NXP Semiconductors
Release Notes

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Bluetooth® Low Energy Software for the Kinetis MKW41Z Dual Mode Wireless Microcontroller, Version 1.2.2

Release Notes

1 Overview

These release notes pertain to the platform software that was developed for the Kinetis MKW41Z Bluetooth® low energy (BLE) v4.2 compliant wireless microcontroller, and the associated development boards FRDM-KW41Z, USB-KW41Z. These notes pertain to the Kinetis BLE Software version 1.2.2.

Contents

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2 Release Contents

The Freescale Kinetis MKW41Z Bluetooth® LE Software version 1.2.2 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: - BPS – Blood Pressure Sensor - CSCS – Cycling Speed Cadence Sensor - HID – Host and Device - CPS – Cycling Power Sensor - HRS – Heart Rate - HTS – Health Thermometer - PXR – Proximity Reporter - IPv6 – IPSP Node and Router - RSCS – Running Speed and Cadence Sensor - ANS – Alert Notification Sensor - GLS – Glucose Sensor - PLXP – Pulse Oximeter Demo applications not based on standard GATT profiles: - Temperature Sensor - Temperature Collector - Wireless UART - OTAP server and client - Beacon advertiser - Shell/Console application - IPv6 node/router - Mesh relay/node
boards/[board]/wireless_examples/hybrid	Hybrid dual mode (BLE + 802.15.4) applications
middleware/wireless/bluetooth_1.2.2/host	Bluetooth® LE v4.2 host stack
middleware/wireless/bluetooth_1.2.2/controller	Bluetooth® LE v4.2 controller
middleware/wireless/bluetooth_1.2.2/profiles	Bluetooth® LE GATT profiles
doc/wireless	Wireless connectivity documentation
middleware/wireless/framework_5.3.2/Common	Connectivity Framework common files
middleware/wireless/framework_5.3.2/DSP	Signal processing and bit manipulation helper functions
middleware/wireless/framework_5.3.2/FSCI	Freescale Serial Connectivity Interface
middleware/wireless/framework_5.3.2/LowPower	Low Power Module
middleware/wireless/framework_5.3.2/MemManager	Memory Manager
middleware/wireless/framework_5.3.2/Messaging	Messaging API
middleware/wireless/framework_5.3.2/NVM	Non Volatile Memory support
middleware/wireless/framework_5.3.2/OtaSupport	Over-The-Air Programming support files
middleware/wireless/framework_5.3.2/Panic	Panic module
middleware/wireless/framework_5.3.2/RNG	Random Number Generator wrapper
middleware/wireless/framework_5.3.2/SerialManager	Serial Manager for various interface
middleware/wireless/framework_5.3.2/Shell	Shell/Console module
middleware/wireless/framework_5.3.2/TimersManager	Timers Manager module
middleware/wireless/framework_5.3.2/SecLib	Security Library
tools/wireless/binaries	Demo applications binaries
tools/wireless/host_sdk	Python host SDK and BLE bindings for FSCI

2.1 List of Pre-compiled Binaries

The *tools/wireless/binaries* folder contains the following pre-compiled binaries:

ble_beacon_frdmkw41z.bin – BLE NXP Beacon Advertiser for FRDM-KW41Z
ble_beacon_usbkw41z.bin – BLE NXP Beacon Advertiser for USB-KW41Z
ble_fsci_blackbox.bin – BLE FSCI host controlled device (a.k.a. black box) application
ble_fsci_blackbox_ack.bin – BLE FSCI host controlled device (a.k.a. black box) application with ACK enabled in the serial protocol
ble_hci_black_box.bin – BLE HCI/DTM modem/black-box firmware
ble_hrs_frdmkw41z.bin – BLE Heart Rate Sensor application for FRDM-KW41Z
ble_hrs_usbkw41z.bin - BLE Heart Rate Sensor application for USB-KW41Z
ble_shell.bin – Console/shell application for controlling the BLE stack via a serial terminal
sniffer_usbkw41z_kw41z.bin – Hybrid (802.15.4 and BLE) sniffer firmware for the KW41Z silicon on the USB-KW41Z board
sniffer_usbkw41z_k22f.bin– Hybrid (802.15.4 and BLE) sniffer firmware for the K22F silicon on the USB-KW41Z board, linked at 0x0 (no OpenSDA bootloader provisioning)
sniffer_usbkw41z_k22f_0x8000.bin – Hybrid (802.15.4 and BLE) sniffer firmware for the K22F silicon on the USB-KW41Z board, linked at 0x8000 (OpenSDA bootloader provisioning)

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 MKW41Z BLE Software v1.2.2 Changes

