

Quectel BG96 Module

Introduction

August, 2020

Technical Background

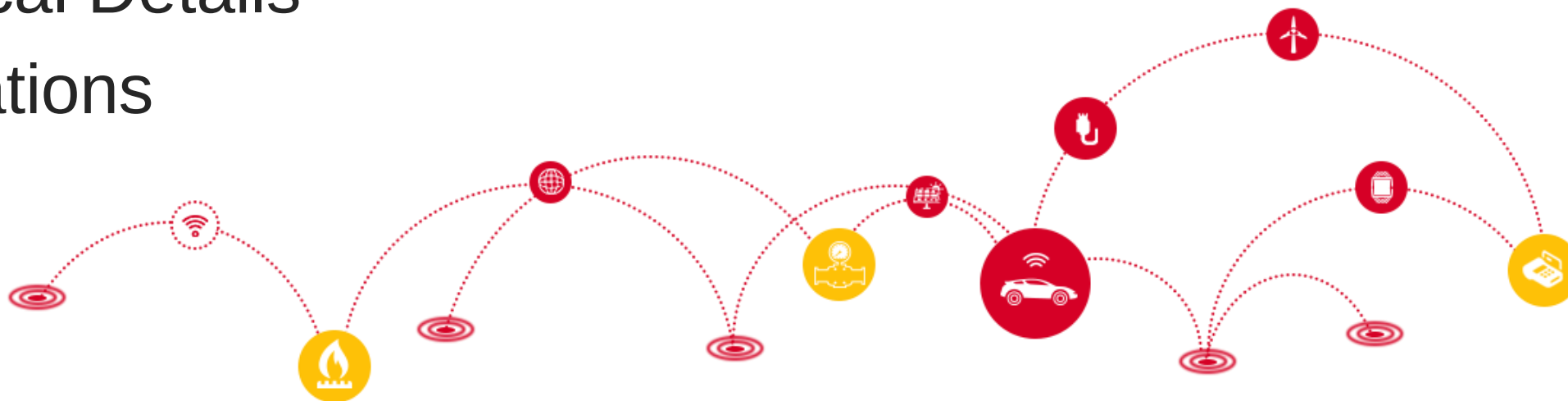
LPWA Roadmap

Highlights & Specifications

Development Timeline

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

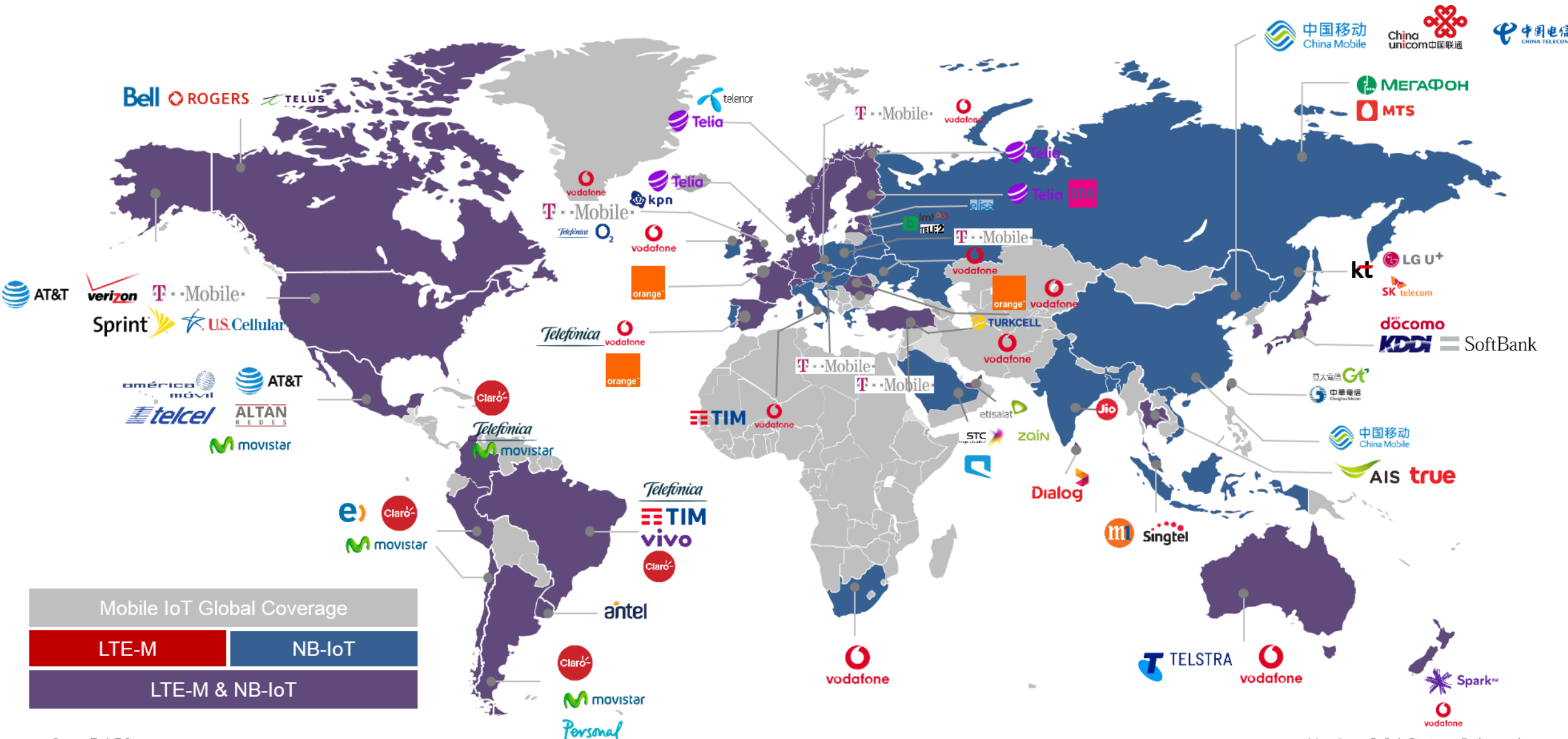
LPWA: Low Power Wide Area

eMTC Advantages

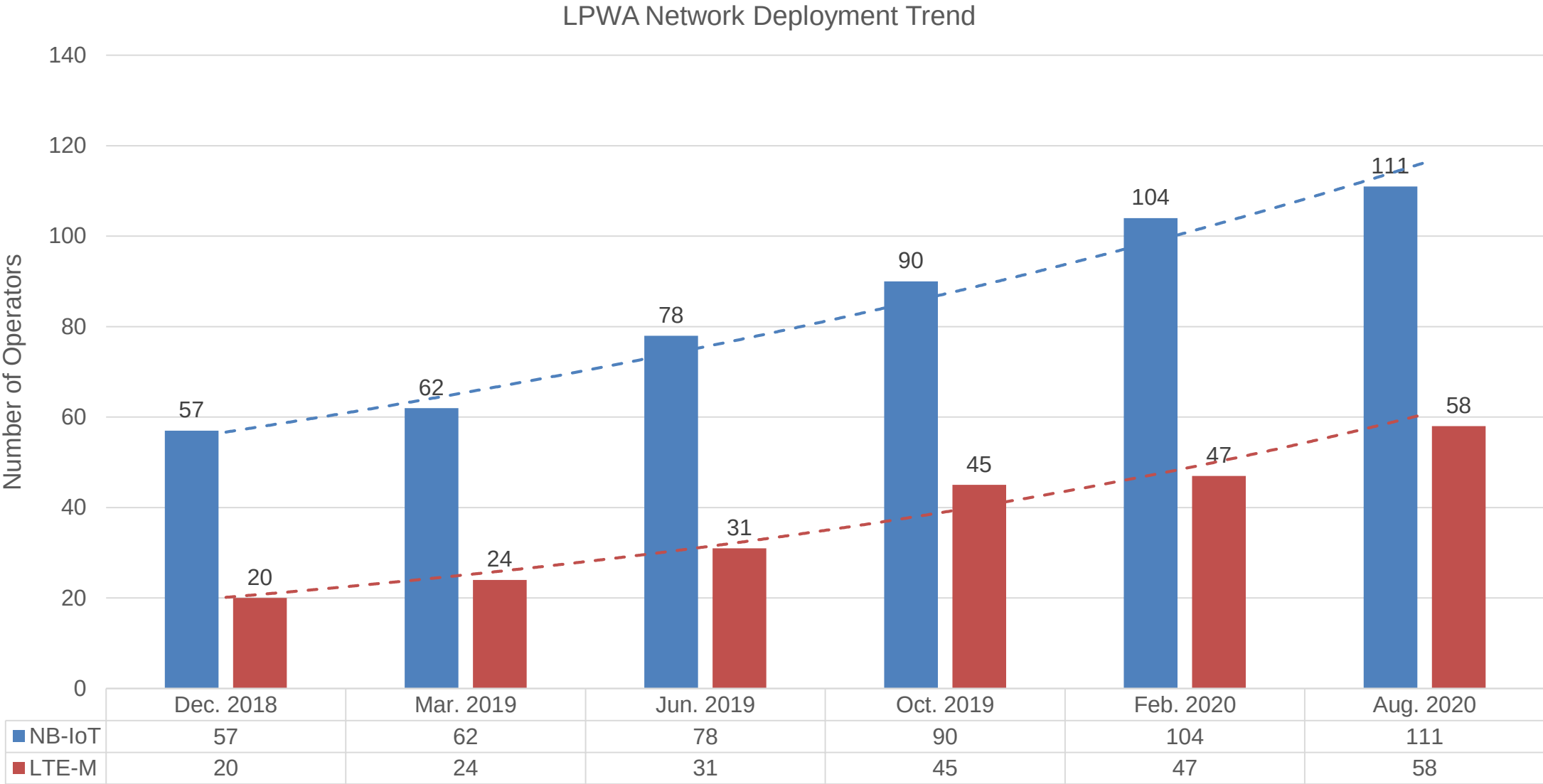


eMTC: Enhanced Machine Type Communication

LPWA Network Deployment (Based on GSMA Data up to Aug. 1, 2020)



LPWA Network Deployment Trend



NB-IoT Deployment (1) (Based on GSMA Data up to Aug. 1, 2020)

NB-IoT = 111								
Operator	Country/Region	Bands	Operator	Country/Region	Bands	Operator	Country/Region	Bands
3	Hong Kong, China	8	Claro	Argentina	4, 28	Movistar	Colombia	5
A1	Austria	20	Dialog Axiata	Sri Lanka	3, 8	Movistar	Argentina	4, 28
A1	Croatia	20	DNA	Finland	20, 3	MTS	Russia	3
A1	Belarus	/	DU	UAE	20	NOS	Portugal	3,20
AIS	Thailand	8	Elisa	Finland	20, 3	Orange	Belgium	3,20
ALTAN	Mexico	28	Elisa	Estonia	20	Orange	Spain	20
Altice	Portugal	20	Entel	Chile	28	Proximus	Belgium	20
Antel	Uruguay	3, 28	Etisalat	UAE	20	Reliance Jio	India	3, 5
APTG	Taiwan, China	8	FarEasTone	Taiwan, China	28	Rogers	Canada	4, 5, 12
AT&T	USA	2, 4, 12	Grameenphone	Bangladesh	3, 8 (TBC)	SFR	France	20
AT&T	Mexico	5	KCELL	Kazakstan	/	Singtel	Singapore	8
BASE (Telenet)	Belgium	3, 20	KT	South Korea	3	SmarTone	Hong Kong, China	8
Bite	Latvia	20	Kyvistar	Ukraine	3	SoftBank	Japan	1, 8
China Mobile	China	8	LGU+	South Korea	5	StarHub	Singapore	3, 8
China Mobile	Hong Kong, China	3	LMT	Latvia	20	STC	Saudi Arabia	28
China Telecom	China	5	M1	Singapore	8	Swisscom	Switzerland	20
China Unicom	China	3, 8	Maxis	Malaysia (6 Cities)	3	Taiwan Mobile	Taiwan, China	3, 28
Chunghwa	Taiwan, China	8	MegaFon	Russia	20, 8, 3	TDC	Denmark	20
Claro	Brazil	3, 28	Mobily	Saudi Arabia	20	Telcel	Mexico	5
Claro	Colombia	5	Mobitel	Sri Lanka	3,8	Tele2	Latvia	20
Claro	Peru	28	Movistar	Peru	28	Telecom Italia/TIM	Brazil	28
Claro	Chile	28	Movistar	Chile	28	Telecom Italia/TIM	Italy	20

NB-IoT Deployment (2) (Based on GSMA Data up to Aug. 1, 2020)

