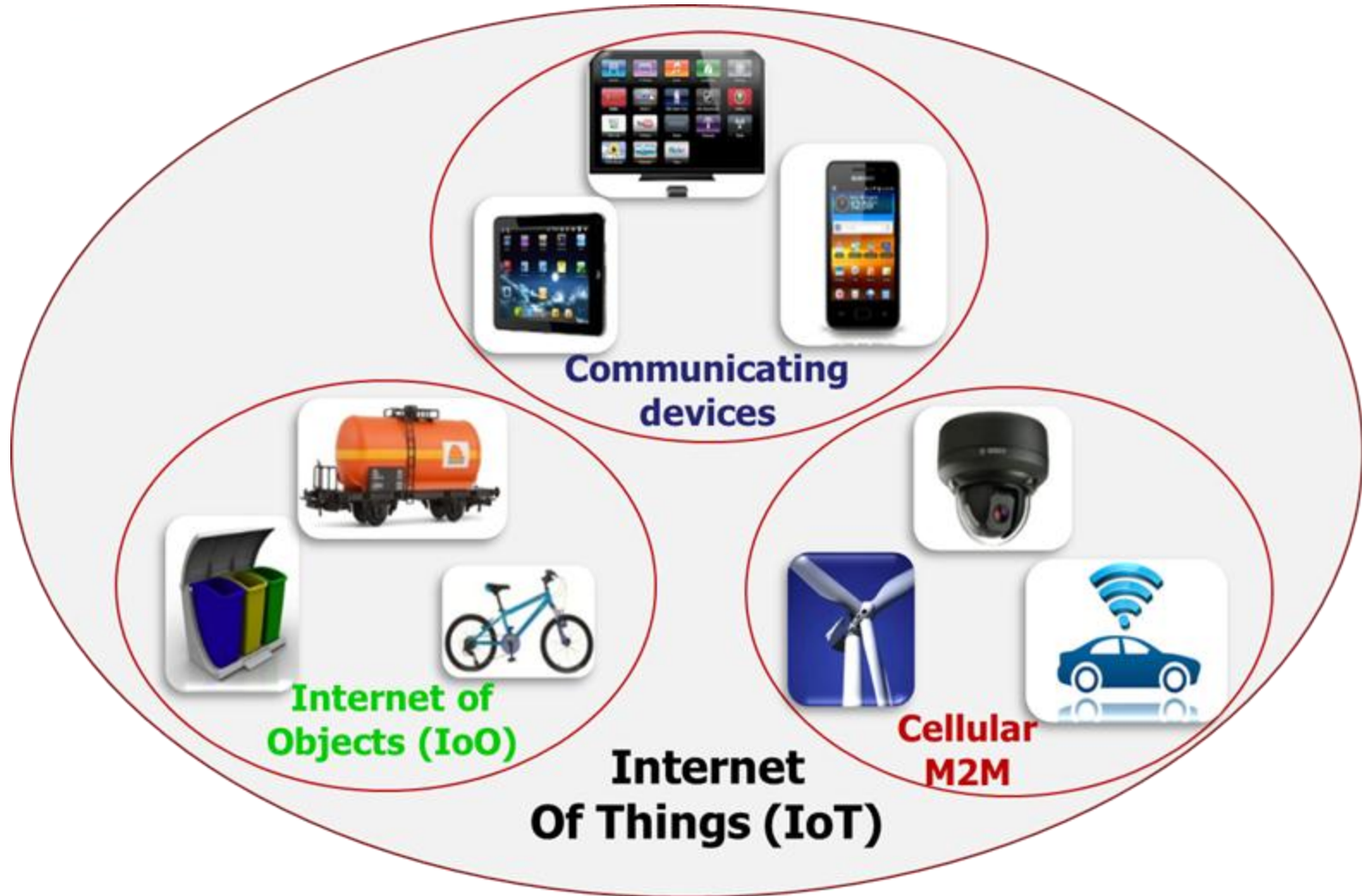# Internet of things , Technology & Ecosystem ready for your applications
