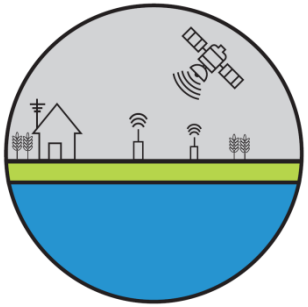
Workshop:
"Aan de slag met sensoren"

WIFI:
SSID: WSBD-Gast
WW: waterbeheer

THE THINGS NETWORK

Waterschap Brabantse Delta



Workshop:
"Aan de slag met sensoren"

Amteburger kalibratie van satellietbeelden met crowedsourced sensoren aangesloten op een crowedsourced netwerk

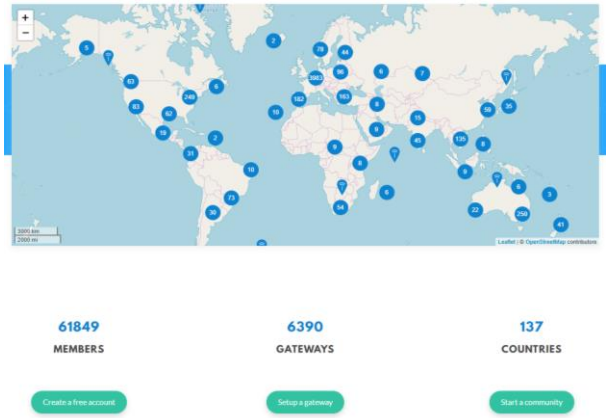
Workshop “Aan de slag met sensoren”

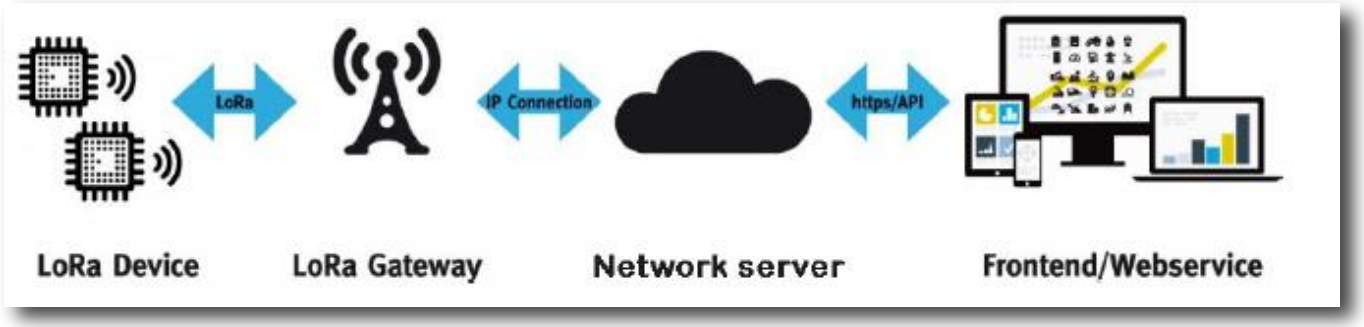
Uitleg & mogelijkheden: IOT & The Things Network

The Things Network hoe het is gestart in 2015 met een “kickstarter campaign”

OUR MISSION
IS TO BUILD
A DECENTRALIZED,
OPEN AND
CROWD SOURCED
IOT DATA NETWORK

OWNED AND OPERATED BY ITS USERS





Workshop “Aan de slag met sensoren”

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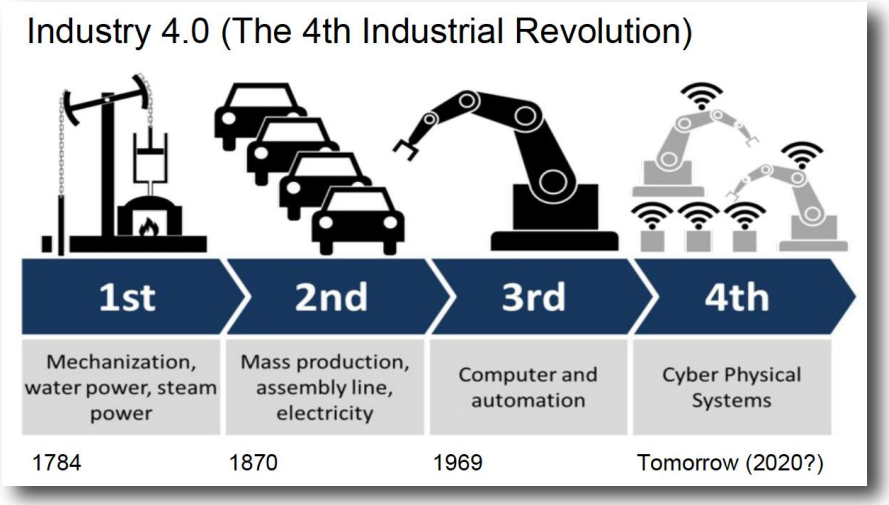
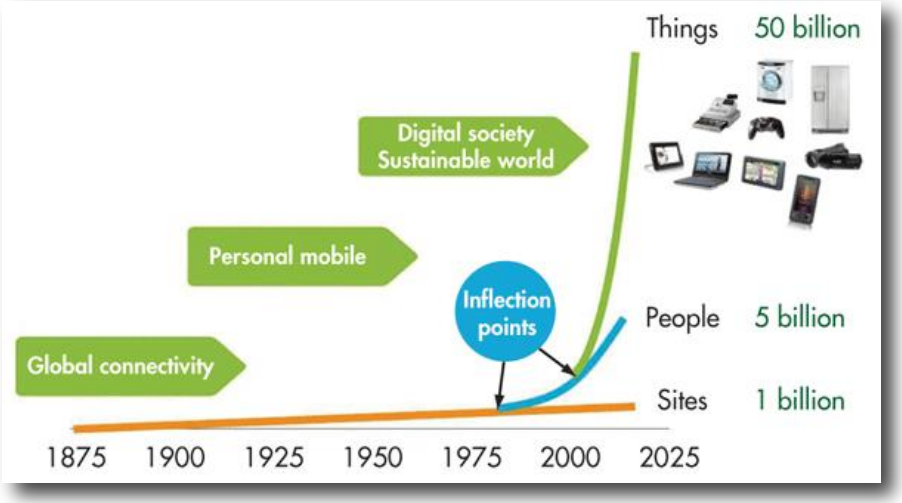
Workshop "Aan de slag met sensoren"