NB-IoT = 111								
Operator	Country/Region	Bands	Operator	Country/Region	Bands	Operator	Country/Region	Bands
Telefónica	Spain	20	Verizon	USA	13	TRUE	Thailand	8
Telefónica	Germany	8, 20	Viettel	Vietnam	3			
Telenor	Denmark	20	Vivo	Brazil	3, 28			
Telenor	Norway	8, 20	Vodafone	Australia	5, 8, 28			
Telia	Finland	20	Vodafone	Czech	8, 20			
Telia	Norway	20	Vodafone	Germany	20			
Telia	Sweden	20	Vodafone	Greece	20			
Telia	Denmark	20, 8	Vodafone	Hungary	20			
Telia	Estonia	20	Vodafone	Ireland	20			
Telkomsel	Indonesia	8	Vodafone	Italy	20			
Telstra	Australia	28	Vodafone	Malta	/			
T-Mobile	Austria	8	Vodafone	New Zealand	28			
T-Mobile	Germany	8, 20	Vodafone	Portugal	8, 20			
T-Mobile	Hungary	20	Vodafone	Spain	8, 20			
T-Mobile	USA	2, 4, 12, 66, 71, 85	Vodafone	Netherlands	20			
T-Mobile (Cosmote)	Greece	20	Vodafone	Turkey	8, 20			
T-Mobile (DT)	Poland	20	Vodafone	United Kingdom	20			
T-Mobile (Slovakia Telecom)	Slovakia	20	Vodafone	Ukraine	3			
T-Mobile (DT)	Croatia	8, 20	Vodafone	Romania	20			
T-Mobile (DT)	Netherlands	20	Vodafone/ Vodacom	South Africa	8			
Turkcell	Turkey	20	XL Axiata	Indonesia	8			
Velcom	Belarus	8	Zain	Saudi Arabia	3			

LTE-M Deployment (Based on GSMA Data up to Aug. 1, 2020)

LTE-M = 58								
Operator	Country/Region	Bands	Operator	Country/Region	Bands	Operator	Country/Region	Bands
AIS	Thailand	3, 8	KPN	Netherlands	20	Sprint	USA	25
ALTAN	Mexico	28	KT	South Korea	3	Swisscom	Switzerland	20
América Móvil	Mexico	4	LGU+	South Korea	5	T-Mobile (DT)	Netherlands	8
Antel	Uruguay	3, 28	LMT	Latvia	20	Telcel	Mexico	4
APTG	Taiwan, China	8, 28	Movistar	Mexico	2	Telefonia	Spain	20
AT&T	Mexico	4	Movistar	Peru	4	Telefonica	Colombia	2
AT&T	USA	2, 4, 12	Movistar	Colombia	4	Telefónica	Germany	20
Bell	Canada	12	Movistar	Argentina	4,28	Telenor	Denmark	20
Chunghwa	Taiwan, China	3	NTT DOCOMO	Japan	1, 19	Telenor	Norway	20
Claro	Brazil	3, 28	O2 Telefonica	UK	20	Telenor	Sweden	20
Claro	Colombia	5	Orange	Belgium	20	Telstra	Australia	28
Claro	Chile	28	Orange	France	20	Telus	Canada	2, 4, 5, 12
Claro	Argentina	28	Orange	Romania	3	Turkcell	Turkey	3, 20
Claro	Peru	28	Orange	Spain	3, 20	USCC	US	2, 4, 5, 12
Dialog Axiata	Sri Lanka	8	Personal	Argentina	4,28	Verizon	USA	4, 13
DNA	Finland	20, 3	Rogers	Canada	4, 5, 12	Vivo	Brazil	3,28
Elisa	Estonia	/	SingTel	Singapore	3, 8	Vodafone	New Zealand	28
Entel	Peru	28	SKT	South Korea	3, 5	Vodafone	Netherlands	20
Etisalat	UAE	5	SoftBank	Japan	1, 3, 8			
KDDI	Japan	18, 26	Spark	New Zealand	3, 28			

Technical Background

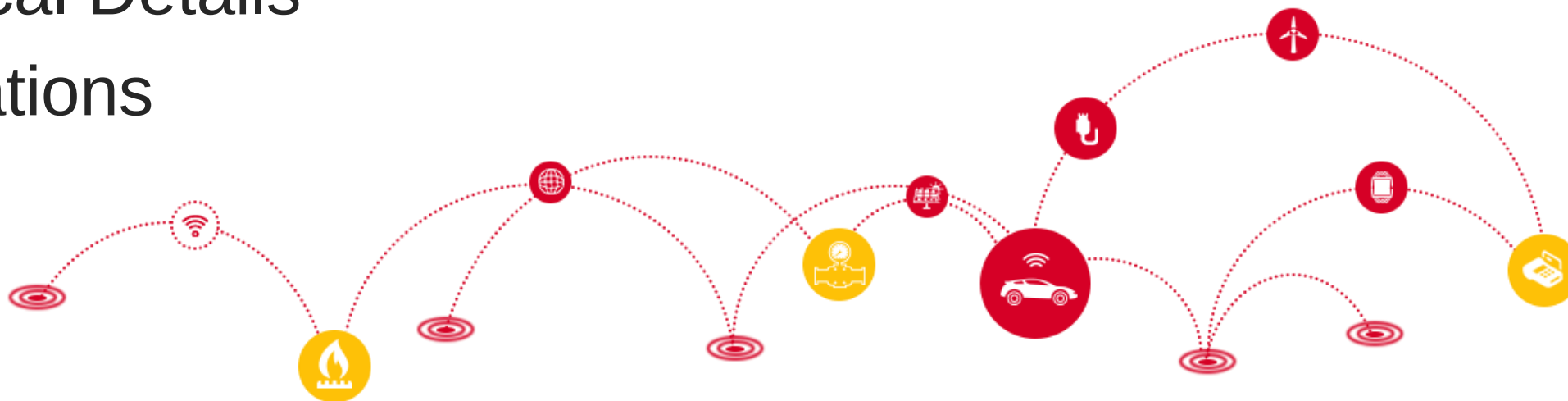
LPWA Roadmap

Highlights & Specifications

Development Timeline

Technical Details

Applications



LPWA Modules (Qualcomm) Roadmap



MDM9205

BG95 Series are Pin-to-Pin Compatible with BG96



BG95-M1

- Cat M1
- Global Version



BG95-M4

- Cat M1/ NB2
- B31/B72/B73 (450 MHz)
- Global Version



BG95-M2

- Cat M1/ NB2
- Global Version



BG95-M5

- Cat M1/ NB2/ EGPRS
- Power Class 3
- Global Version



BG95-M6

- Cat M1/ NB2
- Power Class 3
- Global Version



BG95-M3

- Cat M1/ NB2/ EGPRS
- Global Version



BG95-N1

- Cat NB2
- Global Version



BG95-MF

- Cat M1/ NB2
- Wi-Fi Positioning
- Global Version



BG77

- Cat M1/ NB2
- Super Compact Size
- Global Version



BG600L-M3

- Cat M1/ NB2/ EGPRS
- LGA Package
- Compatible With MC60
- Global Version

MDM9206



BG96

- Cat M1/NB1/EGPRS
- MDM9206-0
- 375 kbps DL/ UL
- Global Version

2017

2018

2019

2020

Technical Background

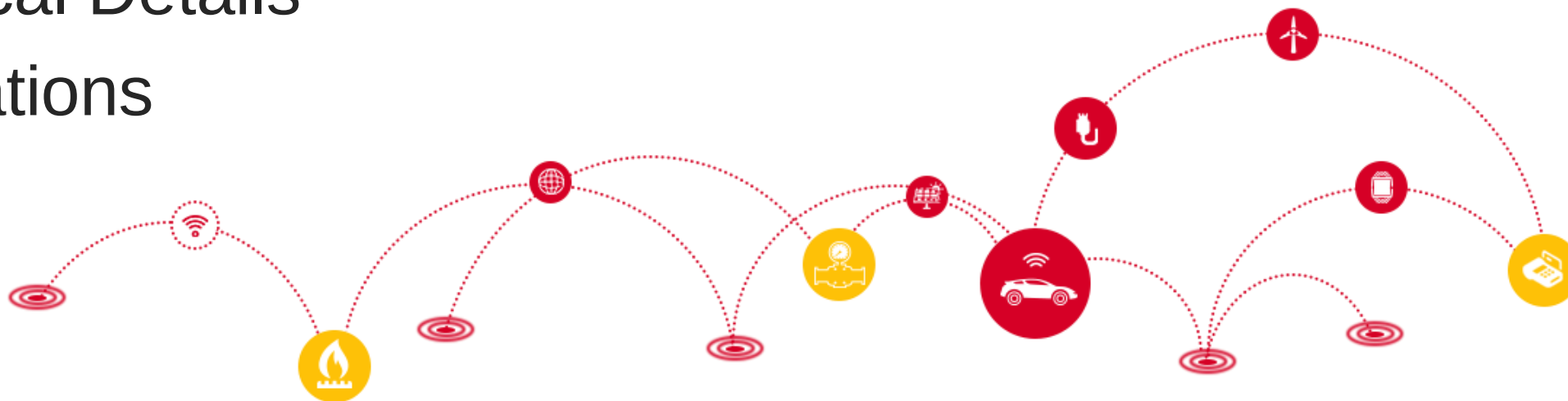
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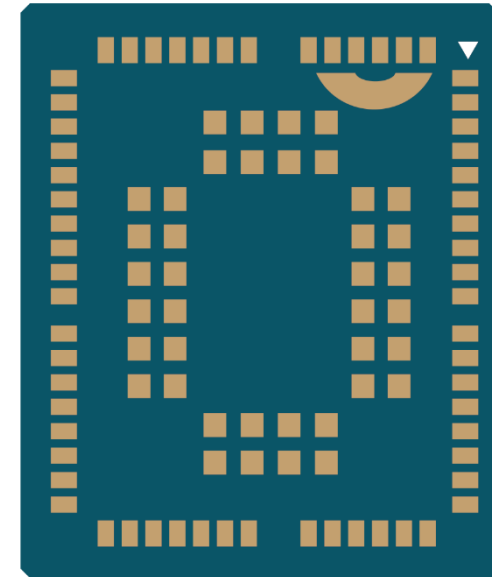
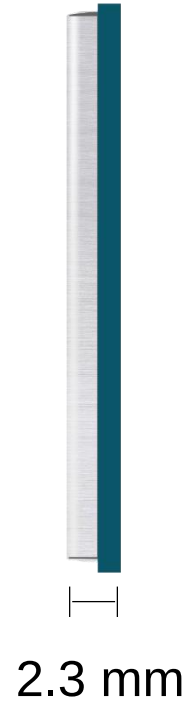
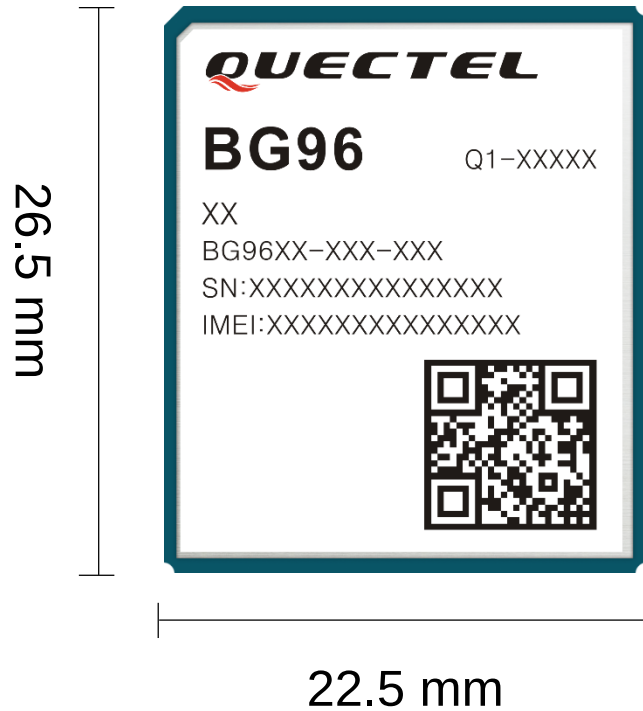
Technical Details

Applications



BG96 Mechanical Dimensions

Multi-Mode LPWA Module (MDM9206)



Length: 26.5 mm (± 0.15 mm)
Width: 22.5 mm (± 0.15 mm)
Height: 2.3 mm (± 0.2 mm)
Weight: Approx. 3.1 g

BG96 Highlights



Highlight	Description
Multi Modes	Cat M1/ Cat NB1/ EGPRS
Package	LGA / Mini PCIe
Global Bands	• Cat M1/NB1: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25^①/B26*/B28/B39 (B39 for Cat M1 only) • EGPRS: 850/900/1800/1900 MHz
Low Power Consumption	Approx. 10μA in PSM mode
Mobility	Movable application (TX3.0)
Extended Power Supply Range	3.3–4.3 V, 3.8 V typ.
GNSS (Optional)	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS
VoLTE	PCM digital audio interface
QuecOpen®	ARM A7 Processor, with 3 MB Flash and 3 MB RAM available for users
QuecLocator® *	Location based on base station cell information
Compatibility	Soldering footprint completely compatible with Quectel UG95/UG96/BC95

“*” means under development.

