



Quectel BC95-G&BC68 NB-IoT Module

Product Overview

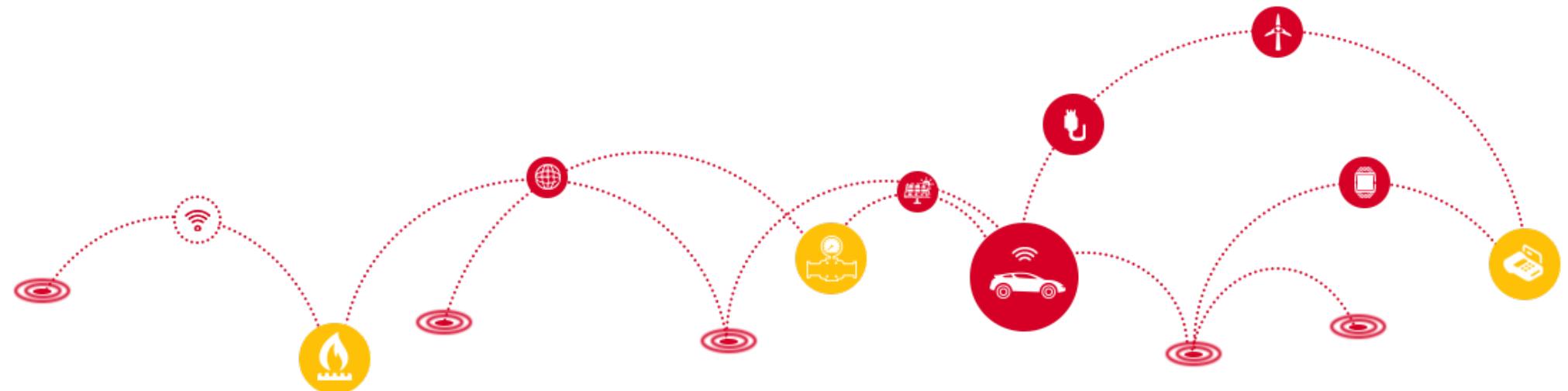
August, 2019

NB-IoT Technology

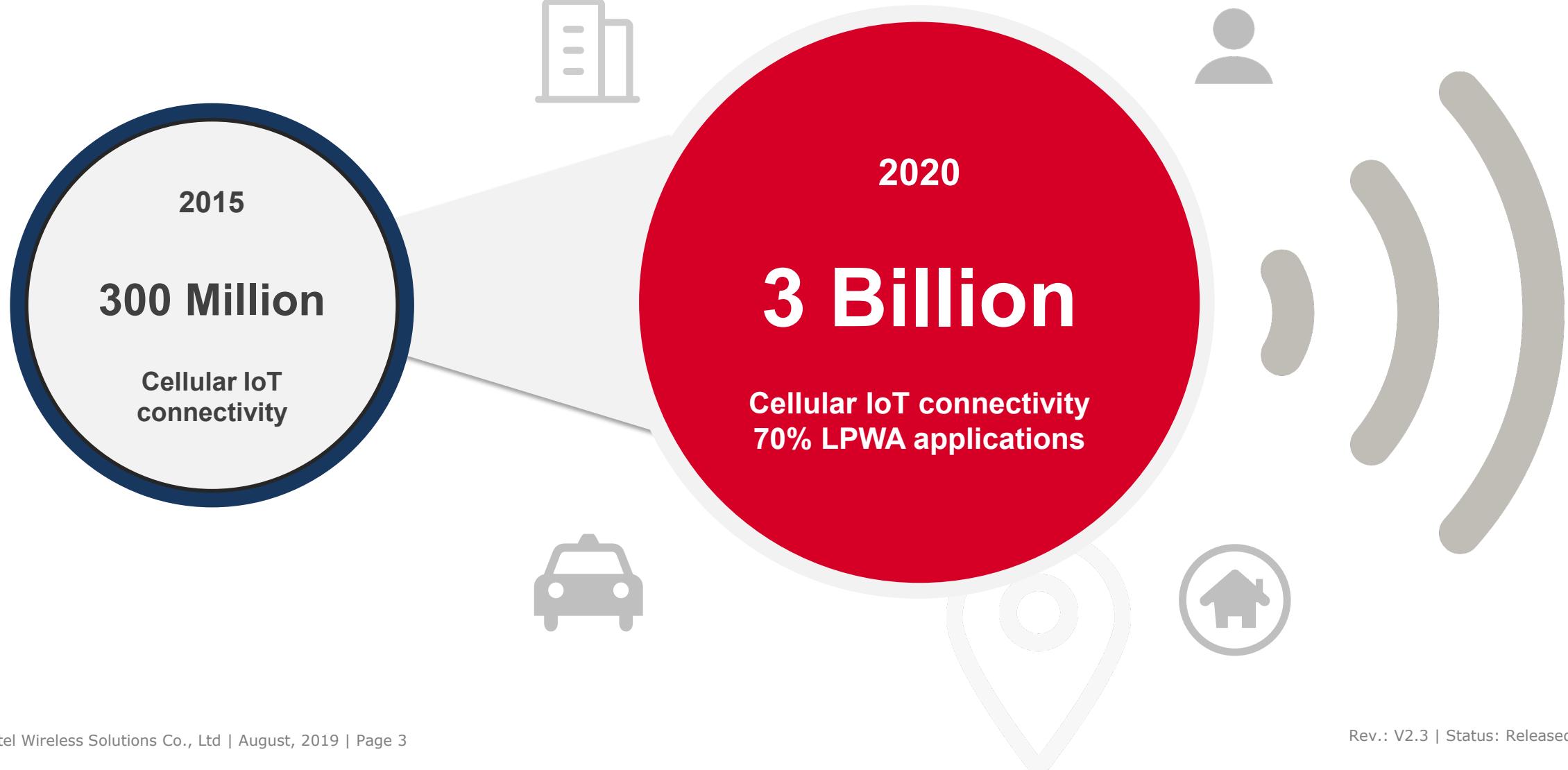
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IoT Connectivity Forecast



Application of Cellular Modules for IoT

Segment	Number of Connectivity by 2020	Requirement	Technology
● Cameras ● Wireless Routers ● Internet of Vehicles...	200 million	>10Mbps	4G/5G
● Smart Home Applications ● Wearable Devices ● Wireless POS...	800 million	~1Mbps Low Power Consumption	Wi-Fi/3G/eMTC
● Sensors, Meter Readings ● Asset Tracking ● Smart Parking ● Smart Agriculture...	2 billion	Small Data Packet (<100kbps) Deeper Coverage (20dB) Low Power (10 Years) Low Cost (<\$5)	Zigbee/BT/ Sigfox/LoRa/ 2G/NB-IoT...



Low-speed M2M modules will cover most applications in the future.

