

**Charles Paumelle**

Marketing Committee Co-Chair & Co-Founder Microchip



**Creating  
Valuable**

**IoT**

**Connections**



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# Sascha Schlosser, General Manager of ZENNER International



# MinolZENNER

CONNECT

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**Brunata**

**Minol**

**ZENNER**  
IOT SOLUTIONS

**ZENNER**

**kelmin**

**SMARTMAKERS**  
IOT SENSOR TO DATA

**ZENNER**  
CONNECT

**ZENNER**  
HESSWARE



# Dealing with preservers, doubters and critics.

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**If I had asked people what they wanted, they would have said: faster horses ...” Henry Ford**

# Berlin - international flagship and a cultural hotspot.



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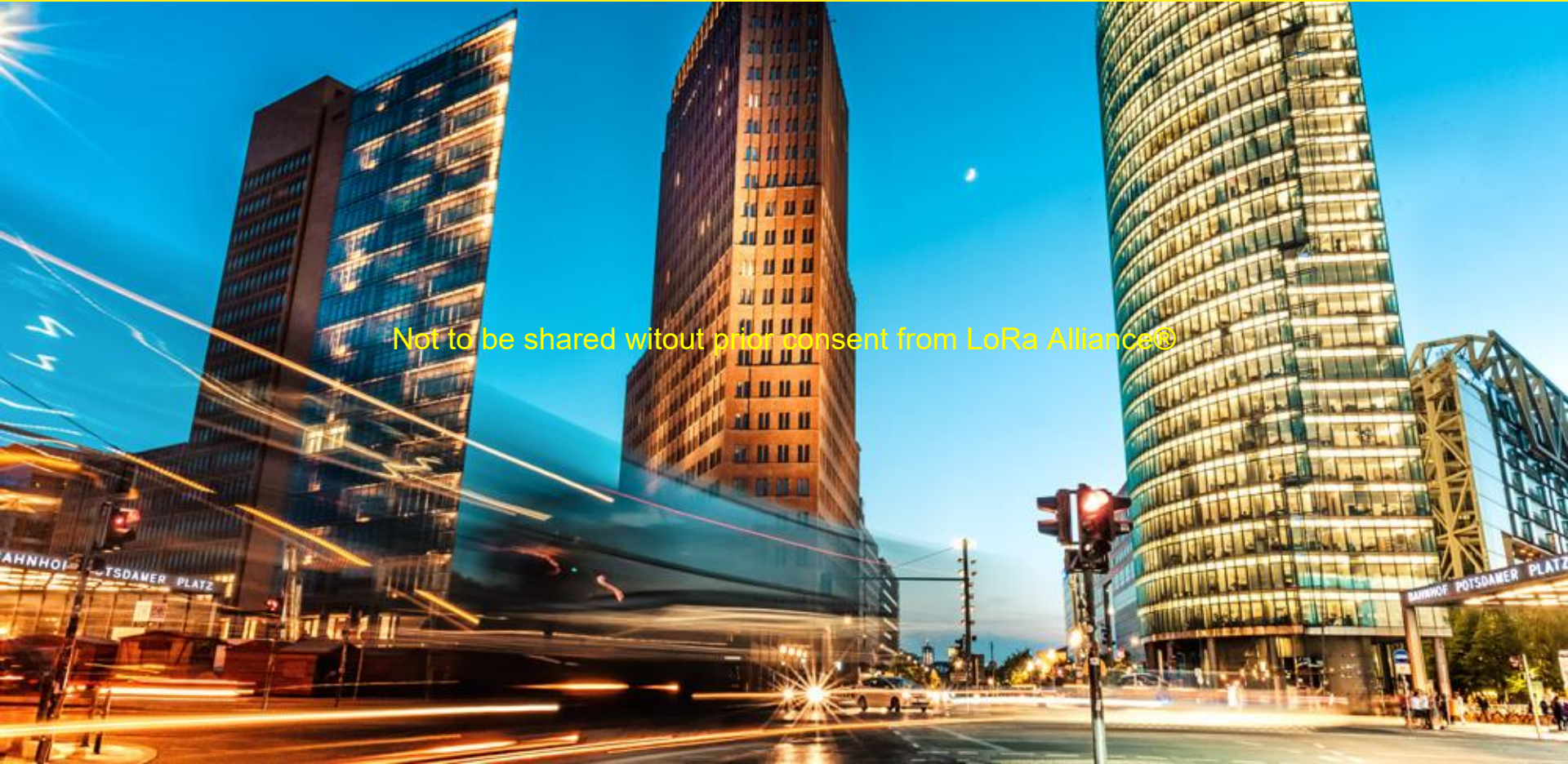
The wall fell and the divided city became the capital of a united Germany.



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**Berlin has developed into the world's leading cultural and political center that we experience today.**



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**Many people think of digitisation as technology,  
protocols and standards.**

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**But crucial to our success is our ability to show people the possibilities and benefits of LoRaWAN®.**



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**Drive it like you stole it!**

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A long-exposure photograph taken from the driver's perspective inside a car at night. The car is moving forward on a multi-lane highway. The background is blurred, showing light trails from other vehicles and streetlights. The car's interior, including the dashboard with illuminated gauges and the side mirrors, is visible in the foreground. The overall color palette is dominated by dark blues and greys, with warm orange and yellow light trails providing contrast.

**Trust has a further dimension: data protection and data security.**

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The image features a conceptual representation of data security. In the background, a person's hands are shown typing on a laptop keyboard. Overlaid on this is a network of white lines connecting several white padlock icons. A large, prominent padlock icon is centered in the right half of the image. The overall color palette is dominated by blue and white tones, with a yellow header at the top. Binary code (0s and 1s) is faintly visible in the background, suggesting digital data.



**The „LoRaWAN Certified<sup>CM</sup>“-mark provides the market with confidence that the devices are performing as expected.**

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**LoRaWAN® is the Black Horse, not the Sleeping Dragon!**

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**Thank you for your attention!**

Also visit the speeches of our group members:

**10:45h** - Network Operator Panel

Marcus Kirchdörfer (Minol Zenner Connect GmbH)

**17:25h** – How LoRaWAN® transforms business

Andrea Krämer (Minol Messtechnik GmbH & Co. KG)

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# WELCOME TO LoRaWAN® LIVE

BERLIN, JUNE 13, 2019



**Creating  
Valuable**

**IoT**

**Connections**



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# WELCOME TO LoRaWAN® LIVE

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# LoRaWAN® vs NB-IoT

- ABI Research white paper published **today**
- Download via LoRa Alliance website [lora-alliance.org](http://lora-alliance.org)



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The screenshot shows the 'resource HUB' section of the LoRa Alliance website. At the top, there is a navigation bar with 'Member's Login', 'Contact', and social media icons. Below that is the 'LoRa Alliance' logo and a search bar. The main heading is 'resource HUB'. A filter menu on the left lists 'Article', 'Case Study', 'FAQ', 'Presentation', 'Technical document', 'Webinar', and 'White paper'. The main content area displays three resource cards. The first card is titled 'LoRaWAN and NB-IoT: competitors or complementary' and is labeled as an 'ABI Research paper'. The second card is 'FUOTA Process Summary Technical Recommendation TR002 v1.0.0'. The third card is 'LoRaWAN Security FAQ'. A watermark 'Not to be shared without prior consent from LoRa Alliance®' is overlaid on the image.

### Introduction

Low-Power Wide-Area (LPWA) technologies are serving a need in multiple IoT markets for devices that are low cost and sustain long battery life, and networks that are low cost, cover wide areas, and can support massive numbers of connections. There are several options for LPWA connectivity, but LoRaWAN and NB-IoT have shown the most momentum and will garner the largest share of the LPWA market in the coming years. This whitepaper will examine the two technologies for their similarities and differences. It will transition to a discussion of LoRaWAN use in several vertical markets, highlighting LoRaWAN's unique benefits. The whitepaper will conclude with the potential use cases where both LoRaWAN and NB-IoT will operate together to provide the greatest value for customers.

### Technical Comparison of LoRaWAN and NB-IoT

LoRaWAN is an open LPWAN system architecture developed and standardized by the LoRa Alliance™, a non-profit association of more than 500 member companies. LoRa is the modulation technique used in the physical layer that enables long-range low-power communications by using Chirp Spread Spectrum (CSS) modulation, which spreads the narrowband signals across a wider channel allowing greater interference resilience and low signal-to-noise ratio levels. NB-IoT, on the other hand, operates in the licensed spectrum, and like LTE, uses Frequency Division Multiple Access (FDMA) in the uplink, Orthogonal FDMA (OFDMA) in the downlink, and Quadrature Phase Shift Keying (QPSK) modulation. While both technologies can compete on Quality of Service (QoS), IoT applications that require more frequent communications will be better served by NB-IoT, which has no duty cycle limitations operating on the licensed spectrum, but at the expense of higher Total Cost of Ownership (TCO) relative to LoRaWAN.

