Bluetooth® Low Energy Software for the Kinetis MKW36A/MKW35A/MKW35Z/MKW36Z Wireless Microcontroller, Version 1.3.6

Release Notes

1   Overview

These release notes pertain to the platform software that was developed for the MKW36A/MKW35A/MKW35Z/MKW36Z Kinetis-based Bluetooth® low energy v5.0 compliant platforms, and the associated development board FRDM-KW36. These notes pertain to the Kinetis Bluetooth LE Platform Software version 1.3.6 maintenance release.

Contents

2 Release Contents

The NXP Kinetis MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth® LE Software version 1.3.6 Maintenance release main wireless connectivity components are listed in the table below.

Table 1. Release Contents

(File | Folder) Name	Description
boards/[*board*]/wireless_examples/bluetooth	Demo applications on top of GATT standard profiles: - ANS – Alert Notification Sensor - BPS – Blood Pressure Sensor - CPS – Cycling Power Sensor - CSCS – Cycling Speed Cadence Sensor - GLS – Glucose Sensor - HTS – Health Thermometer - HRS – Heart Rate - HID – Host and Device - PXR – Proximity Reporter - PLXP – Pulse Oximeter - RSCS – Running Speed and Cadence Sensor - ANCS – Apple Notification Center Service Demo applications not based on standard GATT profiles: - Beacon advertiser - FSCI black box - HCI black box/modem - Proxy Relay - OTAP server and client - Shell/Console application - Temperature Sensor - Temperature Collector - WPT- Wireless Power Transfer - Wireless UART
middleware/wireless/bluetooth_1.3.6/host	Bluetooth® LE v5.0 host stack
middleware/wireless/bluetooth_1.3.6/controller	Bluetooth® LE v5.0 controller
middleware/wireless/bluetooth_1.3.6/profiles	Bluetooth® LE GATT profiles
doc/wireless	Wireless connectivity documentation
middleware/wireless/framework_5.4.6/Common	Connectivity Framework common files
middleware/wireless/framework_5.4.6/DSP	Signal processing and bit manipulation helper functions
middleware/wireless/framework_5.4.6/FSCI	Freescale Serial Connectivity Interface
middleware/wireless/framework_5.4.6/LowPower	Low Power Module
middleware/wireless/framework_5.4.6/MemManager	Memory Manager
middleware/wireless/framework_5.4.6/Messaging	Messaging API
middleware/wireless/framework_5.4.6/NVM	Non Volatile Memory support
middleware/wireless/framework_5.4.6/OtaSupport	Over-The-Air Programming support files
middleware/wireless/framework_5.4.6/Panic	Panic module
middleware/wireless/framework_5.4.6/RNG	Random Number Generator wrapper
middleware/wireless/framework_5.4.6/SerialManager	Serial Manager for various interface
middleware/wireless/framework_5.4.6/Shell	Shell/Console module
middleware/wireless/framework_5.4.6/TimersManager	Timers Manager module
middleware/wireless/framework_5.4.6/SecLib	Security Library
tools/wireless/host_sdk	Python host SDK and BLE bindings for FSCI

Please refer to http://www.nxp.com/connectivity for more information on NXP wireless connectivity platforms.

3   What's New and Change Log

This section describes the major changes and new features implemented in the BLE software releases, as well as the list of GATT supported profiles:

