



# ExpertLoRaWAN

## Application Note 3

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Create a LoRa network with a LoRa slave gateway

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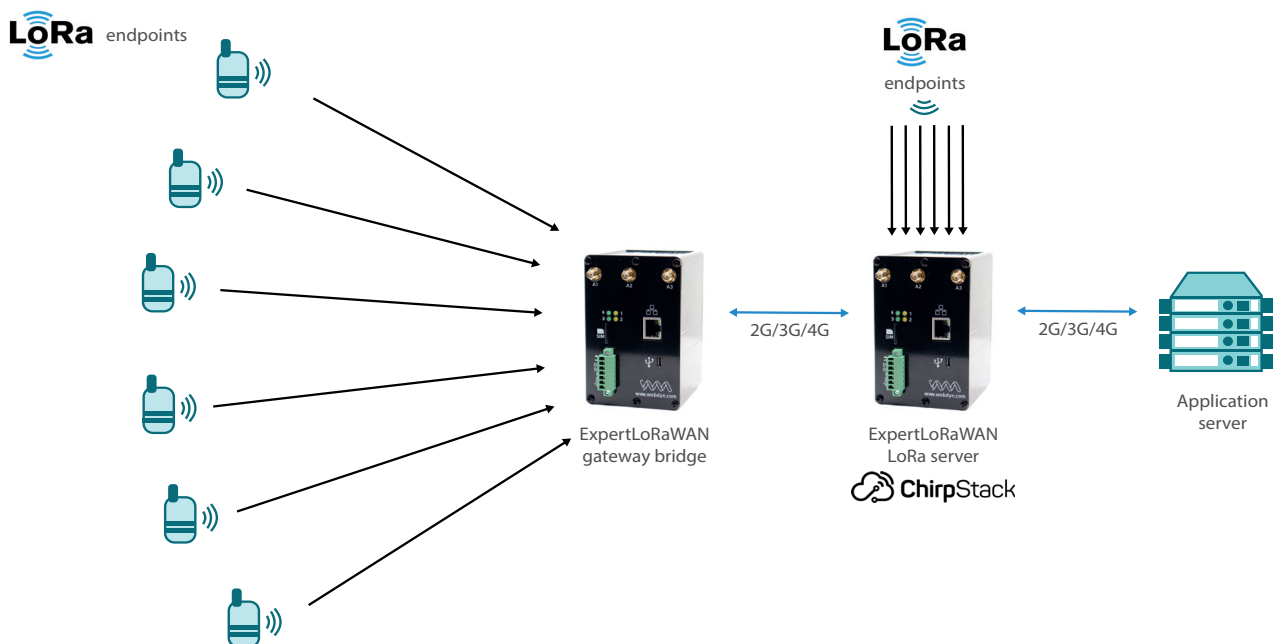
## 1. Introduction

This application note is a continuation of application note “AN2 - Create a LoRa network and send LoRa sensor data to Internal LoRa Server” and shows step by step how to extend a LoRa network by adding more Webdyn ExpertLoRaWAN Gateways.

