



FREE Live Webinar

Data driven IoT for
the housing industry –
How metr solved indoor
connectivity issues

Speakers



Maximilian Thumfart
Chief Technical Officer
at metr



Yannick Bollhorst
Director of Partnerships
at metr

EMnify

EMnify IoT Webinars

Cellular Connectivity
Anywhere In The World



Seamless Integration
In the Cloud



IoT Customer Cases

Their Challenges and Solutions



Smart
Agriculture



e-Health



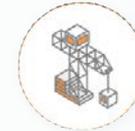
e-Scooter



Smart
Building



GPS
Tracker



Industry

Partners

Their view on State of Art IoT Technology



Wireless
Modem



Sensors



Antenas



Batteries

Agenda

- **About metr**
- Connectivity Challenges at metr
- Solutions (wMBus vs Mioty vs LoRa)
- Connectivity Solutions
- Bandwidth Optimization
- Q&A



Vision

Manufacturer-independent and cross-application workflow

More efficient management of buildings

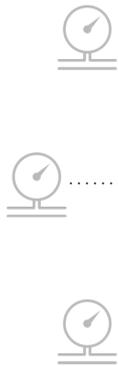
Added value through visualization of building data

metr Hardware and Software

IoT Gateway

Integrating existing IoT Smart Building Solutions.

Raw data in



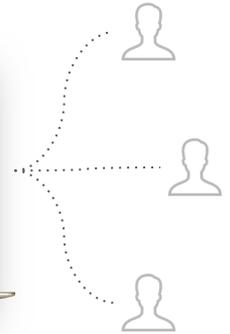
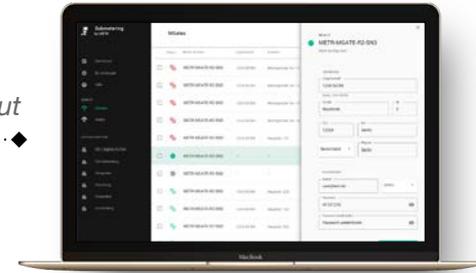
Installed on-site

- ✓ Multi-protocol, multi-functional
- ✓ Plug & Play Installation
- ✓ Efficient, secure

Customer Portal

Single interface. Integrated in Customer ERP systems.

Qualified information out



- ✓ All data of operating systems in one place
- ✓ Real-time monitoring & automatic reports
- ✓ Advanced analytics through AI & Big Data (pattern recognition/ early detection of faults and malfunctions)



metr Products



Smart Submetering

- Heat, water and smoke detectors
- Monthly energy consumption information: legal obligation by 2022
- Early detection of installation errors
- Manufacturer independency - more flexibility in negotiating prices for meters



Guard for Heating System

- Retro-fit solution for old systems
- Optimizing heating system
- Increased utilization and availability of the heating system
- Reduction of consequential damage costs

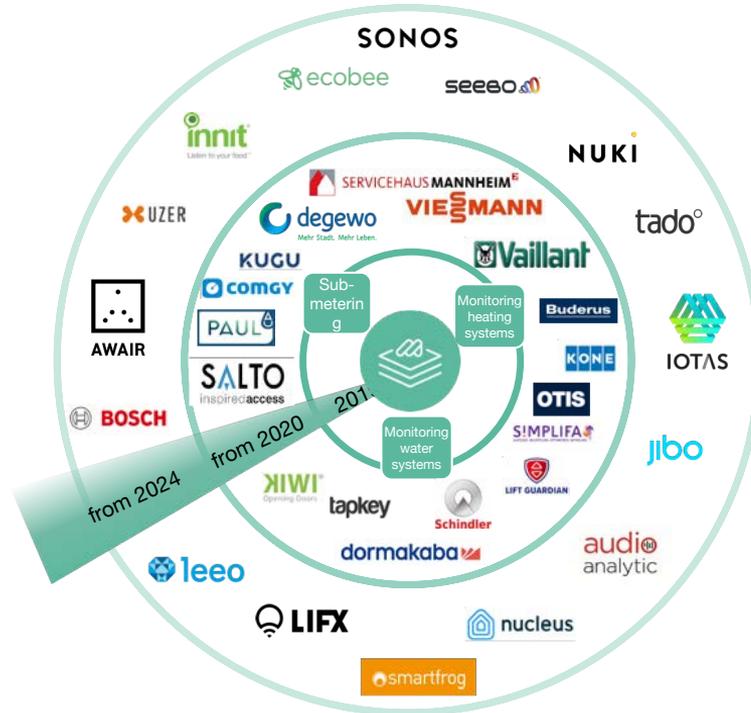


Guard for Water System

- Retro-fit solution for old systems
- Detection of deviations from temperature limits in real time
- Monitoring for conditions for Legionella bacteria growth
- Reduction of costs through early detection of damage

metr Platform

Our goal is to build an IoT platform that enables long-term added value for our customers by providing access to a large amount and variety of building data.



