

Quectel LPWA Module BG96

Product Overview

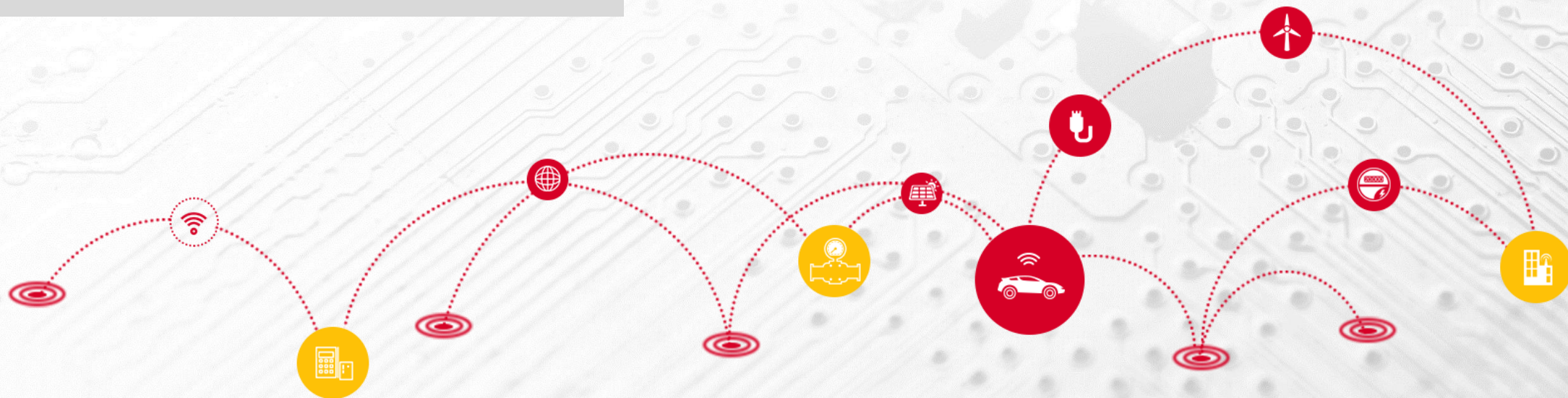
January, 2018

Technical Background

Product Overview

Technical Details

Applications

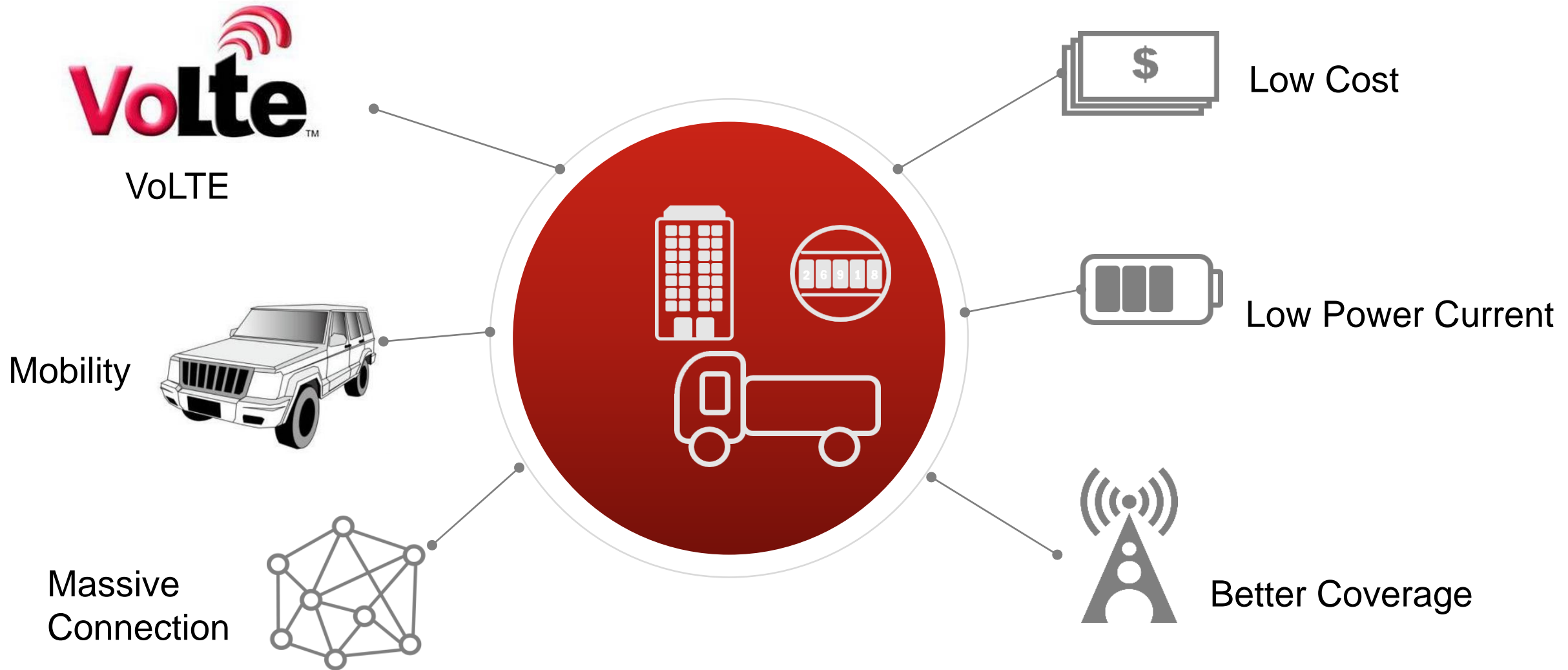


LPWA Evolution

	Rel-8 Cat.4	Rel-11 Cat.1	Rel-13 Cat M1	Rel-13 Cat NB1
Downlink Peak Rate	150Mbps	10Mbps	1Mbps	<100Kbps
Uplink Peak Rate	50Mbps	5Mbps	1Mbps (Full Dup.)	<100Kbps
Coverage MCL (Minimum Coupling Loss)	140.7dB	140.7dB	155.7dB	164dB
Battery Life (200 bytes/day)	<1 year	<1 year	~10 years	~10 years
Number of Antennas	2	2	1	1
UE Receive Bandwidth	20MHz	20MHz	1.4MHz	200KHz
UE Transmit Power	23dBm	23dBm	23dBm	23dBm
Standard Readiness	Now	Now	Mar. 11, 2016	Jun. 9, 2017
Network Readiness	Now	Now	Q3 2017	Q3 2017

LPWA: Low Power Wide Area

eMTC Advantages



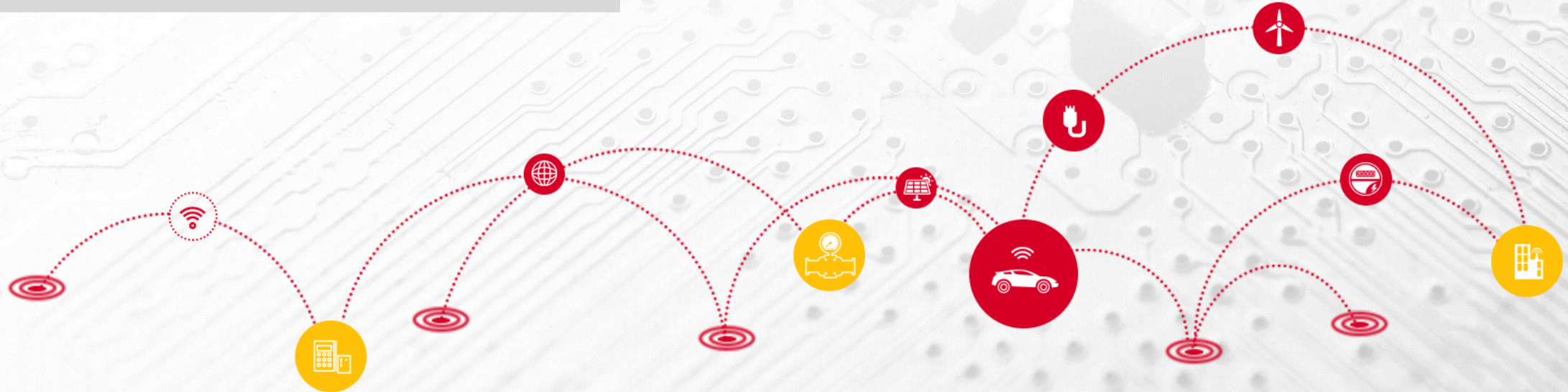
eMTC: Enhanced Machine Type Communication

