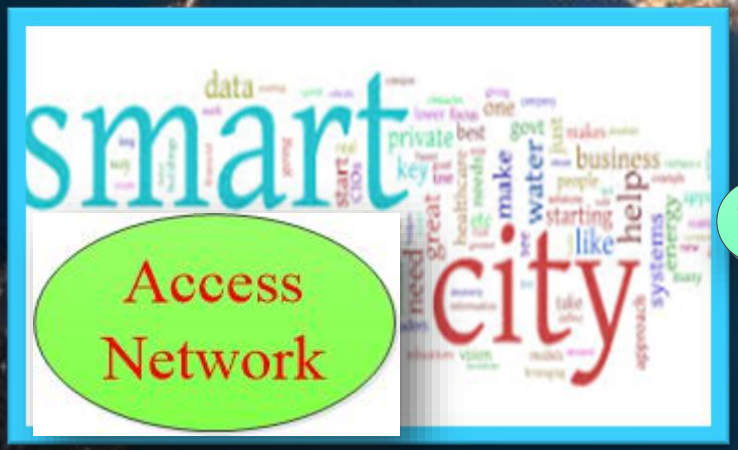
Internet-of-Things (IoT), the drive for LoRa

movie

LoRa is Everywhere for Smart Metering

We need a Large Access Networks to bring Smart Meters data from Everywhere to the Internet



in1

Transport Network

in2

Internet

Technological Prophecy

In 1999, **Kevin Ashton** from MIT coined the term

At the time, there was no Access Network technology available to support the connection of millions of devices and to bring their data to the Internet

History of Internet Connection

In 1999 domestic connection to the Internet was pretty poor, less than 64 kbps using wireline infrastructure only, so how did someone think of connecting large quantity of devices and bring their data to the Internet?

Now we can tell that it was a foresight!

There is no doubt that the Internet-of-Things will fundamentally change the way we experience our World!

Calling **Internet-of-Things** the Next **Industrial Revolution**

IoT (Internet-of-Things)

Devices of Internet-of-Things are any smart communicating product that connected to the Internet, from:

- Smart Metering
- Smart Cities
- Smart-Grid
- Smart Home and Building
- Smart Environment
- Smart Agriculture
- Smart Industrial
- Retail and Logistics

Questions that we need to clarify?

- Are the existing Wireless communication technologies meet IoT's following requirements?
  - Large-Scale Access Network (WAN) ?
  - Wireless technology with high penetration into buildings ?
  - Low data rate ?
  - Access Network to supports very large number of devices?
  - Low cost communication network ?

Cellular and Wi-Fi Technologies

- Cellular is everywhere and developed especially for Mobile devices
- Wi-Fi is perfect for Short-Distance, (LAN)
- Cellular (3G/4G/5G) and Wi-Fi technologies are designed for:
  - High-speed communication for: Voice, Video streaming and Real-Time performance, far beyond what is required for Smart Meters
  - Cannot support connecting millions of Smart Meter
  - Devices are Power-Hungry, very high energy consumption causing fast discharge of the battery
- Cellular is Very-High-Costs for network use

Exception

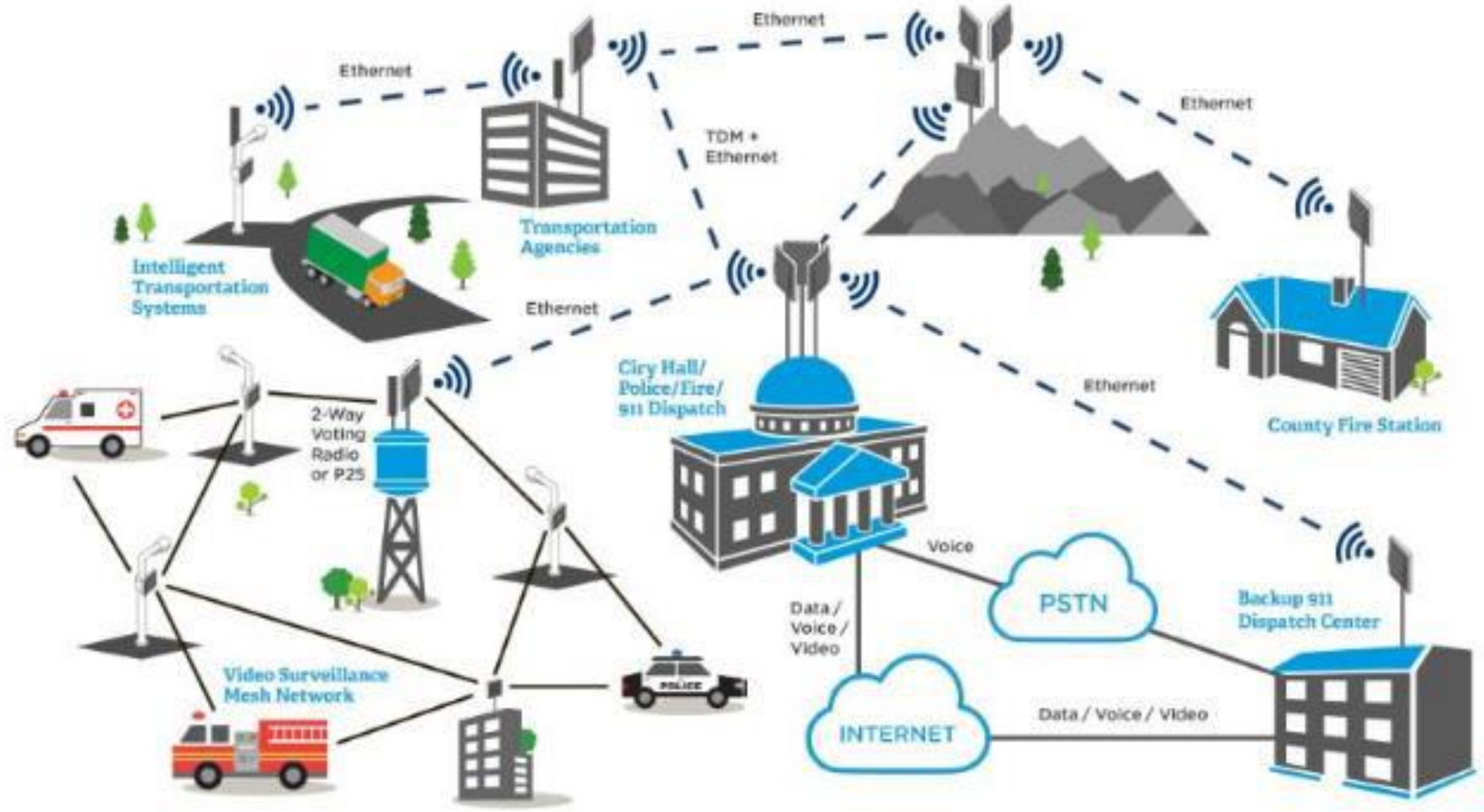
Municipal Network (Muni) can support Smart Meters deployment.

