LTE for IoT

Telecom Paris Talks





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LTE Chipsets for the Internet of Things

Cellular IoT Market Opportunity

Definitions of IoT vary and forecasts are BIG

For our purposes, the <u>wide-area IoT</u> device market is:

2015		2020	
21.5 billion	Connected Devices (Installed Base)	45.5 billion	
(12.2) billion	Less PCs, tablets, mobile phones, digital home	(17.3) billion	
	devices (e.g., STB)		
9.2 billion	= IoT devices (physical-first, not human-first)	28.3 billion	
(5.7) billion	Less RFID and NFC tags/devices (16.4) billi		
3.5 billion	= IoT networked devices 11.9 billi		
(2.6) billion	Less PAN/LAN-only IoT devices (BT, WiFi, Zigbee)	(9.4) billion	
0.9 billion	= TOTAL <u>WIDE-AREA</u> NETWORKED IOT DEVICES	2.5 billion	

Source: ABI Research, 2015 and Sequans estimates

Verticals include: *utilities* (smart meters); *industrial IoT* (agriculture, industrial equipment); *smart cities* (lighting, security, parking, environment); *smart buildings* (automation, climate control, security); *retail* (POS, ATMs, kiosks, vending); *advertising* (digital signage); *supply chain* (asset tracking, inventory management); *wearables* (health, sports, fashion); *smart home* (automation, security, appliances, climate control); *telematics* (usage based insurance, 'buy here, pay here', fleet tracking); *connected car infotainment*.

Wide-Area IoT device market >1.6 Billion units over next 5 years





LTE for IoT

Why it makes sense





LTE for IoT: Application Segmentation

LTE Cat M1 & Cat NB1 (NB-IoT) complement each other – even while Cat 1 & Cat 4 IoT applications will remain





Data rate is used here as main performance indicator Other indicators are used for fine tuning (latency, power consumption)

Main Features of LTE eMTC/NB-IoT Rel13

A viable 2G replacement and an alternative to proprietary LPWA technologies





Cat M1 vs. NB1 KPI analysis

Comparing Cat M1 and Cat NB1 requires looking at a number of performance indicators

	Cat M1	Cat NB1	Coverage
Deployment scenarios	In-band HD/FD-FDD, TDD (1.4MHz) UP mandatory (IP traffic)	Stand-alone, guard-band, in-band (200kHz) CP mandatory (IP and non-IP traffic)	Cost
Coverage (MCL)	Up to ~162 dB (GSM/LTE baseline=144dB)	Up to ~164 dB (GSM/LTE baseline=144dB)	
Mobility	HO supported except in CE mode B	Only cell reselection is supported	
Latency	Shorter in good coverage due to higher bandwidth (300ms at 145dB) Similar in poor coverage	Longer in good coverage (1500ms at 145dB) Similar in poor coverage	Latency
Data Rate (peak vs. sustained)	UL/DL: 375/300 kbps	UL/DL: 17(63) / 30 kbps (63 in multi-tone)	Data rate
Power (peak vs. sustained)	Lower power for payloads above 700 bytes	Lower power for payloads below 700 bytes	Cat 1
Cost	Price of 2G module (single digits)	Further 10%-25% gain (based on NB1 features)	Cat M1
Other	Supports VoLTE, Location Based Services, Public Warning System		



LTE for IoT: Module Cost

LTE evolution for IoT provides a path to 2G module cost parity or better

- LTE Cat 1 modules are available today at price-points below many 3G modules
- Cat M1 and Cat NB1 modules are both expected to be available at single-digit (USD) price points
- Simple Cat NB1 module can go down to \$5





LTE for IoT: Maturity, Availability and Ecosystem Readiness

LTE heritage ensures long-term availability and stability of solutions

Cat 1 is fully commercial, deploying now

Cat M1 & NB1 technology is available now

- Chipsets, components and modules for both are available for testing, trials and certification by end of 2016, followed by commercial ramp in 2017
- Readiness of Cat M1 network equipment, test equipment, certification bodies and labs is supporting an early 2017 deployment. Cat NB1 networks deployment will follow in H2 2017
- While both Cat M1 and Cat NB1 can co-exist in the same network, most operators are likely to implement one at a time
 - > US, Japan and Korea will deploy Cat M1 first, followed by NB1
 - Europe: Vodafone is going Cat NB1 first, other European may start with Cat M1
 - China is pushing NB1, but may need to go M1 as well to address TDD bands
- Carriers preparing an aggressive subscription/data plan offering suitable for various IoT use cases







Wide-area IoT applications are undergoing huge growth
LTE is an ideal technology choice able to cover nearly every IoT use case



