Miercom

Lab Testing Summary Report

September 2007
Report 070904

Product Category:
Wireless WAN Access

Vendor Tested:
Cisco Systems

Product Tested:
Cisco 3G HWIC

CISCO

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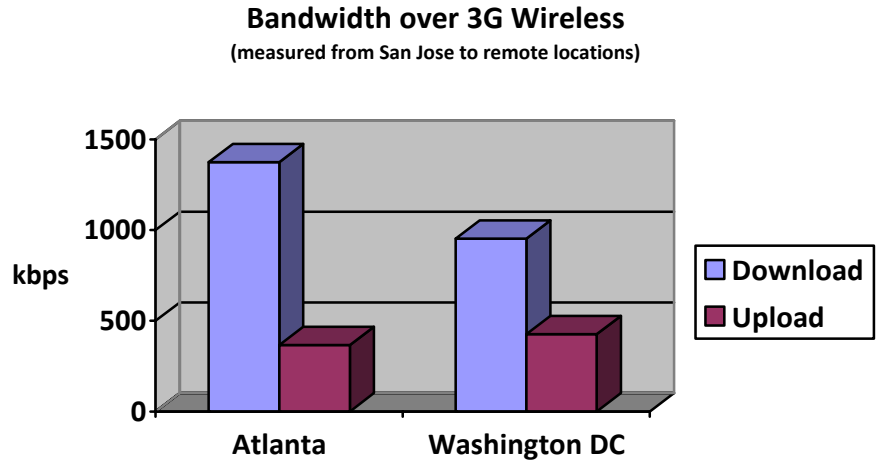
Key findings and conclusions:

- **3G offer reliable WAN backup for remote offices independent of the terrestrial infrastructure**
- **3G can simplify branch office deployment and provide office portability**
- **Fully integrated with Cisco IOS providing straight forward configuration and simple troubleshooting**
- **Support for secure IPSec VPN static and dynamic tunneling over wireless WAN**

Cisco Systems tasked Miercom to verify the setup and operation of the Cisco 3G Wireless WAN (WWAN) High Speed Interface Card (HWIC). The 3G WWAN HWIC suitable for both backup and primary applications, and is designed for use in the modular Cisco 3800 series, 2800 series and 1800 series Integrated Service Router platforms. It provides a rapid and easy to deploy WAN link option for branch and remote offices.

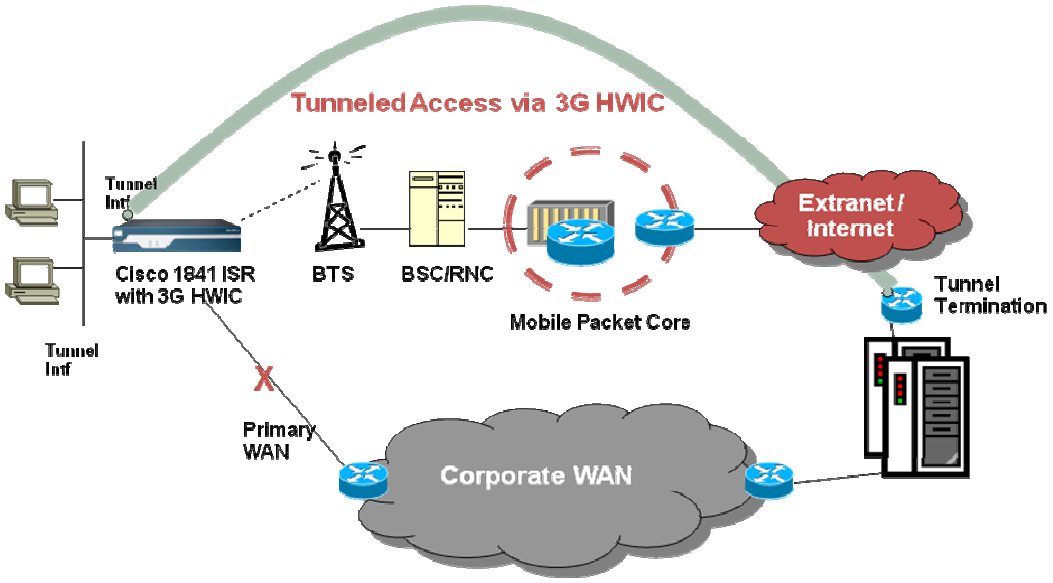
The 3G HWIC can also support IPSec VPN tunnels across the wireless link for added security and network protection. It can be used as a secondary link for fail-over and backup link scenarios or as a primary link for locations where traditional circuits are not available, such as those having a long lead time or those that are not cost effective for the duration of the office need (such as a construction site).

