

# IoT Welcomes MikroTik

**MiRO** WIRELESS IP CONVERGENCE



Wireless



Networking



VoIP



IP Video

# Hannes Willemse

Studied Electronics at the Tshwane University of Technology with Instrumentation and Control as major subjects.

ICT Facilitator at MiRO Distribution in South Africa since 2012.

During this period was or still is a certified trainer for:

MikroTik, Ubiquiti, Radwin, SIAE, Grandstream, Vivotek, Ligowave and Milestone



# What is IoT?

M2M (Machine to Machine)

Internet of Everything (Cisco Systems)

World Size Web (Bruce Schneier)

Skynet (Terminator movie)



# What is IoT?

Wikipedia - The **Internet of Things (IoT)** is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.



# What is IoT?

Let's compare to the known

Wikipedia - **Instrumentation and control engineering (ICE)** is a branch of engineering that studies the measurement and control of process variables, and the design and implementation of systems that incorporate them. Process variables include pressure, temperature, humidity, flow, pH, force and speed.



# What is IoT?

Wikipedia - **Control engineers** are responsible for the research, design, and development of control devices and systems, typically in manufacturing facilities and process plants. Control methods employ sensors to measure the output variable of the device and provide feedback to the controller so that it can make corrections toward desired performance. Automatic control manages a device without the need of human inputs for correction, such as cruise control for regulating a car's speed.



# What is IoT?

So what is the difference?

Instrumentation and Control engineering vs IoT.

The self-imposed limitation of “process/manufacturing plants” and the unavailability of the WWW as the network backbone in the good old days.

**Let's do a bit out of the box thinking**



# What is IoT?

Can a sensor measure “it” or can an actuator respond to a network command?

Yes – call it a thing.

Can the thing connect to an internet gateway via a local network

Can the thing save the measurements in the cloud or some local storage.

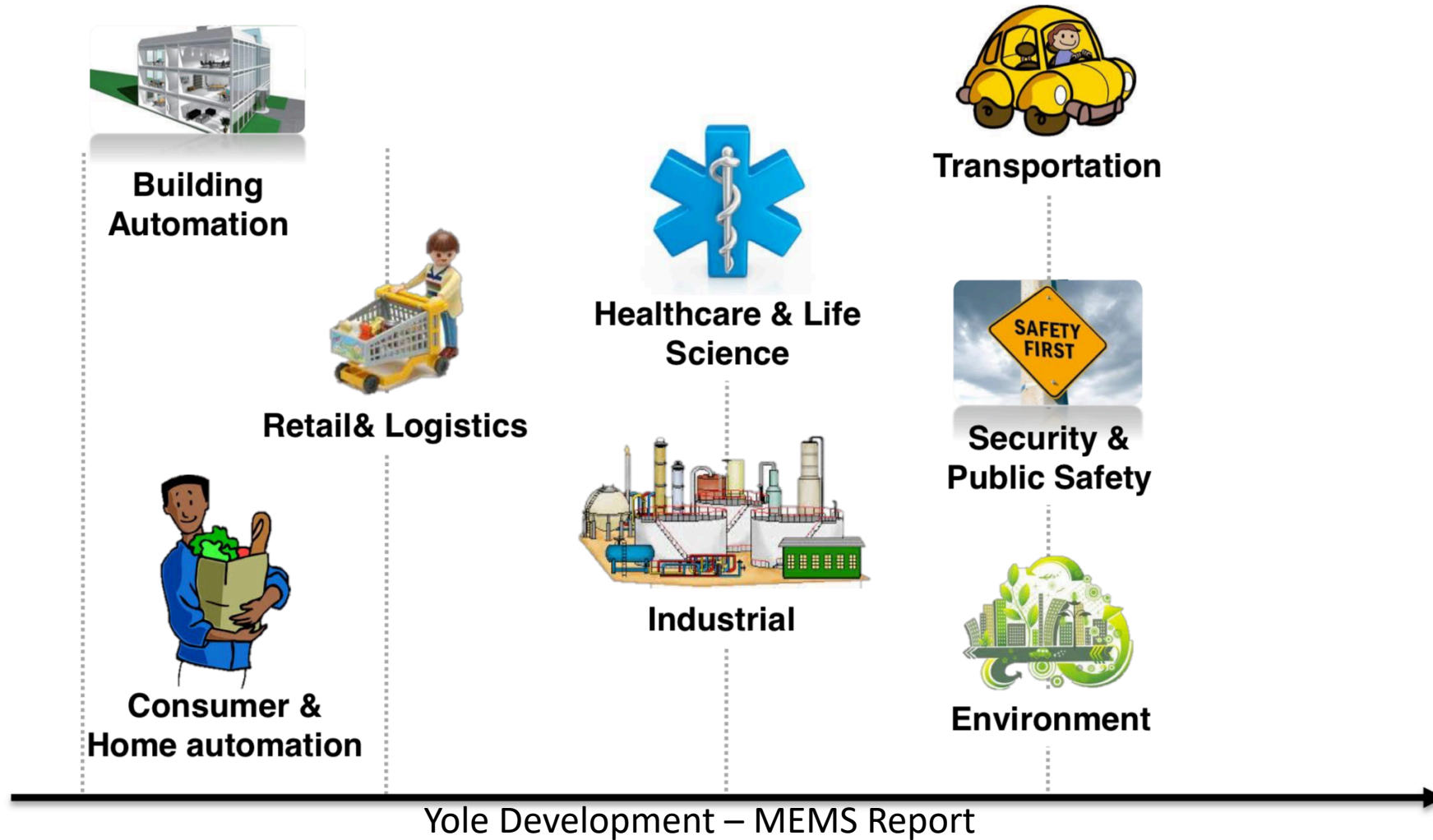
Can you analyse and respond to the measurements.

