NXP Semiconductors
Release Notes

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Bluetooth® Low Energy Software for the Kinetis MKW34/MKW35/MKW36 Wireless Microcontroller, Version 1.3.9.1 Maintenance Release Qualified Patch 2

Release Notes

1 Overview

These release notes pertain to the platform software that was developed for the MKW34/MKW35/MKW36 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 1.3.9.1 Maintenance Release 4 Qualified Patch 2.

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2 Release Contents

The NXP Kinetis MKW36A/MKW35A/MKW35Z/MKW36Z Bluetooth® LE Software version 1.3.9.1 Maintenance Release 4 Qualified Patch 2 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_1.3.9/host	Bluetooth® LE v5.0 host stack
middleware/wireless/bluetooth_1.3.9/controller	Bluetooth® LE v5.0 controller
middleware/wireless/bluetooth_1.3.9/profiles	Bluetooth® LE GATT profiles
doc/wireless	Wireless connectivity documentation
middleware/wireless/framework_5.4.8/Common	Connectivity Framework common files
middleware/wireless/framework_5.4.8/DSP	Signal processing and bit manipulation helper functions
middleware/wireless/framework_5.4.8/FSCI	Freescale Serial Connectivity Interface
middleware/wireless/framework_5.4.8/LowPower	Low Power Module
middleware/wireless/framework_5.4.8/MemManager	Memory Manager
middleware/wireless/framework_5.4.8/Messaging	Messaging API
middleware/wireless/framework_5.4.8/NVM	Non Volatile Memory support
middleware/wireless/framework_5.4.8/OtaSupport	Over-The-Air Programming support files
middleware/wireless/framework_5.4.8/Panic	Panic module
middleware/wireless/framework_5.4.8/RNG	Random Number Generator wrapper
middleware/wireless/framework_5.4.8/SerialManager	Serial Manager for various interface
middleware/wireless/framework_5.4.8/Shell	Shell/Console module
middleware/wireless/framework_5.4.8/TimersManager	Timers Manager module
middleware/wireless/framework_5.4.8/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 MKW34/MKW35/MKW36 BLUETOOTH LE Software v1.3.9.1 Changes

- This version corresponds to the Maintenance Release 4 Qualified Patch 2 build of the MKW34/MKW35/MKW36 Bluetooth LE Software the features described below:
  - Updated controller libraries:
    - lib_ble_kw36z_controller_gcc.a
    - lib_ble_kw36z_controller_iar.a
  - Bug fixing
    - Enable firmware support for enhanced dsm during slave latency
    - Wrong low power behavior using slave latency
    - Cannot enter low power after slave disconnection due to window widening limit

Wireless Modules	Versions
Bluetooth LE Host	1.3.9
Bluetooth LE Controller	1.3.9.1
Framework	5.4.8

3.2 MKW34/MKW35/MKW36 BLUETOOTH LE Software v1.3.9 Changes

- This version corresponds to the Maintenance Release 4 Qualified Patch 1 build of the MKW34/MKW35/MKW36 Bluetooth LE Software the features described below:
  - Bug fixing
    - Disconnection issue in case of supervisionTimeout < 4 x connInterval
    - Integrated latest sdk fixes

3.3 MKW34/MKW35/MKW36 BLUETOOTH LE Software v1.3.8 Changes

- This version corresponds to the Maintenance Release 4 build of the MKW34/MKW35/MKW36 Bluetooth LE Software the features described below:
  - Add support for +5dBm tx power
  - Code optimizations in Bluetooth LE Host Stack modules
  - SweynTooth vulnerabilities and non-conformances updates
  - Bluetooth LE Sample Applications minor improvements
  - Documentation Updates
  - Add support for KW34 in connectivity software
  - GattClient_ExchangeMtu - add a parameter to configure the MTU size
  - Add Role information (Central/Peripheral) in connection event
  - Bug fixing

- Cannot change Filter Duplicates option while the scanning is active
- OTAP Bootloader overlaps the SRAM section for warm boot wake up routine
- Incorrect Channel in Enhanced Notifications
- BLE Shell throughput demo is not working
- Wireless uart with FlexNVM issue
- RPA address not changed if the device is in scanning
- No Pairing response if ResponderKeyDistribution > InitiatorKeyDistribution
- Syncronise gAdvertisingStateChanged_c event with Advertising Status Register
- RTC Oscillator Init code missing delay for stability time
- The newCccd value received is 0
- Server/Client ATT Layer does Not Drop Some ATT PDUs of Invalid Length
- Hardfault when modifying demos on MCUXpresso IDE ONLY
- ANCS - MEM_BufferAlloc with no free
- Pairing does not work with iOS when bonding and privacy are disabled on HRS
- Fix crash when encrypted PDU has length smaller than 4 bytes
- FreeRTOS hybrid wireless UART-GFSK adv has insufficient heap size

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**
- **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/services standardized outside the Bluetooth SIG

- **A4WP -** AirFuel™ Alliance Wireless Power Transfer System **v1.3**
- **ANCS –** Apple Notification Center Service **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_512K.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 9.0 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 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	2,977	8,286
KSDK	200	7,400
Connectivity Framework	2,752	30,877
RTOS	9,172	5,440
BLUETOOTH LE Host	724	49,674
BLUETOOTH LE Controller	3,857	50,027
Total	**19,682**	**151,704**

Application – Beacon **Configuration -** FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	1,731	19,805
KSDK	204	6,818
Connectivity Framework	2,544	32,167
RTOS	9,172	5,770
BLUETOOTH LE Host	519	48,177
BLUETOOTH LE Controller	3,846	59,309
Total	**18,016**	**172,046**

Application – Heart Rate Sensor **Configuration -** FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	4,629	10,772
KSDK	200	7,459
Connectivity Framework	4,288	31,159
RTOS	9,172	5,439
BLUETOOTH LE Host	724	50,966
BLUETOOTH LE Controller	3,857	50,021
Total	**22,870**	**155,816**

Application – Heart Rate Sensor **Configuration -** FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	2,690	23,504
KSDK	204	8,702
Connectivity Framework	4,080	36,085
RTOS	9,172	5,439
BLUETOOTH LE Host	519	49,465
BLUETOOTH LE Controller	3,846	59,309
Total	**20,511**	**183,597**

Application – **Wireless UART** **Configuration -** FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	3,950	12,045
KSDK	200	7,934
Connectivity Framework	9,605	30,101
RTOS	9,172	5,558
BLUETOOTH LE Host	837	72,016
BLUETOOTH LE Controller	3,857	49,885
Total	**27,621**	**177,539**

Application – **Wireless UART** **Configuration -** FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	3,687	24,237
KSDK	204	7,500
Connectivity Framework	9,448	30,919
RTOS	9,172	5,890
BLUETOOTH LE Host	626	69,840
BLUETOOTH LE Controller	3,846	59,185
Total	**26,983**	**197,571**

Application – HID Host **Configuration -** FreeRTOS, IAR Embedded Workbench, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	2,716	10,510
KSDK	200	7,374
Connectivity Framework	6,053	34,457
RTOS	10,172	5,559
BLUETOOTH LE Host	760	52,299
BLUETOOTH LE Controller	3,857	49,888
Total	**23,758**	**160,087**

Application – HID Host **Configuration -** FreeRTOS, MCUXpresso IDE, FRDM-KW36		
	RAM [bytes]	Flash [bytes]
Application code	2,498	22,369
KSDK	204	7,024
Connectivity Framework	5,894	35,537
RTOS	10,172	5,890
BLUETOOTH LE Host	598	51,465
BLUETOOTH LE Controller	3,846	59,185
Total	**23,212**	**181,470**

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