At-a-Glance

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® 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 for Europe, the Middle East, Africa, and India and 902–928 MHz 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.

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.

Benefits

- Fully compliant with LoRa technology and LoRaWAN specification
- Complete solution including Cisco ruggedized gateway, gateway management system (Cisco IoT FND), partner’s LoRa Network Server and application enablement platform (Cisco CAM)
- Robust end-to-end securities
- Distinguished 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
- Ready to market now
The Cisco solution (Figure 2) offers customers a fully integrated and functional infrastructure, including the following elements:

- **Gateway**: Cisco ruggedized outdoor product for LoRa radio access
- **IoT Field Network Director**: Cisco gateway management system
- **Partner’s LoRaWAN network server**: the radio controller and end-device management platform
- **Cisco Asset Management**: the application enablement platform

**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.
Robust Securities

The Cisco advanced IOS features provided by IR809/829 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. 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.

Distinguished Geolocation Capability

The gateway embeds FPGA, DSP and high accuracy GPS specifically designed for 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

At-a-Glance

Ruggedized for Outdoor Deployment

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

Complaint 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 and AS 923 MHz.

Rich Backhaul Options

The gateway can be configured and managed as virtual interface(s) of Cisco Industrial Router 809 and 829. At this configuration, the Gateway provides LoRa radio access and IR809/829 offers IP backhauls, such as Gigabit Ethernet, Fiber, 4G/LTE, Wi-Fi. It can also 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.
Cisco Partner’s LoRaWAN Network Server
This server offers functions for LoRa end-device management, radio controllers, API interfaces to the application platform, OSS and BSS interfaces, user portals, and RF planning tools.

Cisco Asset Management
Cisco Asset Management for IoT intelligence enables customers to connect the unconnected using environmental sensors to gain insight into valuable operational data such as temperature, pressure, power, and fuel levels. It also allows you to integrate valuable information from most IP-based devices or gateways (such as IP cameras) and uses location technologies such as RFID and GPS to provide geographic information system (GIS) analysis. This enables users to realize greater device utilization, improved energy optimization, more controlled operations, and increased productivity. Further, users can combine operational, device, and sensor data with any type of business data, driving end-to-end business-focused key performance indicators (KPIs) such as consumption down to a serial number or key sustainability/CSR metrics.

Cisco Asset Management for IoT intelligence (Figure 4) can help customers:

- Enhance operational efficiency and business productivity
- Measure and improve overall equipment effectiveness (OEE) by creating policies to manage assets efficiently based on usage pattern and behavior
- Increase asset utilization and reduce loss through real-time location tracking
- Lower energy consumption for direct OpEx savings
- Detect and prevent theft through combined security surveillance, sensor alerts, alarms, and policies

Figure 4. Cisco CAM