



STM32F40_41xxx Bluetopia (NoOS) Release Notes



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Revision Control

Rev	Update	Date	Author
1.0	First Release	Feb 9,2015	R.Malovany
1.1	Update to version 4.0.2.1	Jun 21,2015	R.Malovany
1.2	Removed support for some profiles and services.	Oct 13, 2015	S. Hishmeh
1.3	Update to version 4.2.1.0	Oct 27, 2016	D. Horowitz
1.4	Update to version 4.2.1.1	July 10, 2018	V. Parmar

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Terms & Abbreviations

Abbreviation /Term	Meaning / Explanation
BTSP	Bluetooth Controller (CC256x) Service Pack
GAP	Generic Access Profile
HID	Human Interface Device
SPP	Serial Port Profile
A2DP	Advanced Audio Distribution Profile
AVRCP	Audio Video Remote Control Profile
GAVD	Generic Audio/Video Distribution Profile
GATT	Generic Attribute Profile
L2CAP	Logical Link Control and Adaptation Protocol
SDP	Service Discovery Protocol
HFP	Hands Free Profile
PBAP	Phonebook profile
HSP	Headset profile
CSCP	Cycling speed and cadence Profile
ANP	Alert Notification Profile
ANS	Alert Notification Service
HOGP	Hid Over GATT profile
HRS	Heart Rate Monitor Service
HRP	Heart Rate Profile
HSP	Headset Profile
HTP	Health Thermometer Profile
HTS	Health Thermometer Service
MAP	Message Access Profile
PASP	Phone Alert Status Profile
PASS	Phone Alert Status Service
PBAP	Phone Book Profile
PXP	Proximity Profile
FMP	Find Me Profile

1. Introduction

Thank you for selecting the TI's solution.

This release adds support to the STM3240G-EVAL platform based on NoOS, and includes sample applications projects using the IAR Embedded Workbench for ARM and Keil uVision IDEs. GCC compatible libraries are included as well. Please Contact Texas Instruments for any technical support issues. This release includes the core protocol stack with Low Energy support, the Serial Port Profile (SPP), the Human Interface Device Profile (HID), the Message Access Profile (MAP), the Phone Book Access Profile (PBAP), the Generic Attribute Profile (GATT) and various Low Energy services. Sample applications that demonstrate the use of each of the profiles are a part of the release.

This release has been ported to TI CC256x controller only.

2. Changed in rev 1.4 (v4.2.1.1)

2.1. LE Secure Connections Public Key Validation

- The core stack was updated to include Public Key Validation as part of the LE Secure Connections. This security enhancement provides additional protection against man-in-the-middle attacks that would allow for monitoring or manipulation of traffic during LE Secure Connections pairing.

Important Notes:

- These security enhancements are internal to the core stack and do not require any API changes from the previous version (v4.2.1.0). So this change does not require any migration effort at the application layer.

2.2. New libraries support

This release adds build option for every profile and core libraries to support Cortex M7 CPU. This change, in addition to the build options supported in previous releases, allows the following build option for every profile and core library in this release.

- Existing build options in previous releases
 - *_M3 : **-cpu=Cortex-M3** ,
 - *_M4 : **-cpu=Cortex-M4**
 - *_M4.fp_HW_FP : **-cpu=Cortex-M4 --fpu=fpv4-sp**
- New build options added in this release
 - *_M7 : **-cpu=Cortex-M7**
 - *_M7.fp.dp : **-cpu=Cortex-M7.fp.dp**
 - *_M7.fp.sp : **-cpu=Cortex-M7.fp.sp**

2.3. Doxygen API documentation

API documentation in doxygen format was added to this release. The doxygen documentation can be accessed by opening the following file in a web browser.

`<installation_dir>\NoOS\Documentation\TIBluetopiaAPI.html`

2.4. Updated CC2564C Service Pack

This release aligns the CC2564C BTSP to cc256xc-bt-sp_v1.1 version. The updated service pack can be found in the following directory.

`<installation_dir>\NoOS\Bluetopia\btspsvend\CC256XC.h`

2.5. Removed Memory Analysis Report

The Memory Analysis Report included previously is no longer maintained and it is not included in this release. To analyze the memory requirements, please refer to the map file of the relevant sample applications.

