

## Chapter 0: Introduction

Objective: Understand the Environment being presented to develop Bluetooth Mesh Applications.

After completing this chapter, you should be able to explain the pre-requisites, scope and agenda for this workshop as well as the format of the manual.

### TABLE OF CONTENTS

<b>0.1 PREREQUISITES</b> .....	<b>1</b>
0.1-1 KNOWLEDGE: .....	1
0.1-2 EQUIPMENT: .....	1
0.1-3 SOFTWARE: .....	<u>21</u>
<b>0.2 SCOPE</b> .....	<b>2</b>
<b>0.3 AGENDA</b> .....	<u><b>32</b></u>
<b>0.4 APPENDIX: SOFTWARE AND REGISTRATIONS</b> .....	<b>3</b>
0.4-1 CYPRESS ACCOUNT SETUP .....	<u>43</u>
0.4-2 CYPRESS COMMUNITY ACCOUNT SETUP.....	<u>43</u>
0.4-3 DOWNLOAD VERSION 2.0 OF MODUSTOOLBOX™.....	<u>43</u>
0.4-4 START MODUSTOOLBOX™ IDE AND EXPLORE THE DOCUMENTATION .....	<u>43</u>
0.4-5 INSTALL BLE MESH APP ONTO IOS OR ANDROID SMARTPHONE .....	<u>54</u>

### 0.1 PREREQUISITES

#### 0.1-1 KNOWLEDGE:

Solid fundamentals in C-Programming (data types, operators, expressions, control flow, functions, program structure, pointers and arrays, data structures, multi-file module programming).

Some experience with standard MCU concepts and peripherals (Serial communication, PWMs, ADCs).

#### 0.1-2 EQUIPMENT:

A personal computer running a Windows environment is required for those who want a hands-on development experience. A Smartphone can be used to run an App that can provision the Mesh Networks that we'll create in this workshop. In the absence of a device that supports Android or iOS applications, there is a Window tool, which can perform the provisioning, albeit not as efficiently.

- Personal Computer
- Smartphone (optional): Android or IOS

## 0.1-3 SOFTWARE:

Several software tools are utilized to program, provision and provide a connection for Mesh traffic. Cypress' ModusToolbox™ is based on Eclipse IDE and includes a version of GCC. GCC is the Gnu C Compiler. It is open source and can be used for free. Cypress includes a GCC compiler in all there IDEs. ModusToolbox™ is used to write a firmware project, compile it into a binary file and load it into the non-volatile memory space of the Cypress BLE Mesh radio component.

- ModusToolbox™: To interface, write code and load on Cypress based kits.
- Cypress Account: To find and download technical support information.
- Cypress Community Account: To ask questions and find common answers, FAQs.- Android or iOS App: To provision and configure mesh networks.
- Windows Client Control Mesh: Communicates with mesh network via wired interface to one Node of the Mesh network.
- Windows Mesh Client tool: Communicates with specified mesh networks directly using the BLE radio of the computer. *(Only works with Windows 10)*

## 0.2 SCOPE

What this class is:

- An overview of the Cypress Bluetooth Ecosystem (Chips, Modules, ModusToolbox™ IDE, BT Software Development Kit (SDK), Forum etc.)
- An overview of using the BT SDK to create Bluetooth devices by connecting common MCU I/O peripherals to an external Bluetooth client (e.g. a smartphone)
- A high level introduction to Bluetooth Low Energy (BLE) and Classic Bluetooth (Basic Rate and Extended Data Rate)
- An introduction to Bluetooth Mesh
- Introduction to Cypress suite of software tools using hands-on examples
- Introduction to ADI sensor shields that pair with Cypress' BLE-Mesh devices

What this class is not:

- A discussion/debate of what WICED or ModusToolbox™ should be.
- A C-programming primer.
- A detailed examination of Bluetooth or RF Parameters.
- An introduction to Wi-Fi.
- An introduction to ZigBee.
- A discussion of Linux integrated WICED.
- A discussion of how to pick the correct Bluetooth module or device
- A detailed examination of MCU peripherals.