1

metr Platform for metr products

2

Integrating 3rd party applications (B2B)

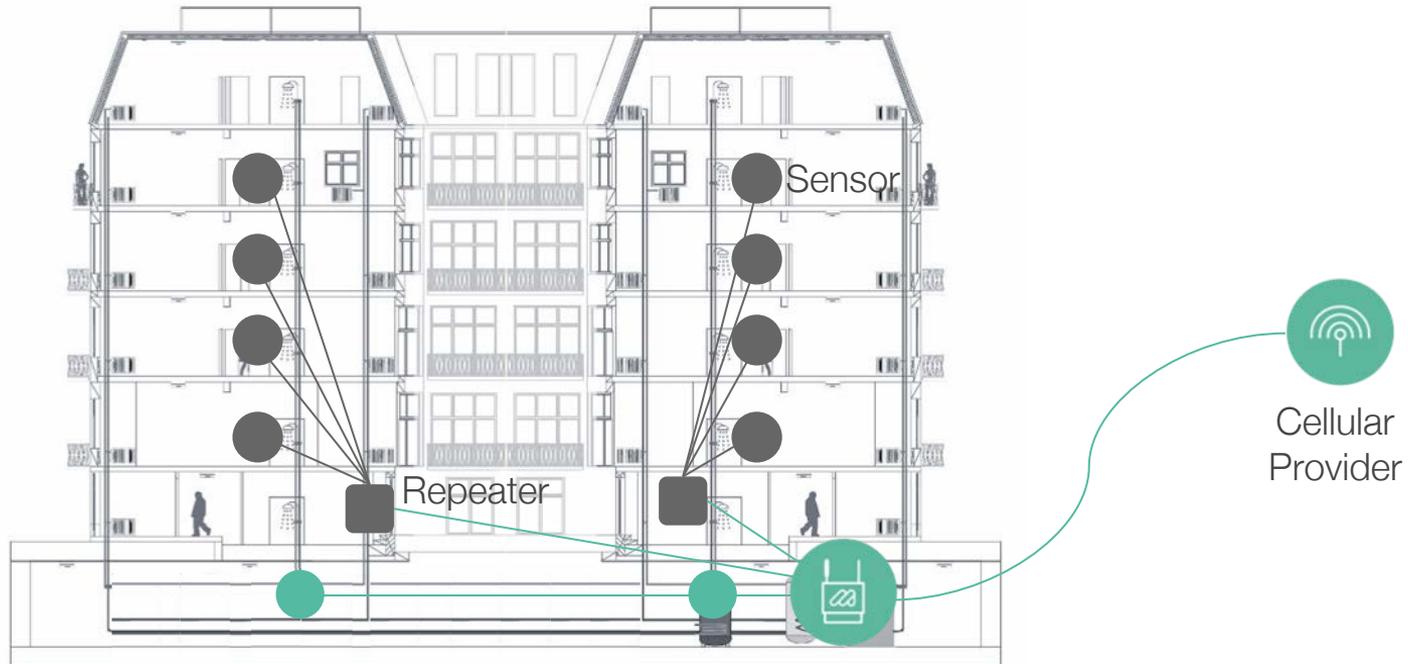
3

Integrating Smart Homes (B2B2C)

