link up to 153.6 kbps)

HSPA+/HSPA/UMTS/EDGE/GPRS:

- HSPA+: 850, 900, 1900, and 2100 MHz (downlink up to 21.1 Mbps; uplink up to 5.76 Mbps)
- HSPA: 850, 900, 1900, and 2100 MHz (downlink up to 7.2 Mbps; uplink up to 5.76 Mbps)
- UMTS: 850, 1900, and 2100 MHz (forward link up to 2.0 Mbps; reverse link up to 384 kbps)

- Enhanced Data Rates for GSM Evolution (EDGE): 850, 900, 1800, and 1900 MHz (forward link up to 384 kbps; reverse link up to 115 kbps)

Q. What Cisco IOS Software releases and feature sets are required to support the Cisco 3G WWAN EHWIC?

A. Cisco IOS Software Releases 15.1(4)M and 15.2(1)T or later.

Q. For 3GPP HSPA+/HSPA/UMTS/EDGE/GPRS carriers, how many kinds of modems exist today?

A. Two. MC8795V supports the global (non-U.S.) HSPA/UMTS/EDGE/GPRS networks. MC8705 supports both the global (non-U.S.) and the North American HSPA+/HSPA/UMTS/EDGE/GPRS networks. Some carriers may require unique modem settings or modem firmware, but most of the carrier and account information resides in the SIM.

Q. Are different firmware versions available for the Cisco 3G WWAN EHWIC?

A. Yes. Different firmware versions may be introduced to address feature enhancements or carrier-specific functions. Current firmware versions and supported carriers are listed at <http://www.cisco.com/go/3g>. MC5728V has firmware Version 1.33.0.1; MC8795V has firmware Version K2.0.7.44; and MC8705 has firmware Version T1.0.3.2.

Q. Is the firmware bundled with the Cisco IOS Software image?

A. The firmware comes preloaded with the PCI Express Mini-card Standard Form Factor F2. It is not bundled with the Cisco IOS Software image. When a new firmware version is released, it is made available at <http://www.cisco.com/go/3g>

To upgrade the firmware of your modem, please check configuration guide at

http://www.cisco.com/en/US/docs/routers/access/1800/1861/software/feature/guide/mrwl_hspa.html.

Q. How are the Cisco 3G routers integrated with Cisco IOS Software?

A. An Interface Cellular based on an asynchronous serial interface has been created in Cisco IOS Software to support these cards. This interface is a dial-on-demand routing (DDR) interface, so a data call is initiated when there is traffic to be routed over the 3G network. Refer to [Configuring Cisco EHWIC and 880G for 3.7G \(HSPA+\)/3.5G \(HSPA\)](#) and [Configuring Cisco EHWIC and 880G for 3G \(EV-DO Rev A\)](#) for more information about how to use the Cisco 3G.

Q. What management capabilities are available for the Cisco 3G WWAN EHWICs?

A. You can configure and monitor the Cisco 3G WWAN EHWICs from the router command-line interface (CLI) using Cisco IOS Software commands that allow you to:

- Activate the 3G modem (only for CDMA)
- Configure the data profile (only for HSPA)
- Upgrade 3G modem firmware either locally or remotely
- Remotely dial in and bring up the 3G link remotely through Short Message Service (SMS) and voice
- Monitor the signal strength, available network and service, and data-connection statistic
- Use SIM locking/unlocking; It adds SIM security by verifying the SIM PIN at modem power-up
- Use mobile equipment personalization (MEP) unlocking, which allows locking the modem or high-speed WAN interface card (HWIC) to a particular cellular carrier, thus allowing the carrier to subsidize the equipment. This feature allows end users to use the modem with other carriers after the locking period is over, as required in some geographical regions and countries

- Use Open Mobile Alliance Diagnostic & Monitoring (OMA-DM) activation, which allows CDMA modems to be activated and provisioned using the OMA-DM protocol

For remote-management capabilities, the EHWICs supports the Simple Network Management Protocol (SNMP) interface 3G MIB, allowing access to the standard interface counters. The interface MIB also provides traps for interface up, interface down, and modem presence events. (A cellular MIB that allows polling of signal and network statistics is under development.)

It supports collecting modem logs through remote Diagnostic and Monitoring capability.

