

IoT workshop
190912

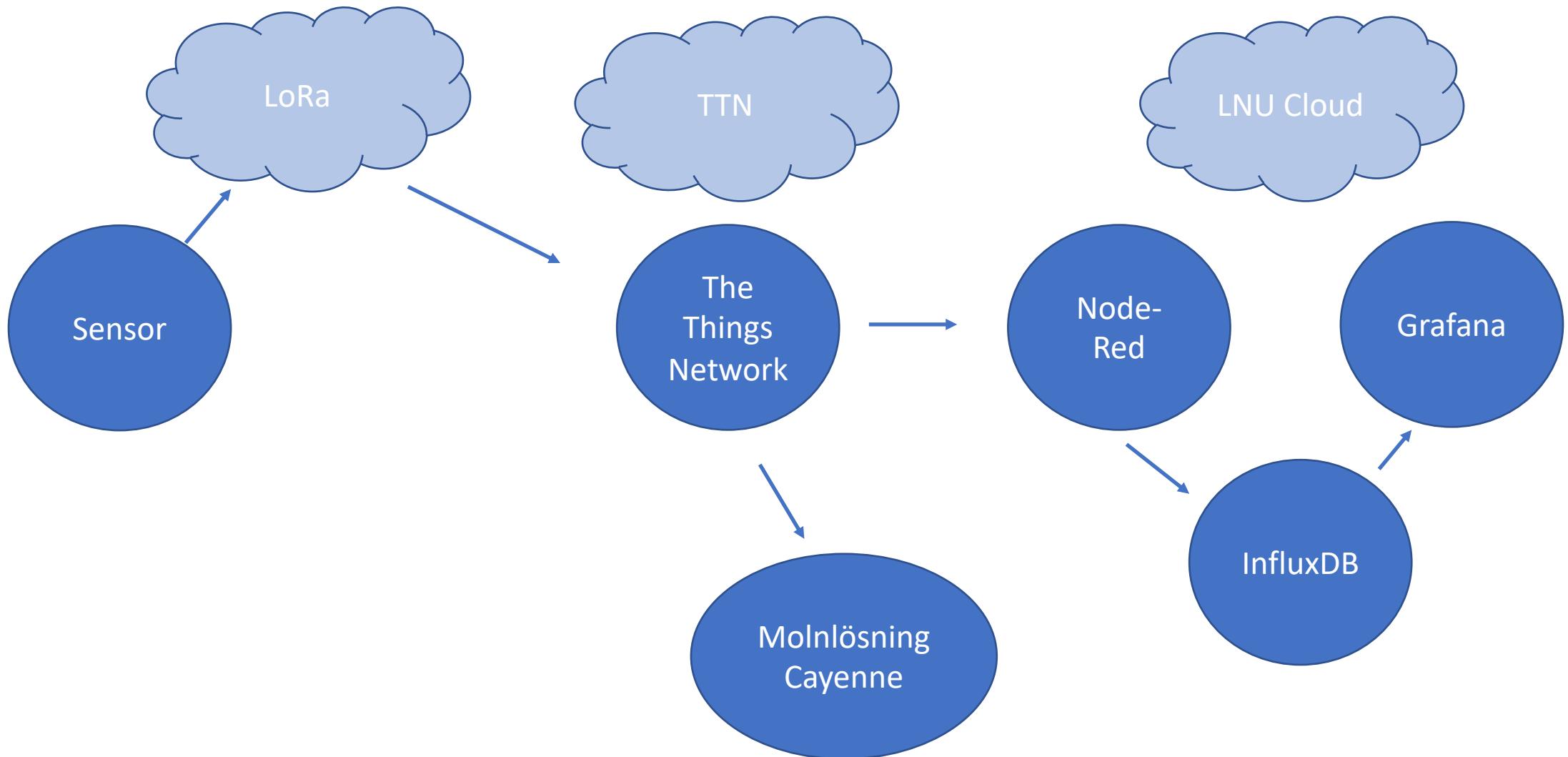
Agenda

- Intro
- Showcase – Kalmar Energi
- Pycom, LoPy4 + Expansion board
- MicroPython
- Grundbegrepp, IoT, LoRaWAN, MQTT, Grafana, Node-red