3.1   MKW36A/MKW35A/MKW35Z/MKW36Z BLE Software v1.3.6 Changes

- This version corresponds to the Maintenance Release 3 build of the MKW36A/MKW35A/MKW35Z/MKW36Z BLE Software the features described below:
    - Completed re-assessment of KW35A/KW36A and KW35Z/KW36Z BLE 5.0 Host Component (QDID 110727) based on TCRL 2019-1:
        https://launchstudio.bluetooth.com/ListingDetails/58468
    - Support for Register/Deregister handles for write/read notifications
    - Optimizations on the Dynamic Memory Allocation:
        - Optimized HCI message overhead for RX data path.
        - Optimized GATT indication allocation.
        - Merged L2CAP and HCI allocations to one allocation for ATT, SM, L2CAP CB and signaling.
        - Optimized L2CAP callback allocations.
    - Optimizations on the Static Memory Usage:
        - Removed bond data from active devices.
        - Use dynamic allocation for Security Manager pairing parameters.
        - Use dynamic allocation for GATT client procedure data storage.
        - Removed GATT server signature verification memory.
        - Removed GATT client data signing memory from stack.
        - Use system/task stack memory for ATT Tx array.
        - Optimized ATT function pointers table to a single function.
        - Removed Non-Volatile Memory pool and use a nvm synchronous save call.
    - Fixed critical denial of service vulnerabilities
        - Link Layer Control packet length greater than expected causing memory corruption.
        - Invalid LLID in Bluetooth LE packet may corrupt the FIFO.
    - Optimized ECDH Computation and Verification
    - Dynamic memory allocation for ATT Long Attributes
    - Improved MISRA 2012 compliance - Bluetooth LE Host Private files.
    - Improved Cyclomatic Complexity compliance - Bluetooth LE Host Private files.
    - Updated DCDC output values in DCDC driver
    - IAR and GCC libraries for Bluetooth LE Host and Controller
    - Bug fixing - see chapter 8

3.2   MKW36A/MKW35A/MKW35Z/MKW36Z BLE Software v1.3.5 Changes

- This version corresponds to the Maintenance Release 2 build of the MKW36A/MKW35A/MKW35Z/MKW36Z BLE Software the features described below:

- o Optimized support for Low power VLLS2/VLLS3
- o Optimized startup time from VLLS2/VLLS3
- o Optimized startup time from Shutdown through PSWITCH
- o Optimized startup time from POR
- o Temperature sensor application updated with VLLS support
- o Low power mode 8
- o Dynamic memory allocation for ATT Long Attributes
- o Controller enhanced events notification;
- o Support for the Bonding data manipulation by the application;
- o Support at GAP level for channel map setting on a GAP Central corresponding to the HCI LE Set Host Channel Classification command;
- o Support at GAP level for channel map read on both GAP Central and Peripheral, corresponding to the HCI Read Channel Map command;
- o Corrected MISRA 2012 mandatory and required rules in Bluetooth Le Host Private files
- o Bug fixing
- o XCVR driver updates
  - ▪ Disabled CYCLE_SLIP and FREQ_TARGET to cleanup TX modulation during preamble
  - ▪ Enabled Zero Fdev feature as a compile option
  - ▪ Fixed error in bbf_dac_step calculation that causes magnified errors in TZA step calculations
  - ▪ Included RSIM register read workaround to prevent compiler optimizations from causing a hard fault. Affected on gcc
  - ▪ Fix to prevent BLE signals interfering with DCOC DAC trim
  - ▪ Fixed incorrect OSR bitfield accesses. Affected the dma_capture routines only

3.3 MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth LE Software v1.3.4 Changes

- This version corresponds to the Maintenance Release 1 build of the MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth LE Software.
  - o OTA and FSCI Bootloaders for KW35
  - o Support for KW36 D-Flash memory
  - o MKW35A/MKW35Z linker configuration files
  - o Bug fixing

3.4 MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth LE Software v1.3.3 Changes

- This version corresponds to the RFP (Ready for Production) build of the MKW36A/MKW35A/MKW35Z/MKW36Z BLUETOOTH LE Software.
  - o Add required changes described in Bluetooth Specification Erratum 10734
    - ▪ Updated Framework Security Library Module

- Updated BLUETOOTH LE Host Security Manager Module
  - Modified BSD-3 Clear Clause in BSD-3 Clause
  - Bug fixing

3.5 MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth LE Software v1.3.2 Changes

- This version corresponds to the PRC Production Ready Candidate) build of the MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth LE Software.
  - The Bluetooth® LE v5.0 features in this release have undergone a Bluetooth® SIG qualification listing process, as follows:
    - **Host:** https://launchstudio.bluetooth.com/ListingDetails/58468
    - **Controller:** https://launchstudio.bluetooth.com/ListingDetails/55052
  - Implemented Apple Notification Center Service demo application
  - Memory Optimizations
  - Radio performances improvements
  - Bug fixing

