



# LoRaWAN<sup>®</sup> Gateway

## What is the LoRaWAN<sup>®</sup> gateway?

The LoRaWAN<sup>®</sup> gateway is a long-range, fixed network data collector that utilizes the LoRaWAN network and LoRa<sup>®</sup> technology to provide robust wireless connectivity for LoRaWAN endpoints. The LoRaWAN gateway and endpoints combined with the Neptune<sup>®</sup> 360<sup>™</sup> host software provide a highly scalable, end-to-end AMI solution.

## What are the key benefits of LoRaWAN for Smart Water AMI?

- Long range communication reduces the number of gateways required for coverage
- Low power requirements support a 20-year endpoint battery life
- Two-way communication provides time-synchronized hourly readings
- Utility focused AMI network enables solution longevity and flexibility
- Protects meter data with robust end-to-end network security
- Strong support from the LoRa Alliance ensures a future proof protocol

## How does the LoRaWAN gateway solution compare to Neptune's Network-as-a-Service (NaaS) offerings?

Neptune's LoRaWAN gateway provides a private AMI solution that is owned and operated by the utility. Since the LoRaWAN Network follows an open-standard protocol, the LoRaWAN gateway is an AMI and IoT/M2M asset that the utility owns. In contrast, Neptune's NaaS solution removes the responsibility of network installation and ownership and ongoing maintenance. The utility only retains ownership of the endpoints with a NaaS agreement.

## Are there recurring subscription fees involved with the LoRaWAN gateway?

There are no recurring subscription fees for the LoRaWAN gateway itself. However, the head-end software (Neptune 360) and back-haul connectivity from the gateways into the LoRaWAN network (Ethernet or cellular) do require subscriptions.

## With which endpoints is the LoRaWAN gateway compatible?

The LoRaWAN gateway is only compatible with LoRaWAN endpoints.

## Does the LoRaWAN gateway support electric AMI or collect data from any other LoRaWAN endpoints besides Neptune's?

While the LoRaWAN gateway is capable of receiving and processing LoRaWAN packets from any LoRaWAN endpoint, additional steps will be required to provision third-party endpoints. By default, Neptune only provisions the LoRaWAN gateway and endpoints for the utility's Smart Water AMI network.

## What data backhaul options are available?

The LoRaWAN gateway is capable of transporting data back to the Neptune 360 host platform via cellular or Ethernet backhaul.

## How many endpoints can be processed per LoRaWAN gateway?

LoRa technology and the LoRaWAN network protocol enable each gateway to receive and transport millions of messages per day. The total number of gateways required for a deployment will depend on the required coverage and propagation characteristics of the service area. The typical network design facilitates each endpoint communicating with more than one gateway.



### What reception range can I expect from the LoRaWAN gateway?

The range that can be achieved between a LoRaWAN gateway and endpoint is dependent upon many environmental factors such as RF propagation characteristics, the height of the gateway's antennas, and the placement of the LoRaWAN endpoints. Neptune will perform a propagation study to aid in the deployment planning.

### What frequencies does the LoRaWAN gateway operate on?

The LoRaWAN gateway operates in the 902-928 MHz ISM band for two-way communication with LoRaWAN endpoints. It receives LoRa transmissions from R900 endpoints on 64 upstream channels from 902.3-914.9 MHz and transmits to LoRaWAN endpoints on eight downlink channels from 923.3-927.5 MHz.

### Are there any FCC or Industry Canada licenses required to operate the LoRaWAN AMI network?

No, Neptune's LoRaWAN gateway and endpoints operate in an unlicensed spectrum. FCC and IC licenses are not required for the utility to operate the LoRaWAN network.

### Will the LoRaWAN gateway be vulnerable to interference because it operates in an unlicensed band?

While interference is possible within the 902-928 MHz unlicensed ISM band, the LoRaWAN gateway and endpoints utilize LoRa modulation techniques to improve receiver performance in the presence of noise and interference. The LoRaWAN network performs optimization via adaptive data rate (ADR) techniques to reduce self-interference and maximize efficiency. Additionally, LoRaWAN endpoints provide redundant readings in each LoRaWAN compatible packet, which allows the head-end system to back-fill missed readings.