Uitleg & mogelijkheden: IOT & The Things Network

Internet of things



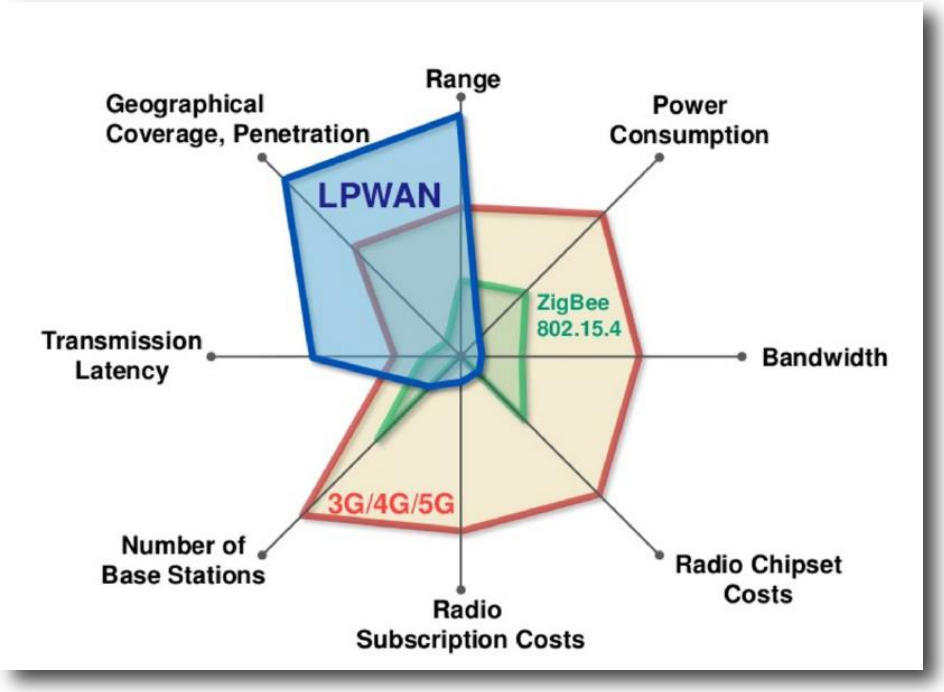


Workshop "Aan de slag met sensoren"

Uitleg & mogelijkheden: IOT & The Things Network

Waarom LoRaWAN en wat is de relatie met andere telemetrie technieken

Key Features	Attribute/Benefit
157dB to 168dB link budget	Long range
>15 km range	
Minimal infrastructure	Ease of deployment
Concentrator with capacity	
>10 yrs battery lifetime	Long battery life
RX - 10 mA, sleep <200 nA	
Unlicensed spectrum	Low cost
Low infrastructure cost	
Low end-node cost	



