Is NB-IoT the ultimate choice in LPWA Networking Technologies?

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- Introduction to Sigfox, LoRa and NB-IoT
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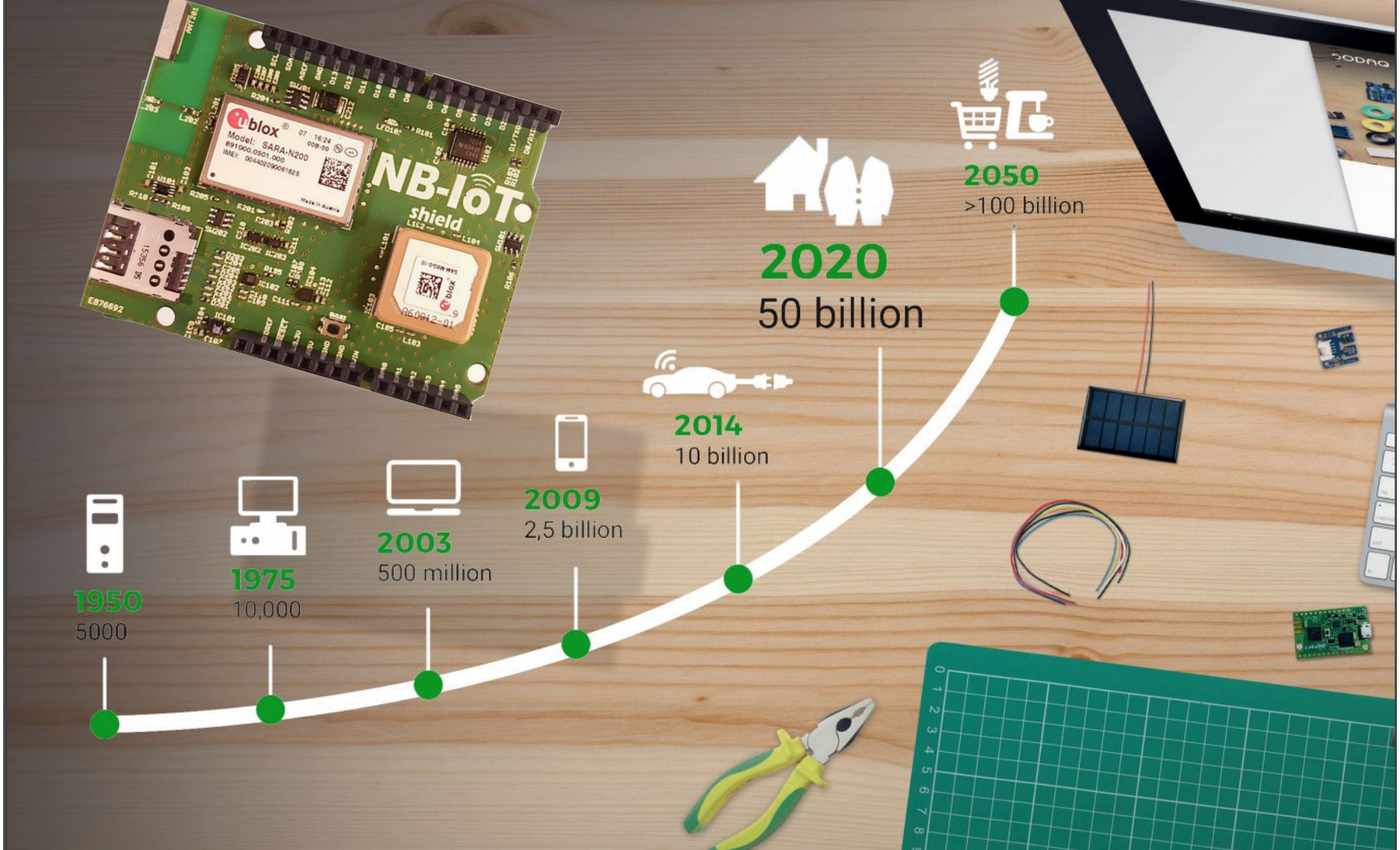
- Is NB-IoT the technology of choice?