Yes, yes, yes - Call it IoT

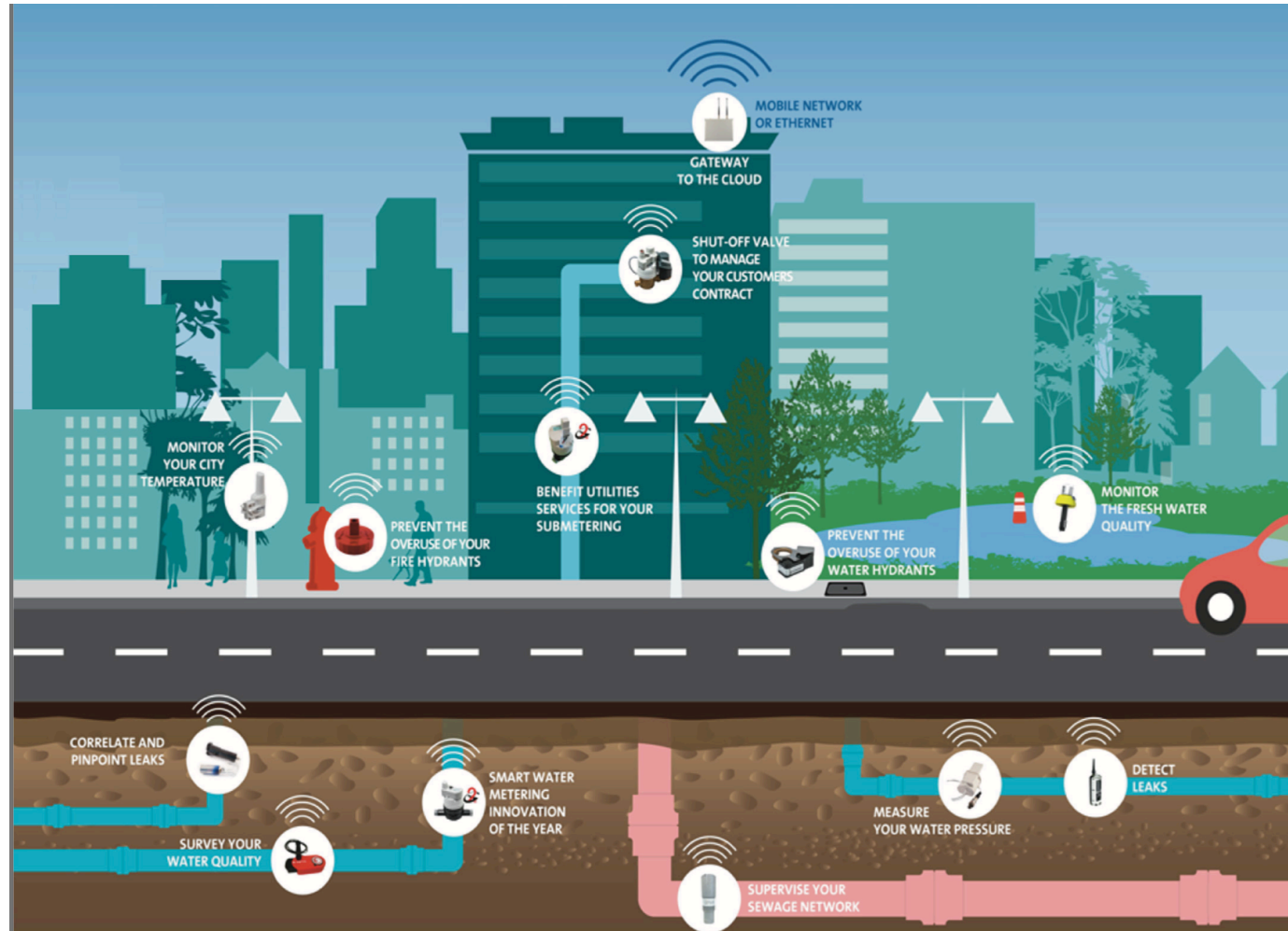




# What is IoT?



# What is IoT? (Case study [www.birdz.com](http://www.birdz.com))



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# What is IoT? (Case study [www.birdz.com](http://www.birdz.com))



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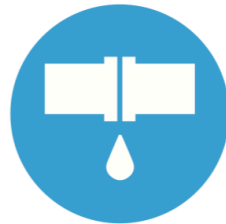
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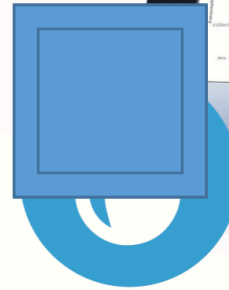
# What is IoT? (Case study [www.birdz.com](http://www.birdz.com))

## BIRDZ RESULTS



**1,200**

water leaks identified,  
located and repaired



**1 million**

cubic meters of water  
saved annually



**8%**

increase in water  
network efficiency



Wireless



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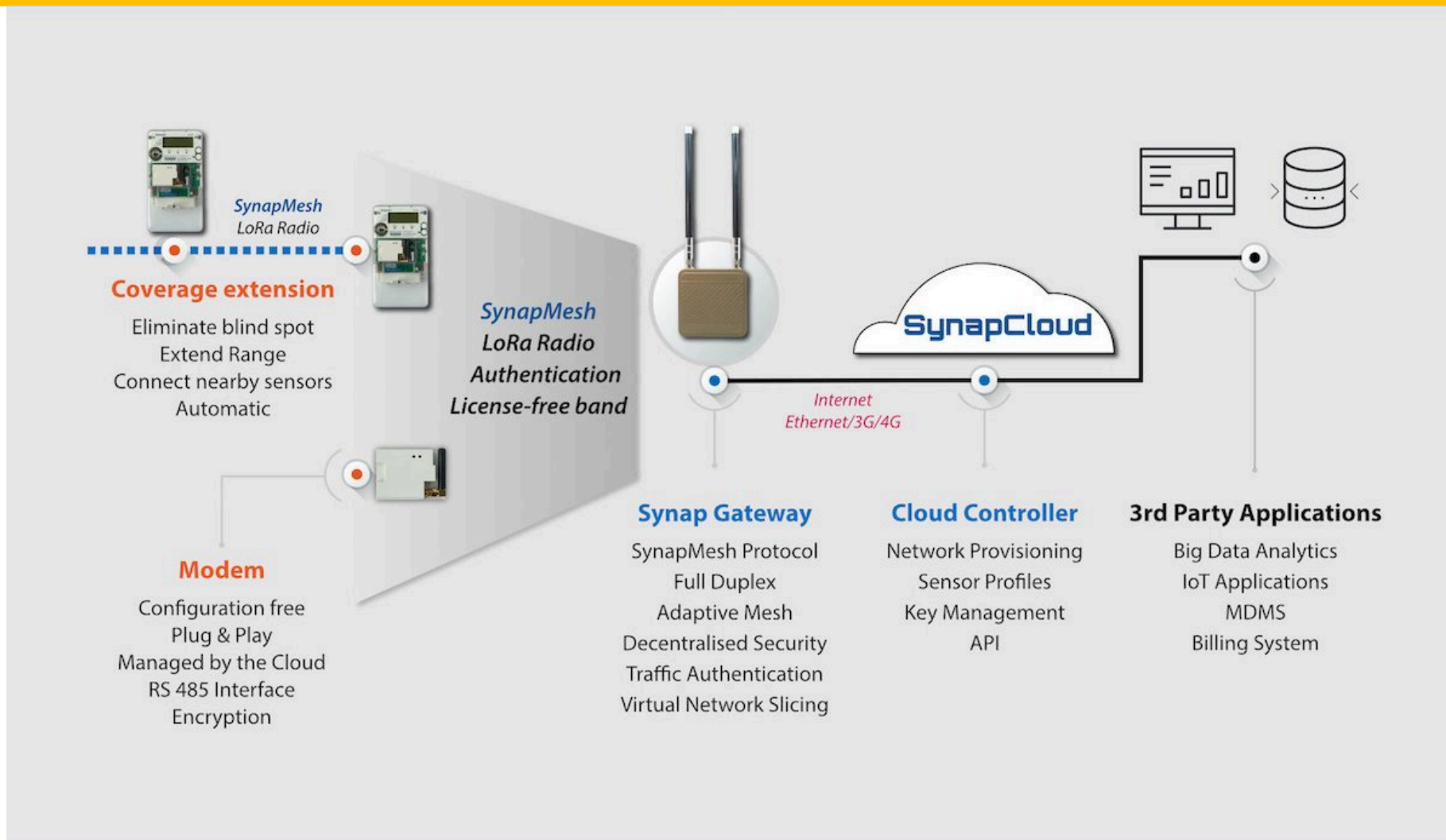


