



IoT Device to Cloud project development with NB-IoT and LTE-M

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Today's hosts

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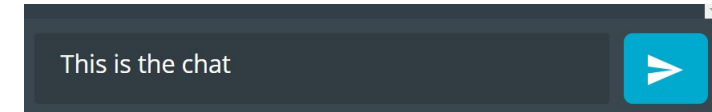
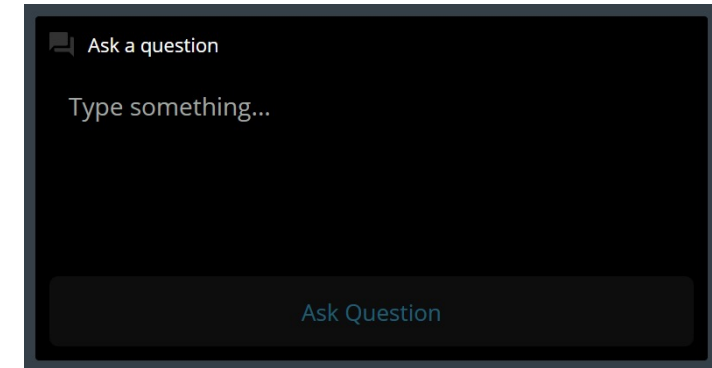


Product Marketing
Engineer



Practicalities

- Duration: 50-60 mins
- Questions are encouraged!
- Please type questions in the top of the right sidebar
 - All questions are anonymous
 - Try to keep them relevant to the topic
- We will answer questions towards the end
- The chat is not anonymous, and should **not** be used for questions
- If you have more questions:
 - Go to DevZone for Nordic related questions
 - E-Mail to hello@grandcentrix.net for grandcentrix related questions
- A recording of the webinar will be available together with the presentation at webinars.nordicsemi.com



{ DevZone

Agenda



Nordic Partner Webinar: IoT Device to Cloud project development with NB-IoT and LTE-M

1. Introduction to grandcentrix
2. Characteristics of LPWA cellular networks
3. Challenges in end-to-end IoT solutions
4. Solutions & components
5. Practical examples & use-cases
6. Q & A

Introduction to grandcentrix



Internet of Things Solution Provider



**We connect your products.
Simply. Safely. Smartly.**



**Microsoft
Partner**

Gold Application Integration
Gold Application Development
Gold Cloud Platform
Silver Datacenter
Silver Data Analytics

**Our vision:
Everything that can be connected
will be connected.**

**Our mission:
We want to make IoT
affordable and available.**

200+

Experts

150+

Large-scale-productions

11+

Years of experience

IoT end-to-end competence



Based on proven building blocks, individually tailored, implemented in an agile manner.



