Chapter 8: Appendix

Objective: Provide links to further reading and Exercises

This Appendix is intended to be a cheat sheet for all development questions related to Cypress ModusToolbox and Bluetooth Mesh.

TABLE OF CONTENTS

8.1 CYPRESS

8.1-1 PRODUCTS:

Cypress product include…
Here's some links….

8.1-2 KITS:

Cypress kits include…
Here's some links….

8.1-3 TOOLS:

Cypress continues to develop tools to aid in the development of applications. Those tools include:
- ModusToolbox
- BT SDK
- Mesh Controller Windows version
- Mesh Controller Apps
<Insert links to all relevant tools>

8.1-4 SUPPORT:

Information to help developers can be found at multiple levels from Datasheets for specific parts, Technical Resource Manuals for features that span a family of parts.
- Datasheets
- TRMs
- Application Notes
- Code Examples
- Cypress Community
- WICED API Reference
- ModusToolbox IDE Help

- Eclipse IDE Survival Guide
- Quick Start Guide
- User Guide
- Modus Toolbox Documentation Index ← <mark>This document describes many other docs – maybe copy its contents here. ???</mark>

8.2 BLUETOOTH

- BLE SIG
- WBT101 chapters
- App Notes specific to Bluetooth
- .

8.3 CODE SNIPS

- RTOS
- .

8.4 CODE EXAMPLES

- GitHub
- .

8.5 BT MESH FAQS

RESOURCES

THE MODULES ARE FCC CERTIFIED IN THE USA. WHAT ABOUT CANADA AND OTHER COUNTRIES?

Yes, the modules are certified in Canada and throughout the world. For more details and a list of certifications read this community article - https://community.cypress.com/docs/DOC-17352.

CAN I RUN THE CYBT-213043-MESH KIT WITH A COIN CELL?

Yes, there is a coin cell socket underneath the kit. Alternatively, you can also power it with a USB cable.

IS THERE A WAY TO ADD ADDITIONAL SENSORS TO THE KIT?

There is a small header on the kit with a few GPIOs available. If you want a lot of IO, you can use a different kit (CYW920819EVB) that has Arduino headers on it with a bunch of GPIOs. It has the same silicon as the CYBT-213043-MESH kit used in the workshop.

FIRMWARE

IS OVER-THE-AIR PROGRAMMING SUPPORTED?

Yes, over-the-air firmware update can be done to unprovisioned devices or provisioned devices that have a GATT proxy. However, the Bluetooth SIG is currently working on an update to the standard for OTA updates over a mesh network so it is likely to change in the near future.

WHY DOES THE BLE_MESH_ONOFFSWITCH APP NOT SUPPORT GATT PROXY? IS THERE A SPECIFIC REASON TO NO DO THAT?

We want to show examples with lots of different settings so we have GATT proxy in some and not in others. There is no reason that you couldn't add a GATT proxy to it. One reason you might not want it though - if you have a switch that is battery powered instead of connected to the AC power source you might want to make it a low power node. In that use case you don't want it to be a proxy node.

CAN WE USE THE CYPRESS LIGHTING MODELS IN OUR OWN APPLICATION AND DO WE NEED BLUETOOTH SIG APPROVAL FOR OUR MESH PRODUCTS?

Yes, the firmware is provided just so you can do that and all our Bluetooth modules are fully certified. See https://community.cypress.com/docs/DOC-17352 for details.

THERE IS NO DEBUGGER INTEGRATED ON THE EVALUATION BOARDS. IS IT POSSIBLE TO USE A SEGGER J-LINK TO DEBUG THE CODE?

Yes, Segger J-Link is fully supported within ModusToolbox IDE. Go to Help > ModusToolbox General Documentation > ModusToolbox Documentation Index and look for Hardware Debugging for WICED Devices.

CAN THE MESH CLIENT RUN ON OSX OR LINUX?

The client only runs on Windows 10 (Windows 7 does not support BLE). Source code is available if you wish to port to other operating systems. Look for windows.zip in the below link.

github.com/cypresssemiconductorco/Code-Examples-BT-SDK-for-ModusToolbox/tree/master/Mesh-Peer-Apps

CAN THE CLIENTCONTROLMESH APP RUN ON IOS?