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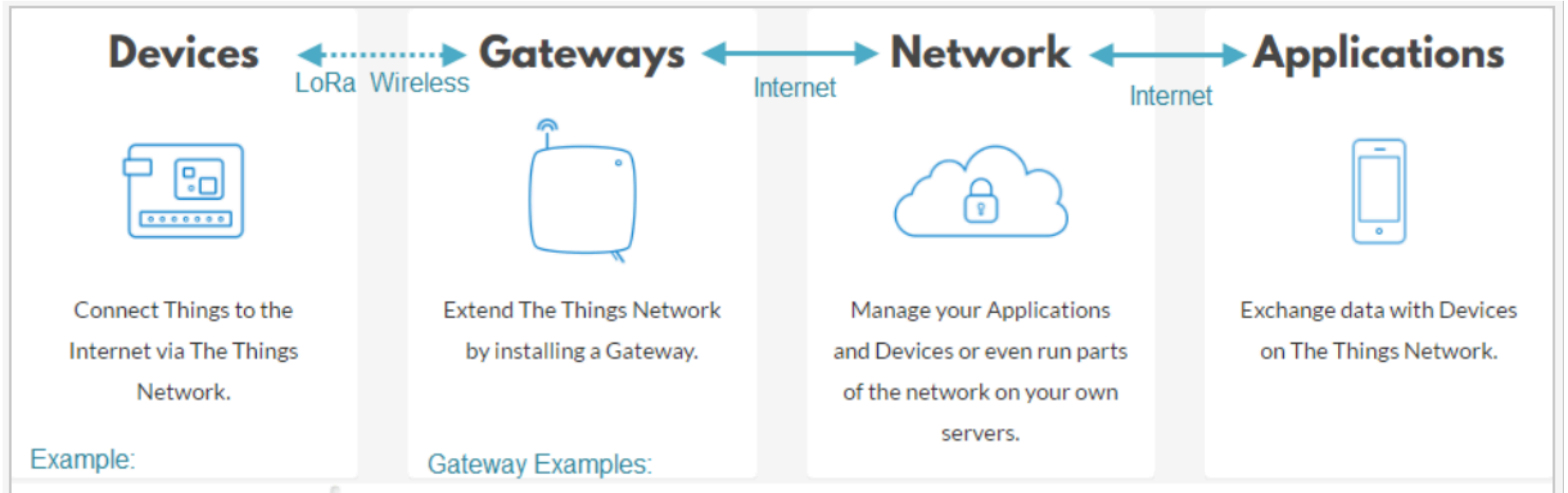


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# IoT Hardware



# IoT Hardware



TTN – The Things Network

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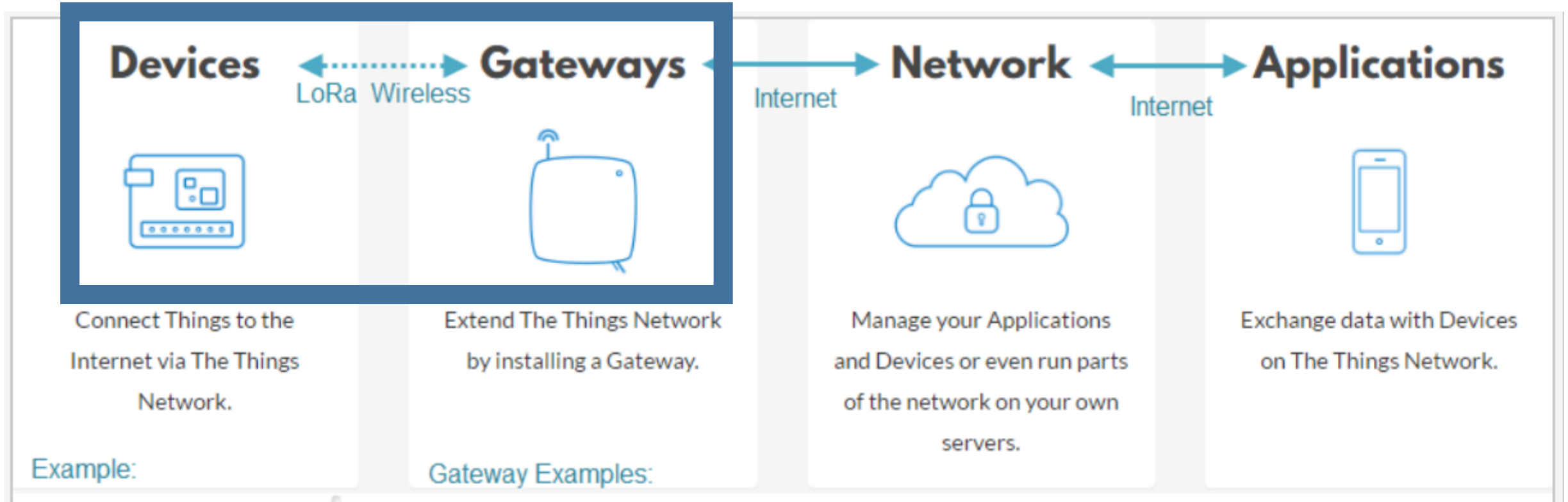


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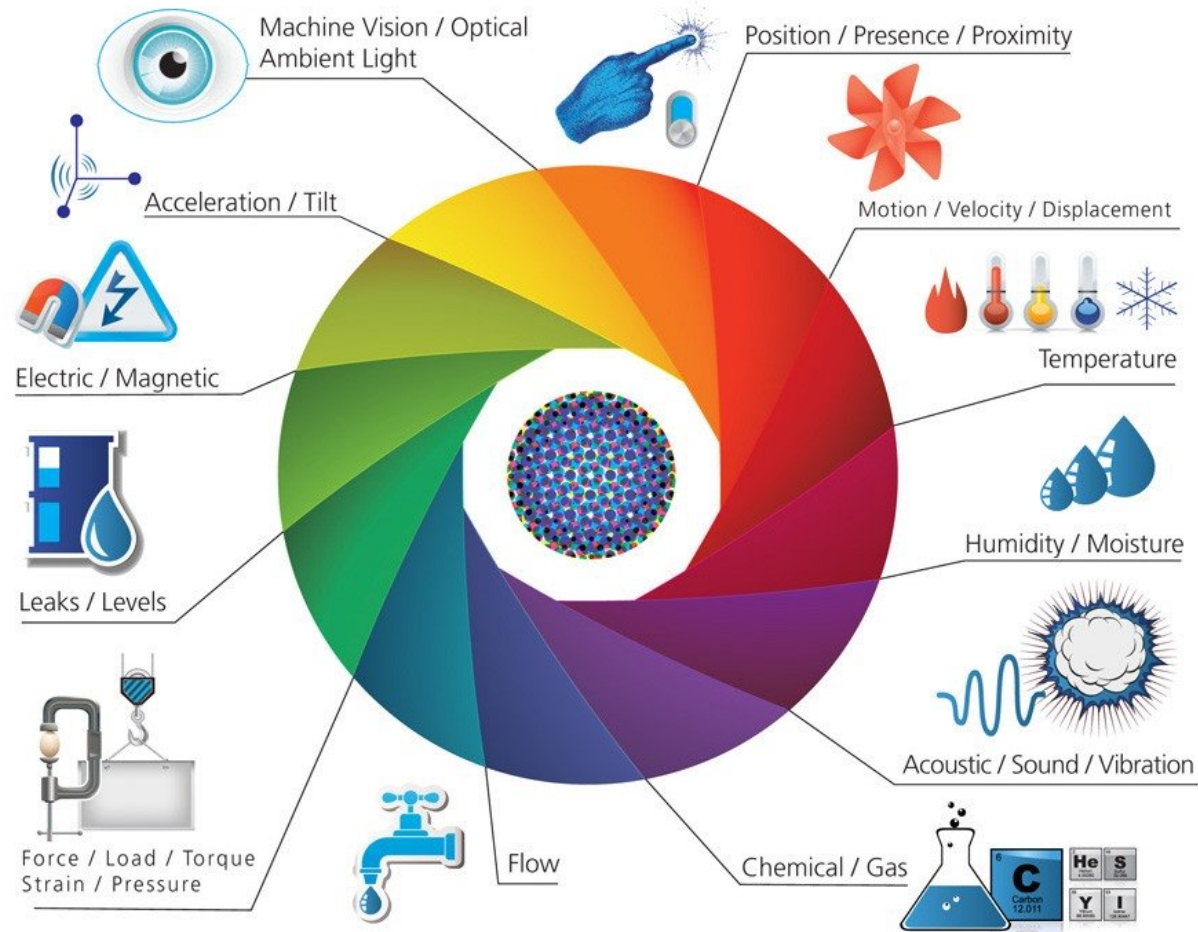


