



Bottom-up LoRaWAN IoT Infrastruktur

Thomas Amberg

Beginn um **17:30** Uhr im Raum **Barockzimmer**, Dauer: **30min**

TheThingsNetwork ist ein Open Source Projekt, das günstige, weiträumige Connectivity für IoT Anwendungen ermöglicht. Basierend auf LoRaWAN, einem Langstrecken-Datenfunk, können ganze Städte mit wenigen Gateways abgedeckt werden. Gestartet in Amsterdam, hat sich die Initiative in weniger als zwei Jahren global verbreitet. Zürich ist eine der weltweit aktivsten Communities. Der Vortrag gibt eine einfach verständliche technische Einführung in LoRa, versucht die Mechanismen hinter der wachsenden Community zu ergründen, und beleuchtet das entstehende Ökosystem.



Tweets	Following	Followers	Likes
1,541	2,974	1,760	14.8K

Follow

Thomas Amberg

@tamberg

Software engineer trying to work on stuff that matters. Founder @yaler. Organizer @iotzh, @makerfairezh. Embracing the future. Becoming a Maker.

📍 Zürich

🔗 tamberg.org

📅 Joined December 2006

Tweets Tweets & replies Media



Thomas Amberg @tamberg · 21h

Super excited to host @iotwatch of @iotlondon presenting @iot__mark at @iotzh meetup.com/IoT-Zurich/eve... March 19th in Zürich





Create a Meetup



IoT Zurich

Location
Zürich, Switzerland

Members
1,896

Organizers
Thomas Amberg and 1 other

Next Meetup

See all

19
MAR

Monday, March 19, 2018, 6:30 PM

Open #iotmark for connected products

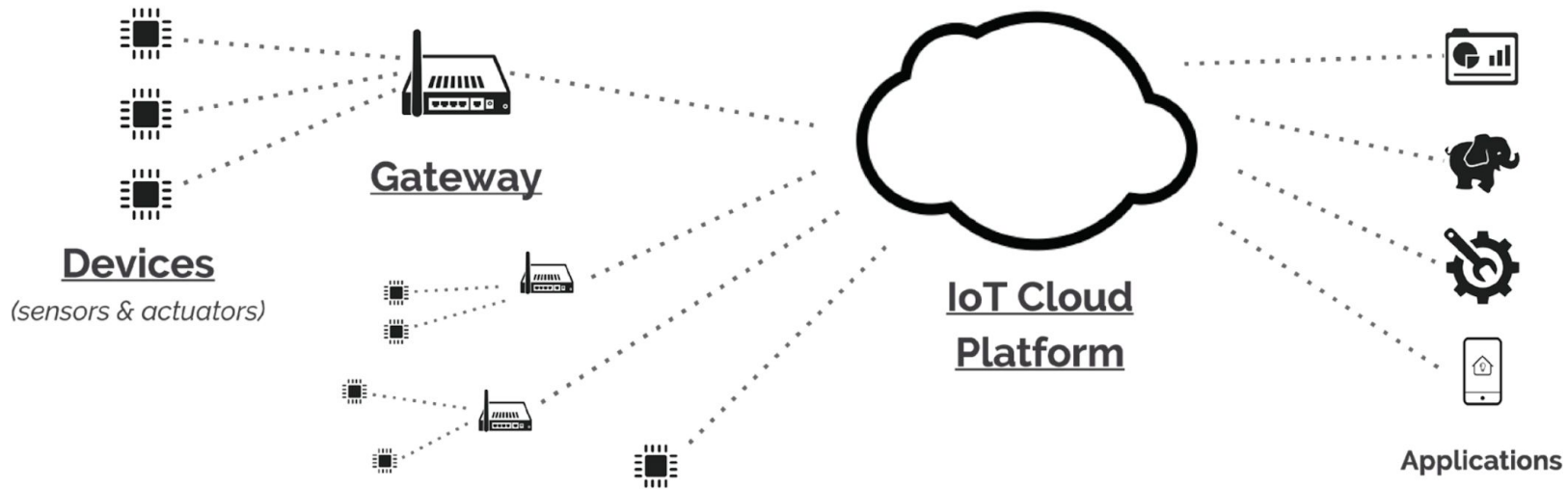
Organizer tools ▼

Internet of Things (IoT)



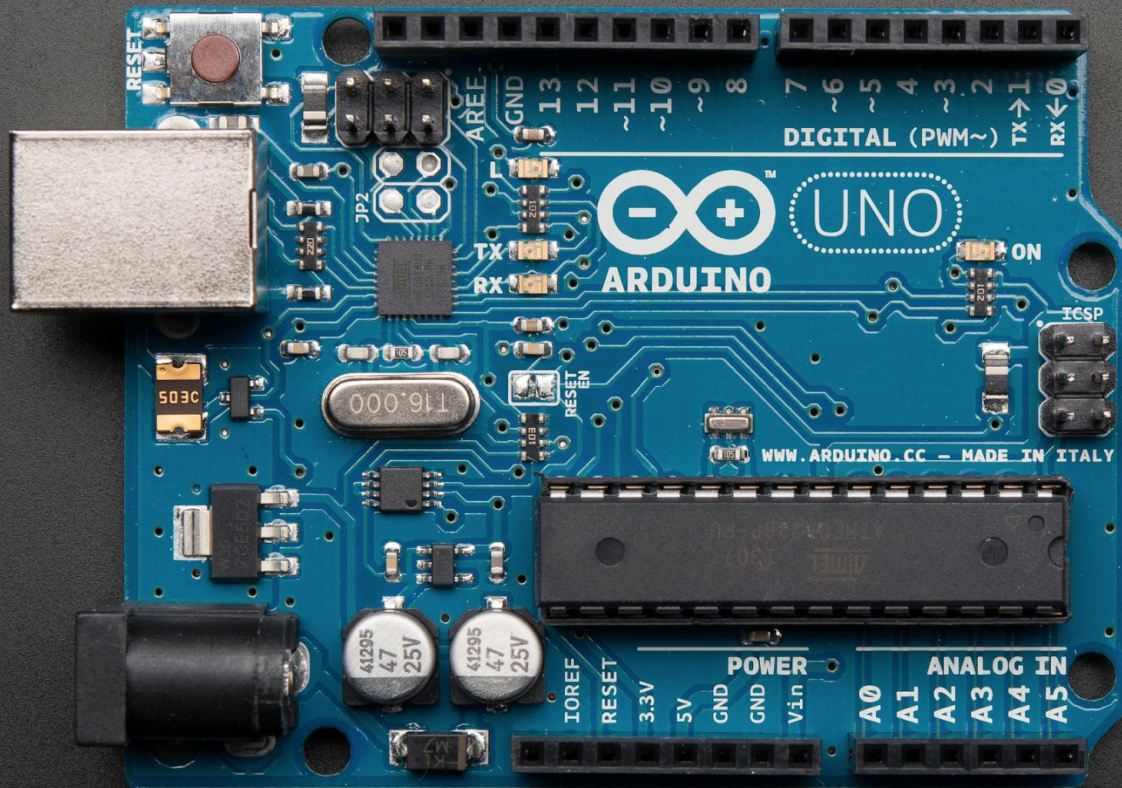
Internet-verbundene Computer
mit Sensoren und Aktuatoren

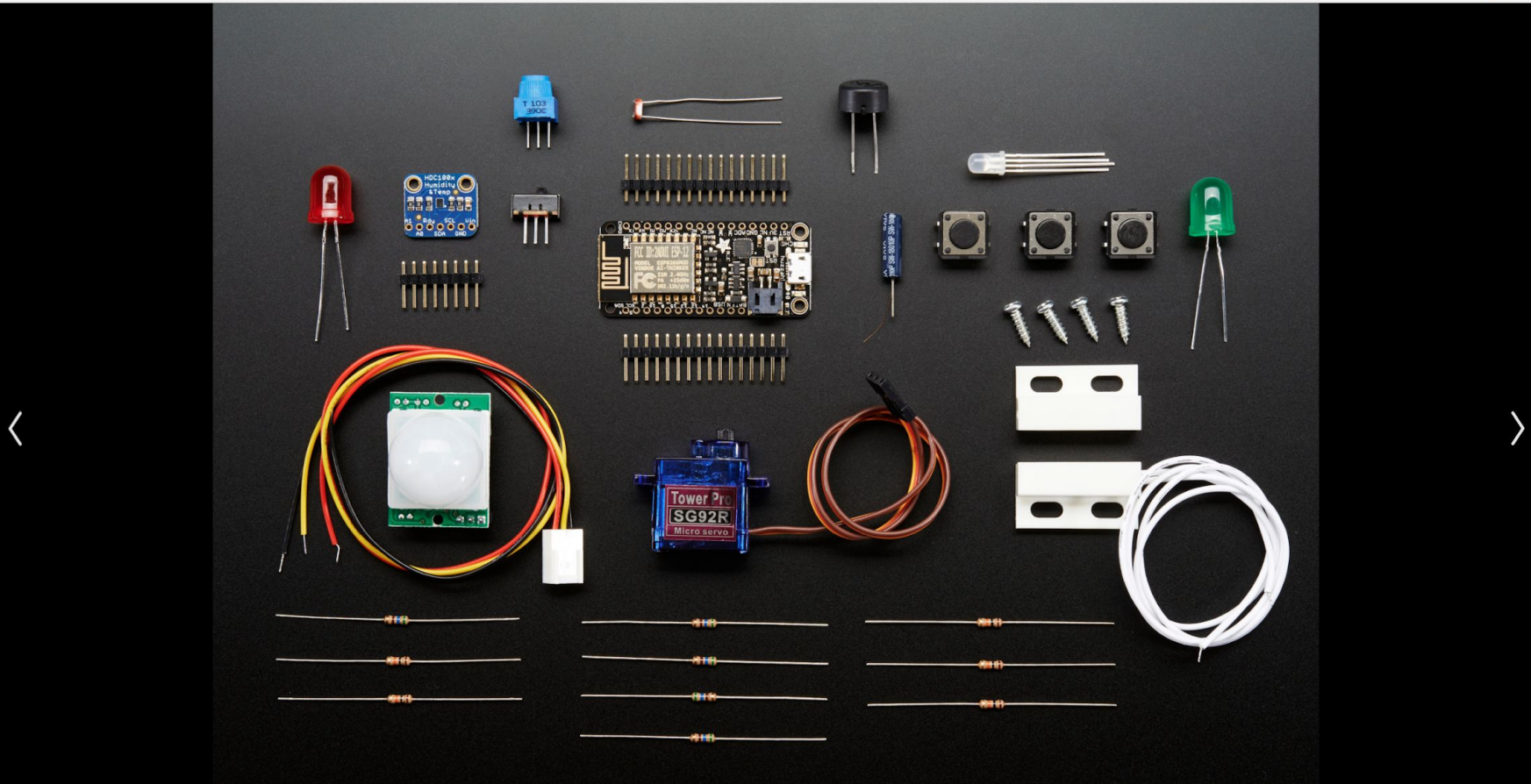
"Physische Objekte mit Web API"

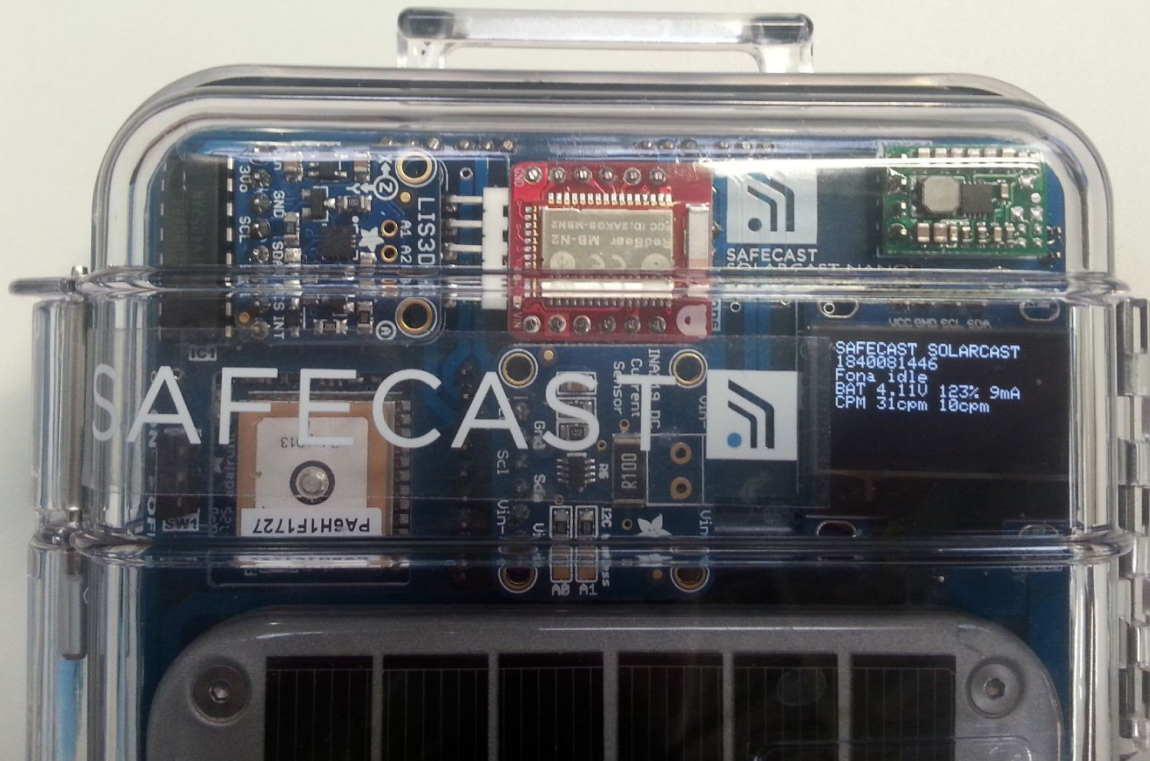


Wie beginnt man mit IoT?

