Cisco Wireless Gateway for LoRaWAN

The Cisco® Wireless Gateway for LoRaWAN supports the LoRa™ physical layer technology and complies with the LoRaWAN specification defined by the LoRa Alliance™ to provide LPWA (Low Power Wide Area) wireless connectivity for low data rate, battery-powered devices and sensors. Through the unlicensed sub-GHz radio, a wide variety of Internet of Things (IoT) endpoints that require low power operation or long-range transmission distances can now be connected and located more economically than ever before. Example use cases include asset tracking, water and gas metering, environmental monitoring, waste management, smart street lighting, smart agriculture, and many others.

This product is a carrier-grade, ruggedized product specifically designed for harsh outdoor deployments, and also suitable for indoor applications. It adheres to the Semtech next-generation (version 2) gateway hardware reference design, offers up to 16 uplink channels, and provides geolocation capabilities through Time Difference of Arrival (TDOA) and Received Signal Strength Indication (RSSI) techniques.

Solution overview

LoRa

LoRa is a disruptive RF physical layer modulation technology that offers long-distance wireless connectivity, excellent power efficiency, very high receiver sensitivity, robust spectrum spreading, and securely encrypted transmissions. It operates on unlicensed Industrial, Scientific, and Medical (ISM) frequencies, for which 863 - 870 MHz spectrum and spectrum subsets are available for Europe, the Middle East, Africa, and India, and 902 - 928 MHz spectrum and spectrum subsets can be utilized in the Americas and in Asia-Pacific countries.
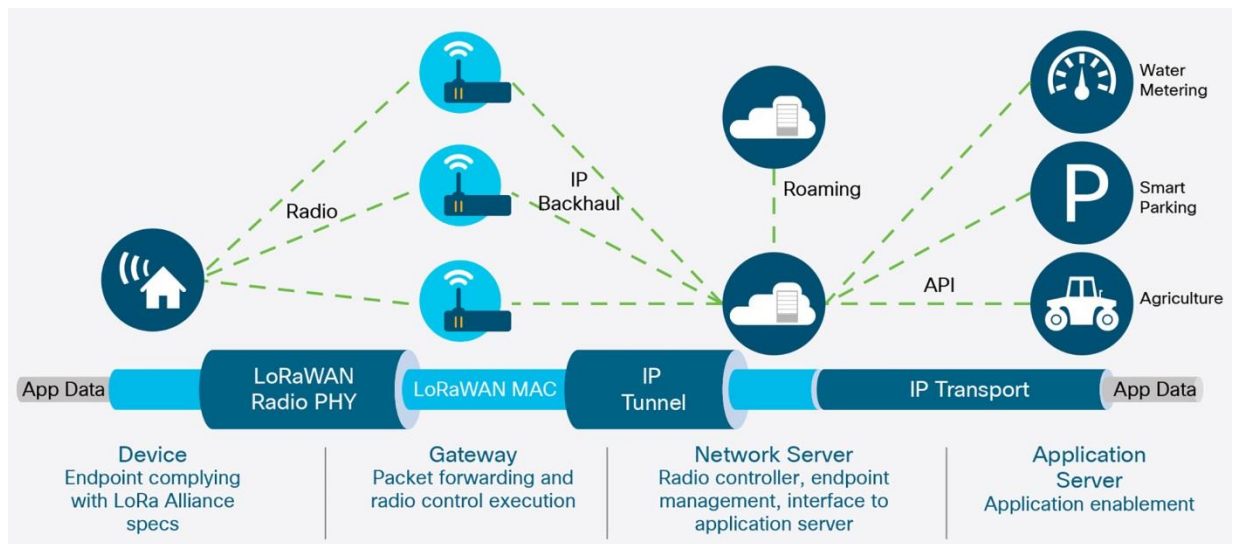
LoRaWAN

LoRaWAN is a MAC (Media Access Control) protocol specification defined by the LoRa Alliance that complements the LoRa physical layer. It is supported by an established ecosystem of LoRaWAN compliant devices that are available from multiple vendors, and which can be certified for interoperability by the LoRa Alliance.

