abeeway
Smart geolocation technology

Low-Power Location Trial Package

GETTING STARTED GUIDE

REVISION 1.1

MAY 2019

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1. ABOUT THE TRIAL PACKAGE

Thank you for purchasing the Abeeway Low-Power Location Trial Package.

The aim of the trial package is for you to discover the power of Abeeway devices with ThingPark Wireless platform using Abeeway Device Analyzer (ADA). The trial package also includes ThingPark Location API to integrate with your business applications.

This Trial Package does not require any configuration. The hardware is fully configured[1] and activated on the Actility ThingPark Wireless network. Once you have installed the hardware on your premises, connect the gateway to the Internet and you can start tracking your assets right with the Abeeway Device Analyzer (ADA) application or start the integration with your application using DX Location API.

You have been granted access to a ThingPark User Portal (https://iot.thingpark.com/portal/web), which will provide you with seamless access to all tools to run your trial. You will be using your ThingPark Store credentials to access this user portal.

In the following sections, we describe briefly the overall architecture of the solution and step by step guide to setup the solution.

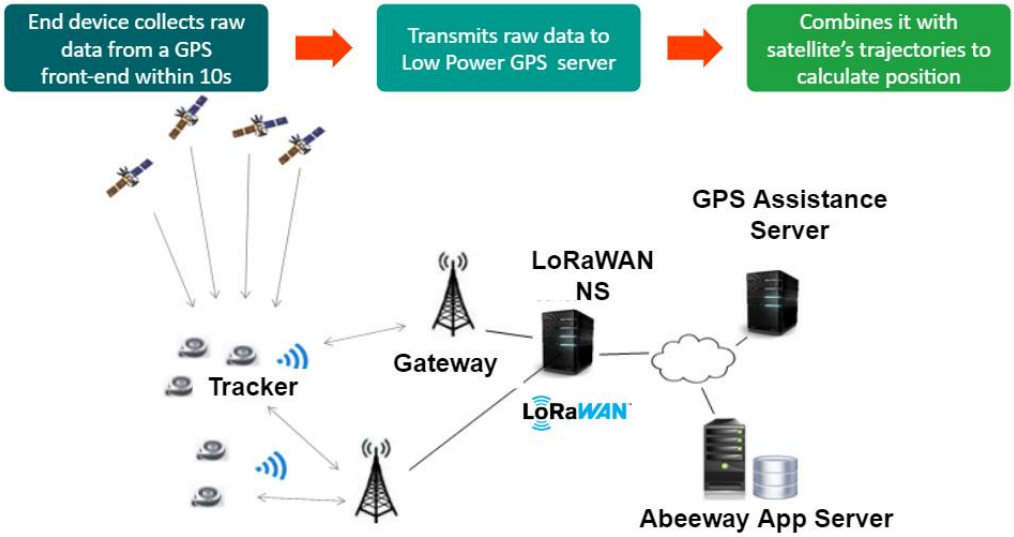
2. THINGPARK LOCATION OVERVIEW

ThingPark Location is a low-power multi-technology geolocation platform that allows tracking applications that demand very long battery lifetime. It enables wide variety of use cases that are not possible over conventional GSM+AGPS tracking technologies. The dramatic reduction in power consumption of tracker significantly increases the battery lifetime of 10 years+ due to reduction in Operating Expense/Total Cost of Ownership (OPEX/TCO) of enterprise deployments. For more details on the business case of Low-Power Wide Area Network (LPWAN) enabled geolocation, please refer to Actility/KPN webinar on multi-technology geolocation [1].

ThingPark Location leverages the appropriate combination of geolocation technologies (GPS, LP-GPS, Wi-Fi, BLE, LoRaWAN TDoA) depending on application preference or environmental conditions. One of the key technologies that enables low power is based on Abeeway's patented technology, Low-Power GPS (LP-GPS) that allows the calculation of location parameters partially in the cloud and thus significantly reduces the Time to first fix (TTFF) compared to traditional GPS based technologies. The key benefits of Low-Power GPS (LP-GPS) are:

1. **High Speed**: First fix in 10s Vs 1 min compared to GPS
2. **Low Power**: 10X power efficient compared to GPS
3. **High Precision**: Able to acquire position even in poor GPS signal conditions

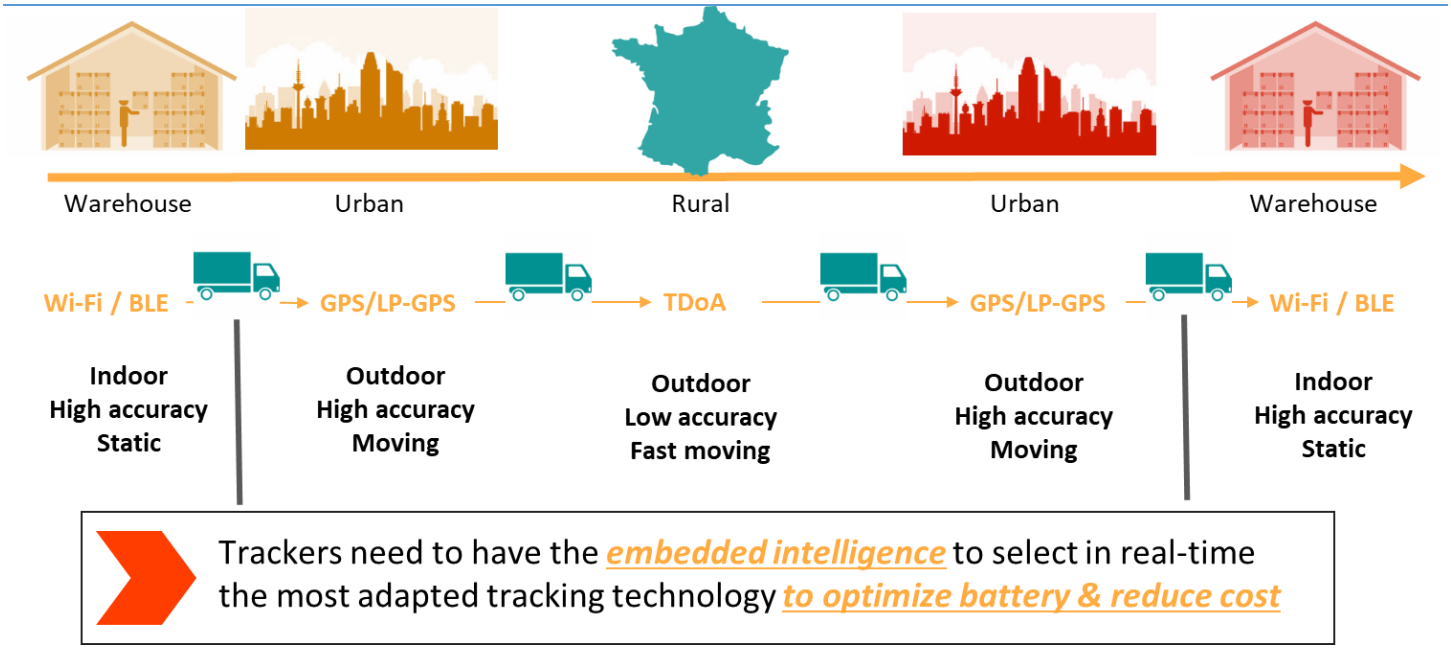
[1] Regional radio regulations require specific settings and hardware per region. Your kit is configured for a given region and should not be used in other regions.



2.1 Optimum Geolocation: Multi-technology and Low-Power GPS (LP-GPS)

The figure below shows a generic example of a connected pallet travelling through different environments and requiring different geolocation technologies.

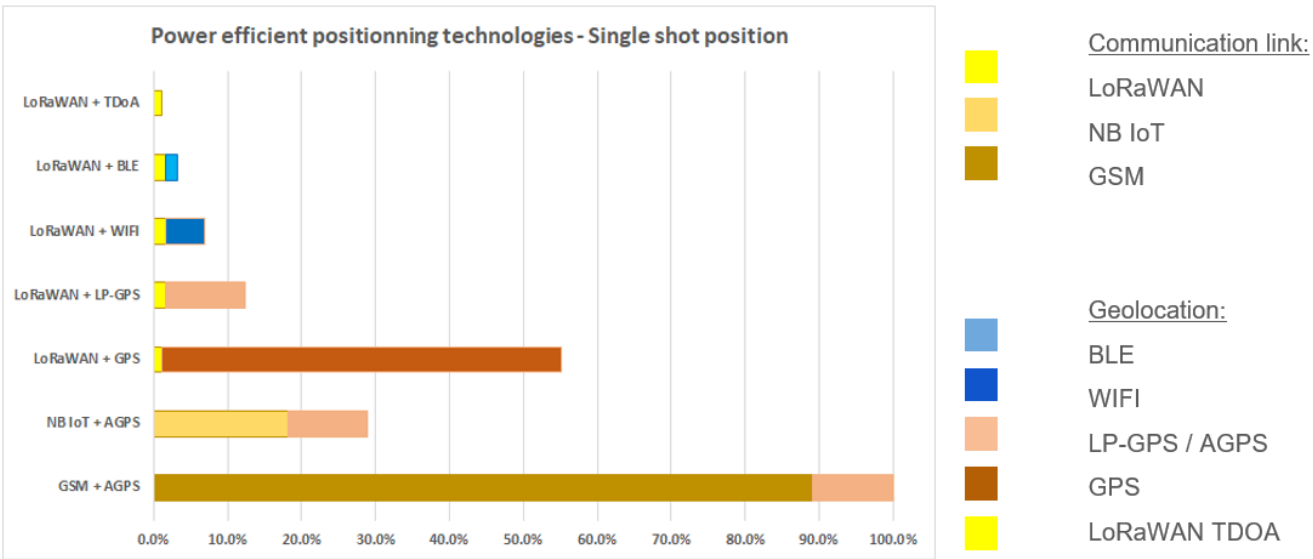
1. **Warehouse**: The connected pallet starts its journey indoors in the warehouse and needs high precision for geolocation. The tracker in this scenario is either static or moving slowly. The tracking technology suitable for such scenario is based on either Wi-Fi/BLE technologies using simple scanning-based on RSSI or relying on fingerprinting more accurate tracking [14][15].
2. **Urban**: Once the connected pallet leaves the warehouse, it is outdoors usually within urban area. In this scenario, the connected pallet is moving in a cargo and requires high accuracy. The most suitable tracking technology for such scenario is based on GPS/LP-GPS.
3. **Rural**: The connected pallet then travels through countryside and is travelling generally at high speeds on motorway. The tracking accuracy is less important, and the tracker will save power by automatically going into frequent sleep mode and using the most suitable technology to save power consumption: TDOA, instead of GPS. This requires the availability of a wide area deployment of LoRaWAN.



Trackers need to have the ***embedded intelligence*** to select in real-time the most adapted tracking technology ***to optimize battery & reduce cost***

For IoT geolocation use cases, wanting to optimize battery life 10 years and more, multi-technologies are required, that includes Low-Power-GPS. The location information is transported over LoRaWAN, which is 3-5X more power efficient LPWAN technology compared to 3GPP based technologies (NB-IoT/LTE-M) [16][17].

The following figure shows the comparison of different geolocation technologies (TDoA, WiFi, BLE, GPS, AGPS, LP-GPS) over different communication technologies such as GSM, LoRaWAN, NB-IoT, LTE-M. The power consumption comparison in the figure below assumes that the tracker sends only one location. It is very clear from the figure below that LoRaWAN+LP-GPS based tracker is around 10X more power efficient than traditional GPS+AGPS based technologies. The power consumption of the tracker can be further reduced when using Wi-Fi/BLE for indoors or when using LoRaWAN based network geolocation such as TDoA. For more information on the study, see [1].

