BG96-QuecOpen Solution

Presentation

February, 2018

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Open Resources

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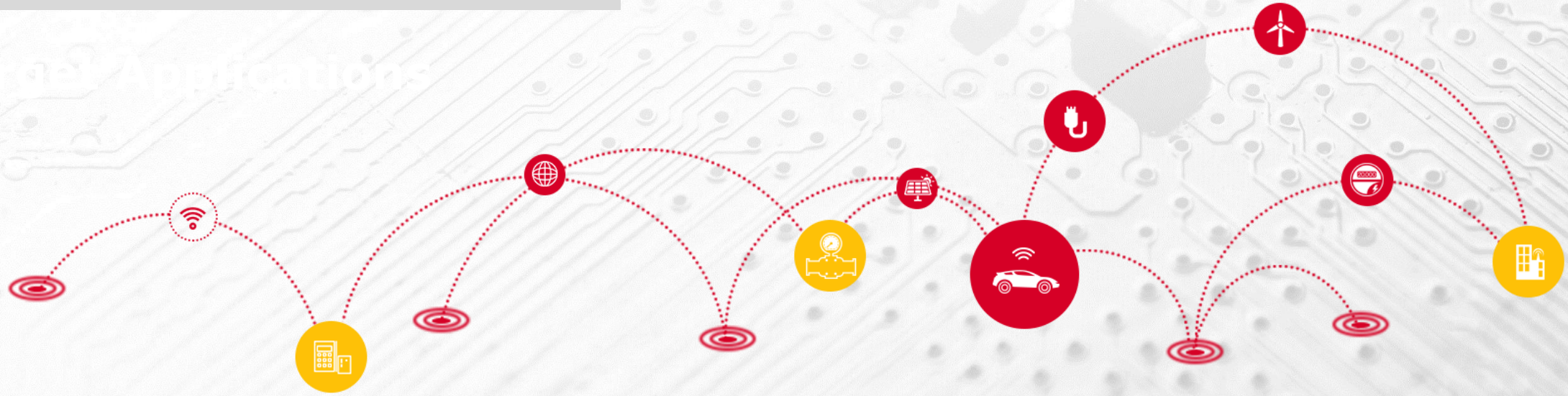
Enhanced Features



Basic Introduction

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

High-powered Platform

With characteristics of high real-time, multithread and micro kernel, etc., QuecOpen transparently manages all LTE related activities to allow developers to natively execute C, shell script based program on the processor and in the memory of Quectel BG96 module.

Fast Development

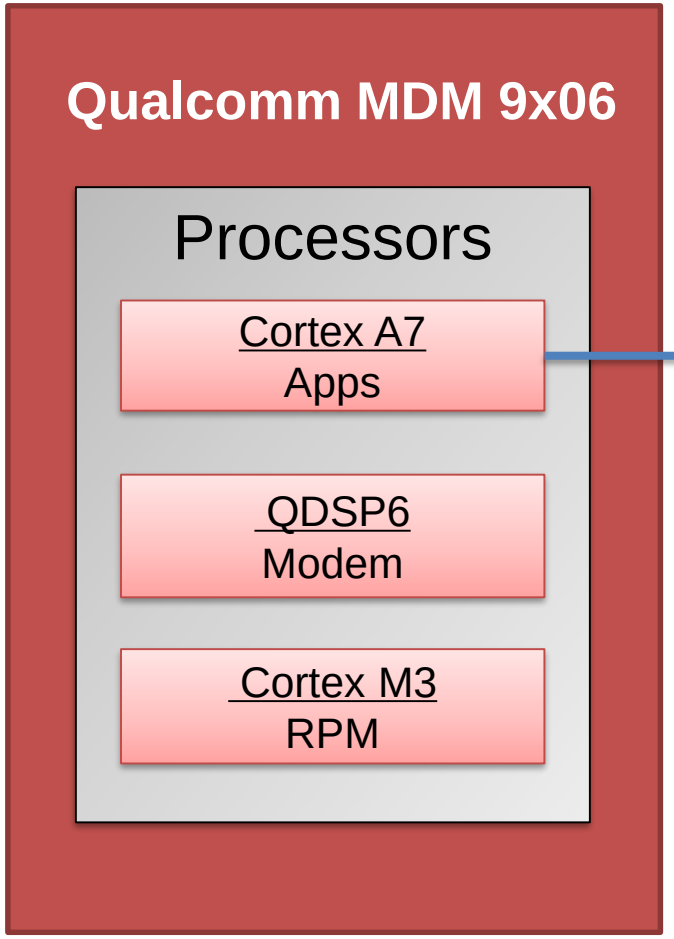
QuecOpen SDK provides rich small examples, which enables developers to realize fast development. Supporting C-based runtime libraries offers more flexibility for developers to design software and program.