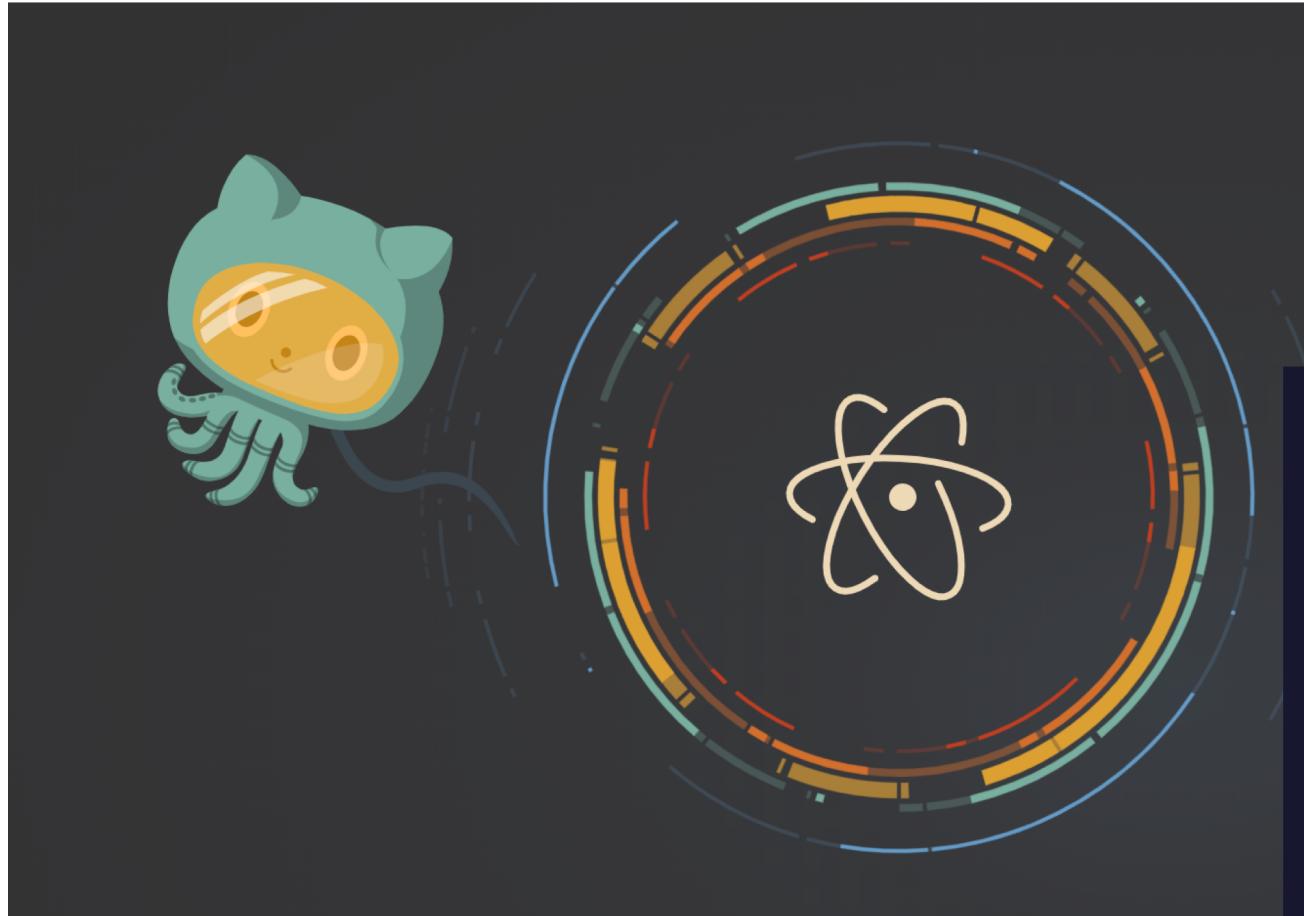
Verktyg

- LoPy4
- Sensorer
- Atom/VSCode, PyMakr (MicroPython)
- The Things Network
- MyDevices - Cayenne
- Eller ... eget moln.
 - MQTT
 - Grafana
 - Node-Red

Hur det hänger ihop?



Atom.io + pymakr



Potent IDE plugin for popular code editors such as Atom and Visual Studio Code. Program your hardware using super-fast MicroPython programming language. Download yours here.

[DOWNLOAD](#)

OBS. Issue med PyMakr Mac/Linux

- Nyaste versionen av PyMakr är bruten pga uppdatering av Electron, serialport module.

```
npm install -g prebuild  
npm install -g prebuild-install
```

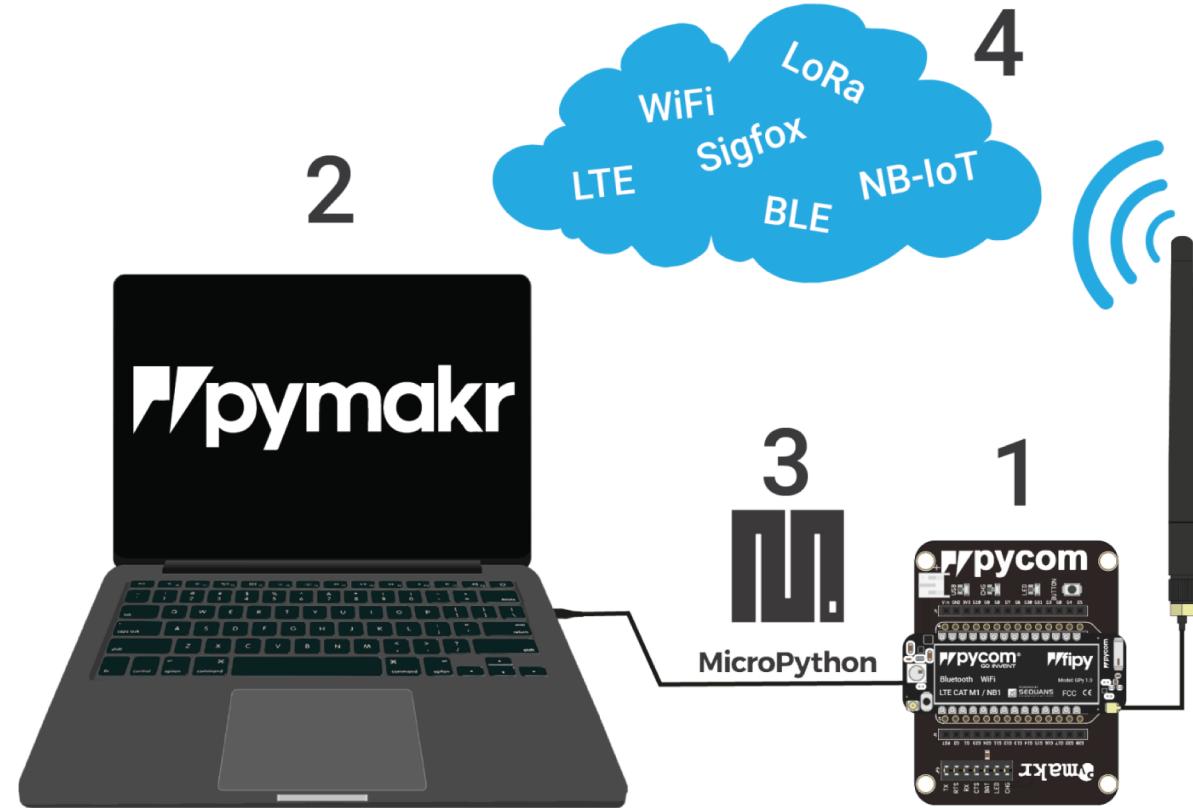
VSCode:

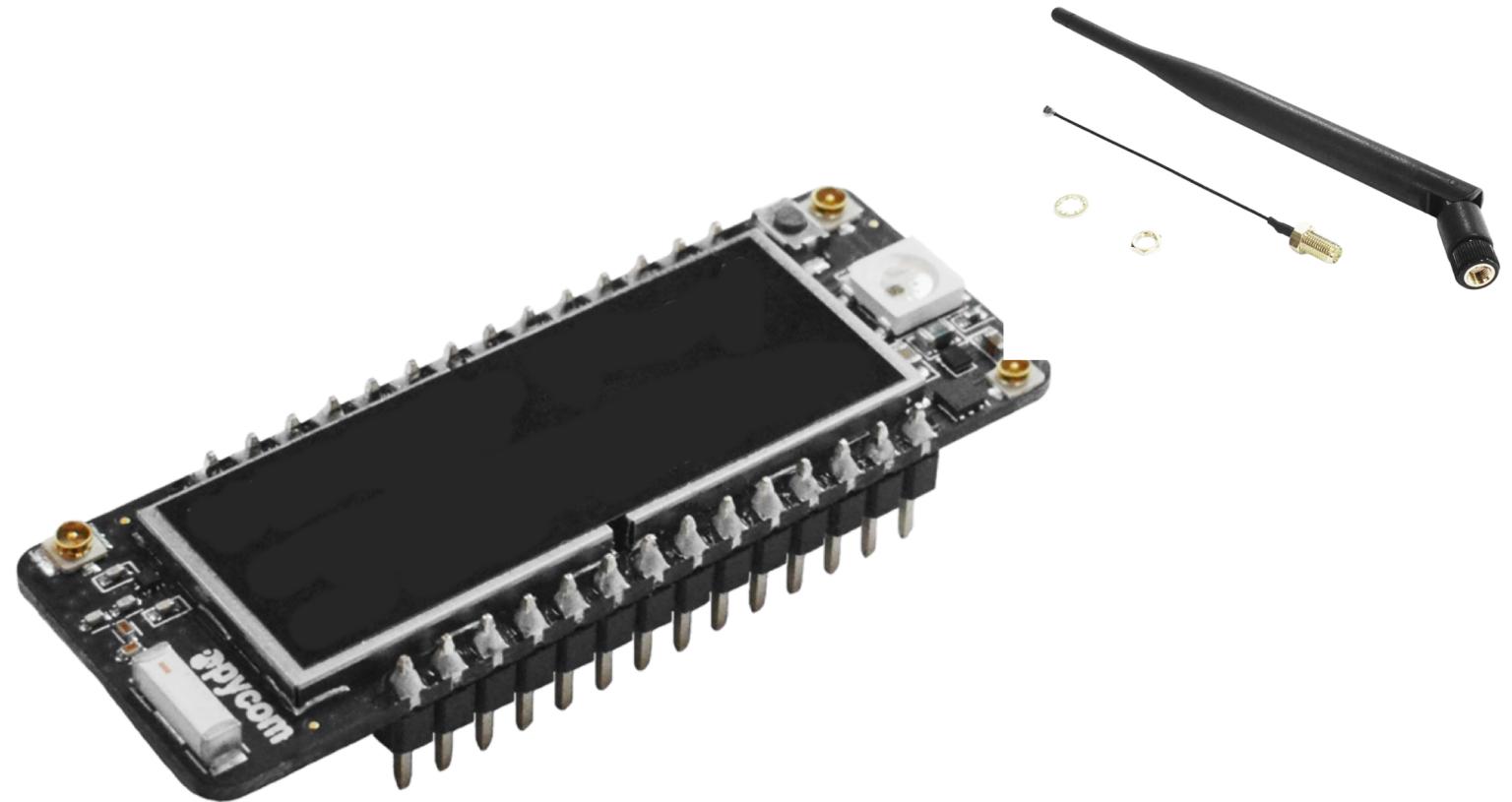
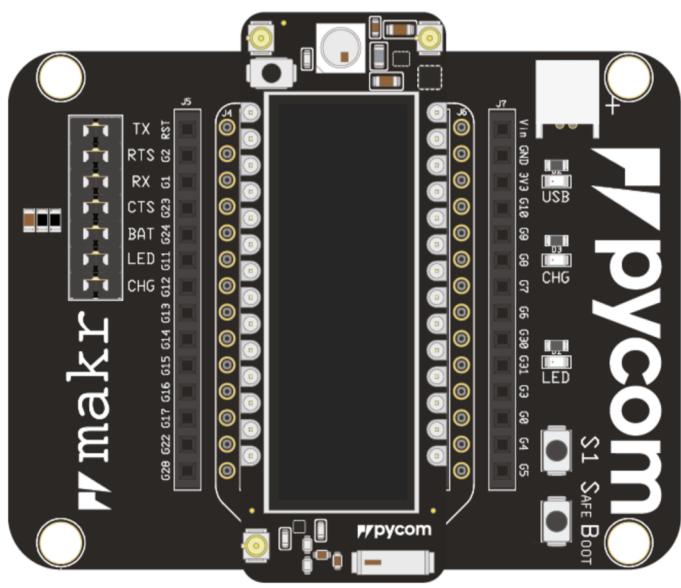
```
cd ~/.vscode/extensions/pycom.pymakr-  
1.1.2/node_modules/@serialport/bindings
```

Atom:

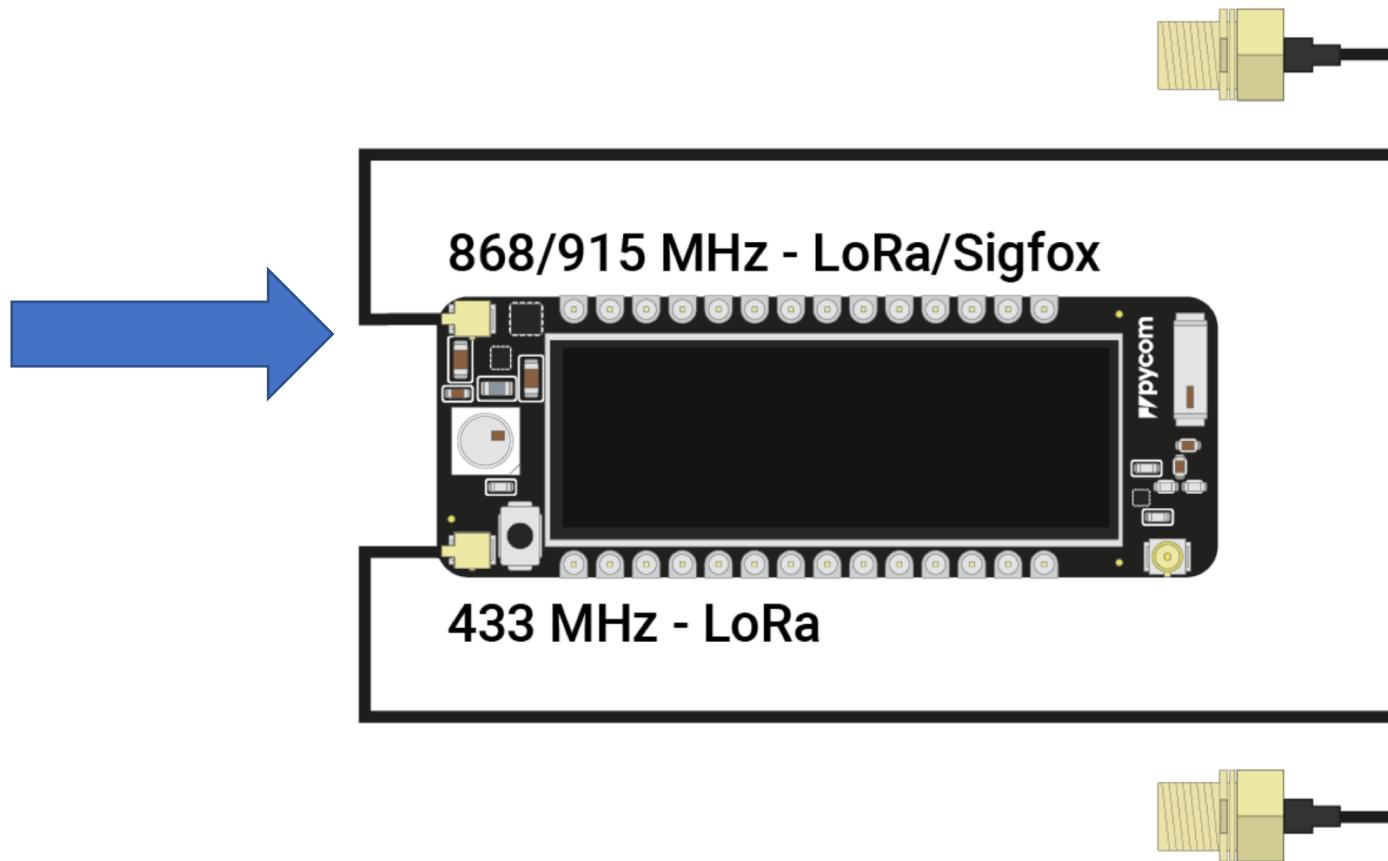
```
cd ~/.atom/packages/pymakr/node_modules/\@serialport/bindings
```

```
prebuild-install --runtime electron --target 4.2.5 --tag-  
prefix @serialport/bindings@ --verbose
```