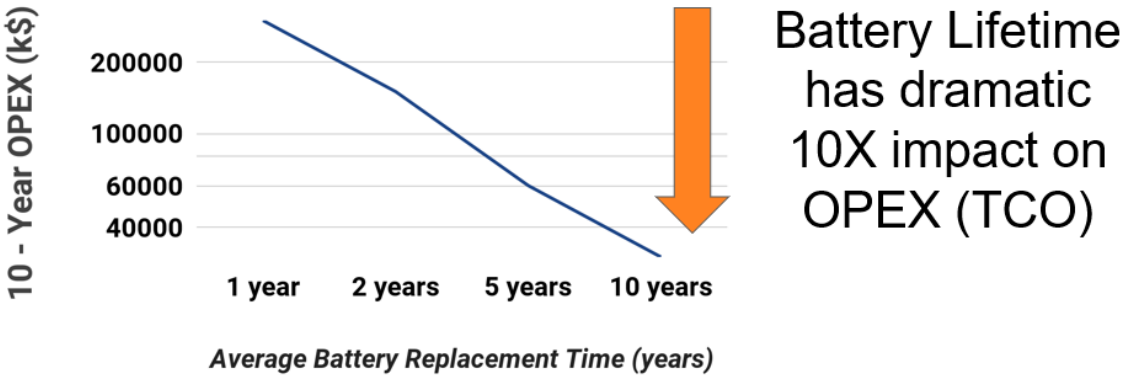


LoRaWAN + Multimode Geolocation is 10X battery efficient compared to conventional Geolocation (GSM + AGPS)

The dramatic reduction in power consumption of the tracker enables IoT geolocation use cases not possible with conventional GPS+AGPS based technologies. The figure in the following example is Total Cost of Ownership (TCO) analysis based on the example of railroad car tracking. Railroad cars carrying heavy equipment usually travel through countryside, thus it is important to track their location and usage to improve the efficiency and optimize the freight capacity. Railroad cars also need to be tracked in case they are lost in remote areas. Replacing the trackers in railroad cars is a very cumbersome exercise that involves activities such as (identification, collection, replacement and re-dispatch). This activity is even more costly if the trackers are placed in hard to reach areas in the wagon. Typically, the battery replacement campaign is carried over large number of railroad cars. In the following example, we assumed the cost of replacing battery to be about 30 USD/tracker which is a rather conservative estimate considering the human labor cost of such replacement. Assuming there are about 100k rail road cars that each have a tracker that needs battery replacement. The following figure shows that the OPEX savings of up to 10X when the tracker needs battery replacement every 10 years Vs 1 year. The simple example below shows clearly that over long durations of IoT deployments (typically 10 years or more), the battery replacement costs have a very dramatic impact on OPEX and could possibly dominate the TCO.

Assumptions:

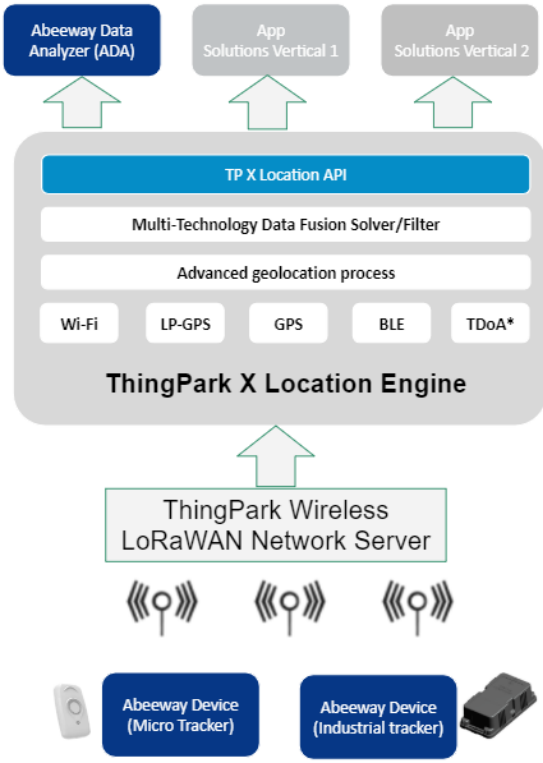
- **Use Case**: Railroad car tracking
- **Battery Replacement campaign cost**: 30 $/tracker
- **Tasks (Identification, collection, replacement, re-dispatch)**
- **Total number of trackers**: 100k



2.2 Architecture

The ThingPark Location architecture is shown in the figure below and has three basic components:

1. **Abeeway Devices**: These are low power devices capable of multi-technology geolocation capabilities.
2. **ThingPark X Location Engine**: This is the back-end geolocation engine that contains multi-technology geolocation solver that relies on Wi-Fi, BLE, GPS, LP-GPS and TDoA. This component also provides DX Location API that can be used to interface with enterprise B2B applications. ThingPark X Location Engine is usually interfaced with LoRaWAN Network server which can be ThingPark Wireless or 3rd Party.
3. **Abeeway Device Analyzer (ADA)**: This is an example application that allows to view the device locations on a map and configure the different geolocation modes of the Abeeway devices.



2.3 Abeeway Devices

There are two types of Abeeway Devices in the low power Location trial package. The sections below describe high-level features and provides an overview. A detailed description of Abeeway device features and specifications are described in reference documents [6-11].

2.3.1 Abeeway Micro Tracker

The Abeeway Micro Tracker is a multi-mode tracker combining GPS, low power GPS (LP-GPS), Wi-Fi, LoRaWAN™ and BLE radios with embedded sensors to support accurate outdoor and indoor geolocation. This low-power location device tracks and locates anything, anyone, anytime at a low cost of ownership. Its small size and long battery lifetime make the Micro tracker the ideal product for numerous tracking applications. It is simple to use, and a single button gives access to numerous functionalities that can be personalized for specific application needs. It can be used to keep track of assets, valuables, improve safety and security.

Applications of Micro-tracker:

- Asset tracking at fixed frequency updates or on demand
- Personal tracking with help button

- Safety monitoring for lone workers inside facilities or in outdoor
- Anti-theft; notify and locate when device is moving
- Geofencing applications

2.3.2 Abeeway Industrial Tracker

The Abeeway Industrial Tracker is the most versatile device to protect your assets designed to withstand harsh environment. It combines high performance GPS, LP-GPS and Wi-Fi receivers as well as Semtech LoRa™ transceiver making it ideal for low-power industrial indoor and outdoor tracking applications. The Abeeway Industrial Tracker tracks your inventory, valuables, livestock and is key for improving operational efficiency. It delivers valuable information about your supply chain and provides precise and accurate data to help making informed decisions. An accelerometer detector associated with proprietary low power GPS (LP-GPS) technology significantly extends the battery life time, dramatically reducing the total cost of ownership.

Applications of Industrial Tracker

- Asset and vehicle tracking at fixed frequency updates or on demand
- Anti-theft; notify and locate when the device is moving
- Activity monitoring
- Geofencing applications

2.3.3 Key Product Features

Multiple operating modes:

- **Motion Tracking:** Tracker reports real-time position only when motion is detected
- **Permanent tracking:** Tracker reports periodic real time positions
- **Start/End motion tracking:** Tracker reports positions ***only*** at the start and end events of the motion
- **Position on demand:** Tracker sends its position only when requested from the end-user (very low power operating mode). The position request can be made from the geolocation backend platform or by using special button sequence on the micro-tracker.
- **Activity tracking:** Monitor activity rate with embedded sensors

- **OFF**: Tracker is switched off

Geolocation technologies:

- **GPS:** Precise outdoor position
- **Low power GPS (LP-GPS):** Proprietary Low-Power GPS algorithm that enables Fast Time to First Fix in outdoor and daylight indoor conditions resulting in improved battery lifetime
- **Wi-Fi:** Position in indoor and urban area
- **BLE:** The micro-tracker has Bluetooth scanning capabilities which can send BLE beacons and their detected RSSIs to the application

Other features

- User interface: Buzzer, LEDs, Multi-modes button (This feature is only supported for Micro-Tracker)
- Temperature monitoring
- Embedded antennas
- LoRaWAN™ Class A radio
- Water-spray resistant enclosure (IP64) (Only relevant for micro tracker)
- Rugged industrial enclosure for protection from dust and powerful water jets - (IP66) (Only relevant from industrial tracker)

3. KIT VERSIONS AND CONTENT

In the trial package, you will find:

- 2 Abeeway Micro Trackers and accessories (USB charging cable and strap)
- 2 Abeeway Industrial Trackers and accessories
- 1 Outdoor Gateway and accessories

Regional versions and country compatibility

Kit version	Kit ordering Link	Compatible countries
EU868 trial kit	https://iot.thingpark.com/clickandgo/location-asset-tracking/1861-lp-location-solution-ufispace-eu868.html	AE, AL, AD, AT, BE, BA, BG, CY, CZ, DE, DK, ES, EE, FR, FI, GB, HU, NL, HR, IT, IE, IR, IS, LB, LI, LT, LU, LV, MD, MK, MT, ME, NO, PL, OM, PT, RO, RS, CH, SA, SK, SI, TR, ZA
US915 trial kit	https://iot.thingpark.com/clickandgo/location-asset-tracking/1888-low-power-location-solution-us915.html	AR, CA, CL, CO, EC, GT, JM, NI, NX, PA, US, UY
AS923 Trial kit (922 – 924 MHz)	https://iot.thingpark.com/clickandgo/location-asset-tracking/1915-low-power-location-solution-as923.html	AU, BN, BO, CR, EC, MY, NZ, PA, PE, PY, SG, SV, TH, UY
AS923 Trial Kit (932 – 925 MHz)	https://iot.thingpark.com/clickandgo/location-asset-tracking/1915-low-power-location-solution-as923.html	AU, BN, BO, CR, EC, ID, KH, LA, NZ, PA, PE, PY, SG, SV, TH, UG, UY
AU915 trial kit	NA	AU, BO, CL, DO, EC, GT, NZ, PA, PE, PG, PY, SV, UY
AS923 Trial kit (Taiwan)	NA	HK, TW

AS923 trial kit (Japan)	NA	JP
CN779 trial kit	NA	CN
CN470 trial kit	NA	CN
	NA	
EU433 trial kit	NA	AD, AE, AL, AM, AT, AZ, BA, BD, BE, BG, BN, BY, CU, CY, CZ, DE, DK, DZ, EE, EG, ES, FR, FI, GB, GR, HK, HU, NL, HR, IE, IL, IR, IS, IT, KW, KZ, LB, LI, LK, LT, LU, LV, MA, MD, ME, MK, MM, MT, MY, NO, NZ, OM, PH, PL, PT, PY, QA, RO, RS, CH, SA, SG, SK, SI, TH, TN, TR, UA, UG, UZ, ZA
EU868 trial kit (Morocco)	NA	MA
EU868 trial kit (Russia)	NA	RU
IN865 Trial Kit	NA	IN
KR920 Trial Kit	NA	KR

4. GATEWAY INSTALLATION

The provided outdoor LoRaWAN™ gateway complies with the specifications defined by the LoRa Alliance™ for the LoRaWAN region supported by the Kit version.

The LoRaWAN Gateway supports 8 simultaneous channels. The ThingPark Wireless network server has been pre-configured with a default 8 channel RF profile compatible with the countries supported by the kit version. The gateway has an embedded GPS receiver, LoRaWAN ™ antenna and supports out of the box class A LoRaWAN ™ devices.

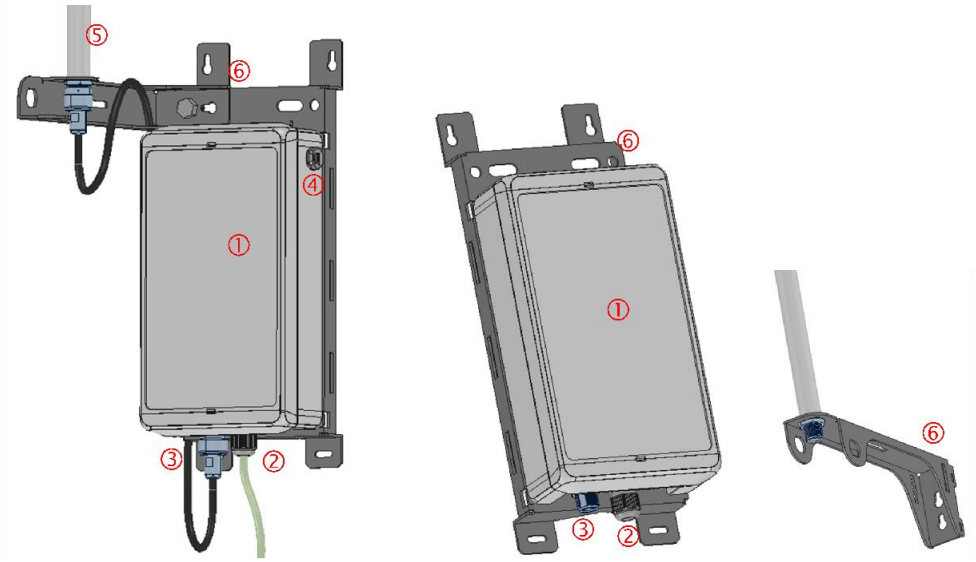
The gateway is pre-configured for internet access via Ethernet and DHCP IP configuration, but also offers a 3G cellular modem. It is powered through PoE via the supplied PoE injector.

