LoRaWAN IoT Infrastruktur

thomas.amberg@yaler.net

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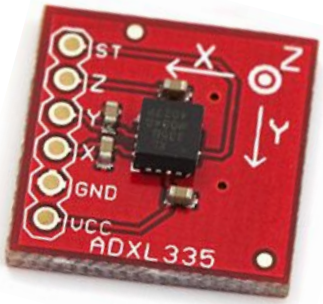
(sofern nicht anders vermerkt)

Internet of Things (IoT)

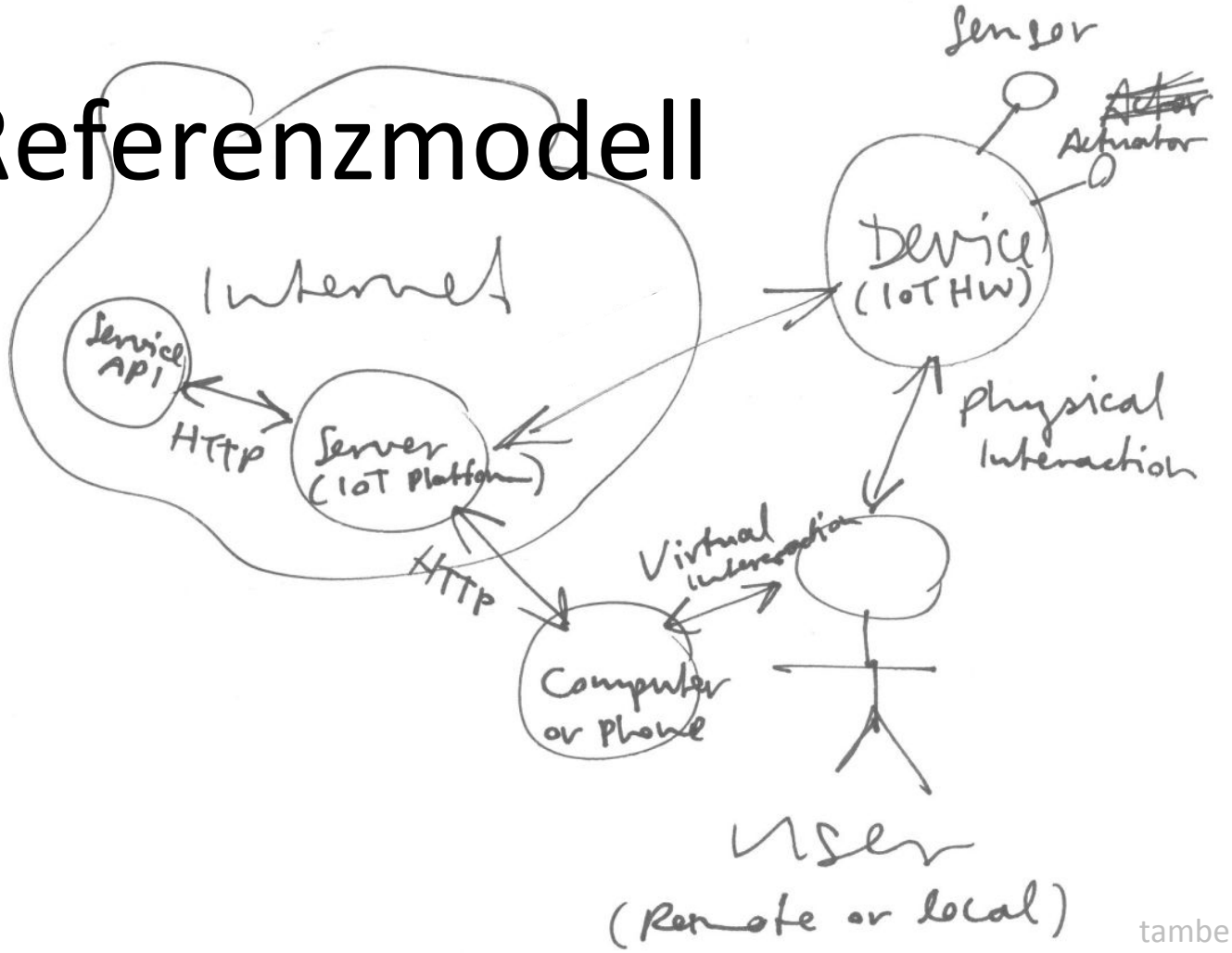


Internet-verbundene Computer mit Sensoren und Aktuatoren

"Physische Objekte mit Web API"

Zitat @hansamann

IoT Referenzmodell



tamberg.org, CC BY-SA

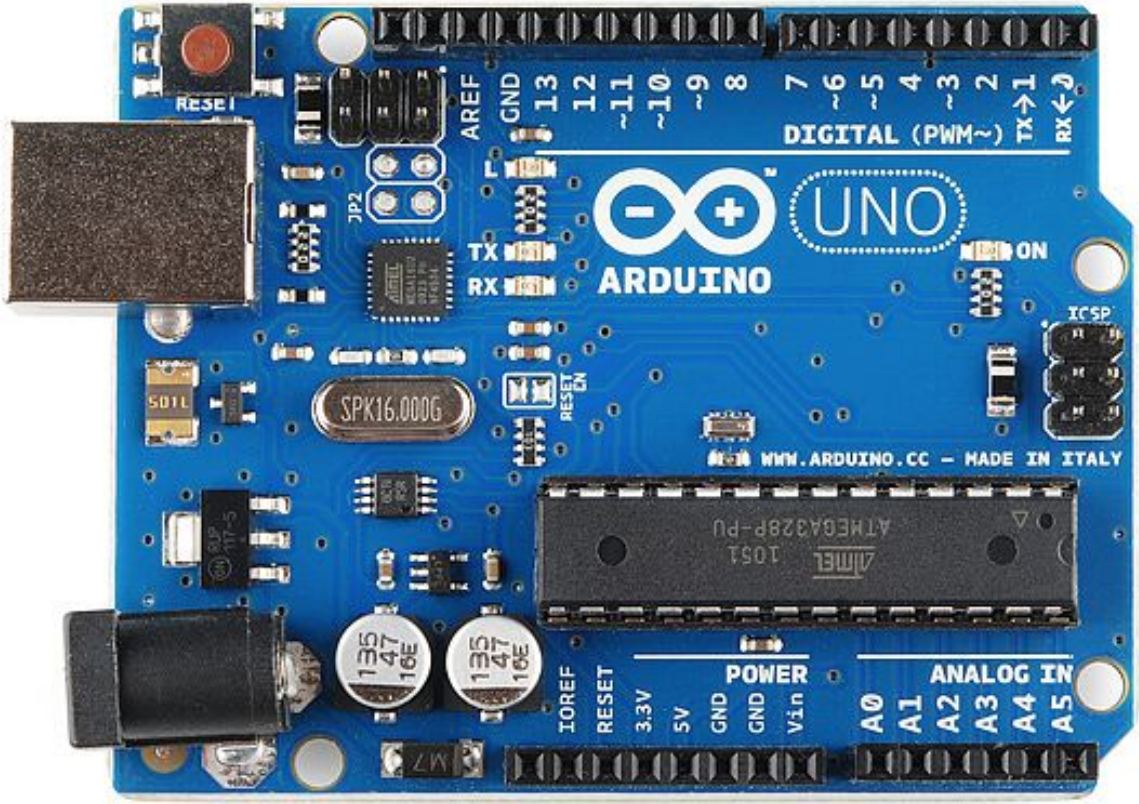
Technologie wird zugänglicher

Arduino, Raspberry Pi & Co

Maker Bewegung

MechArtLab

www.instructables.com/id/Augmented-Water, CC BY-SA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WWW.ARDUINO.CC – MADE IN ITALY
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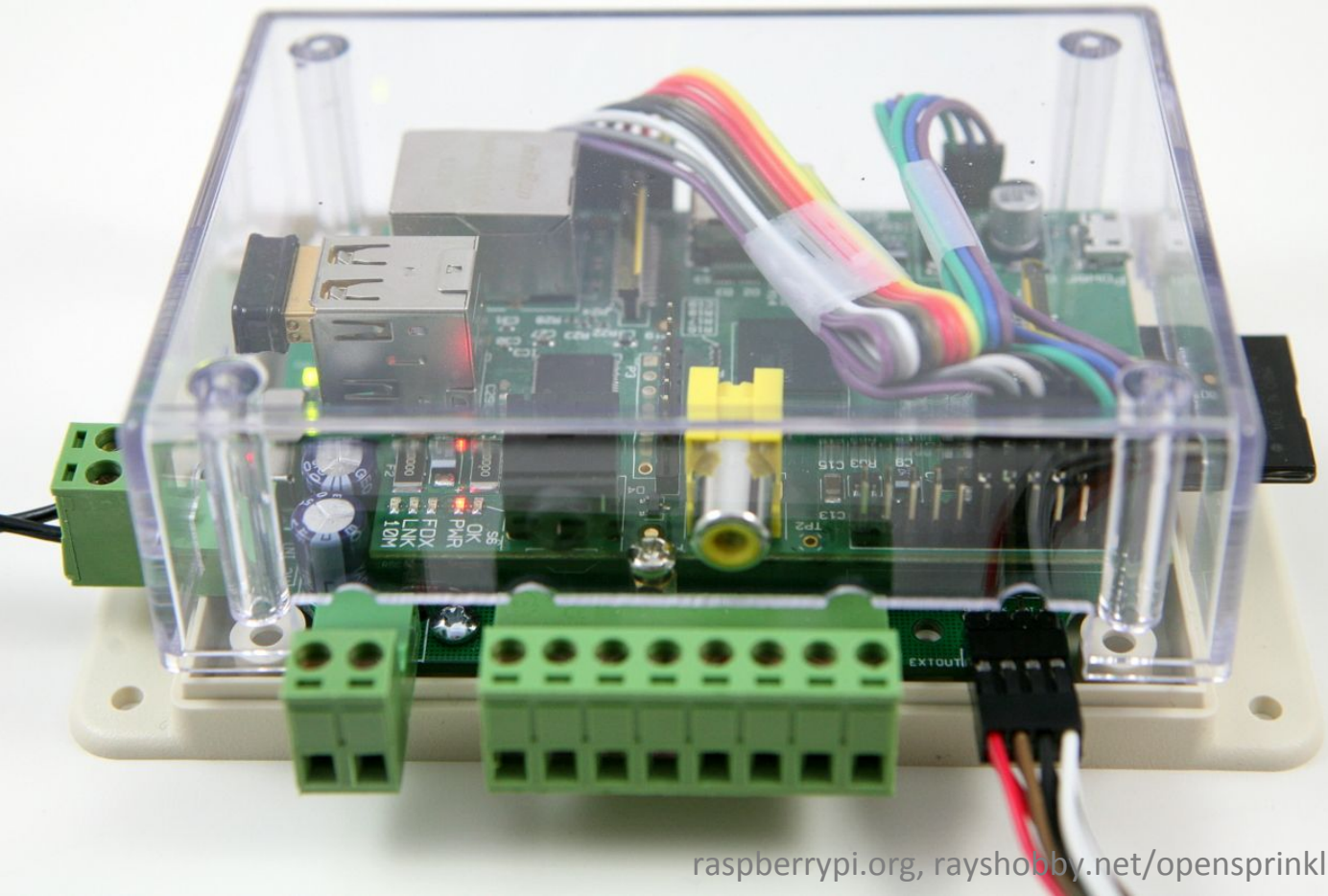
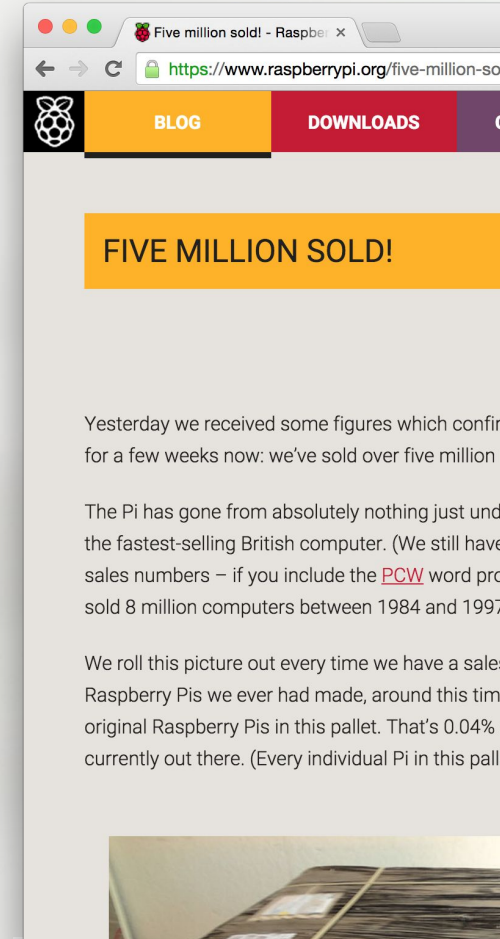
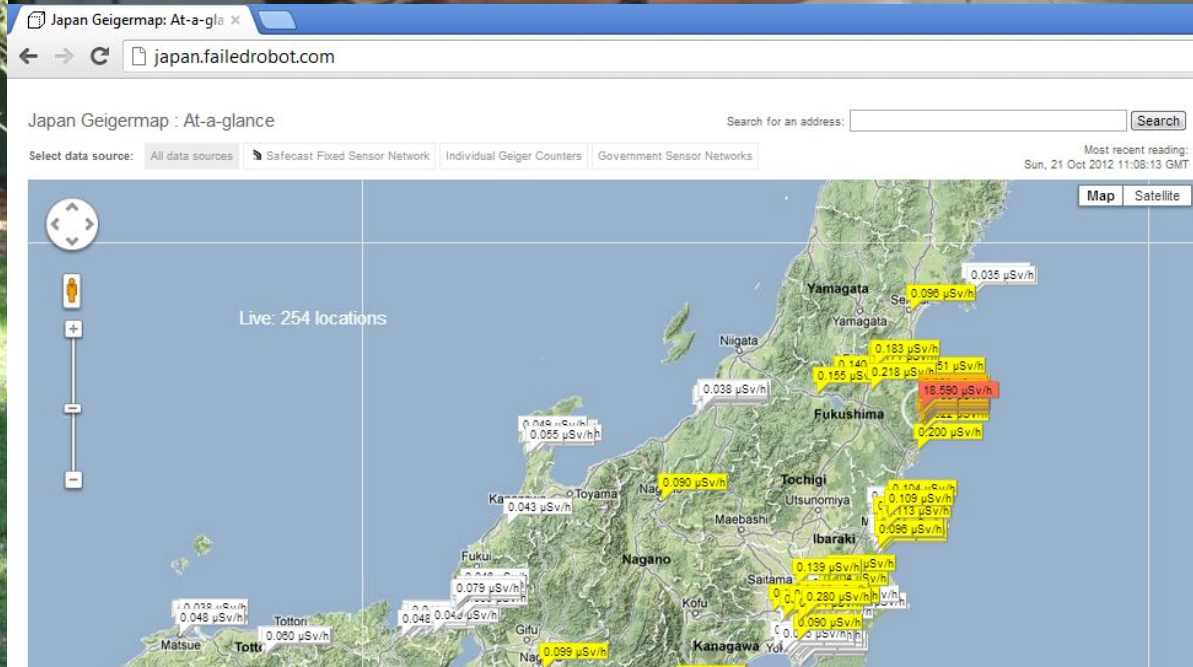
arduino.cc





raspberrypi.org, rayshobby.net/opensprinkler

safecast.org


Japan Geigermap: At-a-gla
japan.failedrobot.com
Japan Geigermap : At-a-glance
Search for an address:
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All data sources
Safecast Fixed Sensor Network
Individual Geiger Counters
Government Sensor Networks
Most recent reading:
Sun, 21 Oct 2012 11:08:13 GMT
Map
Satellite
Live: 254 locations
Yamagata
Niigata
Fukushima
Tochigi
Utsunomiya
Maebashi
Ibaraki
Toyama
Nagano
Saitama
Kofu
Gifu
Kanagawa
Fukui
Tottori
Matsue
0.035 µSv/h
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Long Range Wide Area Network

Low Power, Low Bandwidth

LoRaWAN, LPWAN

LoRa Alliance Introduction

LoRa™

EASY TO INSTALL

EXTREMELY ECONOMICAL

FLEXIBLE TO ADAPT

SCALABLE

BI-DIRECTIONAL

SECURE & ENCRYPTED

3:06 / 4:29

YouTube.com, © LoRa Alliance

New LoRa™ Alliance to En ×

https://www.lora-alliance.org/kb

LoRa Alliance

Wide Area Networks for IoT

New LoRa™ Alliance To E
For The Inter

Industry Leaders Plan LoRa™ Alliance to S
Bi-directional, Battery Friendly, Low-cost, L

San Ramon, Calif., January 6, 2015 - Indus
creating the largest, most powerful cons
the Internet of Things (IoT). An informati
founding members will be held this week
Las Vegas. The LoRa™ Alliance mission is
Networks (LPWAN) being deployed arour
(IoT), machine-to-machine (M2M), smart
members intend to collaborate in order t
protocol (LoRaWAN™) by sharing knowle
interoperability between Telecom operat

The prospective initial Alliance members
Actility, Cisco, Eolane, IBM, Kerlink, IMST,
Microchip Technology, as well as lead tel
SingTel, Proximus, Swisscom, and FastNe
prospective Alliance members are hostin

Swisscom baut ein schweiz ×

Thomas

https://www.swisscom.ch/de/about/medien/press-releases/2016/03/2016031...

swisscom

Unternehmen | Medien | Investoren | Governance | Jobs & Karriere | Inno

Swisscom baut ein schweizweites Netz für das Internet der Dinge

Bern, 14. März 2016

Das Internet der Dinge verbindet längst Millionen von Dingen und Geräten miteinander und mit Menschen. Künftig werden es weltweit Milliarden sein. Swisscom baut als erste Anbieterin schweizweit ein ergänzendes Netz für das Internet der Dinge, das Low Power Network. Es ist für die vom Stromnetz autonome Übermittlung geringster Datenmengen konzipiert.

