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# Alcom Electronics

- Independent technical distributor

- 35+ years expertise in semiconductor, modules and wireless solutions

- 50+ people in Netherlands and Belgium

- Technical salesforce and engineering support

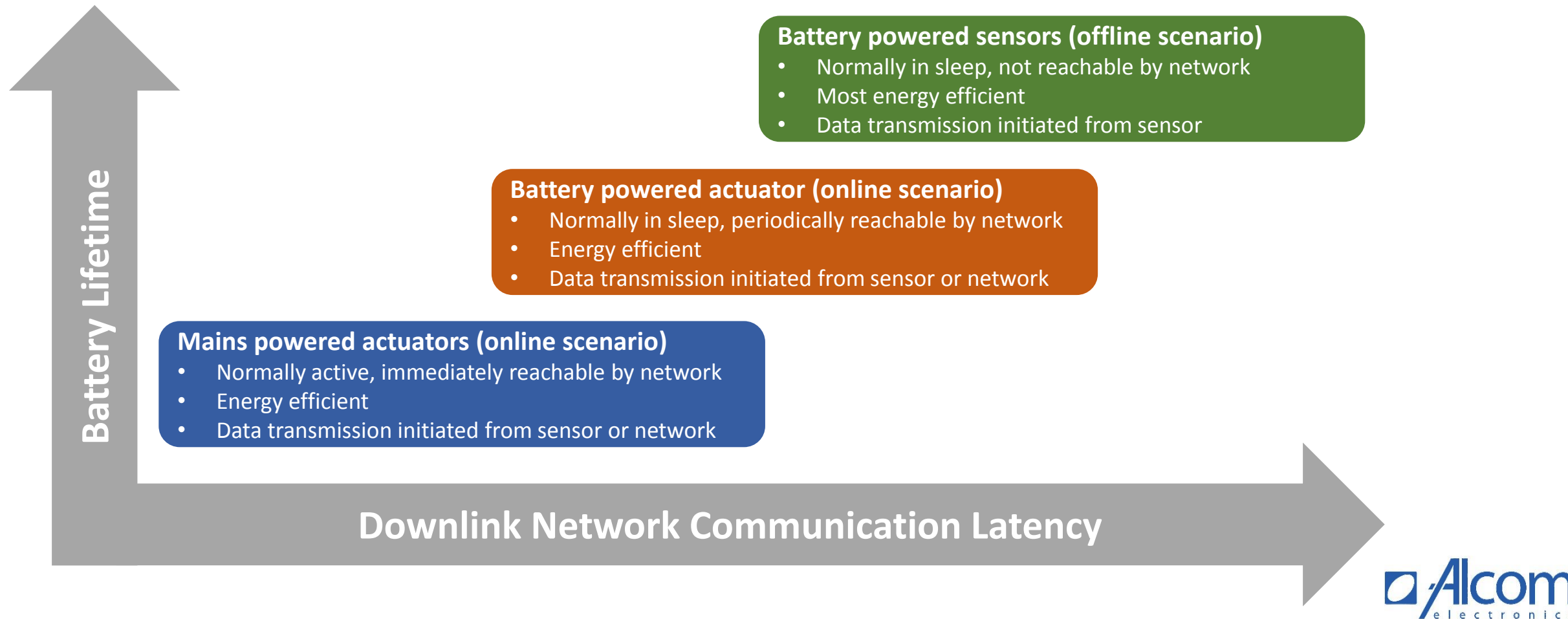- **Frans Lutz**
  Product Specialist Wireless, IoT & Networking

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# Connecting your Thing

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Power consumption                    Security

Reliability & latency                Scalability

Edge/cloud computing           Configuration / installation



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# Typical IoT application

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**Battery Lifetime** ↑

**Downlink Network Communication Latency** →

**Battery powered sensors (offline scenario)**
- Normally in sleep, not reachable by network
- Most energy efficient
- Data transmission initiated from sensor

**Battery powered actuator (online scenario)**
- Normally in sleep, periodically reachable by network
- Energy efficient
- Data transmission initiated from sensor or network

**Mains powered actuators (online scenario)**
- Normally active, immediately reachable by network
- Energy efficient
- Data transmission initiated from sensor or network

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# Many different Wireless Technologies

- Many factors, often yet unknown

- Business case is most important

- You can't beat physics!

