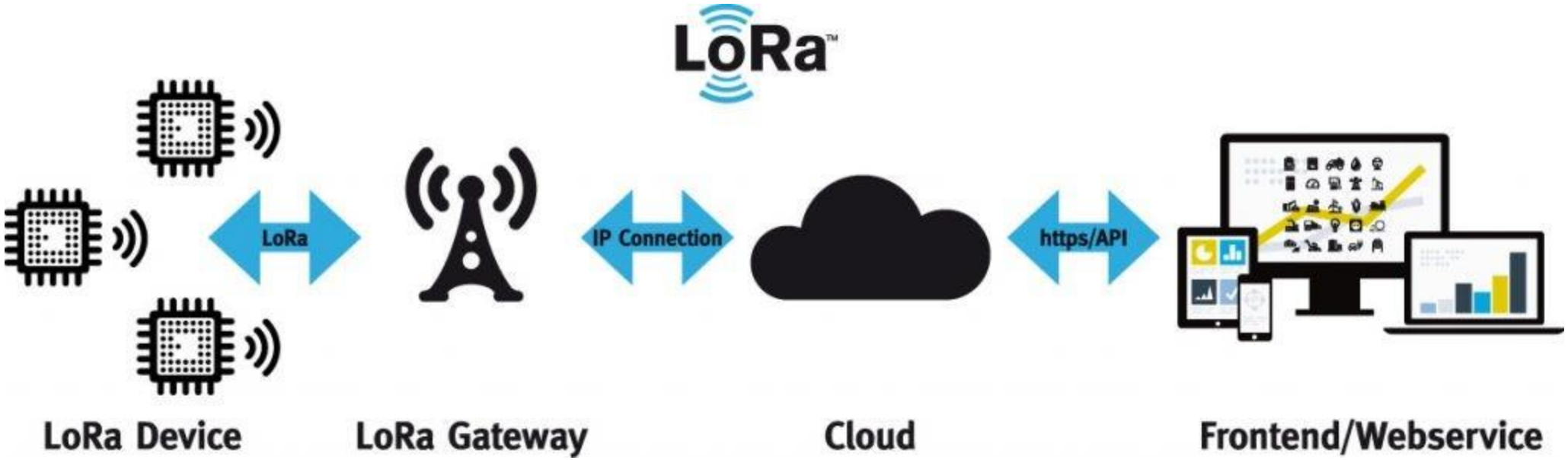
Getting Started With LoRaWAN

Michael Price

Radio Data Networks

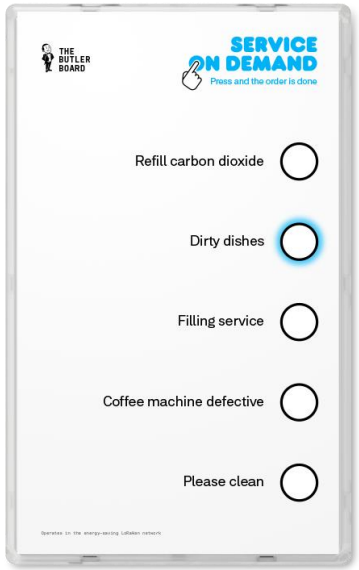
What is LoRaWAN?

LoRaWAN Network



Sensors


Exsignal

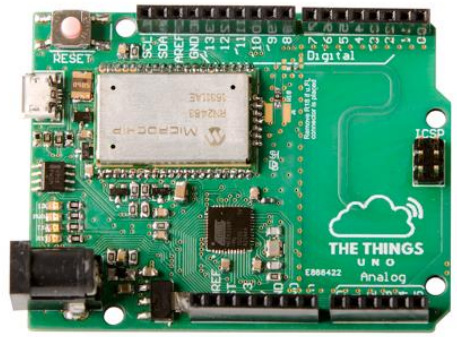

THE BUTLER BOARD
SERVICE ON DEMAND
Press and the order is done
Refill carbon dioxide
Dirty dishes
Filling service
Coffee machine defective
Please clean


Laird
LoRaWAN
Sentrius™ Sensor


The way to get started is to quit talking and begin doing.
Walt Disney

What do we need?

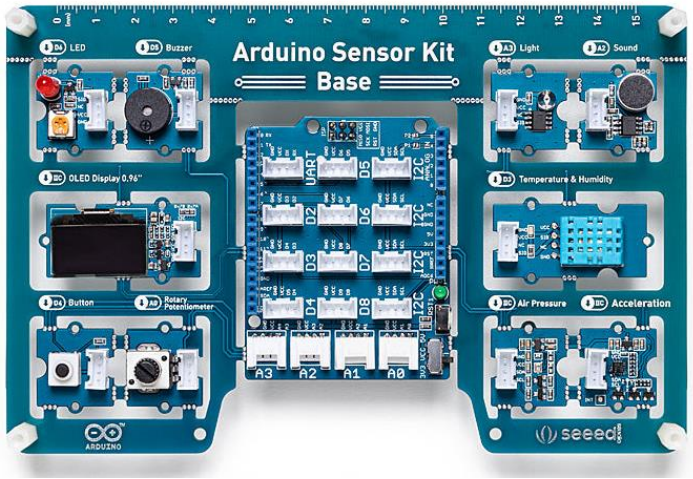
- The Things Uno
- Arduino Sensor Kit



- Arduino IDE
  https://www.arduino.cc/en/software

- Things Network Account
  https://eu1.cloud.thethings.network/console/

- Datacake Account
  https://app.datacake.de/signup



Set Up Arduino

1. Attach the Grove base shield to The Things Uno board.
2. Open the Arduino IDE and install "TheThingsNetwork" library.
3. Select the "Arduino Leonardo" board type and the correct serial port.
4. Open the "DeviceInfo" example sketch. Set the frequency to EU868 then upload to Arduino.
5. Open the serial monitor and set the Baud rate to 9600. The device details should appear in the serial monitor window.