More Competitive

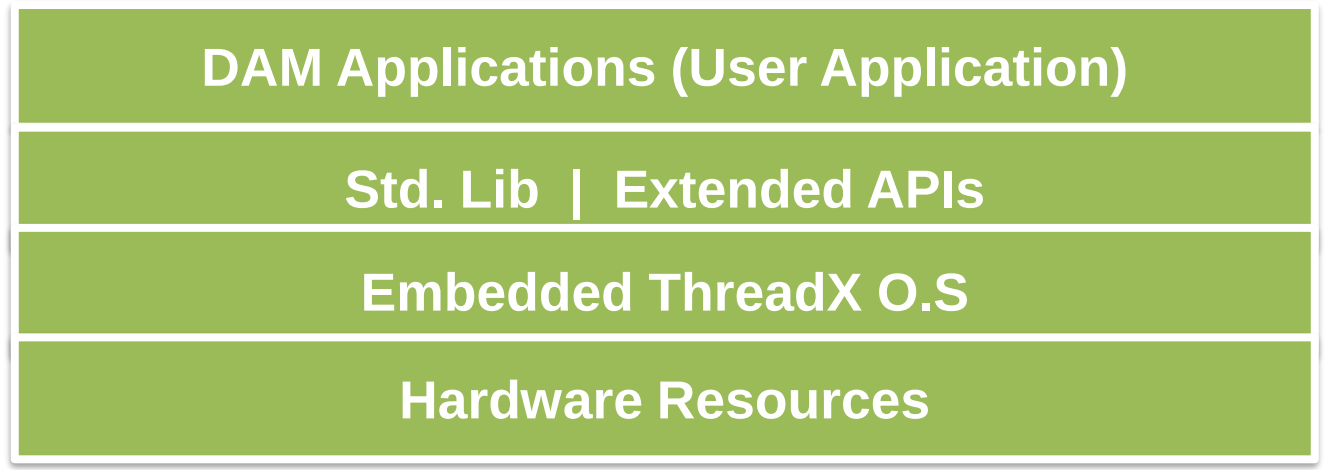
By directly downloading the embedded applications to Quectel BG96 module to run, it is now possible to remove the external host processor, memory, and a range of product specific ASICs such as IO expanders, audio DSPs, and many other analogue and digital devices.

Basic Introduction (Cont.)

Qualcomm MDM 9x06 Block Diagram



Processors	
Applications	ARM Cortex A7 up to 1.2GHz with 256KB L2 cache ARM Cortex A7 – primary boot processor
