EC25&EC21&EC20 R2.0-QeucOpen™ Solution

Presentation

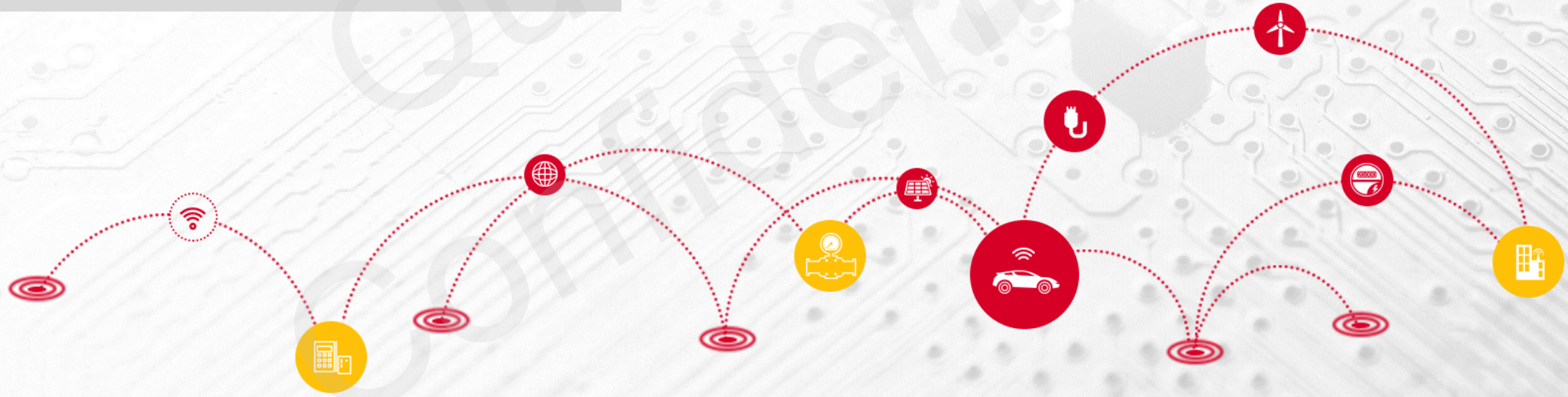
Oct., 2017

Basic Introduction

Open Source

Development Guide

Technical Support



Basic Introduction

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.

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, C++ and shell script based program on the processor and in the memory of Quectel modules.

Fast Development

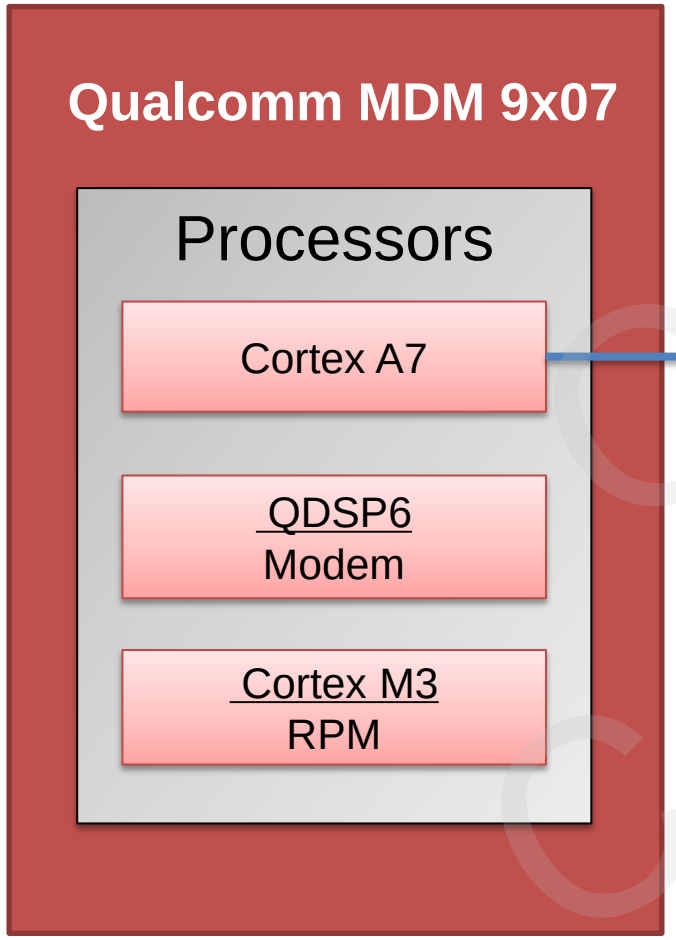
QuecOpen SDK provides rich small examples, which enables developers to realize fast development. Supporting C-based runtime libraries offers more flexibility for developers to design software and program.

More Competitive

By directly downloading the embedded applications to Quectel modules to run, it is now possible to remove 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