Prototyping

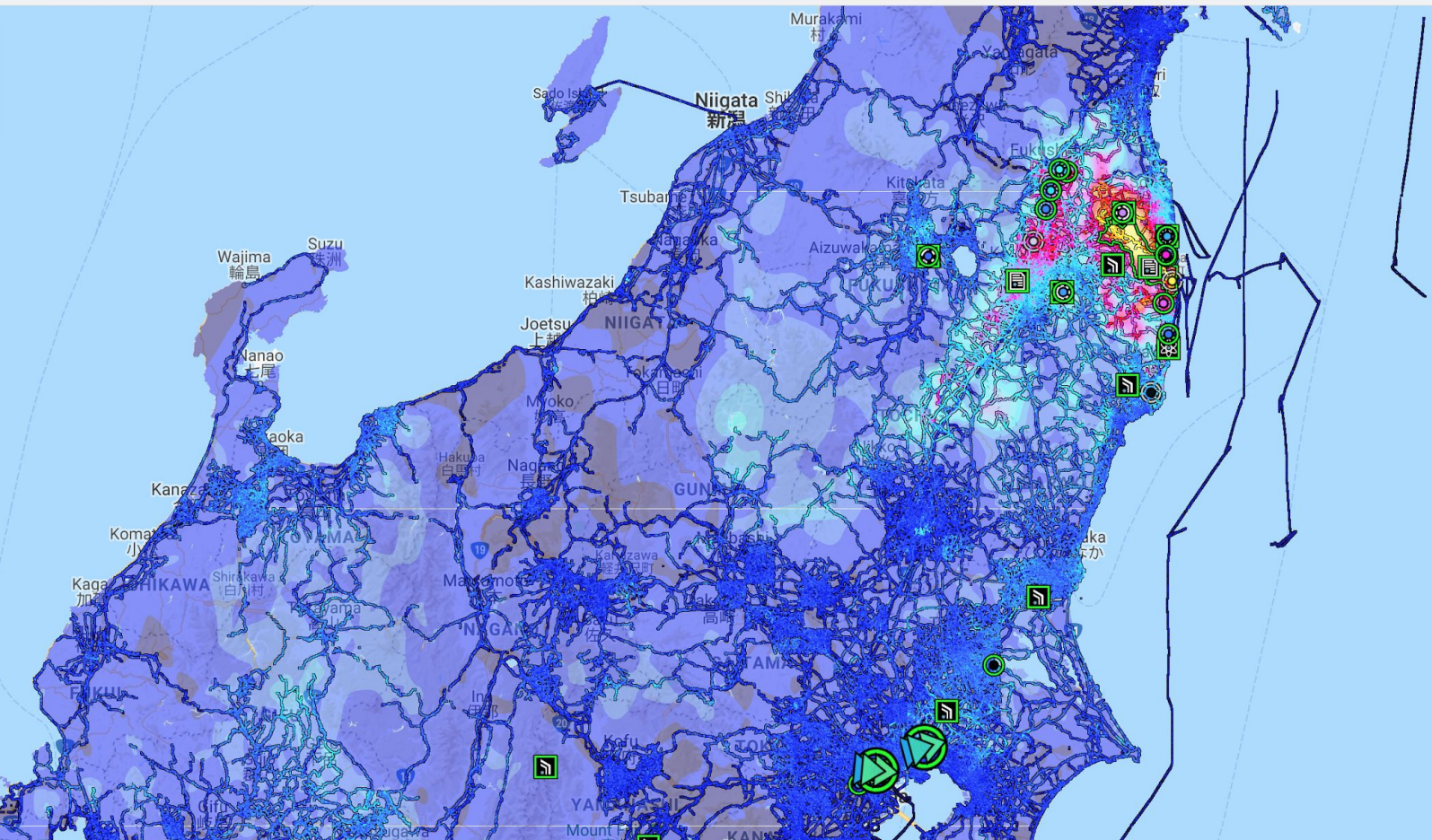
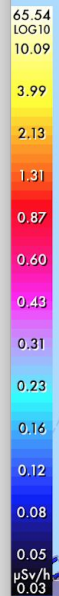






Was können Sensordaten bewirken?

Citizen Sensing





OPEN ENVIRONMENTAL DATA FOR EVERYONE

Safecast is a global volunteer-centered citizen science project working to empower people with data about their environments. We believe that having more freely available open data is better for everyone. Everything we do is aimed at putting data and data collection know-how in the hands of people



Love Hz

HOME / PRODUCTS / CASE STUDIES / BLOG / CONTACT



Citizens, Building a Smart City

Flood Network

LIVE RIVER LEVELS (BETA)

HOME

JOIN

NOMINET



Godstow Lock



Eynsham Lock



Minns Estate



New Botley



Cherwell



Osney Lock



Folly Bridge (Thames)



Eastwyke (Hogacre)



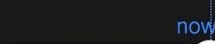
Coldharbour



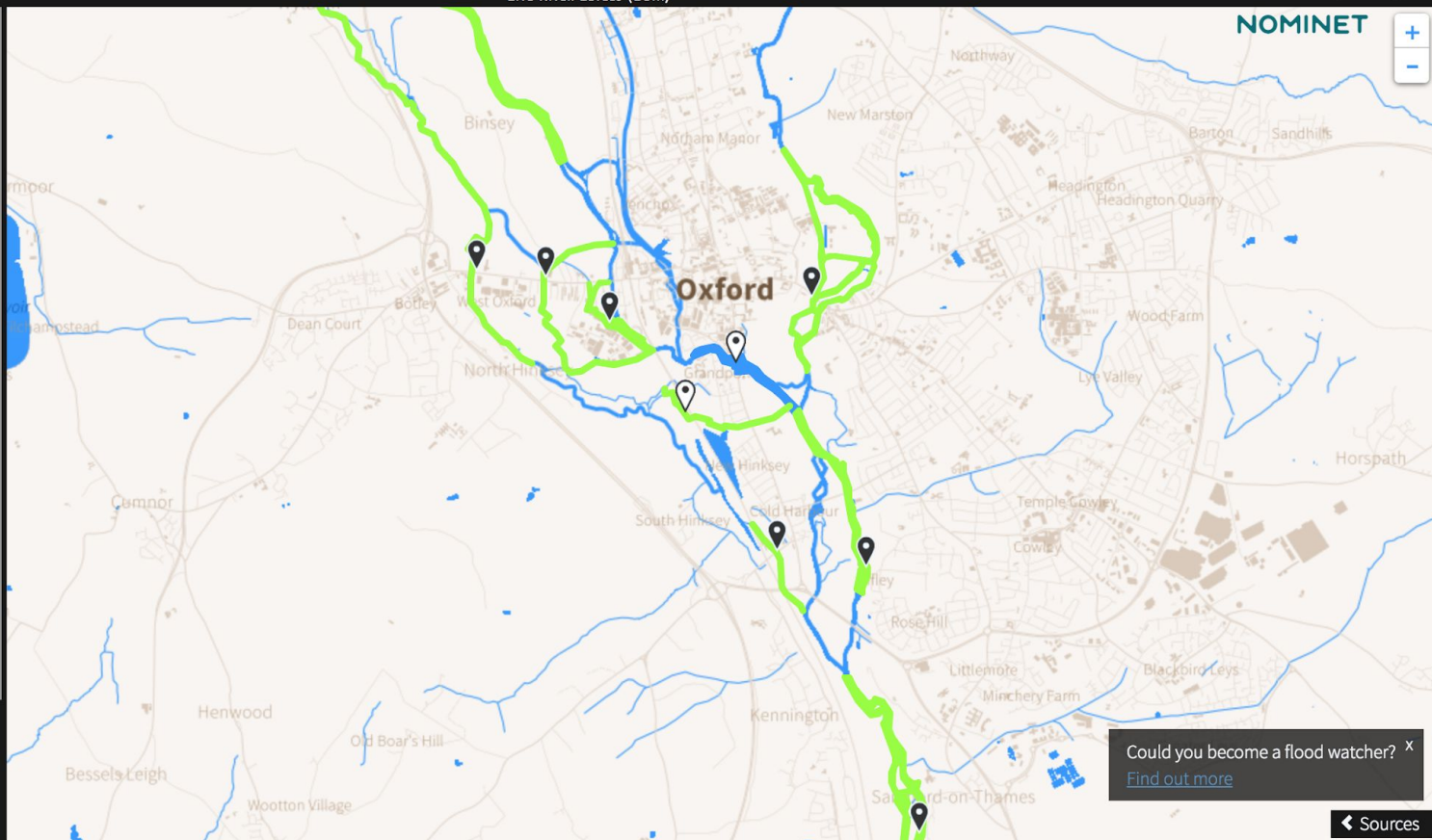
Iffley Lock



Sandford Lock



now



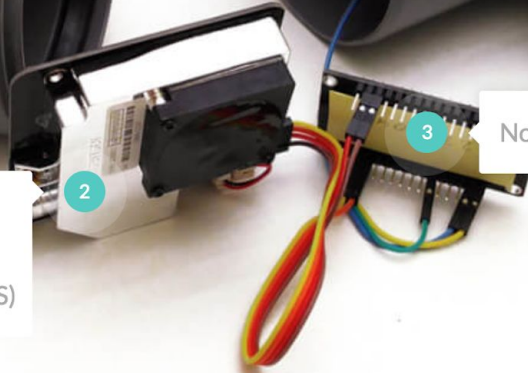
Could you become a flood watcher? [Find out more](#)

Sources

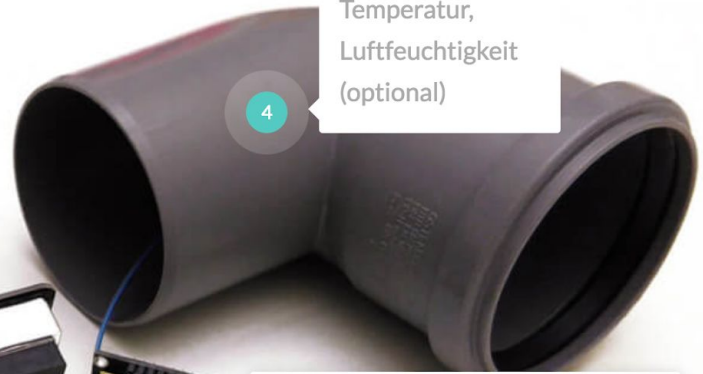
Marley Silent HT Bogen:
Wetterschutz



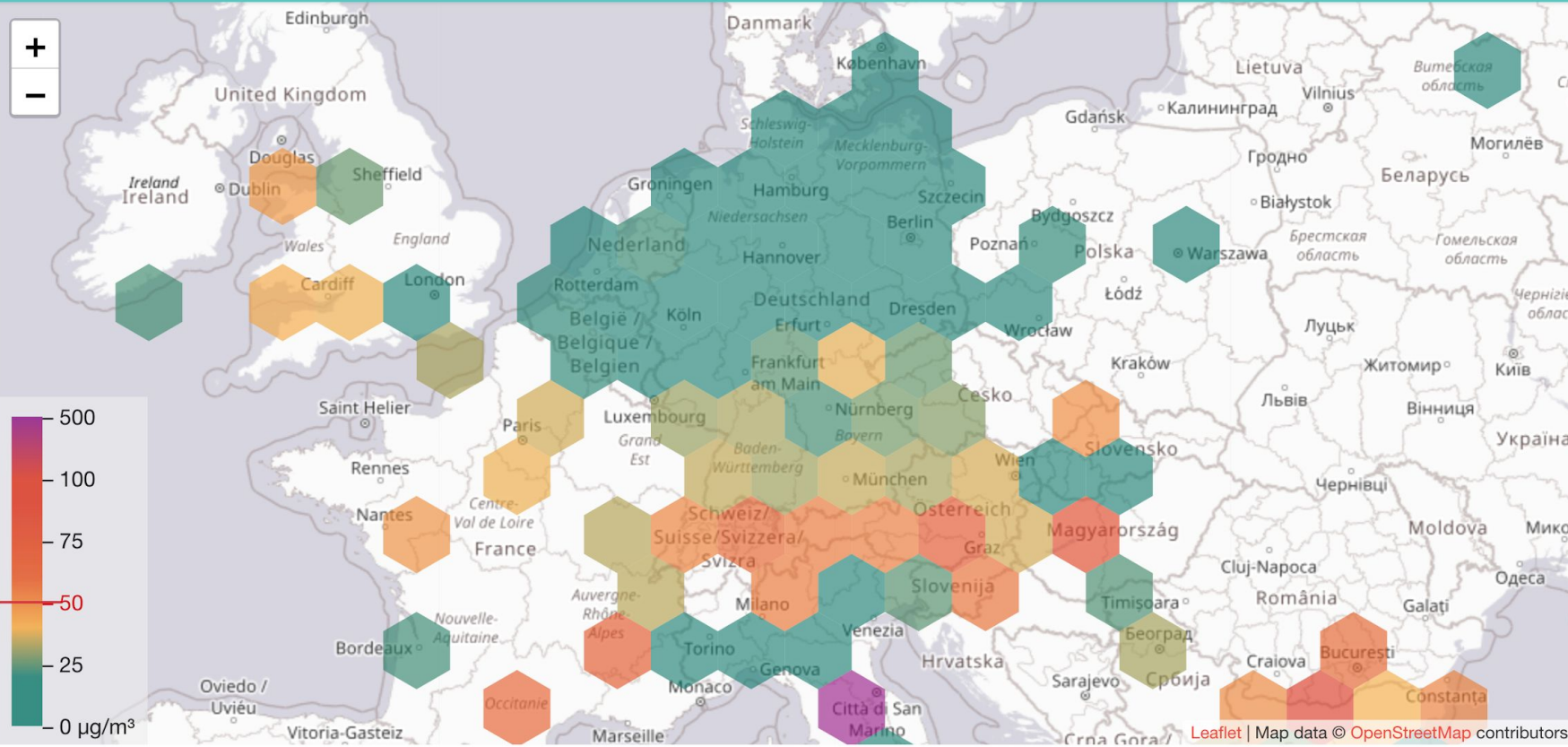
2
SDS011:
Feinstaubsensor
(früher PPD42NS)



3
NodeMCU ESP8266: CPU/WLAN

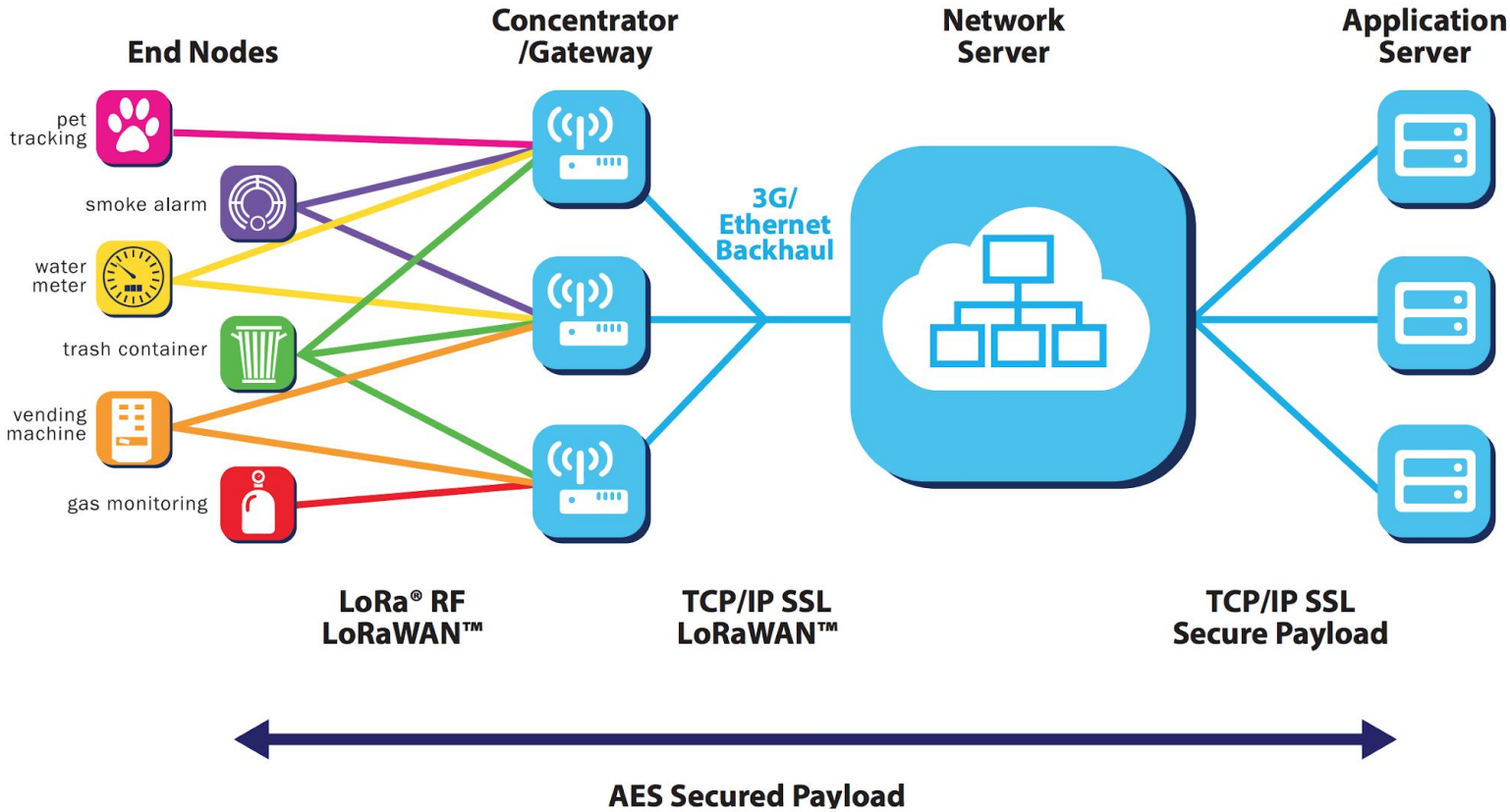


4
DHT22/AM2302:
Temperatur,
Luftfeuchtigkeit
(optional)



Wie kommen Sensordaten ins Internet?