NB-IoT
shield
blox
Model: SARA-N200
1950
5000
1975
10,000
2003
500 million
2009
2,5 billion
2014
10 billion
2020
50 billion
2050
>100 billion

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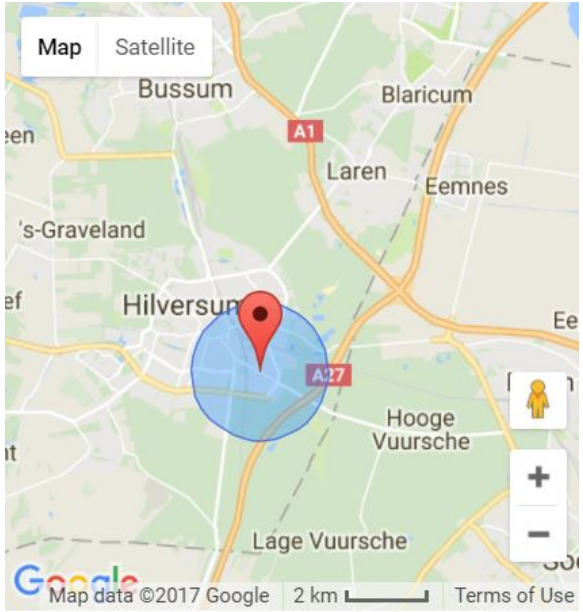
100 Billion things

- Must be plug and play
- Must be low cost
- Can not be wired nor mains powered
- May easily go missing, Geolocation is a must
  - GPS
  - Network Triangulation



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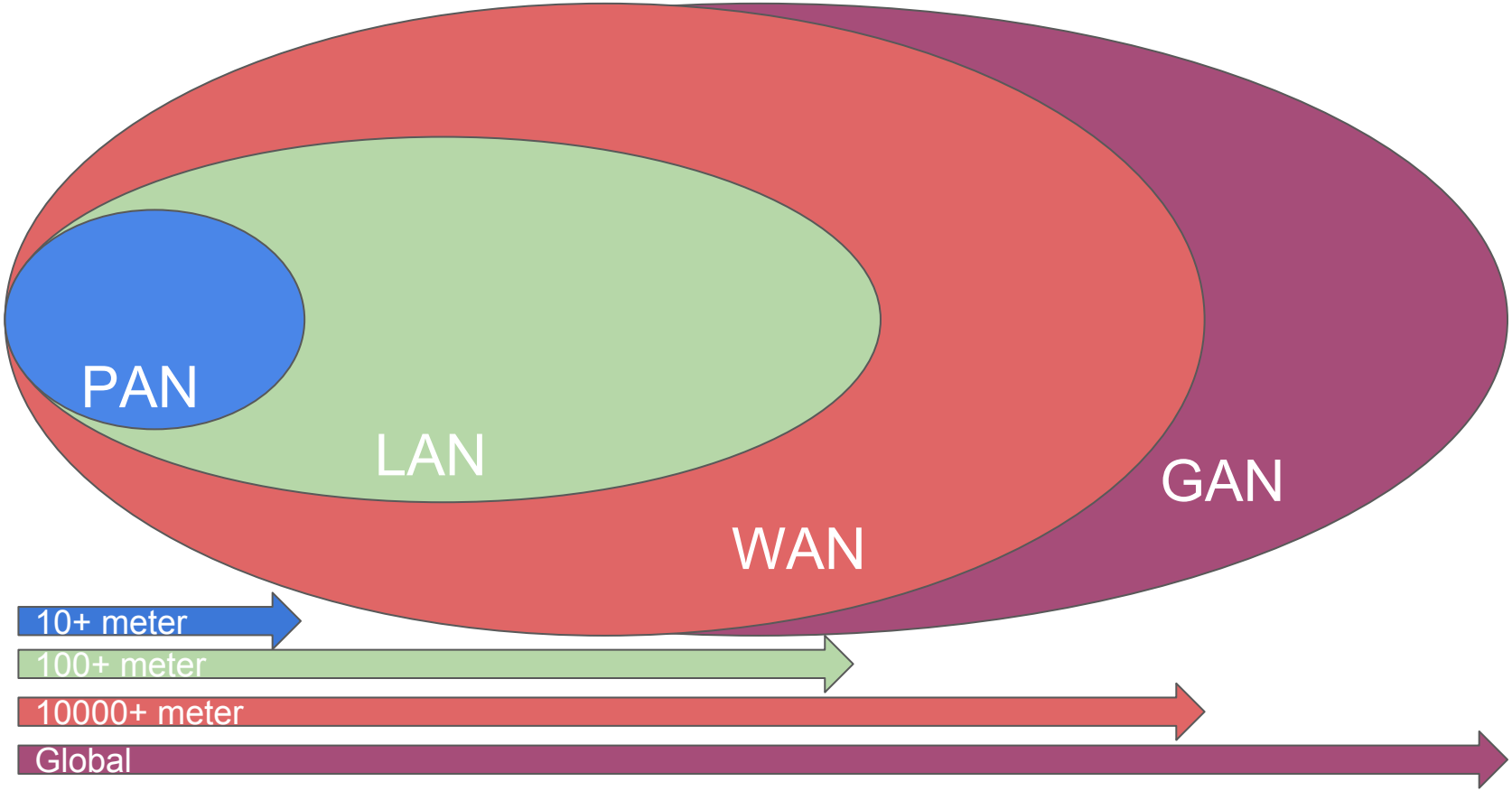
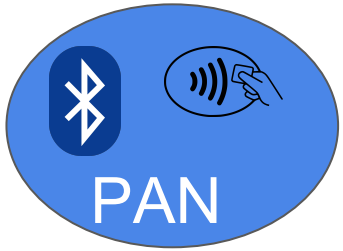
The IoT landscape



