

## What is LPWAN, LoRa, LoRaWAN?

**Low-power wide-area network (LPWAN)** is a type of wireless telecommunication wide area network designed to allow long range communications at low data rate among things (electronic devices), such as sensors and switches.

LPWAN offers multi-year battery lifetime and is designed for sensors and applications that need to send small amounts of data over long distance

LPWAN has no standardised technical protocols. LoRa, SigFox, NB-IoT, Weightless are some of its common implementations.

	LoRa	Sigfox	NB-IoT
Spectrum	License-free ISM bands	License-free ISM bands	License LTE bands,
Typical Range	1-5 km (urban), 10-20 km (rural)	10 km (urban), 40 km (rural)	1 km (urban), 10 km (rural)
Signal Bandwidth	0.5k-125kHz	0.1kHz	180k-200kHz
Data Rate	0.3k-50kbps	0.1kbps	200kbps
Max Payload Length	243 Bytes	12 Bytes	1600 Bytes
Latency Time	Long (Class A) Short (Class C)	Long	Short
QoS	Low	Low	High
Battery Life	10 years	20 years	10 years
Security Encryption	Yes	No	Yes
Deployment Cost	Low	Medium	High
End Device Cost	Low	Low	High

**LoRa** is one of the most popular LPWAN technologies, it is abbreviated for **Long Range**. It is currently patented by Semtech in California.

LoRa works on chirp spread spectrum modulation, which maintains the same low power characteristics as FSK modulation but significantly increases the communication range.

The LoRa technology is capable of covering large area with few gateways / basestations, also offers moderate data rates and low development costs.

**LoRaWAN** is a standardised LoRa protocol presented by LoRa Alliance. However, each country and region generally utilise different ISM band for LoRaWAN, for instance, LoRa devices in Australia often uses 915Mhz – 928 Mhz, hence the AU915.

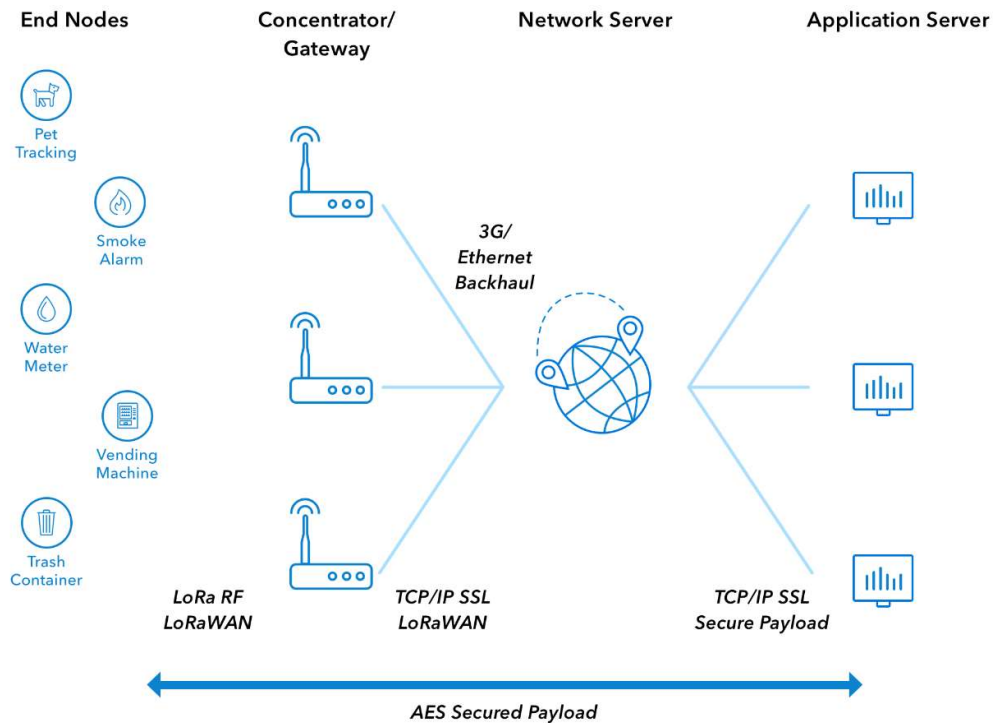
## The architecture for LoRaWAN network

LoRaWAN network architecture is deployed in a star-of-stars topology. The LoRaWAN networks uses base stations relaying the data between the end nodes and the network server

The end nodes could be any form of electronic devices that requires monitoring and control. A single gateway can practically handle a few thousands of end notes.