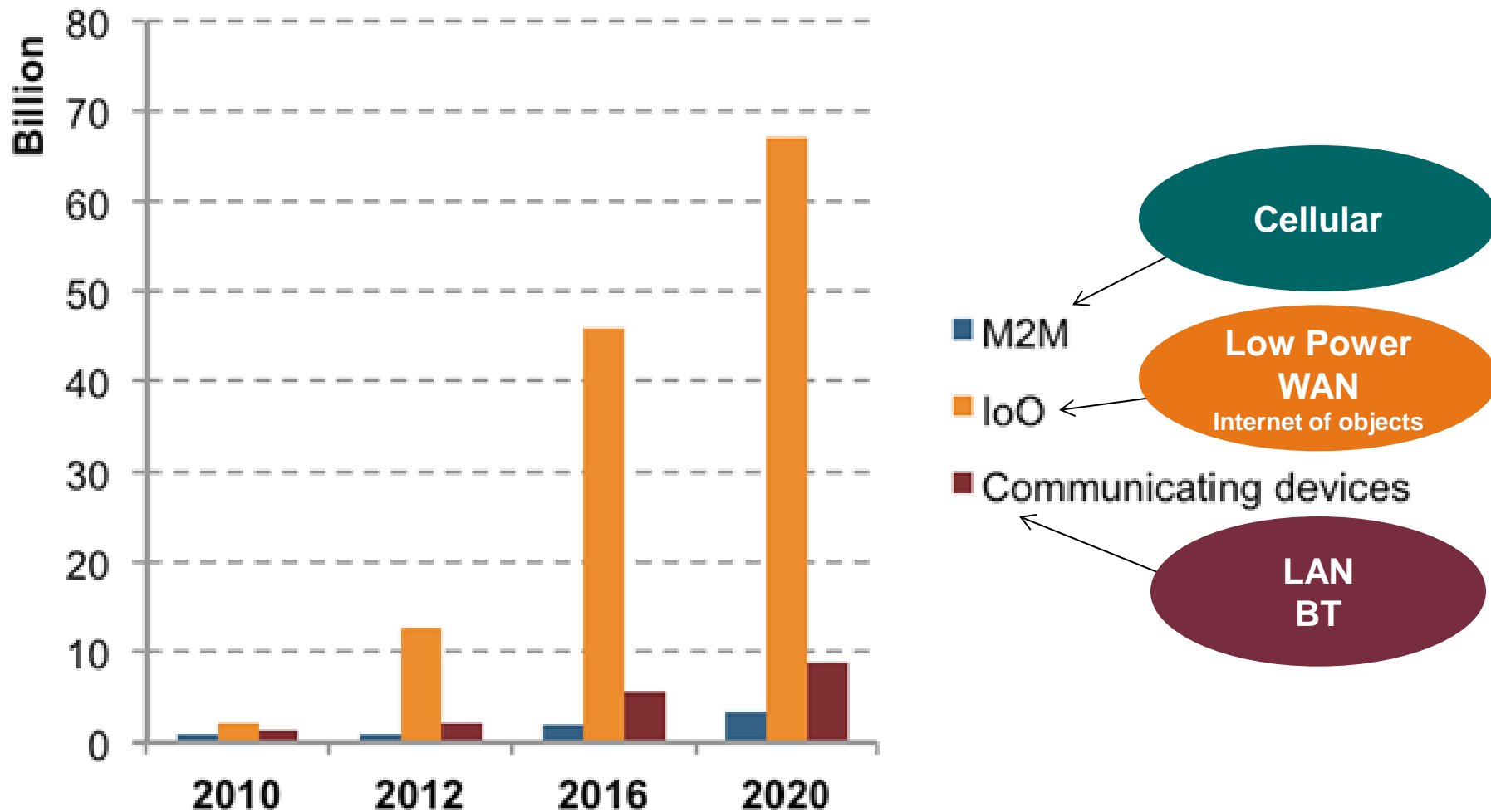
François Sforza – Director , Wireless & IOT Products