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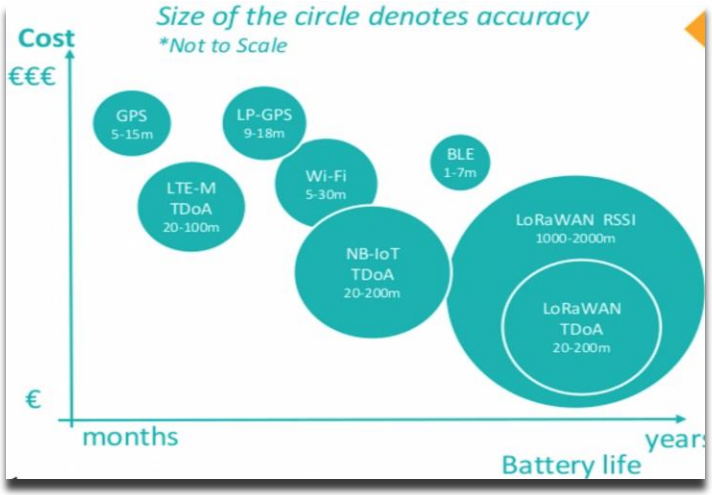
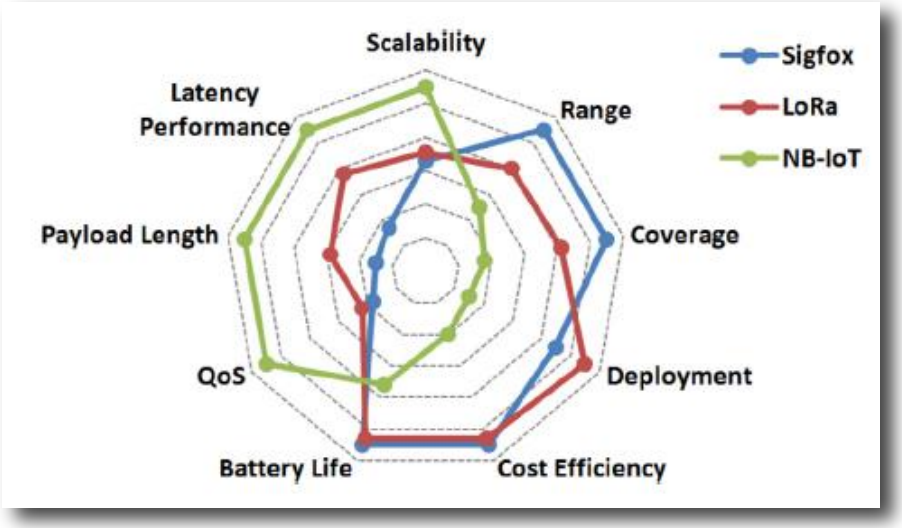
Waarom LoRaWAN en wat is de relatie met andere telemetrie technieken