3.6 MKW36A/MKW35A/MKW35Z/MKW36Z BLUETOOTH LE Software v1.3.1 Changes

- This version corresponds to the PRC (Production Ready Candidate) build of the MKW36A/MKW35A/MKW35Z/MKW36Z BLUETOOTH LE Software.
  - Time services (NDCS, RTUS and CTS) in example applications
  - A4WP Wireless Power Transfer System BLUETOOTH LE profile plus Power Receiving Unit (PRU) and Power Transmitting Unit (PTU) example applications for the BLUETOOTH LE profiles.
  - Coexistence mechanism with WLAN co-located chips
  - Optimized MCU low power management during radio events.
  - Updated MCUXpresso IDE support
  - Added the Test Tool 12 firmware loader feature
  - Bug fixing

3.7 MKW36A/MKW35A/MKW35Z/MKW36Z BLUETOOTH LE Software v1.3.0 Changes

- This version corresponds to the EAR build of the MKW36A/MKW35A/MKW35Z/MKW36Z BLUETOOTH LE Software. Some of its major new features, compared to previous BLUETOOTH LE releases on Kinetis MKW41Z wireless microcontrollers, include:
  - Support for 8 simultaneous connections in the stack and demo applications (Wireless UART and HID host)
  - Support for the FRDM-KW36 board

3.8 Supported GATT Profiles

The complete list of GATT profiles and services defined by the Bluetooth SIG, along with the corresponding versions of the specifications, supported in the demo applications included in this release is enumerated below:

- **BAS** - Battery Service $\qquad$ **v1.0**
- **BLP** - Blood Pressure Profile $\qquad$ **v1.0**
- **BLS** - Blood Pressure Service $\qquad$ **v1.0**
- **CSCP** - Cycling Speed and Cadence Profile $\qquad$ **v1.0**
- **CSCS** - Cycling Speed and Cadence Service $\qquad$ **v1.0**
- **HIDS** - Human Interface Device Service $\qquad$ **v1.0**
- **HOGP** - HID over GATT Profile $\qquad$ **v1.0**
- **HRP** - Heart Rate Profile $\qquad$ **v1.0**
- **HRS** - Heart Rate Service $\qquad$ **v1.0**
- **HTP** - Health Thermometer Profile $\qquad$ **v1.0**
- **HTS** - Health Thermometer Service $\qquad$ **v1.0**
- **PXP** - Proximity Profile $\qquad$ **v1.0.1**
- **DIS** - Device Information Service $\qquad$ **v1.1**
- **IAS** - Immediate Alert Service $\qquad$ **v1.0**
- **LLS** - Link Loss Service $\qquad$ **v1.0.1**
- **TPS** - Tx Power Service $\qquad$ **v1.0**
- **CPP** - Cycling Power Profile $\qquad$ **v1.0**
- **CPS** - Cycling Power Service $\qquad$ **v1.0**
- **RSCP** - Running Speed and Cadence Profile $\qquad$ **v1.0**
- **RSCS** - Running Speed and Cadence Service $\qquad$ **v1.0**
- **GLP** - Glucose Profile $\qquad$ **v1.0**
- **GLS** - Glucose Service $\qquad$ **v1.0**
- **ANP** - Alert Notification Profile $\qquad$ **v1.0**
- **ANS** - Alert Notification Service $\qquad$ **v1.0**
- **PLXP** - Pulse Oximeter Profile $\qquad$ **v1.0**
- **RTUS** - Reference Time Update Service $\qquad$ **v1.0**
- **CTS** - Current Time Service $\qquad$ **v1.1**
- **NDCS** - Next DST Change Service $\qquad$ **v1.0**
- **HPS** - HTTP Proxy Service $\qquad$ **v1.0**

This software package supports the following profiles/services standardized outside the Bluetooth SIG

- **A4WP** - AirFuel^{TM} Alliance Wireless Power Transfer System $\qquad$ **v1.3**
- **ANCS** – Apple Notification Center Service $\qquad$ **v1.0**

4 Software Deployment Considerations

- The Bluetooth® low energy applications in this package have been built in a Kinetis SDK version 2 environment, making use of the FreeRTOS kernel and microcontroller peripheral drivers included in this SDK. This package includes a full build of the Kinetis SDK v2 for Kinetis MKW36A/MKW35A/MKW35Z/MKW36Z.