The end-to-end LoRaWAN network architecture consists of four elements (Figure 1):

- **Device:** Endpoints such as water and gas meters, parking sensors, asset trackers, environmental sensors, or smoke detectors.
- **Gateway:** The wireless infrastructure required to provide radio coverage and packet forwarding for the devices, as well as IP backhaul to the network server. Cisco offerings include this Gateway and the IoT Field Network Director, which may serve as the gateway management system.
- **Network server:** The centralized radio controller, which performs radio management, the provisioning and authentication of devices, and the delivery of the data to one or multiple application servers through a set of Application Programming Interfaces (APIs). Cisco offers a partner network server solution and provides an SDK for this Gateway for integration with alternative network server solutions.

Figure 1.   LoRaWAN Network Architecture

Cisco's LoRaWAN solution offerings are available for service provider, public sector, and enterprise customers.

Hardware overview

The Cisco Wireless Gateway for LoRaWAN supports LoRaWAN Class A, B, and C device types, spreading factors, Adaptive Data Rates (ADR), channel diversity, integrated GPS time synchronization, and geolocation with hardware support for TDOA and RSSI based trilateration. Two models are available for domestic and international customers:

- IXM-LPWA-800-16-K9: Operates on the subsets of 863 - 870 MHz ISM frequencies
- IXM-LPWA-900-16-K9: Operates on the subsets of 902 - 928 MHz ISM frequencies
- IXM-LPWA-900-16-K9 : Operates on the 920.2-923.4 MHz for Thailand regulatory

This product is IP67 rated and can be deployed outdoors on a pole, on a service provider's cellular base station tower, on the roof of a building, or on a wall. It can also be installed in indoor locations such as a parking garage, a basement, or a ceiling inside a building. It comes equipped with support for two powering methods (802.3at POE+ and 48 VDC), two RF antenna connectors, a GPS antenna, a USB port, and a console port, as illustrated in Figure 2.

Figure 2.   Product interfaces and features
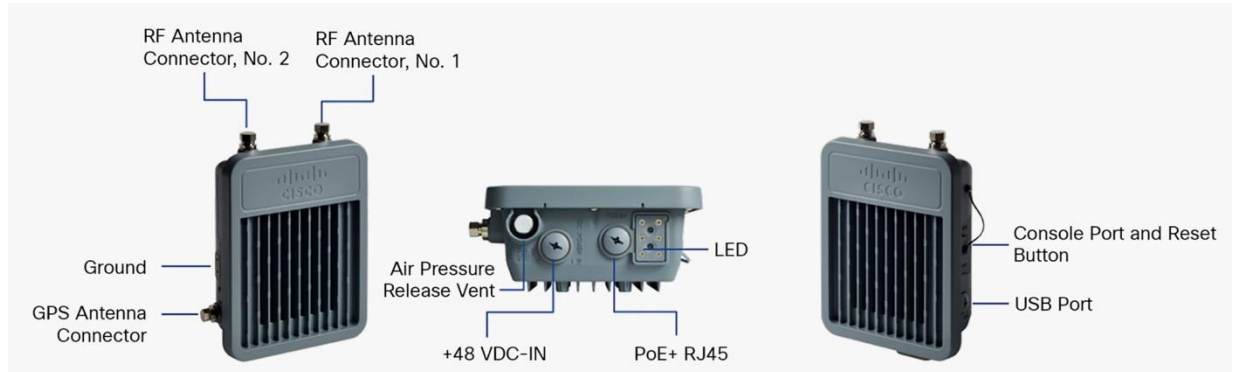
Key benefits

Versatile backhaul options

This product can be configured as a radio interface of the Cisco Industrial Routers 807, 809, 829, Connected Grid Router 1120 and 1240. One or multiple gateways are connected to the LAN port(s) of the IR807, IR809, IR829, CGR-1120 or CGR-1240 via Ethernet or VLANs with encrypted links. Through this configuration, it provides LoRaWAN radio access while the IR809 or IR829 offer backhaul support for Gigabit Ethernet (electrical or fiber), 4G/LTE, or Wi-Fi. This offers customers maximum flexibility in a complex network environment: access to a fiber network through a Small Form-factor Pluggable (SFP) interface, the ability to connect to a cellular network through a single LTE or dual-LTE radios for redundancy, and the ability to connect to a Wi-Fi infrastructure or mesh network.

