



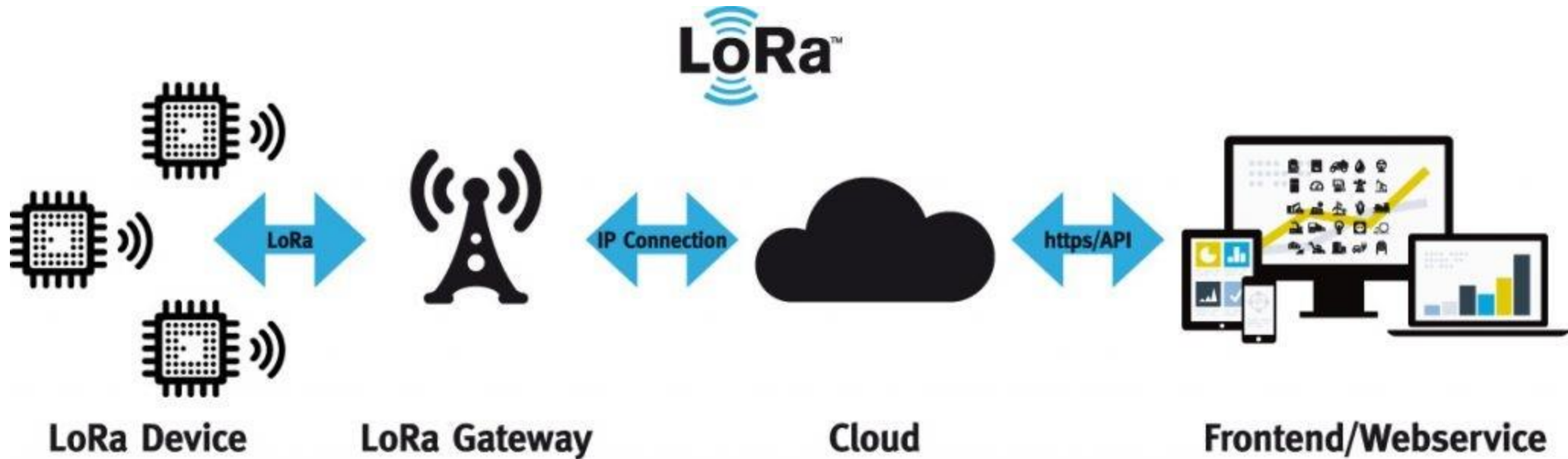
# Getting Started With LoRaWAN

Michael Price  
Radio Data Networks

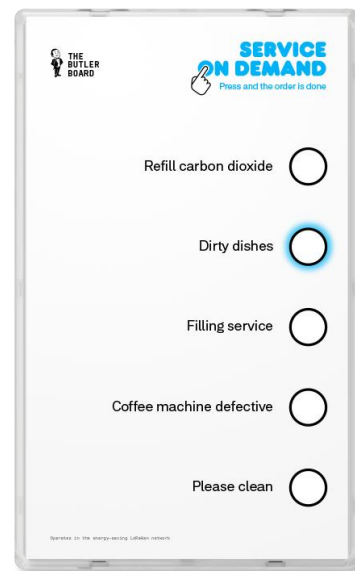
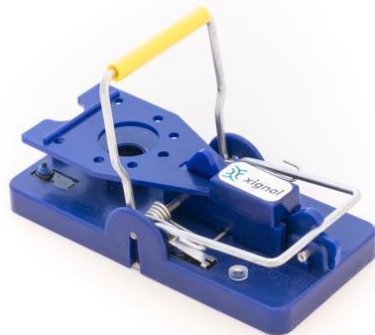



What is  
LoRaWAN?

# LoRaWAN Network



# Sensors



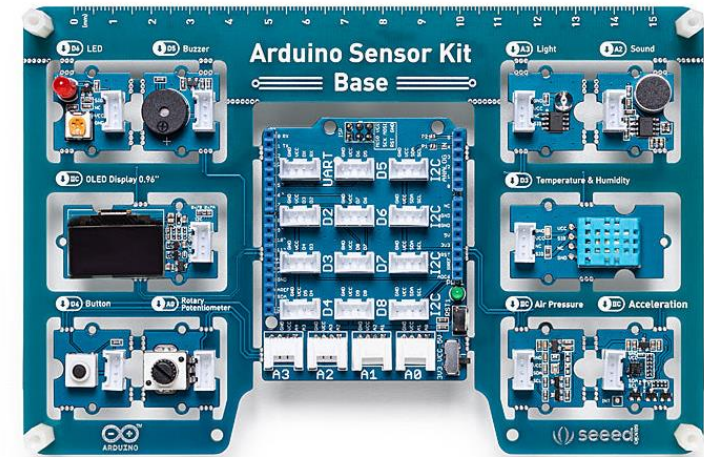
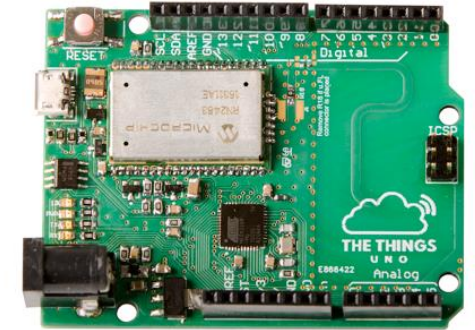