- IAR Embedded Workbench for ARM® **v8.32.4** was used to build and test the Bluetooth low energy associated example applications IDE projects included in this release.

- MCUXpresso IDE **v10.3.2** was used to build the Bluetooth low energy associated example applications IDE projects.

- This release is compatible with the Test Tool for Connectivity Products **v12.8.4** or later. It is recommended to use the *BLE_1.3.6.xml* file found in the *tools/wireless/xml_fsci* folder of this package or the Test Tool installation, with the Test Tool Command Console functionality to interact with the FSCI black box applications provided in this package. For more information, please refer *Test Tool User's Guide* included in the Test Tool installation.

5 Embedded System Considerations

- This release supports the FRDM-KW36 evaluation board.

- This release provides OTA and FSCI demo bootloaders for MKW35A/MKW35Z.

- The FRDM-KW36 board features a composite USB device called OpenSDA which serves as debugger interface and as USB to serial converter via a virtual COM port application. Several firmware images can be programmed on the OpenSDA device, among which:

  https://github.com/mbedmicro/CMSIS-DAP

  https://www.segger.com/opensda.html

- If your FRDM-KW36 board is configured for the buck modee of the DCDC converter inside the microcontroller, the firmware too needs to be configured for these modes of the DCDC, by setting the following defines: gDCDC_Enabled_d to 1 and APP_DCDC_MODE to gDCDC_Mode_Buck_c, in the app_preinclude.h header file.

- The A4WP example applications are configured by default for the DCDC bypass settings of the FRDM-KW36 board, to fully leverage the RGB LED capabilities available at 3.3V supply voltage.

- To enable FlexNVM feature on MKW36A/MKW36Z one needs to set the gNvUseFlexNVM_d compiler define to 1, remove the gUseNVMLink_d=1 linker flag and use the MKW36Z512xxx4_connectivity linker file (256KB Flash) from:

  "middleware\wireless\framework_5.4.6\Common\devices\MKW36Z4\.".

  Also, before programming the device a mass-erase needs to be performed.

- To disable the FlexNVM feature and use entire 512KB of Flash on MKW36A/MKW36Z one needs to set the gNvUseFlexNVM_d compiler define to 0, add the gUseNVMLink_d=1 linker flag and use the MKW36Z512xxx4_PD_connectivity linker file (512KB Flash) from:

  "middleware\wireless\framework_5.4.6\Common\devices\MKW36Z4\.".

Also, before programming the device a mass-erase needs to be performed.

- On MKW36A/MKW36Z the minimum protectable Flash region is 8KB. On MKW35A/MKW35Z the minimum protectable Flash region is 16KB.

  The OTA and FSCI bootloaders are configured to use the minimum protectable Flash region.

- When compiling an image for the Over-the-Air update, the gEraseNVMLink_d linker symbol should be set to 0.

- To use the entire 512KB of Flash on MKW36 with IAR Embedded Workbench versions older than 8.32.2, the default board file from project settings must be override with the one from: "middleware\wireless\framework_5.4.5\Common\devices\MKW36Z4\iar\FlashKW36Z4_512 K.board".

6   Known Limitations

- This release supports only the IAR Embedded Workbench IDE and MCUXpresso IDE toolchain, the FreeRTOS kernel and a bare-metal non-preemptive task scheduler. Other RTOSes and toolchains supported in the KSDK have not been tested with this release.