In addition, this product can be deployed as a standalone unit and directly connected to existing Ethernet switches or routers through its Fast Ethernet port. In standalone, it provides both LoRaWAN radio access and essential IP networking features. This deployment option is suitable for fully secure and trusted networks; for example, customers may directly connect it to a service provider's intranet from an access switch or router that may be available at the service provider's cellular base station site.

Robust security

The advanced features of the Cisco IOS® Software in the Cisco IR807, IR809, IR829, CGR-1120 and CGR-1240 can help customers quickly create a resilient and secure data path to their back-end platform over the public Internet. The Cisco IOS Software advanced security, firewall, routing, management, and Quality of Service (QoS) features enable you to easily overcome the challenges of relying on less secure or untrusted networks for the deployment of the LoRaWAN infrastructure. When this product is configured as a radio interface of IR807, IR809, IR829, CGR-1120 and CGR-1240 the LAN port can be set to restrict access to only the gateway, and the Ethernet link between the two devices can utilize an IP Security (IPsec) tunnel for the encrypted transport of the traffic.

This product embeds a Linux Container (LXC) inside its operating system. This virtualization can help a network server partner to easily adopt its LoRa radio control agent (Packet Forwarder). The radio control agent is strictly isolated from the host operating system, and assigned dedicated CPU and memory resources. The access privileges of the third-party software mandate that it can only run in the LXC, yet not visit the operating system kernel.

Geolocation capability

This product is equipped with hardware support for precise timestamping and high-accuracy GPS/GNSS for geolocation applications. Customers can take advantage of this capability to approximate the position of endpoints, yet without requiring GPS/GNSS to be present in the endpoints themselves. This dramatically reduces the power consumption compared with endpoints with GPS/GNSS built in. It is particularly well suited for geofencing (presence) and coarse asset tracking use cases.

Enhanced spectrum utilization

This product features two LoRa baseband subsystems, allowing it to support up to 16 uplink channels and thus receive up to 16 data packets concurrently. This design improves the radio spectrum utilization to up to 4 MHz channel bandwidths and thereby increases the overall system capacity.

Frequency channel diversity

This product supports software-configurable frequency channel diversity. Frequency channel diversity effectively aids in the propagation of the wireless signal from endpoints to the gateway, especially in multipath environments and for geolocation applications.

Ability to deploy omnidirectional and sectorized cells

This product allows to achieve both omnidirectional and sectorized (directional) propagation patterns. Omnidirectional cells are simply established through the usage of an omnidirectional antenna with a single gateway unit, while tri-sector cells can consist of three of the gateways with a 120-degree sector antenna[1] per each unit. Sectorization is useful for high-density deployments as it effectively increases the capacity of the cell.

Zero-touch provisioning

This product can be easily configured and managed by the Cisco IoT Field Network Director (FND). Zero-touch provisioning allows FND users to automatically and securely download pre-defined configurations to the gateway. Customers benefit from reduced deployment time and cost, in particular for deployments that require a large number of gateways to be installed.

Furthermore, FND supports remote gateway firmware upgrades, configuration backup and restore, IPsec tunnel setup automation and monitoring, and provides a user-friendly dashboard that includes performance statistics and alarm reports.

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[1] Available from third-party antenna vendors

Product features

Table 1 summarizes the features of the Cisco Wireless Gateway for LoRaWAN.