Provided that Wi-Fi transceiver works with special mode for low power consumption.

However still with high Cost

Municipal Network (Muni)

Wi-Fi Hot Spots all over the City



Intermediate Conclusion

There seemed to be no choice, but to invent new Transmission Category

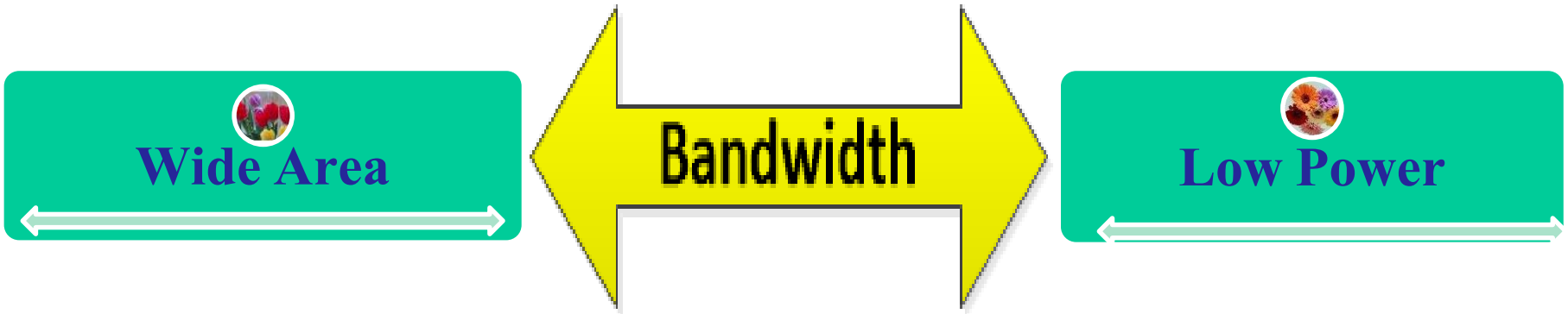
מי זו LORA?

LoRa היא מערכת תקשורת אלחוטית מותאמת ל-IoT – האינטרנט של הדברים " היאזולה, זמינה ויעילה, ומסוגלת לקשר בין מיליארדי מכשירים " אז תשכחו מהסלולאר ומ-WiFi – העתיד עוד מעט כאן

אבי לוגסי

חשמל ואנשים
כתב העת למקצועות החשמל

We have a Dilemma ?

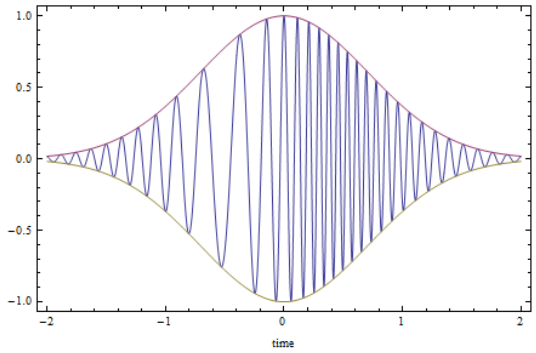


- If we transmit more bits we need to use more power, which is not the case here
- There are 3 main things
  - ✓ Long range
  - ✓ Low power consumption
  - ✓ Low Bandwidth

What is LoRa ?