- Applications like the *heart_rate_sensor* or the *temperature_sensor* are configured to enter low power immediately after boot, to be woken up on a switch press. This functionality will cause a connected debugger to disconnect. To debug these applications, please disable the low power functionality in the *app_preinclude.h* header file.

- Most sensor applications have the pairing and bonding disabled to allow a faster interaction with mobile applications. These two security features can be enabled in the *app_preinclude.h* header file.

- Maximum file path length in Windows® 7 Operating System: Windows OS 7 imposes a 260-character maximum length for file paths. The same limitation influences the command line for build tools in various toolchains, which cannot exceed 8191 characters. When deploying this package, it is recommended to place it in a directory close to the root of the disk drive to prevent the limitations described above. The recommended location is the C:\NXP folder."

- NVM usage for pairing/bonding information storage in the FSCI black-box application must be complemented by the enablement of the FSCI protocol ACK feature, to ensure flash writes do not interfere with the serial communication. More specifically, when enabling *gAppUseNvm_d* in the *app_preinclude.h* file associated with the FSCI black-box application, *gFsciTxAck_c* and *gFsciRxAck_c* must be enabled as well. The corresponding FSCI host must also enable FSCI ACKs. Please note that by default all these preprocessor switches are set to zero and ACKs are disabled in the Host SDK and the BLE FSCI host applications. For more information, please refer the *Kinetis FSCI Host Application Programming Interface User's Guide.*

- Bluetooth Low Energy Application Development Guide documentation issue. The MCUX linker settings for OTAP are wrong. The MCUX linker flags are not functional due to missing pre-build command support in IDE and generators. To enable OTAP support for a custom application, the linker file from the any OTA Client demo should be used and adapted to application's needs.

- IOT Toolbox demo applications were tested against Android 7.0 and iOS 10.2.1 using a limited number of devices.

7 Documentation Included in this Package

The following connectivity-supporting documentation is included in this package:

- *Bluetooth Low Energy Quick Start Guide.pdf*
- *Bluetooth Low Energy Host Stack API Reference Manual*
- *Bluetooth Low Energy Application Developer's Guide*
- *Bluetooth Low Energy Demo Applications User's Guide*
- *Bluetooth Low Energy Host Stack API Reference Manual*
- *Bluetooth Low Energy Host Stack FSCI Reference Manual*

The *docs/wireless/Bluetooth/ICS* folder contains Implementation Conformance Statement (ICS) files for the Bluetooth® LE v5.0 profiles included in this package. The files are in PTS format, which can be opened with the Bluetooth® Profile Tuning Suite.

8 Bug fixing - Bluetooth® LE Software version 1.3.6

The following issues have been fixed in this package:

- GATT Client sends all the signed data to device ID 0
- GAP CM variables shared between CSRK and IRK checking
- GATT Server sign data verification memory is not guarded for multiple requests
- BLE NVM incorrect bond data size value overflows RAM reserved area
- Disconnection event missing from the application
- Bluetooth LE communication freezing
- Link Layer Privacy wrong address for second slave
- Wrong memory size definition in FSCI and OTAP bootloader linker file
- Disconnect reason gHciLLResponseTimeout_c after bonding and reset on second connection
- TestTool cannot flash when configuration is set to lock the chip
- Health Thermometer application memory buffers are misconfigured
- Pairing fails if host privacy is enabled
- LL sends NUMBER_OF_COMPLETED_PACKETS event with 0 packet completed
- ANCS client cannot be connected after first connection and power on reset
- Gap_LoadEncryptionInformation triggers HardFault if LE SC is used
- BleApp_GenericCallback is bypassed by App_GenericCallback
- Error when importing flash loader project into MCUX