LoRaWAN Connectivity



LoRa™

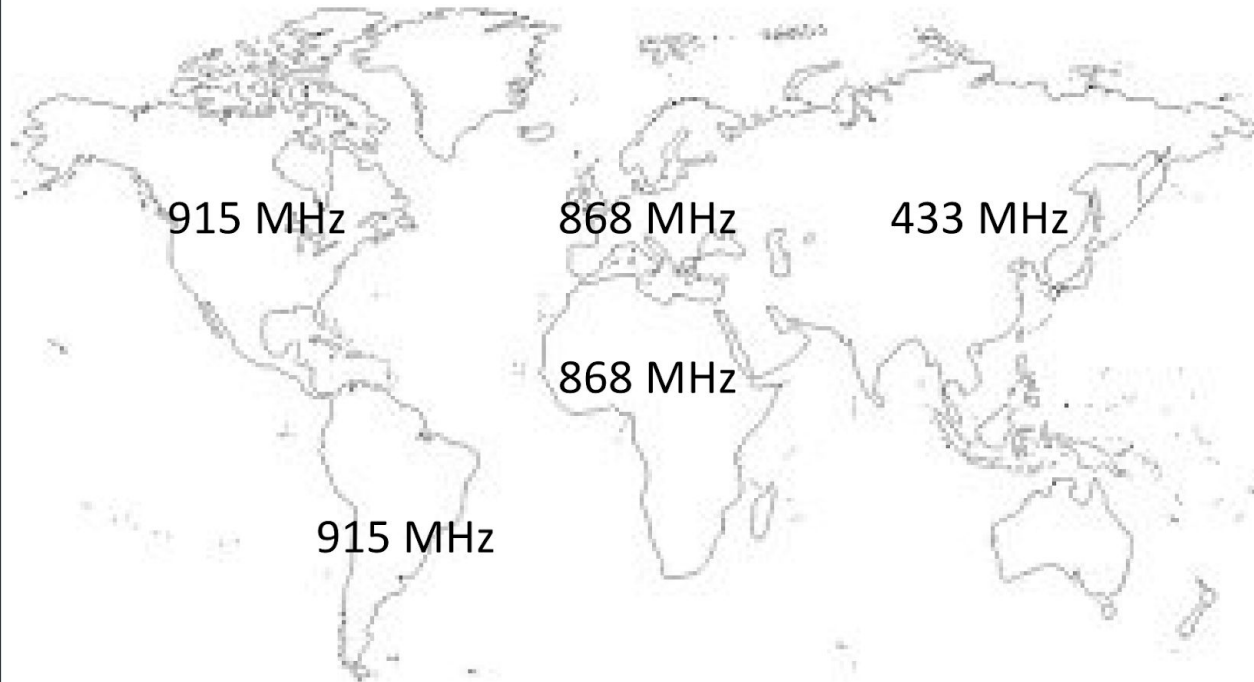
- EASY TO INSTALL
- EXTREMELY ECONOMICAL
- FLEXIBLE TO ADAPT
- SCALABLE
- BI-DIRECTIONAL

SECURE & ENCRYPTED

LoRa Alliance Introduction



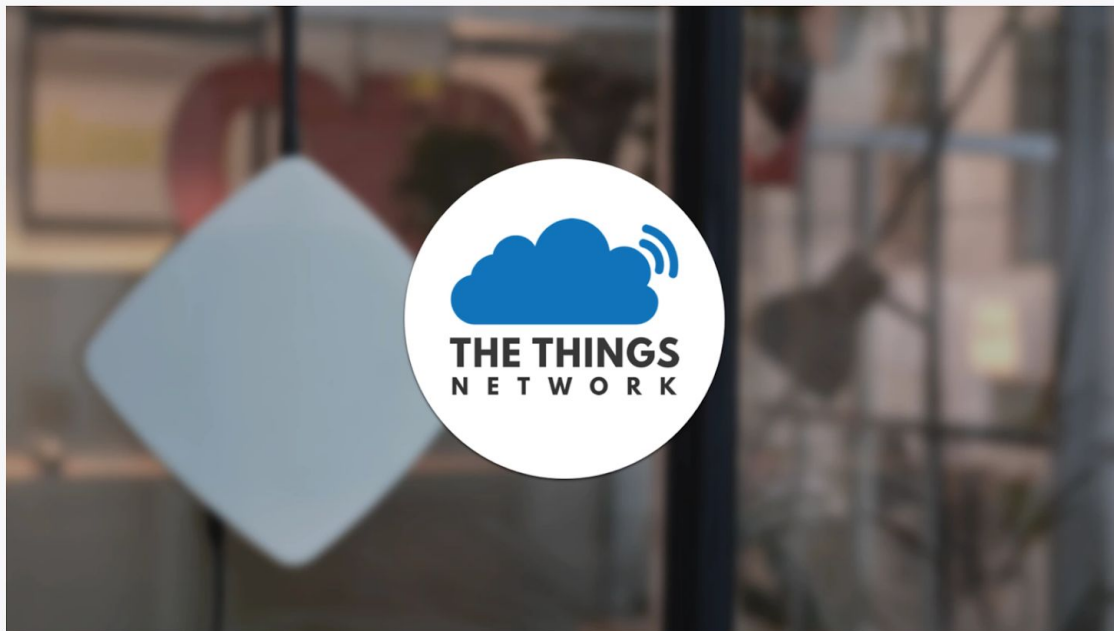
LoRa Spektrum



Let's build this thing together

The Things Network

The Things Network



The Things Network is a global, crowdsourced, open, free and decentralized internet of things network.

Created by

Wienke Giezeman

934 backers pledged €295,331 to help bring this project to life.

Campaign

FAQ ⁵

Updates ³⁵

Comments ²⁵⁰

Community

Share this project

Save



The Things Network

€295,331

Amsterdam, Netherlands Hardware

pledged of €150,000 goal

Pledge €5 or more

Show your support and keep in the loop with all updates!

ESTIMATED DELIVERY

Jul 2016

117 backers

Pledge €40 or more

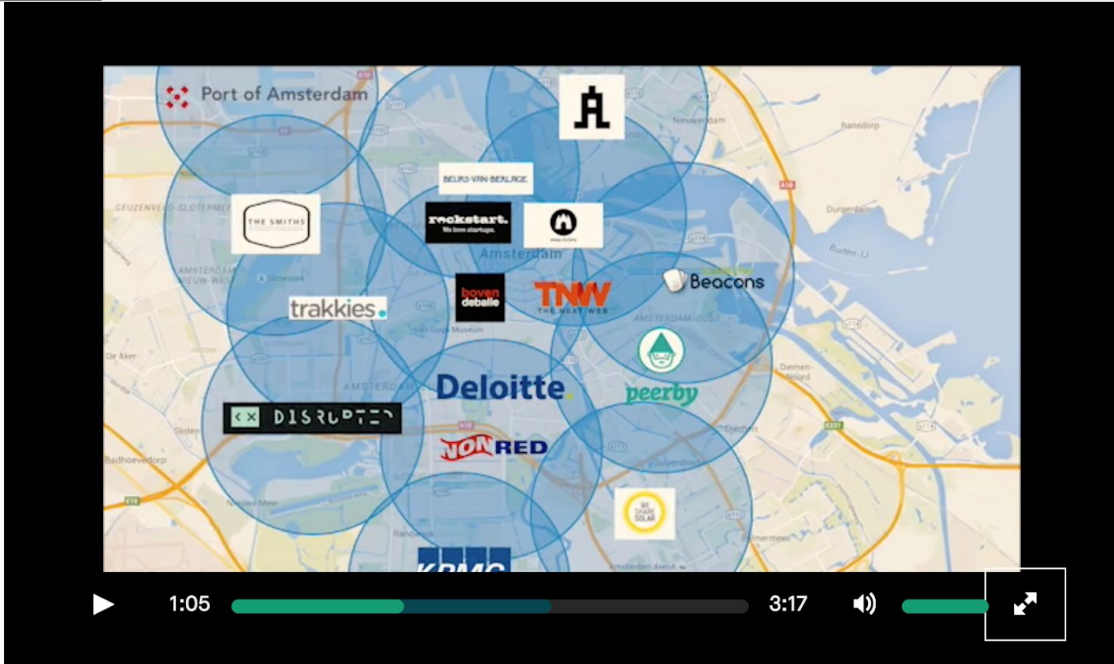
The Things UNO -
The perfect way to start developing your own hardware that will work with the Things Network. 100% Arduino compatible.

ESTIMATED DELIVERY

Jul 2016

SHIPS TO

Anywhere in the world



The Things Network

€295,331

Amsterdam, Netherlands Hardware

pledged of €150,000 goal

Pledge €5 or more

Show your support and keep in the loop with all updates!

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Jul 2016

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The Things UNO -
The perfect way to start developing your own hardware that will work with the Things Network. 100% Arduino compatible.

ESTIMATED DELIVERY
Jul 2016

SHIPS TO
Anywhere in the world

Campaign

FAQ ⁵


Updates ³⁵

Comments ²⁵⁰

Community

Share this project

Save



THE THINGS GATEWAY

SPECIFICATIONS

LoRaWAN compatible
Range: Up to 10 kilometers
WiFi (https) or ethernet
GPS inside for ranging
Open hardware

PRICE: 200 EURO

Pledge €2,400 or more

Large business / incubators starters pack-
Two gateways and 30 Nodes. Cover a large area, make it smart and still have enough node's left over to validate every smart / connected startup idea in a couple of seconds.

Combined with a kick off workshop and advice on the placement and implications from one of our community members on location! (travel and stay not included).

ESTIMATED DELIVERY
Jul 2016

SHIPS TO
Anywhere in the world

1 backer

The Things Network by Wienke

Secure <https://www.kickstarter.com/projects/419277966/the-things-network>

Campaign FAQ ⁵ Updates ³⁵ Comments ²⁵⁰

- Q3 2015 Team up with The Things Network
- Q4 2015 Finalizing all designs (main components)
- Q1 2016 Starting pre-production
- Q2 2016 Production runs & shipping
- Q3 2016 All products shipped

Fokke * Zandbergen on Twitter · Thomas

Twitter, Inc. [US] | <https://twitter.com/FokkeZB/status/962289549736054...>

 **Fokke * Zandbergen**
@FokkeZB [Follow](#)

Finally... 19 months after the original estimated delivery! But having been part of the [@thethingsntwrk](#) team in 2016 I know it was unavoidable and.. worth it!





3000 km
2000 mi

Wie entstehen Ökosysteme?

Offenheit



Device Address





<> ↔ 26 01 2D 6B

Network Session Key

<> ↔

App Session Key

<> ↔


 TheThingsNetwork / ttn  Watch 69  Unstar 287  Fork 197

 Code  Issues 43  Pull requests 1  Projects 0  Wiki  Insights





The Things Network Stack V2 <https://www.thethingsnetwork.org>

[iot](#) [internet-of-things](#) [lorawan](#) [lora](#) [network-server](#) [golang](#) [open-source](#) [lora-server](#) [lorawan-server](#)

 3,177 commits  12 branches  23 releases  20 contributors  MIT

Branch: **develop**  [New pull request](#) [Create new file](#) [Upload files](#) [Find file](#) [Clone or download](#) 

 **johanstokking** committed on 11 Jan Merge pull request #692 from TheThingsNetwork/feature/eu-rx2-data-rate ... Latest commit 6a87cda on 11 Jan

 .env	Add localhost IPs to certificates	3 months ago
 .github	Update README, CONTRIBUTING and ISSUE_TEMPLATE	10 months ago
 amqp	Add details to mqtt/amqp errors	10 months ago
 api	Fix locking for conn closing	3 months ago

Choose an open source license

Which of the following best describes your situation?



I want it simple and permissive.

The **MIT License** is a permissive license that is short and to the point. It lets people do anything they want with your code as long as they provide attribution back to you and don't hold you liable.



I'm concerned about patents.

The **Apache License 2.0** is a permissive license similar to the MIT License, but also provides an express grant of patent rights from contributors to users.

Android, Apache, and Swift use the Apache License 2.0.



I care about sharing improvements.

The **GNU GPLv3** is a copyleft license that requires anyone who distributes your code or a derivative work to make the source available under the same terms, and also provides an express grant of patent rights from



License Features

Your choices on this panel will update the other panels on this page.

Allow adaptations of your work to be shared?

- Yes
- No
- Yes, as long as others share alike

Allow commercial uses of your work?

