

LORIoT Network Server

Specification



LORIoT Network Server (LNS) is a service / software for operation and management of LoRaWAN® networks.

From a population of heterogeneous LoRa® gateways, the Network Server creates a uniform, secure, resilient, distributed LoRaWAN® network with a REST / TLS / WebSocket / MQTT data interface. It provides a scalable connectivity back-end for operations of your LoRaWAN® network.

It features flexible, and modular data output interfaces currently including HTTP / REST, WebSocket, TLS Socket, MQTT and several 3rd party services such as Microsoft Azure, PubNub, IBM Bluemix or Amazon AWS IoT.

The primary roles of the Network Server are:

- Granting and protecting access to the network
- Securing data transport from gateways to data consumers
- End-device and gateway provisioning
- Gateway management and monitoring
- Application & device management and monitoring
- Network health and status monitoring

Most of the currently available LoRaWAN® gateways are already pre-integrated with the Network Server and support with the LORIoT Gateway Software.

Many end-to-end and IoT platforms applications are available out-of-the-box, fully integrated and available through our partner network.

Our pricing scheme is flexible and allows for scaling the operational expenses as the network grows.

Core functionality

- Fully distributed, scalable, secure software
- Enables geographically diverse, low-latency deployment
- REST / TLS / WebSocket / MQTT data output interface
- Easily integrates with value-added cloud services (IBM Bluemix, Microsoft Azure, etc.)
- All interfaces secured through TLSv1.2
- IPv6 Compliant

LoRaWAN® functionality

- LoRaWAN® 1.0.x Compliant
- LoRaWAN® 1.1 Compliant
- Class A and Class C full support
- Class A and C downlink supported
- LoRaWAN® Multicast supported
- Multicast Virtual Networks
- All Major Regional Frequencies supported (Custom plans available)
- Regional ADR supported
- Adjustable RX window settings
- Adjustable frequency bands setup
- Multi-antenna gateways supported
- LoRaWAN Specification Roaming (passive)
- Built-in & External Join Server available
- Frame cryptographic validation and filtering
- Replay and man-in-the-middle attack
- Penetration tested - countermeasures
- WebSocket / REST / TLS / MQTT interface to Application Server

Device population management

- Unlimited number of devices
- Management of address pool
- Management of cryptographic keys
- Device activation by personalisation (ABP)
- Device activation over-the-air (OTAA)
- Automated device provisioning mechanism
- Device Profiles / templates
- Device migration from other operators supported
- REST API for device provisioning
- Bulk import via CSV & JSON
- MAC Commands log
- Detailed Device Radio & Message Statistics

Supported End-devices

- LoRaWAN® 1.0.x compliant devices
- LoRaWAN® 1.1 compliant devices
- debugging features for non-compliant devices
- compatibility features / modes for noncompliant devices

Gateway population management

- Custom LORIoT Gateway Software / Packet Forwarder
 - JSON based protocol over TCP
 - Single outgoing HTTPS connection (port 443)
 - TLS v1.2
 - Optional standard certificate-based mutual authentication
 - Easy to setup on any type of network
 - Network failover (e.g. 3G / 4G to Ethernet and back)
- Advanced Gateway Alerts (latency, online/offline, CPU, Memory, messages)
- Notifications via email, SNMP traps, Webhooks
- Remote control from dashboard
- Remote configuration from dashboard
- Remote access via SSH tunnel
- Self-updating, maintenance free operation
- GPS synchronized multicast downlink
- Advanced downlink planning and queuing for maximum downlink capacity
- Advanced uplink queuing for zero data loss and scale-out during lost NS connection
- Can poll local sensors and operating system parameters
- Can monitor CPU, RAM and storage usage
- Support for legacy USB-based radio front-ends
- Support for both v1.x and v2.x LoRa gateway hardware
- GPS Synchronisation supported
- Semi-automated enrolment and activation
- All network links are TLS secured
- Designed for firewalled / VLAN / cloud scenarios
- Monitoring of KPIs, traffic and radio data

- System Historical Statistics – uptime, latency, load.
- Automated LORIoT Gateway Software updates
- REST API for gateway provisioning
- Multicast Virtual Networks – targeted downlinks
- Gateway health & status alerting – Webhook, SNMP Traps, Email
 - Latency
 - Config Change
 - Online/offline
 - Daily Uplinks threshold
 - Memory utilisation
 - CPU utilisation
- Spectrum Analyser
- Gateway data stream tap (view live data stream)

Supported LoRaWAN Gateways

All gateway models are supported with the LORIoT Binary which is custom built and maintained for each model. Any gateway not mentioned can be connected using the Semtech Packet Forwarder.

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| <ul style="list-style-type: none"> ■ All Tektelik models ■ All Kerlink models ■ All MultiTech models (incl 2.4Ghz) ■ Wifx LorixOne ■ RAK 7249 + 7258 + 7268 ■ Miromico Edge (incl. 2.4Ghz) ■ Browan Mini Pro ■ Laird RG1 ■ Logic-X ■ All Dragino models ■ Robustel R3000LG ■ Browan Minihub Pro ■ Browan Pico Next ■ All Milesight (Ursalink) models ■ Gemtek LoRa models ■ Augtek LoRa models ■ Link Labs LL-BST-8 ■ All Cisco models | <ul style="list-style-type: none"> ■ Option Cloudgate ■ Semtech packet forwarder ■ Basics Station ■ Raspberry Pi + external concentrator ■ OpenWrt ar71xx + external concentrator |
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Key features overview

Sensor network management system

LORIIOT Network Server (LNS) is a scalable, resilient Sensor Network Management System for LoRaWAN®. It is designed to run as a cloud service, with a strong focus on security and distributed, high-availability, 24/7 operation.