PAN : Personal Area Network : Wearable Thing

- BLE
- NFC / RFID
- Very low power
- Short range (0 - 30m line of sight)
- Typically smartphone-dependent



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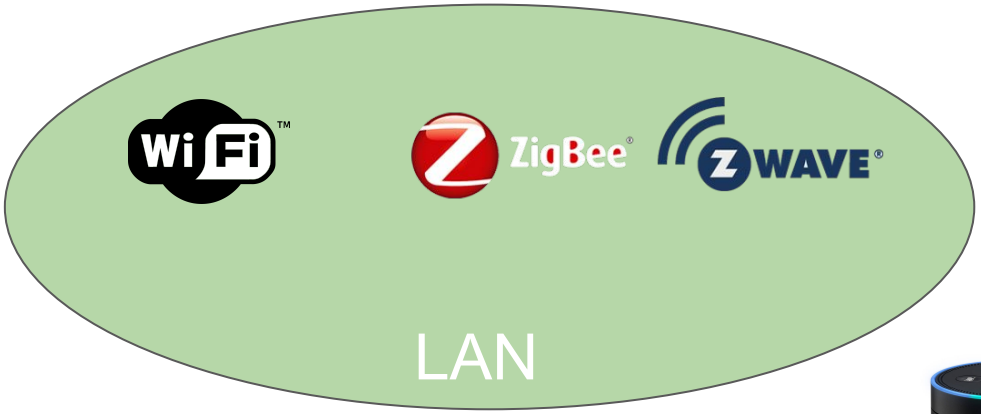
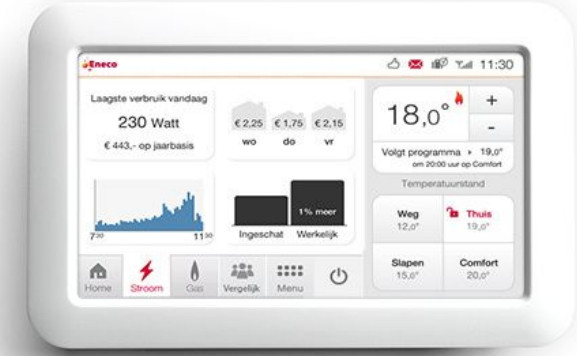
LAN: Local Area Network: Indoor Things