The Things Network

- Sign up for an account
  https://eu1.cloud.thethings.network/console/
- Create an application
- Register an end device using details from Arduino serial monitor
- Enter “00000000” as Join EUI
- Generate an App Key
- Set the payload format to CayenneLPP

THE THINGS NETWORK

The Things Network

End device type

Input method

- (•) Select the end device in the LoRaWAN Device Repository
- ( ) Enter end device specifics manually

End device brand *	Model *	Hardware Ver. *	Firmware Ver. *	Profile (Region) *
The Things Produ...	The Things Uno	1.0	quickstart	EU_863_870

The Things Uno

LoRaWAN Specification 1.0.2, RP001 Regional Parameters 1.0.2 revision B, Over the air activation (OTAA), Class A

The Things Uno is based on the Arduino Leonardo with an added Microchip LoRaWAN® module. It is fully compatible with the Arduino IDE and existing shields.

Frequency plan *

Europe 863-870 MHz (SF9 for RX2 - recommended)

Provisioning information

JoinEUI *

00 00 00 00 00 00 00 00 [Confirm]

To continue, please enter the JoinEUI of the end device so we can determine onboarding options

Provisioning information

JoinEUI *

00 00 00 00 00 00 00 00 [Reset]

This end device can be registered on the network

DevEUI *

00 04 [redacted] 67 70 [Generate] 0/50 used

AppKey *

1A AE [redacted] 25 2B [Generate]

End device ID *

eui-0004 [redacted] 5770

This value is automatically prefilled using the DevEUI

After registration

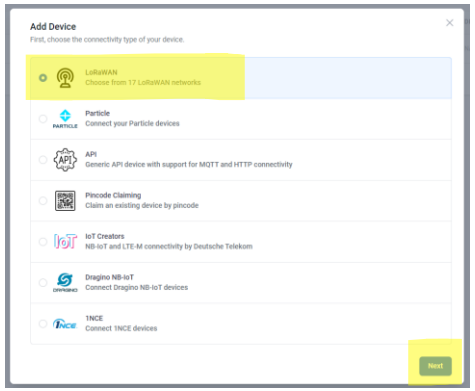
- (•) View registered end device
- ( ) Register another end device of this type

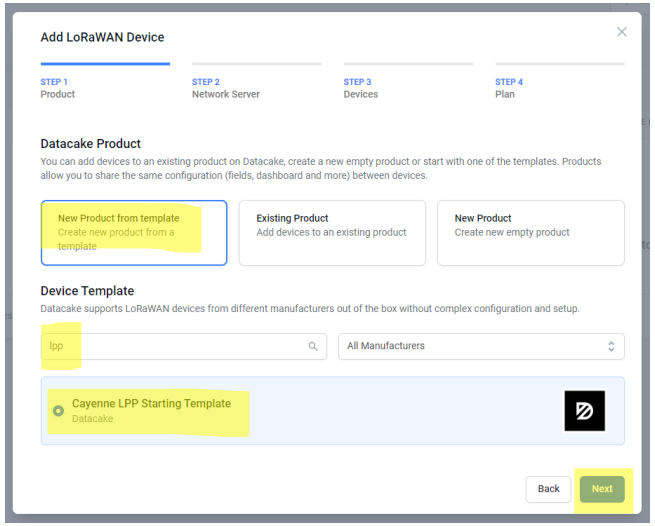
[Register end device]