The way to get started  
is to quit talking and  
begin doing.

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 ⓘ \*

The Things Produ...

Model ⓘ \*

The Things Uno

Hardware Ver. ⓘ \*

1.0

Firmware Ver. ⓘ \*

quickstart

Profile (Region) \*

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 67 70

Generate

0/50 used

AppKey ⓘ \*

1A AE 25 2B

Generate

End device ID ⓘ \*

eui-0004 5770

This value is automatically prefilled using the DevEUI

## After registration

☒ View registered end device

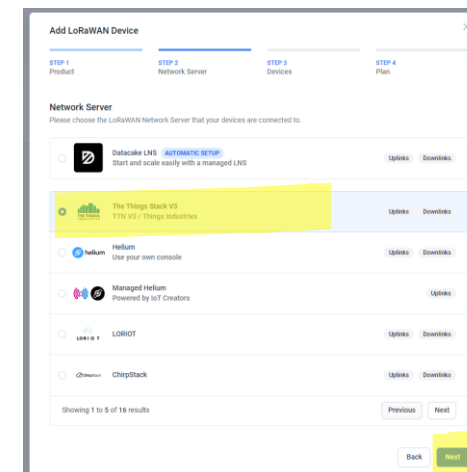
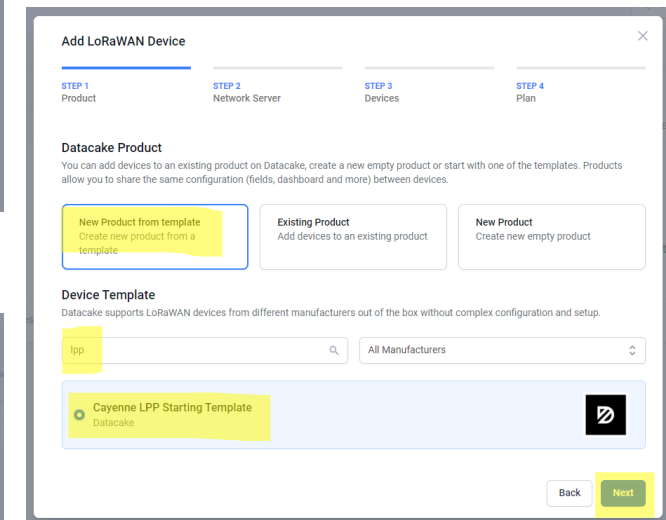
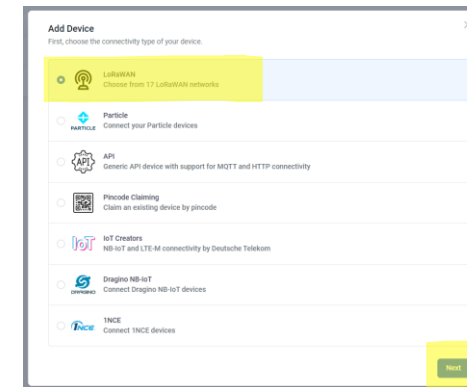
☐ Register another end device of this type