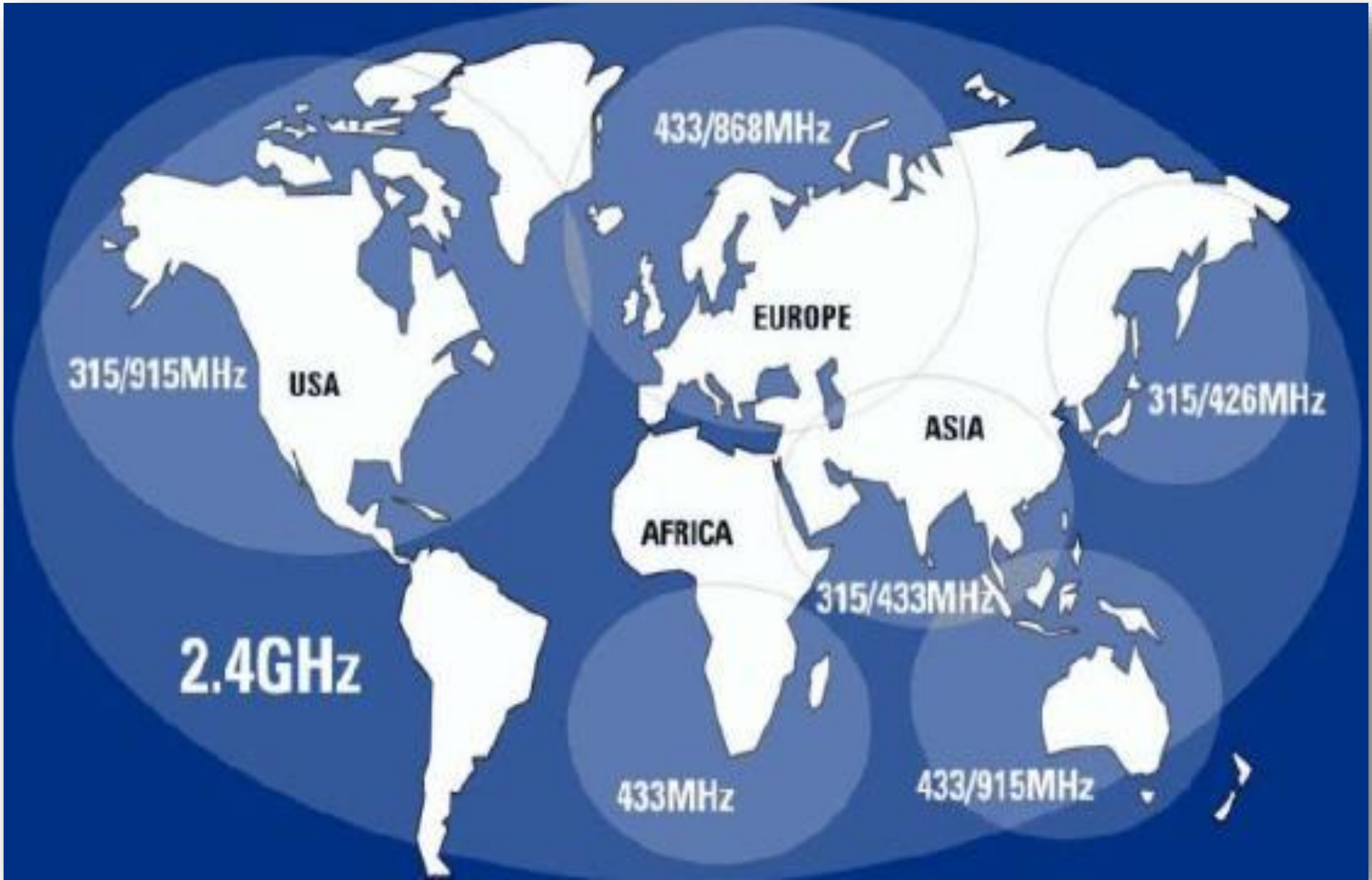
LoRa/LPWAN (Long Range Radio/Low Power Wide Area Network)

- A physical layer using the Chirp-Spread-Spectrum (CSS) Special Modulation method



- Wireless platform that has become the de-facto technology for Internet-of-Things (IoT) and AMI networks worldwide
- Does not sensitive to interference from: Wi-Fi, Bluetooth, ZigBee, GSM and Cellular
- Operating at (ISM) license-free frequencies worldwide

