

Chapter 1: Introduction

After completing this chapter, you will understand what this class is, what topics are covered, and the overall class objectives.

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Document conventions

Convention	Usage	Example
Courier New	Displays code and text commands	CY_ISR_PROTO(MyISR) ; make build
<i>Italics</i>	Displays file names and paths	sourcefile.hex
[bracketed, bold]	Displays keyboard commands in procedures	[Enter] or [Ctrl] [C]
Menu > Selection	Represents menu paths	File > New Project > Clone
Bold	Displays GUI commands, menu paths and selections, and icon names in procedures	Click the Debugger icon, and then click Next .

1.1 What is this Class

This is a class to teach how to use Bluetooth® Low Energy in ModusToolbox™ applications. The descriptions and exercises use a PSoC™ 6 MCU as a host to an AIROC™ CYW43012 Wi-Fi & Bluetooth® combo chip.

After completing this class, you should be able to create and debug full Bluetooth® applications using ModusToolbox™ tools including peripherals, centrals, and beacons.

1.2 Prerequisites

This class assumes that you know the basics of using the ModusToolbox™ ecosystem, how to interact with PSoC™ 6 MCUs including using peripherals, and how to program a PSoC™ 6 device. If you are unfamiliar with these topics, the following classes should be reviewed first:

- ModusToolbox™ Software Training Level 1 – Getting Started
- ModusToolbox™ Software Training Level 2 – PSoC™ MCUs

1.3 Required Software

The following software is required for completing the exercises in this class. Installation instructions will be provided in the exercises.

1.3.1 ModusToolbox™ tools

You should already have ModusToolbox™ tools installed on your system. If not, you will install it in the exercises.

1.3.2 AIROC™ Bluetooth® Connect App

We will make extensive use of a smart phone app called AIROC™ Bluetooth® Connect (also known as AIROC™ Bluetooth® Connect) to act as a Bluetooth® LE central to connect to and test the peripherals that we will create. That tool is available for Android and iOS.

1.3.3 LightBlue

Another popular Bluetooth® development tool is called LightBlue. It is available on both Android and iOS and can perform similar functions as AIROC™ Bluetooth® Connect. It will be used in the scan response exercise and can be used in other exercises instead of AIROC™ Bluetooth® Connect.

1.3.4 Beacon Scanner app

For the chapter on Bluetooth® beacons, a beacon scanner app for Android or iOS was used to test the exercises. Many free beacon scanner apps are available.

1.4 Bluetooth® Families and Development Kits

Infineon supports Bluetooth® on multiple families of devices. A high-level summary of the different solutions is:

- AIROC™ Wi-Fi and Bluetooth® Devices (CYW4343x, CYW43012, CYW4373x) with Host MCU
 - The CYW43xxx device runs the lower levels of the stack in hosted mode while a host processor such as a PSoC™ 6 MCU runs the upper levels of the stack and the application.
 - This solution supports Bluetooth® LE and Wi-Fi
- AIROC™ Bluetooth® SoC (CYW20xxx)
 - The 20xxx device runs the entire Bluetooth® stack and the application.
 - This solution supports Bluetooth® BR, EDR, and LE.
 - The firmware architecture for this solution is almost identical to the 43xxx case.
- AIROC™ Bluetooth® Microcontroller (PSoC™ 63 MCU)
 - The PSoC™ 63 device runs the entire Bluetooth® stack and the application.
 - This solution supports Bluetooth® LE.
 - The stack for this solution is different from the prior two cases so the firmware architecture is considerably different.

Note: This class covers the AIROC™ Wi-Fi and Bluetooth® family of devices with a PSoC™ 6 host.

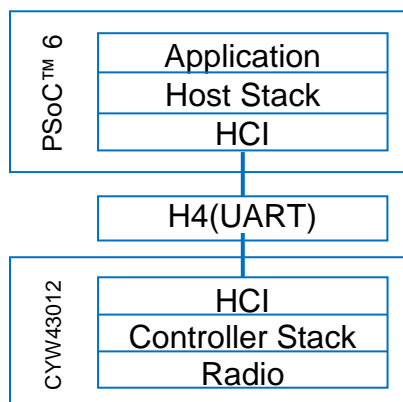
Note: All examples and exercises in this class can be done using the CY8CKIT-062S2-43012 kit which contains the CYW43012 or the CY8CPROTO-062-4343W kit which contains the CYW4343W.

Development kits are available for each of the three families described above. See the list of kits in the ModusToolbox™ Project Creator tool and the Infineon website for the most up-to date list.