4.1 CONTENT OF THE GATEWAY BOX

The gateway and its accessories are packaged in a specific box. Inside you will find the following elements:

- The casing (item 1) including:
  - Acable gland for the PoE Ethernet cable (item 2)
  - The N connector (item 3) to connect the LoRa antenna
  - Apressure stabilizer for protection against condensation (item 4)

- A 3 dBi omnidirectional LoRa RF antenna connection with N connector (item 5) and its cable
- A PoE injector (item 7) and its power supply cable
- A mounting kit (item 6) designed to support various installation configurations:
  - Pole mounting by U-bolt (delivered by default)
  - Wall mounting



4.2 INSTALLATION

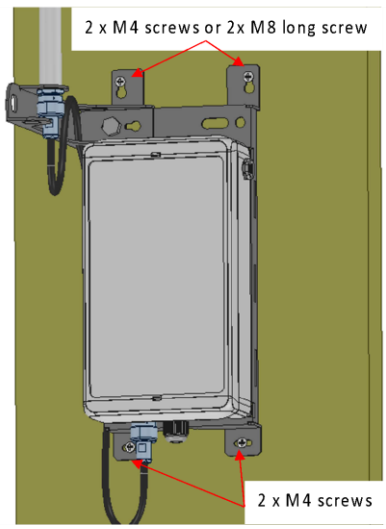
The LoRaWAN gateway must be mounted on a pedestal, concrete wall or any non-flammable surface (UL94-V0).

WARNING: It must not be mounted on a flammable surface.

The mounting kit delivered with the LoRaWAN gateway allows fixing the product in different ways.

4.2.1 Wall Mount

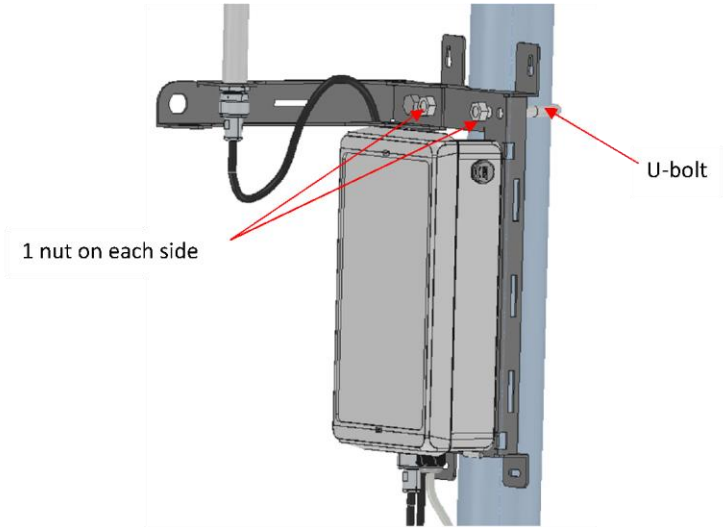
The LoRaWAN gateway can be also mounted on a wall with M4 screws (not delivered with the mounting kit).



For safety reasons, the metallic mounting kit must be grounded. This may be ensured by attaching a grounding wire to one of the four screws (fastening not delivered by default).

4.2.2 Pole Mount

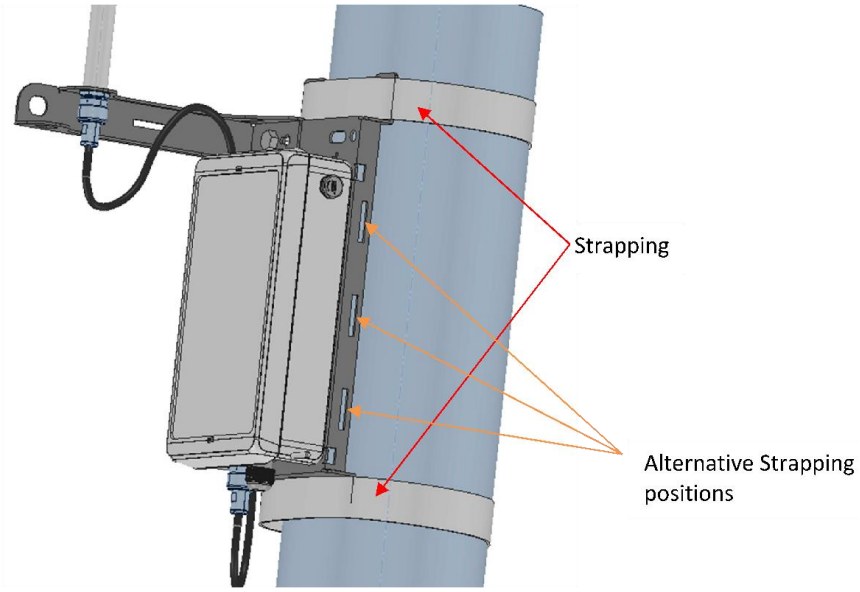
By default, the LoRaWAN gateway is delivered with a U-bolt to be mounted on a pole of a maximum diameter of 60 mm. To fix the U-bolt, we recommend that you use nuts provided in the mounting kit.



For safety reasons, the metallic mounting kit must be grounded. This may be ensured by grounding the pole itself since the U-bolt is conductive.

4.2.3 Metallic strapping Mount

The LoRa IoT Station can be mounted on a pole by strapping. The maximum acceptable width of the strapping is 25mm. We recommend that you use 2 metallic straps as described on the figure below:



4.2.4 Surge protection

Unless the gateway is already protected by surrounding lightning rods, additional protections **must** be used to improve lightning immunity and avoid propagation of lightning strikes to the building via the Ethernet cable. Not doing so may cause property loss or cause serious injuries.

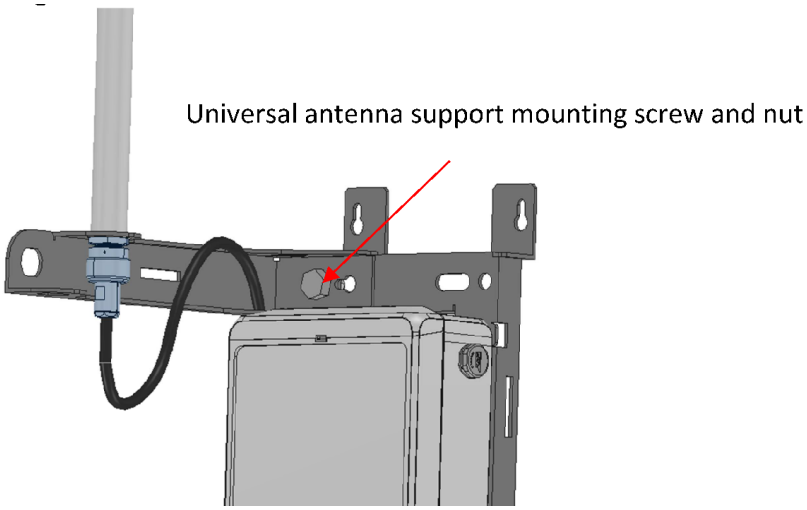
For the antenna link, we recommend the P8AX series 1/4 wave surge protection from CITEL.

For the Ethernet link, we recommend the CITEL MJ8-POE-B reference from CITEL.

Caution: Protections must be installed in accordance to their specifications. If unsure, ask an expert as **Abeeway provides no warranty that the suggested protections will work in all cases or are appropriate to your specific installation**.

4.2.5 Antenna Installation

First, fix the universal antenna support on the enclosure support with provided screw and nut. Then, fix the antenna on the mounting set:



Once the RF antenna is fixed, connect the N connector of the antenna cable to the connector based on the bottom of the casing as described on the figure below.

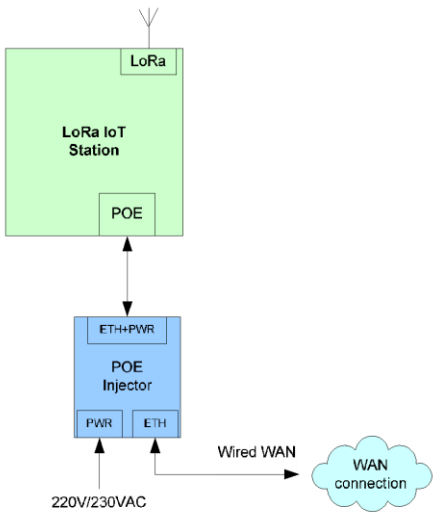
For safety reason, the power supply of the product must be disconnected before plugging the N connector.

4.3 CABLING AND POWER SETUP

Once the RF antenna and the Ethernet wires are connected, the LoRaWAN gateway can be powered on. To POWER ON the LoRaWAN gateway, connect the PoE injector to a 230VAC main power supply. For more details on the LoRaWAN Gateway installation, refer to [4].

4.4 CONNECTION TO INTERNET

The following diagram describe how to connect the Gateway, via the PoE injector, to your Internet router or switch.



The Gateway comes fully provisioned and activated in your ThingPark account.

Note: Default configuration is as follows:
- IP Backhaul: Ethernet. GPRS is not configured, contact support if you want to enable GPRS.
- IP configuration via DHCP server.
- Ports 21, 22, 123 and 2404 must be open on your firewall for communication between LoRaWAN™ Gateway and ThingPark Wireless IoT Platform. See Annex **12.1** for more details.

The gateway administration is performed via the ThingPark Network Manager application which is accessible as a widget in ThingPark User portal. For more information, see section 6.

5. DEVICE INSTALLATION

5.1 CONTENT OF THE DEVICE BOX

The Abeeway kit box contains 2 Micro Trackers and 2 Industrial Trackers.

Abeeway Industrial Tracker

Abeeway Micro Tracker

The Industrial Tracker is designed to withstand harsh environment conditions and a long battery life provided by a non-rechargeable primary cell (supplied). It combines a high-performance GPS receiver, a Wi-Fi receiver, an accelerometer and a Semtech Lora™ transceiver making this product ideal for low-power industrial indoor and outdoor tracking applications. Abeeway patented Low-power GPS (LP-GPS) technology significantly reduces time-to-first fix (TTFF) for GPS, also reducing the required GPS signal level for cold start. This significantly improves battery life time over normal GPS procedure.

The Micro Tracker consists of a multi-mode tracker powered by a USB rechargeable LiPo battery. It 1 The user interface provides a button, a buzzer and 3 LEDs. The Micro Tracker with its small size and long battery lifetime is the ideal product for personal/pet tracking applications.

These devices are managed by two applications:

- **ThingPark device manager**: This is the generic LoRaWAN device management for all LoRaWAN devices in the network

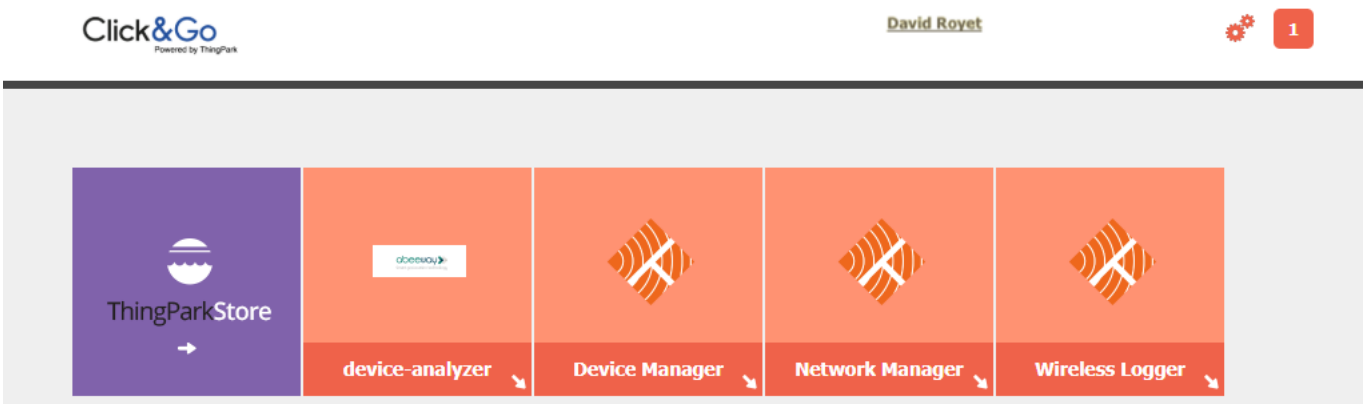
- **Abeeway Device Analyzer application (ADA)**: this is a dedicated application for your Abeeway trackers, providing further application level management and configuration capabilities as well as basic location display of trackers on map (Google, OpenStreet and Baidu). The ADA user interface is configured for using google maps by default.