- home automation
- often mains-powered

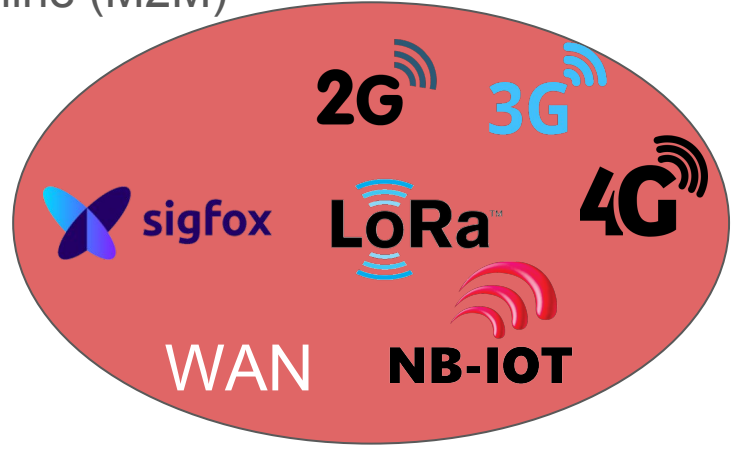




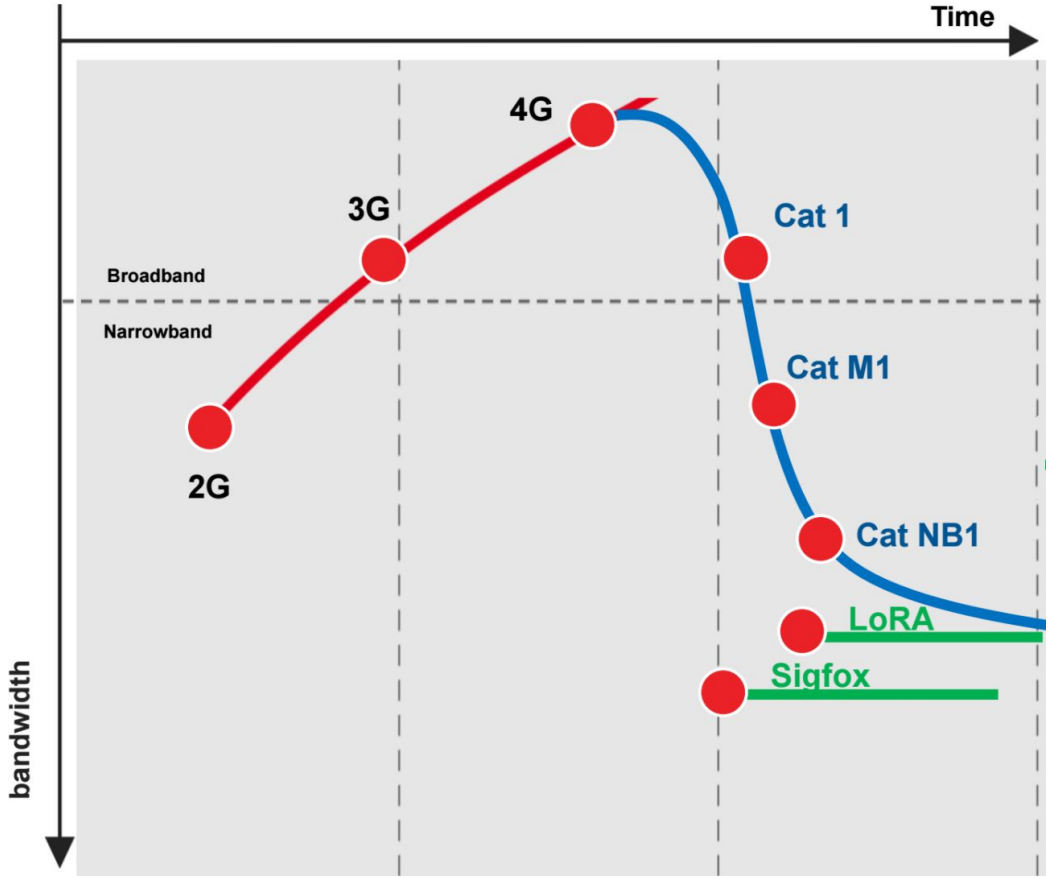
amazon echo

WAN: Wide Area Network: Outdoor things

- 2G/3G/4G Used to be called Machine to Machine (M2M)
  - Power hungry
  - Long time to establish session
  - Not really suitable for battery power
