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Cisco Solution for LoRaWAN

Connecting the unconnected through Cisco Solution for LoRaWAN

Around the world, tremendous amounts of things such as water meters, gas meters, oil tanks, street lights, parking lots, trash bins, manhole covers, pipelines, hydrants, and noise and smoke detectors are being massively deployed in cities. These things were not connected to the network in the past because of the constraints of power supply availability at the installation site. This is also the case in rural areas, leaving vast farmlands and scattered cattle unconnected.

The Cisco® LoRaWAN solution is helping customers to connect these things cost-effectively. It complies with the LoRa technology and LoRaWAN specification defined by the LoRa Alliance operating on unlicensed radio bands, such as 863–870 MHz (or subset) for Europe, the Middle East, Africa, and India and 902–928 MHz (or subset) for the Americas, Asia, and the Pacific. It is specifically designed and optimized for use cases powering end devices by batteries over years and propagating data by radio over a distance of miles/kilometers.

LoRa is a radio Physical layer (PHY) modulation technology provided by Semtech focusing on battery-powered endpoints over long-range radio connectivity. It offers long air propagation distance, low power consumption, high receiving sensitivity, low data rates, robust spectrum spreading, and secured encryption transmission.

Benefits

- Fully compliant with LoRa technology and LoRaWAN specification and regional radio profiles

- Complete solution including Cisco ruggedized gateway, gateway IP management system (Cisco IoT FND), and partner's LoRaWAN Network Server

- Robust end-to-end securities

- Distinguished LoRaWAN geolocation capability for GPS chipset-free endpoints

- Applicable to world-wide market and all segments of customer

- Open standard, strong eco-system and long-term evolution

- Flexible packages for Service Provider, Cities and Enterprise customers

Features

- Support for the radio frequency subset of 863– 870 MHz and 902–928 MHz ISM band, in compliance with LoRaWAN RF regional profiles (EU868, US915, AS923, IN865, AUS915, RU868)

- Support for up to 16 uplink channels

- Support for endpoint class-A, B, and C; spreading factors; adaptive data rate; and channels diversity

- Support for Listen-Before-Talk (LBT) for Japan local regulation (AS923 profile)

- LoRaWAN Geolocation through Time Differential of Arrival (TDoA) and Received Signal Strength Indicator (RSSI)

- Zero-touch provisioning gateway management through IOT FND

LoRaWAN is a Media Access Layer (MAC) protocol specification defined by the LoRa Alliance (https://www.lora-alliance.org) on top of the LoRa radio physical layer. The LoRa Alliance is an open and nonprofit standards association that includes hundreds of registered members from service providers, solution providers, service integrators, application developers, and sensor and chipset manufacturers. The association members are collaborating together to build an open global standard for a secure, carrier-grade Internet of Things (IoT) ecosystem. Cisco is one of founders of the LoRa Alliance and keeps driving the success of customer use cases.

The Cisco solution can be used to support the customer use cases shown in Figure 1.

Figure 1. Customer use cases

Water and Gas Metering	Public Security	Street Lighting	Smart Parking
Location Tracking	Leak Detection	Disaster Precaution	Livestock
Environment Monitoring	Smart Energy	Waste Management	Agriculture

Ruggedized for outdoor and indoor deployment

The gateway is a ruggedized product at IP67 grade with support for an extended operating temperature range. It is applicable to deploy in outdoor and industrial harsh environments, either indoor or outdoor on the top of a tower, roof top or pole in an open field.