- Any advantage has its disadvantage

# Wireless communication

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## PAN/LAN/HAN
### Short Range
Communicating Devices

Bluetooth

ZigBee    WiFi    THREAD

**Well established standards**

**Benefits :**

• In-home / Office building

• Short range

**Considerations:**

• Battery life

• Range limitations

## Cellular
### Long Range w/ Power
Traditional M2M

NB-IoT

**Well established standards**

**Benefits :**

• Mobile

• High data-rate

• Coverage

**Considerations:**

• Battery life (@high data-rates)

• Low OpEx

## Low-Power WAN
### Long Range w/ Battery
Internet of Objects

LTE-M

**Emerging standards**

**Benefits :**

• Long range

• Long battery life

• Low cost

**Considerations:**

• Data-rate limitations

• Duplex communication

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# What is LPWAN?

## Low Power Wide Area Network

- Long battery life

- Wide area connectivity characteristics

- Low cost chipset and low network infrastructure cost

- Limited data throughput capacity

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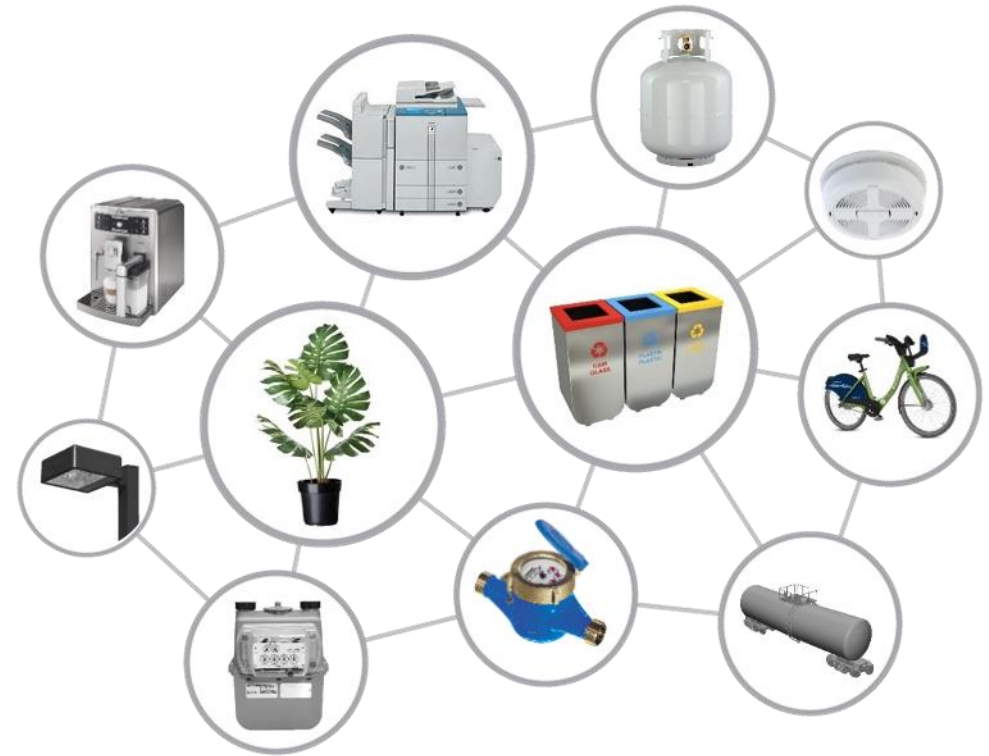
# First questions

- Private network or subscription based?

- Point to Point connection or Cell/Mesh based?

- End to End security needed?

- Where are my devices installed (Local, Global, Office etc.)?

- Communication basics (Bidirectional communication, how much data, how often, confirmation of transmission needed)

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# Cellular Evolution

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**1G**
Voice Only

Introduction 1980 (Analog Only)

**2G**
Voice/CSD/GPRS

Introduction 1991 (First digital phone)

