Nicolas JORDAN
Abeeway CEO – Actility COO

Comment le IoT basse consommation est en train de bouleverser le marché de la logistique (entre autre)

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IoT Geolocation Market Opportunities & Segmentation

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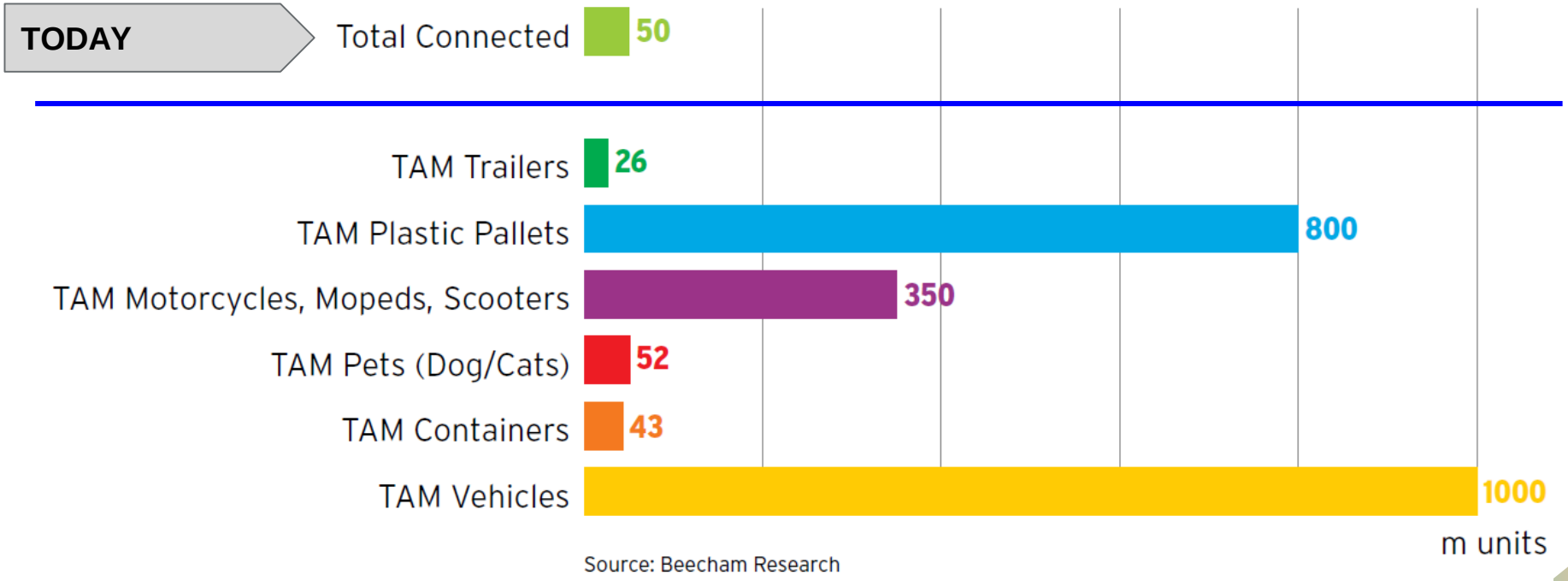
Mobile Asset Tracking Market



http://iotfortracking.com/wp-content/uploads/2018/04/Sierra-Wireless-April.pdf

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LPWAN-Enabled Geolocation Applications

Asset Management

Fleet Management

Anti-theft rental scooter/bike tracking

Logistics parcel/bags tracking

Worker Safety Tracking (Oil & Gas)

Elderly and disabled care

Tracking solution for outdoor sports

Pets and Animal tracking

In the fast growing tracking market segment, LPWAN-Enabled IoT trackers open new possibilities

Tracking modes & Tracking technologies

Tracking use cases combine the following tracking modes

- **Permanent tracking** : low frequency, low resolution
- **On-demand tracking** : high resolution
- **Geofencing** : high frequency, low resolution

Technology segments

One-way trackers (e.g. Periodic wake-up cellular, GlobalStar)

- Cannot switch modes (Permanent tracking only) → require many more fixes
- Cannot use AGPS

Bidirectional trackers (LoRaWAN, always on cellular)

- Allow power optimisation through intelligent mode switching
- Can do both high frequency and on-demand high resolution

Advantages of LPWAN (LoRaWAN, NB-IoT, LTE-M) for tracking

Geofencing	Permanent tracking	On-demand tracking
Ultra low-power radio ▪ Much longer battery life time Vs conventional systems ▪ Compatible with long-life battery powered products (Required peak current much lower than cellular technology) ▪ Lower connectivity and maintenance costs		
Bidirectional technology ▪ Always use optimal tracking mode to optimize battery life ▪ Reduce fix time and power consumption through AGPS ▪ Take action on dynamic geo-triggers		
TDoA technology ▪ provides ultra low power geolocation with 50 to 100m accuracy ▪ may be deployed on private port / campus to locally optimize geofencing energy cost ▪ Ultra-low BOM cost		Exclusive LPWAN AGPS technology provides ▪ Low Time To First Fix (TTFF) ▪ High cold-start sensitivity ▪ Exclusive 3 satellite fix ▪ Lower power consumption