- This version corresponds to the General Availability (GA) build of the MKW41Z BLE Software. Some of its major new features, compared to Beta BLE release on Kinetis MKW41Z wireless microcontrollers, include:
  - The Bluetooth® LE v4.2 features in this release have undergone a Bluetooth® SIG qualification listing process, as follows:
    - Host stack: https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=31668
    - Controller: https://www.bluetooth.org/tpg/QLI_viewQDL.cfm?qid=31669
  - Full IPv6 stack enablement over 6LoBLE and the IPSP profile, including router and node applications.
  - Time services (NDCS, RTUS and CTS) in example applications
  - A4WP Wireless Power Transfer System BLE profile plus Power Receiving Unit (PRU) and Power Transmitting Unit (PTU) example applications for the BLE profiles.
  - HTTP proxy service
  - Coexistence mechanism with WLAN co-located chips
  - Optimized MCU low power management during radio events.
  - Better alignment of connectivity folder structure with the Kinetis SDK.
  - Optional packaging in .tar.gz format for Linux host machines
  - uC/OS-II support for hybrid applications

3.2 MKW41Z BLE Software v1.2.1 Changes

- This version corresponds to the Beta build of the MKW41Z BLE Software. Some of its major new features, compared to Alpha BLE release on Kinetis MKW41Z wireless microcontrollers, include:
  - Implementation of a flooding-based BLE Mesh layer with demo applications
  - Support for the Kinetis Design Studio IDE and the GNU Toolchain
  - Support for the Micriμm uC/OS-II RTOS
  - Pulse Oximeter GATT profile and example application
  - BLE v4.2 Secure LE Connections support in the Over-The-Air update applications
  - BLE v4.2 Secure LE Connections usage as default security in all demo applications
  - BLE v4.2 Enhanced Controller Privacy usage in all demo applications
  - Dual mode (BLE and IEEE 802.15.4) support and hybrid demo applications
  - FSCI host applications running on the K22F MCU on USB-KW41Z
  - FSCI Host SDK support for BLE v4.2 in Python scripts
  - BLE v4.2 sniffer firmware for USB-KW41Z

3.3 MKW41Z BLE Software v1.2.0 Changes

- This version corresponds to the Alpha build of the MKW41Z BLE Software. Some of its major new features, compared to previous BLE releases on Kinetis MKW40Z wireless microcontrollers, include:
    - Bluetooth® LE v4.2 Secure LE Connections support
    - Bluetooth® LE v4.2 Enhanced Controller Privacy support
    - Bluetooth® LE v4.2 Data Packet Length Extension support (up to 254 bytes)
    - Support for two Link Layer hardware connection engines
    - Console/Shell command line interface application for easy interaction with the host stack, usable with a serial terminal program
    - KSDK 2.0 integration of the BLE and Connectivity Framework software
    - Enablement for the FRDM-KW41Z and USB-KW41Z evaluation boards

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

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

- **A4WP** - AirFuel™ Alliance Wireless Power Transfer System **v1.3**

4 Software Deployment Considerations

- The Bluetooth® low energy applications in this package have been built in a Kinetis SDK version 2.0 environment, making use of the FreeRTOS and uC/OS-II kernels and microcontroller peripheral drivers included in this SDK. This package includes a full build of the Kinetis SDK v2.0 for Kinetis MKW41Z/31Z/21Z.
- IAR Embedded Workbench for ARM® **v7.70.1** was used to build and test the corresponding IDE projects included in this release.
- Kinetis Design Studio **v3.2.0** with the latest J-Link runtime software installed from www.segger.com was used to build and test the corresponding IDE projects included in this release.
- This release is compatible with the Test Tool for Connectivity Products **v12.5.5** or later. It is recommended to use the *BLE.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 *TTUG.pdf* included in the Test Tool installation.
- The pre-compiled binaries for FRDM-KW41Z are optimized for the DCDC buck mode configuration of the board.
- The A4WP example applications are configured by default for the DCDC bypass settings of the FRDM-KW41Z board, to fully leverage the RGB LED capabilities available at 3.3V supply voltage.

5 Embedded System Considerations

- This release supports the FRDM-KW41Z and USB-KW41Z evaluation boards
- The FRDM-KW41Z and USB-KW41Z boards feature 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 FRDM-KW41Z OpenSDA device, among which:

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

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

  http://www.pemicro.com/opensda/

- If your FRDM-KW41Z board is configured for the buck or boost modes of the DCDC converter inside the KW41Z 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* or *gDCDC_Mode_Boost_c* respectively, in the *app_preinclude.h* header file.

6 Known Limitations

- This release supports only the IAR Embedded Workbench and Kinetis Design Studio (KDS) IDEs and toolchains, the FreeRTOS and uC/OS-II kernels and a bare-metal non-preemptive task scheduler. Other RTOSes and toolchains supported in the KSDK have not been tested with this release.
- Only the KDS IDE/toolchain is supported on Linux host platforms.
- 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.h* header file.
- The only supported OpenSDA firmware with the KDS IDE is the Segger J-Link.
- Maximum file path length in Windows® 7 Operating System: "Windows OS 7 imposes a 260-character maximum length for file paths. When installing the Thread KW41 Beta Release, place it in a directory close to the root to prevent file paths from exceeding the maximum character length specified by Windows OS. The recommended location is the C:\NXP folder."