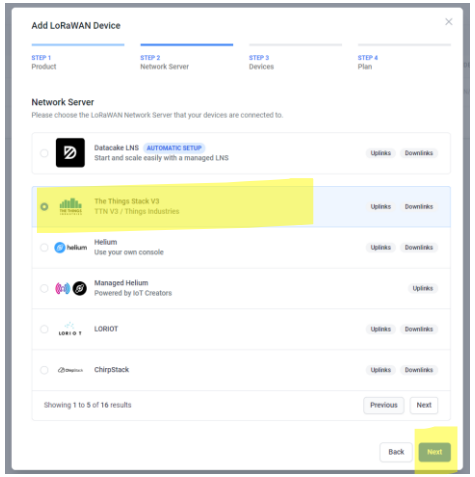
Datacake Dashboard

DATACAKE

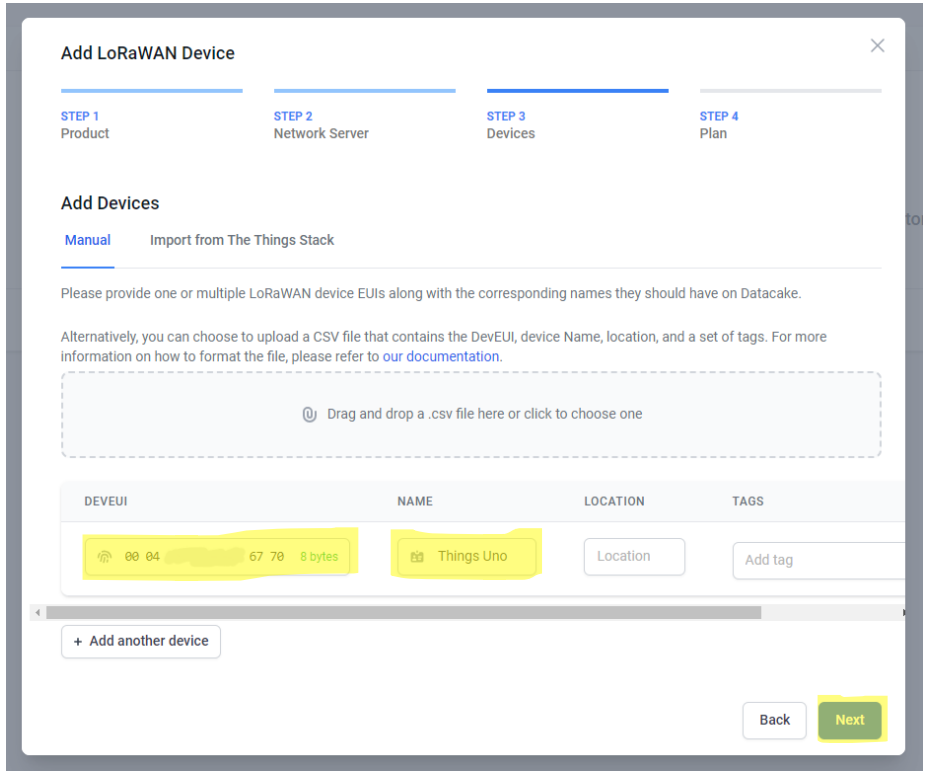
- Sign up for an account
  https://app.datacake.de/signup
- Click “Add Device” button
- Choose “LoRaWAN” and click “Next” button
- Search for “LPP” and select “Cayenne LPP Starting Template” then click “Next” button
- Select “The Things Stack V3” and click “Next” button



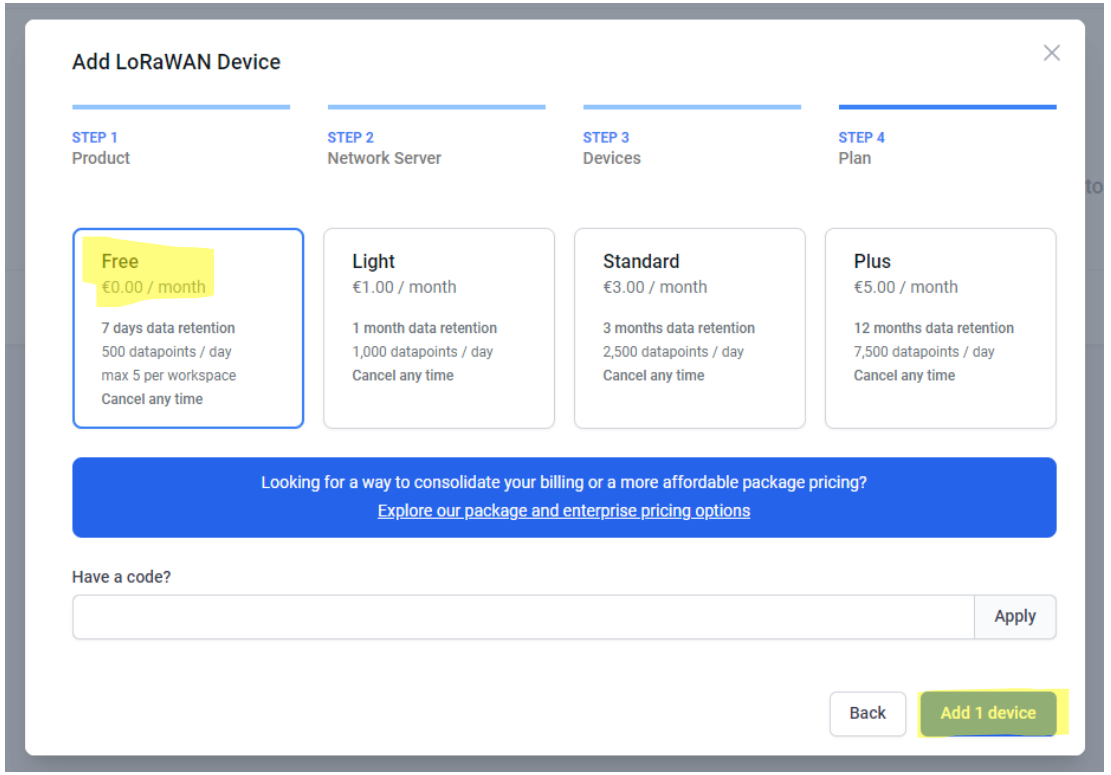




Datacake Dashboard

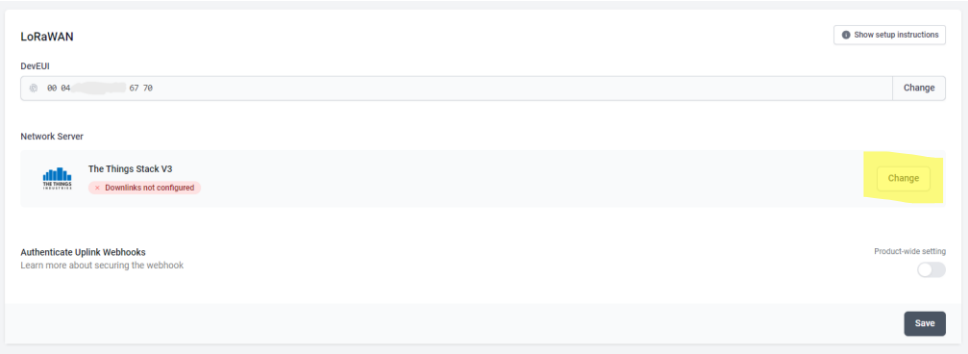


Enter DevEUI from The Things Network and name your device then click the “Next” button