**3G**
Voice/Mobile Internet

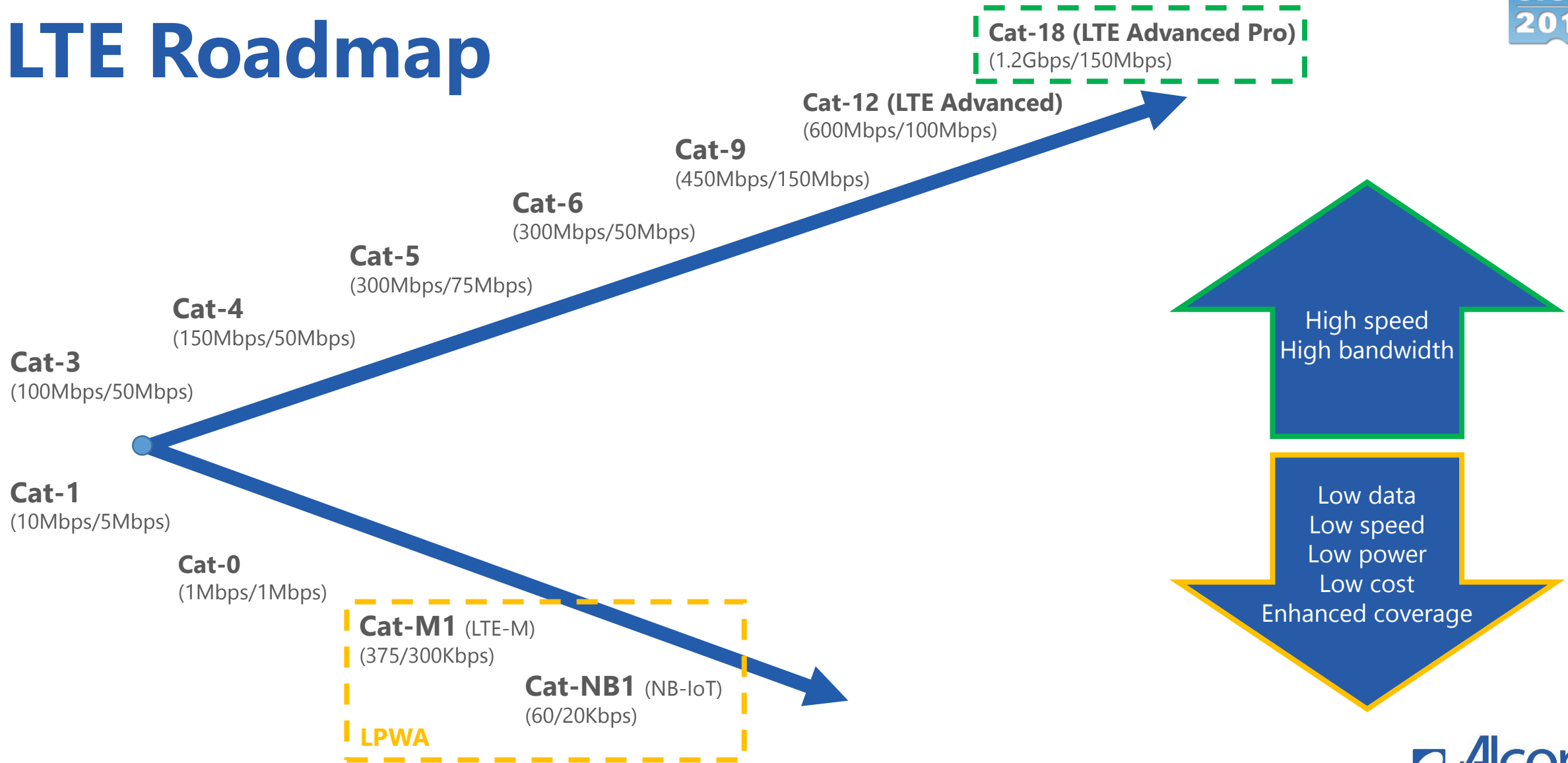Introduction 1998 (Mobile broadband)