3. Changed in rev 1.3 (v4.2.1.0)

3.1. HWSW updated requirements

- TI's CC256x or CC256xB (CC2564MODNEM or CC256xQFNEM) or CC2564C (CC256XCQFN-EM) Baseband.
- IAR Embedded Workbench for ARM 7.70.1.11486 for ARM or Keil uVision 5.21.1.0.
- Device Family Pack for Keil - STMicroelectronics STM32F4 Series Device Support, Drivers and Examples – V2.10.0

Important Note:

CC256xC is required for specific features (See paragraph 4.3.2 in this doc)

3.2. QDID Support

- Bluetopia 4.0 Profile Subsystem – QDID 69886
https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=25552
- Bluetopia Host Subsystem 4.2 – QDID 85355
https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=32797

3.3. New feature support

3.3.1. The following features works on all CC256x flavors:

- LE Secure Connections – enhance the LE Security Manager with public key Elliptic Curve Diffie-Hellman (ECDH) key generation.
- 32-bit UUID – register services with aliases that are represented as 32-bit values instead of 128-bit UUIDs.
- L2CAP LE Connection Oriented – support LE Credit Based Flow Control Mode.

3.3.2. The following features works only on CC256xC:

- LE Dual Mode Topology – connect in Classic Bluetooth and Low Energy Bluetooth to the same device.
- LE Link Layer Topology:

- Support multiple simultaneous roles, i.e., Peripheral (Slave) and Central (Master).
- Connection Parameter Update can be sent by the Peripheral(Slave).
- LE Ping – used to verify presence of the remote Link Layer. In addition, can be used to verify message integrity in the LE ACL by forcing the remote device to send an LE ACL packet that contains a valid MIC.
- LE Low Duty Cycle Advertising – designed for case where reconnection with a specific device is required, but time is not of the essence or it is not known if the central device is in range or not.

3.4. New profiles support

A new set of profiles support were added to this release, the following profiles support were added:

LE

- Cycling Speed and Cadence

3.5. Bluetooth STACK core updates and bug fixes

Core updates

GAP

- Bonding type - When the upper layer sent an IO-Capabilities authentication response, we did not parse the requested bonding type, and simply set it to general (BTSW-102).

L2CAP

- L2CAP modes – Corrected define values that are used to configure the different L2CAP modes according to the Bluetooth specification (BTSW-98).

3.6. New set of API Documentation

- Cycling Speed and Cadence Service

3.7. New Sample apps support

CSCPDemo

This Application shows how to utilize Low Energy (LE) and the GATT profile.

This sample implements the Cycling Speed and Cadence profile (CSCP) using the GATT profile. The Application allow the user to use a sensor (The Server) that measurement the wheel or the cadence speed and rotations and transmits these measurements to a collector (The Client). This sample acts as a LE Server and Client

SPPDMMultiDemo

This application shows how to utilize the new features from paragraph 4.3 of the Low Energy (LE) and the GATT profile as well as the Serial Port Profile. This sample emulates using SPP over LE using the GATT Profile. A device can connect to one or more devices who running this application or SPPLDemo application (using LE or BR/EDR) and send data (using SPP or SPPDMMulti/SPPLE server) to it. This will act as a LE Master and/or LE Slave (Both roles can be at the same time). It can also act as a SPP Server and Client. This application also shows how to utilize the SPP module and how to handle the different SPP callback events. This will act as either a SPP Server or SPP Client and exposes the same command set for SPP as the SPPDemo.

4. Changed in rev 1.2 (v4.0.2.2)

Removed support for the following profiles and services:

- Device ID Profile
- File Transfer Profile
- Health Device Profile
- Object Push Profile
- Personal Area Networking
- Current Time Service
- Glucose Service
- Next DST Change Service
- Reference Time Update Service
- Scan Parameters Service

5. Changed in rev 1.1 (v4.0.2.1)

5.1. HWSW updated requirements

- ST Micro STM3240G-EVAL Evaluation Board.
- TI's CC256x or CC256xB baseband (CC2564MODNEM or CC256xQFNEM).
- CC256XEM – STADAPT CC256xEM Bluetooth Adapter Kit.
 - This adapter can be used for both EVAL and Discovery development boards.
- IAR Embedded Workbench 7.2/7.3 and up for ARM or Keil uVision 4.70.0.0 and up

5.2. HW limitation STM32 –EVAL

- **HFP\HS** – Audio is not heard well in the TX path, due to HW limitation of the STM32 EVAL platform. The microphone in the EVAL platform is connected directly to an A/D and not an actual codec that sample the microphone directly without any filter.

5.3. HW modification for PCM audio related Sample apps

The CC256x Bluetooth module comes with default HW setup.

In order to work with the EVAL platform and enable the audio related sample app. the CC256x can be only slave on the PCM.

The default HW setup is not configured to use the CC256x PCM as Slave.

The default HW setup can be used with all the Demo application that doesn't use the CC256x PCM interface as slave, like the AUDDemo application or any other logical sample apps that are not related to audio.

The Demo applications with the CC256x PCM interface in slave role are:

- HFPDemo_HF
- HFPDemo_AG
- A3DPDemo_SNK
- A3DPDemo_SRC

And in order to use those applications with audio support, HW changes need to be done:

- Place 0 OHM resistor between R18 pads.
- On the QFN EM board another change need to be done - Remove R11.