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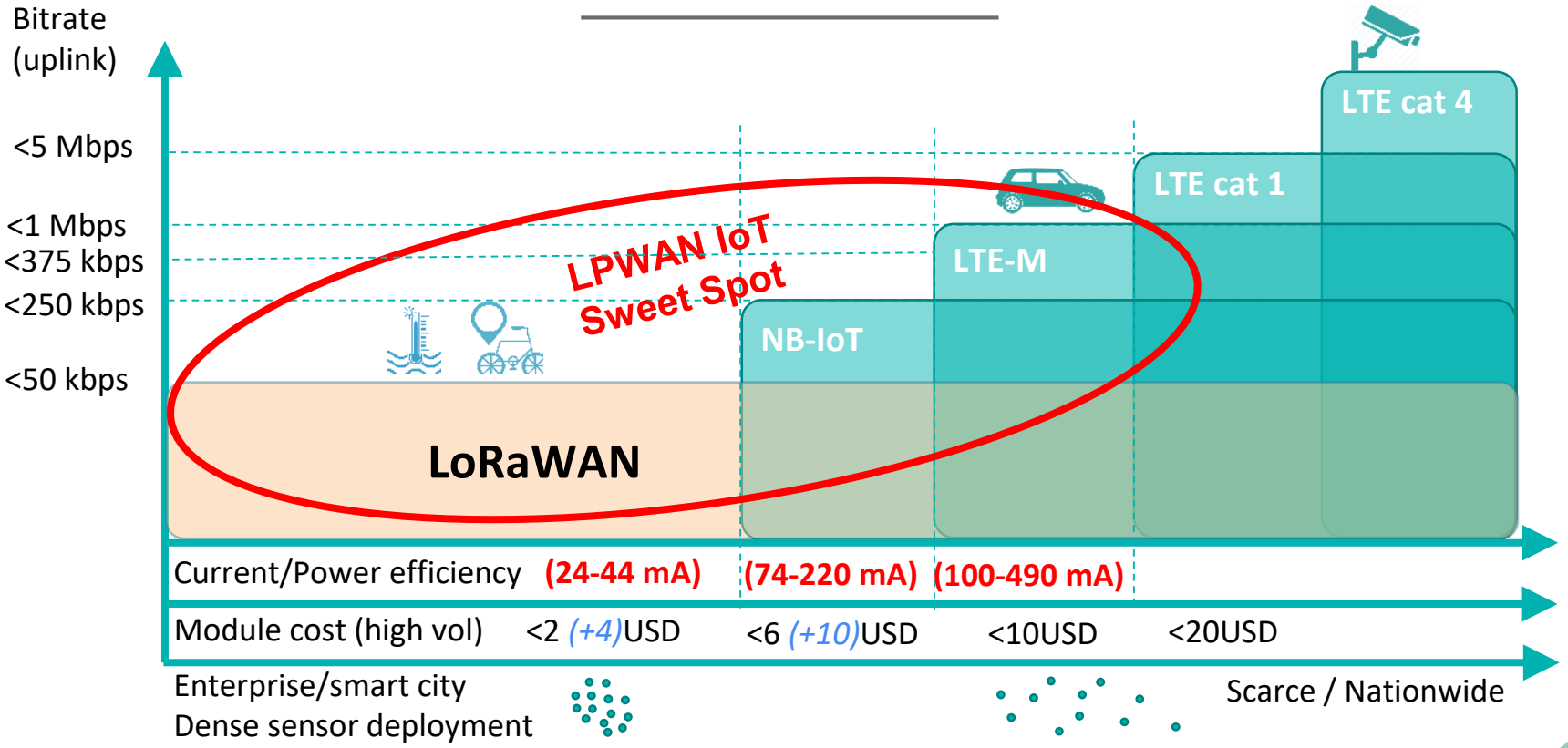
LPWAN Market Segmentation



*For LPWA solutions (LoRa and NB1), **battery for 10yr @ 4USD/2Ah, 10msg/day is shown.***
NB1 power use per 3GPP report R1 156006, 5Wh for 10yr, 1 msg/2h scenario
Source: https://www.slideshare.net/Actility/whitepaper-how-to-build-a-mutiltechnology-scalable-iot-connectivity-platform

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I. Designing a Multi-Technology LPWAN-enabled Geolocation Service

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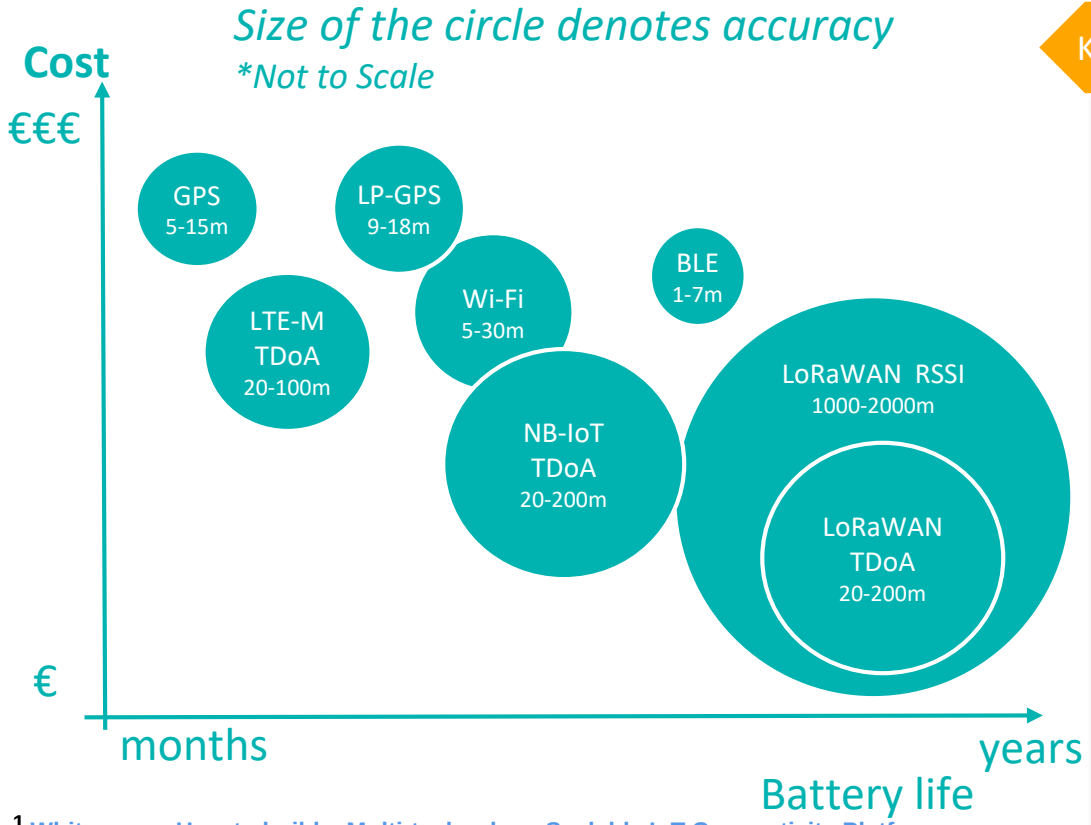
IoT Geolocation Technologies Landscape