NB-IoT Advantages

**NB-IoT
Advantages**

- Extended Coverage** (Church image)
- Low Power Consumption** (Wind turbines image)
- Massive Connectivity** (City skyline image)
- Low Cost** (Hands holding currency symbols image)

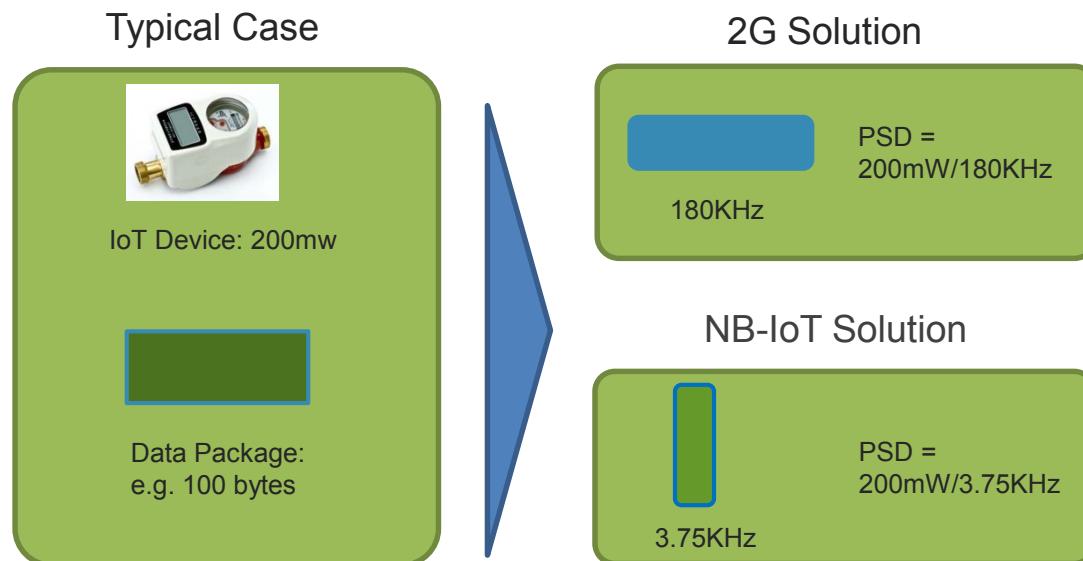
Licensed Spectrum

- Icon: Network graph
- Icon: Battery with lightning bolt
- Icon: Stack of money with dollar sign

NB-IoT Advantage – Extended Coverage

The target for the IoT connectivity link budget is an enhancement of **20dB**. This coverage enhancement would typically be equivalent to the signal penetrating a wall or floor, enabling deeper indoor coverage.

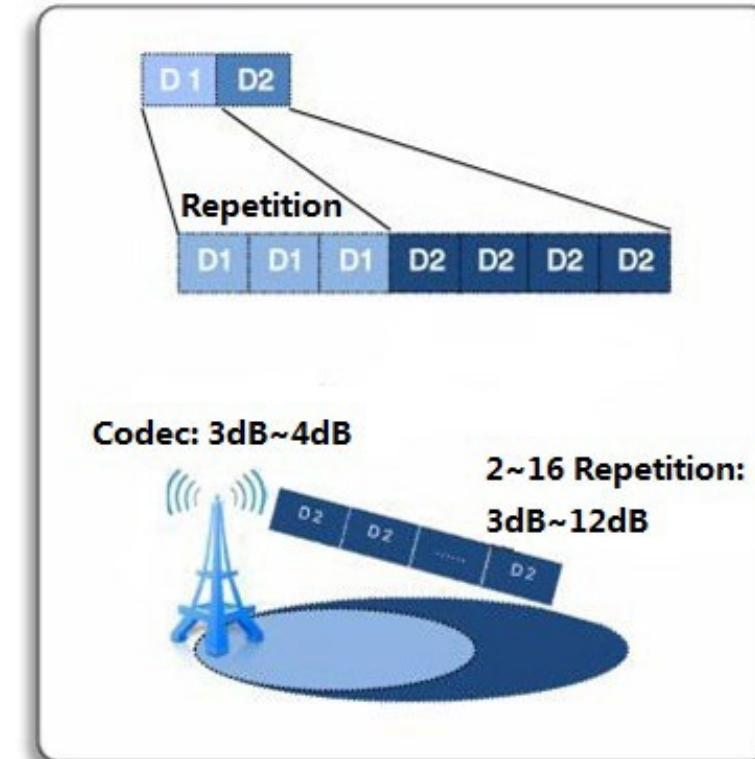
- **Uplink PSD Increased by 17dB**



NOTE: The max Tx power of a GSM terminal can reach 33dBm and that of NB-IoT is about 23dBm, therefore the PSD of NB-IoT is 7dB more than GSM.

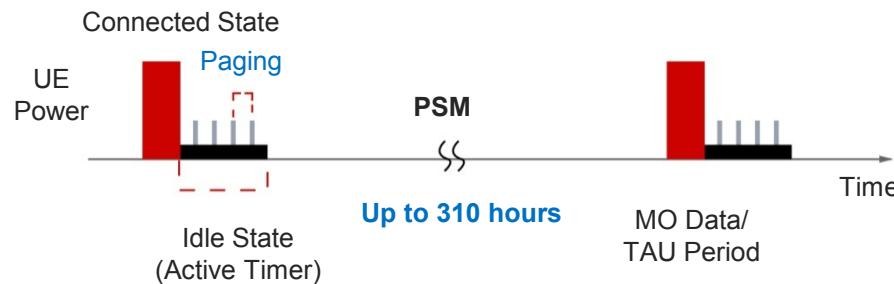
PSD: Power Spectral Density

- **Repetition/Retransmission: 6dB~16dB**



NB-IoT Advantage – Low Power Consumption

The industry aims to achieve a minimum of **10 years** of battery operation for simple daily connectivity with a small amount of data exchanged.



Power Saving Mode in 3GPP Release 12

- PSM (Power Saving Mode) and eDRX (Extended Discontinuous Reception) are the key technologies to extend the battery life in NB-IoT.
 - a) The terminal in PSM is still attached with network but the signals of eNB can not reach until it wakes up automatically. The deep sleep mode substantially reduces power consumption.
 - b) eDRX is a new feature released in 3GPP Rel. 13, which extends the sleep cycle of the terminal in idle mode to reduce the unnecessary start-up of the Rx units. It improves the reachability of downlink greatly compared with PSM.

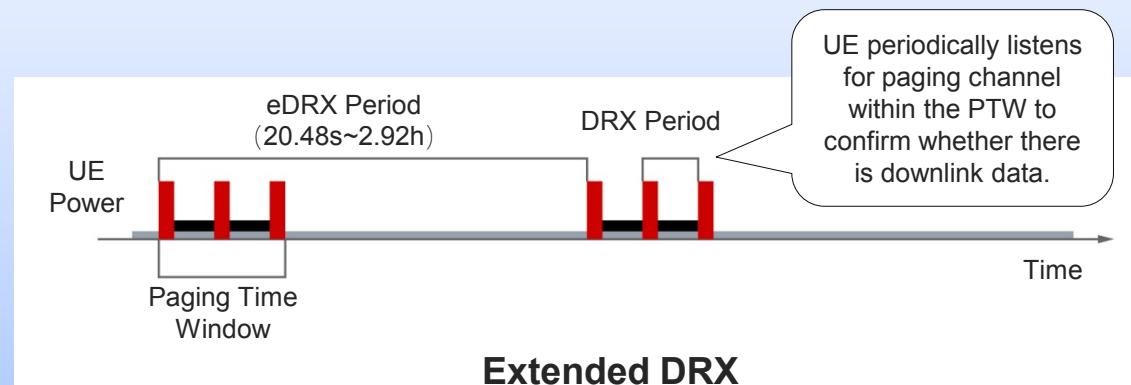
TAU: Tracking Area Update

UE: User Equipment

Rx: Receive

Tx: Transmit

- Simplified protocol
- Low power consumption
- High PA efficiency
- Short Tx/Rx time



NB-IoT Advantage – Massive Connectivity



It is ideal to have about **50,000** devices per cell; this is possible assuming that the household density is 1500 households per square kilometer, and there are 40 devices in every household.

