

TTN in Practice

Credits:

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ICTP smr3188 workshop

Marco Zennaro, PhD
ICTP



The Things Network

THE THINGS NETWORK

A **global** community, building **open source** software and hardware to operate a **crowd-sourced IoT network**.

TheThingsNetwork is known as TTN



3^*10

LORAWAN

3 * 10

10 km range

10 USD/node

10 years battery life

LoRaWAN

LORA

RANGE

Yes No

Up to 15km

LOW POWER CONSUMPTION

Yes No

Devices can last months / years
on a battery

THOUSANDS OF DEVICES

Yes No

Can be connected per gateway

UNLICENSED SPECTRUM

Yes No

868MHz (EU) 915MHz (US)

BANDWIDTH

Yes No

Max 50kb/s

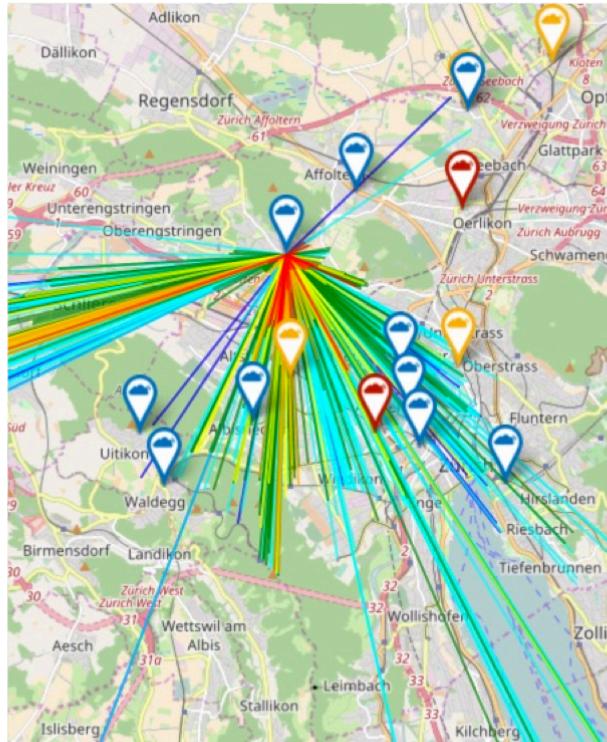


LoRaWAN

LONG RANGE

2km - 5km in urban setting

40km+ in rural setting



TTN's mission

Our mission is to build a
DECENTRALIZED,

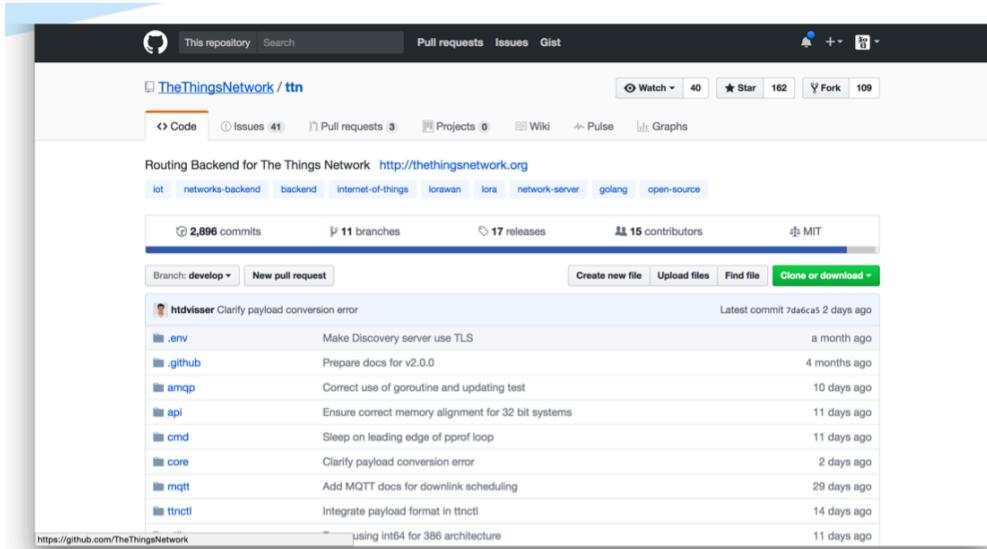
OPEN and **CROWDSOURCED**

INTERNET OF THINGS data network

OWNED and **OPERATED** by its **USERS**



TTN is Open Source



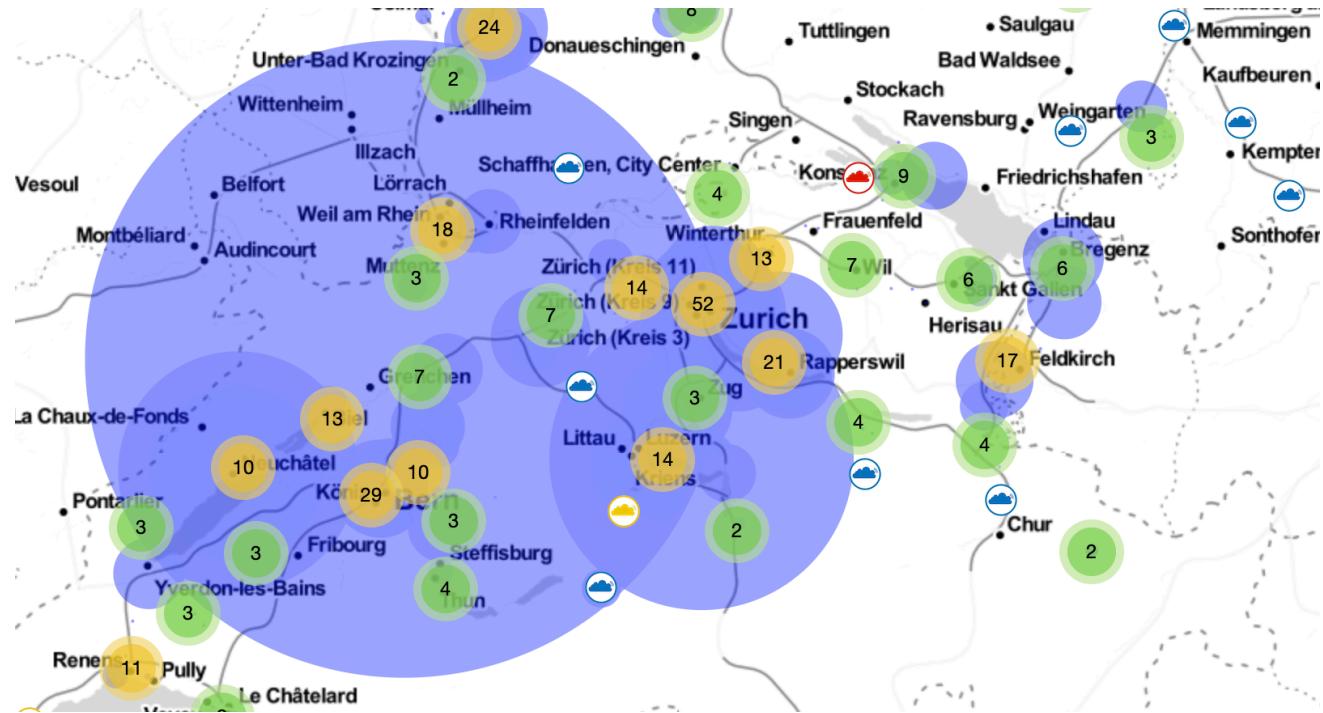
OPEN SOURCE BACKEND

TTN Communities



Over 300 communities in 100 countries

TTN Communities



<https://ttnmapper.org>

TTN: devices, gateways, servers

HOW DOES THIS WORK?



