

# Cisco Connected Grid WiMAX Modules for the Cisco 1000 Series Connected Grid Router

The Cisco<sup>®</sup> Connected Grid Modules for CGR 1000 Series - WiMAX (WiMAX Modules) provide IEEE 802.16e-compliant WiMAX wireless WAN connectivity for the Cisco 1000 Series Connected Grid Routers (CGR 1000 Series). The WiMAX Modules can enable a standards-based private network solution with high-speed and low-latency WiMAX connectivity to your field infrastructure for multiple applications. Examples include Advanced Metering Infrastructure (AMI), Distribution Automation (DA), Integration of Distributed Energy Resources (DER), and Remote Workforce Automation. The ruggedized WiMAX modules and the CGR 1000 Series provide a versatile communications platform for diverse sets of field area network (FAN) and Internet of Things (IoT) deployments.

## Product Overview

The Cisco IEEE 802.16e-compliant WiMAX Connected Grid Module for the CGR 1000 Series provides utilities a high-bandwidth, reliable, self-managed, and highly secure connectivity solution. It has been deployed by utilities worldwide as a standards-based alternative to using a service provider-based public cellular network for mission-critical applications. Figure 1 displays the Cisco Connected Grid WiMAX modules.

**Figure 1.** Cisco Connected Grid WiMAX Modules



There are four SKUs in the WiMAX Module Family, providing utilities with a choice of flexible spectrum offerings in the licensed, lightly licensed, and unlicensed frequencies, as defined in Table 1 below.

**Table 1.** Cisco Connected Grid WiMAX Modules for CGR 1000 Series

SKU	Description	Supported Frequency Bands
<b>CGM-WIMAX-1.4GHZ</b>	Connected Grid Module - IEEE 802.16e WiMAX 1.4 GHz	1390 MHz - 1525 MHz
<b>CGM-WIMAX-1.8GHZ</b>	Connected Grid Module - IEEE 802.16e WiMAX 1.8-1.830 GHz	1800 MHz - 1830 MHz
<b>CGM-WIMAX-2.3GHZ</b>	Connected Grid Module - IEEE 802.16e WiMAX 2.3-2.4 GHz	2300 MHz - 2400 MHz
<b>CGM-WIMAX-3.6GHZ</b>	Connected Grid Module - IEEE 802.16e WiMAX 3.3-3.8 GHz	3300 MHz - 3800 MHz

## High Capacity with Low Latency

Utilities are looking for ways to deploy high-performance applications, like video monitoring and GOOSE messaging support for distribution protection, in their distribution networks. A WiMAX-based solution provides utility network managers with a high-bandwidth network, with maximum throughput up to 10 Mbps. In addition, the CGR 1000 WiMAX Modules offer low latency - down to 20 ms - and support for five classes of WiMAX QoS. Finally, the CGR 1000 provides support for Uplink Centric Frame splits and Uplink Multiple-In-Multiple-Out (MIMO), hence providing two to three times uplink capacity, compared to off-the-shelf service provider WiMAX products.

## Secure Your Mission-Critical Traffic with Low Latency

The Connected Grid WiMAX Modules are tightly integrated with the network services provided on the CGR 1000 Series. The CGR 1000 provides a Layer 2 Tunneling Protocol version 3 (L2TPv3)-based solution for highly secure and encrypted transport of GOOSE traffic over the utility's WiMAX-based network. This solution provides the latency benefits of using a Layer 2 protocol like GOOSE, coupled with the benefit of end-to-end encryption using standards-based IPsec and FlexVPN architectures. In addition, the CGR provides standards-based mechanisms for highly secure and automated certificate management and integration with a utility's Public Key Infrastructure (PKI).

## Ease of Use and Reduced Operating Expense (OpEx)

Since WiMAX is a private network, it eliminates the monthly service provider per-connection costs. These modules provide embedded intelligence (like intelligent WAN sensing and modem reset), allowing for automated link restoration without the need for a truck roll. In addition, the Connected Grid WiMAX Modules provide detailed diagnostic information about the WiMAX WAN link, helping to enable network operators to troubleshoot any connectivity issues, as well as provide detailed performance logs to their service providers.

Refer to the software specifications in Table 3 for more details.