- Memory layout unaligned for OTAP internal storage
- NVM issue when gMaxBondedDevices_c > 8
- Memory leak in FSCI BBox caused by interrupting GATT procedures.
- Host reassembly works only for a single packet at a time
- Update UART adapter
- Update device name from FSL_ to NXP_ on all demo apps
- DUT sends LE_Enhanced_Connection_Complete_Event with Local RPA field set to 0
- DUT uses Public Address in the InitA field of the CONN_IND instead of RPA
- Event mask validation based on errata update
- Local_Resolvable_Private_Address Field Is Set and Valid when Using Non-RPA OTA
- If bonding is enabled, controller privacy must be enabled as well for ota_att project
- Wireless UART is not Display Text on Terminal When Send Data from IoT ToolBox App
- Link Layer init procedure delays
- Disconnect reason gHciLLResponseTimeout_c after bonding and reset on second connection
- Pairing process fails while scanning
- Bootloader fsci error on app upload MCUFlashError
- OTA Process is Not Cancel When Press "Cancel" Button From Test Tool
- Not able to Load Bin with JLINK using Test Tool
- Virtual-board-kw35 bootloader boot_rom region does not match ota application
- DUT does not disconnect link after SMP Timeout expired
- BLE Host does not allow clearing of advertising data
- Temperature sensor collector demo app issue
- Location and Navigation Device Status log is not Display on Serial Console
- BLE: Shell Getting Too Many Argument when Send thrput Param
- WireLess UART Send Data on Only Two Devices when Eight Devices Connected
- OTA Client is Automatically Disconnect When Press Cancel Button from IoT Tool Box App During OTA Process is Running
- HRS Sensor is Connect without Passkey when Pairing Bonding and Privacy enabled
- Temp Sensor Automatically Disconnect when Privacy enabled (i.e. gAppUsePrivacy_d = 1)
- HRS Graph is not Display When Connect Relay Proxy Second Time
- MCU is in RUN instead of STOP during the first advertising event
- Infinite loop in App_NvmErase when gMaxBondedDevices >16
- Second L2CAPCBConnectLePsmRequest does not respond with event
- HW Fault in ble_shell if TAB is pressed with no input
- GATT ReadMultipleCharacteristicValuesIndication contains 0x00 for the second value
- BLE_Shell Advertising setup failed when enable throughput TX
- app_preinclude_common.h should be modified for Ble test app
- Change parameter name from SID to Advertising_Handle in the GAP-AdvertisingEventExtScanReqReceived.Indication
- BLE Proxy advertising not seen by iOS devices
- Handling the reception of an unresolvable RPA (based on wrong IRK) on a privacy-enable Peripheral
- The default Heap size on MCUX should be 0 as for IAR

- LL Connection Param Rsp invalid offset value
- Consecutive GAP commands are called without waiting for event
- LowPower issue when FreeRTOS tickless is enabled with VLLSx modes
- BLE Shell App ShellGap_SetExtAdvertisingParameters ->gExtAdvParams.minInterval is used for "-max" argument
- VLLS demos are not working anymore after integrated latest SDK changes
- HID Host Received for Only few Devices when Eight Devices Connected
- otac_att project enable bonding, ota failed
- AppThroughputTest doesn't work as expected for more than 2 connections
- InternalGap_GetBondedIdentityAddresses causes memory corruption
- DCDC modes should be defines instead of enum values
- Scan in the shield box, abnormal power consumption
- App Idle Task overflow
- HRS:Not able to start advertisement using SW3 when Low power mode is disabled
- ll_get_nearest_instant - invalid value returned
- App_L2caLeDataCallback - inconsistency for function parameters
- Wireless UART: When we switch device role multiple times from Peripheral to central and Central to peripheral, Peripheral faces issue while trying to connect with the mobile application
- Add gTxEntryAvailable_c event to BLE xml
- AppThroughput unconfirmed packets (ATT_MTU 23) doesn't work properly
- LL stuck in disconnecting state
- Host privacy timeout - No active timer after call Gap_StopAdvertising
- HID Host software does not work when an HID Device does not send its shortened name
- DUT sends Error Response in scenario when it should silently ignores the command
- HID Device application legacy privacy code should be removed
- Cannot change Filter Duplicates option while the scanning is active
- SPI pins are not properly configured in ble_fscibb project
- gPoolIdMatchingOrder issue in MemManager Init
- TRNG isr priority is not set
- DCDC isr priority is incorrectly set
- Very low throughput on BLE shell
- The RSSI value reported by receiving advertising is not accurate
- Temp Collector fails to manage low power and connection when privacy and low power are enabled
- Warmboot sensor demos stack overflow on BM
- Update low power application files to match latest low power code
- Device doesn't respond with error when receive an ATT command with unidentified opcode
- 26MHz crystal issue
- Buffers configured by default are not enaugh for some feautures
- GAP-SetTxPowerLevelRequest doesn't work
- Insufficient timers in default configuration
- BLE HTML documentation is missing in MR3 RC1
- The BIN after NVM is enabled cannot be downloaded