### 0.3 AGENDA

Time	Duration	Chapter	Topic	Purpose
9:00 – 9:15	0:15	00 Intro	Lecture	An Introduction to the class (this document)
9:15 – 9:45	0:30	01 Tour-ModusToolbox™	Lecture	A tour of the ModusToolbox™. Details on creating and building projects.
9:45 – 10:30	0:45		Demo/Lab	
10:30 – 11:15	0:45	02 Tour-Bluetooth	Lecture	A tour of the Bluetooth Standard, Chips, Modules, and Kits.
11:15 – 12:00	0:45	04 Bluetooth Mesh Topology	Lecture	Specs, network topology, provisioning
12:00 – 12:15	0:15		Demo/Lab	
12:15 – 12:45	0:30	--- Break ---	Sponsors	Supplier overviews from Cypress and ADI
12:45 – 1:45	0:60	05 Mesh Details	Lecture	Models, security, stack architecture, packet details
1:45 – 2:00	0:15		Lab	
2:00 – 2:30	0:30	03 Peripherals	Lecture	How to use peripherals such as GPIOs, interrupts, UART, I2C, etc.
2:30 – 2:45	0:15		Lab	
2:45 – 3:00	0:15	06 Mesh Firmware	Lecture	Creating Mesh Applications in WICED using ModusToolbox™
3:00 – 3:30	0:30		Lab	
3:30 – 3:45	0:15	Wrap-Up and Surveys	Lecture	Class Wrap-Up and Surveys
3:45 – 5:00	1:15	Self-Paced Exploration	Lab	Students work on whatever is most useful to them

Exercises related to this workshop are contained in Chapter 07 and may be printed as a separate manual. Additional exercises are contained in Chapter 09 provided electronically upon request.

### 0.4 APPENDIX: SOFTWARE AND REGISTRATIONS

Following are basic instructions to setup your PC with software required to participate in the Hands-On portion of the BLE-Mesh workshop. Reference the Power Point slide deck, “BLE\_Mesh\_Workshop\_PreReqs.pptx” if a detailed step-by-step procedure is preferred.

Section	Setup	Reason
0.4-1	Cypress account	Obtain access to software downloads
0.4-2	Cypress Community account	Obtain access to Knowledge Based Articles (KBA), Code Examples (CE), FAQs and more downloads
0.4-3	ModusToolbox 2.0	Cypress’ Integrated Development Environment (IDE) that supports multiple SDKs, platforms and other software components to design and program Cypress’ hardware.

0.4-4	Setup WICED Bluetooth SDK	Prep for first projects by setting up wiced_btsdk as the first New Application. Explore Documentation
0.4-5	BLE Mesh Controller App	Cypress created an Application for Smartphones to interact with BLE-Mesh networks

