

Third-Generation Wireless WAN Cards for Cisco Integrated Services Routers

Product Overview

Q. What are the Cisco® Third-Generation (3G) Wireless WAN (WWAN) High-Speed WAN Interface Cards (HWICs)?

A. The Cisco 3G WWAN HWICs are the first enterprise-class 3G WWAN solution. Suitable for both backup and primary applications, the Cisco 3G WWAN HWICs support the latest Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) standards (Evolution Data Only [EVDO] Revision A and High-Speed Downlink Packet Access [HSDPA]) and are backward compatible with the widely deployed networks (Single-Carrier Radio Transmission Technology [1xRTT], General Packet Radio Service [GPRS], and Enhanced Data for Global Evolution [EDGE]). The Cisco 3G WWAN HWICs are tightly integrated with the services provided on Cisco Integrated Services Routers, which deliver highly secure data, voice, video and mobility services. The Cisco 3G WWAN HWICs are supported on the modular Cisco 1841 Integrated Services Router and Cisco 2800 Series and 3800 Series Integrated Services Routers.

Q. What are the available models of the new Cisco 3G WWAN HWICs?

A. Table 1 lists the Cisco 3G WWAN HWICs supported on the Cisco Integrated Services Router.

Table 1. Cisco 3G WWAN HWICs Supported on the Cisco Integrated Services Router

Part Number	Description
HWIC-3G-GSM	3G Wireless WAN HWIC supporting GPRS/EDGE/UMTS/HSDPA (Global SKU)
HWIC-3G-CDMA-V	3G Wireless WAN HWIC supporting -1xRTT, EVDO Rev A/Rel 0 (Verizon SKU)
HWIC-3G-CDMA-S	3G Wireless WAN HWIC supporting -1xRTT, EVDO Rev A/Rel 0 (Sprint SKU)

In addition to the Cisco 3G WWAN HWICs, Cisco provides a range of antenna solutions to accommodate a variety of installation environments. Table 2 lists the antenna options available.

Table 2. Antenna Options

Part Number	Description
3G-ANTM1919D	Multi-Band Swivel Mount Dipole Antenna, Faceplate Mount
3G-ANTM1916-CM	Multi-Band Omnidirectional Antenna, Ceiling Mount
3G-AE015-R	Single Unit Antenna Extension Base (15-ft cable included)
3G-CAB-ULL-50	50-ft (15 m) Ultra Low Loss LMR 400 Cable with TNC Connector
3G-CAB-ULL-20	20-ft (6 m) Ultra Low Loss LMR 400 Cable with TNC Connector

Q. Is the antenna included with the Cisco 3G WWAN HWICs or do we need to place a separate order?

A. For all the Cisco 3G WWAN HWIC SKUs and spares, one multiband swivel mount dipole antenna (3G-ANTM1919D) is included with each 3G HWIC.

Q. What are the wireless standards supported with the Cisco 3G WWAN HWICs and their relative performance?

A. The following 3G and second-generation (2G) wireless technologies are supported on the 3G WWAN HWICs. Note that performance numbers listed here are theoretical limits and may not be seen in production networks; contact your preferred wireless carrier for expected performance rates:

- HWIC-3G-CDMA-x:
 - CDMA 1xEV-DO Rev A1 (forward link up to 3.1 Mbps; reverse link up to 1.8 Mbps)
 - CDMA 1xEV-DO Rel 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)
- HWIC-3G-GSM:
 - HSDPA: 850, 1900, and 2100 MHz (forward link up to 3.6 Mbps; reverse link up to 384 kbps)
 - Universal Mobile Telecommunication System (UMTS): 850, 1900, and 2100 MHz (forward link up to 2.0 Mbps; reverse link up to 384 kbps)
 - EDGE: 850, 900, 1800, and 1900 MHz (forward link up to 236 kbps; reverse link up to 124 kbps)

Q. What Cisco IOS® Software version and feature set are required to support the Cisco 3G WWAN HWICs?

A. The Cisco 3G WWAN HWICs are supported on Cisco IOS Software Release 12.4(15)T with Cisco IOS Software IP Base feature sets and later. For more information about the feature sets, visit <http://www.cisco.com/en/US/products/ps8258/index.html>.