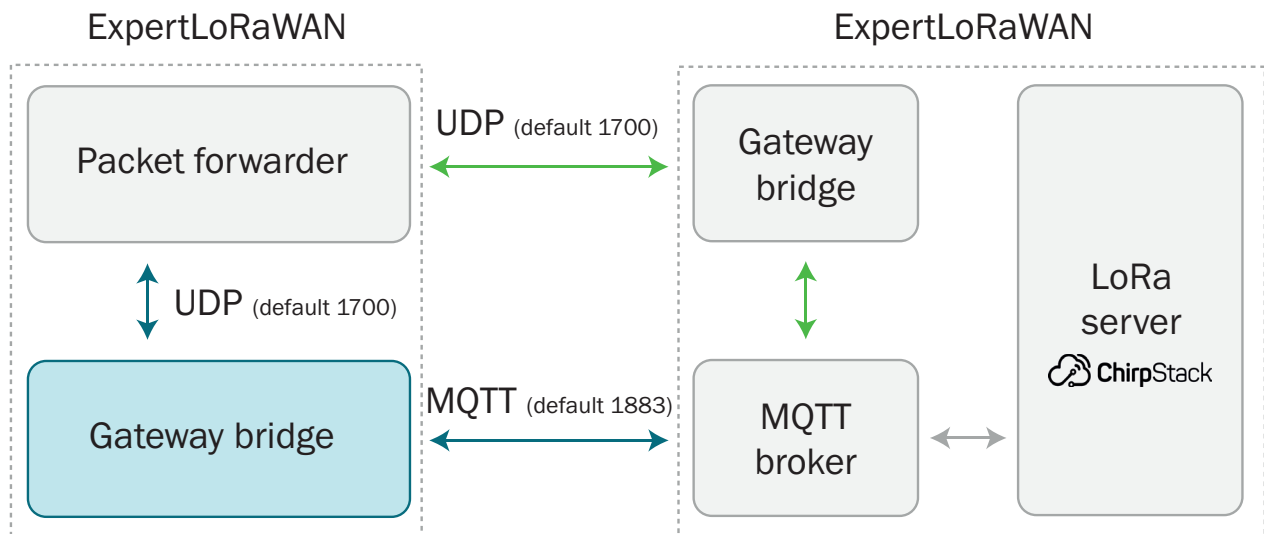
## 2. Scenario Details

This scenario simulates two Webdyn ExpertLoRaWAN Gateways, both receiving data from the LoRa sensors in their RF range.

- One of them receives LoRa packets from end nodes at its range and sends it to its internal LoRa server (ChirpStack). It is acting as a master.
- The other one forwards LoRa packets from end devices at its range to the ChirpStack LoRa server of the other Gateway. It is acting as a packet forwarder (Gateway Bridge).



There are two possible communication options shown in the next scheme.



Option 1 (green): Slave Webdyn ExpertLoRaWAN uses packet forwarding to send the data to the Master. Packet forwarder sends raw packets using UDP to the Gateway Bridge on the other side.

Option 2 (blue): Slave Webdyn ExpertLoRaWAN uses MQTT transmission to send the data to the Master. Slave gateway bridge converts raw UDP packets into MQTT and sends to the MQTT Broker on the other side.

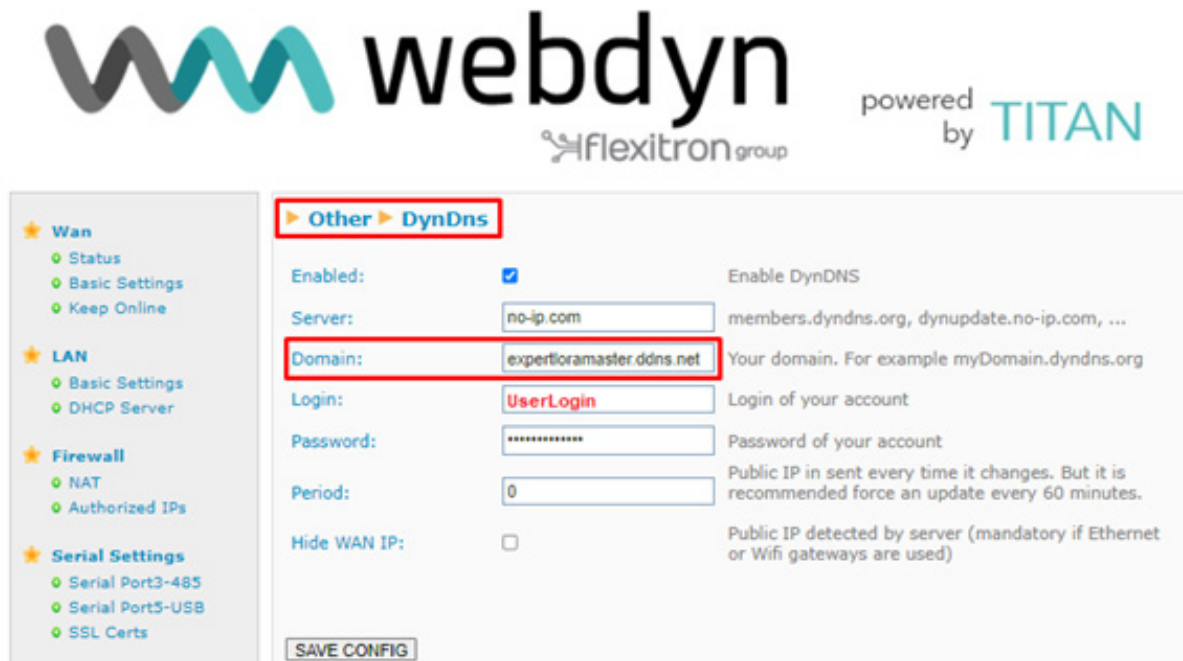
The MQTT Broker is the connection point for the MQTT clients, used for both, the Gateway Bridge and the ChirpStack LoRa Server.

This application note explains the configuration for option 2.

## 2.1 Webdyn ExpertLoRaWAN Configuration

First step is to configure WAN section in both devices.

If your Mobile Operator provides you a dynamic public IP, it is recommended to configure the DynDNS service in the Master Webdyn ExpertLoRaWAN, otherwise you will need a static IP address.



