

## 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.

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### 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 – 10:00	0:15		Demo/Lab	
10:00 – 10:45	0:45	02 Tour-Bluetooth	Lecture	A tour of the Bluetooth Standard, Chips, Modules, and Kits.
10:45 – 11:30	0:15	03 Peripherals	Lecture	How to use peripherals such as GPIOs, interrupts, UART, I2C, etc.
11:30 – 12:00	0:30		Lab	
12:00 – 12:30	0:30	--- Break ---	Sponsors	Supplier overviews from Cypress and ADI
12:30 – 12:45	0:15	04 Bluetooth Mesh Topology	Lecture	Specs, network topology, provisioning
12:45 – 1:00	0:15		Demo/Lab	
1:00 – 1:15	0:15	05 Mesh Details	Lecture	Models, security, stack architecture, packet details
1:15 – 1:30	0:15		Lab	
1:30 – 2:15	0:45	06 Mesh Firmware	Lecture	Creating Mesh Applications in WICED using ModusToolbox™
2:15 – 4:00	1:45		Lab	
4:00 – 4:15	0:15	Wrap-Up and Surveys	Lecture	Class Wrap-Up and Surveys
4:15 – 5:00	0:45	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

### 0.4-1 CYPRESS ACCOUNT SETUP

1. Go to <https://www.cypress.com/user/login?destination=node/527946>
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 THE LATEST MODUSTOOLBOX™

1. Start at <https://community.cypress.com/welcome>
2. Go to "Wireless", "ModusToolbox™ Bluetooth" and download the latest ModusToolbox™ from the Downloads table
3. Find the appropriate version of ModusToolbox™ (Windows/Linux/macOS) @ <https://www.cypress.com/products/modustoolbox-software-environment>
  - a. Reference "ModusToolbox™ Installation Guide" found in the 'Documentation' tab @ <https://www.cypress.com/products/modustoolbox-software-environment>

#### 0.4-4 DOWNLOAD THE LATEST BT SDK

1. Check your version of the SDKs loaded by looking in the installation directory. The default directory is C:\Users\<user\_name>\ModusToolbox\_<version>\sdk\_data
2. Check for the current version at <https://community.cypress.com/welcome>
3. Navigate the box icons to "Wireless", "ModusToolbox™ Bluetooth" then scroll through to determine if there's a more recent version of BT SDK than the version loaded into ModusToolbox™ on your PC
4. If your version is NOT the latest, download then unzip the latest ModusToolbox™ BT SDK from the Downloads table to a temporary directory on your PC

#### 0.4-5 START MODUSTOOLBOX™ IDE, EXPLORE THE DOCUMENTATION, AND UPDATE TO THE LATEST BT SDK

1. Run ModusToolbox™ IDE and create a new workspace
2. Select the Documents tab in the lower-left panel
3. Explore the different documents available such as the *ModusToolbox™ IDE Help*, *Quick Start Guide*, *User Guide*, *Eclipse IDE Survival Guide* and *WICED API Reference*
4. On the main toolbar of ModusToolbox™, Navigate to "Help > Update ModusToolbox SDKs..."
5. Click "OK" if you see a message that says "Unable to find installable SDKs,..."
6. Notice at least two SDKs installed by default. Do NOT remove those
7. If the latest version of the BT SDK is not already installed, Click "Install Custom SDK" and browse to the location of the unzipped BT SDK file that you downloaded to your PC
8. Note: Installing any version of an SDK will uninstall any existing versions, older or newer, of the same SDK