Key geolocation technologies

1. LoRaWAN TDOA/RSSI
   - Lowest cost solution. Works natively with any LoRaWAN sensor
   - LoRaWAN enables long battery life use cases
   - TDOA: 20-200m accuracy range depending on conditions
   - RSSI: 1000-2000m accuracy
2. Cellular TDoA (3GPP Rel 14+) [2]
   - Assuming outdoor solution
   - NB-IoT is 3-5X less power efficient than LoRaWAN[1]
   - LTE-M has more accuracy than NB-IoT
3. Wi-Fi Location
   - Cost efficient solution for outdoor and indoor solution
   - Accuracy increases with hotspot density
   - Accuracy can be 5m with fingerprinting
4. BLE
   - Requires a BLE beaconing system
   - Indoor solution
5. GPS/Low Power-GPS
   - 1 GPS adds $5-$8 to the BOM
   - Most accurate but power consuming solution
   - LP-GPS brings battery consumption improvement

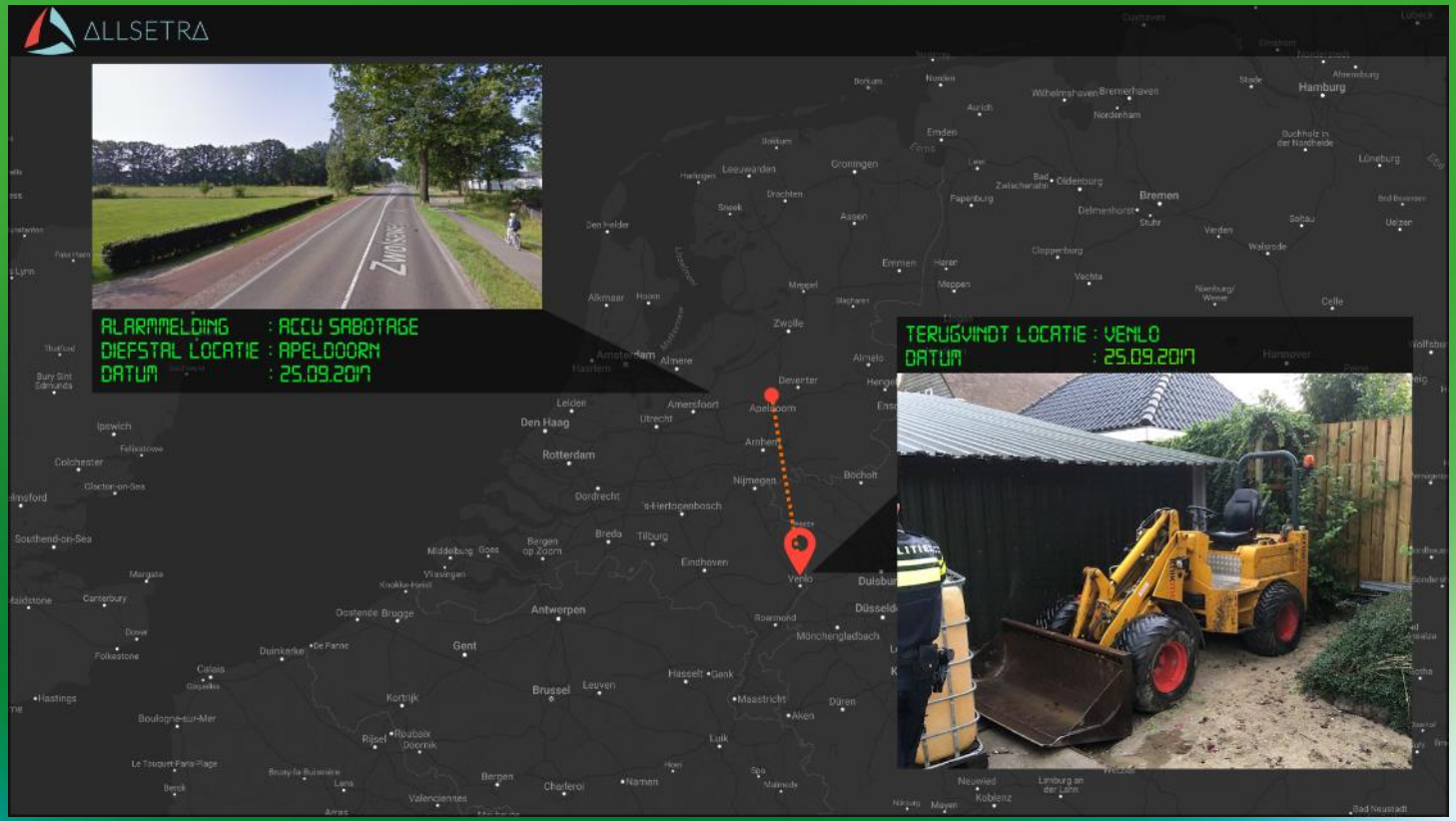
1 Whitepaper: How to build a Multi-technology Scalable IoT Connectivity Platform
2 Positioning for the Internet of Things: A 3GPP Perspective

