

Quectel EC21&EC25 Series (Mini PCIe) Module

Introduction

August, 2020

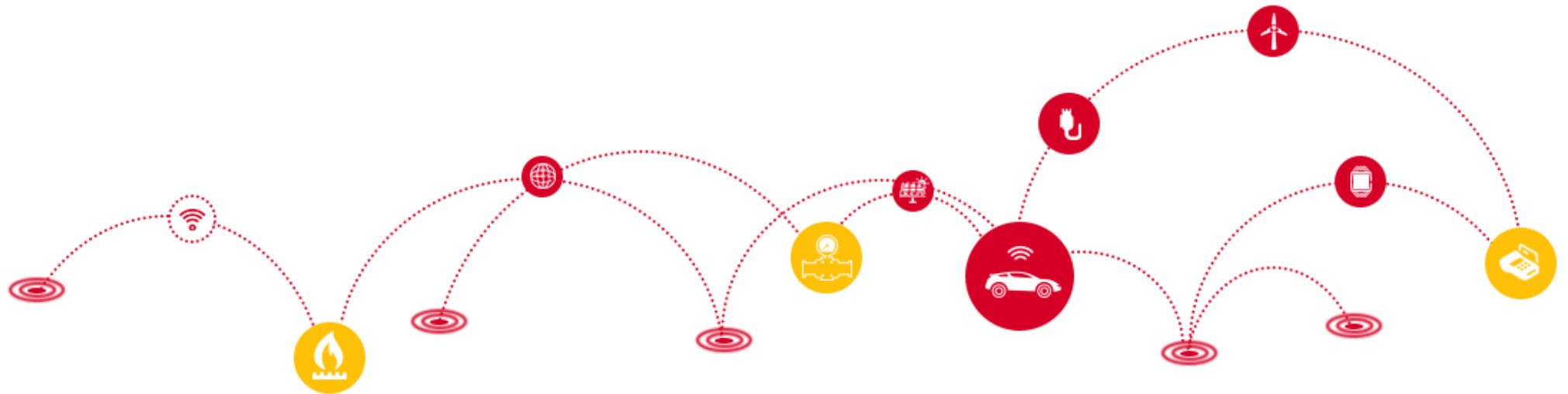
Roadmap

Highlights & Specifications

Development Timeline

Technical Details


Applications



EC21&EC25 Series Modules Roadmap


Product Lifetime > 2025

Cat 4




EC25 Series

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- E/ -A/ -V/ -J/ -AU



EC25-EU


- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- EMEA



EC25-AF


- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- North America

X Series




EC25-MX

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- Mexico




EC25-AFX

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- North America




EC25-EUX

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- EMEA




EC25-AUX

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- Latin America/ Australia/ New Zealand




EC25-AFXD (Data-only)

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- North America



EC21-AUX

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- Latin America/ Australia/ New Zealand




EC21-EUX

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- EMEA

Oct. 2019


NEW

Cat 1



EC21 Series

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- E/ -A/ -V/ -J/ -AU/ -AUT/ -KL



EC21-EU

- Compatible with EC2x Series/ EG2x-G/ UC200T Series
- Multi-mode LTE
- EMEA

MM.YYYY Estimated Engineering Sample Date

2016

2017

2018

2019/2020

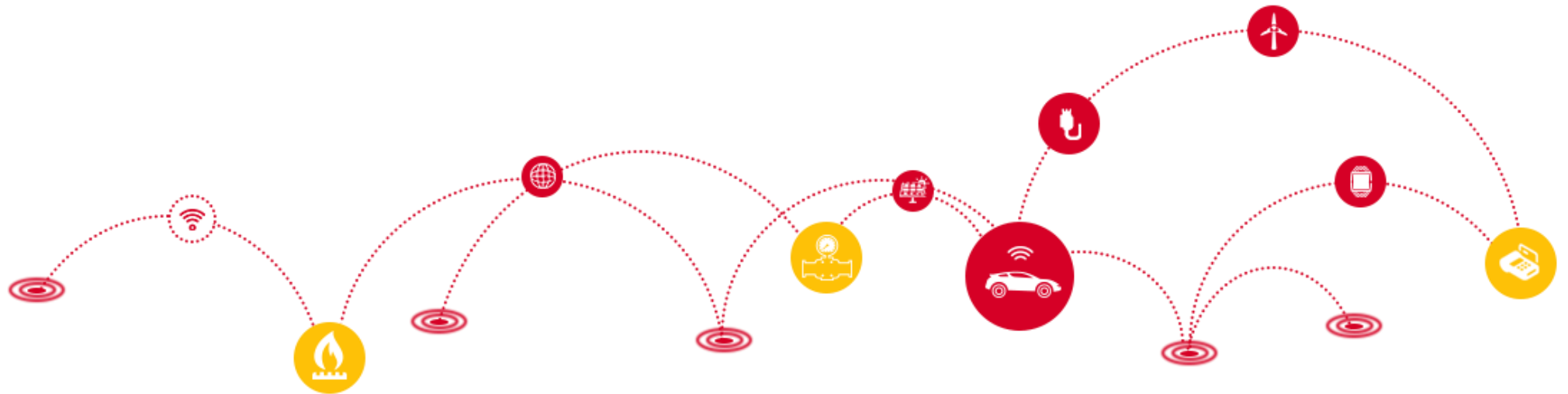
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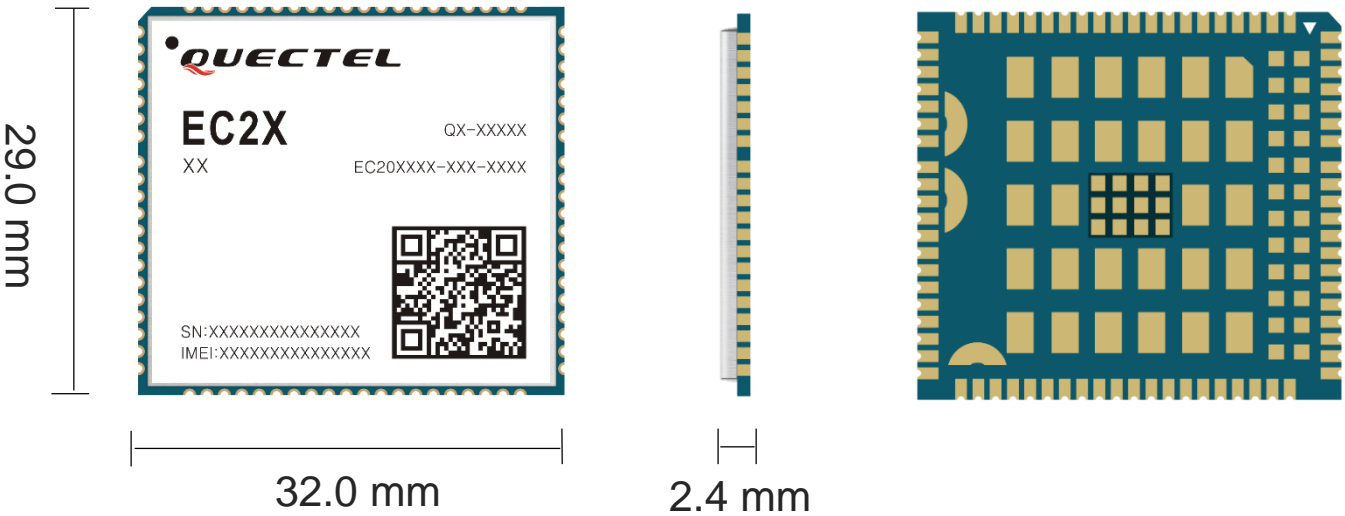
Applications



EC21/EC25 Series Mechanical Dimensions



Multi-Mode LTE Module (MDM9x07)



Length: 29.0 mm (± 0.15 mm)
Width: 32.0 mm (± 0.15 mm)
Height: 2.4 mm (± 0.2 mm)
Weight: Approx. 4.9 g