IoT Segments

Connected Devices: Market

Projected by Type

Context and Issues

❑ **Indeed several communications technologies can address this (or these) usage.**

❑ **But we can regroup them in two basic categories: short range and long range.**

Home automation, électronics, informatic, utilities, industry,…

Short Range

Bluetooth 4.0   ZigBee   WiFi

- Short Range
- Splited
- Low cost
- Energy sobriety

Build a Radio Network:
- Long Range
- Low NRJ
- Low Cost
- Bidirectonnal
- Shared

Mobile Operators & satellite

Long Range

GSM 3^{G+} / H^+ 4G

- Long Range
- Standard (3GPP, etc)
- Huge energy consumption
- High costs

→ **The Lora radio Technology supported on 868Mhz and « SIMLess »** is presented as less expensive, low energy, and with high coverage for communications of a few Kbits/day, and can address a market that GSM technology can not address…

4

LoRa IoT Solution

SEMTECH

Ultra Long Range ...

= Low Cost Infrastructure

Ultra Low Power ...

= multi year battery life

Ultra Robust ...

= interferer agnostic

Frequency Agnostic
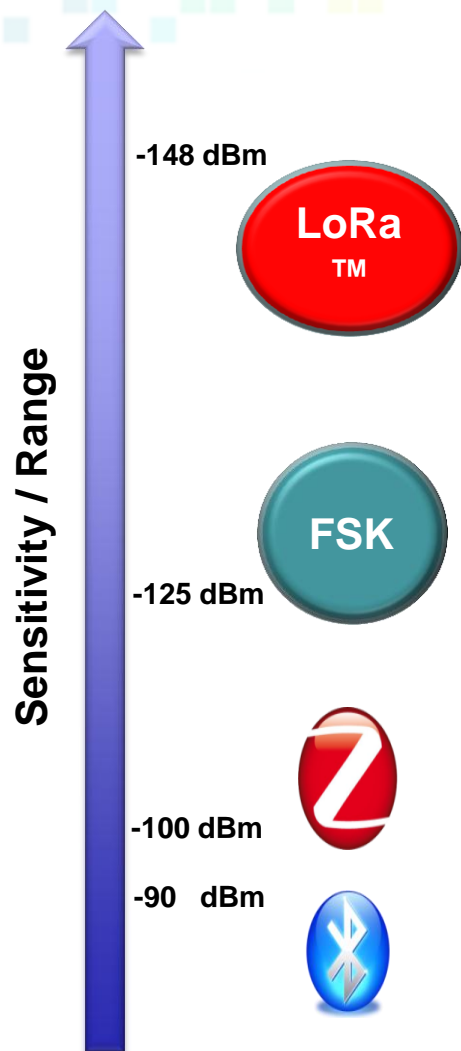
= 169, 433, 868, 915 MHz, ...

Open Middleware...

= Java / C

What is LoRa?

SEMTECH

Sensitivity / Range

-148 dBm

LoRa ™

-125 dBm

FSK

-100 dBm

-90 dBm

❑ **Long Range, Low Power & Small form factor**

At +14dbm output power, 868MHz:

- In Sub-GHz: >2km dense urban, >15km suburban, >80km VLOS
- More than 10 years in operation without changing battery

❑ **Concentrator with Network Capacity & Security**

- Star Network / Link Rate Adaptation / Fully Scalable Network

❑ **Fully bidirectional**

- Acknowledge / Request from user or from sensor
- High Security Level
- Easy Network Management
- Fast Channel Activity Detection
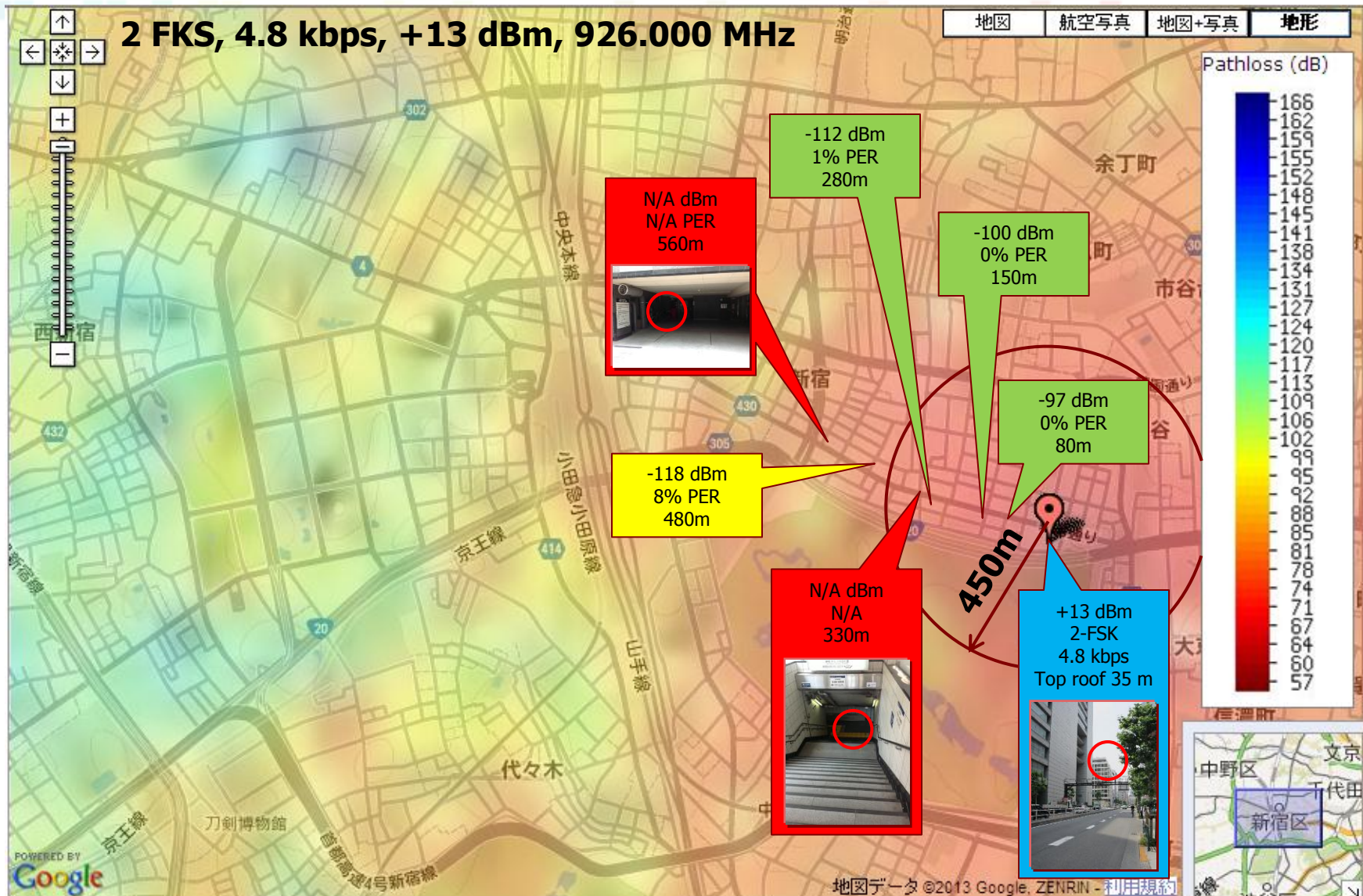
LoRa™