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# Sensor/Sensor connectivity



# Sensor/Sensor connectivity



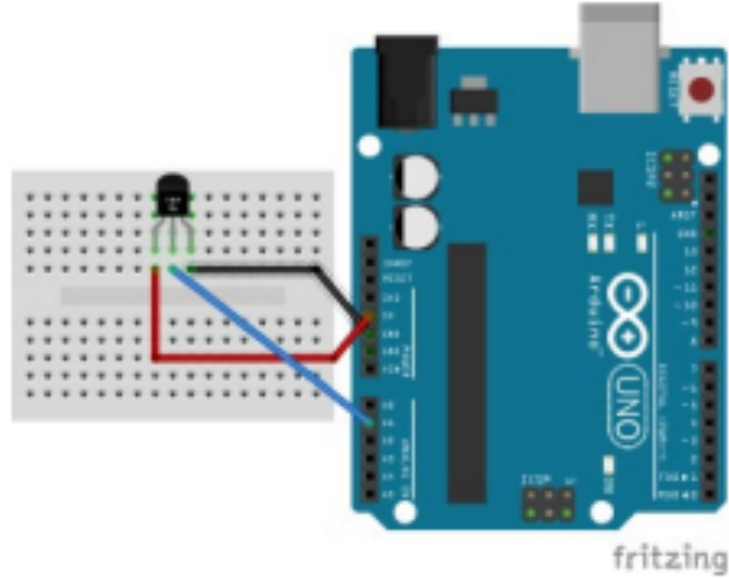
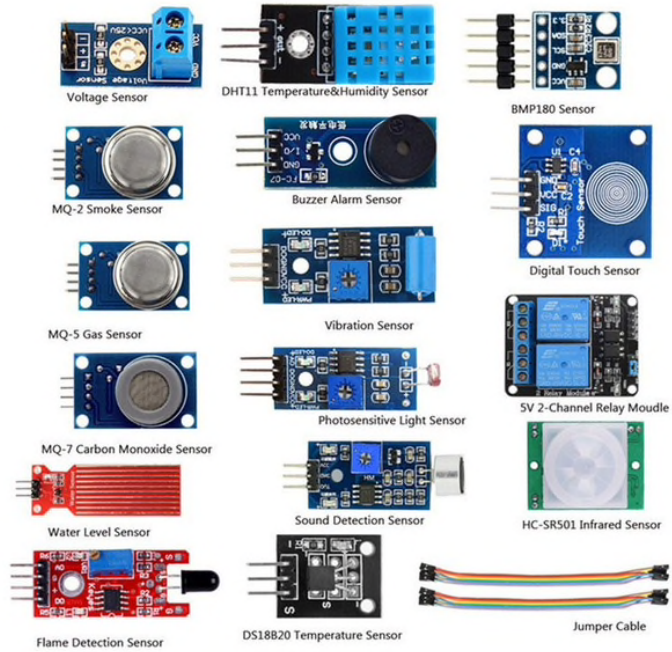
<https://www.postscapes.com/what-exactly-is-the-internet-of-things-infographic/>





# Sensor/Sensor connectivity

## Smart Home IOT Sensor Kit



## Connecting the Internet of Things

Trade-off Between Power Consumption,  
Range, and Bandwidth



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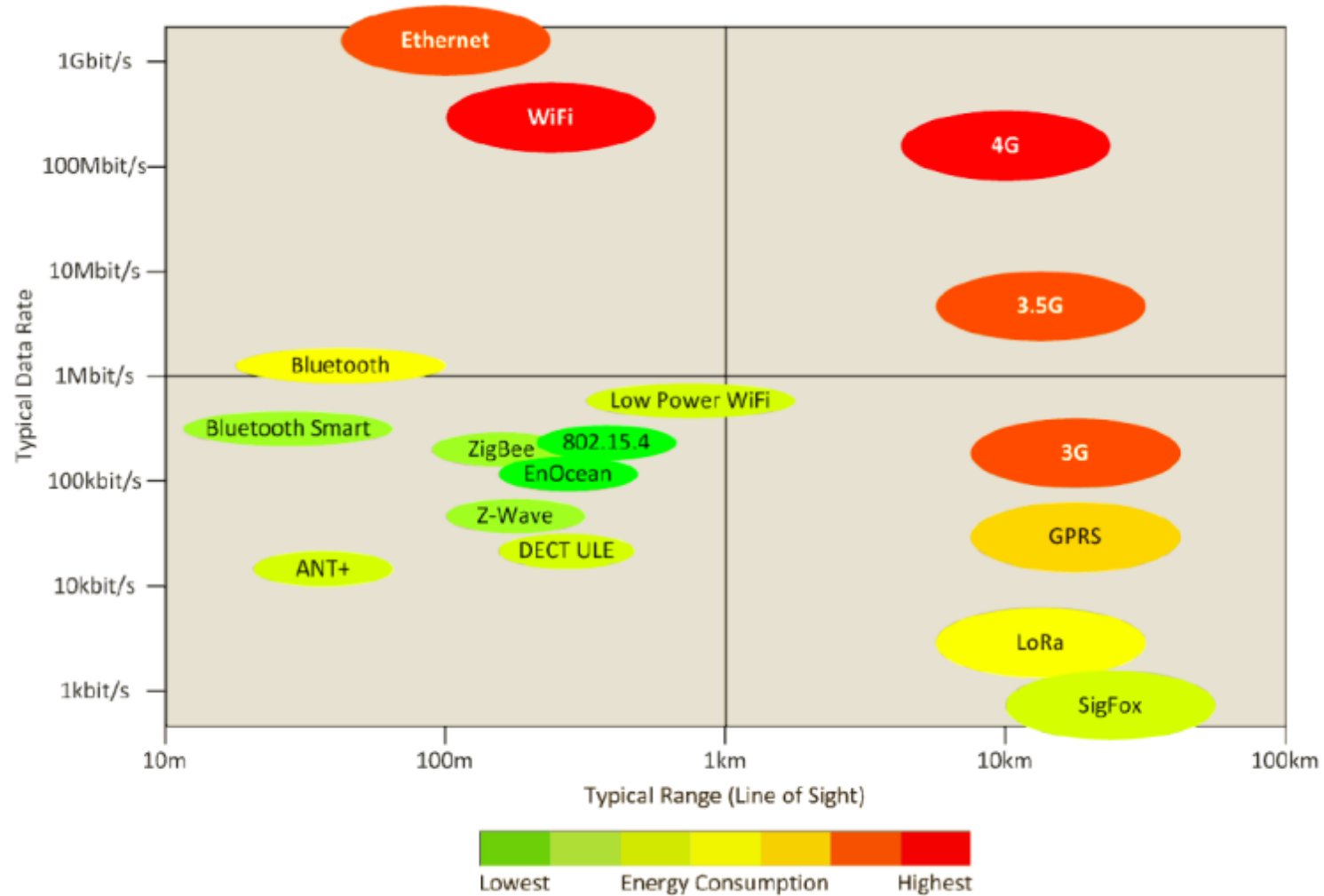


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# Sensor/Sensor connectivity



<https://www.eeekenya.com/the-impact-of-internet-of-things-on-building-services-engineering/>



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## Sigfox

Good coverage in South Africa

Paid service

Low power

Low data rates

Only service provider can extend network

Long distance



## LoRa

Unknown coverage in South Africa (Private)