Global ISM bands



LoRa/LPWAN - Key features

- **Long range**

- **Low Data Rate**

- **Low power**

- **Large Capacity**

- **Data Security**

LoRa/LPWAN - Key features

- **Multi -Application**

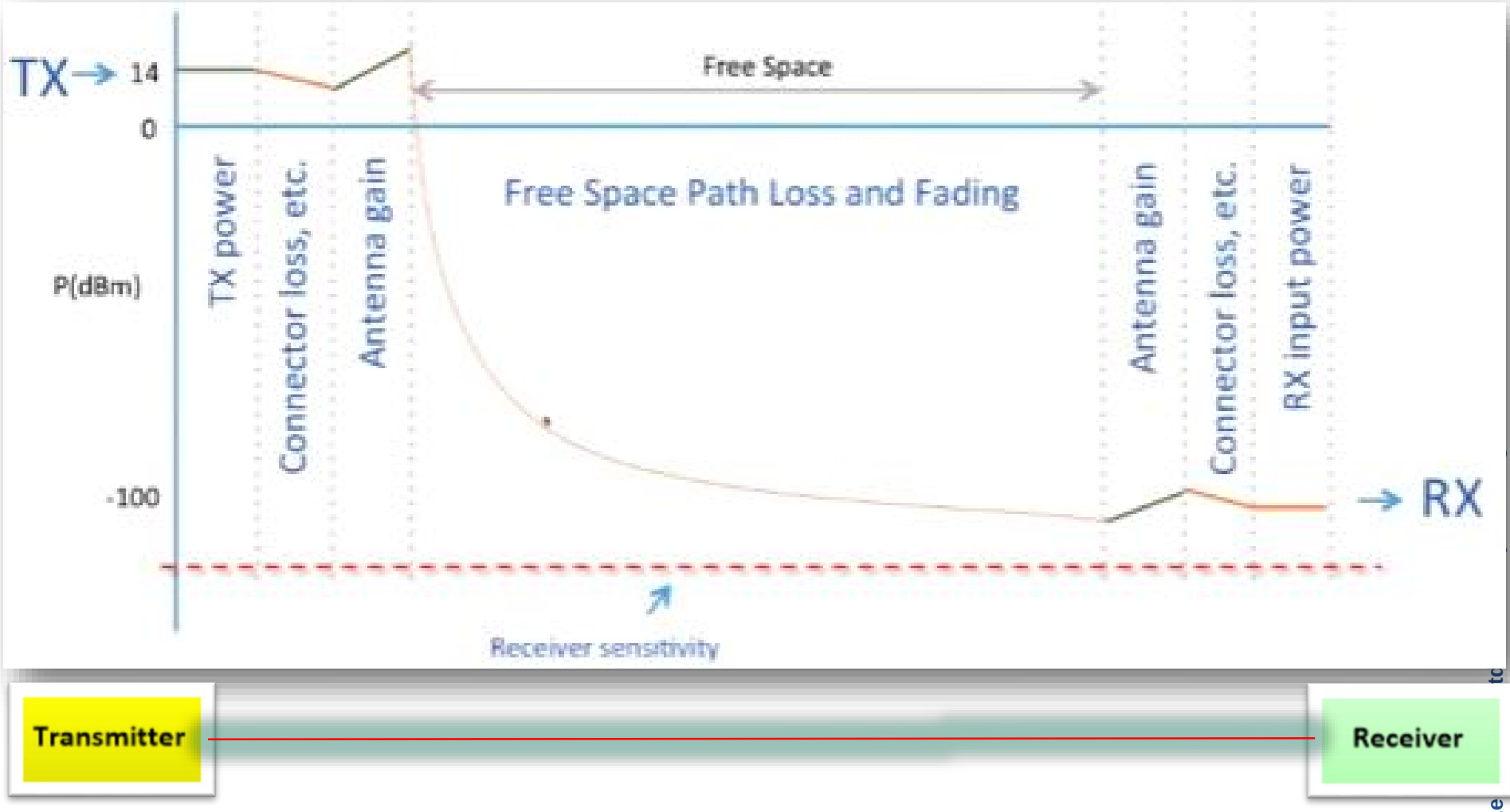
- **Open Standard**

- **Localization**

- **Mobile**

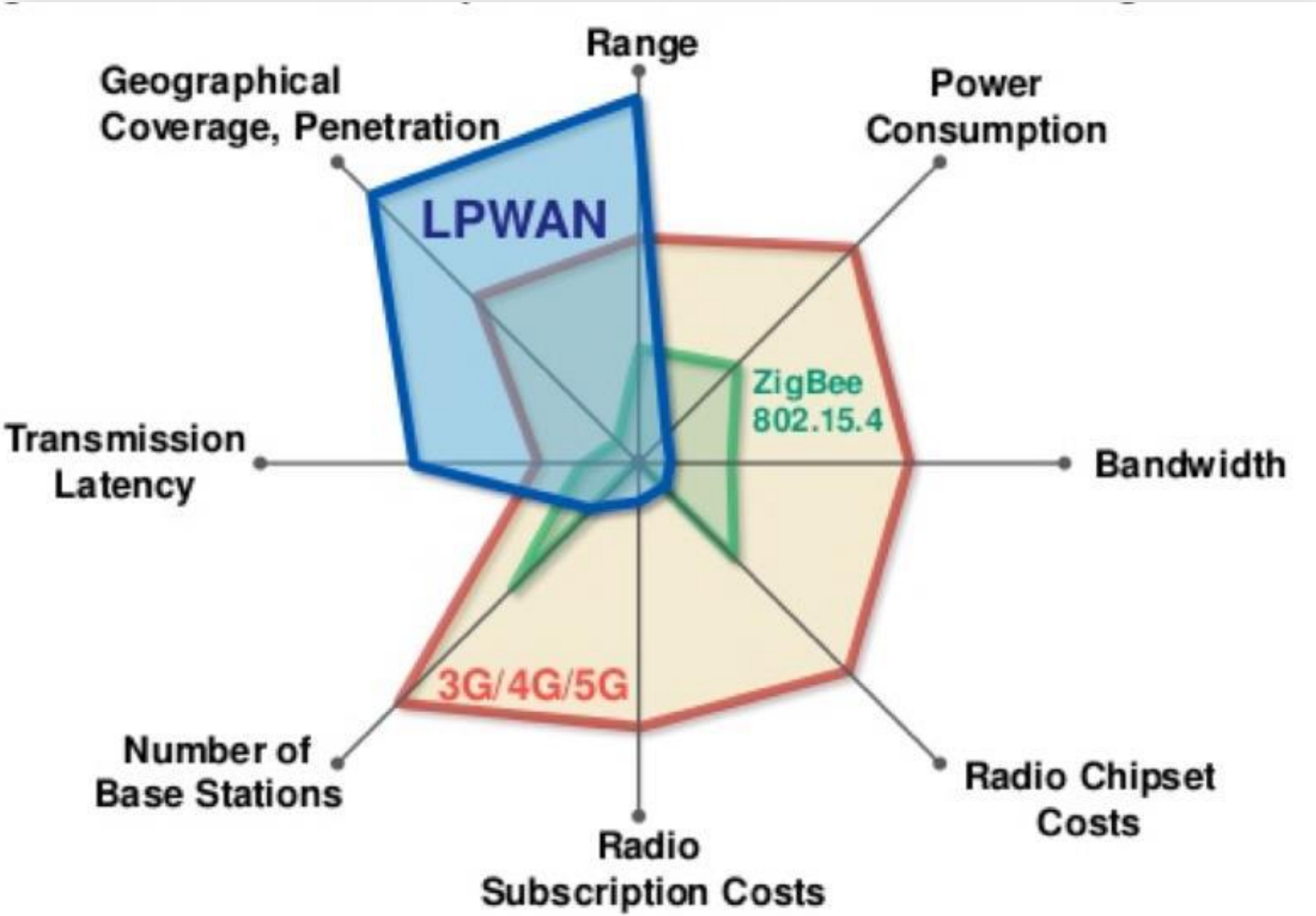
- **Very Low Cost**

Radio Propagation - LoRa's Link Budget



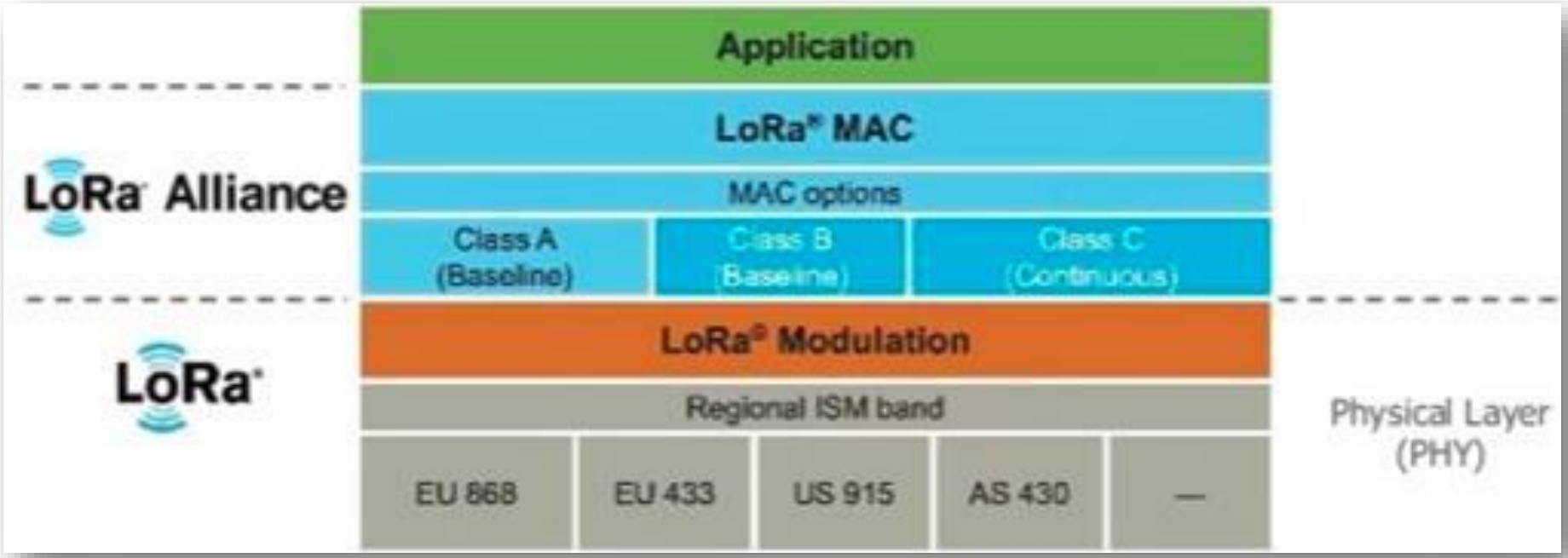