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Connectivity Challenges

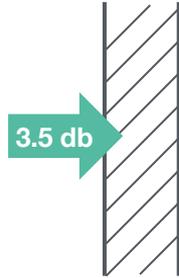


Signal Loss Factors

@ 900 MHz



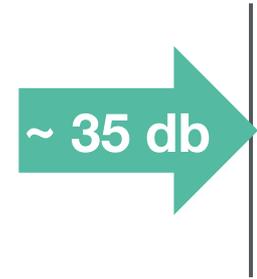
Plaster/Timber
76 mm



Brick
89 mm

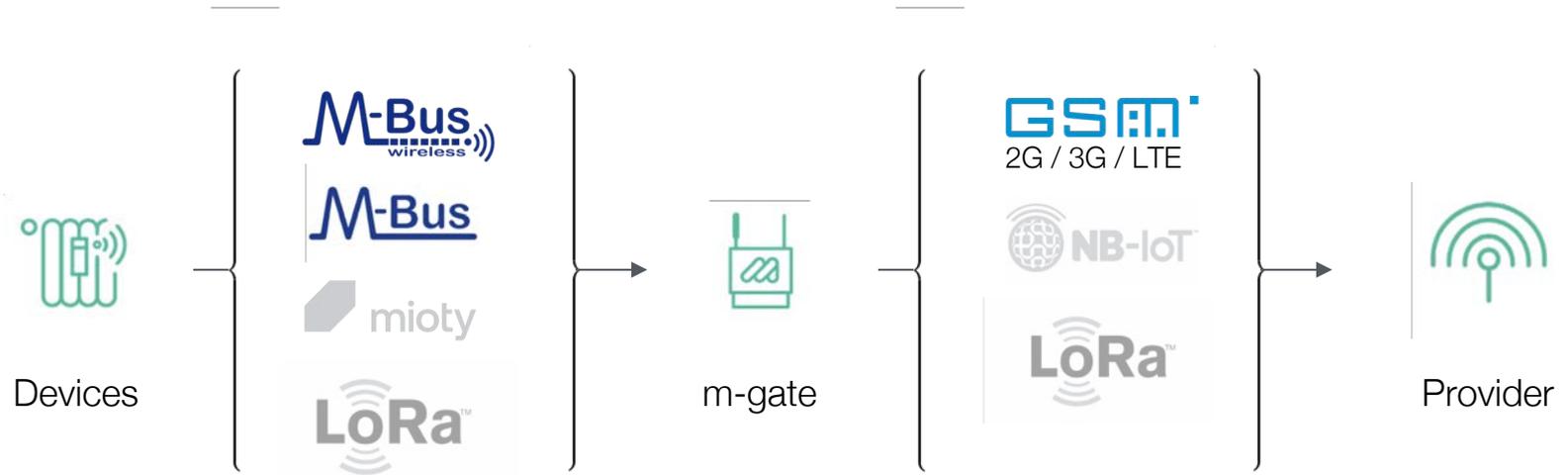


Reinf. Concrete
89 mm



Metal

What metr does



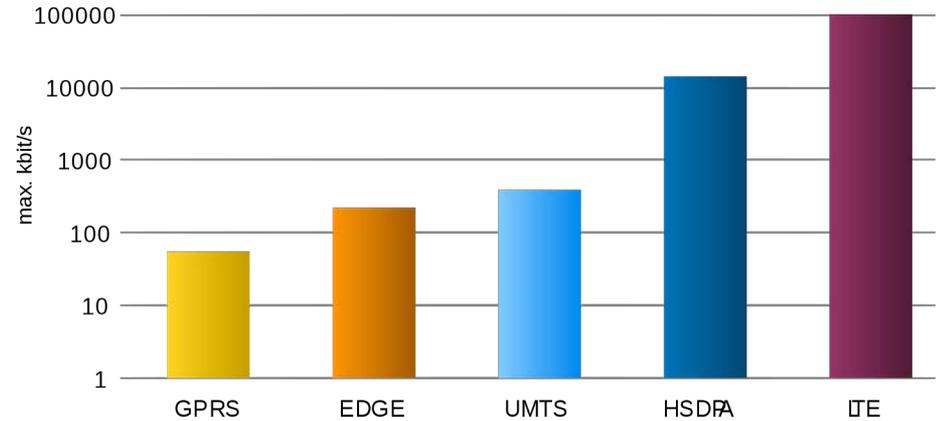
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GSM / 3G / LTE

- coverage (EU wide)
- reliability
- network agnostic provider
- usable from UMTS on



Wireless MBus (868 MHz)

- mostly unidirectional
- many devices and repeater available
- limited reach
- de-facto standard