① LTE B25 supported on BG96 with R1.2 hardware version.

BG96 Specifications 1



26.5 mm × 22.5 mm × 2.3 mm

Cat M1/Cat NB1/EGPRS

Package: 102-pin LGA

Supply Voltage: 3.3–4.3 V, 3.8 V Typ.

Data Rate:

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

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

Functions: Data/VoLTE/GNSS/DFOTA/NITZ/PING

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

Power Consumption (Typical): 10 μA @PSM

BG96 Specifications 2



26.5 mm × 22.5 mm × 2.3 mm
Cat M1: 375 kbps DL/375 kbps UL
Cat NB1: 32 kbps DL/70 kbps UL

■ LPWA Cat M1/Cat NB1/EGPRS Module

Items	Description
Cat M1	LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25 ^① /B26*/B28 LTE TDD: B39
Cat NB1	LTE FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25 ^① /B26*/B28
EGPRS	850/900/1800/1900 MHz
GNSS	Optional
Region	Global
Certification	Carrier: Vodafone/ Deutsche Telekom/ Telefónica/ Verizon/ AT&T/ T-Mobile/ Sprint/ U.S. Cellular/ Rogers/ Telus/ SKT/ LGU+/ NTT DOCOMO/ SoftBank/ KDDI/ Telstra Regulatory: GCF/ CE/ FCC/ PTCRB/ IC/ Anatel/ IFETEL/ CCC/ KC/ NCC/ JATE/ TELEC/ RCM/ NBTC/ IMDA

^①“*” means under development.

^① LTE B25 supported on BG96 with R1.2 hardware version.

BG96 Power Consumption

Description	Conditions	Typ.	Max.	Unit
Power Saving Mode	PSM @ Real Network	10	-	μA
Sleep State^①	DRX = 1.28 s @ Paging Duration = 35 mA/25 ms	1.5	78	mA
	e-I-DRX = 40.96 s @ PTW = 2.3 mA/10 s	1.2	81	mA
Idle State^②	DRX = 1.28 s @ Paging Duration = 45 mA/16 ms	15	77	mA
	e-I-DRX = 40.96 s @ PTW = 16 mA/10 s	15	83	mA
Active State	23 dBm @ Instrument	205	496	mA
	10 dBm @ Instrument	140	278	mA
	0 dBm @ Instrument	128	225	mA
	Data Transfer @ Real Network	95	-	mA
	Voice @ Real Network	108	-	mA

① Sleep state with UART connected and USB disconnected. The module can enter into sleep state through executing **AT+QSCLK = 1** command via UART interface and then controlling the module's DTR pin. For details, please refer to *Quectel_BG96_Hardware_Design*.

② Idle state with UART connected and USB disconnected.

BG96 Main Interfaces



Interface	Description
(U)SIM	1.8 V/3.0 V
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 Interface	2 (for Main Antenna and GNSS Antenna, respectively)
GNSS (Optional)	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS

BG96 Main Functions

Function	Description
Protocols	PPP/ TCP/ UDP/ SSL/ TLS/ FTP(S)/ HTTP(S)/ MQTT
USB Serial Driver	Windows 7/8/8.1/10, Linux 2.6/3.x/4.1–4.15, Android 4.x/5.x/6.x/7.x/8.x/9.x
GNSS Driver	Android 4.x/5.x/6.x/7.x/8.x/9.x
RIL Driver	Android 4.x/5.x/6.x/7.x/8.x/9.x/10.x
NDIS Driver	Windows 7/8/8.1/10
GobiNet Driver	Linux 2.6–5.4
QMI_WWAN Driver	Linux 3.4–5.4
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

“*” means under development

Technical Background

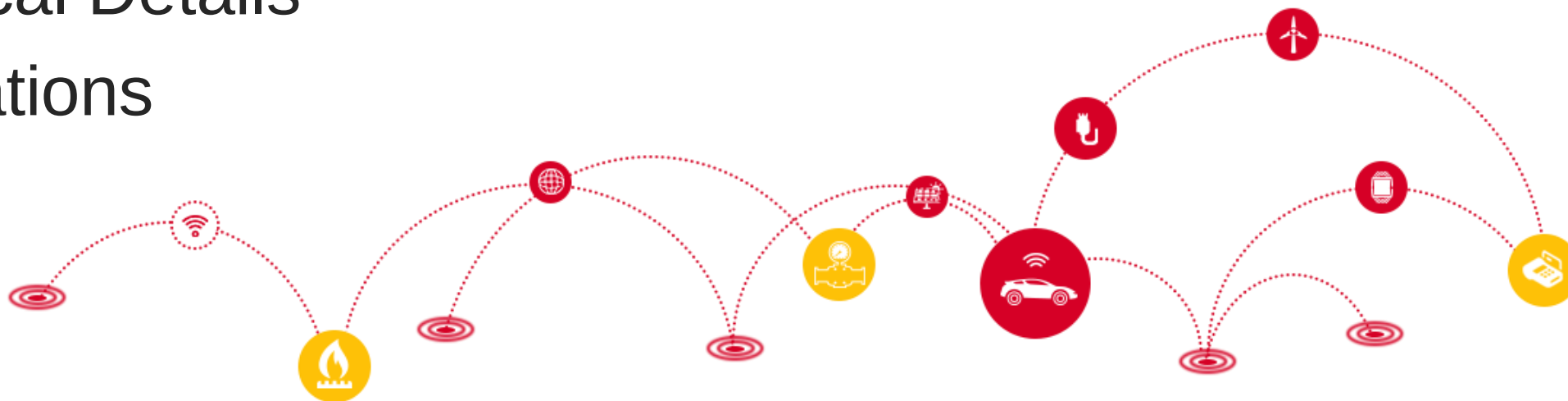
LPWA Roadmap

Highlights & Specifications

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BG96 (TX2.0, R02Axx) Development Schedule

2018		2019				2020		
Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
MP (I)		MP (II)		MP (III)	MP (IV)	MP (V)	MP (VI)	
Version: BG96MAR02A07M1G - TCP/IP - PPP - UDP - PSM - SMS - PING - GNSS - FILE (UFS) - RF TX/RX - FTM - LwM2M - SSL/TLS - FTP(S) - HTTP(S) - BIP - DoNAS - NIDD - MQTT - DFOTA - CMUX - GNSS - Geo Fence		Version: BG96MAR02A08M1G - QuecLocator® - SKT/ Telefónica certification issue fix - Platform optimization and issue fix		Version: BG96MAR02A09M1G - Disable Cat M1 - Add T-Mobile LwM2M new request - Platform optimization and issue fix	Version: BG96MAR02A10M1G - TCP keep alive - Security file folder - Verizon network issue fix - Platform optimization and issue fix	Version: BG96MAR02A11M1G - SKT issue fix - Platform optimization and issue fix	Version: BG96MAR02A12M1G - QuecThing® - GNSS power issue fix - HLPMN issue fix - Jamming detection for LTE Cat M1/GSM - Platform optimization and issue fix	
Completed: AT&T/ Verizon/ U.S. Cellular/ Rogers/ Telus/ KDDI/ Vodafone/ PTCRB		Completed: SKT/ Telefónica		Completed: T-Mobile	Completed: Verizon MR	Completed: SKT MR	No MR plan	

BG96 (TX2.0) Certifications

Project Stage

BG96 (TX2.0)

MP

Carrier Certifications

Vodafone/ Deutsche Telekom/ Telefónica/ Verizon/ AT&T/ T-Mobile/ U.S. Cellular/
Rogers/ Telus/ SKT/ KDDI/ Telstra



Regulatory Certifications

GCF/ CE/ FCC/ PTCRB/ IC/ Anatel/ IFETEL/ CCC/ KC/ NCC/ JATE/ TELEC/ RCM/ NBTC/ IMDA



BG96 Type Approvals (Verizon/GCF)



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' (1xEV-DO and/or 1xEV-DO) 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 Khajehzadeh
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
with the GCF certification requirements of GCF-CC and/or GCF-CC2

For
**Quectel BG96
Module**

On
19-Oct-2018

GCF CC Version:
3.70.1

Status:
Published

GCF Ref. Number:
7479

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, please 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.

Global Certification Forum (GCF) Ltd
www.globalcertificationforum.org Email: gcf@globalcertificationforum.org
Registered Office: Suite 1, 3rd Floor, 11-12 St. James's Square, London SW1Y 4LB, UK.
Company Number 6594830. VAT Number: GB 948 2259 92.

QUECTEL
Build a Smarter World



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



am

Ramy Nabod
Product Assessor

BG96 Type Approvals (FCC/IC)



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



TCB

GRANT OF EQUIPMENT
AUTHORIZATION
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 Emission Tolerance 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

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

BG96 Type Approvals (CCC/RCM)



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

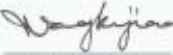
This is to certify that the above mentioned product(s) complies with the requirements of implementation rules for compulsory certification(REFNO.CNCA-C16-01:2014).

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. 188, Nanshuoan Xilu, Beijing 100070 P. R. China Tel: +86 10 83386666

Q 1881178

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

--

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

BG96 Type Approvals (AT&T)



NOTICE OF NETWORK COMPATIBILITY

This Notice of Network Compatibility (this “Notice”) is effective as of 2/16/2018 (the “Effective Date”) and is issued by AT&T Mobility LLC on behalf of itself and its affiliates (collectively “AT&T”) to Quectel BG96 (“Device Manufacturer”) dated 2/16/2018.

This Notice applies only to the following product (the “Product”):

Module:

Manufacturer: Quectel

Model: BG96

Software: Revision: BG96MAR02A05M1G

Hardware: 1.1

Onboarding tool Device id: 109bwIXoIQ

Category: DOM

Release Type: IR

ODIS/DHIR Compliance Method (Only applicable to Devices; please choose one below):

() Full DM ODIS/DHIR support as described in Device Management Implementation Guide (DMIG)

(x) Dedicated TAC 86450803

() Family TAC xxxxxxxx

() Manual File Upload per DMIG (NOTE: This Notice of Network Compatibility letter is subject to revocation by AT&T if Quectel does not provide initial file upload of legacy devices as described in DMIG within 60 days of the issuance of this letter.)

Connection Mgr/ACM Version:

- Attachment A: Modem Manager Validation/ACM TA

This Notice only relates to the Product as specifically described herein and any variations from these component versions, no matter how slight, are not covered by this Notice.

- 4.8 Ability to make Emergency calls (for example to 911) as this is the responsibility of the manufacturer to test and meet the emergency location requirements

Manufacturer will not identify AT&T or its Affiliates in any advertising, sales material, press release, public disclosure or publicity without prior written authorization by AT&T.

Furthermore, AT&T does not make any representation or warranty, express or implied, to any person or entity, including, without limitation, any warranties regarding the performance, desirability, merchantability, suitability, originality, quality, fitness for a particular purpose or otherwise (irrespective of any previous course of dealings between the parties or custom or usage of trade), with respect to the Product. Device Manufacturer may not make any representation to any third party inconsistent with the terms of this Notice.

- a. **Quectel General Indemnity Obligations.** Quectel, as Indemnifying Party, will defend, indemnify and hold harmless AT&T, and its Affiliates, directors, officers, and employees from and against any and all third-party claims, including but not limited to End User claims, causes of action, demands, liabilities, damages, losses, judgments, settlements, costs and expenses, including punitive damages, court costs, and reasonable attorneys' and expert witness' fees before and at trial and on appeal (collectively “Claims”) related to or arising out of (i) the use of the Quectel BG96 ; (ii) services delivered by Quectel BG96 through information services or applications on the Quectel BG96; (iii) the battery in the Quectel BG96; or (iv) personal injury, death or property damage arising out of use of the Quectel BG96 or the information services and/or applications on or delivered by the Quectel BG96 ; except to the extent such Claim arises solely out of the use of the Service and not out of the use of the Quectel BG96 .
- b. **Disclaimer of Warranties:** EXCEPT AS EXPRESSLY STATED IN THIS NOTICE, EACH PARTY DISCLAIMS ALL WARRANTIES, EITHER EXPRESSED OR IMPLIED, WITH RESPECT TO GOODS OR SERVICES HEREUNDER, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. AT&T SUPPLIES A SERVICE, NOT GOODS. AT&T DOES NOT GUARANTEE COMPANY OR ANY END USER UNINTERRUPTED SERVICE.