The wireless functions of the 3G wireless HWIC are fully integrated with Cisco IOS which allows for simplified remote management and troubleshooting. The integration also provides a familiar interface for configuration and setup using standard Cisco IOS commands. Although carrier specific, the 3G wireless network can provide excellent throughput capacity to support remote office locations.



Throughput – Real world throughput achievable between locations with the 3G HWIC over the wireless network (Dependent upon carrier network, time of day and other factors associated with public networks).

Test Set-up



Devices Under Test - Test Bed:
For the four scenarios evaluated a HWIC-3G-CDMA was installed into a Cisco 1841 router running version 12.4(15)T1 of Cisco IOS. A WIC-1ASDL was also installed to provide the alternate WAN circuit for scenarios 2 thru 4. The 3G service was provided by Verizon while the DSL circuit went out over AT&T. The 1841 router was uplinked to a Cisco switch from which a client PC was connected. The headquarters network was represented by a Cisco 3845 with a T1 WAN connection and severs connected directly to the gigabit switch interface in the router.

Test Scenarios
Wireless 3G Primary Link – DSL circuit was disconnected from the Cisco 1841 and WAN connectivity was provided solely by the 3G wireless HWIC. Demonstrated ability for client machines to establish connections back to servers behind the headquarter router.

Wireless 3G Backup Link – Connection from client PC to servers was established over the DSL circuit with the 3G interface configured as a backup. The DSL connection was then failed and re-established with the results noted.

IPSec VPN – Connection from client PC to servers was established over a site to site IPSec VPN tunnel using the DSL circuit with the 3G interface configured as a backup. The DSL connection was then failed and re-established with the results noted.

Dynamic Routing using IPSec and GRE - Connection from client PC to servers was established over a site to site IPSec GRE tunnel with OSPF as the dynamic routing protocol with the DSL circuit as primary and the 3G interface configured as a backup. The DSL connection was then failed and re-established with the results noted.

Throughput tests
Throughput tests were run against Speakeasy.net to gain a general assessment of the throughput available over the WAN connections. Speakeasy.net offers a free speed test to various locations around the country. As the 3G single is traversing the public network, it is subject to the impairments commonly associated with such networks (congestion, delay, time of day dependency). The tests were run several times and a general average was taken. The test is intended to show throughputs that were achieved in real world conditions. They were not intended to demonstrate the theoretical maximum in ideal conditions.

Test Results

Four different configurations representative of various deployment scenarios were evaluated. Basic functionality and performance were verified for each of the scenarios.

Wireless 3G Primary Link

The first test scenarios relied solely on the 3G wireless HWIC for WAN connectivity. This would be typical of a rapid deployment model where the lead time for hard circuits is too long or a temporary location is required such as a construction site or when cabling is inconvenient such as a kiosk or “store within a store” scenario.

The interface was configured for split tunneling, allowing local requests to access the Internet directly while routing server requests to the headquarters. Resources behind the headquarters router were immediately available upon initiation of the WAN connection over the 3G wireless interface. Speed tests run through Speakeasy.net to their Atlanta Georgia servers resulted in an average download speed of 839 kbps and upload speed of 438 kbps. The results can be heavily dependent upon the provider network, location and time of day. Repeating the same test at different times yielded individual throughput results as high as 1578 kbps download and 538 kbps upload. Such fluctuation is somewhat expected.