5.4. Enable codec support

There are several profiles that have audio capabilities that are using the PCM lines from the CC256X. The following sample apps have these capabilities:

- A3DPDemo_SRC
- A3DPDemo_SNK
- HSPDemo
- HFPDemo_AG
- HFPDemo_HF

Important Note:

In order to enable the audio capabilities in these specific applications please refer to HW modification for PCM audio related Sample apps paragraph 2.2 in this doc.

5.5. DMA support – Enabled by default

By default the sample application source code is loaded with **HCITRANS.C** from **Bluetopia\hcritrans.dma**. In order to work with non DMA, please change the **HCITRANS.C** to be loaded from **Bluetopia\hcritrans**. Please refer to **STM32F4xx Porting.pdf** document for more info.

Note

Full test cycle was performed on the DMA version, and only a subset of the tests was done on the DMA.

5.6. New profiles support

A new set of profiles support was added to this release, the following profiles support were added:

BR\EDR

- Advanced Audio Distribution Profile
- Audio/Video Remote Control Profile
- Handsfree Profile
- Headset Profile
- Message Access profile
- Phone Book Access Profile

LE

- Alert Notification Service
- Battery Service
- Human Interface Device Service
- Heart Rate Service
- Health Thermometer Service
- Immediate Alert Service
- Link Lost Service
- Phone Alert Status Service
- TX Power Service

5.7. Enable Discovery board

This release adds support to the STM3240G-EVAL platform based on NoOS, and includes sample applications projects using the IAR Embedded Workbench for ARM and Keil uVision IDEs. The sample apps are written for the STM3240G-EVAL platform only; there are several changes that need to be done in order to be able to work with the samples app on discovery platform.

Note

Audio related samples apps would need an additional porting in order to enable the audio on the Discovery board; this is not a part of this release

Please refer to **Enable_STM32_Discovery.pdf** file for further instructions.

5.8. Bluetooth STACK core updates and bug fixes

Core updates

HCI

- Consider positive return values from **HCI_ReconfigureDriver** to indicate success. This is necessary as reconfiguring the COM protocols will return 1 if they are in the sleep state.

L2CAP

- Verify that opcode is valid for signaling channel messages.
- Verify connectionless channel packets for minimum size
- Fixed a case where list structures were referenced after being freed in error handling code
- Correct the Authentication state for Security Mode 3. This corrects a connection stall that was observed using the Microsoft keyboard that contains a 1.2 radio and older stack

GAP

- Fixed memory leak in **ParseExtendedInquiryDataRecords** in where previously allocated data buffers were not freed when an allocation failed.
- Fixed **ParseExtendedInquiryDataRecords** to allow for fields with length 1 (i.e., type bytes only)
- Added code to **IssueRemoteFeaturesCallback()** in **GAP.c** to not de-reference the LMP Features pointer if it is NULL (since parts of the code pass NULL for this parameter)

GAPLE

- Fixed error code where case where device isn't connected.
- Fixed some more cases where return value was not set correctly when calling **ScheduleAsynchronousCallback()**.

SDP

- Fixed improper return value from **SDPParseServiceAttributeResponseData()** internal function in **SDP.c**
- Fixed **ParseDataElements()** internal function to correctly free the allocated memory when an error occurs in parsing.

RFCOMM

- Updated RFCOMM to handle a Remote Port Negotiation for a channel that is not yet established. This was done to pass PTS test TP/RFC/BV-19-C.

Profiles updates**GATT**

- Fixed bugs relating to discovering included services and dealing with included service's whose UUID is not 16 bits (and thus must be read using a separate operation).
- Fixed a bug where we returned all types of UUID (regardless of the size) in the value for an Include Definition when it was read by a remote device. According to the specification the UUID of an included service is only contained in the Include Definition's value if and only if it is a 16 bit UUID.

HFRE

- Update the Dial Number command function to passes its command argument, the dial string, as is, rather than attempting to filter valid characters. This follows GSM and ITU-T spec recommendations.
- Update **CheckStartingDigit()** to check for all valid starting digits -according to the GSM spec (as well as the '(' character - in case someone formats an area code in parenthesis for readability).

5.9. New libraries support

New set of build option were added for every profile and core libraries Multiple CPU and FPU build options:

- M3 : build option : **--cpu=Cortex-M3** ,
- M4 : build option : **--cpu=Cortex-M4**
- M4 with HW floating point support **--cpu=Cortex-M4 --fpu=fpv4-sp**

A GCC compatible library will also be a part of every folder.