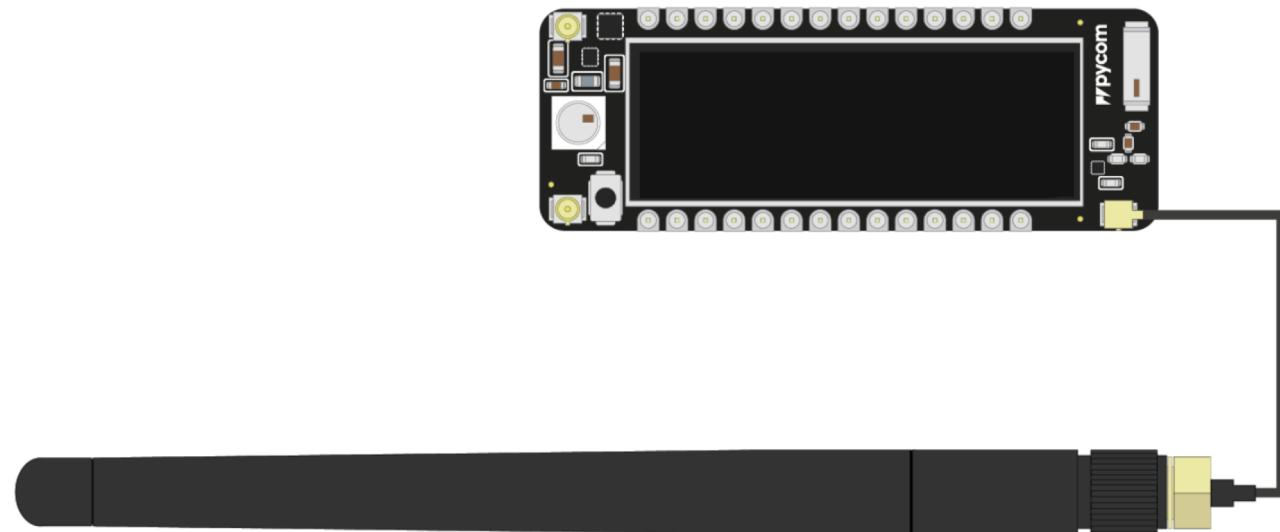


LoRa antenn – måste vara inkopplad

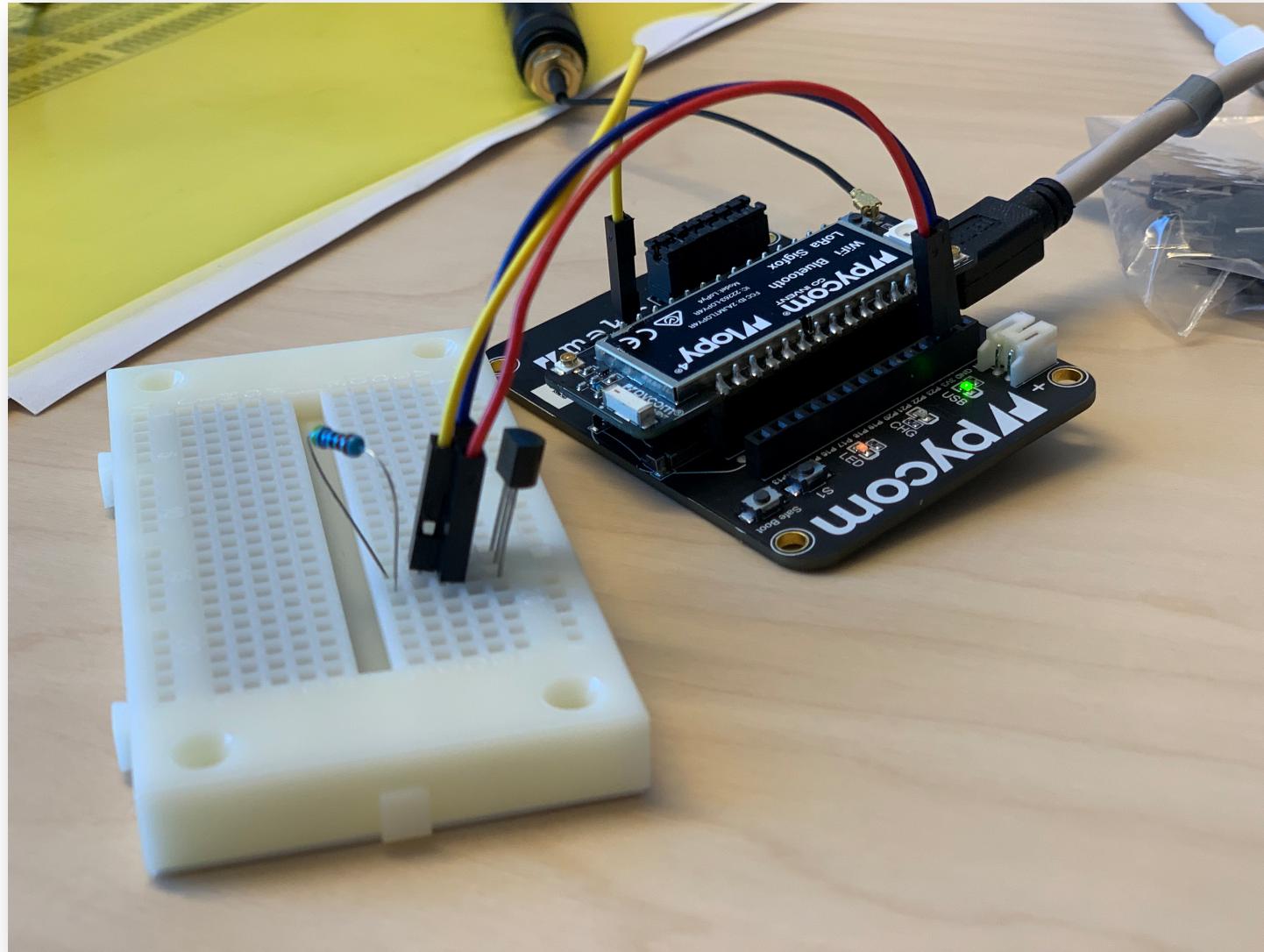


WiFi/Bluetooth (optional)