## Flexibility for a Broad Range of Environments

The Connected Grid WiMAX Modules and CGR 1000 routers can be deployed in many environments found in the worldwide energy infrastructure. Therefore, the product comes with a multitude of antenna and cabling options to allow for deployments in multiple environments. Refer to the antenna specifications in Table 4, cable specifications in Table 5, and accessories specifications in Table 6 for more details.

## Product Specifications

Table 2 shows the hardware specifications for the Cisco Connected Grid WiMAX modules and a partial listing of regulatory compliance and safety data<sup>1</sup>

**Table 2.** Hardware Specifications for the Cisco Connected Grid WiMAX Modules

Feature	Description
<b>Form Factor</b>	<ul style="list-style-type: none"><li>• Single Connected Grid module, no slot placement restrictions</li></ul>
<b>Dimensions (H x W x D)</b>	<ul style="list-style-type: none"><li>• 1.50 in. x 4.24 in. x 5.25 in.</li><li>• 3.81 cm x 10.77 cm x 13.34 cm</li></ul>
<b>Weight</b>	<ul style="list-style-type: none"><li>• 0.5 pounds</li></ul>
<b>Radio Capabilities</b>	
<b>Frequency Support</b>	<ul style="list-style-type: none"><li>• CGM-WIMAX-1.4GHZ: 1390 MHz - 1525 MHz</li><li>• CGM-WIMAX-1.8GHZ: 1800 MHz - 1830 MHz</li><li>• CGM-WIMAX-2.3GHZ: 2300 MHz - 2400 MHz</li><li>• CGM-WIMAX-3.6GHZ: 3300 MHz - 3800 MHz</li></ul>

Feature	Description
<b>Radio Access Method</b>	<ul style="list-style-type: none"> <li>• IEEE802.16e (2009)</li> </ul>
<b>Operation Mode</b>	<ul style="list-style-type: none"> <li>• TDD</li> </ul>
<b>Channel Bandwidth</b>	<ul style="list-style-type: none"> <li>• 3.5 MHz, 5 MHz, 7 MHz, 10 MHz</li> </ul>
<b>Frequency Resolution</b>	<ul style="list-style-type: none"> <li>• 0.25 MHz</li> </ul>
<b>Antenna Interfaces</b>	<ul style="list-style-type: none"> <li>• 2 antenna ports- QMA connector</li> </ul>
<b>Antenna Diversity Support</b>	<ul style="list-style-type: none"> <li>• 1x2 STC/STBC/MIMO-SM [Matrix A], or 2x2 STC/MIMO-SM [Matrix B]</li> </ul>
<b>Linear Output Transmit Power (Average Power)</b>	One of the following: <ul style="list-style-type: none"> <li>• 23 dBm, maximum, one spatial stream at room temperature</li> <li>• 23 dBm, maximum, each, two spatial streams</li> </ul>
<b>Transmit Power Control Range</b>	<ul style="list-style-type: none"> <li>• 10 dB minimum</li> </ul>
<b>Modulation and Coding</b>	<ul style="list-style-type: none"> <li>• Support all configuration defined in WiMAX system profile 1.0 for DL up to QAM 64 5/6</li> <li>• Support all configuration defined in WiMAX system profile 1.0 for UL up to QAM 64 5/6</li> </ul>
<b>Forward Error Correction Code (FEC)</b>	<ul style="list-style-type: none"> <li>• CC (Convolutional Codes) - 1/2 to 3/4</li> <li>• CTC (Convolutional Turbo Codes) - 1/2 to 5/6</li> </ul>
<b>Dynamic Range</b>	<ul style="list-style-type: none"> <li>• Tx dynamic range: 43 dB (-20 dBm to 23 dBm)</li> <li>• Rx dynamic range: 70 dB (-100 dBm to -30 dBm)</li> </ul>
<b>Operating Conditions</b>	
<b>Operating Temperature</b>	-40° F to 140° F (-25 to +60° C) continuous operating temperature range with IEEE 1613 type for upto +85 C for 16 hours
<b>Shock and Vibration</b>	30 G at 6 ms, Class Cm IEEE 1613 CLASS VS3 IEC 870-2-2 CLASS Cm
<b>Operating Seismic Earthquake</b>	IEC 61850-3, Class S3
<b>Altitude</b>	10,000 ft (3048 m) maximum operating temperature is de-rated with increasing altitude per IEEE1613a-2008
<b>Relative Humidity</b>	5 to 95 percent non-condensing
<b>Non-operating Conditions</b>	
<b>Temperature</b>	-40° to +185° F (-25° C to +85° C)
<b>Non-Operating Relative Humidity</b>	5 to 95 percent non-condensing
<b>Altitude</b>	10,000 ft (3000 m); maximum operating temperature is de-rated with increasing altitude per IEEE 1613a-2008
<b>Non-Operating Free-fall Drop</b>	4 in. (100 mm) per ENG-339611
<b>Operating Seismic Earthquake</b>	IEC 61850-3, Class S3
<b>Non-Operating Shock and Vibration</b>	50 - 60 G (3.76 m/s minimum) 3-500 Hz at 1.12 GRMS (BP AT 10 AND 100Hz)
<b>Immunity</b>	<ul style="list-style-type: none"> <li>• EN61000-6-2</li> <li>• EN61000-4-2 (ESD)</li> <li>• EN61000-4-3 (RF)</li> <li>• EN61000-4-4 (EFT)</li> <li>• EN61000-4-5 (SURGE)</li> <li>• EN61000-4-6 (CRF)</li> <li>• EN61000-4-11 (VDI)</li> <li>• EN 55024, CISPR 24</li> <li>• EN50082-1</li> </ul>