Note: For the Cisco 1841 Integrated Services Router, use the Cisco IOS Software Release 12.4(15) T1, which has the fix for a firmware upgrade problem.

Q. What is the difference between HWIC-3G-CDMA-S and HWIC-3G-CDMA-V?

A. Essentially, these are carrier-specific part numbers for Sprint (HWIC-3G-CDMA-S) and Verizon (HWIC-3G-CDMA-V). Their hardware is the same. The differences are in the following:

- Modem firmware
- Modem Preferred Roaming List (PRL)
- HWIC cookie, which controls over-the-air (OTA) provisioning and activation

The modem activation processes supported on these two carrier-specific SKUs are different. HWIC-3G-CDMA-V (Verizon) supports automatic activation based on OTA service provisioning (OTASP) whereas HWIC-3G-CDMA-S (Sprint) supports a manual modem activation process. For more information on the modem activation and provisioning process, visit http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00807ec85b.html#wp1147979.

Q. For GSM carriers are you planning to release separate SKUs for every operator?

A. No. A single GSM SKU (HWIC-3G-GSM) supports all GSM carriers. Some carriers may require unique modem settings or modem firmware, but most of the carrier and account information resides in the subscriber identity module (SIM).

Q. Can I use multiple Cisco 3G WWAN HWICs in a single router?

A. Yes, multiple 3G WWAN HWICs can be used in the single router for both backup as well as bandwidth aggregation. Please note that if all the 3G HWICs are on the same wireless carrier network, the combined throughput is not equal to the sum of their individual throughputs. To improve the total throughput, the 3G HWICs should be on different carrier networks.

Q. I noticed that the CDMA version of the card has two antenna connectors and the GSM version has one antenna connector. Why is this?

A. On the 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/direction and the other at another angle/direction to help improve signal reception.

Cisco testing did not show that diversity provided significant benefit for the GSM environment, thus diversity is not supported on the GSM module.

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

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/en/US/products/hw/routers/networking_solutions_products_generic_content0900aecd80601f7e.html.

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

A. The firmware comes preloaded with the Cisco 3G WWAN HWIC; it is not bundled with the Cisco IOS Software image. When a new firmware version is released, it is made available at <http://tools.cisco.com/support/downloads/go/Redirect.x?mdfid=278875243>. To upgrade the firmware of your modem, download the correct firmware and copy it to the router flash memory. Then use the Cisco IOS Software command-line interface (CLI) to complete the upgrade process. Refer to the Cisco IOS Software feature guide for the firmware upgrade command, which can be found at:

- **For CDMA:**

http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00807ec85b.html#wp1161402

- **For GSM:**

http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a0080802d77.html#wp1202540

Q. Do the Cisco 3G WWAN HWICs ship preloaded with SIM cards?

A. No. The SIM cards must be obtained from a supported wireless carrier and be associated with an appropriate rate plan. A complete list of carriers can be found at http://www.cisco.com/en/US/products/hw/routers/networking_solutions_products_generic_content0900aecd80601f7e.html.

Q. Can I use the SIM card from my PDA in the Cisco 3G WWAN HWIC?

- A.** No. Rate plans for PDAs and laptop computers typically do not cover multiple users and have data usage restrictions. You must purchase a data plan designed for machine-to-machine (M2M) applications.

Features and Applications

Q. What are the applications for the new Cisco 3G WWAN HWICs?

- A.** The Cisco 3G WWAN HWICs are suitable for both backup and primary WAN connectivity.
- **WAN backup:** Resilient WAN access is often a requirement for branch offices connecting to a corporate site or the Internet. While DSL, Frame Relay, ISDN, and dialup are common choices for backup in the event of primary WAN link failure, a nonterrestrial data path such as 3G WWAN provides enhanced WAN diversity. Cisco 3G WWAN HWICs combined with the Cisco Integrated Services Routers offer the capability to automatically initiate connection over the 3G WWAN when the primary WAN link is unavailable. In addition, Cisco 3G WWAN HWICs can be used to provide supplemental bandwidth when the primary WAN link is overused.
 - **Primary connectivity:** For applications that have low data usage but high security requirements such as bank ATMs, gas station kiosks, and telemetry sites, the Cisco 3G WWAN HWIC offers a highly secure, simplified, and cost-effective WAN alternative to DSL or Frame Relay. In areas where terrestrial broadband services (cable, DSL, or T1) are not available or are expensive, 3G WWAN connectivity can be a viable alternative. For businesses requiring rapid setup or temporary connectivity, 3G WWAN offers the capability to bring up a new site quickly and cost-effectively. Using the integrated services available on the Cisco Integrated Services Routers, Cisco 3G WWAN HWICs can provide instant and mobile communications during disasters and service outages.