Qualcomm MDM 9x07 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

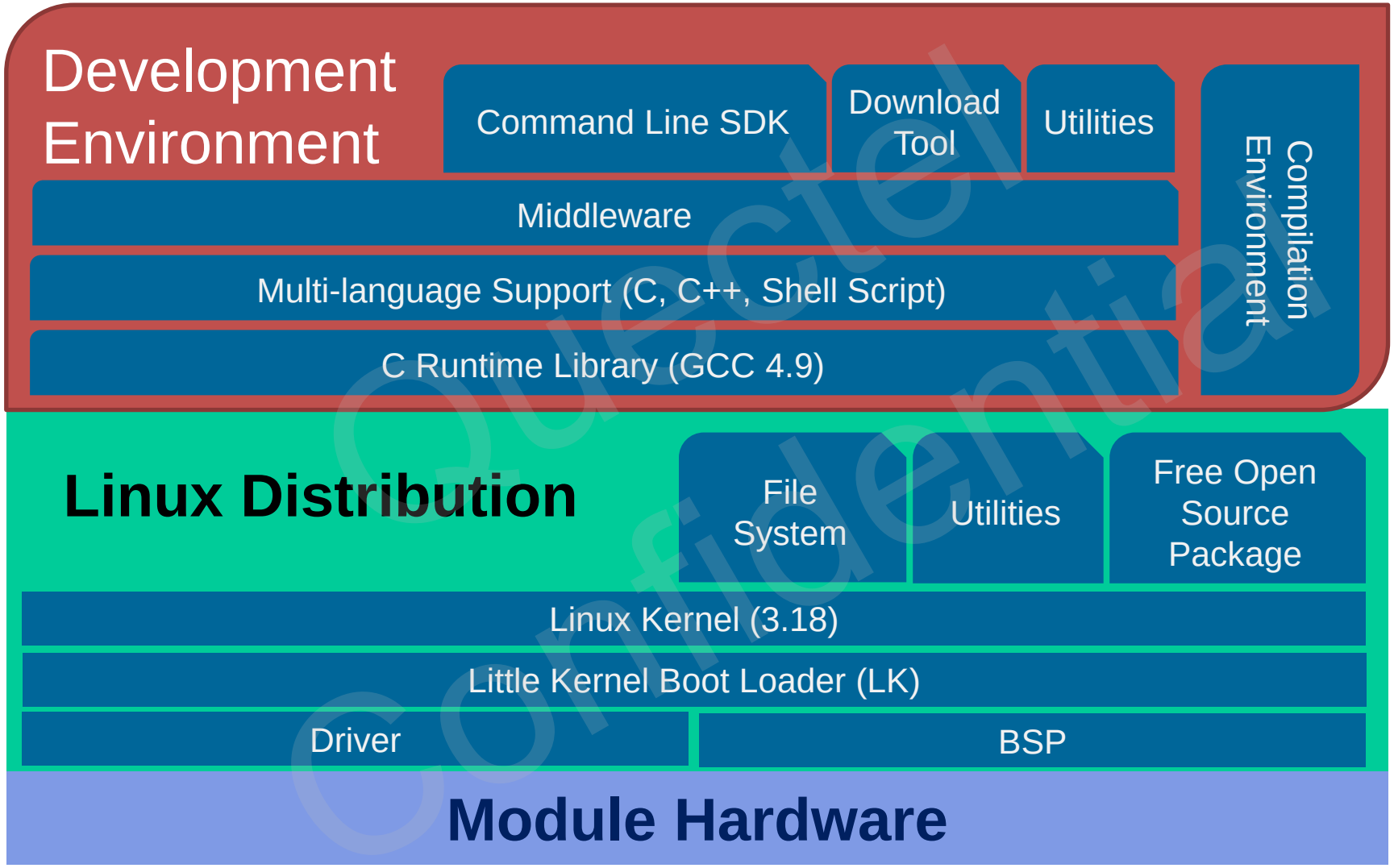
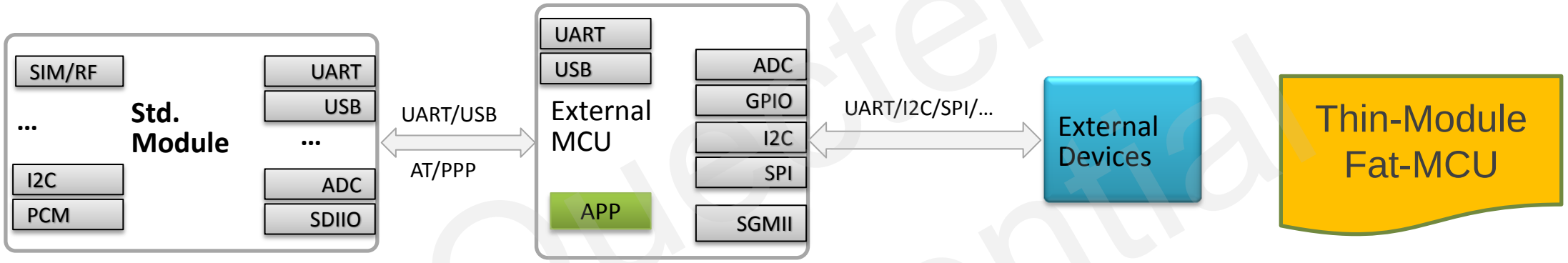