Swisscom baut im Grundausbau bis Ende 2016 schweizweit ein ergänzendes Netz für das Internet der Dinge. Das so genannte Low Power Network (LPN) bildet die Basis für das Internet der Dinge und damit für intelligente Städte, energieeffiziente Gebäude, Machine-to-Machine-Vernetzungen und neue digitale Anwendungen. Es wächst exponentiell, laut diversen Studien werden es künftig weltweit Milliarden von Geräten sein, die unter sich kommunizieren. Einige Beispiele:

- Parkplätze melden ihre Belegung und übermitteln diese ins Verkehrsleitsystem.
- Städte optimieren Sammelrouten nach dem Füllstand von Recyclingcontainern und reduzieren so Kosten und CO_2-Emissionen.
- Der Briefkasten sendet eine Nachricht, sobald ein Paket angekommen ist.
- Heizungszähler senden den aktuellen Bezug des Mieters direkt an den Immobilienbewirtschafter zur exakten Abrechnung.
- Maschinen und Geräte melden anbahnende Ausfälle frühzeitig.

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Die Schweizerische Post

https://places.post.ch/?lang=de&service=places

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Standorte +

Öffnungszeiten +

25 Ergebnisse

Schaffhausen

Die Post baut am Internet

https://www.post.ch/de/ueber-uns/unternehm...

DIE POST
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Über uns ▸ … ▸ Die Post baut am Internet der Dinge

Die Post baut am Internet der Dinge

Mitteilung vom 02.03.2016

In Zukunft werden immer mehr elektronische Geräte untereinander und mit dem Internet vernetzt sein. Das sogenannte Internet of Things eröffnet auch in der Logistik zahlreiche neue Anwendungsmöglichkeiten. Deshalb will die Post ein auf LoRaWAN (Long Range Wide Area Network) basierendes Netzwerk aufbauen und verschiedene Einsatzgebiete testen. Erste Versuche starten Ende März.

The Things Network

https://thethingsnetwork.org

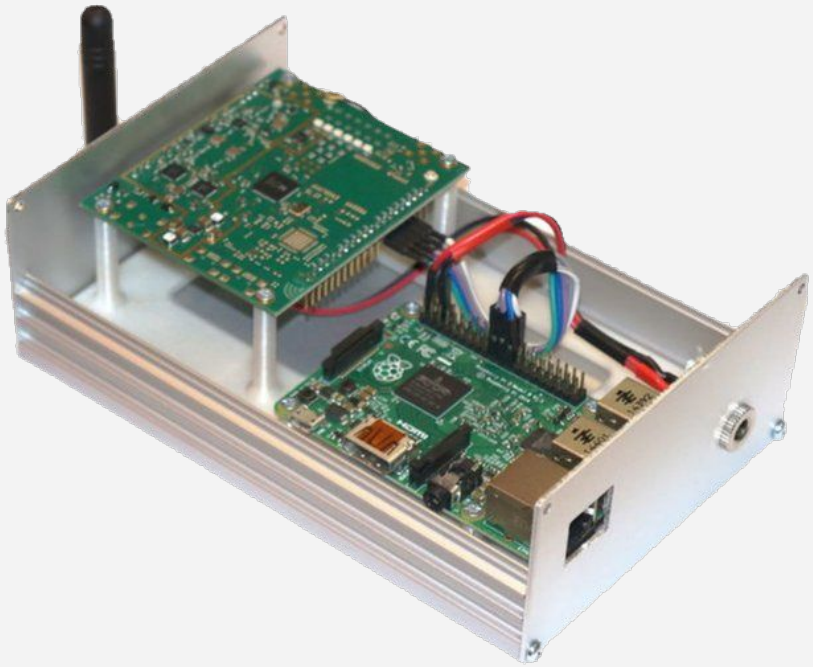
THE THINGS NETWORK

Building the network

With a small group of people it is possible to provide an entire city of data connectivity for things.

In a period of 6 weeks the city-wide coverage of Amsterdam was crowdsourced and implemented.

From day one use cases were built on top of this network. We believe the abundance we are creating will lead to exponential innovation from which we all benefit. Join our global campaign by contributing.



© Christian A. Weber, @ultrachris3000

The Thing Network Zurich

https://www.thethingsnetwork.org/c/zurich/

THE THINGS NETWORK

THE THINGS NETWORK ZURICH

JOIN THIS COMMUNITY

OUR STORY

We are on a mission to build a global open crowdsourced Internet of Things data network.

Feedback

Join The Things Network S

Thomas

https://ttn-ch.herokuapp.com

THE THINGS NETWORK SWITZERLAND

+

Join **The Things Network Switzerland** on Slack.

1 users online now of **175** registered.

you@yourdomain.com

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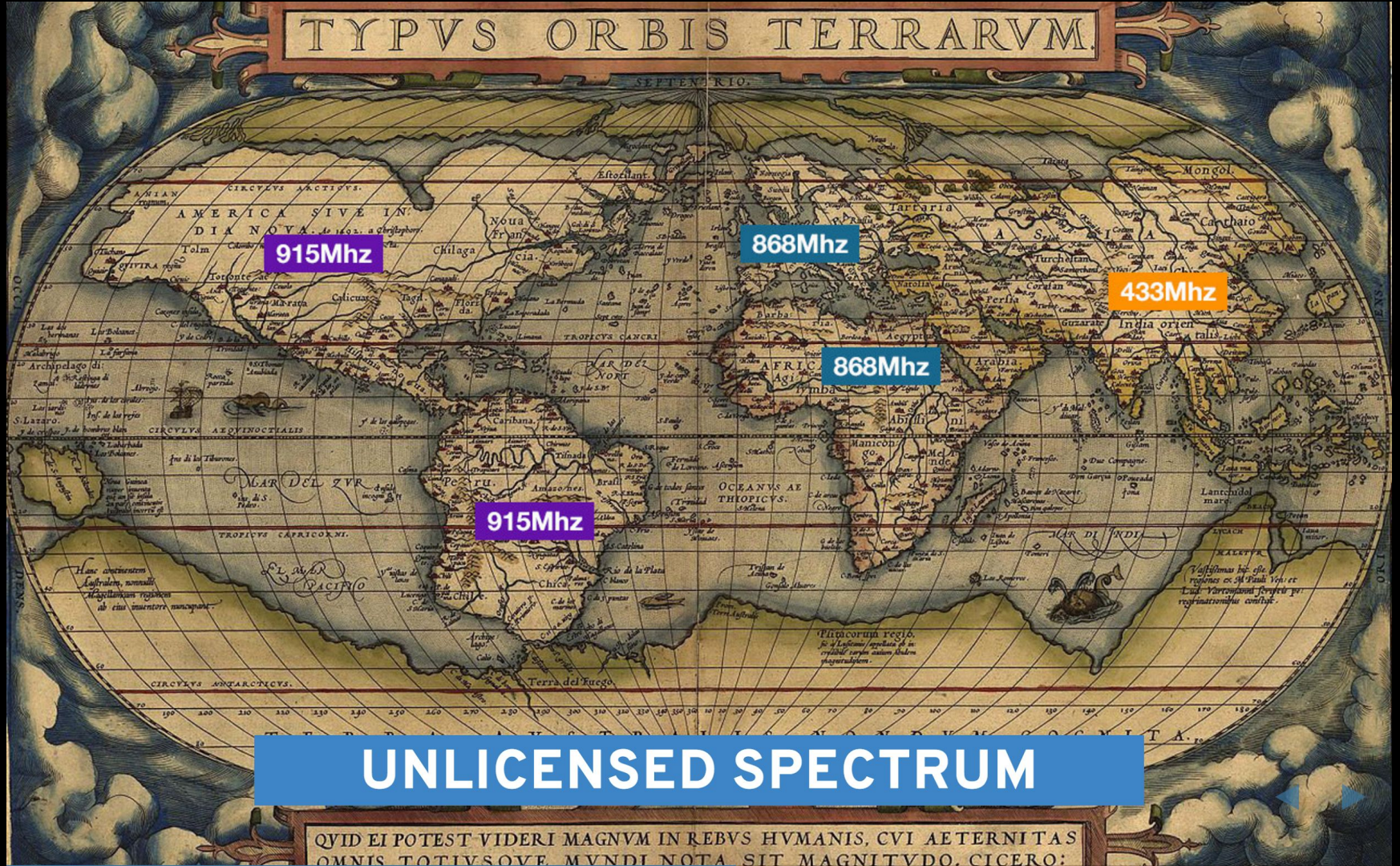

Gonzalo Casas, CC BY-SA, Map: CC0

LORIOT | LoRaWAN Service

https://loriot.io/index.html

LORIOT

HOME TECHNOLOGY PRICING NEWS CONTACT LOG IN

SMALL, INEXPENSIVE, BATTERY POWERED SENSORS

LORIOT is focused on providing 10 years of battery life for ultra-low maintenance cost of large-scale sensor deployments.

LORIOT | LoRaWAN Service

https://loriot.io/index.html

LORIOT

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SERVICES AND SOFTWARE

HOW WE DELIVER OUR LORAWAN SOLUTION

PUBLIC CLOUD

Your Virtual Private LoRaWAN network running in minutes. Ideal as a first step into the technology, short time to market and proof-of-concept projects.

REGISTER FREE ACCOUNT

SOFTWARE AS A SERVICE

Your very own LoRaWAN network, provided by LORIOT as a managed or unmanaged service. Our pricing scales as you grow the network.

CONTACT US

SOFTWARE LICENSE

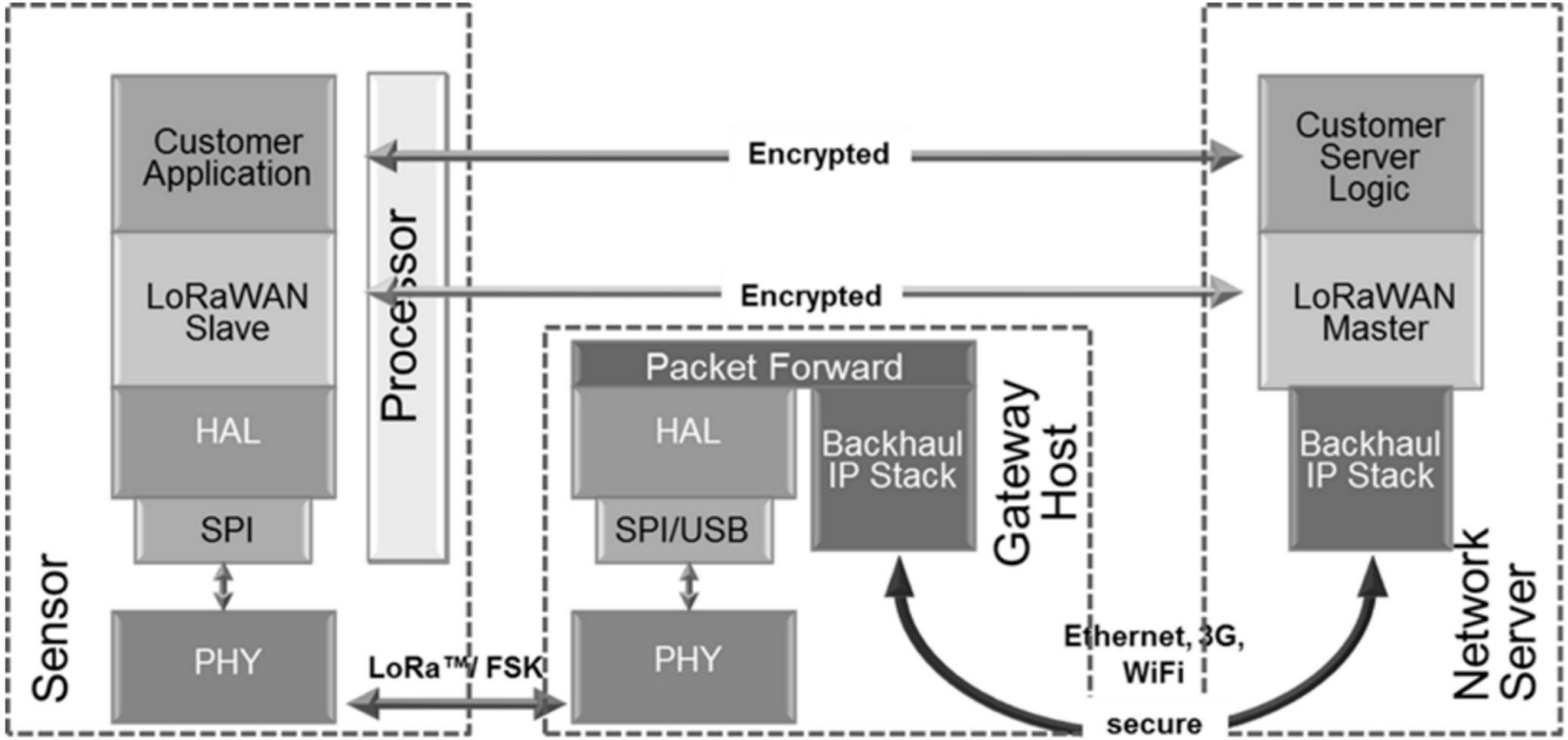
Want to run the network on your own? Fine with us. We can license you our software for your own LoRaWAN network deployment.

CONTACT US

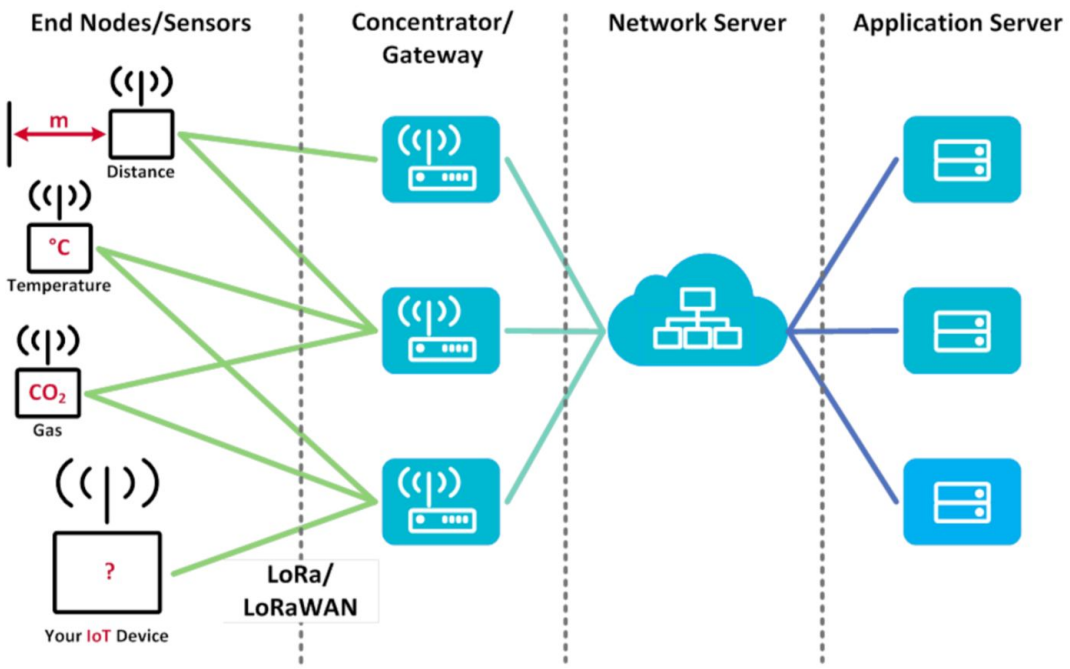
Netzwerk-Architektur:

Node → LoRa → Gateway

Gateway → TCP/IP → Server



LoRaWAN network architecture is a typical star-of-stars topology in which the **gateways** are a transparent bridge relaying messages between **end-devices** and a central **network server**. Gateways are connected to the network server via standard IP connections, while end-devices use single-hop wireless communication to one or many



- **End Nodes/Sensors** measure values and transmit the data
- **Concentrator/Gateway** receive the radio packets and trasmit them to the network server over LAN, Cell, …
- **Network Server** forwards and/or collects data from the end nodes/sensors
- **Application Server** makes something useful out of the data. Usually your server or application, that simplyfies your customers life

Documentation | LORIOT.io

Thomas

https://eu1.loriot.io/home/documentation.html#docu/app-output

LORIOT

Dashboard > Documentation

Community Network tamberg@yaler.net

- back to dashboard
- Documentation
- Gateways
  - Basic setup
  - Setup guides
  - Change log
  - Frequency plans
  - Gateway Catalog
- Applications
  - API Data Format
  - Output types

Available Application APIs

Amazon AWS IoT 3rd party	IBM Bluemix IoT Foundation 3rd party	HTTP Push LORIOT.io	Iron.io IronMQ v1 3rd party
Iron.io IronMQ v3	PubNub	TLS Socket	WebSocket