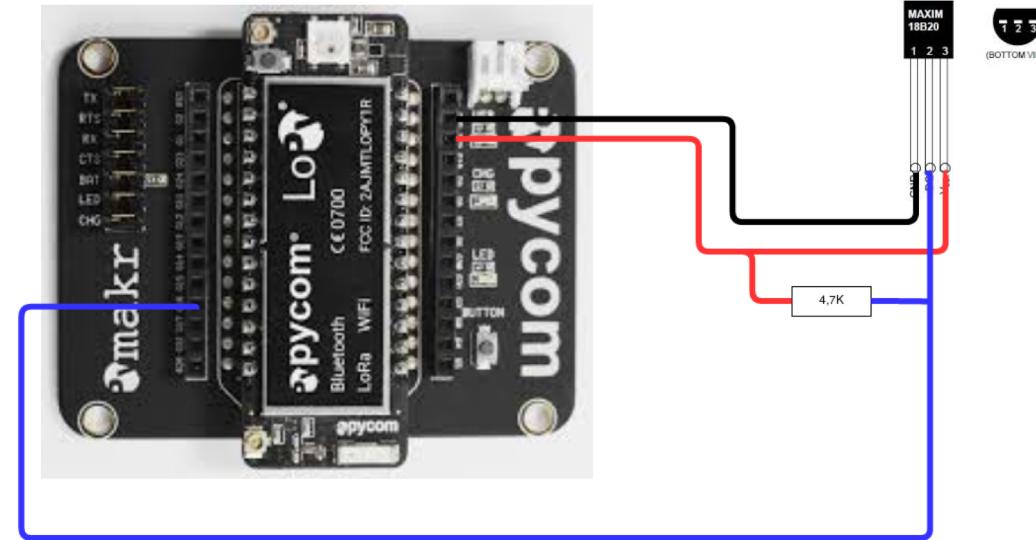
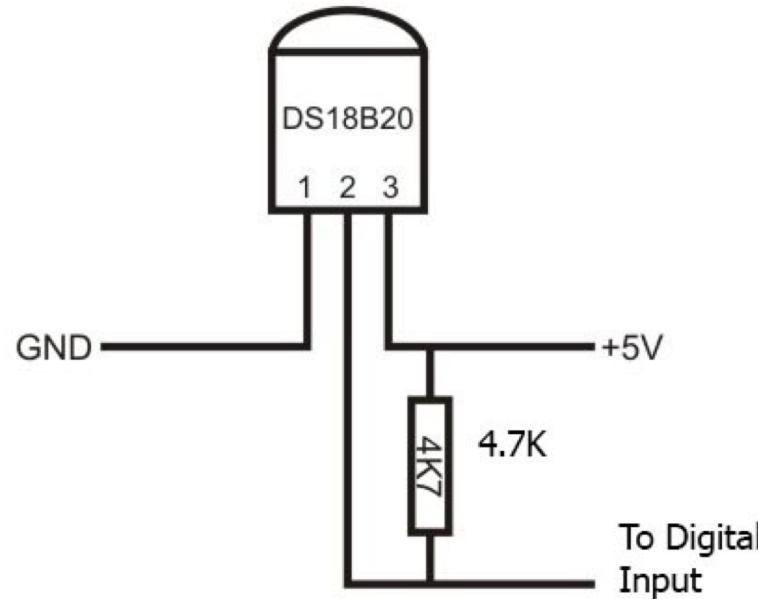
All Pycom modules, including the LoPy4, come with a on-board WiFi antenna as well as a U.FL connector for an external antenna. The external antenna is optional and only required if you need better performance or are mounting the LoPy4 in such a way that the WiFi signal is blocked. Switching between the antennas is done via software, instructions for this can be found [here](#).



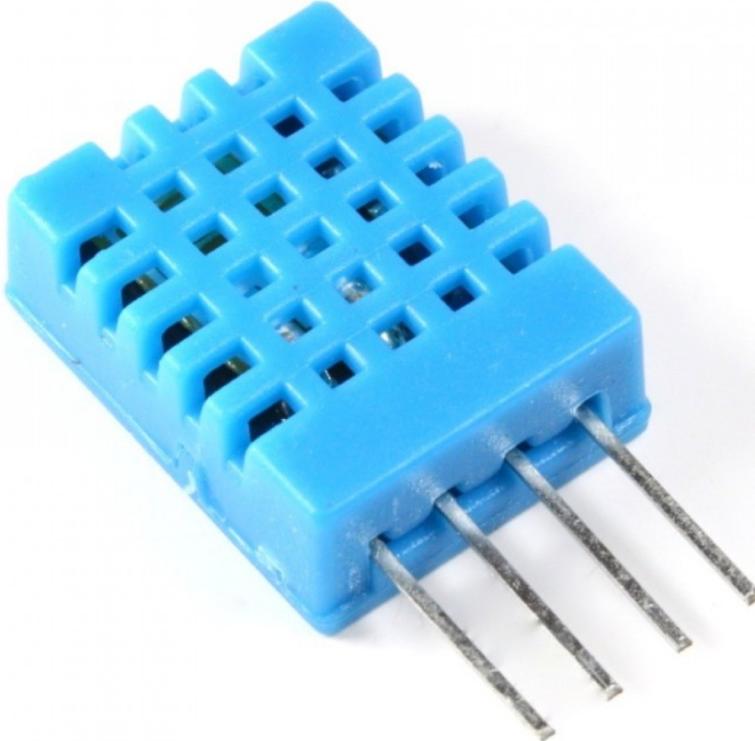
Målbild



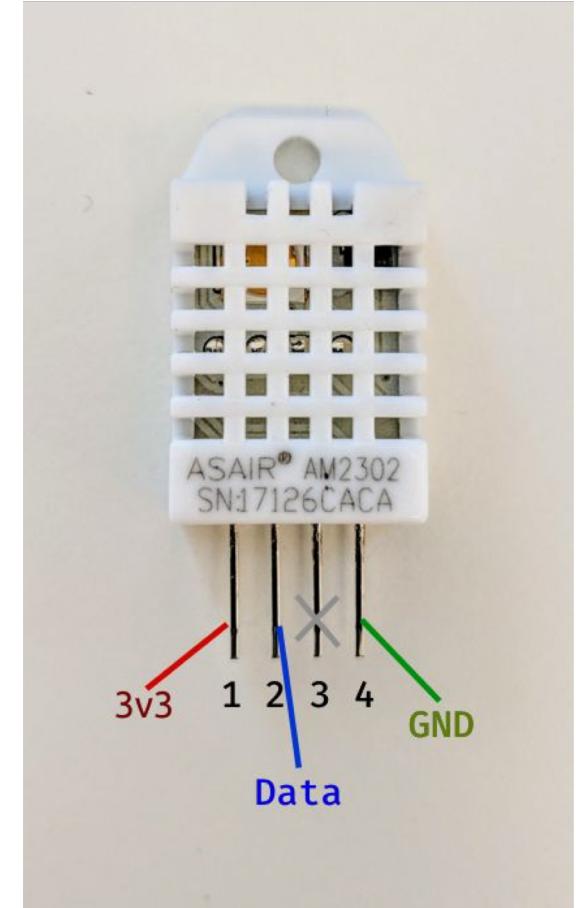
DS18B20 – Dallas temperature sensor (Onewire)



DHT11 Humidity and Temperature sensor (One wire)