Typical Model

15 min. ~ 1 day

> 100 bytes



About 50,000 Devices per Cell



Delay-tolerant

Special System Design for Massive Links

■ Narrowband Technology

Uplink equivalent power: 36 channels * 23dBm

■ Decrease Signal Interaction

Optimize the efficiency of frequency spectrum

■ Nodes Optimization

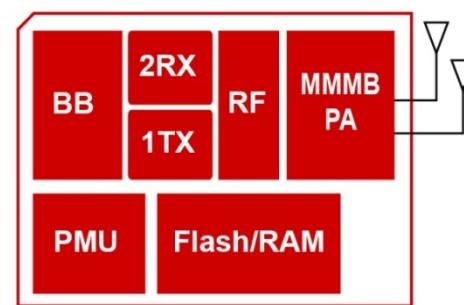
Independent congestion control
Save terminal context

■ Core Net Optimization

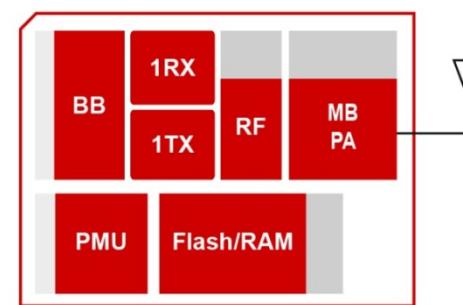
Save registered information
Download data cache

Low Deployment Cost

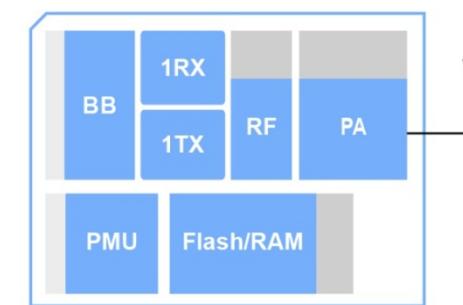
Reusing LTE for NB-IoT takes advantage of existing technology as well as the installed system base. It is possible to reuse the same hardware and share spectrum by making NB-IoT compatible with LTE, without running into coexistence.



Cat 4



Cat 0



Cat NB1/NB2 (NB-IoT)

Low Device Cost

- Half duplex (HD) operation
- Single receiving antenna
- Decreased peak rate
- Reduced device bandwidth: as low as 180kHz in downlink and uplink
- Lessened memory requirements (500kByte)

MMMB: Multiple Mode Multiple Band

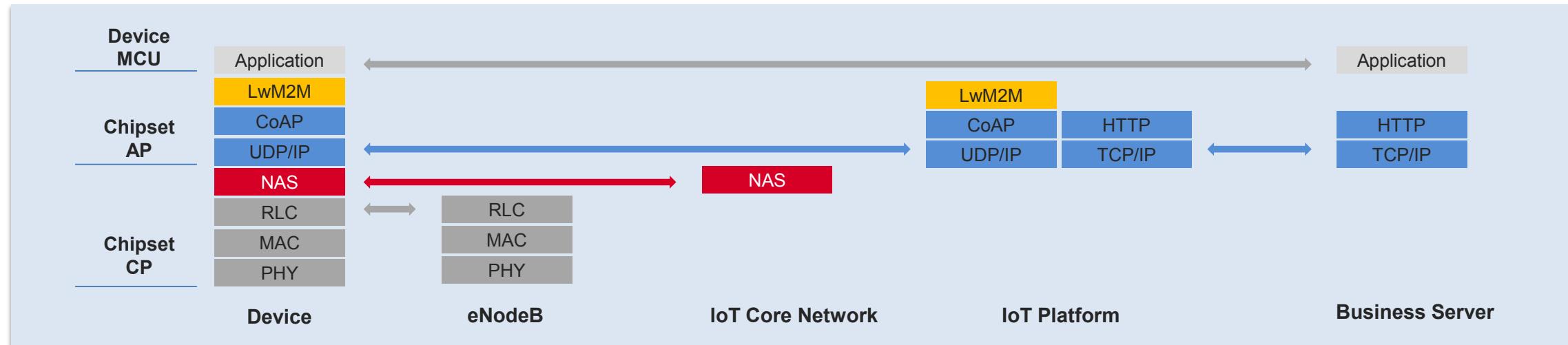
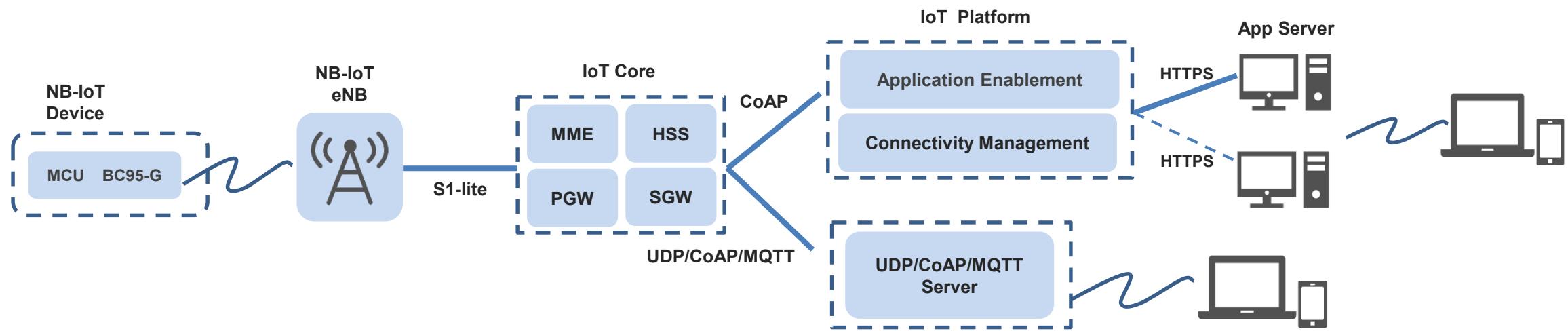
BB: Base Band

MB: Multiple Band

PMU: Power Management Unit

PA: Power Amplifier

NB-IoT Network Architecture

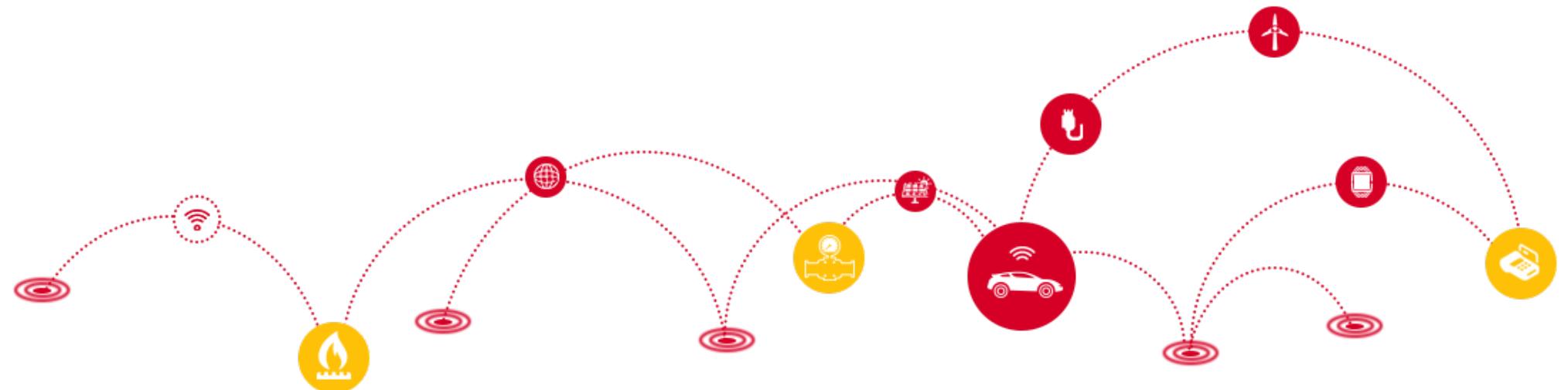


NB-IoT Technology

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NB-IoT Modules (Hisilicon) Roadmap



Boudica V200



BC950V/BC680V^①

- Hisilicon Boudica V200
- PA Integrated
- GNSS&BLE
- Consumption Reduced by 30%
- OpenCPU