ABIresearch | [www.abiresearch.com](http://www.abiresearch.com)



# WELCOME TO LoRaWAN® LIVE

BERLIN, JUNE 13, 2019



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# Unlocking Captive Value

## LPWAN Enables Emerging IoT Applications

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June 2019

**Lee Ratliff**  
Senior Principal Analyst  
IoT Connectivity  
 @leeratliff

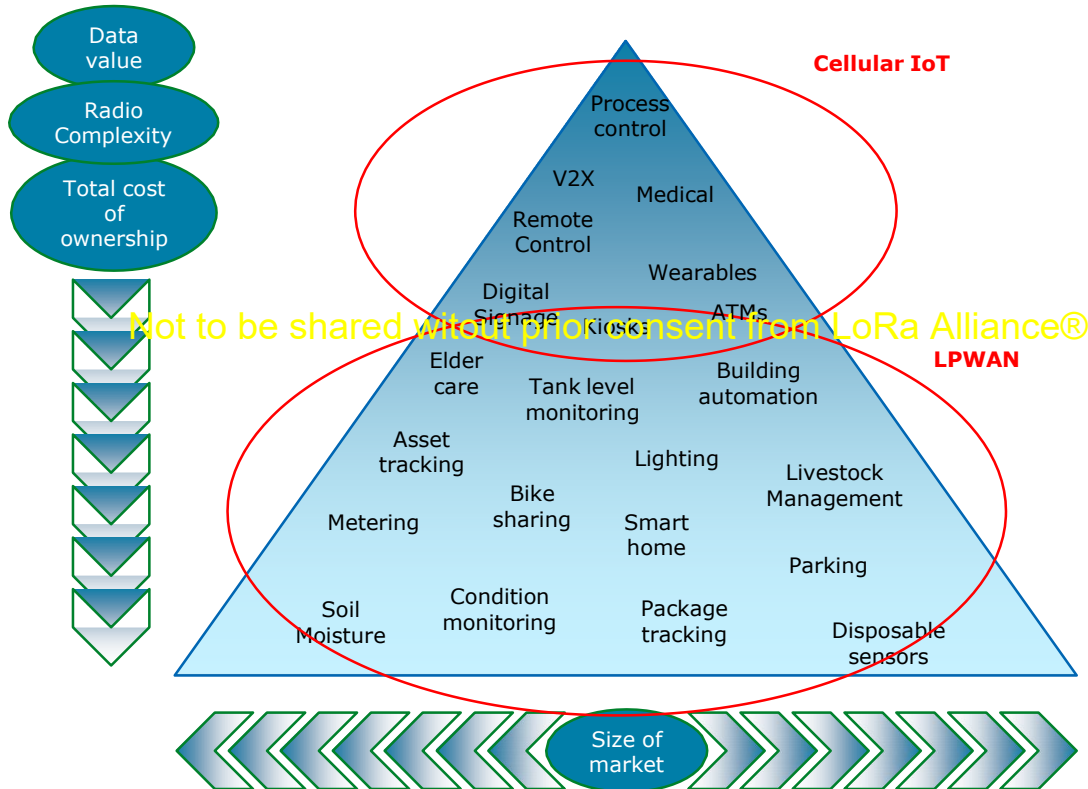


## LPWAN Market Report - 2019

- IHS Markit's 4<sup>th</sup> annual LPWAN report
- Published June 10<sup>th</sup> 2019
- 449 data tables
- Applications
  - > Smart Meters & Utilities
  - > Connected Spaces
  - > Consumer
  - > Asset Management
  - > Transportation
  - > Other Applications
- Regions
  - > Americas
  - > EMEA
  - > Asia-Pacific
- Technologies
  - > LoRa/LoRaWAN
  - > Sigfox
  - > NB-IoT
  - > LTE-M
  - > Other Technologies
- Measures
  - > Public connections
  - > Private connections
  - > IC unit shipments, ASP, and revenue
  - > Module unit shipments, ASP, and revenue
  - > Service revenue and ARPU

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# Market size and data value





## LPWAN Applications

### Smart meters & utilities

- Meters - Electric, gas, water, heat, retrofit modules
- Infrastructure - Aggregation nodes, gateways

### Connected spaces

- Smart cities – Parking, street lighting, waste management
- Smart buildings – HVAC, occupancy, lighting, access control
- Public spaces – Airports, stadiums, museums

### Consumer

- Smart home – Lighting, HVAC, automation
- Security – Alarms, access control, networked cameras
- Wearables – smart watches, pet trackers

### Asset management

- Asset tracking – location, proximity, vibration, temperature
- Condition monitoring – tank level, maintenance, temperature

### Transportation

- Fleet monitoring – Location, speed, direction, maintenance
- Insurance – OBDII dongles

### Other applications

- Agriculture – Soil moisture, automation, livestock management
- Medical – Patient monitoring
- Health – Elder care

## Stereotyping LPWAN technologies

### LoRa/LoRaWAN

- Accessible choice for private networks and non-traditional wireless service providers

### Sigfox

- Not to be shared without prior consent from LoRa Alliance®
- Minimum viable network for low-end applications

### NB-IoT

- The comfortable choice for traditional wireless service providers

### LTE-M

- Higher performance, but too expensive for truly massive IoT



## LoRa & NB-IoT: A two-horse race

LPWAN connections by technology - Worldwide, 2017-2023

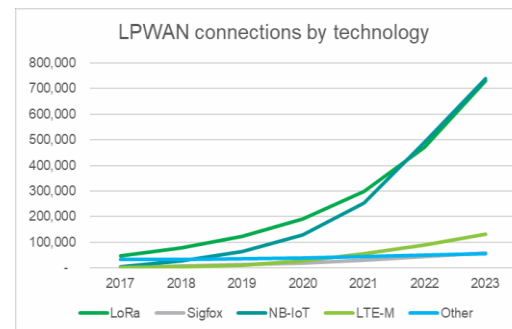
(thousands of connections)

	2017	2018	2019	2020	2021	2022	2023
LoRa	46,388	78,339	123,329	190,755	299,061	470,690	730,686
Sigfox	2,458	6,155	11,928	19,943	30,124	42,925	58,046
NB-IoT	5,428	27,421	64,940	129,581	252,077	491,192	739,802
LTE-M	861	3,858	10,508	25,933	56,041	89,826	132,746
Other	32,402	34,123	36,585	39,897	43,936	49,219	55,704
<b>Grand total</b>	<b>87,537</b>	<b>149,896</b>	<b>247,289</b>	<b>406,109</b>	<b>681,239</b>	<b>1,143,852</b>	<b>1,716,985</b>

Source: IHS Markit

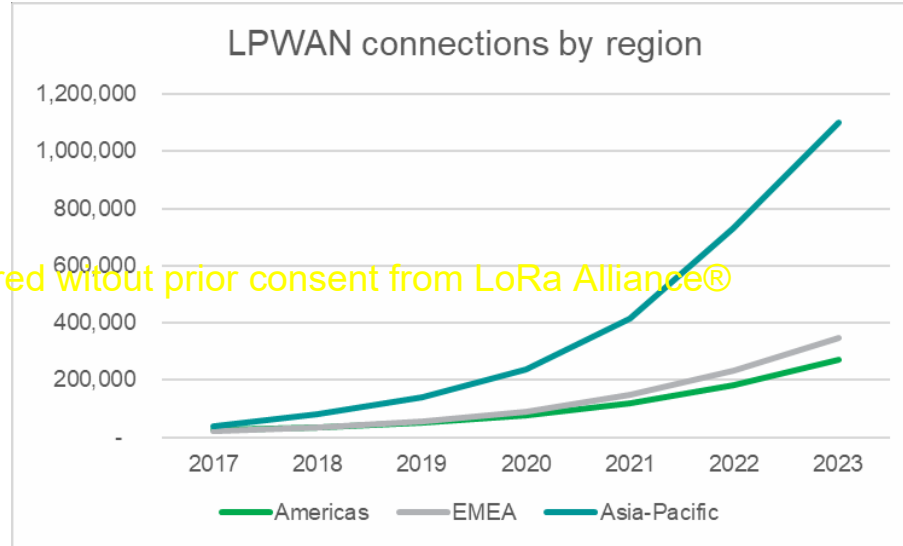
© 2019 IHS Markit

By 2023, LoRa & NB-IoT will account for 86% of total LPWAN connections



## Asia-Pacific to dominate LPWAN activity

By 2023, Asia will account for 2 out of 3 LPWAN connections

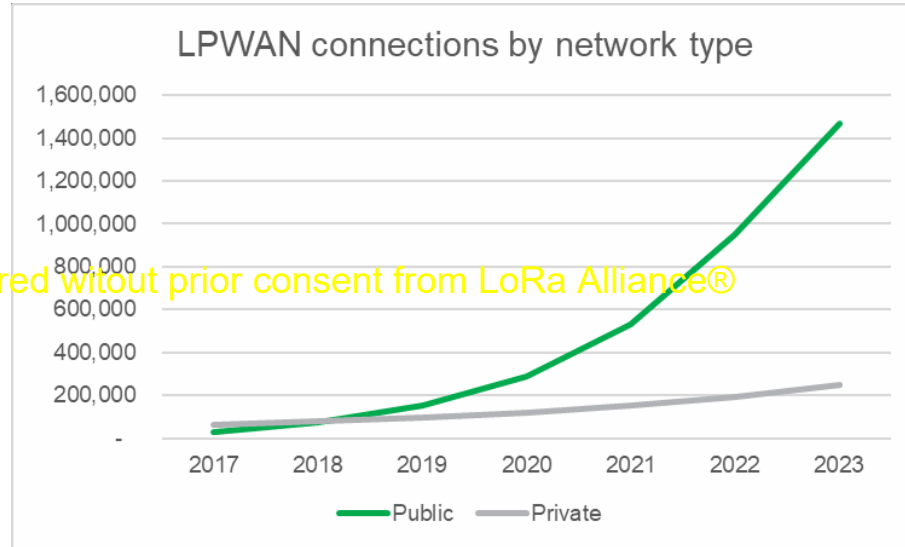


LPWAN standards must have exposure to China to be volume leaders



## Availability of public networks fuels LPWAN growth

2019 is the first year in which public connections will outnumber private connections



Public networks reduce the time to break-even ROI and enable LPWAN applications that would not otherwise be feasible.