#### 0.4-1 CYPRESS ACCOUNT SETUP

1. Go to <https://www.cypress.com/user/login>
2. Create an account

#### 0.4-2 CYPRESS COMMUNITY ACCOUNT SETUP

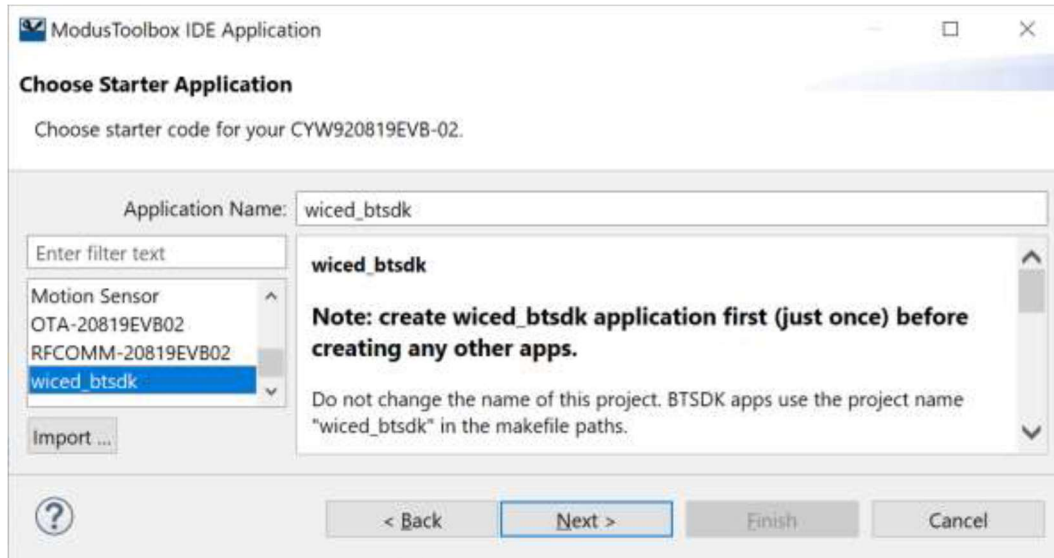
1. Go to <https://community.cypress.com/welcome>
2. Click "Log in" from the top right corner of the page and login to your Cypress account. If you do not have an account, you will need to create one first.
3. Once you are logged in, click the "Wireless" icon and then explore

#### 0.4-3 DOWNLOAD VERSION 2.0 OF MODUSTOOLBOX™

1. Navigate to and install from either Cypress.com or Cypress' Community:
  - a. <https://www.cypress.com/products/modustoolbox-software-environment>
  - b. <https://community.cypress.com/community/modustoolbox-bt-sdk>
2. Install ModusToolbox following the prompts. Do not change the location where it wants to install ModusToolbox. The environment variables are setup for this location and the available Board Support Packages (BSP) will not appear when starting a new application if Modus is not in the default location unless paths are changed, which is beyond the scope of this workshop.

#### 0.4-4 START MODUSTOOLBOX™ IDE AND EXPLORE THE DOCUMENTATION

1. Run ModusToolbox™ IDE and create a new workspace
2. Select **New Application** in the Quickpanel (lower left window). Select **CYW920819EVB-02** then **Next >**. Select **wiced\_btsdk** then **Next >** then **Finish** to create the Bluetooth Board Support Package (BSP) and tools needed to program Cypress' WICED based radios.  
Do NOT change the Application Name.



3. The following steps of this section are optional...
  - a. Getting Started and Configurator Guides → From the dropdowns, select **Help > ModusToolbox General Documentation > ModusToolbox Documentation Index**. Browse through the list of available documents.
  - b. ModusToolbox IDE Help → Again, from the dropdown, select **Help > ModusToolbox IDE Documentation > ModusToolbox IDE Help**. Expand and explore the Contents to get a sense for additional support information
  - c. *Quick Start Guide, User Guide, Eclipse IDE Survival Guide* → Available under **Help > ModusToolbox IDE Documentation**
  - d. *WICED API Reference* is found in the Bluetooth Documentation link in the ModusToolbox Documentation Index or directly @ <https://cypresssemiconductorco.github.io/btstack-docs/BT-SDK/index.html>. Note: The kits associated with this workshop are based on the CYW208XX WICED Chip Family.

#### 0.4-5 INSTALL BLE MESH APP ONTO IOS OR ANDROID SMARTPHONE

For Apple iOS Smartphone users

Download and install Cypress MeshApp from the Apple Play Store

For Android Smartphone users

1. Find and copy the file “MeshController.apk” onto your Android phone

Note: MeshController.apk is added to your computer upon creating the first ModusToolbox 2.0 application for a WICED based radio device, wiced\_btstack. Reference step 2 in section 0.4.4 above.

2. Check the location selected as a workspace for your ModusToolbox project, which defaults to C:\Users\<username>\mtw

3. Within the workspace, MeshController.apk and an associated readme.txt file can be found @ C:\Users\<username>\mtw\wiced\_btsdk\tools\btsdk-peer-apps-mesh\Android\src\bin\
4. Reference detailed instructions in the PowerPoint document, "BLE\_Mesh\_Workshop20\_PreReqs..." provided by the Workshop host