- Q.** What new 3G MIB features are supported on the Cisco 3G WWAN EHWIC?
- A.** In addition to traditional 3G WWAN, ENTITY, and IF MIB support, the Cisco 819 ISRs support 3G WWAN MIB persistence, which allows SET objects to survive from router reloads and modem power cycle. New MIB objects will be implemented for SMS statistics and Global Positioning System (GPS) data:
<ftp://ftp.cisco.com/pub/mibs/v2/CISCO-WAN-3G-MIB.my>.
- Q.** What is SMS-initiated data callback?
- A.** Voice-initiated data callback (also called dial-in), which is implemented in previous Cisco 3G products, requires customers to subscribe to a voice plan. However, not all service providers offer voice service for data-only modems. SMS-initiated data callback addresses this limitation. It allows customers to set up a data connection by sending a text message to the modem. This feature includes message screening using the originating number. This feature improves the feature security and eliminates unauthorized callback requests.
- Q.** Do the Cisco 3G WWAN EHWICs support SMS?
- A.** Yes, SMS service, which allows event notification through SMS and SMS-initiated data callback, is supported. Refer to [Configuring Cisco EHWIC and 880G for 3.7G \(HSPA+\)/3.5G \(HSPA\)](#) and [Configuring Cisco EHWIC and 880G for 3G \(EV-DO Rev A\)](#) for SMS and SMS-initiated data callback related configuration.
- Q.** Do the Cisco 3G WWAN EHWICs support GPS?
- A.** The Cisco EHWICs support standalone GPS. Refer to [Configuring Cisco EHWIC and 880G for 3.7G \(HSPA+\)/3.5G \(HSPA\)](#) and [Configuring Cisco EHWIC and 880G for 3G \(EV-DO Rev A\)](#) for GPS-related configuration.
- Q.** How do I display GPS data information?
- A.** The Cisco IOS EXEC command **show cellular<slot>gps** displays GPS state, mode, latitude, and longitude information.
- Q.** Can I use IP Security (IPsec) with the Cisco 3G WWAN EHWIC?
- A.** Yes. IPsec is supported on the Cisco 3G WWAN EHWIC. IPsec has been tested in both site-to-site and Dynamic Multipoint VPN (DMVPN) configurations.

Service Plans and Carriers

- Q.** How do I get a service plan for the Cisco 3G WWAN EHWICs?
- A.** You must obtain a service plan from a supported wireless carrier. For a complete list of supported wireless carriers, please visit <http://www.cisco.com/en/US/products/ps11615/index.html>.

For the GSM express card, the service plan information is included in the SIM card. You must purchase the SIM card from your local wireless carrier. In general, service plans should be metered plans. Several of the

unlimited data plans are designed for laptop computers and PDAs and not for routers, where a customer can have multiple data devices.

For the CDMA express card, the carrier must activate the modem. Typically this activation involves providing account information as well as the ESN of the modem.

- Q.** How do I get my Cisco 3G activated?
- A.** The service activation procedure varies by wireless carrier. Activation can be performed through a phone call or by logging into a specific website so that the carrier can perform the activation. To activate a modem, typically you need to have a reseller agreement with the carrier. The typical scenarios follow:
- **Managed services or wireless carrier**—If you purchased the modem through a wireless carrier or affiliate, that carrier or affiliate should activate the modem
 - **Reseller**—If your reseller has an agreement with a wireless carrier, the reseller may perform service activation. If the reseller does not have a relationship with a wireless carrier, the reseller may partner with a wireless agent to activate the modem
- Q.** Is over-the-air (OTA) provisioning supported, or is provisioning performed by a technician during installation over the connection to the console port?
- A.** OTA provisioning is supported. However, the OTA protocols of different wireless network operators vary. Sprint supports OMA-DM provisioning and Verizon support OTASP provisioning.
- Q.** Why are there two antenna connectors on the 3G WWAN EHWIC?
- A.** 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.
- Q.** Is quality of service (QoS) supported with the 3G EHWIC wireless cards?
- A.** QoS is supported on the Cisco 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 EHWIC 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 interface.
- Q.** Can I configure the 3G EHWIC WWAN cellular interface as the primary interface and configure another interface as a backup to the cellular interface?
- A.** No, the 3G EHWIC 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
- Q.** What does the LED mean?
- A.** For a detailed description of the LEDs please refer to [Configuring Cisco EHWIC and 880G for 3.7G \(HSPA+\)/3.5G \(HSPA\)](#) and [Configuring Cisco EHWIC and 880G for 3G \(EV-DO Rev A\)](#).
- Q.** How many profiles can I configure for my GSM modem, and how many are active at any given time?
- A.** You can configure 16 access point name (APN) profiles. Only one will be active at any point in time.