Wireless 3G Backup Link

For the second scenario a DSL link was added as the primary means of WAN service. In this case 3G can be used as a cost-effective alternative to ISDN or Frame Relay for backup services. A continuous ping was setup up from the remote site to the headquarters and the DSL link was then broken forcing a failover to the 3G wireless link. With the default timers the pings were re-established in less than three minutes without any user intervention[1]. Once the DSL link was re-established the service failed back in under two minutes, again without user intervention. In addition to the diagnostics display on the router terminal session, PATHPING from a Microsoft Windows client was used to verify that traffic was flowing over the DSL or 3G link.

IPSec VPN

For additional data security, IPSec VPN tunnels can be established over the 3G wireless WAN links. Similar to the topology above, connections were made over the DSL interface with VPN tunnels. Once established, the DSL circuit was interrupted, forcing a failover to the 3G wireless. Prior to the client connection being re-established, the VPN tunnels were automatically brought up over the wireless interface without any user intervention. As before, once the DSL circuit came back online, services reverted back automatically.

Dynamic Routing using IPSec VPN and GRE

For a larger Enterprise, dynamic routing is supported using IPSec/GRE over the 3G connection. Like the IPSec test, the DSL circuit was interrupted. Once the link was established over the 3G interface, the VPN tunnels initiated and the routing tables were updated and the VPN tunnels established automatically.

In both IPSec VPN scenarios, split tunneling was supported to allow Internet traffic to egress locally while maintaining the secure corporate tunnel.

Configuration

Software Configuration

The 3G HWIC is tightly integrated with Cisco IOS. Once installed, the HWIC can be setup and configured using the standard Cisco IOS CLI. Specific account information for the wireless provided is stored on the SIM card in the case of GSM and on the modem in the case of CDMA.

Physical Configuration

The 3G Wireless HWIC is available with either a GSM or CDMA based wireless modem depending upon the carrier. The HWIC is supported by the modular 1800, 2800 and 3800 series Cisco ISR platforms. The bulk of the testing was performed with a Cisco 1841 using a Verizon CDMA version of the 3G WWAN HWIC. The basic functionality was also demonstrated on several platforms including Cisco 2811 and 3825 routers with AT&T GSM service and a Cisco 2851 with Sprint CDMA.

Figure 1: HWIC-3G-CDMA and HWIC-3G-GSM

With each of these configurations, the 3G WWAN HWIC was installed in the router platform and all other WAN connections were removed. Connection to the Internet was then successfully proven by placing a PING to various web address showing DNS resolution and connectivity over the 3G wireless network.

Varieties of antenna options are also available and were used during the testing of the different platforms. Multi-band dipole antennas can be mounted directly on the HWIC or extended up to 15 feet with use of cradle.

LED indicators for HWIC status, RSSi and service connectivity are located on the faceplate for visual troubleshooting. A monitoring and diagnostics port for modem protocol level debugging using industry standard management applications is also present.

The cellular modem for the 3G WWAN HWIC is provided by Sierra Wireless. Firmware for the modem card can be uploaded directly from within Cisco IOS without having to reboot the router.

Conclusion

The 3G wireless HWIC provides enterprises with a quick and easy deployment option for remote and branch offices. The integration with Cisco IOS provides for a familiar configuration interface and allows for use as a backup or primary link with all of the features and functionality provided to other HWIC interfaces including static and dynamic IPSec VPN tunnels.

[1] Default timers can be adjusted to further reduce recovery time.

Miercom Performance Verified

Based on Miercom's examination and testing of the Cisco 3G Wireless HWIC and review of its configuration, deployment and operation as described herein, Miercom hereby issues the Performance Verified certification for the product in this report. Miercom certifies the following key observations made during this review:

- **3G offer reliable WAN backup for remote offices independent of the terrestrial infrastructure**
- **3G can simplify branch office deployment and provide office portability**
- **Fully integrated with Cisco IOS providing straight forward configuration and simple troubleshooting**
- **Support for secure IPSec VPN static and dynamic tunneling over wireless**

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