❑ **Robust communication**

- . Robust to interferer / Coexistence with other ISM
- . Robust to Jamming
- . Suitable for Mobile , Nomadic & fixed nodes
- . Indoor / Outdoor coverage

❑ **High accuracy localization and ranging**

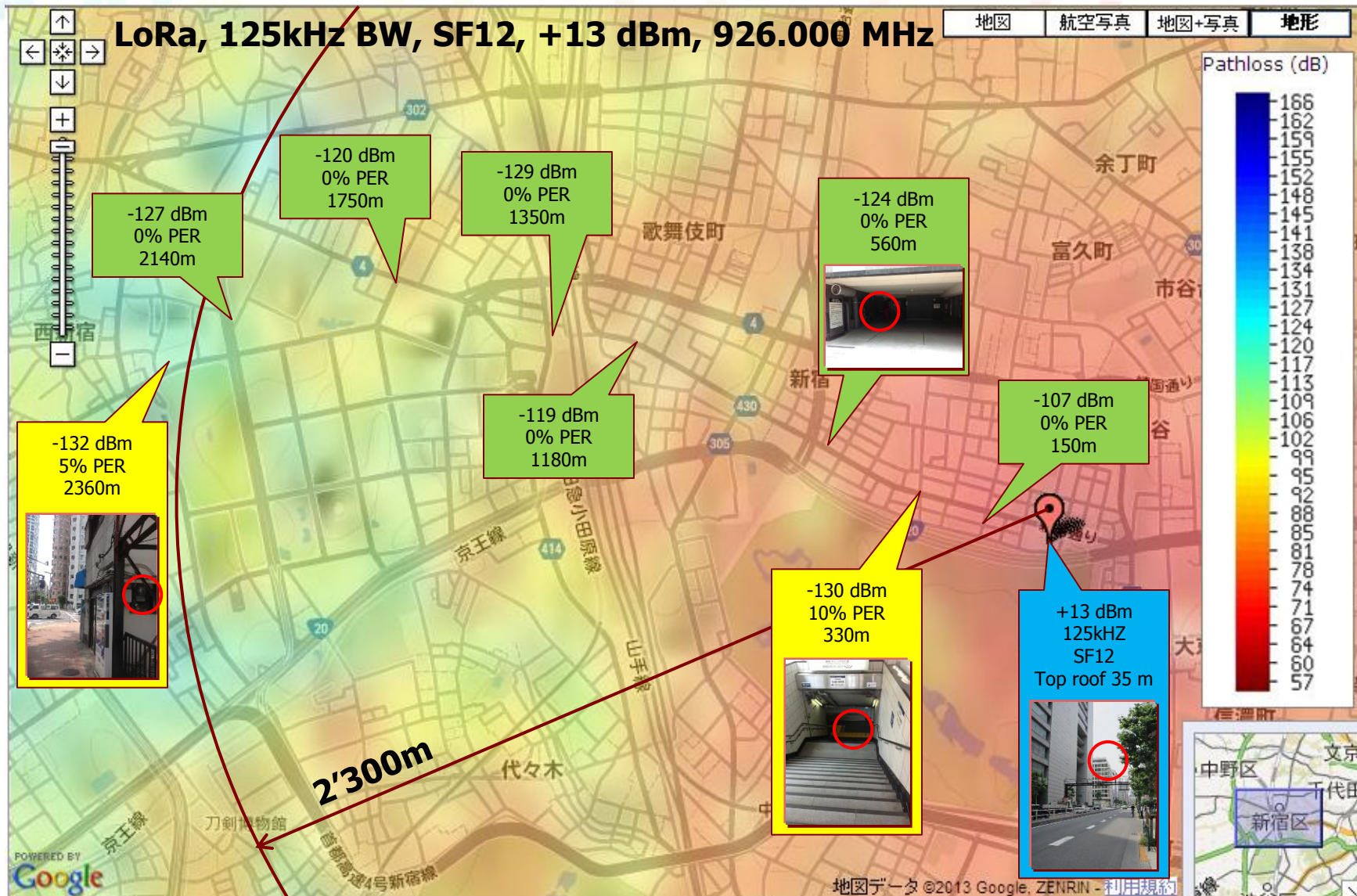- Modulation format permits high accuracy localization
- Not RSSI based and accounts for multi-path and fading