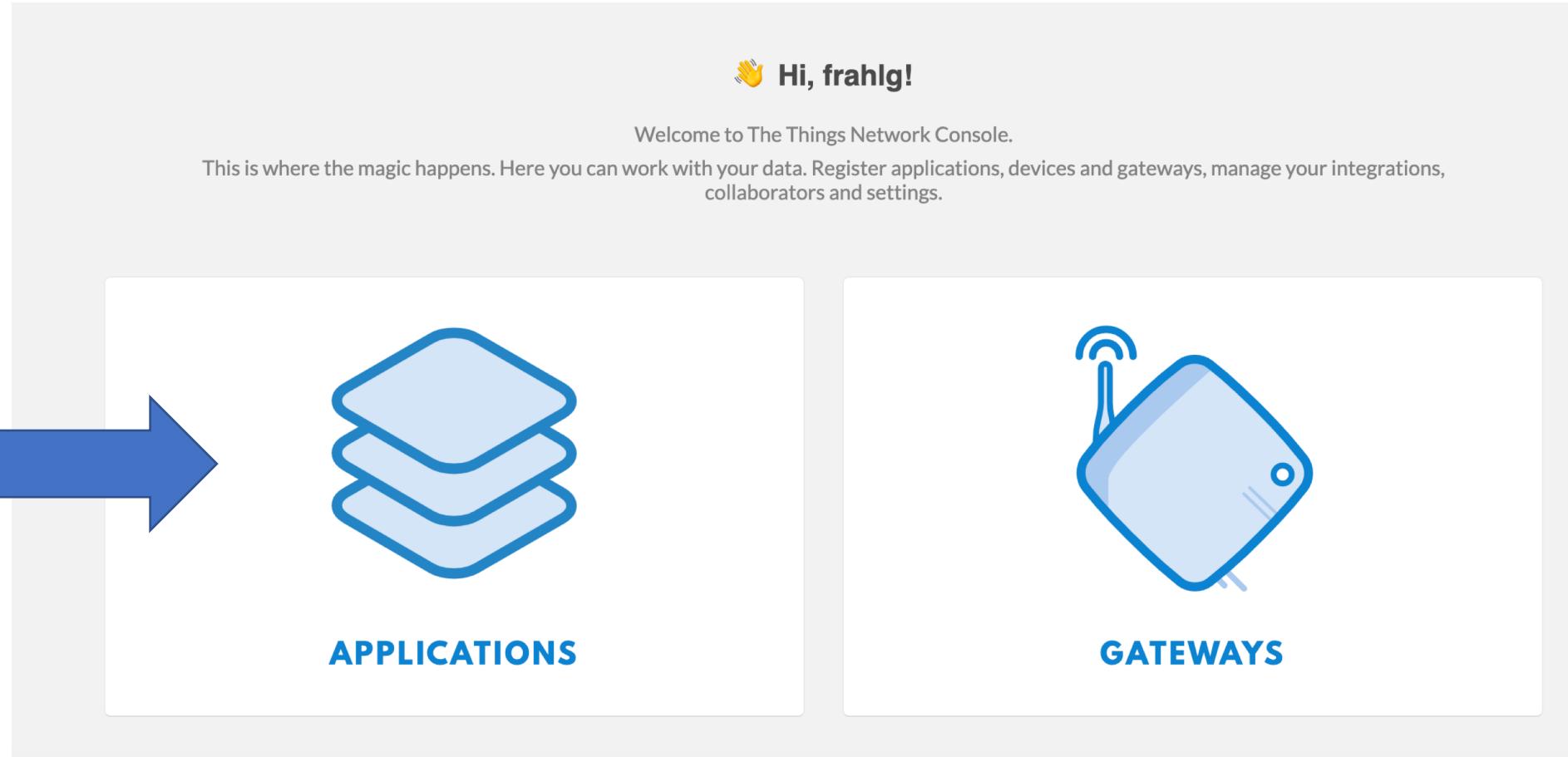
```
>>> import dht  
>>> import machine  
>>> d = dht.DHT11(machine.Pin(4))  
>>> import dht  
>>> import machine  
>>> d = dht.DHT22(machine.Pin(4))
```



The Things Network

- Öppen server, fri att använda.
- <https://www.thethingsnetwork.org/>
- **Skapa ett konto!**

Skapa en Application



ADD APPLICATION

Application ID

The unique identifier of your application on the network

**Description**

A human readable description of your new app

Eg. My sensor network application

**Application EUI**

An application EUI will be issued for The Things Network block for convenience, you can add your own in the application settings page.

EUI issued by The Things Network

Handler registration

Select the handler you want to register this application to

ttn-handler-eu



Overview

Devices

Payload Formats

Integrations

Data

Settings

APPLICATION OVERVIEW

[documentation](#)

Application ID transund-1

Description Trångsund sensor 1

Created 6 seconds ago

Handler ttn-handler-eu (*current handler*)

APPLICATION EUIS

 [manage euis](#)

  70 B3 D5 7E D0 01 A2 F6 

OTA auth

- Varje enhet behöver registreras på en application i TTN.
- App EUI – Kod för applikationen
- Dev EUI – Unik kod för varje enhet (hårdvarukodad)
- App KEY – Nyckel genererad av TTN

Kommunikationen är **krypterad** med ovanstående koder.

Lägg till device

DEVICES

[register device](#) [manage devices](#)

 0 registered devices

Device EUI – unikt för varje enhet

Applications >  transund-1 > Devices

REGISTER DEVICE

[bulk import devices](#)

Device ID
This is the unique identifier for the device in this app. The device ID will be immutable.

Device EUI
The device EUI is the unique identifier for this device on the network. You can change the EUI later.

0 bytes

App Key
The App Key will be used to secure the communication between your device and the network.

this field will be generated

App EUI

Access key för din App, TTN console

The screenshot shows the TTN Console interface for an application named "transund-1". The main navigation bar includes links for Applications, Gateways, and Support. The current view is under the Applications section. A large blue arrow points from the left towards the "ACCESS KEYS" section.

DEVICES + register device manage devices

1 registered device

COLLABORATORS manage collaborators

frahlg collaborators delete devices settings

ACCESS KEYS manage keys

default key devices messages base64 copy

A detailed description of the "ACCESS KEYS" section is provided below:

The "ACCESS KEYS" section displays a table with one row. The first column is labeled "default key" and contains three buttons: "devices", "messages", and "base64". To the right of the "base64" button is a "copy" icon. The second column contains a placeholder text "....." followed by a "copy" icon.

Dev EUI. Unik address för varje enhet.

```
from network import LoRa  
import binascii  
lora = LoRa(mode=LoRa.LORAWAN)  
  
binascii.hexlify(lora.mac())
```

Data från TTN?

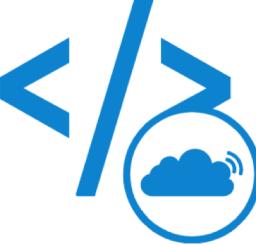
- Finns massor av integrations.
 - Bra start ex. – myDevices Cayenne. Gratis att skapa konto.
- Alternativt – Node-Red och MQTT.

Integrations TTN

Applications > Inu-iot-workshop > Integrations

Overview Devices Payload Formats Integrations Data Settings

ADD INTEGRATION

 AllThingsTalk Maker v2.6.0 AllThingsTalk	 COLLOS collaborative location service	 Data Storage v2.0.1 The Things Industries B.V.
 EVRYTHNG v2.6.0 EVRYTHNG	 HTTP Integration v2.6.0 The Things Industries B.V.	 IFTTT Maker v2.6.0 The Things Industries B.V.