6. THINGPARK WIRELESS PORTAL

All your ThingPark applications are accessible from the ThingPark User Portal on the following URL:

https://iot.thingpark.com/portal/web/

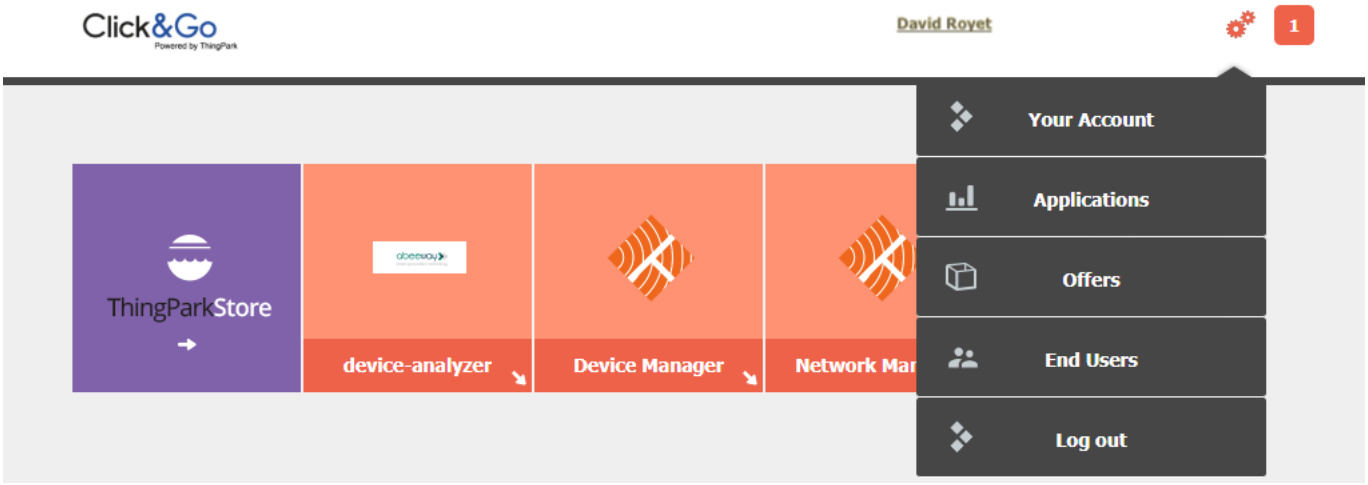
Once logged-in, the applications subscribed on ThingPark market appear as widgets on the User Portal.



Every location kit package comes with the following applications:

- Device Manager
- Wireless Logger
- Network Manager
- Abeeway Device Analyzer

Your account settings as well as the general configuration of the User Portal and its applications are accessible by clicking on the gearing icon:



- **Your account**: Review or change your account settings or password.
- **Applications**: See/hide widgets for all applications linked to the offers you have purchased on ThingPark market and their activation state.
- **Offers**: Review the subscription status for all applications you have subscribed.
- **End Users**: List all users associated with your subscriber account. If you want to share access to your applications, but do not wish to share your account and password, create a specific "additional end user" for the individual sharing access.

7. OVERVIEW OF THE KIT APPLICATIONS

7.1 Network Manager

The ThingPark Network Manager is a standard ThingPark Wireless application which enables ThingPark Wireless subscribers to provision, monitor and manage their LoRaWAN base stations. The LoRaWAN gateway is preconfigured for your Kit before shipping, however you may use this application to monitor the LoRaWAN base station, access RF statistics and alarms.

To extend your Trial Pack and add additional LoRaWAN gateways and or Trackers, refer to the Actility Click&Go site to order extension. Refer to [3] for the detailed instructions how to use the Network Manager. All Network Manager operations are also available via APIs.

7.2 Device Manager

The ThingPark Wireless Device Manager is a standard ThingPark Wireless application which enables ThingPark Wireless subscribers to provision and manage their LoRaWAN or LTE-m/nb-IoT devices.

Device Manager allows configuration of new devices and association of each device to Application Servers for application layer uplink frames processing and downlink command generation.

The Device Manager also allows to manage the association of devices to Connectivity Plans subscribed from the service provider.

The Device Manager is preconfigured for the devices included in the Kit before shipping, however you may use this application to monitor the LoRaWAN level statistics and alarms for each device. The devices are pre-associated to the Abeeway application server.

If you need to configure more LoRaWAN devices, refer to [2] for the detailed instructions how to use the Device Manager. All Device Manager operations are also available via APIs.

7.3 Wireless Logger

ThingPark Wireless Logger enables ThingPark Wireless subscribers to view and analyze end devices LoRaWAN traffic, visualize base stations with best link to each sensor, monitor SNR levels and data rates. Wireless logger already has Abeeway device decoder that allows easy accessibility to all application level communication. Wireless Logger is a very handy tool to use in your integration phase, allowing to view traffic with fully decoded messages.

For more information and instructions how to use the Wireless Logger, refer to [5].

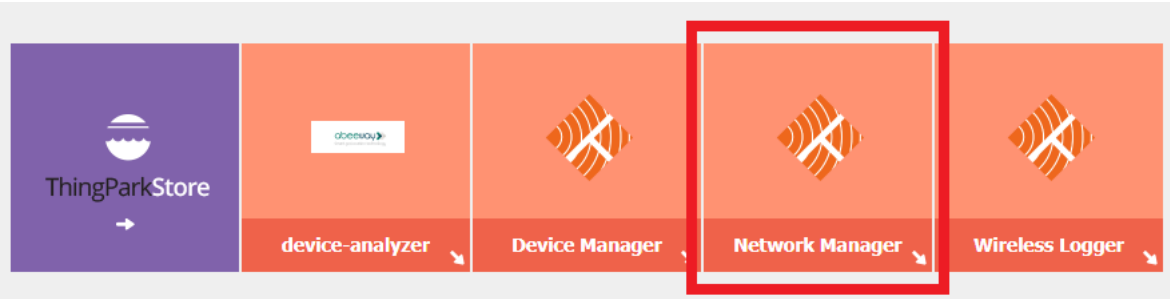
7.4 Abeeway Device Analyzer

Abeeway Device Analyzer (ADA) is a very useful application that can be used to configure the tracker and see location of trackers on a map.

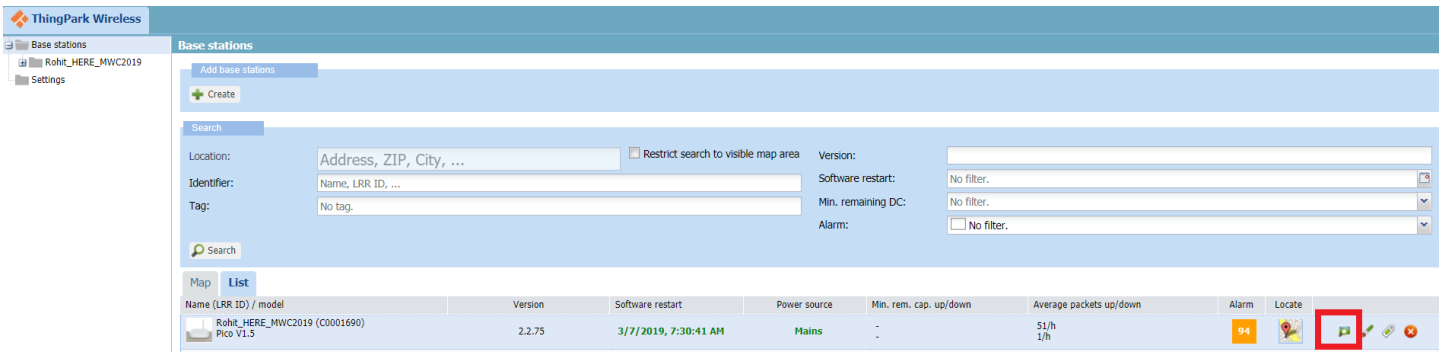
8. STEPS TO CHECK THE CONNECTIVITY

8.1 Gateway

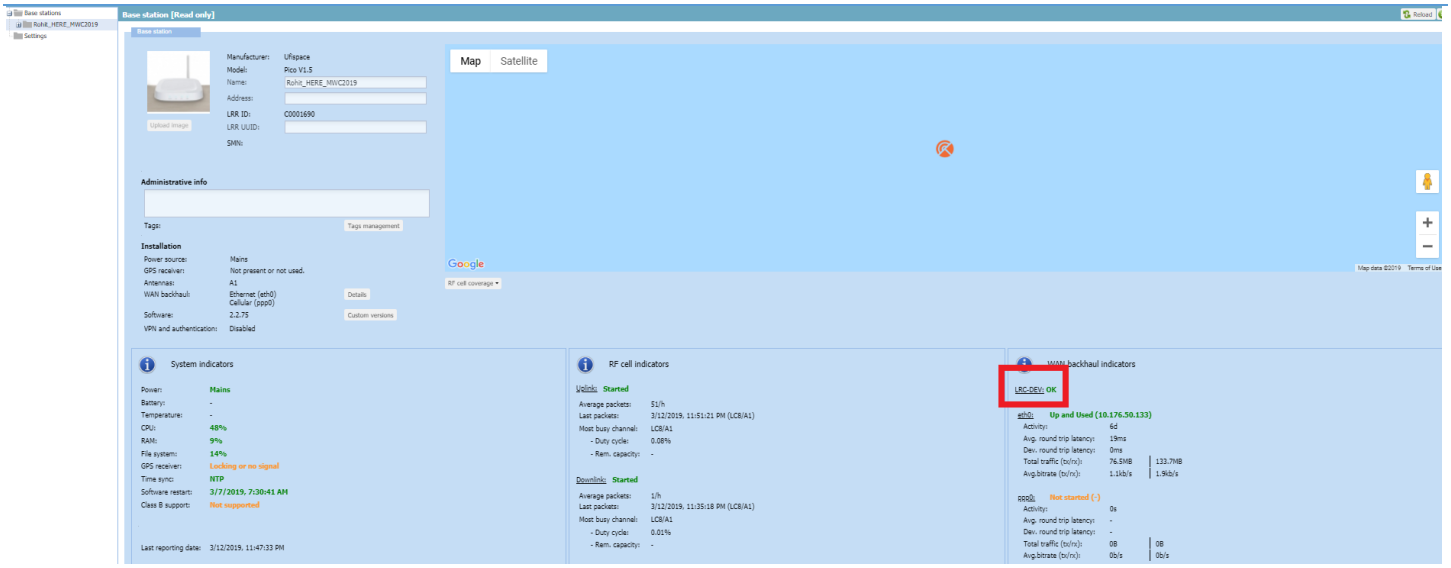
The LoRaWAN GW comes pre-provisioned in the ThingPark Wireless platform. Once you turn on the GW and connect to Internet, you can select the network manager application to verify that the Gateway is working properly.



You can click the view button below in the network manager application to see the status of gateways that are already provisioned in the ThingPark platform.



In order to verify that the gateway is connected to the platform properly, you should see OK next to the LRC (LRC is the ThingPark Wireless LoRaWAN™ network server).



If there is a connectivity issue with the gateway, then there may be a firewall blocking the connection from LoRaWAN gateway to the ThingPark Wireless platform. ThingPark Wireless supports Network Address Translation (NAT) traversal, but you need to open outgoing TCP ports. For more information, refer to the gateway installation in section 4.

8.2 Abeeway Trackers

Ensure the Abeeway Micro Tracker's battery is charged.

The Click&Go package comes pre-provisioned with the Micro Tracker. When it is turned on the first time, the tracker will send a Join request automatically to attach to the LoRaWAN network. A long press is required to turn on the micro-tracker. The first time the tracker joins the network, it will attempt to send a JOIN request to the LoRaWAN network server. However, this procedure can take some time due to LoRaWAN network constraints. Join Request/Response messages can be seen in the Wireless Logger application.