Technical Background

Product Overview

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Applications



BG96 Highlights

1

Multi Modes: Cat M1, Cat NB1, EGPRS

2

Global Bands:

Cat M1/NB1: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28/B39 (*B39 for Cat M1 only*)

EGPRS: 850/900/1800/1900MHz

3

Low Power Consumption: Approx. 10uA in PSM mode

4

Mobility: Movable application

5

GNSS: GPS, GLONASS, BeiDou/Compass, Galileo, QZSS

6

VoLTE: PCM digital audio interface

7

QuecOpen: ARM A7 Processor, with 3MB Flash and 3MB RAM available for users

BG96 Specifications 1

Cat M1/Cat NB1/EGPRS



26.5mm × 22.5mm × 2.3mm

Package: 102-pin LGA

Supply Voltage: 3.3V~4.3V, 3.8V Typ.

Data Rate:

- LTE Cat M1: Max. 300kbps (DL), Max. 375kbps (UL) (Half Duplexer)
- LTE Cat NB1: Max. 32kbps (DL), Max. 70kbps (UL)
- EGPRS: Max. 296kbps (DL), Max. 236.8kbps(UL)
- GPRS: Max. 107kbps (DL), Max. 85.6kbps (UL)

Protocols: PPP/TCP/UDP/SSL/TLS/FTP(S)/HTTP(S)/NITZ/PING/MQTT

Functions: Data/VoLTE/GNSS/DFOTA

Interfaces: (U)SIM/UART/USB/I2C/PCM/ADC/GPIO/Antenna

Power Consumption (Typical):

LTE Cat M1 Mode:

- Power Saving Mode: 10uA
- Standby State: 16mA @DRX=1.28s
15mA @e-I-DRX=20.48s
- Sleep state: 1.7mA @DRX=1.28s
1.1mA @e-I-DRX=20.48s
- LTE Connected Mode:
124mA @0dBm
130mA @10dBm
190mA @23dBm

LTE Cat NB1 Mode:

- Power Saving Mode: 10uA
- Standby State: 16mA @DRX=1.28s
15mA @e-I-DRX=20.48s
- Sleep state: 2.3mA @DRX=1.28s
1.7mA @e-I-DRX=20.48s
- LTE Connected Mode:
65mA @0dBm
66mA @10dBm
78mA @23dBm

BG96 Specifications 2



26.5mm × 22.5mm × 2.3mm
LTE Cat M1/NB1/EGPRS

■ LPWA Cat M1/Cat NB1/EGPRS Module

Items	BG96
Cat M1	LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28 LTE-TDD: B39
Cat NB1	LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28
EGPRS	850/900/1800/1900MHz
GNSS	Optional ^{NOTE}
Region	Global
Certification	CE/ GCF/ FCC/ PTCRB/ Verizon/ T-Mobile*/ AT&T*/ RCM/ Telstra*/ BELL*/ Telus*/ IC/ IFETEL*/ CCC/ JATE*/ TELEC*/ KDDI*

NOTE: GNSS function is not included by default. If needed, a different OC will be provided.

“” means the certification is ongoing.*

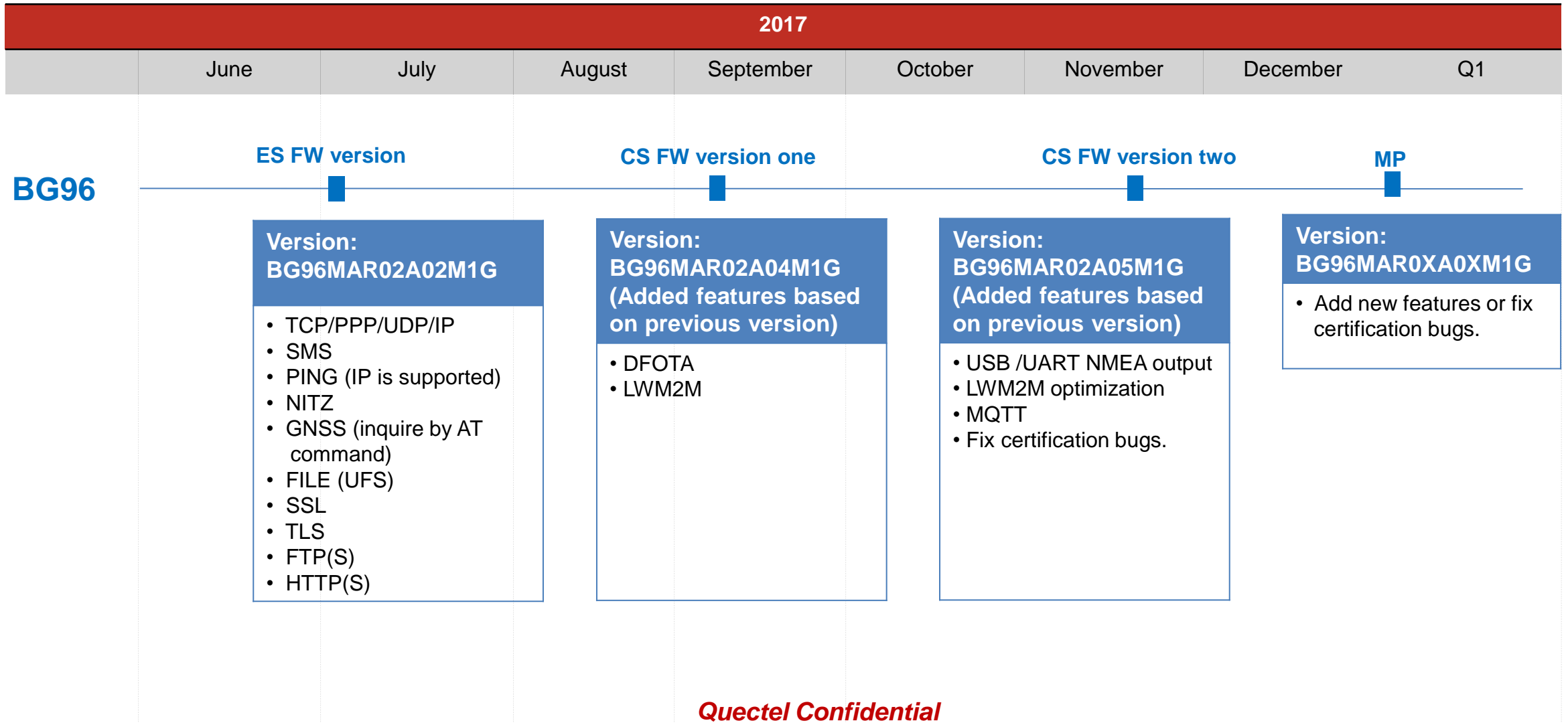
BG96 Main Interfaces

Interface	BG96
(U)SIM	1.8V/3.0V
UART	3 (UART1, UART2, UART3)
USB	1
I2C	1
ADC	2
GPIO	2 (I2C and UART3 can be re-configured as extra 4 GPIOs if they are not used)
PCM	1
Antenna pad	2 (for Main Antenna and GNSS Antenna, respectively)
GNSS (Optional)	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS

BG96 Main Functions

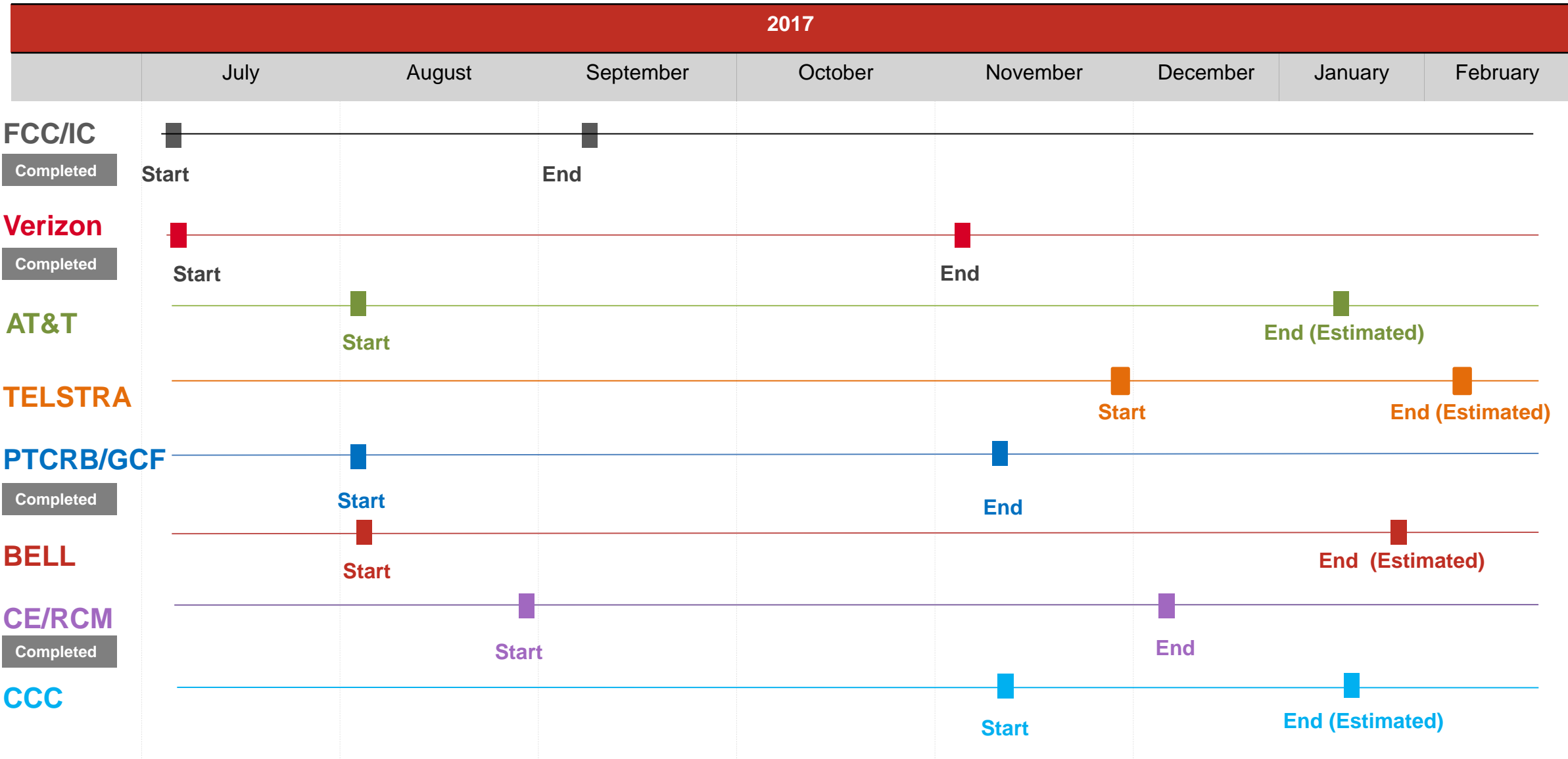
Function	BG96
Protocols	PPP/TCP/UDP/SSL/TLS/FTP(S)/HTTP(S)
RIL Driver	Android 4.x/5.x/6.x/7.x
USB Serial Driver	Windows XP, Windows Vista, Windows 7/8/8.1/10, Windows CE 5.0/6.0/7.0, Linux 2.6/3.x/4.1, Android 4.x/5.x/6.x/7.x
NDIS Driver	Windows 7/8/8.1/10
Gobinet Driver	Linux 2.6/3.x/4.1
QMI_WWAN Driver	Linux 3.x (3.4 or later)/4.1
SMS	Point-to-point MO and MT; SMS Cell Broadcast; Text and PDU Mode
Voice	VoLTE (for Cat M1 only. Support Realtek ALC 5616 codec by default firmware)
DFOTA	Delta firmware upgrade over the air
LWM2M	Enabled

BG96 Timeline



Quectel Confidential

BG96 Certification Test Schedule



BG96 Type Approvals



Verizon Wireless
One Verizon Way
Basking Ridge, NJ 07920

Nov 6, 2017

RE: Quectel Wireless Solutions Co., Ltd. BG96 Open Development Certification

Dear Loren Anderson:

Congratulations! On behalf of the Verizon Open Development team, we are pleased that you are participating in the Open Development Initiative. The Quectel Wireless Solutions Co., Ltd. BG96, under software version BG96MAR02A05M1G and hardware version R1.1 has been approved, hereinafter the "Approved Device", through the Open Development certification process.

Open Development is centered on driving innovation and providing customers with flexibility in wireless solutions. Most importantly, Open Development is designed to encourage the development community to create new products and services in addition to what Verizon currently offers. Quectel Wireless Solutions Co., Ltd. can now market the Approved Device to operate on the nation's most reliable wireless data network. Our customers can now utilize these devices to support their business needs.

The Approved Device remains certified for the applicable category mentioned below provided it continues to satisfy the terms of the Certification Agreement between Verizon and Quectel Wireless Solutions Co., Ltd.. No less than ninety days prior to the expiration of the certification term, Quectel Wireless Solutions Co., Ltd. must submit the Approved Device for retesting and re-certification for the Approved Device to remain certified. The terms of validity for device certification are as follows:

- * 'LTE' capable device: Certification lasts five years from the date of this letter if each device complies with a Firmware Over The Air (FOTA) upgrade. Failure to comply with a FOTA upgrade grants each device conditional approval only until December 31, 2017.
- * 'Multimode' device: A multimode device that supports HD voice over LTE and complies with a FOTA upgrade will remain certified for five years from the date of this letter. Certification for a multimode device (LTE with CDMA) supporting CDMA Voice expires on December 31, 2019.
- * A 'CDMA only' (1xRTT and/or 1xEVDO) device and its maintenance releases (MR) certifications expire December 31, 2019. Once the term expires, the device will receive no re-certification or (MR) certification. In addition effective July 1st, 2018, Verizon will no longer accept uploads or activations for any new CDMA-only MEID/ESN on our network, unless the devices are 4G LTE capable.

Thank you for choosing to have your devices certified via the Verizon Wireless' Open Development program.

Sincerely,

Behyar Khajezadeh
Director, Sales Operations
Connected Solutions - IOT
Verizon Wireless



CERTIFICATE

The Global Certification Forum Ltd advises that
Quectel Wireless Solutions Co., Ltd.

Has successfully demonstrated compliance
to the GCF certification requirements of GCF CC(2)

For
**Quectel BG96
Module**

On
2017-10-30

GCF CC Version:
3.66.1

Status:
New

GCF Ref. Number:
6628

This certificate has been issued by the Global Certification Forum in accordance with the requirements of the GCF PRDs.
For the actual status of a device certification, refer to the GCF web site.

The device manufacturer confirms that they are solely responsible for certifying the product and holds the GCF entirely harmless from any responsibility or liability associated with the product and/or the certification process. All GCF marks and/or certificates are provided "as is" with no representation and GCF expressly disclaims all warranties whatsoever whether express, implied statutory or otherwise. In no event shall GCF be liable for any direct, indirect, consequential or any damages whatsoever in any way connected with the use or performance of any GCF certified product whether based on contract, tort, negligence, strict liability or otherwise.

BG96 Type Approvals



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[home](#) > [view certified devices](#) > [certified device detail](#)

Certified Device Detail

Below are all of the certified HW/SW versions of this device.