**4G**
Faster Internet

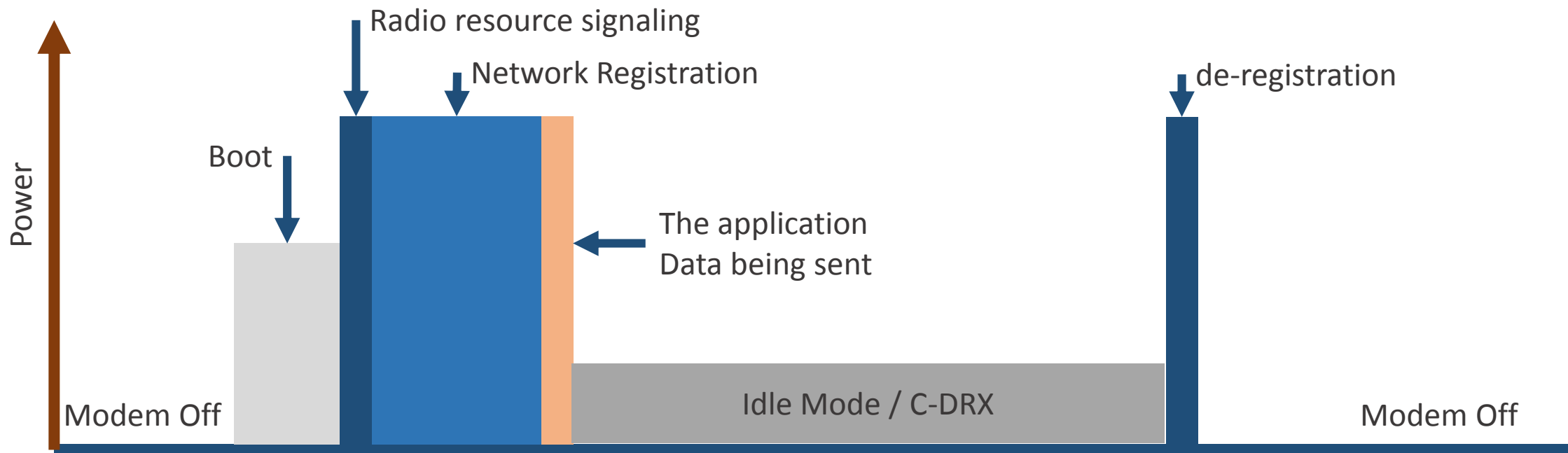Introduction 2008 (Completely packet based)
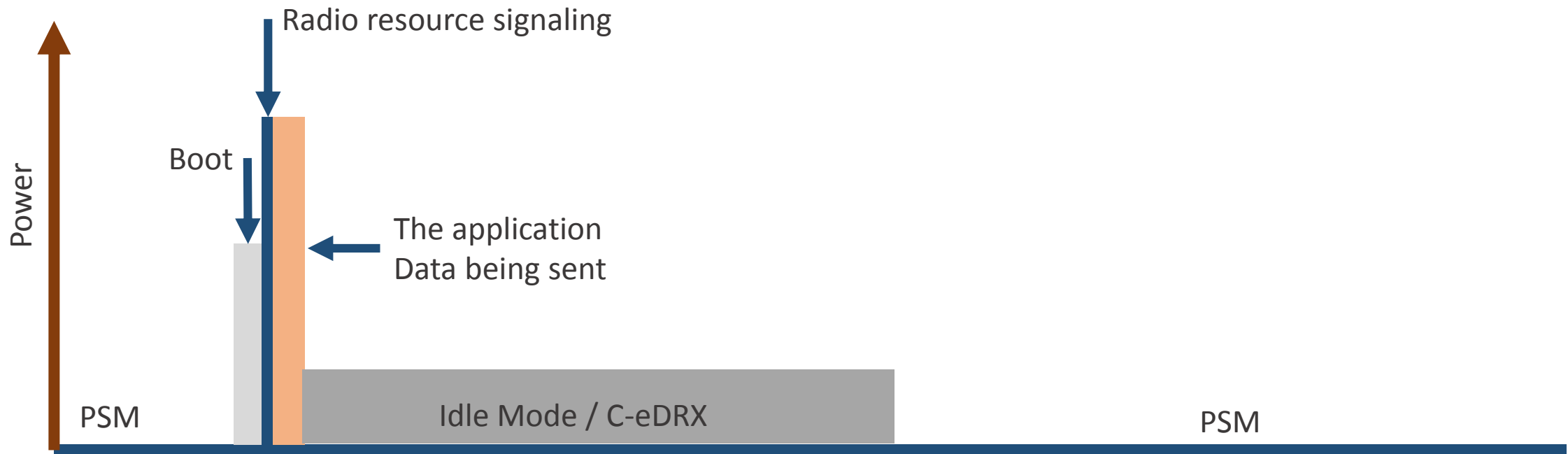
**5G**
The Future

Introduction 2019 (First Phase)

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# Typical Cellular communication

Power

Radio resource signaling

Network Registration

de-registration

Boot

The application
Data being sent

Modem Off

Idle Mode / C-DRX

Modem Off

Offline Performance

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# LPWA Cellular communication