DEVICES

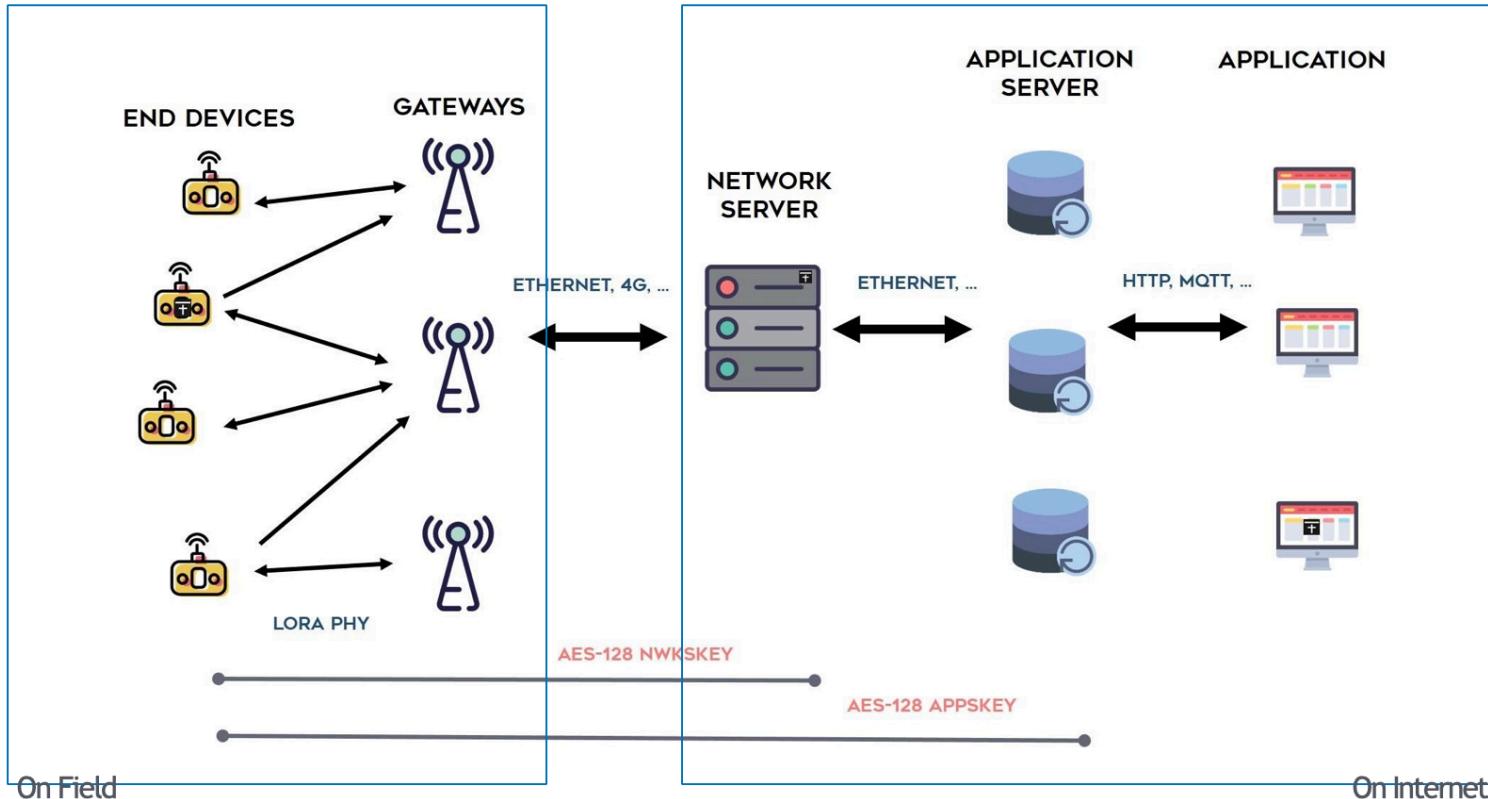
GATEWAYS

NETWORK
SERVER

APPLICATION
SERVER



LoRaWAN architecture



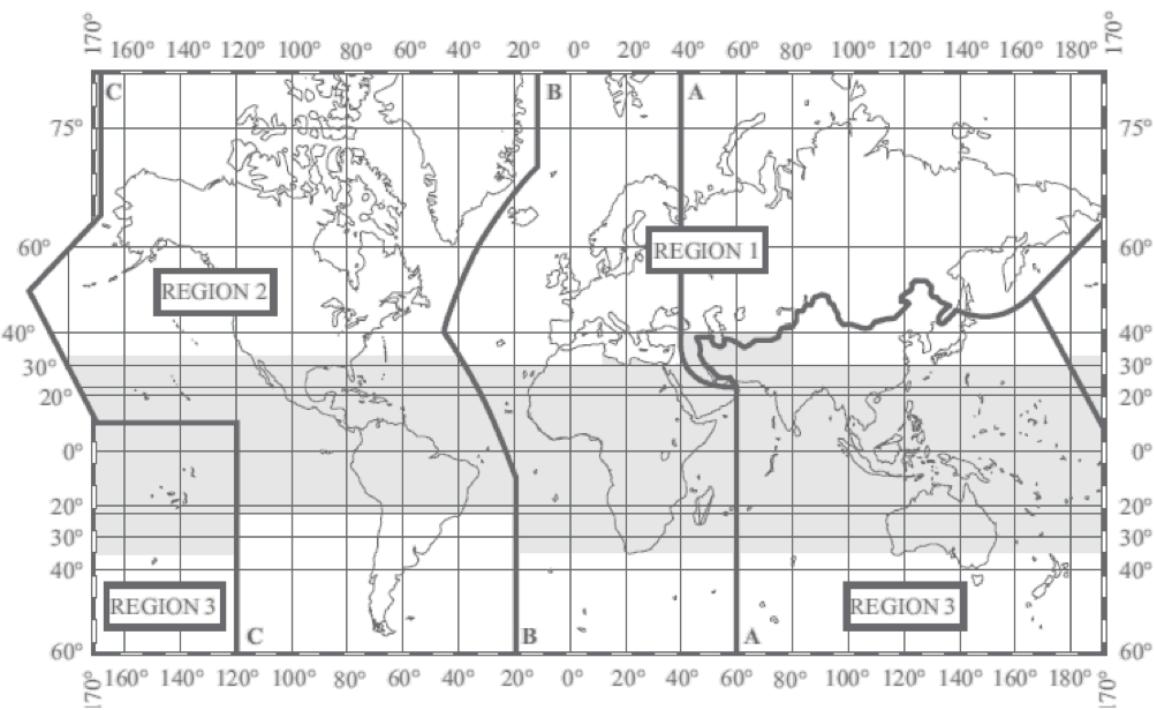
Gateways

Gateways

- Gateways are **packet forwarders**
- They “forward” LoRaWAN packets to TCP/IP using WiFi/Ethernet/Cellular
- They operate on different frequency bands, depending on the region (pay attention!)
- Once you buy/build a gateway, there is not much to do!
- You simply need to register your gateway in TTN

LoRa frequency bands

Countries	Frequency band review	Max. output power
EU	868 MHz	14 dBm
USA	915 MHz	20 dBm
Korea	900 MHz	14 dBm
Japan	920 MHz	
Malaysia	862 to 875 MHz	20 dBm
Philippines	868 MHz	
Vietnam	920 to 925 MHz	20 dBm
India	865 to 867 MHz	
Singapore	922 MHz	20 dBm
Thailand	920 to 925 MHz	
Indonesia		20 dBm
ANZ	915 to 928 MHz	
Taiwan	920 to 925 MHz	
China	470 to 510 MHz	17 dBm



Single Channel Gateway



70 euro

RPi+board

No enclosure

Single Channel

7/8 Channels Gateway



500-1500 euro

Enclosure

8 Channels

7/8 Channels Gateway



200-300 euro

No enclosure

8 Channels

Is it working?

GATEWAY OVERVIEW

Gateway ID **eui-b827ebfffebbee2**

Description MarconiLab LoRaWAN Gateway

Owner  **marcozen** [Transfer ownership](#)

Status  **connected**

Frequency Plan Europe 868MHz

Router **ttn-router-eu**

Gateway Key  **.....**

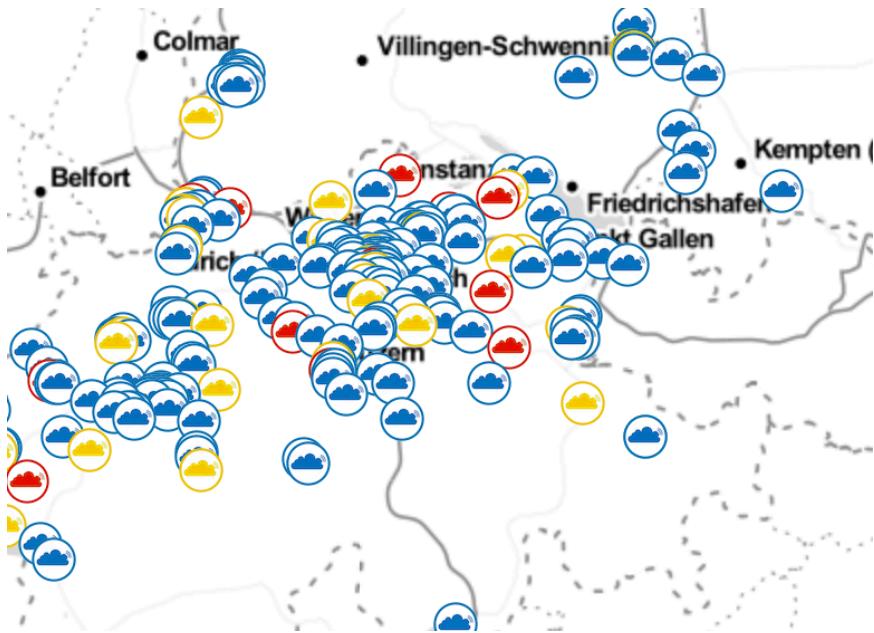
Last Seen 2 seconds ago

Received Messages 1315877

Transmitted Messages 6702

Connected!