The KPN LoRa network: denser network in urban area:

Legenda

- Trisector sites
- Omni sites

Excavator stolen and found



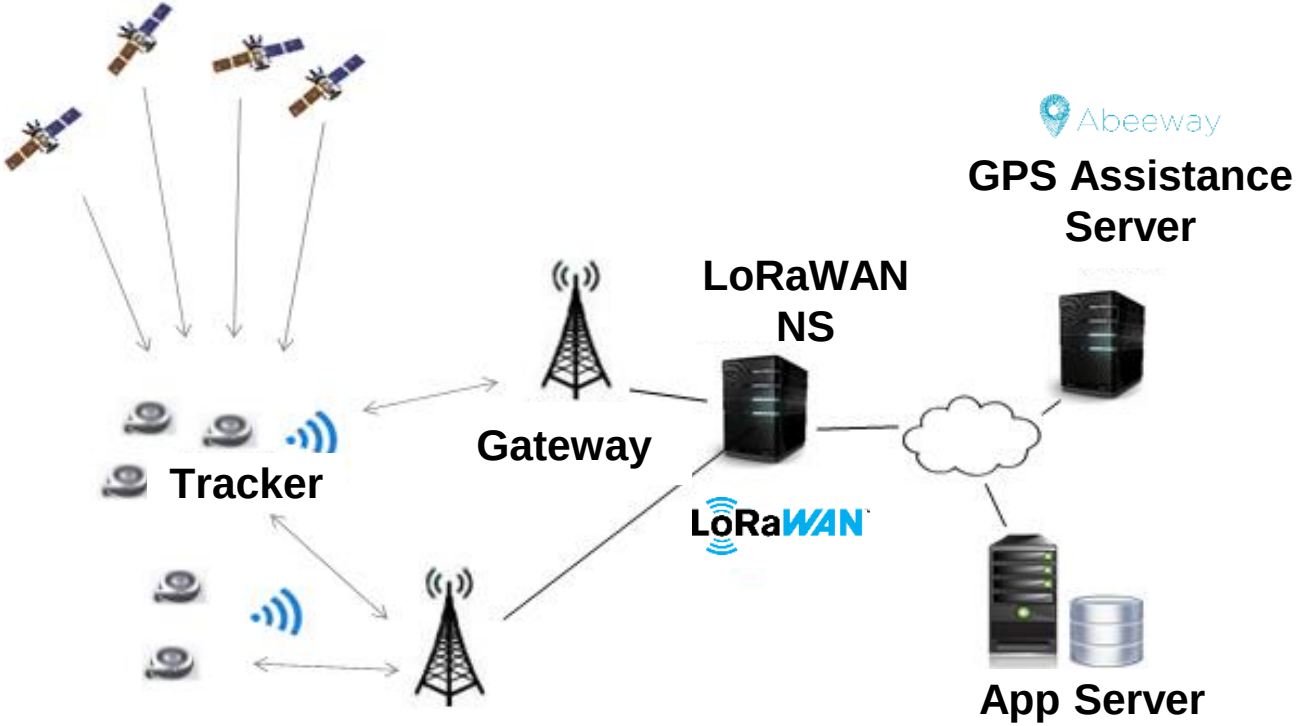
https://www.linkedin.com/feed/update/urn:li:activity:6319124217761800192/

Abeeway's patented technology: Low Power GPS

End device collects raw data from a GPS front-end within 10s

Transmits raw data to Low Power GPS server

Combines it with satellite's trajectories to calculate position



HIGH SPEED:
First fix in 10 sec, vs 1 min with GPS

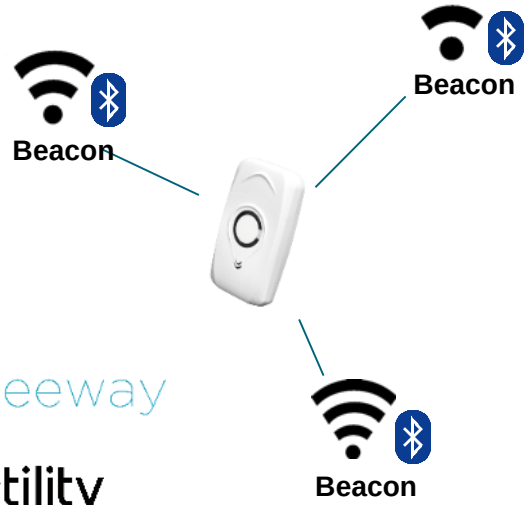
LOW POWER
LP-GPS 10x power efficient compared to GPS

HIGH PRECISION
Even in extreme conditions

BEACON SNIFFING – INDOOR GEOLOCATION

BLE BEACON SNIFFER:

- **Compatible with iBeacon, Eddystone, and Altbeacon**
- **Solver by solution provider**
- **Accuracy depending on BLE Beacons density (5m)**