LoRa Range Test – Shinjuku, Tokyo

2 FKS, 4.8 kbps, +13 dBm, 926.000 MHz

-112 dBm
1% PER
280m

-100 dBm
0% PER
150m

N/A dBm
N/A PER
560m

-97 dBm
0% PER
80m

-118 dBm
8% PER
480m

N/A dBm
N/A
330m

+13 dBm
2-FSK
4.8 kbps
Top roof 35 m

450m

Pathloss (dB)
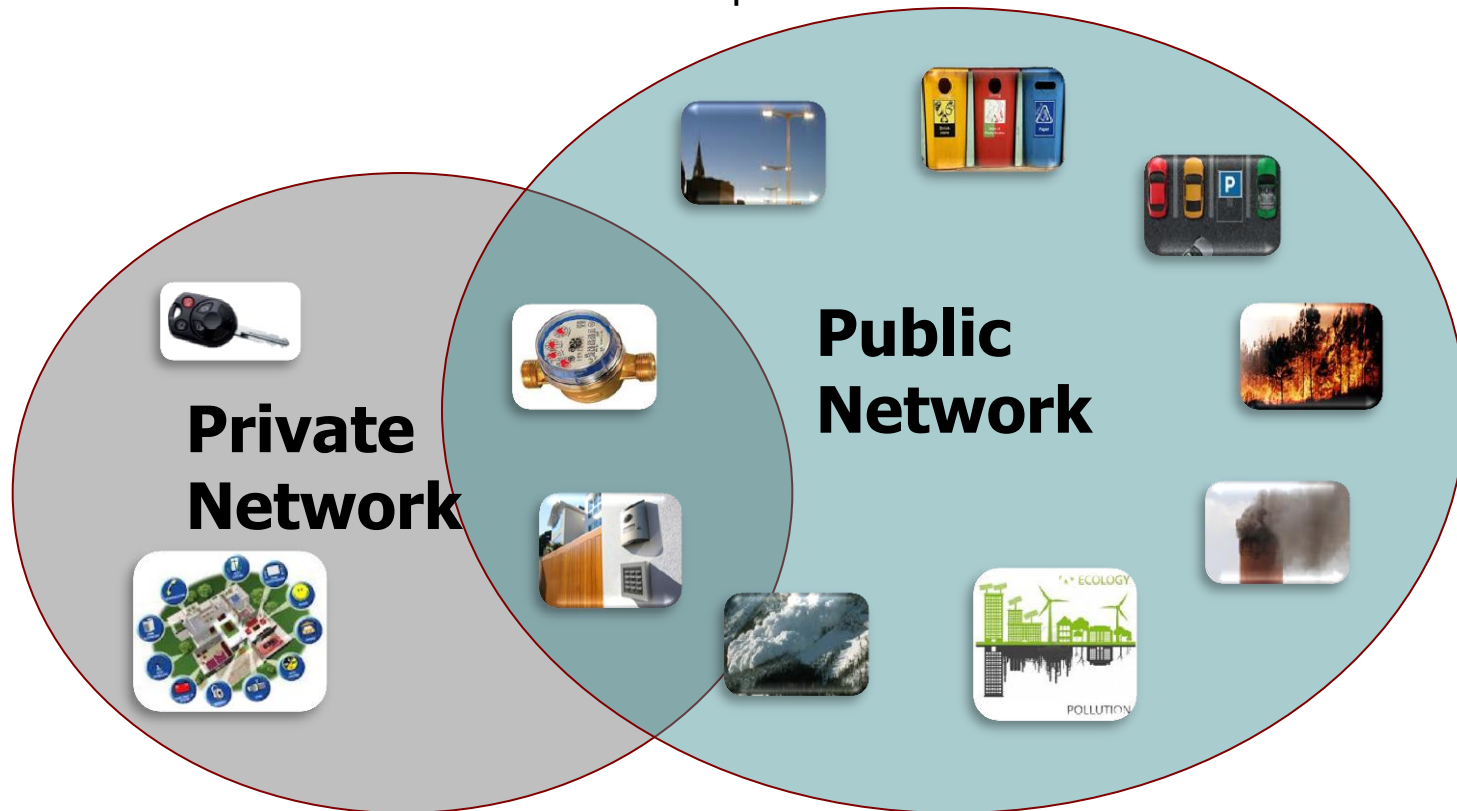
LoRa Range Test – Shinjuku, Tokyo