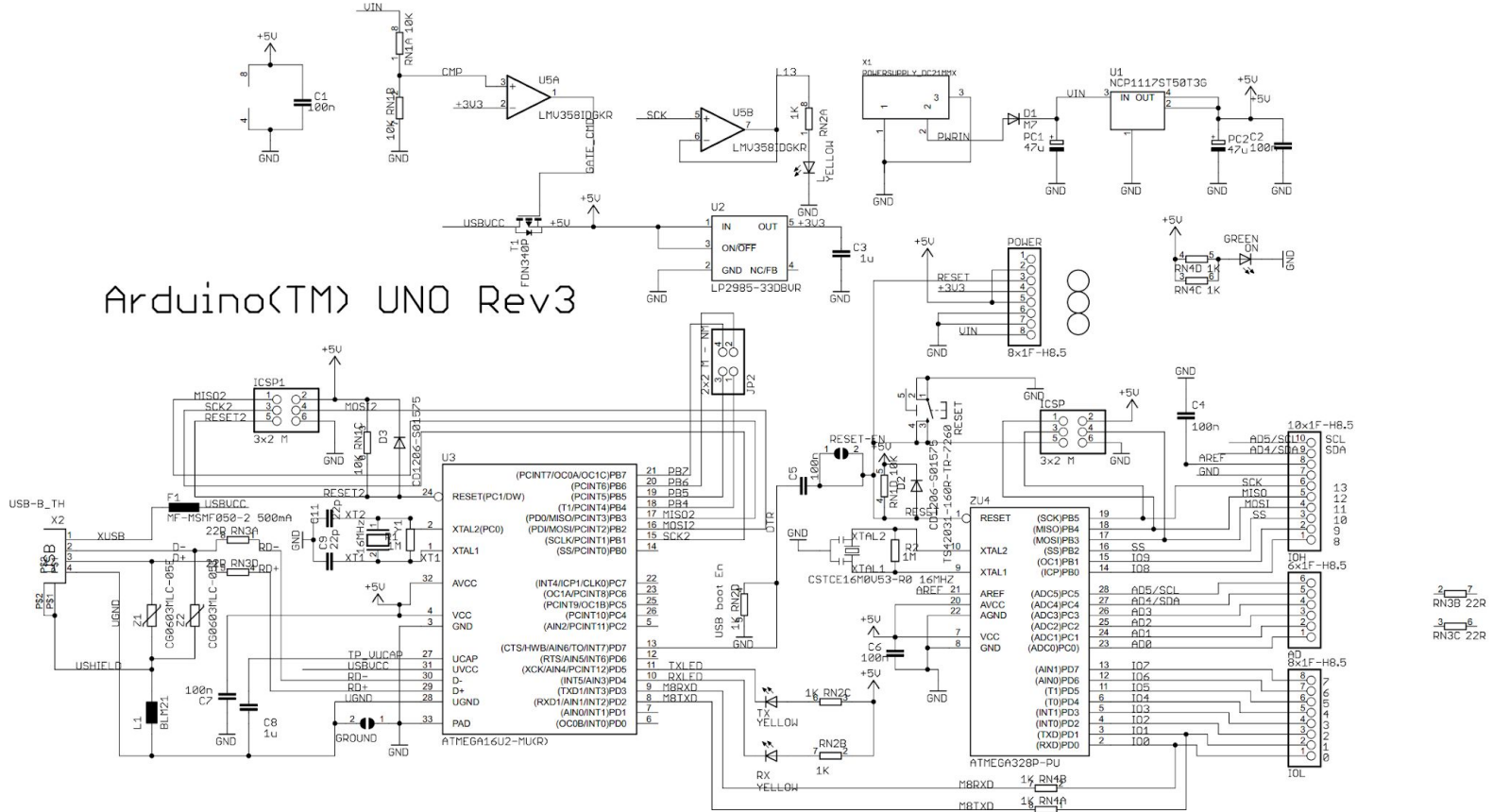
- Yes
- No

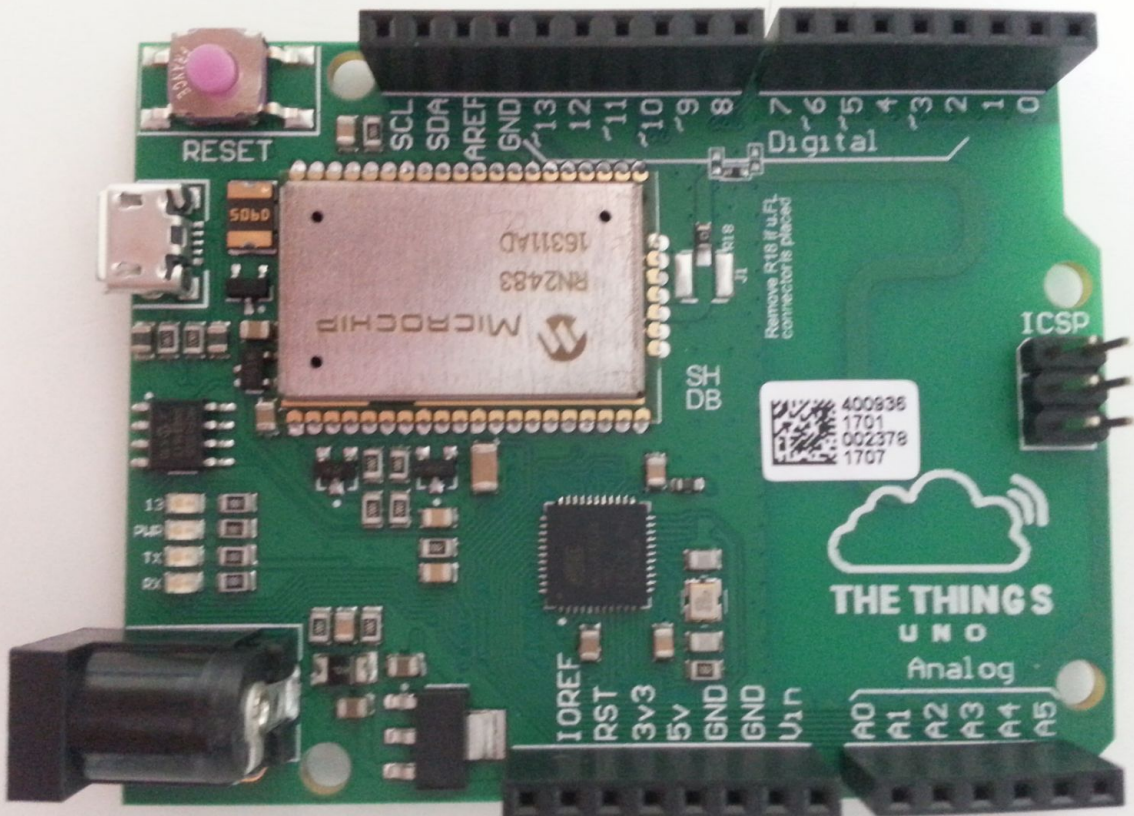
Selected License

Attribution-ShareAlike 4.0 International



Arduino(TM) UNO Rev3





You are the network

Communities



Most Gateways

Zurich 88 Gateways

Bern 66 Gateways

Friesland 60 Gateways

Walloon region, Belgium 56 Gateways



Most contributors

Amsterdam 115 contributors

Zurich 111 contributors

Sydney 94 contributors

Eindhoven 70 contributors



Latest communities

Hanoi 2018-02-08
Welcome little one !

Malta 2018-02-08

Sophia Antipolis 2018-02-02

Great Yarmouth 2018-01-24



Let's build an open, free and community-owned IoT data network for Zurich! [Join us on Slack](#) or [follow us on Twitter](#)

LoRaWAN has the potential to enable an entire new class of use cases for the Internet of Things, but we need to open this up to the hacker/maker community. And the best way to do it, is to build the network ourselves. A **free** (as in beer), **open** network (free as in speech), based on...

[Read more](#)

ABOUT THIS COMMUNITY

88

Gateways

111

Contributors



Official community

The Core Team of Zurich consists of:



Gonzalo Casas

INITIATOR TTN ZURICH

And **110** contributors.

[SHOW ALL](#)

Past Meetup

You went 30 people went

Make IoT ZH: The Things Network Hands-on



Hosted by [Thomas Amberg](#) and [Gonzalo Casas](#)

From [IoT Zurich](#)

TheThingsNetwork (<http://thethingsnetwork.org/>) arrived in Zürich! Gonzalo (<https://twitter.com/gnz>) from [@ttn_zh](https://twitter.com/ttn_zh) (https://twitter.com/ttn_zh) will bring his LoRa gateway running the open source firmware (<https://github.com/TheThingsNetwork>) for a first round of hands-on testing. Want your own hardware? Back the Kickstarter (<https://www.kickstarter.com/projects/419277966/the-things-network>) or get a gateway (<http://thethingsnetwork.org/#gateways-section>).

Copy Meetup



Wednesday, November 11, 2015

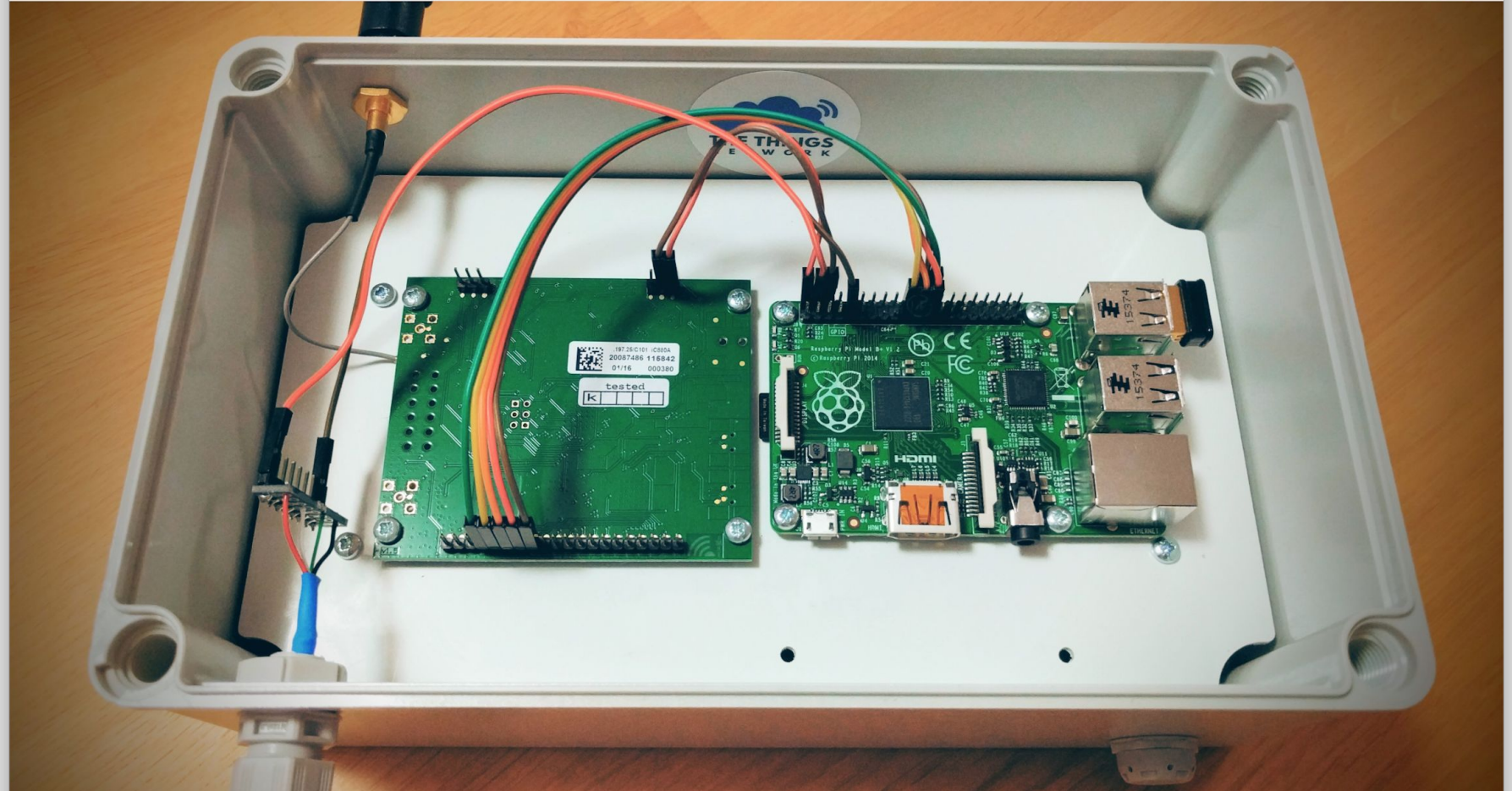
6:00 PM to 9:00 PM



Tamedia

Werdstrasse 21 · Zürich





Home

Edit New Page

Gonzalo Casas edited this page 18 days ago · 53 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

coverage | The Things Network

Secure <https://ttn-ch.slack.com/messages/C0DEH55UP/>

The Things Net...


Thomas Amberg

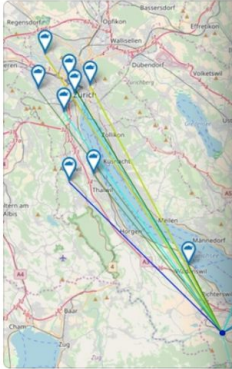
Channels

- # arduino-mkr-wan-1300
- # association
- # basel
- # beehive
- # buttonspace
- # code
- # coverage
- # crowdsensing
- # data
- # events
- # gateways
- # general
- # geneva
- # iota
- # lausanne
- # make-zurich-helpers
- # makezurich
- # m2-bicycle-tracking