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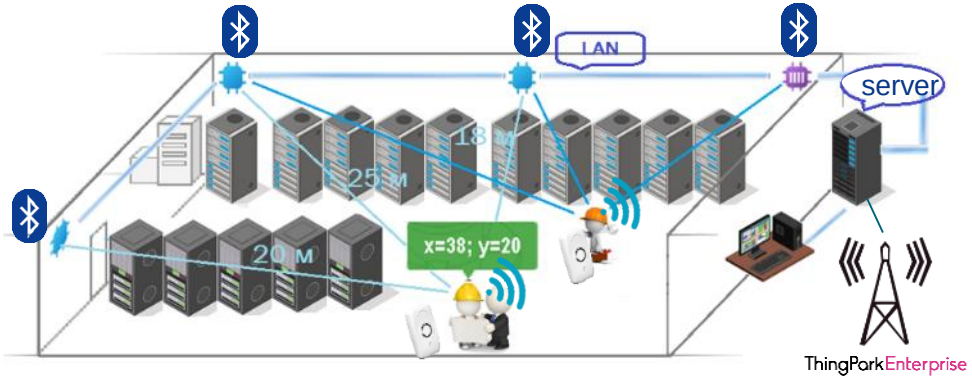
Listen to BLE Beacons advertisings to transmit nearby SSID and Received Signal Strength (RSSI) to the solver

Solution provider solver return the most likely position based on signal strength and database

Indoor tracking based on BLE Beaconing

RTLS



Bluetooth Low Energy 5.0

- The BLE radio interface allows to the tracker to periodically listen surroundings and receive a signal from nearby BLE beacons. The power of the received signal determines the distance to the beacon.
- Information about the beacon identifiers and the power of their signal is transmitted to the positioning system server through the LoRaWAN network. On the RTLS server, the received identifier is compared with the coordinates of the beacon, and thus the tracker is localized on the territory.
- **Ease of deployment**
- **Zonal positioning with an accuracy of 5 -10 m**
- **Low power consumption**

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Wi-Fi SNIFFING – INDOOR & OUTDOOR GEOLOCATION

Wi-Fi SNIFFER:

- **Simplicity and low cost implementation, still requires data processing on geolocation server**
- **Limited accuracy depending on Wi-Fi hotspot density (cities, home) accuracy 30m**

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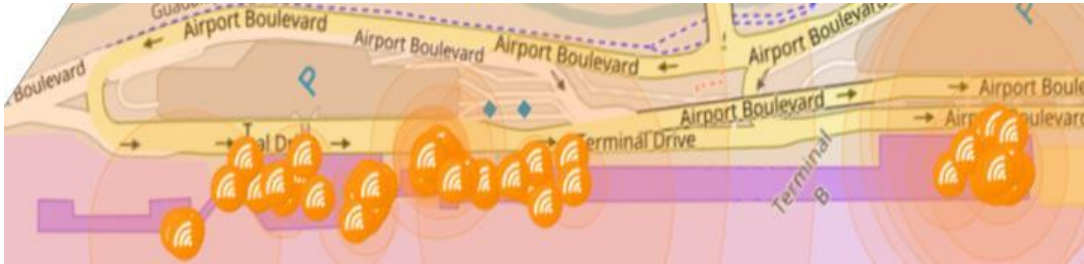
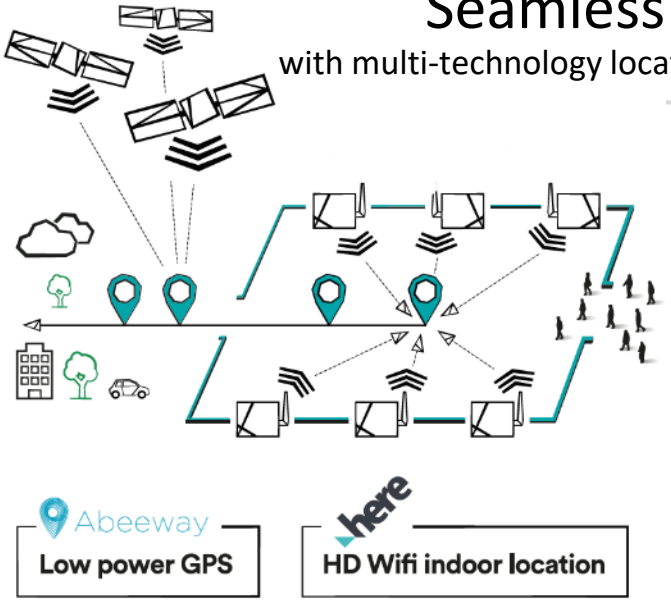
Listen to Wi-Fi Access Points to transmit nearby SSID and Received Signal Strength (RSSI) to the server

Search in database the position and return the most likely position based on signal strength



Seamless outdoor/indoor tracking

with multi-technology location solution: **Actility, Abeeway & HERE Technologies**



KEY BENEFITS:

- Seamless outdoor/indoor
- **HD Precision <5m (indoor & outdoor)** with wifi sniffing and fingerprinting
- No dedicated infrastructure required
- Low power devices
- Selects best location technology based on context
- Pre-integrated with business apps like SAP
- Compatible with custom apps, through geofencing, routing, navigation, fleet telematics & automotive APIs

KEY USE CASES:

- People safety & security
- Warehouse management
- Seamless goods tracking
- Supply chain management

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Optimizing Campus geolocation with D-AGPS (outdoor)

D-AGPS probes with fixed known positions allow the AGPS solver to increase location accuracy