LoRaWAN Funk-Module

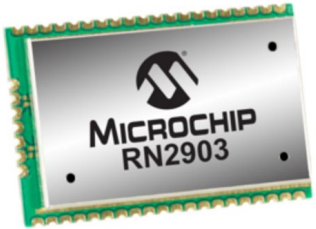
Mit/ohne LoRa Stack

Ab 15.- pro Stück

RN2903 - Wireless Module

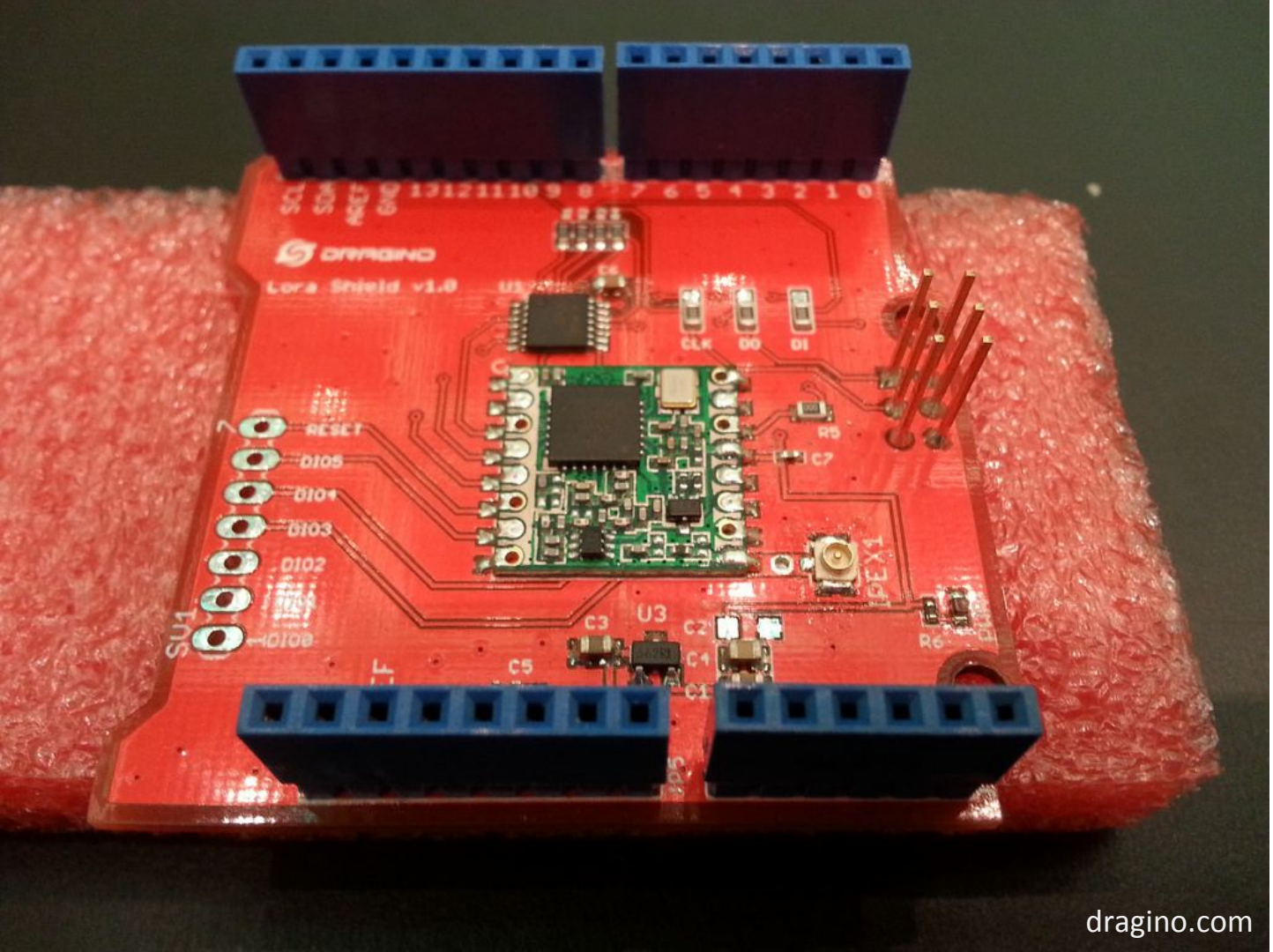
Thomas

https://www.microchip.com/wwwproduc...



Features

- On-board LoRaWAN™ Class A protocol stack
- ASCII command interface over UART
- Compact form factor 17.8 x 26.7 x 3 mm
- Castellated SMT pads for easy and reliable PCB mounting
- Device Firmware Upgrade (DFU) over UART
- 14 GPIO for control, status, and ADC
- Highly integrated module with MCU, crystal, EUI-64 Node Identity Serial EEPROM, Radio transceiver with analog front end, and matching circuitry
- Environmentally friendly, RoHS compliant
- FCC and IC Certified


DRAGINO
Lora Shield v1.0
CLK
DO
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DIO5
DIO4
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DIO2
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U3
C3
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C4
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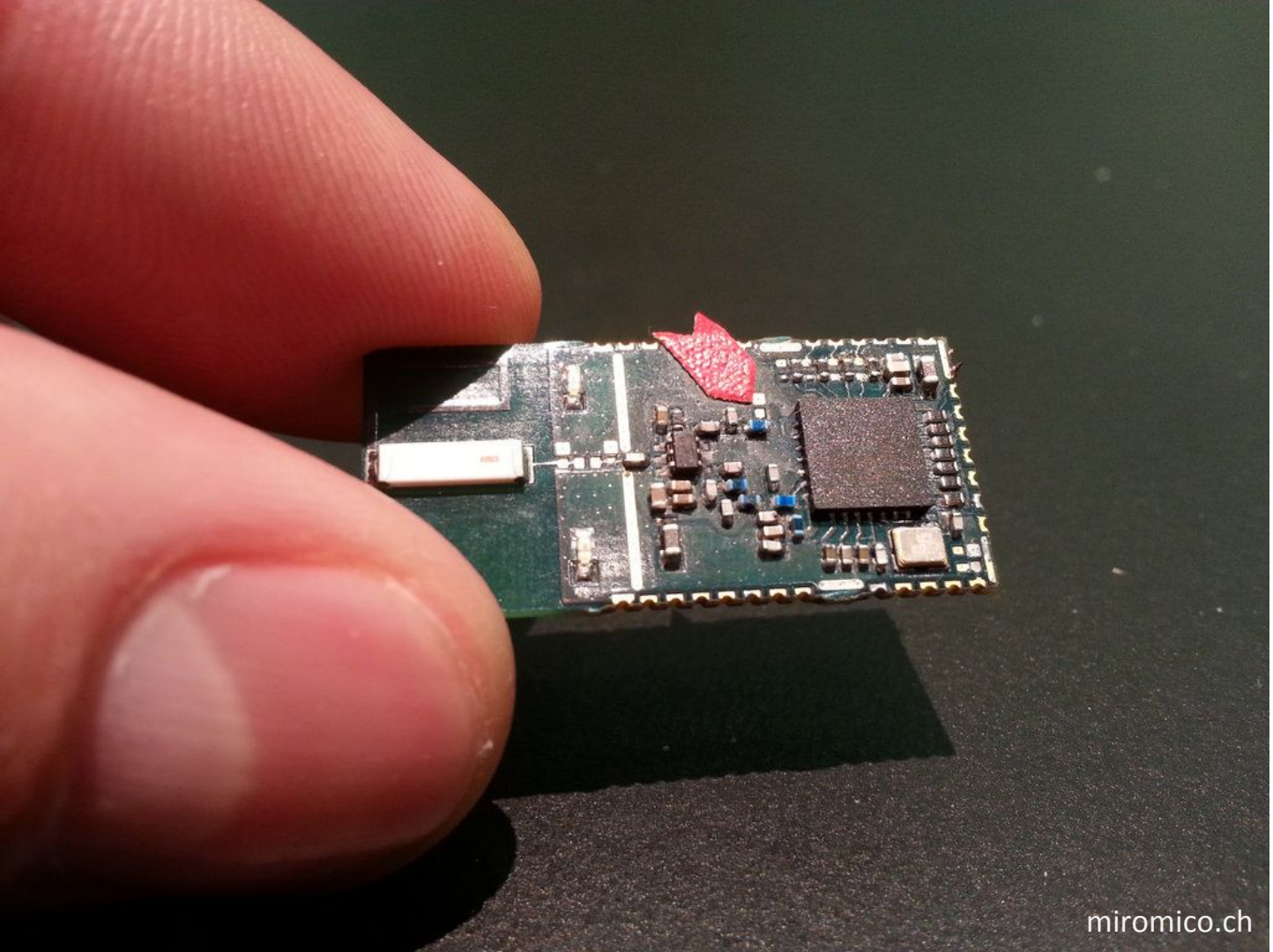
C7
R5
R6

dragino.com


miromico.ch

Berner
Fachhochschule

ttn_moteino/Readme.md at

Thomas

GitHub, Inc. [US] https://github.com/lukastheiler/ttn_moteino/blob/master/Readme.md

Branch: master ttn_moteino / Readme.md

Find file Copy path

lukastheiler + EV_REJOIN_FAILED handling e6711e6 on May 15

1 contributor

375 lines (290 sloc) | 14.4 KB

Raw Blame History

The Things Network with the Moteino and RN2483

This guide has been modified for the new staging backend, and has the following sections:

1) Moteino, LMIC and ABP Walkthrough

2) Moteino, LMIC and OTAA Walkthrough

3) RN2483 and OTAA Walkthrough

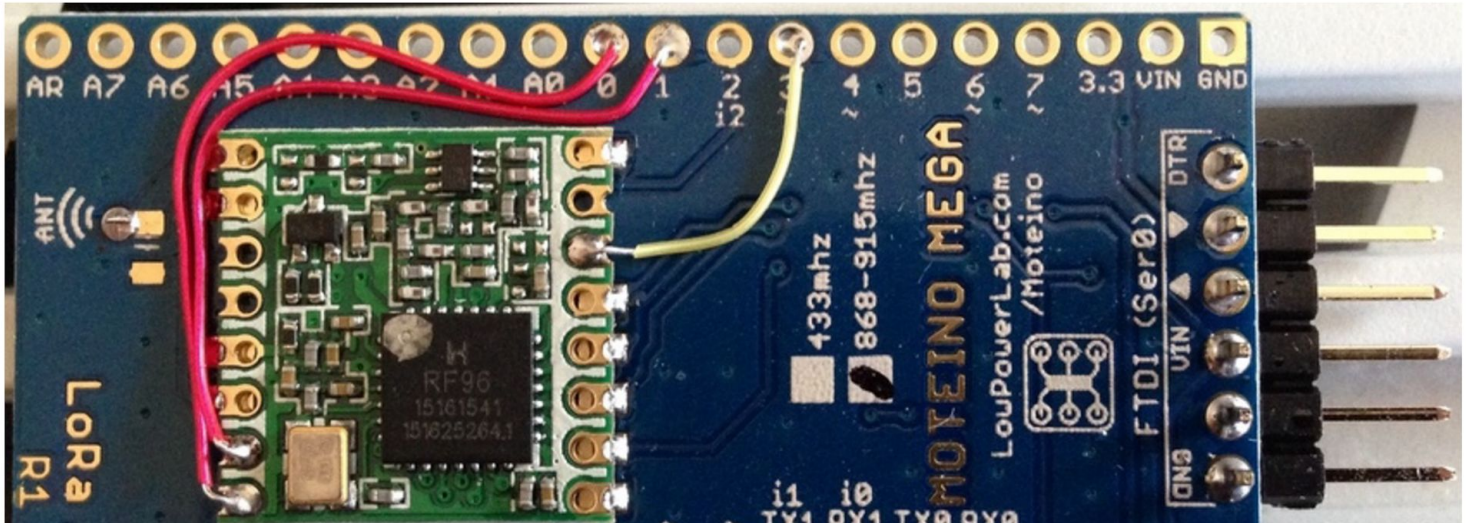
4) Misc, tips, tricks, lessons learned

1) Moteino, LMIC and ABP Walkthrough

Sodering

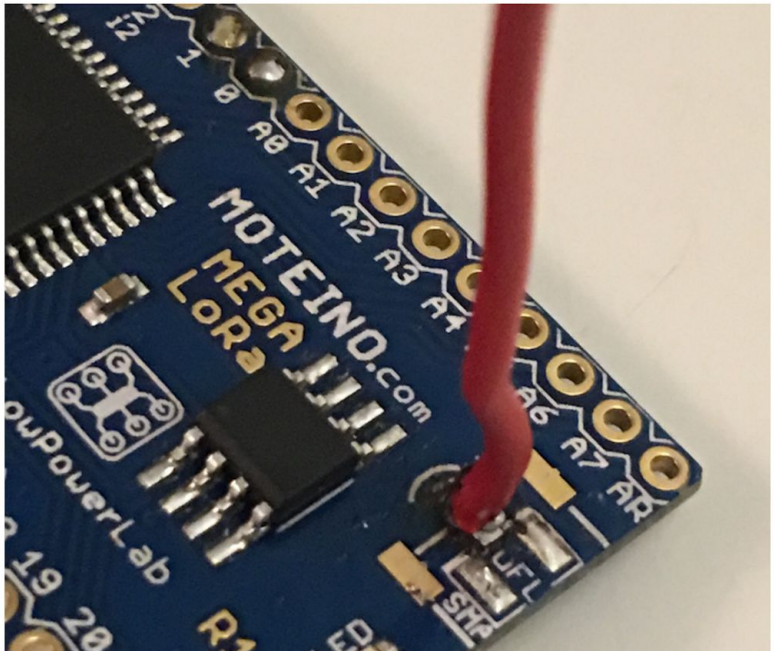
D0 and D1 pins

Ouf ot the box, the Moteino is meant for peer to peer communication. In order to make the SX1276 chip talk to the things network, you'll have to soder at least the D0 and D1 pin of the chip to the moteino's pins 0 and 1. Note that D2 is already connected with pin 0. My sodering skills are far beyond Urs Marti's so I just show you his image, D0/D1 are the red cables, the yellow one is reset (not really needed).



Antenna

You'll also need to attach an antenna. I just took a copper wire of 8.2cm length, and attached it to the antenna.



LoRaWAN Gateways

Produkte ab 1000.-

DIY-Kits ab 250.-

LoRa-Enabled M2M Gateway

Model: ***LL-BST-8***

This industrial-grade LoRa gateway—LL-BST-8—is a multiprotocol, large-scale connectivity platform for original equipment manufacturers (OEMs) seeking fast time to market. The gateway is built for use with LoRa™ networks and is capable of supporting thousands of endpoints with eight simultaneous receive channels. It provides a cost effective replacement for wide-area IoT networks.

BUY NOW

iC880A-USB

Thomas

webshop.imst.de/ic880a-usb-lorawan-concentrator-868mhz.html

iC880A-USB – LoRaWAN Concentrator 868MHz

Availability: In stock

€199.00

Excl. 19% Tax
Buy 10 for **€189.00** each and ***save 6%***

Qty: 0

ADD TO CART

Quick Overview

The iC880A-USB is the RF frontend board of a LoRa™ gateway. It is able to receive on different frequency channels at the same time and is able to demodulate the LoRa™ signal without knowledge of the used spreading factor of the sending node.

This product is well suited for the plug & play development together with a Rasberry Pi-platform to build the foundation for a gateway. Together with our accessories you are almost ready to start.

MORE VIEWS

LoRa

Home · ttn-zh/ic880a-gate

Thomas

GitHub, Inc. [US] https://github.com/ttn-zh/ic880a-gateway/wiki

This repository Search

Pull requests Issues Gist

ttn-zh / ic880a-gateway

Watch 13 Unstar 28 Fork 23

Code Issues 0 Pull requests 0 Wiki Pulse Graphs

Home

Edit New Page

Gonzalo Casas edited this page 16 days ago · 30 revisions

From zero to LoRaWAN in a weekend

So you want to extend the coverage of The Things Network in your neighborhood but missed the kickstarter to buy a gateway?

Worry not! It's really easy to build one yourself that is on par with most other gateways when it comes to specs, but is significantly cheaper.