Note: **If for any reason you want to force a new Join Request for a tracker that is already Joined (e.g. to attach it to a new network), follow the procedure below:**

1. Make sure the tracker is switched off (You can see if it is switched off if it does not blink when you do short press. If the tracker is on, then press long enough and the Tracker will switch off with a beep). Once you are sure the tracker is switched off, follow the steps below.
2. 4 short press.
3. Long press until the tracker is turned on with a small beep.
4. 2 short press.
5. Long press until the tracker is turned off.
6. Wait for the tracker to blink (it can sometimes take few seconds). We recommend that you wait for 30s before switching on the tracker again.
7. Switch on the tracker with a long press until the tracker light is on with a melody. Then, the tracker will send a Join Request message and do short blinks multiple times to indicate that Join Request is in progress.

Note: The duration of short press is lower than a second.

Note: The duration of long press is greater than 5 seconds.

Micro Tracker survival guide

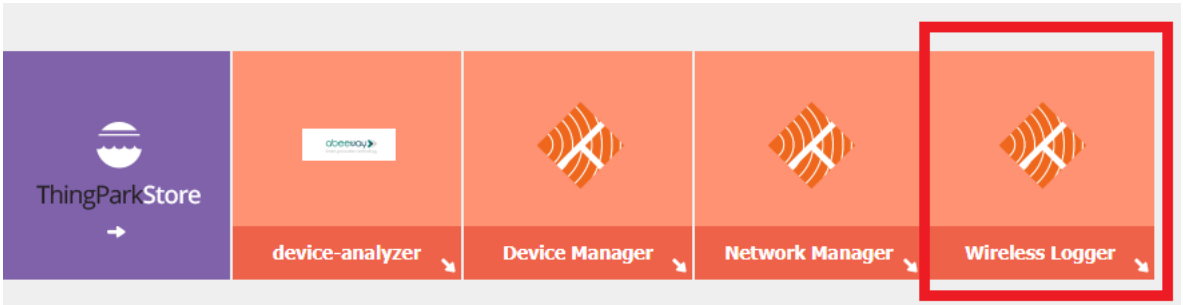
Switch on: A long press (until a melody is heard) is needed to turn ON the device (starting in motion tracking mode in standard configuration).
Switch off: A long press (until a melody is heard) is needed to turn OFF the device.
Check on/off status: Short press on the button will flash the blue led if the tracker is on
Trigger SOS mode/stop SOS mode: Double click the button.
When this feature is activated, the behavior is the following:

- The tracker sends continuously positions at a fixed period of 120 s.
- The tracker's blue led is blinking slowly.
- In order to stop SOS mode, double click the button again.

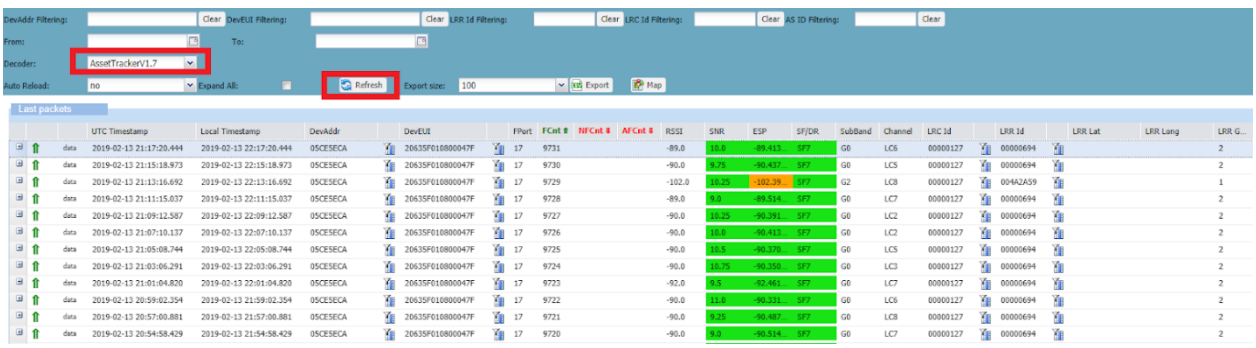
For more information, see the Micro Tracker reference guide [6].

For the case of Industrial tracker, it is operational and sending messages once shipped from the warehouse.

Look and check the Join Session success on the Wireless logger interface. The Wireless logger is an application that you can find after login into https://iot.thingpark.com/portal/web/, by clicking on the widget that is shown in the following capture.

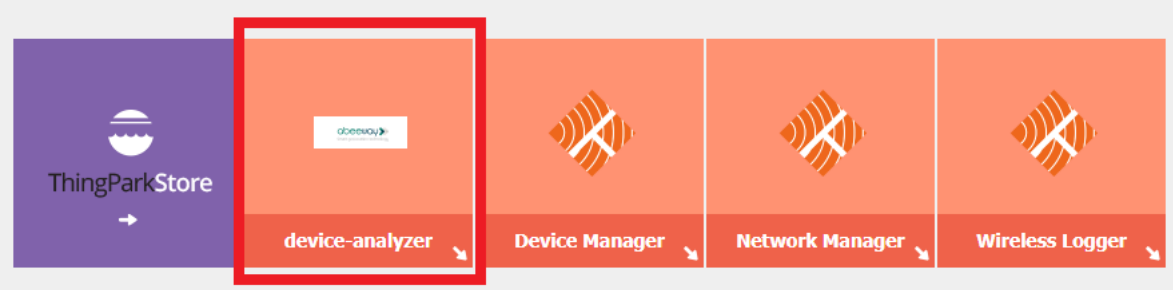


You can also decode the payload of UL/DL messages from/to the tracker from the Wireless Logger UI by selecting the appropriate decoder in the Wireless logger GUI (see figure below). If everything is working fine, you will see a JOIN Request/Response and several UL and DL messages as the tracker communicates with the network and the solver.

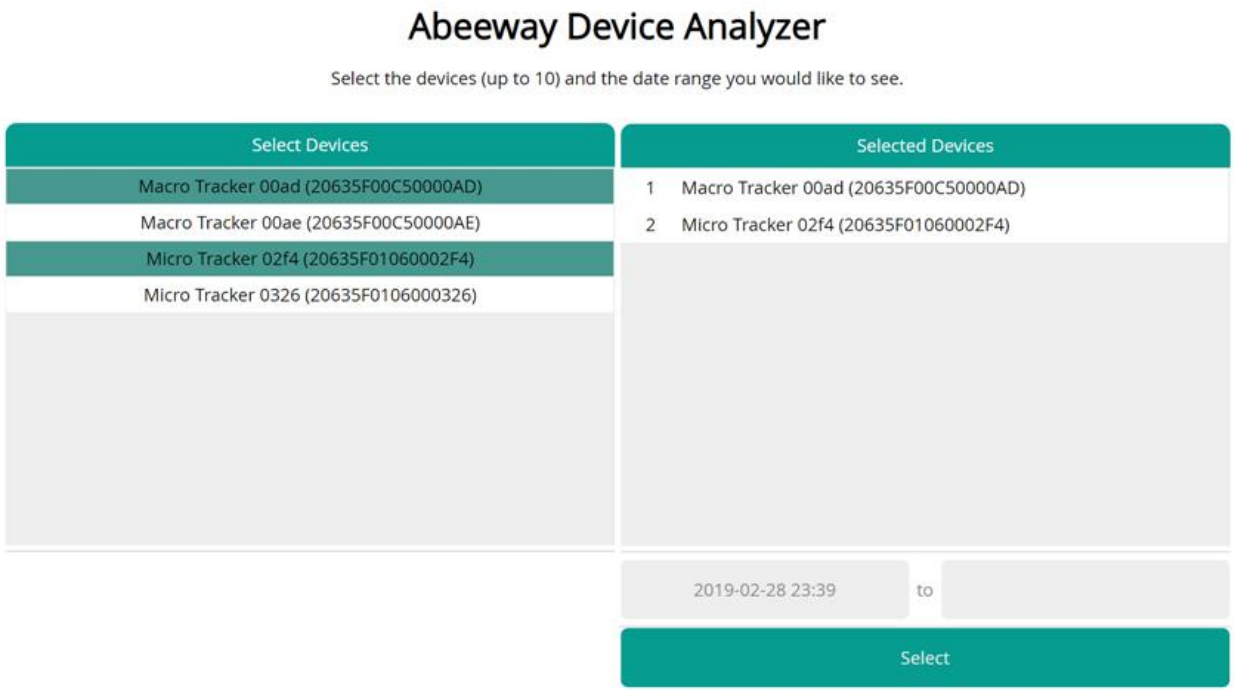


8.3 Abeeway Device Analyzer Usage

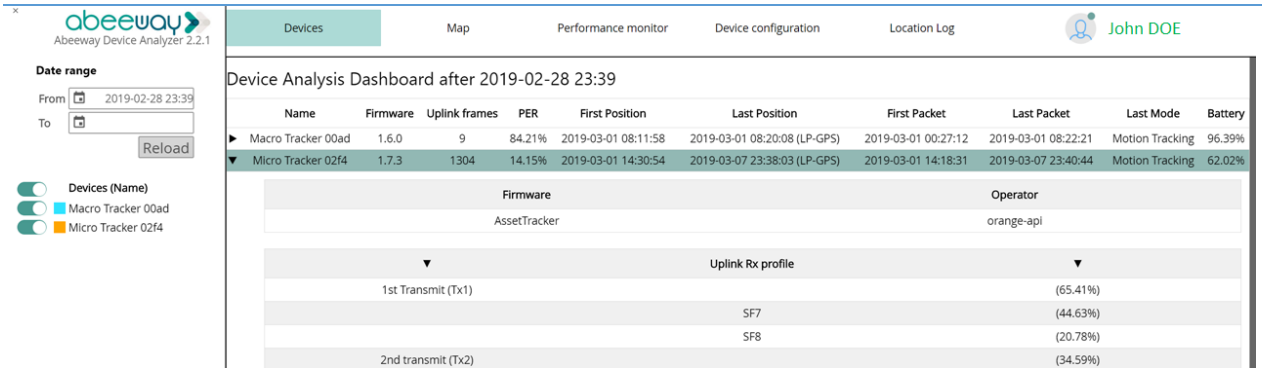
Abeeway Device Analyzer (ADA) is application that can be used to configure the tracker and see location of trackers on a map. You can select ADA widget after logging-in to https://iot.thingpark.com/portal/web/.



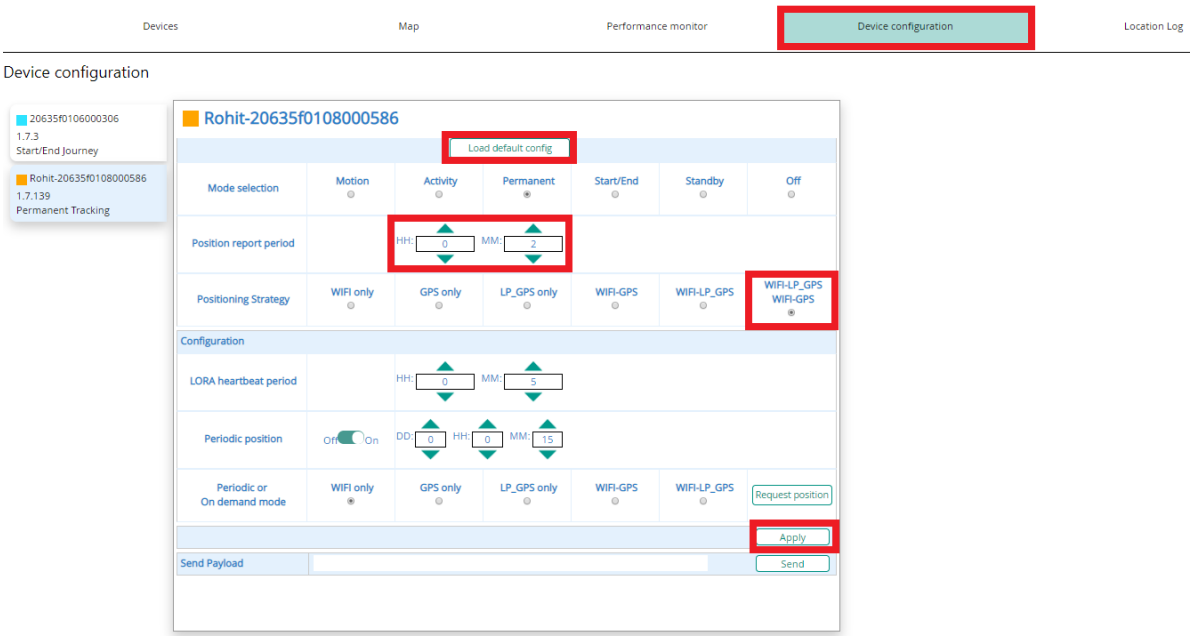
1. After you are logged in, ADA displays the list of trackers associated with the application. You may select up to 10 devices in this list.