- Low Power
  - Sigfox
  - LoRa
  - NB-IoT

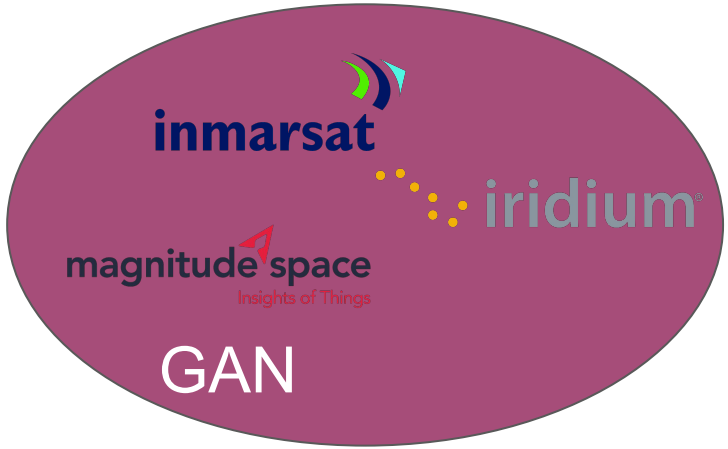


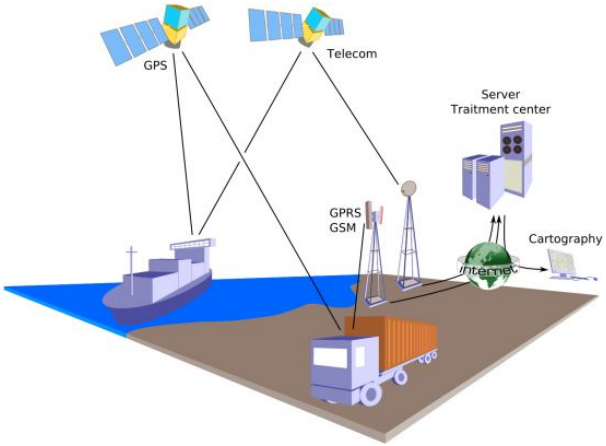
WAN: Evolution over time

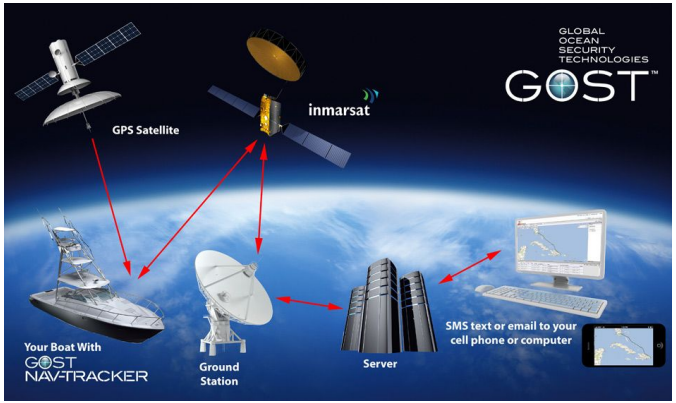


GAN: Satellite networks

- Geostationary
  - VSAT
  - Inmarsat
- Low Orbit
  - Iridium
  - LPGAN: Magnitude Space