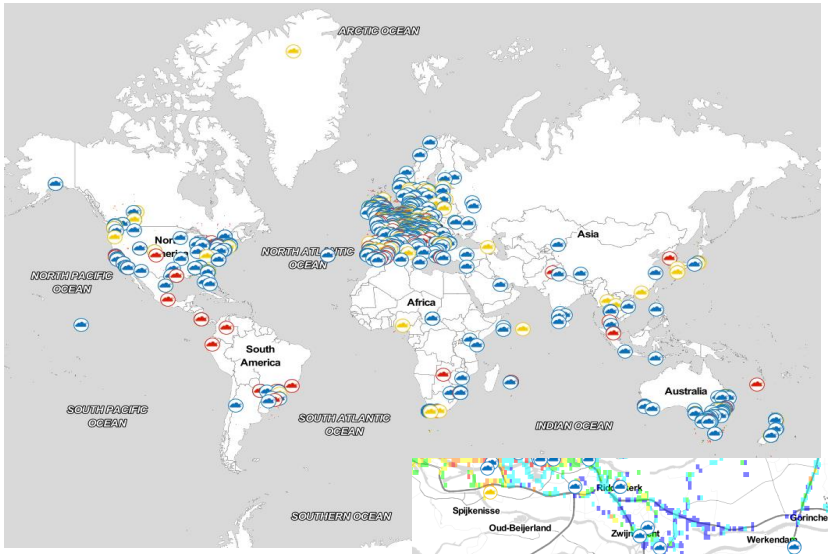


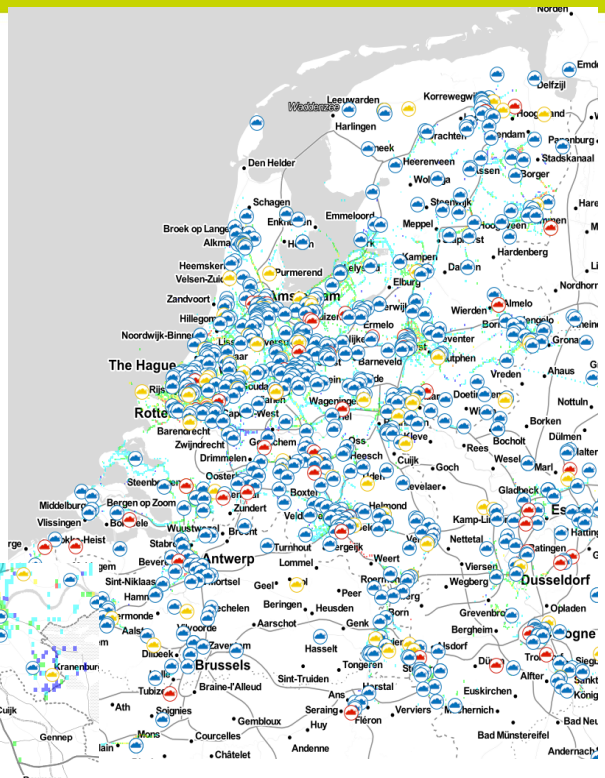


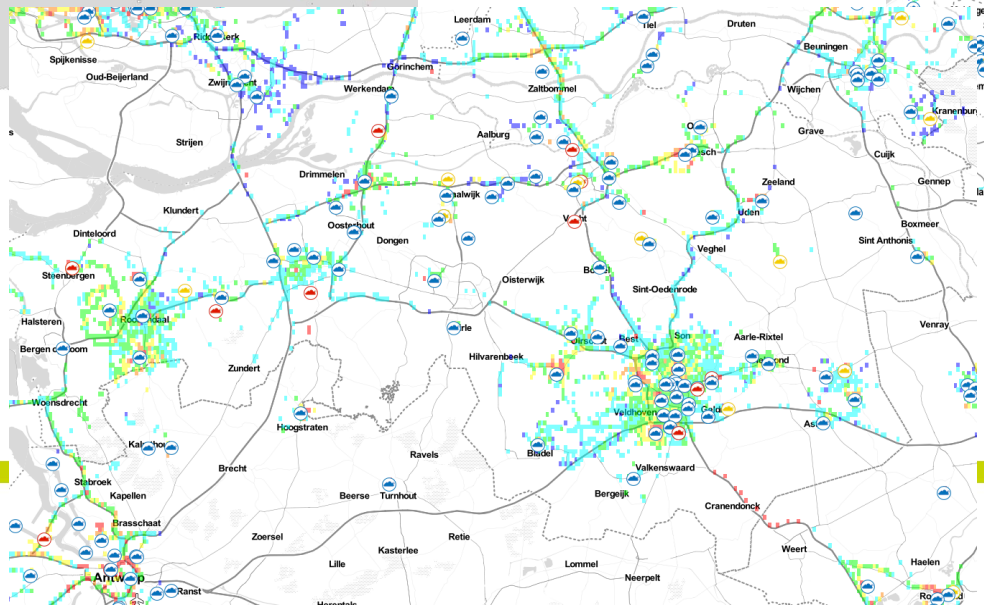
	Spectrum cost	Deployment cost	End-device cost
Sigfox	Free	>4000€/base station	<2€
LoRa	Free	>100€/gateway >1000€/base station	3–5€
NB-IoT	>500 M€ /MHz	>15 000€/base station	>20€

Workshop “Aan de slag met sensoren”

Uitleg & mogelijkheden: IOT & The Things Network

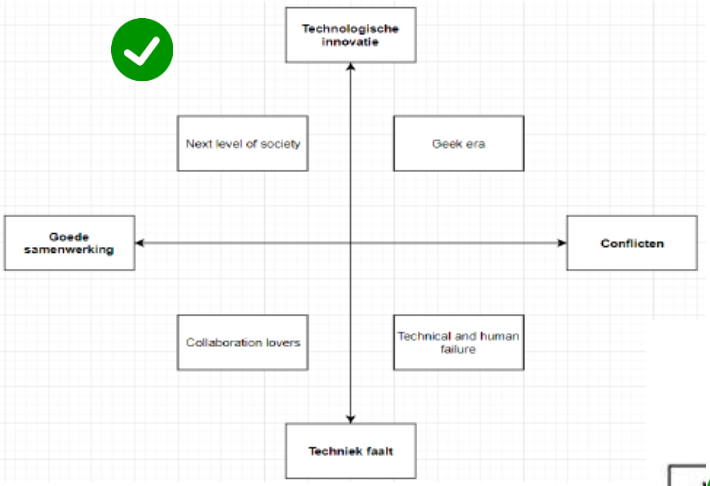


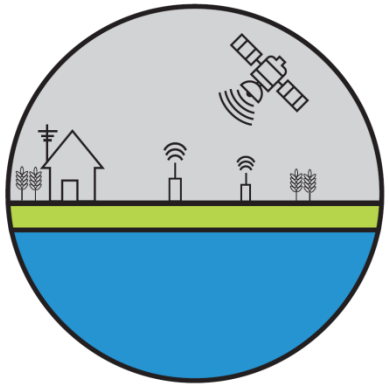


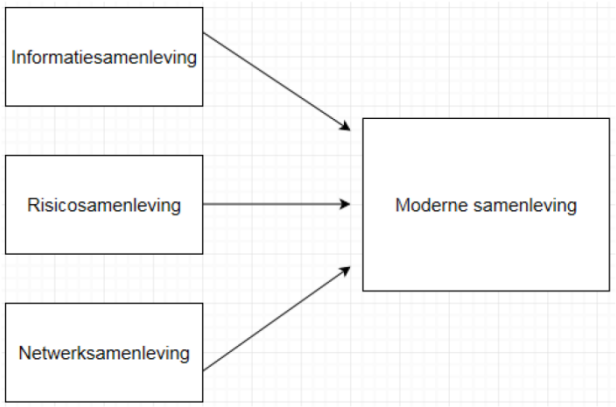


Workshop "Aan de slag met sensoren"

