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.
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
- Water and Gas Metering
- Leak Detection
- Disaster Precaution
- Livestock
- Environment Monitoring
- Smart Energy
- Waste Management
- Agriculture

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
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.
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**

**Applicable customer**
- Build and operate a public network to sell LoRa access subscription package
- Mobile SP, Cable/Broadband/WiFi/Broadcast SP, Cities

**Benefits**
- High scalable - Supports over thousands of GWs and millions of sensors
- Full functions - Billing, CDR, single/multi-tenant, TDOA geolocation capability, multiple radio profiles

**Deployment model**
- IOT FND - On-premise
- Network Server - On-premise or Cloud base

**Pricing option**
- Gateway - Hardware sell
- FND - One-time or recurring
- Network server - One-time or recurring

**Enterprise edition**

**Applicable customer**
- Build private network for their own use cases
- Utilities, Oil&Gas, Manufacturing, Logistics, Agriculture, Smart City, Universities, Governments

**Benefits**
- Cost-effective - Pay as you growth
- Low entry point - Supports up to 100 Gateways and 20K sensors
- Easy installation - Single software image, plug-and-play
- Easy operation - Simplified admin GUI

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- Network server - Recurring

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