Offline Performance

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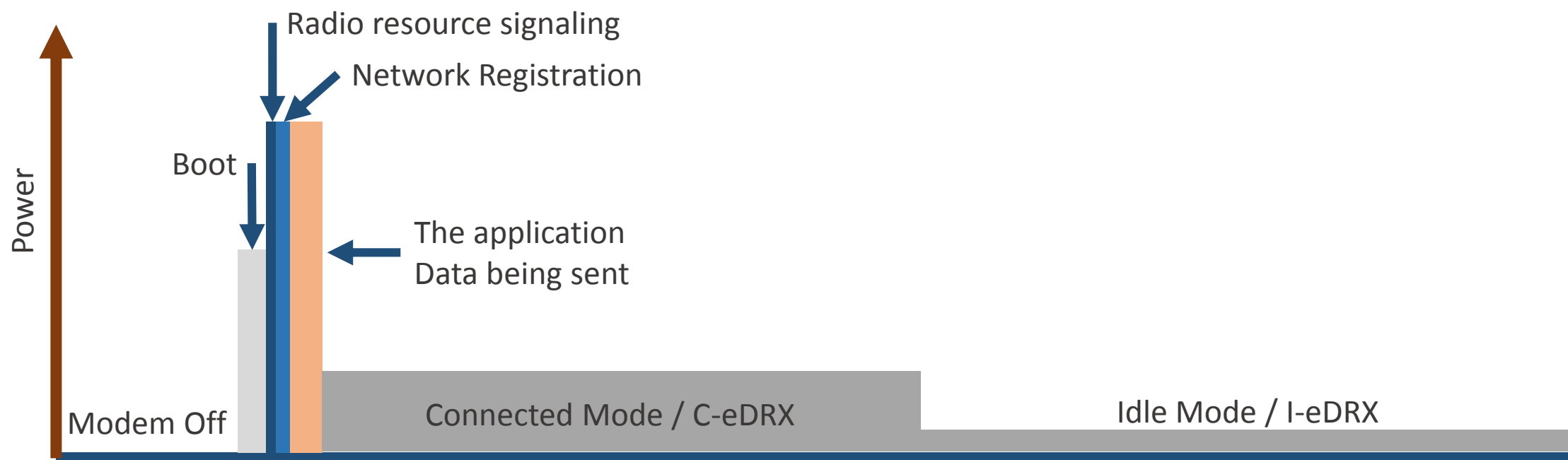
# New LTE features with Cat M1 / NB1

## Power Saving Mode (PSM)

- Ability to reduce Idle/Standby power by sleeping for extended periods of time
- During this time the device is NOT reachable
- Device requests duration of PSM period up to 413 days in sleep mode

## Extended Discontinuous Reception (eDRX)

- Reducing power consumption by extending the paging period (I-eDRX).
  This allows incoming traffic, i.e. the device is reachable!
- Device requests duration of DRX period from second to 44 minutes in idle mode

## Extended Coverage mode

- Boost cell edge performance by improving RF link budget
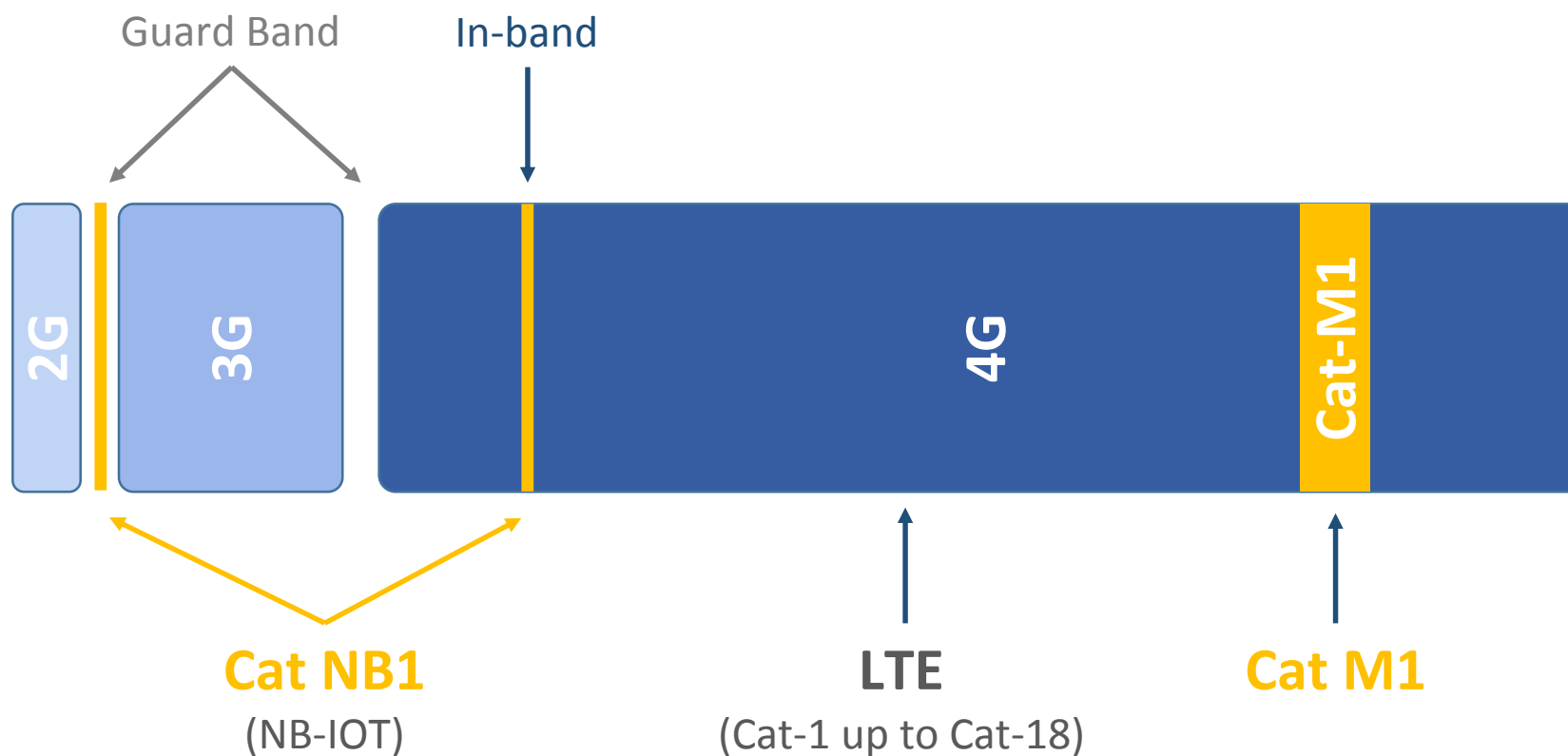- Narrower BW, Coding Schemes & Retransmissions