Free service

Low power, Sigfox a bit lower

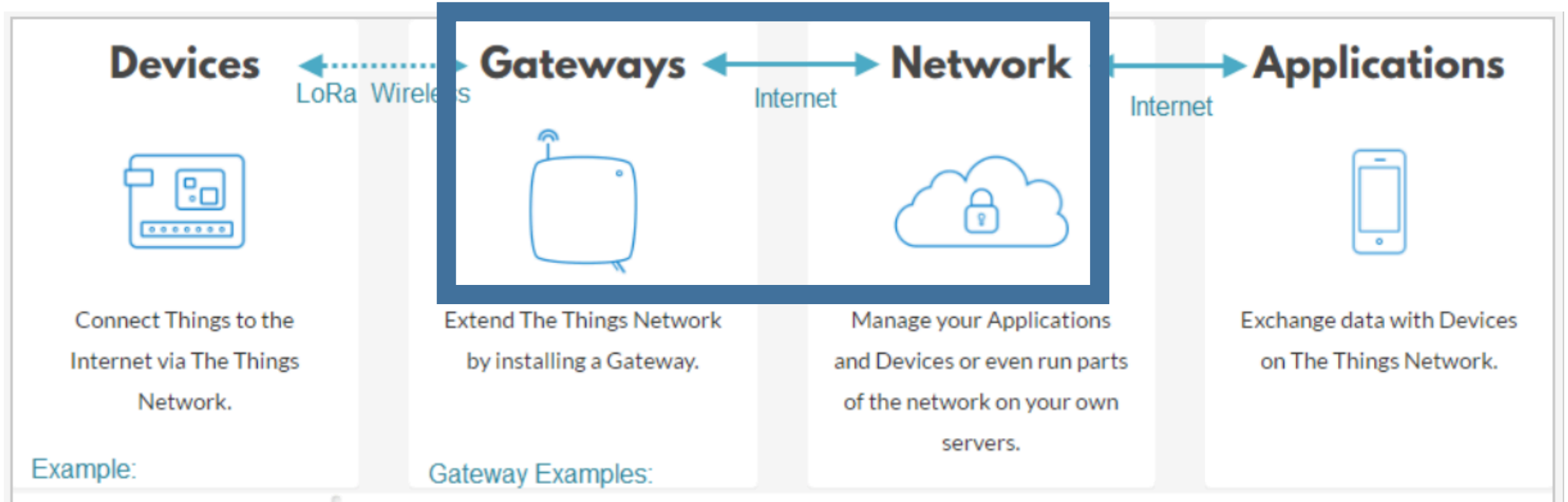
Low data rates, higher than Sigfox

Setup and manage your own network

Long distance



# Gateways



# Gateways



Eurotech  
Adlink  
Dell  
HPE Edgeline  
Cisco  
Huawei  
Raspberry Pi  
Dragino  
MikroTik



# Gateways



R11e-LoRa8  
863-870 MHz

R11e-LoRa9  
902-928 Mhz



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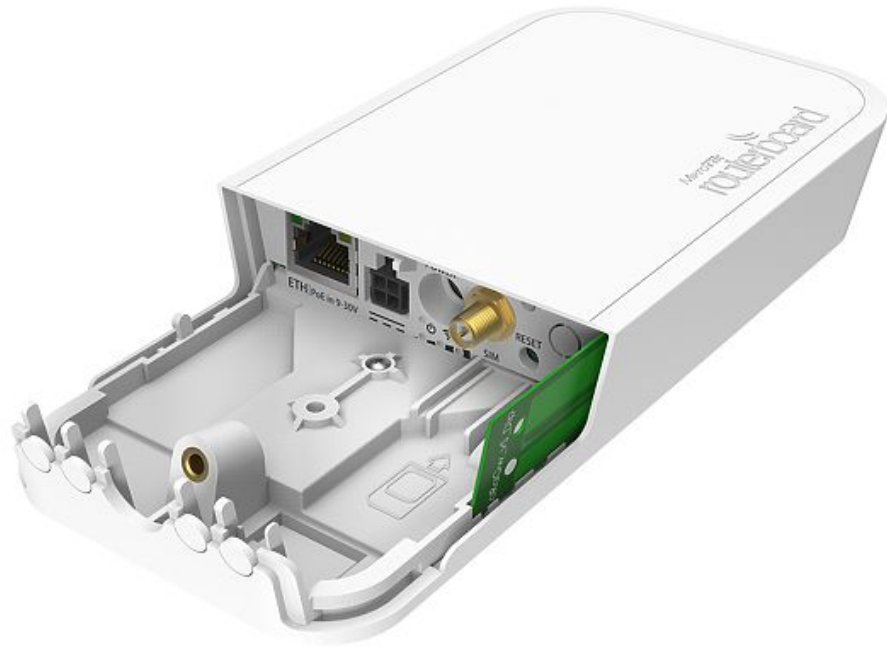
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# Gateways



## wAP LoRa8/9 kit

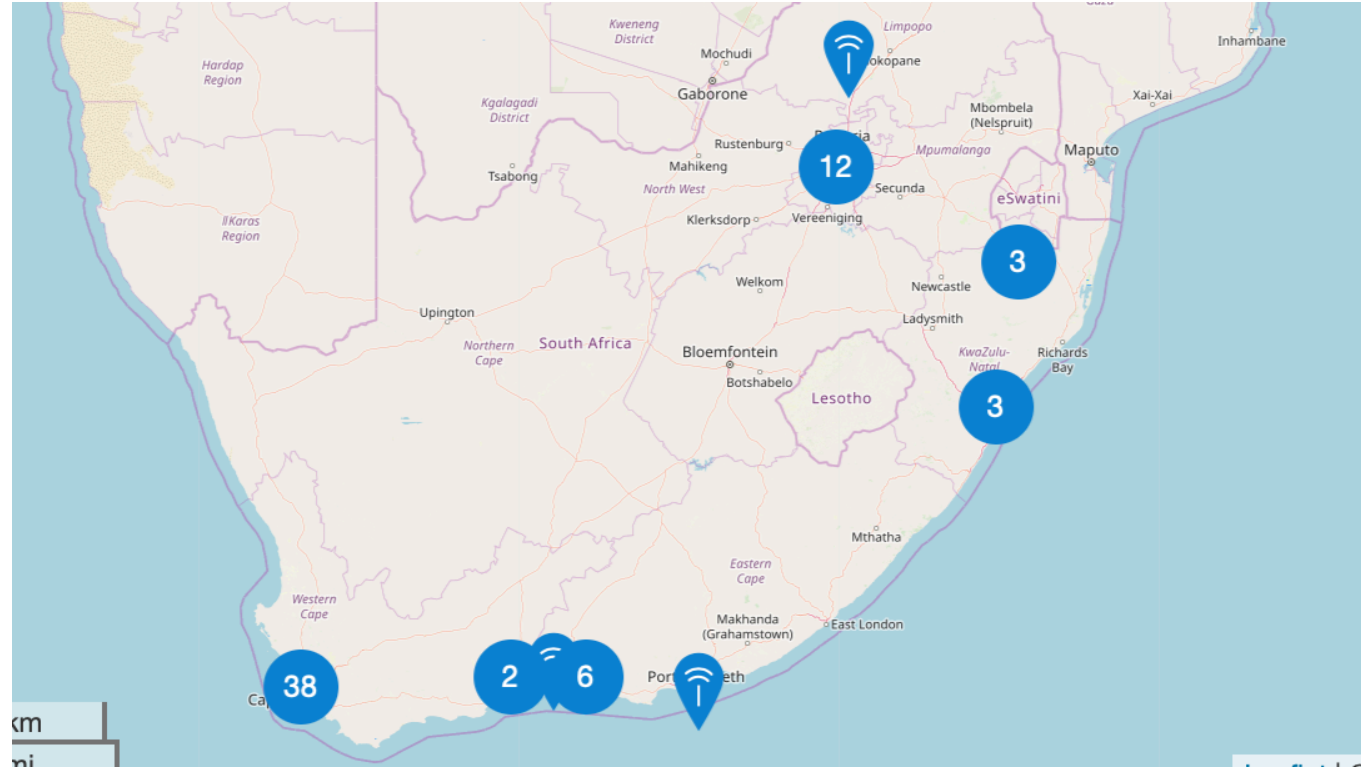
2,4GHz WLAN + Ethernet port.  
Optional internal 2dBi antenna.  
Pre-installed UDP packet forwarder to  
any public or private LoRa servers.