The image shows the Webdyn logo at the top, with the text "webdyn" and "flexitron group" below it, and "powered by TITAN" to the right. Below the logo is a configuration interface for DynDNS. On the left is a sidebar with a tree view containing: Wan (Status, Basic Settings, Keep Online), LAN (Basic Settings, DHCP Server), Firewall (NAT, Authorized IPs), and Serial Settings (Serial Port3-485, Serial Port5-USB, SSL Certs). The main area is titled "Other > DynDns" and contains the following fields: "Enabled:" with a checked checkbox and the text "Enable DynDNS"; "Server:" with a text box containing "no-ip.com" and a hint "members.dyndns.org, dynupdate.no-ip.com, ..."; "Domain:" with a text box containing "expertloramaster.ddns.net" and a hint "Your domain. For example myDomain.dyndns.org"; "Login:" with a text box containing "UserLogin" and a hint "Login of your account"; "Password:" with a text box containing "\*\*\*\*\*" and a hint "Password of your account"; "Period:" with a text box containing "0" and a hint "Public IP in sent every time it changes. But it is recommended force an update every 60 minutes."; and "Hide WAN IP:" with an unchecked checkbox and a hint "Public IP detected by server (mandatory if Ethernet or Wifi gateways are used)". At the bottom left of the main area is a "SAVE CONFIG" button.

## 2.2 Lora Configuration

### Master Configuration

Enable the MQTT Broker service with default listening port 1883 and, optionally, add user and password.



The image shows the Webdyn logo at the top, with the text "webdyn" and "flexitron group" below it, and "powered by TITAN" to the right. Below the logo is a configuration interface for the MQTT Broker. On the left is a sidebar with a tree view containing: Wan (Status, Basic Settings, Keep Online), LAN (Basic Settings, DHCP Server), and Firewall (NAT). The main area is titled "Other > MQTT Broker" and contains the following fields: "Enabled:" with a checked checkbox and the text "Enable MQTT broker service"; "TCP Port:" with a text box containing "1883" and a hint "Listening port (for example 1883)"; "Anonymous User:" with an unchecked checkbox and a hint "Allow anonymous user (no user / password is needed)"; "User:" with a text box containing "user" and a hint "Username (used if anonymous is not selected)"; and "Password:" with a text box containing "\*\*\*\*" and a hint "Password (used if anonymous is not selected)".

Enable Lora Server and configure LoRa Gateway as follows:

- LoRa mode: Gateway Lora—Bridge (MQTT)
- ID: Define a unique ID for the gateway with 16 digits
- MQTT Broker: Internal

The screenshot displays the webdyn router configuration interface. The left sidebar contains a navigation menu with categories: Wan, LAN, Firewall, Serial Settings, External Devices, VPN, and Plugins. The 'External Devices' category is expanded, and the 'LoRa' option is selected and highlighted with a red box. The main content area is divided into two sections: 'External Devices > LoRa Server' and 'External Devices > LoRa Gateway'. In the 'LoRa Server' section, the 'Server Enabled' checkbox is checked and highlighted with a red box. Below it, the 'Http Server Port' is set to 8080, 'LoRaWAN Band' is set to EU868, 'NET ID' is 000000, and 'JWT Secret' is gTgynIKoWL20zV1cFX8fbu. In the 'LoRa Gateway' section, the 'Enabled' checkbox is checked and highlighted with a red box. Below it, the 'Latitude' is 40.39924, 'Longitude' is -3.71709, and 'Altitude' is 609. At the bottom of the 'LoRa Gateway' section, the 'LoRa mode' is set to 'Gateway LoRa - Bridge (MQ)', the 'ID' is 3530850900362560, and the 'MQTT Broker' is set to 'Internal'. All these three fields in the 'LoRa Gateway' section are highlighted with a red box. The 'SAVE CONFIG' button is visible at the bottom of both sections.

Remember to click on “SAVE CONFIG” button and, important, reboot the router using menu Other->Reboot to allow the router to restart with the new configuration and be able to connect to the Internet.

## Slave Configuration

Configure the LoRa gateway section in Bridge (MQTT) mode and set an ID for the gateway.

Fill the information of the external MQTT broker with the settings previously configured in the Master, including the MQTT username and password defined.

- ID: Define a unique ID for the slave gateway with 16 digits
- MQTT URL: tcp://<Master DynDNS address>:1883
- MQTT ID: Define a MQTT ID for the slave gateway

**External Devices**

- Logger configuration
- Temperature Sensor
- ModBus Devices
- Distance Sensor
- Wavenis Concentrator
- W-MBus Concentrator
- GPS Receiver
- Generic Serial Device
- LoRa**

**External Devices > LoRa Gateway**

Enabled: ☒ Enable LoRa Gateway

Latitude: 40.39924 Optional GPS Latitude. Ex: 40.39924

Longitude: -3.71709 Optional GPS Longitude. Ex: -3.71709

Altitude: 609 Optional GPS Altitude. Ex: 609

LoRa mode: Gateway LoRa - Bridge (MQTT) Select the mode of LoRa behaviour

ID: 3540330917793090 Gateway ID (Ex: 010203040A0B0C0D)

MQTT Broker: External Internal or external url

MQTT URL: tcp://expertloramaster.ddns. URL of MQTT Broker  
Ex: tcp://127.0.0.1:1883

MQTT ID: slave1 Device identification

MQTT Username: user MQTT Username (blank if not used)

MQTT Password: 1234 MQTT Password (blank if not used)

MQTT QoS: 1 MQTT Quality Of Service (0 ... 2)

SAVE CONFIG

Save this configuration and reboot the device.