AT&T IS NOT THE MANUFACTURER OF ANY Quectel EQUIPMENT AND MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT THERETO. **AT&T HAS NO RESPONSIBILITY OR LIABILITY FOR ANY BATTERY IN A Quectel BG96.** TO THE EXTENT AT&T PROVIDES ACCESS TO INFORMATION PROVIDED BY OTHER SOURCES, AT&T ACCEPTS NO LIABILITY FOR AND MAKES NO WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THE CONTENT THEREOF. Quectel HAS NOT RELIED ON AND WILL NOT CLAIM THAT IT IS ENTITLED TO THE BENEFITS OF ANY REPRESENTATIONS, PROMISES, DESCRIPTION OF SERVICES OR OTHER STATEMENT NOT SPECIFICALLY SET FORTH IN THIS NOTICE.

BG96 Type Approvals (IFETEL)



UNIDAD DE CONCESIONES Y SERVICIOS
DIRECCIÓN GENERAL DE AUTORIZACIONES
Y SERVICIOS
IFT/223/UCS/DG-AUSE/ 6778 / 2017



"Año del Centenario de la Promulgación
de la Constitución Política de los Estados Unidos Mexicanos"

Ciudad de México, a 13 de diciembre de 2017.

ASUNTO: Se otorga Certificado de Homologación
Provisional

LIC. LUCY LOZANO PÉREZ
REPRESENTANTE LEGAL DE
JF INTERNACIONAL, S.A. DE C.V.
Alcantares No. 16
Col. Jardines de San Mateo
C.P. 53240, Naucalpan, Edo. de México

En atención a su escrito recibido el 28 de noviembre de 2017, con el que solicita el Certificado de Homologación Provisional del equipo módulo LTE, marca Quectel, modelo BG96 y en virtud de haber cumplido con los requisitos correspondientes, se hace de su conocimiento que el Instituto Federal de Telecomunicaciones emitió el Certificado Homologación número RTIQUBG17-2093, mismo que mediante el presente se entrega.

Lo anterior, con fundamento a lo previsto en el párrafo 15 del artículo 28 de la Constitución Política de los Estados Unidos Mexicanos y los artículos 3, fracción XXIV; 289, 290 de la Ley Federal de Telecomunicaciones y Radiodifusión publicada en el Diario Oficial de la Federación el 14 de julio de 2014 y 35 fracción X, del Estatuto Orgánico del Instituto Federal de Telecomunicaciones, publicado en el Diario Oficial de la Federación el 4 de septiembre de 2014.

ATENTAMENTE
EL DIRECTOR GENERAL

GERARDO LÓPEZ MOCTEZUMA

UNIDAD DE CONCESIONES Y SERVICIOS
DIRECCIÓN GENERAL DE AUTORIZACIONES
Y SERVICIOS



"Año del Centenario de la Promulgación
de la Constitución Política de los Estados Unidos Mexicanos"

CERTIFICADO DE HOMOLOGACIÓN
Clase: **PROVISIONAL**
Número: **RTIQUBG17-2093**
Vigencia: **13 de diciembre de 2018**

LIC. LUCY LOZANO PÉREZ
REPRESENTANTE LEGAL DE
JF INTERNACIONAL, S.A. DE C.V.
Alcantares No. 16
Col. Jardines de San Mateo
C.P. 53240, Naucalpan, Edo. de México

Fecha de emisión: 13 de diciembre de 2017	Oficio respuesta a solicitud: IFT/223/UCS/DG-AUSE/ 6778 / 2017
Equipo: Módulo LTE	
Marca: Quectel	Modelo: BG96
Parte(s) en Telecomunicaciones: Ing. Mario Olmos Cordero (514)	
CARACTERÍSTICAS TÉCNICAS	
Transmisor:	
Banda de frecuencias	703-748 MHz, 824 a 840 MHz, 1850 a 1910 MHz, 1710 a 1755 MHz
Potencia de salida	≤ 0.3162 W (700 MHz), ≤ 2 W(1900 MHz), ≤1 W (850/2100 MHz)
Receptor:	
Banda de frecuencias	758-803 MHz, 869 a 894 MHz, 1910 a 1990 MHz, 2110 a 2155 MHz
GPS:	
Frecuencias de operación	1575.42 (GPS/Galileo/QZSS) 1567.5-1565.8 (GLONASS) 1561.098 (BeiDou)

Distinto: ARTURO CUBILLAS DOMÍNGUEZ	Revisó: El Director de Homologación ÁNGEL AGUILAR LÓPEZ	Activó: El Director General GERARDO LÓPEZ MOCTEZUMA
--	---	---

BG96 Type Approvals (JATE/TELEC)



Type Certificate

Certified to	Quectel Wireless Solutions Co.,Ltd.
Type of Equipment	Leased line or Digital data transmission terminal equipment
Name of Equipment	BG96
Development Equipment Name	
Certified Number	D180034003
Certified Date	April 9, 2018
Remarks	No.18-0496

This is to certify that the above mentioned equipment has been approved technical conditions compliance design in accordance with the provisions of Article 56, Paragraph 1 of the Telecommunication Business Law.

April 9, 2018

DSP Research, Inc.



Type Certificate

Certified to	Quectel Wireless Solutions Co.,Ltd.
Classification of specified radio equipment	Article 2-1-11-19-2 FD-LTE, Land mobile station(NB-IoT)
Type of emissions, frequency and antenna power	200K G1A,G1B,G1C,G1D,G1F,G1X,G7W 718.335~747.665MHz, 815.335~844.665MHz, 900.335~914.665MHz, 1710.335~1784.665MHz, 1920.335~1979.665MHz 0.2W
Model Name	BG96
Vendor Name	Quectel Wireless Solutions Co.,Ltd.
Certified Number	003-180062
Certified Date	April 9, 2018
Remark	No.18-0494 Refer to the attachment for "frequency details"

This is to certify that the above mentioned certification by type has been granted in accordance with the provisions of Article 38-24, Paragraph 1 of the Radio Law.

April 9, 2018

DSP Research, Inc.



BG96 Type Approvals (IMDA)



AVNET ASIA PTE LTD
151 LORONG CHUAN #06-03
NEW TECH PARK
SINGAPORE 556741

ATTN: LIM CHOON SHYAN
(OTHERS)

Dear Sirs,

EQUIPMENT REGISTRATION UNDER TELECOMMUNICATIONS (DEALERS) REGULATIONS

Registration Number: G3028-18

We acknowledge that the equipment listed below has been registered with the Info-communications Media Development Authority under regulation 20(6) of the Telecommunications (Dealers) Regulations (Cap 323, Rg 6) (the "Dealers Regulations") and approved for sale in Singapore.

Equipment Description

Manufacturer	: QUECTEL WIRELESS SOLUTIONS CO., LTD.
Country of Origin/Import	: China
Technical Specification	: IMDA TS IOT
Type of Equipment	: Cat-M1 B3 Module
Brand/Trade Name	: Quectel
Model Name	: BG96
Frequency Range	(Tx) : 1710 - 1785 MHz (Rx) : 1805 - 1880 MHz
RF Power Output	: 23 dBm (LTE B3 Cat-M1)
Date of Registration	: 01 August 2018
Date of Expiry	: 31 July 2023

This is a computer generated printout. No signature is required.



AVNET ASIA PTE LTD
151 LORONG CHUAN
#06-03 NEW TECH PARK
SINGAPORE 556741

ATTN: LIM CHOON SHYAN
(ASSOCIATE DIRECTOR)

Dear Sirs,

EQUIPMENT REGISTRATION UNDER TELECOMMUNICATIONS (DEALERS) REGULATIONS

Registration Number: G2102-18

We acknowledge that the equipment listed below has been registered with the Info-communications Media Development Authority under regulation 20(6) of the Telecommunications (Dealers) Regulations (Cap 323, Rg 6) (the "Dealers Regulations") and approved for sale in Singapore.

Equipment Description

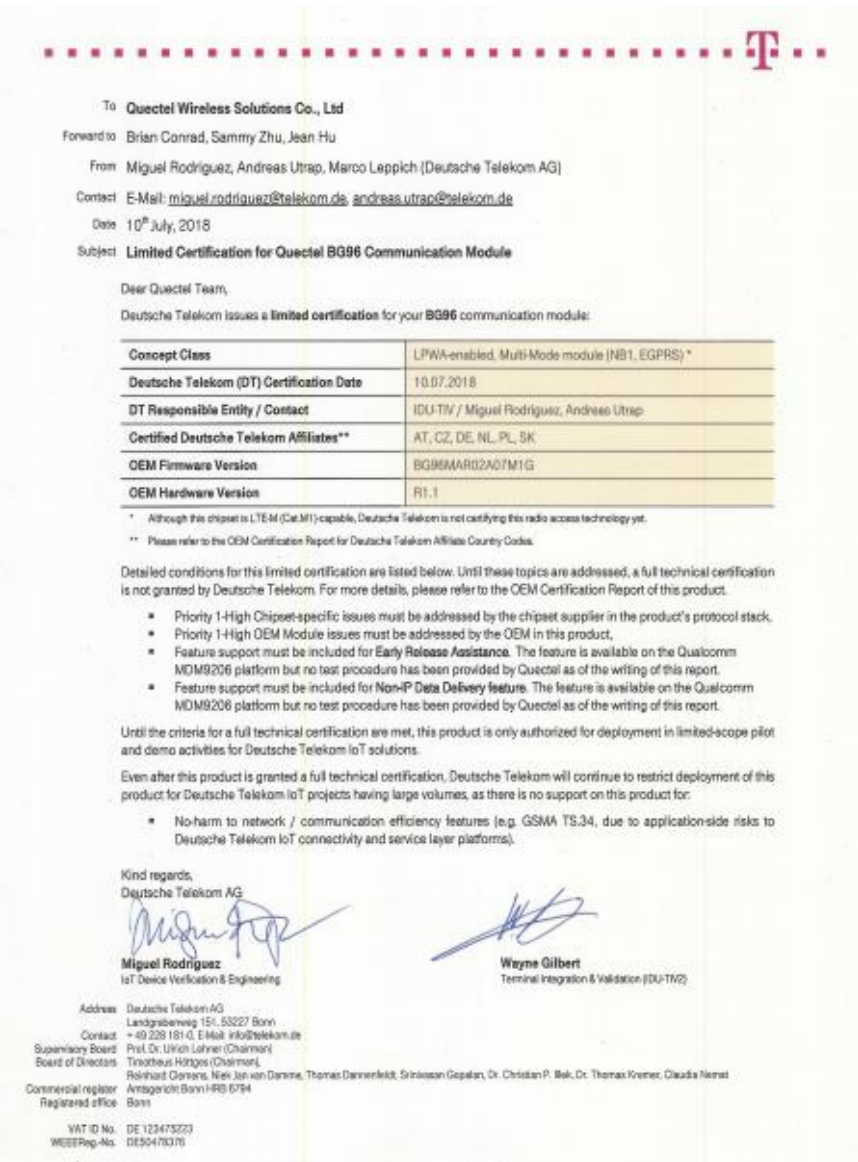
Manufacturer	: QUECTEL WIRELESS SOLUTIONS CO., LTD.
Country of Origin/Import	: CHINA
Technical Specification	: IMDA TS IOT
Type of Equipment	: NB-IoT Module
Brand/Trade Name	: Quectel
Model Name	: BG96
Frequency Range	(Tx) : 880 - 915 MHz 1710 - 1785 MHz (Rx) : 925 - 960 MHz 1805 - 1880 MHz
RF Power Output	: 23 dBm (LTE B8 NB-IoT) 23 dBm (LTE B3 NB-IoT)
Date of Registration	: 24 May 2018
Date of Expiry	: 30 April 2023

This is a computer generated printout. No signature is required.