## Key Findings

- It's a two-horse race between LoRa/LoRaWAN and NB-IoT for the majority of volume in the LPWAN market. They will account for 86% of all connections in 2023.
- China will continue to lead in NB-IoT market adoption.
- NB-IoT and LTE-M market adoption is slower than expected. **NOTE: We shared without prior consent from LoRa Alliance®**
- 2019 will be the first year that connections on public LPWAN networks outnumber connections on private LPWAN networks.
- As a region, Asia-Pacific will account for 64% of total LPWAN connections in 2023.
- A single company, Securitas, accounted for 45% of the 6.2 million Sigfox connections as of February 2019.

# Thank You

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## Customer Care:

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# NETWORK OPERATOR PANEL

**Moderator:** Remi Lorrain, Semtech

**Marcus Kirchdörfer**, Minol Zenner Group

**Wolfgang Krüger**, Netzikon

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**Matthias Emmerman**, Unitymedia

**Arnaud Vandererven**, Objenious

**Ronan Le Bras**, Orange

**Steve Dyett**, BT

# Minol ZENNER Connect

Marcus Kirchdörfer



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# Minol ZENNER Connect – what we do



- Operating and building a Germany wide customer owned LoRaWAN<sup>®</sup> network



- Planning and Installation support

- LoRaWAN Coverage estimation/simulation



- On Site evaluation
- Compatibility Testing



- Gateway- and Backhaul Monitoring

- Network Performance and Fraud Prevention

- Fault Clearance and Incident Reporting



- Hosting and IT Infrastructure



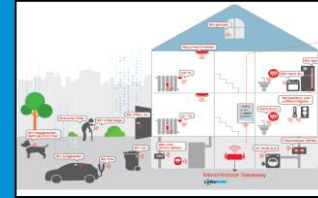
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# Minol ZENNER Connect – use cases that drive the rollout

## Productive Use Cases

1. Sub Metering: 400,000 devices (online)
2. Security: 250.000 devices (online)
3. Utility Metering: 50.000 devices (online)



## P.o.C Phase

1. Smart City Use Cases: P.o.C Phase 2.000 devices (online)
2. Smart Home/Building: P.o.C Phase 500 devices (online)
3. Industrial UseCases: P.o.C Phase 500 devices (online)

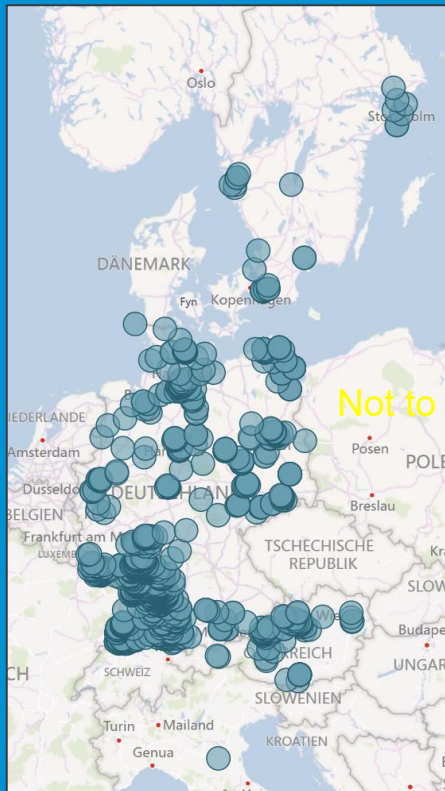
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## Not yet in P.o.C Phase

1. Logistics Tracking
2. Asset Management and localization
3. Smart Agriculture

## Minol ZENNER Connect – where we are



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- 3.000 Gateways Live (Indoor and Outdoor)
  - 80% Indoor Gateways
  - 20% Outdoor Gateway
- Plan for 5.000 New Gateways in 2019
- Live Operation in Germany, Sweden, Austria, Italy
- Live this Month: Poland, Denmark
- Live in 2019: China, Asia/Pacific, Americas

Netzikon

Wolfgang Krüger



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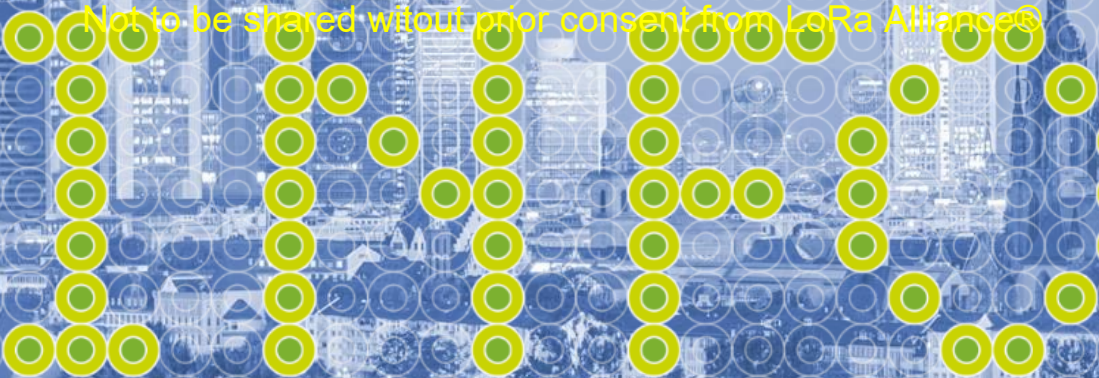


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# NETZIKON, GERMANY'S PUBLIC LORAWAN® NETWORK

get



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from things

## Netzikon - Who we are

- Nationwide public LoRaWAN<sup>®</sup> network operator in Germany
- LoRa Alliance<sup>™</sup> Member since 2015
- Founded in 11/2016
- 100% subsidiary of telent GmbH

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# Netzikon – Our pretension

- E2E data security for privacy and confidentiality
  - Own LRC in own premises, hardened GW interfaces, GW-VPN, AS-Security, HSM
- High network availability and reliability
  - HW + geo-redundant Tier3 computing center, 24/7/365 NOC, own field force
- High network quality
  - Demanding certified devices, tool-based coverage & network planning, HW testing
- Roaming (national, international)
  - National with strategic roaming partners > to enhance and densify our network
  - International > demand for boarder-free international use cases
  - Roaming Hub > time to market, reduced effort and costs, many roaming partners

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# Our strategy

- Progressively set up a full-coverage LoRaWAN<sup>®</sup> network all over Germany
  - Target: Nation-wide full-coverage LoRaWAN network by the end of 2020
  - Main Rollout: Concentration in the beginning on larger cities in Germany
  - Flexible Rollout on customer demand
- Secure, reliable, highly efficient, intelligent and innovative LoRaWAN Services
  - LoRaWAN is global! Large business customers are global!
  - LoRaWAN works thinking big with regard to volume of devices!
  - Use cases like tracking and localization require internationally connected networks with many roaming partners!

Therefore we go for a future-proof public network approach!

We bring your IoT to the edge



Netzikon

*DAS NETZ DER DINGE*

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Digital IoT Infrastructure for Germany

Netzikon GmbH  
Gerberstraße 34 • 71522 Backnang  
[www.netzikon.de](http://www.netzikon.de)  
[info@netzikon.de](mailto:info@netzikon.de)

# IoT bei Unitymedia Business

Matthias Emmerman



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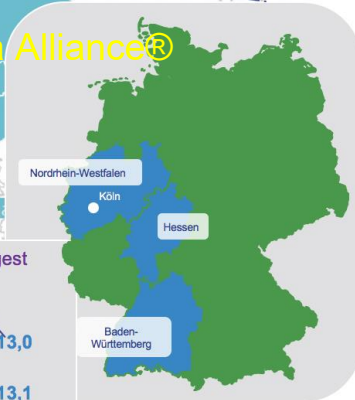
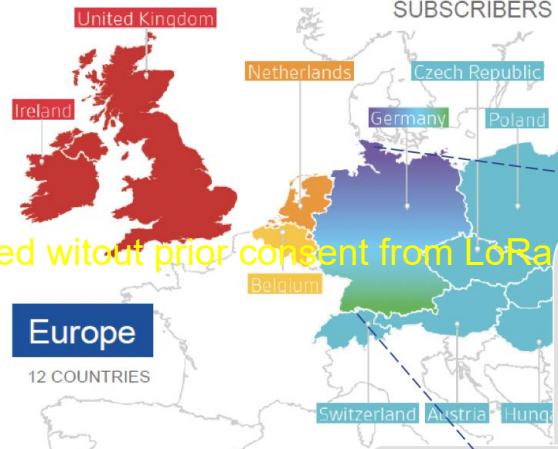
# OUR FOOTPRINT



LIBERTY GLOBAL

**56 mm** HOMES PASSED  
**59+ mm** RGUs  
**11+ mm** MOBILE SUBSCRIBERS  
**\$19.3 bn** REVENUE  
**45,000** EMPLOYEES

**Other operations**  
 Business Services  
 Media Investments Group  
 UPC DTH  
 Ventures



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Unitymedia 2<sup>nd</sup> largest cable operator (regarding coverage)