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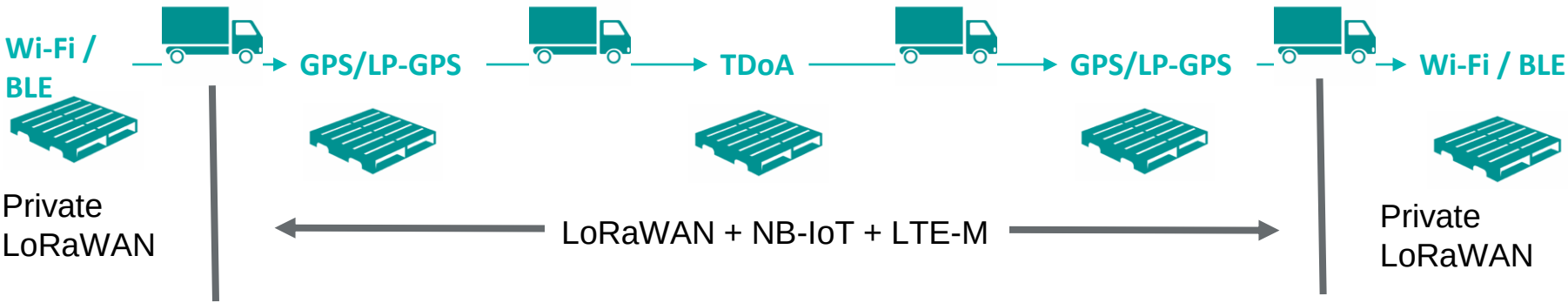
Life of smart pallet



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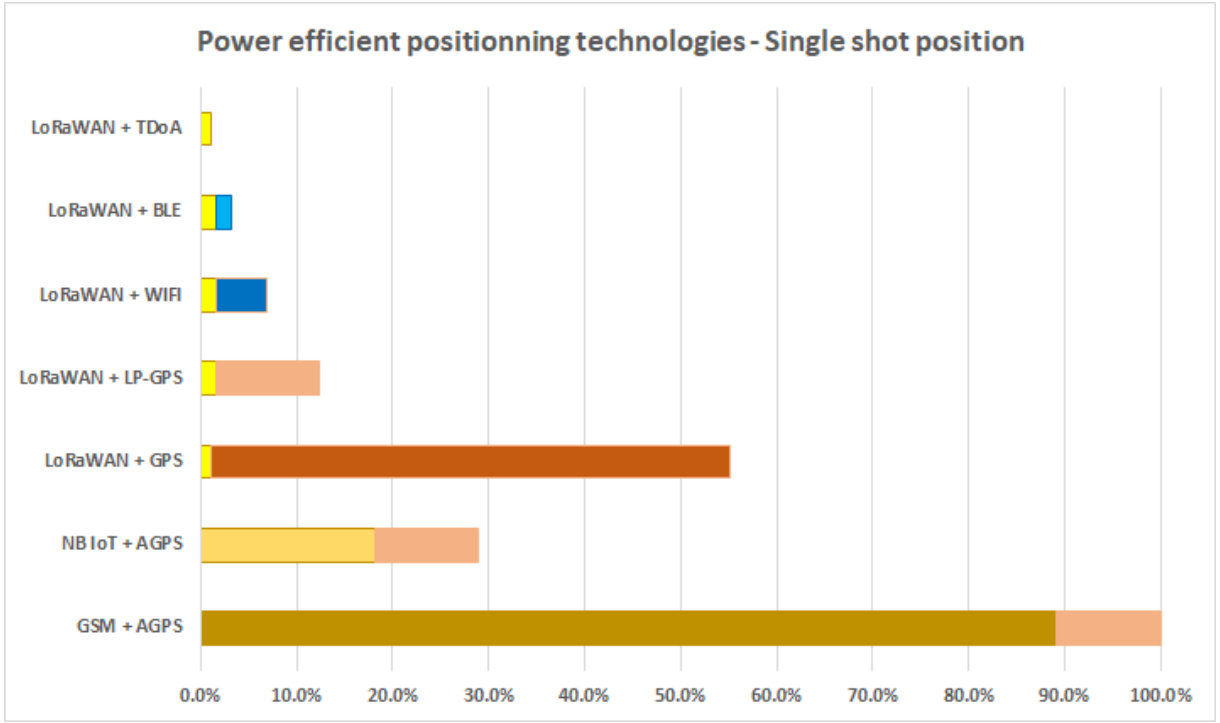
Life of smart pallet

Wi-Fi / BLE → **GPS/LP-GPS** → **TDoA** → **GPS/LP-GPS** → **Wi-Fi / BLE**

Indoor High accuracy Static	Outdoor High accuracy Moving	Outdoor Low accuracy Fast moving	Outdoor High accuracy Moving	Indoor High accuracy Static

Trackers need to have the ***embedded intelligence*** to select in real-time the most adapted tracking technology ***to optimize battery & reduce cost***

LoRaWAN and LP-GPS increase significantly the battery lifetime



LoRaWAN + Multimode Geolocation is 10X battery efficient compared to conventional Geolocation (GSM + AGPS)

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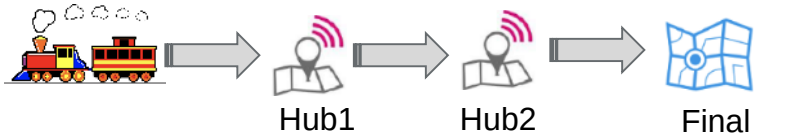
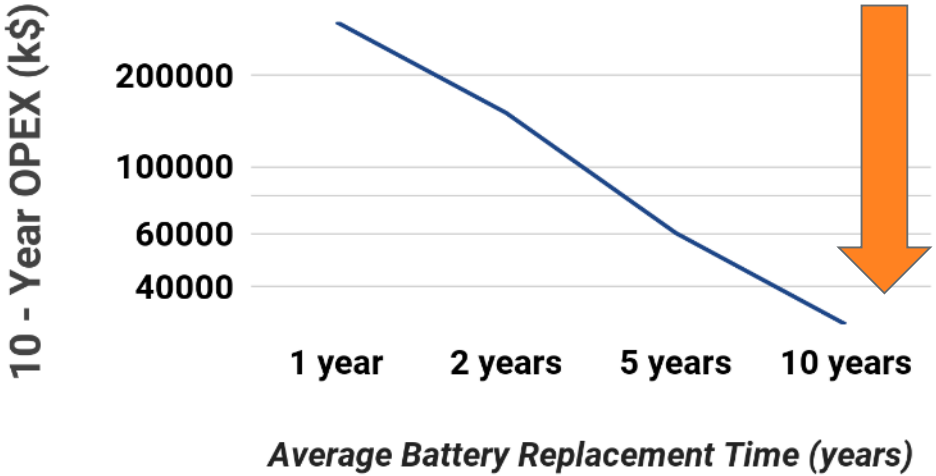
What is the impact of battery lifetime on 10yr TCO?