BG96 Type Approvals (Deutsche Telekom/SoftBank)



ソフトバンク株式会社
デバイス技術本部 プロダクト企画統括部
プロダクト開発 1部プロジェクト4課
村田 雄治
2018年7月30日



ネットワーク接続連絡書

拝啓 貴社益々ご清祥のこととお喜び申し上げます。平素は格別のご高配を賜り、厚く御礼申し上げます。

以下の端末の最終ソフトウェアにおいて、弊社での接続許可に関する審査が完了しましたので、審査結果を連絡致します。

【メーカー名】	Quectel Wireless Solutions Co., Ltd
【モデル名】	BG96
【FW Ver】	BG96MAR03A02M1G
【MBN File Ver】	MBN_Softbank_0x05814803
【最終結果】	許可

上記結果を以って、上記の内容での弊社商用ネットワークへの接続を許可致します。

- ご注意
- ・本接続許可は、上記の最終ソフトウェアでの弊社商用ネットワークへの接続を許可するものであるため、本接続許可以降にソフトウェア変更が発生した場合には、改めて変更したソフトウェアでの接続許可が必要となります。
 - ・本接続許可は、御社にて実施する接続試験項目の範囲内における接続を許可するものであり、当該端末が弊社ネットワークに影響を与えないことを保証するものではありません。このため、本接続許可後に弊社より接続禁止通知が発行された場合には、直ちにネットワークへの接続を中止して頂くこと、及び接続禁止の解除通知が発行されるまで、接続中止を継続して頂くことを、本接続許可に基づく接続条件と致します。

以上

BG96 Type Approvals (Telefónica)

Telefónica

Quectel BG96 Global Technical Testing Acceptance Letter

Addressed to: Quectel
Manufacturer: Quectel
Device Type: M2M-IoT Module
Model: BG96
Version: BG96MAR02A08M1G_
Remarks: Sep 12 2018 version

Madrid, 9th October 2018

To whom it may concern,

It is a pleasure to inform you that the **Quectel BG96** M2M-IoT Module has obtained this Global Technical Testing Acceptance letter from Telefónica under certain disclaimers (see Annex).

The tested version includes:

- Module version:
 - Model: BG96
 - SW Version: BG96MAR02A08M1G (Sep 12th 2018)

This document validates the correct running of **Quectel BG96** within **Telefónica IoT/M2M platforms** in **Telefónica España** Mobile Communications Network and Infrastructure as a reference network, after tests executed by Dekra according to **IoT/M2M Module Certification** testing plan.

It is important to remark that Steering of Roaming / RAT Independent tests have been performed partially successful, so there are some pending bugs that should be solved in next future version of the module.

It is also important to remark that **Service Behaviour** tests have NOT been performed. Therefore, this document has no effect over **Service Behaviour** functionality or performance or any other functionality not tested. Device behaviour implementation is the responsibility of the final device/application.

The **IoT-M2M module** has been tested in a standalone configuration, so any other app/platform are not certified by Telefónica.

Highlights of the test:

Communication features	
2G working frequency bands:	850/900/1800/1900 MHz
3G working frequency bands:	N/A
IoT-NB working frequency bands:	E20
LTE-M working frequency bands:	E20 (only tested in laboratory environment)
Tested network:	Spain
M2M platform features	
M2M platform:	Movistar Kite Platform
SIM card type:	Telefónica Spain UICC Electrical profile: M02 / E05
APNs:	m2mtrial.telefonica.com m2mtest@movistar.es
Control Center:	Spain
Commercial plan:	SE_TDIG_FACT_PILOTO COMERCIAL Subscription Group: DoB_TDIG_Home_Y_Roaming
Smart M2M account:	TGR_Device OnBoarding

Telefónica

Main tested block cases:

General test cases
Certificates and documents
RAT Independent
SIM USIM
Conformance 2G
Conformance NB-IoT
Conformance LTE-M
SAT USAT
SMS
AT Commands
FOOTA/FUOMO
Satellite Positioning
Radio Testing (2 network configurations)
GPS
NB-IoT
LTE-M

Pending bugs

Bug number	Severity	Description
82745	P2	Network Reselection - EF_HPLMN is based in hours instead of minutes
82694	P4	Retry schema after PDP context reject cause 34 is not based on minutes
85745	P4	DuT is not able to request a second PDP Context after network sends two Deactivate PDP Context Requests.

Note: P1 - Blocker, P2 - Major, P3 - Minor, P4 - Information

(*) Please, see details in Annex.

Please transmit our congratulations to your team for the support and work during this project.

Best Regards,

Sergio Castillo Paniagua

Telefónica España
DSS Desarrollo de Servicios Gran Público
Dispositivos Móviles de Cliente

José Rubén García Muñoz

On behalf of:
CTO - Telefónica Global Resources
Desarrollo de Servicios, Ingeniería y Tecnología de Plataformas Globales
Plataformas de Servicio IoT

BG96 Type Approvals (Vodafone/Telus)



Vodafone Test Certificate

This is to certify that Vodafone Group has tested the following stand-alone module (NB-IoT part only) and found it acceptable for use on all Vodafone and Partner networks

MANUFACTURER : Quectel

MODEL : BG96
(HW: R1.1,
SW: BG96MAR02A07M1G)

TECHNOLOGY : NB-IoT

DATE : 24/09/2018


Nicholas Dixon
on behalf of Stephen Packer
Head of Platforms and Enablers (Vodafone Group Terminals)

This certificate is a statement that the module referred to above has been tested by Vodafone Group and is acceptable for use on all Vodafone and Partner networks. It is not a validation of the performance of the module other than in relation to acceptability on Vodafone networks at the time of testing. No warranty is given by Vodafone Group with regard to the module or its fitness for purpose. The use of this certificate and the Vodafone names are subject to the terms and conditions set out in the Vodafone Group Module Approval Services Agreement.

© 2011 Vodafone Group. VODAFONE and the Vodafone logo are trade marks of the Vodafone Group.

Document Reference Number: 0001

Date: May 15, 2018
To: Roddick Sun, Certification Engineer
7th Floor, Hongye Building,
No.1801 Hongmei Road, Xuhui District, Shanghai, China, 200233

Dear Mr. Roddick Sun

I am pleased to inform you that the validation of BG96 module is complete.

The letter constitutes a notice from TELUS that the device, as specified below, has achieved basic technical compatibility with the TELUS wireless network and can therefore now be used in integrations that can be activated on our network.

PTCRB Model	BG96
Module Name	BG96
Firmware Version	BG96MAR02A05M1G
Hardware Version	R1.1
SVN	05

Device activated on the TELUS wireless network shall have the above mentioned configuration of the module.

TELUS assumes no liability for any devices activated on the TELUS wireless network using BG96 Module.

On behalf of TELUS Wireless Devices team, I would like to express our appreciation for all outstanding support and cooperation received from your team during the technical validation of this product.

We are looking forward towards our future cooperation.

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

Signed:



Printed: Roddick Sun
Title: Certification Engineer
Date: March 5, 2018

TELUS Communications Company
200 Consilium Place, Suite 1600
Scarborough, ON

M1H3J3

Signed:



Printed: Jovan Mikarovski
Title: Senior Design Specialist
Date: March 5, 2018

QUECTEL
Build a Smarter World



BG96 Type Approvals (KC)



98C3-6AC3-EB68-3C20

방송통신기자재등의 적합인증서	
Certificate of Broadcasting and Communication Equipments	
상호 또는 성명 Trade Name or Applicant	주식회사 엠투엠넷
기자재명칭(명칭) Equipment Name	LTE 이동통신용 무선설비의 기기(기타)
기본모델명 Basic Model Number	BG96
파생모델명 Series Model Number	
인증번호 Certification No.	R-C-M2N-BG96
제조사/제조국가 Manufacturer/ Country of Origin	Quectel Wireless Solutions Co., Ltd. / 중국
인증연월일 Date of Certification	2018-09-03
기타 Others	
위 기자재는 「전파법」 제58조의2 제2항에 따라 인증되었음을 증명합니다. It is verified that foregoing equipment has been certificated under the Clause 2, Article 58-2 of Radio Waves Act.	
2018년(Year) 09월(Month) 03일(Day)	
국립전파연구원장 Director General of National Radio Research Agency	
※ 인증 받은 방송통신기자재는 반드시 "적합성평가표시"를 부착하여 유통하여야 합니다. 위반시 과태료 처분 및 인증이 취소될 수 있습니다.	

CA6B-F2A7-CAD8-A66B

방송통신기자재등의 적합인증서	
Certificate of Broadcasting and Communication Equipments	
상호 또는 성명 Trade Name or Applicant	Quectel Wireless Solutions Co., Ltd
기자재명칭(명칭) Equipment Name	LTE 이동통신용 무선설비의 기기(기타)
기본모델명 Basic Model Number	BG96
파생모델명 Series Model Number	
인증번호 Certification No.	R-C-QUT-BG96
제조사/제조국가 Manufacturer/ Country of Origin	Quectel Wireless Solutions Co., Ltd / 중국
인증연월일 Date of Certification	2018-10-19
기타 Others	
위 기자재는 「전파법」 제58조의2 제2항에 따라 인증되었음을 증명합니다. It is verified that foregoing equipment has been certificated under the Clause 2, Article 58-2 of Radio Waves Act.	
2018년(Year) 10월(Month) 19일(Day)	
국립전파연구원장 Director General of National Radio Research Agency	
※ 인증 받은 방송통신기자재는 반드시 "적합성평가표시"를 부착하여 유통하여야 합니다. 위반시 과태료 처분 및 인증이 취소될 수 있습니다.	

BG96 Type Approvals (SKT/US Cellular)



Certificate of Device
Device 적합 인증서

18-L-08

Trade Name or Applicant 상호 또는 성명	명투영넷
Basic Model Number 기본모델명	BG96
Manufacturer/Country of Origin 제조사/제조국가	명투영넷
Type Identification 형식기호	2018-L-14 모뎀 내장형 Cat.M1
Date of Certification 인증연월일	2018-12-14

This is to certify that the above device is approved on SK telecom's reliability test requirement.
위 단말은 SK telecom 내부 신뢰성 시험을 만족하여 인증되었음을 증명합니다.

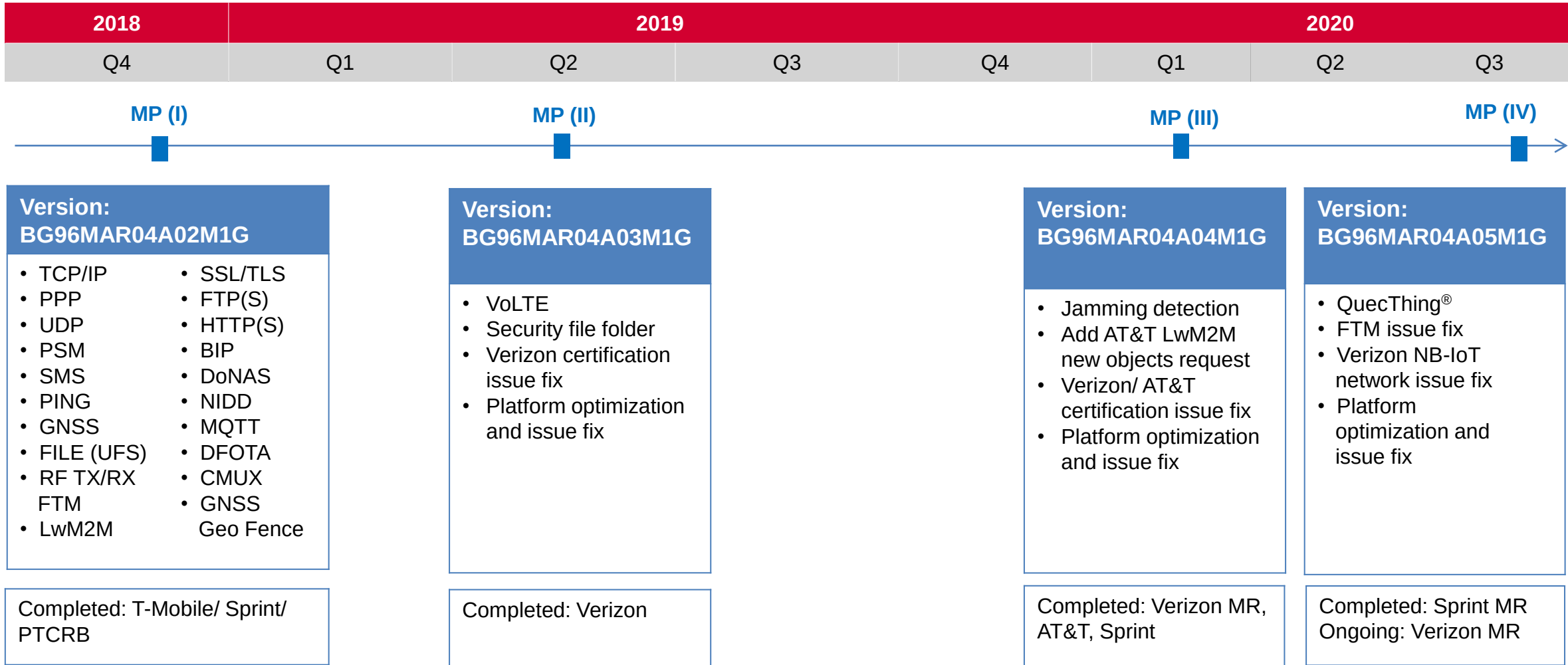
SK telecom



Device Engineering
HW / SW Conditional TA Approval
Quectel BG96
07/19/2019

Software / Firmware: BG96MAR02A07M1G
PRI: NA
Hardware Version : R1.1
Integrated Module: BG96
Band Supported : LTE: 2,4,5,12

BG96 (TX3.0, R04Axx) Development Schedule (North America)



The timeline will be adjusted according to the actual development status.