Table 1. Features and descriptions

Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
Product components	• Standalone unit	• Attached to IR809 LAN Port	• Attached to IR829 LAN Port
Ethernet backhaul	• 1x FE built in the Gateway	• 1x GE on IR809	• 1x SFP module for copper and fiber on IR829
4G/LTE backhaul	–	• Single radio, dual SIMs on IR809	• Single or dual radios, dual SIMs on IR829
Wi-Fi backhaul	–	–	• 2.4 GHz/5 GHz 802.11n
PoE+ injector for the Gateway	• External	• External	• PoE+ module option in IR829 to supply power to one Gateway
Cisco IOx support	–	• Yes, on IR809	• Yes, on IR829
IP features	• DHCP client (IPv4) • Static IP (IPv4) • PPPoE • 802.1Q VLAN tagging • Network Address Translation (NAT) • Domain Name System (DNS) • Network Time Protocol (NTP)	• Routing Information Protocol Versions 1 and 2 (RIPv1 and RIPv2) • Generic Routing Encapsulation (GRE) and Multipoint GRE (MGRE) • Cisco Express Forwarding • Standard 802.1d Spanning Tree Protocol • Layer 2 Tunneling Protocol (L2TP) • Layer 2 Tunneling Protocol Version 3 (L2TPv3) • NAT • DHCP server, relay, and client (IPv4 and IPv6) • Static IP (IPv4 and IPv6) • Dynamic DNS (DDNS) • NTP • DNS Proxy • DNS Spoofing • Access Control Lists (ACLs) • IPv4 and IPv6 Unicast and Multicast • Open Shortest Path First (OSPF) • Border Gateway Protocol (BGP) • Enhanced Interior Gateway Routing Protocol (EIGRP) • Virtual Route Forwarding (VRF) Lite • Next-Hop Resolution Protocol (NHRP)	
Security features	• IPsec (open source) • Two IPsec tunnels – support Active/Active or Active/Standby mode • Public Key Infrastructure (PKI) • Simple Certificate Enrollment Protocol (SCEP, open source) • Network Address Translation (NAT) traversal • Software image secure boot • Cisco ACT2 hardware IEEE 802.1ar secure identity • Support SHA256 for firmware signature and uboot • Authentication of the firmware image before flashing it	**Secure Connectivity:** • Secure Sockets Layer (SSL) VPN for secure remote access • Hardware-accelerated Data Encryption Standard (DES), 3DES, Advanced Encryption Standard (AES) 128, AES 192, and AES 256 • PKI support • Twenty IPsec tunnels • Cisco Easy VPN Solution client and server • Network Address Translation (NAT) transparency • Dynamic Multipoint VPN (DMVPN) • Tunnel-less Group Encrypted Transport VPN • FlexVPN • IPsec stateful failover • VRF-aware IPsec • IPsec over IPv6 **Cisco IOS Firewall:** • Zone-based policy firewall • VRF-aware stateful inspection routing firewall • Stateful inspection transparent firewall • Advanced application inspection and control • Secure HTTP (HTTPS), FTP, and Telnet Authentication Proxy	

Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
	• Password protection in filesystem	• Dynamic and static port security • Firewall stateful failover • VRF-aware firewall **Integrated threat control:** • Control-plane policing • Flexible packet matching • Network foundation protection **Others:** • Software image secured boot • Cisco ACT2 hardware IEEE 802.1ar secure identity • LAN port authentication to access IXM Gateway • IPsec encryption between IR809 or IR829 and IXM Gateway	
Quality-of-service (QoS) features	-	• Low-Latency Queuing (LLQ) • Weighted Fair Queuing (WFQ) • Class-Based WFQ (CBWFQ) • Class-Based Traffic Shaping (CBTS) • Class-Based Traffic Policing (CBTP) • Policy-Based Routing (PBR) • Class-Based QoS MIB • Class of Service (CoS) to Differentiated Services Code Point (DSCP) mapping • Class-Based Weighted Random Early Detection (CBWRED) • Resource Reservation Protocol (RSVP) • Real-Time Transport Protocol (RTP) header compression (cRTP) • Differentiated Services (DiffServ) • QoS preclassify and prefragmentation • Hierarchical QoS (HQoS)	
ISM band support	• EU 863 - 870 MHz, India 865 - 867 MHz, U.S. 902 - 928 MHz, Australia 915 - 928 MHz, and AS 923 MHz, 902.2-923.4MHz Thailand • Support for up to 16 uplink channels, 4 MHz bandwidth		
LoRa technology	• Semtech version 2 gateway hardware reference design compliance • Adaptive Data Rates (ADR) • Spreading Factors • Channel diversity (no diversity and full diversity)		
LoRaWAN specification	• LoRaWAN specification 1.0.1, 1.0.2 and 1.1 (draft) release compliant • Support for Class A, B and C endpoints		
Radio spectrum sniffer	• Online scanning of the interference noise on the RF channel		
LTE coexistence	• Insertion interference reduction to LTE band 20 uplinks (832 – 862 MHz)		
Geolocation capability	• Through TDOA and RSSI for GPS-free endpoints		
Linux Container (LXC)	• Host third-party LoRa Packet Forwarder through software virtualization • Support unprivileged mode		
IoT FND management features	• Zero-touch provisioning: automatically download configuration file to the Gateway, IR809 and 829 during registration • Automatically download third-party LoRa Packet Forwarder to the Gateway during its initial registration • IPSec tunnel setup automation • Configure the settings of Gateway, the IR809 and IR829 • Firmware upgrade • Configuration file backup and restore • Gateway reboot • Gateway model • Gateway ID (name and serial number) • Gateway operational status • Gateway up time • Gateway enclosure cover close/open • WAN IP address		