- LoRa's Link Budget is 154dB which is significantly higher (100 times) than LTE(4G) with 130dB

Wireless Features Comparison



What is LoRaWAN™

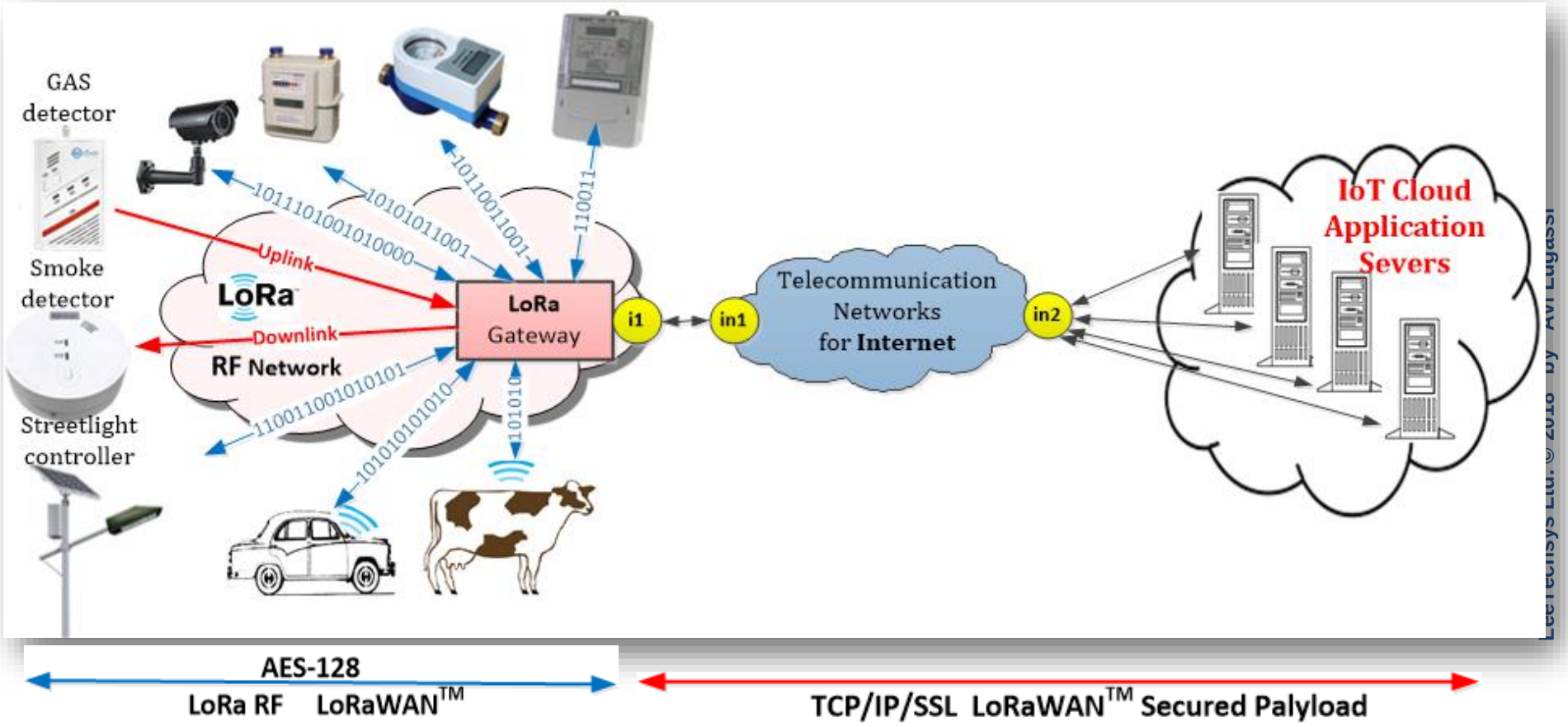
LoRaWAN is a Software Protocol



- Embedded data security, End-to-End encryption for the Network and Application layer
- Two-way communication protocol physical enables devices not only to transmit data but also to receive it
- Smart Meters are a target for malicious software and code, it is used as a point of entry for broader attacks