Waterschap in 2069







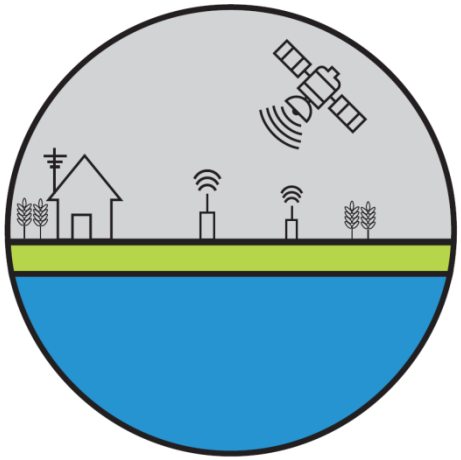
Managing Complex Change

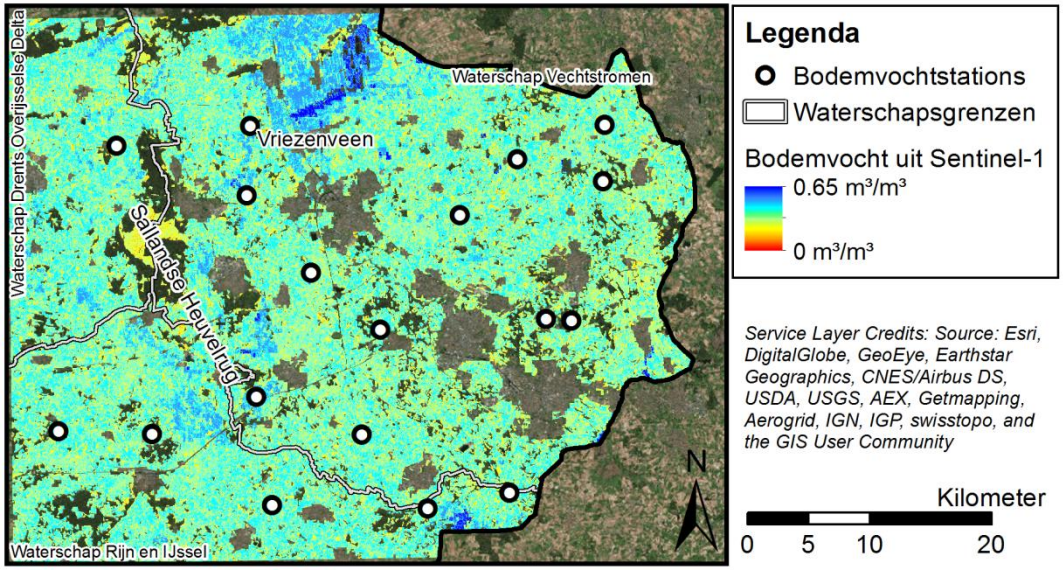
✓	+ ✓	+ ✓	+ ✓	+ ✓	= Change
■	+ Skills	+ Incentives	+ Resources	+ Action Plan	= Confusion
Vision	+ ■	+ Incentives	+ Resources	+ Action Plan	= Anxiety
Vision	+ Skills	+ ■	+ Resources	+ Action Plan	= Resistance
Vision	+ Skills	+ Incentives	+ ■	+ Action Plan	= Frustration
Vision	+ Skills	+ Incentives	+ Resources	+ ■	= False Starts

Workshop "Aan de slag met sensoren"

Waterschap in 2069

Ambtenaar 3.0 ➔ Ambteburger 18.0
Opensource: "So 2030…" ➔ 2069: Waterschap is datahandelaar





Managing Complex

Vision + Skills + Incentives + Resou

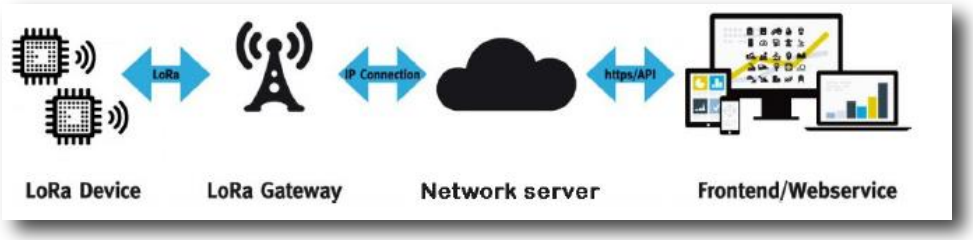
+ Skills + Incentives + Resou

Workshop “Aan de slag met sensoren”

Workshop intro

Hier nog plaatjes invoegen:

- Trello
- Sensor
- PCB
- Casing



Workshop “Aan de slag met sensoren”

Inhoud

- 13:30-14:00
  - Uitleg & mogelijkheden:
    - IOT & The Things Network (mogelijkheden voor het waterschap)
    - Waterschap 2069
    - Workshop intro
- 14:00-15:00
  - Workshop “Aan de slag met sensoren”
- 15:00-15:15
  - Afsluiting – inspirerende ideeën

Workshop “Aan de slag met sensoren”

Workshop “Aan de slag met sensoren”

```
// LoRaWAN NwkSKey, network session key

static u1_t NWKSKEY[16] = { .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .., 0x77, 0x1C, 0xC3, 0x7C, 0x5D, 0xED, 0x43, 0x6C };

// LoRaWAN AppSKey, application session key
// This is the default Semtech key, which is used by the early prototype TTN
// network.
static u1_t APPSKEY[16] = { .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .., 0xB4, 0xB7, 0x31, 0xE8, 0x60, 0x38, 0x82, 0x8D };

// LoRaWAN end-device address (DevAddr)
static u4_t DEVADDR = 0x........ ; // <-- Change this address for every node!
```

HiGrowOTAAtestv0.2 | Arduino 1.8.8 (Windows Store 1.8.19.0)