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# NB-IoT versus LTE-M

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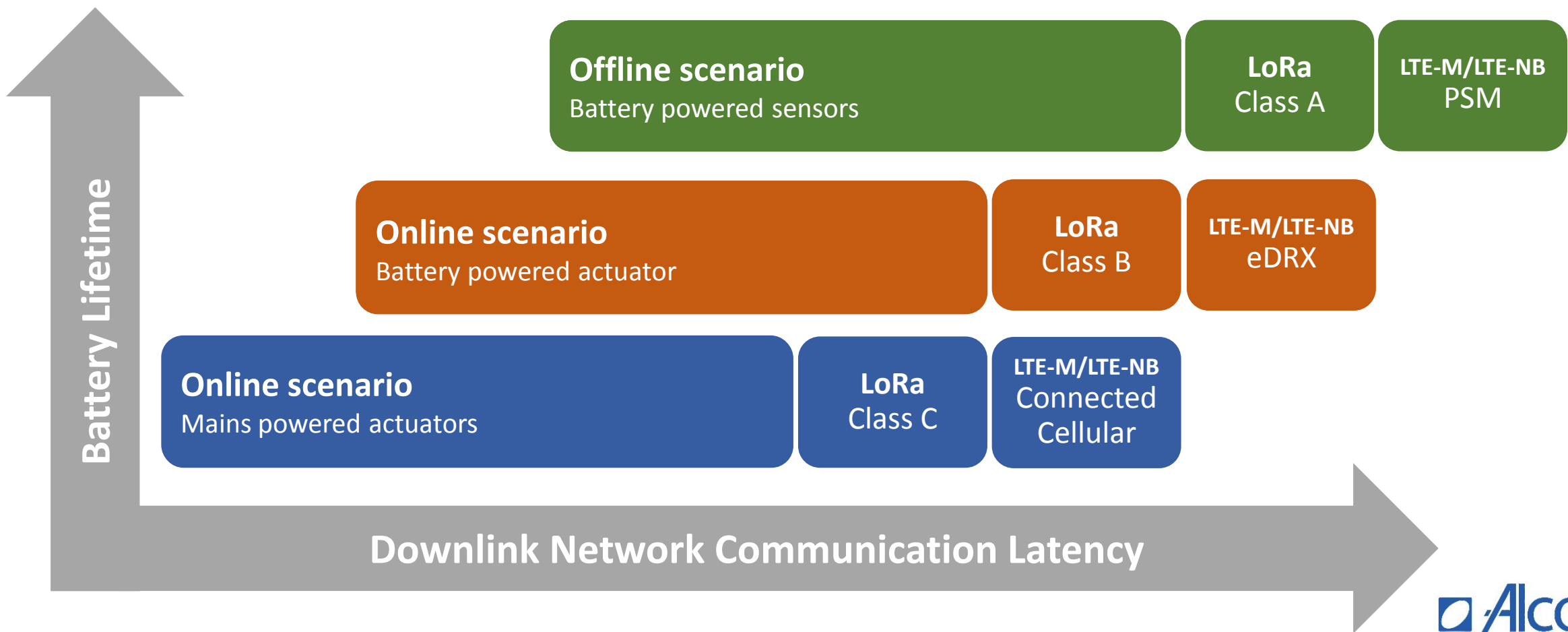|  | LTE-M | LTE-NB1 |
|---|---|---|
| PSM | ✓ | ✓ |
| eDRX | ✓ | ✓ |
| Extended coverage | *Up to 16 dB* | *Up to 24 dB* |
| Voice (VoLTE) | ✓ | ✗ |
| Roaming by design | ✓ | ✗ |
| Connection type | *TCP/IP* | *Packet based* |
| Latency | *Low* | *High* |
| Subscriptions* | €€ | € |
| Hardware costs** | *Medium* | *Low* |