■ Multi-mode LTE Cat 1 Module



Build a Smarter World

Version: 1.3 | Status: Released

EC21 Series Mini PCIe Specifications



30.0 mm × 51.0 mm × 4.9 mm
10 Mbps DL/ 5 Mbps UL

■ Multi-mode LTE Cat 1 Module

Variant		EC21-E Mini PCIe	EC21-EU Mini PCIe	EC21-EUX Mini PCIe	EC21-A Mini PCIe	EC21-V Mini PCIe	EC21-AUT Mini PCIe	EC21-AU Mini PCIe	EC21-KL Mini PCIe	EC21-J Mini PCIe	EC21-AUX Mini PCIe
LTE	LTE-FDD	B1/ B3/ B5/ B7/ B8/ B20	B1/ B3/ B7/ B8/ B20/ B28A	B1/ B3/ B7/ B8/ B20/ B28A	B2/ B4/ B12	B4/ B13	B1/ B3/ B5/ B7/ B28	B1/ B2 ^① / B3/ B4/ B5/ B7/ B8/ B28	B1/ B3/ B5/ B7/ B8	B1/ B3/ B8/ B18/ B19/ B26	B1/ B2 ^① / B3/ B4/ B5/ B7/ B8/ B28
	LTE-TDD	/	/	/	/	/	/	B40	/	/	B40
UMTS		B1/ B5/ B8	B1/ B8	B1/ B8	B2/ B4/ B5	/	B1/ B5	B1/ B2/ B5/ B8	/	/	B1/ B2/ B5/ B8/ B4
EVDO/CDMA		/	/	/	/	/	/	/	/	/	/
GSM/EDGE		B3/ B8	B3/B8	B3/B8	/	/	/	Quad-band	/	/	Quad-band
Embedded GNSS		Optional	Optional	Optional	Optional	Optional	Optional	Optional	/	/	Optional
Region		EMEA/ Thailand/ India	EMEA/ Thailand	EMEA/ Thailand	North America	Verizon	Australia	Latin America/ Australia/ New Zealand	Korea	Japan	Latin America/ Australia/ New Zealand
Certification		Carrier: Vodafone/ Deutsche Telekom/ Telefónica* Regulatory: GCF/ CE/ RCM/ FAC Others: WHQL	Carrier: Deutsche Telekom Regulatory: GCF/ CE/ NCC/ RCM Others: WHQL	Regulatory: GCF/ CE/ RCM Others: WHQL	Carrier: AT&T/ T-Mobile/ Rogers/ Telus Regulatory: FCC/ PTCRB/ IC Others: WHQL	Carrier: Verizon Regulatory: GCF/ FCC Others: WHQL	Carrier: Telstra Regulatory: GCF/ RCM Others: WHQL	Carrier: Telstra Regulatory: FCC/ IC/ Anatel/ NCC/ JATE/ TELEC/ RCM Others: WHQL	Carrier: KT/ SKT Regulatory: KC Others: WHQL	Carrier: NTT DOCOMO/ KDDI Regulatory: JATE/ TELEC Others: WHQL	Regulatory: CE/ FCC/ Anatel/ NCC/ RCM Others: WHQL

“*” means under development/ongoing.

① means Rx-diversity is not supported.

EC25-E/-A/-V/-J/-AU Specifications



29.0 mm × 32.0 mm × 2.4 mm
150 Mbps DL/ 50 Mbps UL

■ Multi-mode LTE Cat 4 Module

Variant		EC25-E	EC25-A	EC25-V	EC25-J	EC25-AU
LTE	LTE-FDD	B1/ B3/ B5/ B7/ B8/ B20	B2/ B4/ B12	B4/ B13	B1/ B3/ B8/ B18/ B19/ B26	B1/ B2 ^① / B3/ B4/ B5/ B7/ B8/ B28
	LTE-TDD	B38/ B40/ B41	/	/	B41	B40
UMTS	WCDMA	B1/ B5/ B8	B2/ B4/ B5	/	B1/ B6/ B8/ B19	B1/ B2/ B5/ B8
	TD-SCDMA	/	/	/	/	/
EVDO/CDMA		/	/	/	/	/
GSM/EDGE		B3/ B8	/	/	/	Quad-band
Embedded GNSS		Optional	Optional	Optional	Optional	Optional
Wi-Fi/BT Interface		Y	Y	Y	Y	Y
Ethernet Interface		Y	Y	Y	Y	Y
Region		EMEA/ South Korea/ Thailand/ India	North America	Verizon	Japan	Latin America/ Australia/ New Zealand
Certification		Carrier: Vodafone/ Deutsche Telekom/ SKT/ Telefónica/ LGU+* Regulatory: GCF/ CE/ KC/ NCC/ RCM/ FAC/ NBTC/ ICASA Others: WHQL	Carrier: AT&T/ T-Mobile/ Rogers/ Telus Regulatory: FCC/ IC/ PTCRB Others: WHQL	Carrier: Verizon Regulatory: GCF/ FCC Others: WHQL	Carrier: NTT DOCOMO/ SoftBank/ KDDI Regulatory: JATE/ TELEC Others: WHQL	Carrier: Telstra Regulatory: GCF/ FCC/ Anatel/ NCC/ RCM Others: WHQL

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① means Rx-diversity is not supported.

EC25-E/-A/-V/-J/-AU Mini PCIe Specifications



30.0 mm × 51.0 mm × 4.9 mm
150 Mbps DL/ 50 Mbps UL

Multi-mode LTE Cat 4 Module

Variant		EC25-E Mini PCIe	EC25-A Mini PCIe	EC25-V Mini PCIe	EC25-J Mini PCIe	EC25-AU Mini PCIe
LTE	LTE-FDD	B1/ B3/ B5/ B7/ B8/ B20	B2/ B4/ B12	B4/ B13	B1/ B3/ B8/ B18/ B19/ B26	B1/ B2 ^① / B3/ B4/ B5/ B7/ B8/ B28
	LTE-TDD	B38/ B40/ B41	/	/	B41	B40
UMTS	WCDMA	B1/ B5/ B8	B2/ B4/ B5	/	B1/ B6/ B8/ B19	B1/ B2/ B5/ B8
	TD-SCDMA	/	/	/	/	/
EVDO/CDMA		/	/	/	/	/
GSM/EDGE		B3/ B8	/	/	/	Quad-band
Embedded GNSS		Optional	Optional	Optional	Optional	Optional
Region		EMEA/ South Korea/ Thailand/ India	North America	Verizon	Japan	Latin America/ Australia/ New Zealand
Certification		Carrier: Vodafone/ Deutsche Telekom/ SKT/ Telefónica/ LGU+* Regulatory: GCF/ CE/ KC/ NCC/ RCM/ FAC/ NBTC/ ICASA Others: WHQL	Carrier: AT&T/ T-Mobile/ Rogers/ Telus Regulatory: FCC/ IC/ PTCRB Others: WHQL	Carrier: Verizon Regulatory: GCF/ FCC Others: WHQL	Carrier: NTT DOCOMO/ SoftBank/ KDDI Regulatory: JATE/ TELEC Others: WHQL	Carrier: Telstra Regulatory: GCF/ FCC/ Anatel/ NCC/ RCM Others: WHQL