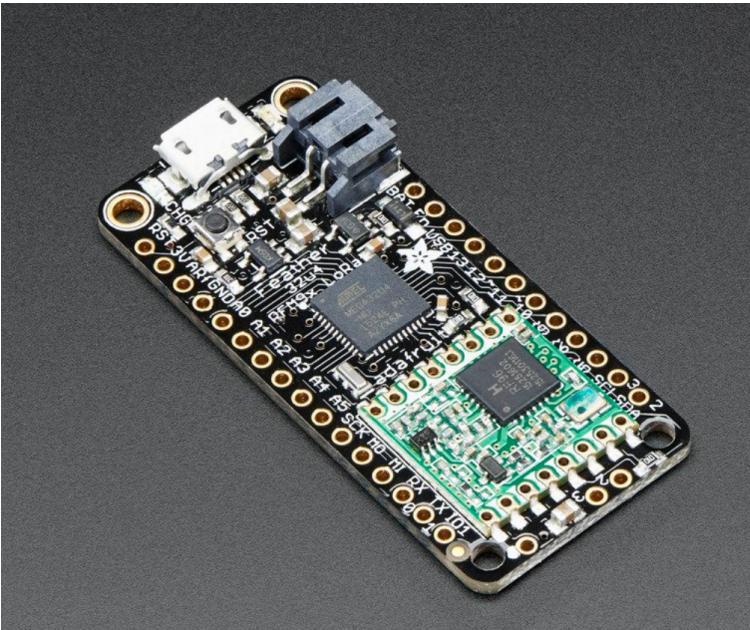
Do I need a gateway?



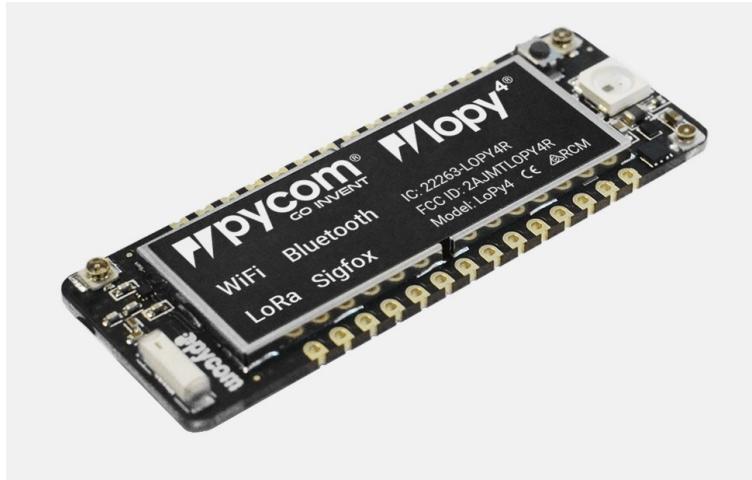
You don't need to install a Gateway to use TTN if there are gateways available in your area!