Manufacturer:	Quectel						
Model	BG96						
Name/Number:							
Supported Technologies and Frequency Bands:	GSM	850 MHz	900 MHz	1800 MHz	1900 MHz		
	E-UTRA FDD	Band 1	Band 2	Band 3	Band 4	Band 5	Band 8
		Band 12	Band 13	Band 18	Band 19	Band 20	Band 26
		Band 28					
	E-UTRA TDD	Band 39					
	Additional/Other Bands	None					

Regulatory Approval IDs:

Type	ID	Issuing Country
ICTA	10224A-201709BG96	Canada

telefication bv
The Netherlands
Chamber of Commerce
51565536
www.telefication.com



TCB

GRANT OF EQUIPMENT AUTHORIZATION

TCB

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

Telefication B.V.
Edisonstraat 12a
Zevenaar, NL-6902 PK
Netherlands

Date of Grant: 09/12/2017

Application
Dated: 09/07/2017

Quectel Wireless Solutions Company Limited
7th Floor, Hongye Building,
No.1801 Hongmei Road, Xuhui District
Shanghai, 200233
China

Attention: Johnny xiang

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: XMR201707BG96
Name of Grantee: Quectel Wireless Solutions Company Limited
Equipment Class: PCS Licensed Transmitter
Notes: Quectel BG96
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	22H	824.2 - 848.8	0.624	0.04 PM	246KGXW
	24E	1850.2 - 1909.8	0.582	0.019 PM	246KGXW
	22H	824.2 - 848.8	0.188	0.032 PM	249KG7W
	24E	1850.2 - 1909.8	0.174	0.019 PM	248KG7W
	24E	1850.7 - 1909.3	0.925	0.004 PM	1M25G7D
	24E	1850.7 - 1909.3	0.851	0.006 PM	1M15W7D

BG96 Type Approvals

telefication bv
The Netherlands
Chamber of Commerce
51565536
www.telefication.com



EU-type examination (Module B)

certificate

No: 172141372/AA/00

In compliance with the procedure specified in RD_061, Telefication declares as designated Notified Body 0560 for the European Radio Equipment Directive, that the stated product, complies with the essential requirements, in accordance with Article 3 of Directive 2014/53/EU, as indicated under Annex 1 of this certificate, based on the applicable Technical Standards and Specifications as listed under Annex 2 of this Certificate.

Product description: Quectel BG96
Trademark: Quectel
Type designation: BG96
Hardware / Software version: R1.1 / BG96MAR02A05M1G
Variants: -

This certificate is granted to manufacturer:

Name: Quectel Wireless Solutions Co., Ltd.
Address: 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District
City: 200233 Shanghai
Country: China

This certificate remains valid as long as the stated product stays in compliance with the essential requirements of the Radio Equipment Directive.

This certificate has THREE Annexes.

Zevenaar, 18 December 2017




Remy Nabod
Product Assessor



telefication bv
The Netherlands
Chamber of Commerce
51565536
www.telefication.com



TECHNICAL ACCEPTANCE CERTIFICATE

CERTIFICAT D'ACCEPTABILITÉ TECHNIQUE

CERTIFICATION No.
No. DE CERTIFICATION

10224A-201709BG96

TELEFICATION No.
No. DE TELEFICATION

172170569/AA/00

TEST SITE No.
No. DE LABORATOIRE

8510A-1

ISSUED TO
DÉLIVRÉ A

Quectel Wireless Solutions Co., Ltd.

TYPE OF EQUIPMENT
GENRE DE MATÉRIEL

Cellular Mobile GSM (824-849 MHz)
PCS MOBILE (1850-1910 MHz)
Advanced Wireless Services (1710-1755 MHz and 2110-2155 MHz)
Mobile Broadband Service (MBS) (698-756 and 777-787 MHz)

TRADE NAME AND MODEL
MARQUE ET MODELE

Quectel / BG96

CERTIFIED TO
CERTIFIÉ SELON LE

SPECIFICATION
CAHIER DES CHARGES

	RSS-102	ISSUE	5
	RSS-130	EDITION	1
	RSS-132		3
	RSS-133		6
	RSS-139		3

BG96 Type Approvals



CERTIFICATE FOR CHINA COMPULSORY PRODUCT CERTIFICATION

CERTIFICATE NO.: 2018011606038032

NAME AND ADDRESS OF THE APPLICANT
 Quectel Wireless Solutions Co., Ltd.
 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China.

NAME AND ADDRESS OF THE MANUFACTURER
 Quectel Wireless Solutions Co., Ltd.
 7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China

NAME AND ADDRESS OF THE FACTORY
 Sintave Technology Co., Ltd
 Building A Building B, Sintave Industrial Park, Lundu Road, Qisha Village, Shatian Town, Dongguan City, China

PRODUCT NAME, MODEL AND SPECIFICATION
 LTE Module
 Quectel BG96 , Quectel BG36 (Powered by mainboard)

THE STANDARDS AND TECHNICAL REQUIREMENTS FOR THE PRODUCTS
 GB/T22450.1-2008;YD/T2583.14-2013;GB4943.1-2011

This is to certify that the above mentioned product(s) complies with the requirements of implementation rules for compulsory certification(REFNO.CNCA-C16-01:2014).

Valid from: Jan.08,2018 **Valid until:** Jan.08,2023

The validity of the certificate is subject to positive result of the regular follow up inspection by issuing certification body until the expiry date.

The certificate information is available through CNCA's website: www.cnca.gov.cn



President: 
 Wang Kejiao



CHINA QUALITY CERTIFICATION CENTRE

<http://www.cqc.com.cn> Section 9, No. 186, Nanshuoan Xilu, Beijing 100070 P. R. China Tel: +86 10 83866666

Supplier's declaration of conformity



As required by the following Notices:

- > Radiocommunications (Compliance Labelling - Devices) Notice 2014 made under section 182 of the Radiocommunications Act 1992;
- > Radiocommunications Labelling (Electromagnetic Compatibility) Notice 2008 made under section 182 of the Radiocommunications Act 1992
- > Radiocommunications (Compliance Labelling – Electromagnetic Radiation) Notice 2014 made under section 182 of the Radiocommunications Act 1992 and
- > Telecommunications (Labelling Notice for Customer Equipment and Customer Cabling) Instrument 2015 made under section 407 of the Telecommunications Act 1997.

Instructions for completion

- > Do not return this form to the ACMA. This completed form must be retained by the supplier as part of the documentation required for the compliance records and must be made available for inspection by the ACMA when requested.

Supplier's details (manufacturer, importer or authorised agent)

Company Name (OR INDIVIDUAL)

Alfacomm Wireless Pty Ltd
TRADING AS

ACN/ABN

620383066

OR

Street Address (AUSTRALIAN OR NEW ZEALAND)

U13, 165-171 North Rocks Rd, North Rocks NSW 2151, Australia
POSTCODE 2151
Phone: +61 452 624 491

New Zealand IRDN

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Product details and date of manufacture

Product description – brand name, type, current model, lot, batch or serial number (if available), software/firmware version (if applicable)

Product name: LTE Cat M1&Cat NB1&EGPRS Module
Brand name: Quectel
Model : BG96
Date of manufacture or importation of the original/modified item