The network server are commonly implemented by HTTP/MQTT servers, depending on the requirements. And cloud-based network servers (by AWS®, Azure®, Google® etc) are also gaining popularity these days.

Data security has been enforced in every single section in a LoRaWAN network, making it one of the most secure IoT technologies.



## Where LoRaWAN can be used?

### Farming / Agriculture

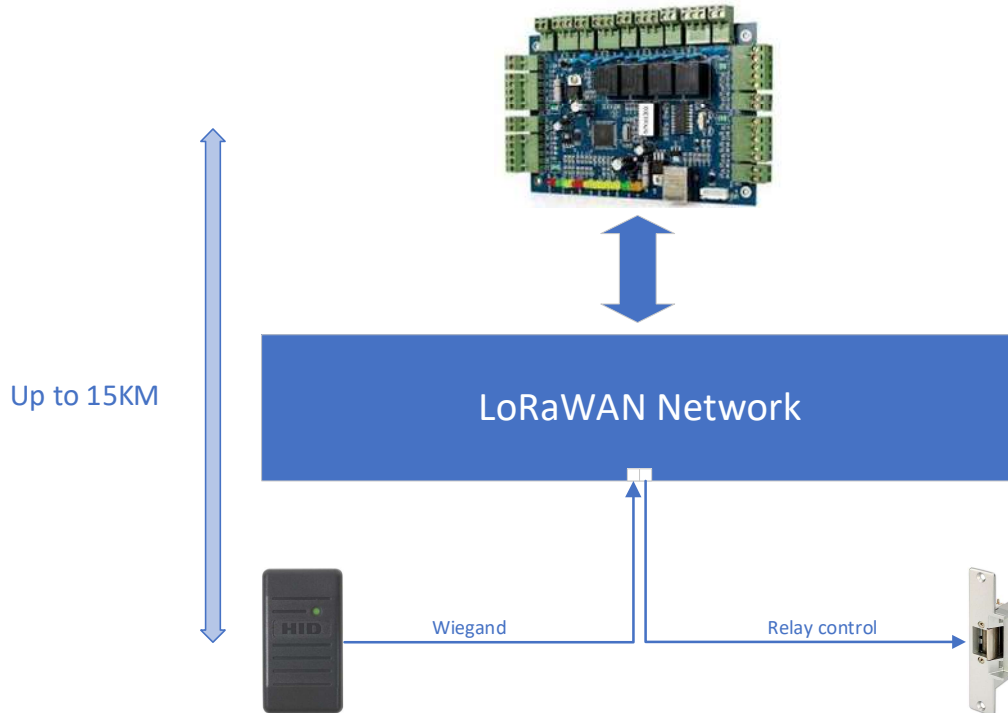
The LoRaWAN technology is capable of cover large regional areas and connect thousands of sensors and controllers reliably, securely and cost-effectively.

Farmers and farm operators can have real-time access to critical data such as soil moisture, rainfall, fluid levels, cattle status and many more, also being able to control gates, pumps, fans, and lights at their fingertip.



### Security

Given the transmission range and network capability of LoRaWAN, security systems can easily employ LoRaWAN to relay some operational data in scenarios where hardwiring is not feasible. For instance, Wiegand protocol and relay signal can be transmitted over LoRaWAN for access control system.



### Automation

Automation systems often communicate in RS232, RS485 and I/O status for telemetry and controls. LoRaWAN end nodes that has built-in DI, DO, RS232 and RS485 interfaces are able to relay such data between edge and cloud, ultimately allowing remote access and control in the last mile.