Nodes

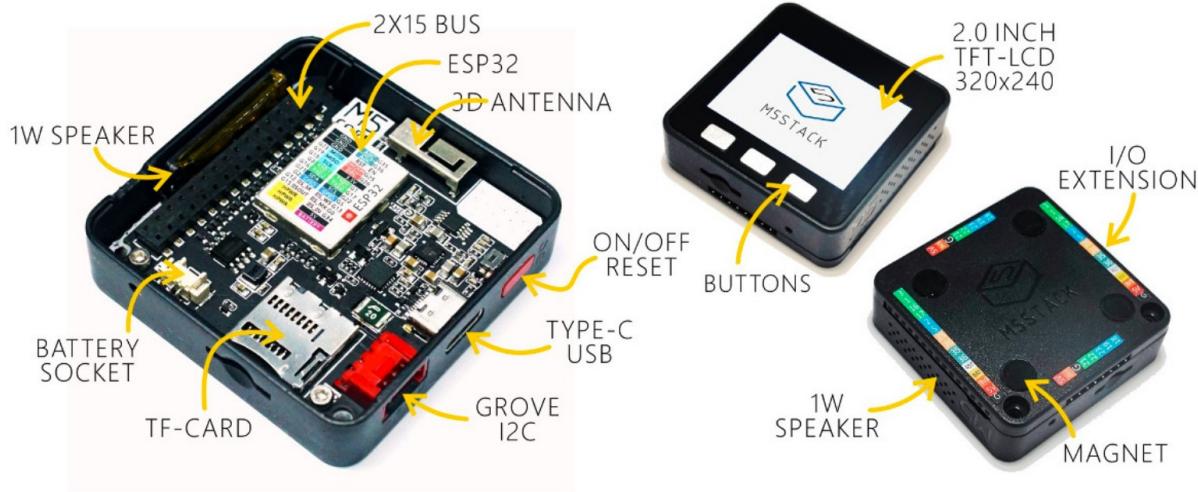
LoRaWAN nodes - Feather



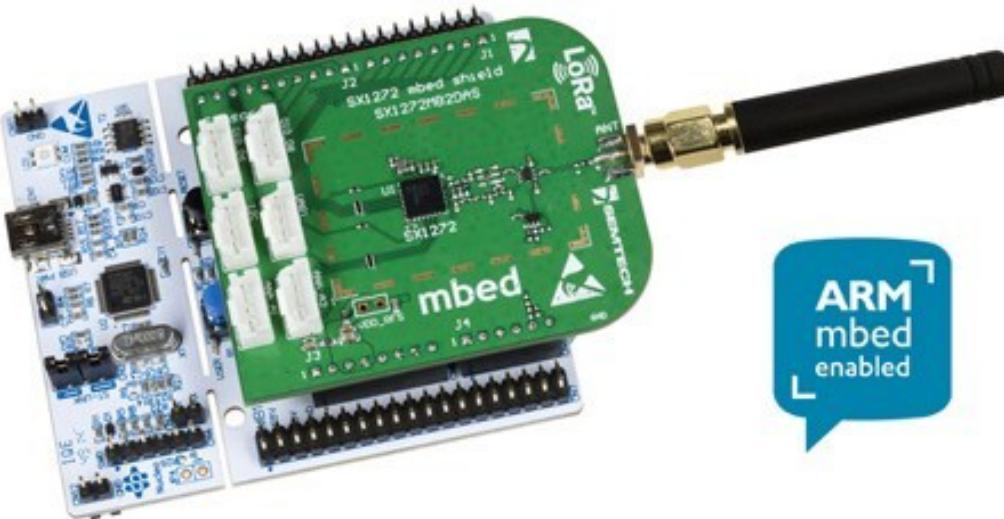
LoRaWAN nodes – Pycom Lopy



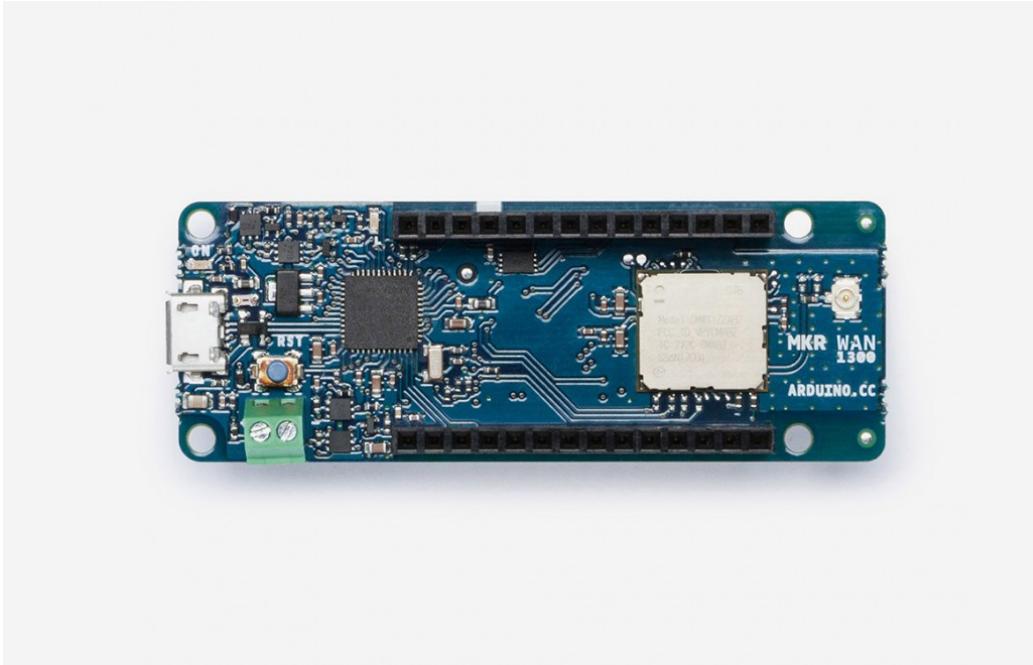
LoRaWAN nodes – m5stack



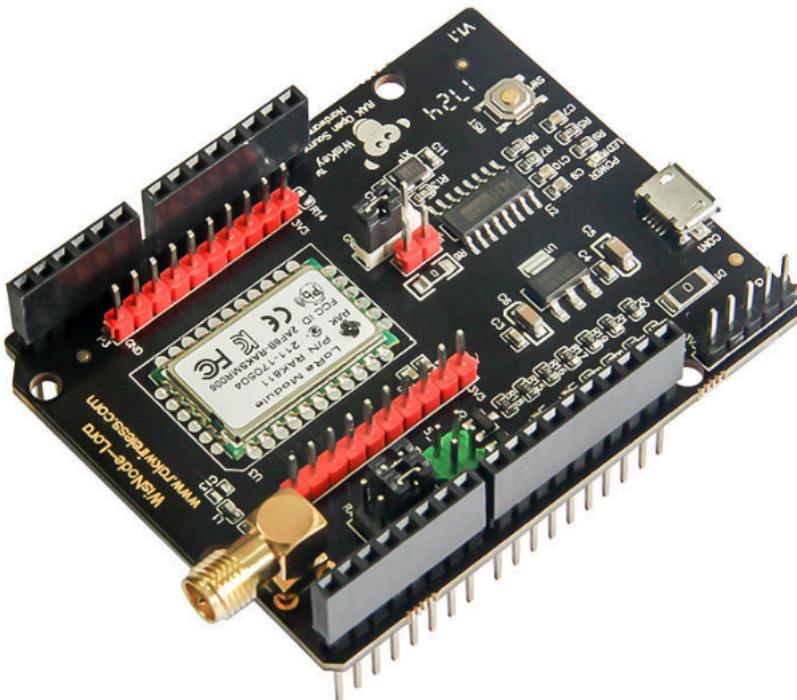
LoRaWAN nodes – ARM mbed



LoRaWAN nodes – Arduino 1300



LoRaWAN nodes – Arduino shield



LoRaWAN products



ZTEMP LORAWAN TEMPERATURE SENSOR Z01856

€ 52

LoRa temperature sensor in IP65 house with external DS18B20 sensor

1



Add to cart

Categories: industrial, LoRaWAN



LoRaWAN products



ZTAG – LORAWAN GPS TRACKER – Z01915

€ 87

zTag is a LoRaWAN GPS tracker for tracking mostly cattle and other livestock. The tracker is constantly charging itself via its solar panel.

For more info about the device, please visit zane.hu/en/iot.

Devices are available in the following frequency regions:

- EU863-870
- US902-928
- AU915-928
- IN865-867.

LoRaWAN products

A blue banner featuring the The Things Network logo on the left and the text "MARKETPLACE" and "IoT-ready products & solutions offered by The Things Industries partners." on the right. A button at the bottom says "Add your product".

**THE THINGS
NETWORK**

MARKETPLACE

IoT-ready products & solutions offered by The Things Industries partners.