Homes past in million	13,0
RGU in million	13,1
Revenue in million €	2.382

CVC Consumer/B2B/Networks  
 CVC B2B/Networks including markets where domestic connection is competitive or party owner networks

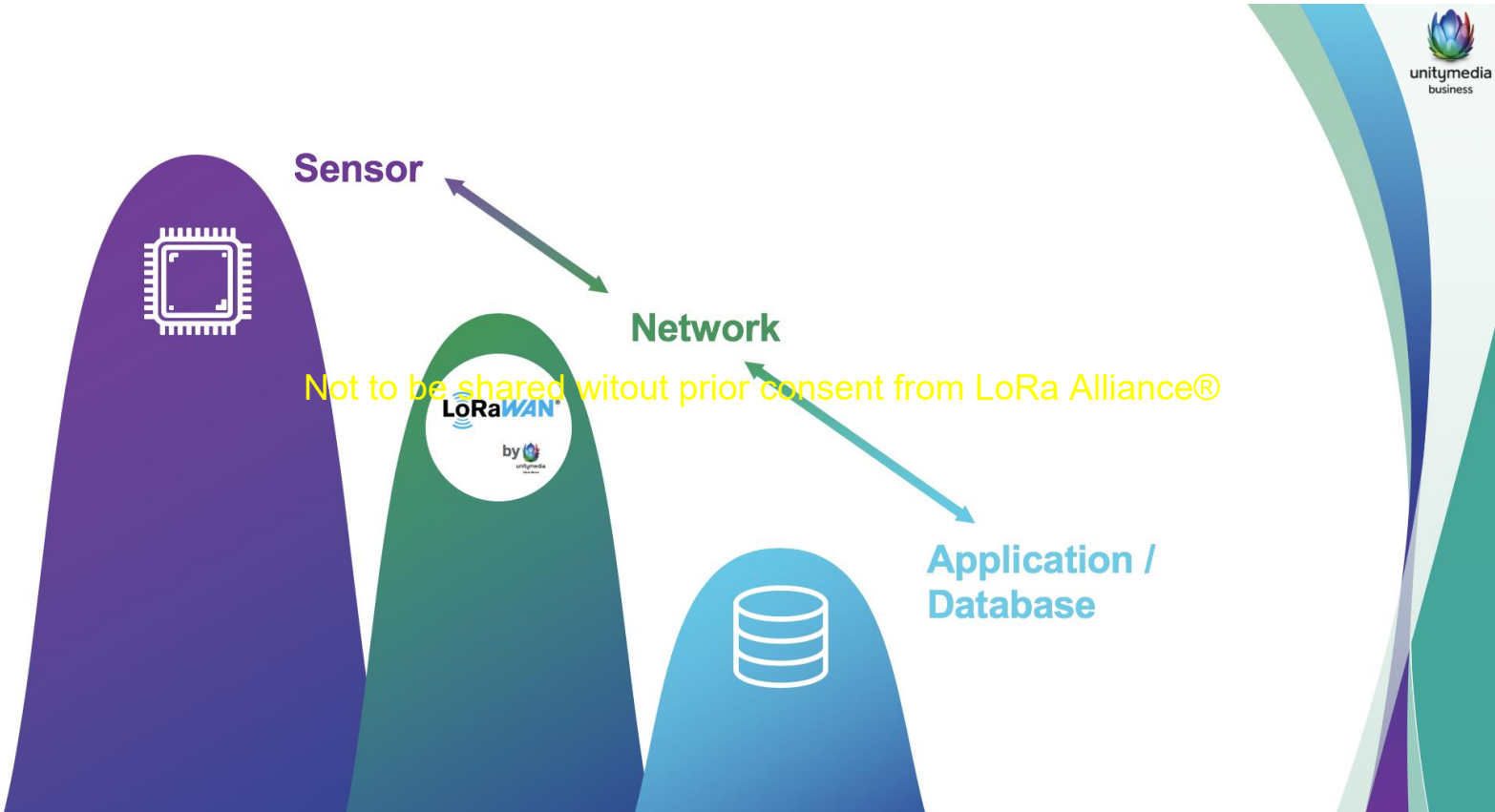


Revenue is presented as annualized results for the six months ended June 30, 2016. All other fact & figures as of June 30, 2016.  
 Unitymedia IoT Connect – die Infrastruktur für das Internet der Dinge!





# LoRaWAN® by Unitymedia: Network, just the Network





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# Building up the Network with Infrastructure Partners

## Gaining Revenue via EcoSystem Partners



### EcoSystem Partners

- Today's lack of connectivity in sales pitch is solved
- End user contract with direct payment between partner and end user
- Use the Unitymedia network to offer their use case to customers
- Pay Unitymedia for using connectivity



- Use Unitymedia network to offer their e2e solution to their customers
- Hold the end user contract

### Infrastructure Partners

- Utilizing the partners' infrastructure (buildings, internet access, power) for gateway locations
- Partner approach allows Unitymedia to rapidly build up the network nation-wide
- The infrastructure partner receives a revenue share, based on the connectivity revenue being generated via its gateway locations



- Providing their infrastructure to build up network
- Asking for a massive number of use cases themselves

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Unitymedia IoT Connect – die Infrastruktur für das Internet der Dinge!

Objenious

Arnaud Vandererven



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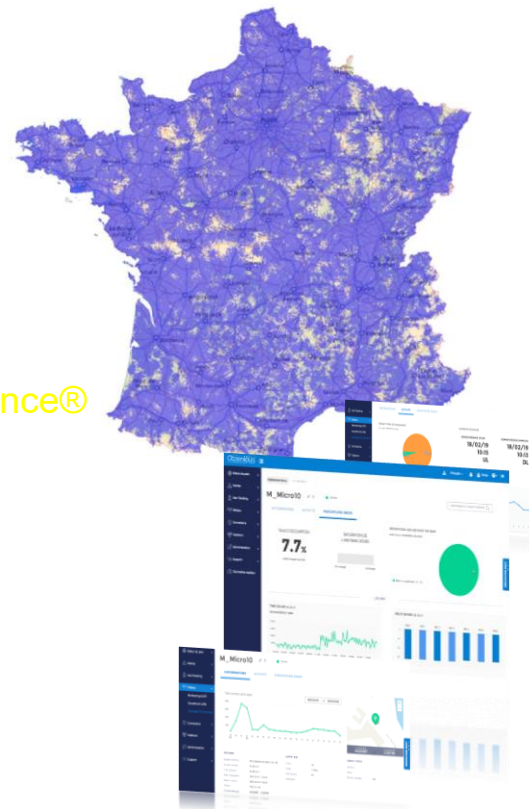


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# WHAT IS OBJENIOUS

- Objenious is the Bouygues Telecom brand focused on IoT
- Co-founder of the LoRa Alliance™ in 2015
- A LoRaWAN® nationwide network in France since 2016
  - 4200+ antennas on air
  - 93% coverage of the French population (outdoor)
  - A carrier grade operator SLA & State of the art security level
- Home made IoT platform SPOT (Smart Portal of Things) not to be shared without prior consentings LoRa Alliance®
- 150k devices which generate 5 million messages / day
- Capability to roll out dedicated LoRaWAN infrastructure
- Some big customers



AIRBUS

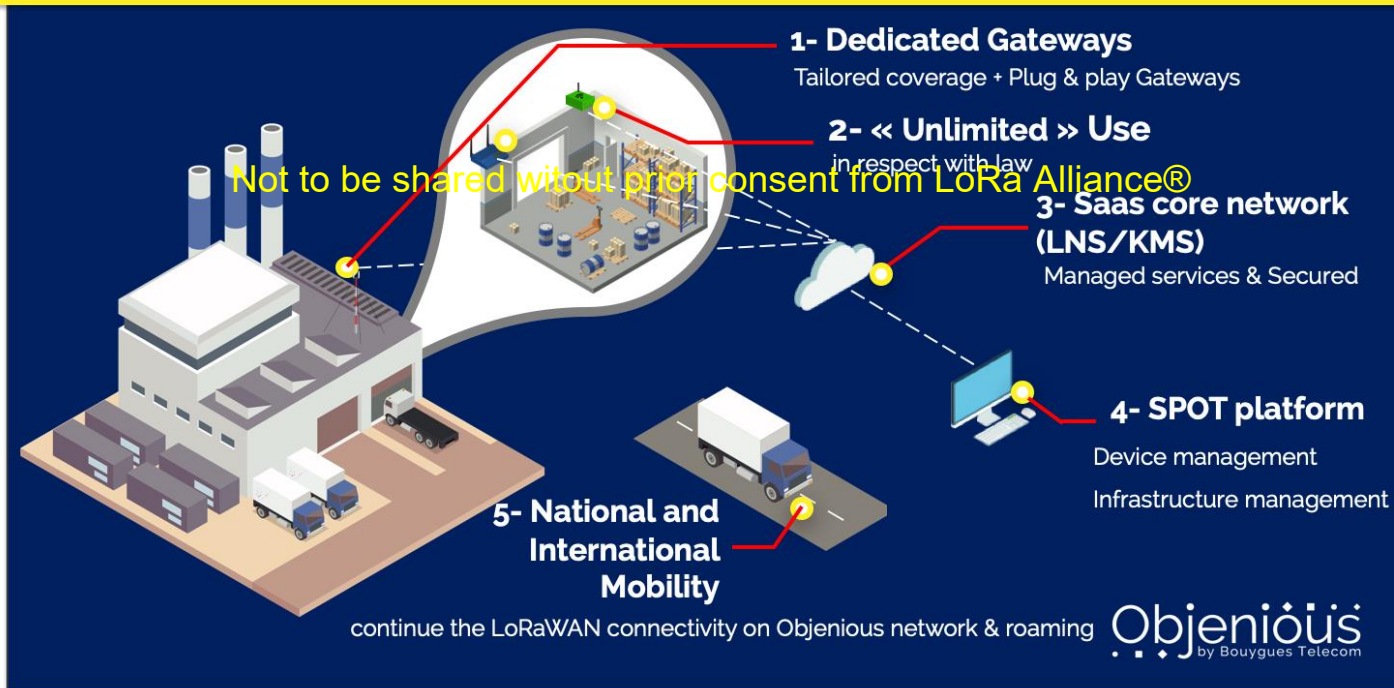
antargaz

SNCF

Carrefour

## What is the main competitor of Objeniou's in France ?

### OBJENIOUS LORAWAN® DEDICATED NETWORK IN 5 COMPONENTS



# Orange IoT Network LoRaWAN®

The Internet of Things is going to change the world. For everyone.  
Ronan Le Bras



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# To address variety of use cases, Orange deploys a portfolio of **complementary technologies**



N°1 in Europe  
for M2M connectivity.