Core library will be located in **\Bluetopia\lib**, and will include the following folders and files:

- Ewarm
 - **Bluetopia.a** – this is a copy of **Bluetopia_16_M3.a** in order to simplify the Sample application linkage configuration.
 - **Bluetopia_16_M3.a** - M3 build option.
 - **Bluetopia_16_M4.a** – M4 build option.
 - **Bluetopia_16_M4.fp_HW_FP.a** – M4 HW floating point support
- GCC
 - **libBluetopia_32_M3.a** - M3 build option with **WCHAR=--wchar32**
 - **libBluetopia_32_M4.a** – M4 build option. with **WCHAR=--wchar32**
 - **libBluetopia_32_M4.fp_HW_FP.a** – M4 HW floating point support with **WCHAR=--wchar32**
- rvmrk
 - **Bluetopia.lib** – this is a copy of **Bluetopia_16_M3.a** in order to simplify the Sample application linkage configuration.
 - **Bluetopia_16_M3.lib** - M3 build option.
 - **Bluetopia_16_M4.lib** – M4 build option.
 - **Bluetopia_16_M4.fp_HW_FP.lib** – M4 HW floating point support

Every profile will also have a complete set of library support, let look at the PBAP for an example:

Located is **\Bluetopia\profiles\PBAP\lib** and will include the following folders and files:

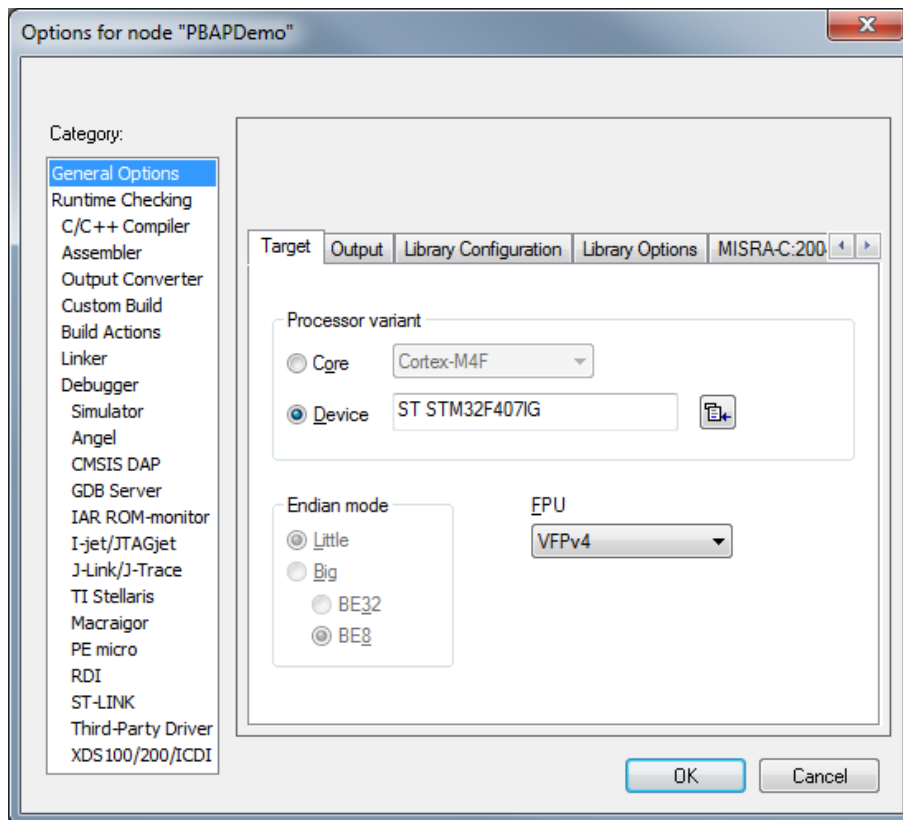
- Ewarm

-
- **SS1BTPBA.a** – this is a copy of **SS1BTPBA_16_M3.a** in order to simplify the Sample application linkage configuration.
 - **SS1BTPBA_16_M3.a** - M3 build option.
 - **SS1BTPBA_16_M4.a** – M4 build option.
 - **SS1BTPBA_16_M4.fp_HW_FP.a** – M4 HW floating point support
 - GCC
 - **libSS1BTPBA_32_M3.a** - M3 build option with **WCHAR=--wchar32**
 - **libSS1BTPBA_32_M4.a** – M4 build option. with **WCHAR=--wchar32**
 - **libSS1BTPBA_32_M4.fp_HW_FP.a** – M4 HW floating point support with **WCHAR=--wchar32**
 - rvmrk
 - **SS1BTPBA.lib** – this is a copy of **SS1BTPBA_16_M3.lib** in order to simplify the Sample application linkage configuration.
 - **SS1BTPBA_16_M3.lib** - M3 build option.
 - **SS1BTPBA_16_M4.lib** – M4 build option.
 - **SS1BTPBA_16_M4.fp_HW_FP.lib** – M4 HW floating point support

5.10. Enable HW floating point library usage in IAR

PBAPDemo as an example

- Open the project located in :
“**STM3240G-EVAL\Samples\PBAPDemo\FreeRTOS\EWARM\PBAPDemo.eww**”
- Go to project options –‘right click on the PBAPDemo-Debug’→Options. And then select ‘General options’ category.
- Set the FPU to → VFPv4



- Change the core and profiles library linkage in order to link with the HW floating point pre build libraries
- Go to project options –‘right click on the PBAPDemo-Debug’→Options , select ‘Linker’ category , choose the library tab. Remove the libraries that are currently there

Note: we will add the same libraries location only with a different naming.