#coverage

☆ | 👤 100 | 🔒 0 | ✎ Add a to

 **urs marti** 11:46 PM
uploaded and comm



“ short measurement t

 **urs marti** 11:47 PM
thanks @funlab pro
max. distance (excl. t


👍 2 🍷 1

+ Message #coverage


Join The Things Network Switz x

Secure <https://ttn-ch.herokuapp.com>

Thomas



THE THINGS
NETWORK
SWITZERLAND



+

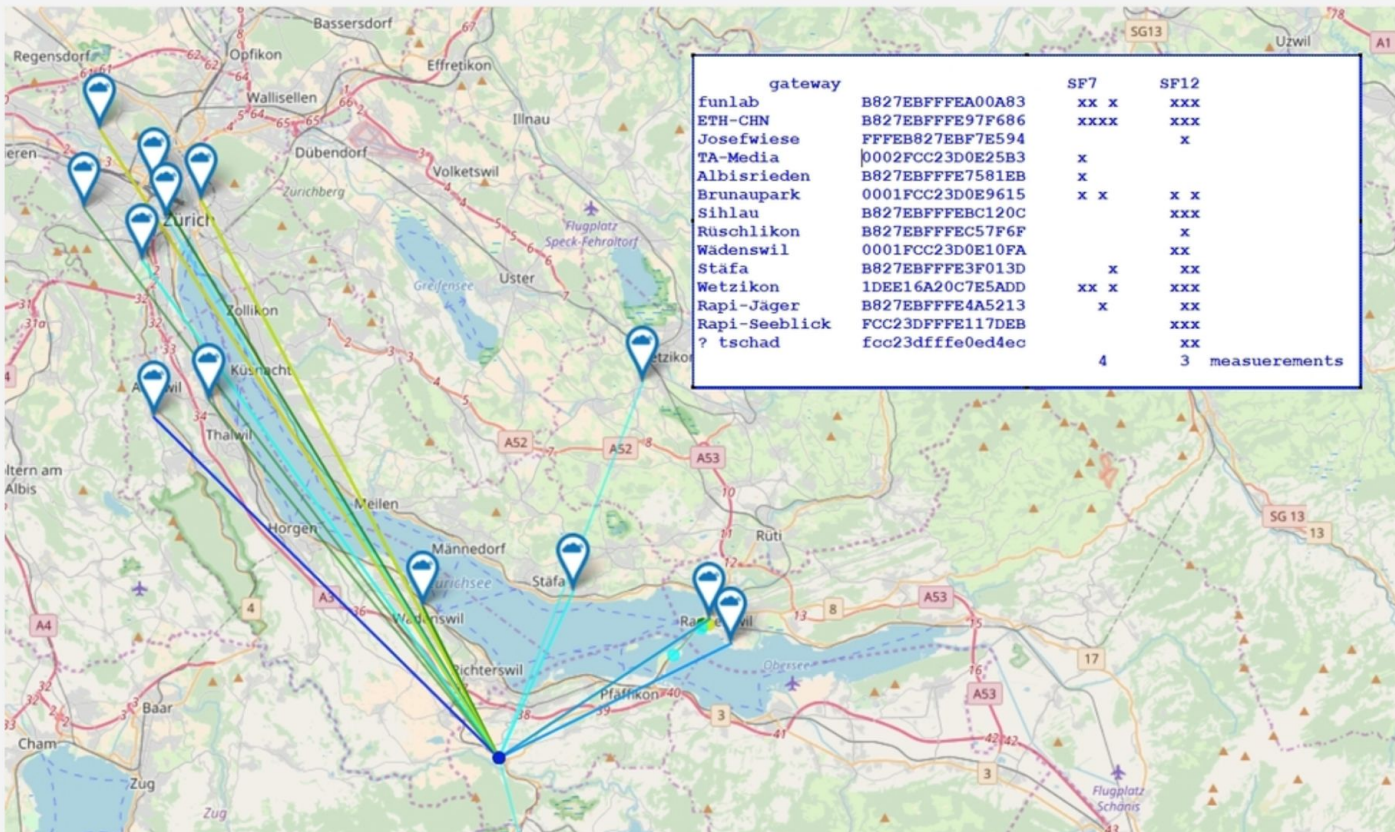
Join **The Things Network Switzerland** on Slack.

19 users online now of **602** registered.

GET MY INVITE

or [sign in](#).

coverage_Schind-Feusi_20171122
urs marti • Nov 22nd, 2017 at 11:46 PM in #coverage



- My apps
- Shop

- Games
- Family
- Editors' Choice

- Account
- My subscriptions
- Redeem
- Buy gift card
- My wishlist
- My Play activity
- Parent Guide



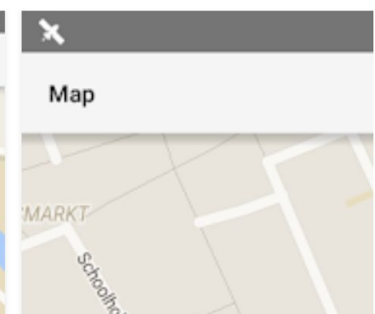
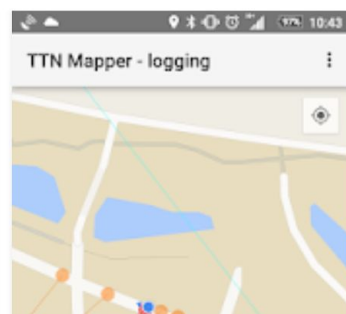
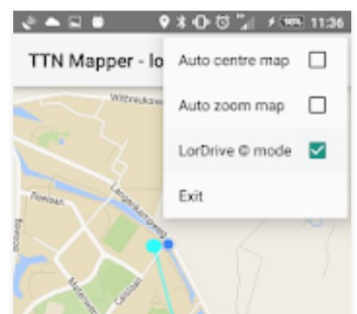
TTN Mapper

JPMeijers.com Tools ★★★★★ 13

3 PEGI 3

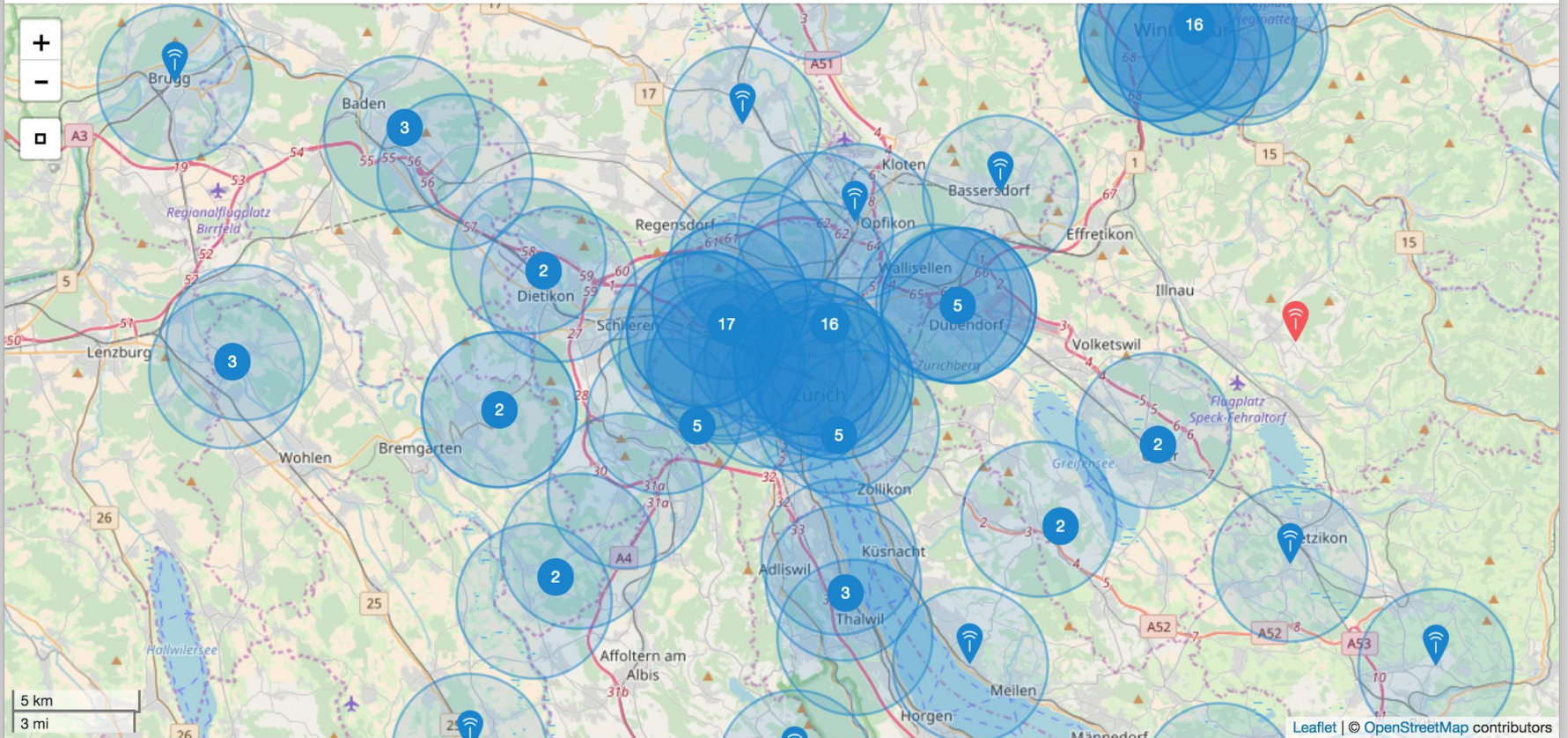
i This app is compatible with all of your devices.