### Does the LoRaWAN network comply with current FCC and IC requirements which include proper labeling of any system components?

Yes. Neptune's LoRaWAN gateway and endpoints operate in the 902-928 MHz unlicensed band. FCC approvals on the LoRaWAN gateway can be viewed on the FCC website and/or provided upon request to the utility. IC approvals can be viewed on the Industry Canada website's Radio Equipment List (REL).

### Will Neptune provide a propagation study to help in the deployment planning?

Yes. Neptune utilizes sophisticated propagation modeling that incorporates the specific variables for the utility's coverage area to determine the optimum infrastructure placement. Propagation modeling incorporates such factors as geographic and topographic parameters of the endpoint locations and proposed sites of LoRaWAN gateways. Once the modeling is complete, a proposal will be provided to the utility outlining implementation and infrastructure requirements.

### Prior to installing the LoRaWAN capable AMI infrastructure, what activities are required of the utility?

Prior to installation, the utility will be asked to:

- Provide a list of the meter locations (address and/or GPS coordinates, meter settings – pit, wall, basement set)
- Provide address and tower specifications for proposed gateway sites, confirm AC power availability, and secure access privileges
- Assist with discussions/negotiations with owners to gain access for the gateway installations if buildings or other non-utility owned sites or towers are required for LoRaWAN gateway installation.

### How important is it to provide accurate information during preinstallation activities and adhere to the proposed deployment specifications for the AMI network components?

It is critical to the accuracy of the propagation analysis and projected performance of the system that the meter setting and tower site information furnished is accurate and the proposed tower locations and heights are utilized in the deployment of the system infrastructure. If this information is not accurate or proposed tower sites and/or heights are not utilized, the projections will not be accurate, resulting in deficiencies in network coverage and read success rate (RSR).



### Who is responsible for installing the infrastructure such as the LoRaWAN gateway and the antennas?

The utility is responsible for installing the LoRaWAN gateway and the antennas. Neptune utilizes decades of experience with AMI to facilitate successful deployment of the required infrastructure, including recommendations for third-party licensed contractors as needed. Neptune will provide the appropriate instructions and documentation to the utility and/or licensed contractors for successful deployment of the gateways and endpoints.

### Which locations are suitable for the LoRaWAN gateway?

The LoRaWAN gateway offers the flexibility to deploy the gateway at the top of the structure (near the antenna) for maximum RF performance or at ground level (with a remote antenna) for easy maintenance. A high point such as a water tower, communications tower, or building rooftop, that provides RF line-of-sight (LOS) to as many endpoints as possible is optimal for mounting the gateway antenna. All proposed sites must have access to electrical power and either a cellular or ethernet communication link to transport data back to the Neptune 360 host platform.

### What type of power is required for the LoRaWAN gateway?

The LoRaWAN gateway comes with an outdoor-rated UPS (uninterruptible power supply) that requires nominal 120V AC power. The LoRaWAN gateway itself typically consumes 24 watts and is either fed directly by the UPS or by a PoE (Power Over Ethernet) injector connected to the UPS.

### Does the LoRaWAN gateway have battery backup power?

The LoRaWAN gateway comes with an outdoor-rated UPS that can supply battery backup power for full operations up to 18 hours in the event of a power outage.

### Is the LoRaWAN gateway protected against electrical surges such as lightning?

Yes, if installed according to the provided specifications. The LoRaWAN gateway contains primary lightning surge suppression on the Direct DC power port, the copper Ethernet port, the GPS antenna port and the RF antenna ports to protect against over-voltages. If the cellular antenna is not mounted directly to the gateway's connector panel, an external mounting kit, which includes a surge suppressor for that interface, must also be purchased from Neptune. Furthermore, an additional Ethernet surge protector is provided with the gateway to protect indoor networking equipment if Ethernet backhaul is utilized.



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