Bestand Bewerken Schets Hulpmiddelen Help

HiGrowOTAAtestv0.2 §

```
// lora keys

// This EUI must be
// first. When copyi
// the bytes. For TT
// 0x70.
static const u1_t PR
void os_getArtEui (u

// This should also
static const u1_t PR
```

Automatische opmaak Ctrl+T
Sla schets op
Codering herstellen en opnieuw laden
Bibliotheken beheren... Ctrl+Shift+I
Seriële monitor Ctrl+Shift+M
Seriële Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "ESP32 Dev Module"
Upload Speed: "921600"
CPU Frequency: "240MHz (WiFi/BT)"
Flash Frequency: "80MHz"
Flash Mode: "QIO"
Flash Size: "4MB (32Mb)"
...cheme: "Standaard"
...g Level: "Geen"
...Disabled"
...M3"
...d Info
...er: "AVRISP mkII"
...r branden

```
static osjob_t sendjob;

// Schedule TX every this many seconds (might become longer due
// cycle limitations).
const unsigned TX_INTERVAL = 60;

// Pin mapping for HiGrow
const lmic_pinmap lmic_pins = {
    .nss = 5,
    .rxtx = LMIC_UNUSED_PIN,
    .rst = 4,
    .dio = {2, 13, 15}
```

...t-byte

Board Beheer...

Arduino Leonardo
Arduino Leonardo ETH
Arduino/Genuino Micro
Arduino Esplora
Arduino Mini
Arduino Ethernet
Arduino Fio
Arduino BT
LilyPad Arduino USB
LilyPad Arduino
Arduino Pro or Pro Mini
Arduino NG or older
Arduino Robot Control
Arduino Robot Motor
Arduino Gemma
Adafruit Circuit Playground
Arduino Yún Mini
Arduino Industrial 101
Linino One
Arduino Uno WiFi

ESP32 Arduino
ESP32 Dev Module
ESP32 Wrover Module
ESP32 Pico Kit
Turta IoT Node
TTGO LoRa32-OLED V1
XinaBox CW02
SparkFun ESP32 Thing
u-blox NINA-W10 series (ESP32)
Widora AIR

Workshop “Aan de slag met sensoren”

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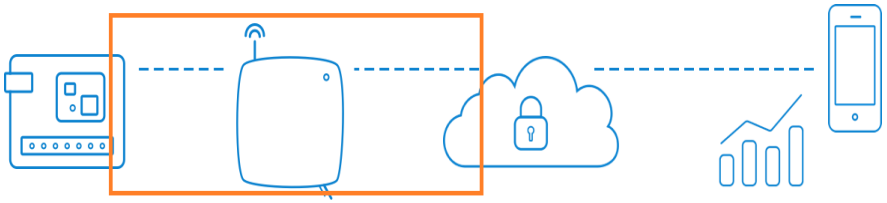