Yes, the iOS app can be found in ios.zip in the below link.

github.com/cypresssemiconductorco/Code-Examples-BT-SDK-for-ModusToolbox/tree/master/Mesh-Peer-Apps.

DO MESH CLIENT AND THE CLIENTCONTROLMESH APP SUPPORT NON-CYPRESS DEVICES?

We do not know why you would ever want to do this but, yes, both the desktop program and mobile app should work with any device that follows the Bluetooth Mesh spec.

WHY DOES THE MESHCLIENT PROGRAM NOT FIND ANY DEVICES WHEN I PRESS "SCAN UNPROVISIONED"?

There is a bug in the version of MeshClient in the SDK 1.2. The corrected version can be found on GitHub. There is a file called windows.zip in the Mesh-Peer-Apps folder.

github.com/cypresssemiconductorco/Code-Examples-BT-SDK-for-ModusToolbox.

IS IT POSSIBLE TO USE THE MESH CLIENT APPLICATION WITH THE BLE INTEGRATED INTO THE LAPTOP?

Yes, but you must be running Windows 10 because Windows 7 does not support Bluetooth Low Energy.

WHAT HAPPEN IF A LOW POWER NODE MOVES OUT OF RANGE OF ITS FRIEND? WOULD IT FIND A NEW FRIEND NODE ANYWHERE IT WAKES UP?

That isn't really the expected model for friend/low power nodes, but if a low power node moves out of range of its friend it will eventually (after a defined number of failed attempts) realize that the friend is gone and will then look for a new friend. Obviously, any messages waiting in the previous friend node will be lost.

WHAT IS THE APPROXIMATE RANGE BETWEEN NODES?

The maximum range is the same as the Bluetooth radio range, which is obviously dependent upon the antenna, environment, and so on.

CAN A NODE BE A PROXY AND A FRIEND AT THE SAME TIME, TO ENABLE MULTIPLE LOW POWER NODES TO CONNECT TO A SMARTPHONE?

Yes, nodes can be proxy and friend and relay at the same time.

HOW MANY LOW POWER NODES CAN A FRIEND NODE SUPPORT?

A low power node always has exactly 1 friend. A friend node can support multiple low power nodes. The maximum depends on how much RAM is available in the friend to store messages.

CAN A NORMAL NODE INITIATE THE NODE REMOVAL PROCESS?

A configuration client is needed for removal, typically a provisioner, such as a mobile mesh app, does this job.

WHAT IS THE MAXIMUM RATE AT WHICH MESSAGES CAN BE BROADCAST TO THE NETWORK?

According to the SIG, devices should not send more than 100 network PDUs in any 10 second window, which corresponds to a median average of 10ms between messages.

WHAT IS THE DISTANCE THAT A MESSAGE CAN TRAVEL?

The distance depends very much on the power of the radio and the physical arrangement of the nodes in the network. As a result, it is more useful to think about the maximum number of hops a message can make and that is defined by the SIG to be 127.

HOW IS SECURITY HANDLED IN A CYPRESS BLUETOOTH MESH NETWORK?

Security is mandatory in any Bluetooth mesh network. It is managed by a set of three keys.

NETWORK KEY

Possession of the NetKey makes a node a member of a given mesh network. It allows a node to decrypt and authenticate messages at the network Layer. The mesh packet header and address are encrypted and authenticated with the network key, enabling relay nodes with the NetKey to forward messages that are not addressed to it without being able to access the data.

APPLICATION KEY

The mesh packet payload is encrypted and authenticated with the AppKey so that data for a specific application can only be decrypted by nodes that have the AppKey. AppKeys are used by the upper transport layer to decrypt and authenticate messages before passing them to the access layer. AppKeys enable multiple applications – such as room lighting and door locks in a hotel – to share a mesh network (and therefore gain all the benefits of having more nodes such as increased reliability and range) without each node having access to all messages.

DEVICE KEY

Each device has its own unique device key known only to itself and the provisioner device. This key is used for secure communication during configuration.

In addition to the keys, Cypress Bluetooth mesh has built in protection against trash can attacks (with automatic key refresh and black-listing of removed nodes) and replay attacks (using the sequence number and IV index).

IS IT POSSIBLE FOR A DEVICE TO BELONG SIMULTANEOUSLY TO TWO DIFFERENT MESH NETWORKS?

Yes, there is a concept of sub-networks. Devices can belong to multiple sub-nets but only one main mesh network.

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