7 Documentation Included in this Package

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

- *BLE Application Developer's Guide.pdf*
- *BLE Demo Applications User's Guide.pdf*
- *BLE Host Stack API Reference Manual.pdf*
- *BLE Host Stack FSCI Reference Manual.pdf*
- *BLE Quick Start Guide.pdf*
- *BLE Mesh API Reference Manual.pdf*
- *BLE Mesh User's Guide.pdf*
- *BLE Transport for IPv6 Datagrams User's Guide.pdf*
- *Connectivity Framework Reference Manual.pdf*
- *USB-KW41Z Wireless Protocol Sniffer Quick Start Guide.pdf*

The *docs/wireless/Bluetooth/ICS* folder contains Implementation Conformance Statement (ICS) files for the Bluetooth® LE v4.2 profiles included in this package. The files are in PTS format, which can be opened with the Bluetooth® Profile Tuning Suite.

The package also includes extensive Kinetis SDK v2.0 documentation in the "*docs*" folder.

8 BLE Library and Applications Memory Footprints

8.1 BLE Library Memory Footprints

Target Board/Platform: FRDM-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	**Memory Footprint (bytes)**			**Description**
	READ ONLY CODE (bytes)	**READ/WRITE (bytes)**	**READ ONLY DATA (bytes)**	
ble_kw41z_controller_lib_IAR.a	43830	124	1744	Controller
ble_4-2_host_cm0p_IAR.a	74968	632	3677	Full stack support
ble_4-2_host_peripheral_cm0p_IAR.a	54944	444	3005	GAP Peripheral + GATT Server
ble_4-2_host_central_cm0p_IAR.a	57158	456	3056	GAP Central + GATT Client
ble_4-2_host_fsci_cm0p_IAR.a	93788	672	3822	FSCI support
ble_4-2_host_mesh_cm0p_IAR.a	32666	444	1222	Host support for Advertising Mesh
ble_4-2_mesh_cm0p_IAR.a	5580	0	950	Mesh Library for Node
ble_4-2_mesh_comm_cm0p_IAR.a	5616	0	950	Mesh Library for Commissioner

Target Board/Platform: FRDM-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	Memory Footprint (bytes)			Description
	READ ONLY CODE (bytes)	READ/WRITE (bytes)	READ ONLY DATA (bytes)	
ble_kw41z_controller_lib_GCC.a	45114	1150	1727	Controller
ble_4-2_host_cm0p_GCC.a	79614	259	2770	Full stack support
ble_4-2_host_peripheral_cm0p_GCC.a	58526	259	2396	GAP Peripheral + GATT Server
ble_4-2_host_central_cm0p_GCC.a	60984	243	2160	GAP Central + GATT Client
ble_4-2_host_fsci_cm0p_GCC.a	98538	277	2889	FSCI support
ble_4-2_host_mesh_cm0p_GCC.a	58778	163	2927	Host support for Advertising Mesh
ble_4-2_mesh_cm0p_GCC.a	6670	30	923	Mesh Library for Node
ble_4-2_mesh_comm_cm0p_GCC.a	6722	30	923	Mesh Library for Commissioner

8.2 Application Sizes on KW41Z512 Using FreeRTOS

The sizes for the following applications were obtained assuming bare minimum allocated space for memory manager pools and including the OS required read/write data (RAM). The configuration was made for the target boards FRDM-KW41Z and USB-KW41Z.

Target Board/Platform: FRDM-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	148472	5600	23901	Default platform configuration

Beacon	125302	4824	21157	Default platform configuration
BLE FSCI App	178202	5103	25980	Default platform configuration
BLE Relay Proxy	150406	5040	29367	Default platform configuration
BLE Shell App	169722	12309	24739	Default platform configuration
BPS – Blood Pressure Sensor	130626	5218	22041	Default platform configuration
CPS - Cycling Power Sensor	132518	5280	22329	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	131180	5249	22191	Default platform configuration
GLS – Glucose Sensor	131662	5259	22217	Default platform configuration
HCI Application	79734	4663	15892	Default platform configuration
HTS - Health Thermometer Sensor	131098	5270	22201	Default platform configuration
HRS – Heart Rate Sensor	133298	5239	26190	Default platform configuration
HID Device (Mouse)	130724	5498	23261	Default platform configuration
HID Host	138246	5162	24762	Default platform configuration
IPV6 - Node	196463	7599	34606	Default platform configuration
IPV6 – Router	199907	7566	34508	Default platform configuration
Mesh Commissioner	120472	5692	20794	Default platform configuration
Mesh Device	107202	4763	20287	Default platform configuration
OTAP Client ATT Support	135371	5253	26637	Default platform configuration