Modem system	QDSP6 processor at up to 691MHz (Turbo) Low-power audio post-processing supported in the modem system 768KB L2 caches
RPM system	Cortex M3 up to 100MHz The only master of the modem power manager (MPM) MPM coordinates shutdown/wakeup, clock rates, and VDDs Boot flow is RPM/applications processor-based



QuecOpen™ Framework

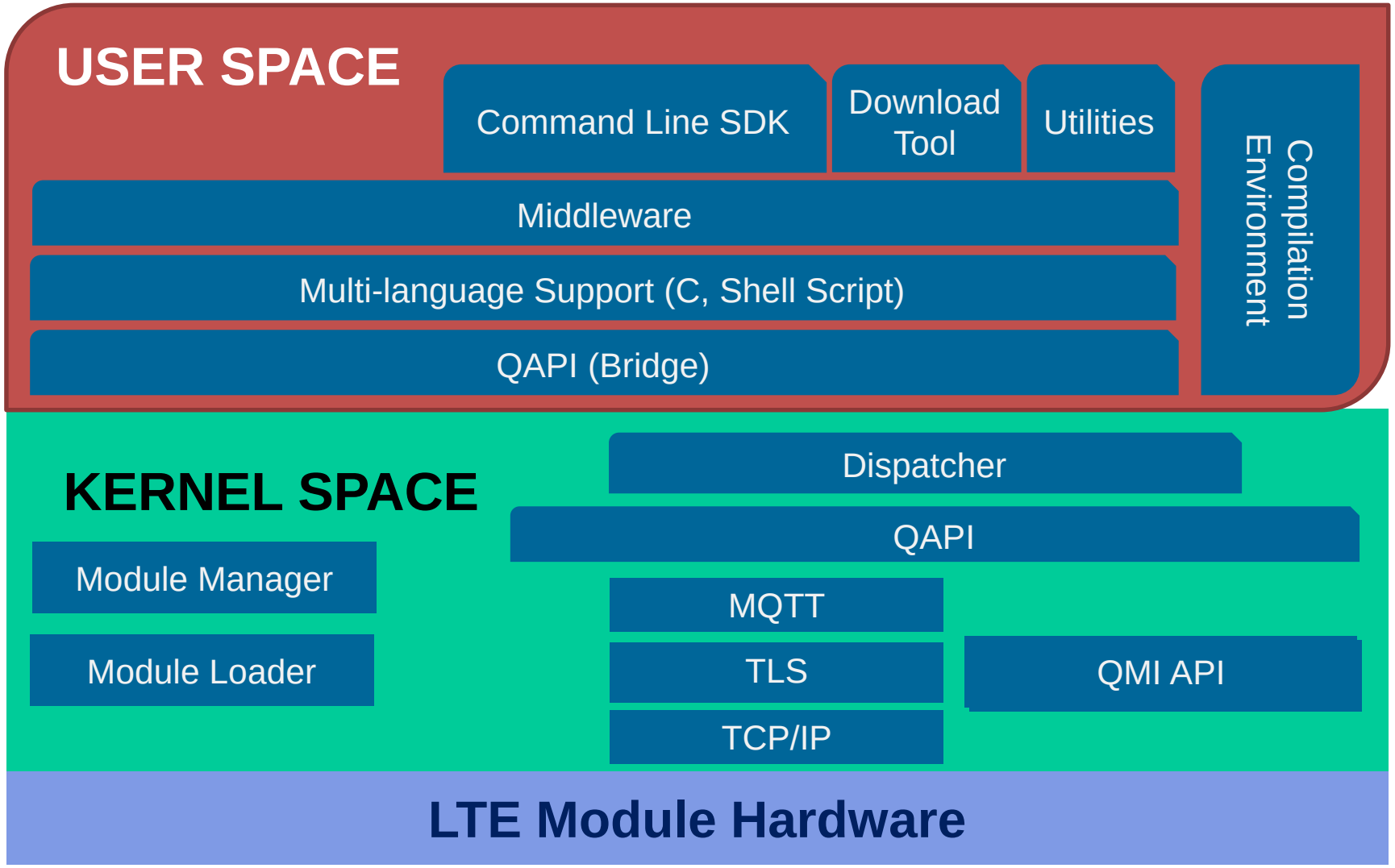
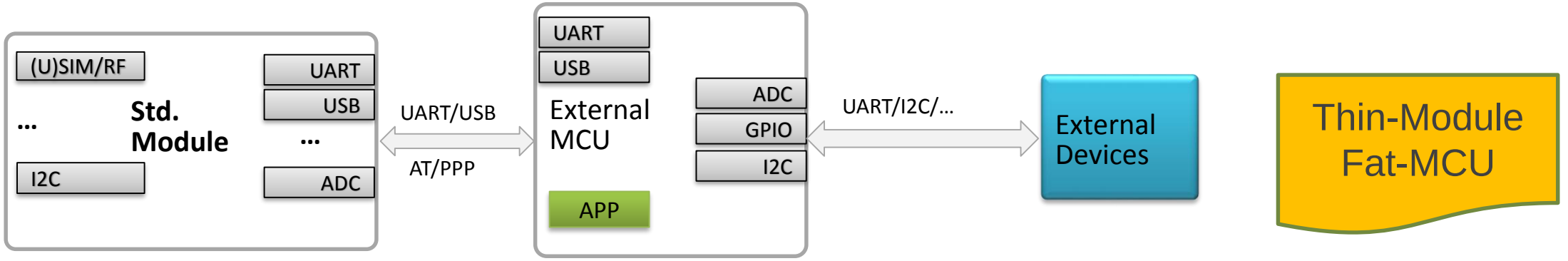