## External antenna

6,5 dBi + 1M SMA cable



# Gateways



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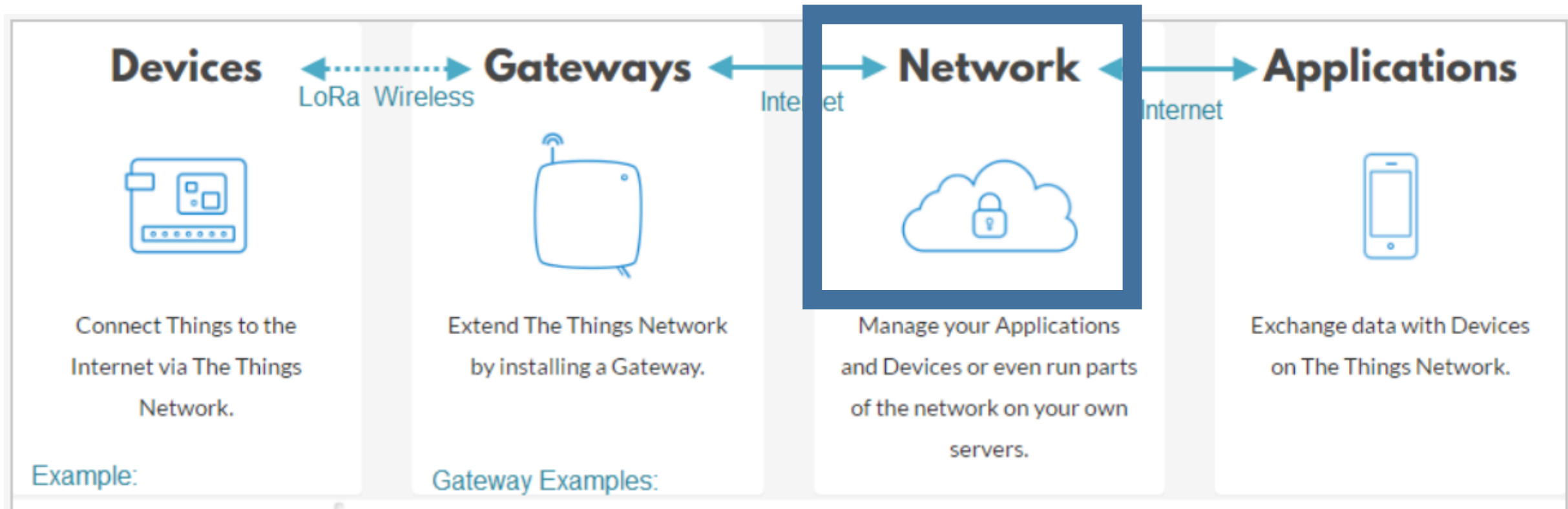


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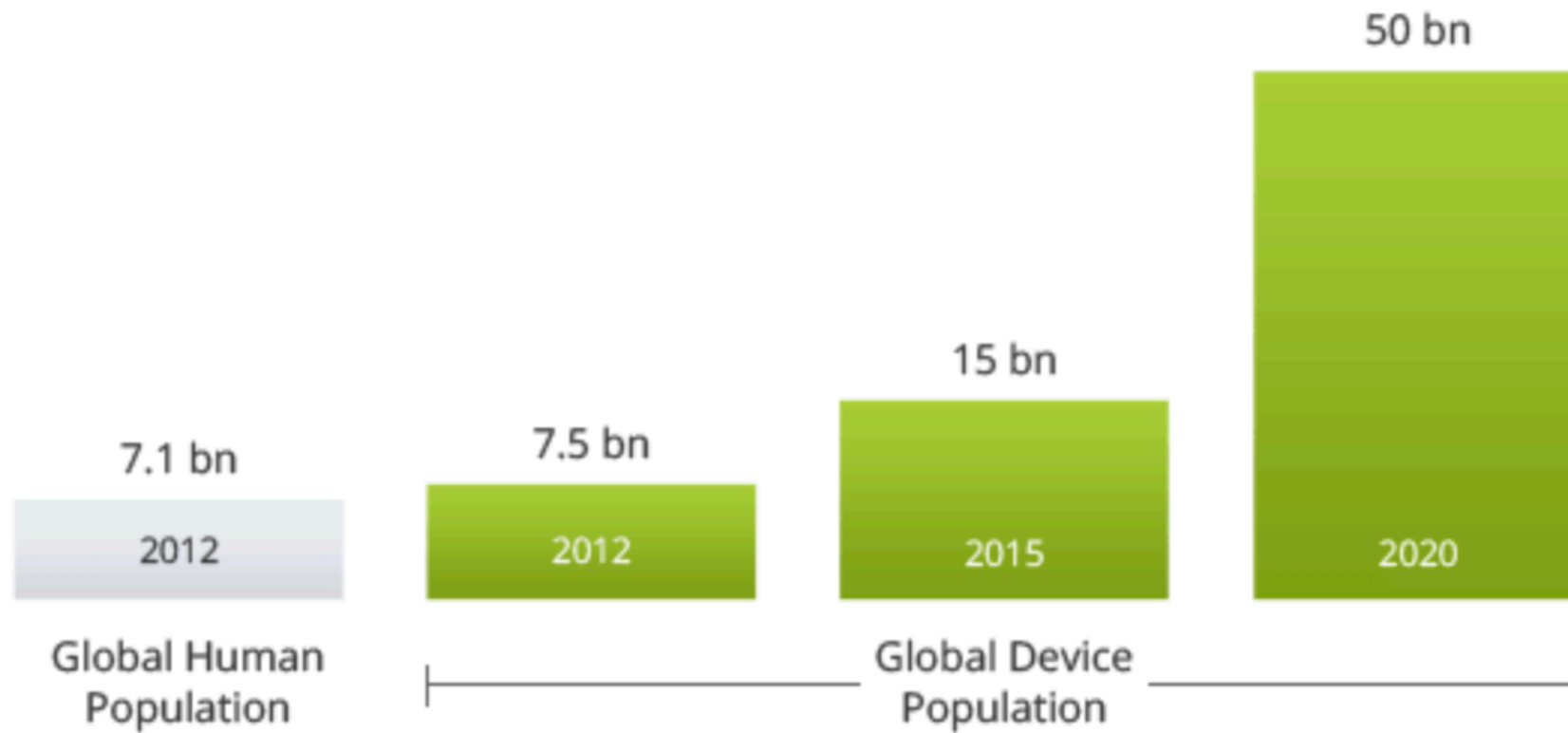


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# Storage



# Storage



<https://www.devteam.space/blog/10-best-internet-of-things-iot-cloud-platforms/>



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# Storage

## Amazon Web Services IoT Platform

Charged per million messages  
Good SDK kit to build applications

## Microsoft Azure IoT Hub

8000 messages per unit per day free  
Good development tools

## IBM Watson IoT Platform

100Mb per month free (\$500 per instance per month)  
Good development tools



# Storage

## ThingsSpeak

MATLAB analytics build in  
Free up to 8200 messages per day

## ThingWorx

No pricing detail on website, trial versions available  
Purpose-built for industrial applications

## The Things Network

Free  
Specific LoRaWan network



## Storage

### Google Cloud Platform

Charged per minute (Starts at \$1758 pm)

Documentation and development tools not the same as above

### Oracle

Pricing per device

Focused on manufacturing and logistics

### AND LOTS OF OTHERS

There is no best IoT cloud platform, and ultimately it will depend on the specific needs of your business.