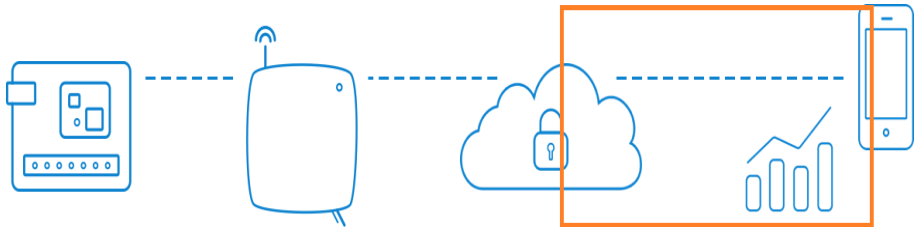

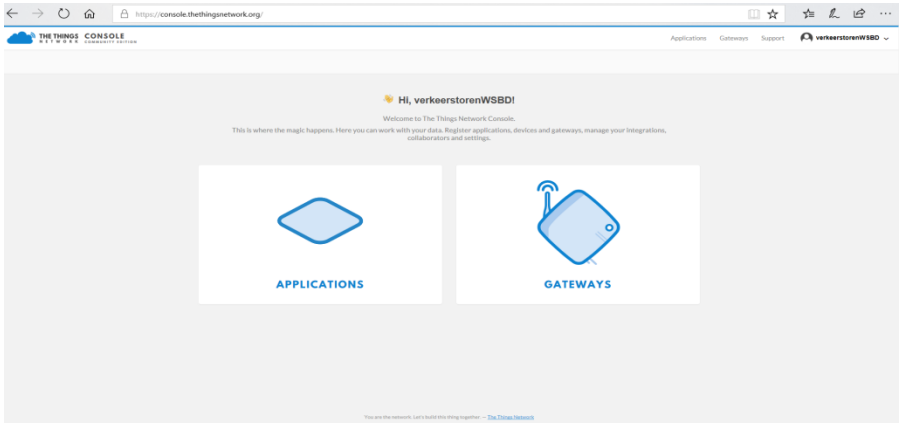

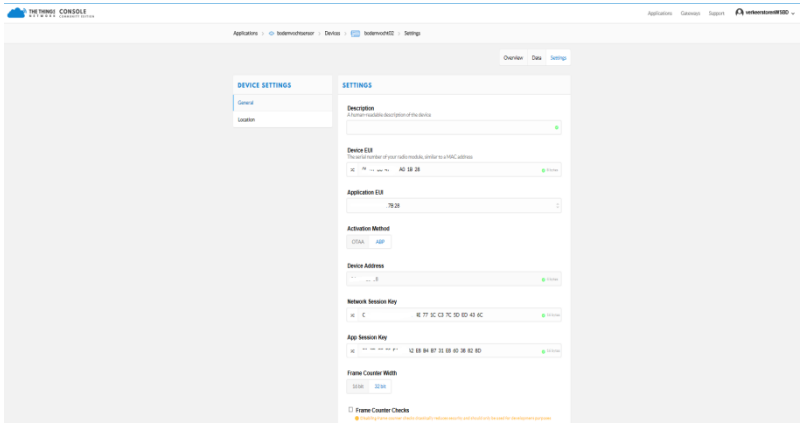

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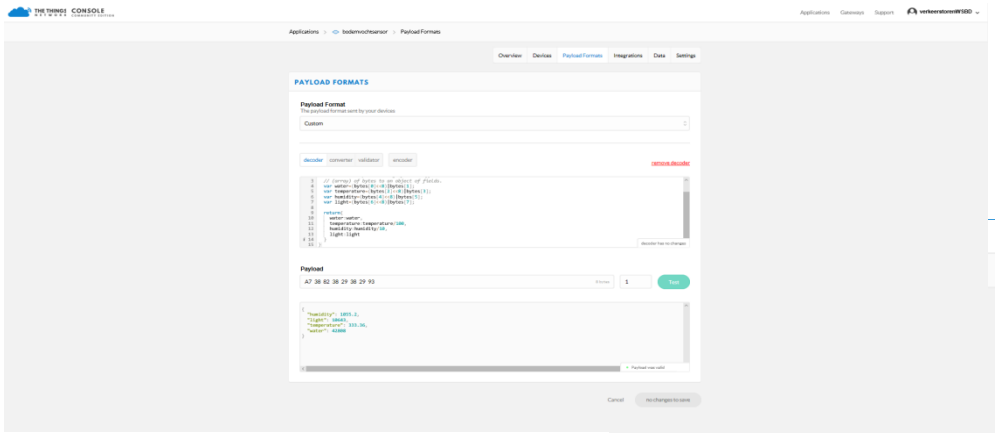

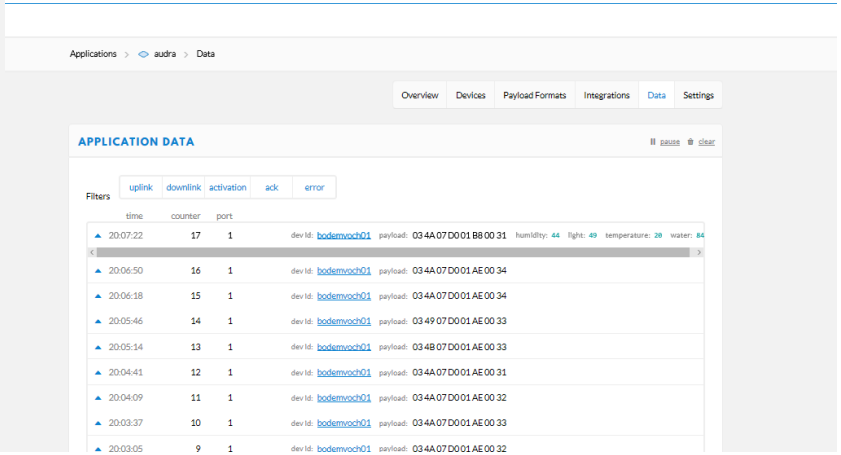

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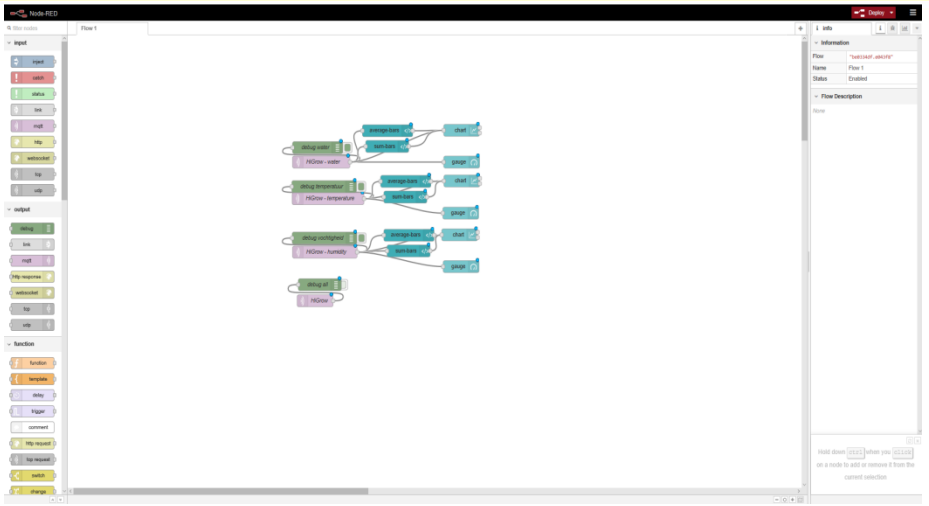