LNS is an all-in-one solution for LoRaWAN® network operators, allowing users to monitor, query control and manage all LoRaWAN® system components.

Multi-tenancy / Virtual Private LoRaWAN®

LNS provides a multi-tenant environment. Multiple sensor applications can securely run over the same network in Virtual Private LoRaWAN® networks. Four server roles provide secure private data and user access with granular server and user management controls.

User Management

Multitenant Organisations to manage hierarchy and roles on the network server and enable collaborative operations. Two-factor Authentication supported for User and Admin Interface.

Monitoring and management features for user resources and four standard roles with varying permissions available: Server Operator, Organisation Admins, Standard Users, Read-only Users.

Gateway management

LNS aims to deliver centralised management and operations facility. A number of key performance indicators are continuously monitored through the system, and a set of remote-control tools is available for every gateway. The LORIIOT gateway software adds addition gateway insights and security layers.

End-node life cycle management

Secure and efficient management of the end-nodes is a key functionality of the LNS. It accelerates the deployment and simplifies the operations of a large-scale sensor network.

Monitoring and diagnostics

The system monitors in real-time a large number of key performance indicators for all the components. Based on this information the system can provide an early indication of potential problems in the sensor network.

User Interfaces

Web-based user interfaces enable convenient management of all components and network parameters. A User interface for management and operation of an accounts resources and Admin User interface for server wide management.

System interfaces (API)

The user interfaces are complemented by a comprehensive set of secure, RESTful APIs, allowing for the integration of the LNS with existing systems and development of custom control interfaces.

Multicast Virtual Networks

Advanced multicast is possible via grouping gateways into Virtual Networks. Multicast downlinks can then be assigned to one or more Virtual Networks to delivery and with variable prioritisation.

LoRaWAN Roaming

LoRaWAN Specification passive roaming implemented to enable peer to peer roaming or roaming via a roaming Hub. LORIoT has a type 0 NetID and can allocate clients a part of the NetID for their private network. Roaming has already been conducted with Actility, TTI, Lacuna Space and Orbiwise Network Servers.

LoRa 2.4Ghz

The network server supports LoRa 2.4Ghz gateways from Multitech and Miromico. This enables global interoperability of all devices using the 2.4Ghz frequency across all regions.

Log Analysis

Log filtering and browser available in the the user, organisation and server wide level, with the option to router log events to an external log analysis and alerting tool such as the LORIoT Log Analyser.

Billing

Along with performance indicators, LNS collects statistics on the data transferred through the network. The collected data can be exported into an existing billing system.

Various subscription models can be defined in the system to limit the maximum number of sent/received messages per device per day.

- Real-time traffic information available for billing
- Per-device, -gateway and -application records
- Per-application and per-device limits

Deployment

For easy on-boarding and a short time to market, we offer the software as a geographically distributed service. For customers wanting to run the system on-premise, we offer a software license.

Requirements

LNS can run in a container or a virtual machine. The only system requirement is 64-bit Linux operating system and availability of NTP time synchronisation.

Scalability

Horizontal scaling of the system allows for scaling of the system as the network size grows. LNS can also be scaled up and use all available / newly added system resources.

Gateway Private Key Infrastructure

For increased security, a gateway certificate and key can be required when connecting a new gateway to the server.

With this feature enabled, gateways are registered in a separate component within the same environment as the front-end, and when a gateway requests to join the network, it's certificate and key are checked against the certificate authority.

Public Documentation

The server includes an extensive public documentation available at docs.loriot.io which covers most features and usability of the network server available to users. Additional admin controls are provided in a private operator manual.

Interfaces

- Application Programming Interfaces
- Management interfaces are HTTP based
- REST / HTTPS for commands and controls
- WebSocket for real-time interaction
- Separate API for data access (WebSocket, TLS Socket, REST / HTTPS, MQTT)
- Multiple API outputs possible for a single LORIoT application (default 6)

API interfaces are built around industry standard protocols. Data interfaces are built as flexible output modules, that can easily integrate new transport layers. Management interfaces are available over a REST/HTTPS interface.

Real-time interaction and server-side notifications are delivered through WebSockets.

Pre-integrated Application Outputs

- Allthingstalk
- AWS IoT
- Azure IoT Hub
- CoAP Push
- Cumulocity IoT
- HTTPS Push
- Thingsboard (HTTPS)
- IBM Cloud
- Iron.io Iron MQ v1
- Iron.io Iron MQ v3
- MQTT
- MyDevices Cayenne
- PubNub
- Smartmakers ThingsHub
- TLS Socket
- WebSocket

User Interfaces

- HTML5 / JavaScript
- Web browser based
- Can be used as a sample implementation of the REST API
- User interfaces are web browser based and are optimised for usage in Chrome and Firefox.

Deployment models

- Community Public Server (free of charge)
- Professional Public Server (SaaS, 99.9% SLA)
- Multi-tenant cloud infrastructure (SaaS, 99.5-99.99% SLA)
- Private cloud deployment (Software License)

Private Server Models

- Monolithic Starter
- Enterprise Advanced
- Full Fail Sale Enterprise

Version 8 of the LORIoT Network Server is due for release in Summer 2022.

Notable new features include:

- Hybrid Network Server – LoRaWAN & mioty protocol compatible
- mioty protocol support added
- LORIoT Roaming Hub
- Basics Station packet forwarder
- New UI overhaul with a better UX
- Separate SSH tunnel Gateway application