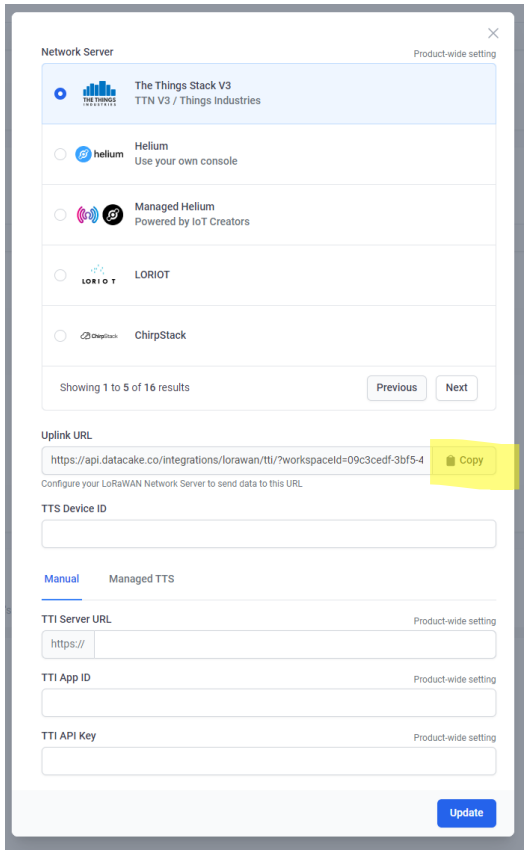
Select the free plan and click the “Add 1 device” button

Datacake Dashboard



Click on your new device, select the configuration tab and scroll down until you see the LoRaWAN section.

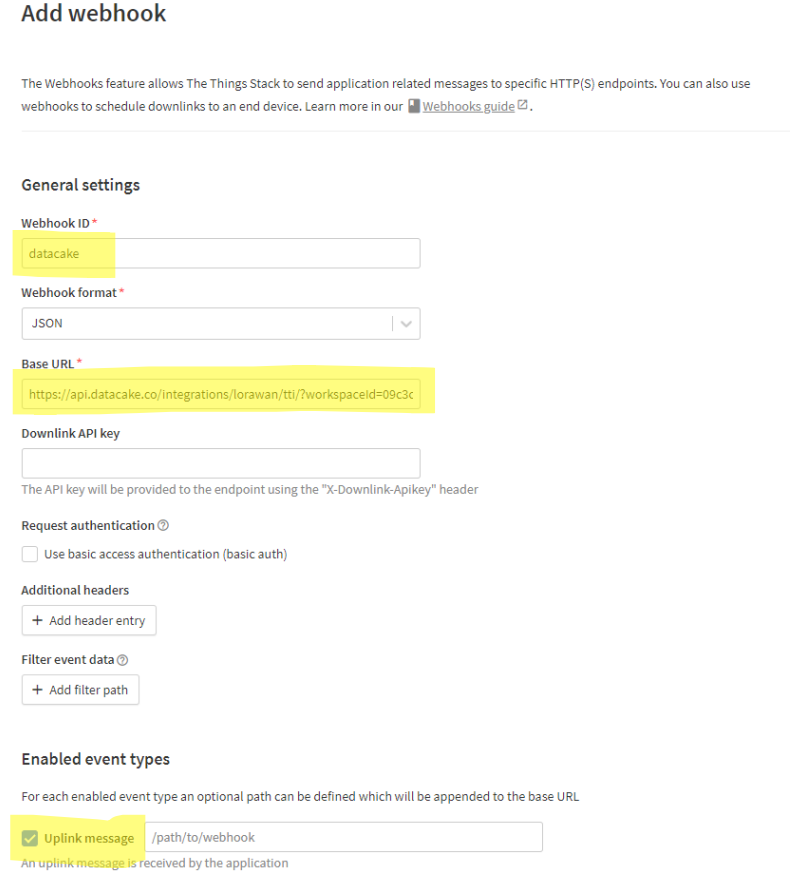
Click on the “Change” button on The Things Stack V3 network server.



Copy the Uplink URL. You will need to enter it on The Things Network console in the next step.

The Things Network

- Add custom webhook integration
- Paste in URL from Datacake
- Select “Uplink Message” event type
- Click “Add Webhook” button at the bottom of the page.



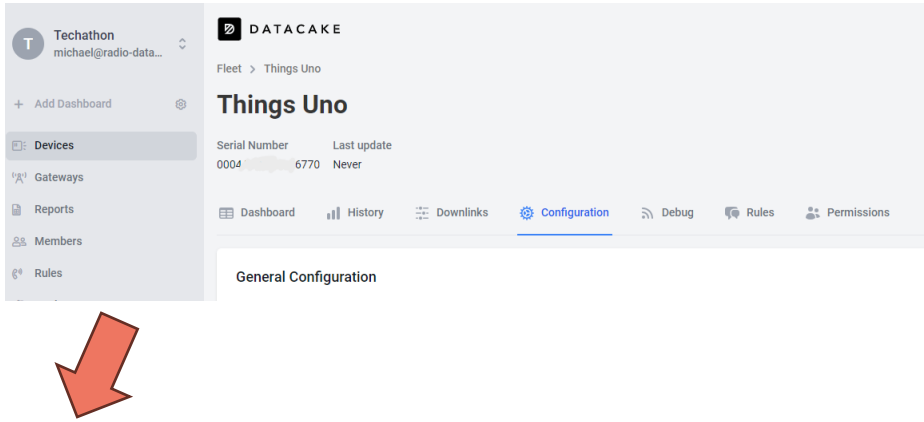
Send Some Data!