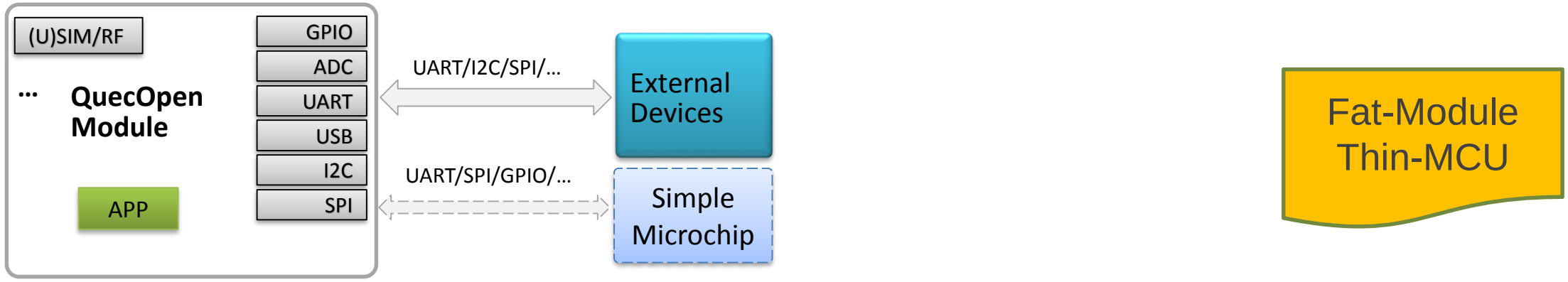
Figure: Framework of QuecOpen™ Solution

Advantages of QuecOpen™

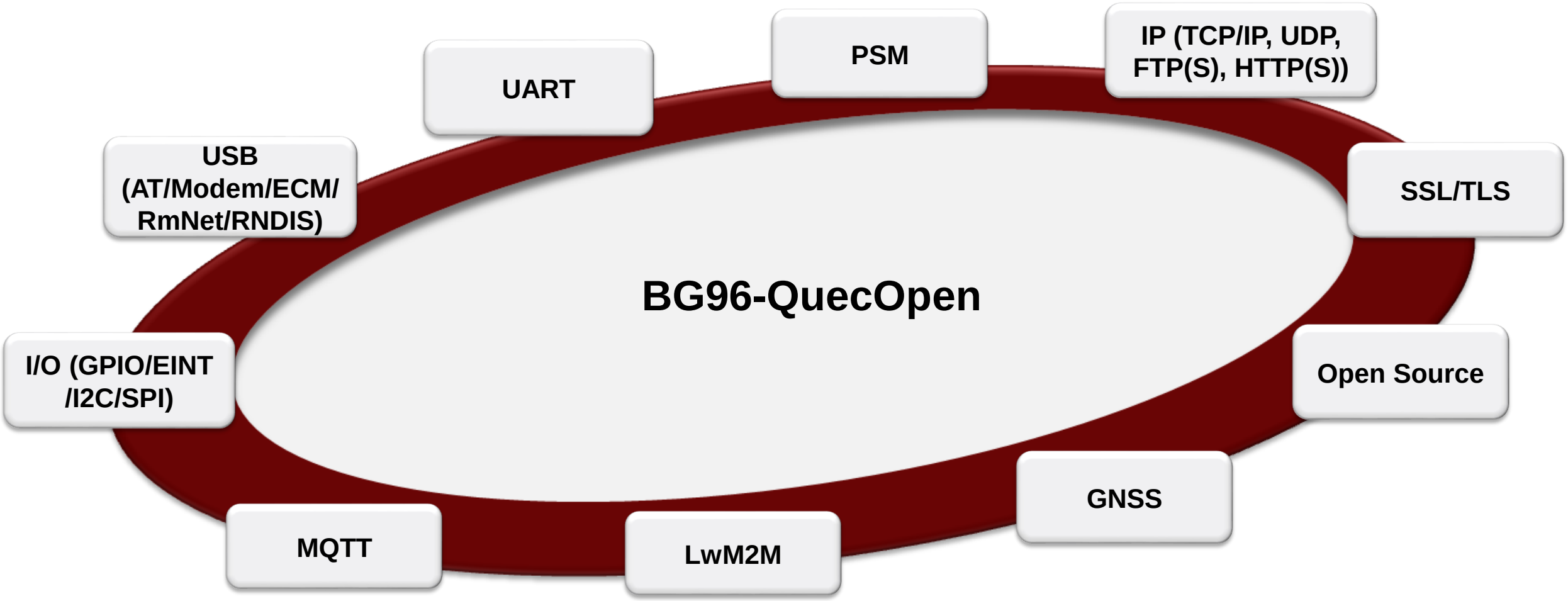
Standard Module Mode



QuecOpen™ Mode



Functionalities of QuecOpen™



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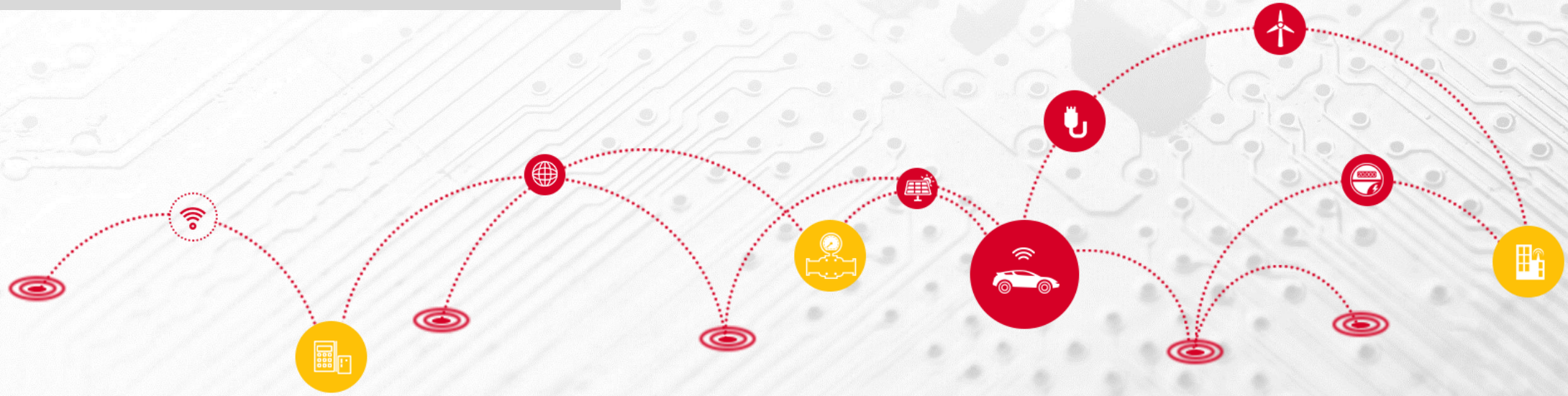


Open System Resources

MDM9206 Baseband

- LTE Cat M1, LTE Cat NB1 and EGPRS
- GPS, GLONASS, BeiDou/Compass, Galileo, QZSS
- Integrated ARM Cortex A7 @1.2GHz
- 1G bits NAND Flash, with 24M bits for customer
- 512M bits DDR2, with 24M bits for customer
- USB 2.0 High Speed Interface
- Power Consumption:

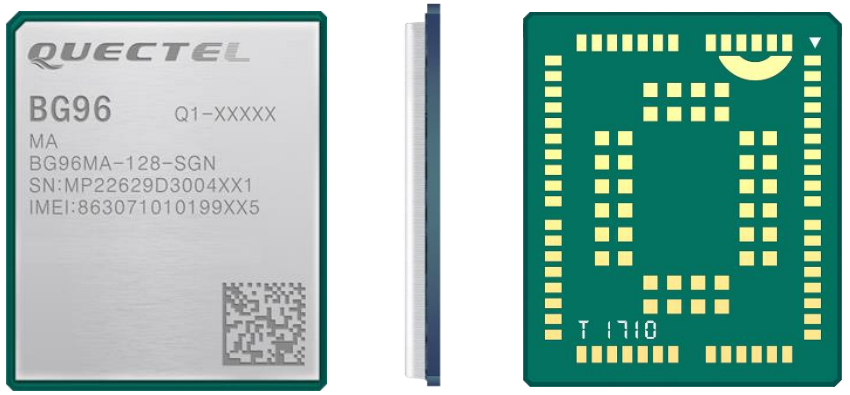
  PSM: 10uA

  Standby: 16mA@DRX=1.28s

  Max TX Power: 190mA

  *GNSS (**AT+CFUN=0**): 42mA*

LTE Cat M1 & Cat NB1 & EGPRS Module



- GPIO (≥ 14)
- I2C (maximally up to 2)
- SPI (maximally up to 2)
- ADC (x2)
- UART (maximally up to 4)

Open Hardware Resources

- **USB** (x1)

  Can be mapped into several different functional interfaces:

  - USB-AT port
  - USB-DM port
  - USB-NMEA port
  - USB-Modem port
  - USB-Network adapter

  In BG96-QuecOpen, the GNSS NMEA Sentences can be got in the User Application.

USB Design Suggestions:

- *For downloading → DM port*
- *For capturing system log → DM port*

Open Hardware Resources (Cont.)

Pin Name	Pin No.	Mode 1	Mode 2	Mode 3	Mode 4	Interrupt	Remark
GPIO01 [1)]	4	GPIO_23	GPIO_23	SPI1_CLK	-	No	BOOT_CONFIG_4
GPIO02	5	GPIO_20	UART1_TXD	SPI1_MOSI	-	Yes	
GPIO03	6	GPIO_21	UART1_RXD	SPI1_MISO	-	Yes	
GPIO04	7	GPIO_22	GPIO_22	SPI1_CS_N	-	Yes	
GPIO05	18	GPIO_11	-	SPI2_CLK	I2C2_SCL	Yes	
GPIO06	19	GPIO_10	-	SPI2_CS_N	I2C2_SDA	No	
GPIO07	22	GPIO_9	UART2_RXD	SPI2_MISO	-	Yes	
GPIO08	23	GPIO_8	UART2_TXD	SPI2_MOSI	-	Yes	
GPIO09	26	GPIO_15	GPIO_15	-	-	No	
GPIO10	27	GPIO_12	UART3_TXD	-	-	Yes	
GPIO11	28	GPIO_13	UART3_RXD	-	-	Yes	
GPIO19	40	GPIO_19	-	-	I2C1_SCL	No	
GPIO20	41	GPIO_18	-	-	I2C1_SDA	No	
GPIO21	64	GPIO_07	-	-	-	No	

Notes

1. The pin functions in Mode 1/2/3/4 take effect only after software configuration.
2. [1)] All **BOOT_CONFIG** pins **cannot** be pulled up before startup.

For more details, please refer to *Quectel_BG96-QuecOpen_GPIO_Assignment_Speadsheet*.

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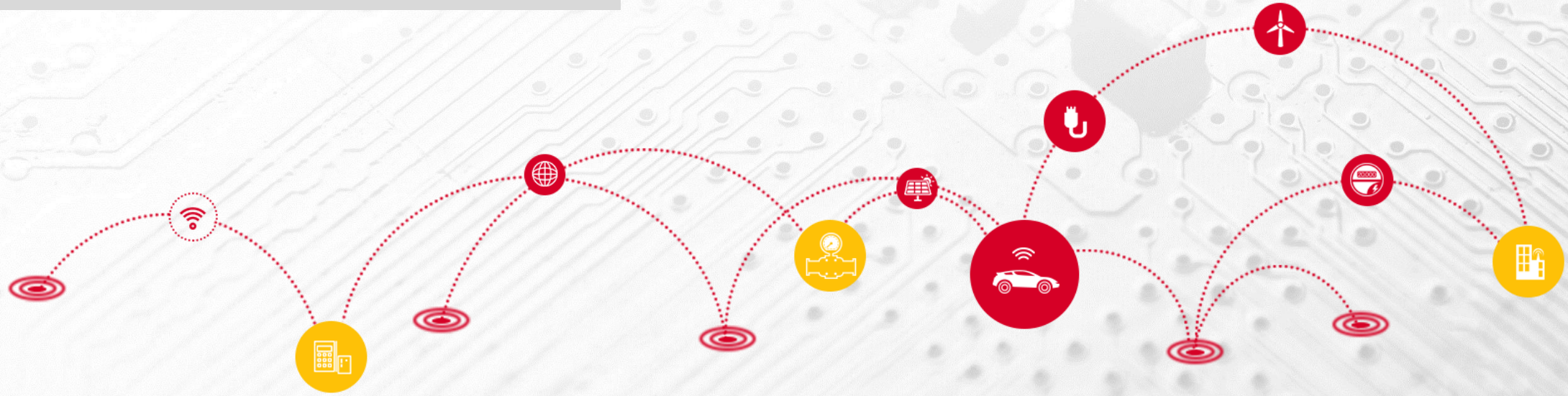