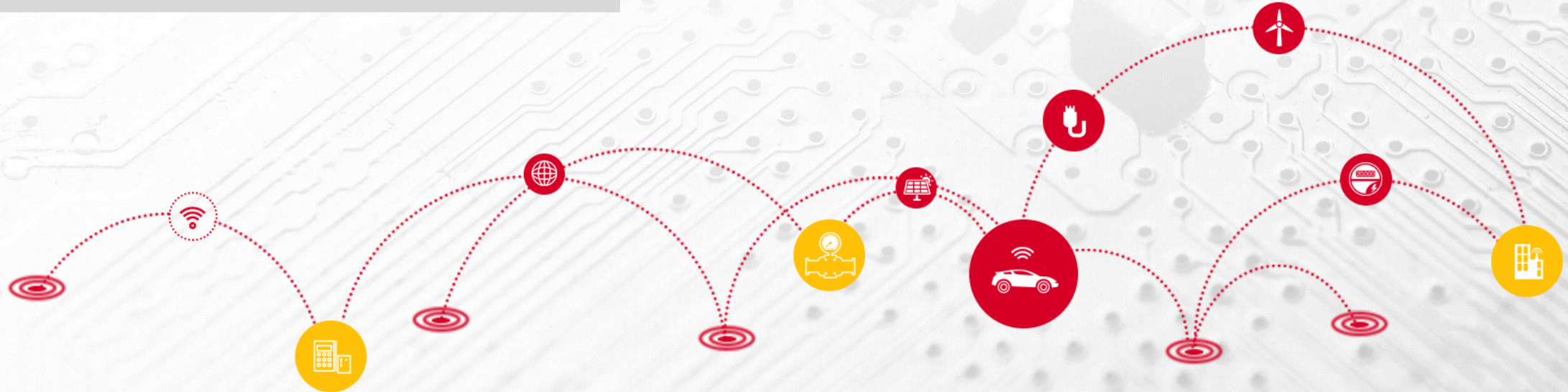
Q 1881178

Technical Background

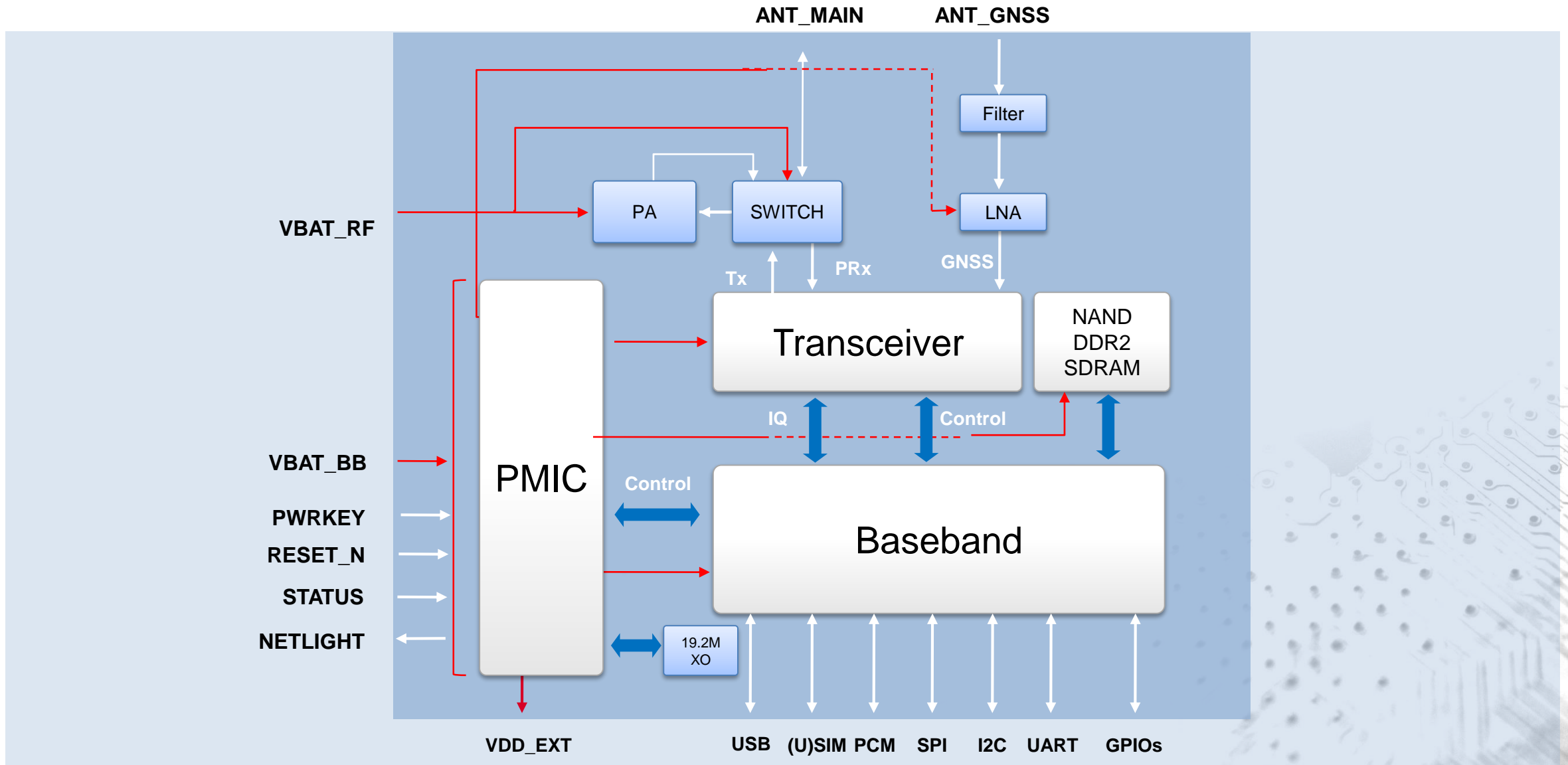
Product Overview

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Applications



Hardware Architecture

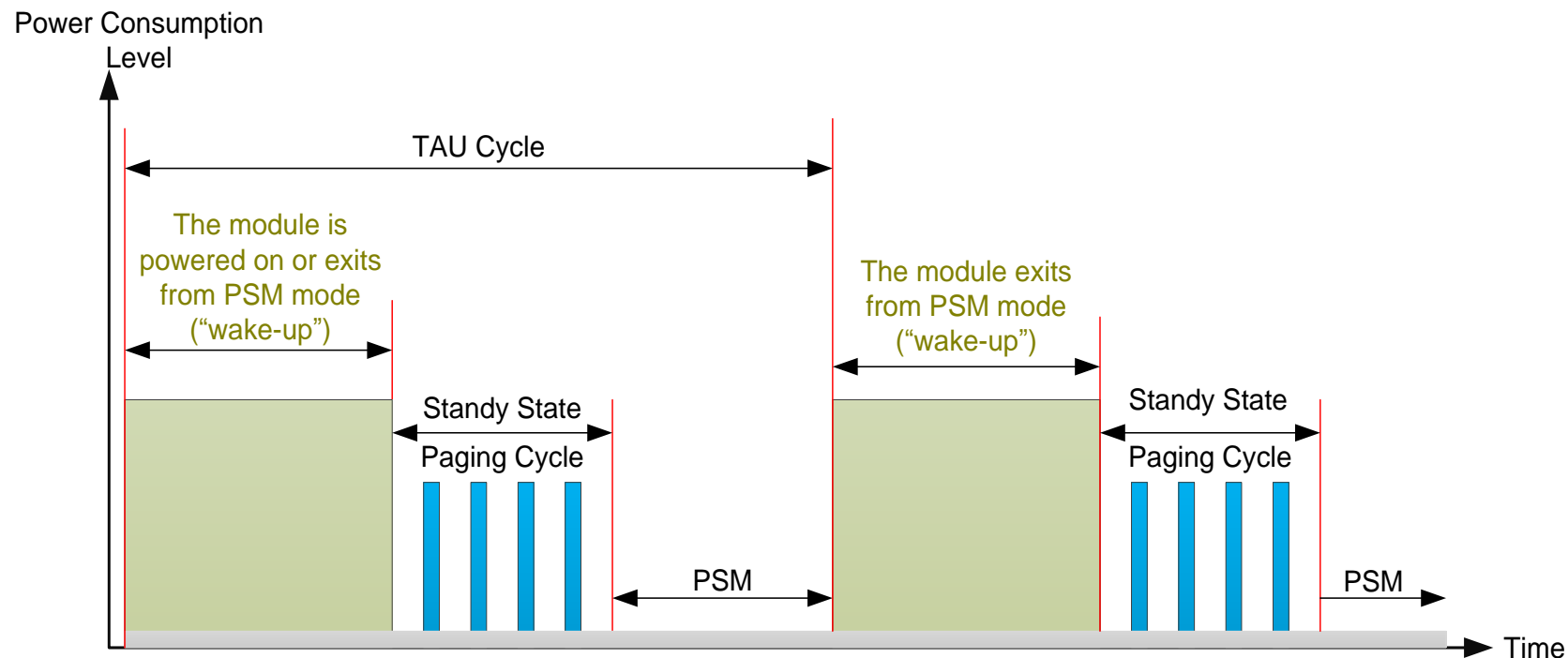


Key Technologies 1 - PSM

Power Saving Mode (PSM) is similar to power-off, but the module remains registered on the network. When the module is woken up from PSM, there is no need to re-attach or re-establish PDN connection. When the module in PSM, it is not immediately reachable for mobile terminating services. PSM is therefore intended for applications that are expecting only infrequent mobile originating and terminating services and that can accept a corresponding latency in the mobile terminating communication.