Feature	Description
<b>Safety</b>	<ul style="list-style-type: none"> <li>• USA: UL 60950-1</li> <li>• Canada: CAN/CSA C22.2 No. 60950-1</li> <li>• Europe: EN 60950-1</li> <li>• China: GB 60950-1</li> <li>• Australia/New Zealand: AS/NZS 60950-1</li> <li>• Rest of World: IEC 60950-1</li> <li>• CSA-certified to UL/CSA 60950-1, 2<sup>nd</sup> Ed.</li> <li>• CB report to IEC60950-1, 2<sup>nd</sup> Ed., covering all group differences and national deviations.</li> </ul>
<b>Electromagnetic Compliance</b>	<ul style="list-style-type: none"> <li>• 47 CFR, Part 15</li> <li>• ICES-003 Class A</li> <li>• EN55022 Class A</li> <li>• CISPR22 Class A</li> <li>• AS/NZS 3548 Class A</li> <li>• VCCI V-3</li> <li>• CNS 13438</li> <li>• EN 300-386</li> </ul>
<b>Radio</b>	FCC Part 2, FCC Part 22, FCC Part 24, RSS 129 and RSS 133, RSS 132 and RSS 133, EN 301 511 GSM, EN 301 908-1, and EN 301 908-2 <ul style="list-style-type: none"> <li>• CGM-WIMAX-1.4GHZ:</li> <li>• CGM-WIMAX-1.8GHZ:</li> <li>• CGM-WIMAX-2.3GHZ:</li> <li>• CGM-WIMAX-3.6GHZ:</li> </ul>

<sup>1</sup> - For more information, consult the Product Approval Database at <http://www.ciscofax.com> or consult your local Cisco representative (Cisco.com login required).

Table 3 shows the software specifications for the Cisco Connected Grid WIMAX Modules.

**Table 3.** Software Specifications for the Cisco Connected Grid WIMAX Modules

Feature	Description
<b>Software Compatibility</b>	<ul style="list-style-type: none"> <li>• 15.4(1) CG</li> </ul>
<b>Transport Modes</b>	<ul style="list-style-type: none"> <li>• IP Convergence Sublayer</li> <li>• ETH Convergence Sublayer</li> </ul>
<b>WIMAX Security</b>	<ul style="list-style-type: none"> <li>• PMKv2</li> <li>• AES-128</li> <li>• EAP-TLS/EAP-TTLS</li> <li>• Authentication: Hash-based Message Authentication Code (HMAC) and Cipher-based MAC (CMAC) support</li> <li>• Support for X.509 digital certificates (utility certificates and WIMAX forum)</li> </ul>
<b>WIMAX Quality of Service (QoS)</b>	<ul style="list-style-type: none"> <li>• Support for WiMAX QoS classes: UGS, RT, eRT, nRT, BE</li> </ul>
<b>GOOSE over WIMAX</b>	<ul style="list-style-type: none"> <li>• L2TPv3 for Layer 2 (Non-IP) Traffic</li> </ul>
<b>Network Management and Diagnostics</b>	<ul style="list-style-type: none"> <li>• Detailed WIMAX diagnostics such as Tx power, received signal strength indication (RSSI), carrier-to-interference-plus-noise-reduction (CINR), modem state, base station ID (if connected), frequency (if connected)</li> <li>• Configurable base station scan list</li> </ul>
<b>MIBs</b>	<ul style="list-style-type: none"> <li>• WIMAX MIB</li> <li>• ENTITY MIB</li> <li>• IF MIB</li> </ul>