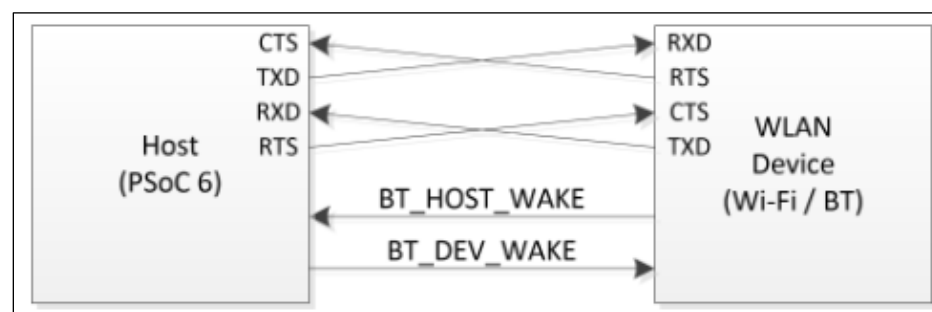
1.4.1 AIROC™ Wi-Fi and Bluetooth® Devices with Host MCU

In the solution with separate radio controller and host MCU, the interface between the host (e.g. PSoC™ 6) and the radio device (e.g. CYW43012) uses the Host Controller Interface (HCI). The lower level of the Bluetooth® stack (the Controller Stack) will run on the CYW43012 while the higher level of the Bluetooth stack (the Host Stack) will run on the PSoC™ 6 along with the user application.

Here is a picture that illustrates the connection:



The HCI interface physically runs using a 4-pin UART interface. The PSoC™ 6 that we are using has multiple UARTs on it so don't worry, you will still have a UART interface to print debug messages. There are also two wake pins that are used for low power which we will cover later.



Note: The CYW43012 also supports Wi-Fi which uses a completely independent SDIO interface (not shown) for communication between the PSoC™ 6 host and the CYW43012.

The controller (e.g. CYW43012) runs the radio physical layer (PHY) and link layer (LL). Everything above that runs on the PSoC™ 6.

1.4.2 AROC™ Bluetooth® SOC

In the Bluetooth™ SOC solution, the stack and user application run on a single device. Many of the devices in this family are combo devices that support Bluetooth® BR/EDR and LE.

1.4.3 AIROC™ Bluetooth® Microcontroller

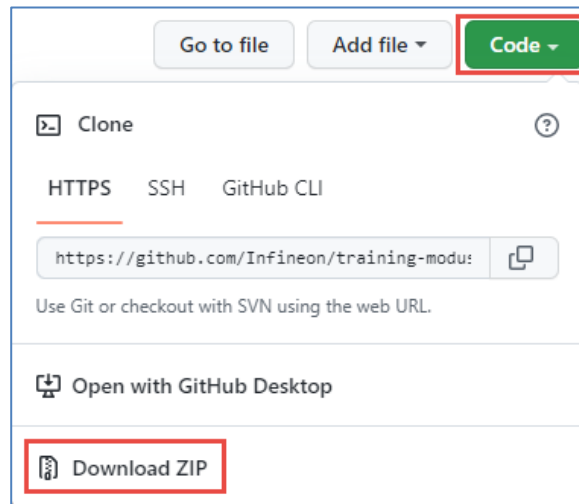
PSoC™ 63 offer the benefit of a powerful PSoC™ MCU including CAPSENSE™ along with Bluetooth® LE in a single device.

1.5 Exercises

Exercise 1: Download Class Material

In this exercise, you will download the class material from GitHub. This will give you local access to the manuals and projects.

- ☐ 1. Use a Web browser to go to the class GitHub site at: <https://github.com/Infineon/training-modustoolbox-level3-bluetooth>
- ☐ 2. Click the Code button.



- ☐ 3. Click the Download ZIP button to download the repo to your local disk to a convenient location and then unzip it.

Note: If you are familiar with Git operations, you can clone the repository to your local disk using the URL instead of downloading a ZIP file if you prefer.

Exercise 2: Install Software

In this exercise, we will make sure you have all of the software needed for the class.

ModusToolbox™ tools



4. You should already have ModusToolbox™ tools installed on your system. If not, refer to the ModusToolbox™ Software Training Level 1 Getting Started class or visit <https://www.infineon.com/cms/en/design-support/tools/sdk/modustoolbox-software> for instructions.

Note: You must use ModusToolbox™ 2.3.1 or later. If you have ModusToolbox™ 2.3, you must install the 2.3.1 patch for the exercises in this class to work.

AIROC™ Bluetooth® Connect



1. Install AIROC™ Bluetooth® Connect onto your smartphone from the Android or iOS app store.

LightBlue



1. Install LightBlue onto your smartphone from the Android or iOS app store.

Beacon Scanner App



1. Install the beacon app of your choice onto your smartphone from the Android or iOS app store.

For Android, "Beacon Scanner" is a good choice.

For iOS, "BLE Scanner" is a good choice.

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Infineon Technologies AG
81726 Munich, Germany

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