OTAP Client L2CAP Support	136051	5287	29285	Default platform configuration
OTAP Server	137254	5027	30363	Default platform configuration
PXR - Proximity Reporter	130592	5202	22121	Default platform configuration
Pulse Oximeter Sensor	132388	5300	24705	Default platform configuration
RSCS - Running Speed Cadence Sensor	131224	5262	22191	Default platform configuration
Temperature Collector	143290	5170	25928	Default platform configuration
Temperature Sensor	134208	5231	25022	Default platform configuration
Wireless Power PRU	134466	5147	23033	Default platform configuration
Wireless Power PTU	137534	4953	22684	Default platform configuration
Wireless UART	152200	5576	47885	Default platform configuration
Hybrid FSCI App	204654	5092	25446	Default platform configuration
BLE 802.15.4 Dual Mode Demo	159794	5368	29095	Default platform configuration

Target Board/Platform: FRDM-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
ANS - Alert Notification Sensor	154936	216	23264	Default platform configuration
Beacon	130888	216	20904	Default platform configuration

BLE FSCI App	186080	216	25424	Default platform configuration
BLE Relay Proxy	157416	216	28816	Default platform configuration
BLE Shell App	183708	216	24216	Default platform configuration
BPS – Blood Pressure Sensor	136288	216	21728	Default platform configuration
CPS - Cycling Power Sensor	138228	216	22020	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	136912	216	21876	Default platform configuration
GLS – Glucose Sensor	137328	216	21904	Default platform configuration
HCI Application	82276	216	16244	Default platform configuration
HTS - Health Thermometer Sensor	136856	216	21884	Default platform configuration
HRS – Heart Rate Sensor	139336	216	25884	Default platform configuration
HID Device (Mouse)	136460	216	22960	Default platform configuration
HID Host	144936	216	24240	Default platform configuration
IPV6 - Node	191872	228	34368	Default platform configuration
IPV6 – Router	195624	228	34024	Default platform configuration
Mesh Commissioner	124208	216	21112	Default platform configuration
Mesh Device	112696	216	20600	Default platform configuration
OTAP Client ATT Support	141456	204	26336	Default platform configuration
OTAP Client L2CAP Support	142240	204	28984	Default platform configuration

OTAP Server	143808	216	29844	Default platform configuration
PXR - Proximity Reporter	136324	216	21812	Default platform configuration
Pulse Oximeter Sensor	138128	216	24400	Default platform configuration
RSCS - Running Speed Cadence Sensor	136960	216	21868	Default platform configuration
Temperature Collector	150656	216	25400	Default platform configuration
Temperature Sensor	140460	216	24752	Default platform configuration
Wireless Power PRU	140524	216	22760	Default platform configuration
Wireless Power PTU	144232	216	22144	Default platform configuration
Wireless UART	159144	216	47296	Default platform configuration
Hybrid FSCI App	212132	228	24912	Default platform configuration
BLE 802.15.4 Dual Mode Demo	165544	228	28784	Default platform configuration

Target Board/Platform: USB-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
ANS - Alert Notification Sensor	148364	5581	23867	Default platform configuration
Beacon	125198	4806	21123	Default platform configuration
BLE FSCI App	173902	5011	25786	Default platform configuration

BLE Relay Proxy	150302	5021	29337	Default platform configuration
BLE Shell App	169730	12294	24721	Default platform configuration
BPS – Blood Pressure Sensor	128926	5203	21987	Default platform configuration
CPS - Cycling Power Sensor	130818	5267	22271	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	129480	5226	22133	Default platform configuration
GLS – Glucose Sensor	129966	5242	22159	Default platform configuration
HCI Application	79746	4646	15874	Default platform configuration
HTS - Health Thermometer Sensor	129402	5256	22147	Default platform configuration
HRS – Heart Rate Sensor	129002	5241	26066	Default platform configuration
HID Device (Mouse)	130616	5490	23235	Default platform configuration
HID Host	138114	5109	22624	Default platform configuration
IPV6 - Node	195075	7571	34563	Default platform configuration
IPV6 – Router	196855	7323	34401	Default platform configuration
Mesh Commissioner	120336	5671	20760	Default platform configuration
Mesh Device	105944	4736	20114	Default platform configuration
OTAP Client ATT Support	132099	5242	26571	Default platform configuration
OTAP Client L2CAP Support	132779	5271	29211	Default platform configuration
OTAP Server	137122	5007	30333	Default platform configuration

PXR - Proximity Reporter	128896	5195	22063	Default platform configuration
Pulse Oximeter Sensor	130688	5289	24651	Default platform configuration
RSCS - Running Speed Cadence Sensor	129524	5240	22133	Default platform configuration
Temperature Collector	138206	5103	21504	Default platform configuration
Temperature Sensor	129628	5199	21922	Default platform configuration
Wireless Power PRU	134082	5131	22999	Default platform configuration
Wireless Power PTU	137406	4887	22616	Default platform configuration
Wireless UART	152064	5559	47855	Default platform configuration