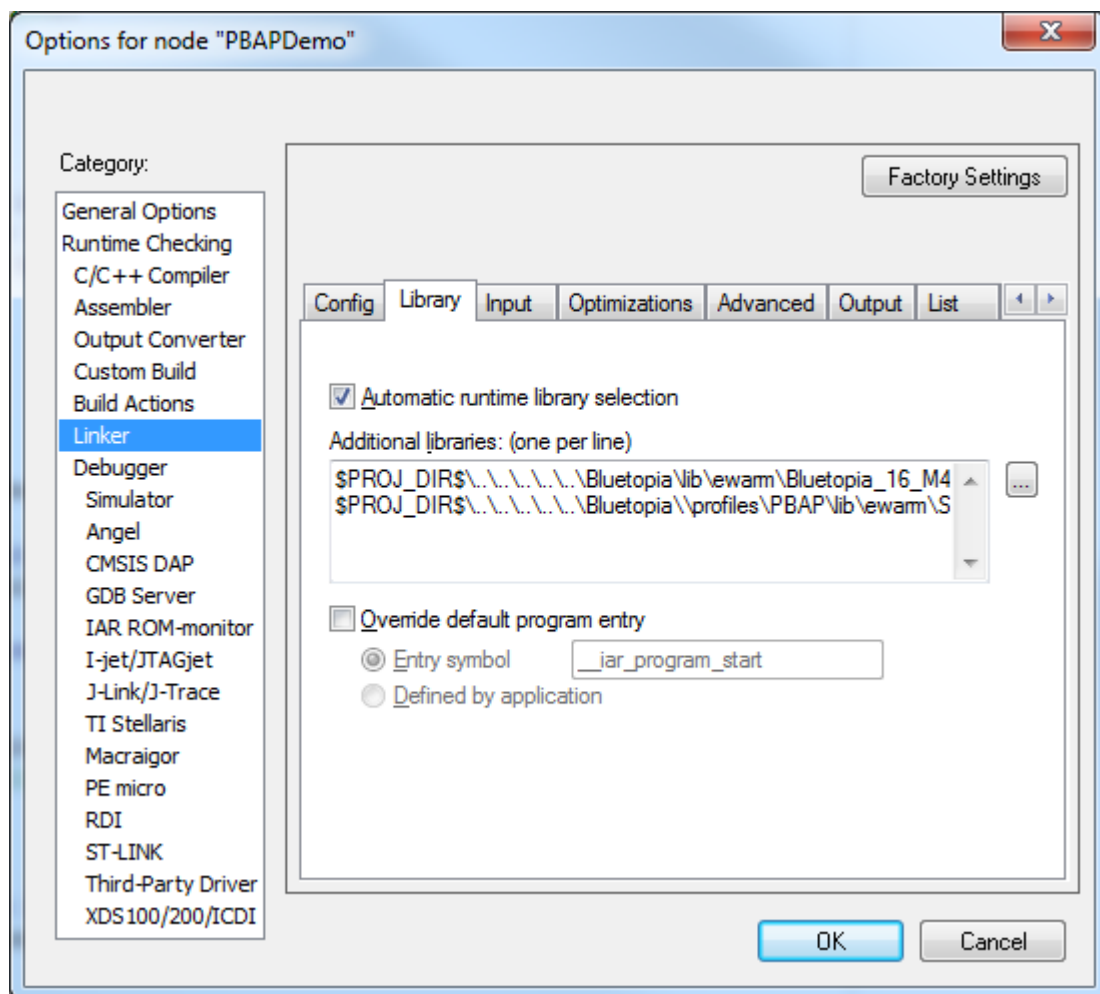
For this example we got the following libraries that are needed for this sample app:

Core: \$PROJ_DIR\$\..\..\..\..\Bluetopia\lib\ewarm\Bluetopia.a , we will change this to
\$PROJ_DIR\$\..\..\..\..\Bluetopia\lib\ewarm\Bluetopia_16_M4.fp_HW_FP.a

Profile: \$PROJ_DIR\$\..\..\..\..\Bluetopia\profiles\PBAP\lib\ewarm\SS1BTPBA.a ,
we will change this to:

\$PROJ_DIR\$\..\..\..\..\Bluetopia\profiles\PBAP\lib\ewarm\SS1BTPBA_16_M4.fp_HW_FP.a

It should look like this:

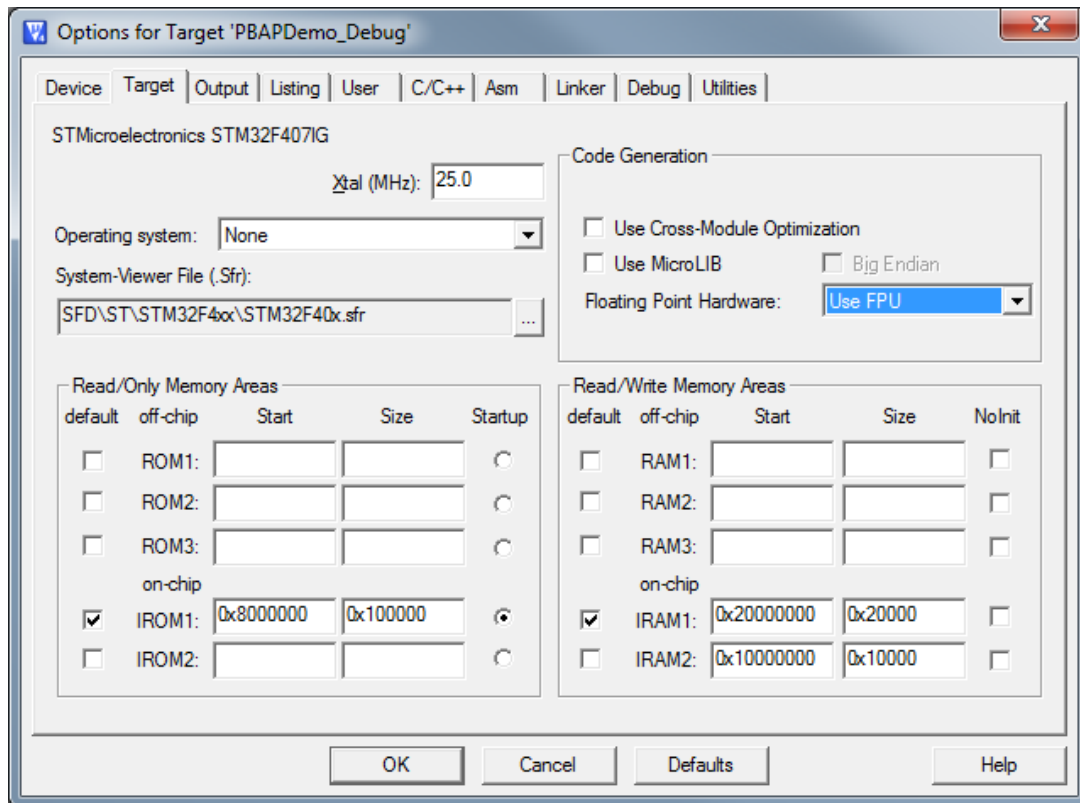


- Preform Clean and rebuild the entire project.
- **Important Note:**
Since we are not using any OS it is up to the use to enable the floating point on the CPU by itself.

5.11. Enable HW floating point library usage in KEIL

PBAPDemo as an example

- Open the project located in :
"STM3240G-EVAL\Samples\PBAPDemo\FreeRTOS\RVMDK\PBAPDemo.uvproj"
- Go to project options –'right click on the PBAPDemo-Debug'→Options for target.
- In the code generation change the 'Floating point Hardware' to Use FPU and press OK.



- At the project folders remove the .lib files from the folders.
- At the HW floating point enabled libraries crosspanding to this project in this demo is the PBAP lib and the core lib. Right click the libraries folder and chose 'add files to group Libraries' , add the following files:
 - Bluetopia\lib\rvmdk\Bluetopia_16_M4.fp_HW_FP.lib
 - Bluetopia\profiles\PBAP\lib\rvmdk\SS1BTPBA_16_M4.fp_HW_FP.lib
- Preform rebuild to the project
- **Important Note:**
Since we are not using any OS it is up to the use to enable the floating point on the CPU by itself.

5.12. New set of API Documentation

- Alert Notification Service
- Battery Service
- Device Information Service
- Headset Profile
- Health Thermometer Service
- Heart Rate Service
- HID Host Subsystem
- Immediate Alert Service
- Link Loss Service
- Message Access Profile
- Phone Alert State Service
- Phonebook Access Profile
- Tx Power Service

5.13. New Sample apps support

AUDDemo

This application shows how to utilize Audio over A2DP profile with SW CODEC for SBC decoding. The Application also shows how to handle the AVRCP profile for controlling the audio stream and open/close the stream with Generic Audio/Video Distribution Profile using the Audio/Video Distribution Transport Protocol (AVDTP)

A3DPDemo_SRC

This application shows how to utilize the A2DP function of the Bluetopia core stack and the Assisted A2DP (A3DP) of the TI CC2564. This will act as a Source device and also demonstrates the AVRCP Target role.