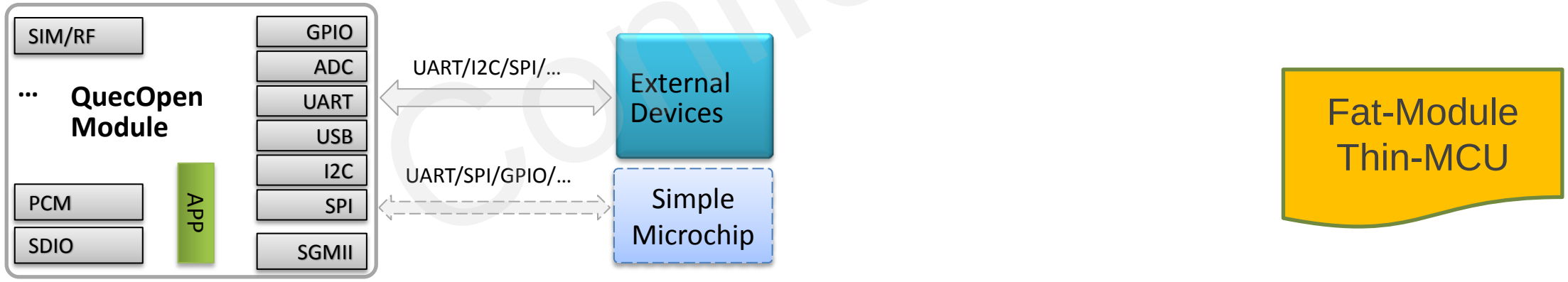
Figure: Framework of QuecOpen™ Solution

Advantages of QuecOpen™

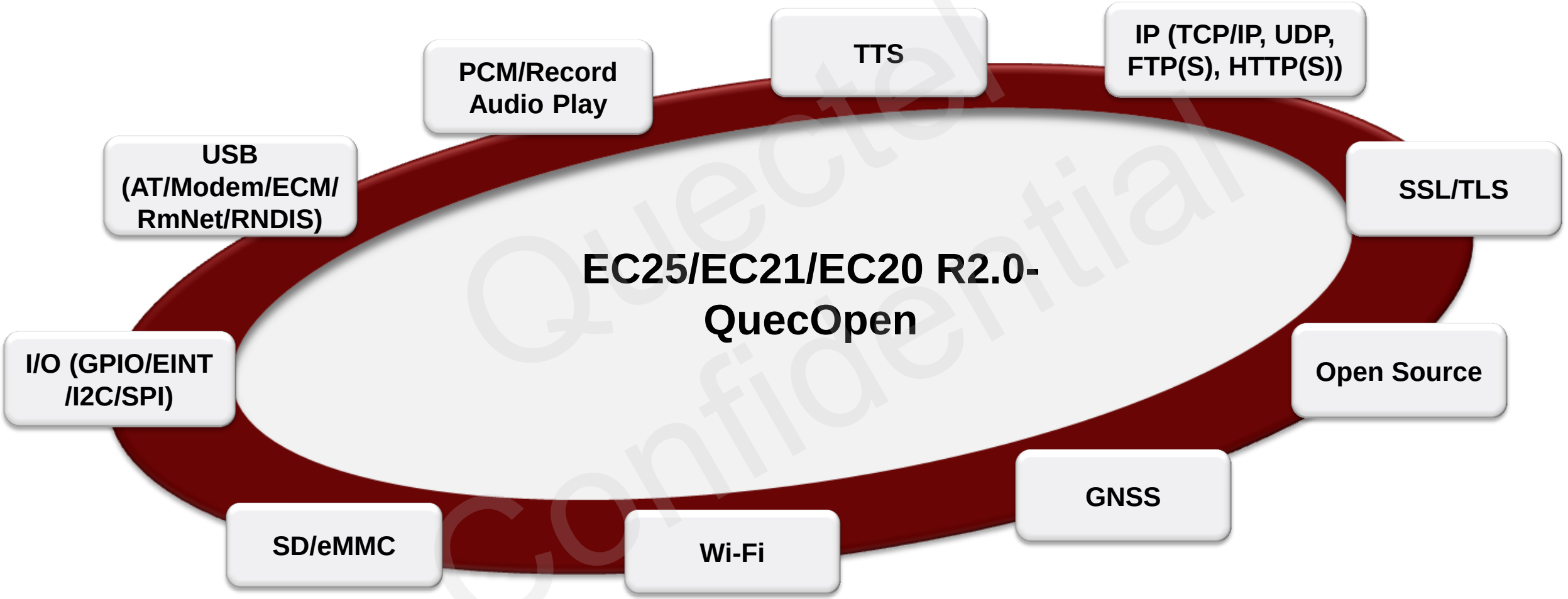
Standard Module Mode



QuecOpen™ Mode



Functionalities of QuecOpen™



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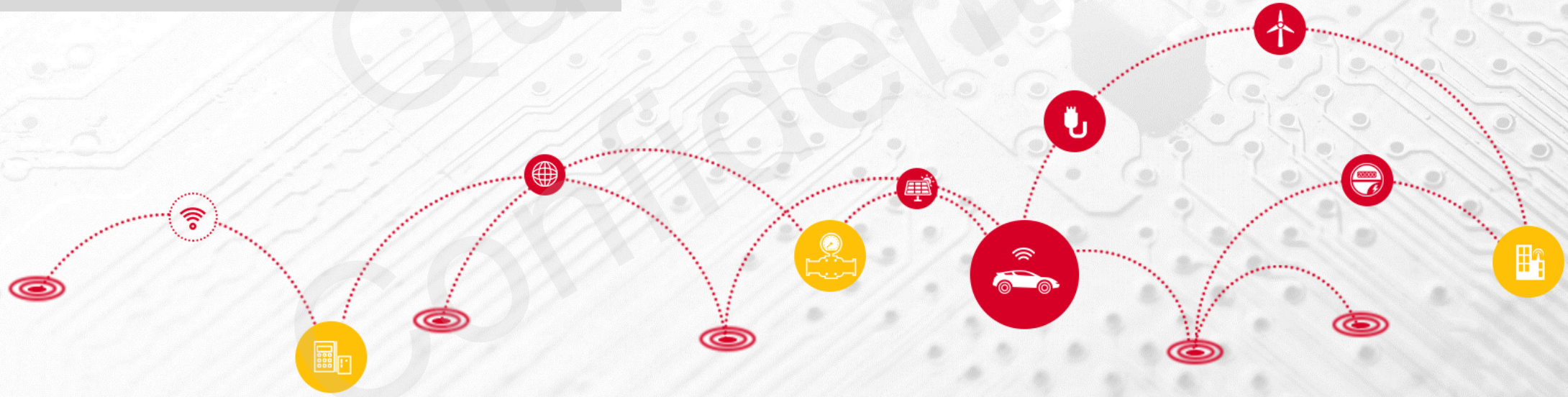


Open System Resources

CPU & O.S

ARMv7 Cortex A7 up to 1.2GHz with 256KB L2 cache.
(Performance: 2280 DMIPS @1.2GHz, 1.9 DMIPS/MHz).
Linux distribution with kernel 3.18.