**User Experience
Design**



**Product
Ownership**



**Scrum
Mastery**



**Embedded/
Hardware**



**Device
Connectivity**



Backend



**Apps und
Frontends**



Data Science



**Quality
Assurance**



**End-to-end
Security**



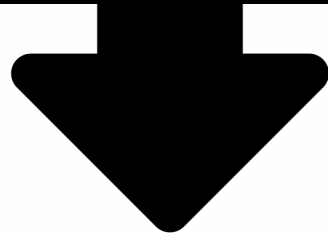
Operations



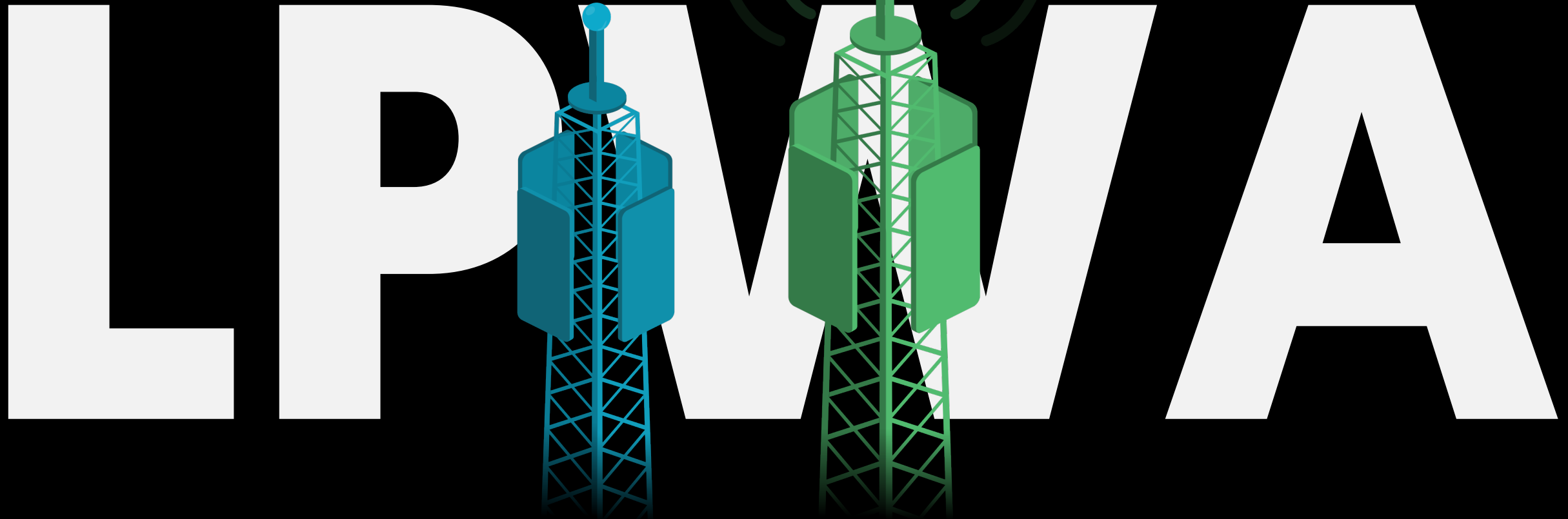
**Manufacturing
& Supply Chain**

Characteristics of LPWA cellular networks

**Many producers are looking for
the shortest way of communication
with their products.**



**But the shortest way
might be not the best way in the long run.**



cellular networks

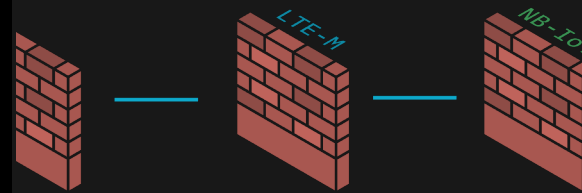
**up to
10-years**
battery life



cost-efficient

**Large
coverage**

deep indoor coverage



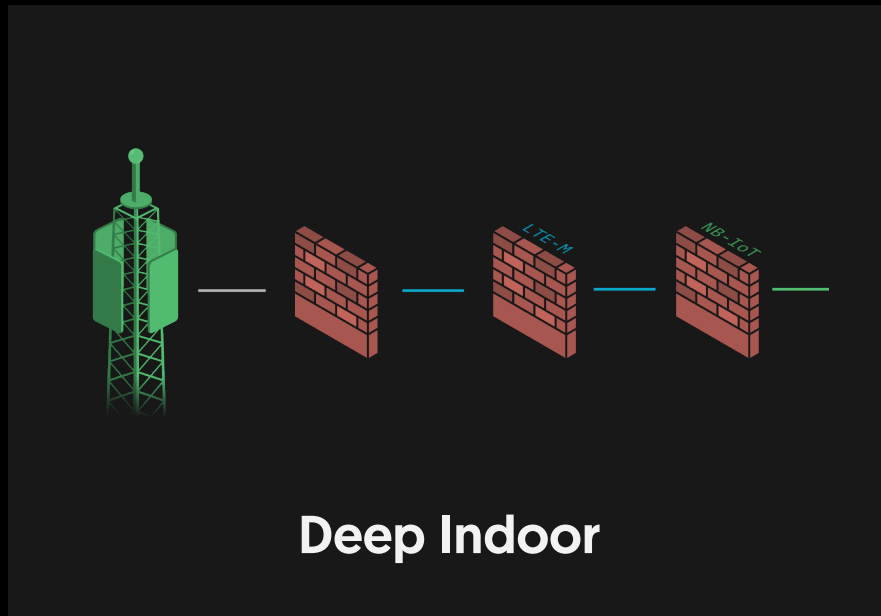
penetration



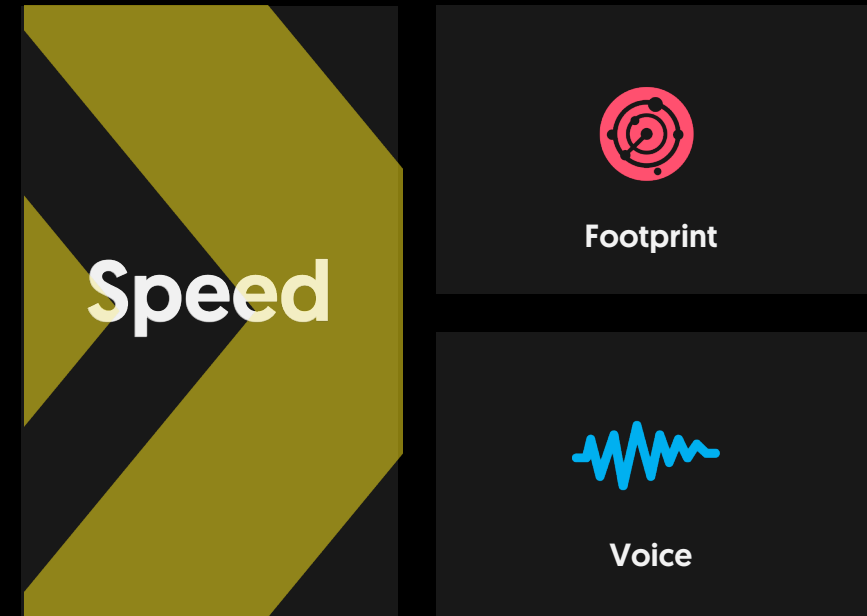
plug-and-play onboarding

secure

NB-IoT









LTE-M



A network specialized for IoT applications – LPWA networks



The benefits of NB-IoT & LTE-M:

-  Improvement of **structure penetration and range** (+20dB NB-IoT or +15 dB LTE-M)
-  Long **battery life** (up to 10 years) due to extreme low energy usage
-  **Connection of millions of devices** (LTE-M) or multiple hundreds of thousand devices (NB-IoT) in a cell
-  **Cost-efficient** implementation due to low component costs
-  Good **network coverage** in difficult environments (e.g. basements or remote regions)
-  Optimal **security** during data transmission through end-to-end encryption according to LTE standard

NB-IoT or LTE-M? Which technology is suitable for which application depends on the specific requirements of the IoT solution and the country



Smart Meter



Agriculture

Narrowband-IoT

Focused on very low data rates.
Ideal for simpler static sensor applications



Home Automation



Street Lighting

200 kHz


Bandwidth

1.4 MHz

164dB
(+20dB)


Coverage

160dB
(+15dB)

10+ years


Batt. life

10+ years

200K/cell


Capacity

1M+/cell

250 kbps
(25 kbps)