Q. How is the Cisco 3G WWAN HWICs integrated with Cisco IOS Software?

- A.** A new asynchronous serial interface, Interface Cellular, has been created in Cisco IOS Software to support the Cisco 3G WWAN HWICs. This is a dial-on-demand routing (DDR) interface, so a data call is initiated when there is traffic of interest to be routed over the 3G network. Refer to the configuration guide for more information about how to use the Cisco 3G WWAN HWICs.

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

- A.** The 3G Wireless WAN HWICs can be configured and monitored from the router CLI using Cisco IOS Software commands that allow the user to do the following:
- Activate the 3G modem (only for HWIC-3G-CDMA-x)
 - Configure the data profile (only for HWIC-3G-GSM)
 - Upgrade modem firmware
 - Select the network (only for HWIC-3G-GSM)
 - Monitor the signal strength, available network and service, and data connection statistics

For remote management capabilities, Cisco 3G WWAN HWICs support the Simple Network Management Protocol (SNMP) interface MIB, allowing access to the standard interface counters. The interface MIB also provides traps for interface up and down events. (Note that a cellular MIB is under development that would allow polling of signal and network statistics.)

Q. Can IP Security (IPsec) be used with the Cisco 3G WWAN HWICs?

- A.** Yes. All Cisco Integrated Services Router security features are supported on the Cisco 3G WWAN HWIC interface. IPsec has been tested in both site-to-site and Dynamic Multipoint VPN (DMVPN) configurations with the new Cisco 3G WWAN HWICs.

Q. What factors affect throughput on the 3G WWAN?**A.** Several factors can affect throughput and performance:

- 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 base transceiver station (BTS) or 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: Radio frequency (RF) noise from nearby devices can inhibit performance.

Q. Are the Cisco 3G WWAN HWICs suitable for use as primary links?**A.** The 3G wireless standards for data rate and latency performance have continuously improved. Today both EVDO and HSDPA 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 HWICs may be suitable.**Q. Can I run voice-over-IP (VoIP) traffic over Cisco 3G WWAN HWICs?****A.** VoIP is not a qualified configuration at this time.**Q. Is latency a problem with the Cisco 3G WWAN HWIC 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 ms.**Q. Do the Cisco 3G WWAN HWICs provide switched voice capability using the dual transfer mode (DTM)?****A.** No. The Cisco 3G WWAN HWICs do not support DTM at this time.**Q. What is the Diag port on the faceplate for?****A.** The Diag (diagnostics) port on the faceplate of the Cisco 3G WWAN HWIC allows users and network administrators to connect the Cisco 3G WWAN HWIC to industry-standard diagnostic and monitoring tools. These tools connect directly to the embedded 3G modem and provide detailed information about the air interface. The interface has been tested with the QUALCOMM CDMA Air Interface Tester (CAIT), which characterizes performance by measuring real-time, mobile-based CDMA RF characteristics, as well as messaging and protocols. This tool displays statistics and diagnostic information that users can read and write to nonvolatile memory. A similar tool, the Spirent Universal Diagnostics Monitor (UDM), is also supported.**Q. Do Cisco 3G WWAN HWICs support HSUPA? If not, will they support HSUPA with a firmware upgrade?****A.** No. Currently the Cisco 3G WWAN HWICs do not support HSUPA. HSUPA support would require new modem hardware and is planned for in future releases.

3G WWAN Technology

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 Telecommunication 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, among other capabilities, deliver improved system capacity and spectrum efficiency over 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 HSDPA?