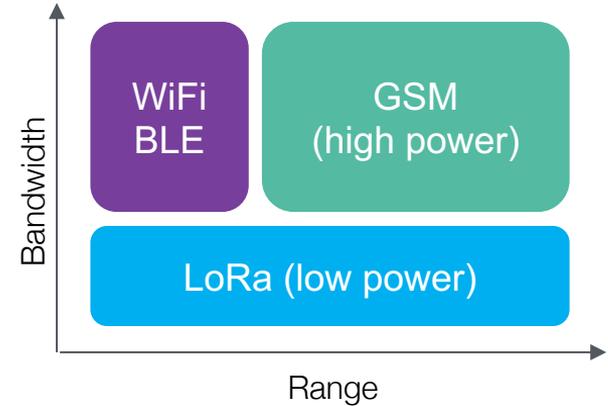
data rate	50 kbit/s
reach (experience, indoor)	max. 4 - 5 building
storeys	
telegram size	255 Bytes



LoRa (868 MHz)

- LoRa WAN not enough coverage
- improved connectivity (concrete)
- duty cycle limitations (1%)
- few devices available

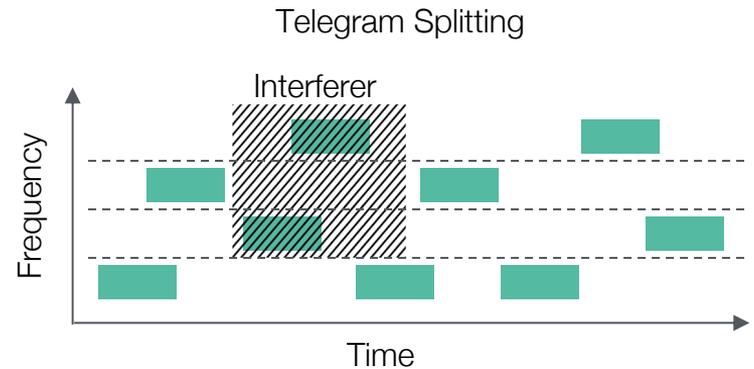
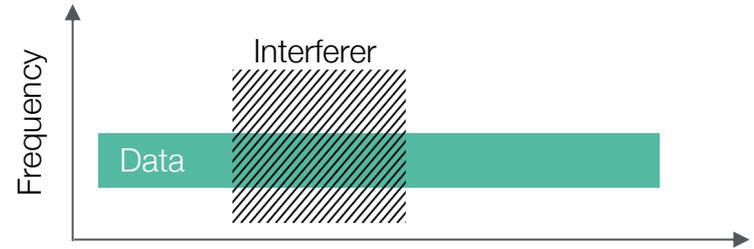
data rate	250 bit/s -
11 kbit/s	
reach (claimed, outdoor)	multiple kilometers
telegram size	255 Byte



Mioty (868 MHz)

- avoids duty cycle by splitting
- high fault tolerance by splitting
- high resource consumption
- few devices available

data rate	407
bit/s	
reach (claimed, outdoor)	5-15 km
telegram size	250 Byte



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Connectivity (dB,dBi,dBm)

$$EIRP = P_T - L_C + G_a$$

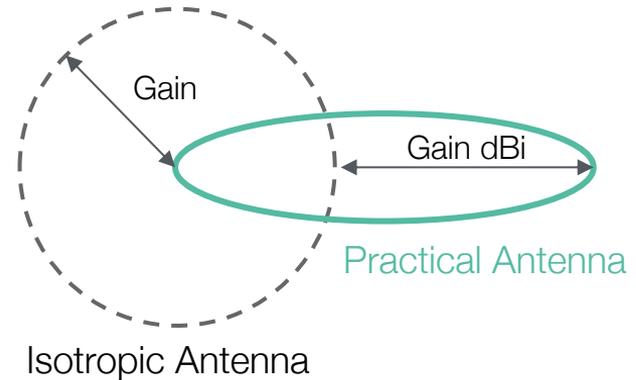
Where,

EIRP(Effective Isotropic Radiated Power) = Output power of a signal when it is concentrated into a smaller area by the antenna

