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
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
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.
Rich backhaul options
The gateway works 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 customers 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 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
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:

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