Target Board/Platform: USB-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	154864	216	23232	Default platform configuration
Beacon	130816	216	20868	Default platform configuration
BLE FSCI App	181244	216	25240	Default platform configuration
BLE Relay Proxy	157336	216	28784	Default platform configuration
BLE Shell App	183732	216	24192	Default platform configuration
BPS – Blood Pressure Sensor	134444	216	21680	Default platform configuration
CPS - Cycling Power Sensor	136392	216	21964	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	135076	216	21816	Default platform configuration
GLS – Glucose Sensor	135484	216	21844	Default platform configuration
HCI Application	82308	216	16228	Default platform configuration
HTS - Health Thermometer Sensor	135020	216	21832	Default platform configuration
HRS – Heart Rate Sensor	134492	216	25756	Default platform configuration
HID Device (Mouse)	136388	216	22924	Default platform configuration
HID Host	144824	216	22092	Default platform configuration
IPV6 - Node	190432	228	34336	Default platform configuration

IPV6 – Router	192400	228	33912	Default platform configuration
Mesh Commissioner	124096	216	21076	Default platform configuration
Mesh Device	111284	216	20420	Default platform configuration
OTAP Client ATT Support	138040	204	26260	Default platform configuration
OTAP Client L2CAP Support	138824	204	28908	Default platform configuration
OTAP Server	143696	216	29816	Default platform configuration
PXR - Proximity Reporter	134488	216	21752	Default platform configuration
Pulse Oximeter Sensor	136292	216	24344	Default platform configuration
RSCS - Running Speed Cadence Sensor	135124	216	21816	Default platform configuration
Temperature Collector	144944	216	20980	Default platform configuration
Temperature Sensor	135312	216	21644	Default platform configuration
Wireless Power PRU	140088	216	22724	Default platform configuration
Wireless Power PTU	144056	216	22076	Default platform configuration
Wireless UART	159032	216	47256	Default platform configuration

Target Board/Platform: USB-KW41Z/K22F (IAR compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
HRS – Heart Rate Sensor Host	37464	564	22758	Default platform configuration

Target Board/Platform: USB-KW41Z/K22F (GCC compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
HRS – Heart Rate Sensor Host	40972	1048	24972	Default platform configuration

8.3 Application Sizes on KW41Z512 Using bare-metal scheduler

The sizes for the following applications were obtained assuming bare minimum allocated space for memory manager pools and including the OS required read/write data (RAM). The configuration was made for the target boards FRDM-KW41Z and USB-KW41Z.

Target Board/Platform: FRDM-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	143256	5591	15573	Default platform configuration
Beacon	120088	4817	12829	Default platform configuration
BLE FSCI App	173210	5100	17756	Default platform configuration
BLE Relay Proxy	144990	5031	21047	Default platform configuration
BLE Shell App	164034	12342	19107	Default platform configuration
BPS – Blood Pressure Sensor	125408	5227	15137	Default platform configuration
CPS - Cycling Power Sensor	127296	5274	14009	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	125958	5236	13863	Default platform configuration
GLS – Glucose Sensor	126444	5253	13897	Default platform configuration
HCI Application	74018	4654	7592	Default platform configuration
HTS - Health Thermometer Sensor	125880	5259	13881	Default platform configuration
HRS – Heart Rate Sensor	128128	5261	17902	Default platform configuration
HID Device (Mouse)	125506	5487	14941	Default platform configuration

HID Host	132570	5170	17490	Default platform configuration
IPV6 - Node	190802	7592	19302	Default platform configuration
IPV6 – Router	194239	7558	21212	Default platform configuration
Mesh Commissioner	114802	5682	12458	Default platform configuration
Mesh Device	101978	4755	11967	Default platform configuration
OTAP Client ATT Support	130146	5250	17677	Default platform configuration
OTAP Client L2CAP Support	130778	5283	20312	Default platform configuration
OTAP Server	131562	5019	20387	Default platform configuration
PXR - Proximity Reporter	125374	5189	13801	Default platform configuration
Pulse Oximeter Sensor	127170	5291	16385	Default platform configuration
RSCS - Running Speed Cadence Sensor	126002	5249	13863	Default platform configuration
Temperature Collector	137666	5201	17632	Default platform configuration
Temperature Sensor	129038	5256	16734	Default platform configuration
Wireless Power PRU	128788	5143	14705	Default platform configuration
Wireless Power PTU	131860	4946	14356	Default platform configuration
Wireless UART	146580	5569	39557	Default platform configuration
Hybrid FSCI App	198970	5088	17126	Default platform configuration
BLE 802.15.4 Dual Mode Demo	154130	5360	16815	Default platform configuration

Target Board/Platform: FRDM-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	149484	216	14940	Default platform configuration
Beacon	125436	216	12572	Default platform configuration
BLE FSCI App	180740	216	17200	Default platform configuration
BLE Relay Proxy	151744	216	20492	Default platform configuration
BLE Shell App	177736	216	18580	Default platform configuration
BPS – Blood Pressure Sensor	130836	216	14820	Default platform configuration
CPS - Cycling Power Sensor	132776	216	13696	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	131460	216	13544	Default platform configuration
GLS – Glucose Sensor	131876	216	13572	Default platform configuration
HCI Application	76312	216	7936	Default platform configuration
HTS - Health Thermometer Sensor	131404	216	13560	Default platform configuration
HRS – Heart Rate Sensor	133960	216	17592	Default platform configuration
HID Device (Mouse)	131008	216	14628	Default platform configuration
HID Host	138988	216	16956	Default platform configuration
IPV6 - Node	185920	228	19072	Default platform configuration