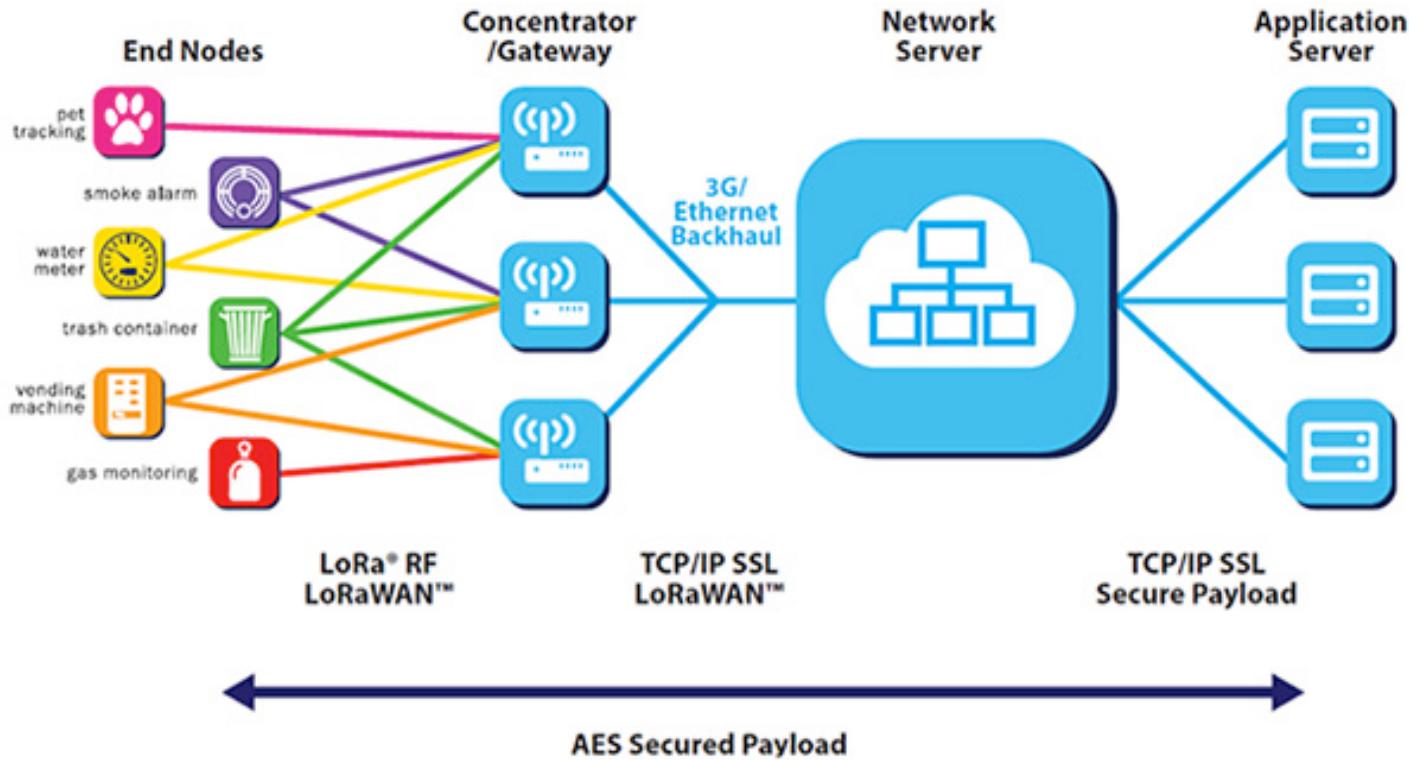
Add your product

<https://www.thethingsnetwork.org/marketplace/products/devices>

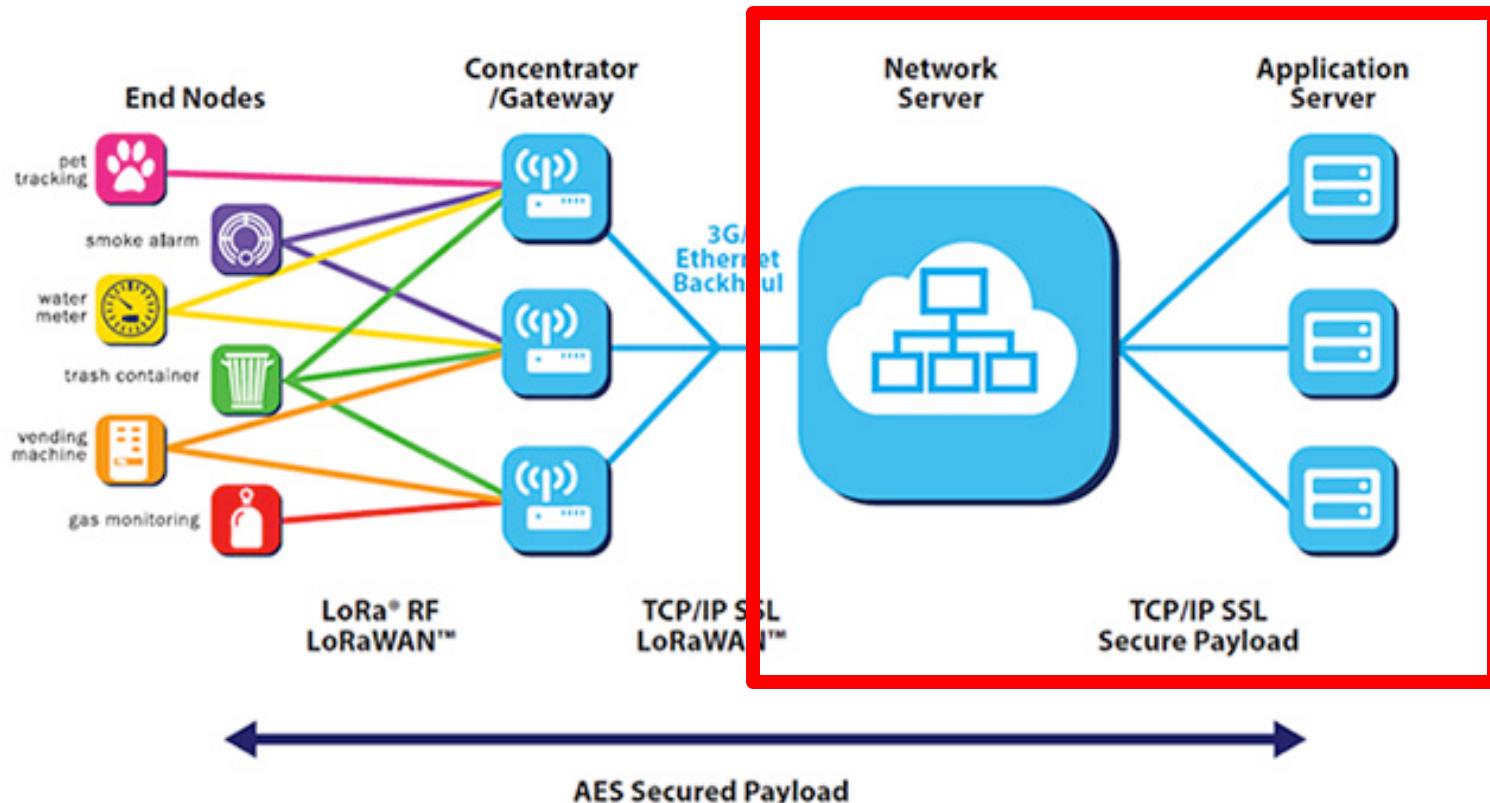


Packets

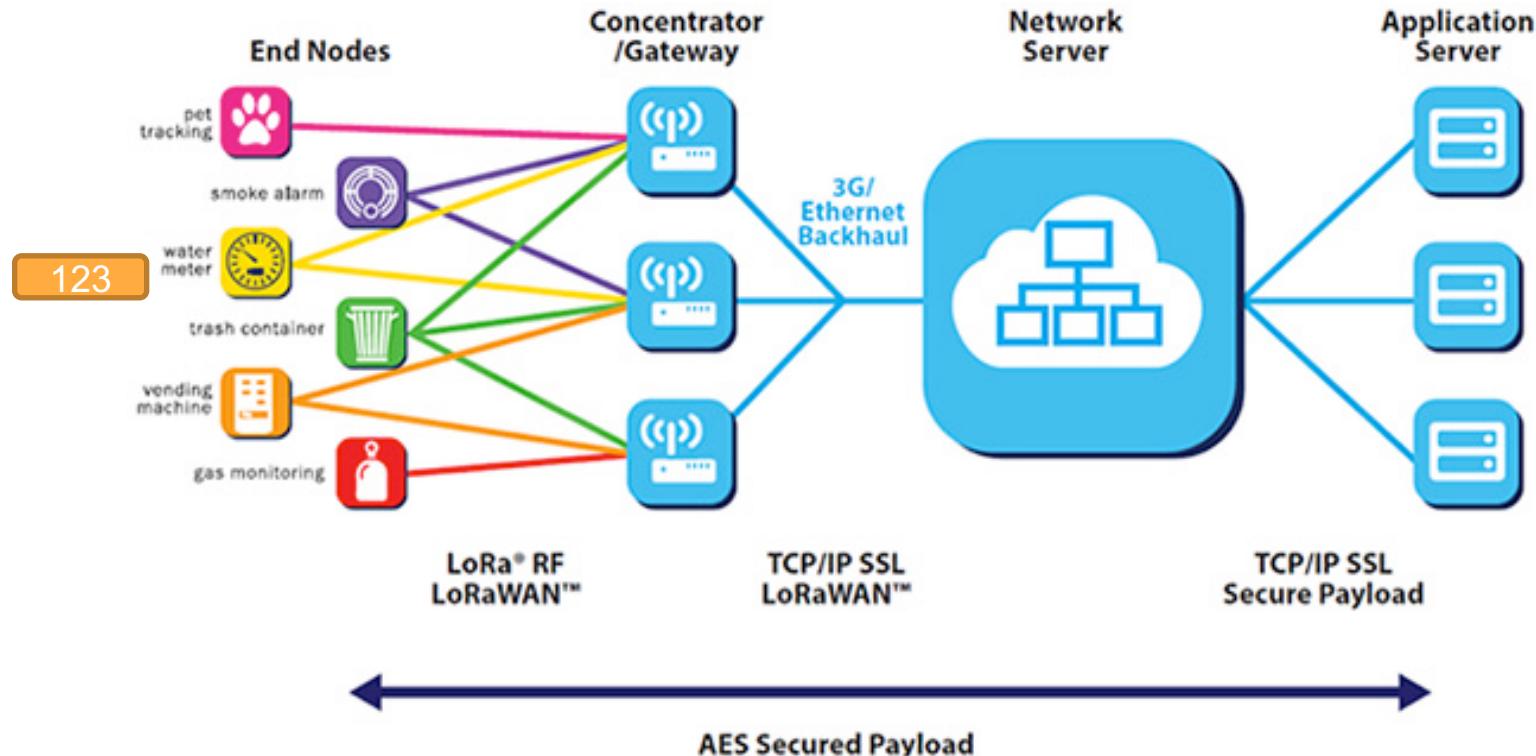
LoRaWAN architecture



