5G/IoT Technologies for Smart Metering

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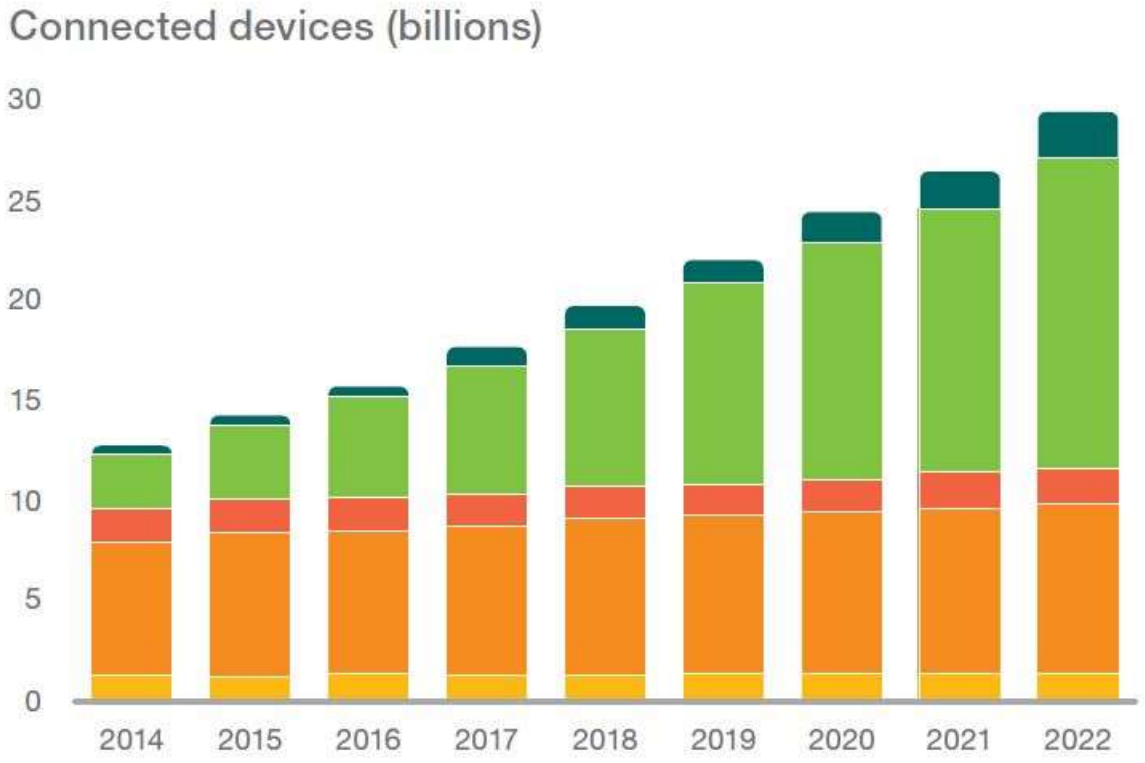
IoT

- Not new but markets are here now!
- Existed earlier in industrial automation, vending machines, tracking, etc.
- Recently markets started increasing drastically
- New applications + lower device costs

IoT Market Projection

It's already here!



	2016	2022	CAGR
Wide-area IoT	0.4	2.1	30%
Short-range IoT	5.2	16	20%
PC/laptop/tablet	1.6	1.7	0%
Mobile phones	7.3	8.6	3%
Fixed phones	1.4	1.3	0%
	16 billion	29 billion	10%

[1] In our forecast a connected device is a physical object that has an IP stack, enabling two-way communication over a network interface. Traditional landline phones are included for legacy reasons

[2] Connected devices connecting to a wide-area network through a common gateway

Source: Ericsson Mobility Report, Nov. 2016.

Smart City

- Overcome urban challenges using smart, connected services
- Quality of services to end users (citizens!)
- City -> Cost + resource efficiency gains

Metering:
Water, Gas & Electricity

Source: http://www.gsma.com/iot/smart-cities/

Electricity Metering Case Study

- City wide deployment of NB-IoT Network (2.4 million meters for houses)
- Electricity Meter + IoT Comm Module required
- $2 Comm Module

Table 7.5: Electricity access to households across Bengaluru Urban district

	Total	Households with access to electricity	Per cent
Anekal	128132	123905	96.7
BBMP	2105894	2069750	98.3
Bengaluru East	22317	21526	96.5
Bengaluru North	75881	73189	96.5
Bengaluru South	44832	42261	94.3
District	2377056	2330631	98.0

Source: Census 2011, Department of Census, Government of India.