Flash Space

Filesystem	Type	Size	Used	Available	Use%	Mounted on
ubi0:rootfs	ubifs	55.8M	36.1M	19.7M	65%	/
/dev/ubi2_0	ubifs	99.5M	32.0K	99.5M	0%	/usrdata

Rootfs: 20MB available. Customers may put read-only data, such as binary code bin and some configuration files and resource data.

/usrdata: an R/W flash space, **100MB** available for user code and data.

RAM

RAM available: 100MB

Open Hardware Resources (1)

- **UART**

  - Debug port (x1)
  - Application UART port (x3): All of them support hardware handshake option

- **GPIO** (more than 30)
- **I2C** (x1)
- **SPI** (x1)
- **PCM** (x1)
- **ADC** (x2)
- **SDIO** (x2): one for Wi-Fi, and the other for SD card or eMMC.
- **SGMII** (x1)

Open Hardware Resources (2)

- **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 QuecOpen, the GNSS NMEA is outputted to applications through a virtual serial port (/dev/smd7).

USB Design Suggestions:

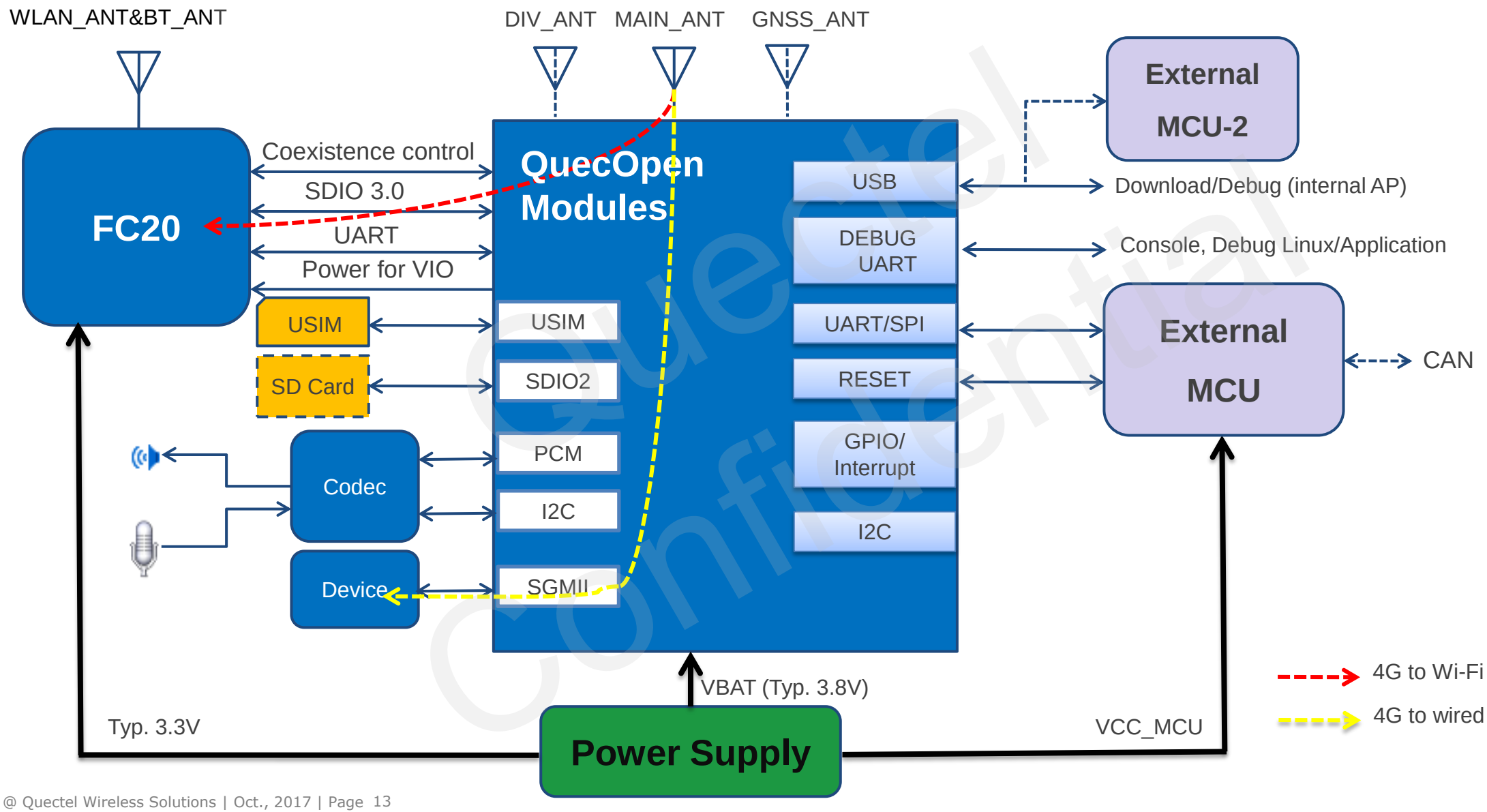
- *For downloading → DM port*
- *For Capturing system log→ DM port*
- *For debugging → ADB port*