Ordering the parts

Pages 1

Home

Clone this wiki locally

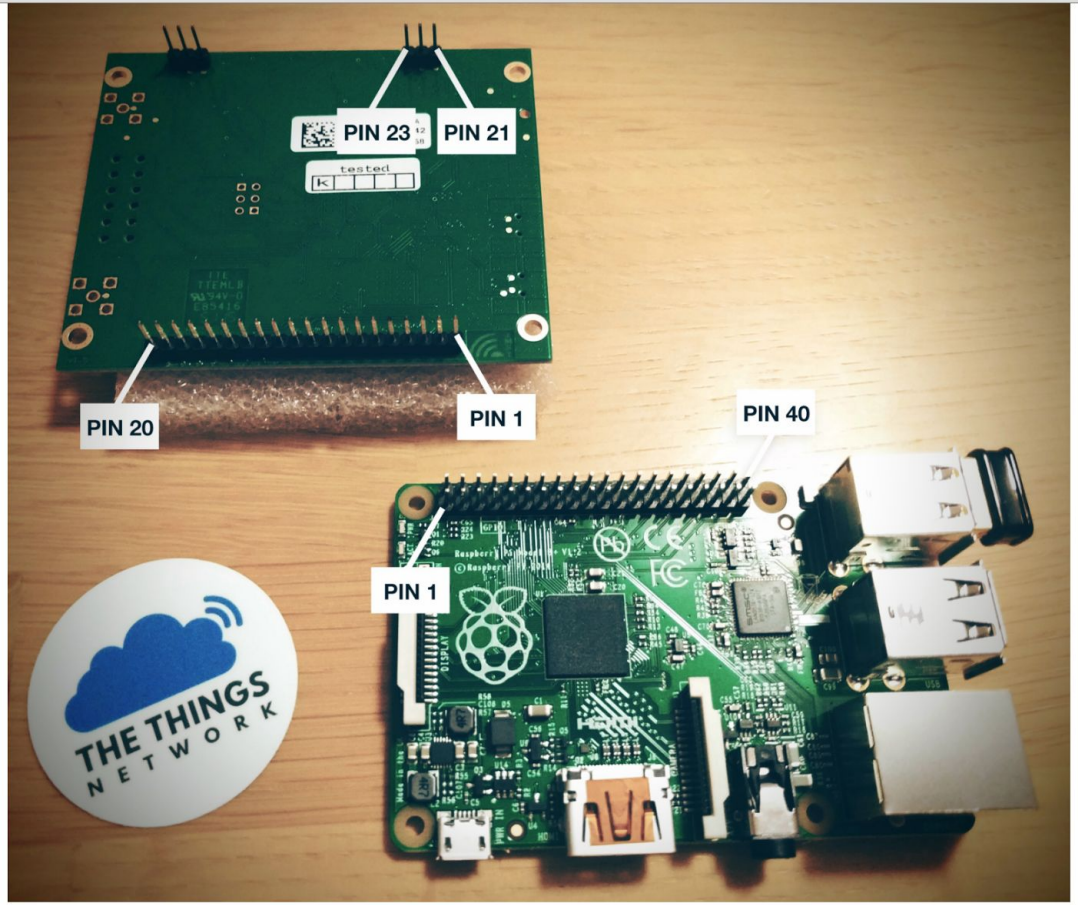
https://github.com/ttn-zh

Clone in Desktop

Home · ttn-zh/ic880a-gate

Thomas

GitHub, Inc. [US] https://github.com/ttn-zh/ic880a-gateway/wiki



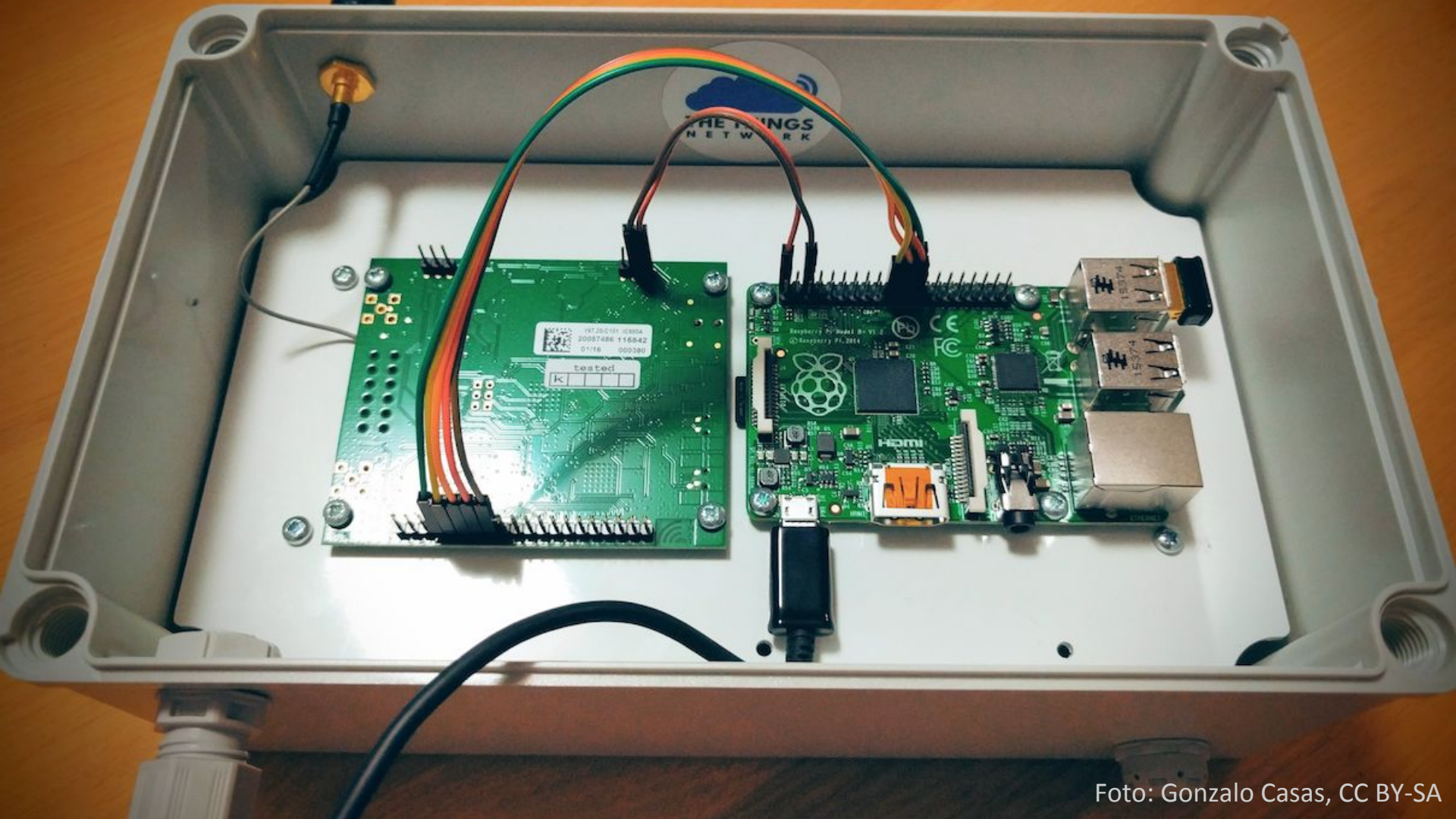
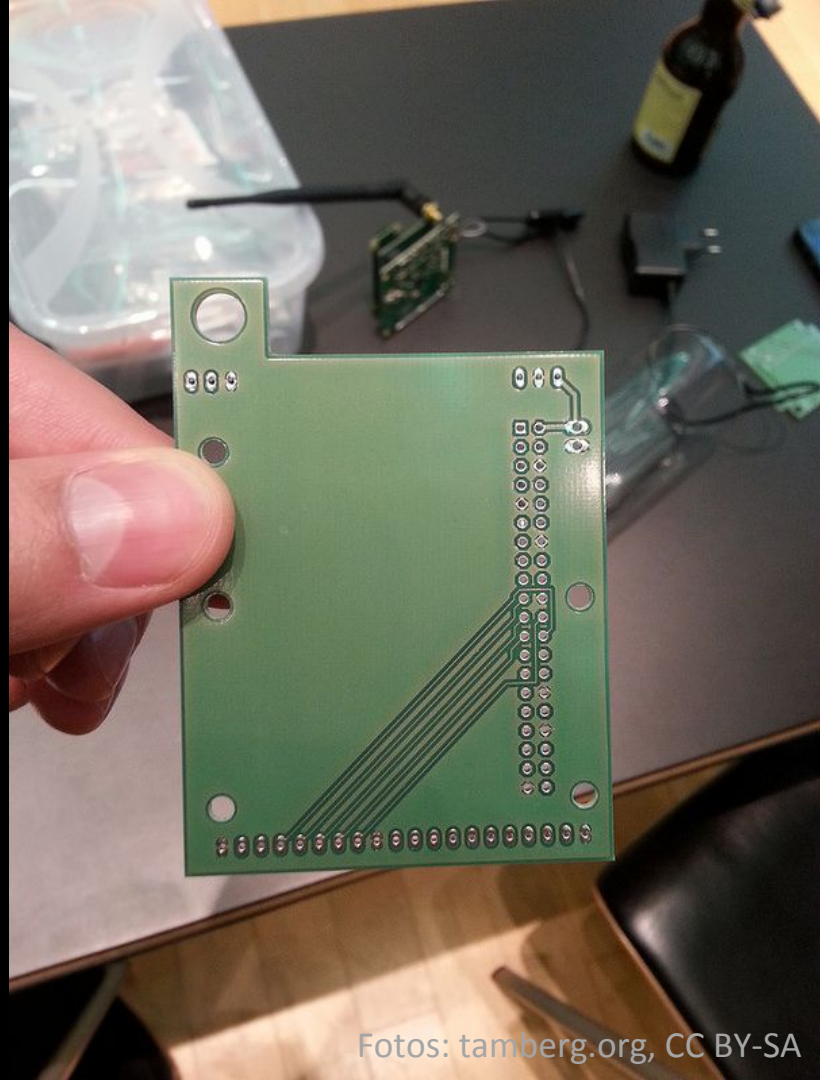


Foto: Gonzalo Casas, CC BY-SA



Fotos: tamberg.org, CC BY-SA

Gateway – Django REST fra ×

Thomas

https://www.thethingsnetwork.org/api/v0/gateways/

Django REST framework

Index / Gateway

Gateway

OPTIONS GET

GET /api/v0/gateways/

HTTP 200 OK
Allow: GET, HEAD, OPTIONS
Content-Type: application/json
Vary: Accept


```
[
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        "rxcount": 0,
        "rxforwarded": 0
    },
```

Node – Django REST frame

Thomas

https://www.thethingsnetwork.org/api/v0/nodes/

Django REST framework

Index / Node

Node

OPTIONS GET

GET /api/v0/nodes/

HTTP 200 OK
Allow: GET, HEAD, OPTIONS
Content-Type: application/json
Vary: Accept


```
[
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        "node_eui": "02015504"
    },
    {
```

https://www.thethingsnetw

Thomas

https://www.thethingsnetwork.org/api/v0/nodes/?format=json


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{"last_gateway_eui":"B827EBFFFFC61FBF","packets_count":53,"last_seen":"2016-06-23T12:04:20.783Z","node_eui":"03FF0002"},
{"last_gateway_eui":"008000000000A47E","packets_count":786,"last_seen":"2016-06-29T06:50:10.786Z","node_eui":"02032302"},
{"last_gateway_eui":"B827EBFFFF643FAC","packets_count":6,"last_seen":"2016-06-25T08:37:43.540Z","node_eui":"02012306"},
{"last_gateway_eui":"0000024B080E0814","packets_count":36,"last_seen":"2016-06-24T10:36:55.386Z","node_eui":"06FD88F9"},
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{"last_gateway_eui":"B827EBFFFF7E993B","packets_count":41,"last_seen":"2016-06-26T14:06:38.182Z","node_eui":"02013508"},
```

Node – Django REST frame

Thomas

https://www.thethingsnetwork.org/api/v0/nodes/0201BA01/

Django REST framework

Index / Node / Node

Node

OPTIONS GET

```
GET /api/v0/nodes/0201BA01/
```

```
HTTP 200 OK
Allow: GET, HEAD, OPTIONS
Content-Type: application/json
Vary: Accept
```

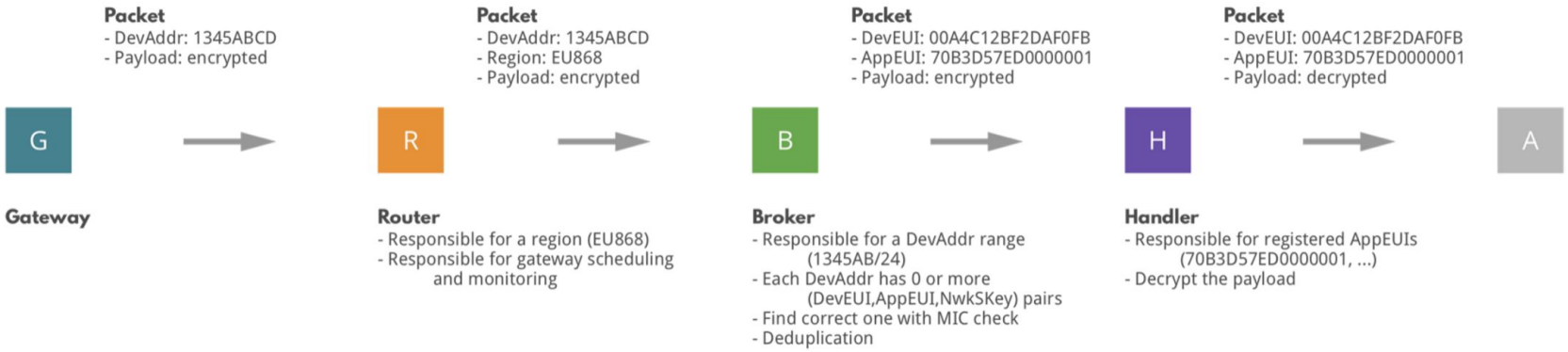