Development-Host Requirements

Operating system

Windows 7 / Linux

Compiler

- ARM compiler tools 5.0.5 (build 106)
- Cygwin 2.2.1 or above

Basic C-language programming knowledge

SDK and Other Requirements

- Quectel BG96 Module with QuecOpen Solution
- Quectel EVB
- QuecOpen SDK
- Firmware Download Tool (included in SDK)

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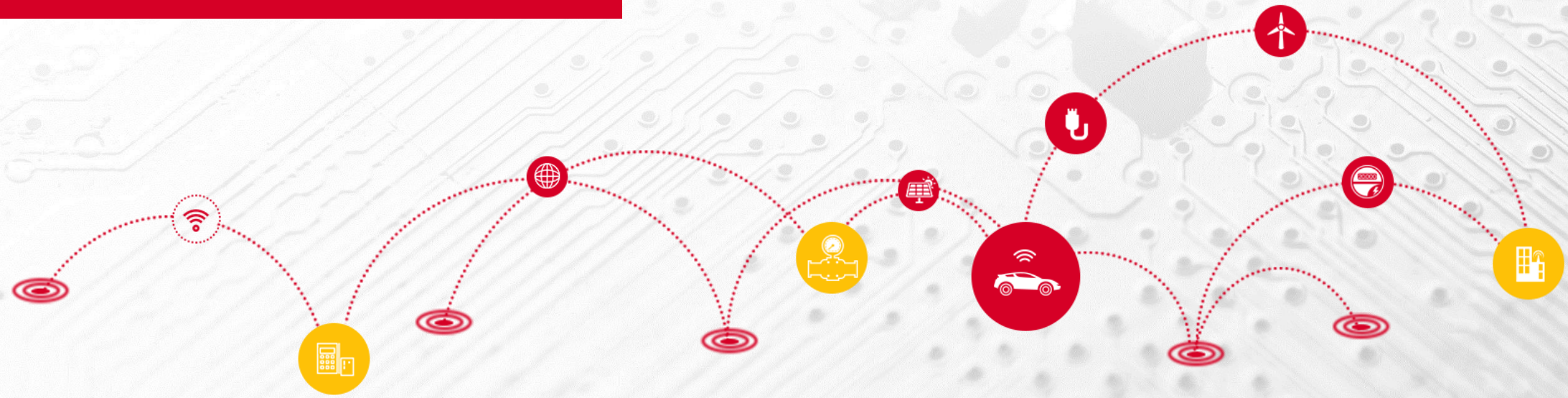
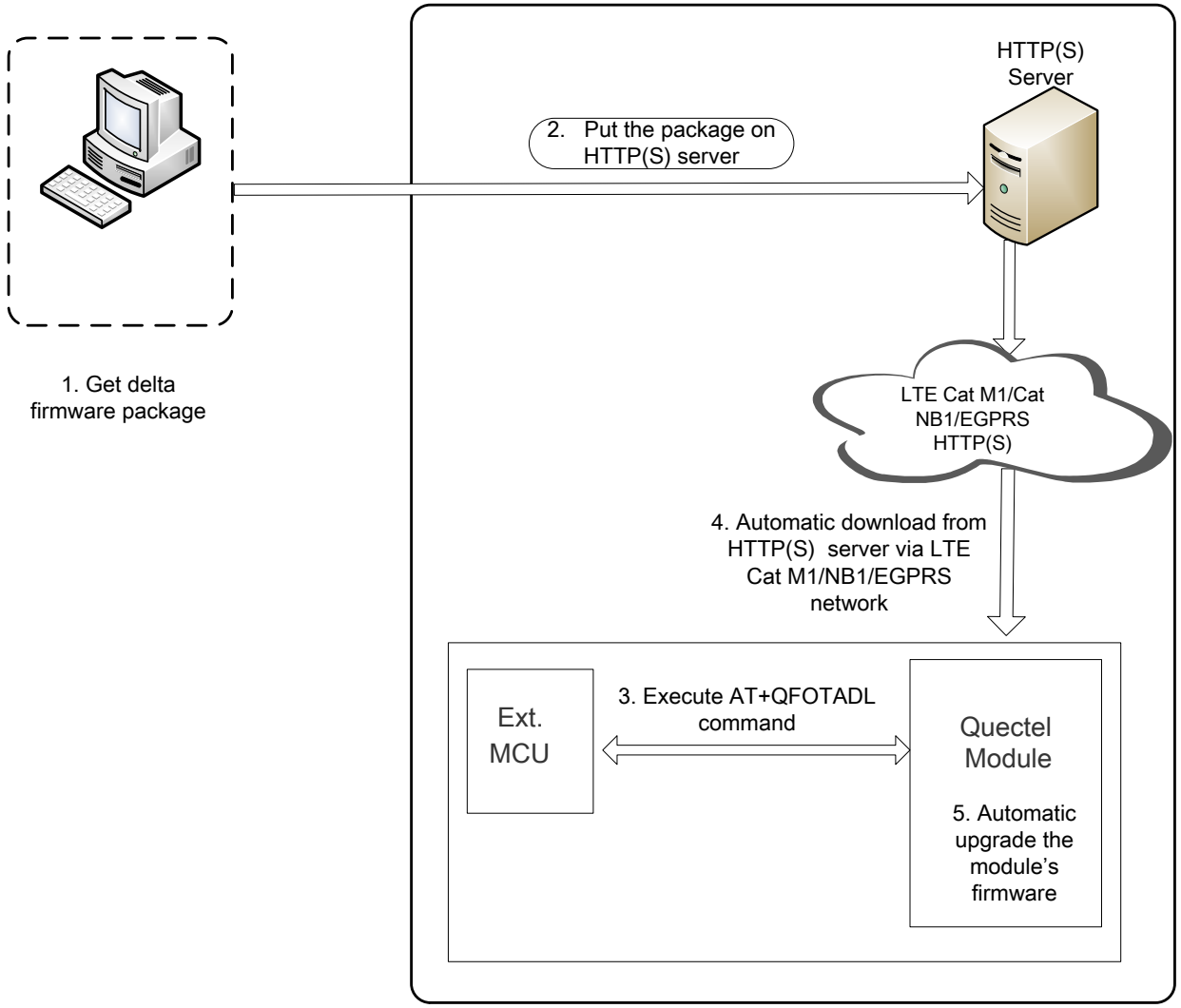