Sigfox

- First LPWA Network
- Unlicensed spectrum
  - 868 MHz Europe, regulated by ETSI
  - maximum output power 14 dBm (25 mW)
  - duty cycle 1%
- Ultra Narrow Band
- 12 bytes data payload
- 140 messages per day
- Simplex by design, one way traffic

LoRa

- Same unlicensed spectrum as SigFox
- Spread spectrum
- 51 bytes payload
- ~ 300 messages per day upload
- ~ 30 messages per day download
- Telco Networks (KPN, Proximus)
- Community Networks (TTN)
- Private Networks

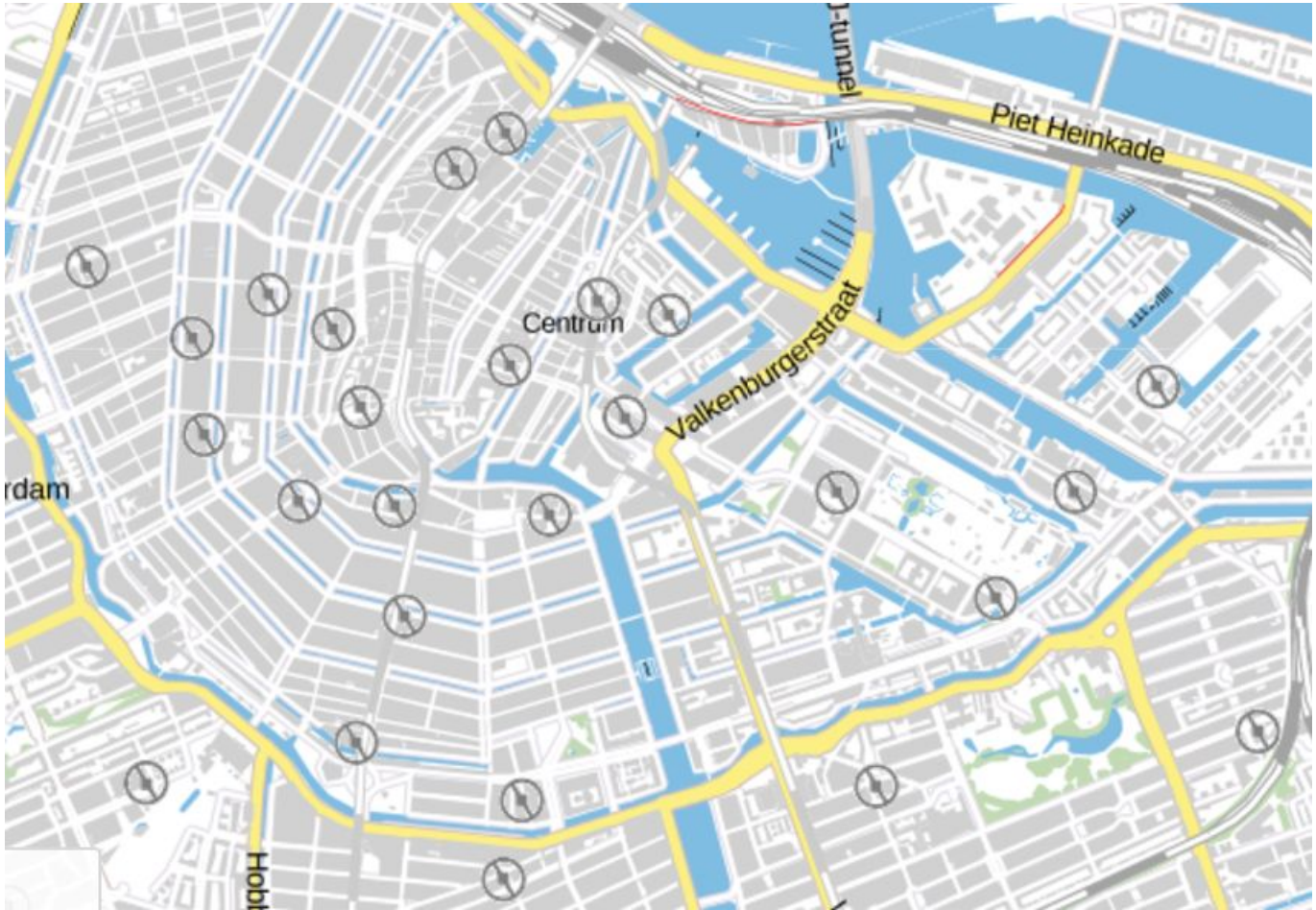
NB-IoT

- Licensed spectrum
  - no duty cycle limits
- Extreme good coverage
  - > 12000 gateways in the Netherlands
- Deep indoor penetration