IPV6 – Router	189680	228	20712	Default platform configuration
Mesh Commissioner	118252	216	12772	Default platform configuration
Mesh Device	107228	216	12276	Default platform configuration
OTAP Client ATT Support	136004	204	17364	Default platform configuration
OTAP Client L2CAP Support	136752	204	20012	Default platform configuration
OTAP Server	137848	216	19872	Default platform configuration
PXR - Proximity Reporter	130872	216	13480	Default platform configuration
Pulse Oximeter Sensor	132676	216	16076	Default platform configuration
RSCS - Running Speed Cadence Sensor	131508	216	13544	Default platform configuration
Temperature Collector	144788	216	17100	Default platform configuration
Temperature Sensor	135084	216	16460	Default platform configuration
Wireless Power PRU	134580	216	14428	Default platform configuration
Wireless Power PTU	138288	216	13820	Default platform configuration
Wireless UART	153256	216	38956	Default platform configuration
Hybrid FSCI App	206184	228	16596	Default platform configuration
BLE 802.15.4 Dual Mode Demo	159604	228	16504	Default platform configuration

Target Board/Platform: USB-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	143148	5570	15547	Default platform configuration
Beacon	119980	4800	12803	Default platform configuration
BLE FSCI App	168886	5011	17562	Default platform configuration
BLE Relay Proxy	144886	5013	21017	Default platform configuration
BLE Shell App	164042	12286	16401	Default platform configuration
BPS – Blood Pressure Sensor	123708	5201	13739	Default platform configuration
CPS - Cycling Power Sensor	125600	5262	13951	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	124262	5218	13805	Default platform configuration
GLS – Glucose Sensor	124744	5233	13839	Default platform configuration
HCI Application	74026	4638	7546	Default platform configuration
HTS - Health Thermometer Sensor	124180	5242	13819	Default platform configuration
HRS – Heart Rate Sensor	123784	5233	17746	Default platform configuration
HID Device (Mouse)	125394	5479	14907	Default platform configuration
HID Host	132442	5102	14288	Default platform configuration
IPV6 - Node	189411	7563	19259	Default platform configuration

IPV6 – Router	191185	7318	21097	Default platform configuration
Mesh Commissioner	114666	5662	12432	Default platform configuration
Mesh Device	100524	4729	11786	Default platform configuration
OTAP Client ATT Support	126874	5235	17603	Default platform configuration
OTAP Client L2CAP Support	127510	5270	20246	Default platform configuration
OTAP Server	131430	5000	20357	Default platform configuration
PXR - Proximity Reporter	123674	5180	13743	Default platform configuration
Pulse Oximeter Sensor	125470	5280	16323	Default platform configuration
RSCS - Running Speed Cadence Sensor	124306	5225	13805	Default platform configuration
Temperature Collector	132534	5096	13176	Default platform configuration
Temperature Sensor	124406	5188	13602	Default platform configuration
Wireless Power PRU	128408	5126	14671	Default platform configuration
Wireless Power PTU	131734	4880	14288	Default platform configuration
Wireless UART	146444	5550	39527	Default platform configuration

Target Board/Platform: USB-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
ANS - Alert Notification Sensor	149412	216	14900	Default platform configuration

Beacon	125364	216	12544	Default platform configuration
BLE FSCI App	175888	216	17016	Default platform configuration
BLE Relay Proxy	151664	216	20468	Default platform configuration
BLE Shell App	177768	216	15876	Default platform configuration
BPS – Blood Pressure Sensor	128992	216	13428	Default platform configuration
CPS - Cycling Power Sensor	130940	216	13632	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	129624	216	13492	Default platform configuration
GLS – Glucose Sensor	130032	216	13520	Default platform configuration
HCI Application	76344	216	7888	Default platform configuration
HTS - Health Thermometer Sensor	129568	216	13500	Default platform configuration
HRS – Heart Rate Sensor	129040	216	17424	Default platform configuration
HID Device (Mouse)	130936	216	14600	Default platform configuration
HID Host	138876	216	13760	Default platform configuration
IPV6 - Node	184488	228	19032	Default platform configuration
IPV6 – Router	186456	228	20608	Default platform configuration
Mesh Commissioner	118132	216	12744	Default platform configuration
Mesh Device	105604	216	12080	Default platform configuration
OTAP Client ATT Support	133336	204	19936	Default platform configuration

OTAP Client L2CAP Support	137736	216	19836	Default platform configuration
OTAP Server	129036	216	13428	Default platform configuration
PXR - Proximity Reporter	130840	216	16012	Default platform configuration
Pulse Oximeter Sensor	129672	216	13484	Default platform configuration
RSCS - Running Speed Cadence Sensor	138996	216	12640	Default platform configuration
Temperature Collector	129860	216	13320	Default platform configuration
Temperature Sensor	134144	216	14384	Default platform configuration
Wireless Power PRU	138108	216	13752	Default platform configuration
Wireless Power PTU	153144	216	38924	Default platform configuration
Wireless UART	149412	216	14900	Default platform configuration