Features	Operates as Standalone Gateway	Operates as a Radio Interface of IR809	Operates as a Radio Interface of IR829
	• IPsec tunnel status • Firmware version • Boot loader version • CPU usage rate • Device temperature • Alarm and event reports • GPS status • FPGA version • HAL driver version • Antenna RSSI value • AES key • Packet Forwarder ID, status, firmware version, and public key installed		

Product specifications

Tables 2 and 3 list the Gateway part numbers and specifications, respectively. Table 4 contains the performance specifications, and Table 5 provides product compliance information. Table 6 lists the RF antenna specifications, and Table 7 lists the GPS antenna specifications.

Table 2.   Product part numbers and applicable regions

Part Number	Description
IXM-LPWA-800-16-K9	• Cisco wireless gateway for LoRaWAN, operates on the frequency subset of 863 - 870 MHz ISM band, applicable to LoRaWAN regional profile for Europe, Middle East, Africa and India
IXM-LPWA-900-16-K9	• Cisco wireless gateway for LoRaWAN, operates on the frequency subset of 902 - 928 MHz ISM band, applicable to LoRaWAN regional profile for Americas, Asia and Pacific
IXM-LPWA-900-16-K9	• Cisco wireless gateway for LoRaWAN, operates on the frequency subset of 920.2 – 923.4 MHz ISM band, applicable to LoRaWAN regional profile for Thailand

Please contact your local Cisco account representative for the region and country certification availability for each model.

Table 3.   Product specifications

Specification	Description
Physical Specifications	
IP rating	• Outdoor, IP67
External dimensions (H x W x D)	• 281 (incl. RF antenna connector) x 206 (not incl. GPS antenna connector) x 100 (incl. mount screws) mm or 11 x 8 x 4 inches
Net weight	• 3.6 kg (8 pound)
Enclosure material	• Aluminum, die-cast
Mounting options	• Wall and pole mount
Operating temperature range	• -40 to 158°F (-40 to 70°C) without solar load
Operating humidity	• 5 to 95%, noncondensing
Altitude	• Operational: 13,800 feet (4,206 meters) • Nonoperational: 15,000 feet (4,572 meters)
Wind resistance	• Up to 100 mph (sustained) • Up to 165 mph (gusts)
Thermal cooling	• Passive (fan-less)
Compute and Storage	
CPU	• 1.33 GHz, single core

Specification	Description
Memory	• 1 GB DDR4 RAM
Flash memory	• 4 GB
Interfaces and Controls	
Ethernet	• 1x 10/100 Mbps Fast Ethernet (RJ-45) • Support for PoE+ (802.3at) PD
RF antenna connectors	• Two extendable RF antennas, N-type
GPS antenna connector	• One extendable GPS antenna, TNC
Console	• 1x RJ-45
USB	• 1x USB 2.0, type A connector
Reset button	• Push to reboot system or for factory default recovery
Power	
Power input options	• PoE+, 802.3at • DC-In, 48 VDC, 0.7 A
Power consumption	• 30 Watts maximum
Ground	• 1x ground connector
GPS	
Built-in GPS	• High-sensitivity GNSS module • GPS L1C/A, QZSS L1C/A, SBAS L1C/A, GLONASS L1OF, and Galileo E1B/C ready • Time pulse accuracy <20 ns (clear sky) • NMEA 0183, Version 4.0
LEDs	
System LED	• Off: Device not powered on • Red: Alarm • Green solid: System ready
Mode LED	• Off: The gateway operates as standalone unit • Green solid: The gateway operates as the radio interface of IR 807, 809, 829, CGR-1120 and 1240
Operating System	
Linux	• Version 4.4.52
Device Manufacturing Security	
ACT2	• Cisco Anti-Counterfeit Technology, 2nd Generation