Private vs Public Network

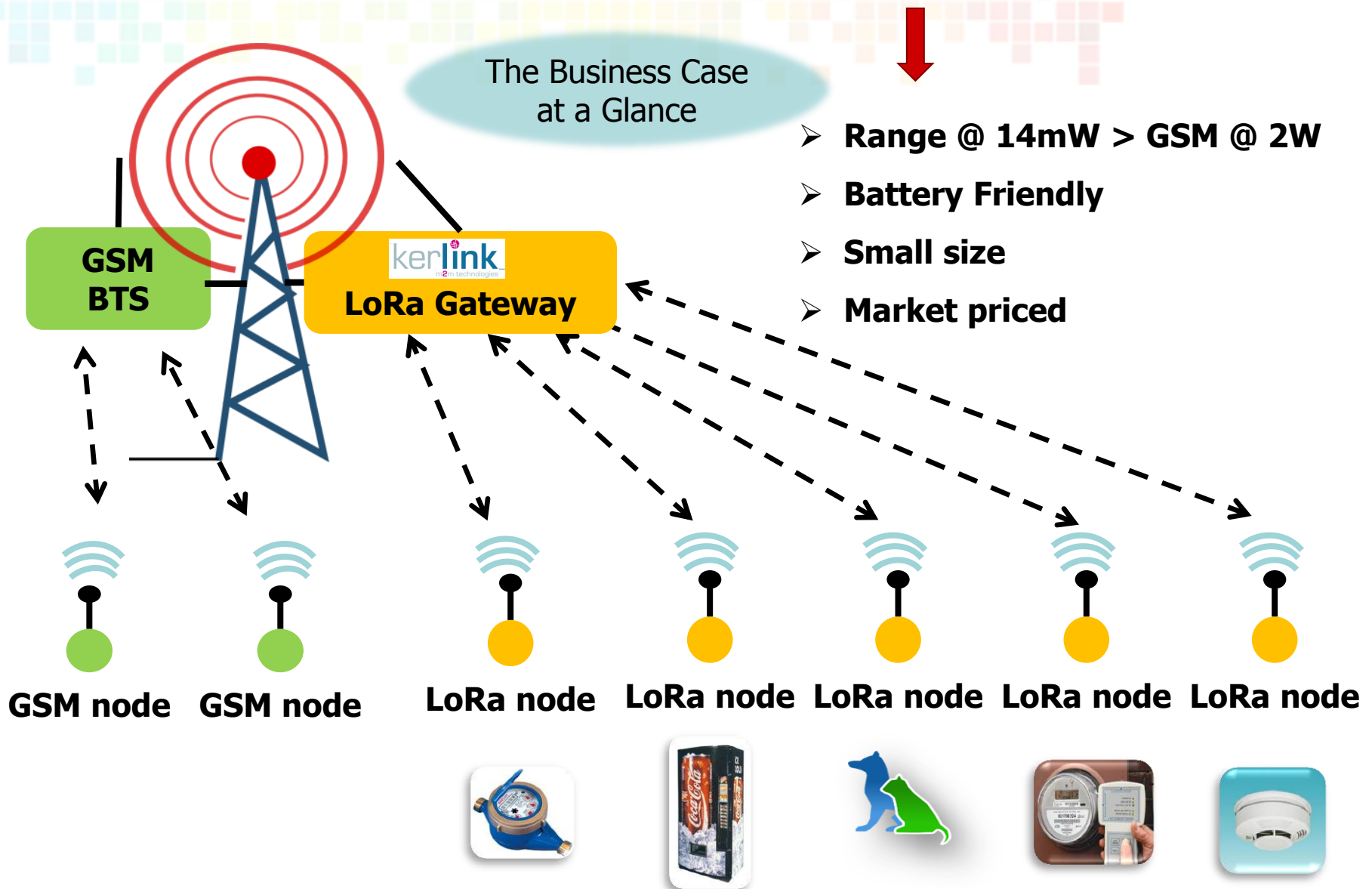- ❑ **Private network – individually managed networks**
  - ▪ Our traditional business – Metering, security, home automation, industrial control
- ❑ **Public network – Telecom/operator managed networks**
  - ▪ Includes our traditional business, permits numerous new applications, infinitely more scale able than the traditional private network