Target Board/Platform: USB-KW41Z/K22F (IAR compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
HRS – Heart Rate Sensor Host	31416	556	11514	Default platform configuration

Target Board/Platform: USB-KW41Z/K22F (GCC compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
HRS – Heart Rate Sensor Host	33896	1048	13840	Default platform configuration

8.4 Application Sizes on KW41Z512 Using uCOSII

The sizes for the following applications were obtained assuming bare minimum allocated space for memory manager pools and including the OS required read/write data (RAM). The configuration was made for the target boards FRDM-KW41Z and USB-KW41Z.

Target Board/Platform: FRDM-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
ANS - Alert Notification Sensor	151520	5720	24457	Default platform configuration
Beacon	126766	4951	21686	Default platform configuration
BLE FSCI App	179508	5243	27833	Default platform configuration
BLE Relay Proxy	151706	5167	30524	Default platform configuration
BLE Shell App	171274	12325	27584	Default platform configuration
BPS – Blood Pressure Sensor	132088	5347	22649	Default platform configuration
CPS - Cycling Power Sensor	133978	5399	22981	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	132636	5366	22719	Default platform configuration
GLS – Glucose Sensor	133124	5379	22789	Default platform configuration
HCI Application	81574	4790	16356	Default platform configuration
HTS - Health Thermometer Sensor	132560	5383	22737	Default platform configuration
HRS – Heart Rate Sensor	134800	5398	27146	Default platform configuration

HID Device (Mouse)	132186	5623	23913	Default platform configuration
HID Host	139544	5256	23503	Default platform configuration
IPV6 - Node	197758	7722	31538	Default platform configuration
IPV6 – Router	201204	7697	33449	Default platform configuration
Mesh Commissioner	121774	5818	21627	Default platform configuration
Mesh Device	108680	4891	20812	Default platform configuration
OTAP Client ATT Support	136824	5382	26649	Default platform configuration
OTAP Client L2CAP Support	137504	5413	29289	Default platform configuration
OTAP Server	138800	4982	31868	Default platform configuration
PXR - Proximity Reporter	132052	5320	22657	Default platform configuration
Pulse Oximeter Sensor	133848	5422	25241	Default platform configuration
RSCS - Running Speed Cadence Sensor	132680	5377	22719	Default platform configuration
Temperature Collector	144632	5343	27213	Default platform configuration
Temperature Sensor	135710	5389	25990	Default platform configuration
Wireless Power PRU	135762	5274	24485	Default platform configuration
Wireless Power PTU	138838	5089	24137	Default platform configuration
Wireless UART	153504	5697	48501	Default platform configuration
Hybrid FSCI App	206192	5103	27114	Default platform configuration

BLE 802.15.4 Dual Mode Demo	161092	5495	28227	Default platform configuration

Target Board/Platform: FRDM-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	158528	216	24836	Default platform configuration
Beacon	132716	216	22452	Default platform configuration
BLE FSCI App	187740	216	28292	Default platform configuration
BLE Relay Proxy	159060	216	30988	Default platform configuration
BLE Shell App	185368	216	28076	Default platform configuration
BPS – Blood Pressure Sensor	138108	216	23356	Default platform configuration
CPS - Cycling Power Sensor	140056	216	23688	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	138740	216	23424	Default platform configuration
GLS – Glucose Sensor	139148	216	23484	Default platform configuration
HCI Application	84524	216	17720	Default platform configuration
HTS - Health Thermometer Sensor	138684	216	23432	Default platform configuration
HRS – Heart Rate Sensor	141216	216	27856	Default platform configuration
HID Device (Mouse)	138280	216	24620	Default platform configuration
HID Host	146604	216	23988	Default platform configuration
IPV6 - Node	193528	228	32320	Default platform configuration

IPV6 – Router	197288	228	33968	Default platform configuration
Mesh Commissioner	125860	216	22956	Default platform configuration
Mesh Device	114508	216	22132	Default platform configuration
OTAP Client ATT Support	143284	204	27356	Default platform configuration
OTAP Client L2CAP Support	144068	204	30004	Default platform configuration
OTAP Server	145476	216	32368	Default platform configuration
PXR - Proximity Reporter	138152	216	23360	Default platform configuration
Pulse Oximeter Sensor	139956	216	25948	Default platform configuration
RSCS - Running Speed Cadence Sensor	138788	216	23416	Default platform configuration
Temperature Collector	152372	216	27700	Default platform configuration
Temperature Sensor	142340	216	26740	Default platform configuration
Wireless Power PRU	142184	216	25228	Default platform configuration
Wireless Power PTU	145892	216	24620	Default platform configuration
Wireless UART	160804	216	48916	Default platform configuration
Hybrid FSCI App	213804	228	27596	Default platform configuration
BLE 802.15.4 Dual Mode Demo	167208	228	28928	Default platform configuration