1

Our mobile  
2G, 3G, 4G networks

In coming years...

5G

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2

  
LoRaWAN®  
Technology

3



LTE-M

LTE-M Technology

Orange restricted



# Orange selected LoRaWAN® beginning 2015 as first LPWA solution to address B2B customer connectivity needs

## LoRaWAN, an unlicensed LPWA technology...

Non-cellular technology based on a new network



Available now



Easy to deploy, anywhere in the world on-demand



National deployment in France



World Wide Eco-system

## LoRaWAN Model

Specifications of LoRaWAN MAC by LoRa Alliance

Regional Specific Band  
433 / 868 / 915 MHz

Private and Public operators deployment

Certification program by LoRa Alliance and Orange to ensure interoperability

Roaming under definition by LoRa Alliance

## LoRaWAN Key Strengths



Low cost modules available Now



Proven Low power consumption



Long Range Deep Indoor



Bi-Directional



Geolocation



Small size Gateway and Nano-gateway



Light Backhaul (LTE / Ethernet)

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# Orange IoT LoRaWAN® network deployments

- France : Nationwide coverage in 2018.
- 95% population coverage, 30 000 cities
- 4900 Gateways deployed on mobile site
- Densify our networks on demand depending on customers needs



(1) Figures as of early July 2018



A targeted LoRaWAN coverage in other countries, in cities, airports, ports or industrial sites for B2B Market

# LoRaWAN® technology: the first LPWA (Low Power Wide Area) network dedicated to the Internet of Things

## Nova Veolia - Birdz

Connected sensors to predict water consumption and detect atypical consumption



3 000 000

intelligent water meters in France over the next 10 years

70%

Their goal is to read more than 70% of their meters remotely by 2027.

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LoRaWAN is the maturity and sustainable technology for *Water Smart Metering* for the next 10 years : Deep Indoor and long life without battery change

"Birdz has chosen Orange Business Services to help it make a strategic shift from a technology requiring deployment of a radio network infrastructure to a solution that is open, interoperable and reversible and also a solution which meets the needs of our customers."

Xavier Mathieu  
CEO of Birdz

## City of Alba Iulia

Alba Iulia Smart City 2018 project, in Romania.



The smart lighting solution is connected to the LoRaWAN network. The use of smart lighting, whereby streetlights are dimmed when there is no one around, has reduced related energy consumption by 50-70%.





# Smart Water Projects – Largest deployment EU

Birdz – Bruno Hamamlian



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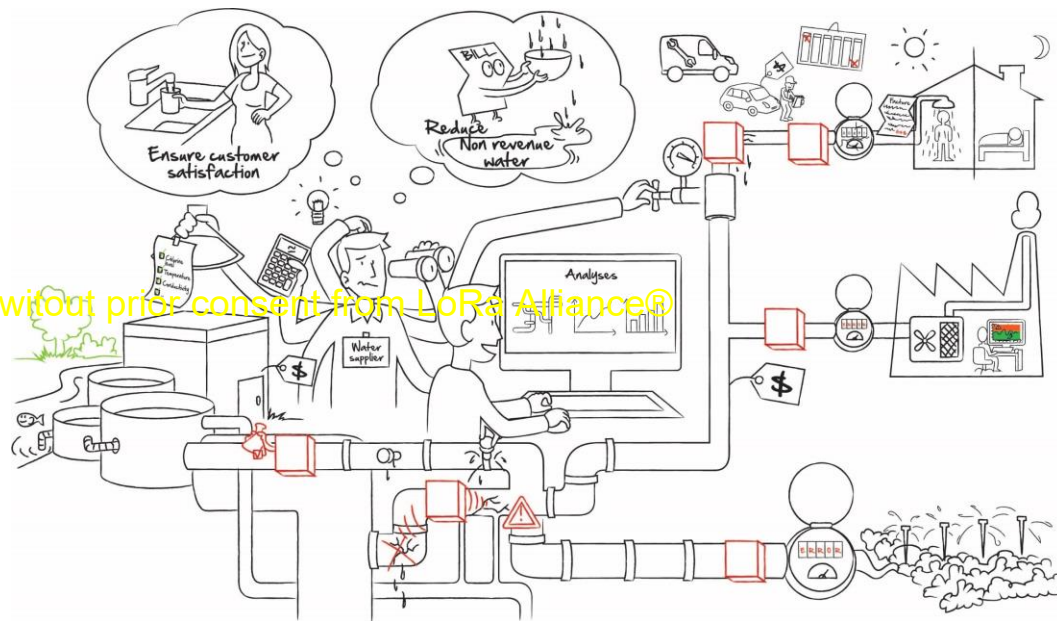




# FOCUS ON WATER INDUSTRY

# 1

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# NON-REVENUE WATER : THE TOUGH REALITY