Image Source: http://www.gsma.com/iot/narrow-band-internet-of-things-nb-iot/

IoT Network Traffic

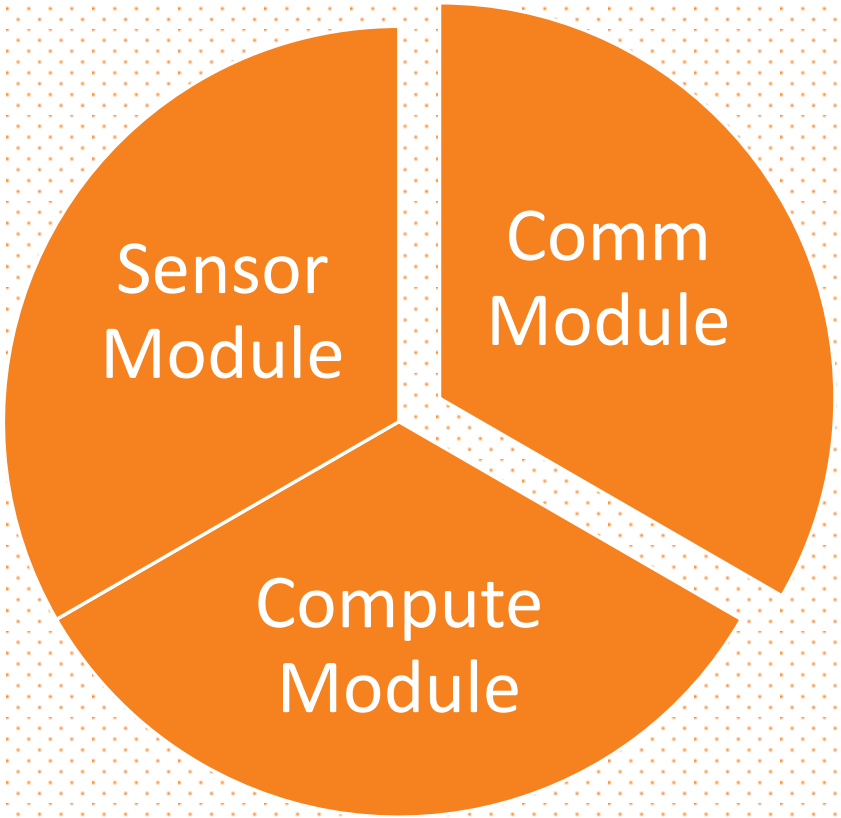
Traffic characteristics of deployed massive IoT connected devices in a city scenario

	WATER METERS	ELECTRICITY METERS	GAS METERS	VENDING MACHINES	BIKE FLEET MANAGEMENT	PAY-AS-YOU-DRIVE
Typical message size	100 bytes	100 bytes	100 bytes	150 bytes	150 bytes	150 bytes
Message interval	12 hours	24 hours	30 minutes	24 hours	30 minutes	10 minutes
Device density	10,000/km²	10,000/km²	10,000/km²	150/km²	200/km²	2,250/km²

Image Source: Ericsson Mobility Report, Nov. 2016.

Technology Overview

- Long Range Communication Technology
- Wireless/Radio Access + Core Network
- Cost efficient device (Comm Module < $2)
- Sensor, Compute -> Application specific
- High connection density



Device Components

NB-IoT (Cellular LPWAN)

- Software upgrade to existing cellular base stations (already reach every corner of city)
- Licensed Spectrum deployment (guaranteed QoS)
- Low bit rate (~A few bytes)
- Device battery life 10-15 years, 20 dB more coverage than GSM, underground coverage
- Massive number of connected devices, up to 1 Million devices/sqkm

Image Source: Ericsson Mobility Report, Nov. 2016.

Security and Privacy

- One of the major challenges in IoT
- Large number of connected devices -> Scaling issues
- Initial deployments -> cellular security Embedded SIM with IPv6 Internet security
- Privacy issues raising from data collection, sensing, tracking

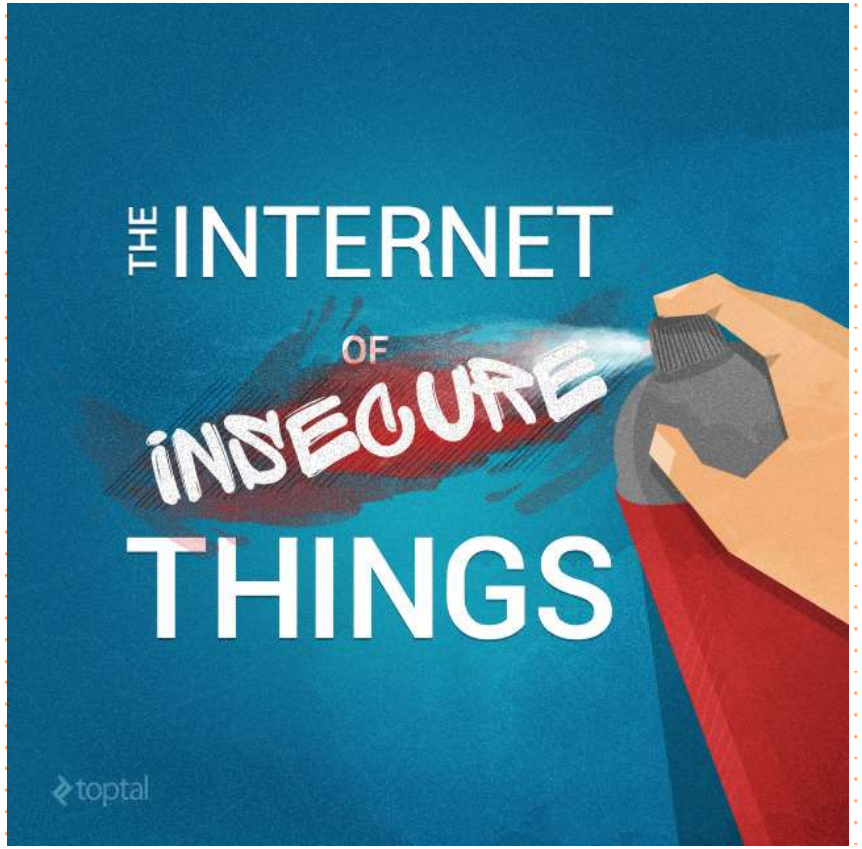


Image Source: https://www.toptal.com/it/are-we-creating-an-insecure-internet-of-things

NB-IoT SoC

- WiSig Networks is a 5G wireless startup incubated at IITH
- NB-IoT SoC being developed by WiSig and IITH
- Mass product in Q2 2020
- Sample board available for testing

Summary

- NB-IoT is right around the corner
- India Networks will be enabled with NB-IoT in 2020
- To kick start initial deployment/trials
- NB-IoT right technology for Electricity meters
  - Low-cost, long range (20 dB more coverage than GSM)
  - Up to 1 Million devices/sqKm (GSM not suitable)

Thanks!

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