Interfaces & Multiplexing Pins

Pin No.	Pin Name	Pin Location	Combined Interface (Default)	Pin Multiplexing			Power Domain	Reset	Wake-up Interrupt	Remark
				Primary Function	Alternate Function 1	Alternate Function 2				
1	GPIO1	Edge		GPIO_25	--	--	1.8V	B-PD,L	√	BOOT_CONFIG_2
2	GPIO2	Edge		GPIO_10	--	--	1.8V	B-PD,L	×	
3	GPIO3	Edge		GPIO_42	--	--	1.8V	B-PD,L	√	
4	GPIO4	Edge		GPIO_11	--	--	1.8V	B-PD,L	√	
5	GPIO5	Edge		GPIO_24	--	--	1.8V	B-PD,L	×	BOOT_CONFIG_1
6	NET_STATUS	Edge		NET_STATUS	PMU (GPIO_01)	--	1.8V	DO-Z		
11	DBG_RXD	Edge	DEBUG UART	DBG_RXD	GPIO_9	--	1.8V	B-PD,L	√	
12	DBG_TXD	Edge		DBG_TXD	GPIO_8	--	1.8V	B-PD,L	√	
13	USIM_PRESENCE	Edge		USIM_PRESENCE	GPIO_34	--	1.8V	B-PD,L	√	
15	USIM_DATA	Edge		USIM_DATA	GPIO_31	--	1.8V/2.85V	BH-PD	×	
16	USIM_CLK	Edge		USIM_CLK	GPIO_32	--	1.8V/2.85V	BH-PD	×	
17	USIM_RST	Edge		USIM_RST	GPIO_33	--	1.8V/2.85V	BH-PD	×	
23	SD_CARD_DET	Edge		SD_CARD_DET	GPIO_26	--	1.8V	B-PD,L	√	
24	PCM_IN	Edge	PCM interface	PCM_IN	GPIO_76	--	1.8V	B-PD,L	√	
25	PCM_OUT	Edge		PCM_OUT	GPIO_77	--	1.8V	B-PD,L	×	
26	PCM_SYNC	Edge		PCM_SYNC	GPIO_79	--	1.8V	B-PD,L	√	BOOT_CONFIG_7
27	PCM_CLK	Edge		PCM_CLK	GPIO_78	--	1.8V	B-PD,L	×	BOOT_CONFIG_8
37	SPI_CS_N	Edge	SPI Interface	SPI_CS_N_BLSP6	GPIO_22	UART_RTS_BLSP6	1.8V	B-PD,L	√	
38	SPI_MOSI	Edge		SPI_MOSI_BLSP6	GPIO_20	UART_TXD_BLSP6	1.8V	B-PD,L	√	
39	SPI_MISO	Edge		SPI_MISO_BLSP6	GPIO_21	UART_RXD_BLSP6	1.8V	B-PD,L	√	
40	SPI_CLK	Edge		SPI_CLK_BLSP6	GPIO_23	UART_CTS_BLSP6	1.8V	B-PU,H	×	BOOT_CONFIG_4
41	I2C_SCL	Edge	I2C interface, host only	I2C_SCL_BLSP2	GPIO_7	UART_CTS_BLSP2	1.8V	B-PD,L	×	
42	I2C_SDA	Edge		I2C_SDA_BLSP2	GPIO_6	UART_RTS_BLSP2	1.8V	B-PD,L	×	
61	STATUS	Edge		STATUS	PMU (GPIO_04)	--	OC	DO-Z		
62	GPIO6	Edge		GPIO_75	--	--	1.8V	B-PD,L	√	

For more details, please refer to *Quectel_EC25&EC21&EC20 R2.0_QuecOpen_GPIO_Assignment_Speadsheet*.

Application Model (QuecOpen Modules)



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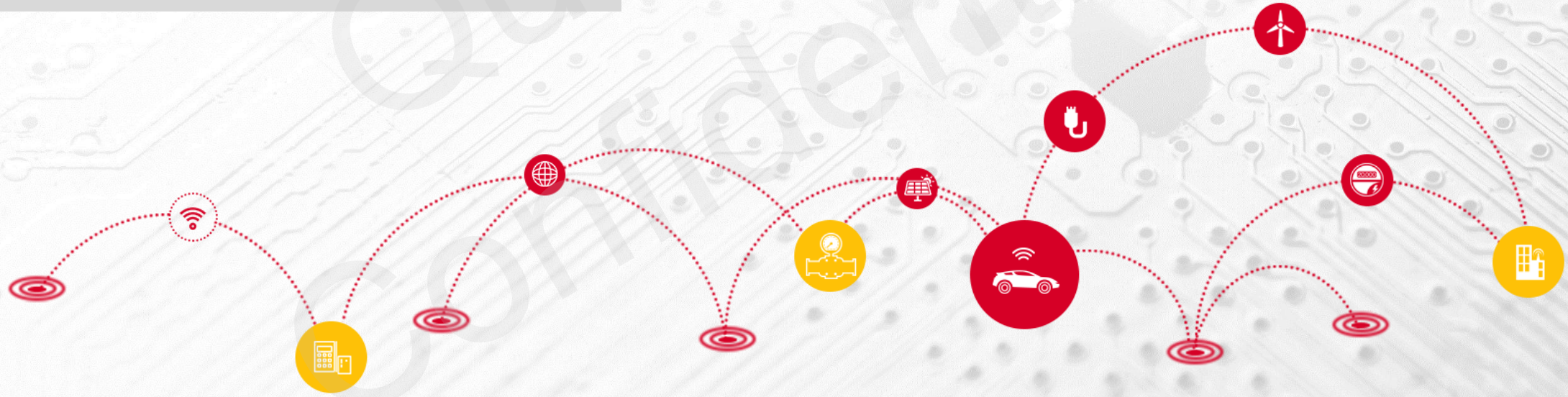


Dev-Host Requirements

- **Operating system**

  Ubuntu 64-bit OS, version 12.04 or 14.

- **Compiler**

  Specified compilation environment with GCC version 4.9.

- **ADB (option for development stage)**

  Android Debug Bridge version 1.0.31.