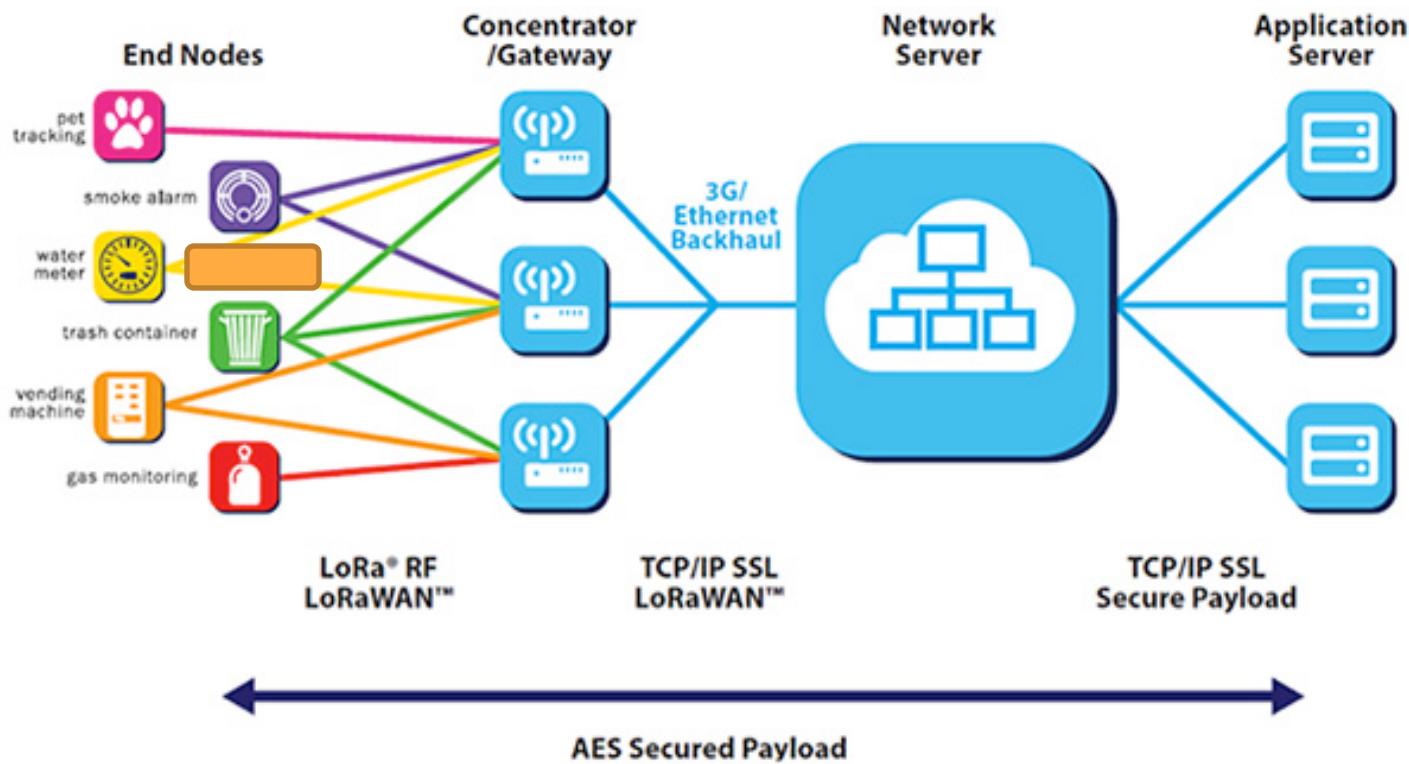
LoRaWAN architecture - TTN



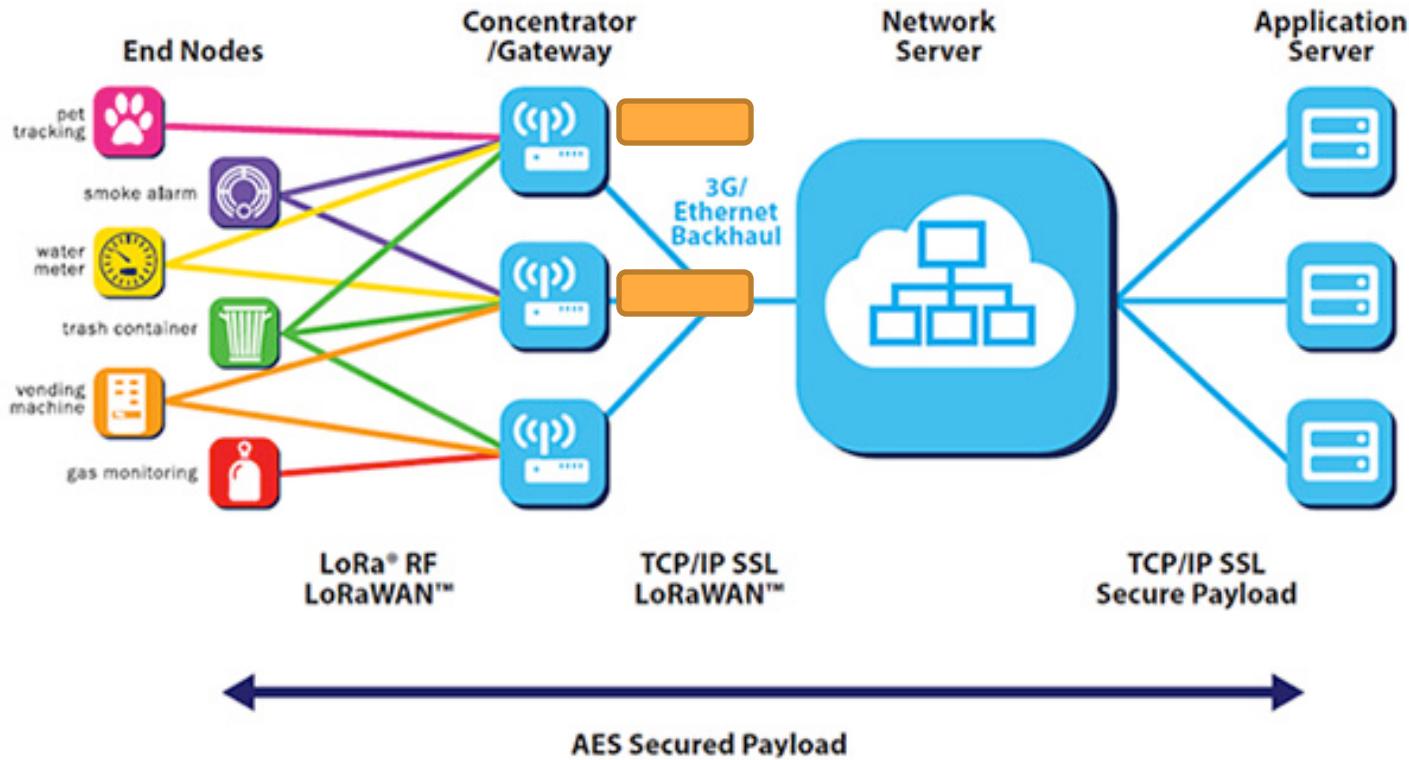
LoRaWAN architecture



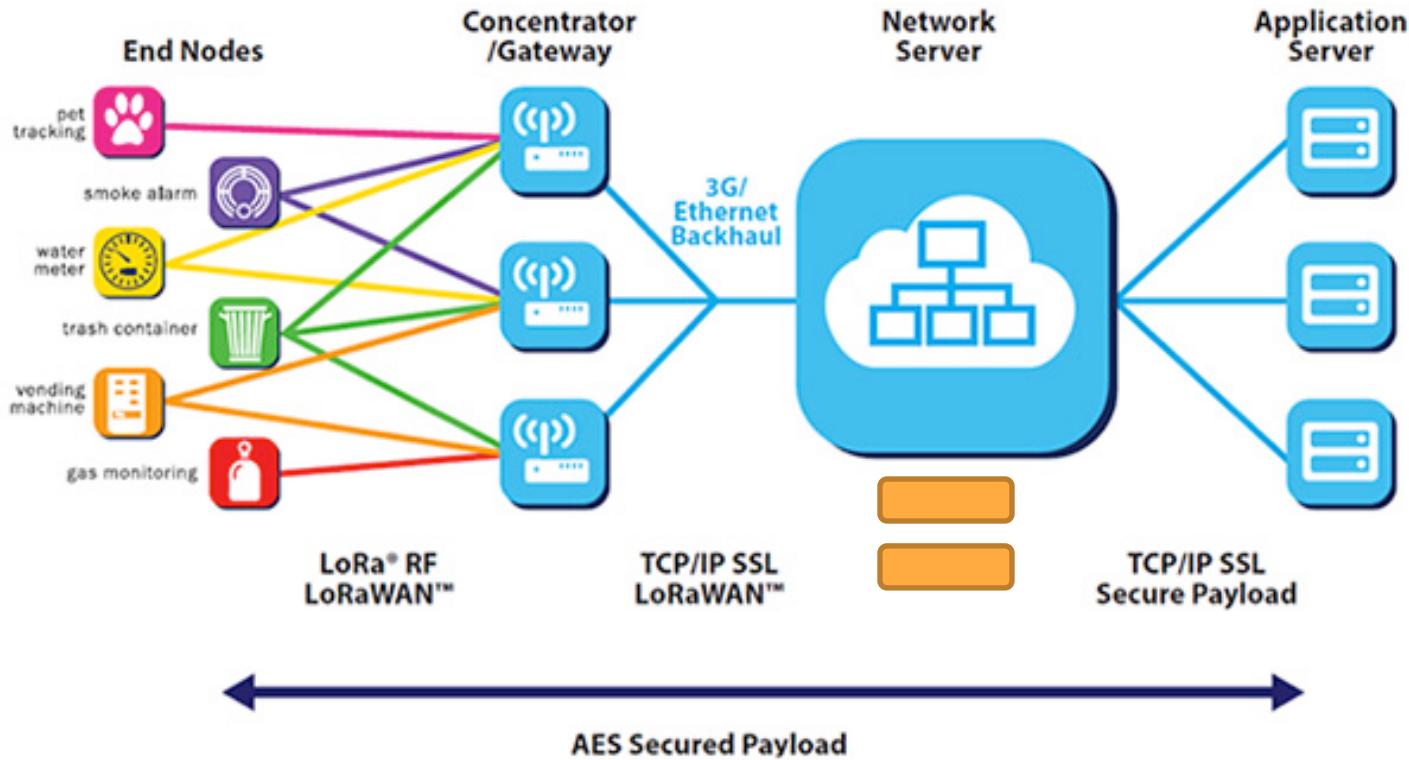
LoRaWAN architecture



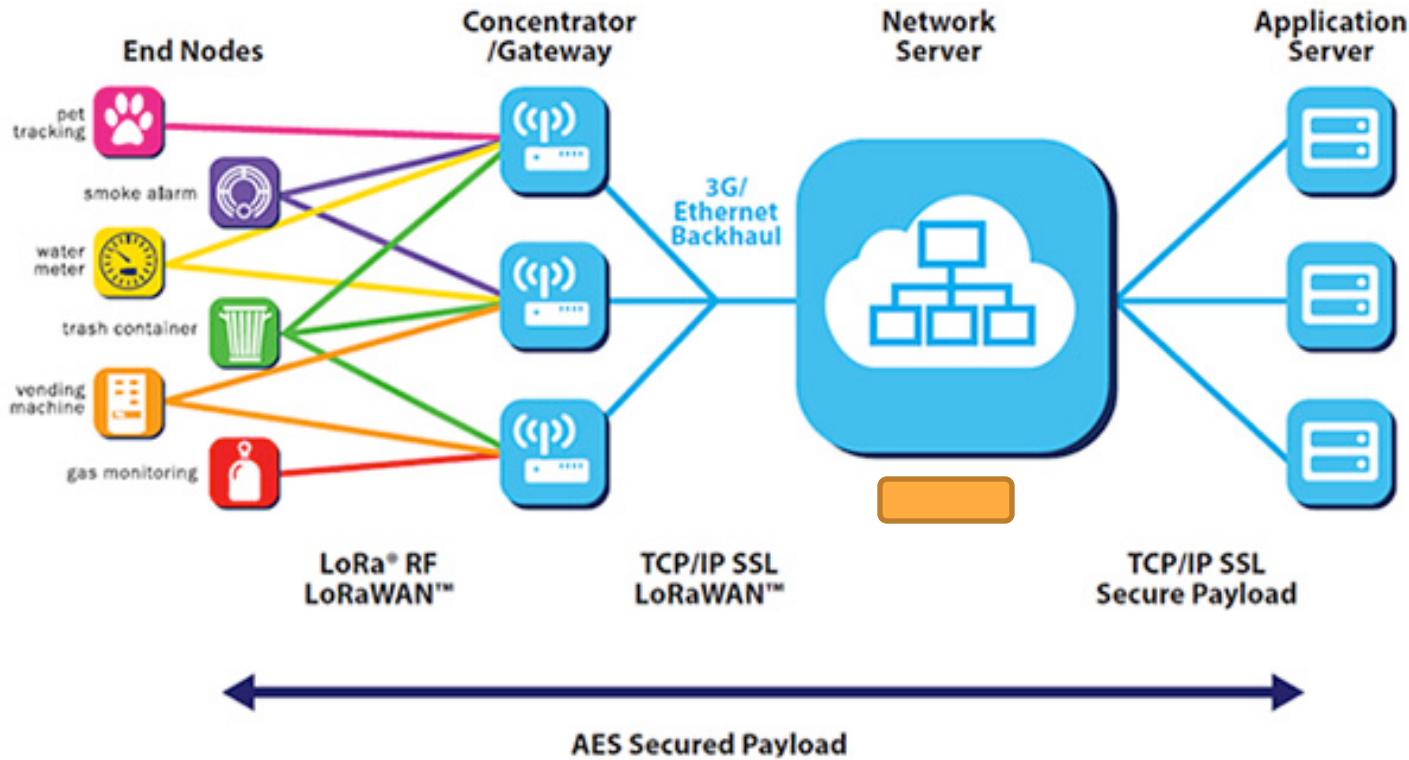
LoRaWAN architecture