BG96 (TX3.0, R04Axx) Timeline (North America)



Project Stage

BG96 (TX3.0, R04Axx) MP

Carrier Certifications

Verizon/ AT&T/ T-Mobile/ Sprint/ Telstra

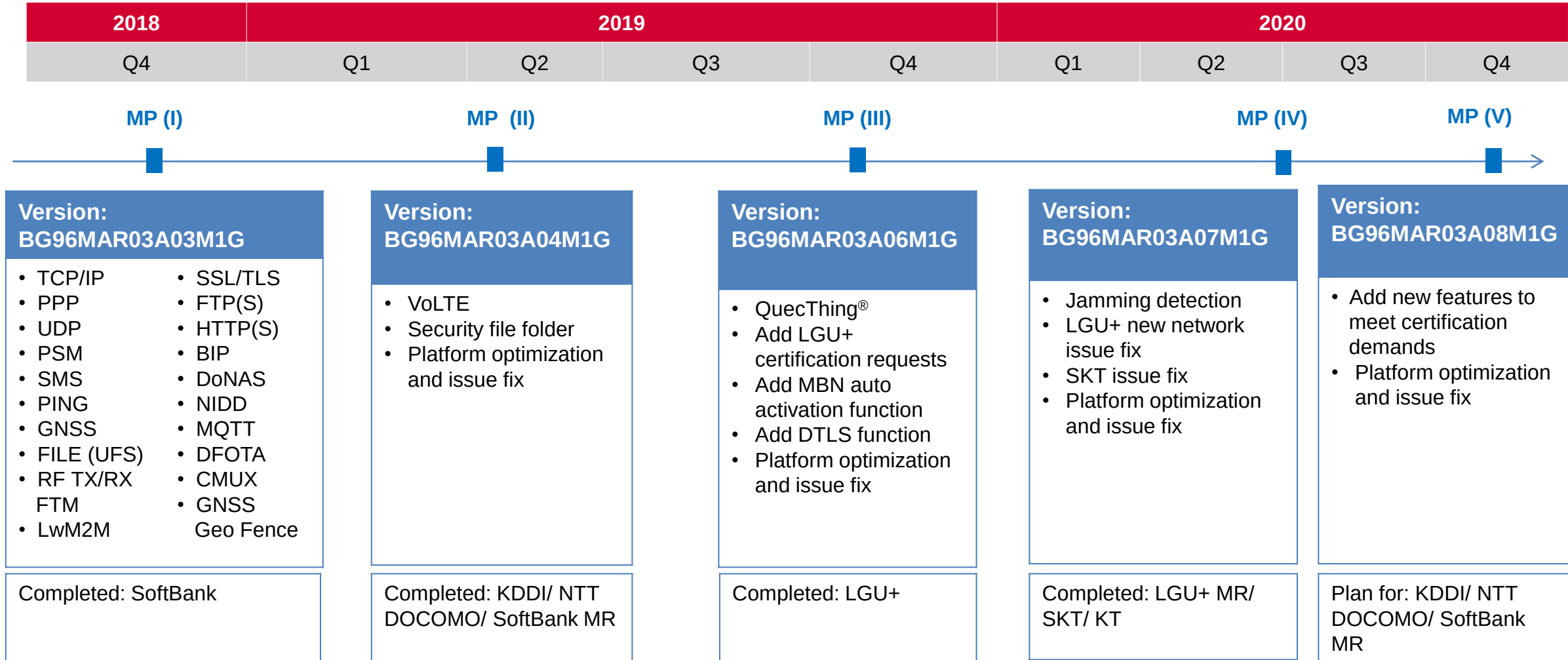


Regulatory Certifications

GCF/ CE/ PTCRB/ FCC/ IC/ RCM



BG96 (TX3.0, R03Axx) Development Schedule (Other Regions)



The timeline will be adjusted according to the actual development status.

BG96 (TX3.0, R03Axx) Certifications (Other Regions)



Project Stage

BG96 (TX3.0, R03Axx)

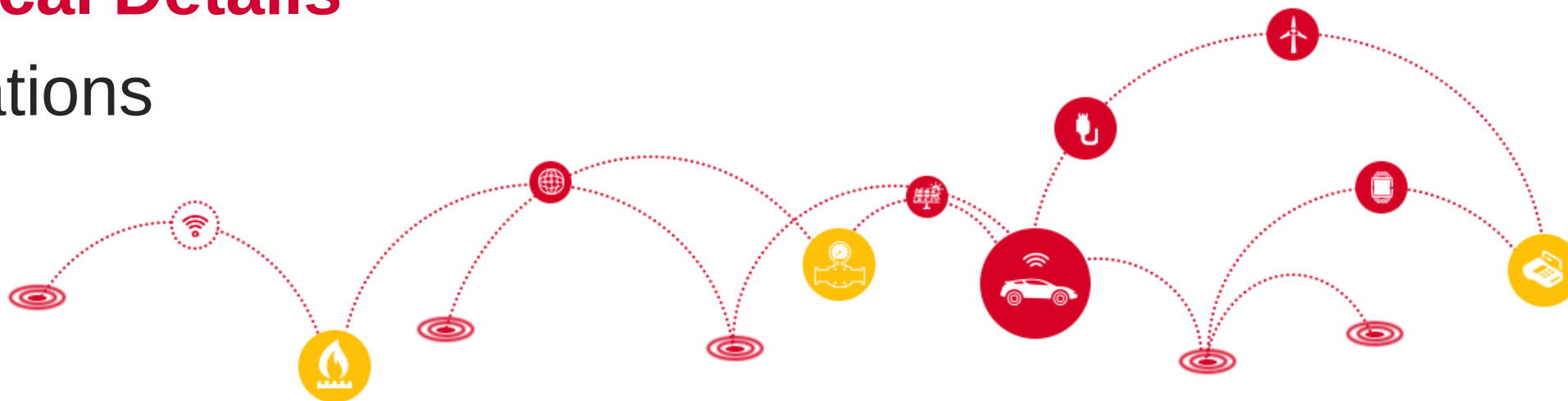
MP

Carrier Certifications

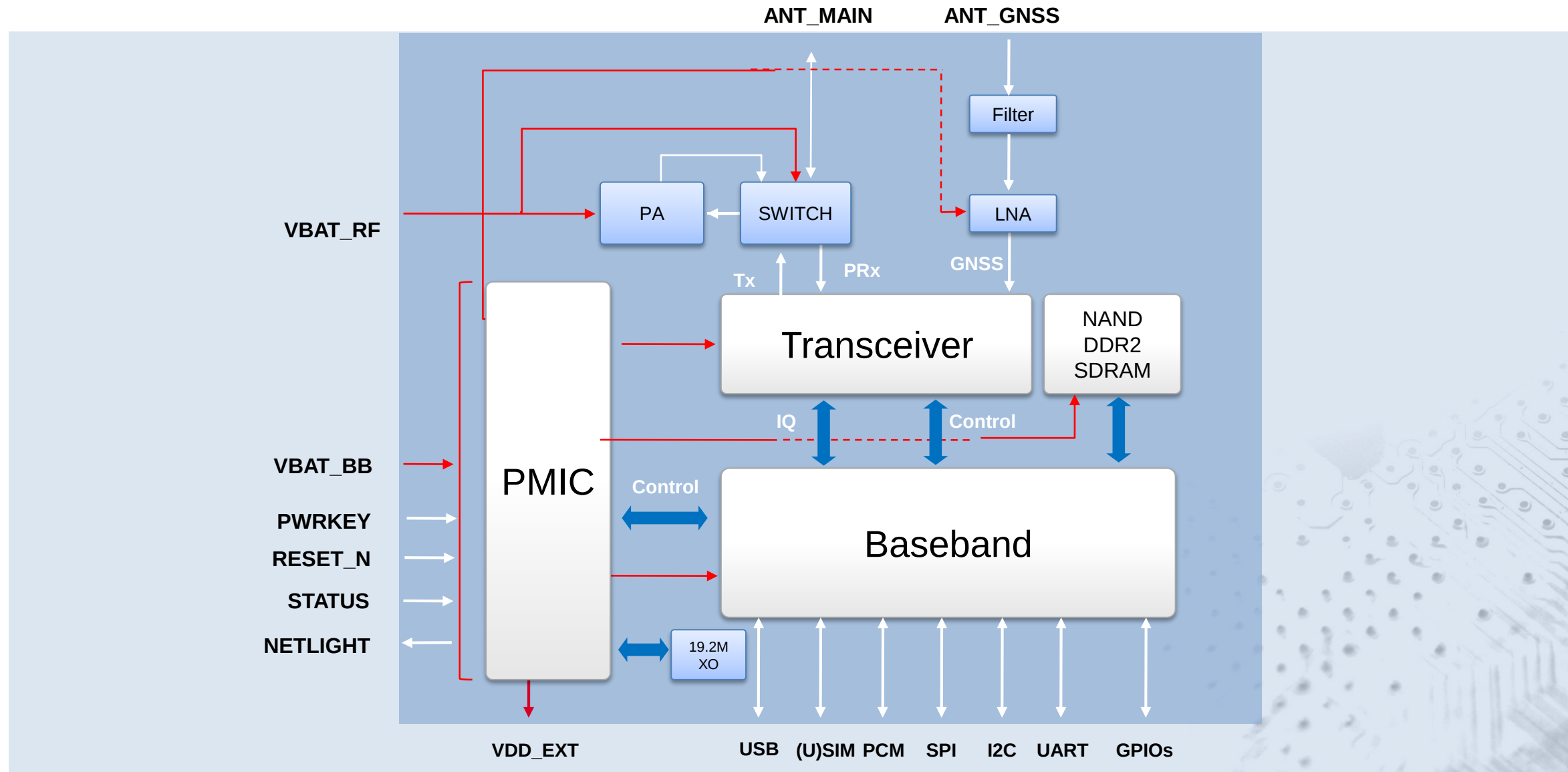
LGU+/ NTT DOCOMO/ SoftBank/ KDDI/ Telstra



Technical Background
LPWA Roadmap
Highlights & Specifications
Development Timeline
Technical Details
Applications



Hardware Architecture

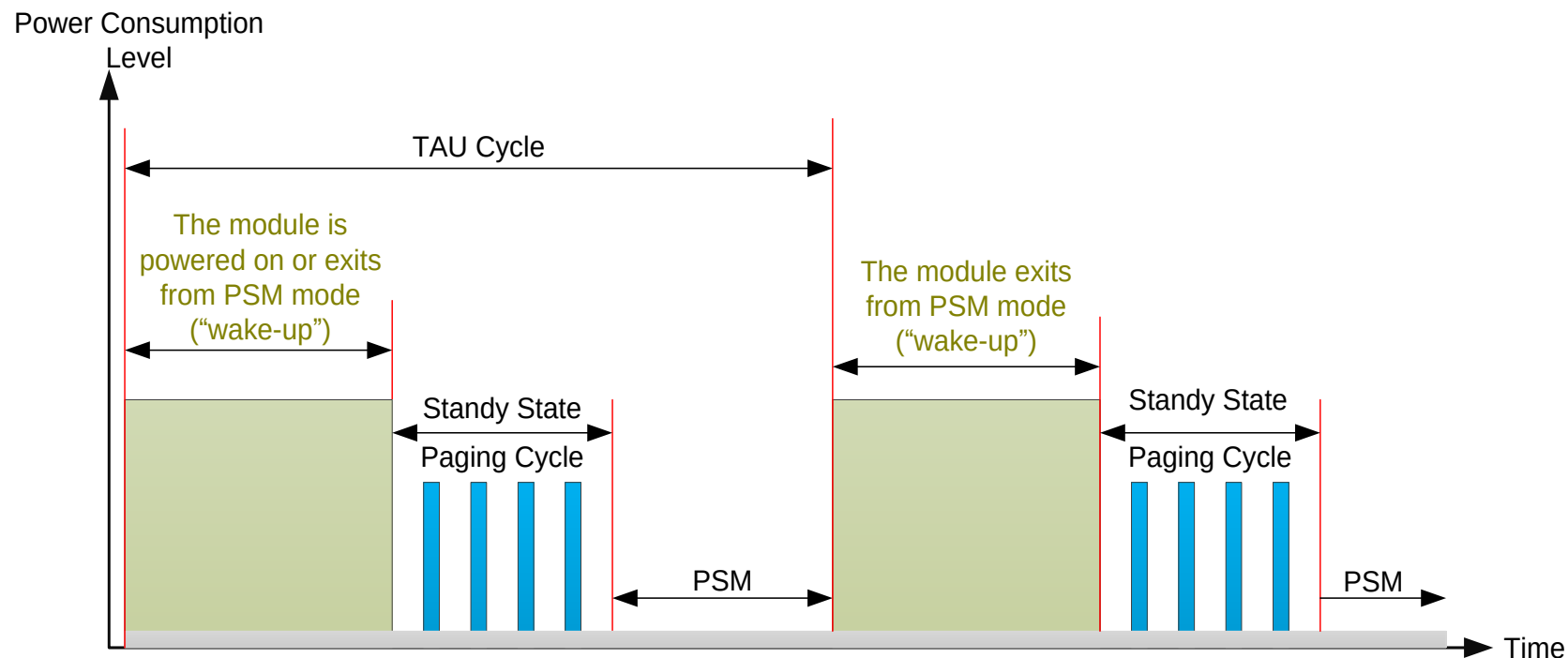


Key Technologies 1 - PSM

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.