Applications > Inu-iot-workshop > Integrations

Overview Devices Payload Formats Integrations Data Settings

INTEGRATIONS

 MyDevices

Inu-workshop-1

[Add new...](#)Commercialize your IoT solution
using your own brand. [Learn more](#)[Demo IoT](#)
[dev-pysense-lpp](#)
[GPS Demo Pycom 1](#)

Devices & Widgets

 Search

DEVICES

[Single Board Computers](#)[MicroControllers](#)[Sensors](#)[Actuators](#)[Extensions](#)[LoRa](#)[Acklio](#)[Actility](#)[CityKinect](#)[Everynet](#)[Kerlink](#)[Loriot](#)[Objenious](#)[OrbiWise](#)[Pixel Networks](#)[Sagemcom](#)[Semtech](#)[Senet](#)[SenRa](#)[Spark](#)[Stream](#)[Swisscom](#)[The Things Network](#)[Talis](#)[1M2M ED1608](#)

Generic with many sensors and connectors

[AAEON AIOT-ILND01](#)

Industrial LoRa Node platform

[Abeeway MasterTracker](#)

Low Power Industrial GPS Tracker

[AC Outlet and Switch](#)

Tektelic AC Control and Energy Monitoring

[AcSIP EK-S76SX](#)

S76S EVB in X-Bee Form Factor

[AcSIP S76S](#)

LoRa development board

[Adeunis Analog EU](#)

Giving IoT connectivity to wired sensors

[Adeunis Analog PWR EU](#)

Giving IoT connectivity to wired sensors

[Adeunis Contact Sensor EU](#)

Enter Settings



Cayenne Cayenne LPP

Cayenne Low Power Payload

This device uses Cayenne LPP

Name
Cayenne LPP

DevEUI

Activation Mode
Already Registered

Tracking

Location
This device moves[Add device](#)

Underlag

Pycom Documentation

- <https://docs.pycom.io/gettingstarted/introduction.html>
- Pycom libraries
- <https://github.com/pycom/pycom-libraries>