- Using existing 4G hardware
- link budget 20dB better than GSM
- 500 byte message size

NB-IoT

- Started in 2014 by a first 3GPP study
- Initial Specifications
  - Low device cost (<€5 per module)
  - Extended coverage (better than GSM/GPRS)
  - Large Capacity (> 40 devices per household, up to 100.000 devices per cell)
  - Long battery life (> 10 years, 1 packet a day, 200 bytes)
  - Moderate latency (< 10 seconds)
- part of LTE (4G) standards
  - NB-IoT uses the existing 4G network

NB-IoT Coverage Amsterdam City



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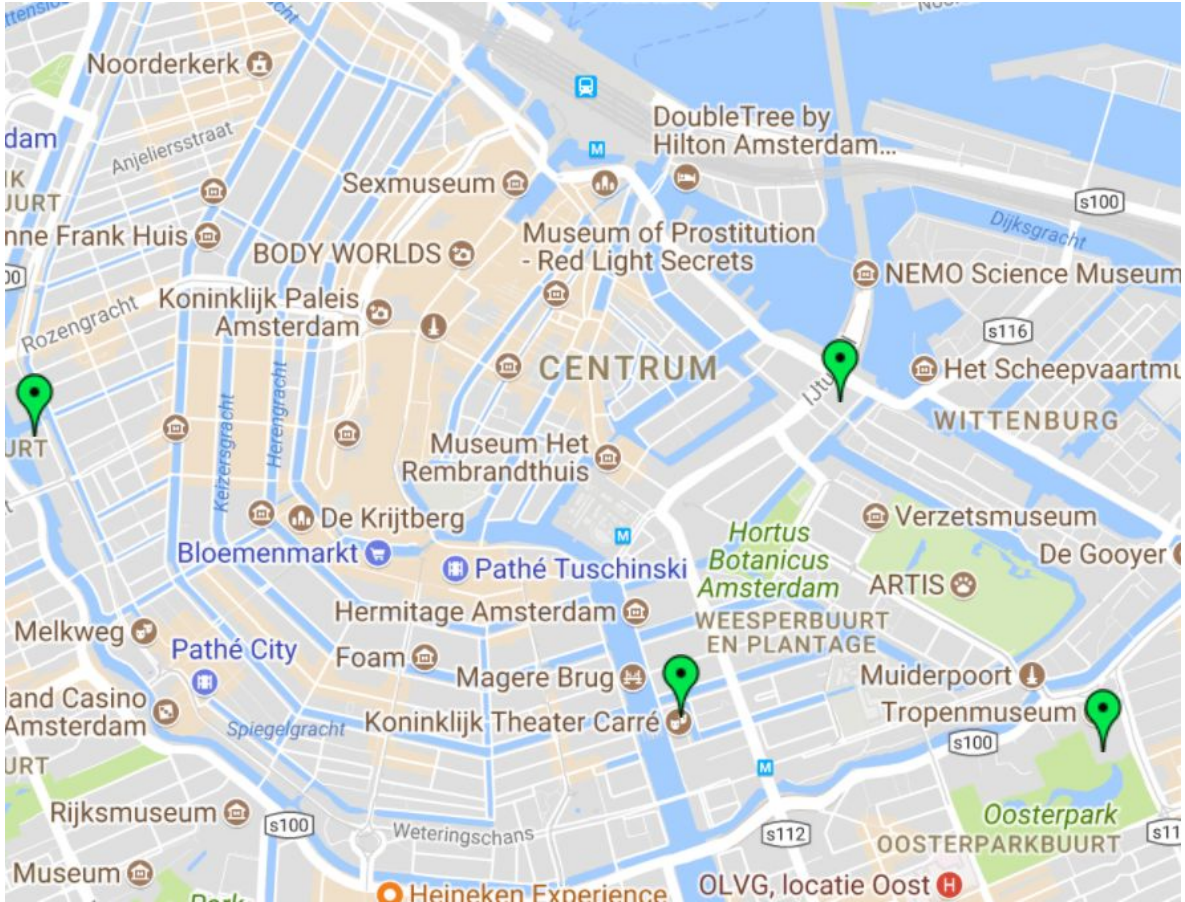
KPN LoRa Coverage Amsterdam City



