1   Introduction

This introduction manual provides an overview of the in the Qorvo Test Component software library. The document intends providing a general overview of the test component system and its intended usage. Besides providing this overview it links to documentation of the systems building blocks.

The Test Component software library targets to enable RF validation, RF production test and PHY and MAC certification measurements of the Qorvo IEEE802.15.4 and BLE Silicon. The system includes test firmware running on the target hardware (=Qorvo radio silicon), a PC console application allowing to configure the radio and dll's enabling to integrate the test solution in an automated test setup.

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2 System Overview

The Qorvo Test Component library can be split up in a top level and (multiple) lower level building blocks.

On the top level a Radio Control Package enables to control the Qorvo silicon. The Package includes both a Radio Control Console (RCC) PC application and a test component driver dll exposing the test API's. The latter enables to build a custom test application on top of the Qorvo test API.

The lower level blocks implement test functionality for a specific use case. The product Test Component (PTC) enables to control the radio interface of the target hardware. Features like Transmitting or Receiving radio frames are implemented. Detailed info of the supported functionality is described in [3]. On top of this Qorvo proprietary implementation the PTC component also embeds the by BLE SIG specified Direct Test Mode interface. The Coexistence Test Component (CTC) enables to configure the coexistence interface of the target hardware. Here the supported set of features is documented in [7].

The CTC ad PTC packages consist of both extension dll's and a firmware component. The extension dll exposes the functionality the firmware component implements to the Test Component Driver. Further it manages setting up a physical connection with the firmware running on the target hardware. Here UART, Ethernet and ADB over USB physical connections exist.
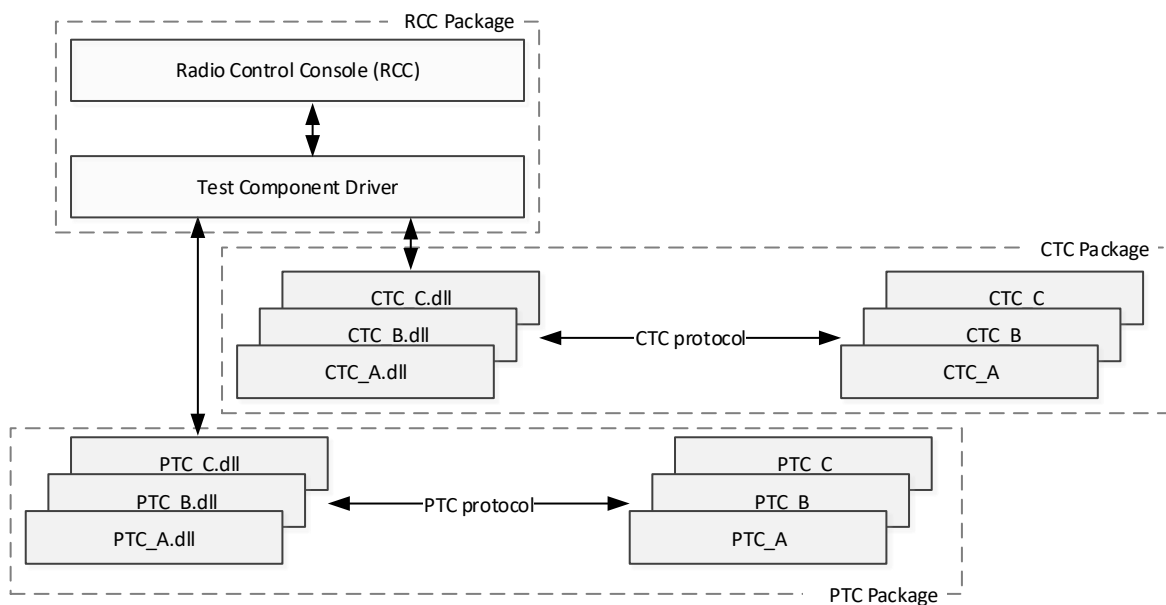

Figure 1: System Overview / Radio Control Console Usage

3   Radio Control Console Usage

The Radio Control Console is a PC application allowing to control a radio running PTC and/or CTC firmware. The console application runs on top of the Product Test Component Driver (Figure 1). This driver takes ownership of setting up the connection with the PTC and/or CTC firmware running on the target. Further, it ensures the compatibility in-between software running on the PC and firmware running on the target. The latter is achieved via dynamically loading the unique dll associated with each PTC firmware binary. In case both the PTC and CTC are to be controlled in parallel two RCC applications can be used at the same time. The Radio Control Console User manual [3] provides an overview of the available functionality.