When the module wants to use the PSM it shall request an Active Time value during every Attach and TAU/RAU procedures. If the network supports PSM and accepts that the module uses PSM, the network confirms usage of PSM by allocating an Active Time value to the module.

The following figure illustrates the power consumption cycle of BG96 module.

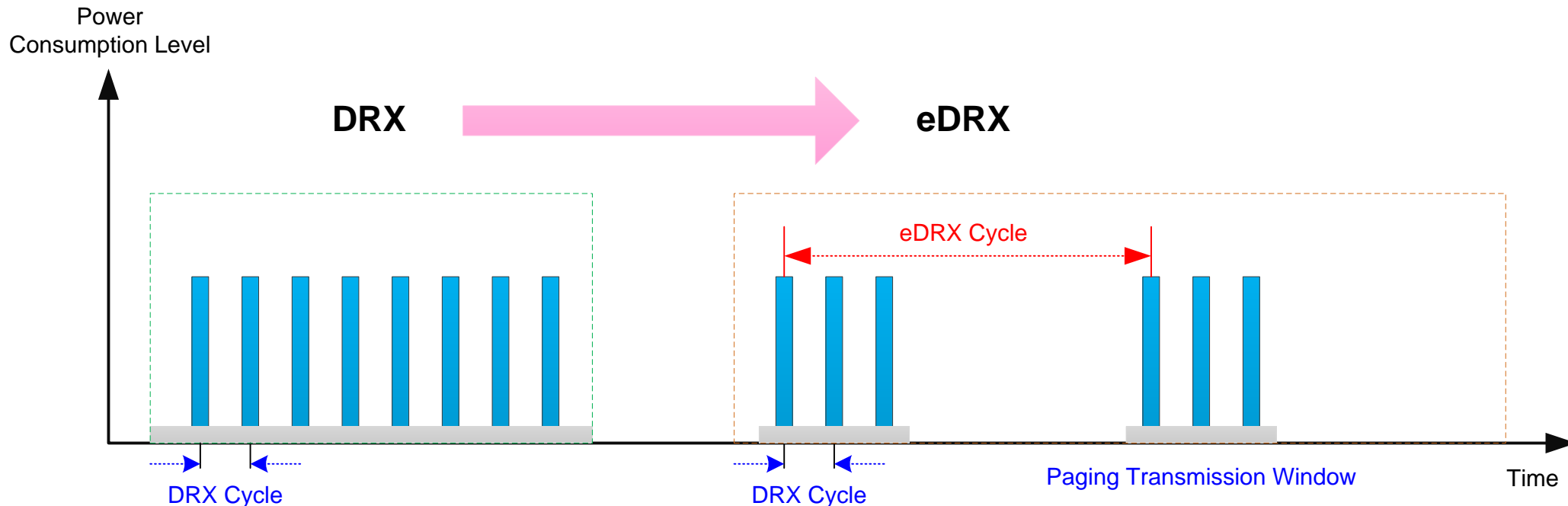


Key Technologies 2 – e-I-DRX

The module (UE) and the network may negotiate over non-access stratum signaling the use of Extended Idle Mode DRX (e-I-DRX) for reducing its power consumption, while being available for mobile terminating data and/or network originated procedures within a certain delay dependent on the DRX cycle value.

Applications that want to use e-I-DRX need to consider specific handling of mobile terminating services or data transfers, and in particular they need to consider the delay tolerance of mobile terminated data.

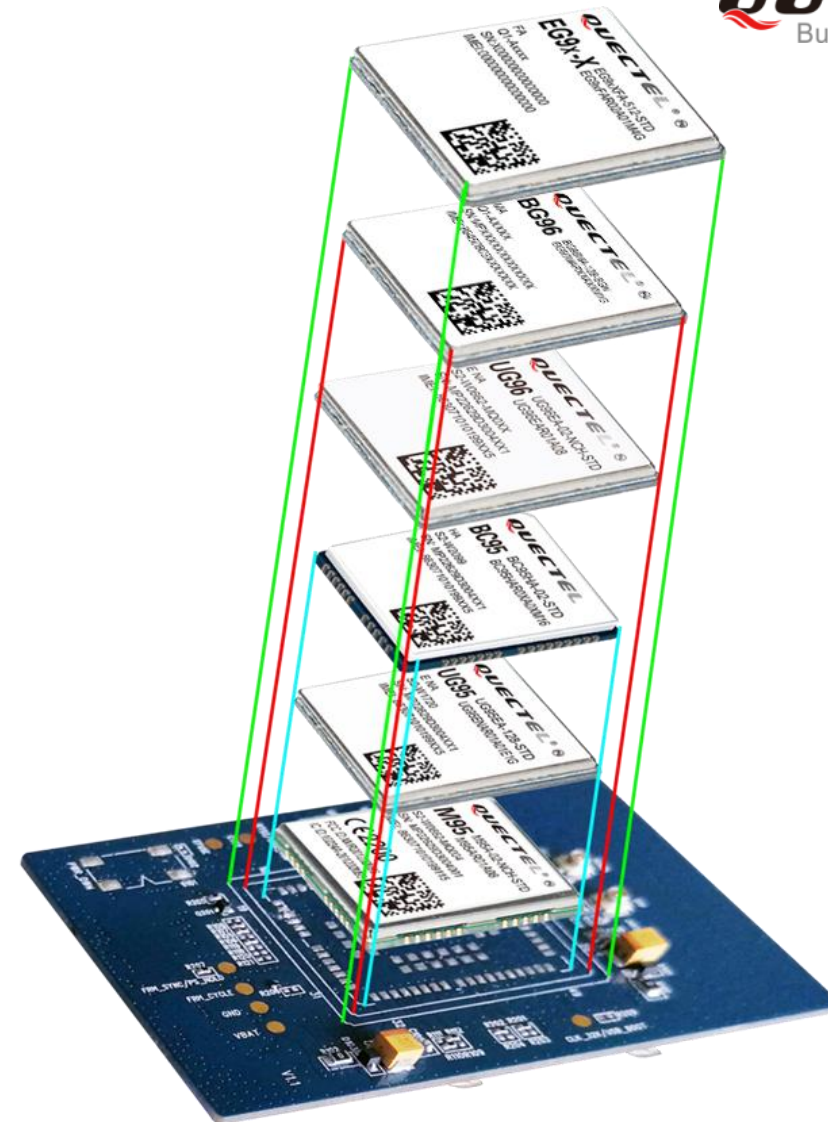
The following figure illustrates the DRX and e-I-DRX cycle of BG96 module.



Layout Compatibility

BG96 is compatible with the following Quectel modules:

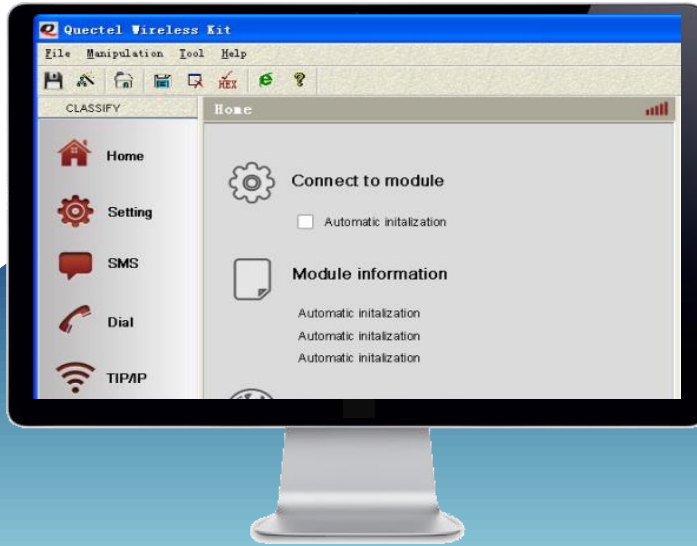
- GSM/GPRS module M95
- UMTS/HSPA modules UG96 & UG95
- LTE Cat 4/Cat 1 module EG95/EG91
- LTE Cat NB1 module BC95



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

Quick Start

UMTS & LTE EVB Kit



Quectel offers a GUI tool named **QNavigator**. It can help customers quickly test Quectel module's functionality.