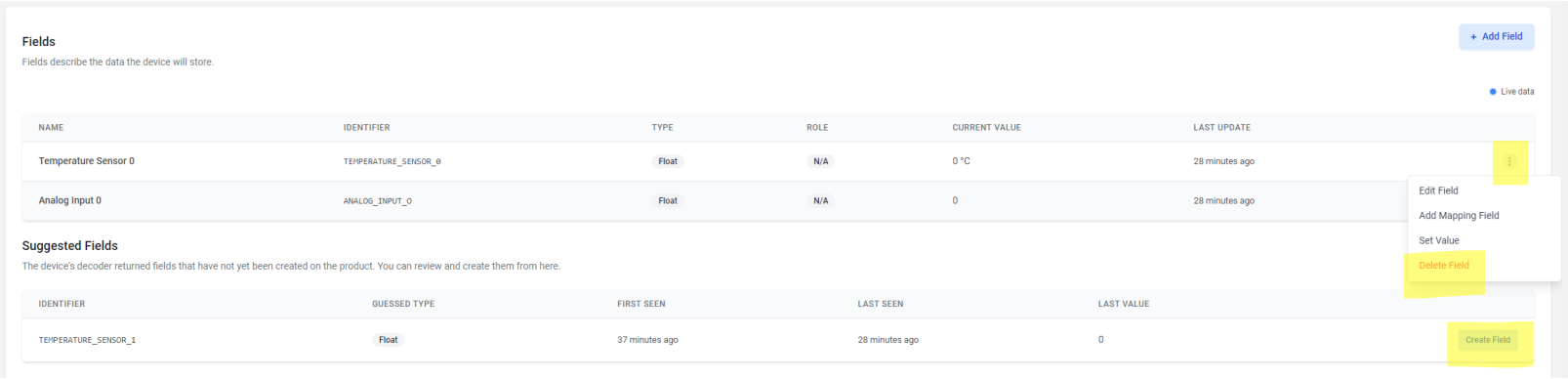
- Download example code from Github
  - https://github.com/rdn-mike/techathon-arduino-examples
- Start the Arduino IDE
- Install the “Arduino_Sensorkit” library
- Open the example sketch from Github
- Paste in App Key from TTN console
- Save sketch & upload
- Check the OLED screen, serial monitor and TTN console
- Data comes through to your device on Datacake

Datacake Dashboard

DATACAKE

Select your device in Datacake and click on the “Configuration” tab then scroll down to the “Fields” section



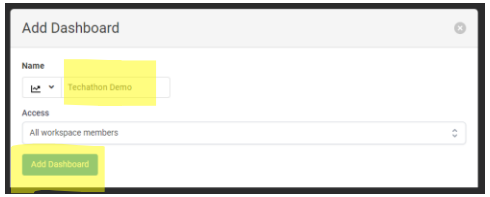


Delete the automatically added fields.

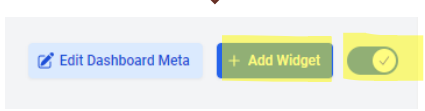
When your device has sent some data to Datacake suggested fields will be shown.

Click the “Create Field” button to add them to your device.

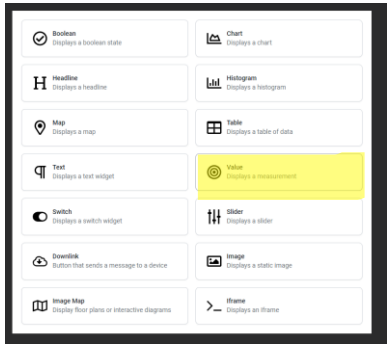
Datacake Dashboard



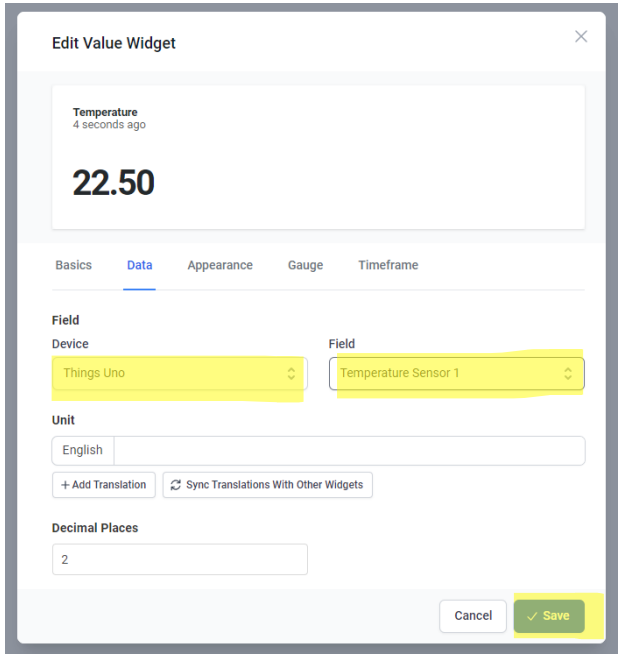
Add a dashboard and give it a name



Click on the switch and then on “Add Widget”