EC25-AF/-AFX/-AFXD/-EU/-EUX/-MX/-AUX/ Specifications



29.0 mm × 32.0 mm × 2.4 mm
150 Mbps DL/ 50 Mbps UL

■ Multi-mode LTE Cat 4 Module

Variant		EC25-AF	EC25-AFX	EC25-AFXD (Data-only)	EC25-EU	EC25-EUX	EC25-MX	EC25-AUX
LTE	LTE-FDD	B2/ B4/ B5/ B12/ B13/ B14/ B66/ B71	B2/ B4/ B5/ B12/ B13/ B14/ B66/ B71	B2/ B4/ B5/ B12/ B13/ B14/ B66/ B71	B1/ B3/ B7/ B8/ B20/ B28A	B1/ B3/ B7/ B8/ B20/ B28A	B2/ B4/ B5/ B7/ B28/ B66	B1/ B2 ^① / B3/ B4/ B5/ B7/ B8/ B28
	LTE-TDD	/	/	/	B38/ B40/ B41	B38/ B40/ B41	/	B40
UMTS	WCDMA	B2/ B4/ B5	B2/ B4/ B5	B2/ B4/ B5	B1/ B8	B1/ B8	B2/ B4/ B5	B1/ B2/ B5/ B8/ B4
	TD-SCDMA	/	/	/	/	/	/	/
EVDO/CDMA		/	/	/	/	/	/	/
GSM/EDGE		/	/	/	B3/ B8	B3/ B8	/	Quad-band
Embedded GNSS		Optional	Optional	Optional	Optional	Optional	/	Optional
Wi-Fi/BT Interface		Y	/	/	Y	/	/	/
Ethernet Interface		Y	Y	Y	Y	Y	Y	Y
Region		North America	North America	North America	EMEA/ Thailand	EMEA/ Thailand	Mexico	Latin America/ Australia/ New Zealand
Certification		Carrier: Verizon/ AT&T (FirstNet)/ T-Mobile/ U.S. Cellular/ Rogers/ Telus Regulatory: GCF/ FCC/ PTCRB/ IC Others: WHQL	Carrier: Verizon/ AT&T (FirstNet) Regulatory: GCF/ FCC/ PTCRB/ IC Others: WHQL	Carrier: Verizon*/ AT&T (FirstNet)*/ T-Mobile* Regulatory: GCF/ FCC/ PTCRB Others: WHQL	Carrier: Deutsche Telekom/ British Telecom Regulatory: GCF/ CE/ NCC/ RCM Others: WHQL	Regulatory: GCF/ CE/ RCM/ NCC Others: WHQL	Regulatory: FCC/ PTCRB/ IFETEL Others: WHQL	Regulatory: CE/ FCC/ Anatel/ NCC/ RCM/ ICASA* Others: WHQL

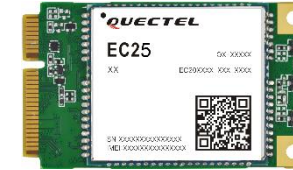
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① means Rx-diversity is not supported.

EC25-AF/-AFX/-AFXD/-EU/-EUX/-MX/-AUX

Mini PCIe Specifications



51.0 mm × 30.0 mm × 4.9 mm
150 Mbps DL/ 50 Mbps UL

■ Multi-mode LTE Cat 4 Module

Variant		EC25-AF Mini PCIe	EC25-AFX Mini PCIe	EC25-AFXD Mini PCIe (Data-only)	EC25-EU Mini PCIe	EC25-EUX Mini PCIe	EC25-MX Mini PCIe	EC25-AUX Mini PCIe
LTE	LTE-FDD	B2/ B4/ B5/ B12/ B13/ B14/ B66/ B71	B2/ B4/ B5/ B12/ B13/ B14/ B66/ B71	B2/ B4/ B5/ B12/ B13/ B14/ B66/ B71	B1/ B3/ B7/ B8/ B20/ B28A	B1/ B3/ B7/ B8/ B20/ B28A	B2/ B4/ B5/ B7/ B28/ B66	B1/ B2 ^① / B3/ B4/ B5/ B7/ B8/ B28
	LTE-TDD	/	/	/	B38/ B40/ B41	B38/ B40/ B41	/	B40
UMTS	WCDMA	B2/ B4/ B5	B2/ B4/ B5	B2/ B4/ B5	B1/ B8	B1/ B8	B2/ B4/ B5	B1/ B2/ B5/ B8/ B4
	TD-SCDMA	/	/	/	/	/	/	/
EVDO/CDMA		/	/	/	/	/	/	/
GSM/EDGE		/	/	/	B3/ B8	B3/ B8	/	Quad-band
Embedded GNSS		Optional	Optional	Optional	Optional	Optional	/	Optional
Region		North America	North America	North America	EMEA/ Thailand	EMEA/ Thailand	Mexico	Latin America/ Australia/ New Zealand
Certification		Carrier: Verizon/ AT&T (FirstNet)/ T-Mobile/ Rogers/ Telus Regulatory: GCF/ FCC/ PTCRB/ IC Others: WHQL	Carrier: Verizon/ AT&T (FirstNet)* Regulatory: GCF/ FCC/ PTCRB/ IC Others: WHQL	Carrier: Verizon*/ AT&T (FirstNet)*/ T-Mobile* Regulatory: GCF/ FCC/ PTCRB Others: WHQL	Carrier: Deutsche Telekom Regulatory: GCF/ CE/ NCC/ RCM Others: WHQL	Regulatory: GCF/ CE/ RCM/ NCC Others: WHQL	Regulatory: FCC/ PTCRB/ IFETEL Others: WHQL	Regulatory: CE/ FCC/ Anatel/ NCC/ RCM Others: WHQL

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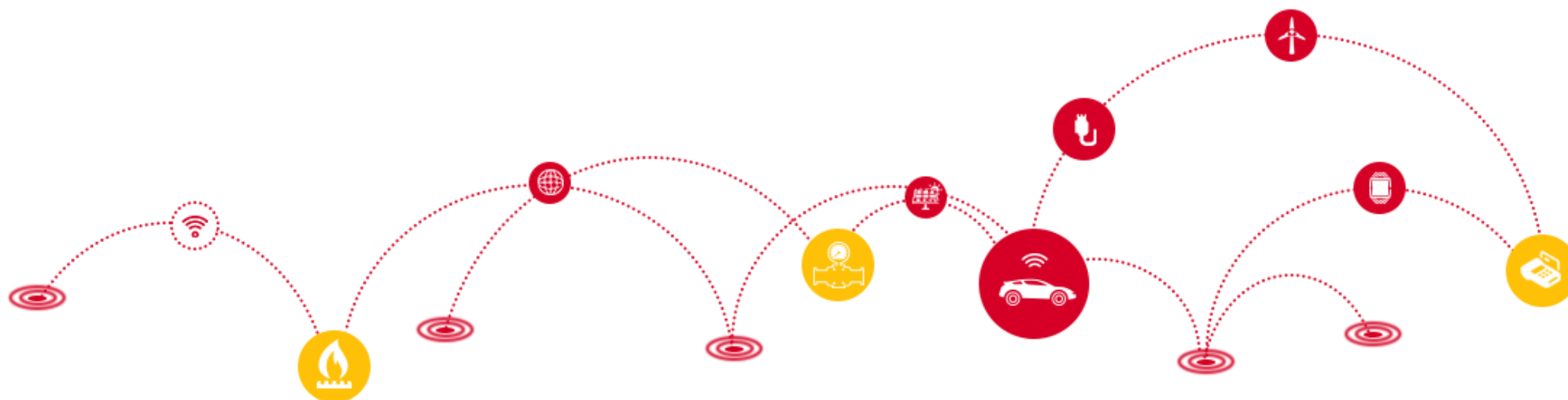
Roadmap

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EC25-AF Timeline



2019/2020

Project Stage

EC25-AF MP

Carrier Certification Schedule

Verizon/ T-Mobile/ AT&T (FirstNet)/ U.S. Cellular/ Rogers/ Telus



Regulatory Certifications

GCF/ FCC/ IC/ PTCRB



Others

WHQL

EC25-AFX Timeline



2019					2020							
Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.

Project Stage

EC25-AFX 

Carrier Certification Certifications

Verizon/ AT&T (With FirstNet)^①



Regulatory Certifications

GCF/ FCC/ IC/ PTCRB



Others

WHQL

^① This is EC25-AFX's AT&T (With FirstNet) certification, and the certification of EC25-AFX Mini PCIe is expected to be completed in late August 2020.

EC25-AFXD (Data-only) Timeline



2019					2020								
Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.

Project Schedule



ES: Engineering samples ready. Basic functions are available for customers' simple demo purpose.
CS: Commercial samples ready. Stable hardware design and quite stable software design. New software features can be added upon request.
MP: Hardware and software ready for mass production. For certification status, please refer to the "certification schedule".

Carrier Certification Schedule



Regulatory Certifications

GCF/ FCC/ PTCRB Completed

Others

WHQL Completed

EC21-EUX Timeline



Project Stage

EC21-EUX MP

Regulatory Certifications

GCF/ CE/ RCM



Others

WHQL

EC25-EUX Timeline



2019/2020

Project Stage

EC25-EUX MP

Regulatory Certifications

GCF/ CE/ NCC/ RCM



Others

WHQL

EC25-MX Timeline



2019/2020

Project Stage

EC25-MX 

Regulatory Certifications

FCC/ PTCRB^①/ IFETEL



Others

WHQL

^① The PTCRB is not full certificate, and is only for authentication and ciphering cases.