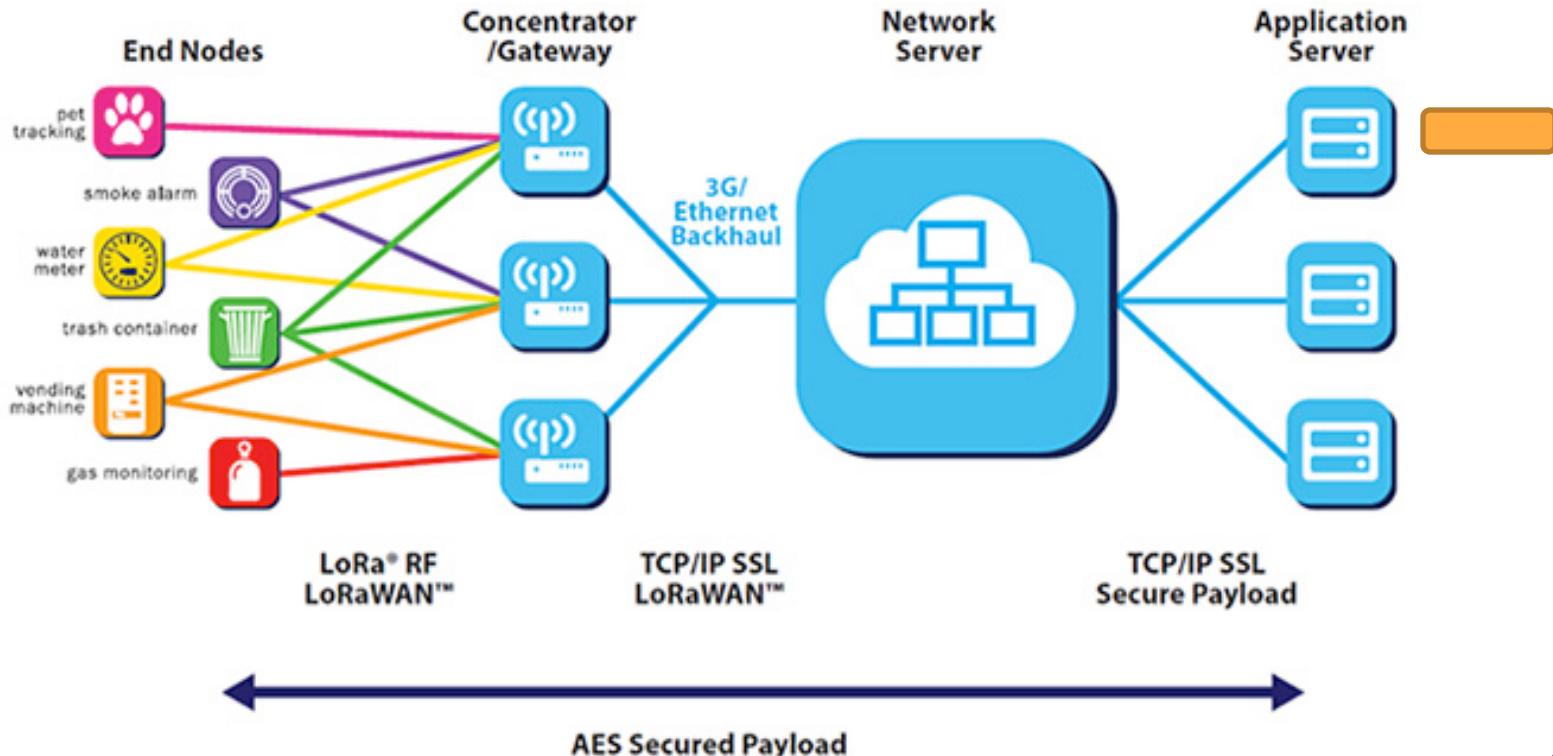
LoRaWAN architecture



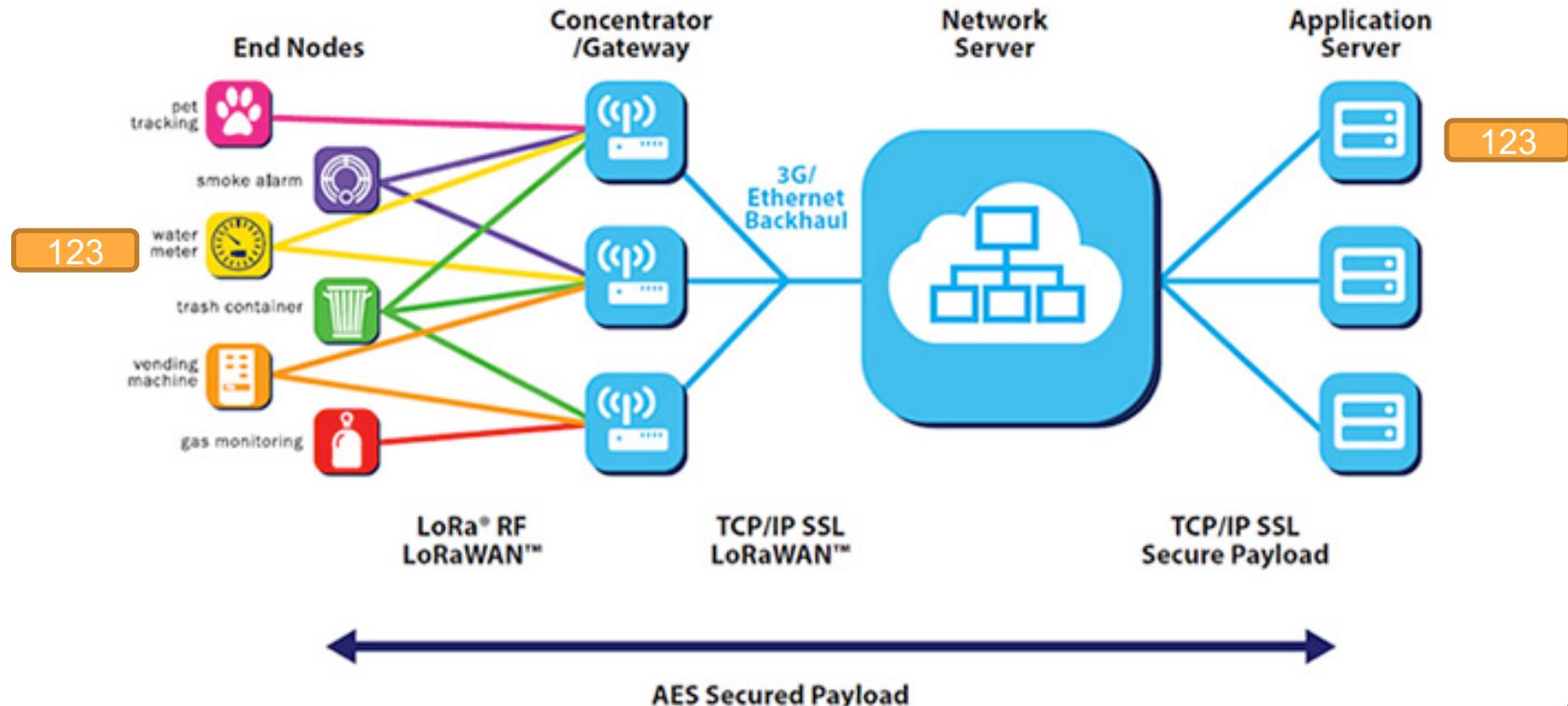
LoRaWAN architecture



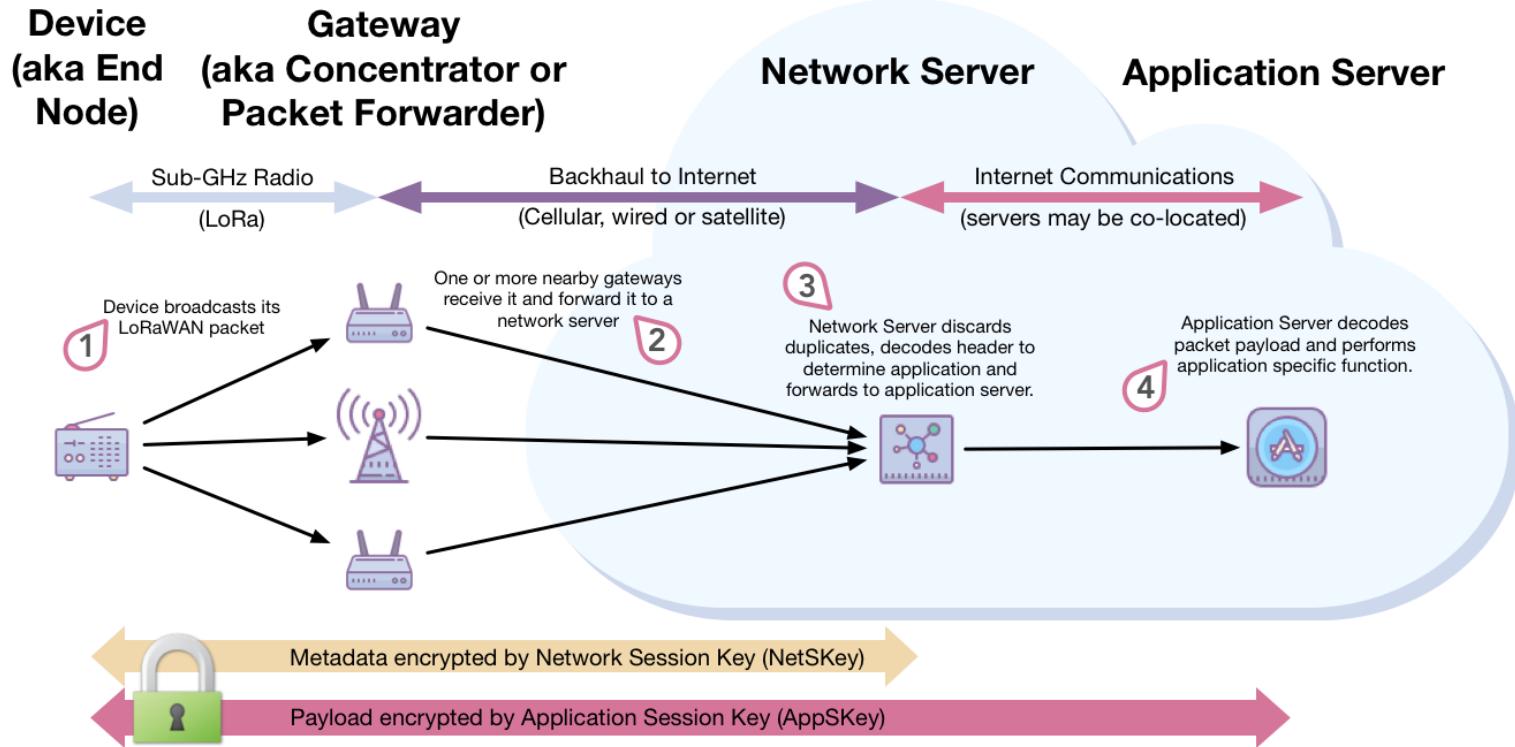
LoRaWAN architecture



LoRaWAN architecture

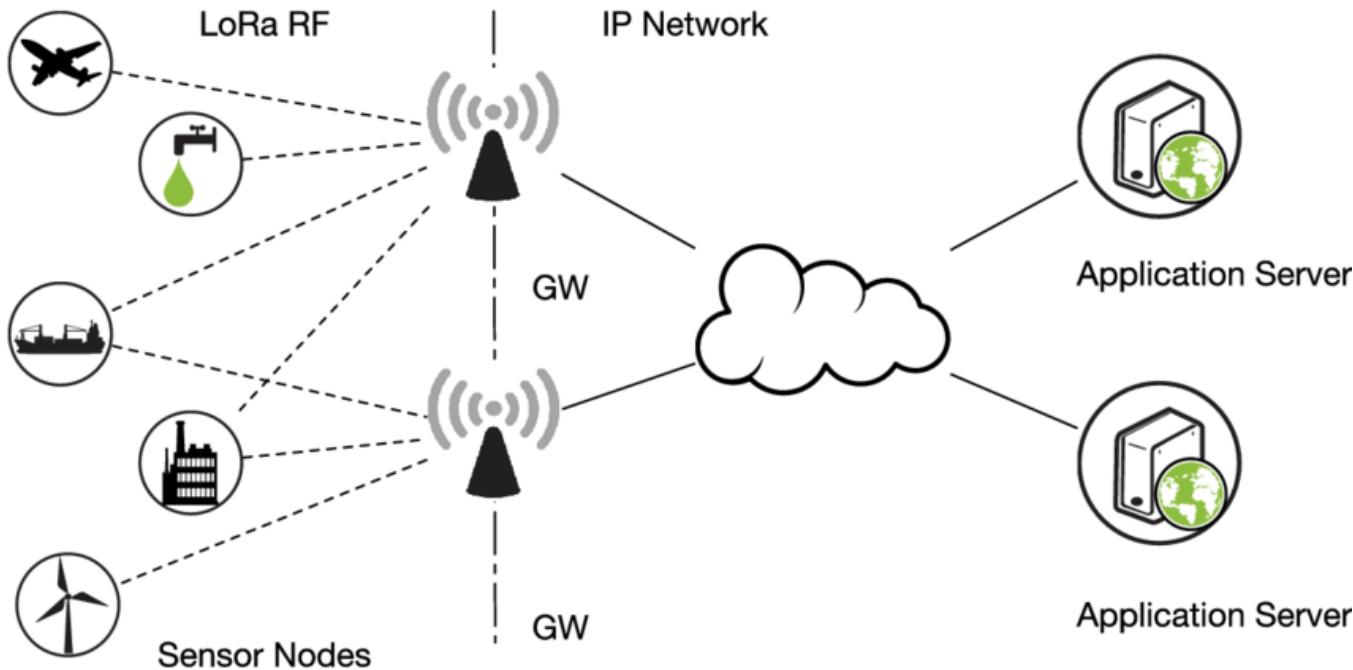