## 20-50% OF WATER IS LOST DUE TO



LEAKAGE & PIPELINE BURSTS



WATER THEFT



PRIVATE TANKERS



ILLEGAL CONNECTIONS

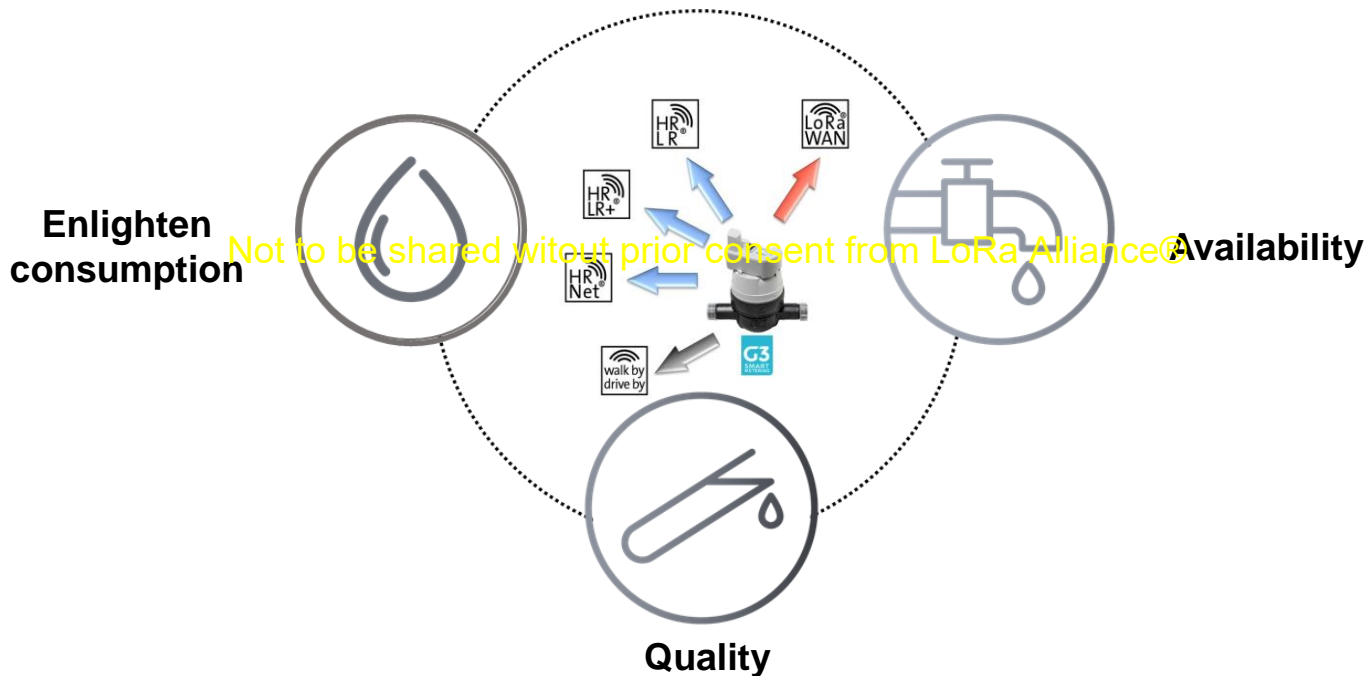


MAINTENANCE PROBLEMS

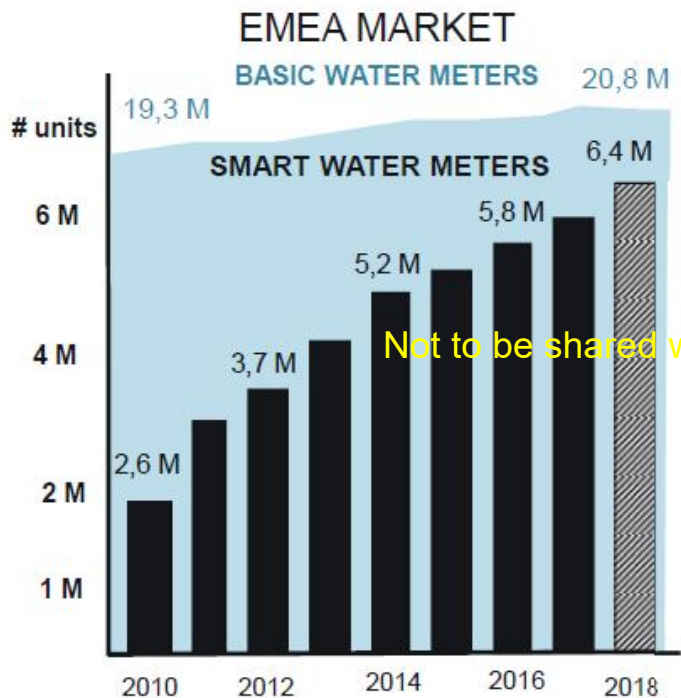
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# HELP CITIES AND WATER UTILITIES TO BETTER MANAGE WATER DISTRIBUTION AND IMPROVE WATER MANAGEMENT

Smart water meters provide a comprehensive digital water solutions to maximize balance with 3 water KPIs



# IN EMEA, AMR DOMINATES AMI



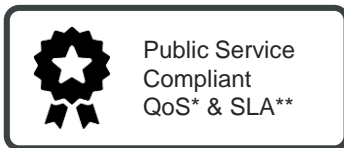
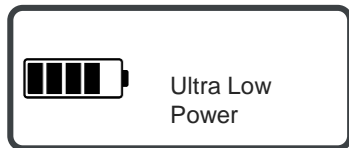
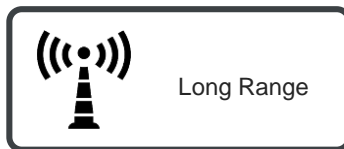
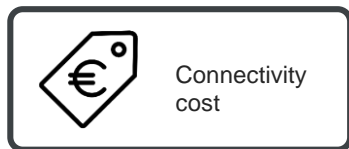
Source : IHS Markit 2017

- EMEA Market for water metering is stable
- Smart Water metering has grown continuously at fast pace (CAGR : +14%)
- AMR (Walk-by/Drive-by) is the dominant meter reading mode (>95% smart water meters)
- Public water sector requires long battery lifetime (12-15 years)



# AMI AS A MASTER USE CASE...NOT A CONNECTION-ONLY PROBLEM

- No single connectivity solution will dominate as far as the operator's offers are still very dispersive



QoS\*: Quality of Service  
SLA\*\*: Service Level Agreement

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Source : Kurrant 2019 & estimation

# LARGE SMART WATER PROJECTS

Starting Point : How do you define « Large »?

2

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# CASE #1 : EAUX DU GRAND LYON (FR – 2014)

## One the largest LoRaWAN® digital water network project in Europe



- 54 municipalities
- 1,3 million supplied customers
- 396 000 metering points
- 97,4 millions m<sup>3</sup> distributed water per year
- 4 000 km distribution pipe network

### Positive Outcomes:

- 1200 new water leaks found and repaired
- 1 million m<sup>3</sup> of water saved annually in production
- increase of water network efficiency in four years, from 77% in 2014 to 85,2% in 2018

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# CASE #1 : EAUX DU GRAND LYON

## Description of the Smart Water Network program

### Smart Instrumentation

- 396 000 Smart Water meters
- 6 000 Acoustic Correlators from Gutermann
- 100 Fire and Water Hydrants
- 50 KAPTAS quality sensors

### A Tough program

- Roll-out planned from Feb-2015 to Jan-2019
- O&M over 10 years duration
- Reference Project in terms of KPI and SLA for Water Conservation

### Contractual SLA & KPI

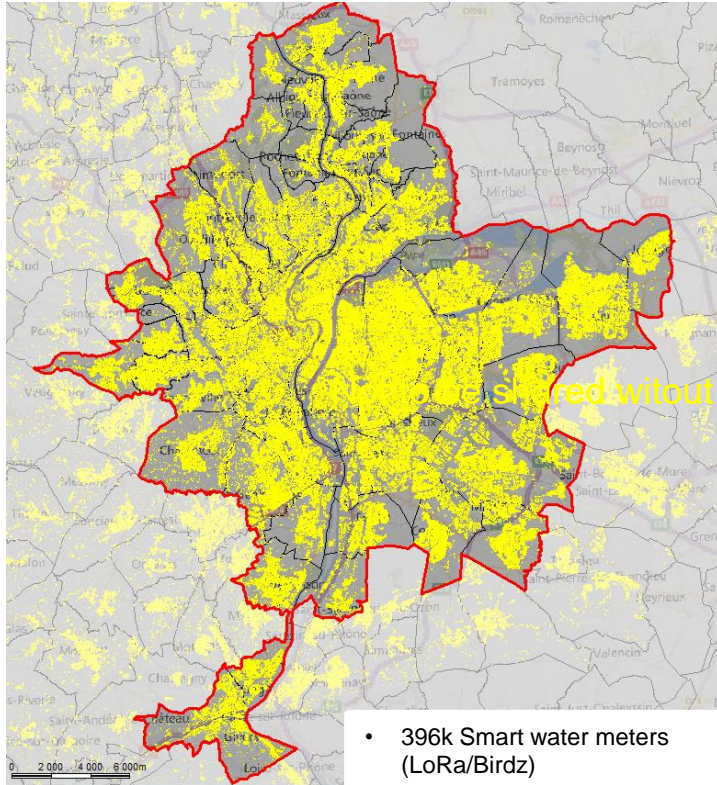
- **100% of smart water meters must be connected** to Eaux du Grand Lyon Business ERP (Public Service compliancy) and **service continuity is guaranteed for 10 years**
- Data Collection KPI : **98% of the smart meters must send all daily midnight index...**  
each day in a month
- If KPI are not satisfied, a **financial penalty is applied** (the client doesn't pay the monthly fee for faulty meters.
- Example :  
97% Measured vs 98% KPI, means 7,9k faulty smart meters,  
**Financial penalty equal to -2,0% on monthly contract revenues for 1% deviation from KPIs**

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# CASE #1 : EAUX DU GRAND LYON

## LoRa® enabled AMI System from Birdz



Geographical distribution of smart meters

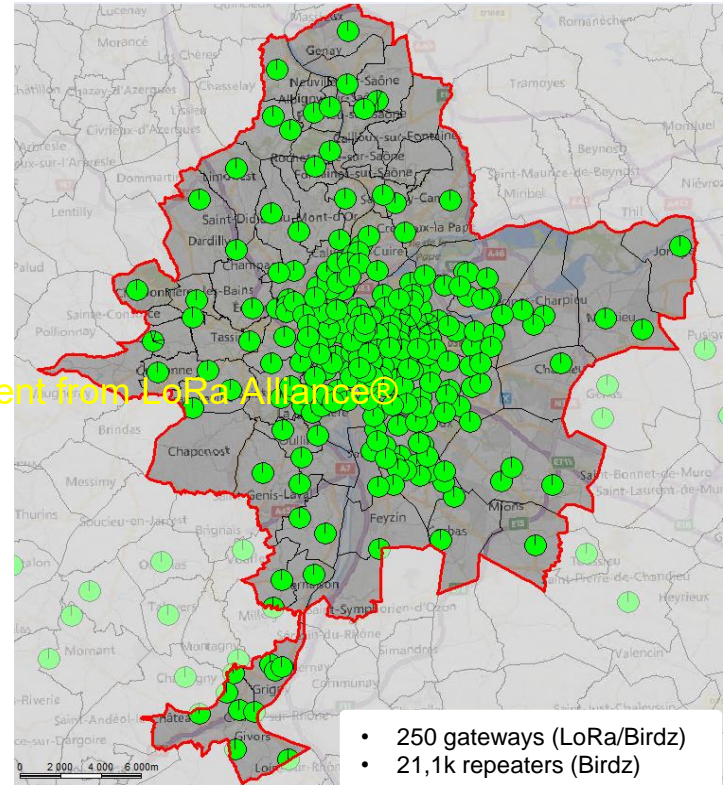
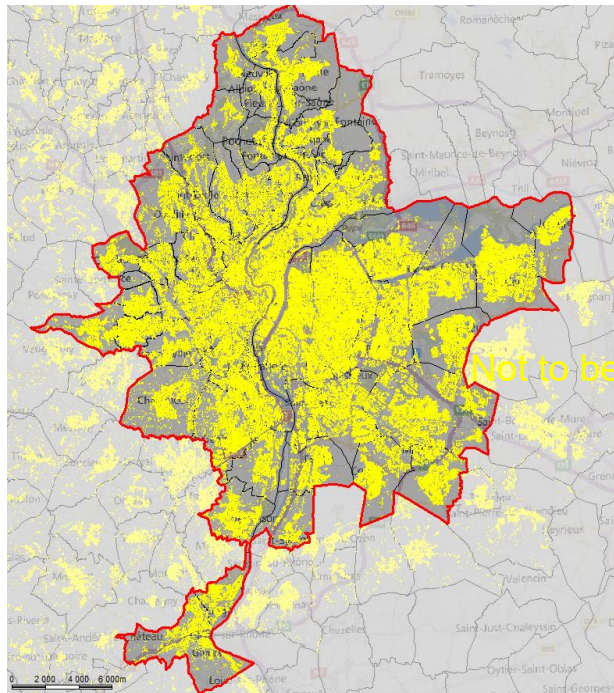