DFOTA

DFOTA is an acronym for Delta Firmware Upgrade Over-the-Air. DFOTA technology enables mobile device manufacturers to remotely update software. New software can be delivered over the air, 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
- Automatic Firmware Download and Upgrade

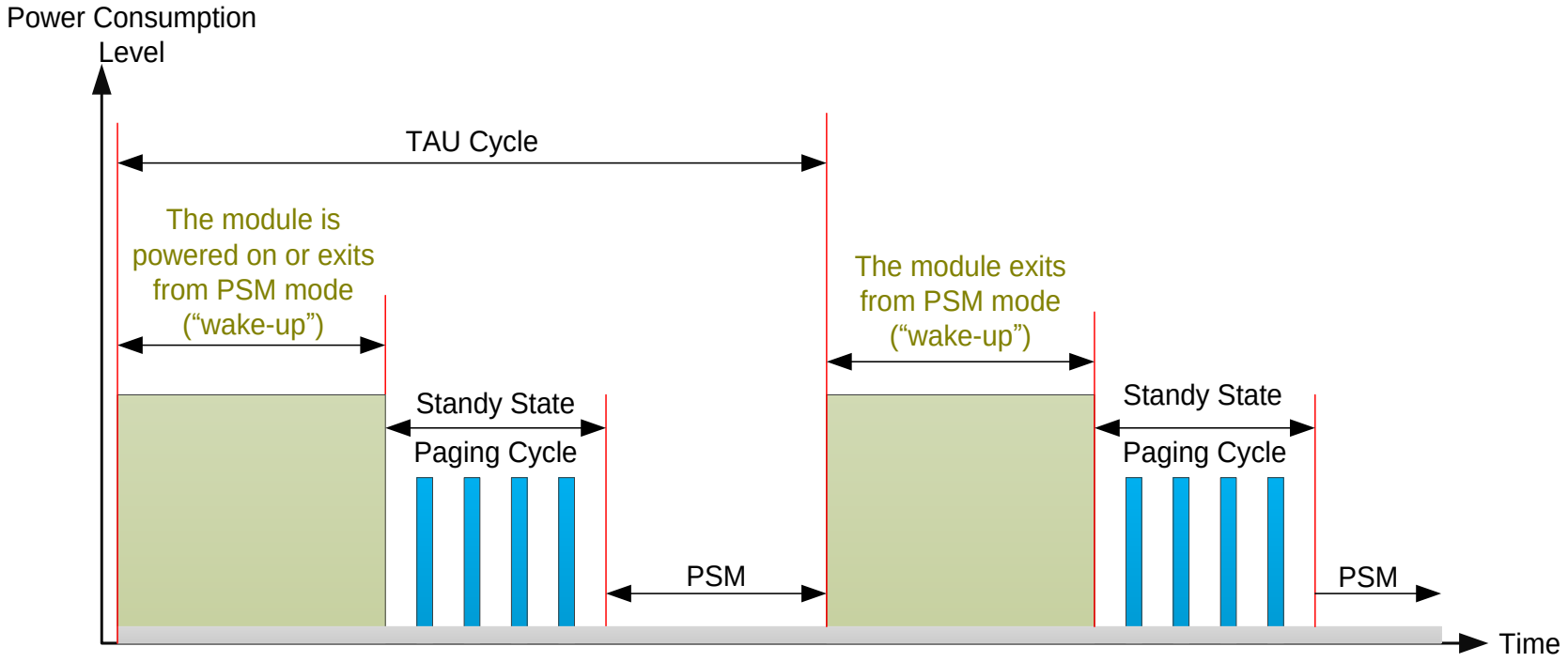


PSM

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 is 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 the module.