EC21-AUX Timeline



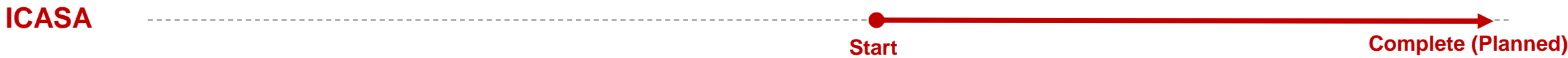
2019	2020											
Oct.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Stage

EC21-AUX MP

Regulatory Certification Schedule

CE/ FCC/ Anatel/ NCC/ RCM Completed



Others

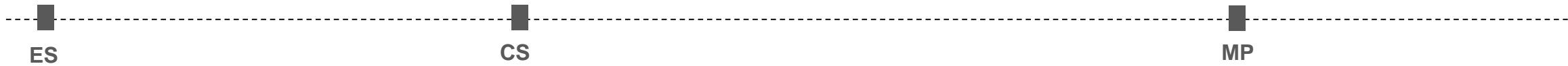
WHQL Completed

EC25-AUX Timeline



2019	2020											
Oct.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule



ES: Engineering samples ready. Basic functions are available for customers’ simple demo purpose.
CS: Commercial samples ready. Stable hardware design and quite stable software design. New software features can be added upon request.
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Regulatory Certification Schedule

CE/ FCC/ Anatel/ NCC/ RCM Completed



Others

WHQL Completed

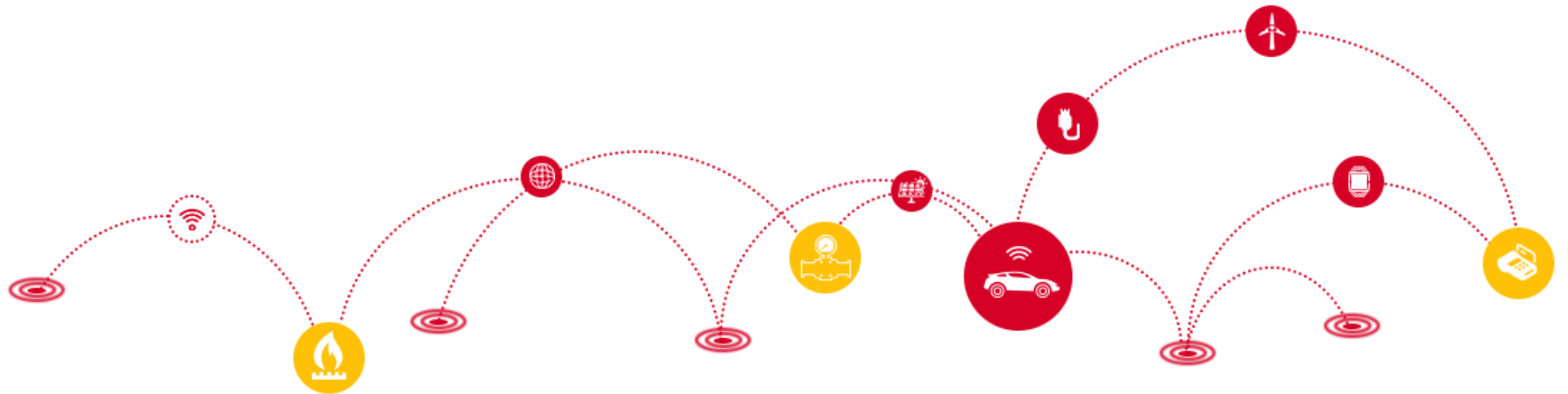
Roadmap

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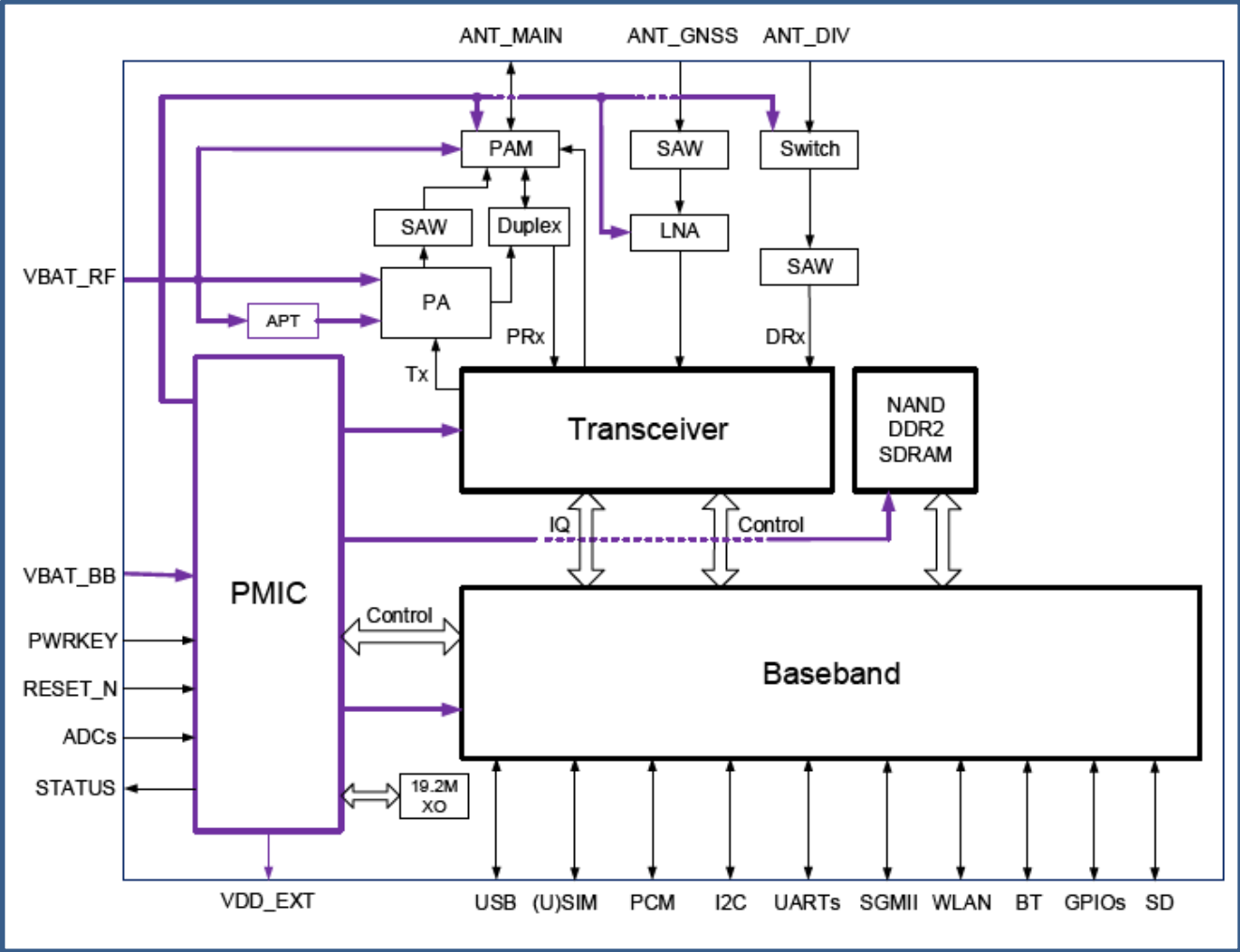
Development Timeline

Technical Details

Applications



Hardware Architecture



The block diagram is for reference only and varies among different modules.

Software Advantages

USB Serial Driver

- Windows 7/8/8.1/10
- Linux 2.6~5.4
- Android 4.x~9.x

GNSS & RIL & NDIS & MBIM & GobiNet & QMI_WWAN Drivers

- GNSS Driver:
Android 4.x~9.x
- RIL Driver:
Android 4.x~10.x
- NDIS Driver:
Windows 7/8/8.1/10
- MBIM Driver:
Windows 8/8.1/10, Linux 3.18~5.4
- GobiNet Driver:
Linux 2.6~5.4
- QMI_WWAN Driver:
Linux 3.4~5.4

Quality Guarantee

- Reliable network protocols
- Steady flash protection mechanism
- Superior audio algorithms
- High sensitivity

Special Features

- QuecOpen®^①
- PSM*

Flexible Applications

- (U)SIM card detection
- DTMF

Enhanced AT Commands

- Standard V.25ter AT commands
- 3GPP TS 27.007 (GSM 07.07)
- 3GPP TS 27.005 (GSM 07.05 SMS)
- TCP/IP stack AT commands
- STK (SIM Application Toolkit)

** means under development.*

① means QuecOpen® function is optional.