4   Direct Test Mode BLE Testing

Besides the Qorvo proprietary test implementation the PTC firmware also implements the by BLE SIG specified Direct Test Mode (DTM) protocol. This protocol enables third party test and measurement equipment, supporting the DTM test protocol, can be connected to the target hardware running PTC firmware.
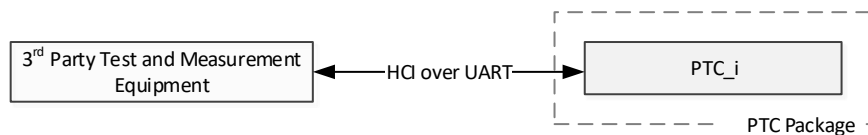

Figure 2: Direct Test Mode Usage

The PTC component implements the HCI over UART variant of the DTM protocol. Note in this configuration, the extension dll included in the PTC package not used. Details on the Direct Test Mode protocol can be found in the DTM section of [2].

5   Product Test Component -BLE / IEEE 802.15.4 Testing

Instead of using the RCC application the customer can develop a custom test application on top of the Qorvo Product Test. Doing so provides a customer a fast path to enable product test support.
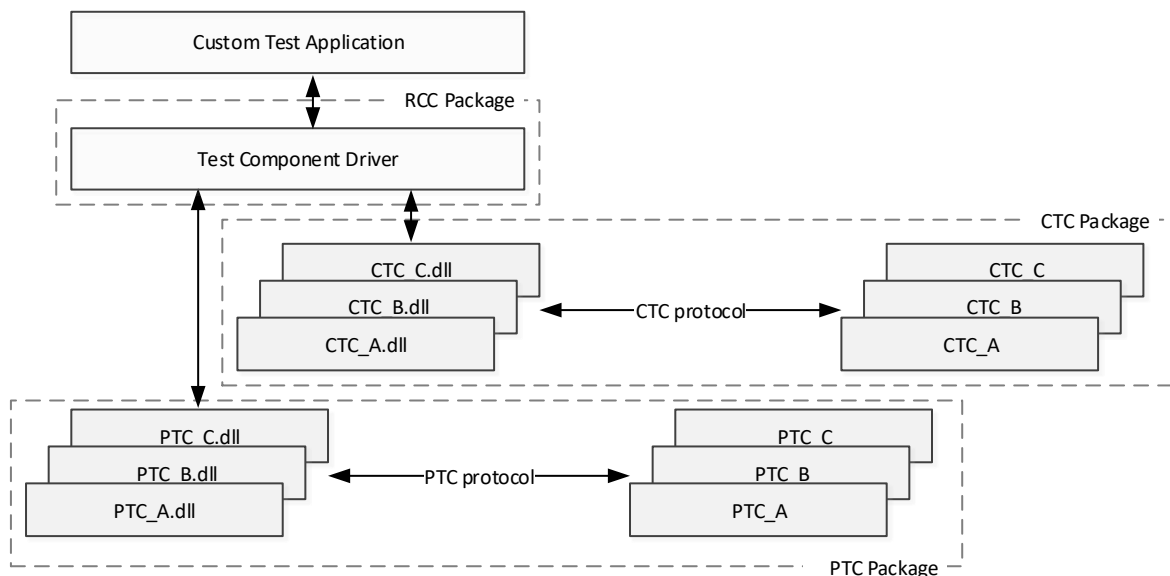

Figure 3: Custom Test application

The set of commands and radio modes a custom application uses to control a radio running the PTC/CTC firmware is identical to when using the RCC. Instead of using the console, commands are triggered by means of function calls. Detailed information on building a custom test application on top of the Test Component Driver can be found in [6].

6   Software Development Kit Integration

The Product and Coexistence Test Component are embedded in the Qorvo SDK. This enables the customer to include and customize the PTC and/or CTC test component in their products. In case PTC/CTC is integrated, the SDK output can be used together with the RCC and PTC driver. In case DTM is enabled, test and measurement equipment supporting the DTM protocol can be used to test the product. More information on the test component integration in the SDK can be found in [4]. This application note is included in the Software Development Kit Package.

References

[1]   IEEE Standard for Low-Rate Wireless Personal Area Networks (WPANs);
        IEEE Std 802.15.4 – 2015

[2]   Bluetooth 4.2 Specification

[3]   GP_P864_UM_12253_RadioControlConsoleUserManual

[4]   GP_P330_AN_13550_Integrate_PTC_into_SDK

[5]   GP_P864_RN_12254_ProductTestComponentReleaseNotes

[6]   GP_P864_UM_14144_PTCDriverUserManual

[7]   GP_P864_UM_16482_QPG7015M_CTC_API

Abbreviations

ADB	Android Debug Interface	PTC	Product Test Component
API	Application Program Interface	RCC	Radio Control Console
CFG	Configuration	RF	Radio Frequency
CTC	Coexistence Test Component	UART	Universal Asynchronous Receiver and Transmitter
DLL	Dynamic Link Library		
DTM	Direct Test Mode	USB	Universal Serial Bus
DTM	Direct Test Mode		

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Document History

Version	Date	Section	Changes
0.10	18 Dec 2019		First Draft
1.00	19 Dec 2019		Reviewed