Private Network

Public Network

LoRa Expands M2M Connectivity …

SEMTECH

The Business Case at a Glance

➢ **Range @ 14mW > GSM @ 2W**

➢ **Battery Friendly**

➢ **Small size**

➢ **Market priced**

GSM BTS

kerlink
m2m technologies

LoRa Gateway

GSM node   **GSM node**   **LoRa node**   **LoRa node**   **LoRa node**   **LoRa node**   **LoRa node**

Semtech LoRa IoT Solution

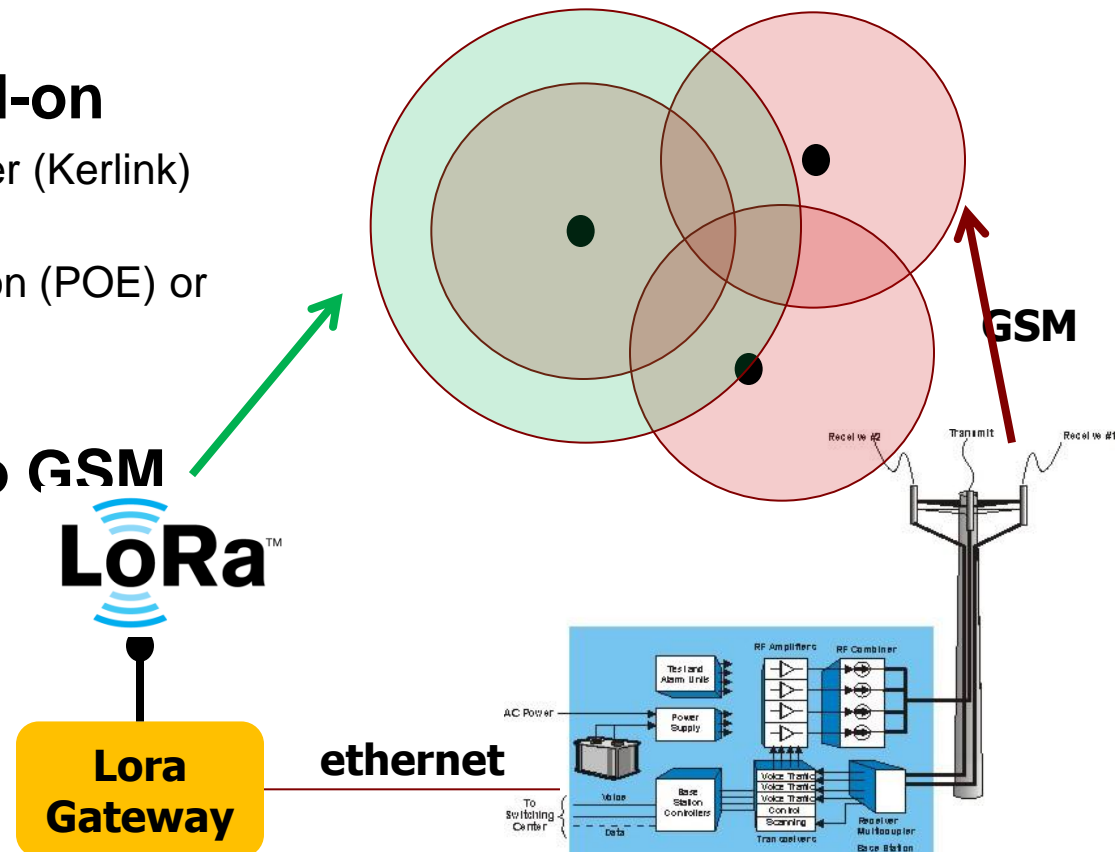☐ **Complete HW solution for long range, high capacity system**

- Both end-node RFIC and concentrator/gateway
- MAC level SW to provide adaptive link rate
- Full SW solutions available from partners – IBM and Actility