Assumptions:

- **Use Case**: Railroad car tracking
- **Battery Replacement campaign cost**: 30 $/tracker
- **Tasks (Identification, collection, replacement, re-dispatch)**
- **Total number of trackers**: 100k





Battery Lifetime has dramatic 10X impact on OPEX (TCO)

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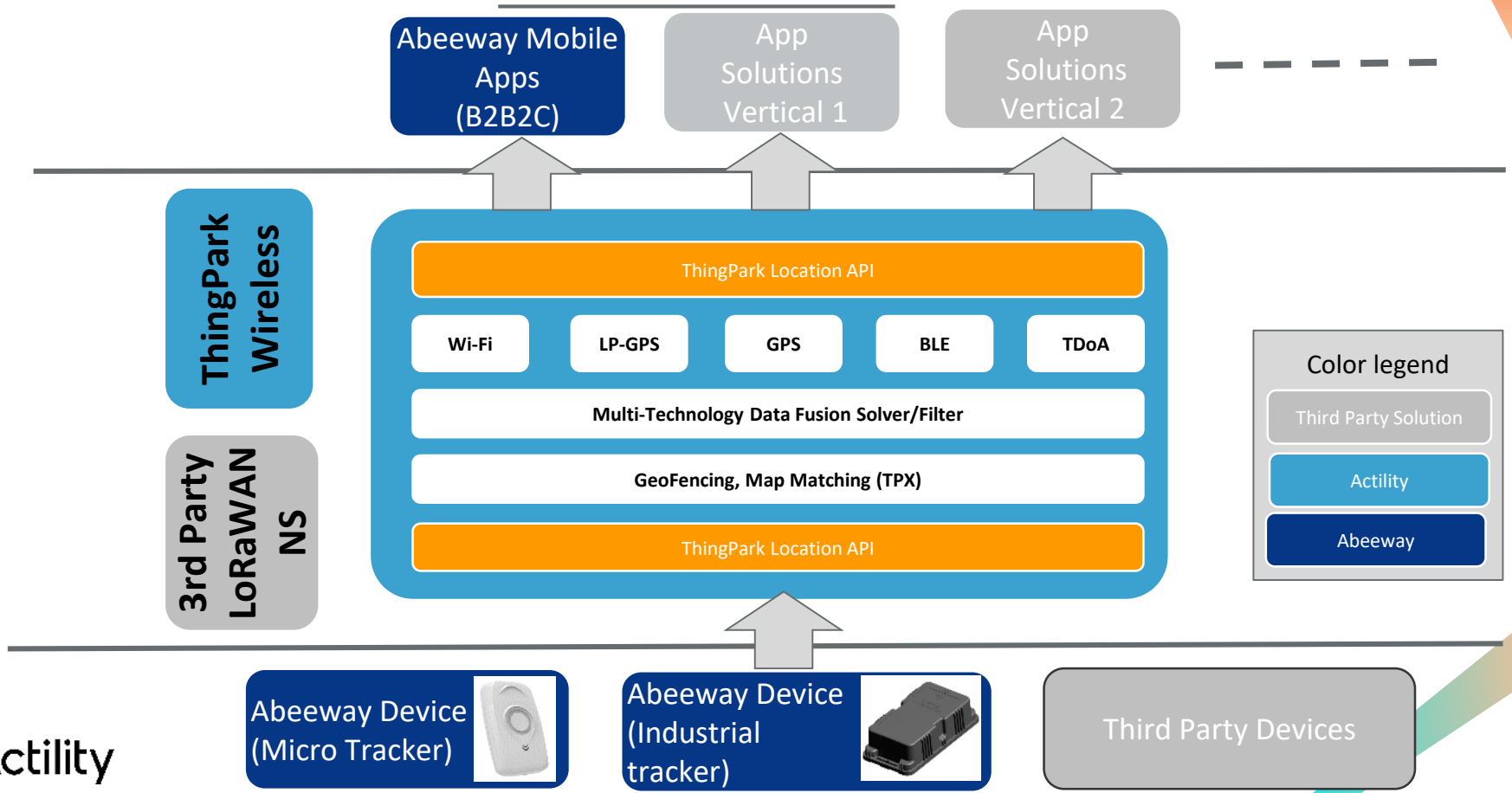
Actility ThingPark Location Solution



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II. LPWAN-Enabled Geolocation (Selected Use Cases)

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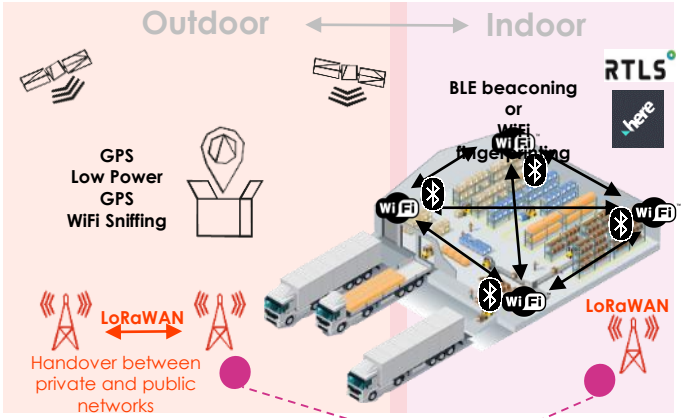
Smart Industry

WAREHOUSE INDOOR-OUTDOOR TRACKING



CHALLENGE

How to track assets seamlessly outdoors and in radio-constraint environment like warehouses ?