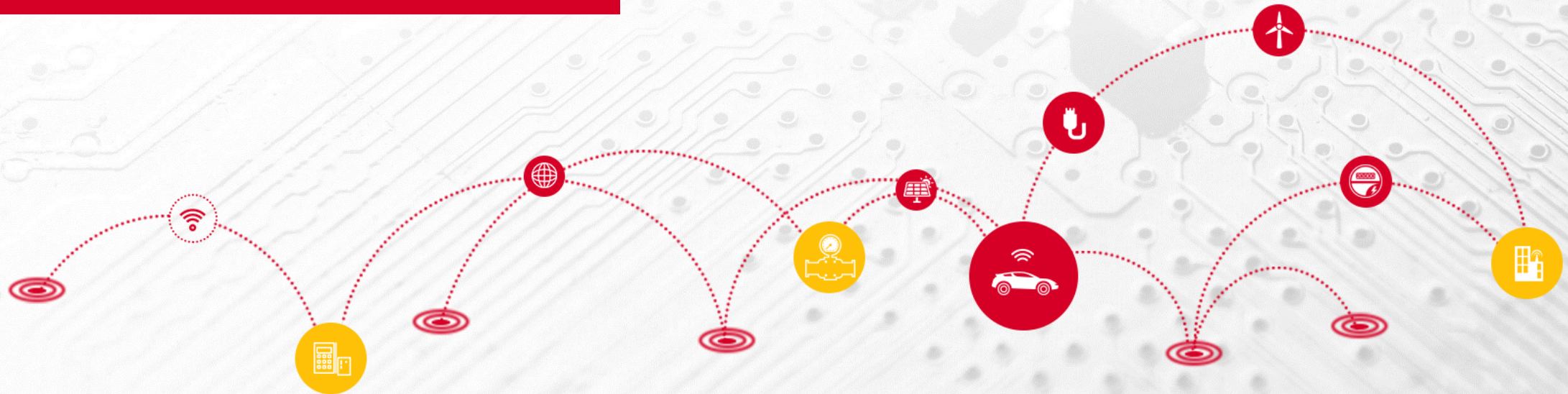


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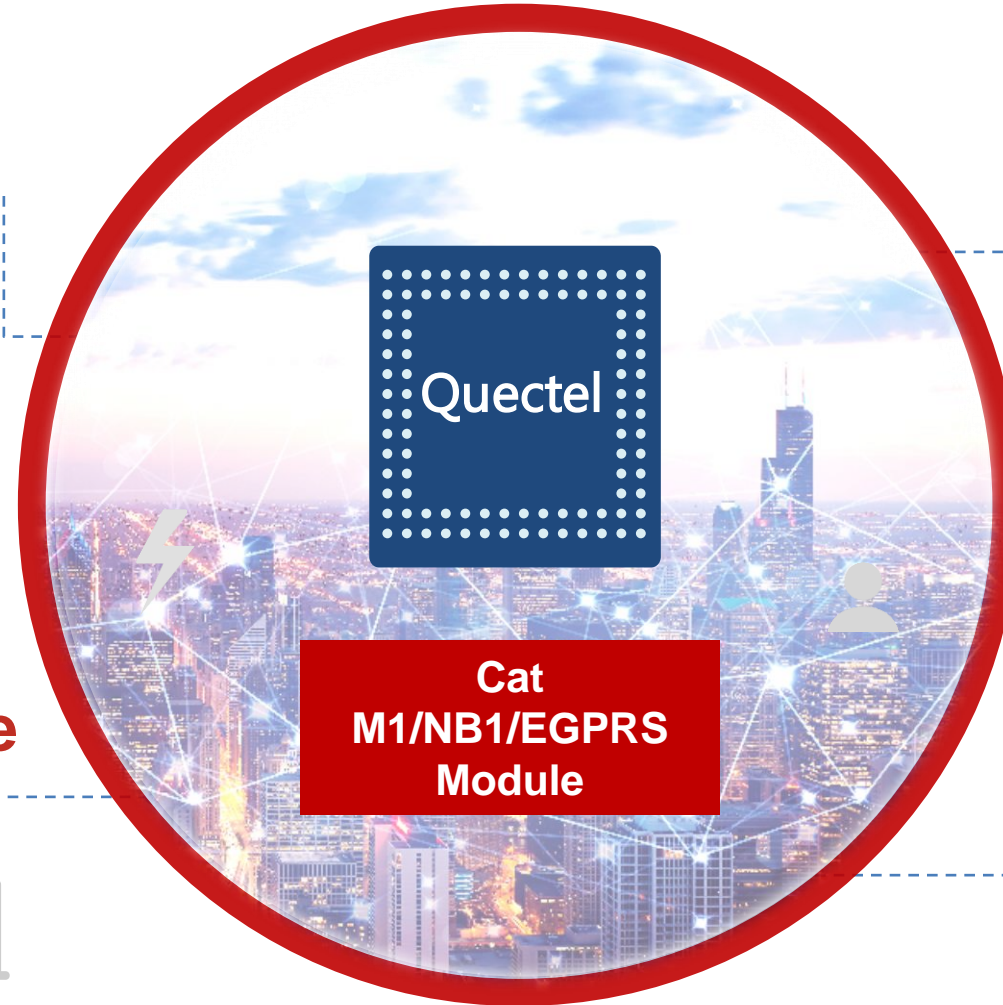
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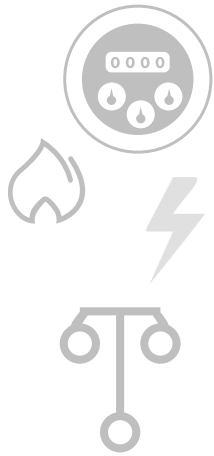
Applications



LPWA Application Markets



Public Utilities



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

Personal Life

- Asset Tracking
- Electronics
- Person/Pet Tracking



Industry & Agriculture

- Gas Detector
- Soil PH/Optical Sensor
- Machine Alarm
- Irrigation Controller
- Elevator