2. Once identified, ADA displays a table with status details and statistics for each tracker. Each line may be expanded to display further information. An important piece of information is the device firmware version which can be used to know the right firmware features and documentation.



3. Then go to the "Device configuration" tab to manage the geolocation strategy, geolocation triggers and the periodicity for each device. Select a device and use the UI to select the desired mode and parameters.



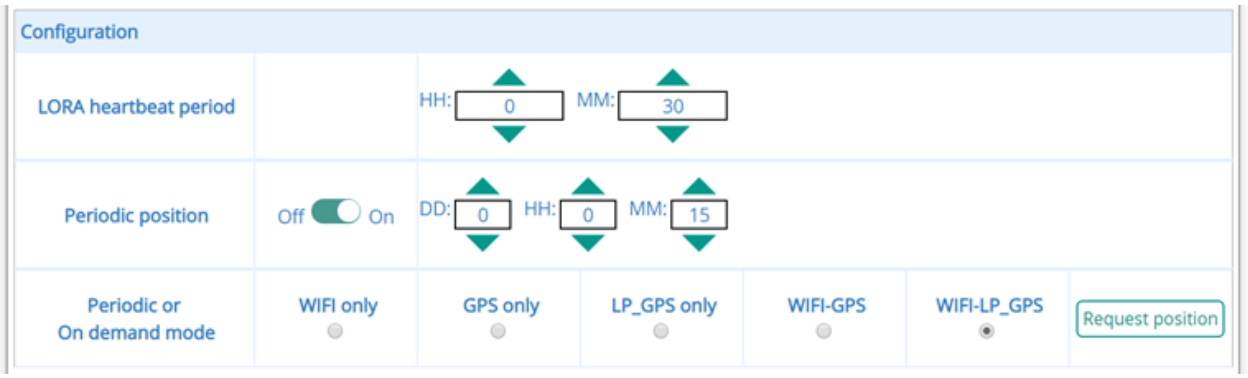
For the purpose of this document and fast integration, set the geolocation operational mode to "Permanent tracking", with a short position report period (e.g. 2 minutes). As this drain's batteries faster than other modes, change back to mode "motion" or any other mode as per your use case after successful integration.

It takes a while for downlink messages to be sent to the tracker as downlinks are sent only in the next receive window following an uplink (LoRaWAN class A). Each of the tracker sends periodic uplinks which are called LoRa Heartbeat messages. Depending on the current configuration of your tracker, it may take up to 30 minutes. The default tracker parameters (for example, the periodicity of LoRa heartbeat messages) for Micro Tracker are in Abeeway Micro-Tracker Firmware Reference Guide [6] and Industrial Tracker are in Abeeway Industrial Tracker Reference Guide [7].

Note that your firmware version in ADA matches the documentation firmware version to ensure correct default configuration.

Abeeway trackers have two geolocation modes which can be configured, the main operational mode (see preceding figure), and a secondary mode. The latter is used for on-demand geolocation requests, as well as optional lower frequency

periodic positions which will be sent regardless of the main mode settings. ADA also provides settings UI for this secondary mode.



It is possible to set different geolocation strategies for the main mode (For example, GPS only), and the on-demand/secondary mode (For example, Wi-Fi/LP_GPS).

Note: Tracker firmware prior to 1.7 reports Wi-Fi SSIDs when available regardless of the configured mode. This had been designed as an energy saving feature, but appeared confusing to users. As of v1.7, the GPS only and LP-GPS only modes never report Wi-Fi SSIDs even when available. Select the WiFi-LPGPS/GPS modes to enable multi-technology geolocation, which is optimal for energy conservation and it works indoor as well as outdoor.

9. THINGPARK DX LOCATION API

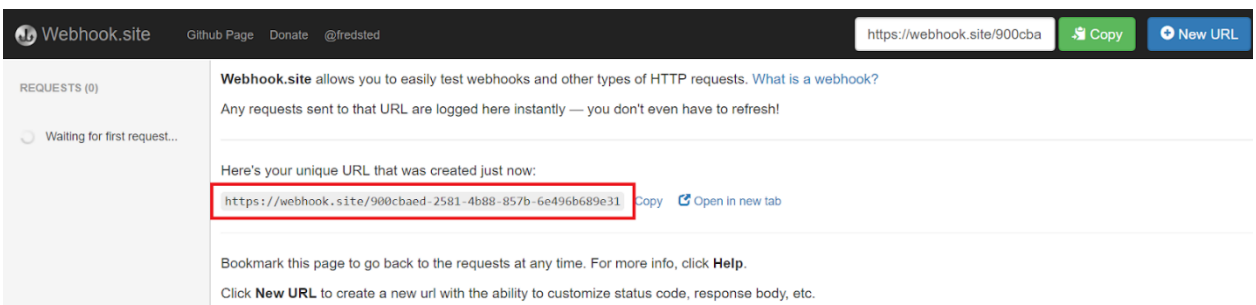
We also provide the API which can be used to integrate B2B Applications with the ThingPark Location platform. The following procedure describes the ways to use the DX Location API using swagger UIs.

9.1 Generating Callback URL

Use https://webhook.site/ when no callback URL available.

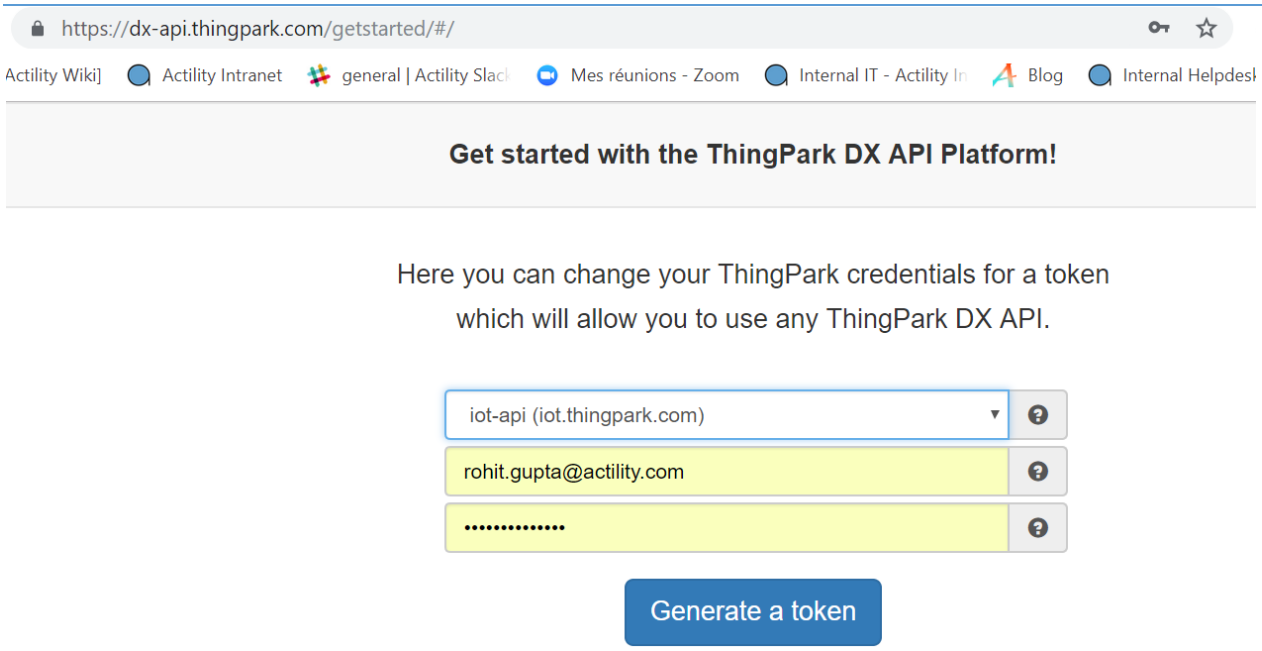
Note: This part can be skipped if there is already a URL from an application server to collect the device uplink frame data.

The Webhook.site generates an automatic URL which you will need to put in the next steps.