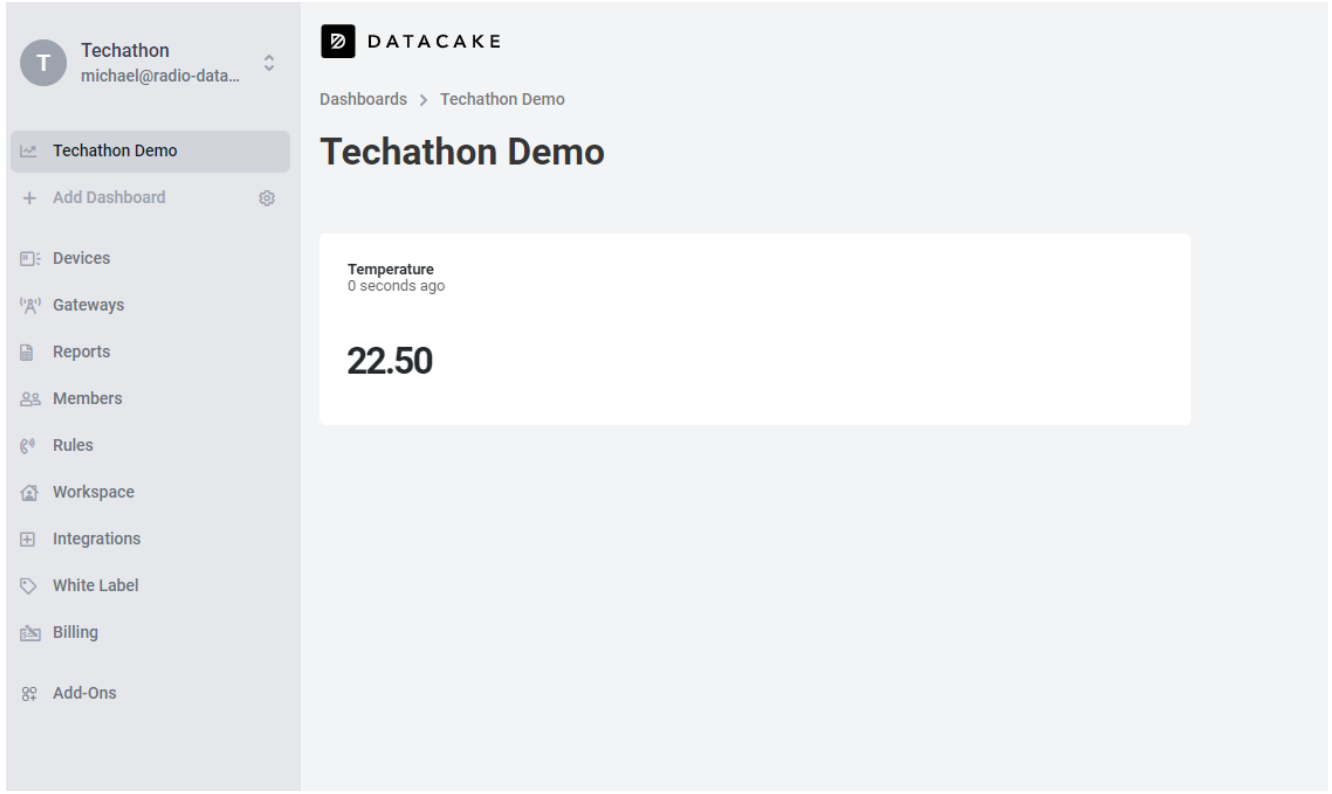
Click on the “Value” widget



Give the widget a title, then select the device and field you would like to display.

Click the “Save” button to add the widget to your dashboard.

Datacake Dashboard



The widget will now show on your dashboard.

It will automatically update when new data is received from the device.

Try adding different types of widget to your dashboard.

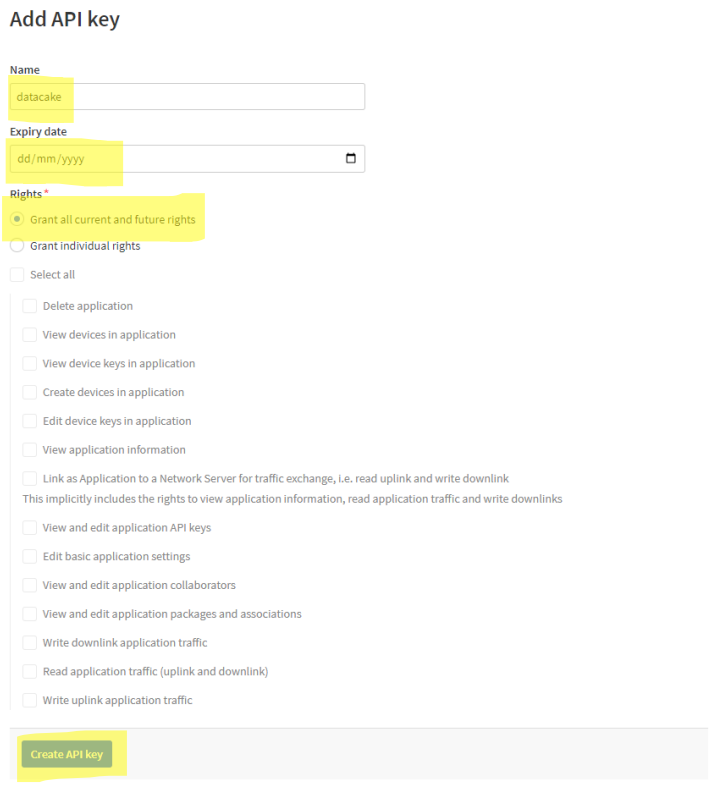
Two-Way Communication

LoRaWAN Downlinks

- When your device sends data to the LoRaWAN network it can also receive a downlink from the network
- The downlink must be queued on the network server so that it can be sent whenever the device sends an uplink
- The downlink will be sent to the device once and removed from the queue
- Downlink messages use a lot of network capacity so should only be used when you need them