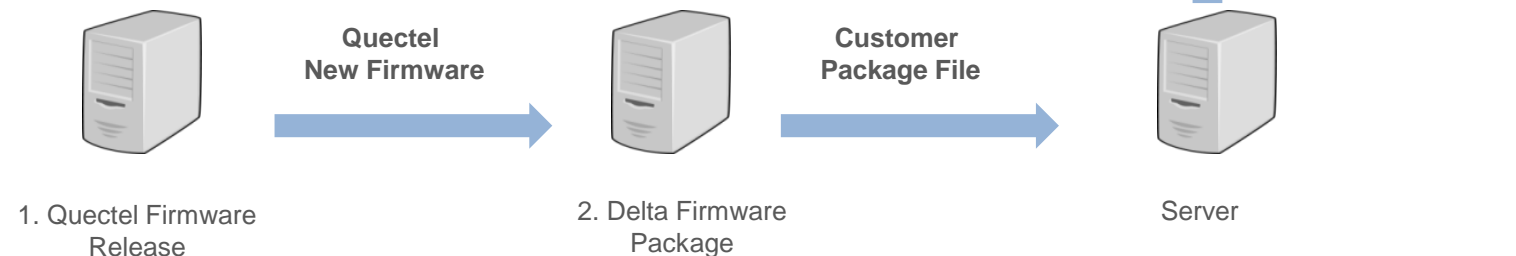
DFOTA

DFOTA refers to Delta Firmware Upgrade Over-The-Air, which enables customers to upgrade firmware wirelessly.

In DFOTA, a delta firmware package, which only contains the differences between the source and the target firmware versions, occupies small memory. Thus the firmware can be upgraded quickly over LTE/WCDMA/GSM/GPRS networks, eliminating the need for users to bring the device to a service facility.

Firmware Upgrade Process via DFOTA

- Get Delta Firmware Package
- Put Delta Package on Server
- Execute **AT+QFOTADL** Command
- Download and Upgrade Firmware Automatically

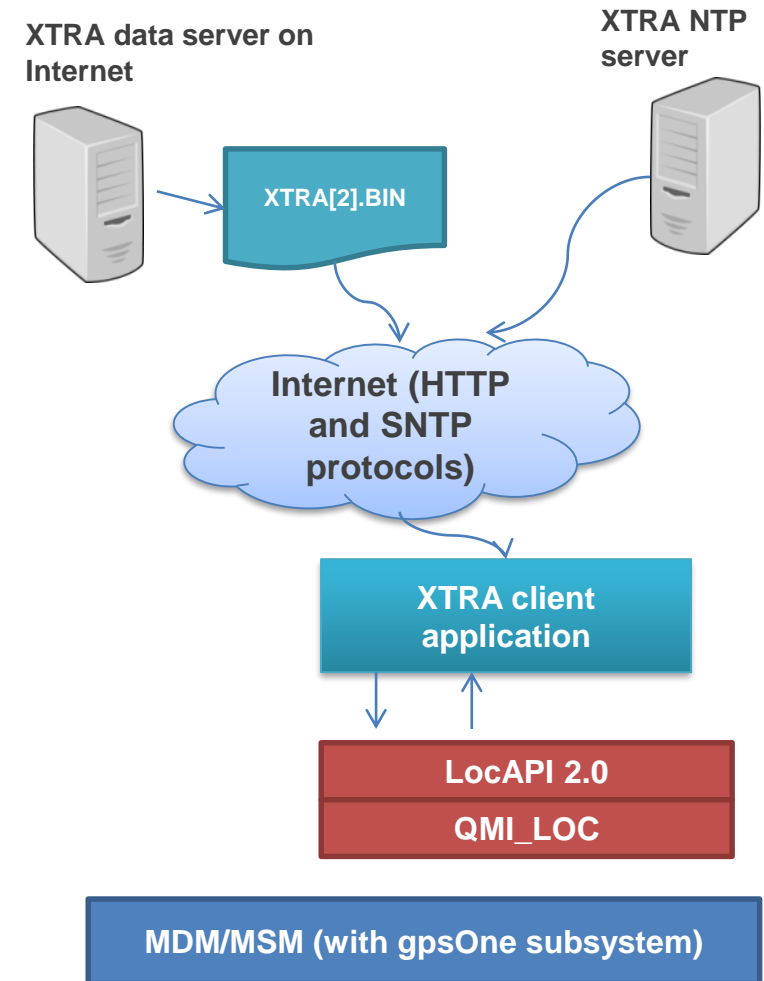


Qualcomm gpsOne Gen8

gpsOneXTRA Assistance Technology

Qualcomm's new gpsOneXTRA Assistance technology provides enhanced operation by enabling users to download a small assistance data file through a brief Internet access session.

This technology delivers more accurate positioning with greater sensitivity than otherwise possible with standalone GPS receivers, especially in challenging areas such as indoors and in dense urban canyons.