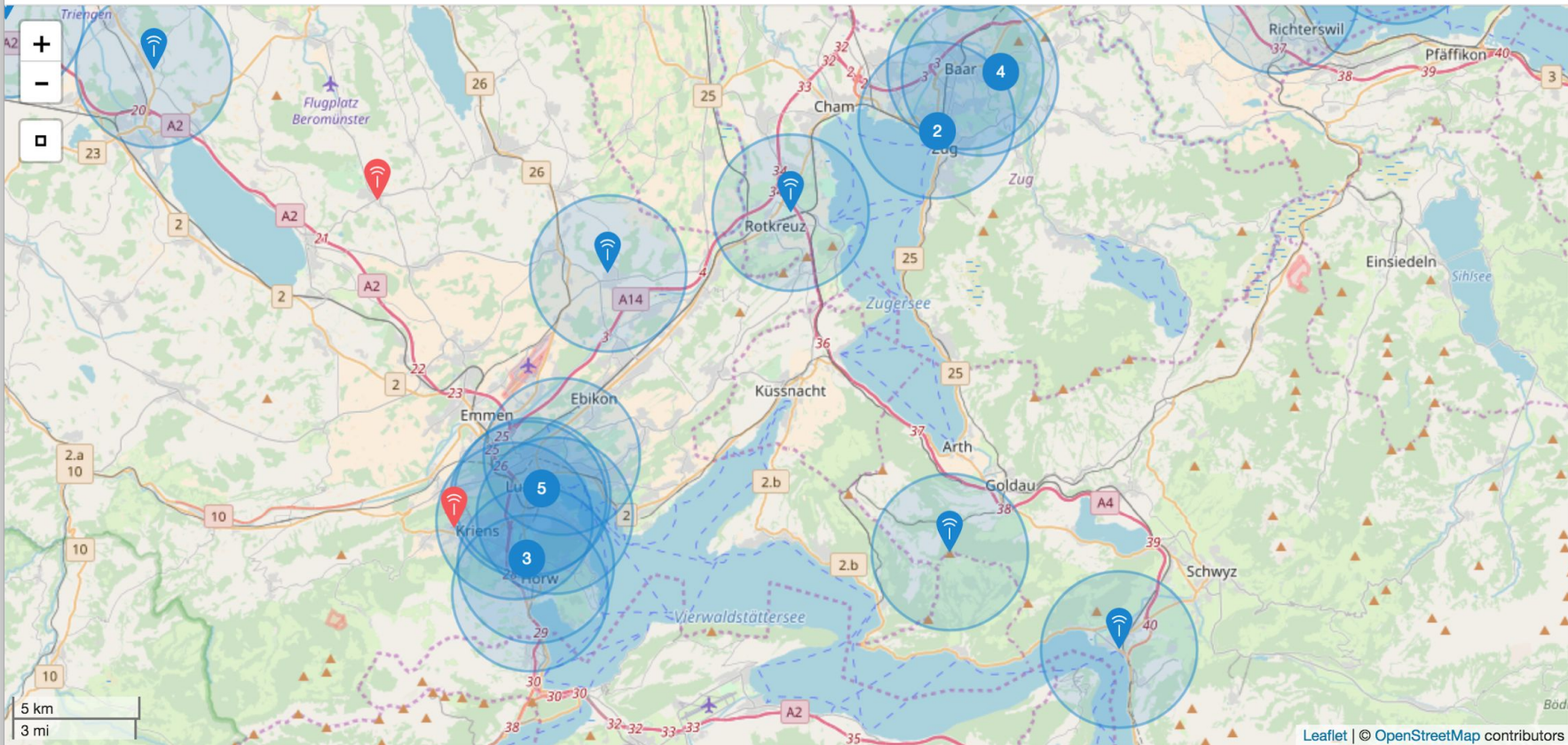
Add to Wishlist

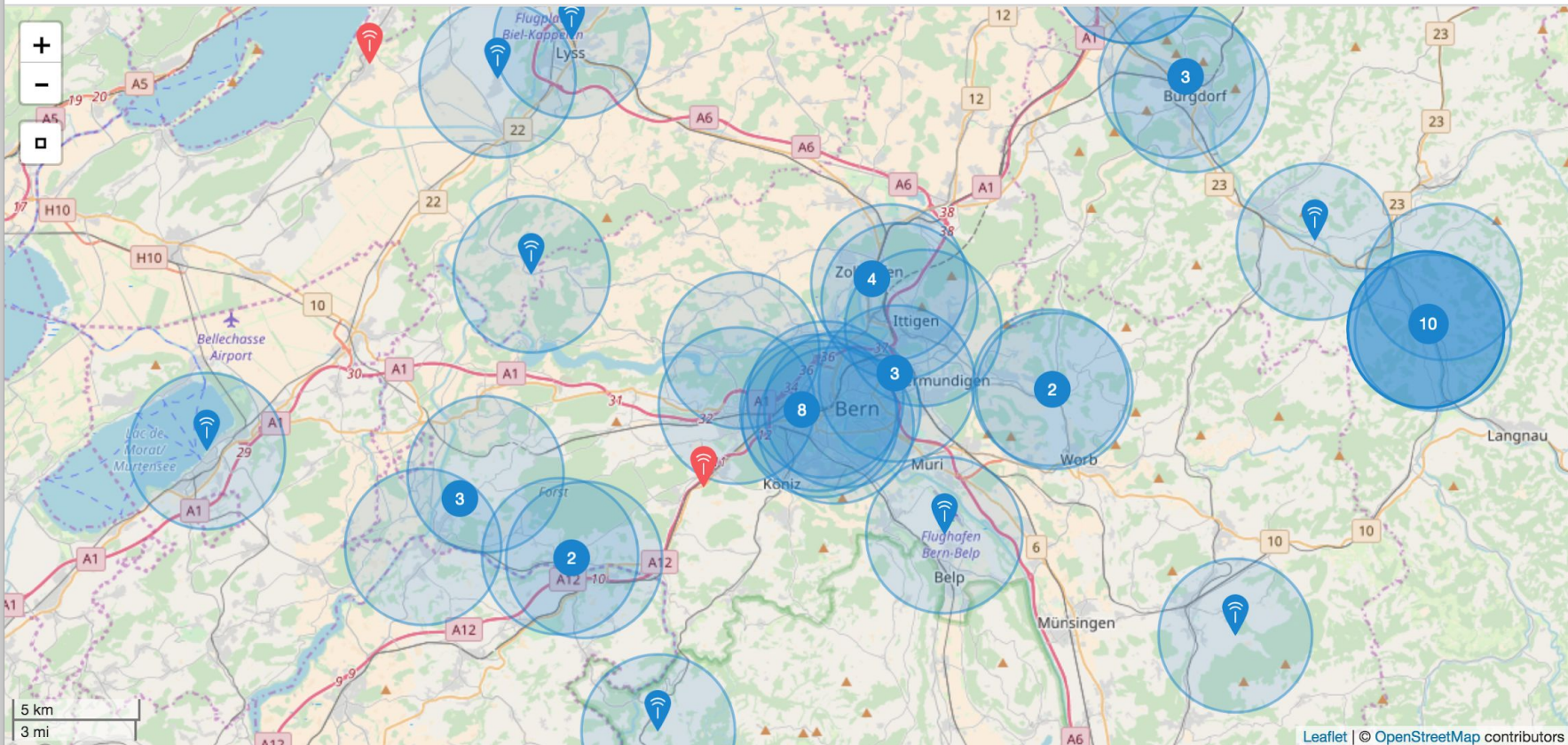


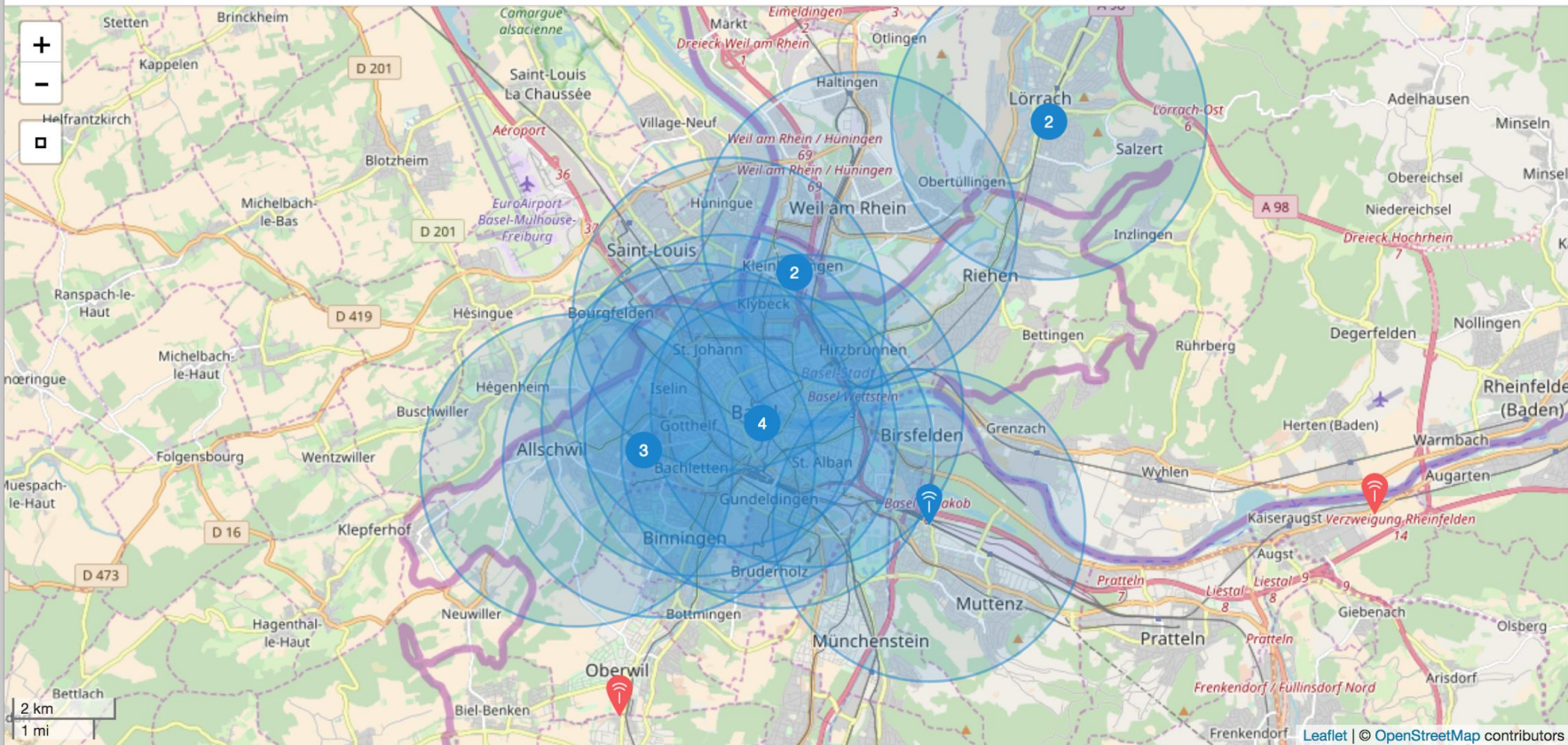
Wo hat es TTN LoRaWAN in der Schweiz?

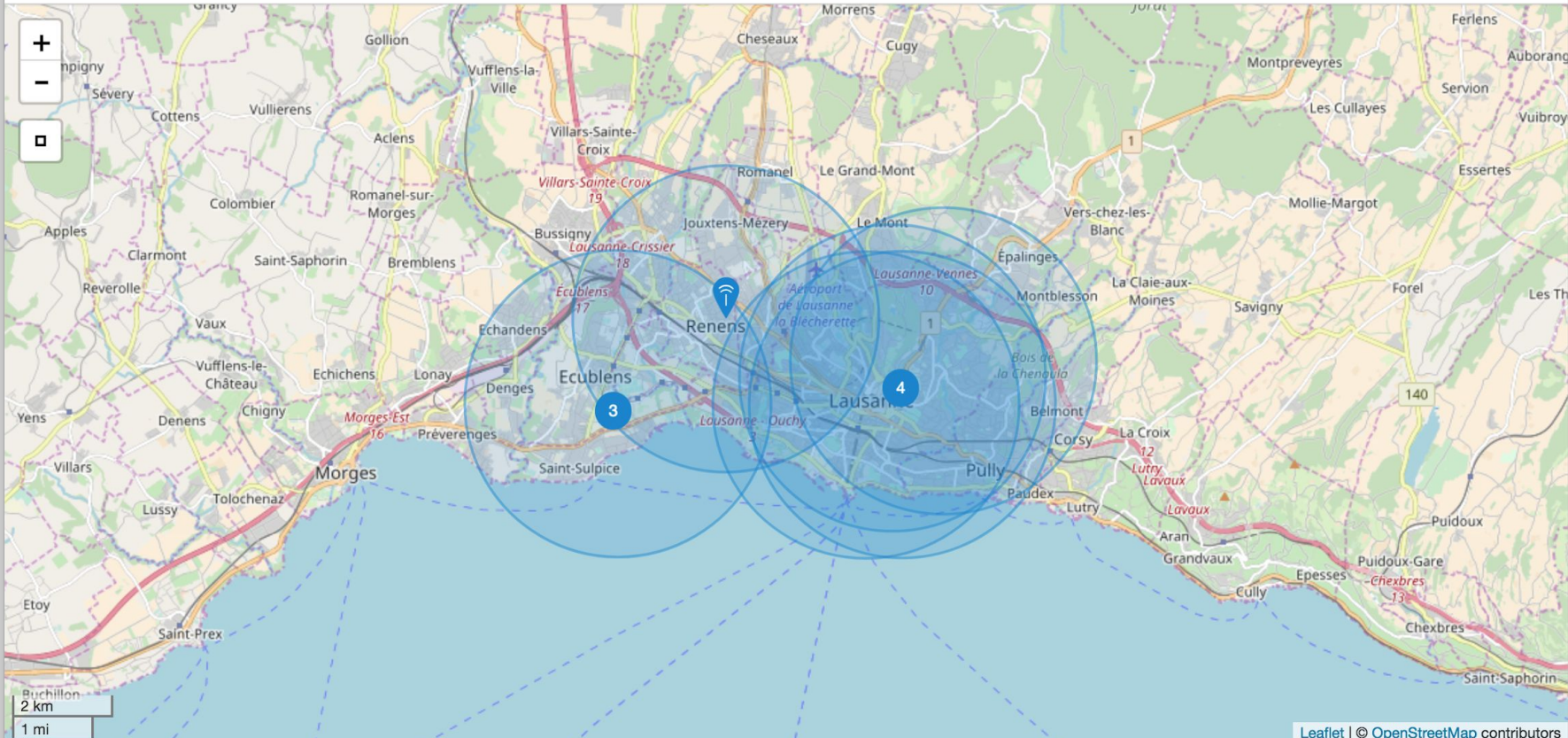
Gateways

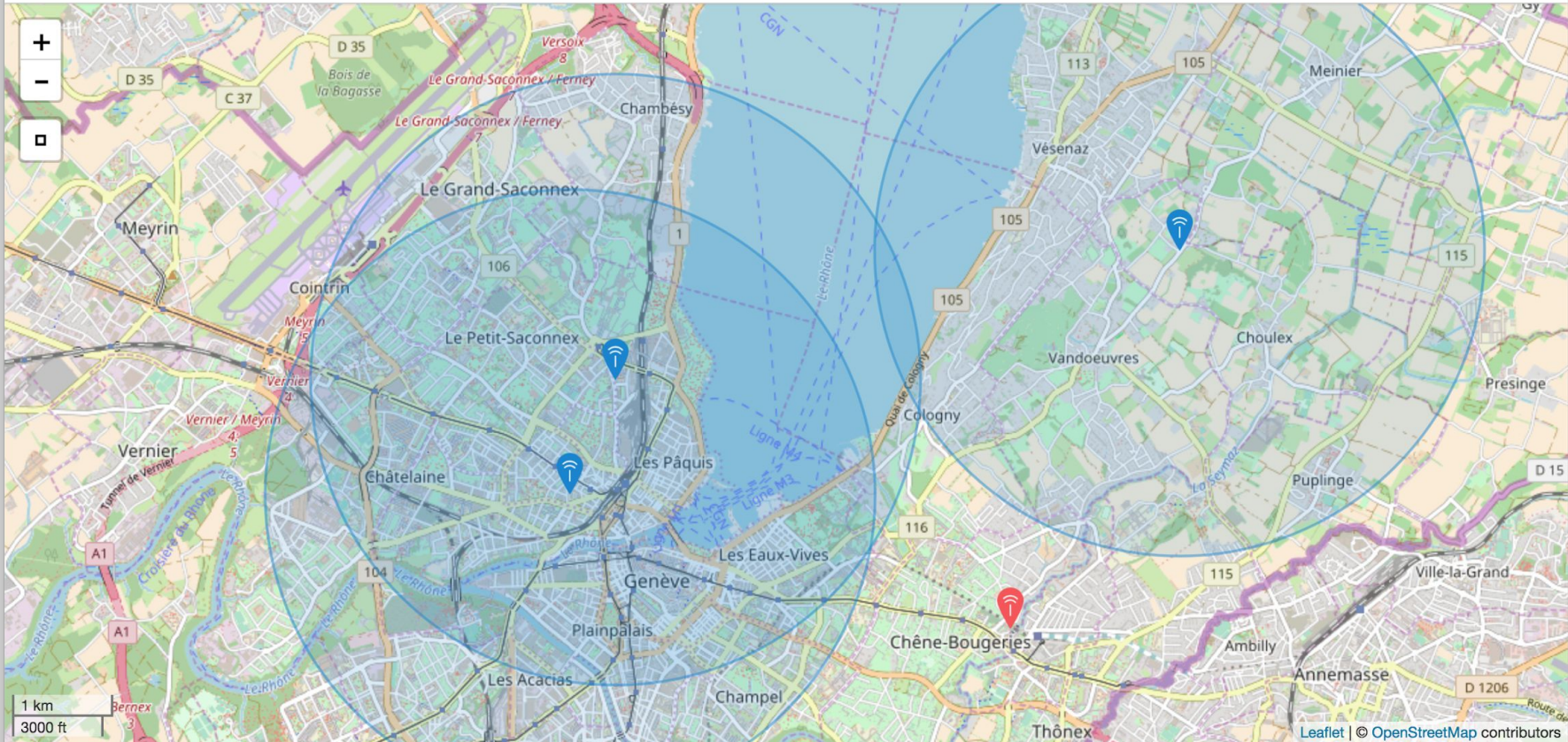












Wer baut was damit?

LoRaWAN Use Cases

LoRa WAN demo project by



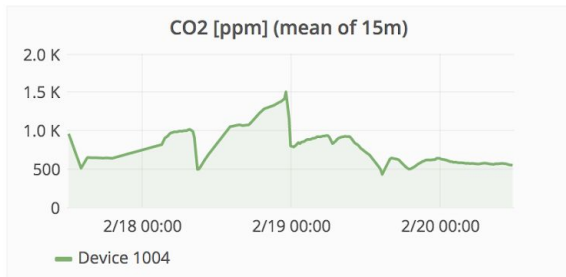
[CO2, temperature, and humidity sensor](#)



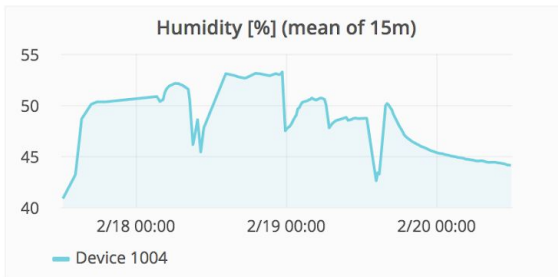
Node [1004](#) (CO2)



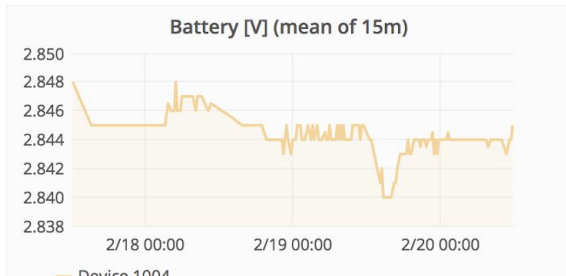
LoRa infrastructure provided by



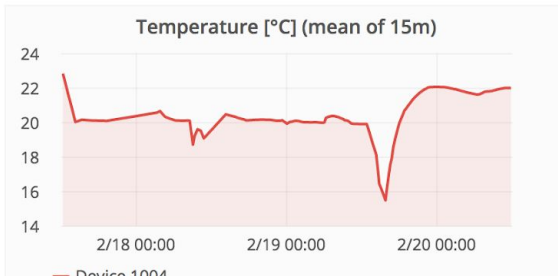
545.5
ppm



44.1 %



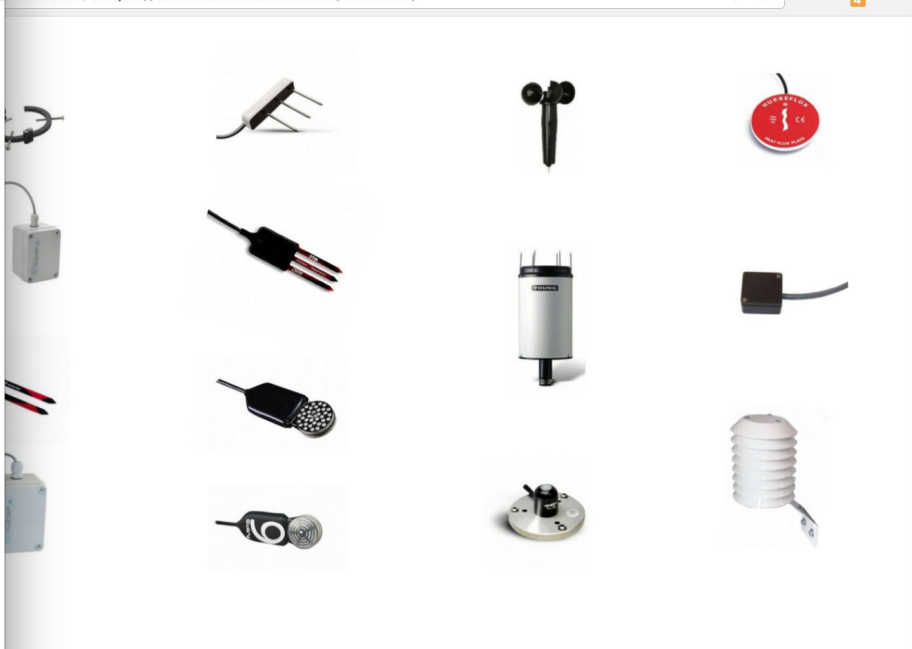
2.85 V



21.98
°C



NDIR CO₂, temperature, humidity and barometric pressure sensor



Supported analog and digital sensor

LoRaWAN sensor device interfaces with a wide range of sensors. It provides a stable sensor supply and includes signal conditioning for analog sensor signals or provides an appropriate interface for sensors with digital outputs. The device is designed for



Deutsch English (English)

Alles inklusive - sogar das Internet.