A3DPDemo_SNK

This application shows how to utilize the A2DP function of the Bluetopia core stack and the Assisted A2DP (A3DP) of the TI CC2564. This will act as a Sink device and also demonstrates the AVRCP Controller role

HFPDemo_AG

This application shows how to utilize the HFP (Hands-Free Profile) module, and how to handle the different HFP callback events. This will act only as AG role

HFPDemo_HF

This application shows how to utilize the HFP (Hands-Free Profile) module, and how to handle the different HFP callback events. This will act only as Headset role, This application demonstrate an ability to work with 2 phones in parallel

FMPDemo

This application shows how to utilize Low Energy (LE) and the GATT profile. This sample implements the Find Me Profile (FMP) using the GATT profile. This sample acts as a LE Master and LE Slave.

HSPDemo

This application shows how to utilize the HSP (Headset Profile) module, and

how to handle the different HSP callback events. This will act only as AG and HS roles

iBeaconDemo

This application shows how to utilize Low Energy (LE) and advertise the parameters according to Apple iBeacon spec.

5.14. Update FBL (Flexible build library) options

FBL options were updated to have 3 different sets of libraries:

- M3
- M4
- M4 with HW floating point support.

Please refer to **Using the Flexible Build Library.pdf** document for more info.

5.15. HFP 3 way calling support

- HFPDemo_HF application was updated to support 2 phones in parallel
- Add audio routing to the STM3240G-EVAL board - The CC256x Bluetooth module and the on-board DAC are the PCM slaves and the STM32 is the PCM master that provides the clock and the FSync lines. The input audio from the Bluetooth configured to come from the CC256x PCM directly to the DAC. The input MIC from wired headset, that connect to the EVAL board, is sampled via the ADC peripheral of the STM32 and then output to the PCM for the CC256x and then to the Bluetooth transmission. For all the above a driver to the STM32 I2S and driver to the DAC CS43I22 added
- Add two phones handling with the ability to open two HFP servers with structure for each one to hold the status. Each phone can also open SCO/eSCO but the audio always routed to the first one that opened.
- Add user function, **SwitchAudioFor2PhonesWithActiveCall()**, to switch the audio between two active calls in the two phones.
- Add user function **AnswerSeconePhoneIncomingCallAndSwitchAudio()**, to answer incoming call from second phone during active call in the first call and rout the audio to the second phone

5.16. Removed CSCP support

CSCP was removed till we will have it qualified by the SIG.

6. Overview

This release includes support for the STM32F407IG processor. The following precompiled libraries, which are part of this release, were built using the ARM compiler 5.04:

- **Bluetopia.lib, Bluetopia.a** – Core Bluetopia library (HCI, L2CAP, SDP, RFCOMM, SPP, GAP)
 - **Bluetopia.a** – Core for IAR Embedded Workbench
 - **Bluetopia.lib** – Core for Keil uVision
 - **libBluetopia.a** – GCC compatible library

The following source files, which are part of this release, were ported to STM32F407IG:

- **BTPSKRNL.c** – O/S abstraction layer
- **HCITRANS.c** – HCI UART transport abstraction layer

Porting documentation for the required functions is included for reference.

Finally, this release contains sample applications in source format. Those applications are fully functional applications that show the following usage:

- Initializing/shutting down of the stack
- Device Discovery (Inquiry and SDP)
- Device Pairing
- Serial Port Profile (SPP) usage
- Message Access Profile (MAP) usage
- Human Interface Device (HID) usage
- Hands Free Profile (HFP) usage
- Phone Book Access Profile (PBAP) usage
- LE usage – demonstrates through a dedicated proprietary SPP like service
- Several LE profiles and services

- Local Device Management (class of device, local name, device address, connectivity modes, discoverability modes, pairability modes, etc).

The samples applications provide a command line interface (through a UART or some other mechanism) that can be used to issue commands in real-time and watch the results. These samples should easily be modifiable to add/change features during testing/development.

7. Documentation

- Doxygen API documentation (html)
 - TIBluetopiaAPI.html
- API documentation (PDF)
 - Core Protocol Stack
 - Generic Access Profile Service
 - Generic Attribute Profile
 - Alert Notification Service
 - Battery Service
 - Device Information Service
 - Health Thermometer Service
 - Heart Rate Service
 - HID Host Subsystem
 - Human Interface Device Profile
 - Human Interface Device Service
 - Immediate Alert Service
 - Link Loss Service
 - Message Access Profile
 - Phone Alert State Service
 - Phonebook Access Profile
 - Tx Power Service
 - Cycling Speed and Cadence Service
- Porting documentation
 - Architecture overview
 - System call requirements

- BTPSKRNL (O/S abstraction layer)
- HCITRANS (HCI Transport abstraction layer)
- Memory analysis report
 - CC256x STM32 NoOS Bluetopia SDK v4.0.2.0 Memory Analysis Report
- STM32F40_41xxx porting
- Using the Flexible Build Library

All documentation is located under the Documentation sub directory.