Throughput

1 Mbps
(300 kbps)

No mobility


Mobility

Mobility

Not
supported


Voice

Supported



Patient Monitoring



Wearables

LTE-M

Highest bandwidth of any LPWA technology.
Ideal for fixed and mobile applications

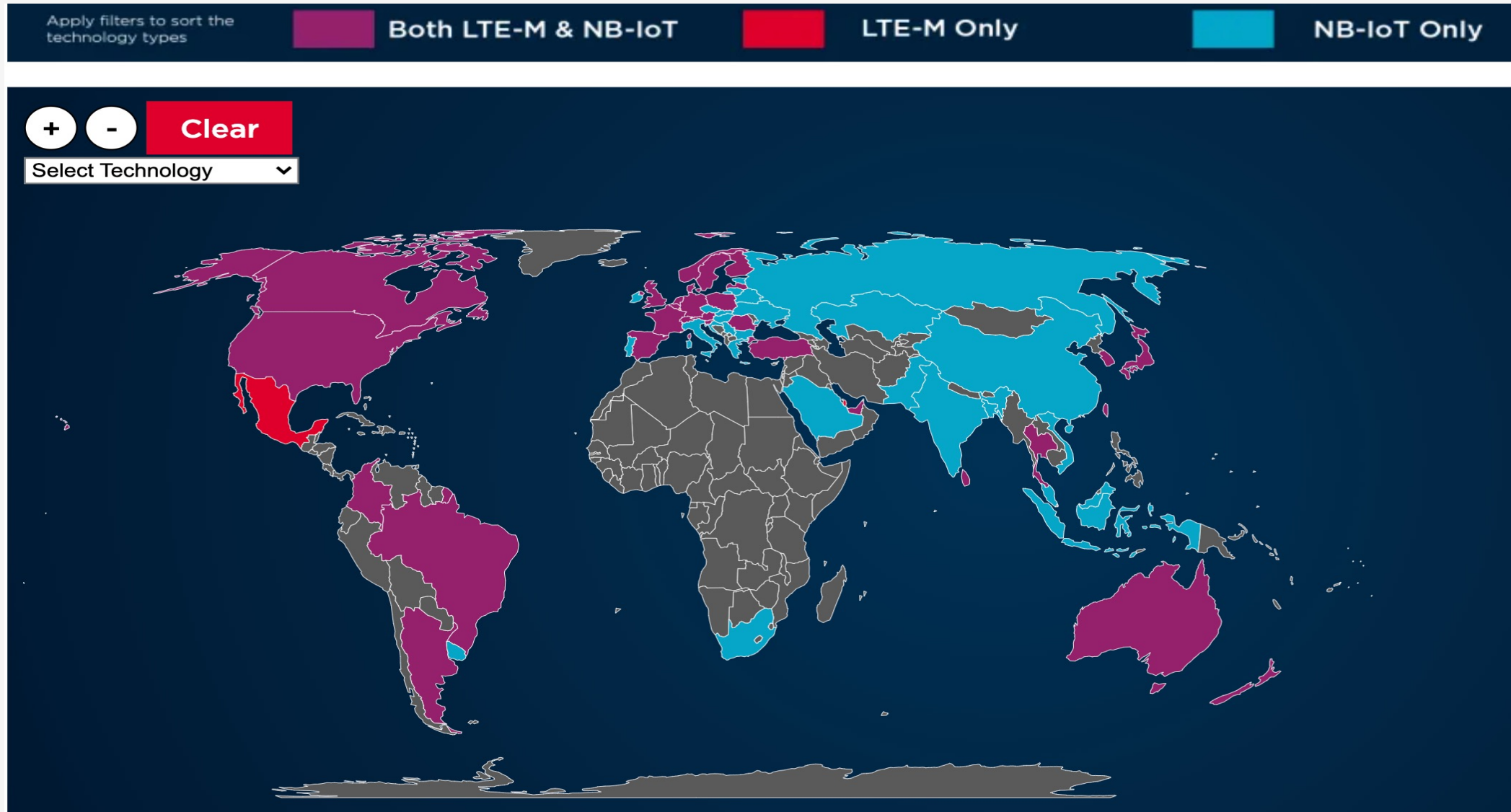


Tracking



Home Monitoring

LPWA network map



Challenges in end-to-end IoT solutions

How do you connect your product?



Challenges in end-to-end IoT solutions

Business-related challenges

- **Complexity** of different work sections, subsections and **managing the pieces-in-the-puzzle**
- Risk of failure due to **multivendor approach** (mostly in addition to inhouse development)
- Risk of failure due to **missing technical expertise**
- **Product misses the target market** due to long development cycles (**go-to-market timing**), or missing **customer feedback**
- **Pressure on return-on-invest (ROI)** / business case
- **Right and relevant setting of the organization** to support scalable IoT product & service developments and operations (and business models based on those)