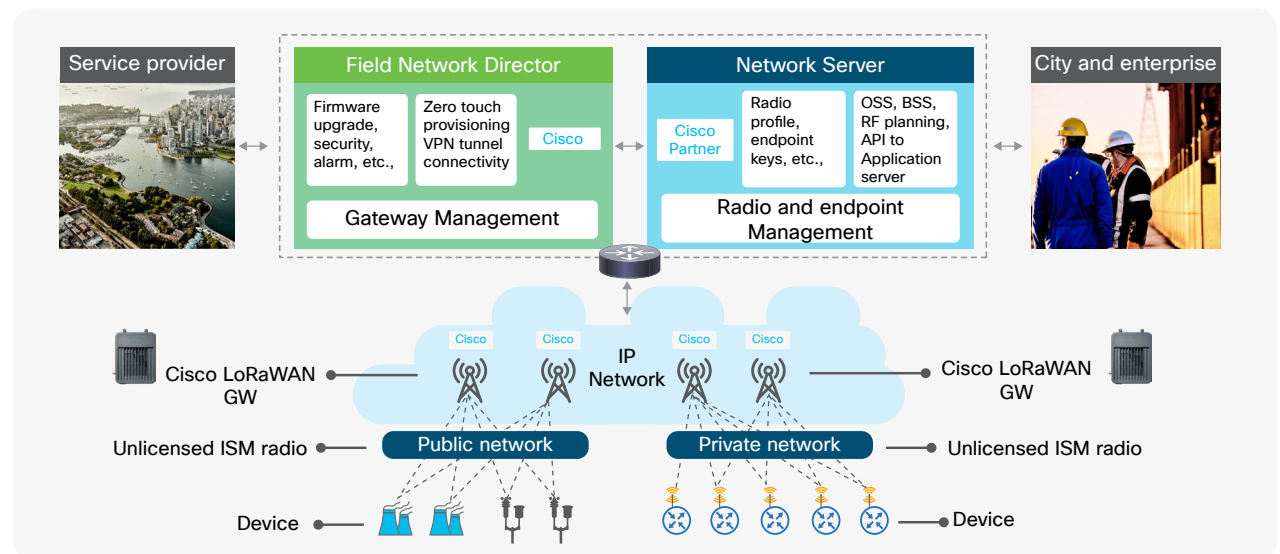## Compliant with LoRa and LoRaWAN specifications

The gateway supports end-device types of Class A, B and C, GPS clock timing synchronization, channel diversity, spreading factors, adaptive data rate (ADR). It also supports the regional frequency profile defined for LoRa Alliance such as EU 863-870 MHz, India 865-867 MHz, US 902- 928 MHz, Australia 915-928 MHz, Russia 864-870 Mhz and AS 923 MHz.

Cisco Solution for LoRaWAN

The Cisco solution (Figure 2) offers customers a fully integrated and functional infrastructure, including the following elements:

- **Gateway:** IP67 ruggedized outdoor/indoor product for LoRa radio access
- **IoT Field Network Director:** gateway IP management system
- **LoRaWAN Network Server:** the centralized LoRaWAN controller for LoRaWAN radio management of gateways and end-devices

Figure 2. Cisco Solution for LoRaWAN

Cisco LoRaWAN gateway

The Cisco Gateway complies with the Semtech version 2.0 gateway hardware reference design, with two of Semtech SX1301 baseband chipsets, FPGA, DSP, and high-accuracy built-in GPS.

The Cisco Gateway provides the following benefits to address customers' diverse deployment requirements.

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Rich backhaul options

The gateway work as a standalone unit with its built-in Fast Ethernet backhaul, such as to access to LAN switches, routers, Wi-Fi AP or other IP interface. It can also be configured and managed as virtual IOS interface(s) of Cisco Industrial Router 807, 809, 829 and Connected Grid Router 1120 and 1240. At this configuration, the Gateway provides LoRa radio access and IR809/829 offers IP backhauls, such as Gigabit Ethernet, Fiber, 4G/ LTE, Wi-Fi.

Robust securities

The gateway embeds a Linux Container (LXC) inside its OS. This approach is strictly to isolate the 3rd party software from the host OS with the dedicated CPU and memory resource. Two IPsec VPN tunnels can be configured in standalone mode between the gateways and the operation center(s) hosting the LoRaWAN Network Server(s). The Cisco advanced IOS features provided by IR807/809/829 and CGR1120/1240 can help customer to easily create robust and secured data path crossing public internet to their back-end platform. The Cisco IOS advanced features of security, firewall, routing and QoS enables the customers to easily overcome the challenges to leverage less secure and untrusted network to deploy the LoRaWAN gateway.