**MikroTik currently support The Things Network by default  
but  
any custom server can be added too.**

MikroTik slides right into the open spot in the The Things Network by supplying one of the cheapest LoRa gateways **plus** all the normal capabilities and reliability of a MikroTik Router ie. remote management.

As an open network you can be the owner of a gateway publicly available to other users building a big worldwide LoRa network.





## Software developers dream

We at least have an:  
ID  
Time and date stamp  
Value

*What can you NOT do with it?*



## Mikrotik wAP LoRa kit Hardware



- 863-870MHz and 902-928MHz models are available
- Supports 8 RX channels, Listen Before Talk and Spectral scan
- Based on Semtech SX1301 GW concentrator chipset
- Optional integrated 1.6dBi 860-930MHz antenna
- Gigabit Ethernet and 2.4Ghz WiFi interfaces
- 12-30V DC input with PoE in support
- Weatherproof outdoor case
- Mounting options for pole, wall or desktop



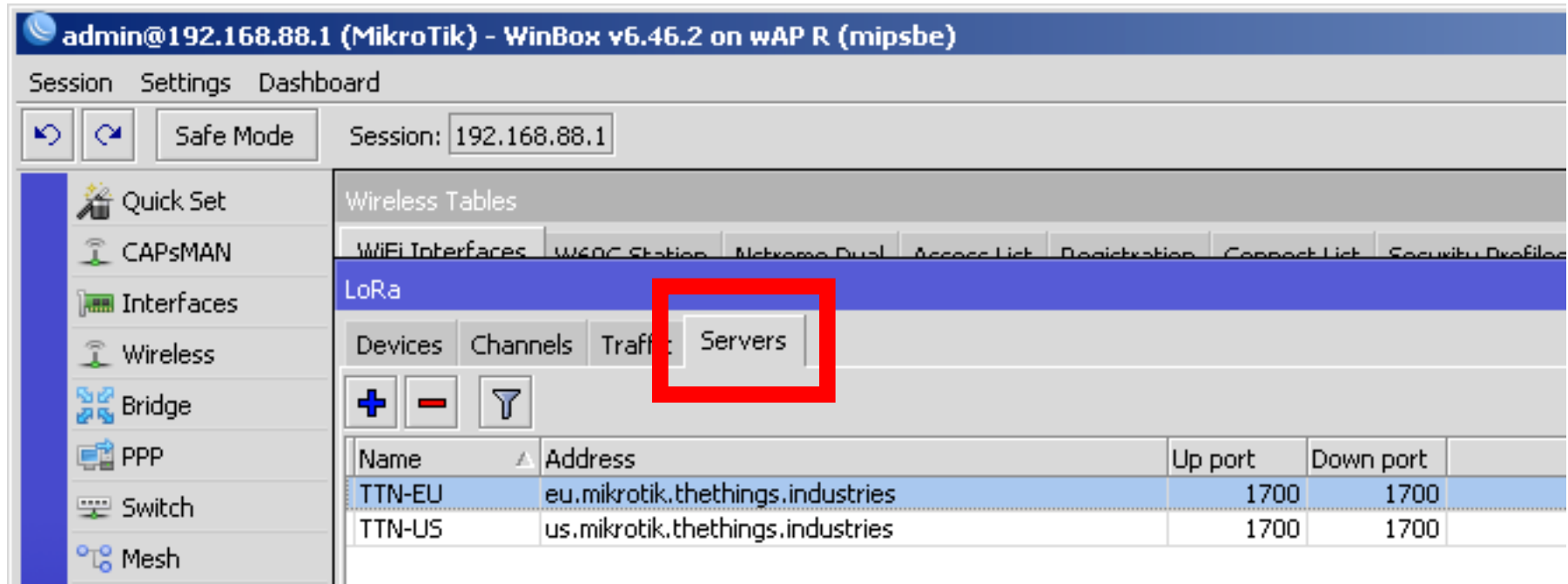
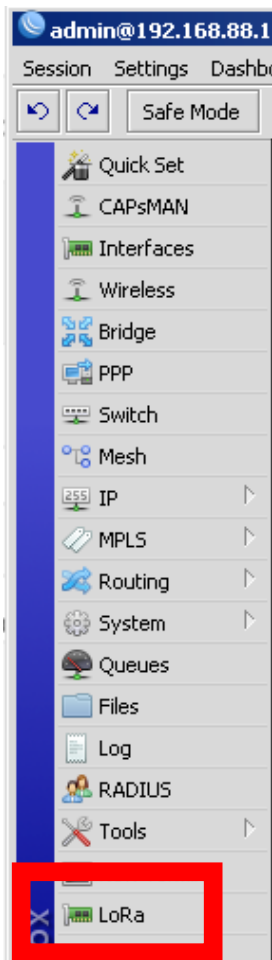
Product page  
<https://mikrotik.com/products/group/lora-products>



Where to buy  
<https://mikrotik.com/buy>



# MikroTik



# MikroTik

The screenshot displays the MikroTik WinBox interface. The top bar shows the user 'admin@192.168.88.1 (MikroTik)' and the version 'WinBox v6.46.2 on wAP R (mipsbe)'. Below this are navigation tabs for 'Session', 'Settings', and 'Dashboard', along with a 'Safe Mode' button and a session ID of '192.168.88.1'. The left sidebar contains a menu with categories like 'Quick Set', 'CAPsMAN', 'Interfaces', 'Wireless', 'Bridge', 'PPP', 'Switch', 'Mesh', 'IP', 'MPLS', 'Routing', 'System', 'Queues', 'Files', 'Log', 'RADIUS', 'Tools', 'New Terminal', and 'LoRa'. The 'Devices' menu item is highlighted with a red box. The main window shows a table with columns 'Status' and 'Name', containing one entry: 'Enabled MumMikro'. A 'LoRa Device' configuration window is open, showing the following settings:

- Status: Enabled
- Name: MumMikroTik
- Hardware ID: 3135323515004F00
- Gateway ID: 3135323515004F00
- Network Servers: TTN-EU
- Channel plan: EU 868
- Antenna Gain: 2 dB
- Forward:  Valid  Error  Disabled
- Network:  Public  Private
- LBT
- Src. Address: [Dropdown menu]

Buttons on the right include OK, Cancel, Apply, Disable, and Reset devices. The bottom of the window shows the status 'enabled'.



# MikroTik

The screenshot shows a web browser window with the address bar containing `console.thethingsnetwork.org`. The page title is "The Things Network Console". The navigation bar includes "Applications", "Gateways", and "Support". The "Gateways" menu item is highlighted. The main content area is titled "Gateways" and features a "GATEWAYS" section with a "+ register gateway" link.



The Things Network Console

Semtech UDP Packet Forwarder | The Things Network

THE THINGS NETWORK CONSOLE COMMUNITY EDITION

Applications Gateways Support SennahW

Gateways > Register

### REGISTER GATEWAY

**Gateway EUI**  
from the LoRa module

31 35 32 35 15 00 4F 00

I'm using the legacy packet forwarder  
Select this if you are using the legacy [Semtech packet forwarder](#).