Technical-related challenges

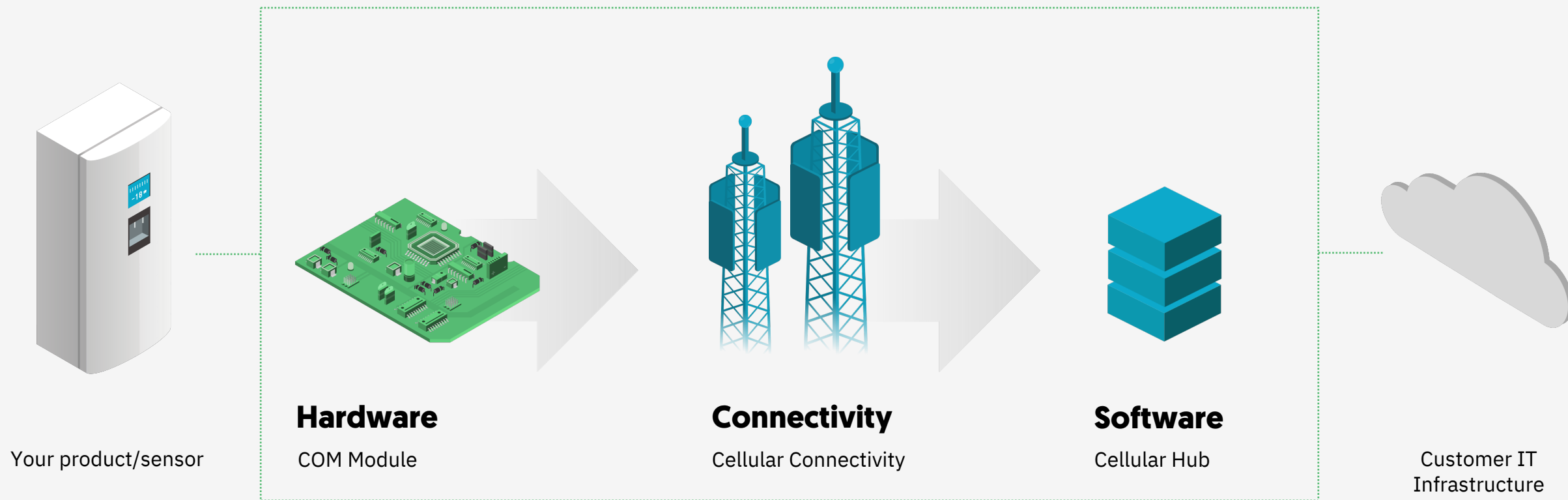
- **Technical integration and harmonization** of all different work sections and deliverables (e.g. firmware encryption equals backend encryption) and **integration into customer processes**
- Hardware
"nothing suitable available off-the-shelf"; **low energy footprint** or even self-sufficient; **construction space & size**, device **specific antenna design**
- Firmware
Use **LPWA specific algorithms and protocols**; No standard internet protocols (**no TCP/IP**); implementation of eDRX and **deep sleep**
- Connectivity network
Non-cellular IoT level: lack of **quality of service, maintenance & operations** of networks, **TCO/Total cost of ownership**
Cellular IoT level: **SIM states, roaming, directions of traffic, FOTA, protocols, data volumes**, etc.)
- Backend / Cloud Application
Unique device identification; integration in **existing systems**; scalability; maintenance & operations)
- Interfaces for User (UI) and Machines (API) (e.g. user experience, usability, benefit for users)
- Product lifecycle (5+ years, "what's happening when connected products are sold/being repaired/changed, etc)

Solutions & components

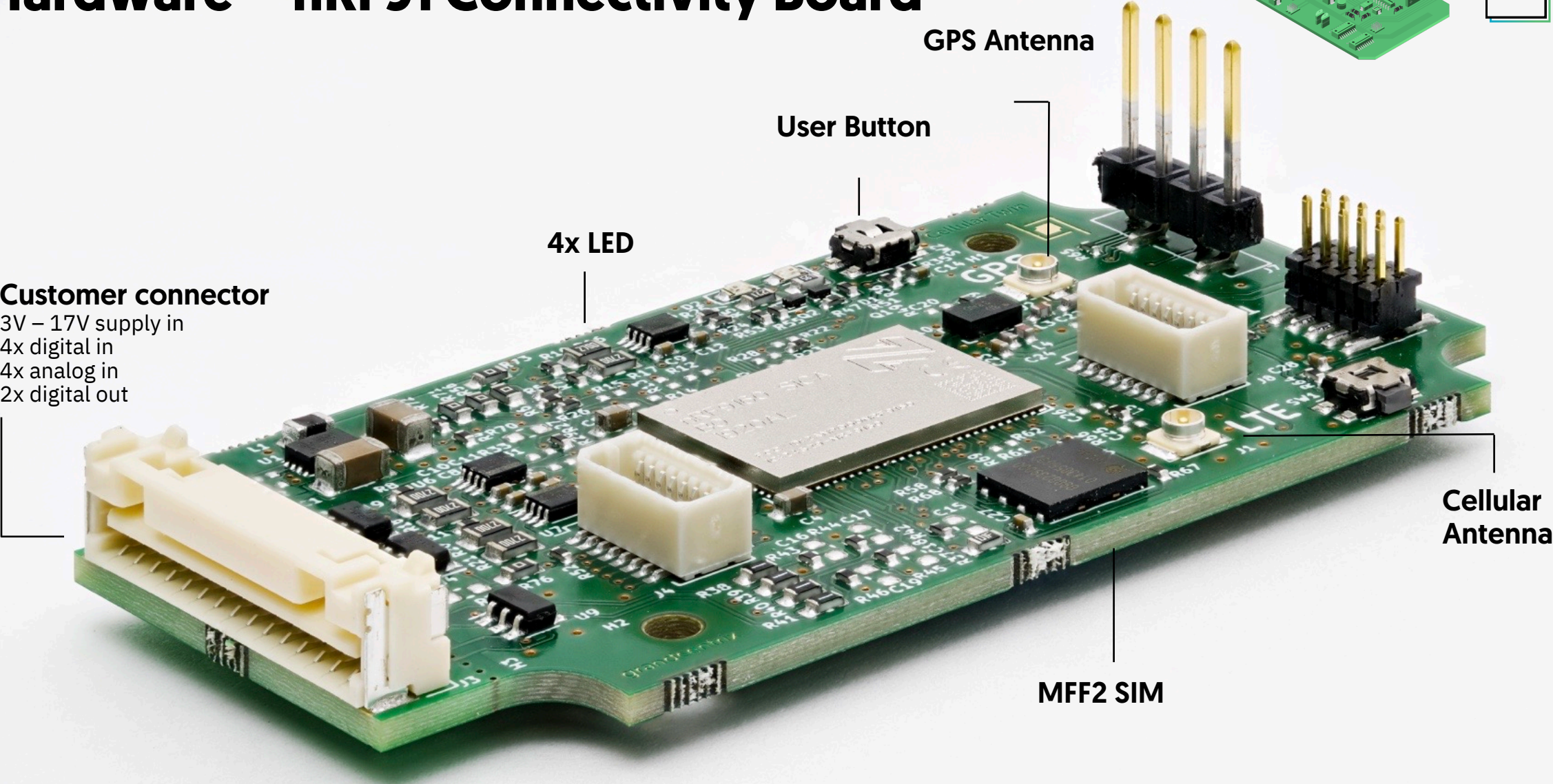
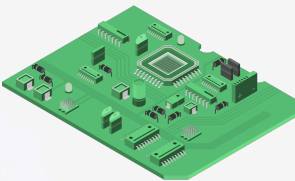
grandcentrix has all components to connect your devices using LPWAN and LwM2M.