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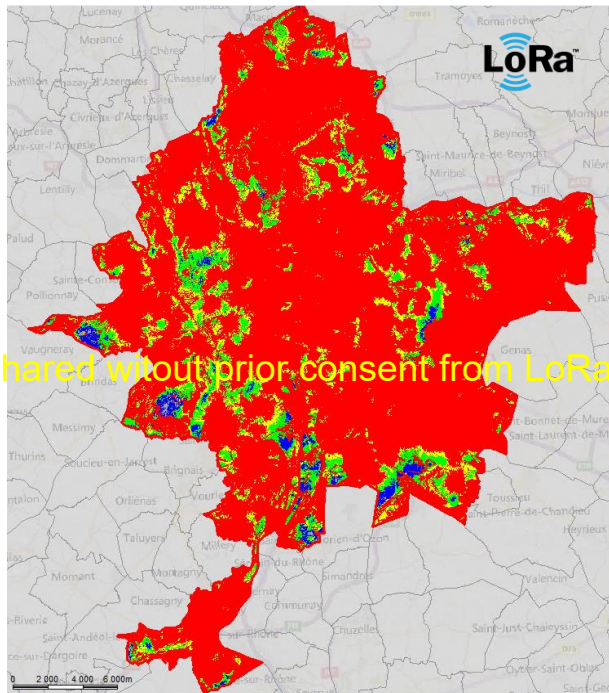


# CASE #1 : EAUX DU GRAND LYON

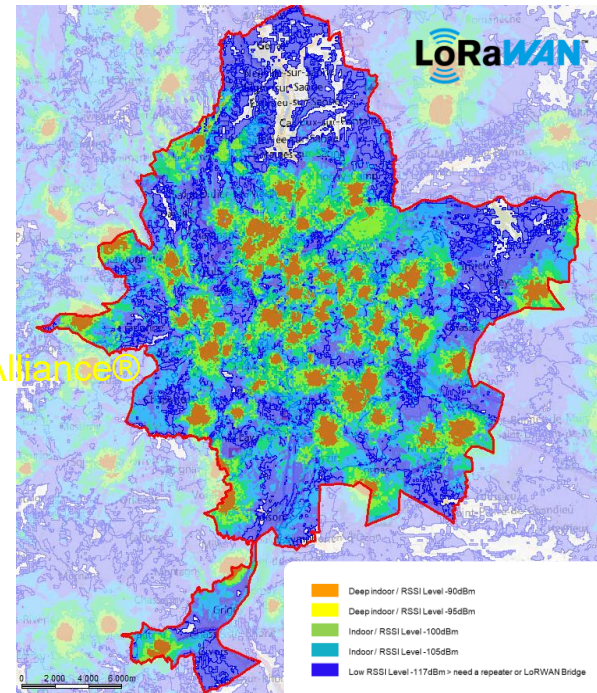
## Proprietary LoRa AMI Network vs Public LoRaWAN® Network?



Geographical distribution of smart meters



LoRa enabled proprietary Network by Birdz



Public LoraWAN network

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# 2019, FINETUNING THE LoRaWAN® USE CASE WITH PARTNERS

# 3

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# CASE #2 : CAPA (Corsica – 2018)

## First Veolia project with public LoRaWAN® operator



- 10 municipalities
- 85,104 supplied customers
- **30 000 metering points**
- 450 km distribution pipe network
- Most of cities are on the seaside, with hills
- Contract duration : 12 years

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# CASE #2 : CAPA (Corsica – 2018)

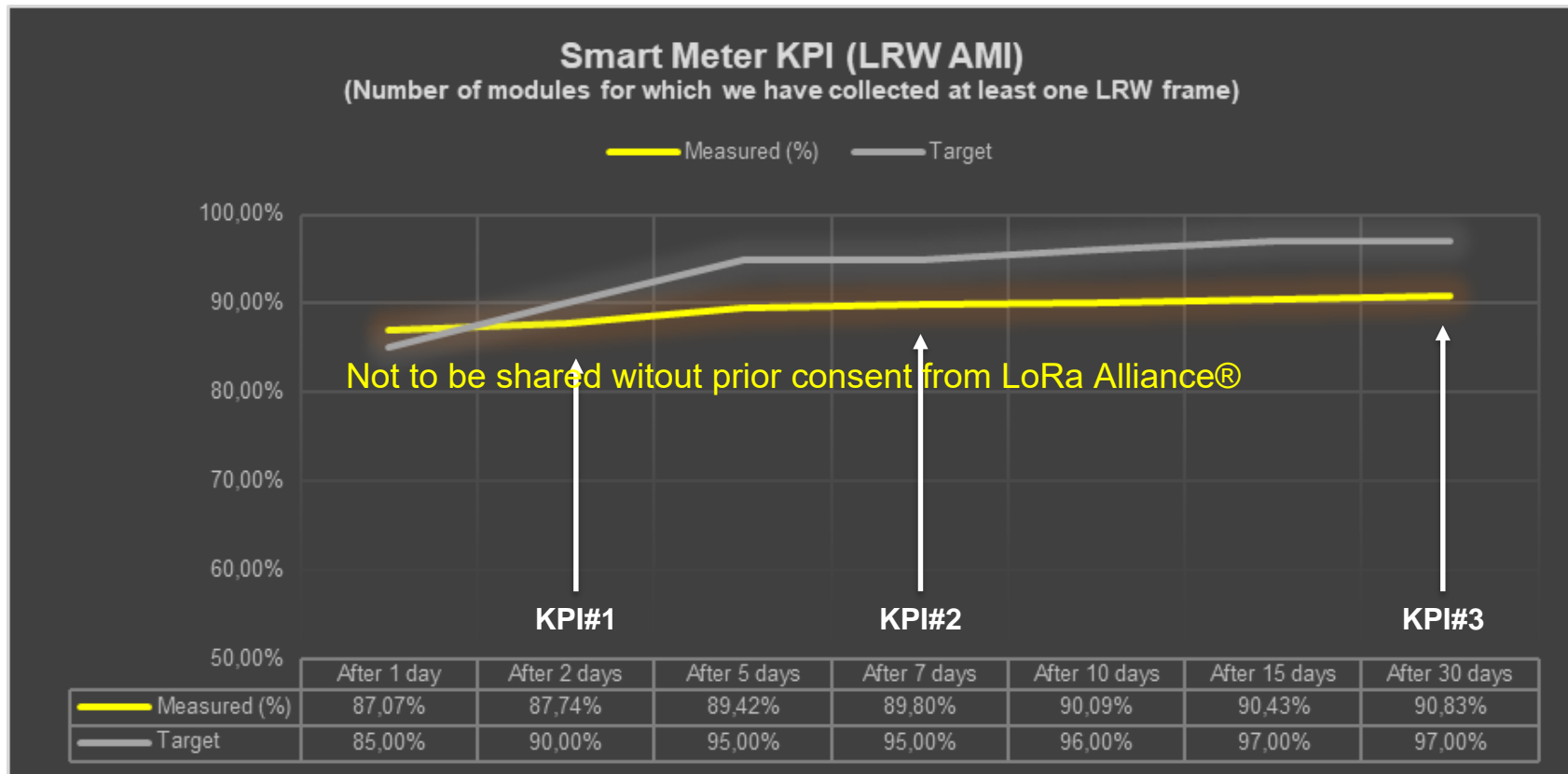
## Project figures



Rollout status : 10,897 smart meters installed YTD (36%) - Target : 30,000 smart meters by Dec-2020