<sup>\*</sup> For more information about CGOS software capability support, consult your local Cisco representative (Cisco.com login required).

Table 4 lists the Antenna options for the Connected Grid WIMAX Modules.

**Table 4.** Antenna Options for Connected Grid WIMAX Modules

Item	Specification
ANT-1.4-PNL-OUT-N	<ul style="list-style-type: none"> <li>Flat panel antenna</li> <li>Outdoor</li> </ul>
ANT-1.8-PNL-OUT-N	<ul style="list-style-type: none"> <li>Flat panel antenna</li> <li>Outdoor</li> </ul>
ANT-2.3-PNL-OUT-N	<ul style="list-style-type: none"> <li>Flat panel antenna</li> <li>Outdoor</li> </ul>
ANT-3.X-PNL-OUT-N	<ul style="list-style-type: none"> <li>Flat panel antenna</li> <li>Outdoor</li> </ul>

**Note:** For an extensive description of antenna options and the potential deployment scenarios, please see the following Deployment Guide:

[http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/cg\\_antenna\\_install\\_guide.html](http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/cg_antenna_install_guide.html).

Table 5 lists the RF cable options for the Connected Grid WIMAX modules.

**Table 5.** RF Cable Options for Connected Grid WIMAX modules

Item	Specification
<b>Indoor Cable Options for Cisco CGR 1120</b>	
CAB-L240-10-Q-N	10-ft (3-m) low-loss LMR 240 cable with QMA and N connectors
CAB-L240-15-Q-N	15-ft (4.5-m) low-loss LMR 240 cable with QMA and N connectors
CAB-L240-20-Q-N	20-ft (6-m) low-loss LMR 240 cable with QMA and N connectors
<b>Outdoor Cable Options for Cisco CGR 1120 &amp; CGR1240</b>	
CAB-L400-5-N-N	5-ft (1.5-m) low-loss LMR 400 cable with N connectors (straight to right angle)
CAB-L400-5-N-NS	5-ft (1.5-m) low-loss LMR 600 cable with N connectors (straight to straight)
CAB-L400-20-N-N	20-ft (6-m) low-loss LMR 400 cable with N connectors
CAB-L600-30-N-N	30-ft (9.14-m) ultra-low-loss LMR 600 cable with N connectors

Table 6 lists additional accessories available for Connected Grid WIMAX modules.

**Table 6.** Additional accessories for Connected Grid WIMAX modules

Item	Specification
CGR-LA-NM-NF	Lightning arrestor for CGR 1240
CGR-N-CONN-WIMAX	N connectors (quantity of 2) for CGR 1240 for WIMAX - ext. antennas
CGR-LA-NF-NF	Lightning arrestor for CGR 1120
ANT-ADPTR-Q-TNC	Connecting adapter for CGR antennas- QMA to TNC for CGR 1120

**Note:** For an extensive description of antenna and cable options and the potential deployment scenarios, please see the following Deployment Guide:

[http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/cg\\_antenna\\_install\\_guide.html](http://www.cisco.com/en/US/docs/routers/connectedgrid/antennas/installing/cg_antenna_install_guide.html).

## Ordering Information

These products are available to any Cisco authorized partner. For more information, contact your Cisco representative.

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## For More Information

For more information on the Cisco Connected Grid WiMAX Modules for the Cisco CRG 1000 Series, visit: <http://www.cisco.com/en/US/products/ps12279/index.html>.

For more information on the Cisco CGR 1000 Series, visit: <http://www.cisco.com/go/cgr1000>.

For more information on the Cisco Field Area Network (FAN) solution visit: <http://www.cisco.com/go/fan>.




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