Already deployed and in production.

The Big Picture

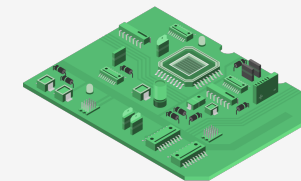


Hardware – nRF91 Connectivity Board



Hardware – nRF91 Connectivity Board

Universal, ready-to-go PCB which fits into a wide range of products



- Developed for rapid prototyping projects, PoCs, field tests
- Powered by nRF9160 with NB-IoT and LTE-M modem
- Global Vodafone MFF2 SIM card included
- CE certified – legally allowed usage in Europe
- Wide range of device interfaces (UART, GPIO, SPI)
- Supported supply voltage range between 3.3V – 17V
- Extendable by using daughterboards for industrial solutions
 - RS485 (enables e.g. Modbus solutions)
 - low voltage power supply
- Edge SDK available for guaranteed compatibility



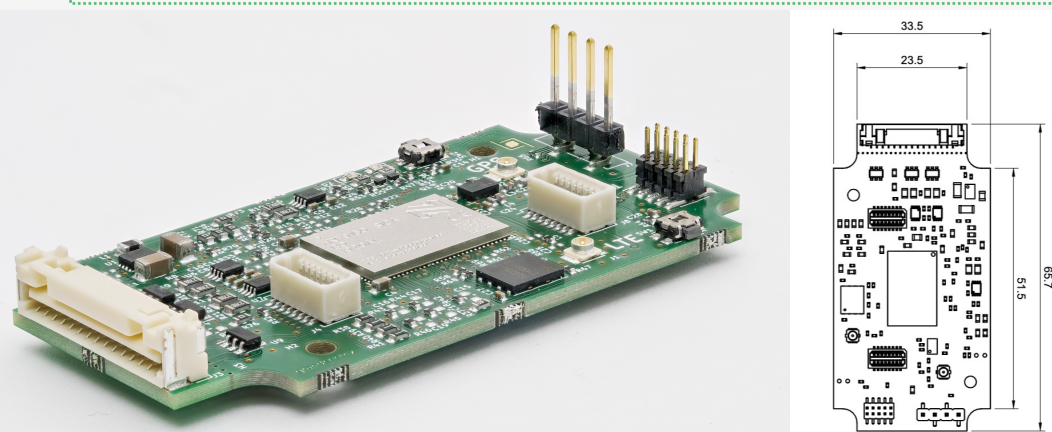
Options regarding hardware

Individual hardware development

- grandcentrix experts will develop a hardware solution based on pre-existing assets
- Certification and production included on demand
- Approach us to meet our experts and get a bespoke offer.