☐ **Simple Base station Add-on**

- Install LoRa gateway from Partner (Kerlink) at existing locations
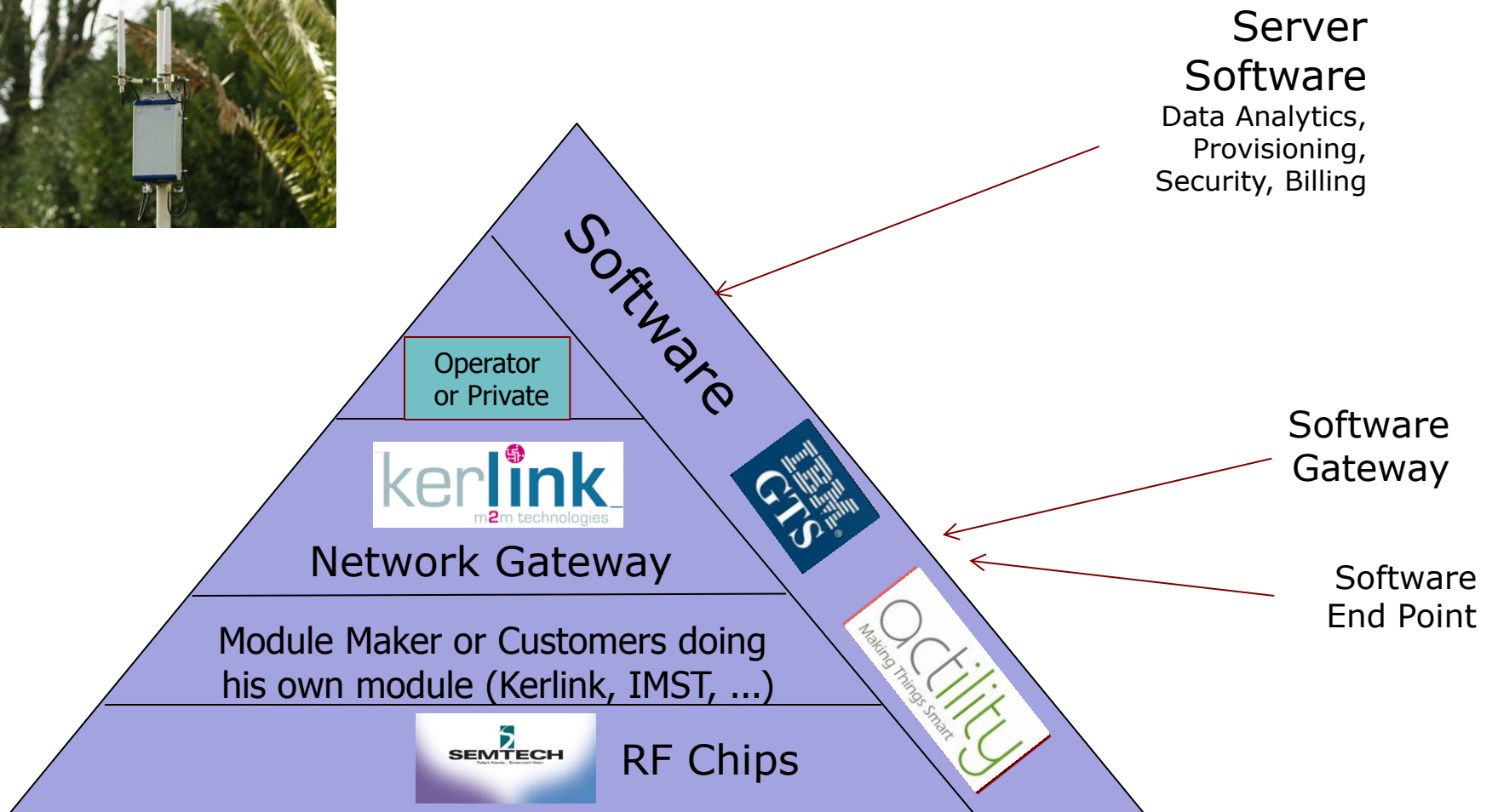- Requires only Ethernet connection (POE) or 3G/4G connection

☐ **Complimentary model to GSM**

- Same business model
- Low power (battery operated)
- Low cost
- Unlicensed spectrum

GSM

LoRa™

Lora Gateway **ethernet**

Example

Server
Software
Data Analytics,
Provisioning,
Security, Billing

Software

Operator
or Private

kerlink
m2m technologies

Network Gateway

Module Maker or Customers doing
his own module (Kerlink, IMST, ...)

SEMTECH

RF Chips

GTS

actility
Making Things Smart

Software
Gateway

Software
End Point

LoRa Concentrator – SX1301 based

Concentrator

DR1
Ch2

DR3
Ch4

DR5
Ch6

DR5
Ch2

DR6
Ch1

DR7
Ch3

Superior System

- ❑ **Multi-modem/channel concentrator**
    - ▪ Improved network capacity
        - ➢ Simultaneous reception on same channel
        - ➢ Easily scalable to add more capacity
    - ▪ Simultaneously demod - 2MHz spectrum
    - ▪ Simple star network – no latency
    - ▪ Adaptive link rate
    - ▪ Up to 5 million node transactions per day
    - ▪ Easily scalable for more capacity

- ❑ **Localization**
    - ▪ The feature everyone wants

- ❑ **Solves all system desires**
    - ▪ Range, battery lifetime, capacity, cost

- ❑ **Reduces design cycle**
    - ▪ System HW and MAC provided