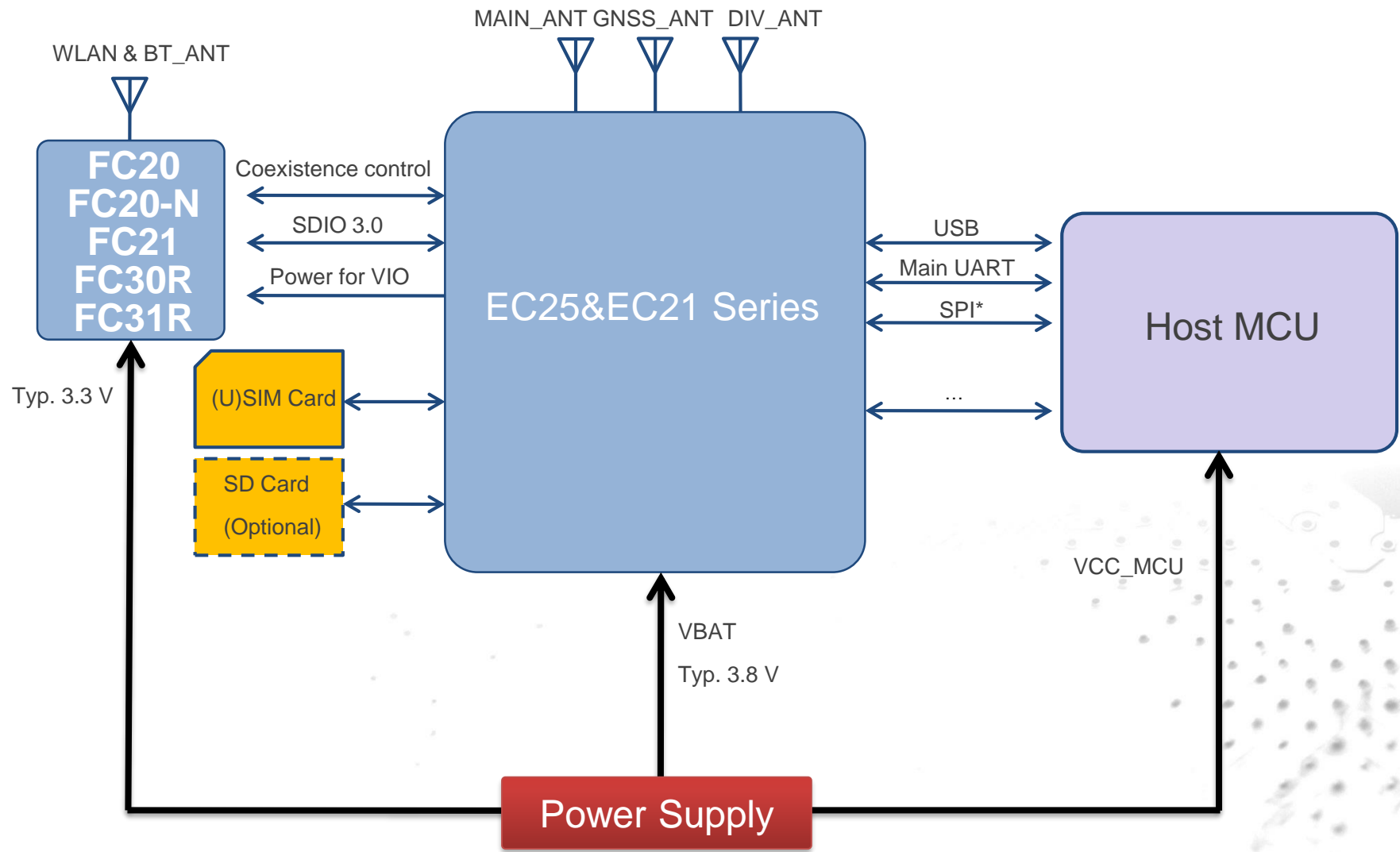


GNSS Performance of EC21&EC25 Series

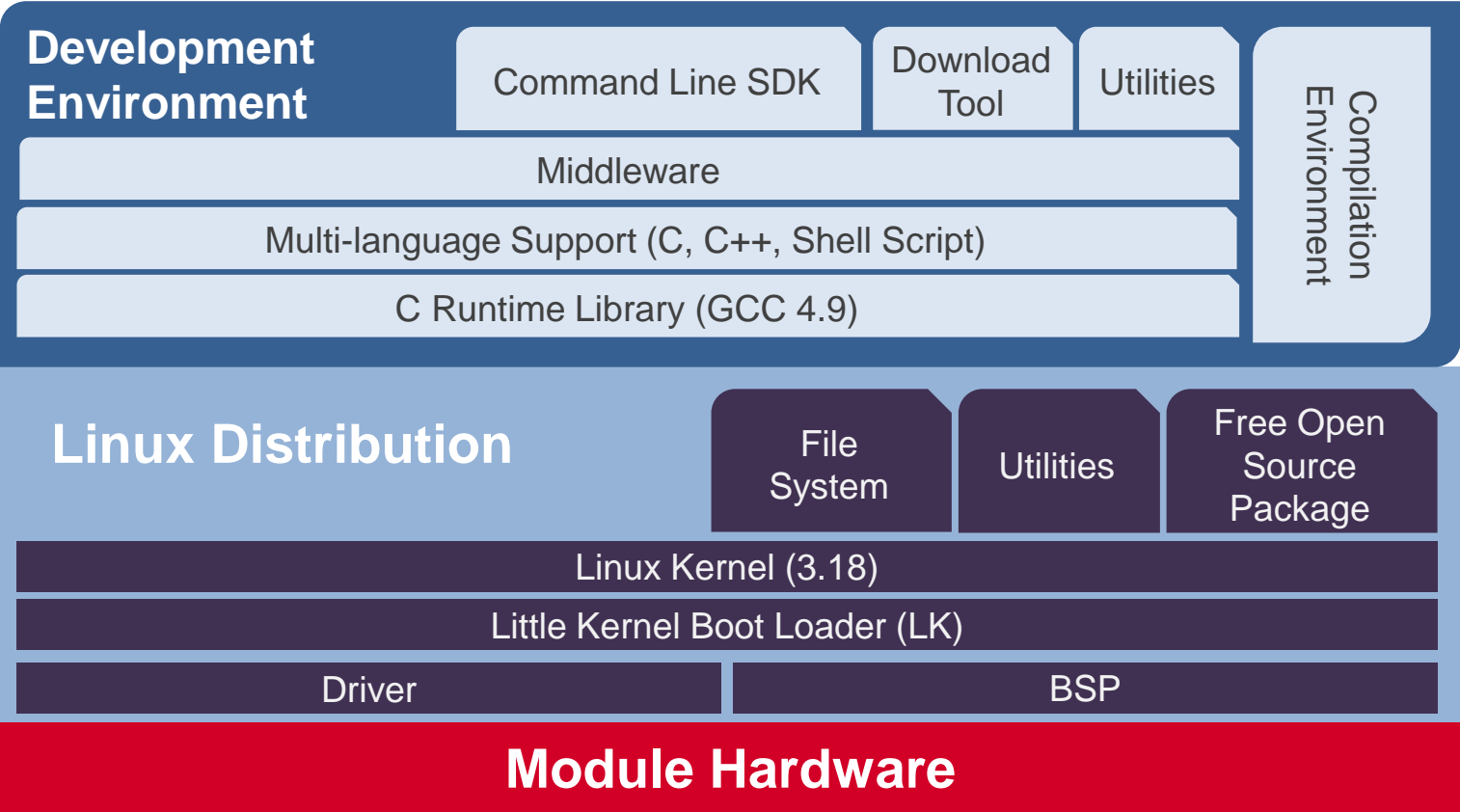


Module		EC21 Series		EC25 Series	
GNSS (Optional)		GPS, GLONASS, BeiDou (Compass), Galileo, QZSS		GPS, GLONASS, BeiDou (Compass), Galileo, QZSS	
Sensitivity (GNSS)	Cold start	-146 dBm		-146 dBm	
	Reacquisition	-158 dBm		-158 dBm	
	Tracking	-157 dBm		-157 dBm	
TTFF (GNSS)	Cold start @ open sky	Autonomous	35 s	35 s	
		XTRA enabled	18 s	18 s	
	Warm start @ open sky	Autonomous	26 s	26 s	
		XTRA enabled	2.2 s	2.2 s	
	Hot start @ open sky	Autonomous	2 s	2 s	
		XTRA enabled	1.5 s	1.5 s	
SVs	Total number of SVs available	55		55	
Accuracy (GNSS)	CEP-50	< 2.5 m		< 2.5 m	

LTE + Wi-Fi Solution



“*” means under development.