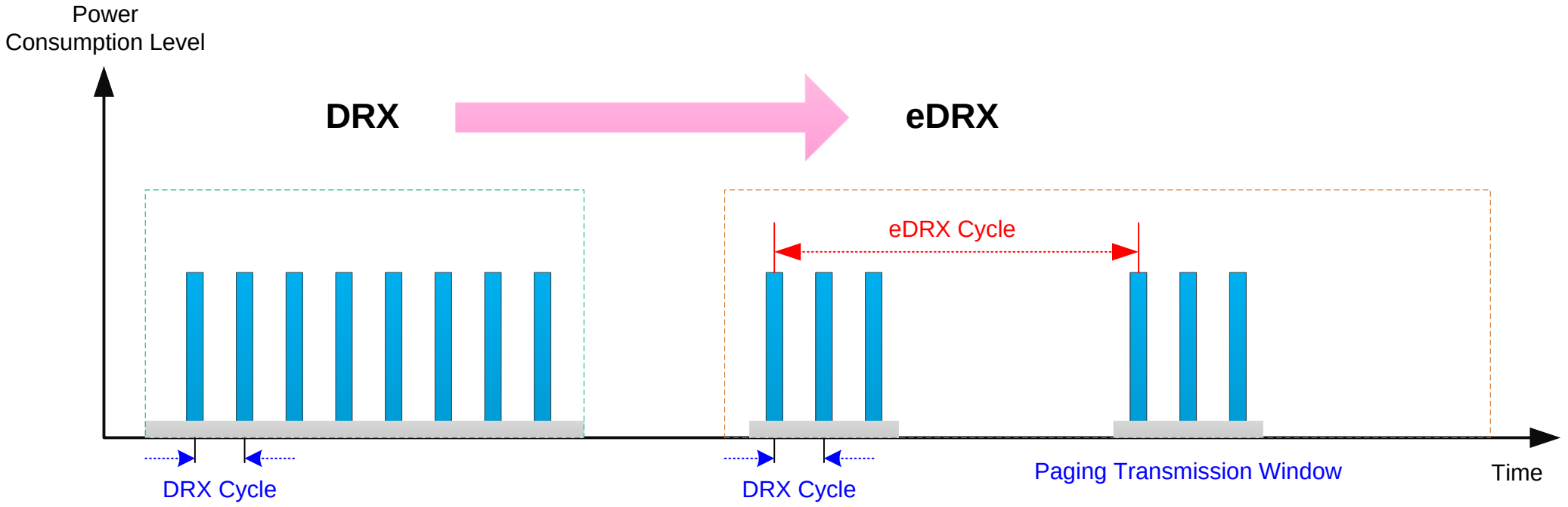


e-I-DRX

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 the module.

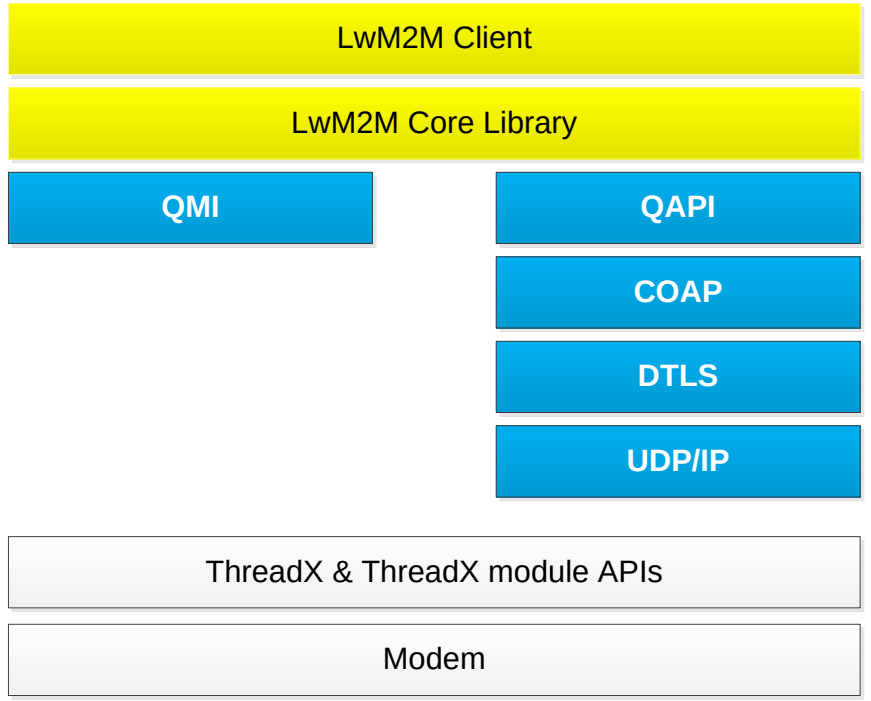


LwM2M

Open Mobile Alliance (OMA) specifies the application layer communication protocol between a LwM2M Server and a LwM2M Client, located in a LwM2M device. The OMA LwM2M enabler includes device management and service enablement for LwM2M devices.

BG96-QuecOpen provides LwM2M Client on MDM9206 ThreadX platform. The LWM2M client is compliant with OMA Lightweight Machine to Machine (LwM2M) Technical Specification and supports the following interfaces:

- Bootstrap
- Client Registration
- Device Management and Service Enablement
- Information Reporting



Thank you!

7th Floor, Hongye Building, No.1801 Hongmei Road, Xuhui District, Shanghai 200233, China
Tel: +86-21-5108 6236 Email: **info@quectel.com**
Website: **www.quectel.com**

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

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