Github - exempel

- <https://github.com/frahlg/pycom-lnu-dev>

Skicka värde till TTN

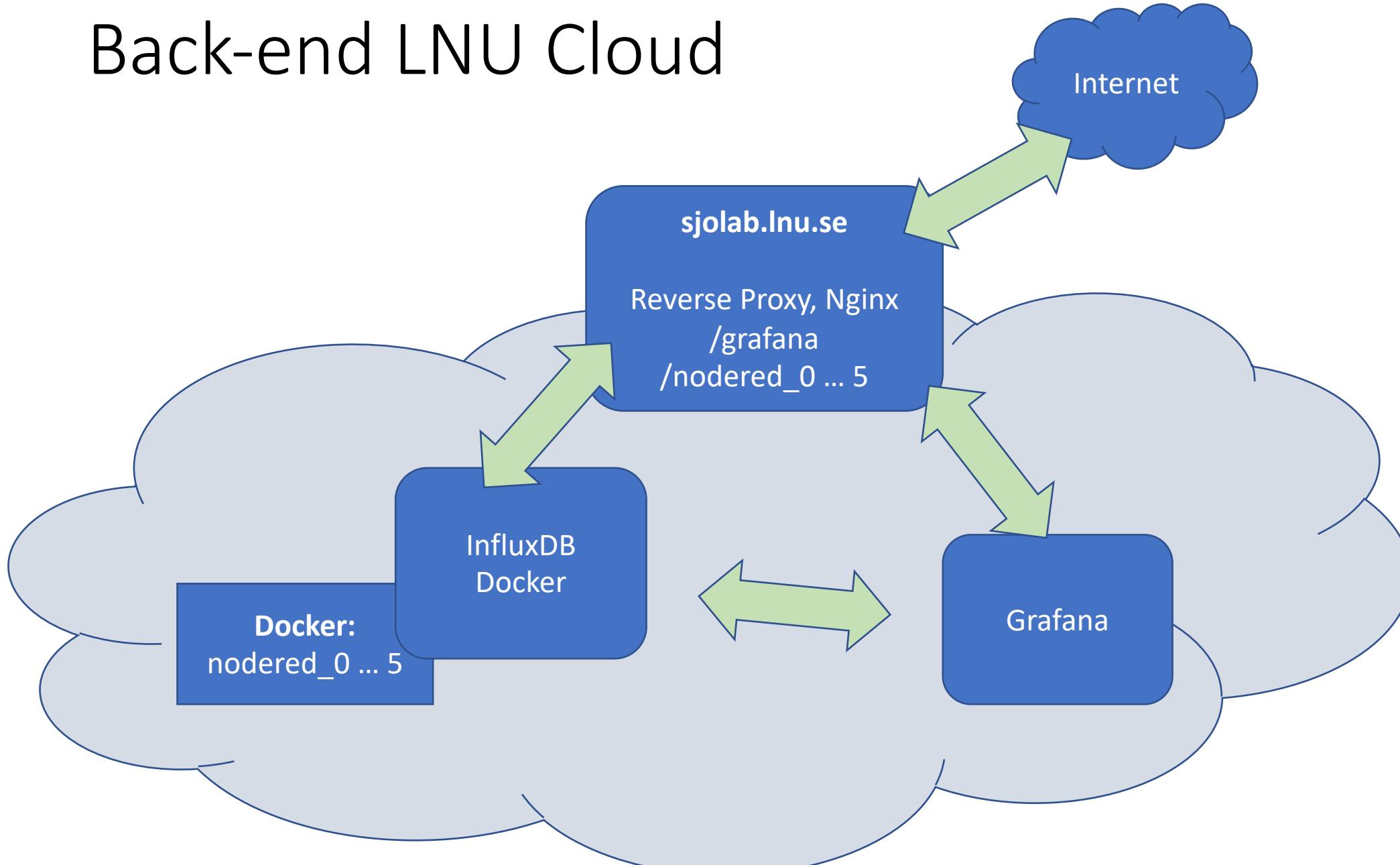
Pycom Documentation

- <https://docs.pycom.io/tutorials/lora/>

LoRaWAN with OTAA

- <https://docs.pycom.io/tutorials/lora/lorawan-otaa.html>

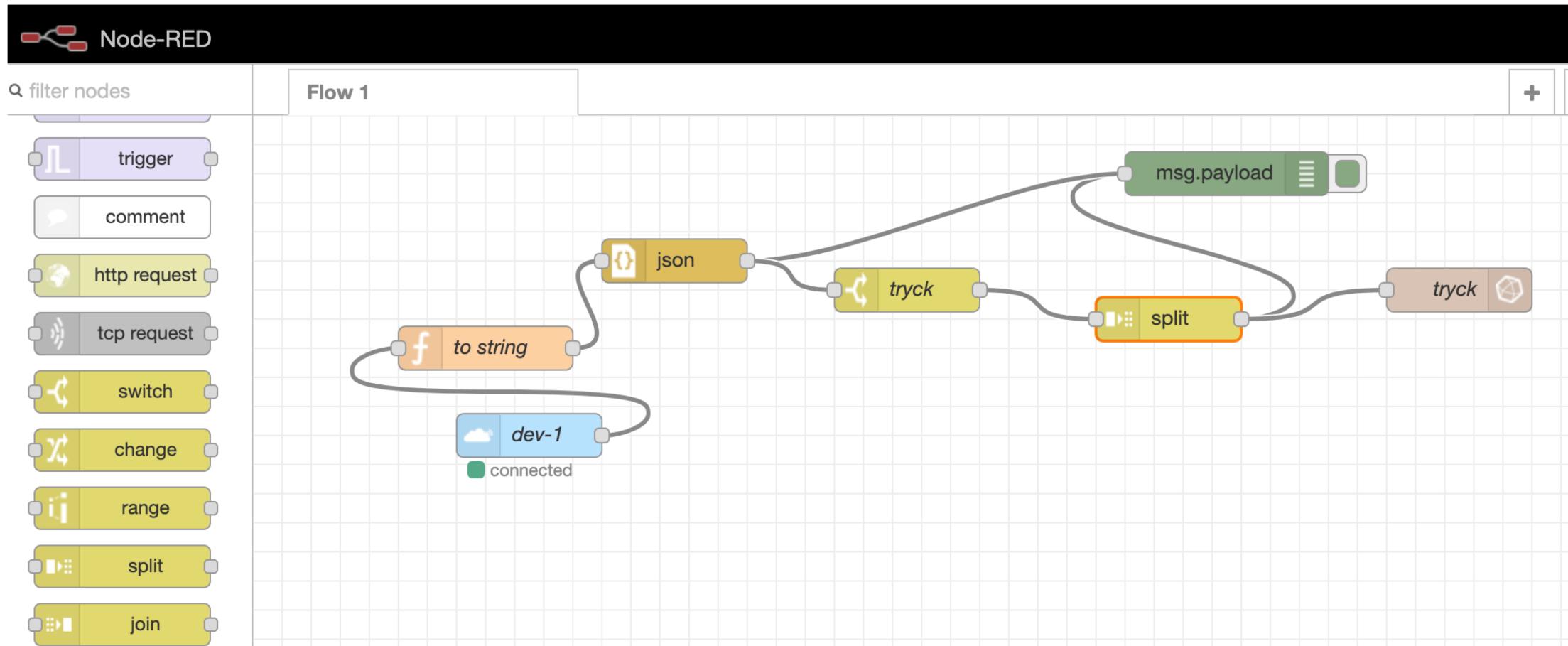
Back-end LNU Cloud



Servers lokalt

- sjolab.lnu.se/grafana
- sjolab.lnu.se/nodered_0
- sjolab.lnu.se/nodered_1
- sjolab.lnu.se/nodered_2
- sjolab.lnu.se/nodered_3
- sjolab.lnu.se/nodered_4
- sjolab.lnu.se/nodered_5
- ... -10
- Node-Red: **sjo/hejsan**
- Grafana: **sjo1...5 / hejsan**
- InfluxDB: 192.168.1.107:8086 + databas *sjolab_1 eller ttn_1*

Hur det hänger ihop?

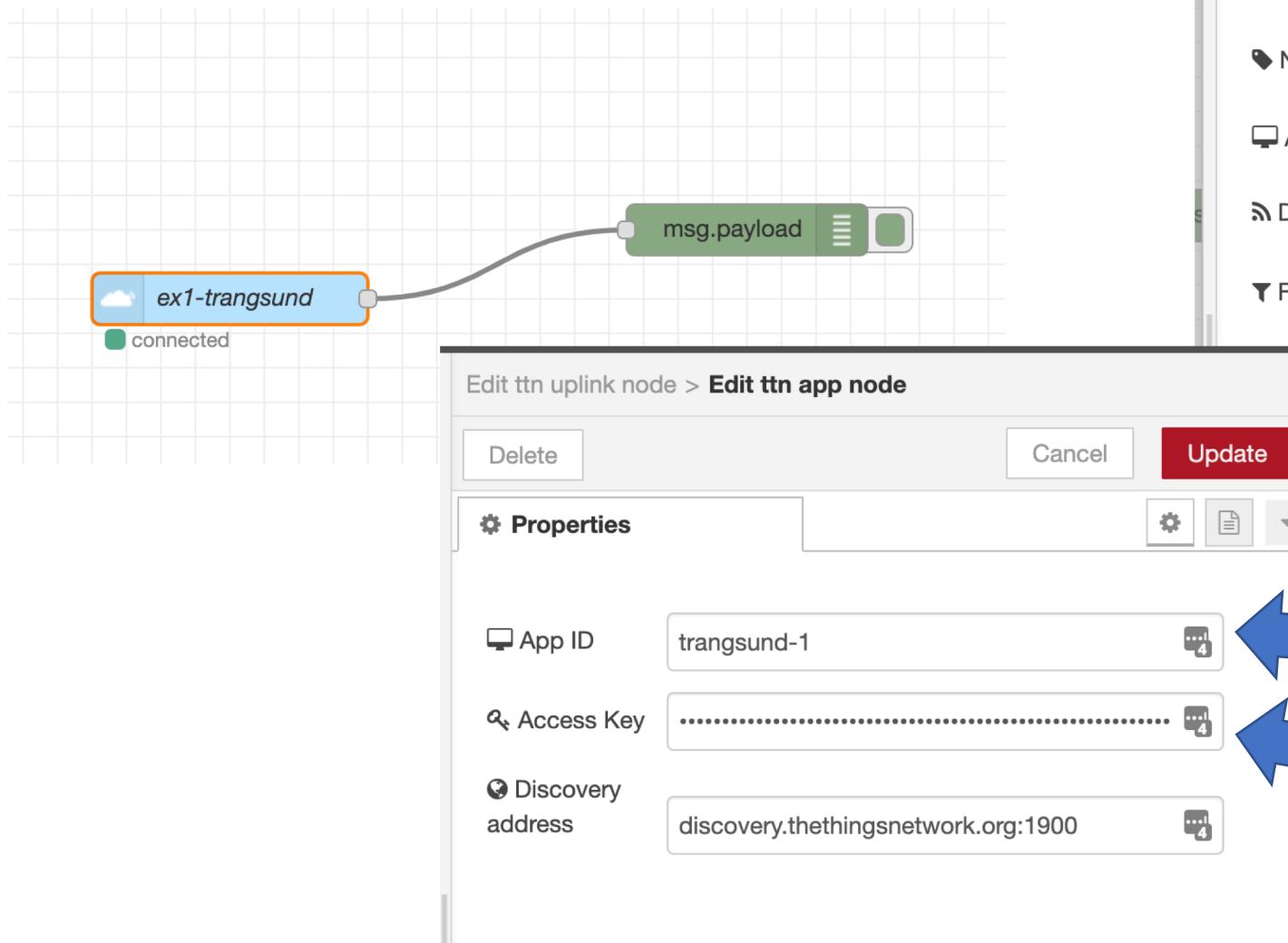




Node-Red

- Programmeras med nodes.
- Flöde -> gjort för att slussa data mellan olika saker
- TTN Node – För att kommunicera med TTN (även MQTT-node)
- Debug Node – För att se paket, använd flitigt
- Influx Node – Skriva till vår databas
- Function Node – Kan skriva kod, Javascript.

TTN Node Node RED



Edit ttn uplink node

Properties

Name	ex1-transsund
App	transsund-1
Device ID	
Field	

Edit ttn uplink node > Edit ttn app node

Properties

App ID	transsund-1
Access Key
Discovery address	discovery.thethingsnetwork.org:1900

App ID
Access key TTN