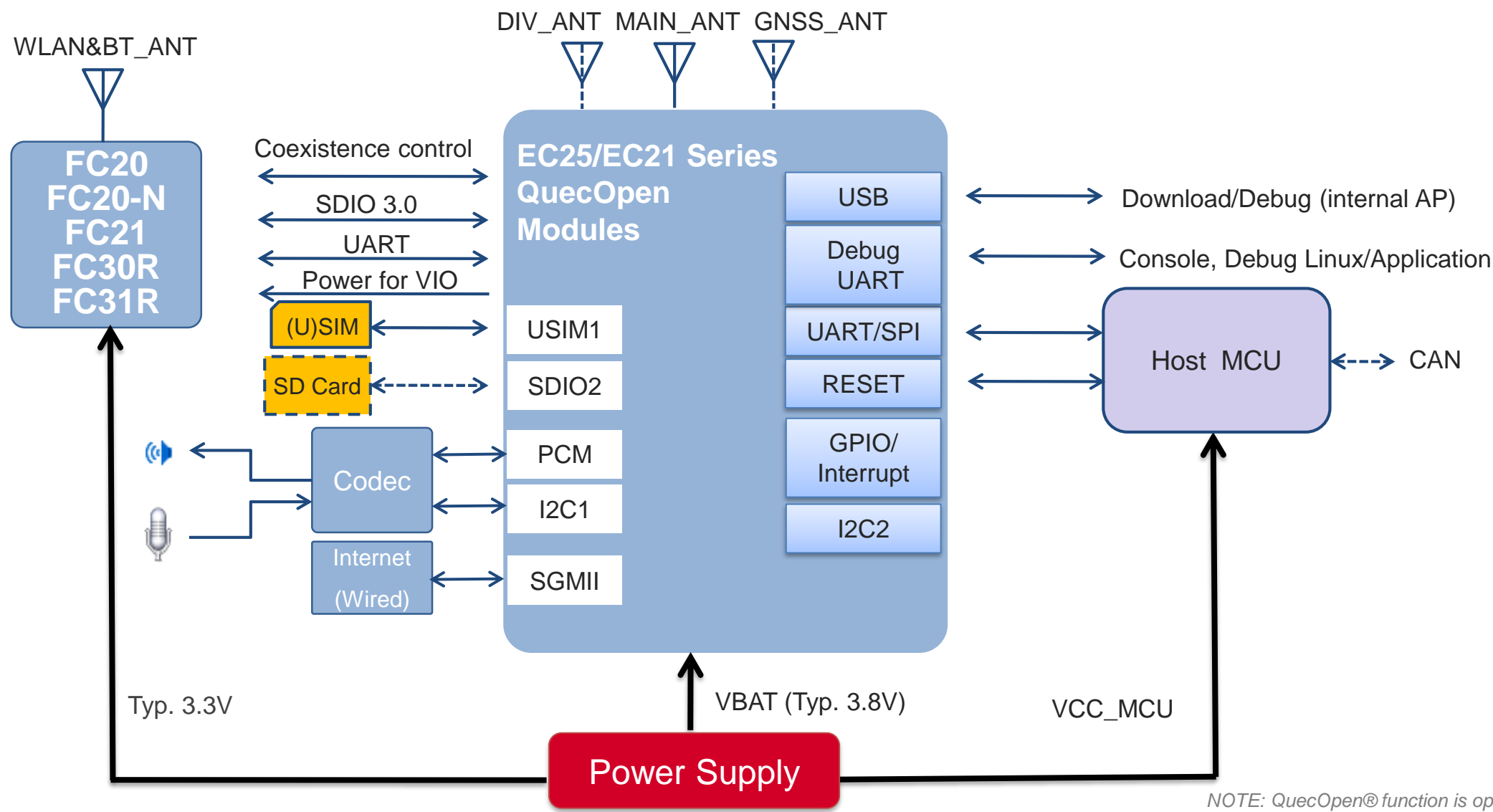


QuecOpen® is an open source embedded development platform based on Linux system, which is intended to simplify the design and development process for IoT applications.

Figure: Framework of QuecOpen®

NOTE: QuecOpen® function is optional.

QuecOpen® - Typical Router Solution

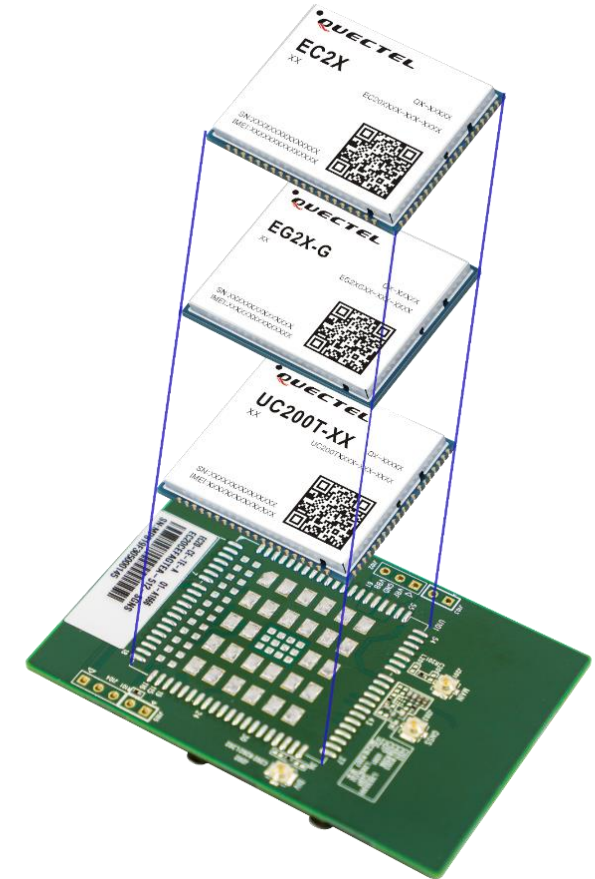
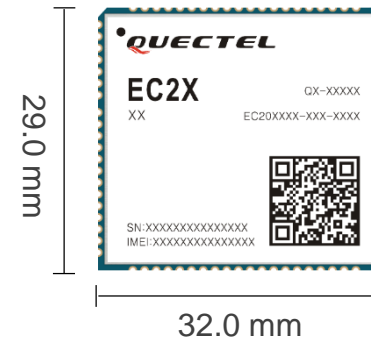


NOTE: QuecOpen® function is optional.

Design Compatibility

EC25&EC21 Series are compatible with:

- LTE Standard Cat 1 module **EG21-G**
- LTE Standard Cat 4 module **EC20 R2.1/EG25-G**
- UMTS/HSPA+ module **UC200T Series**



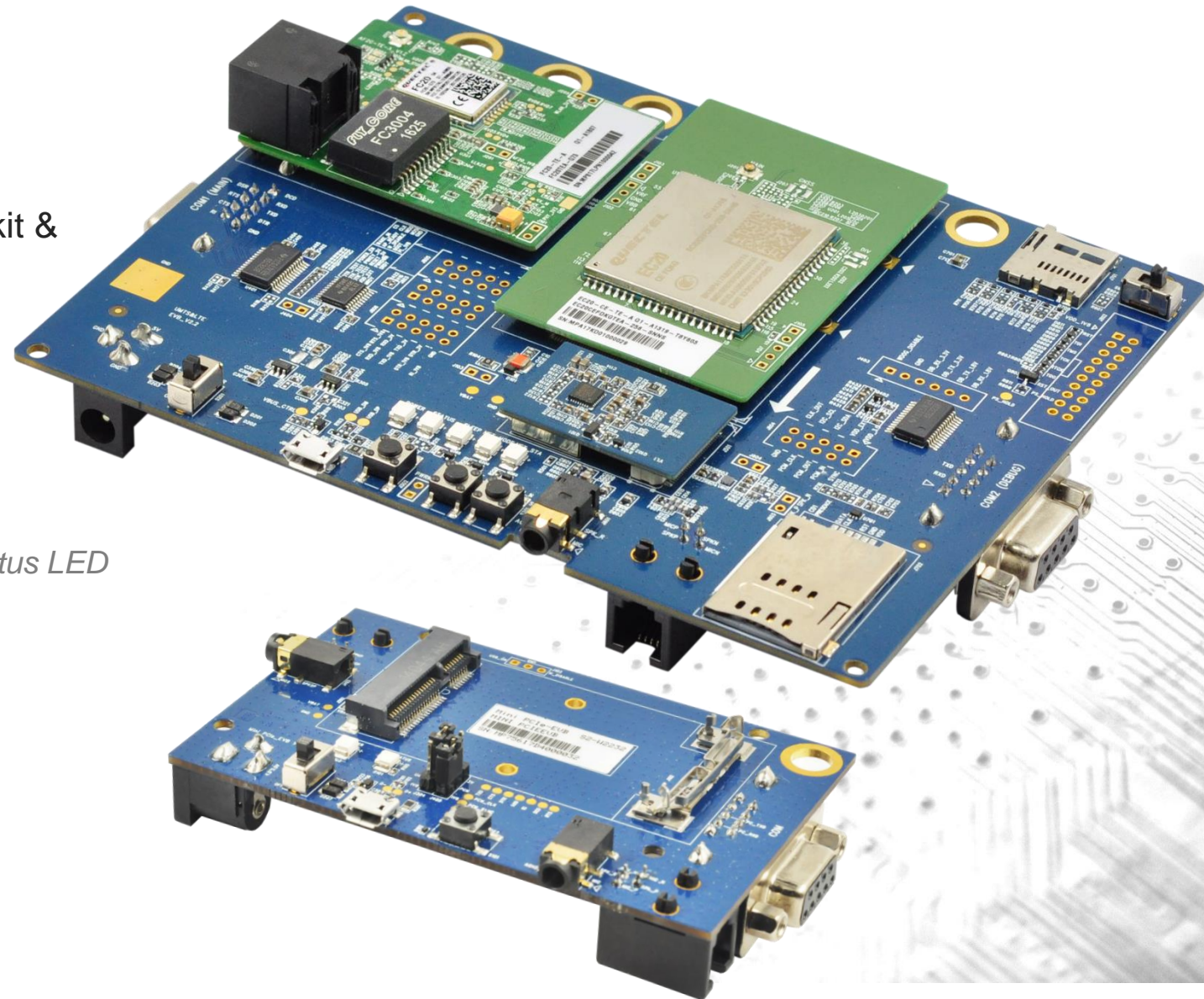
Support Package - Technical Materials & EVB Kit