Register end device

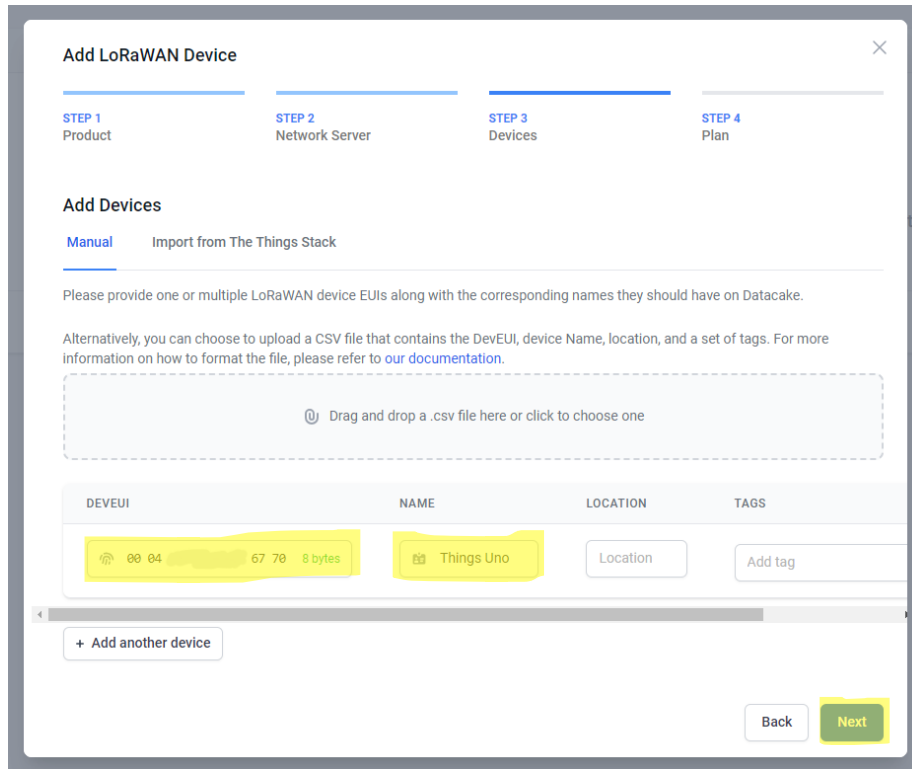
# Datacake Dashboard



- 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



**Add LoRaWAN Device**

STEP 1 Product    STEP 2 Network Server    STEP 3 Devices    STEP 4 Plan

**Add Devices**

[Manual](#)    [Import from The Things Stack](#)

Please provide one or multiple LoRaWAN device EUIs along with the corresponding names they should have on Datacake.

Alternatively, you can choose to upload a CSV file that contains the DevEUI, device Name, location, and a set of tags. For more information on how to format the file, please refer to [our documentation](#).

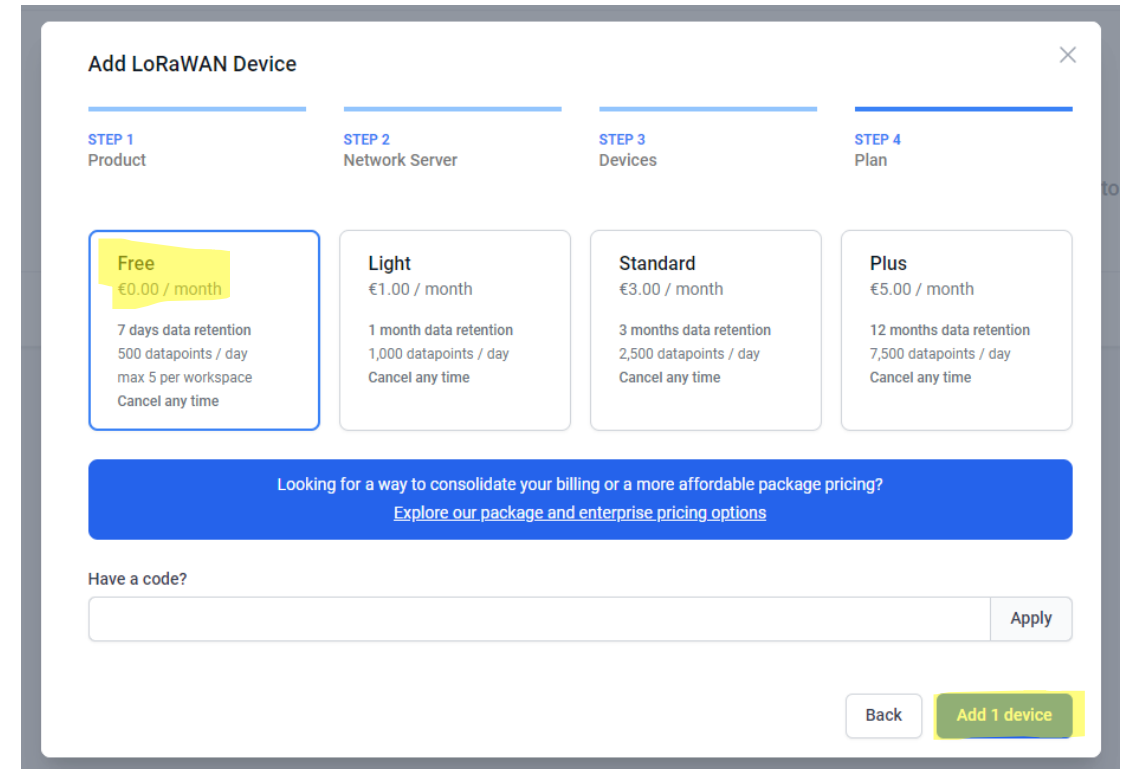
Drag and drop a .csv file here or click to choose one

| DEVEUI              | NAME       | LOCATION | TAGS    |
|---------------------|------------|----------|---------|
| 00 04 67 70 8 bytes | Things Uno | Location | Add tag |