```
[
    {
        "datarate": "SF10BW125",
        "rssi": -85,
        "gateway_eui": "008000000000B670",
        "data_raw": "QAG6AQIArgMB4eihTg8pSD3ibkeLdfRO",
        "frequency": 904.5,
        "time": "2016-06-20T23:18:59.374Z",
        "data": "aGVsbG8gcm9wdSE=",
        "snr": 12.2,
        "data_plain": "hello ropu!",
        "node_eui": "0201BA01"
    },
    {
```

Backend/Overview - The Th

Thomas

staging.thethingsnetwork.org/wiki/Backend/Overview

Backend Components



Backend Connect a Gateway | Connect an Application

Backend Components: Router | Broker | Handler

Backend/Communication

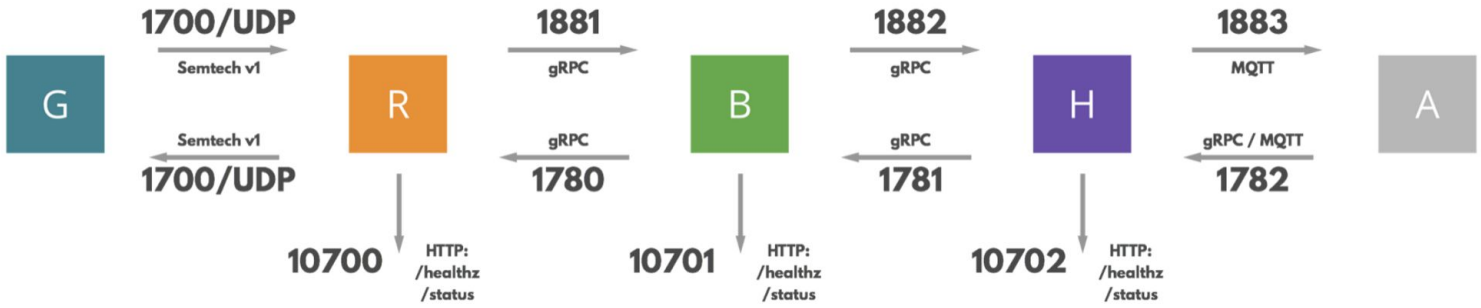
staging.thethingsnetwork.org/wiki/Backend/Communication

The Things Network Wiki: Backend/Communication

Search… | Home | All | Files | History | Latest Changes

Overview Pages: Home | LoRaWAN | Gateways | Nodes | Backend |

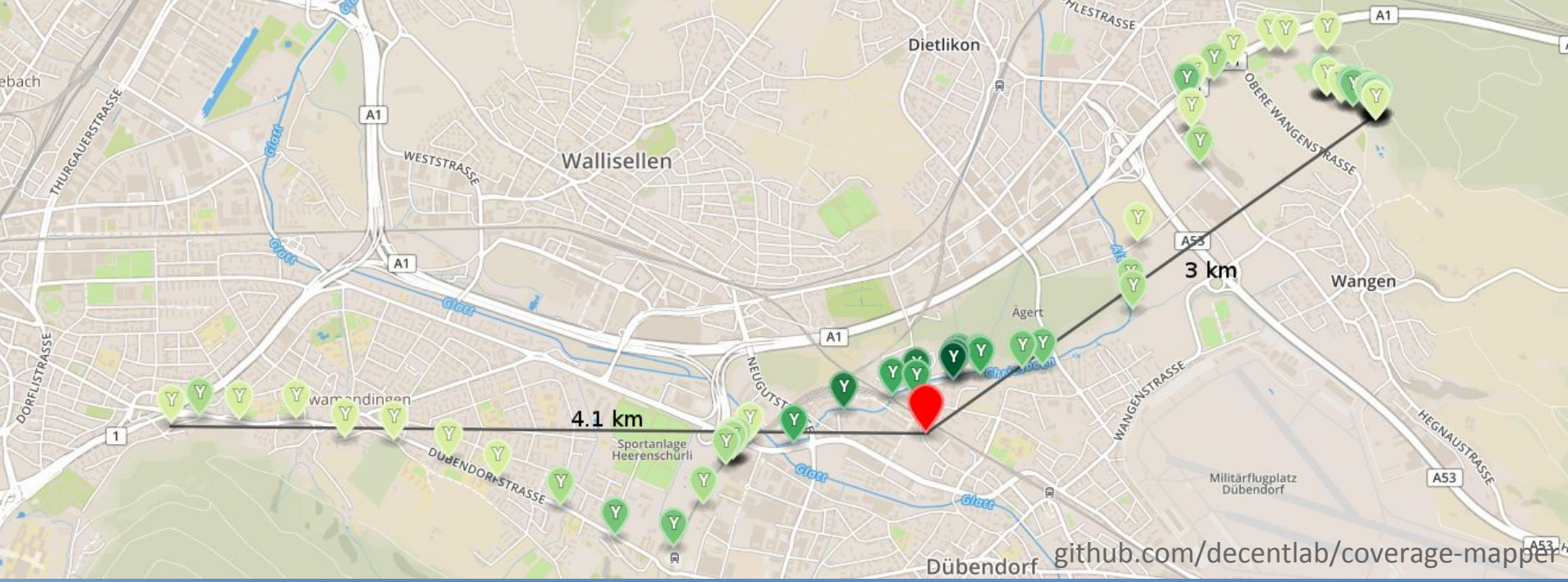
Communication Between Backend Components



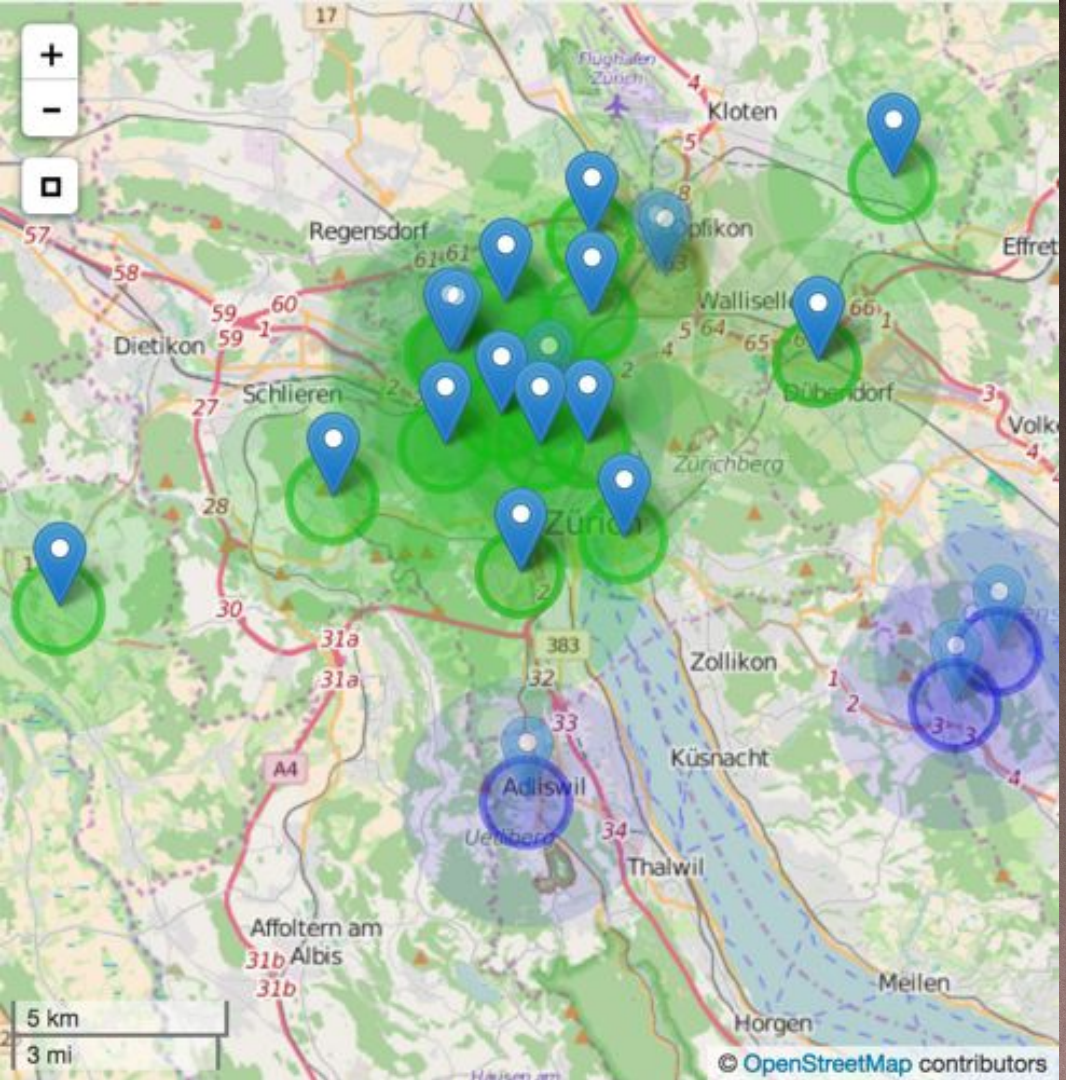
Netzabdeckung

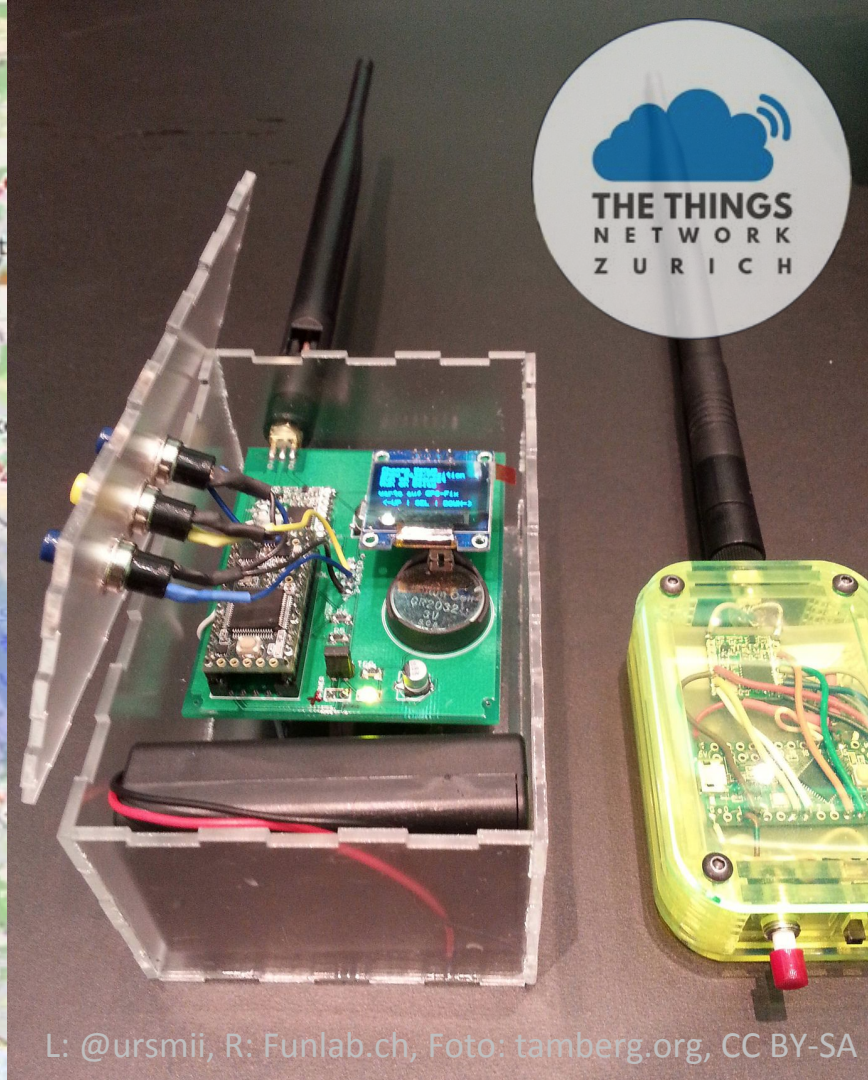
TTN_ZH, TTN

Swisscom


Dietlikon
Wallisellen
Wangen
Dübendorf
Ägert
Militärflugplatz Dübendorf
Sportanlage Heerenschürli
4.1 km
3 km
A1
A53
WESTSTRASSE
THURGAUERSTRASSE
DÖRFLISTRASSE
DÜBENDORFSTRASSE
NEUGUTSTRASSE
WANGENSTRASSE
OBERE WANGENSTRASSE
HEGNAUSTRASSE
Glatt
github.com/decentlab/coverage-mapper

decentlab.com





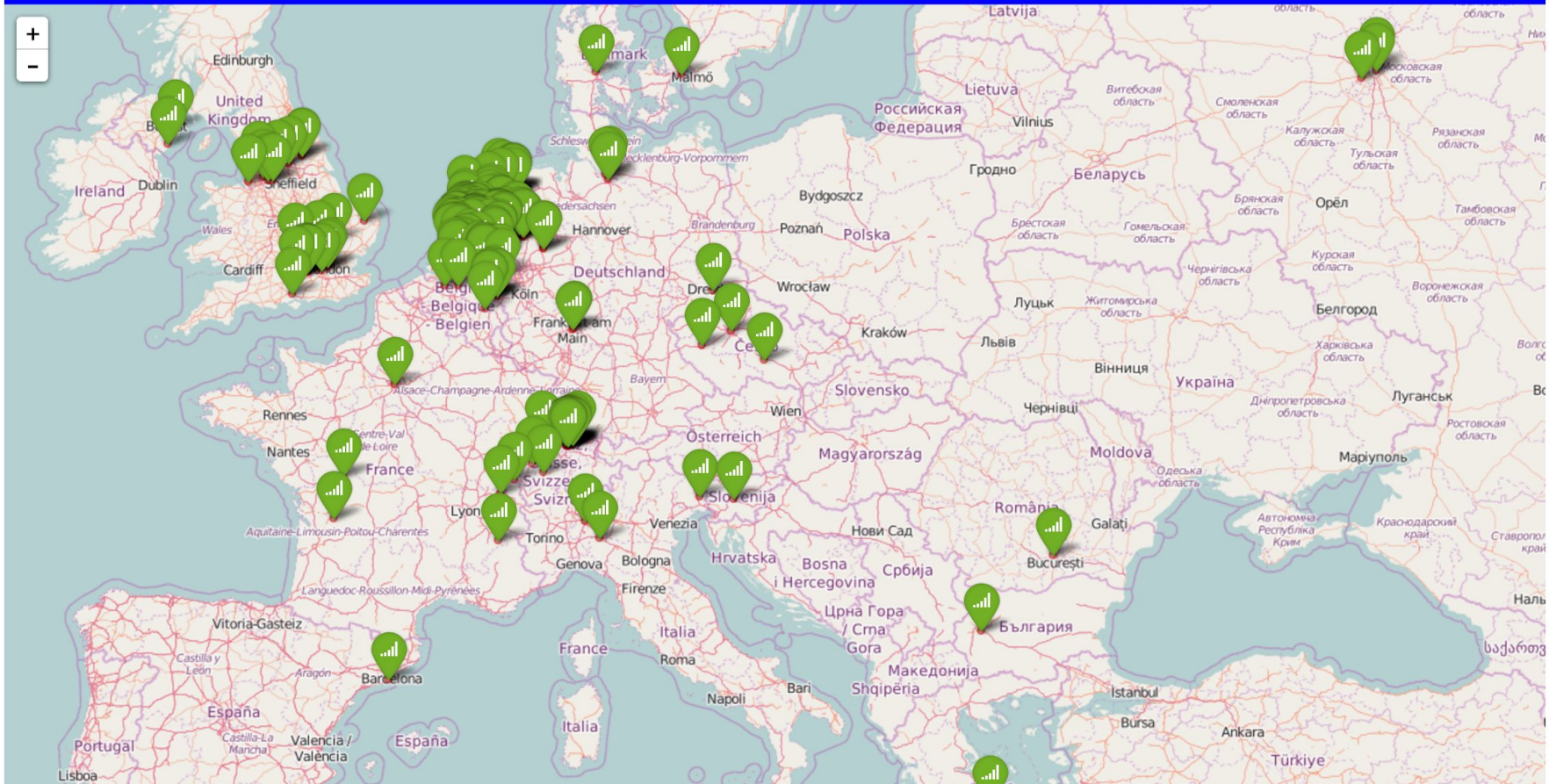
L: @ursmii, R: Funlab.ch, Foto: tamberg.org, CC BY-SA

Just Another TTN map

Thomas

ha-23.eradus.eu/croft.html

Just Another The Things Network Map



*mit freundlicher Genehmigung von Simon Prior, Programmleiter Swisscom LPN

Low Power Network

Coverage Status 30.06.2016

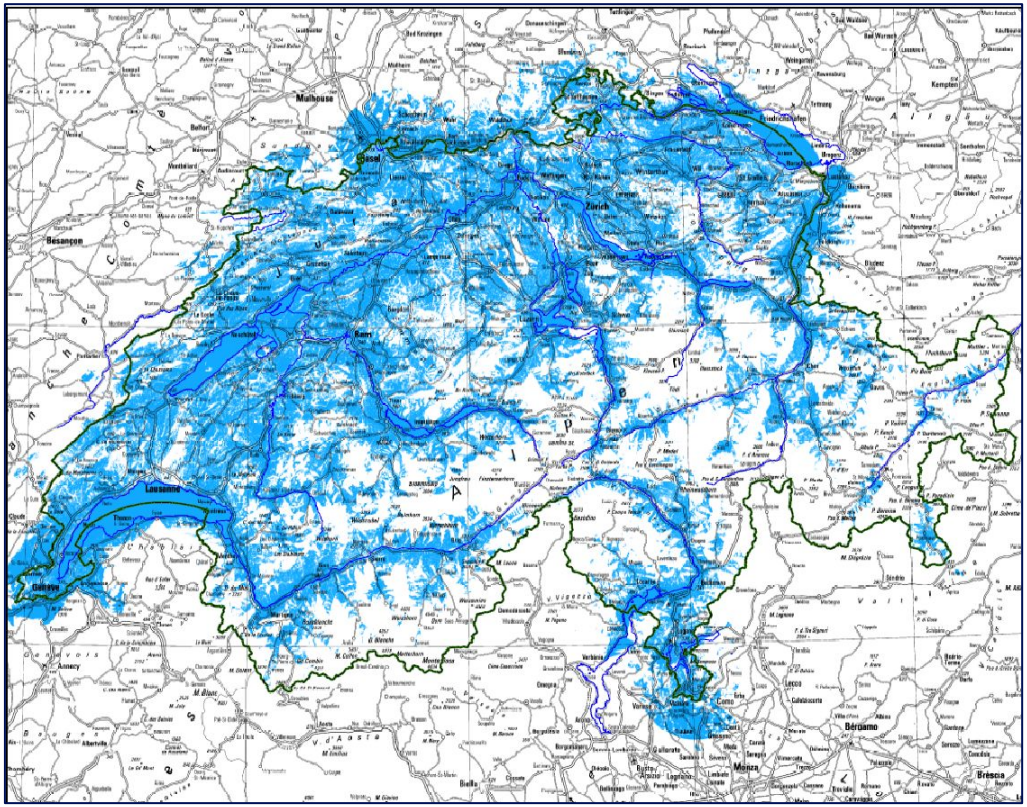
Light Indoor Coverage

in two Cities

Geneva and Zurich (40 Gateways)

Start Establishing nationwide Outdoor Coverage

approx. 180 Gateways



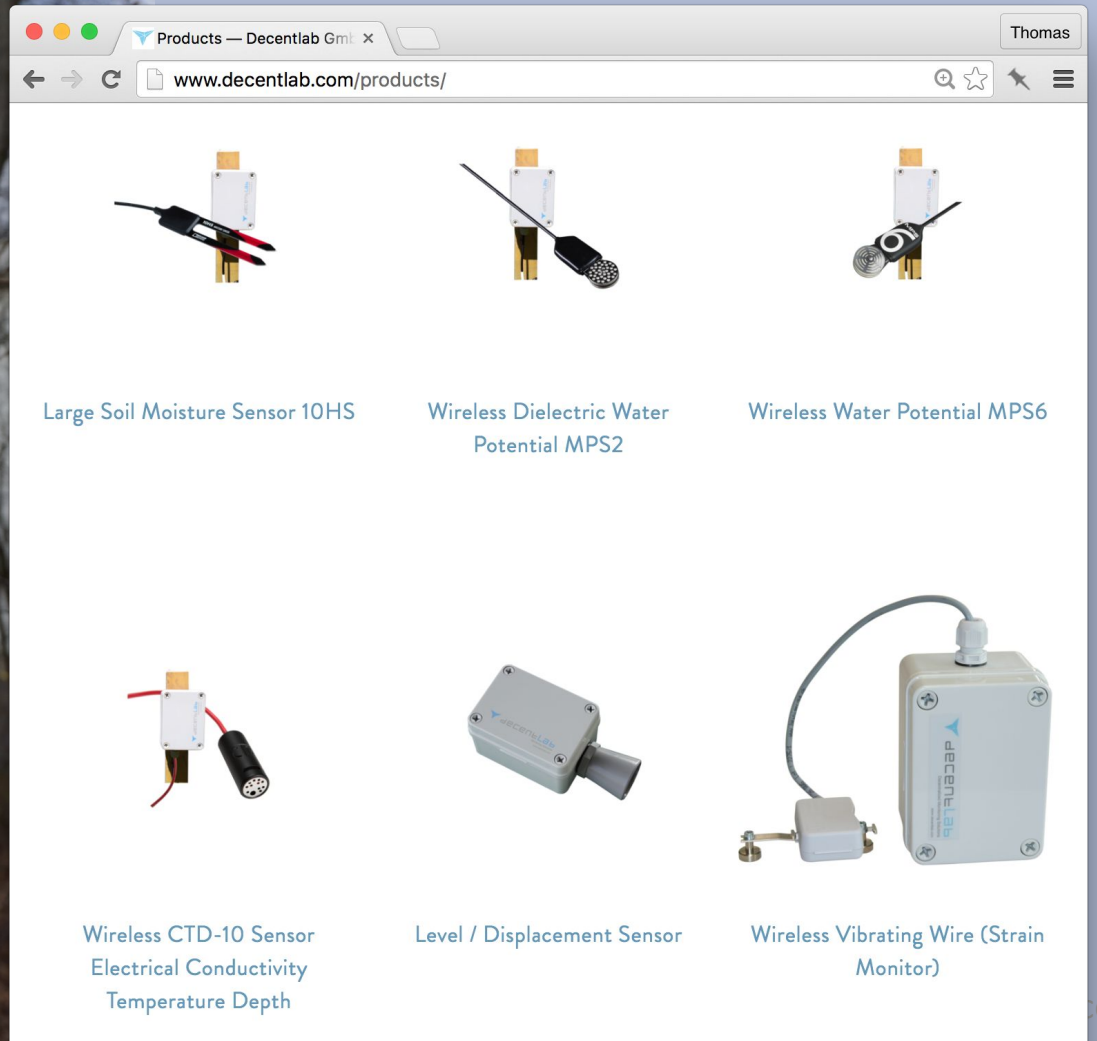
swisscom

LoRaWAN Use-Cases

Messen, zählen, triggern

Auch sehr seltene Ereignisse

decentlab.com


Products — Decentlab Gmb
Thomas
www.decentlab.com/products/
Large Soil Moisture Sensor 10HS
Wireless Dielectric Water Potential MPS2
Wireless Water Potential MPS6
Wireless CTD-10 Sensor Electrical Conductivity Temperature Depth
Level / Displacement Sensor
Wireless Vibrating Wire (Strain Monitor)

Decentlab Data Display - S

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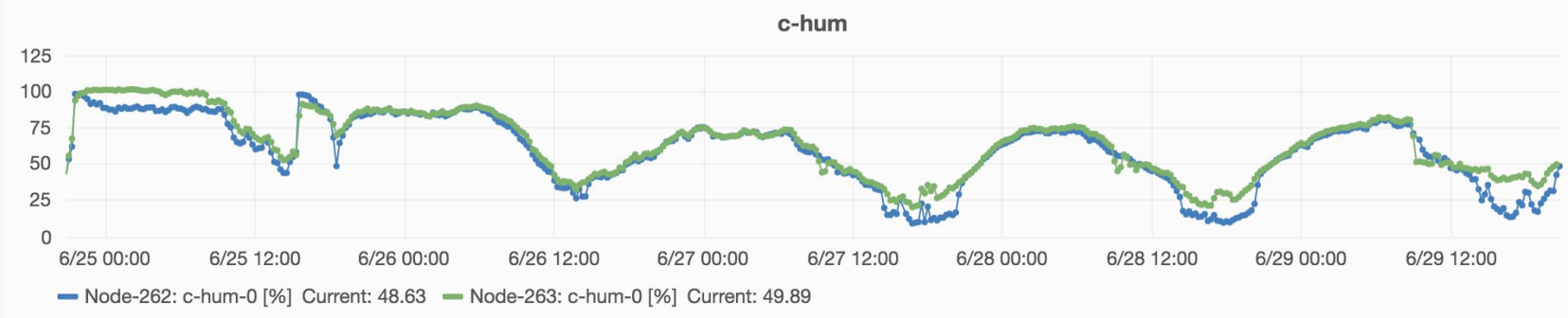
https://demo.decentlab.com/dashboard/db/swisscom-demo?org=3

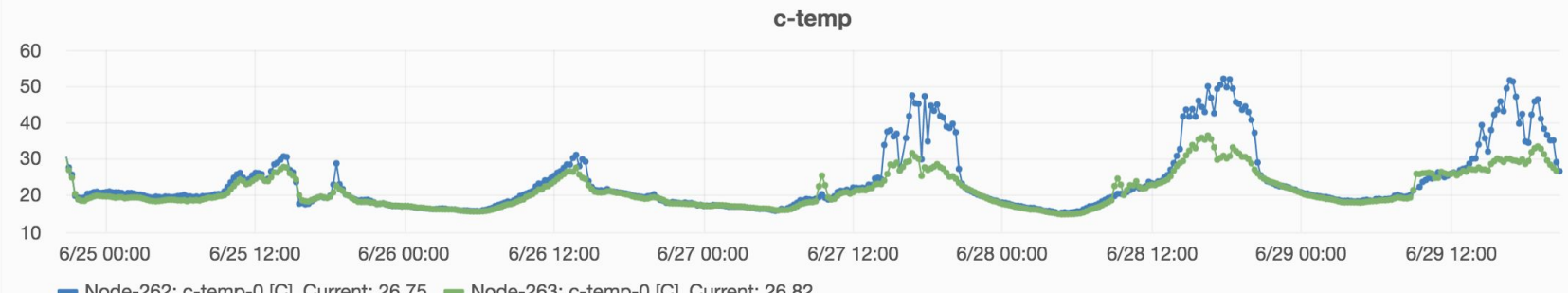
LoRa WAN Demo by

decentlab

LoRa Infrastructure provided by

swisscom





Grafana - LoRaWAN Demo

Thomas

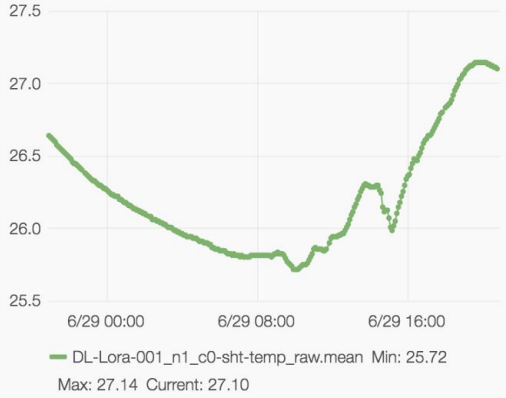
loriot.decentlab.com

LoRa WAN Demo
A collaborative project of

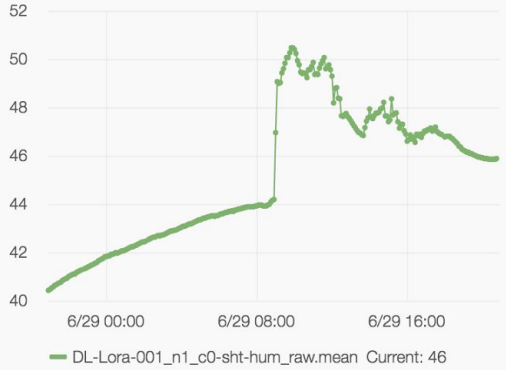
AIR TEMPERATURE & HUMIDITY (SHT21)

Actual Temperature [°C]

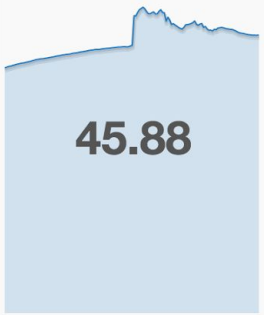
Temperature [°C]



Relative Humidity [%]



Actual Humidity [%]



Overview

Time	Temperature	Humidity	Battery
2016-06-29 20:50:00	-	-	3.01 V
2016-06-29 20:49:00	27.10	45.88	-
2016-06-29 20:44:00	27.11	45.85	-
2016-06-29 20:40:00	-	-	3.00 V
2016-06-29 20:39:00	27.11	45.85	-

https://map.flood.network

Thomas

https://map.flood.network

Flood Network

Live River Levels (Beta)

HOME

JOIN

Godstow Lock

Eynsham Lock

Minns Estate

New Botley

Wareham Stream

Cherwell

Folly Bridge (Thames)

Whitehouse Road Basement

Eastwyke (Hogacre)

Hogacre Basement

now

NOMINET

Oxford

Cherwell sensor

Water Level **0.77m**

At time: 01:50:00 01 Jul 2016

Source: Environment Agency

Could you become a flood watcher? x

Find out more

Sources

Flickr, Simon Li, CC BY-NC-SA

New Smart Parking by Libe

www.libelium.com/smart-parking-surface-sensor-lorawan-sigfox-lora-868-900-915-mhz/

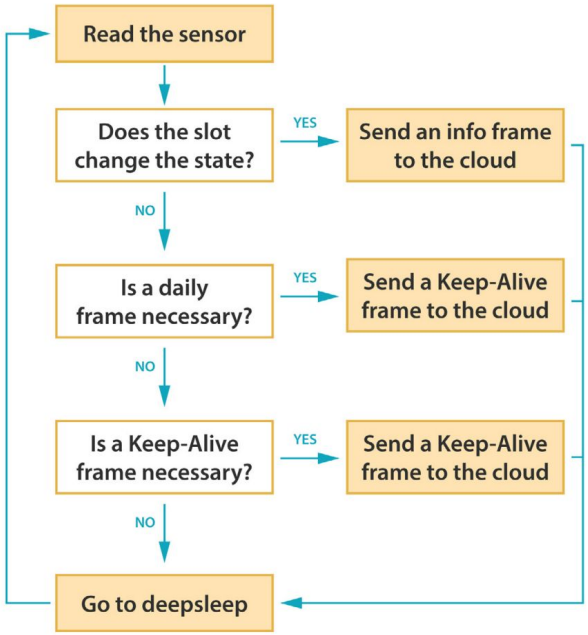
libelium

SIGFOX READY

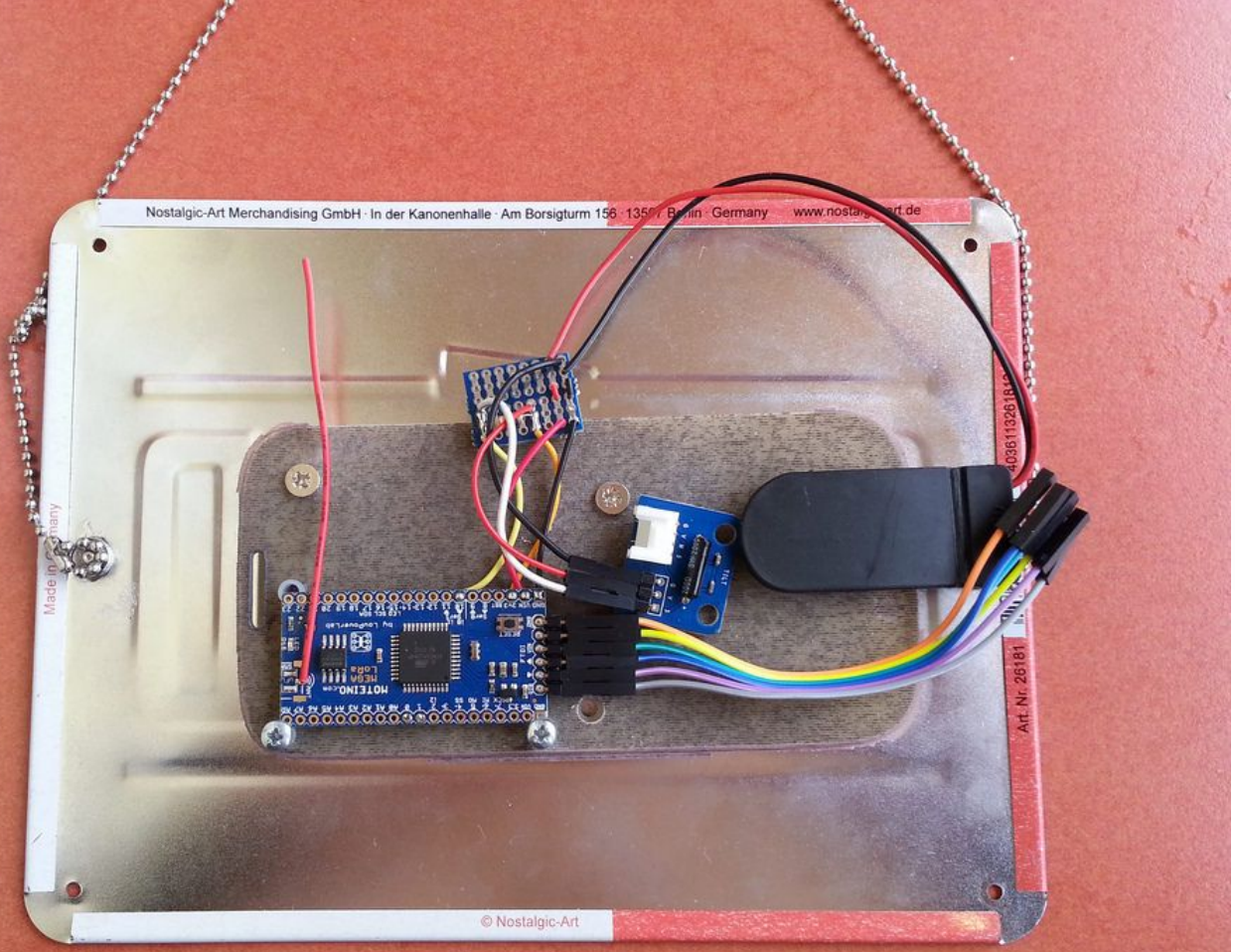
LoRa

plug_and_sense_smart_par

www.libelium.com/downloads/documenta...



Gonzalo Casas, Fotos: tamberg.org, CC BY-SA



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End-to-end Beispiel

Semtech SX1276 → ThingPark

ThingPark → IFTTT → Google Docs

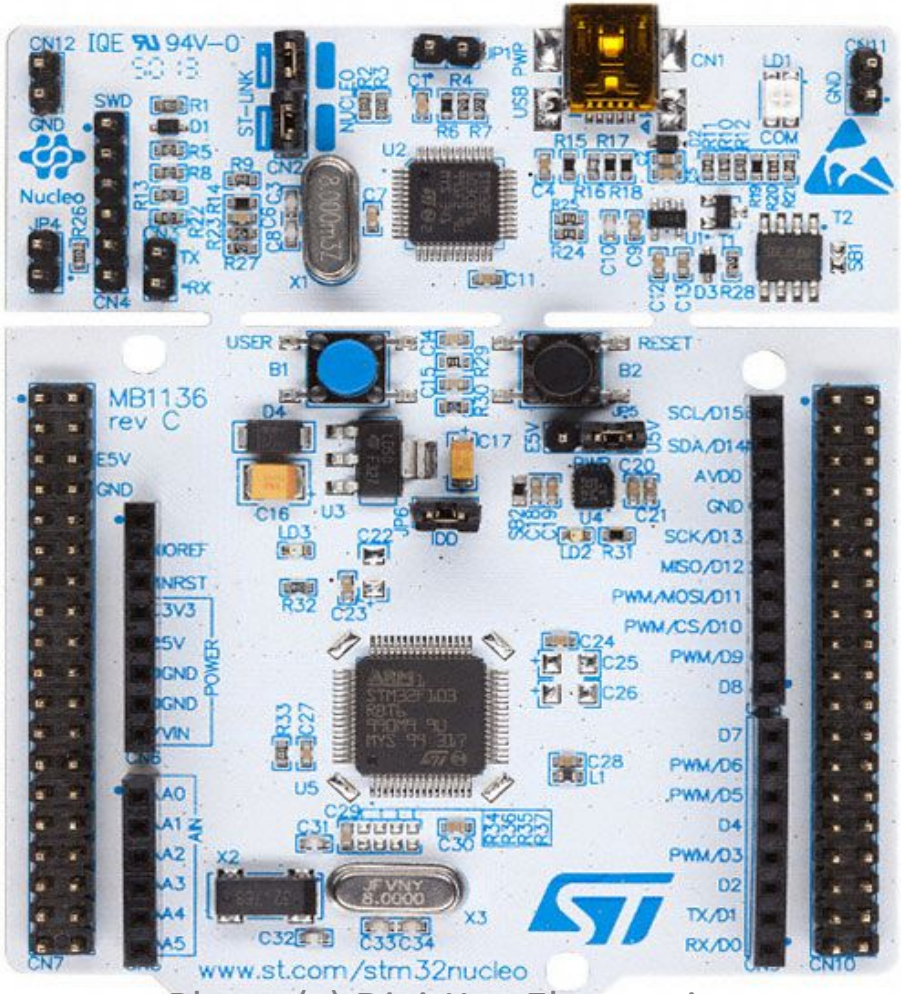
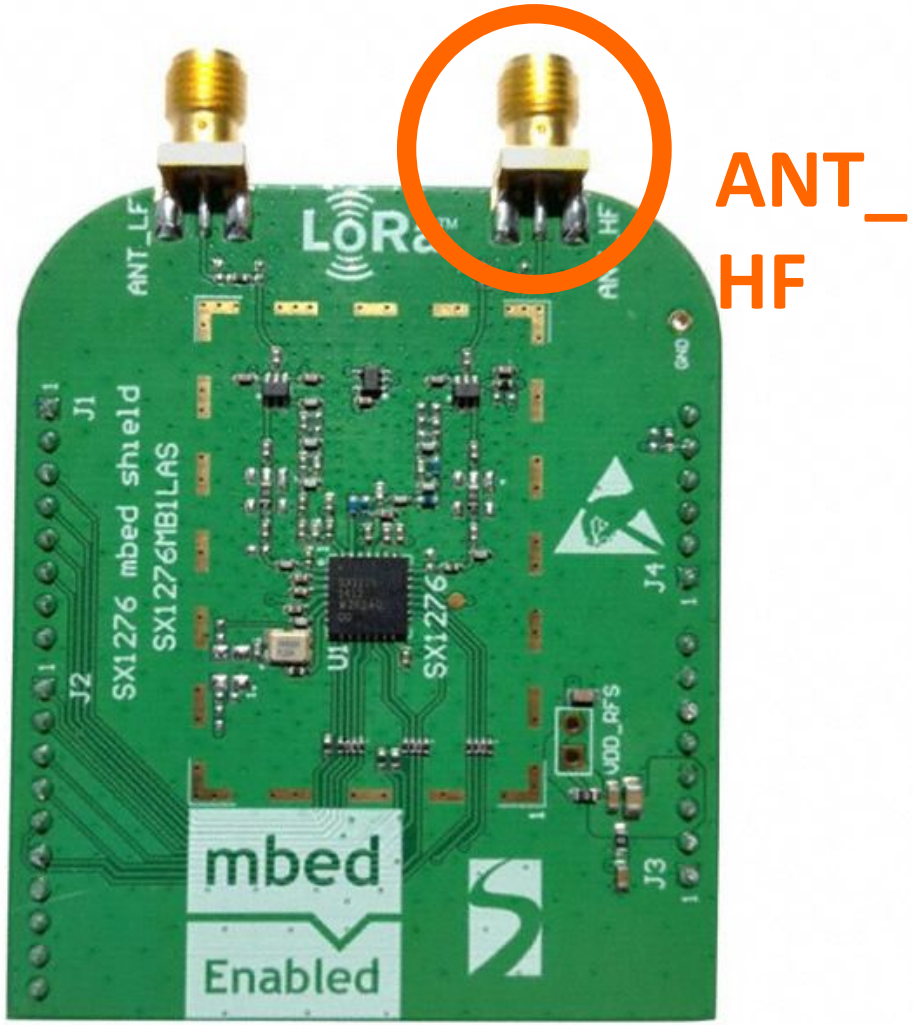


Photo (c) Digi-Key Electronics



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NUCLEO-L152RE | mbed

https://developer.mbed.org/platforms/ST-Nucleo-L152RE/

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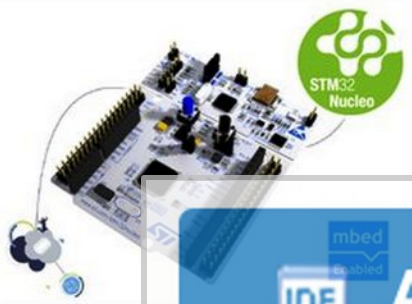
Platforms » NUCLEO-L152RE

NUCLEO-L152RE

Affordable and flexible platform to ease prototyping using a STM32L152RET6 microcontroller.



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life.augmented

ST

A world leader in providing the semiconductor solutions that make a positive contribution to people's lives now and in the future.

Add to your mbed Compiler

Overview

The STM32 Nucleo board provides an affordable and flexible way for users to try out new ideas and build prototypes with any STM32 microcontroller line, choosing

Table of Contents

1. Overview

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LoRaWAN-lmic-app - a me

https://developer.mbed.org/teams/Semtech/code/LoRaWAN-lmic-app/

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Semtech / LoRaWAN-lmic-app

LoRaWAN Class A node example based on IBM LoRa MAC in C (LMiC) implementation

Dependencies: LMiC SX1276Lib mbed

Home History Graph API Documentation Wiki Pull Requests

Files at revision 3:ce28e3313a88

Download repository: zip gz

/ default tip

Name	Size	Actions
[up]		
LMiC.lib	65	Revisions Annotate
SX1276Lib.lib	59	Revisions Annotate

Repository toolbox

Import this program

Export to desktop IDE

Build repository

Follow

Embed url:

<<program /teams/Semtech/

Clone repository to desktop:

hg clone https://tamberg@dev

Import this program

SX1276Lib - a mercurial re

https://developer.mbed.org/teams/Semtech/code/SX1276Lib/

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Semtech / SX1276Lib

Driver for the SX1276 RF Transceiver

Dependents: SX1276PingPong LoRa_PIR

Home History Graph API Documentation Wiki Pull Requests

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Download repository: zip gz

Files at revision 17:8add7ec2ee9c

/ default tip

Name	Size	Actions
[up]		
debug		
enums		

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mbed Compiler /HelloLoRa

https://developer.mbed.org/compiler/#nav:/HelloLoRaWAN/main.cpp;

mbed /HelloLoRaWAN/main.cpp

New Import Save Save All Compile Commit Revision Help NUCLEO-L152RE

Program Workspace

- My Programs
  - BLE_PhysicalWeb
  - BLE_UriBeacon
  - C027_HelloWorld
  - C027_SMSTest
  - HelloLoRaWAN
    - LMiC
    - SX1276Lib
    - debug.cpp
    - debug.h
    - hal.cpp
    - main.cpp
    - mbed
  - LoRaWAN-lmic-app

main.cpp