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

A. You need to get the following information from your service provider to activate the modem:

- APN
- Authentication type—Password Authentication Protocol (PAP) or CHAP
- Username and password

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

A. The cellular GSM SIM lock or unlock command is: `cellular <unit>gsm sim<lock | unlock><pin>`

Q. I have the cellular EHWIC 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". What is wrong?

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 `pppipcpdns request` under the cellular interface, as shown in the following configuration, updates the name-server database on the router.

```
interface Cellular0/0/0
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
pppipcpdns request
```

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:
- [Configuring Cisco EHWIC and 880G for 3.7G \(HSPA+\)/3.5G \(HSPA\) and Configuring Cisco EHWIC and 880G for 3G \(EV-DO Rev A\)](#).

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.** Can I configure the 3G EHWIC WWAN cellular interface as the primary interface and configure another interface as a backup to the cellular interface?
- A.** No, the 3G EHWIC 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

- Q.** When I issue the show ip route command and during Point-to-Point Protocol (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 0000 to network 0000
66000/32 is subnetted, 1 subnets
C 66174507 is directly connected, Cellular0/2/0
10000/24 is subnetted, 1 subnets
C 1024250 is directly connected, FastEthernet0/0
16615900/32 is subnetted, 1 subnets
C 166159147238 is directly connected, Cellular0/2/0
S* 0000/0 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 IP Control Protocol (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. Why?
- 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 money.

Q. My customer has problems when trying to ping with a domain name, but does not have problems pinging with IP addresses. Why?

A. Add the following CLI under the cellular interface:

```
pppipcpdns 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
pppipcpdns 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 (EHWIC-3G-HSPA-U), but is always stuck at the IPCP stage. What could be causing this?

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 EHWIC 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 please refer to Configuring Cisco EHWIC and 880G for 3.7G \(HSPA+\)/3.5G \(HSPA\) and Configuring Cisco EHWIC and 880G for 3G \(EV-DO Rev A\).
```

Q. On a 3G EHWIC, 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. What is happening?

- 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 an EHWIC is reporting a problem pinging or getting pinged. Why?
- A.** Verify that the syntax for the CHAT script is correct and is as follows: chat-scriptgsm "" "ATDT*98*1#" TIMEOUT 6 where "1" in this case corresponds to the profile number configured for the cellular interface.
- Q.** I have a 3G EHWIC with CDMA that is now activated with Rev A, but has problems pinging or being pinged. Why?
- 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 connect 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. What is happening?
- 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. What is wrong?
- A.** Typically this circumstance occurs 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 setu For example, do I need to add IP on Fast Ethernet? If no IP address is associated to any physical interface, ip route 0000 0000 cellular 0/0/0 does not wor 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 five minutes the interface resets. What could be causing this problem?
- A.** Typically this problem happens because you send illegal IP addresses for the cellular network such as 10xxx, 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, 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. This explains why the interface comes up until the next TERMREQ is received.
- Q.** I have a host connected to a Cisco Catalyst<sup>®</sup> 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 EHWIC router. Why does this happen?
- A.** Verify to ensure that:
- The IP address on the tunnel interface is static
  - The access list used for dialer group has the head-end 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.

- Q.** My cellular connection is not coming up or appears to be connected but not passing any traffic or stays down for longer periods. What is the problem?
- A.** On a small subset of Cisco ISR 3G deployments on the Verizon Wireless Network, an anomaly is seen where the cellular interface stops communicating with the cellular network for up to two hours. (Until the Mobile IP/PDP session keep alive from the wireless network refreshes the connection). During this time, the 3G interface appears as up/up. Although a manual reset of the 3G modem and/or a clearing of the cellular interface (via shut/no shut) can often resolve this, on rare occasions, a reload of the ISR is needed to clear the condition. While the root cause is being determined, Cisco is providing an automated mitigation script to restore service more quickly.

The two scripts offer an automated method, versus a manual method of mitigation. The scripts attempt the least disruptive method for service restoration, and check if that has succeeded. If it has not, then the next least disruption method is executed. The scripts reset when service is restored so detection and restoration can be executed again if needed, without manual intervention. Below is a flow chart of the script logic, along with two scripts. One script is for use with Verizon Mobile Private Network/Dynamic Mobile Network Routing (MPN/DMNR) service; the other script is for use with Verizon Wireless 3G Internet connection service. The instructions for each script (also below) provide detail on how to load the TCL script onto the ISR flash, and the few commands to be added to the ISR configuration to automate execution. Please find the script and guidelines at:

Cellular Recovery Script <<http://www.cisco.com/cisco/software/type.html?mdfid=281295442&flowid=6999>>

If you are unsure whether using this script is appropriate for your site, please contact your Cisco representative, or the Cisco Technical Assistance Center at 800-553-2447



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