8. Hardware/Software Requirements

- For Hardware and Software requirements, please refer to the CC2564CSTBTBLESW User's Guide : www.ti.com/lit/pdf/swru498

9. Arm compiler library notes

The libraries contained in this distribution were compiled using the ARM compiler 5.04. Users simply are required to link with the Bluetopia.lib library or Bluetopia.a for core stack functionality (stored in the folder lib). All other profiles and support libraries have a corresponding library directory (also named lib) which contains the library required for linking

10. General Porting Notes

Porting Bluetopia stack for a new platform includes the following steps. Further Information on the various steps will be provided on next sections:

- Port **BTPSRKNL.c** to support the target platform (provided)
- Port **HCITRANS.c** to support the target platform (provided)
- Port **BTPSVEND.c** to support the target TI Bluetooth chipset (provided)
- Create the sample/test application
- Create a project that includes the above ported files, the sample/test application, and links with supplied binary libraries.

10.1. BTPSKRNL Porting Notes

For information on porting **BTPSKRNL.c** to the target platform, please see the attached BTPSKRNL porting documentation.

10.2. HCITRANS Porting Notes

For information on porting **HCITRANS.c** to the target platform, please see the attached HCITRANS porting documentation. The **HCITRANS.c** file located in the Core directory should be used (Multi-threaded version).

10.3. BTPSVEND Porting Notes

This module is primarily to configure the specific Bluetooth chipset. This typically entails:

- Required chipset Patch RAM
- Required chipset default Bluetooth values (Name, Class of Device, etc)
- Radio Tuning parameters (specific to physical board layout)
- Means to apply a unique BD_ADDR to the chipset

The content of what is actually downloaded to the chip is typically provided by TI. The implementation of how to download these configuration parameters is what is contained in this module.

11. DMA Support

By default the sample application source code is loaded with **HCITRANS.C** from **Bluetopia\hcitrans**. In order to work with DMA, please change the **HCITRANS.C** to be loaded from **Bluetopia\hcitrans.dma**. Please refer to **STM32F4xx Porting.pdf** document for more info.

Note: Full test cycle was performed on the non-DMA version, and only subsets of the tests were done on the DMA.

12. Flexible Build Library

The Flexible Build Library (FBL) is a mechanism that allows the user to generate different versions of the Bluetopia library tailored to the specified use case. This allows the user to reduce the flash memory requirements of the Bluetopia stack by removing code that is not needed by the user's specific application. Some examples are adding or removing

Low Energy support, adding or removing SPP support and adding or removing SCO audio support for more info please refer to **Using the Flexible Build Library.pdf** document

13. Application Development Notes

This section details specific usage information on how to effectively use Bluetopia with C/C++ Compilers.

In order to include all necessary prototypes/constants, the programmer needs to only include the SS1BTPS.h header file (for the core library). In order to include all necessary prototypes/constants for profiles, the programmer needs to only include the SS1BTxxx.h for the specific profile (where, 'xxx' is the profile name).

Users using C++ MUST use the following code to include the SS1BTPS.H Header File in their C++ Source:

```
extern "C" {  
#include "SS1BTPS.h"  
};
```

Users using C (and NOT C++) do NOT need to include the above code snippet and can simply include the SS1BTPS.h Header File as normal, for example:

```
#include "SS1BTPS.h"
```

All API structures that are used with Bluetopia at the hardware device interface level are aligned on default packing boundaries. This shouldn't pose much of a problem because most of the structures are aligned such that they would not cause too many packing problems otherwise. Lower level structures are aligned based on compiler switches as specified by the customer.

14. Sample Application Notes

The sample applications provided demonstrate how to utilize the various Bluetopia Application Programming Interfaces provided for each profile (GAP, SPP, GAPS, GATT, PBAP, MAP, HID HF and a bunch of LE profiles). This release is intended to be built with either IAR's Embedded Workbench for ARM or Keil uVision.

- IAR Project is included in the **\\[Demo app name]\\NoOS\\EWARM**
- Keil uVision project is included in the **\\[Demo app name]\\NoOS\\RMVDK**

The sample applications can be found under the following subdirectory "Samples":

These sample applications are simple, command line applications which will display a list of available commands. Input and Output can be utilized by plugging in the USART DB9 (CN16) to a PC via a NULL modem cable. The parameters for this port are:

Baud: 115,200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None
Local Echo: Off