Boudica V150



BC95-G

- Cat NB2 (NB-IoT)
- 125K DL/ 150K UL
- Global Version



BC68

- Cat NB2 (NB-IoT)
- 125K DL/ 150K UL
- Global Version

^① Project name and hardware/software specifications to be determined

2017

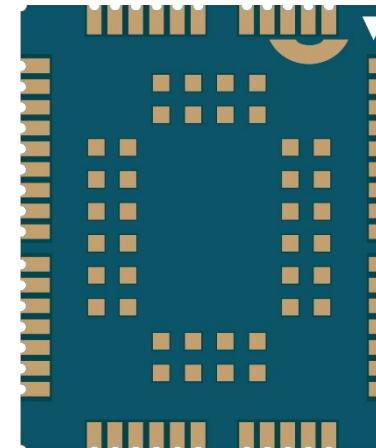
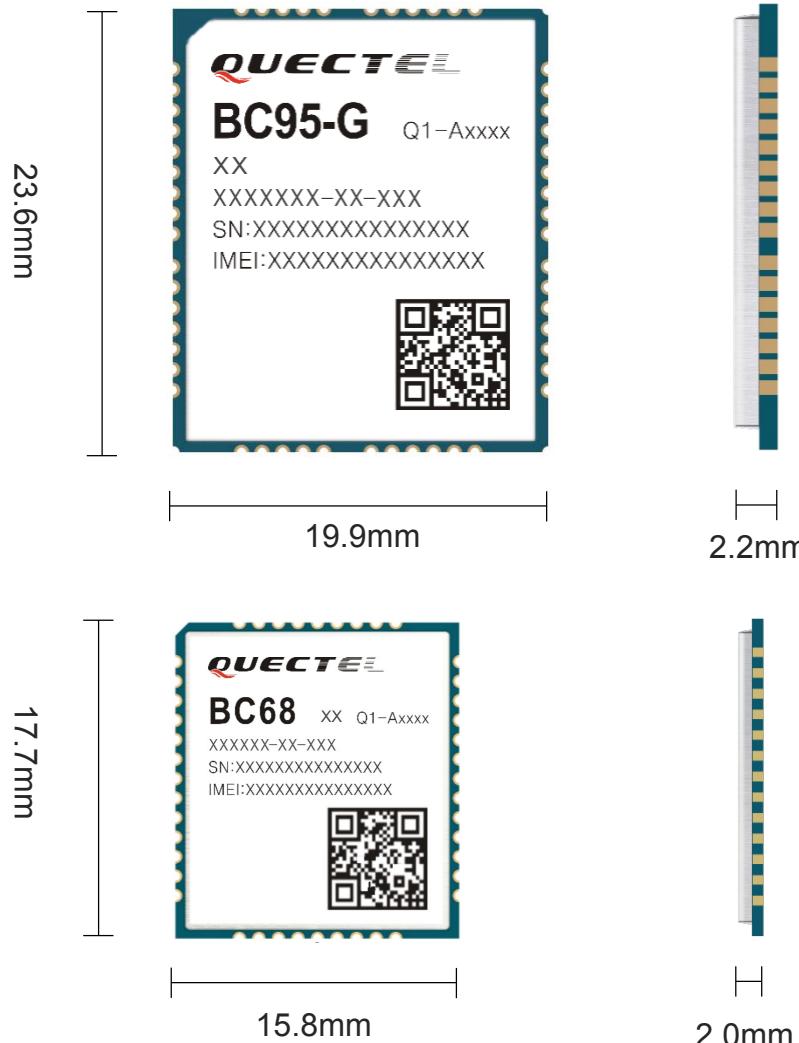
2018

2019

2020

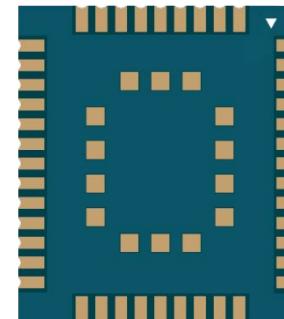
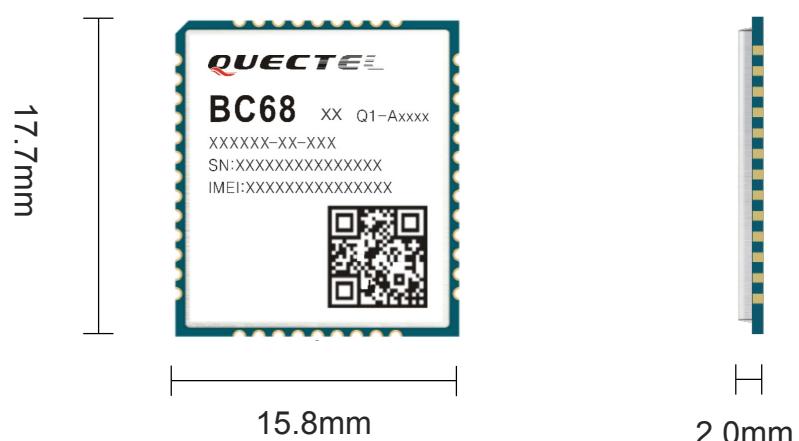
BC95-G/BC68 Mechanical Dimensions

Multi-Band LTE Cat NB2 Module (Hisilicon Boudica V150)



23.6mm × 19.9mm × 2.2mm

Length: 23.6mm ($\pm 0.15\text{mm}$)
Width: 19.9mm ($\pm 0.15\text{mm}$)
Height: 2.2mm ($\pm 0.2\text{mm}$)
Weight: Approx. 1.8g ($\pm 0.2\text{g}$)



17.7mm × 15.8mm × 2.0mm

Length: 17.7mm ($\pm 0.15\text{mm}$)
Width: 15.8mm ($\pm 0.15\text{mm}$)
Height: 2.0mm ($\pm 0.2\text{mm}$)
Weight: Approx. 1.1g ($\pm 0.2\text{g}$)

LTE Cat NB2 (NB-IoT) BC95-G/BC68 Specifications



23.6mm x 19.9mm x 2.2mm
LTE Cat NB2



17.7mm x 15.8mm x 2.0mm
LTE Cat NB2

Module	BC95-G	BC68
LTE	B1/B3/B8/B5/B20/B28 @LTE-FDD	B1/B3/B8/B5/B20/B28 @LTE-FDD
Supply Voltage	3.1V~4.2V, 3.6V Typ.	3.1V~4.2V, 3.6V Typ.
Dimension	23.6mm x 19.9mm x 2.2mm	17.7mm x 15.8mm x 2.0mm
Region	Global	Global
Certification	Carrier: Vodafone/ Deutsche Telekom/ Telefónica*/ KT*/ LGU+*/ SoftBank/ Telstra Regulatory: GCF/ CE/ KC/ NCC/ JATE/ TELEC/ RCM/ NBTC /IMDA Others: ATEX*	Carrier: Vodafone/ Deutsche Telekom/ Telefónica*/ SoftBank/ Telstra Regulatory: GCF/ CE/ NCC/ JATE/ TELEC/ RCM/ IMDA Others: ATEX

** means under development.

BC95-G/BC68 Features



Item	BC95-G/ BC68	
Chipset	Boudica 150 (Hi2115)	
Band	Multi band (698MHz-960MHz, 1695MHz-2180MHz) B1/B3/B8/B5/B20/B28	
LCC Package	<ul style="list-style-type: none">• BC95-G: 23.6mm x 19.9mm x 2.2mm• BC68: 17.7mm x 15.8mm x 2.0mm	
Data Rate	Single Tone	DL: 25.2kbps; UL: 15.625kbps
	Multi Tone	DL: 25.2kbps; UL: 54kbps
	Extended TBS/2 HARQ	DL: 125kbps; UL: 150kbps
Protocols	IPv4/IPv6/UDP/CoAP/LwM2M/Non-IP/DTLS/TCP/MQTT	
Power Consumption (Typical)	<ul style="list-style-type: none">• 3uA @PSM• 0.5mA @Idle Mode, DRX=2.56s, ECL0• 250mA @Tx, 23dBm (B1/B3)• 220mA @Tx, 23dBm (B8/B5/B20)• 280mA @Tx, 23dBm (B28)• 130mA @Tx, 12dBm (B1/B3/B8/B5/B20/B28)• 70mA @Tx, 0dBm (B1/B3/B8/B5/B20/B28)• 60mA @Rx	

Enhanced Features



Feature	Description
NB-IoT Network	Cat NB1 / Cat NB2
Global Bands	B1 / B3 / B5 / B8 / B20 / B28
Low Power Consumption	PSM and eDRX features realize ultra-low power consumption and extended battery life; 3uA @PSM; 0.5mA @Idle Mode, DRX=2.56s, ECL0; Max 220mA @Tx, 23dBm; 60mA @Rx
Abundant Protocols	IPv4 / IPv6 / UDP / CoAP / LwM2M / Non-IP / DTLS / TCP / MQTT
Special Features	DFOTA (proprietary algorithm), OpenCPU, eSIM
Security	TEE Security, Digital Signature*
Compatibility	Compatible with various other Quectel modules in packaging
Extensive Experience	Over 10 million shipments, five-hundred-customer foundation; Customers can deploy commercial products more quickly and stably. Millions of terminals have been functioning well with Quectel NB-IoT modules, and such applications includes smart meters, trackers and smart NB-IoT white goods, etc.