+ Add another device

Back    **Next**

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



**Add LoRaWAN Device**

STEP 1 Product    STEP 2 Network Server    STEP 3 Devices    STEP 4 Plan

**Free**  
€0.00 / month

7 days data retention  
500 datapoints / day  
max 5 per workspace  
Cancel any time

**Light**  
€1.00 / month

1 month data retention  
1,000 datapoints / day  
Cancel any time

**Standard**  
€3.00 / month

3 months data retention  
2,500 datapoints / day  
Cancel any time

**Plus**  
€5.00 / month

12 months data retention  
7,500 datapoints / day  
Cancel any time

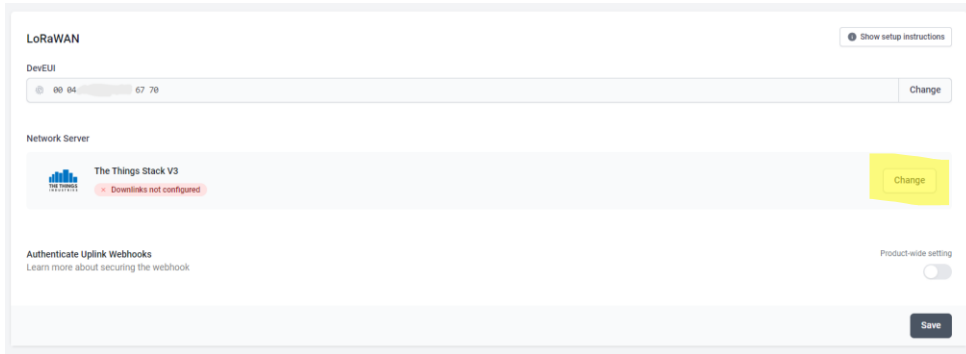
Looking for a way to consolidate your billing or a more affordable package pricing?  
[Explore our package and enterprise pricing options](#)

Have a code?  **Apply**

Back    **Add 1 device**

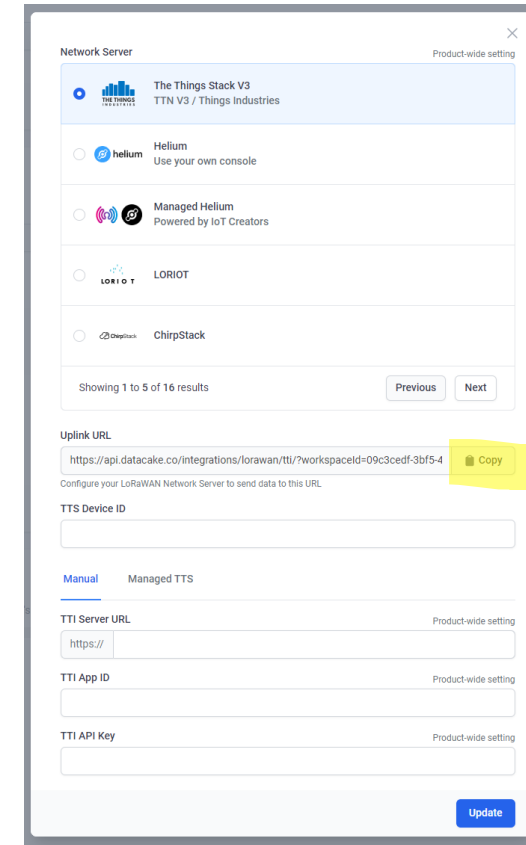
Select the free plan and click the "Add 1 device" button

# 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.



**THE THINGS  
NETWORK**

## Add webhook

The Webhooks feature allows The Things Stack to send application related messages to specific HTTP(S) endpoints. You can also use webhooks to schedule downlinks to an end device. Learn more in our [Webhooks guide](#).