**Description**  
A human-readable description of the gateway

MikroTikTest

**Frequency Plan**  
The [frequency plan](#) this gateway will use

Europe 868MHz

**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.

ttn-router-eu

Name: MumMikroTik

Hardware ID: 3135323515004F00

Gateway ID: 3135323515004F00

Channel plan: EU 868

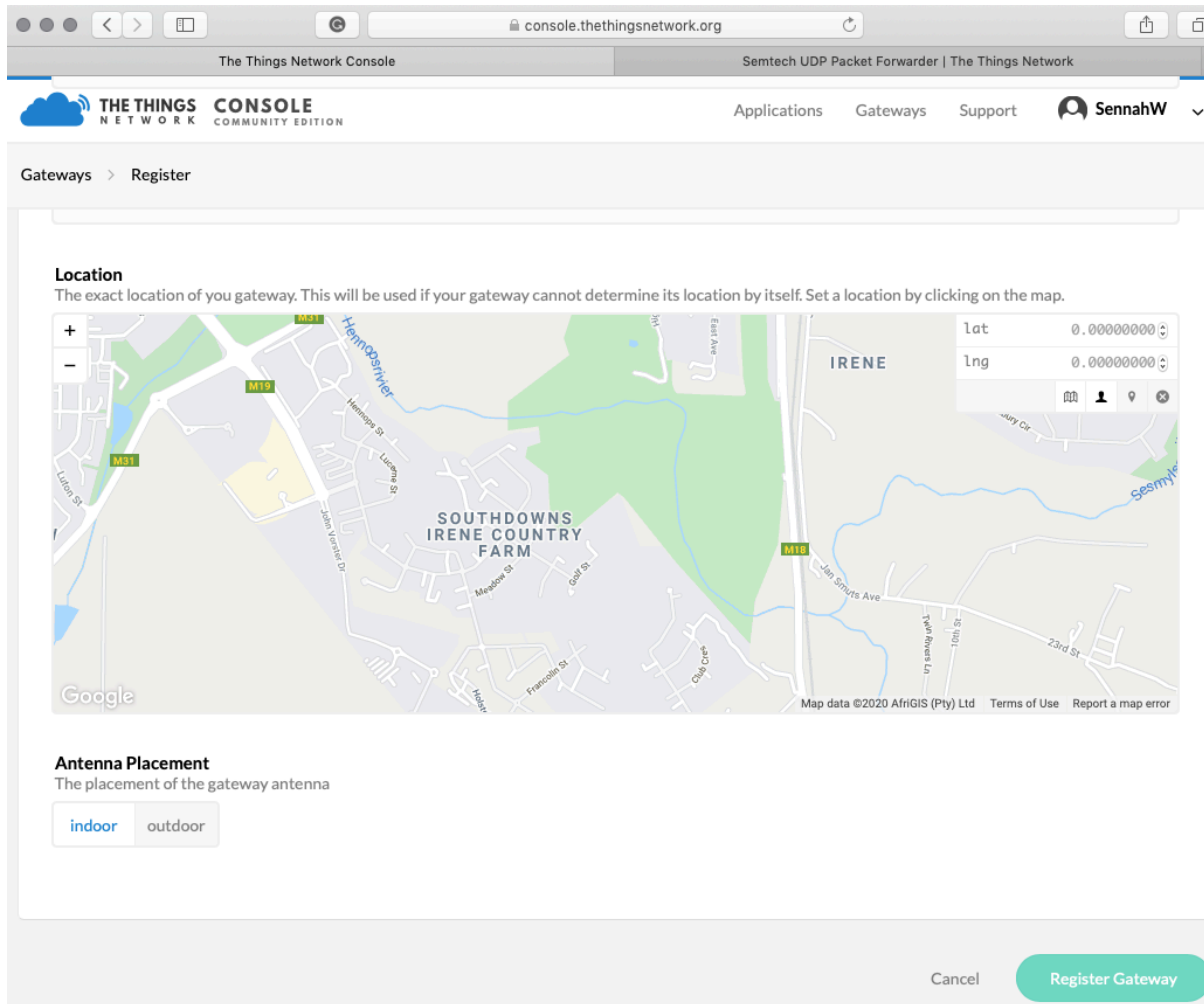
Antenna Gain: 2 dB

Apply

Disable

Reset device





The screenshot shows a web browser window at `console.thethingsnetwork.org`. The page title is "The Things Network Console" and the sub-header is "Semtech UDP Packet Forwarder | The Things Network". The user profile "SennahW" is visible in the top right. The main navigation includes "Applications", "Gateways", and "Support". The current page is "Gateways > Register".

**Location**  
The exact location of your gateway. This will be used if your gateway cannot determine its location by itself. Set a location by clicking on the map.

The map shows a residential area with labels for "IRENE", "SOUTH DOWNS IRENE COUNTRY FARM", and "Hemphill St". A location pin is placed on the map. To the right of the map, the coordinates are displayed as:  
lat: 0.00000000  
lng: 0.00000000

**Antenna Placement**  
The placement of the gateway antenna

There are two radio buttons: "indoor" (selected) and "outdoor".

At the bottom right, there are two buttons: "Cancel" and "Register Gateway".



## GATEWAY OVERVIEW

 [settings](#)

Gateway ID **eui-3135323515004f00**

Description MumMikroTik

Owner  SennahW  [Transfer ownership](#)

Status ● connected

Frequency Plan Europe 868MHz

Router ttn-router-eu

Gateway Key  .....base64 

Last Seen 7 seconds ago

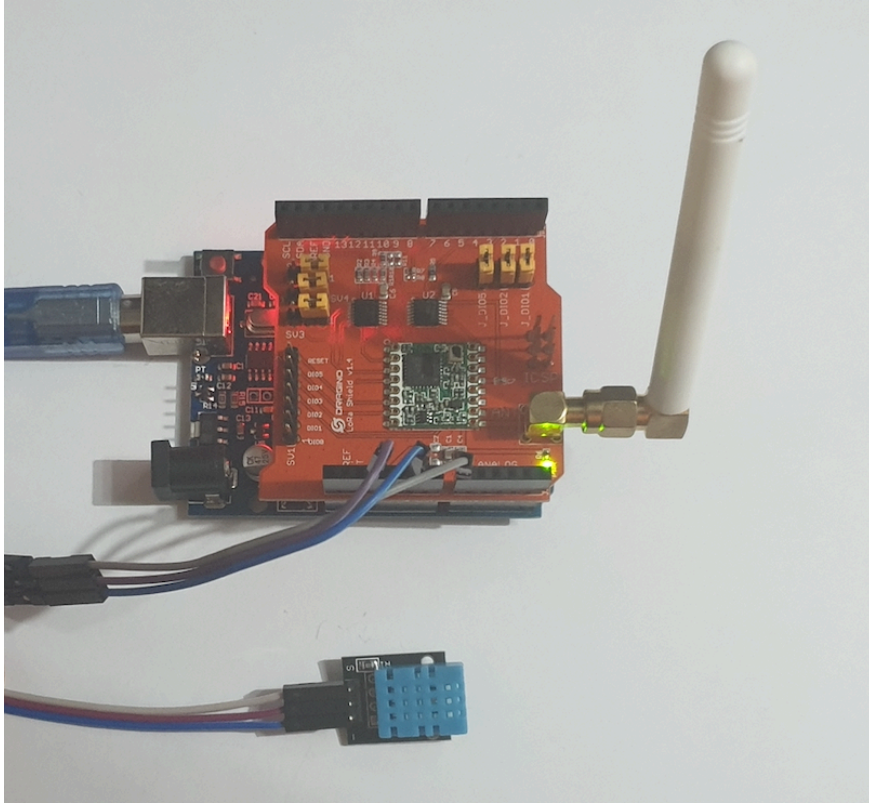
Received Messages 35

Transmitted Messages 0





# MikroTik



Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.0C
Current humidity = 30.0%	Temperature = 30.1C
Current humidity = 30.0%	Temperature = 30.1C
Current humidity = 30.0%	Temperature = 30.1C
Current humidity = 30.0%	Temperature = 30.1C
Current humidity = 30.0%	Temperature = 30.1C



Thank you very much for your participation

QUESTIONS

[hannes@miro.co.za](mailto:hannes@miro.co.za)



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