Bring your own device

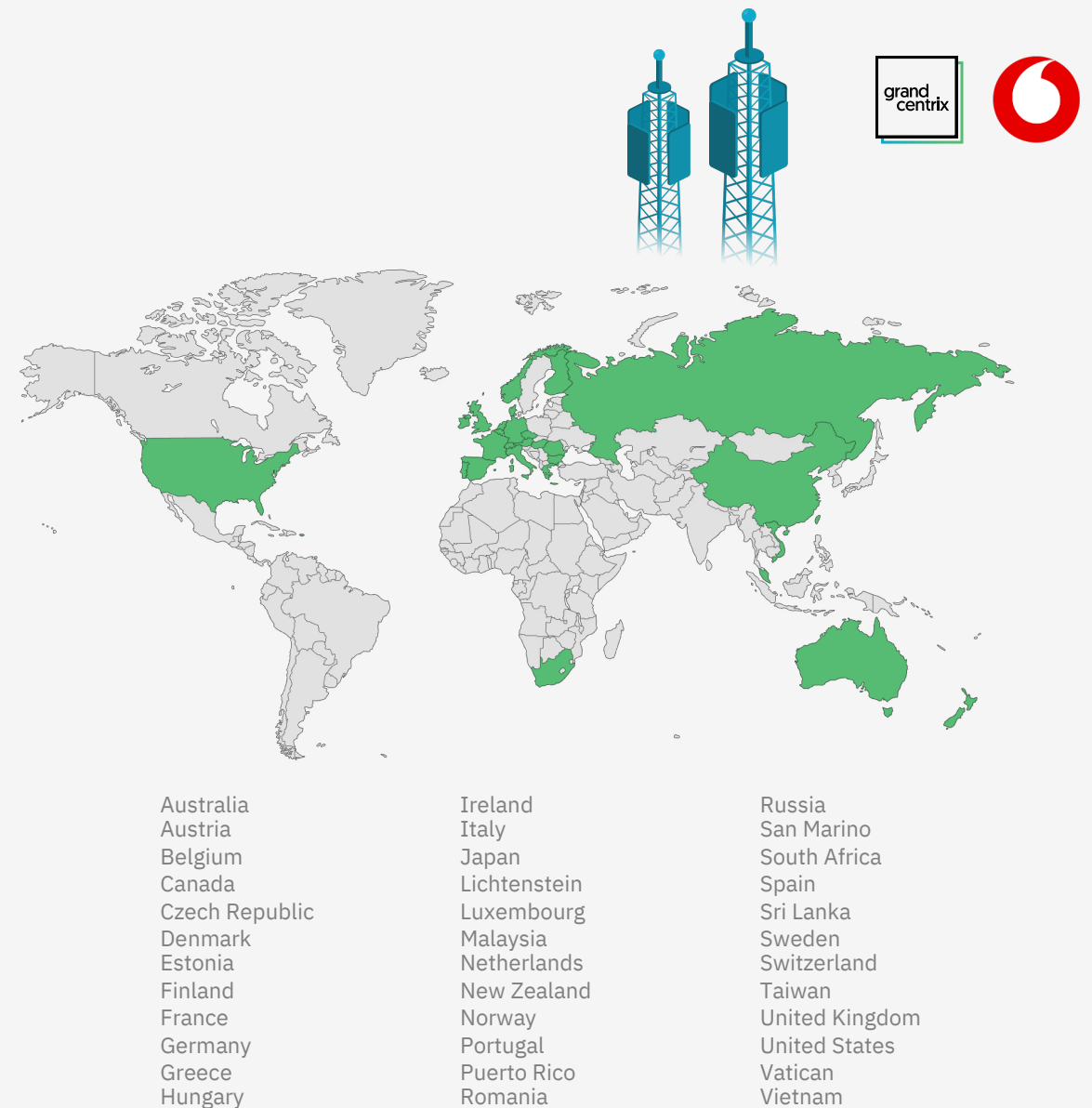
- All devices which support industry standard protocol Lightweight M2M will work immediately.
- Use standard LwM2M operations for communication (object reads, writes, register, etc).
- We doesn't "own" your devices – they are compatible with other LwM2M-based solutions, such as Device Management



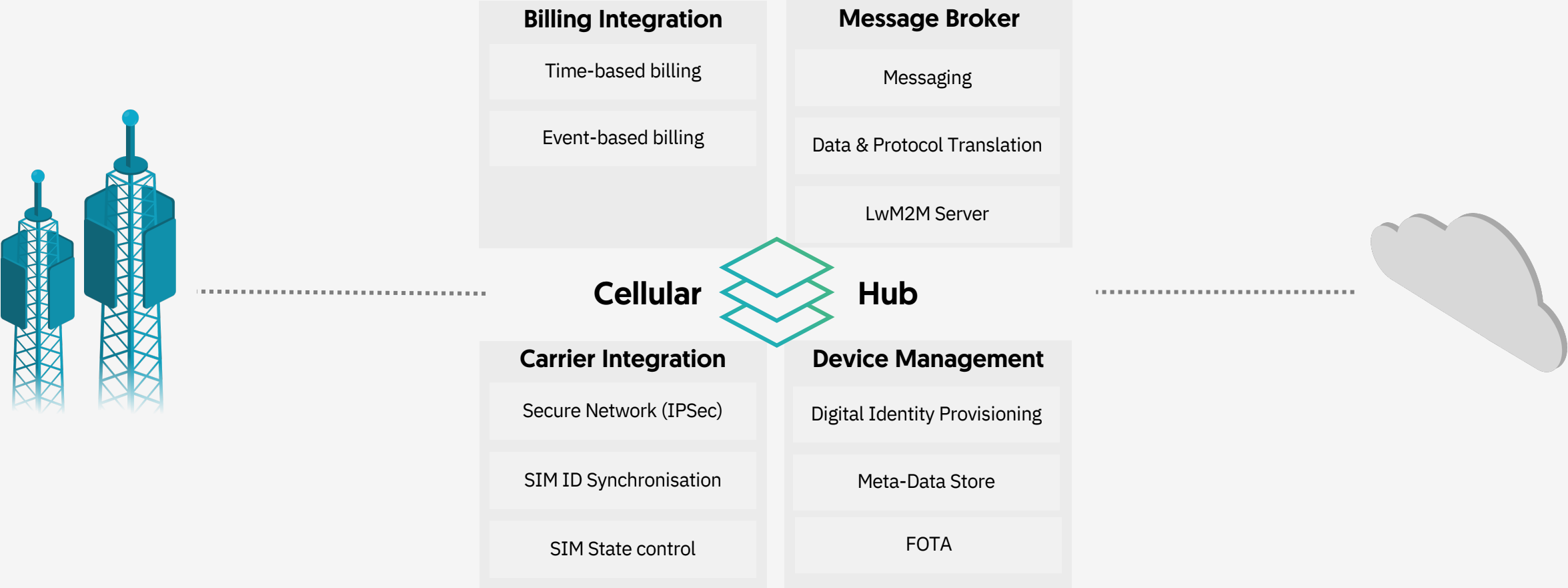
Connectivity

Global Footprint

- Available in **30 countries** (future supported countries are included)
- International and National **Roaming** (e. g. Telekom DE)
- Works in these global regions:
 - DACH
 - Most of Europa
 - Australia, Russia, South Africa & USA
- **China / Russia:** Regulatory restrictions must be followed (local SIM required, encryption must be visible to government, cloud systems must be hosted locally, only certain frequencies may be used).
- Further planned countries:
Poland, Croatia, Slovakia and China