“” means under development.*

BC95-G Timeline

2018						2019											
Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Stage
BC95-G MP

Carrier Certification Schedule

Vodafone/ Deutsche Telekom/ SoftBank/ Telstra Completed



Regulatory Certification Schedule

GCF/ CE/ KC/ NCC/ JATE/ TELEC/ RCM/ NBTC/ IMDA Completed



BC68 Timeline

2018						2019											
Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

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BC68 MP

Carrier Certification Schedule

Vodafone/ Deutsche Telekom/ SoftBank/ Telstra Completed



Regulatory Certification

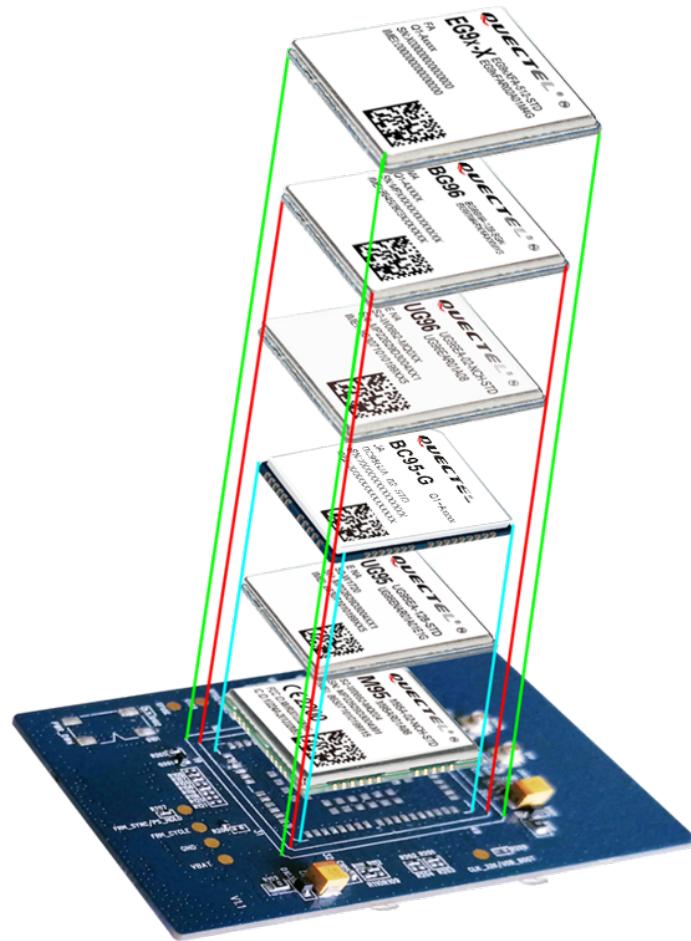
GCF/ CE/ NCC/ JATE/ TELEC/ RCM/ IMDA/ ATEX Completed

BC95-G Compatibility

BC95-G is compatible with the following

Quectel 2G/3G/4G modules:

- GSM/GPRS module M95
- UMTS/HSPA modules UG96/UG95
- LTE Cat 4/Cat 1 module EG95/EG91
- Cat M1/Cat NB1/EGPRS module BG96

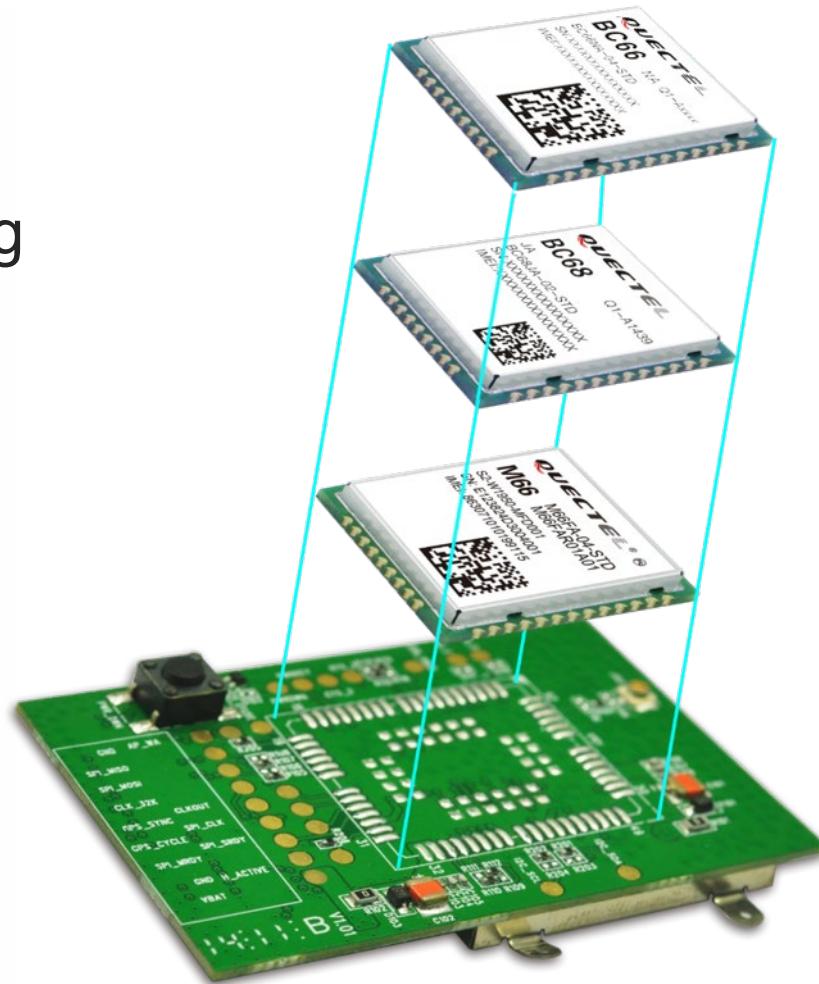


NOTE: The compatibility diagram shown above is for illustration purpose only. The actual appearance of the modules may be different.