Einfach an die Wand – und fertig!
Unglaublich, aber so funktioniert das Internet der Dinge. Der i10 kommuniziert verschlüsselt über Long-Range-WANs. In Ballungsräumen hast du in der Regel sofort Empfang. Die Reichweite aus Gebäuden beträgt 2-7 km. Seine Batterie hält lang, sehr lang.



Wienke @wienke

Following

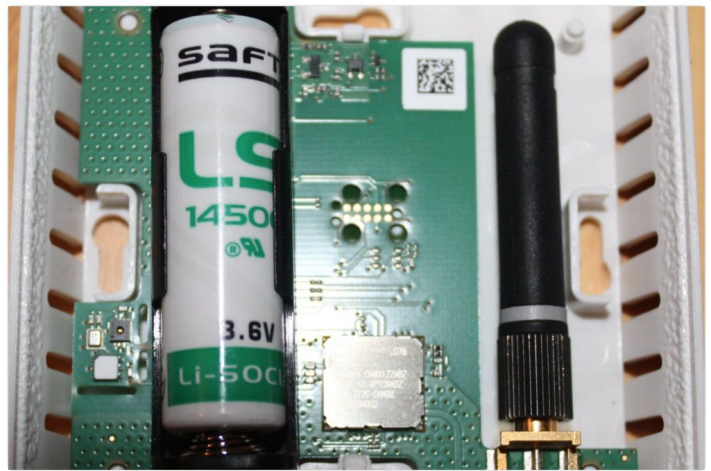
This must be the coolest @thethingsntwrk sensor around. Sensor data goes over LoRaWAN to @thethingsntwrk and is displayed through an AR web application. Made by Avelon and @miromicoAG cc. @LoRaAlliance



((TTN_Berlin)) @TTN_Berlin

Follow back

#Avelon #i10 teaser arrived... working



9:46 AM - 17 Feb 2018

5 Retweets 25 Likes





Alplora

Finde deine Herde jederzeit und überall

Perfekt für die Schweizer Alpen





Company

Integrated Circuits

Embedded Systems

Products

Radio Modules and Sensors

FMLR LoRaWAN Modules, Modems and Sensors

FMLR LoRaWAN Modules

FMLR LoRaWAN Sensors

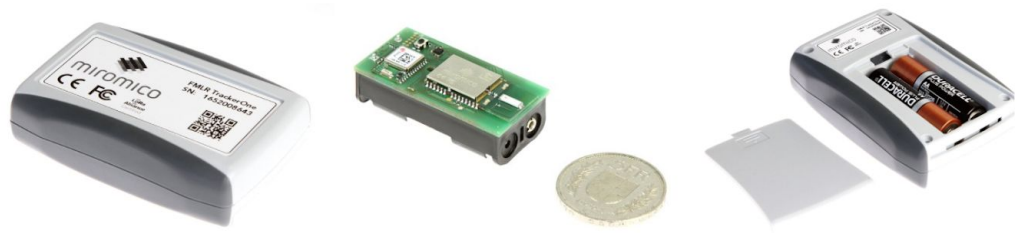
FMLR LoRaWAN MultiSensor Hub

FMLR Intelligent

FMLR TrackerOne GPS LoRaWAN Tracker

Key Benefits

- Tracks location of humans, animals and goods
- Transmits its GPS position regularly into the LoRaWAN™ cloud
- Multi-Band GPS receiver for GPS, Glonass, Galileo, BeiDou
- Optional In-Door localisation support
- Multiple options and customizations available



- Multiple housing options available

Bibliothek

Bologna

Career Service

E-Learning

Events

Jahresübersicht

Infotage

Techdays

researchXchange

Gebühren + Finanzierung

Gesamtstundenplan

Informatikdienste

Internationaler Austausch



Service > Events > The Things Network / LoRaWAN

The Things Network / LoRaWAN

Datum: 07.03.17

Zeit: 16:00 bis 19:00

Ort: Biel, Quellgasse 21

Lokalität: Aula

Die Berner Fachhochschule erschliesst das Internet of Things für Unternehmen und

Wie wird man offiziell ansprechbar?

Vereinsgründung

Past Meetup

You went 28 people went

Founding the Open Network Infrastructure Association



Hosted by [Gonzalo Casas](#)

From [IoT Zurich](#)

To promote open network infrastructure, Gonzalo Casas and other members of the TheThingsNetwork Zürich

(<http://thethingsnetwork.org/c/zurich>) community propose to found the "Open Network Infrastructure Association". Everyone interested to join the Verein is invited to attend the founding meeting. The draft of the articles of association (Statuten) is on Github <https://github.com/open-network-infrastructure/articles-of-association>

Copy Meetup



Monday, August 29, 2016
6:30 PM to 9:30 PM



Cafe Sphères
Hardturmstrasse 66 ·
Zürich



600_453630617.jpeg (600x45 x

Thomas



Secure https://secure.meetupstatic.com/photos/event/7/7/9/9/600_453630617.jpeg



Charter of the Open Network Infrastructure Association

Article 1 Legal Form and Name

Under the name Open Network Infrastructure Association exists a non-profit association according to the present charter and as defined by the articles 60 ff. of the Swiss Civil Code.

Article 2 Open Network Infrastructure - Definition

Infrastructure in the scope of this association are the basic physical and organizational structures and means needed to operate a digital network.

Network in this context refers to a group of interconnected electronic systems.

Open in this context means the network should be freely accessible by anyone, at anytime, without having to ask for permission.

Article 3 Purpose of the Association

The purpose of the association is to promote open network infrastructure by, for example:

- Promoting, installing and operating one or many open networks, freely accessible by anyone.
- Organizing events and meetups for both the open network infrastructure community and for the broader public.
- Offering educational material and workshops in the area of open infrastructure.

Wie findet man neue Anwendungen?

Hackdays



Stadt Zürich



**open network
infrastructure
association**

WHEN?

Kick-off & Aperó

June 22, 2018

Open Lab

June 23 - June 28, 2018

Hackathon

June 29-30, 2018

WHERE?

Kick-off & aperó

Kraftwerk

[Map](#)

Open Lab

TBA

[Map](#)

Hackathon

Kraftwerk

[Map](#)

Wenn das Mietvelo Alarm schlägt

Der Hackathon «Make Zurich» sollte der Stadt einen Schubser Richtung Smart-City geben. Rund 70 Programmierer haben am Wochenende im Viadukt ihre Ideen dazu programmiert. Herausgekommen ist nicht nur Voodoo.

Walter Bernet
6.2.2017, 05:30 Uhr



MEISTGELESEN IM RE...

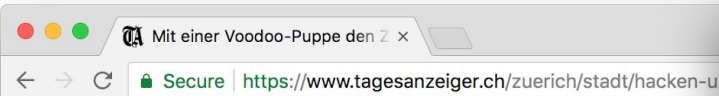
AUDIO
Der NZZ-Podcast: «Chris»
Daniel Fritzsche / 15.2.2018, 10:01 U

BILDSTRECKE
Die Ufenau erstrahl Glanz
Susanna Rusterholz / 19.2.2018, 05

 **Robert Salzer**
@rob_salzer

#MakeZurich Not a bomb, just a biketracking-prototype.

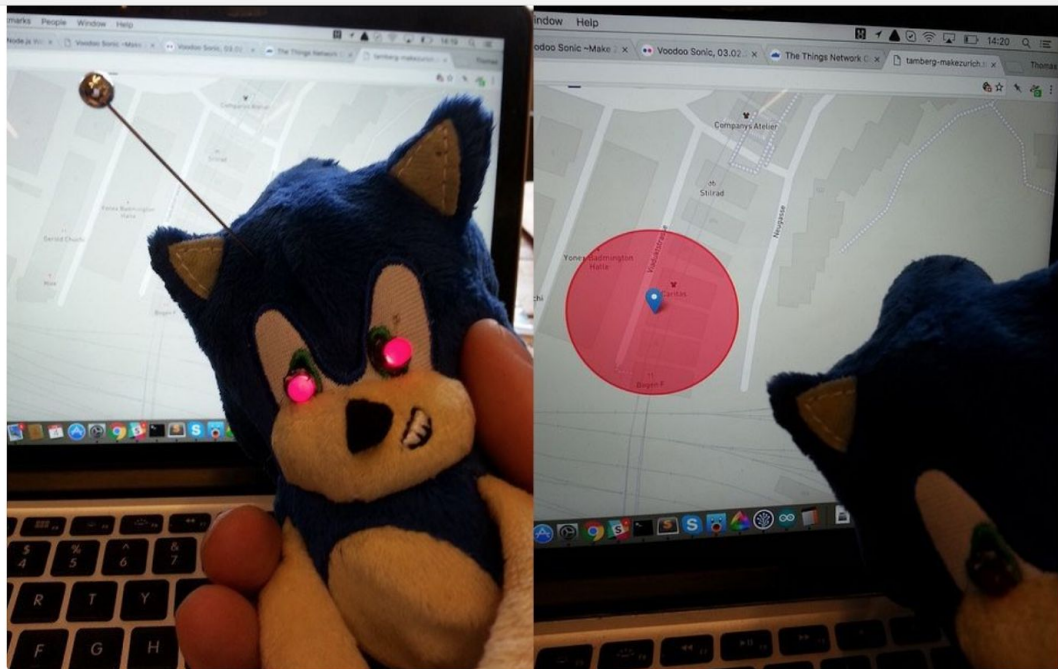
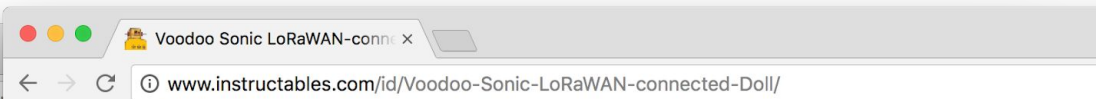
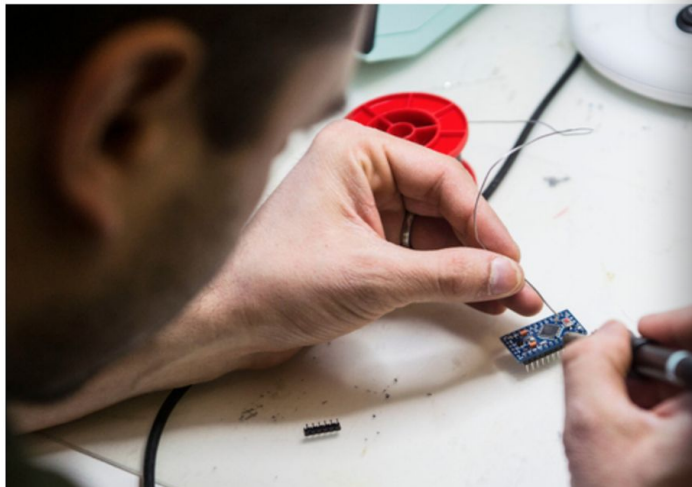




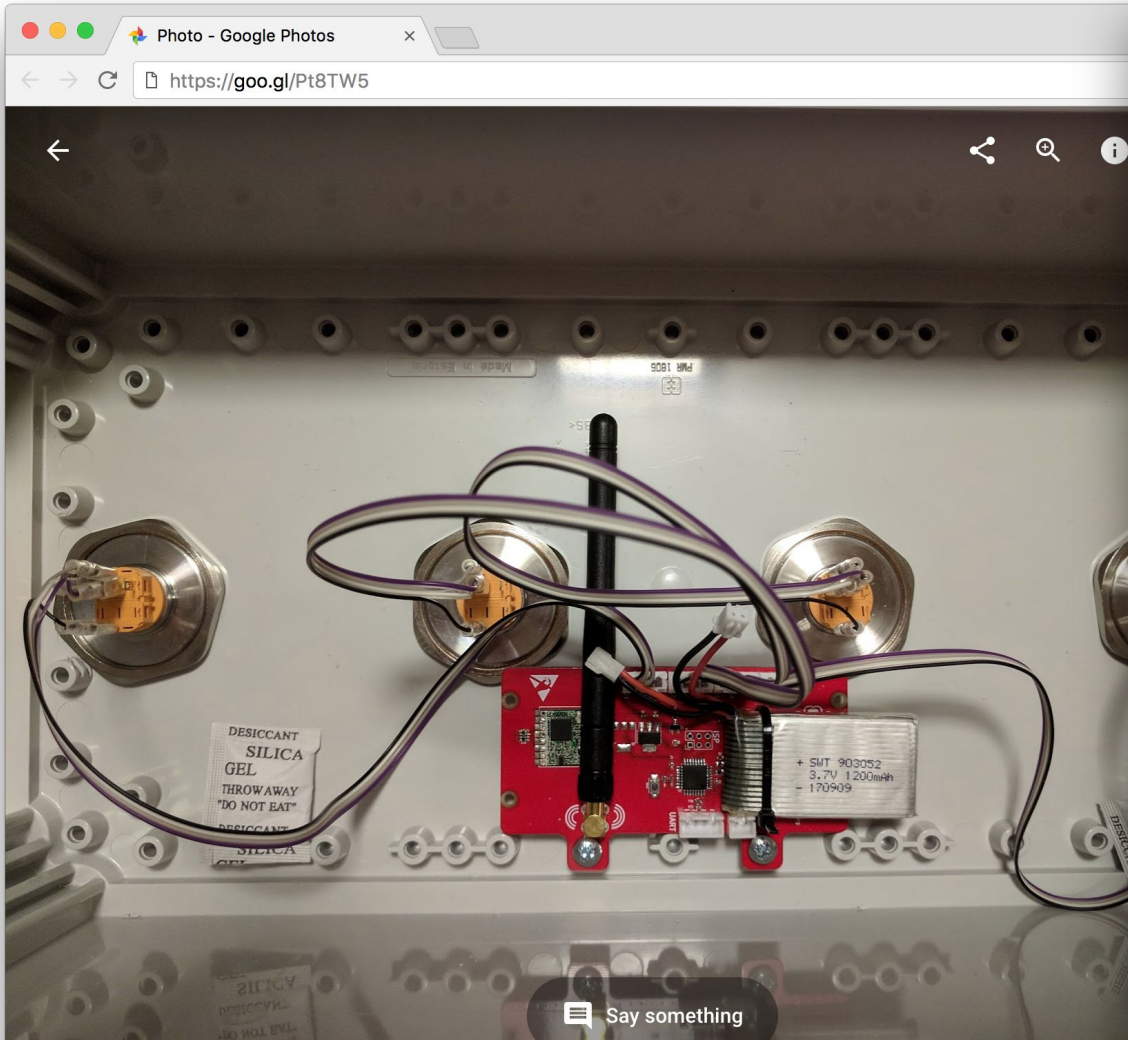
TagesAnzeiger

Mit einer Voodoo-Puppe messen

Rund 80 Personen programmieren und basteln im ...
Ideen.