Cellular Hub Overview



Cellular Hub integration

Integration into industry-leading services and protocols



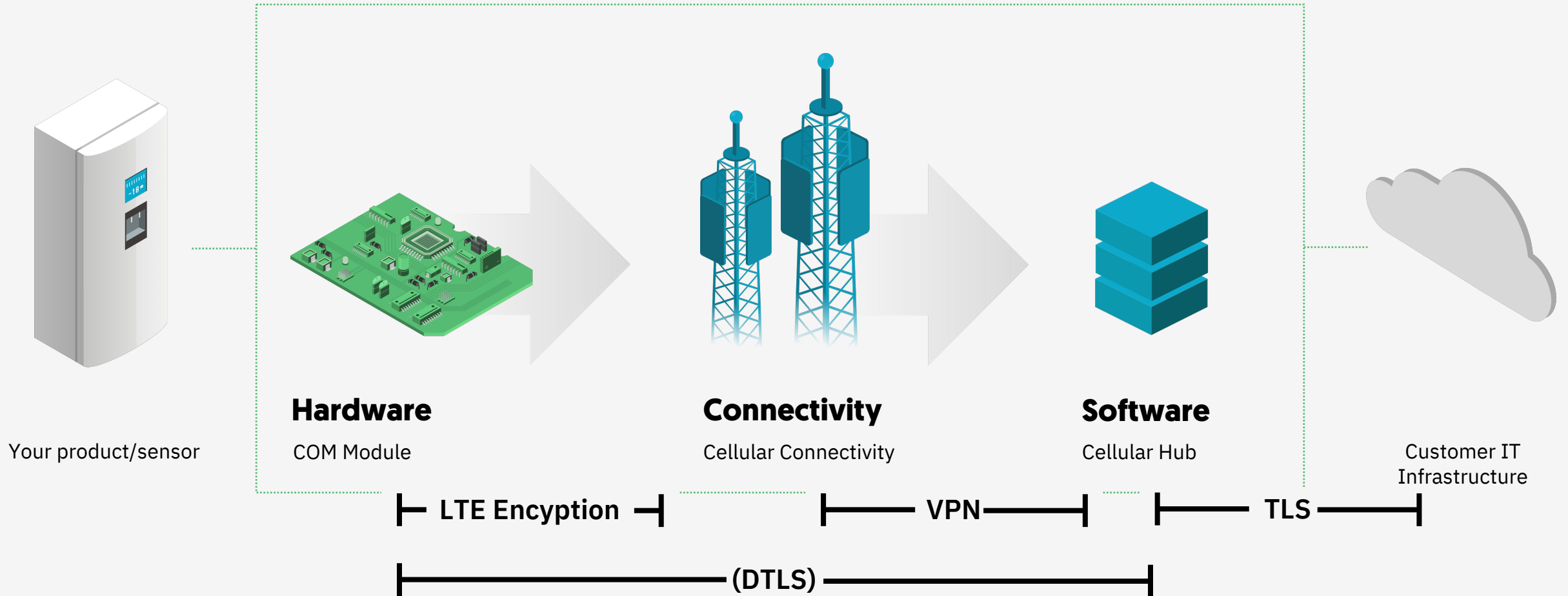
Azure IoT Hub

- Cellular Hub acts as a translator between your device and your IoT Hub
- Provision devices into IoT Hub device registry
- Device data gets published as “Reported Properties” into IoT Hub Device Twins
- Change “Desired Properties” in IoT Hub Device Twin to modify device settings