- **Fastboot (option for development stage)**

Development Suites

- Development Documentation
- Compilation Environment
- SDK
- Drivers (USB, ADB)
- Download Tools:
  Quectel_Customer_FW_Download_Tool, ADB, Fastboot
- Utilities: serial tool “QCOM”, assistant tool for making rootfs/boot.img
- Open Kernel Source (optional)

Programming Capacities

- Shell script, C, C++
- GNU C Library
- main() entry procedure (application entry)
- Freely apply/free dynamic memory, malloc()/delete()
- Multithreading, dynamically threads creation
- Open-source APIs for I/O interfaces accessing
- DSI_NetCtrl library for network activation and management
- Standard Unix socket APIs for TCP/UDP connection establishment
- Standard 3GPP AT commands
- Quectel extended AT commands

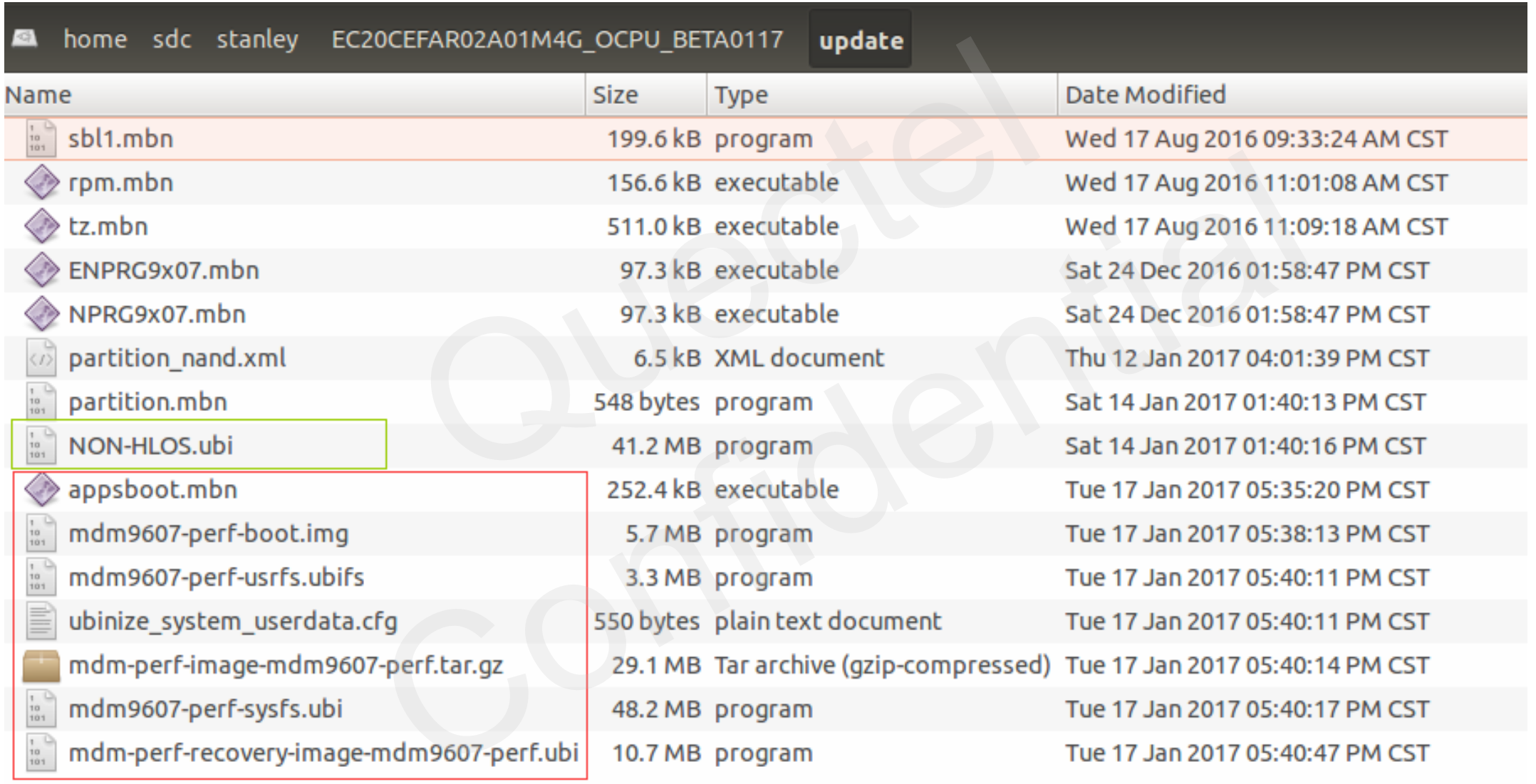
How to Work with QuecOpen™ (1)

For more details about how to start working with QuecOpen™, please refer to ***Chapter 3*** of *Quectel_EC25&EC21&EC20 R2.0_QuecOpen_Developer_Guide.*