Positioning Sigfox

- Simplicity
- Low cost modules
- Low cost usage
- International Roaming
  - Provided by private company (non-telco)
- Poor indoor penetration
- Not for mission critical applications

Positioning LoRa

- We don’t see much future for LoRa provided by Telcos
- Community networks (The Things Network)
- Private networks (e.g. agriculture)
- No running data costs!
- Geolocation better than 50m is possible

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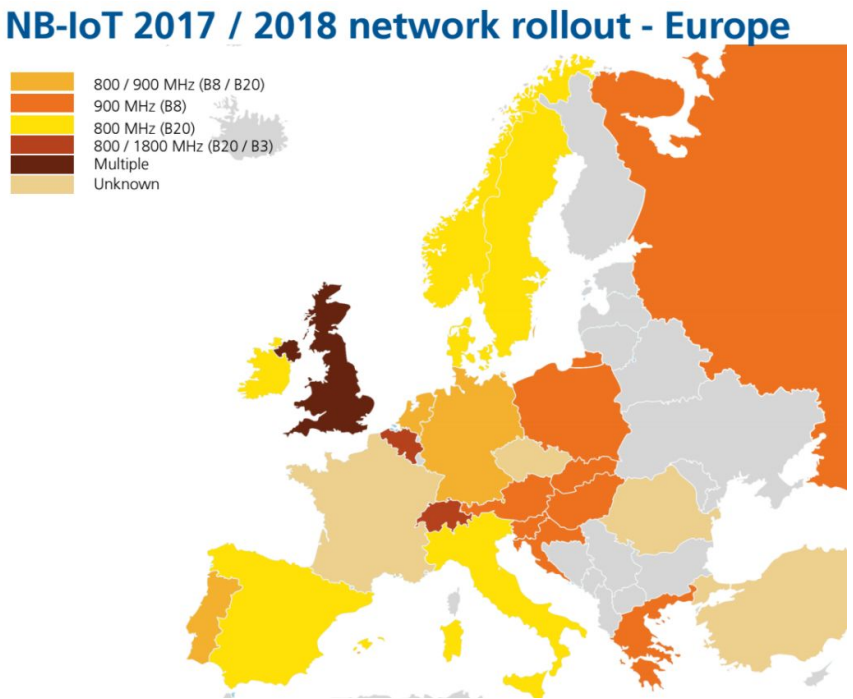
Positioning NB-IoT

- Rapid international roll-out
- Supported by all major Telcos
- Great worldwide coverage expected soon
- Deep indoor penetration (suitable for both outdoor & indoor = more compatibility)
- Better suitable for mission critical applications (SLAs with Telcos)



NB-IoT

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Comparison

	sigfox	LoRa	NB-IoT
Message size (bytes)	12	51	500
Messages/day	140	300	> 300
Spectrum	Unlicensed	Unlicensed	Licensed
Message Ack	No	~	Yes
Module cost	Low	Medium	Medium High
Private Network Option	No	Yes	No
Geolocation < 50m	No	Yes	On the roadmap
Power Consumption	Very low	Very low	Low
Vendor Monopoly	Yes	No	No

Demo

Please come and visit us in the Adelco Booth for a NB-IoT Demonstration

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