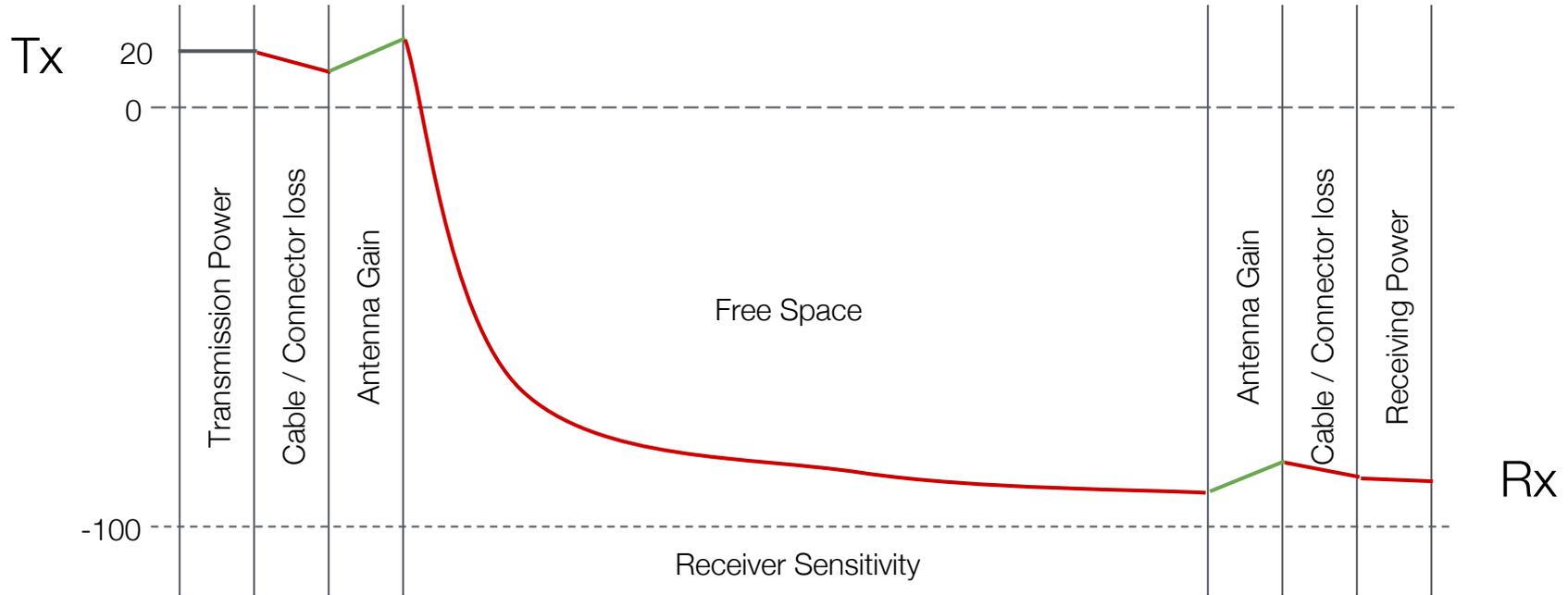
P_T = Output power of the transmitter (dBm)

L_C = Cable Loss (dB)

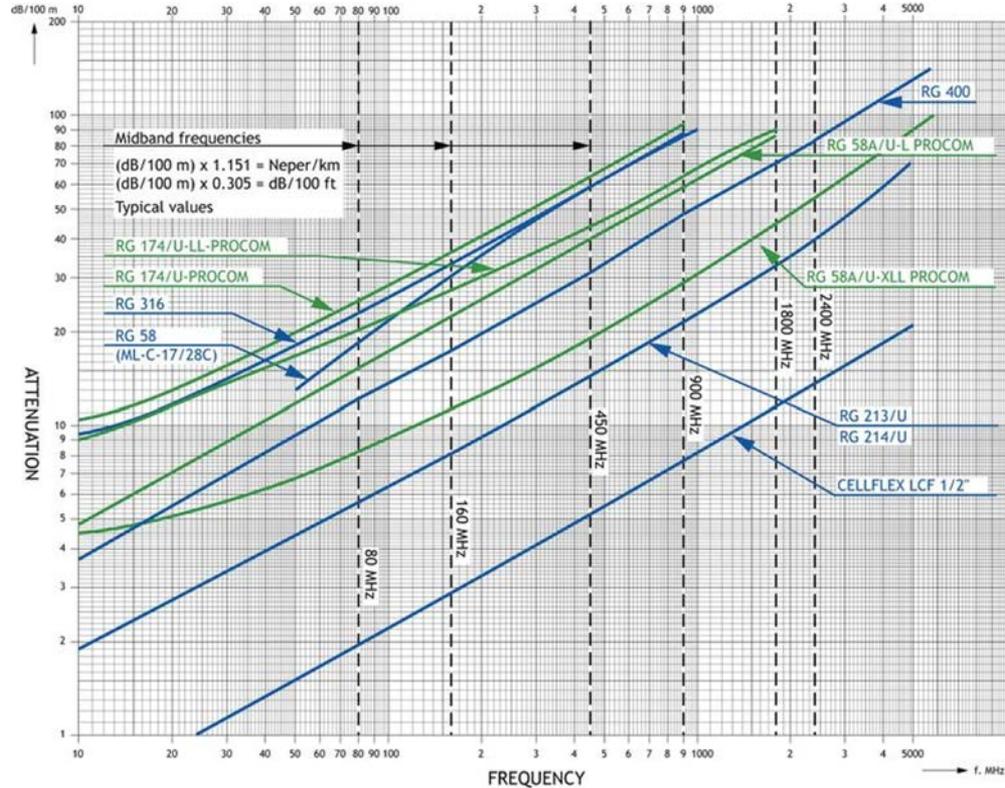
G_a = Antenna Gain (dBi)