```
1 // License: Revised BSD License, see LICENSE.TXT, (c)2015 Semtech
2
3 #include "mbed.h"
4 #include "lmic.h"
5 #include "debug.h"
6
7 #define LORAWAN_NET_ID (uint32_t) 0x00000000
8 #define LORAWAN_DEV_ADDR (uint32_t) 0x00000006
9 #define LORAWAN_ADR_ON 1
10 #define LORAWAN_CONFIRMED_MSG_ON 1
11 #define LORAWAN_APP_PORT 15
12
13 static uint8_t NwkSKey[] = {
14     0x00, 0x, 0x, 0x, 0x, 0x, 0x, 0x,
15     0x, 0x, 0x, 0x, 0x, 0x, 0x, 0x
16 };
17
18 static uint8_t ArtSKey[] = {
19     0x00, 0x, 0x, 0x, 0x, 0x, 0x, 0x,
20     0x, 0x, 0x, 0x, 0x, 0x, 0x, 0x
21 };
22
23 osjob_t initjob;
24 osjob_t sendFrameJob;
25 u1_t n = 0;
26
27 void os_getArtEui (uint8_t *buf) {} // ignore
28 void os_getDevEui (uint8_t *buf) {} // ignore
29 void os_getDevKey (uint8_t *buf) {} // ignore
30
```