### General settings

Webhook ID \*

datacake

Webhook format \*

JSON

Base URL \*

<https://api.datacake.co/integrations/lorawan/tti/?workspaceId=09c3c>

Downlink API key

The API key will be provided to the endpoint using the "X-Downlink-APIkey" header

Request authentication ⓘ

☐ Use basic access authentication (basic auth)

Additional headers

+ Add header entry

Filter event data ⓘ

+ Add filter path

### Enabled event types

For each enabled event type an optional path can be defined which will be appended to the base URL

☒ Uplink message /path/to/webhook

An uplink message is received by the application

# Send Some Data!

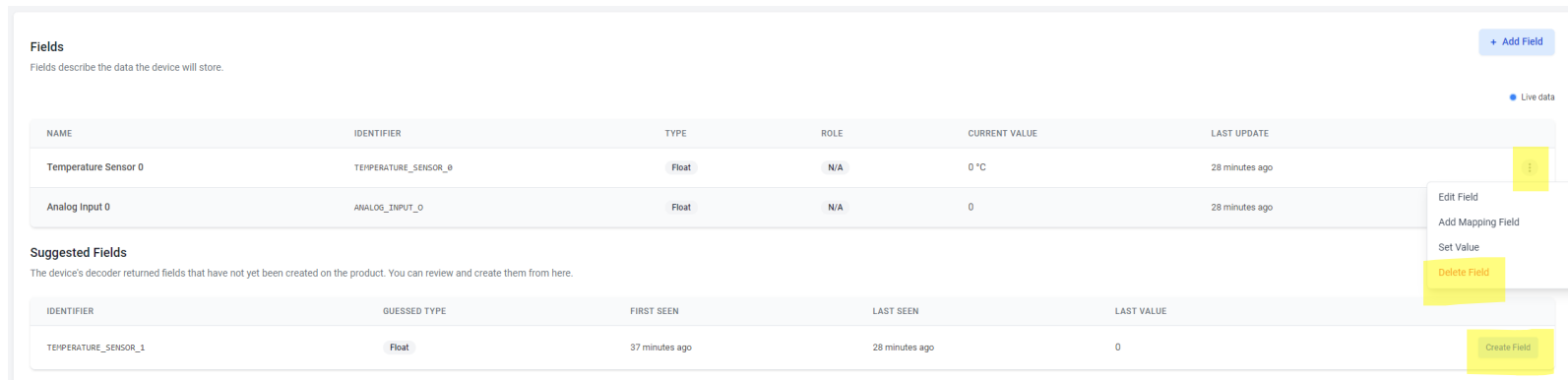
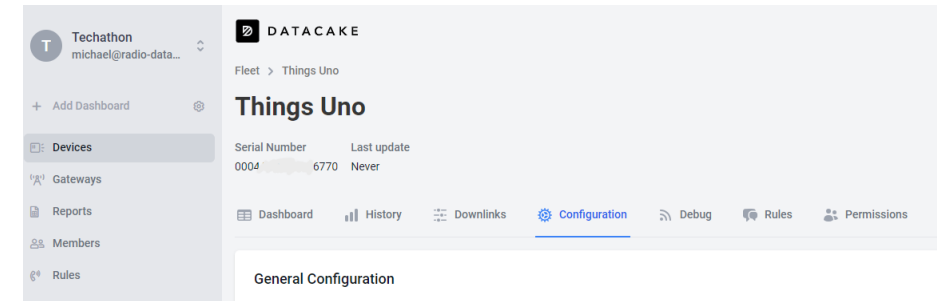
- Download example code from Github
  - <https://github.com/rdn-mike/techathon-arduino-examples>
- Start the Arduino IDE
- Install the "Arduino\_Sensorkit" library
- Open the example sketch from Github
- Paste in App Key from TTN console
- Save sketch & upload
- Check the OLED screen, serial monitor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



# Datacake Dashboard



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.