LoRaWAN™ End-to-End Network Architecture

Asymmetric cryptography with Key-Pairs



LoRa's Gateway Channels and Capacity

64 Channels with 100% of connectivity time

64 Meters

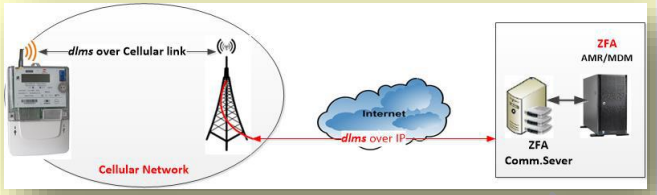
64 Channels with 50% of connectivity time

128 Meters

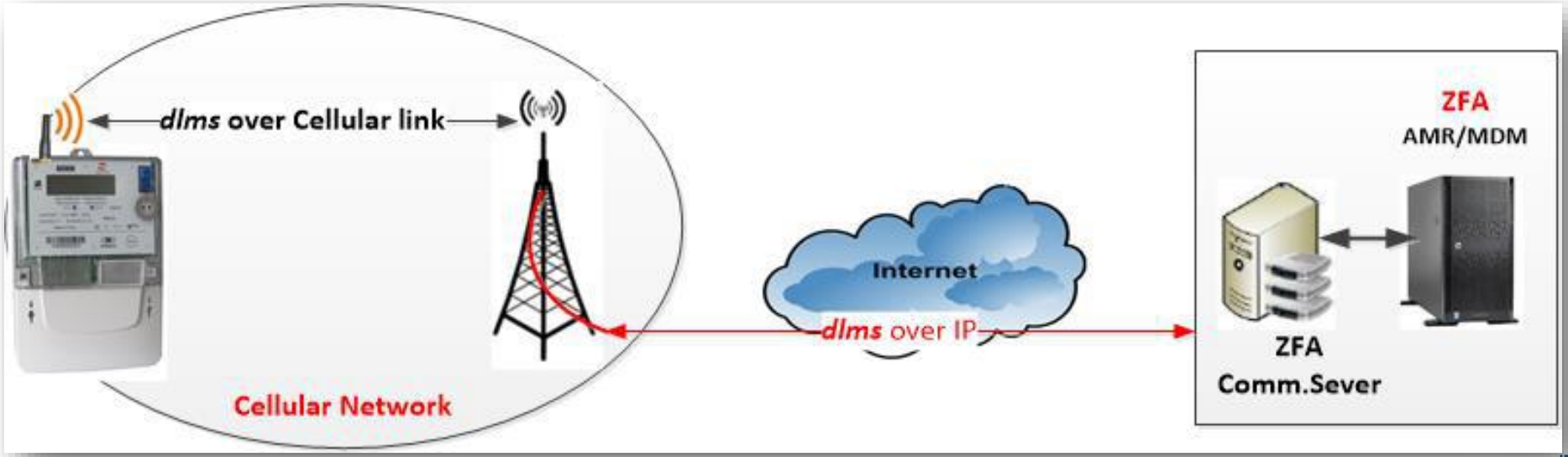