Table 4.   Product performance specifications

Specification	Description
Sensitivity	
Receiver sensitivity	• Up to -139.5 dBm
Output Power	
IXM-LPWA-800-16-K9	• For the 868 MHz ISM band in Europe, supports up to +27 dBm Effective Radiated Power (ERP) on the high-power channel at 869.525 MHz and +14 dBm at other channels, complying with EN 300 220-2
IXM-LPWA-900-16-K9	• For the 915 MHz ISM band in USA, supports up to +30 dBm conducted output power with 5 dBi gain antenna, complying with FCC 15.247 DTS rules • For the 920.2 – 923.4MHz in Thailand, supports up to 27dBm EIRP

Table 5.   Product certification and compliance

Specification	Applicable Regions
Safety	
IEC 60950-1	• INTL
EN 60950-1	• EU
UL 60950-1	• USA
EN 50385	• EU
CAN/CSA-C22.2 No. 60950-1	• Canada
CAN/CSA-C22.2 No. 60950-22	• Canada
UL 60950-22	• USA
RSS-102	• Canada
FCC Part 2	• USA
IEC 60529	• INTL
EMC Emission	
FCC Part 15 Class A	• USA
EN 55032 Class A	• EU
ICES-003	• Canada
CISPR 32	• Australia and New Zealand
VCCI Class A	• Japan
EMC Immunity	
EN 55024	• EU
EN 301 489-1/-3	• EU
Radio	
EN 300 220-2	• EU
EN 300 440-2	• EU
AS/NZS 4268	• Australia and New Zealand
FCC Part 15.247	• USA
RSS-247	• Canada
ARIB STD-T108	• Japan
NBTC	• Thailand

Table 6.   Product RF antenna specifications

Specification	Applicable Regions
ANT-LPWA-DB-O-N-5	• Type: Omnidirectional

Specification	Applicable Regions
	• Operating frequency range: 863 - 928 MHz • Gain: 5 dBi • Environmental: Outdoor, IP67 rated • Operating temperature range: -40 to 158°F (-40 to 70°C) • Mounting: Wall and pole • Impedance: 50 Ohms • VSWR: 1.5 • Half power beam width: H:360°, V:30° • Polarization: Vertical • Weight: 790 g (not including the mounting kit) • Height: 692 mm • Diameter: 33 mm (mounted part) and 25 mm (body part) • Lighting protection: DC grounded • Connector: Type N Female • Wind resistance sustained: Up to 100 mph • Wind resistance gusts: Up to 165 mph • Datasheet specs URL: https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/antennas/installing-combined/industrial-routers-and-industrial-wireless-antenna-guide/ANT-LPWA-DB-O-N-5.pdf
ANT-WPAN-OD-OUT-N	• Type: Omnidirectional • Operating frequency range: 863 - 928 MHz • Gain: 1.5 dBi • Environmental: Outdoor and indoor • Operating temperature range: -40 to 185°F (-40 to 85°C) • Mounting: Direct chassis or bulkhead mount • Impedance: 50 ohms • VSWR: 1.5 • Half power beam width: H:360°, V:30° • Polarization: Vertical, liner • Weight: 120 g • Height: 20 mm • Connector: Type N Male • Datasheet specs URL: https://www.cisco.com/c/en/us/td/docs/routers/connectedgrid/antennas/installing-combined/industrial-routers-and-industrial-wireless-antenna-guide/ANT-WPAN-OD-OUT-N.pdf

Table 7.   GPS antenna specifications

Specification	Applicable Regions
ANT-GPS-OUT-TNC	• Type: Patch, active • Environmental: Outdoor • Height: 3.2 in. (8.13 cm) • Width (maximum, at base):1.75 in. (4.45 cm) • Operating frequency range: 1,575.42 MHz • Impedance: 50 ohms, nominal • VSWR: 2.0 maximum in band • Gain: 4 dBi • Minimum gain: 1 dBi @ 10-degrees elevation • Pattern type: Hemispherical • Polarization: Circular RHCP • LNA gain: 25 dB +/–2 dB, DC voltage: 3 to 5 VDC • Out-of-band attenuation: 60 dB minimum at 1575 +/– 50 MHz • Current draw: 20 mA maximum @ 3.3 VDC +/– 0.3 VDC • Operating temperature: -40 to 185ºF (- 40 to 85ºC) • Connector: Right-angle MCX (male) • Wind-speed rating: 165 mph • Compliance: ROHS

Ordering information

Table 8 provides ordering information for the Cisco LoRaWAN Gateway and associated accessories.