BC68 Compatibility

BC68 is compatible with the following
Quectel 2G and NB-IoT modules:

- NB-IoT module BC66
 - GSM/GPRS module M66



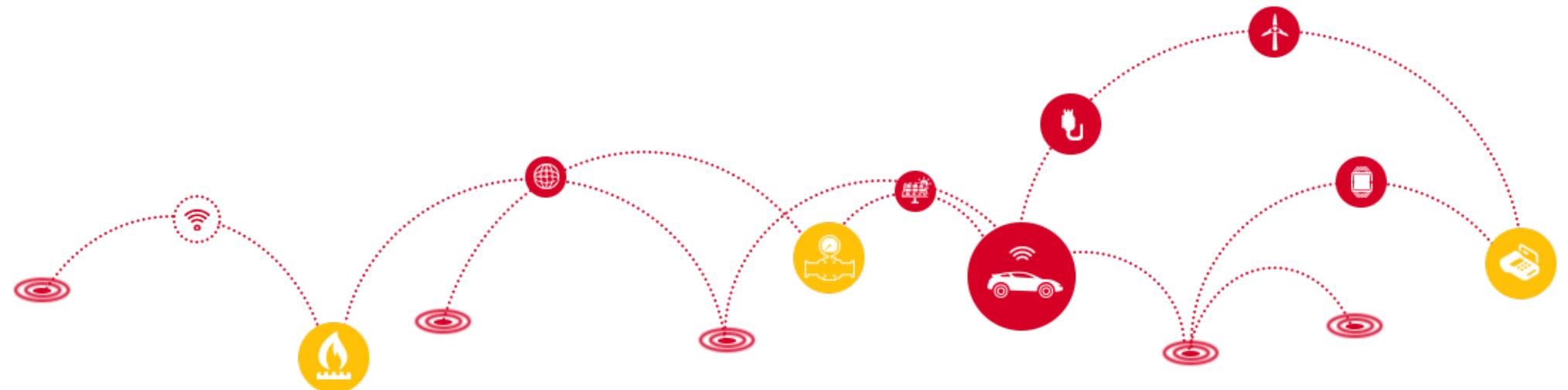
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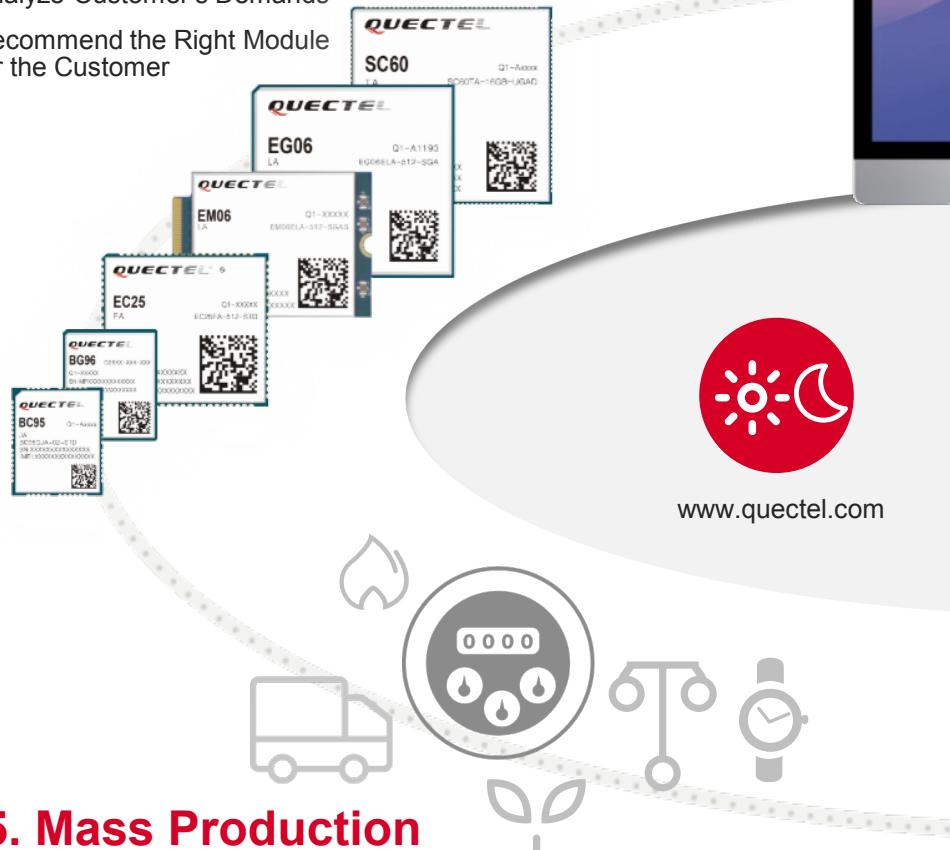


Quectel 360-Degree Support



1. Design Concept

- Analyze Customer's Demands
- Recommend the Right Module for the Customer

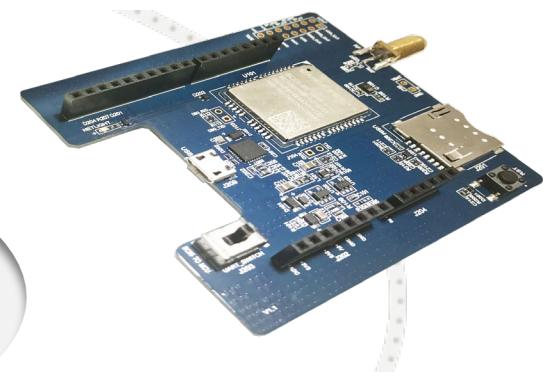


5. Mass Production

- Provide Assembly and Test Guidelines
- After-sales Service

2. Design In

- Recommend Reference Hardware Designs
- Check Schematic and Layout
- Provide Software Design Support



4. Test Service

- RF Test
- Power Consumption Test
- Reliability & Environmental Test
- ESD Test

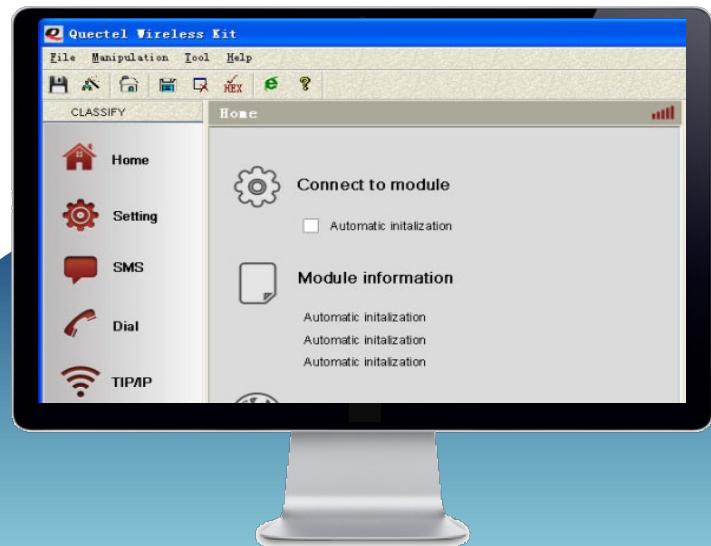


3. Prototype

- Provide Design Validation Test
- Recommend Suppliers

Quick Start

EVB Kit

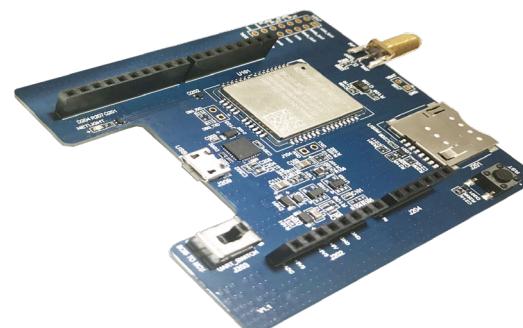


Quectel offers a GUI tool named **Qnavigator** to help customers quickly test Quectel module's functionality.