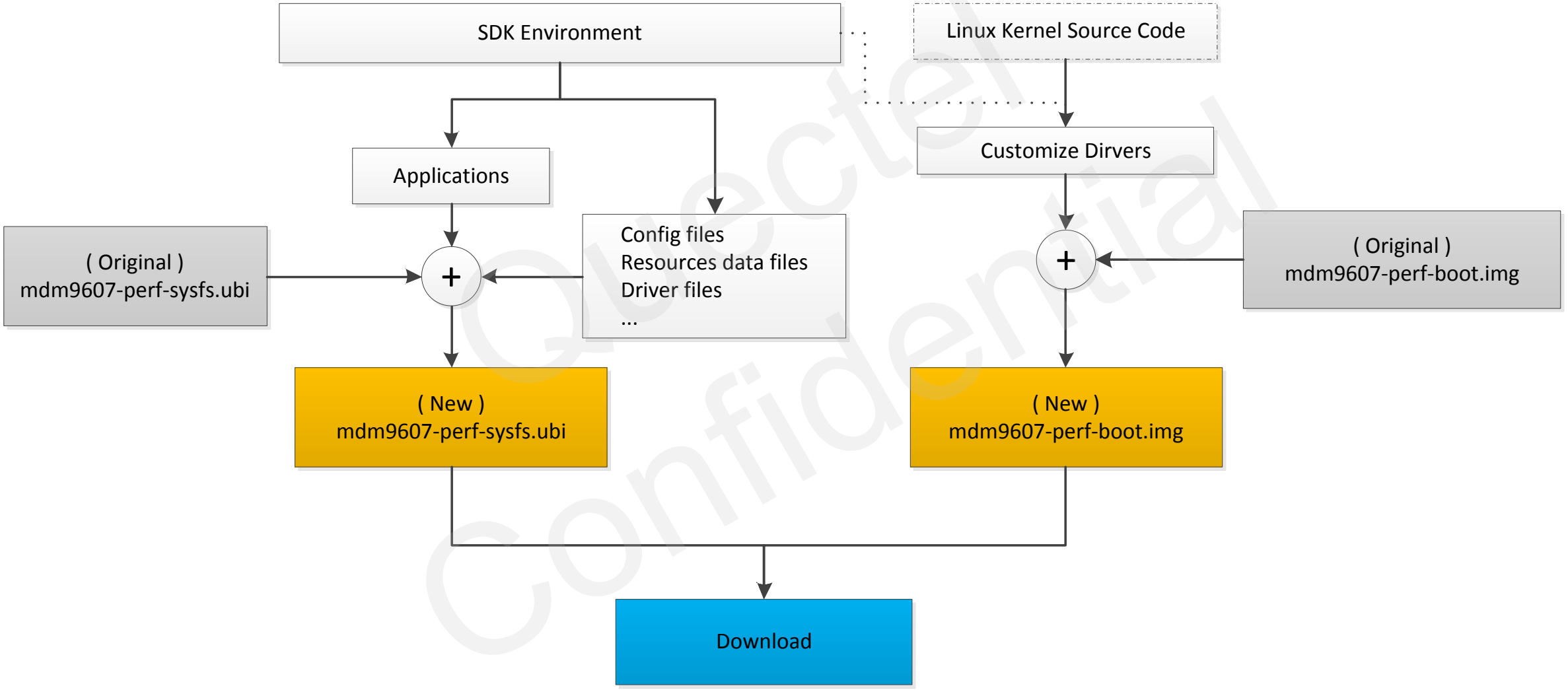
How to Work with QuecOpen™ (2)

For more details about how to develop QuecOpen™, please refer to ***Chapter 2*** and ***Chapter 4*** of *Quectel_EC25&EC21&EC20 R2.0_QuecOpen_Developer_Guide.*

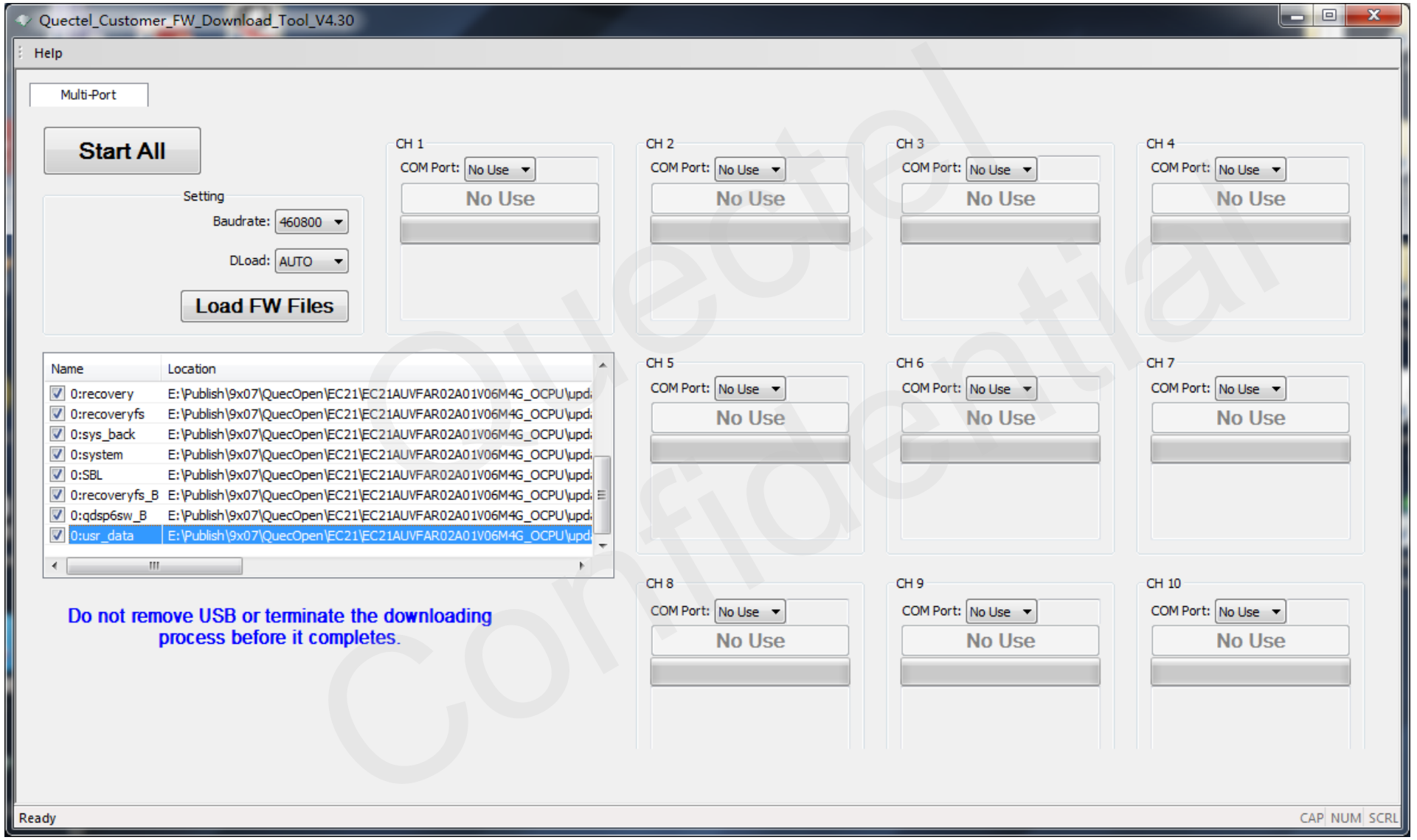
Dev./Download/Production (1)