TTN: authentication

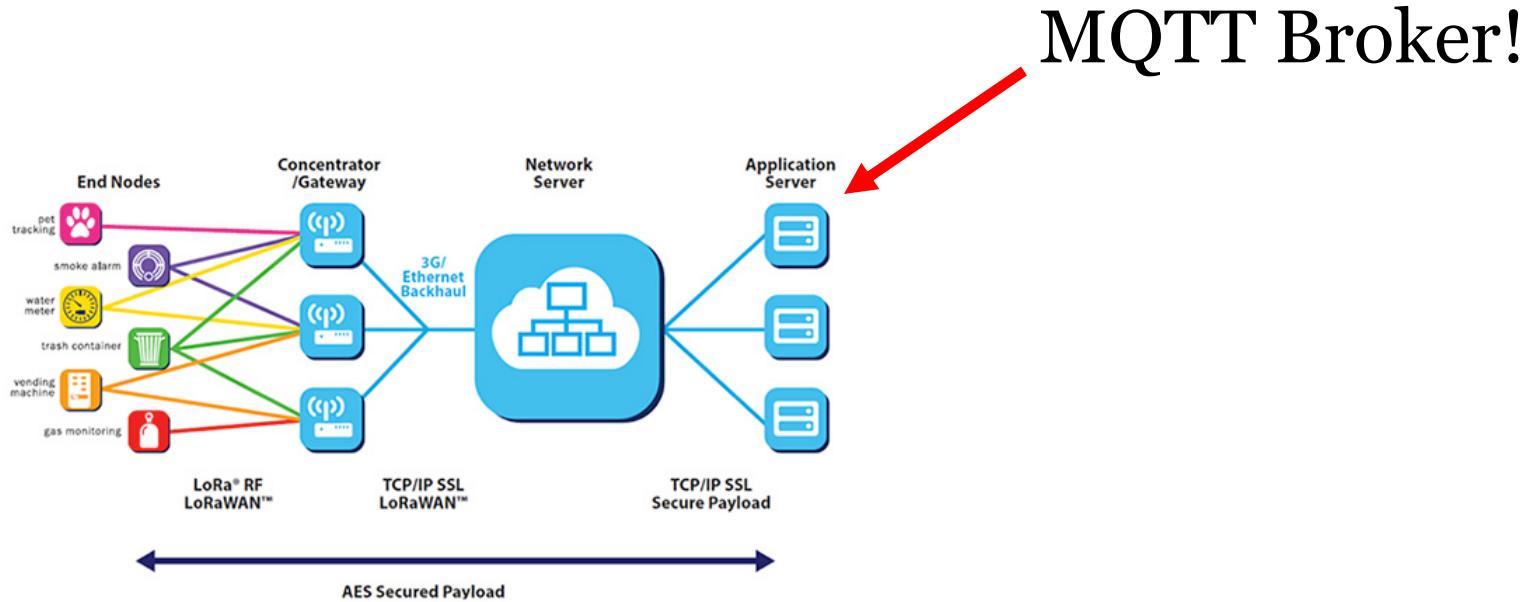


Credit: <https://www.newieventures.com.au/blogtext/2018/2/26/lorawan-otaa-or-abp>

LoRaWAN architecture



LoRaWAN architecture



Feedback?

Email mzennaro@ictp.it