64 Channels with 1% of conectivity time

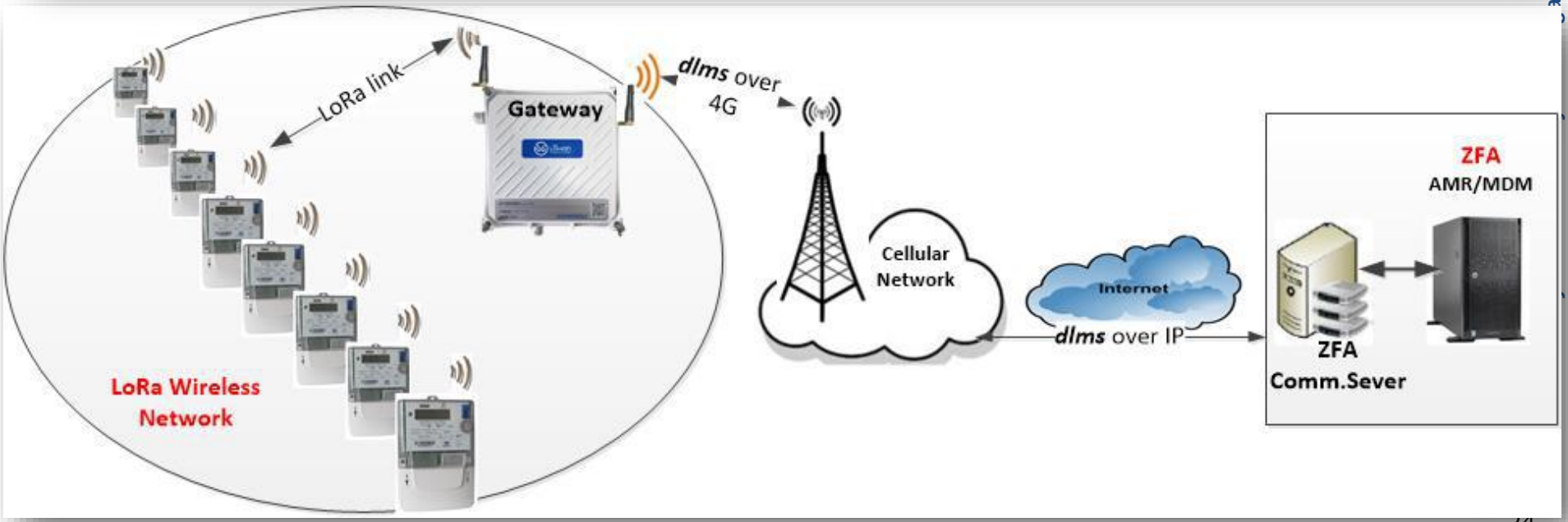
6,400 Meters

Possible AMI Deployments

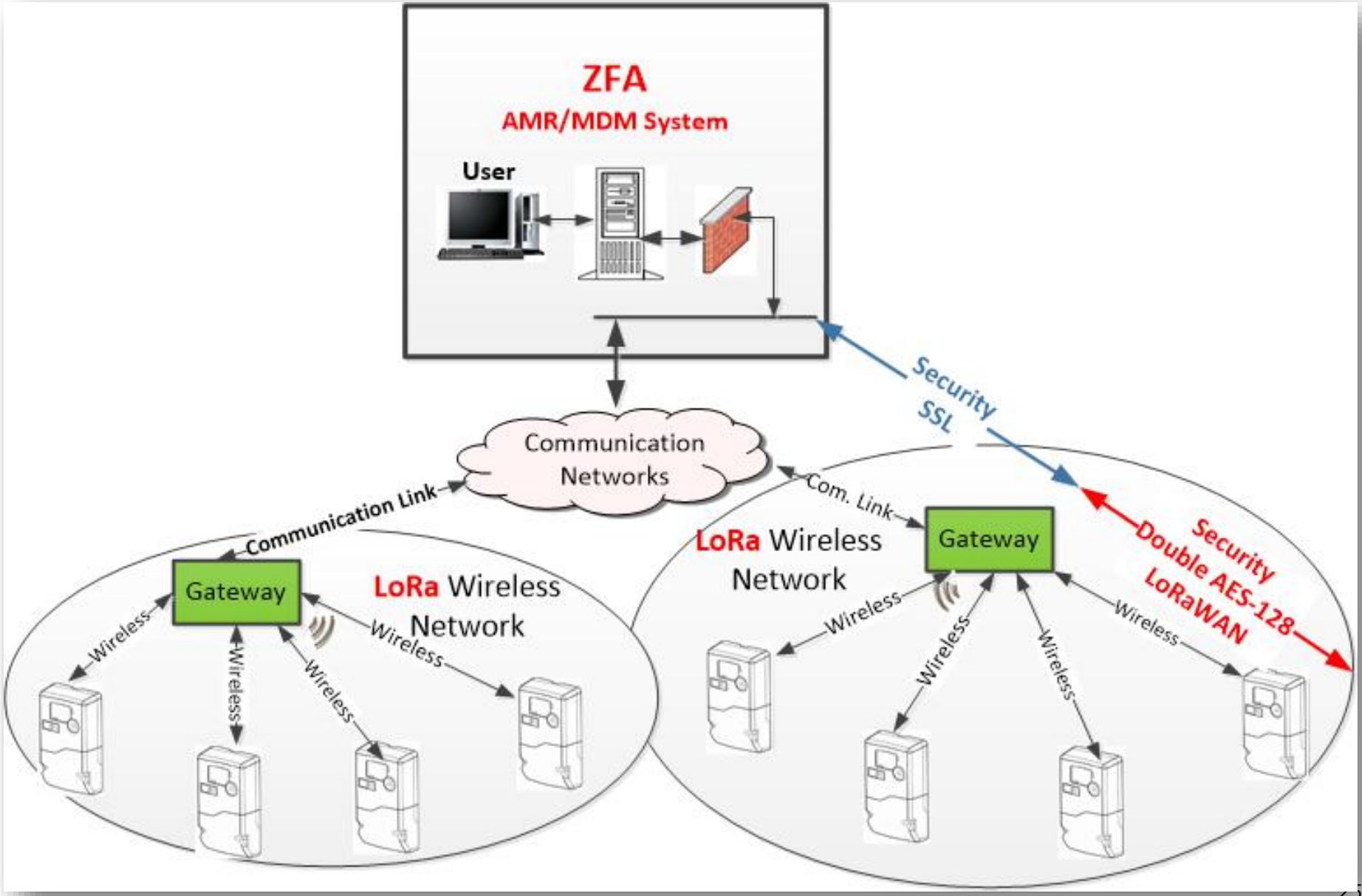


LoRa Possible AMI Networks

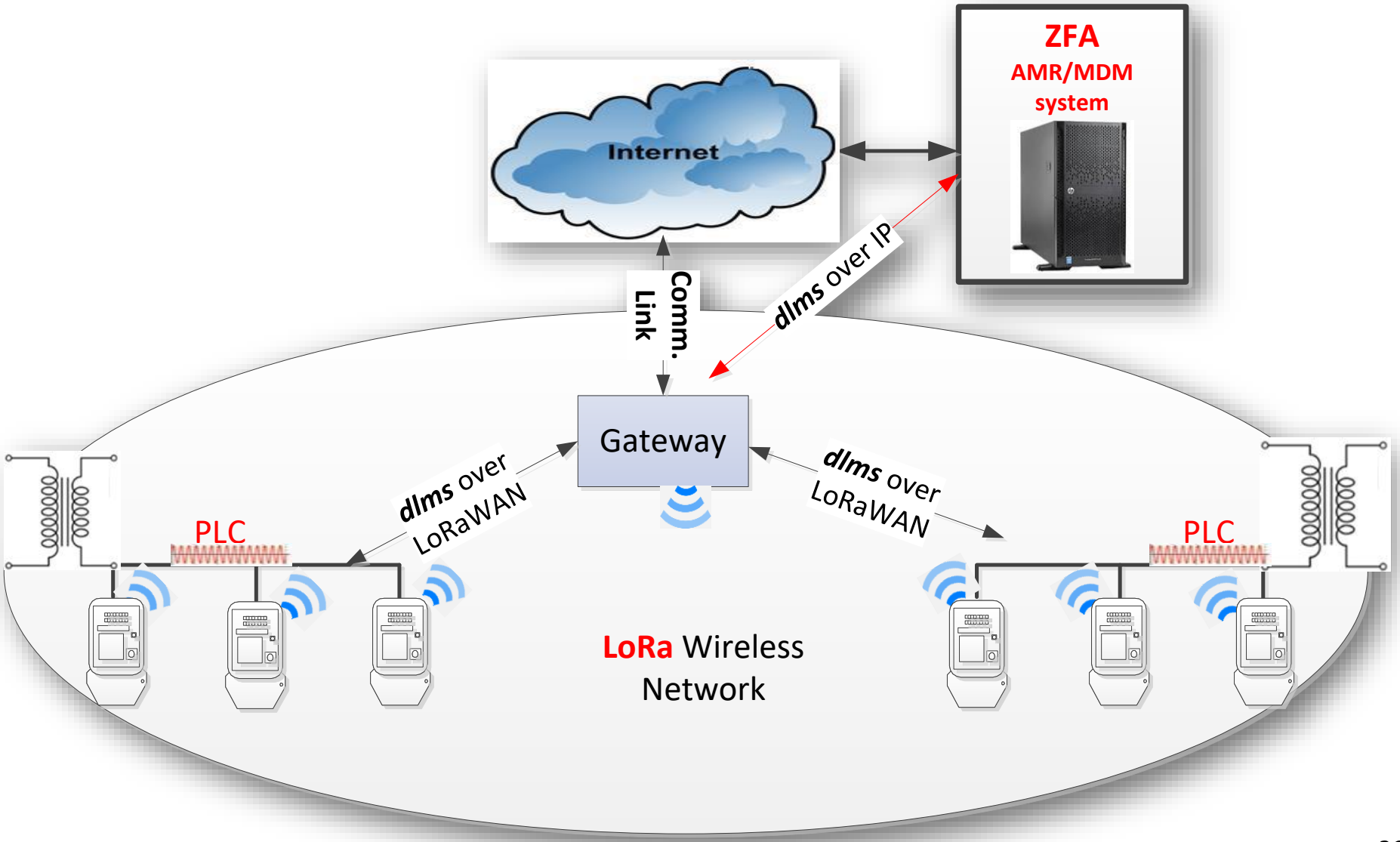




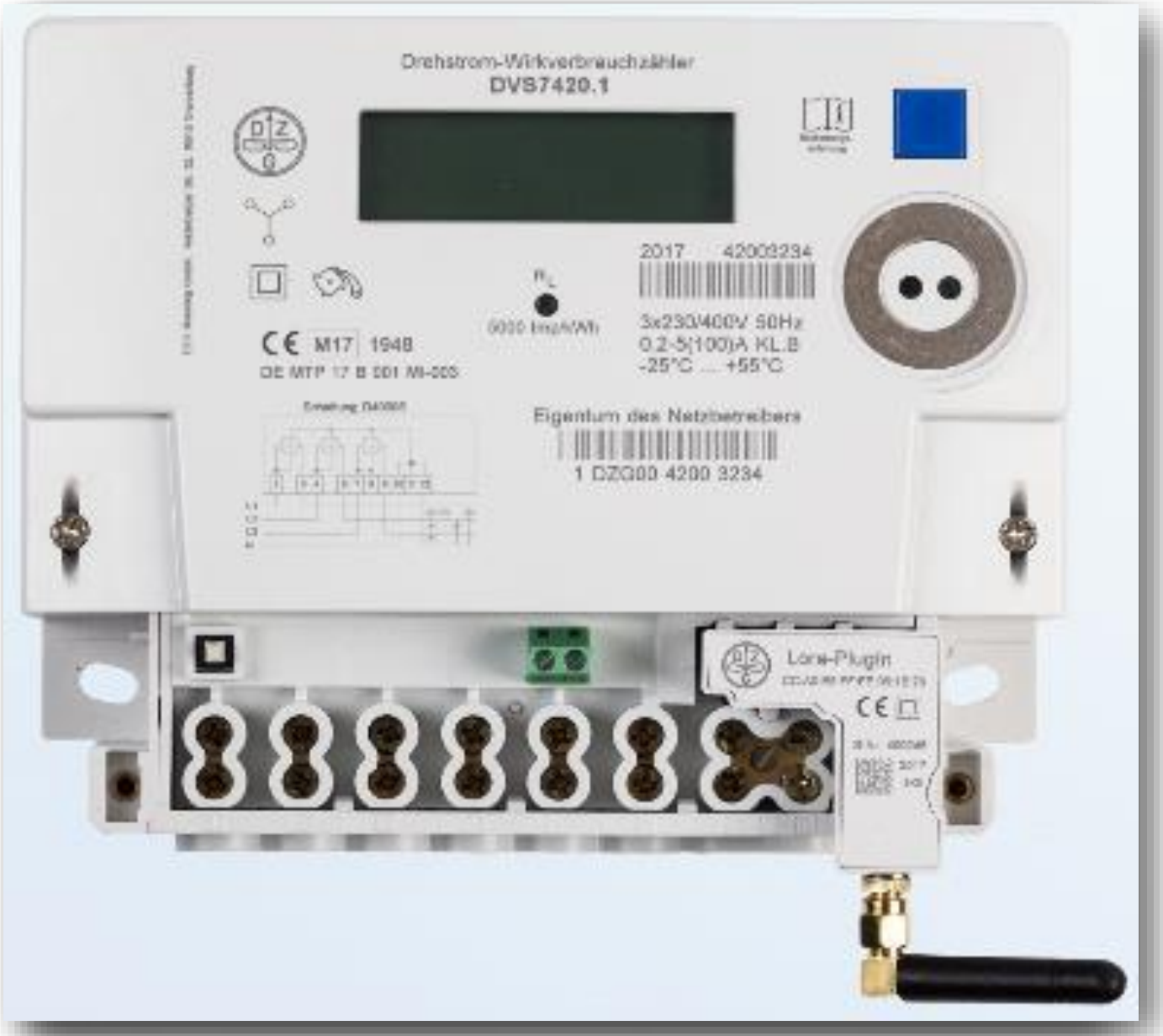
LoRa Point to Multi Points



LoRa combined with PLC-G3



Dr. Neuhaus/Reallin LoRa Communicating meter



Summary

The main difference between LoRa and the traditional Wireless technologies is that:

LoRa has less of everything:

- Less transmission power
- Less bandwidth
- Less power consumption (devices)
- Less Expensive

Thank you for your attention

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