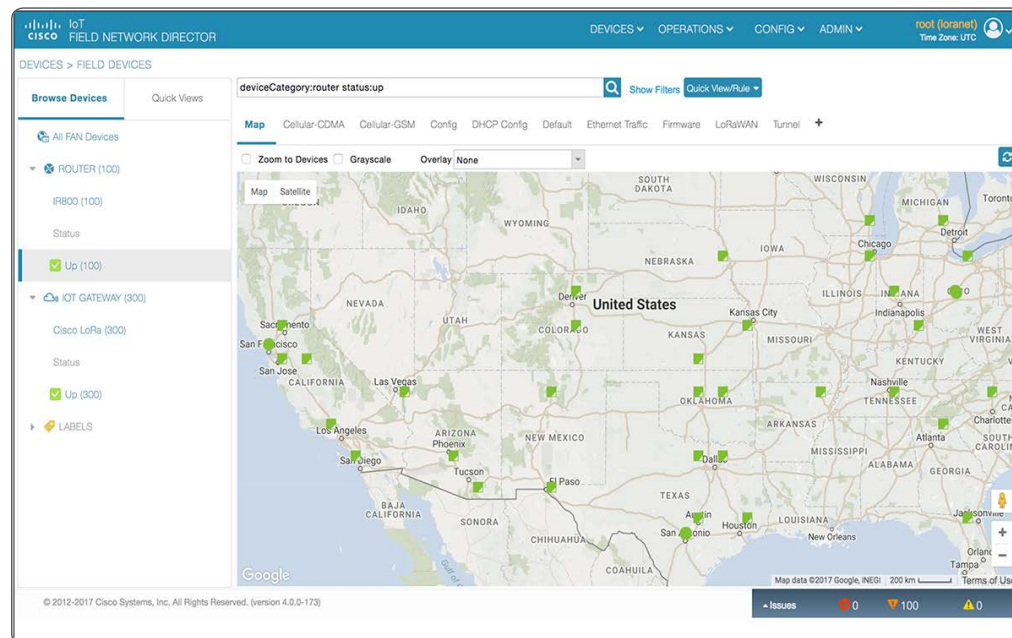## Distinguished Geolocation Capability

The gateway embeds FPGA, DSP and high accuracy GPS specifically designed for LoRaWAN geolocation through TDoA and RSSI. Compared to the traditional built-in GPS chipset endpoint with higher power consumption, this capability can locate the position of GPS chipset-free endpoint at a lower power consumption level.

Cisco IoT Field Network Director (FND)

The Cisco IoT FND provides zero-touch provisioning capability to automatically download predefined configuration data to the gateway when power is on. This capability can help customers to avoid the huge workload needed to manually configure the gateway, especially in massive deployment.

Cisco IoT FND supports gateway firmware upgrade, configuration file backup and restore, IPSEC tunnel setup automation and monitoring, gateway information dashboard display, alarm reports, and performance statistics. (See Figures 3)

Figure 3. Cisco IoT FND

Next steps

To learn more about the Cisco solution and product, visit www.cisco.com/go/lorawan and http://www.cisco.com/go/fnd.

Partner's network server

This server offers functions for end-device management, radio controllers, API interfaces to the application platform, OSS and BSS interfaces, user portals, and RF planning tools.

Cisco LoRaWAN solution offering packages

Cisco offers customers two solution packages as below

Service provider edition	Enterprise edition
Applicable customer	**Applicable customer**
• Build and operate a public network to sell LoRa access subscription package	• Build private network for their own use cases
• Mobile SP, Cable/Broadband/WiFi/Broadcast SP, Cities	• Utilities, Oil&Gas, Manufacturing, Logistics, Agriculture, Smart City, Universities, Governments
Benefits	**Benefits**
• High scalable - Supports over thousands of GWs and millions of sensors	• Cost-effective - Pay as you growth
• Full functions - Billing, CDR, single/multi-tenant, TDOA geolocation capability, multiple radio profiles	• Low entry point - Supports up to 100 Gateways and 20K sensors
	• Easy installation - Single software image, plug-and-play
	• Easy operation - Simplified admin GUI
Deployment model	**Deployment model**
• IOT FND - On-premise	• IOT FND - On-premise
• Network Server - On-premise or Cloud base	• Network Server - On-premise or Cloud base
Pricing option	**Pricing option**
• Gateway - Hardware sell	• Gateway - Hardware sell
• FND - One-time or recurring	• FND - One-time or recurring
• Network server - One-time or recurring	• Network server - Recurring