- Incorrect event counter in enhanced notifications
- GattDb_FindServiceHandle returns last handle of given UUID instead of the first handle
- High peak power consumption in DSM5-8 with MCUXpresso
- Incorrect event counter in enhanced notifications
- Incorrect Channel in Enhanced Notifications
- Second Master fails to connect to Slave with privacy while Slave in scanning mode
- Bluetooth LE specifiction version indication in link layer
- Auto initiation of Feature Exchange is not properly disabled
- Controller should accept all parameter values in the range defined for HCI_LE_Set_Data_Length
- Beacon application runs out of buffers when using extended advertising
- Some snippet commands should be modified for ble_shell in demo application user guide

9 BLUETOOTH LE Applications Memory Footprints

The following tables represent the memory footprints of the listed BLUETOOTH LE-based applications:

Application – Beacon Configuration - FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	4,318	7,254
KSDK	200	7,062
Connectivity Framework	1,848	21,316
RTOS	9,172	5,388
BLUETOOTH LE Host	726	50,214
BLUETOOTH LE Controller	3,853	48,962
Total	**20,117**	**140,196**

Application – Beacon Configuration - FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	3,072	19,066
KSDK	204	6,696
Connectivity Framework	1,634	22,753
RTOS	9,172	5,744
BLUETOOTH LE Host	522	49,739
BLUETOOTH LE Controller	3,842	58,120
Total	**18,446**	**162,118**

Application – Heart Rate Sensor Configuration - FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	6,133	10,203
KSDK	200	7,118
Connectivity Framework	3,716	24,310
RTOS	9,172	5,387
BLUETOOTH LE Host	726	51,262
BLUETOOTH LE Controller	3,853	49,082
Total	**23,800**	**147,362**

Application – Heart Rate Sensor Configuration - FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	4,199	23,271
KSDK	204	8,504
Connectivity Framework	3,518	28,081
RTOS	9,172	6,524
BLUETOOTH LE Host	522	50,765
BLUETOOTH LE Controller	3,842	58,252
Total	**21,457**	**175,397**

Application – Wireless UART		
Configuration - FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	5,403	11,464
KSDK	200	7,701
Connectivity Framework	10,173	23,018
RTOS	9,172	5,507
BLUETOOTH LE Host	843	72,085
BLUETOOTH LE Controller	3,853	48,947
Total	**29,644**	**168,722**

Application – Wireless UART		
Configuration - FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	5,136	24,012
KSDK	204	7,456
Connectivity Framework	10,026	24,365
RTOS	9,172	5,864
BLUETOOTH LE Host	633	71,464
BLUETOOTH LE Controller	3,842	58,128
Total	**29,013**	**191,289**

Application – HID Host		
Configuration - FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	3,119	10,354
KSDK	200	7,301
Connectivity Framework	8,177	34,298
RTOS	9,672	5,507
BLUETOOTH LE Host	746	53,141
BLUETOOTH LE Controller	3,853	48,694
Total	**25,767**	**159,295**

Application – HID Host		
Configuration - FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	2,905	22,425
KSDK	204	7,144
Connectivity Framework	8,018	35,461
RTOS	9,672	5,864
BLUETOOTH LE Host	568	53,448
BLUETOOTH LE Controller	3,842	57,828
Total	**25,209**	**182,170**

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