## ChirpStack LoRa Server configuration

Go to the Master and open the LoRa Webserver to configure Chirpstack settings. You can also access it by the Master DynDNS address:port8080 (in this case, <http://ExpertLoRaWANmaster.ddns.net:8080/>)

In the application note “AN2 - Create a LoRa network and send LoRa sensor data to Internal LoRa Server” it is explained the necessary configuration steps to create a LoRa Network in ChirpStack. Once all steps have been followed, just repeat step 5 to add the slave gateway and repeat step 7 to add remote end devices.

- Add a Server
- Add/create a Gateway profile — connected to 1) Server
- Add/create a Service profile — must be connected to 1) Server
- Add/create a Device profile – must be connected to 1) Server

- Add/create a Gateway – must be connected to 1) Server and 2) Gateway profile
- Add/create an Application – must be connected to 3) Service Profile
- Add Devices – must be connected to 4) Device Profile
  - Repeat step 7 to add more end devices

## Adding the Slave Gateway

Fill with a name, description and the defined Slave Gateway ID. Use LoRa Server and Gateway profile already created.

Please check slave Gateway is connected (it might take a few minutes).

Last seen	Name	Gateway ID	Network server	Gateway activity (30d)
a few seconds ago	WebdynExpertLoRa-MasterGW	3530850900362560	WebdynExpertLoRa-Server	
a few seconds ago	WebdynExpertLoRa-SlaveGW	3540330917793090	WebdynExpertLoRa-Server	



Next, add the LoRaWAN nodes in the RF range of Slave device to the same application. Please check application note “AN2 - Create a LoRa network and send LoRa sensor data to Internal LoRa Server” if you need any help. You will need Device EUI and LoRa APP KEY. In this case we used an Adeunis Temperature sensor.

Last seen	Device name	Device EUI	Device profile	Link margin	Battery
a few seconds ago	Adeunis-Temp	0018b210000045d2	AdeunisDeviceProfile	5 dB	91.73%
a few seconds ago	Milesight-EM500-UDL	24e124126a217474	MilesightDeviceProfile	12 dB	



You can check the LoRa frames to see the received gateway device information.

ChirpStack

Search organization, application, gateway or device

admin

Network-servers

Gateway-profiles

Organizations

All users

API keys

chirpstack

Org. settings

Org. users

Org. API keys

Service-profiles

Device-profiles

Gateways

Applications

Multicast-groups

Applications / WebdynExpertLoRa-APP / Devices / Milesight-EM500-UDL

DELETE

DETAILS CONFIGURATION KEYS (OTAA) ACTIVATION DEVICE DATA LORAWAN FRAMES FIRMWARE

HELP PAUSE DOWNLOAD CLEAR

UPLINK

12:20:55 PM ConfirmedDataUp 013bc6d1

rxinfo: 1 item

gatewayID: "3330809900362560"

time: null

timeSincePSRepoch: null

rsst: -17

loranRNR: 12.8

channel: 6

rfChan: 6

board: 0

antenna: 0

location: 5 keys

latitude: 40.39924

longitude: -3.71709

altitude: 609

source: "UNKNOWN"

accuracy: 0

fineTimestampType: "NONE"

context: "LY83A++"

uplinkID: "c4c016d-fb8b-4a4a-9970-66ee3f923c39"

rxStatus: "CRC\_OK"

txinfo: 3 keys

frequency: 867700000

modulation: "LORA"

loralabelationinfo: 4 keys

bandwidth: 125

spreadingFactor: 9

codeRate: "4/5"

polarizationInversion: false

phyPayload: 3 keys

mhdr: 2 keys

mType: "ConfirmedDataUp"

major: "LoRaWANv1"

macPayload: 3 keys

fhdr: 4 keys

devAddr: "013bc6d1"

fCtrl: 5 keys

ack: true

ackAckReq: false

ack: false

rfPending: false

rfValid: false

rfCtrl: 101

rfData: null

rfPort: 85

rfmPayload: 1 item

rfData: 1 key

bytes: "76770000"

rfm: "14727ec5"

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