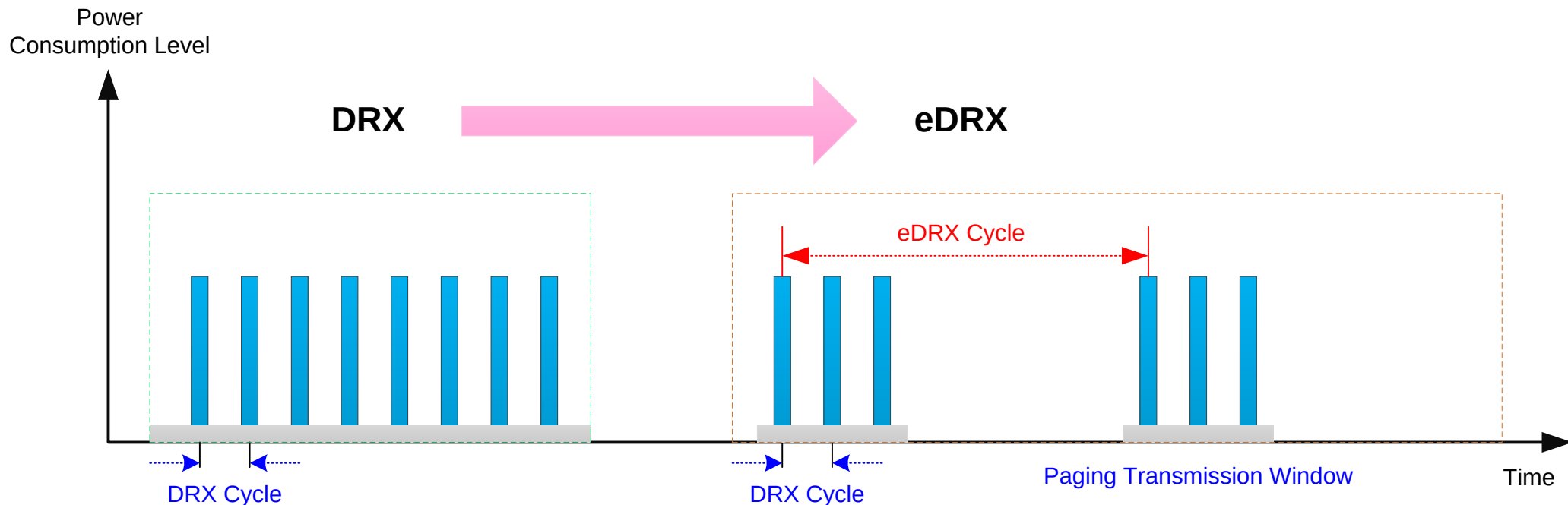


Key Technologies 2 - e-I-DRX

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.

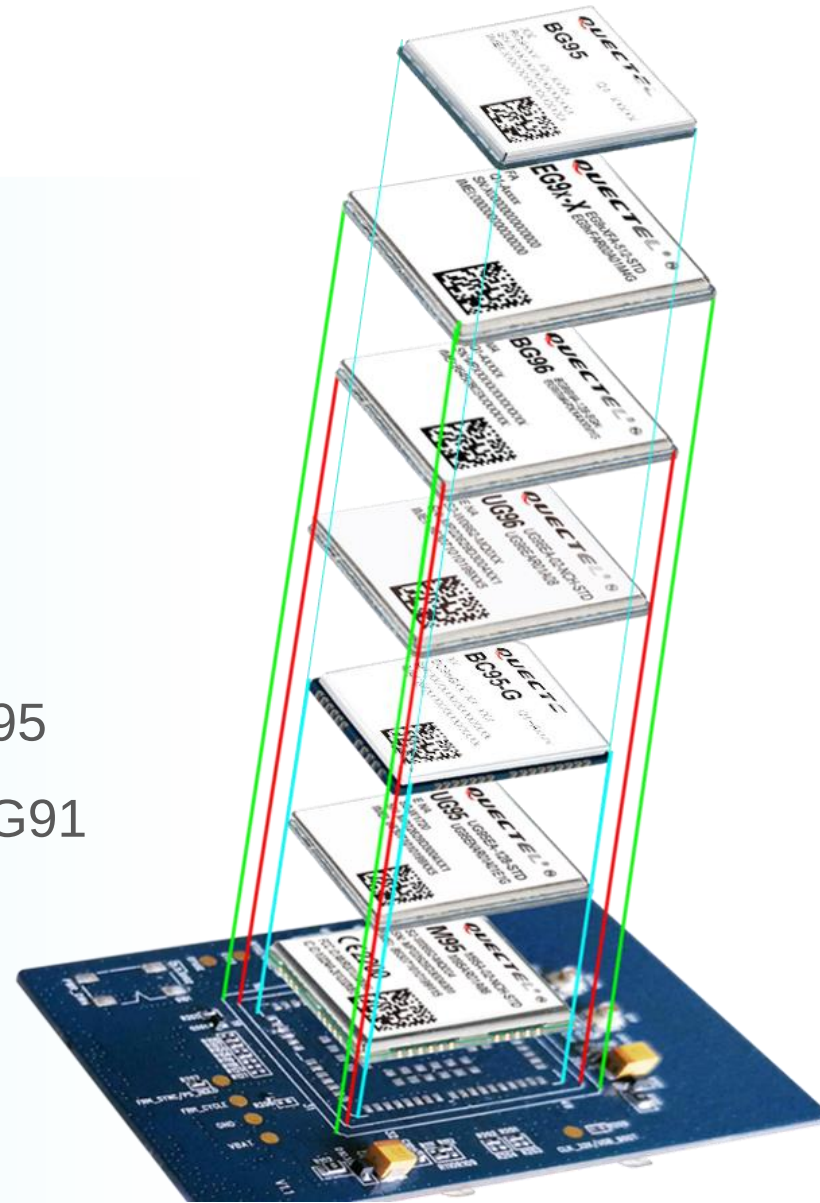
The following figure illustrates the DRX and e-I-DRX cycle of BG96 module.



Layout Compatibility

BG96 is compatible with the following Quectel modules:

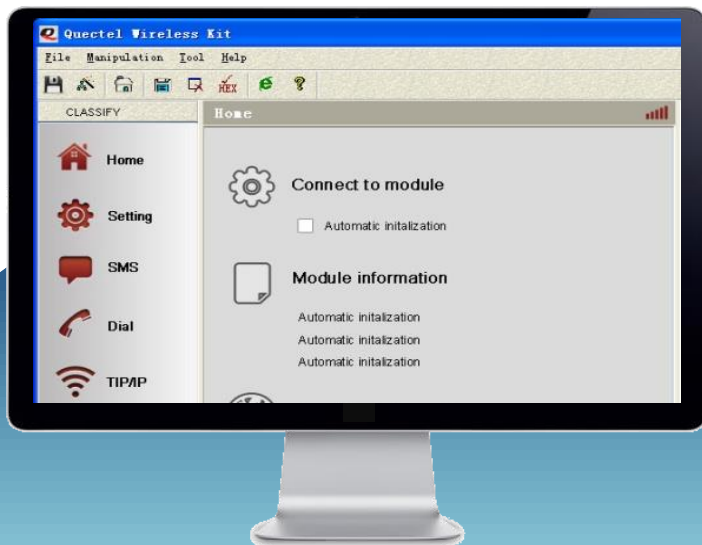
- GSM/GPRS module M95
- UMTS/HSPA modules UG96/UG95
- LTE Cat 4/Cat 1 module EG95/EG91
- LPWA module BC95-G/BG95



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

Quick Start

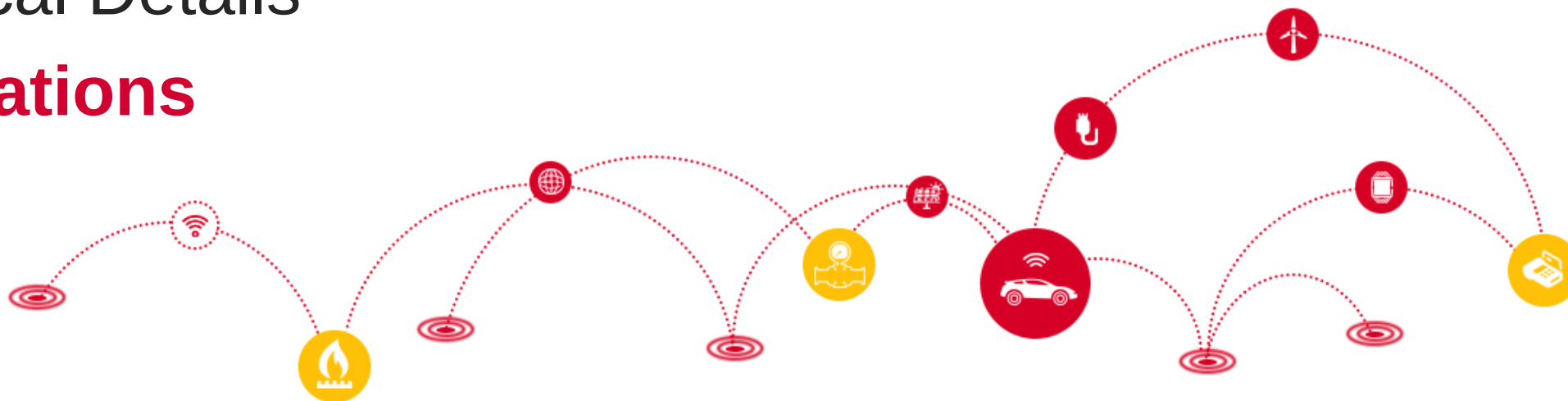
UMTS & LTE EVB Kit



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



Technical Background
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LPWA Application Scenarios

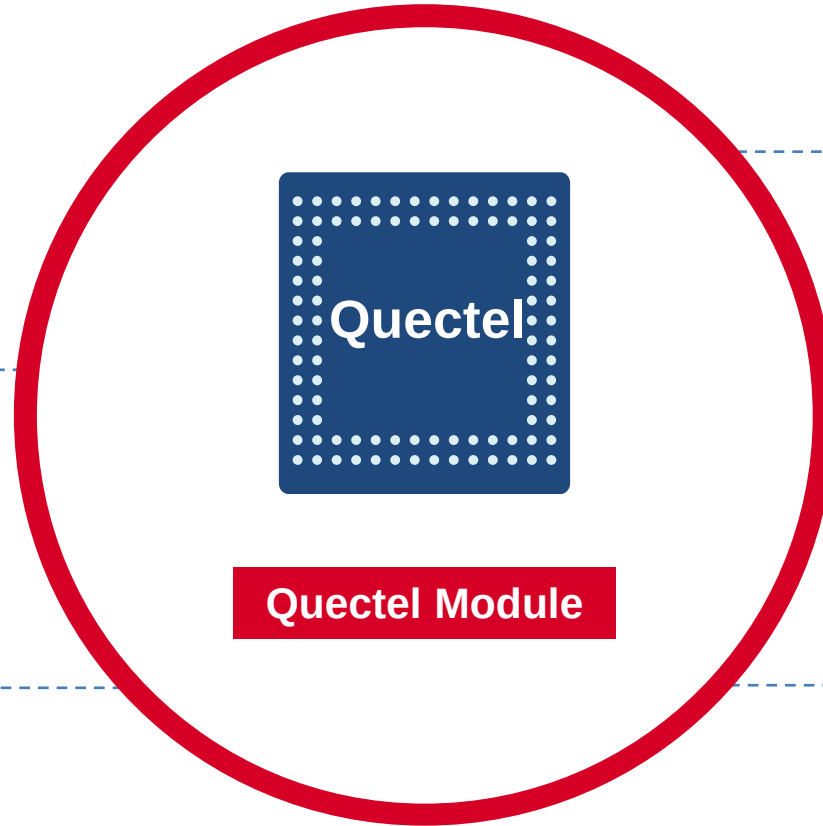


Public Utilities

- Water/Gas Metering
- Smart Parking
- Fire Hydrant
- Smoke Detector
- Street Lighting
- Smart Dustbin