A. EVDO and HSDPA are parallel 3G data standards in the CDMA and GSM environments. EVDO evolved from the CDMA2000 standards, whereas HSDPA evolved from the UMTS standard that was developed for the countries using GSM technology.

Q. In general, what is the level of adherence to the 3G Partnership Project 2 (3GPP2)? For example, does the Cisco 3G WWAN HWICs support EVDO Rev A quality of service (QoS)?

A. Adherence to the EIA/TIA and CDMA Development Group (CDG) standards depends on the carrier implementation and a combination of modem hardware and firmware and software. All Cisco 3G WWAN HWICs comply with the standards, but the specifics of carrier implementations vary by carrier.

Q. Do the Cisco 3G WWAN HWICs support Mobile IP or Simple IP only?

A. The CDMA 3G WWAN HWIC supports Mobile IP (MIP) on the modem. Depending on 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 WWAN does not have a Mobile IP stack but the Mobile IP feature on the IOS could be used.

Q. How does the modem select the service to attach to? Does it switch to a better service when one is available?

A. The modem by default registers with the best available network. For example, if you have HSDPA coverage in your area, the modem is automatically attached to HSDPA service as it is the best available service. If you have only EDGE service, the modem continues to scan in the background for UMTS or HSDPA service. If the UMTS or HSDPA service becomes available, the modem automatically switches to that service.

Q. Is signal strength a concern? Can remote antennas be used?

A. Cellular frequency bands have very good building penetration characteristics, which makes them a good choice for WWAN connectivity. Ideally, the Cisco 3G WWAN HWIC should have signal strength of -85 dB for maximum throughput. The Cisco 3G WWAN HWICs operate in environments with lower signal strength; however, this results in diminished throughput. The minimum throughput recommended for acceptable performance is -95 dB.

In cases where the signal strength needs to be improved, external antenna solutions are available. Refer to the Cisco 3G WWAN HWIC installation guide for more information about the antenna and cable accessories available with the Cisco 3G WWAN HWICs.

In very challenging environments where a remote antenna solution does not work, RF signal booster solutions can be used. There are a variety of solutions on the market today to solve indoor coverage challenges. Contact your wireless service provider for more information about these solutions.

Service Plans and Carriers

Q. How do I get a service plan for the Cisco 3G Wireless WAN HWICs?

- A.** A service plan must be obtained from a supported wireless carrier. For a complete list of supported wireless carriers, visit http://www.cisco.com/en/US/products/hw/routers/networking_solutions_products_generic_content0900aecd80601f7e.html.

For HWIC-3G-GSM, the service plan information is included in the SIM card. The SIM card has to be purchased 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 HWIC-3G-CDMA, the SIM card must be activated by the carrier. Typically this involves providing account information as well as the electronic serial number of the modem.

Q. How are modems provisioned?

- A.** There are two steps in provisioning the modem. The first step—the load of the firmware, PRL, and initial parameters—occurs in the manufacturing process. The second step occurs during the service activation procedure and may be OTA or manual. This second step may be performed by the service provider, value-added reseller (VAR), or distributor.

Q. How do I get my Cisco 3G WWAN HWICs 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. These are the typical scenarios:
- Managed services or wireless carrier: If the modem was purchased through a wireless carrier or affiliate, the modem should be activated by the carrier or affiliate.
 - 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 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.

Q. How can I tell if my preferred wireless carrier supports the Cisco 3G WWAN HWICs?

- A.** The list of supported carriers can be found at http://www.cisco.com/en/US/products/hw/routers/networking_solutions_products_generic_content0900aecd80601f7e.html.

Q. Where can I find configuration and installation guides for the Cisco 3G WWAN HWICs?**A.** All configuration and installation guides can be found at:• **CDMA:**

http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a00807ec85b.html

• **GSM:**

http://www.cisco.com/en/US/products/ps6441/products_feature_guide09186a0080802d77.html

• **Installation Guides:**

http://www.cisco.com/en/US/products/hw/modules/ps2641/products_module_installation_guide_chapter09186a00807ecd4b.html#wp1060382



Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

Europe Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: +31 0 800 020 0791
Fax: +31 0 20 357 1100

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