Signal Loss Factors



Cable Loss

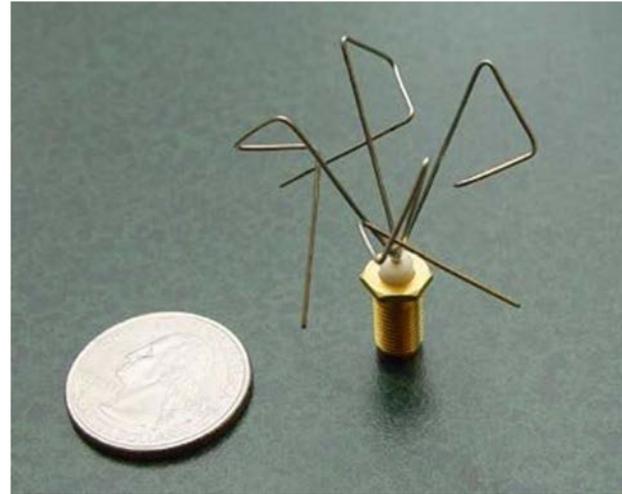




...and... we are hiring!

Evolutionary Antennas

NASA ST-5-3-10
“achieves high gain (2-4dB)”



Indoor Antennas

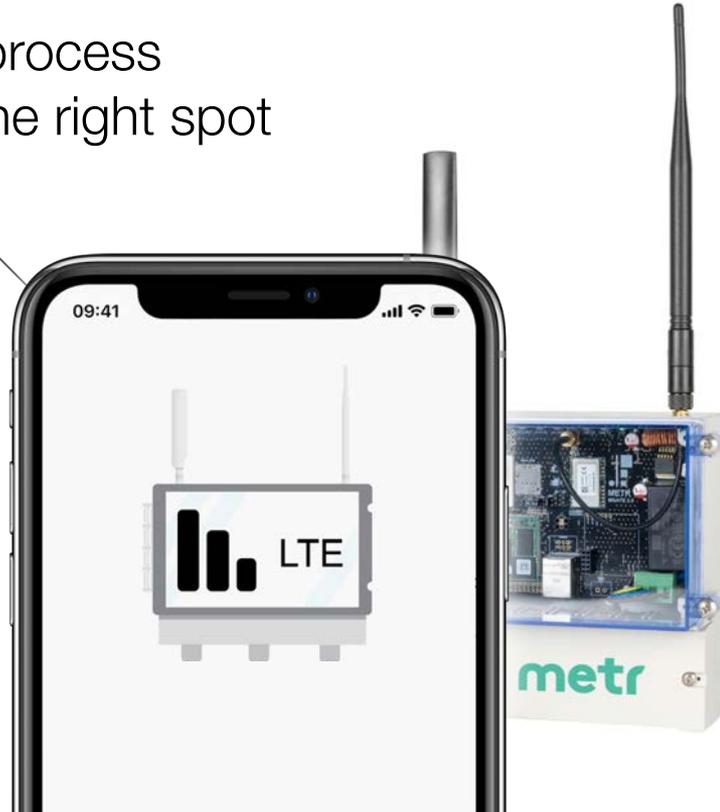
- keep cable length short
- do not crimp yourself