Technical Materials Package

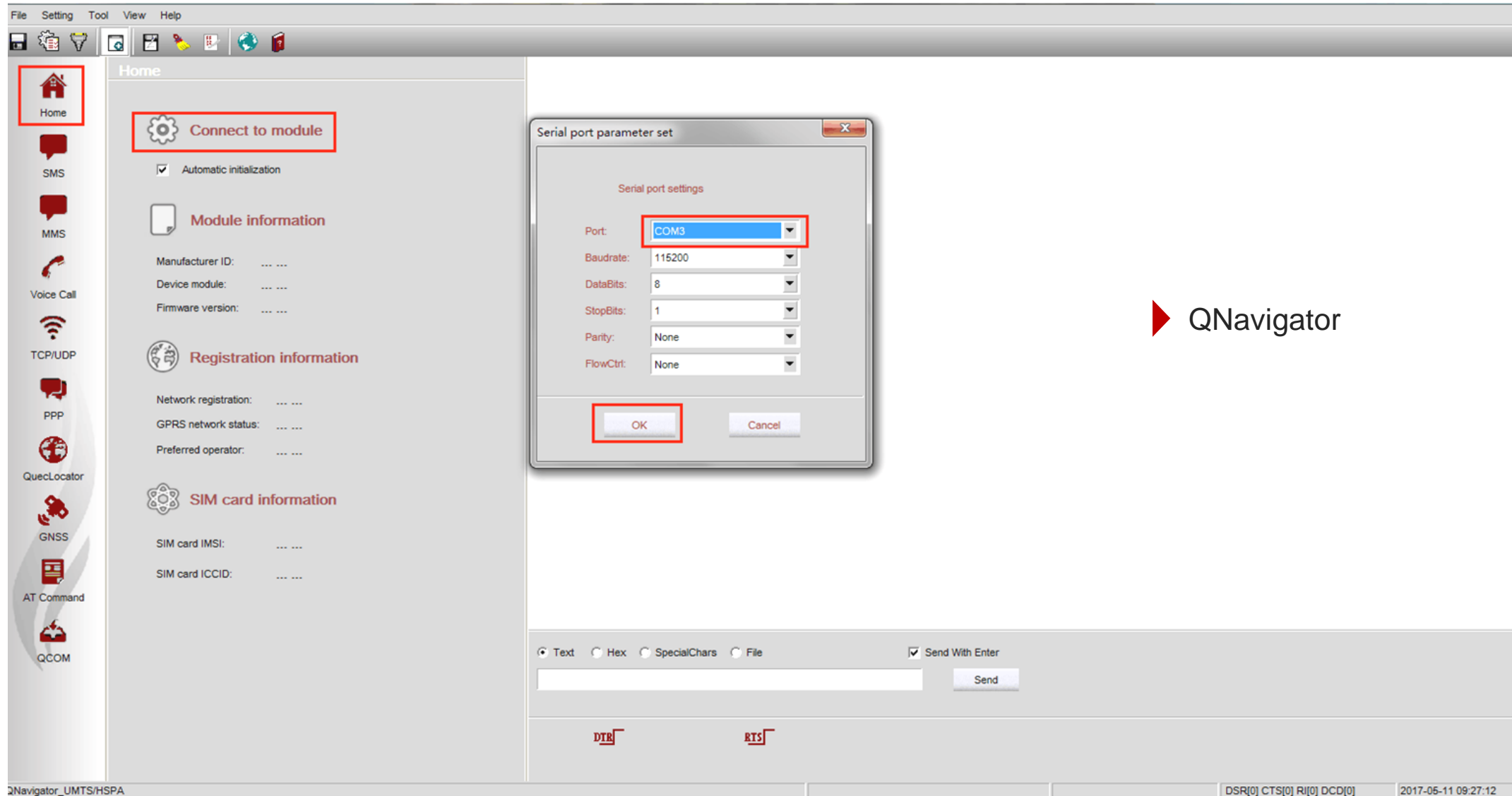
- Hardware & software documents
- Debug tools, download tools, test tools, EVB kit & USB drivers
- Approvals & test reports
- QNavigator

Development Tool (UMTS<E EVB Kit)

- | | |
|---------------------------------|-----------------------|
| ▪ Connectors | ▪ Auxiliaries |
| a) Power supply connectors | a) Network status LED |
| b) USB connector | b) Power key |
| c) UART connectors | c) Reset key |
| d) (U)SIM card connector | d) Test points |
| e) SD card connector | |
| f) Digital and audio connectors | |

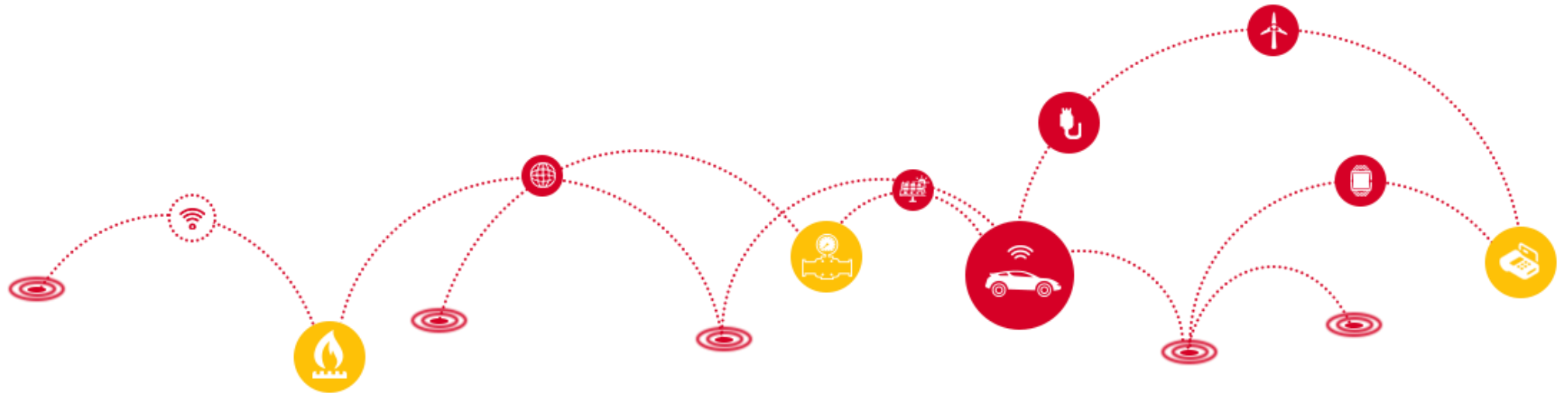


Support Package - QNavigator



► QNavigator

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Target Applications



Telematics & Transport

- Automotive OEM
- Vehicle Tracking
- Container Tracking
- Ship Tracking
- Fleet Management
- OBD
- DVR
- Insurance Box



Energy

- Electricity Meter
- Gas Meter
- Water Meter
- Heat Meter
- Smart Grid
- Wind Turbines
- Solar Panel
- Charging Pile



Payment

- Wireless POS
- Cash Register
- ATM
- Vending Machine
- Top-up Machine



Security

- Alarm
- Camera
- Video Surveillance
- Intrusion Detection
- Smoke Detector
- Asset Protection



Smart City

- Street Lighting
- Sharing Economy
- Traffic Light
- Elevator
- Digital Signage
- Advertisement Display
- LED Lighting
- Garbage Bin Monitoring
- Parking



Gateway

- DTU
- Consumer Router
- Industrial Router
- VoIP
- Server
- Wi-Fi Hotspot



Industry

- Industrial PDA
- Rugged Tablet PC
- Pipeline Management
- UAV
- Robot
- Flow Meter
- Refrigerator
- Industrial Control
- Industrial Monitoring



Life & Healthcare

- Personal Tracker
- Household Appliances
- Pet Tracker
- Wearables
- Elderly Monitoring
- Remote Medical Equipment
- Glucometer
- Blood Pressure Monitor
- Gambling Machine



Agriculture & Environment

- Trail Camera
- Food Traceability
- Farm Machinery
- Irrigation
- Meteorological Station
- Wildlife Tracking
- Environment Monitoring
- Pollution Monitoring

Thank you!

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