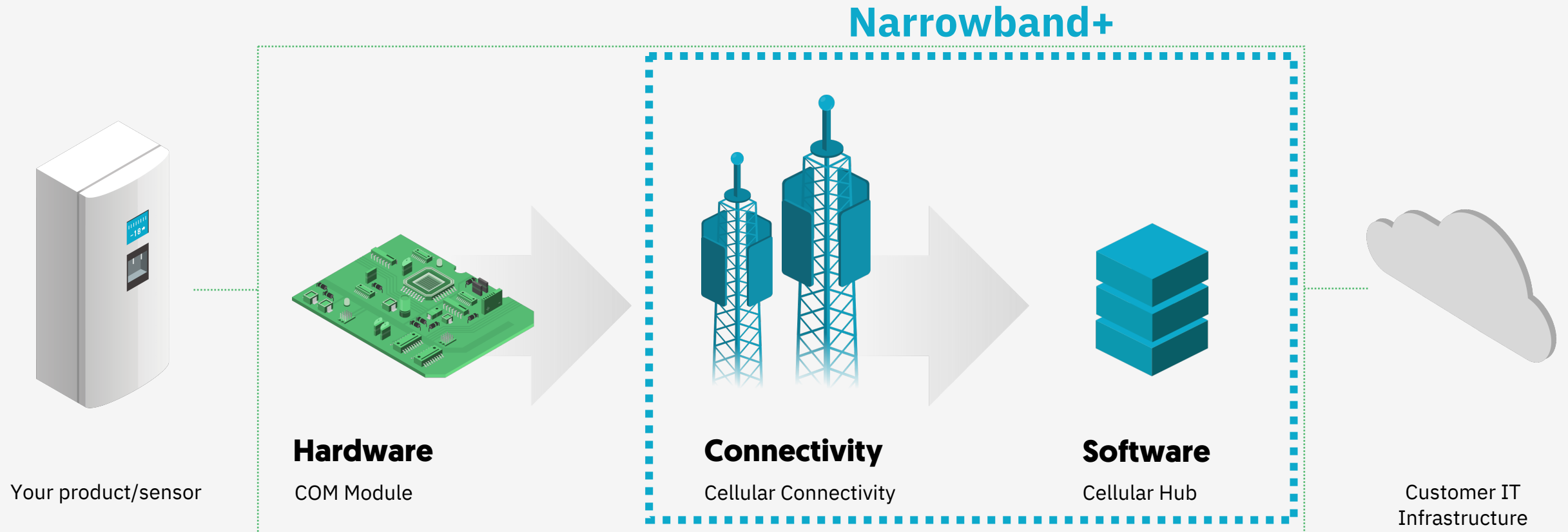
MQTT Broker

- Publish directly into your MQTT broker with a templating system which translates into your desired message format (JSON, XML, CSV, freestyle)
- Placeholders will be substituted with actual device data

Best-in-class security for your specific use case



Narrowband+ is our bundle to combine LPWA connectivity and our Cellular Hub Paas service



What is Narrowband+?

- ✓ It connects your product
- ✓ No need for local gateway infrastructure
- ✓ Direct integration into Azure IoT or MQTT clouds
- ✓ Minimal integration effort
- ✓ Works out of the box in 30 countries
- ✓ starting at 1 cent per day per activated device

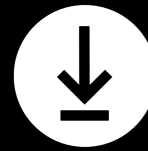
Easy and cheap way to connect your product
and access digital business models!



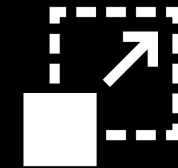
**Remote
Monitoring**



**Remote
Configuration**



**Over-the-air-
updates**



**Carrier-grade
Scalability**



**Zero Touch
Onboarding**



**Manufacturing
Integration**



**Fulfilment &
Logistics Support**



**Secure Digital
Identity**



**Encrypted
Traffic**

Practical examples & use-cases

What applications are suited to LPWA?



Gas metering



Large homogenous market measured in millions
Battery life and propagation is critical
Large number of potential meter manufacturers



Water metering



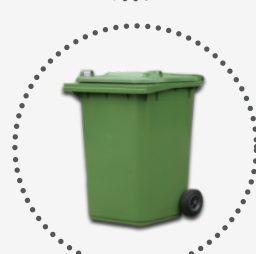
Large homogenous market measured in millions
Battery life and propagation is critical
Large number of potential meter manufacturers



Liquid and pressurised fuels



Large homogenous market measured in millions
Asset is currently un monitored & losses are high
Battery life is critical



Smart Bins



Growing market with good business case
Battery life and network coverage is critical
Complements our hi end connected bins



Environmental Monitoring



Latent market waiting for a low power solution
Battery life and network coverage is critical
Fragmented channel to market in low volumes



Smoke and fire alarms



Massive market measured in hundreds of millions
Battery life and ability to test device is critical
High volume B2C play



Parking monitoring



Market measured in hundreds of thousands
Battery life and low install cost are critical
Low data throughput



Alarms and event detectors



Market measured in hundreds of thousands
Battery life is ultra critical
Very low data throughput on check and trigger

Practical examples & use-cases of LPWA connected devices

Successfully delivering cellular IoT devices (NB-IoT & LTE-M) devices across different industries and applications



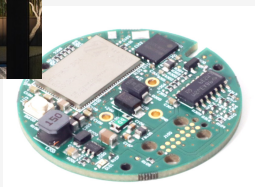
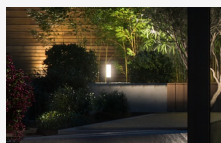
„Connected care beds“ for nursing homes and hospitals

MVP based on NB-IOT Hardware and development of cloud-based platform for digital bed and client-management to enable digital services (e.g. out-of-bed alarming)



„Connected power plugs and distributors“

NB-IOT com-module hardware with industry-standard Modbus/RS 485 and connection to cloud, e.g. to identify consumption of third parties or determine the locations.



„Connected lights“

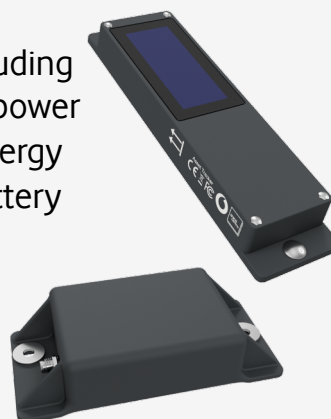
Development of standard product and demonstrator by supporting protocols of building automation (Dali, KNX, Zigbee) and interface (Zhaga) to LPWA (NB-IoT and LTE-M)

„Asset tracking“

Development of two serial products for Vodafone within asset tracking.

Container tracker including autonomous battery-power supported by solar-energy for 2 years without battery charging.

Robust tracker for construction assets



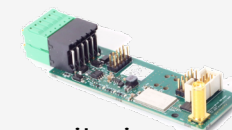
„Connected air compressors“

Hardware based on new Modbus (RS485)/ NB-IoT com-module for DIN-rail to enable new after sales service models by monitoring the devices and knowing the customers and the usage of the product in multistage sales systems



„Connected air cleaner“

NB-IOT com-module for remote monitoring also in basement/deep indoor applications



Q&A

E-Mail to hello@grandcentrix.net for approaching grandcentrix afterwards

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