\* Subscription prices not publicly available

\*\* Hardware pricing based on current situation. Prices will improve and change over time with the availability of new chipsets and further optimizations.
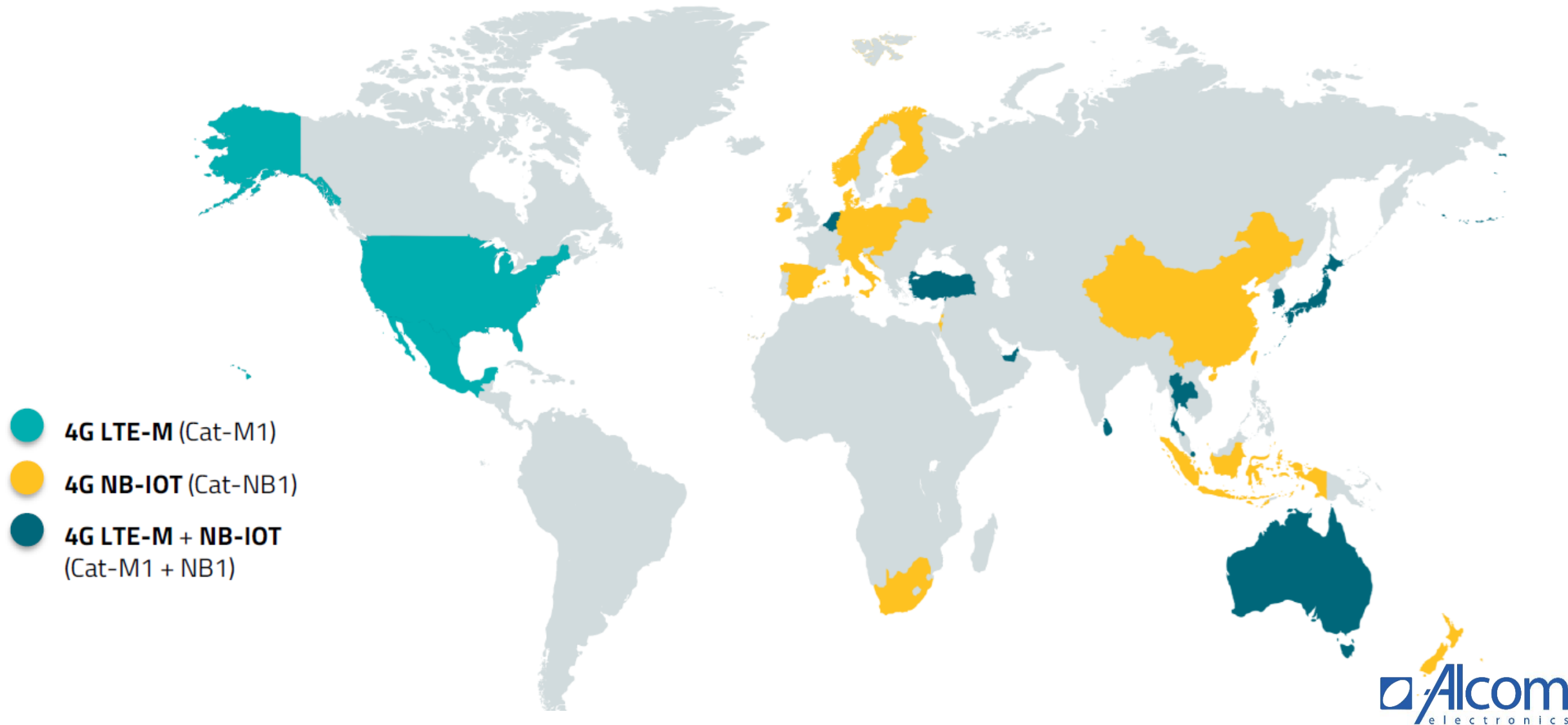
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# Example usage of frequency band



