

LoRa and LoRaWAN explained

The relationship between LoRa and LoRaWAN is a common question that is often asked in IoT discussions with potential customers.

LoRa and LoRaWAN are wireless Internet of Things (IoT) networking protocols that enable low power “things” (smart sensors) to connect and exchange data with other devices and systems over the Internet or other communications networks.

LoRa

The name LoRa was derived from the term “Long Range” and is a radio modulation technique-based spread-spectrum technique that were developed by Cycleo and that was later acquired by Semtech. It has the ability to enable low-power, long-range communications which include excellent indoor penetration and resiliency against interference makes it perfect for IoT applications.

LoRaWAN

LoRaWAN is the protocol that enables IoT device to use LoRa to communicate with each other. The LoRaWAN specification targets low-power, bi-directional communication, security, mobility, and localization services in regional, national and global network settings.

Topology

The LoRaWAN architecture is deployed in a star (and in many cases star-within-star topologies) where Gateways provide the interface between “things” and respective network servers.

Classes

There are three different classes:

- Class A – Lowest power, bi-directional end-devices
- Class B – Bi-directional end-devices with deterministic downlink latency
- Class C – Lowest latency, bi-directional end-devices

Data Rates

LoRaWAN data rates range from 0.3 kbps to 50 kbps. But the network server manages the data rate and output power for each “thing” with an Adaptive Data Rate (ADR) scheme.

Security

The LoRaWAN specification defines two layers of cryptography:

- A unique 128-bit Network Session Key shared between the end-device and network server
- and a unique 128-bit Application Session Key (AppSKey) shared end-to-end at the application level

What is the attraction to LoRaWAN?

Low Power

LoRaWAN data rates range from 0.3 kbps to 50 kbps. But the network server manages the data rate and output power for each “thing” with an Adaptive Data Rate (ADR) scheme.

Low Cost

Costs could easily become a barrier to entry, but LoRaWAN enables IoT growth and roll-out by minimizing required infrastructure, providing open-source software and support of low-cost end-nodes.

Long Range

Typical transmission ranges vary between 3km in dense urban areas to 15km or more in rural or suburban areas.

Unlicensed Band

The low-power nature of operation allows for LoRa to be used over the unlicensed spectrum (ISM bands). These bands have usage rules associated with them and LoRaWAN is designed to comply with these by supporting compliant payload sizes and transmission data rates.

Open Source

Not all LoRaWAN networks and solutions are open source, but there are open source LoRaWAN network servers suitable for global, geo-distributed public and private deployments like The Things Stack.

Indoor penetration

LoRa and associated techniques provide some of the best building and indoor penetration to even reach “things” in hard to reach places like basements and multi-storey buildings.

Capacity

LoRaWAN was designed with the mindset to support messages originating from millions of “things” via thousands of Gateways.

Public and private networks

Depending on the level of control and dedication required, the same hardware and software can be used for both public and private implementations.

Security

LoRaWAN provides a layer of security for the network and one for the application with AES encryption.

Over-the-air (OTA)

The nature of IoT is small, low-power battery-operated devices that are installed and not necessarily easily accessible. In support of this, LoRaWAN support Firmware-over-the-air (FOTA) as well as Over-the-air Activation (OTAA) activation of devices.

Who is the LoRa Alliance?

The LoRa Alliance is an association that supports LoRaWAN (long-range wide-area network) protocol and is tasked to define standards to ensure interoperability of all LoRaWAN products and technologies.

In closing

LoRa and LoRaWAN are some of the most widely adopted IoT protocols that have, and will continue to enable the growth we have seen in the IoT space.