TE-B

(USB interface for power supply and debugging & Arduino interface)

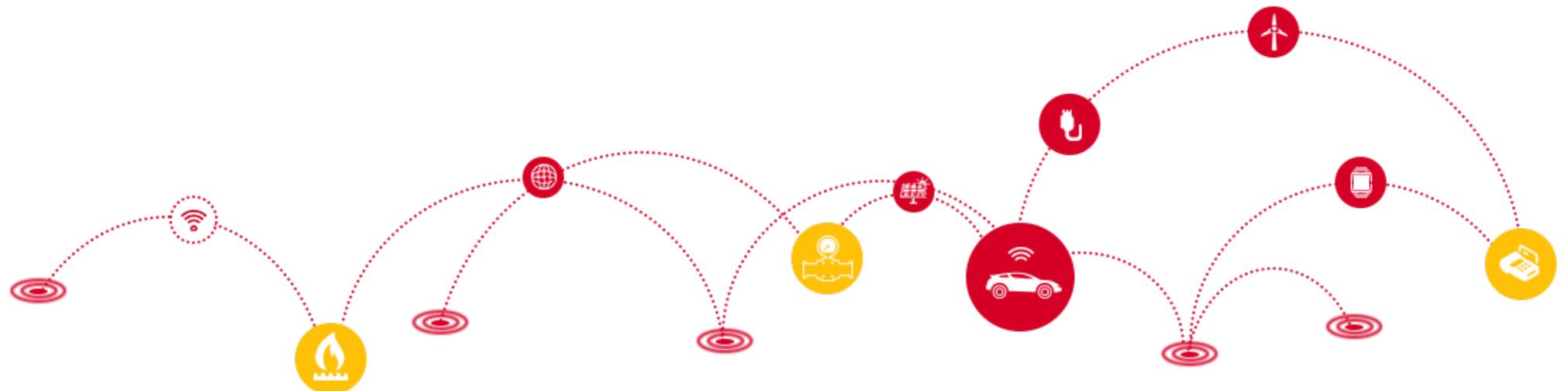


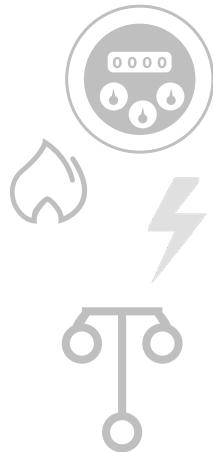
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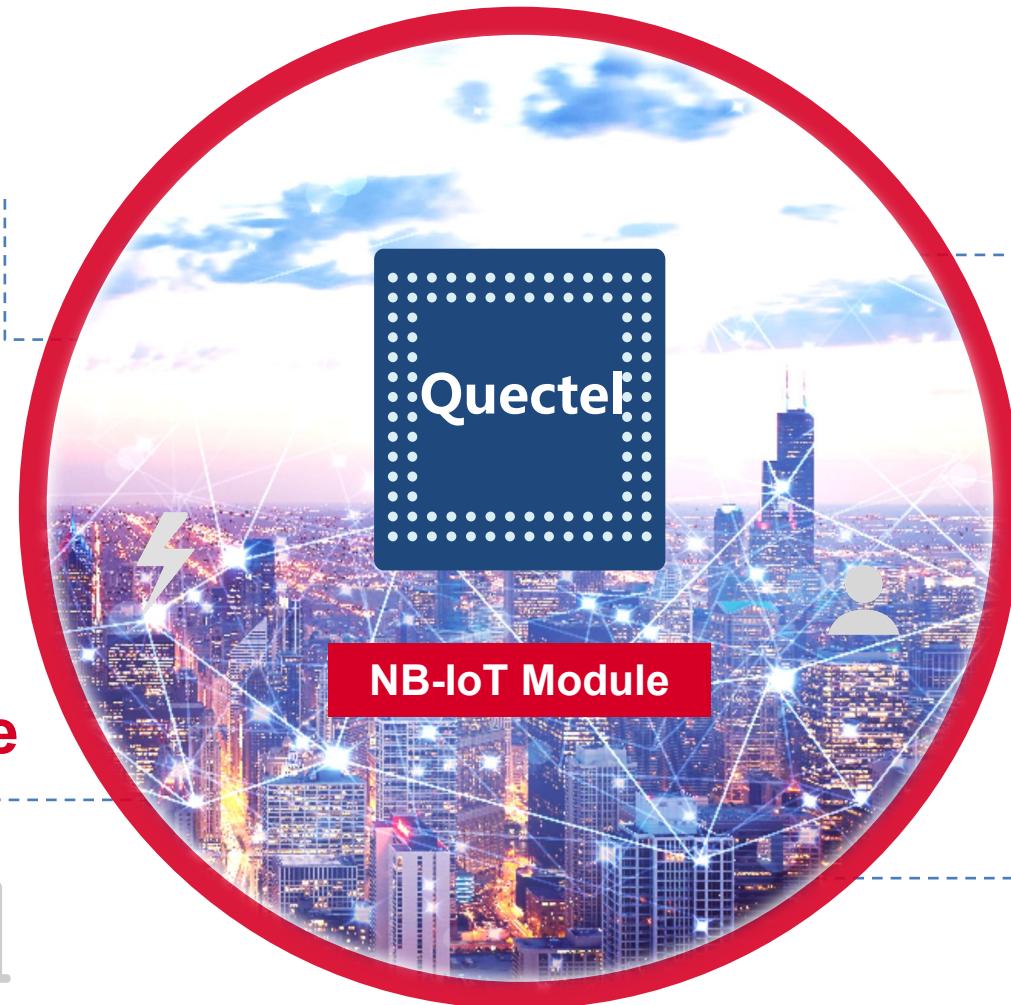
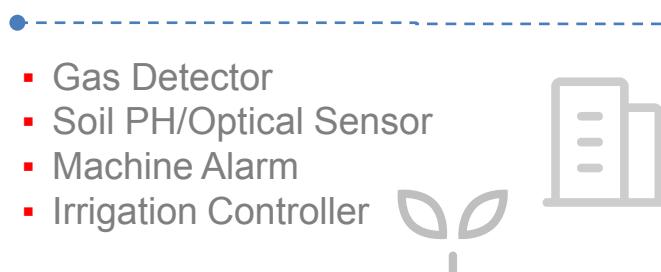




Public Utilities

- Water/Gas Metering
- Parking
- Fire Hydrant
- Smoke Alarm
- Street Lighting
- Trash Bin

Industry & Agriculture



Personal Life

- Asset Tracking
- Wearable Devices
- Person/Pet Tracking



Smart Home

- Intelligent Door Lock
- Intelligent Control

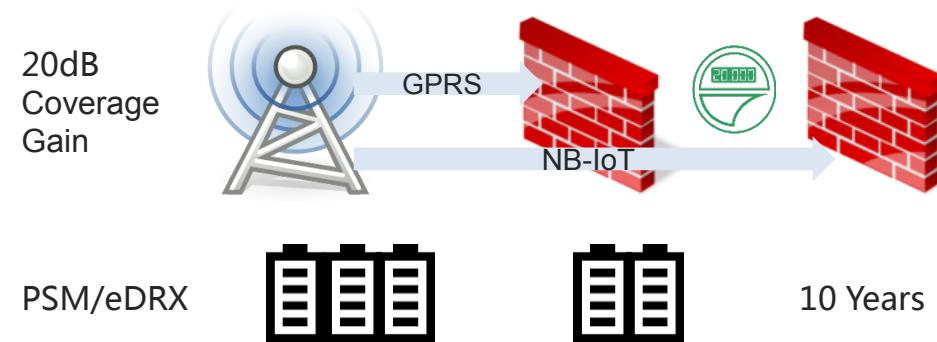


Smart Metering

QUECTEL[®]
Build a Smarter World



The most suitable solution for water meters



- Battery driven
- Daily water data collection
- Automatically pipeline leakage, burst, blockage and temperature detection



Smart Home

- NB-IoT smart locks
- Smart smoke detectors
- NB-IoT white goods
- Higher safety, more convenient
- Easy connection to NB-IoT platform