Guard Band

In-band

2G

3G

4G

Cat-M1

**Cat NB1**
(NB-IOT)

**LTE**
(Cat-1 up to Cat-18)

**Cat M1**

# Offline/Online Scenario versus LPWA modes

**Battery Lifetime** →

**Offline scenario**
Battery powered sensors

**LoRa** Class A

**LTE-M/LTE-NB** PSM

**Online scenario**
Battery powered actuator

**LoRa** Class B

**LTE-M/LTE-NB** eDRX

**Online scenario**
Mains powered actuators

**LoRa** Class C

**LTE-M/LTE-NB** Connected Cellular

**Downlink Network Communication Latency** →

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# IoT Deployments June 2018
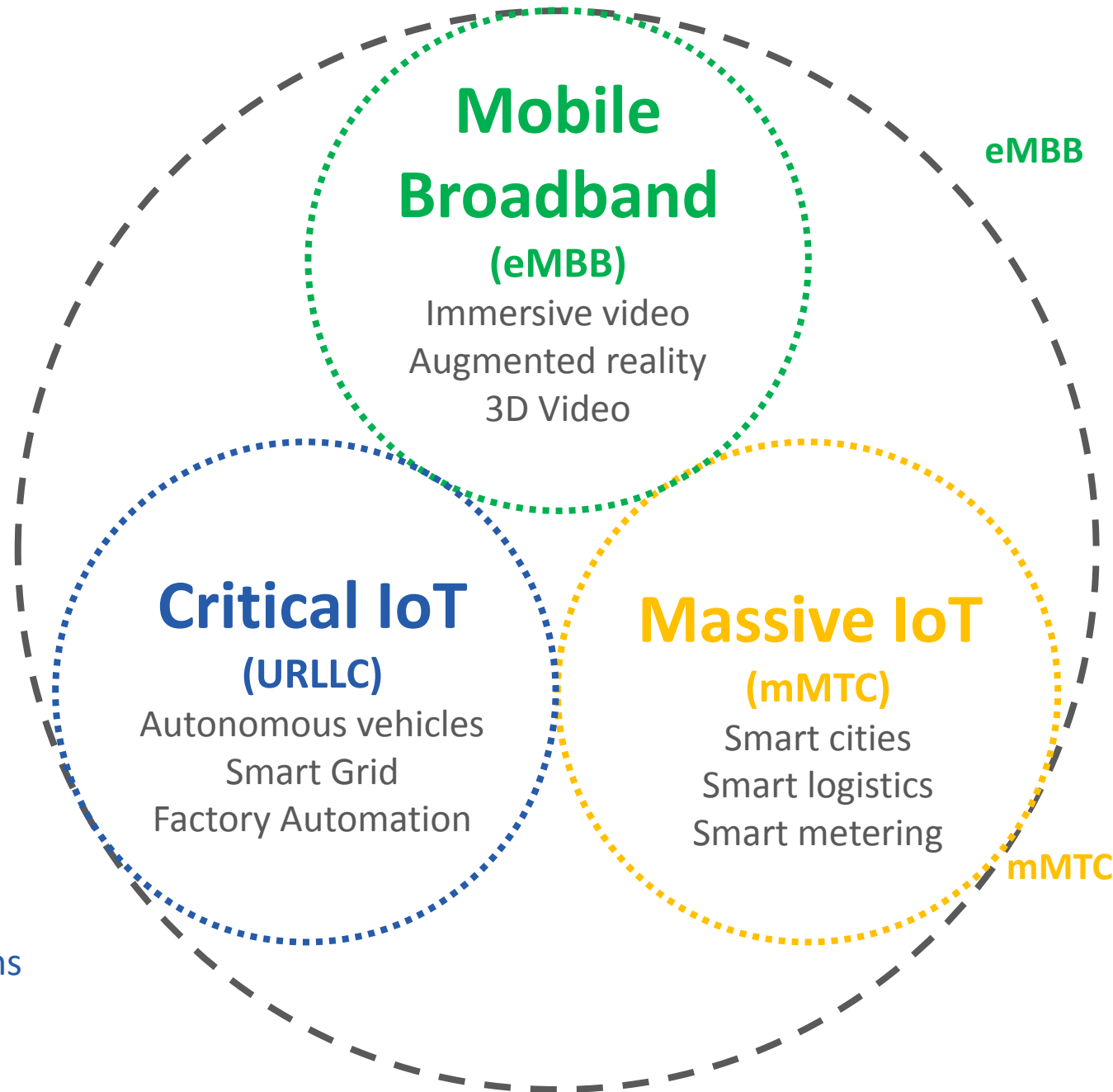
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- 4G LTE-M (Cat-M1)
- 4G NB-IOT (Cat-NB1)
- 4G LTE-M + NB-IOT (Cat-M1 + NB1)

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# What can Alcom do for you?

- Help you to choose the best wireless technology for your solution.

- Solutions for most wireless technology, from silicon, module to box products (Sierra Wireless, Digi, Silabs, Microchip and many more).

- Wide range solutions for microcontrollers, power management and analog interface for IoT products.

- Pre-provisioned hardware solutions to handle cryptography and authentication with all the major cloud providers

- **38 year experience in the electronic components market**

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