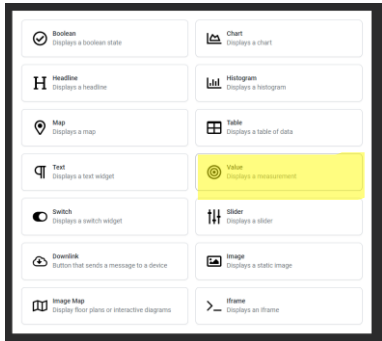
# Datacake Dashboard



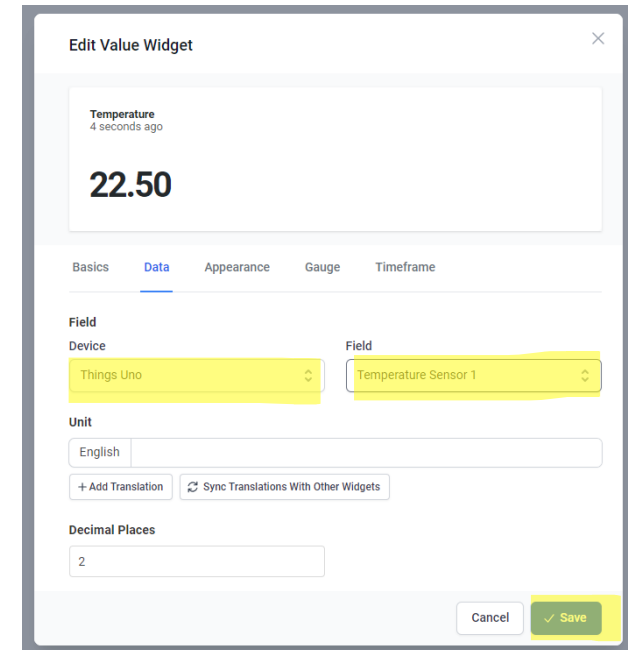
Add a dashboard  
and give it a name



Click on the switch and  
then on "Add Widget"



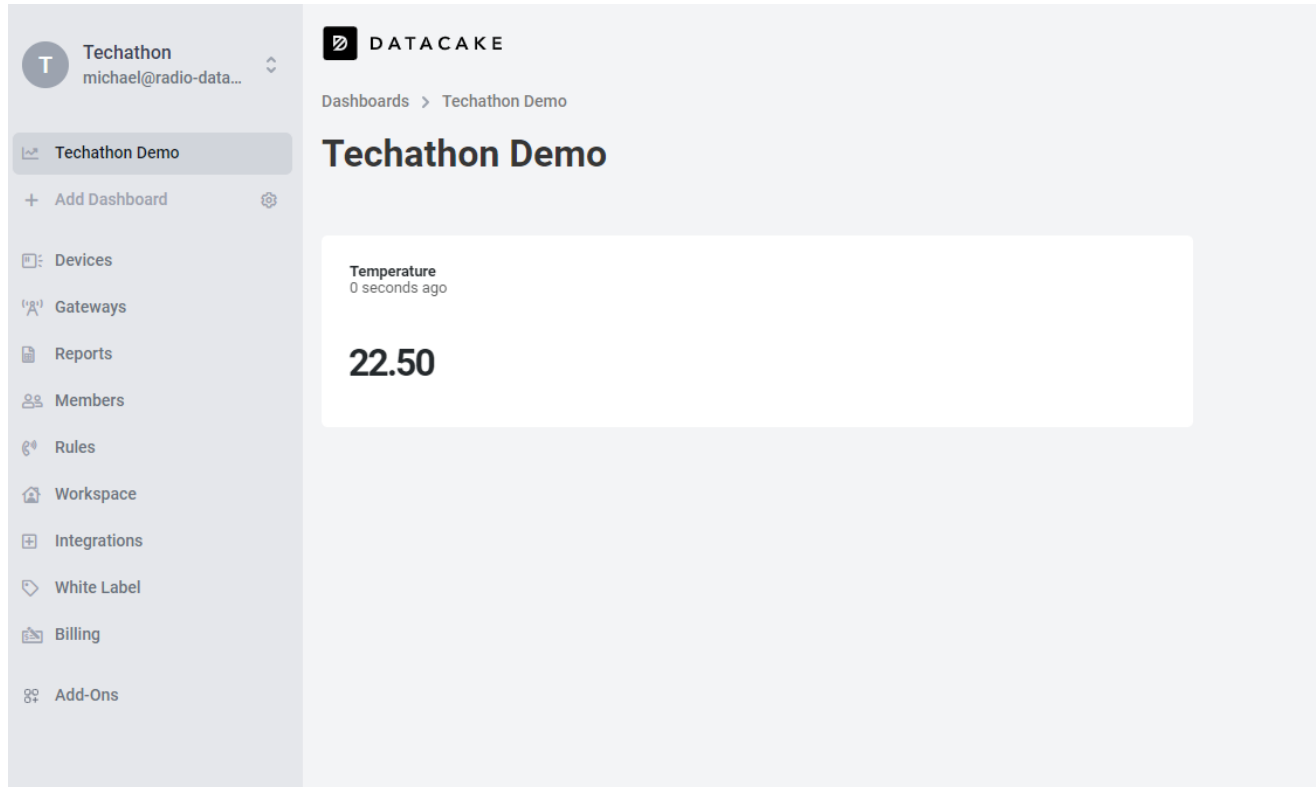
Click on the "Value"  
widget



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)



**THE THINGS  
NETWORK**

## Add API key

Name  
datacake

Expiry date  
dd/mm/yyyy

Rights\*

☒ Grant all current and future rights

☐ Grant individual rights

☐ Select all

☐ Delete application

☐ View devices in application

☐ View device keys in application

☐ Create devices in application

☐ Edit device keys in application

☐ View application information

☐ Link as Application to a Network Server for traffic exchange, i.e. read uplink and write downlink  
This implicitly includes the rights to view application information, read application traffic and write downlinks