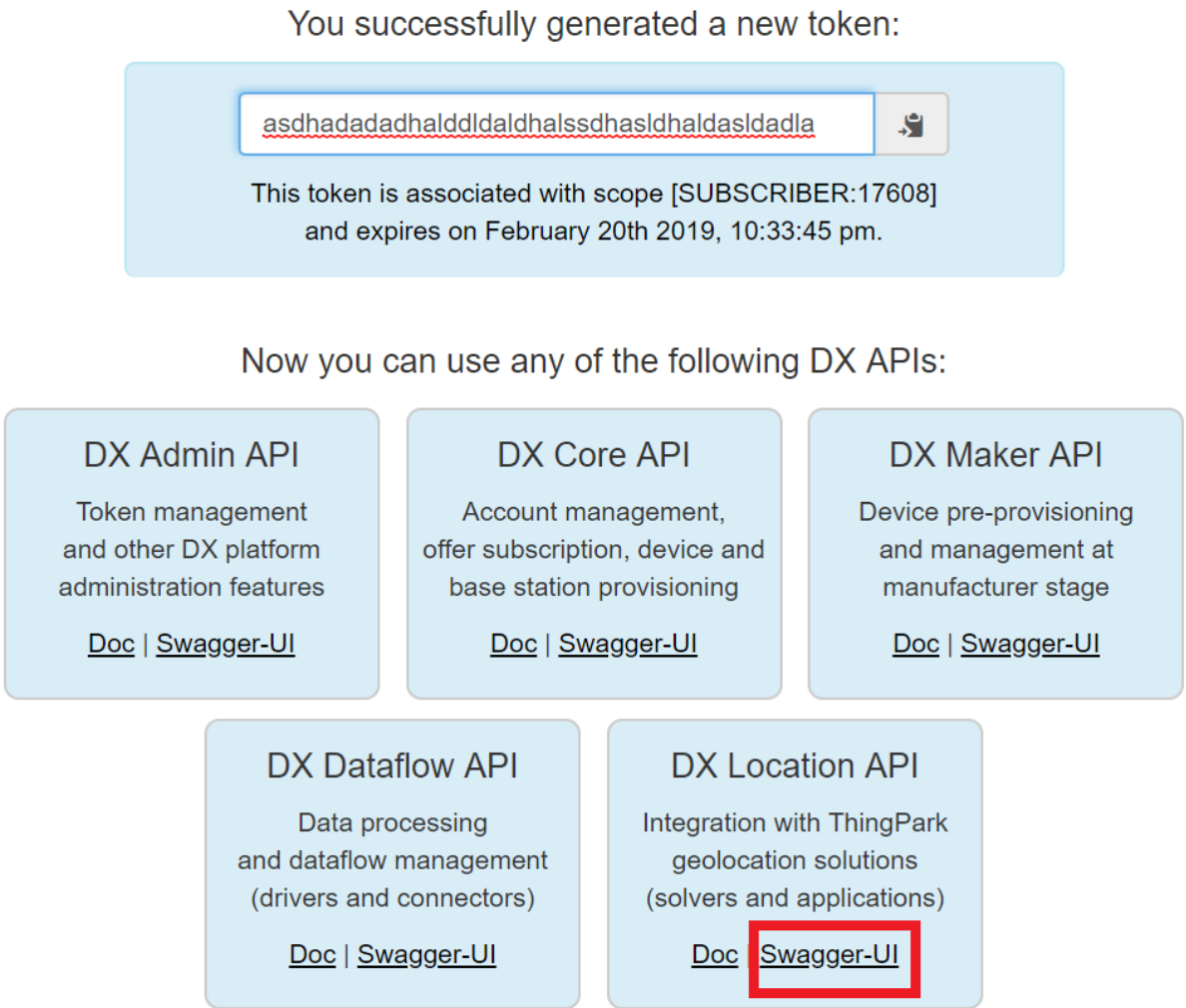


9.2 Generating DX API Token

1. Go to link https://dx-api.thingpark.com/getstarted to generate the token as shown in the following capture.

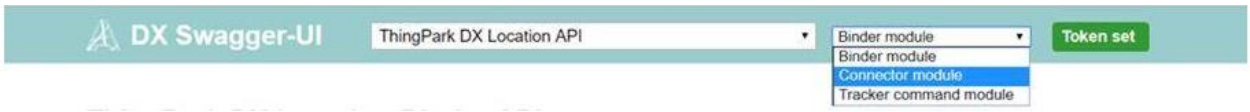


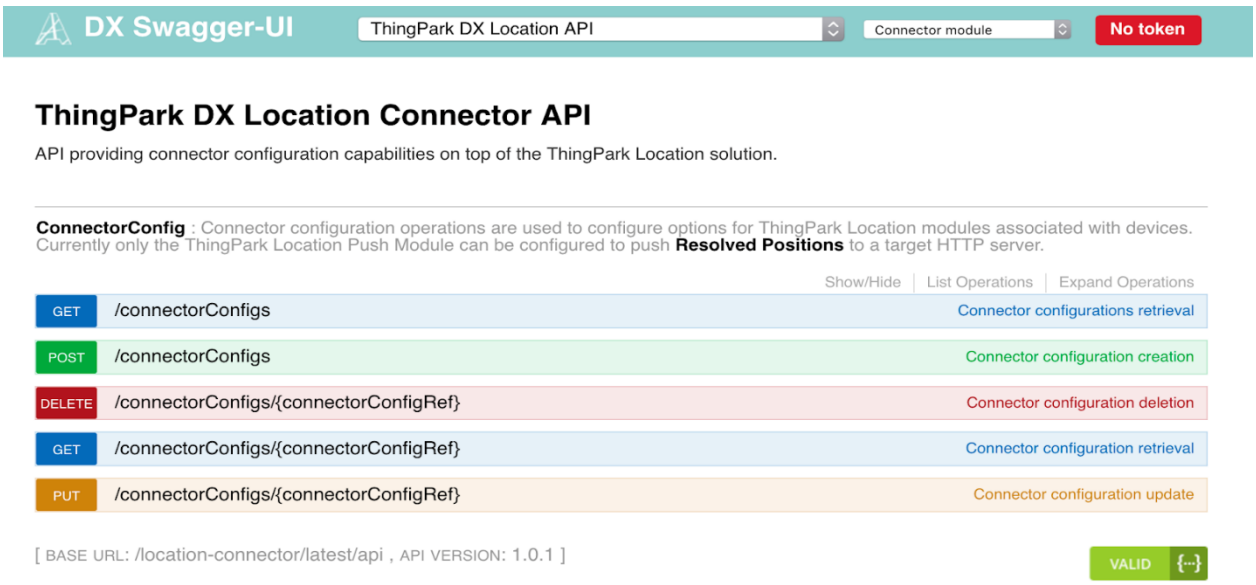
2. Once you get the token, click the DX Location swagger UI link below for the next steps



9.3 Setting Connector Module to Receive Resolved Positions

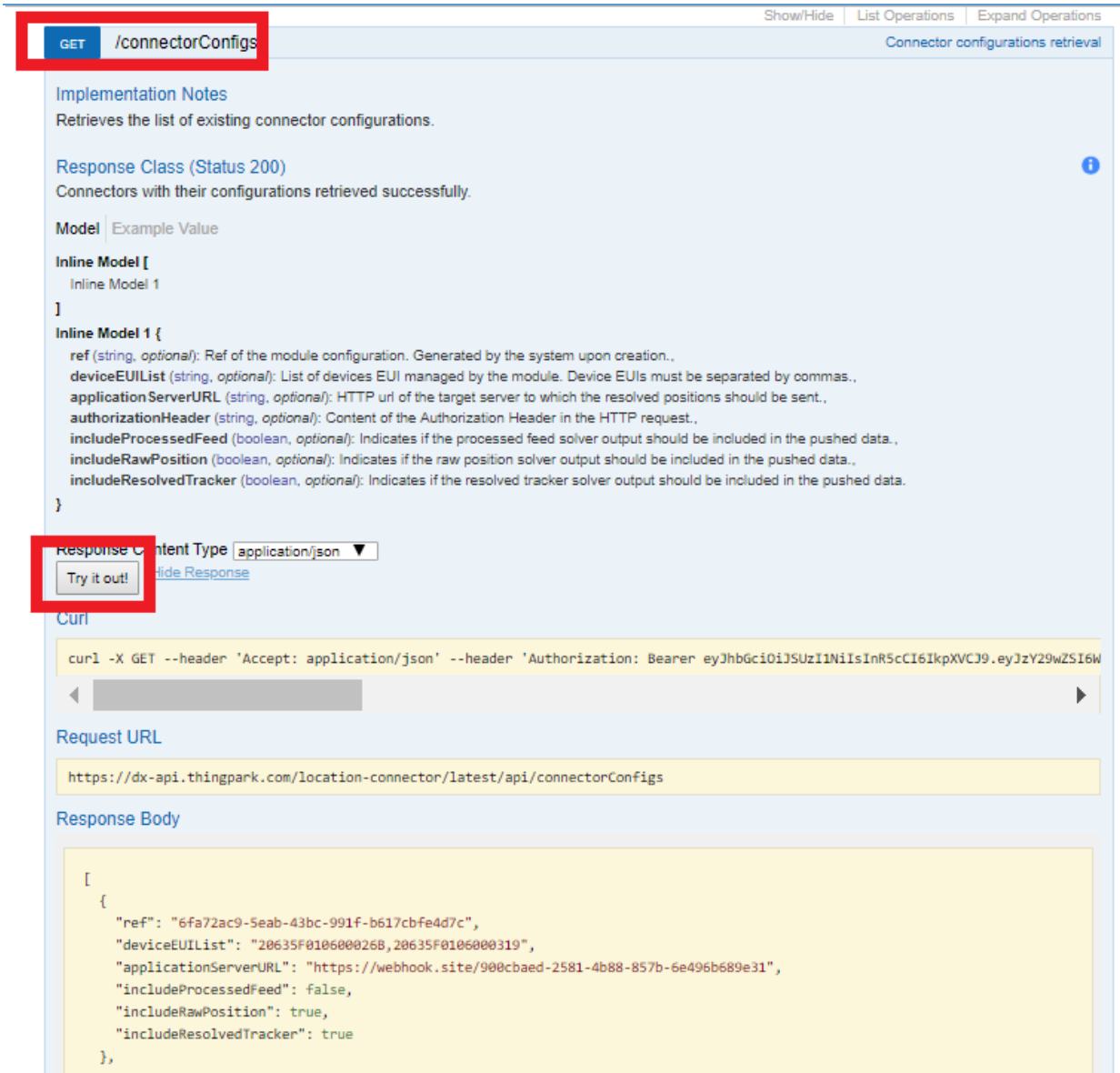
Once you are logged on DX Location Swagger UI, select the connector module. The Connector module is used to set the URL where ThingPark Location can send the resolved positions.





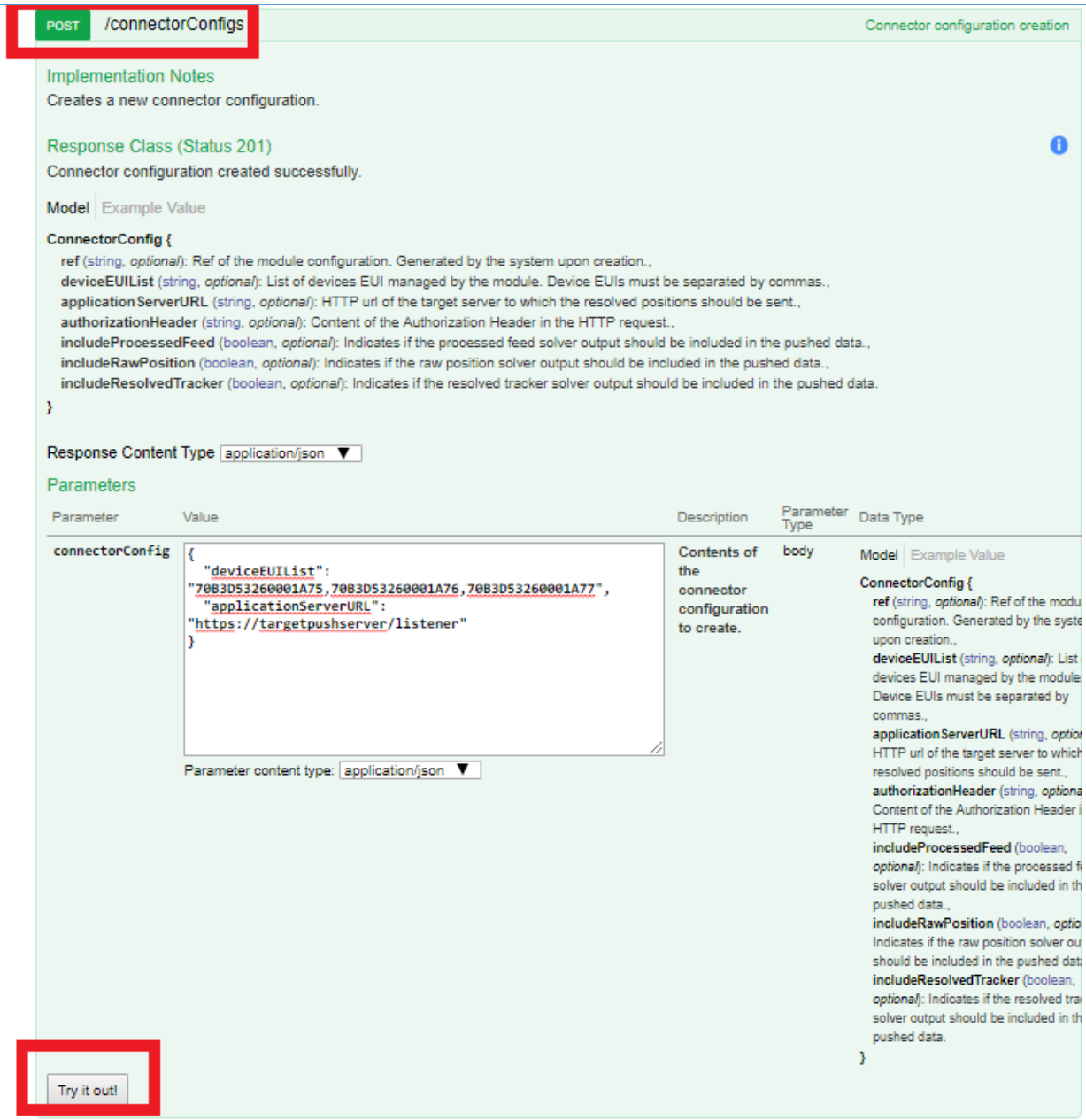
9.3.1 Retrieving the list of existing Connector Configs

You can retrieve the list of existing connector configurations by using instructions from the screen below.



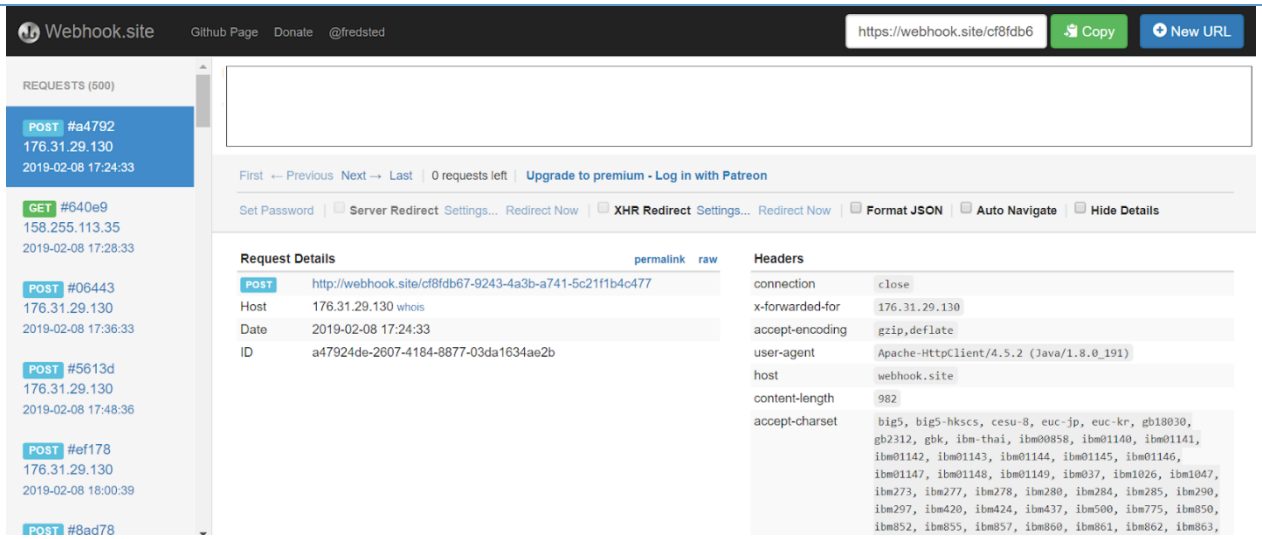
9.3.2 Connect the application server to the Solver

From the DX Location API interface, perform a POST request on the connector Configuration.
Note: You must set below the same URL that was generated in step 9.1.