Dev./Download/Production (2)



Dev./Download/Production (3)



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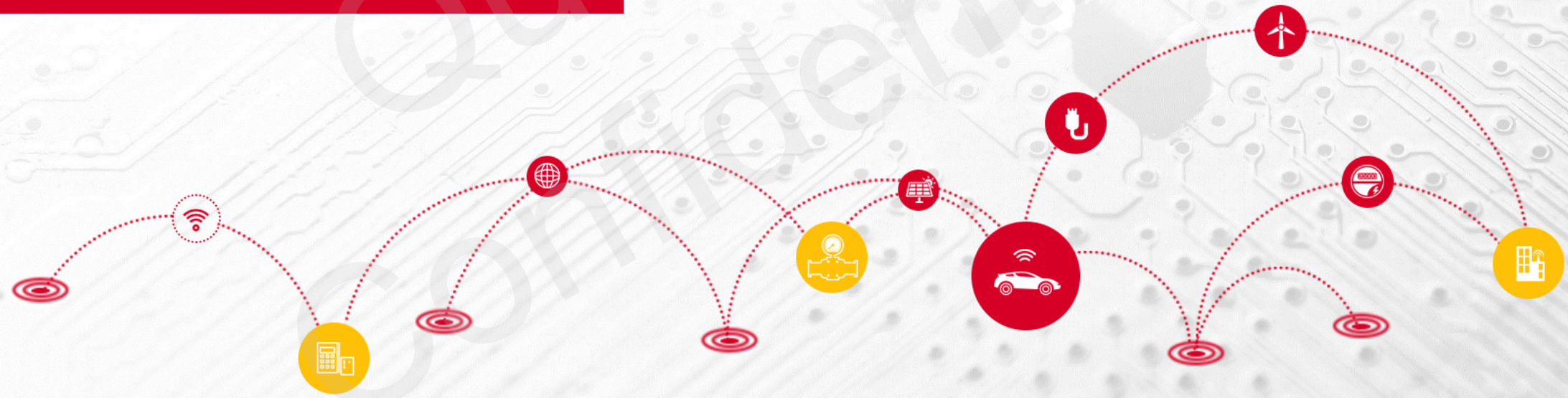

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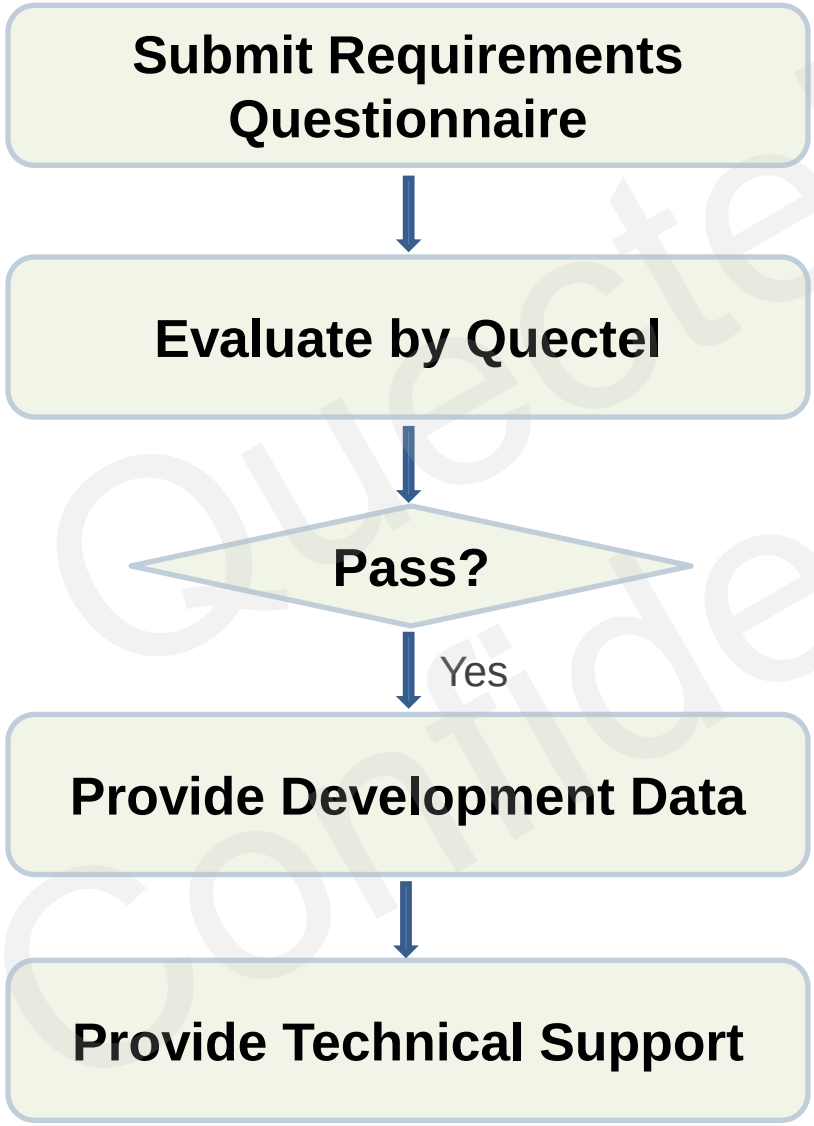

Target Applications

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
- 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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