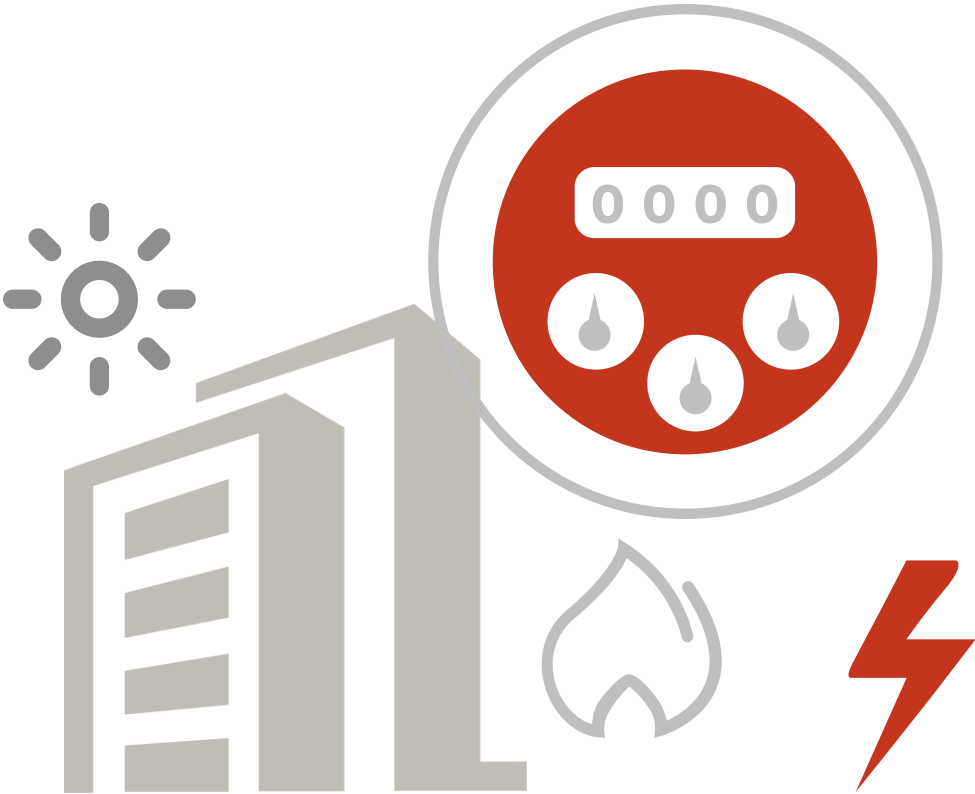


Smart Home

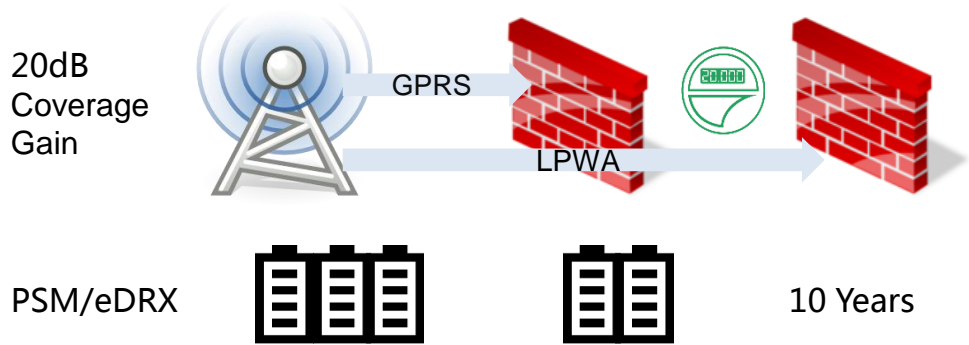
- Intelligent Door Lock
- Intelligent Control



Smart Metering



The most suitable solution for water meters



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

Smart Home



Smart Lock



Smart Smoke Detector



Home Appliances



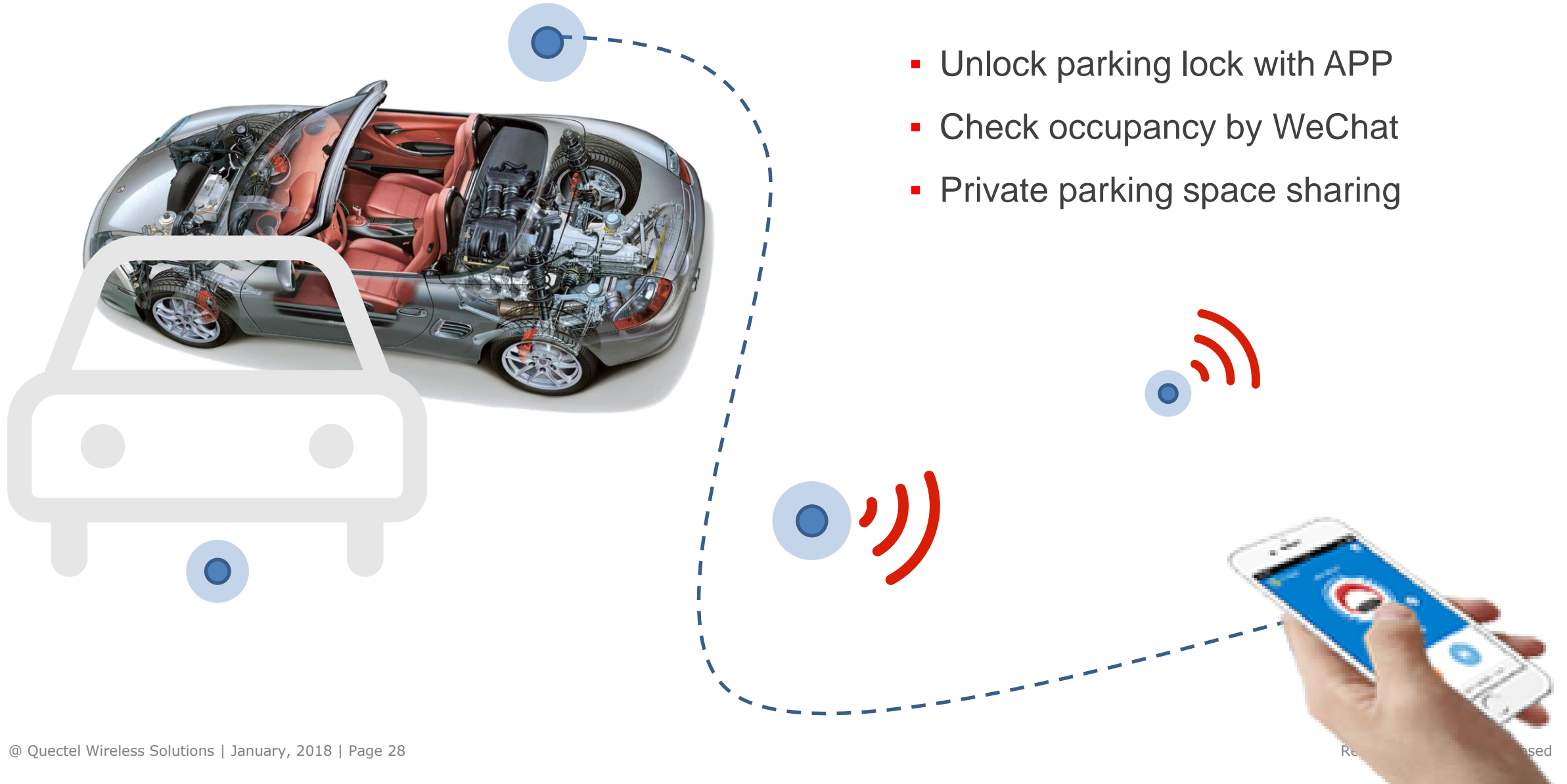
- NB-IoT smart locks
- Smart smoke detector
- NB-IoT white goods
- Higher safety, more convenient
- Easy connection to NB-IoT platform

Street Lighting



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

Parking



Bike Sharing



Animal Testing



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

Multi-gas Detector



- Monitors up to several threats, including VOCs, combustibles and toxics
- Real-time gas concentration reading, location, alarm and status indication

LPWA Network Deployments

Over 25 mobile operators committed to deploy Cat M1 and/or Cat NB1 networks

Verizon/ AT&T/ TELUS (Cat M1)
Sprint (Cat M1 + Cat NB1)

KPN/ Orange (Cat M1)
Vodafone/ T-Mobile/ MegaFon/ Turkcell/ Etisalat (Cat NB1)
Telefonica/ Telia (Cat M1 + Cat NB1)

Telefonica/ Vivo (Cat NB1)

- Cat NB1
- Cat M1
- Cat M1 + Cat NB1

MTN (Cat NB1)

SKT (Cat M1)
CMCC / CTCC / CUCC / KT / LGU+ / M1 (Cat NB1)
NTT Docomo / SoftBank/ KDDI (Cat M1 + Cat NB1)

Telstra (Cat M1)
Vodafone (Cat NB1)

Thank you!

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Shanghai 200233, China
Tel: +86-21-5108 6236 Email: info@quectel.com
Website: www.quectel.com

 <https://www.linkedin.com/company/quectel-wireless-solutions>

 <https://www.facebook.com/quectelwireless>

 https://twitter.com/Quectel_IoT