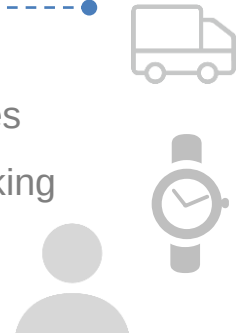
Industry & Agriculture

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



Smart Life

- Asset Tracking
- Wearable Devices
- Person/Pet Tracking



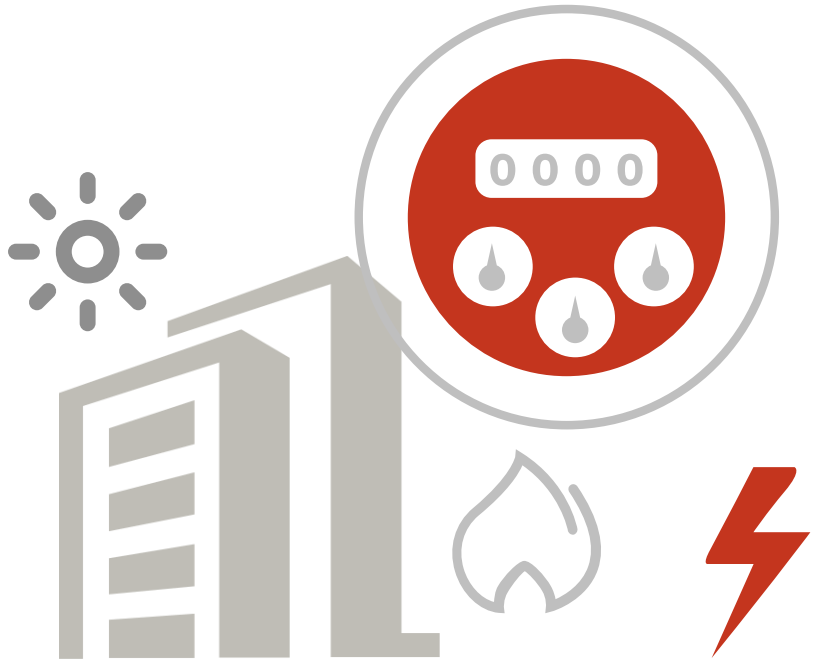
Smart Home

- Intelligent Door Lock
- Intelligent Control



Public Utilities – Smart Metering

By 2024, there will be
1.9 billion
connected meters ^①



Domestic Meters

Wind Power Plant

Factory

Workplace



Gas Meter



Water Meter



Heat Meter



Electricity Meter

Nuclear Power Plant

Thermal Power Plant

Hydraulic Power Plant

Renewable Energy

Ecological Vehicle

Photoelectricity

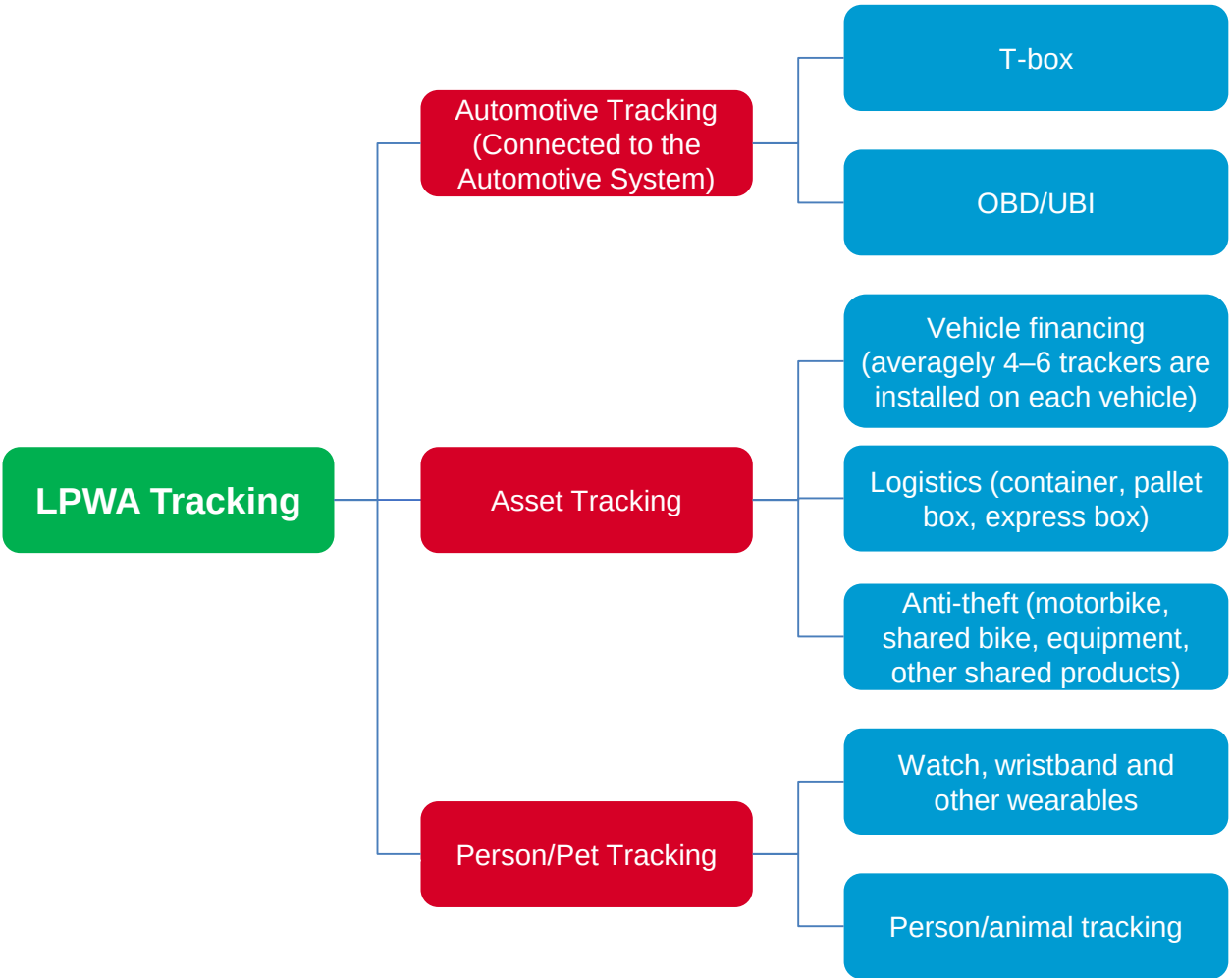
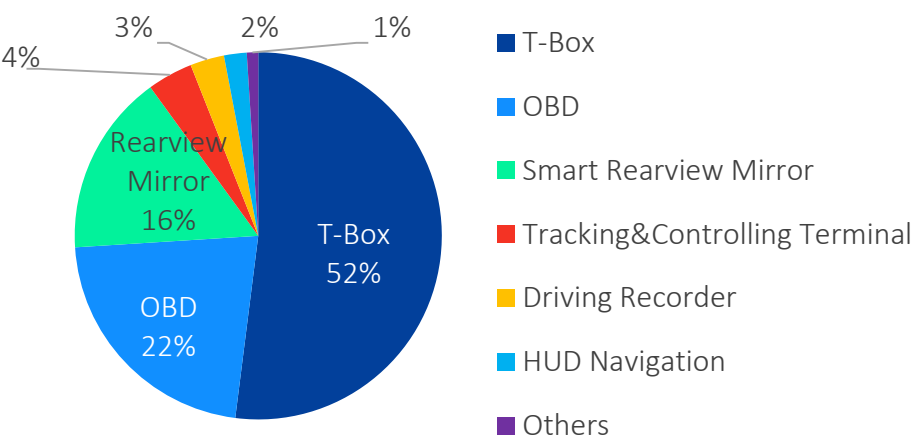
Public Utilities – Street Lighting



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

Smart Life – LPWA Tracker

According to CAICT ①, 10 million automotive wireless terminals were sold in 2018 in China:



Smart Home

Feature:

Non-inductive connection,
automation, machine learning

Trend:

Smarter, more convenient,
safer, more energy-efficient

Including:

White goods, black goods,
security, monitors, medical
treatment, healthcare,
wearables, wireless controllers,
etc.

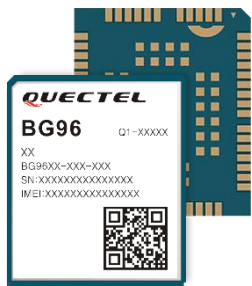


Industry & Agriculture – Multi-gas Detector



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

Industry & Agriculture – Robotic Lawn Mower



Smart Robotic Lawn Mower

(Based on Quectel LPWA module)



1 Wireless Communication
Easy Operation with APP



Positioning technology, easy installation

2 Intelligent Cutting
Smart Route



Smart algorithm

3 Wireless Charging
High-efficiency Cutting



Self charging

4 Safe & Eco-friendly
Low Noise and Power Consumption

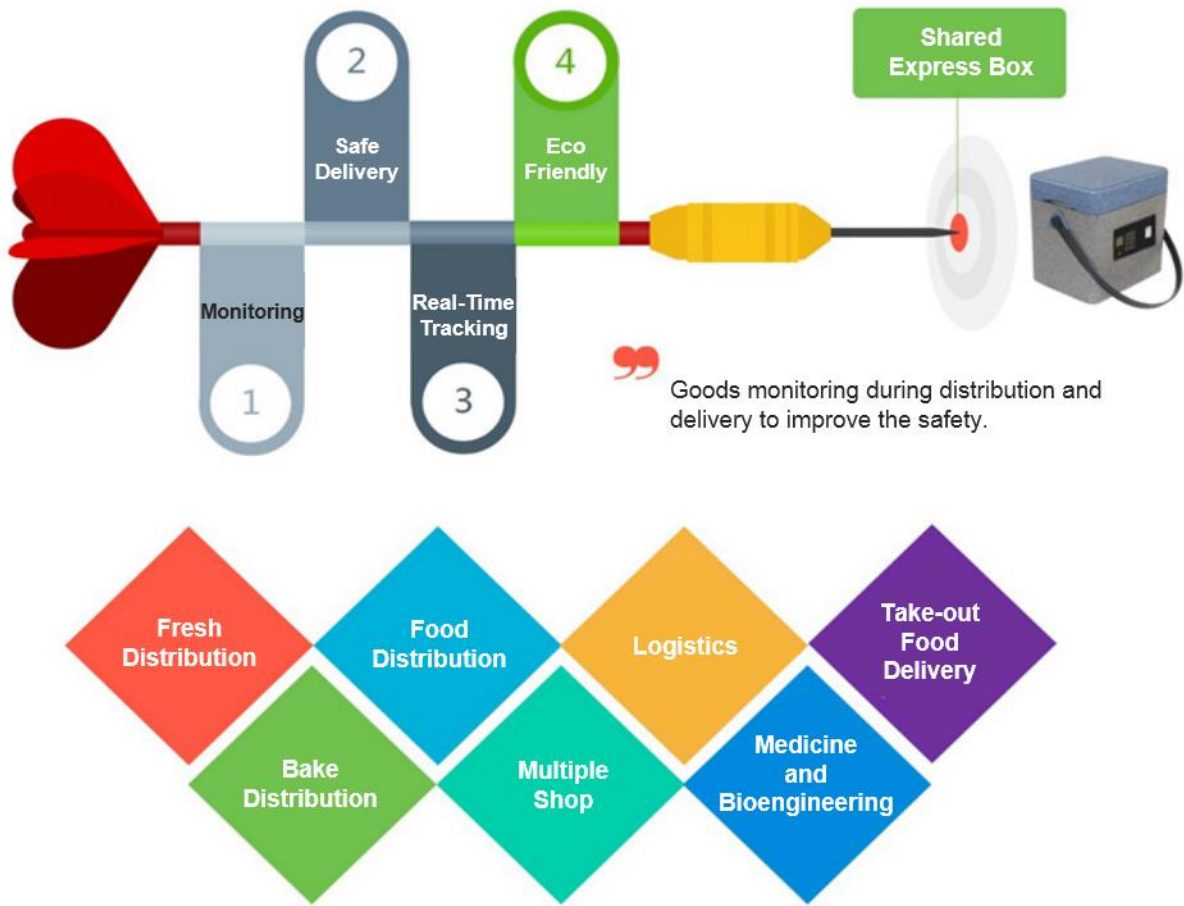


Lower noise

Smart Logistics – NB-IoT Shared Express Box



Smart IoT express box, featuring heat preservation, safe lock, real-time location, real-time temperature, integrates information technology and equipment IoT automation



Thank you!

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