Voodoo Sonic is a LoRaWAN-connected Voodoo doll for noise pollution stress relief. Developed by [@tamberg](#) during the [MakeZurich.ch](#) civic tech hackathon. Noise pollution is highly subjective, so measuring nightlife noise does not help, according to Zürich city officials. Therefore, this project tries to measure the anger of affected residents instead, and display the result on a map.





This repository

Search

Pull requests

Issues

Marketplace

Explore



gonzalocasas / taz-data-collector

Watch 1

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Insights

Branch: master

taz-data-collector / README.md

Find file

Copy path

gonzalocasas Fix readme

7fb785a on 15 Nov 2017

1 contributor

132 lines (91 sloc) | 6.39 KB

Raw

Blame

History



[Embedded](#) | [Backend/Data collection](#) | [Frontend/Dashboard](#)

Feedback Buttons: Data collector microservice

Collect data from Feedback Buttons from MQTT into DynamoDB aggregated tables

Wo steht The Things Network?

The Things Conference





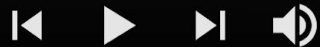
The Things Network @thethingsntwrk · Jan 27
Sneak peak into #TheThingsConference. The #LoRaWAN WALL of Fame. @LoRaAlliance
@SemtechCorp @MicrochipMakes
Laird, Flex, DraginoTech and 7 others



The Things Conference



8:54 / 16:59



 **The Things Network** ✓
@thethingsntwrk

Following

Decentralizing the global network. A panel with Gonzalo Casas (@gnz), Andrew Maggio, Eric Gourlaouen, @johanstokking, Simon Gehren and Kurt Baumann.
[#TheThingsConference](#)



 **TheThingsNetwork ZH**
@ttn_zh

Following

Going to production: Wall of sensors of @decentlab's CO2 sensor network at #TheThingsConference



2:48 PM - 2 Feb 2018

1 Retweet 4 Likes



Wie kam es soweit?

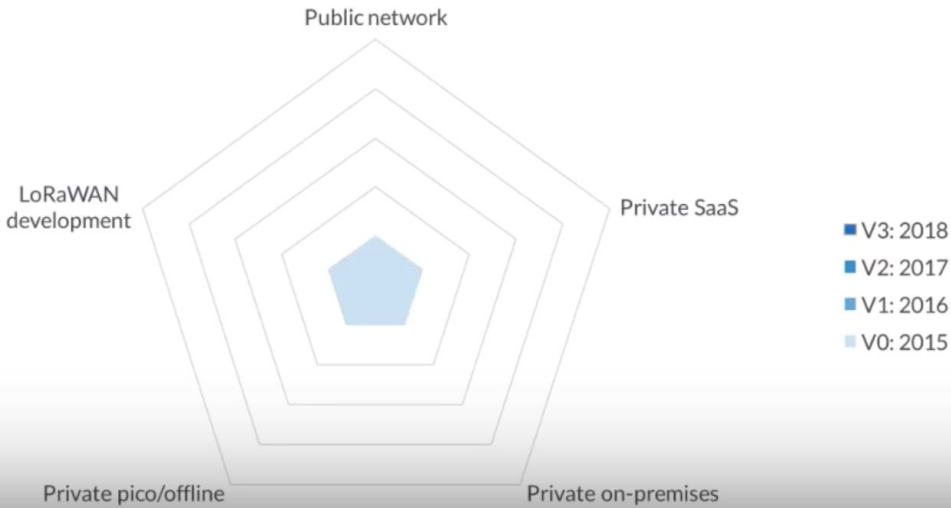
Iterationen



Announcing The Things Network Stack V3

Google

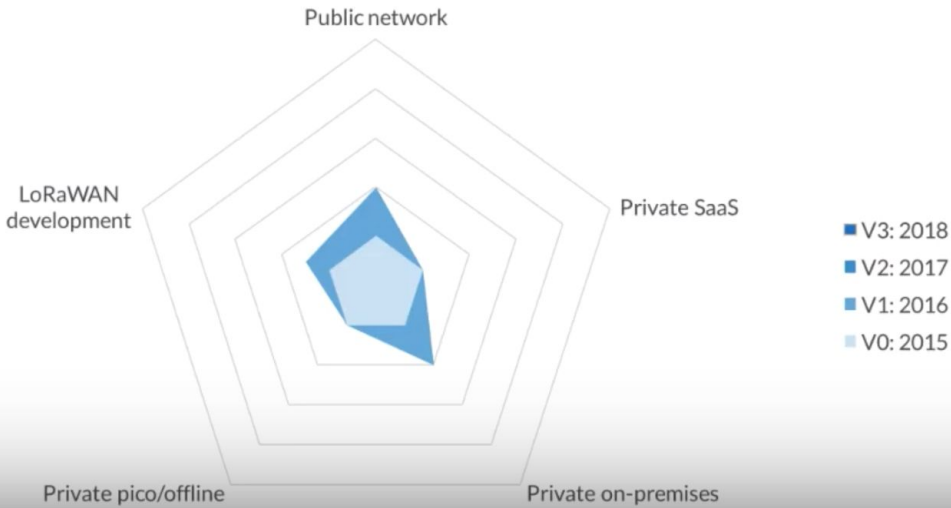
V0: BOOTSTRAPPING



Announcing The Things Network Stack V3

Google

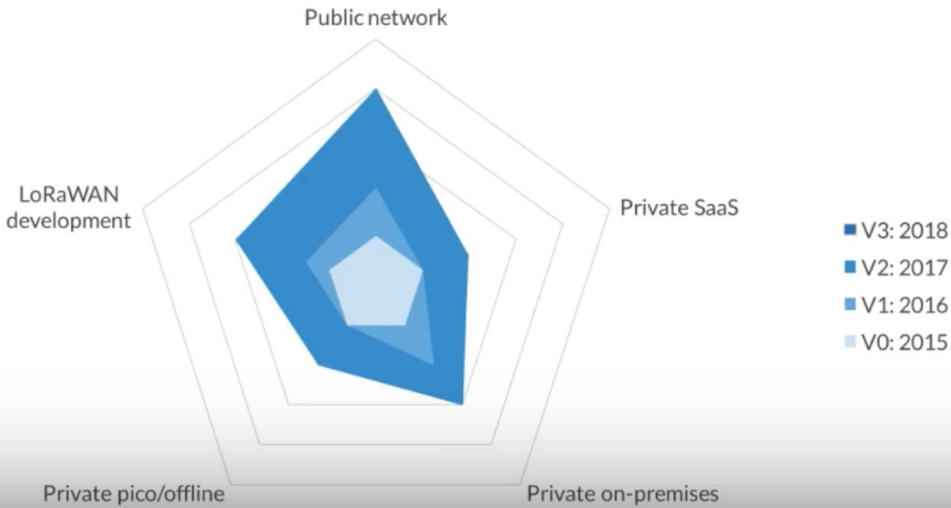
V1: GOOD IDEA, BAD EXECUTION



Announcing The Things Network Stack V3

Google

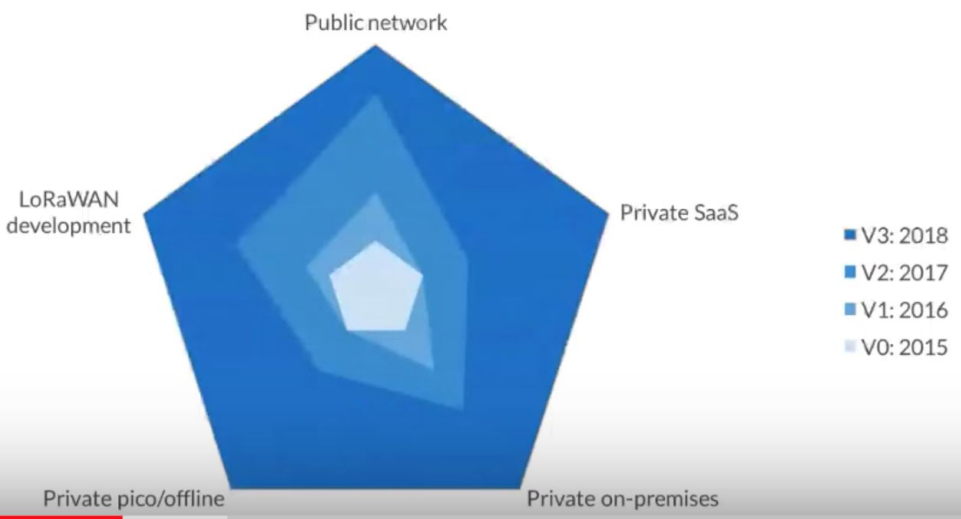
V2: BETTER IDEA, STABLE AND FAST



Announcing The Things Network Stack V3

Google

V3: ONE ALMIGHTY STACK



Announcing The Things Network Stack V3

Google

ANNOUNCING THE THINGS NETWORK STACK V3

- Supports LoRaWAN versions: 1.1, 1.0.2 and 1.0
- Features Gateway Agent, Gateway Server, Network Server, Application Server, Join Server, Identity Server and Console
- Runs as single binary or as micro services in clusters
- Supports peering within The Things Network ecosystem
- Supports roaming and third party Join Servers within the LoRa Alliance ecosystem
- MVP release in March 2018, May 2018 for private networks and June 2018 for the public network
- All components are open source, MIT licensed



Wie sieht die Zukunft aus?

Dezentralisierung

Google

V3: FREE PUBLIC NETWORK

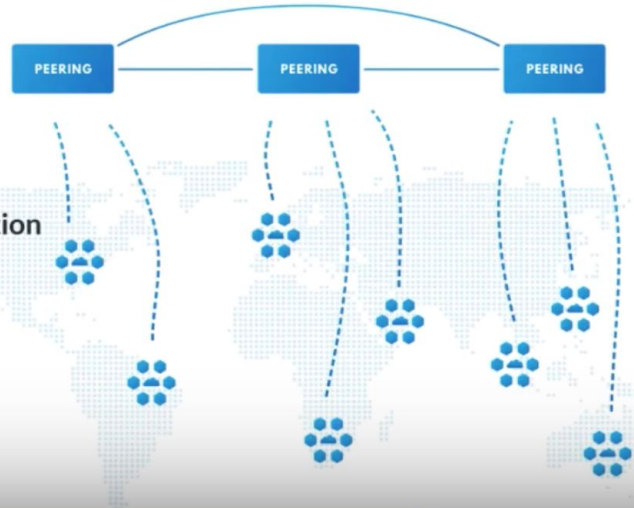
The Things Network Foundation



Open Network Infrastructure Association



Meshed



Announcing The Things Network Stack V3



Router

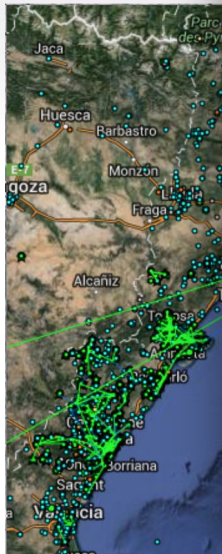
The router this gateway will connect to. To reduce latency, pick a router that is in a region which is close to the location of the gateway.

switch-router		✓
meshed-router	public	thethings.meshed.com.au:1901
switch-router	public	ttn.opennetworkinfrastructure.org:1901
ttn-router-asia-se	public	asia-se.thethings.network:1901

created: Sun, 07/06/2009 - 22:45 — lluis.dalmau - updated: 21/12/2016 - 5:07pm

What is **guifi-net**?

guifi-net is a bottom-up, citizenship-driven **technological, social and economic project** with the objective of creating a **free, open and neutral telecommunications network** based on a **commons model**. The development of this common-pool infrastructure eases the access to quality, fair-priced telecommunications in general and **broadband Internet** connections in particular, for everybody. Moreover, it generates a model for collaborative economic activity based on proximity and sustainability.



The technological project

guifi-net started in 2004 as a **telecommunications technological project** in the Osona county (Catalonia, Spain) to solve the **broadband Internet access difficulties in rural areas**, given the lack of traditional operators to provide services there. By means of radio links built with commodity WiFi routers, the neighbours deployed **their own network to interconnect** different locations (the so-called *nodes*) such as public buildings, etc. to be able to access telecommunications and the Internet wherever they work, in the library, etc.

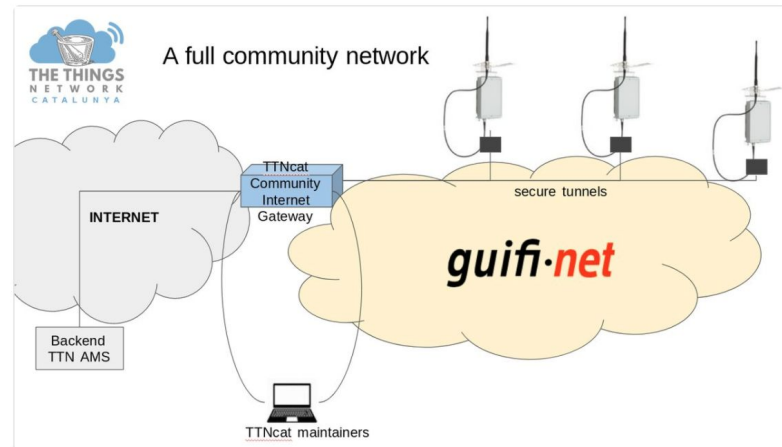
As of December 2016, **guifi-net** accounts for **more than 32.500 operating nodes**, most of them in the Valencian Community, the Balearic Islands, Madrid, Andalusia, Asturias, etc. Nowadays, hundreds of homes and offices access the Internet by means of **guifi-net's** fiber-based network. It is estimated that more than 50,000 people are **serviced** by this network.



TheThingsNetworkCat

Following

We've been designing our community in TTN Catalonia as a full **#CommunityNetwork** in collaboration with the **@guifinet** network and now a Community Internet Router to connect to the big Net. Advantages: we coordinate, don't pay for telecom towers, self-manage every bit of the stack





**YOU ARE THE NETWORK
LET'S BUILD THIS
THING TOGETHER**

Das war's

Danke

www.tamberg.org

- [@tamberg](#)
- tamberg@yaler.net

Presentations

- [Bottom-up LoRaWAN IoT Infrastr](#)
at [Winterkongress](#) of [Digitale Ges](#)
in Zürich, 24.02.2018