```
LORAWAN_DEV_ADDR (uint32_t) 0x0000 6
static uint8_t NwkSKey[] = {
0x00, 0x, 0x, 0x, 0x, 0x, 0x, 0x,
0x, 0x, 0x, 0x, 0x, 0x, 0x, 0x
};
static uint8_t ArtSKey[] = {
0x00, 0x, 0x, 0x, 0x, 0x, 0x, 0x,
0x, 0x, 0x, 0x, 0x, 0x, 0x, 0x
};
```

```
void onInit (osjob_t* j) {
    LMIC_reset();
    LMIC_setAdrMode(LORAWAN_ADR_ON);
    LMIC_setDrTxpow(DR_SF12, 14);
    LMIC_setSession(LORAWAN_NET_ID, LORAWAN_DEV_ADDR, NwkSKey, ArtSKey);
    onSendFrame(NULL);
}

void onSendFrame (osjob_t* j) {
    int frameLength = 32; // max 51?
    for (int i = 0; i < frameLength; i++) {
        LMIC.frame[i] = n++; // or any other payload
    }
    int result = LMIC_setTxData2(LORAWAN_APP_PORT, LMIC.frame,
        frameLength, LORAWAN_CONFIRMED_MSG_ON); // calls onEvent()
}

void onEvent (ev_t ev) { // called by lmic.cpp, see also oslmic.h
    debug_event(ev);
    if (ev == EV_TXCOMPLETE) {
        os_setCallback(&sendFrameJob, onSendFrame);
    }
}
```

Session initialisieren

LoRa Paket senden mit eigener Payload...

...nach TXCOMPLETE, neues Paket senden

mbed Compiler /HelloLoRa × | ThingPark® Wireless Logg ×

https://swisscom.thingpark.com/wlogger/

WIRELESS-LOGGER Last Update: 2015-09-27 19:21:09

Dashboard [[redacted] 4]

Device UID Filtering: Clear LRR Id Filtering: Clear LRC Id Filtering: Clear

From: To:

Decoder: raw Last: 50

Auto Reload: no Expand All: Refresh Export Map Logout

50 last packets

	UTC Timestamp	Local Timestamp	Device UID		Port	Counter UP	LRR RSSI	LRR SNR	Sp Fact	Sub Band	Channel	LRC Id		LRR Id
⊟	2015-09-22 20:51:37	2015-09-22 22:51:37	[redacted] 6		15	0	-108	4	12	G2	LC5	[redacted] 5		[redacted] 1
	Payload (hex) : 000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f													
	2015-09-22 20:51:37	2015-09-22 22:51:37	[redacted] 6		15	0	-114	-5.25	12	G2	LC5	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:50:51	2015-09-22 22:50:51	[redacted] 6		15	0	-118	-2.75	12	G1	LC1	[redacted] 5		[redacted] 0
⊞	2015-09-22 20:50:51	2015-09-22 22:50:51	[redacted] 6		15	0	-119	-17.5	12	G1	LC1	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:50:42	2015-09-22 22:50:42	[redacted] 6		15	0	-108	-5	12	G2	LC4	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:50:42	2015-09-22 22:50:42	[redacted] 6		15	0	-111	3.5	12	G2	LC4	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:50:14	2015-09-22 22:50:14	[redacted] 6		15	1	-119	-17.5	12	G1	LC1	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:50:14	2015-09-22 22:50:14	[redacted] 6		15	1	-105	6.5	12	G1	LC1	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:50:09	2015-09-22 22:50:09	[redacted] 6		15	0	-105	5.75	12	G2	LC4	[redacted] 5		[redacted] 1
⊞	2015-09-22 20:11:20	2015-09-22 22:11:20	[redacted] 6		15	5	-93	8.5	12	G1	LC3	[redacted] 5		[redacted] 1

Payload (hex) :
000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f

http_logger.js

```
1   var http = require('http');
2   var requestListener = function (req, res) {
3     var body = "";
4     req.on('data', function (chunk) {
5       body += chunk;
6     });
7     req.on('end', function () {
8       console.log(req.method + ' ' + req.url);
9       console.log(req.headers);
10      console.log(body);
11      res.writeHead(200);
12      res.end('200 OK');
13    });
14  }
15
16  var server = http.createServer(requestListener);
17  server.listen(8080);
```

HTTP Web-Request empfangen, Inhalt auf die Konsole schreiben

mbed Compiler /HelloLoRa × | Yaler GmbH - ThingPark W ×

swisscom.thingpark.com/deviceManager/

Yaler GmbH [Subscriber] | Thomas Amberg

ThingPark Wireless

- Devices
- Connectivity plans
- AS routing profiles
  - MyAS
- Settings

AS routing profile

Close

AS routing profile

Name: MyAS

ID: [redacted]8

Is default: ☐

Route

Source ports: *

Routing strategy: Sequentia

Destinations

Type	Destination
ThingPark Cloud	bigONG1
Third party AS (HTTP)	https://[redacted].yaler.net/
Third party AS (HTTP)	https://[redacted]-ifttt-fw.appspot.com/

Delete Up Down

Add a route

Add an additional route to this application routing rule

Status

Last modification: 9/16/2015, 5:59:41 PM

Updated by: Thomas Amberg

ThingPark Cloud bigONG1

Third party AS (HTTP) https://[redacted].yaler.net/

Third party AS (HTTP) https://[redacted]-ifttt-fw.appspot.com/

Yaler.net - access devices

https://yaler.net

Thomas

Yaler.net

Status | Docs & Help | Pricing & Sign up | **Log in**

Access devices from the Web

Yaler is a relay infrastructure for secure access to embedded systems

Get Started with Yaler

Trusted by makers, small business and enterprise customers

SIEMENS PHONAK decentlab ZAAK ZURICH

Why Yaler? (relay spelled backwards)

Connectivity as a service

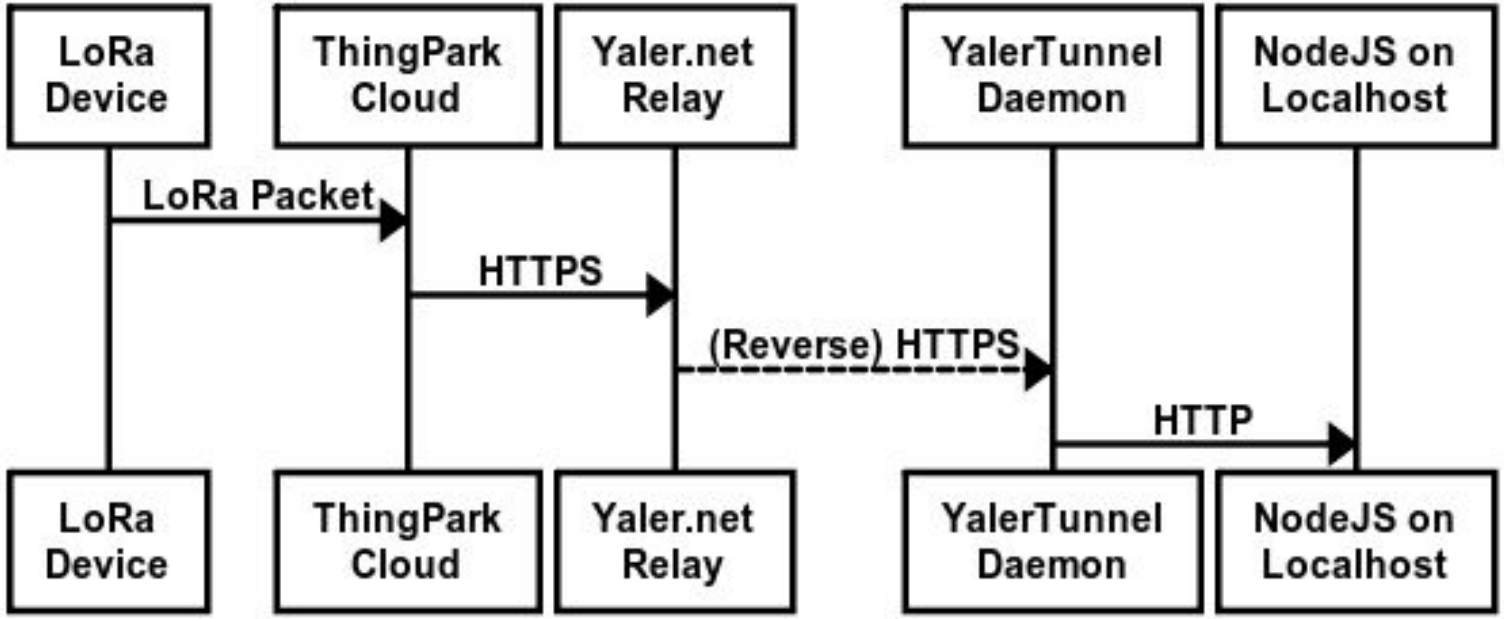
Get secure Web and SSH access to your embedded systems, no matter if they're located behind a firewall, a NAT or a mobile network router. Pay-per-use, with premium enterprise support.

How it works

YalerTunnel2 — yalertunnel — 80×24

node | yalertunnel

```
mac:YalerTunnel2 tamberg$ ./yalertunnel server 127.0.0.1:8080 ssl:try.yaler.net:
443
```



Web-Zugriff auf localhost via Yaler.net

Lora — node — 80×24

node | yalertunnel

```
mac:Lora tamberg$ node http_logger.js
POST /?LrnDevEui=[redacted]6&LrnFPort=15&LrnInfos=[redacted]

{ 'user-agent': 'ACTILITY-LRCLRN-DEVICE-AGENT/1.0',
  host: '[redacted].yaler.net',
  accept: '*/*',
  'content-type': 'application/xml',
  'content-length': '1019' }
<?xml version="1.0" encoding="UTF-8"?><DevEUI_uplink xmlns="http://uri.actility.
com/lora"><Time>2015-09-28T00:48:45.735+02:00</Time><DevEUI>[redacted]6</De
vEUI><FPort>15</FPort><FCntUp>0</FCntUp><ADRbit>1</ADRbit><FCntDn>40</FCntDn><pa
yload_hex>000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f</payl
oad_hex><mic_hex>6fd46349</mic_hex><Lrcid>[redacted]</Lrcid><LrrRSSI>-112.000000</
LrrRSSI><LrrSNR>1.500000</LrrSNR><SpFact>12</SpFact><SubBand>G1</SubBand><Channe
l>LC1</Channel><DevLrrCnt>4</DevLrrCnt><Lrrid>[redacted]</Lrrid><LrrLAT>47.385860<
/LrrLAT><LrrLON>8.567800</LrrLON><Lrrs><Lrr><Lrrid>[redacted]</Lrrid><LrrRSSI>-112
.000000</LrrRSSI><LrrSNR>1.500000</LrrSNR></Lrr><Lrr><Lrrid>[redacted]</Lrrid><Lrr
RSSI>-118.000000</LrrRSSI><LrrSNR>-0.250000</LrrSNR></Lrr><Lrr><Lrrid>[redacted]</
Lrrid><LrrRSSI>-113.000000</LrrRSSI><LrrSNR>-1.500000</LrrSNR></Lrr></Lrrs><Cust
omerID>[redacted]4</CustomerID><CustomerData>[redacted]
</CustomerData><ModelCfg>0</ModelCfg></DevEUI_uplink>
```

POST Request von ThingPark

http_logger.js | payload_logger.js

```
1   var http = require('http');
2   var requestListener = function (req, res) {
3     var body = "";
4     req.on('data', function (chunk) {
5       body += chunk;
6     });
7     req.on('end', function () {
8       var startTag = "<payload_hex>";
9       var i = body.indexOf(startTag, 0);
10      var j = body.indexOf("</payload_hex>", i);
11      var payload = body.substring(i + startTag.length, j);
12      console.log((new Date()).toISOString() + ' ' + payload);
13      res.writeHead(200);
14      res.end('200 OK');
15    });
16  }
17
18  var server = http.createServer(requestListener);
19  server.listen(8080);
```

Request empfangen, XML parsen, Payload auf die Konsole schreiben

Lora — node — 80×24

node | yalertunnel