Target Board/Platform: USB-KW41Z/KW41Z512 (IAR Embedded Workbench compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
ANS - Alert Notification Sensor	149822	5702	24403	Default platform configuration
Beacon	126656	4934	21696	Default platform configuration
BLE FSCI App	175194	5146	27231	Default platform configuration
BLE Relay Proxy	151600	5149	30494	Default platform configuration
BLE Shell App	171282	12318	27566	Default platform configuration
BPS – Blood Pressure Sensor	130386	5333	22631	Default platform configuration
CPS - Cycling Power Sensor	132280	5388	22923	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	130938	5353	22661	Default platform configuration
GLS – Glucose Sensor	131422	5363	22731	Default platform configuration
HCI Application	81582	4774	16338	Default platform configuration
HTS - Health Thermometer Sensor	130858	5372	22675	Default platform configuration
HRS – Heart Rate Sensor	130462	5361	26602	Default platform configuration
HID Device (Mouse)	132072	5613	23879	Default platform configuration
HID Host	139416	5238	23469	Default platform configuration
IPV6 - Node	196368	7693	31495	Default platform configuration

IPV6 – Router	198150	7454	33334	Default platform configuration
Mesh Commissioner	120070	5774	17665	Default platform configuration
Mesh Device	105954	4839	17019	Default platform configuration
OTAP Client ATT Support	133550	5364	26575	Default platform configuration
OTAP Client L2CAP Support	134234	5396	29223	Default platform configuration
OTAP Server	138420	5136	31838	Default platform configuration
PXR - Proximity Reporter	130350	5310	22599	Default platform configuration
Pulse Oximeter Sensor	132146	5406	25179	Default platform configuration
RSCS - Running Speed Cadence Sensor	130982	5357	22661	Default platform configuration
Temperature Collector	139508	5231	22357	Default platform configuration
Temperature Sensor	131084	5320	22458	Default platform configuration
Wireless Power PRU	135382	5258	24451	Default platform configuration
Wireless Power PTU	138706	5018	23469	Default platform configuration
Wireless UART	153368	5678	48471	Default platform configuration

Target Board/Platform: USB-KW41Z/KW41Z512 (GCC compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	

ANS - Alert Notification Sensor	156692	216	24780	Default platform configuration
Beacon	132636	216	22456	Default platform configuration
BLE FSCI App	182912	216	27708	Default platform configuration
BLE Relay Proxy	158988	216	30956	Default platform configuration
BLE Shell App	185400	216	28052	Default platform configuration
BPS – Blood Pressure Sensor	136272	216	23340	Default platform configuration
CPS - Cycling Power Sensor	138212	216	23624	Default platform configuration
CSCS - Cycling Speed Cadence Sensor	136896	216	23364	Default platform configuration
GLS – Glucose Sensor	137312	216	23432	Default platform configuration
HCI Application	84556	216	17696	Default platform configuration
HTS - Health Thermometer Sensor	136840	216	23380	Default platform configuration
HRS – Heart Rate Sensor	136312	216	27304	Default platform configuration
HID Device (Mouse)	138208	216	24592	Default platform configuration
HID Host	146484	216	23952	Default platform configuration
IPV6 - Node	192104	228	32280	Default platform configuration
IPV6 – Router	194064	228	33864	Default platform configuration
Mesh Commissioner	124124	216	18992	Default platform configuration
Mesh Device	111584	216	18328	Default platform configuration

OTAP Client ATT Support	139868	204	27280	Default platform configuration
OTAP Client L2CAP Support	140652	204	29928	Default platform configuration
OTAP Server	145356	216	32332	Default platform configuration
PXR - Proximity Reporter	136308	216	23300	Default platform configuration
Pulse Oximeter Sensor	138112	216	25892	Default platform configuration
RSCS - Running Speed Cadence Sensor	136944	216	23364	Default platform configuration
Temperature Collector	146612	216	22840	Default platform configuration
Temperature Sensor	137132	216	23192	Default platform configuration
Wireless Power PRU	141748	216	25184	Default platform configuration
Wireless Power PTU	145724	216	23944	Default platform configuration
Wireless UART	160692	216	48884	Default platform configuration

Target Board/Platform: USB-KW41Z/K22F (IAR compiler)				
Component/ Application	**Code Size (bytes)**	**Data Size (bytes)**		**Comments**
	READ ONLY (bytes)	**READ ONLY (bytes)**	**READ/WRITE (bytes)**	
HRS – Heart Rate Sensor Host	38414	687	19318	Default platform configuration

Target Board/Platform: USB-KW41Z/K22F (GCC compiler)				
Component/ Application	Code Size (bytes)	Data Size (bytes)		Comments
	READ ONLY (bytes)	READ ONLY (bytes)	READ/WRITE (bytes)	
HRS – Heart Rate Sensor Host	41660	1048	22920	Default platform configuration

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