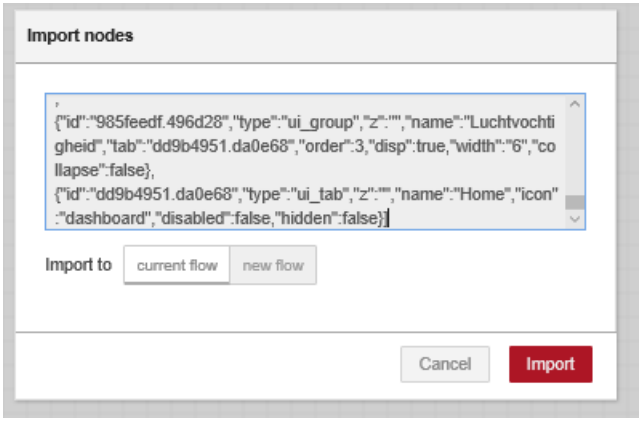

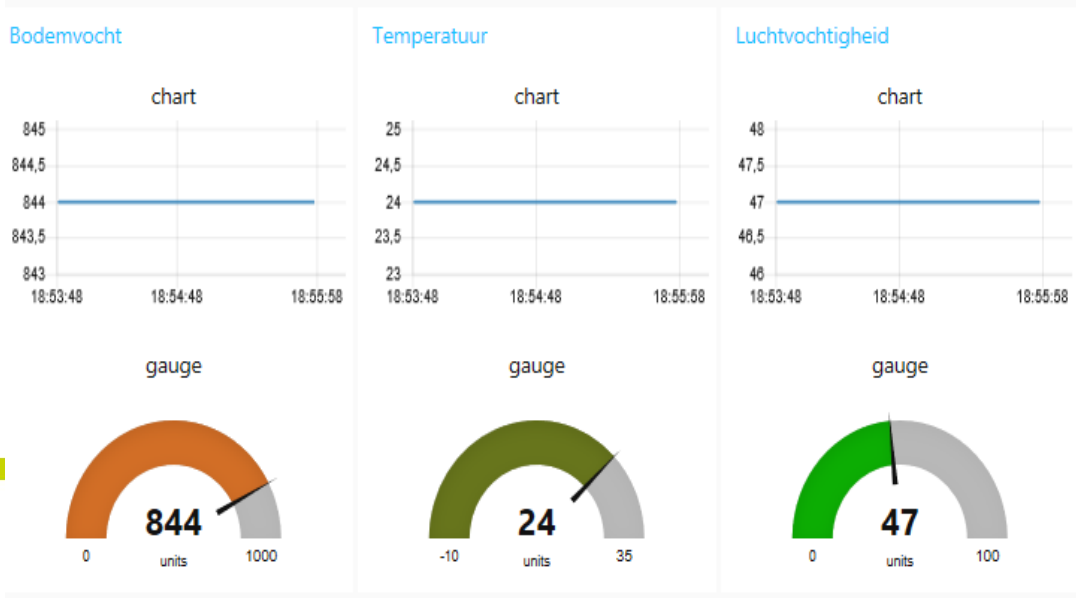

Workshop “Aan de slag met sensoren”

Workshop “Aan de slag met sensoren”

Wellicht nog “nice to have” invoegen voor COLLOS

Workshop “Aan de slag met sensoren”

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Workshop "Aan de slag met sensoren"

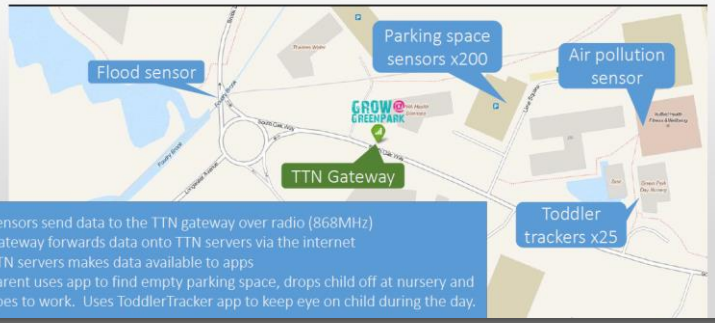
Afsluiting & inspirerende ideeën?!

Applicaties

Smart Parking

Smart Metering

For example



1. Sensors send data to the TTN gateway over radio (868MHz)
2. Gateway forwards data onto TTN servers via the internet
3. TTN servers makes data available to apps
4. Parent uses app to find empty parking space, drops child off at nursery and goes to work. Uses ToddlerTracker app to keep eye on child during the day.

Workshop “Aan de slag met sensoren”

Credits

- **Presentatie & ontwerp:** **Roger & Wouter**
- **Ontwerp PCB:** **Mark & Roger**
- **Code & debug:** **Rob & Roger**
- **Installatie voorbereiding:** **Toine & Roger**
- **Infograph:** **Mariozee**
- **Casing?:** **Mark?**
- **Testers:** **Wouter, Mark, Jarno, Linda, Rob, Audra , XXX**