The Things Network

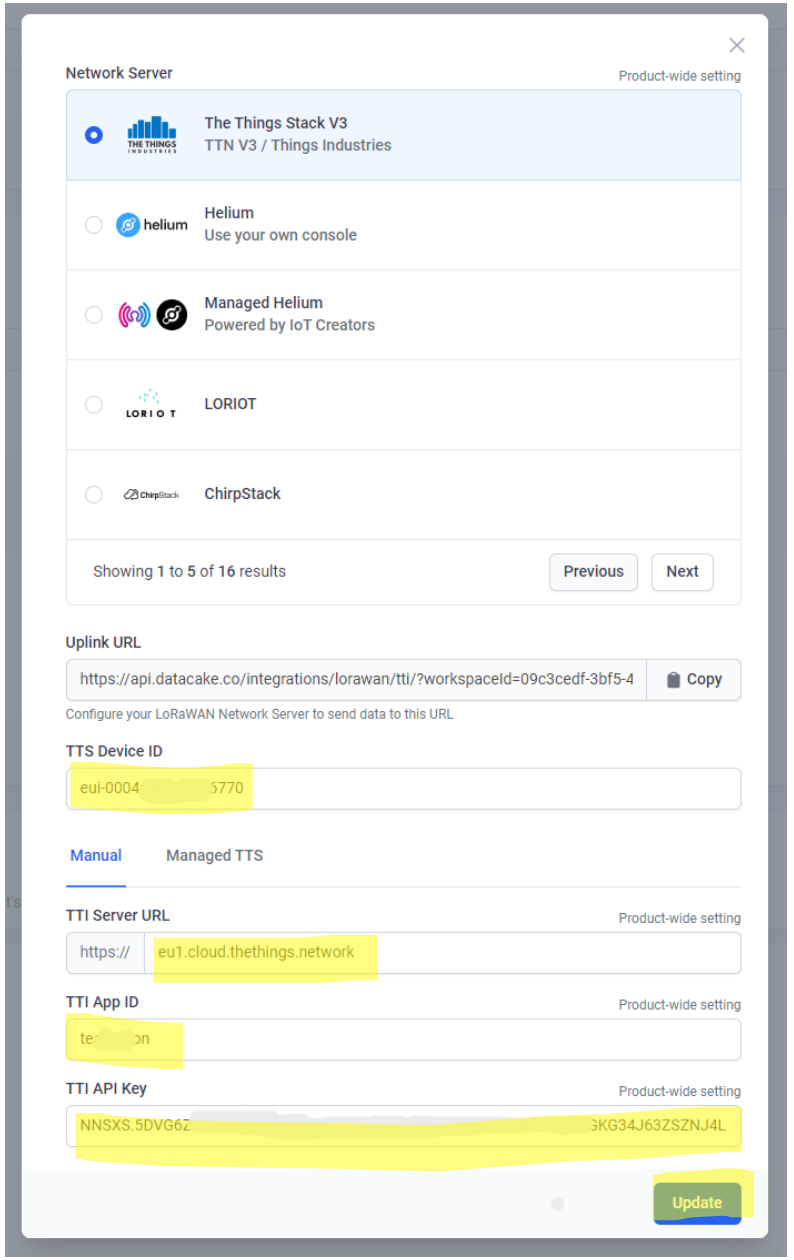
- Add an API key to your application
- Enter a name
- Leave the expiry date blank
- Select “Grant all current and future rights”
- Click the “Create API key” button
- Copy the API key (you won’t be able to copy it again later)



Datacake Dashboard

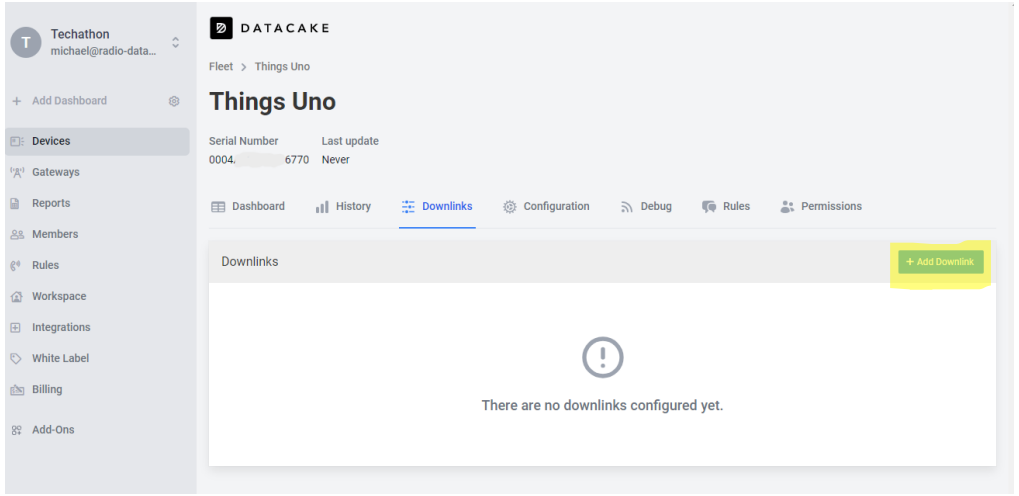
- Paste the API key into the Datacake network server settings for your device under “TTI API Key”
- Enter the TTI Server URL: “eu1.cloud.thethings.network”
- Enter your TTI App ID. You can find this on the Things Network app overview page.
- Enter your TTS Device ID. You can find this on the Things Network end devices page.
- Click the “Update” button

Your device is now set up for two-way communication over the LoRaWAN network.