☐ View and edit application API keys

☐ Edit basic application settings

☐ View and edit application collaborators

☐ View and edit application packages and associations

☐ Write downlink application traffic

☐ Read application traffic (uplink and downlink)

☐ Write uplink application traffic

Create API key

# 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.

The screenshot shows the 'Network Server' configuration page in the Datacake dashboard. At the top, there's a 'Product-wide setting' label. Below it, a list of network servers is shown, with 'The Things Stack V3' selected. Other options include Helium, Managed Helium, LORIoT, and ChirpStack. Below the list, there's an 'Uplink URL' field with a copy button. The 'TTS Device ID' field is highlighted with a yellow background. Below that, there's a 'Manual' tab selected, showing the 'TTI Server URL' field with 'https://eu1.cloud.thethings.network' entered. The 'TTI App ID' field is also highlighted with a yellow background. The 'TTI API Key' field is highlighted with a yellow background. At the bottom right, there's an 'Update' button.

Network Server Product-wide setting

☒ The Things Stack V3  
TTN V3 / Things Industries

☐ Helium  
Use your own console

☐ Managed Helium  
Powered by IoT Creators

☐ LORIoT

☐ ChirpStack

Showing 1 to 5 of 16 results Previous Next

Uplink URL

Copy

Configure your LoRaWAN Network Server to send data to this URL

TTS Device ID

Manual Managed TTS

TTI Server URL Product-wide setting

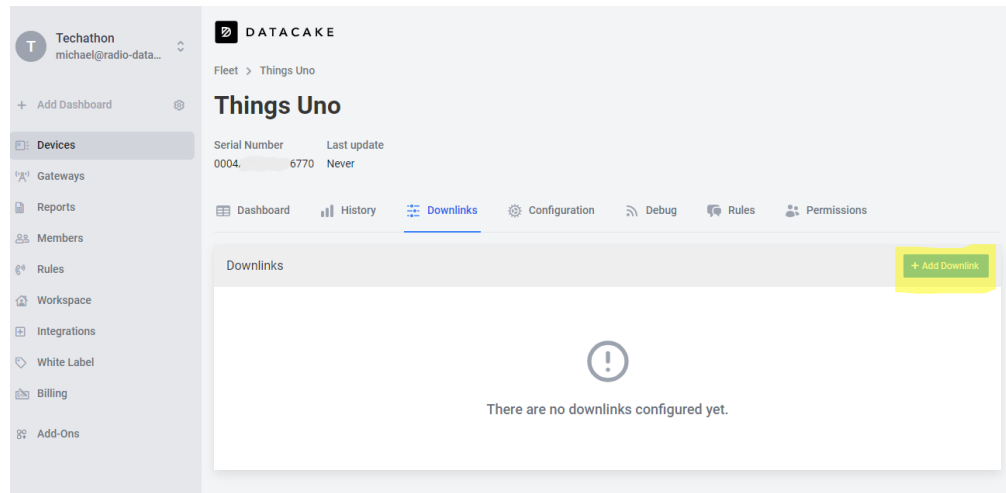
TTI App ID Product-wide setting

TTI API Key Product-wide setting

Update

# Datacake Dashboard

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

A screenshot of the 'Configure Downlink' form. It has a title bar with a close button. The form contains several fields: 'Name' with the value 'Example Downlink', 'Description' (empty), 'Downlink UUID' with the value 'd643b53d-5447-4f8c-bec9-add4dc9b1691' and a 'Copy' button, 'Fields used' (empty), a checkbox for 'Trigger on measurements', 'Port' with the value '1', and a 'Payload Encoder' section with a code editor containing the following code:

```
1 function Encoder(measurements, port) {  
2   return [0x01];  
3 }
```

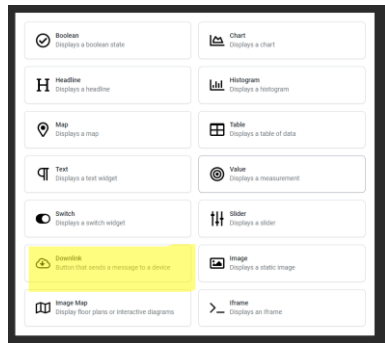
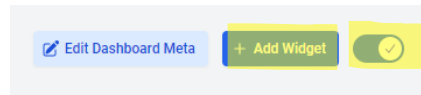
Give your downlink a name and change the Payload Encoder function to return **[0x01]**