Haier

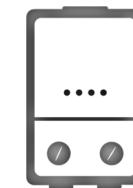
ahua
TECHNOLOGY

HOTHINK

LittleSwan



Water Heaters



Smart Door Locks



Air Cleaners



Smoke Detectors



Water Purifiers



Air Conditioners



Washing Machines



QUECTEL
Build a Smarter World

Street Lighting

QUECTEL[®]
Build a Smarter World



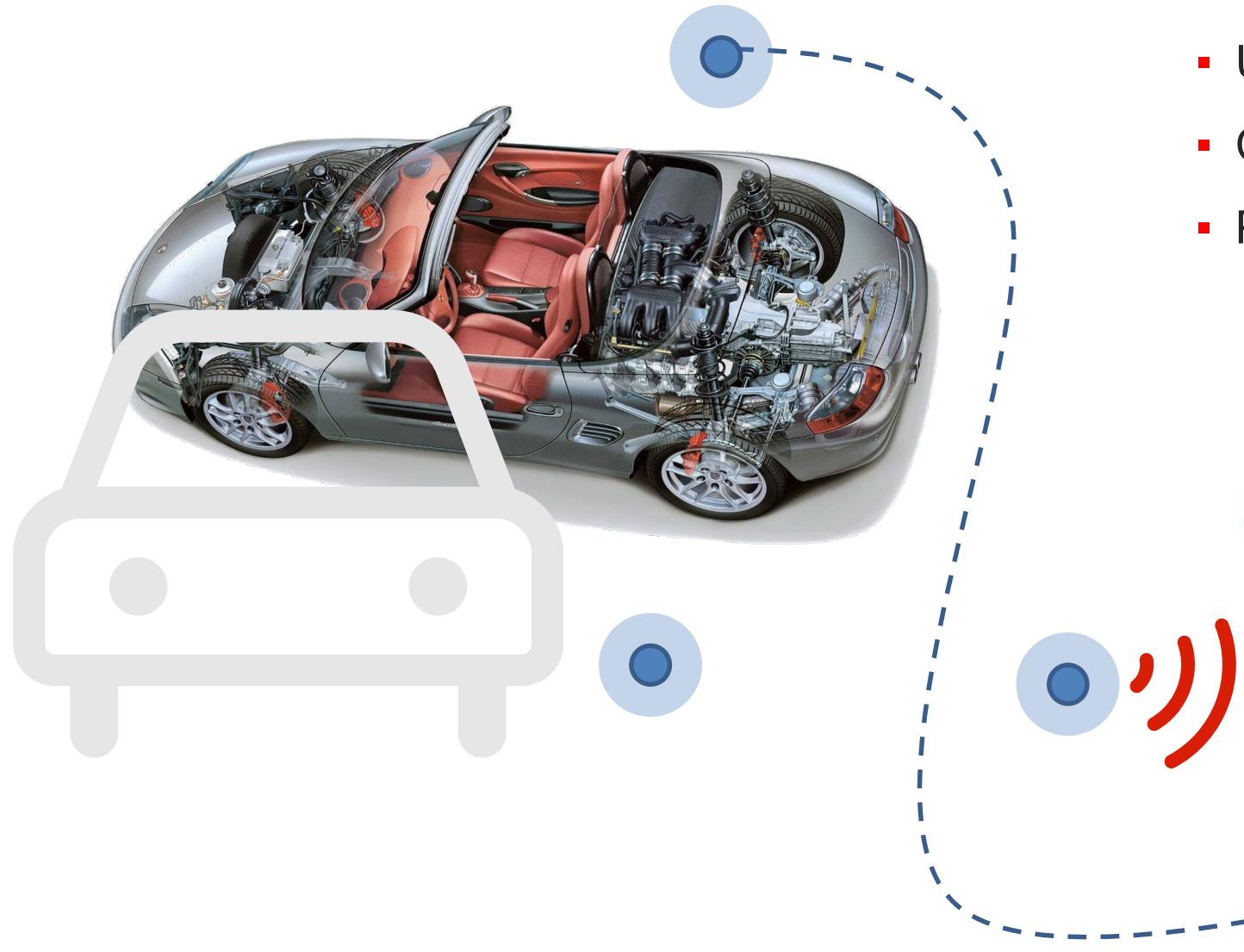
- Real time data feeds directly to the operation center
- Manual brightening of lighting when required
- Improved energy efficiency

PHILIPS

 泰华智慧
TCL

OPPLE 欧普照明

Parking



- Unlock parking lock with App
- Check occupancy by WeChat
- Private parking space sharing

 ECARAY亿车

 SHST
上海苏通信息科技有限公司



Animal Testing

QUECTEL[®]
Build a Smarter World



- Monitor health and safety of the cattle
- Improve milk yield and ensure in time cow breeding

AOTOSO 银川奥特信息技术股份公司

Multi-gas Detector

QUECTEL[®]
Build a Smarter World

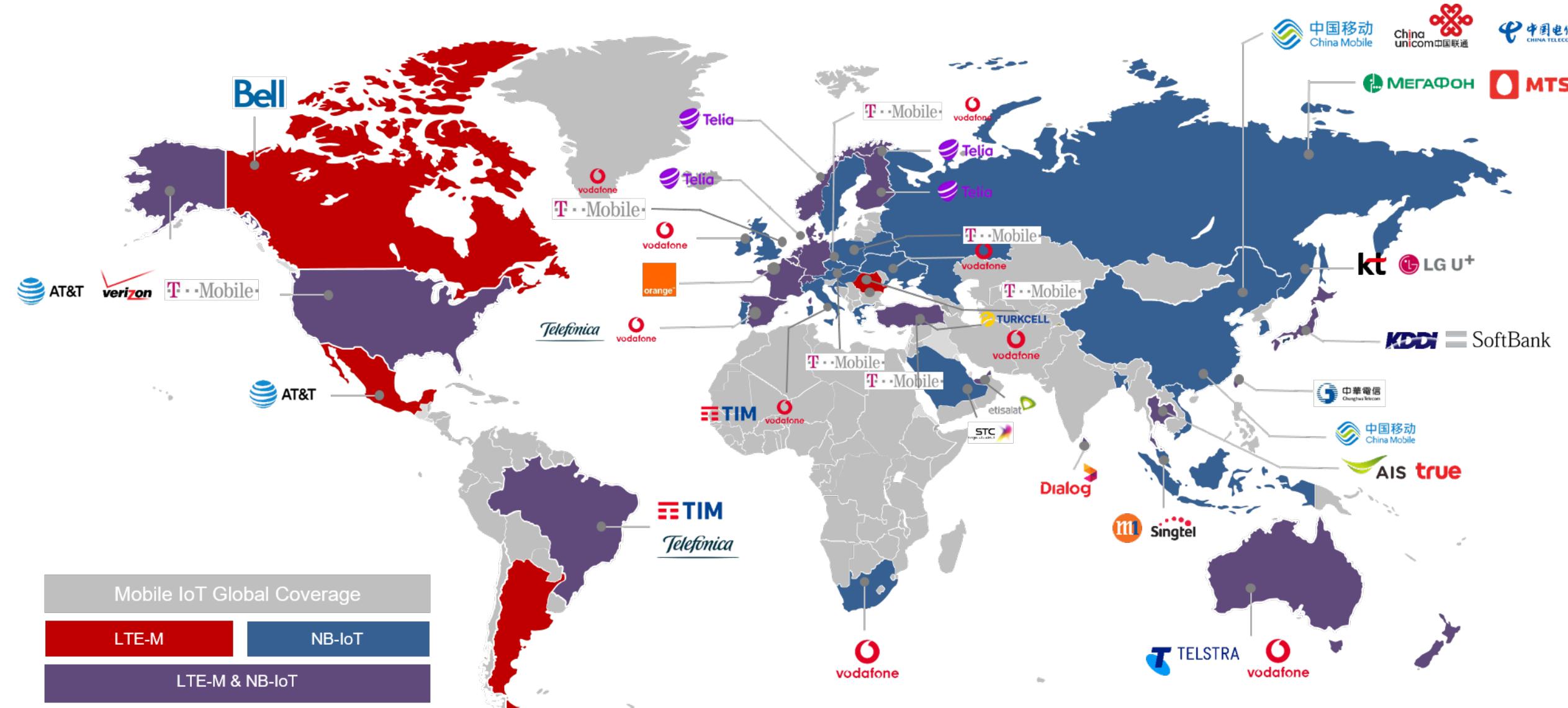


- Hazardous gas monitoring, including VOCs, combustibles and toxics, etc.
- Real-time gas concentration reading, location, alarm and status indication

Honeywell
THE POWER OF CONNECTED

LPWA Network Deployment

(Based on GSMA Data up to August 20, 2019)





Thank you!

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