# CASE #2 : CAPA (Corsica – 2018)

## First results promising, but strong need for coverage densification

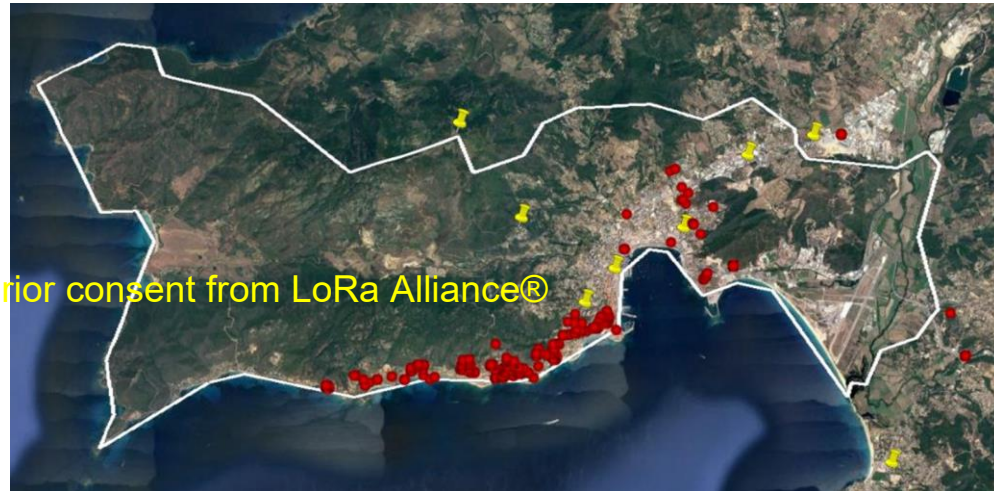


# CASE #2 : CAPA (Corsica – 2018)

## Still a long way to go...



**Projected coverage :** Projected Coverage Map of Public LoRaWAN® Operator (in yellow)



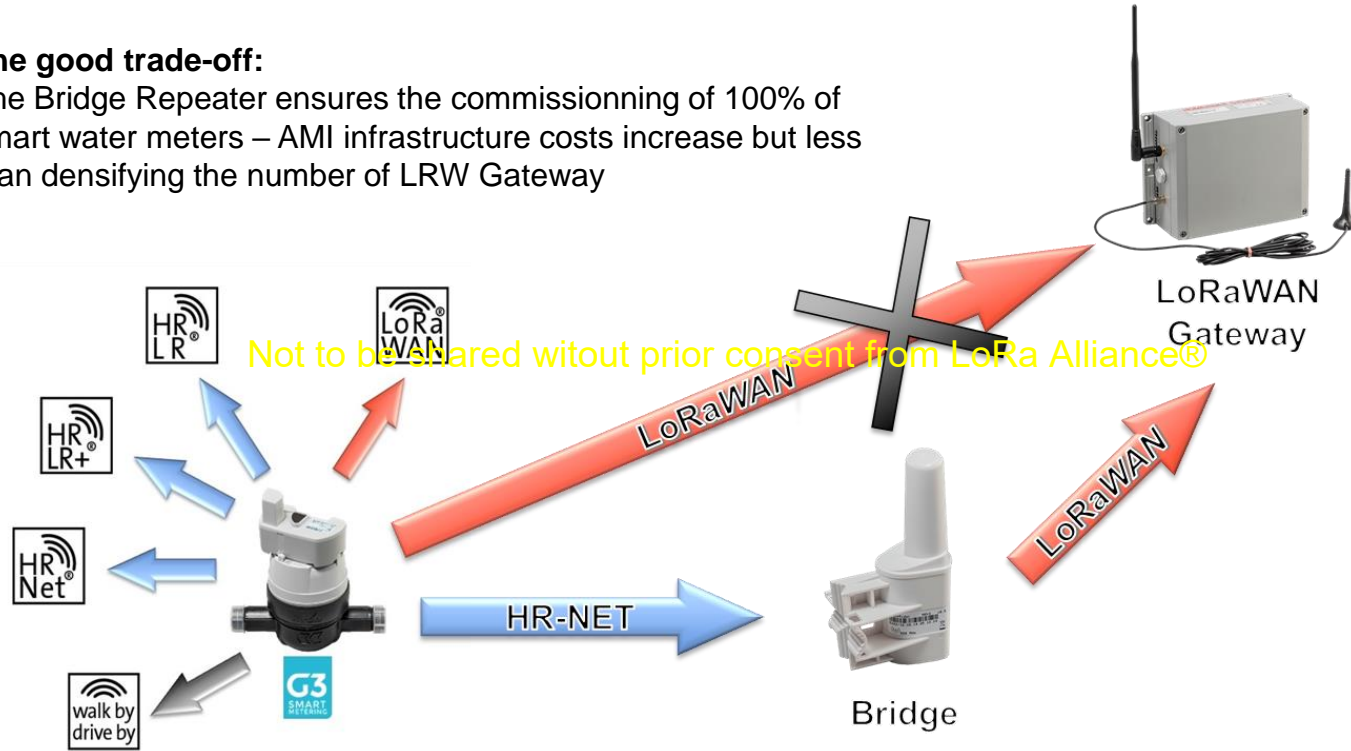
**Reality :** Geographical distribution of smart water meters **with no communication.**  
(9,17%; 999 smart water meters out of 10,897 installed YTD)

# CASE #2 : CAPA (Corsica – 2018)

## How to deal with Deep Indoor – The Bridge

### The good trade-off:

The Bridge Repeater ensures the commissioning of 100% of smart water meters – AMI infrastructure costs increase but less than densifying the number of LRW Gateway





# CASE #3 : TOULOUSE (FR – 2019)

## First Big project with public LoRaWAN® operator

toulouse  
métropole

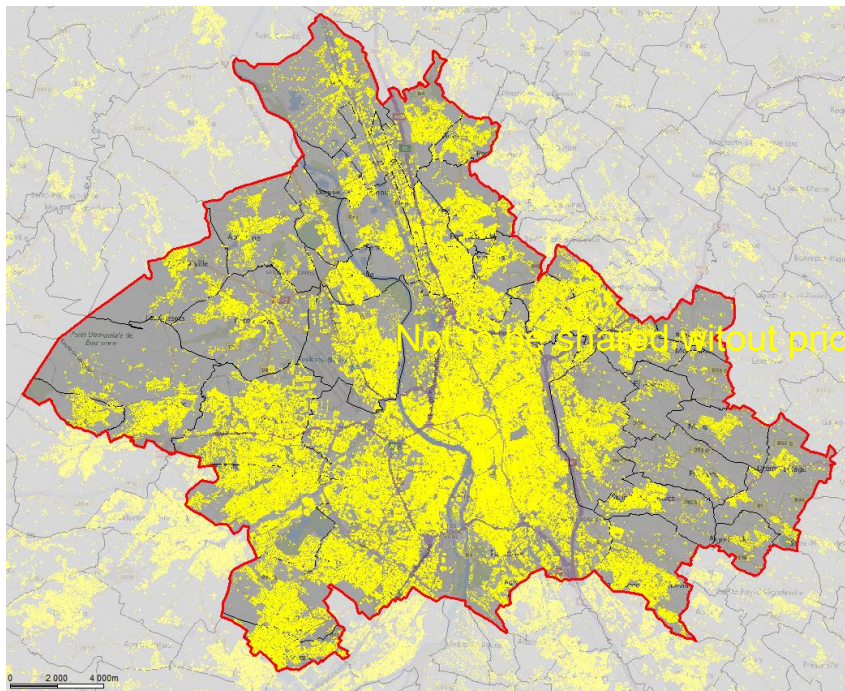


- 37 municipalities
- 756,000 supplied customers
- **466km<sup>2</sup>** area to cover
- **200,000 metering points** (end of contract)
- 3,340 km distribution pipe network
- 56 reservoirs
- Contract duration : 12 years
- KPIs are tough, as always!

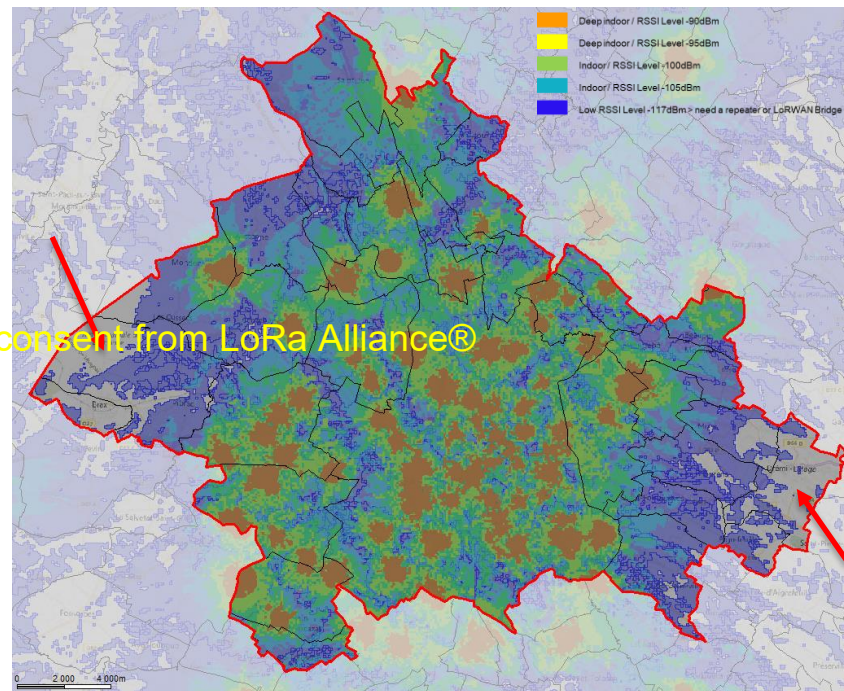


# CASE #3 : TOULOUSE (FR – 2019)

## LPWAN coverage : the perfect match?



Geographical distribution of the smart water meters



Projected LoRaWAN coverage of the public operator

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# ON THE ROAD TO 3 MILLION LoRaWAN® SMART WATER METERS



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**Creating  
Valuable**

**IoT**

**Connections**



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**Lunch served in Bon Dia, 2 hour rolling service, please be sure to visit the Marketplace during lunch**

Momenta Finalists Judging Session to begin at 12:45pm, Bordeaux Conference Room

**Business Track 2.00pm – 6.00pm, Bordeaux Conference Room 2<sup>nd</sup> Floor**  
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**Technical Track 2.00pm – 6.00pm Romanee-Conte Room 1<sup>st</sup> Floor**

**Workshops Zoo I & II 1<sup>st</sup> Floor**

Networking Drinks Sponsored by Semtech 6.00pm – 7.00pm in the Marketplace