Datacake Dashboard

Select your device in Datacake and click on the “Downlinks” tab then click on the “Add Downlink” button



Give your downlink a name and change the Payload Encoder function to return `[0x01]`

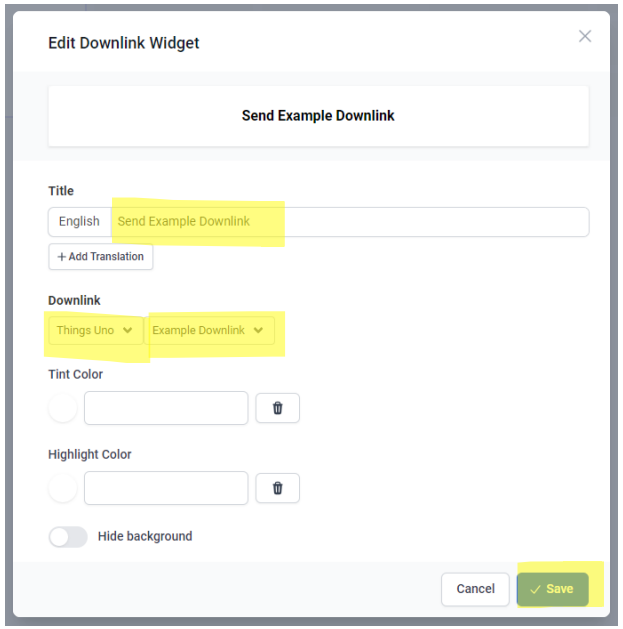
Click the “Save Downlink” button.

Datacake Dashboard

Go to your dashboard on Datacake and add a widget

Click on the switch and then on “Add Widget”

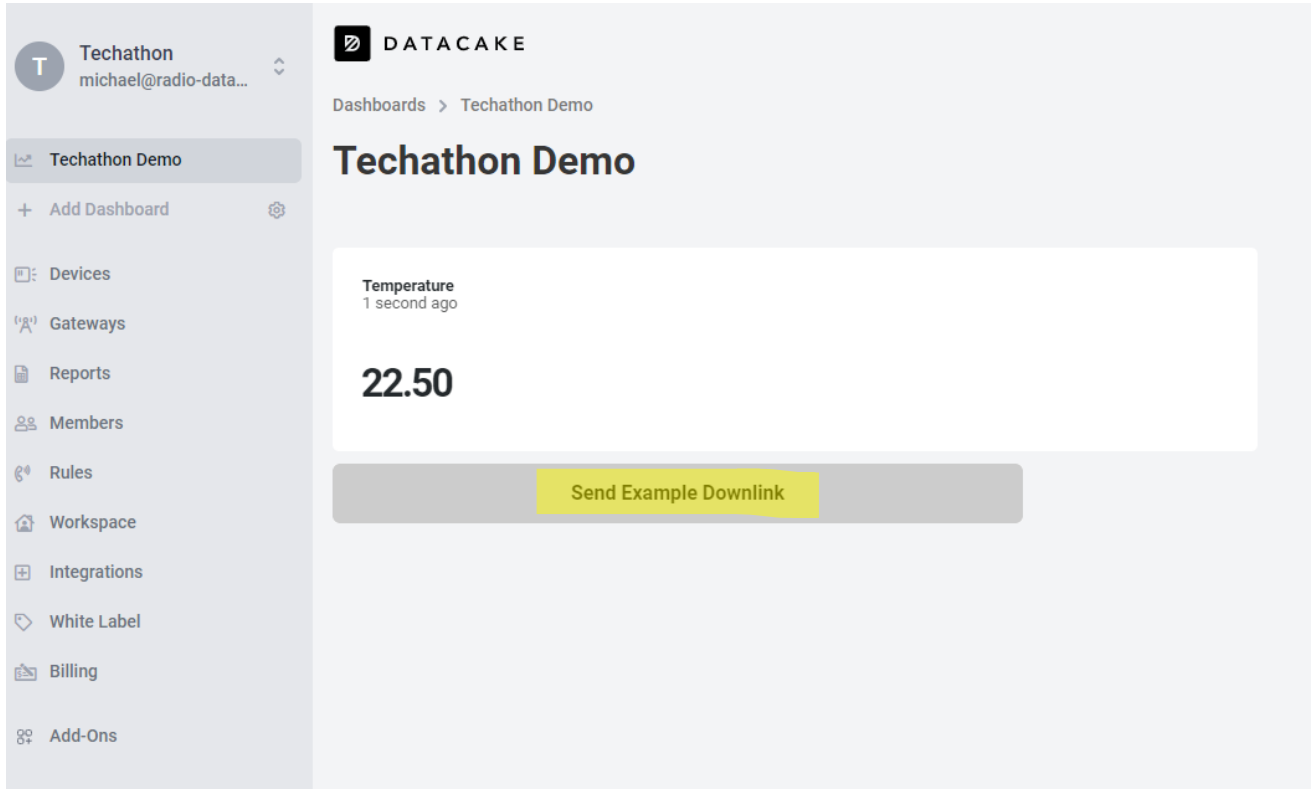
Click on the “Downlink” widget



Give the widget a title, then select the device and downlink you would like to send.

Click the “Save” button to add the widget to your dashboard.

Datacake Dashboard



When you click on the button on your dashboard the downlink will be queued ready to send to your device when it next sends an uplink.

Any
Questions?

Useful Links

- Arduino Sensor Kit
  https://sensorkit.arduino.cc/
- Grove Starter Kit
  https://github.com/Seeed-Studio/Sketchbook_Starter_Kit_for_Arduino
- Cayenne Low Power Payload
  https://docs.mydevices.com/docs/lorawan/cayenne-lpp
  https://github.com/ElectronicCats/CayenneLPP/blob/master/API.md
- TheThingsNetwork Arduino Library
  https://github.com/TheThingsNetwork/arduino-device-lib/tree/master/examples
- Example Arduino Code
  https://github.com/rdn-mike/techathon-arduino-examples