Expected HTTP answer is **201**:

You should see uplink packets arriving on the callback URL created in earlier step. The following example below is an from webhook.site

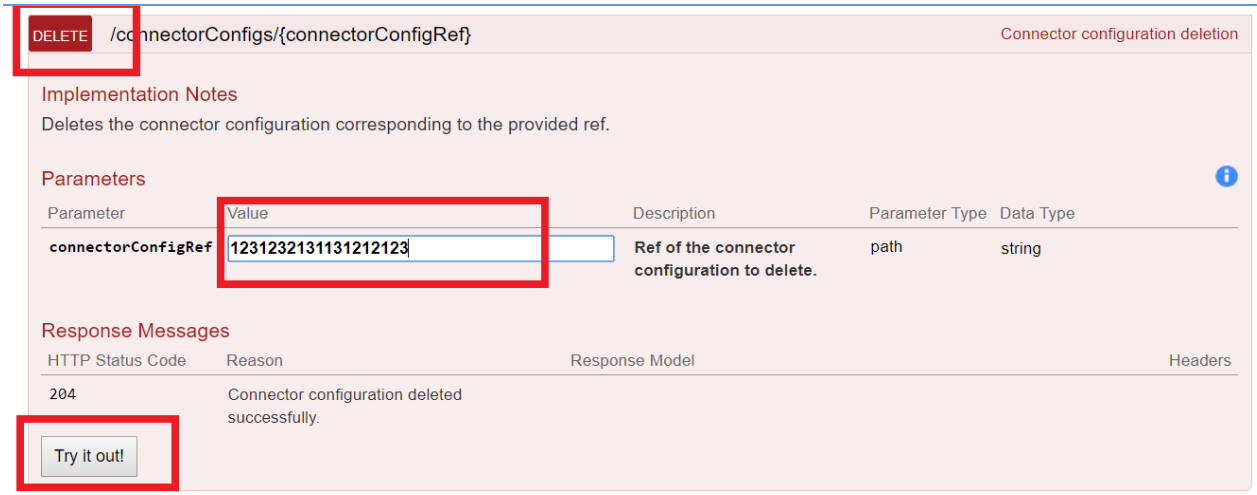


Excerpt from the packets sent:

```
validityState: NEW
rawPosition__rawPositionType:  RawPositionByWifiSolver
rawPosition__coordinates: 2.3336077,48.874687
age:      0
coordinates:   2.3336077,48.874687,20.0
horizontalAccuracy: 148
time:     2018-10-23T15:48:27.638000+00:00
deviceEUI:      20635F0106000304
rawPosition__bssidCount:  4
customerId:    100000796
dxProfileId:   iot-api
```

9.3.3 Delete the existing connector configuration

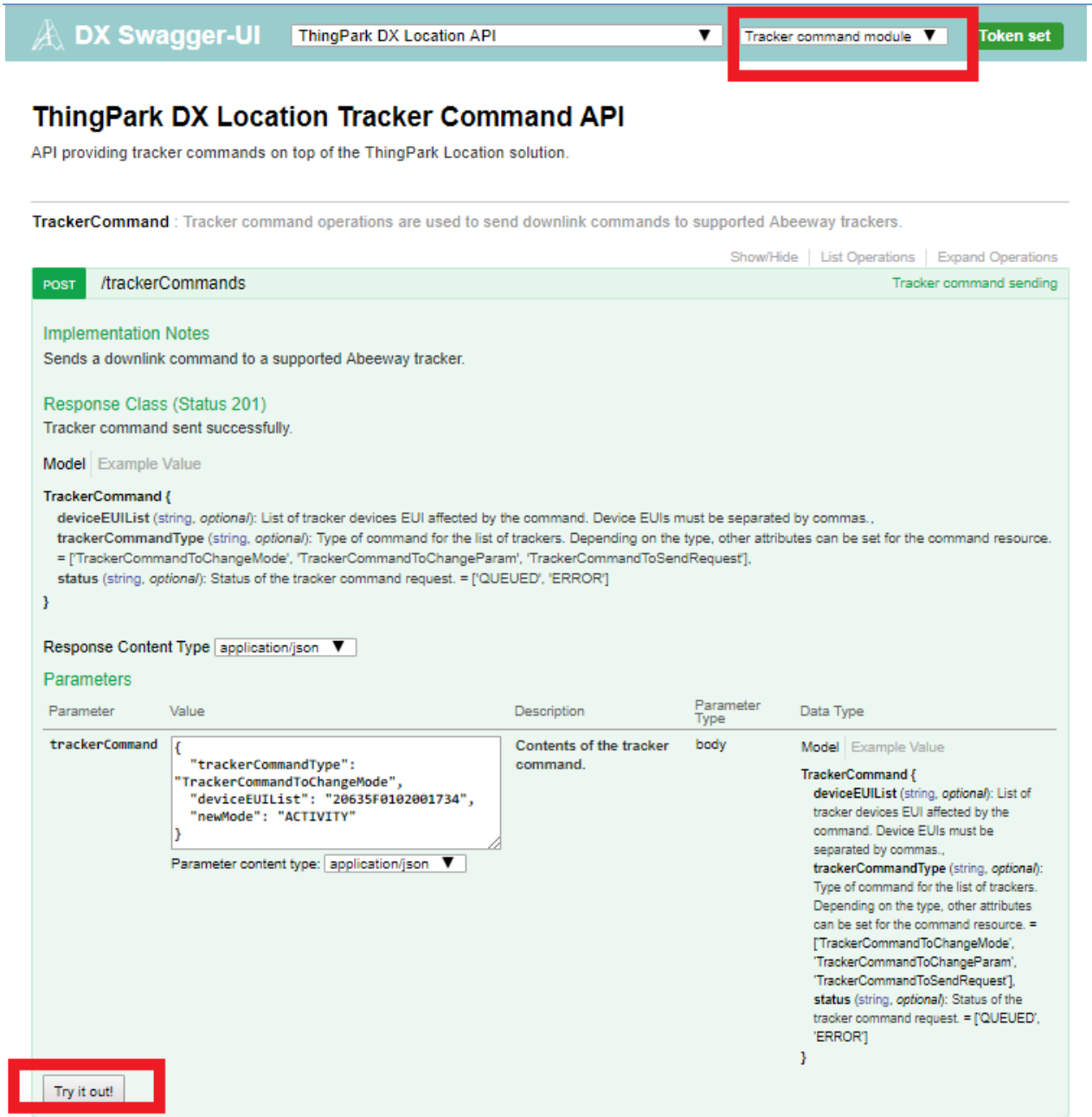
You can delete existing connector config based on the ***reference*** which can be retrieved using GET operation described earlier in the section 9.3.1. You can put the ***reference*** in the swagger UI below to delete the specific connector config ***reference***.



9.4 Send Downlink Tracker Command

The following example shows how Downlink tracker commands can be sent to change the tracker's parameters. For the purposes of the example below, we will change the device's mode to **ACTIVITY**.

Select Tracker command module as shown below in swagger UI.



Forge a JSON with newMode=ACTIVITY

POST /trackerCommands

```
{
 "trackerCommandType": "TrackerCommandToChangeMode",
 "deviceEUIList": "XXXXXX",
 "newMode": "ACTIVITY"
}
```

And it should return HTTP code 200.
Note: This will be queued in the LRC until the device' s next uplink and it can be checked through the Wireless Logger.

You can also change the tracker firmware parameters.
For the full list of parameters, see https://dx-api.thingpark.com/location-trackercommand/latest/doc/index.html#trackercommandtochangeparam and refer to your firmware reference guide [6] [7].

Forge a JSON to change parameter, TRACKING_UL_PERDIOD to 200s. This will send position reports every 200 seconds.

POST /trackerCommands

```
{
 "trackerCommandType": "TrackerCommandToChangeParam",
 "deviceEUIList": "20635F0102001734",
 "paramName": "TRACKING_UL_PERIOD",
 "paramValue": "200"
}
```

And it should return HTTP code 200.
Note: This will be queued in the LRC until the device' s next uplink and it can be checked through Wireless logger.

Note: It is possible that downlink can take time from the network as the network has to wait for next uplink to be received, which is dependent on LoRa heartbeat message configuration (see ADA tracker configuration page for its value). Sometimes this downlink message can get lost due to radio errors. If the ADA configuration page does not show you the right value after enough time, then you must repeat this procedure again. Note that you must refresh the ADA configuration page in your web browser to see the updated settings.

10. FAQ AND SUPPORT

10.1 Frequently asked questions

FAQ pages are located here: https://iot.thingpark.com/clickandgo/content/category/7-faq

For further questions, send us a mail to customer-support@thingpark.com

Ensure that you add the required information:

- Name
- Surname
- Organization
- Account name
- Login
- Trial Package questions

Your Account name and Login on the welcome mail you have received.

11. REFERENCES

[1] Actility/KPN Webinar on Multi-technology Geolocation: Slides, Recording.

[2] ThingPark Wireless Device Manager User Guide

[3] ThingPark Wireless Network Manager User Guide

[4] ThingPark Wireless Outdoor LRR Physical Installation Guidelines

[5] ThingPark Wireless Logger User Guide

[6] Abeeway Micro Tracker Firmware Reference Guide

[7] Abeeway Industrial Tracker Firmware Reference Guide

[8] Abeeway Micro Tracker Product Brief

[9] Abeeway Industrial Tracker Product Brief

[10] Abeeway Micro Tracker Data Sheet

[11] Abeeway Industrial Tracker Data Sheet

[12] Kerlink Wirnet LoRaWAN GW Datasheet: https://www.the-iot-marketplace.com/media/documents/DataSheet_Wirnet_station.pdf

[13] Ufispace Macro 1.5 GW Datasheet: https://drive.google.com/drive/u/1/folders/1mp--hxVrbPCv3cmcLK6YE9hzEr-Ph_Ss

[14] WiFi Positioning Technologies Overview: https://en.wikipedia.org/wiki/Wi-Fi_positioning_system

[15] Indoor Positioning Technologies Overview: https://en.wikipedia.org/wiki/Indoor_positioning_system

[16] Actility/Orange Webinar on how does LoRaWAN and Mobile IoT Complement each other. Slides, Recording

[17] Actility Whitepaper: LoraWAN and Cellular IoT (NB-IoT, LTE-M): How do they complement each other?. Link

12. APPENDIX

12.1 Flow Matrix from LoRaWAN Gateway towards ThingPark Wireless IoT Platform (https://iot.thingpark.com)

protocol	Host	protocol
DNS	8.8.8.8	
SSH	lrc1-eu.thingpark.com (217.69.25.85), lrc2-eu.thingpark.com (217.69.25.69)	TCP/22
IEC104	lrc1-eu.thingpark.com (217.69.25.85), lrc2-eu.thingpark.com (217.69.25.69)	TCP/2404
FTP	lrc1-eu.thingpark.com (217.69.25.85), lrc2-eu.thingpark.com (217.69.25.69)	TCP/21
NTP	lrc1-eu.thingpark.com (217.69.25.85), lrc2-eu.thingpark.com (217.69.25.69)	UDP/123
ICMP	lrc1-eu.thingpark.com (217.69.25.85), lrc2-eu.thingpark.com (217.69.25.69) 8.8.8.8, 4.2.2.2, 8.8.4.4, support1.actility.com(91.134.250.106)	ICMP
NTP	lrc1-eu.thingpark.com (217.69.25.85), lrc2-eu.thingpark.com (217.69.25.69) 0.pool.ntp.org, 1.pool.ntp.org	UDP/123

FTP	a-support1-eu.thingpark.com (217.69.25.90), b-support1-eu.thingpark.com (217.69.25.74)	TCP/21
SSH	a-support1-eu.thingpark.com (217.69.25.90), b-support1-eu.thingpark.com (217.69.25.74)	TCP/22