Table 8.   Ordering information

Part Number	Product Description	Note
Base Unit		
IXM-LPWA-800-16-K9	Cisco wireless gateway for LoRaWAN, operates on the frequency subset of 863 - 870 MHz ISM band, applicable to LoRaWAN regional profile for Europe, Middle East, Africa and India	
IXM-LPWA-900-16-K9	Cisco wireless gateway for LoRaWAN, operates on the frequency subset of 902 - 928 MHz ISM band, applicable to LoRaWAN regional profile for Americas, Asia (not for India and China) and Pacific	
Mount Kit		
AIR-ACC1530-PMK1	Pole/Wall Mount Kit	1 per base unit
ACC-LPWA-HDWR-KIT	Cable gland and grounding lug	1 per base unit
RF Antenna		
ANT-LPWA-DB-O-N-5	Outdoor omni-antenna, operates on 863-928 MHz, 5 dBi, type N female connector	1 or 2 per base unit
ANT-WPAN-OD-OUT-N	Outdoor/indoor omni-antenna, operates on 863-928 MHz, 1.5 dBi, type N male connector	1 or 2 per base unit
GPS Antenna		
ANT-GPS-OUT-TNC	Outdoor GPS antenna with integrated 15-ft cable, type TNC connector	1 per base unit
Software and License		
SW-IXM-LPWA-K9	Cisco software for LoRaWAN gateway	1 per base unit
L-IOTFND-LORAWAN	Cisco IOT Field Network Director (FND) license to manage the LoRaWAN gateway	1 per base unit

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For more information

For more information about the Cisco wireless gateway for LoRaWAN, please visit https://www.cisco.com/go/lorawan or contact your local Cisco account representative.

Cisco and partner services for the Enterprise Networks Architecture

Enable the Cisco Enterprise Networks Architecture and the business solutions that run on it with intelligent, personalized services from Cisco and our partners. Backed by comprehensive networking expertise and a broad ecosystem of partners, these services can help you plan, build, and run a network that enables you to expand geographically, embrace new business models, and promote business innovation. Whether you are looking to transition to a Cisco ONE Enterprise Networks Architecture, solve specific business problems, or improve operational efficiency, we have a service that can help you get the most from your IT environment. For more information, visit https://www.cisco.com/go/services.

Warranty coverage and technical service options

The Cisco wireless gateway for LoRaWAN comes with 5-year limited hardware warranty. Adding a contract for a technical service offering, such as Cisco SMARTnet® Service, provides additional benefits not available with the warranty, including access to operating system updates, Cisco.com online resources, and Cisco Technical Assistance Center (TAC) support services. Table 9 shows the available technical services.

For information about Cisco warranties, visit https://www.cisco.com/go/warranty.

For information about Cisco Technical Services, visit https://www.cisco.com/go/ts.

Table 9. Cisco services and support programs

Service and Support	Features
Cisco SMARTnet Service	• Global access to the Cisco TAC 24 hours a day • Unrestricted access to the extensive Cisco.com resources, communities, and tools • Next-business-day, 8 x 5 x 4, 24 x 7 x 4, and 24 x 7 x 2 advance hardware replacement[1] and onsite parts replacement and installation available • Ongoing operating system software updates within the licensed feature set[2] • Proactive diagnostics and real-time alerts on Cisco Smart Call Home-enabled devices
Cisco Smart Foundation Service	• Next-business-day advance hardware replacement as available • Business-hours access to Small and Medium-sized Business (SMB) Cisco TAC (access levels vary by region) • Access to Cisco.com SMB knowledge base • Online technical resources through Smart Foundation Portal • OS software bug fixes and patches

[1] Advance hardware replacement is available in various service-level combinations. For example, 8 x 5 x NBD indicates that shipment will be initiated during the standard 8-hour business day, 5 days a week (the generally accepted business days within the relevant region), with NBD delivery. Where NBD is not available, same-day shipping is provided. Restrictions apply; review the appropriate service descriptions for details.

[2] Cisco operating system updates include the following: maintenance releases, minor updates, and major updates within the licensed feature set.

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