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”

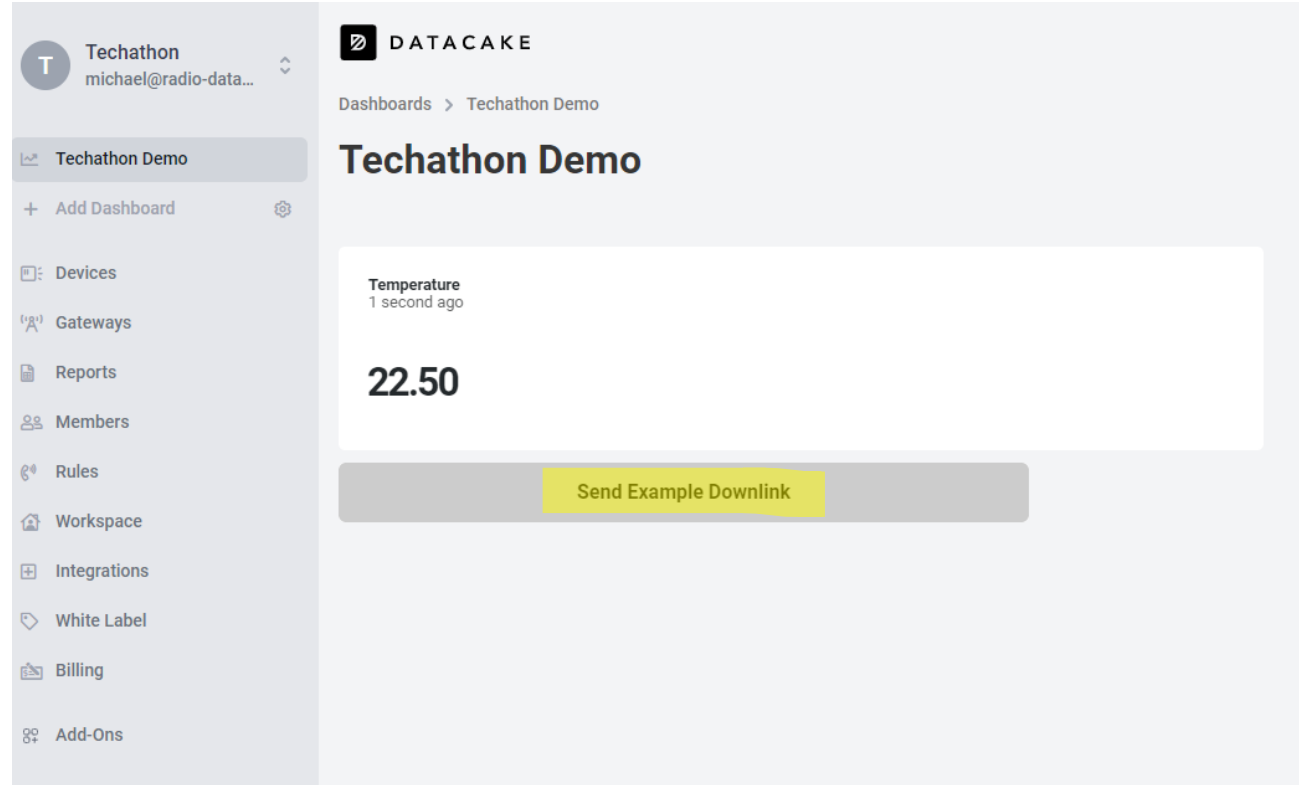
Click on the “Downlink” widget

A configuration window titled 'Edit Downlink Widget'. It has a close button (X) in the top right corner. The window contains several sections: a 'Send Example Downlink' button at the top; a 'Title' section with a dropdown menu set to 'English' and a text input field containing 'Send Example Downlink', with a '+ Add Translation' button below it; a 'Downlink' section with two dropdown menus, the first set to 'Things Uno' and the second set to 'Example Downlink'; 'Tint Color' and 'Highlight Color' sections, each with a color picker and a trash icon; and a 'Hide background' toggle switch. At the bottom right are 'Cancel' and 'Save' buttons.

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



The screenshot displays the Datacake dashboard interface. On the left is a sidebar with a user profile for 'Techathon' (michael@radio-data...) and a list of navigation items: Techathon Demo, Add Dashboard, Devices, Gateways, Reports, Members, Rules, Workspace, Integrations, White Label, Billing, and Add-Ons. The main content area shows the 'Techathon Demo' dashboard. It features a 'Temperature' widget with a value of '22.50' and a timestamp of '1 second ago'. Below the widget is a prominent yellow button labeled 'Send Example Downlink'.

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](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>