```
mac:Lora tamberg$ node payload_logger.js
2015-09-28T00:04:17.760Z 000102030405060708090a0b0c0d0e0f101112131415161718191a1
b1c1d1e1f
2015-09-28T00:04:27.868Z 202122232425262728292a2b2c2d2e2f303132333435363738393a3
b3c3d3e3f
2015-09-28T00:08:22.076Z 404142434445464748494a4b4c4d4e4f505152535455565758595a5
b5c5d5e5f
```

LoRa Payload von ThingPark

mbed Compiler /HelloLoRa | ThingPark® Wireless Logg | Connect Maker to hundred

https://ifttt.com/maker

Maker Channel

All Channels

20 Personal Recipes 6 Published Recipes

The Maker Channel allows you to connect IFTTT to your personal DIY projects. With Maker, you can connect a Recipe to any device or service that can make or receive a web request (aka webhooks). See how others are using the Maker Channel, or share your own experience at **hackster.io**.

Connected as: tamberg

Your key is:

How to Trigger Events

Your key is: a

a

Reconnect Channel

Disconnect

http_logger.js | payload_logger.js | payload_forwarder.js

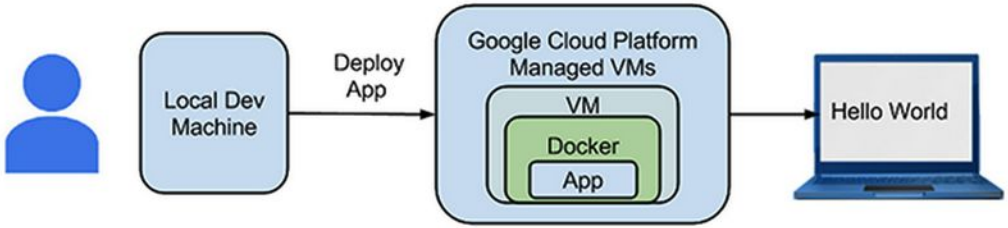
```
9     req.on('end', function () {
10      var startTag = "<payload_hex>";
11      var i = body.indexOf(startTag, 0);
12      var j = body.indexOf("</payload_hex>", i);
13      var payload = body.substring(i + startTag.length, j);
14      console.log((new Date()).toISOString() + ' ' + payload);
15      if (payload != "") {
16        var options = {
17          host: 'maker.ifttt.com',
18          path: '/trigger/lora_packet_sent/with/key/[redacted]',
19          method: 'POST',
20          headers: { 'Content-Type': 'application/json' }
21        };
22        var fwReq = https.request(options, null);
23        fwReq.write('{"value1":"' + payload + '"}');
24        fwReq.end();
25      }
26      res.writeHead(200);
27      res.end('200 OK');
28    });
29  }
30
31  var server = http.createServer(requestListener);
32  server.listen(8080);
```

ThingPark XML rein,
IFTTT JSON raus

BUILD YOUR FIRST APP
Hello World
Download and run the app
Hello World code review
Running Hello World on GCP
BOOKSHELF APP
Node.js Tutorial App
Using Structured Data
Using Cloud Storage
Authenticating Users

Running Hello World on Google Cloud Platform

The following diagram shows the process of deploying the app on Cloud Platform.



Managed VMs runs your application in containers that can automatically scale to handle your application's load. Behind the scenes, this utilizes both Google Compute Engine and Docker. To learn more, see the Managed VMs documentation.

Deploy the app to Google Cloud Platform

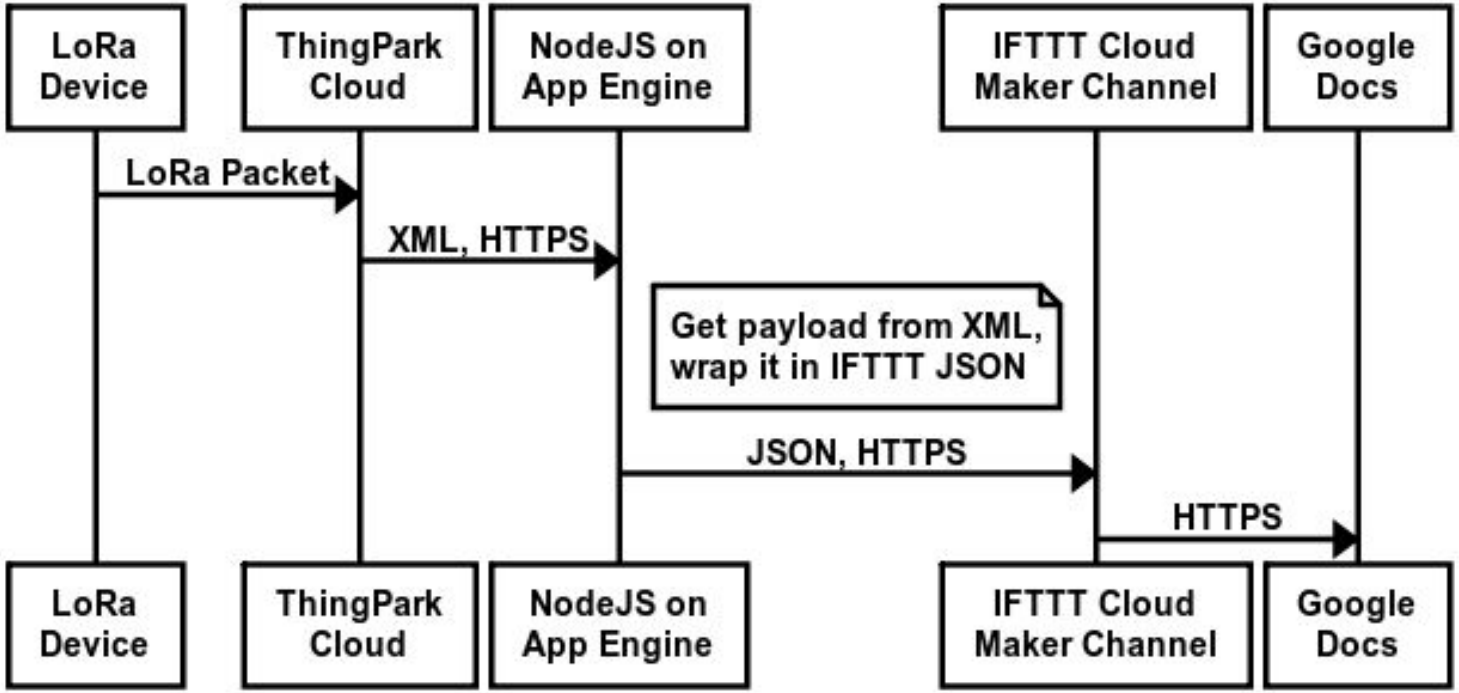
In your terminal window, enter the following command to deploy the sample:

```
$ gcloud preview app deploy app.yaml --set-default
```

Lora — bash — 80×24

bash

```
mac:Lora tamberg$ gcloud preview app deploy app.yaml --set-default
```



NodeJS Glue-Code auf App Engine

mbed Compiler /HelloLoRa × | ThingPark® Wireless Logg × | Recipe 28107179 - IFTTT ×

https://ifttt.com/myrecipes/personal/28107179

Search | My Recipes | Browse | Channels | tamberg

Recipe ID 28107179

Back to My Recipes

Maker Event
"lora_packet_sent"

Add row to spreadsheet in
@gmail.com's Google Drive

Turn off

Publish

Check now

Log

Delete

created September 16, 2015
last run about 1 hour ago
run 1,110 times

Recipe Title

On "lora_packet_sent", add a row to my spreadsheet

mbed Compiler /HelloLoRa | ThingPark® Wireless Logg | Recipe 28107179 - IFTTT | IFTTT_Maker_Events - Goo

https://docs.google.com/spreadsheets/d/1

IFTTT_Maker_Events

File Edit View Insert Format Data Tools Add-ons Help Last edit was 1 hour ago

@gmail.com Comments Share

$ % .0 .00 123 Courier New 10 More

fx September 16, 2015 at 04:51PM

	A	B	C	D
1075	September 28, 2015 at 12:02AM	lora_packet_sent	000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f	
1076	September 28, 2015 at 12:06AM	lora_packet_sent	202122232425262728292a2b2c2d2e2f303132333435363738393a3b3c3d3e3f	
1077	September 28, 2015 at 12:10AM	lora_packet_sent	404142434445464748494a4b4c4d4e4f505152535455565758595a5b5c5d5e5f	
1078	September 28, 2015 at 12:13AM	lora_packet_sent	606162636465666768696a6b6c6d6e6f707172737475767778797a7b7c7d7e7f	
1079	September 28, 2015 at 12:17AM	lora_packet_sent	808182838485868788898a8b8c8d8e8f909192939495969798999a9b9c9d9e9f	
1080	September 28, 2015 at 12:21AM	lora_packet_sent	a0a1a2a3a4a5a6a7a8a9aaabacadaeafb0b1b2b3b4b5b6b7b8b9babbbcbdbebf	
1081	September 28, 2015 at 12:25AM	lora_packet_sent	c0c1c2c3c4c5c6c7c8c9cacbcccdcecfd0d1d2d3d4d5d6d7d8d9dadbdcdddedf	
1082	September 28, 2015 at 12:36AM	lora_packet_sent	e0e1e2e3e4e5e6e7e8e9eaebecedeeeff0f1f2f3f4f5f6f7f8f9fafbfcfdfeff	
1083	September 28, 2015 at 12:38AM	lora_packet_sent	000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f	
1084	September 28, 2015 at 12:40AM	lora_packet_sent	202122232425262728292a2b2c2d2e2f303132333435363738393a3b3c3d3e3f	
1085				
1086				
1087				
1088				
1089				
1090				
1091				
1092				
1093				
1094				

lora_packet_sent 000102030405060708090a0b0c0d0e0f101112131415161718191a1b1c1d1e1f

Wo sich die Akteure treffen

Hackdays, Meetups, Labs

Make, Learn, Share

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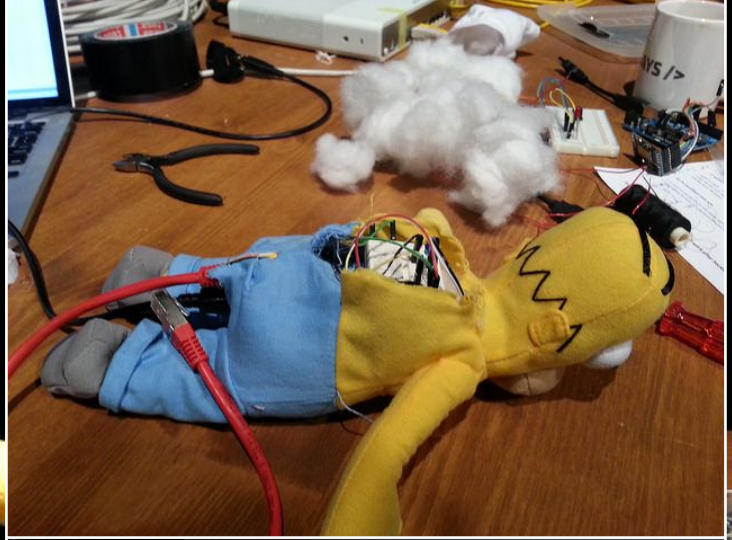
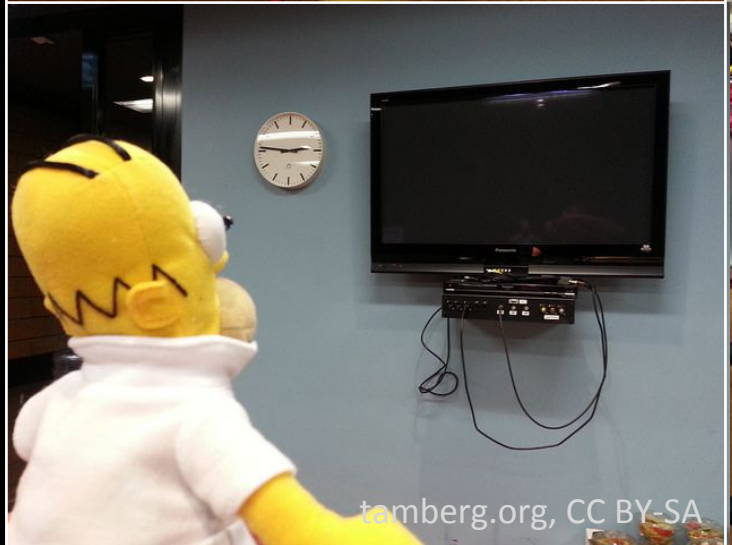
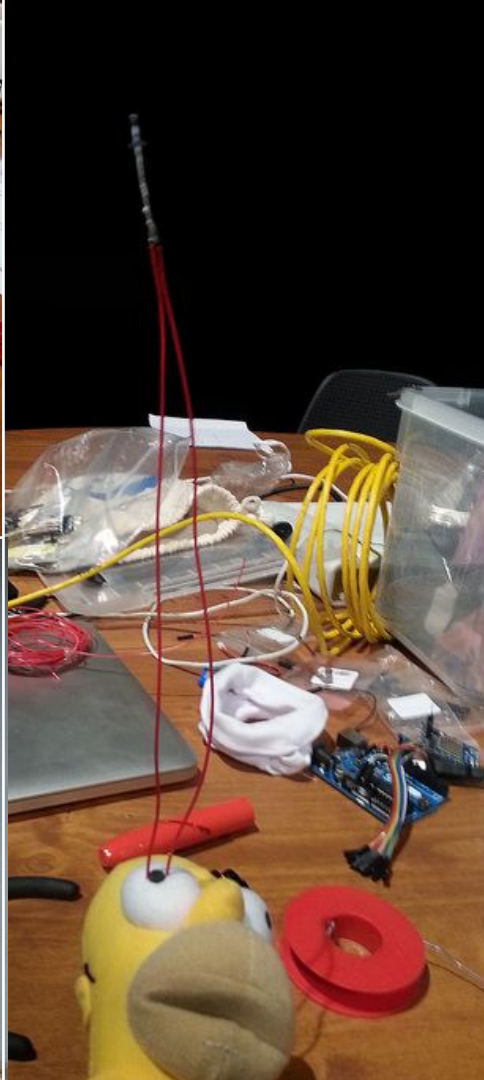
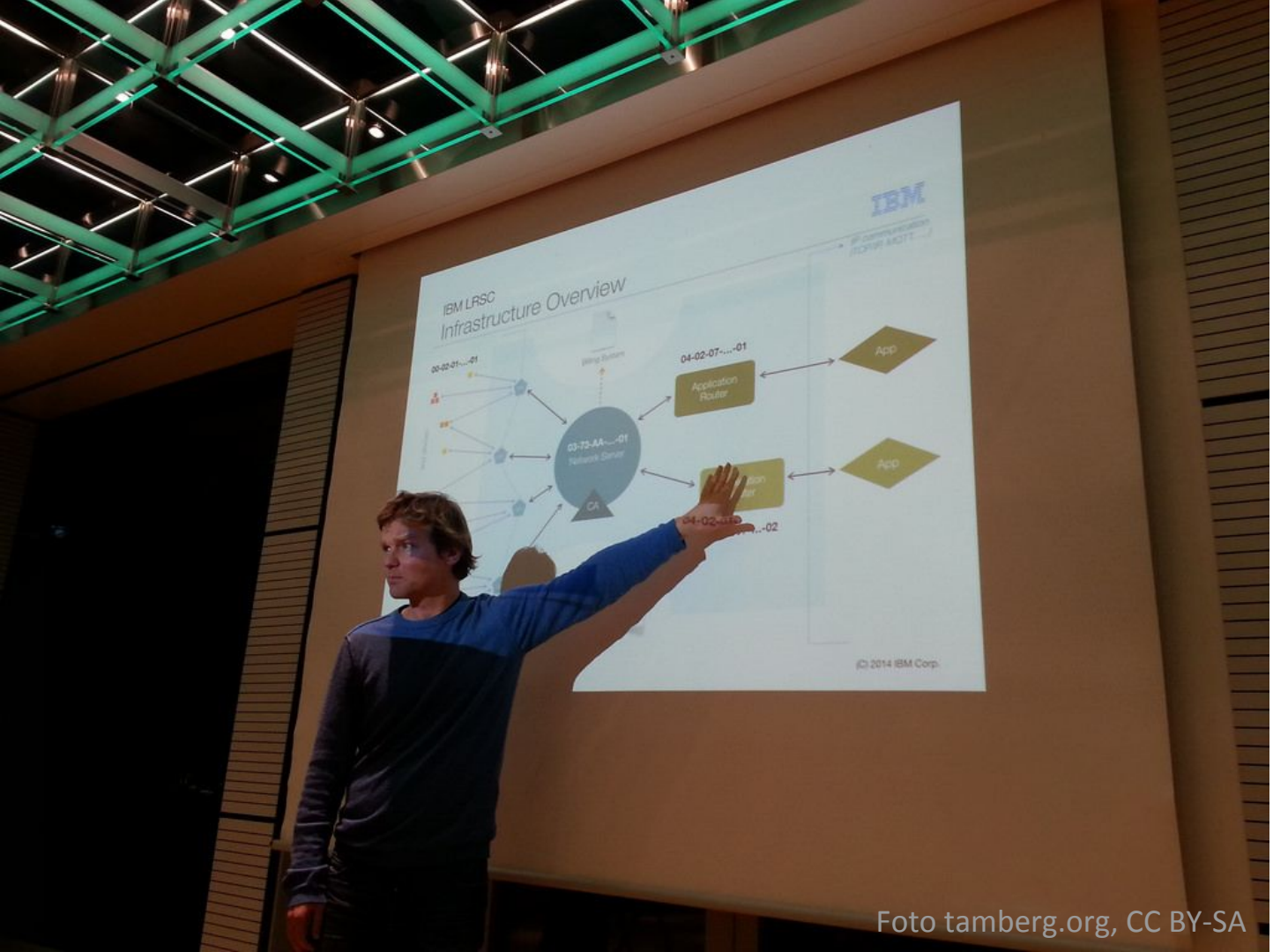






tomberg.org, CC BY-SA



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IOT/ZH

1100 Members

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Schweizerische Gesellschaft für Mechatronische Kunst

SGMK

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Laser-cut DIY Bio Lab Equipment

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makerfairerome.eu, Antonio Marcello, Shoot4Change

Mini Maker Faire
17.-18. Sept. 2016
ZÜRICH

makerfairezurich.ch

Danke.

thomas.amberg@yaler.net
twitter.com/tamberg

Slides: www.tamberg.org