Warehouses operators are trying to minimize inefficiencies in logistics processes and reduce costs of operations. This requires better outdoor & indoor location services for optimized operations and reduced losses/thefts. Indoor positioning can be useful for tracking assets, vehicles and staff. For example, rolls caring items from warehouses to stores are often lost or unused.

BENEFITS

Easy-to-deploy and cost effective solution based on very low power **LoRaWAN** network requiring minimal investment.

Seamless outdoor-indoor tracking, with high autonomy devices, using an indoor geolocation system based on BLE beaconing or WiFi fingerprinting allowing up to 2-5m precision.

Improved visibility and operations : know where are the boxes, pallets, trolleys and other assets to efficiently prepare the reception of goods, making staff available, avoid delays and unused stocks of equipment. Always have the necessary equipment available and accessible.

Enhanced assets security: theft detection based on movement and geofencing, Asset misplacement is monitored and thefts/losses are reduced.

LoRaWAN

ThingParkEnterprise

Gateways for Private LoRaWAN coverage

DATA COLLECTION

Trackers on reusable pallets, rolls, boxes for transportation, fork lifts, trollies, reporting their location and status.

Actility

LORAWAN NETWORK

Data transmission via **long range, ultra low power** LoRaWAN wireless network on private infrastructure, providing **low cost connectivity & low TCO. Actility's ThingPark Platform** for devices and gateways operations support system (OSS), data transfer and security.

DX API

DATA PROCESSING

Integration with **Business Applications and Cloud Connectors**

Microsoft Azure · aws · IBM Bluemix · IBM Watson

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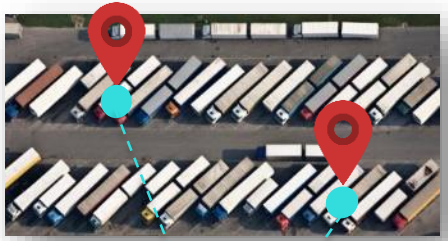
ASSET MANAGEMENT ON AUTOMOTIVE PLANTS & PARKINGS



Abeeway

LoRaWAN

ThingParkEnterprise

Gateways for Private LoRaWAN coverage

CHALLENGE

How to avoid losing time looking for vehicles on big parking lots ?

Automotive manufacturing plants have huge outdoor parking zones for trucks, trailers, cars and other vehicles undergoing various processes on site, like customization, maintenance etc. Those assets have to be easily localized in order to speed up the processes, save time and money.

BENEFITS

Easy-to-deploy and cost effective solution based on very low power LoRaWAN network requiring minimal investment, and high-performance tracking devices proving accurate geolocation and lasting for years.

Improved visibility and productivity: this IoT solution allows to locate and monitor the status of vehicles in real time, to optimize fleets placement, resulting in quicker processes, reduced delays and operations mistakes.

Improved operations and enhanced maintenance: real-time operations management based on manufacturing operations schedule. You can optimize and right-size your vehicles fleet, parking placement.

Enhanced assets security: assets monitoring allows reducing accidents, theft detection based on movement and geofencing allows to quickly react to unauthorized actions, like driver access control. Excessive shock alerts can also be reported immediately.

DATA COLLECTION

Trackers on vehicles - trucks, cars, trailers, vans, buses … - **capturing data** like their position, state of motion, and sending and motion and geofencing alerts

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Microsoft Azure · aws · IBM Bluemix · IBM Watson

Smart Industry

RAILROAD CARS TRACKING IN MAINTENANCE YARDS

CHALLENGE

How to ensure enhanced visibility of railcars at every point of the railway network?

Railroads have multiple maintenance yards and depots scattered along hundreds of miles of track. Because the cars lack geofencing technology, operators have trouble tracking the cars with precision. **Lost rail cars can sometimes take up to 18 months to find.** In the marshalling yards, it's often difficult to get the confirmation that the **wagon is on the right track** targeting the expected destination. **Insufficient information** on where exactly the trains, carriage and specific wagons are located can lead to **poor or ineffective capture and coordination of processes and operations.**

BENEFITS

Cost-efficient solution allowing operators to keep track of the **exact location of railcars**, to ensure the **right railcar is attached to the right train**, to **find the lost ones** in the classification yard

Optimized freight logistics and asset management due to real-time localization of railcars, location overview of all operating trains so workers always know exactly where each car is and no longer have to waste time searching for them.

Adaptable tracking modes, with *Stop & Go* mode allowing additional energy saving for Abeeway trackers

Abeeway

LoRaWAN

ThingParkEnterprise

Gateways for Private LoRaWAN coverage

DATA COLLECTION

LoRaWAN-connected trackers in railcars reporting their **precise location**

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Key Takeaways

1. Market momentum

2. There is no single Geolocation/LPWAN technology able to respond to all uses cases

3. IoT Geolocation deployments are ‘real’ not just statistics

4. Actility ThingPark platform easily integrates IoT Geolocation, and is a secure investment for the future

Questions?

Actility