- DELOCK 88571 (GSM/LTE) Gain ~ 2 dBi
- RF Solutions
ANT-8WHIP3H-SMA (868 MHz) Gain ~ 3 dBi



Responsive Hardware

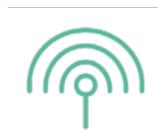
eases installation process
when looking for the right spot



Indoor Antenna



20 dbm



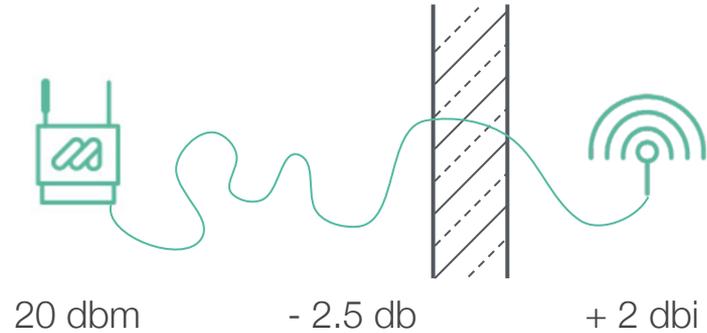
+ 2 dbi



- 27 db

-5 dbm

Outdoor Antenna



19.5 dbm

Outdoor Antennas

- flat window cable
 - vandalism / theft
 - exposure to rain, sun and snow
 - dripping edge
-
- DELOCK 88749 (GSM/LTE) Gain ~ 2 dbi
 - DELOCK 89533 (868 MHz) Gain ~ 2 dbi



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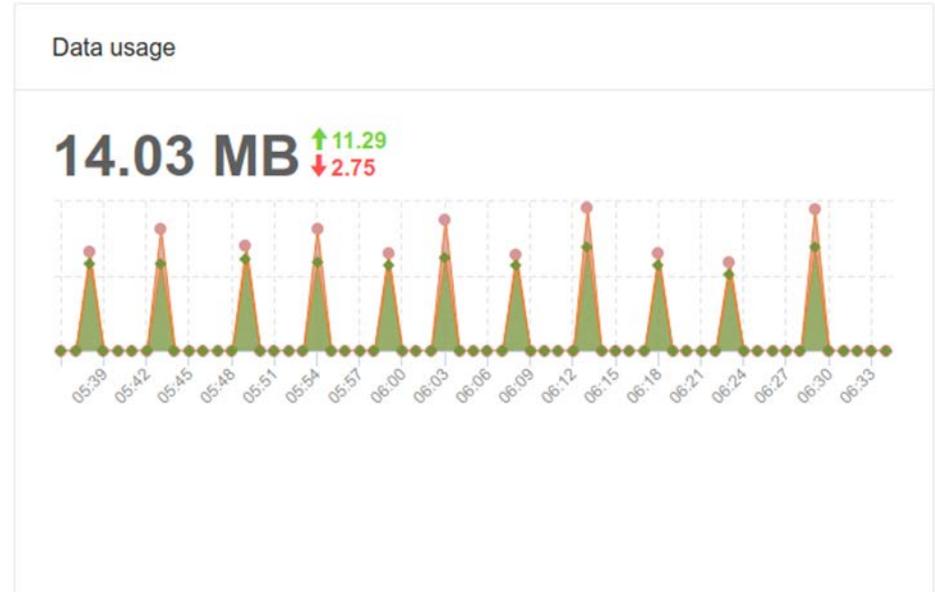


Bandwidth Optimization

500 MB: € 2 / m *

250 MB: € 1.2 / m *

Saving € 0.80 / device on
10k devices = € 8000 / m



* Wunschpreis metr

Bandwidth Optimization

health messages

frequent, little data, low security relevance, fixed schema

> be slim and verbose, use fap or MQTT

data messages

scheduled, more data, high security, variable

> send data only if needed and drop rubbish data

> gzip compression

Bandwidth Optimization

```
message Test1 { optional int32 a = 1; }
```

in Json

7 Bytes

in Protobuf (min. 32-bit Ints)

3 Bytes

in Byte Packing

1 Byte (as 8-bit

Int)

Thank you!

Q&A

