



MediaTek LinkIt™ SDK v4 Release Notes

Version: 4.5.1

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Document Revision History

Revision	Date	Description
3.0.0	7 March 2016	Initial release for MediaTek LinkIt SDK v3.0.0.
3.1.0	31 March 2016	<ul style="list-style-type: none"> Added support for LinkIt 2523 HDK. Added the change logs for MediaTek LinkIt SDK v3.1.0.
3.2.0	2 May 2016	<ul style="list-style-type: none"> New Bluetooth stack support in MediaTek LinkIt SDK v3.2.0. New SDK API support for Bluetooth, Wi-Fi and HAL modules. IAR embedded workbench IDE support for LinkIt 2523 HDK.
3.3.0	30 June 2016	Added the release notes for SDK v3.3.0.
3.3.1	4 July 2016	<ul style="list-style-type: none"> Update the HAL module in MT2523 API reference manual. Update KEIL EULA license path.
3.3.2	28 July 2016	Enhanced the Wi-Fi throughput on MT76x7.
4.0.0	2 September 2016	<ul style="list-style-type: none"> Added support for new Bluetooth stack on MT2523. Updated new features, applied bug fixes and added known issues for SDK 4.0.0.
4.1.0	4 November 2016	<ul style="list-style-type: none"> Added the list of documents supporting the chipset. Updated the features, applied bug fixes and added known issues for SDK 4.1.0.
4.2.0	13 January 2017	<ul style="list-style-type: none"> Added support for MT2533D. Added a migration guide to migrate applications from SDK v4.1.0 to SDK v4.2.0.
4.2.1	10 March 2017	<ul style="list-style-type: none"> Fixed an issue in debugger and an issue in Wi-Fi reference design.
4.2.2	12 April 2017	<ul style="list-style-type: none"> Fixed five MT2523 issues.
4.3.0	5 May 2017	<ul style="list-style-type: none"> Added support for MT7682S. Fixed software issues. Added a migration guide to migrate applications form SDK v4.2.x to SDK v4.3.0.
4.3.1	2 June 2017	<ul style="list-style-type: none"> Fixed two MT2523 issues.
4.5.0	7 July 2017	<ul style="list-style-type: none"> Added support for MT7686. Fixed software issues. Added a migration guide to migrate applications form SDK v4.3.x to SDK v4.5.0.
4.5.1	4 August 2017	<ul style="list-style-type: none"> Fixed software issues.

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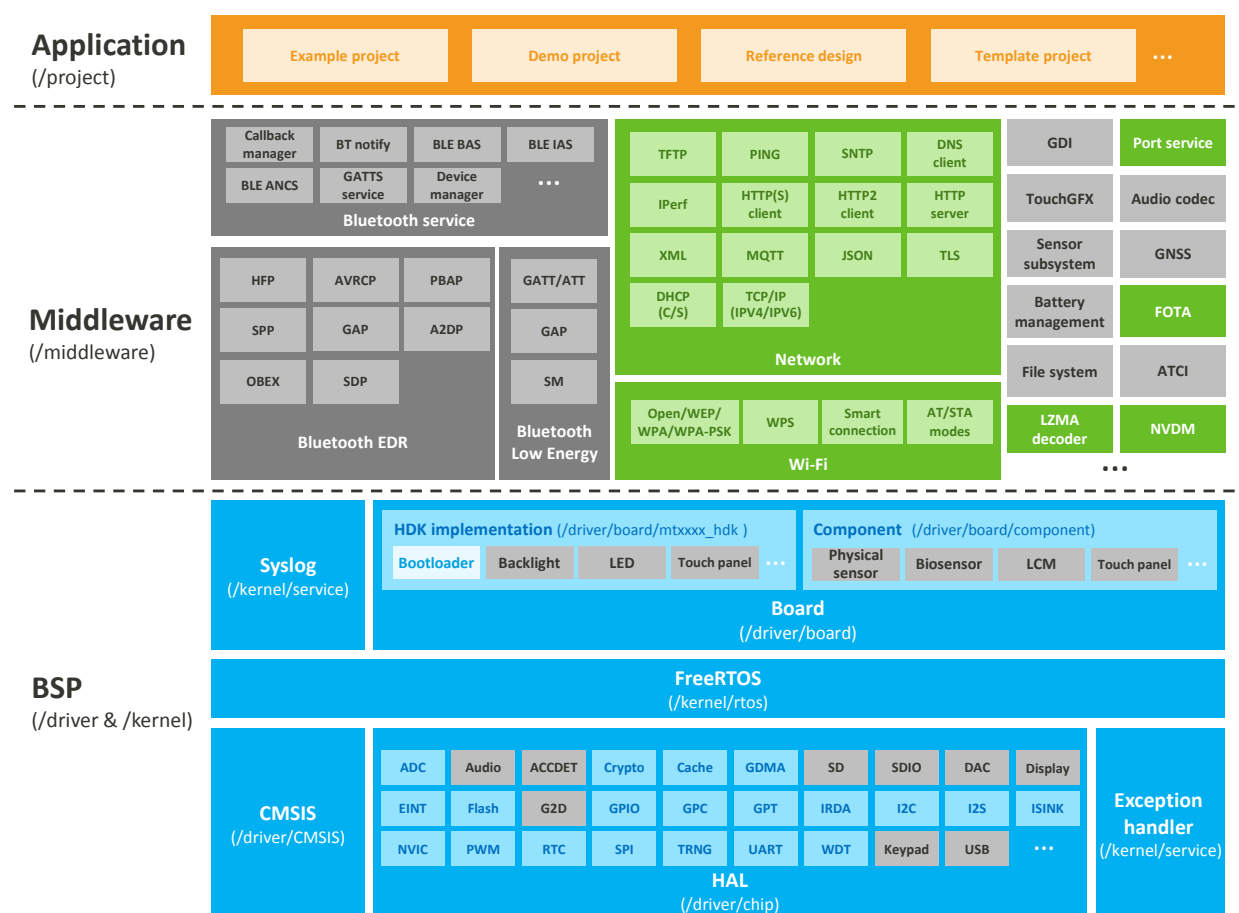
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1. Introduction

MediaTek LinkIt™ software development kit (SDK) v4 provides comprehensive software solution for LinkIt 7687 HDK and LinkIt 2523 HDK. The SDK supports hardware abstraction layers (HAL), peripheral drivers, Wi-Fi module, FreeRTOS, Lightweight IP (lwIP) and other features.

1.1. Architecture layout of the LinkIt SDK v4

The three-layer architecture layout of the SDK for LinkIt 7687 HDK includes Applications, Middleware and BSP, as shown in Figure 1.

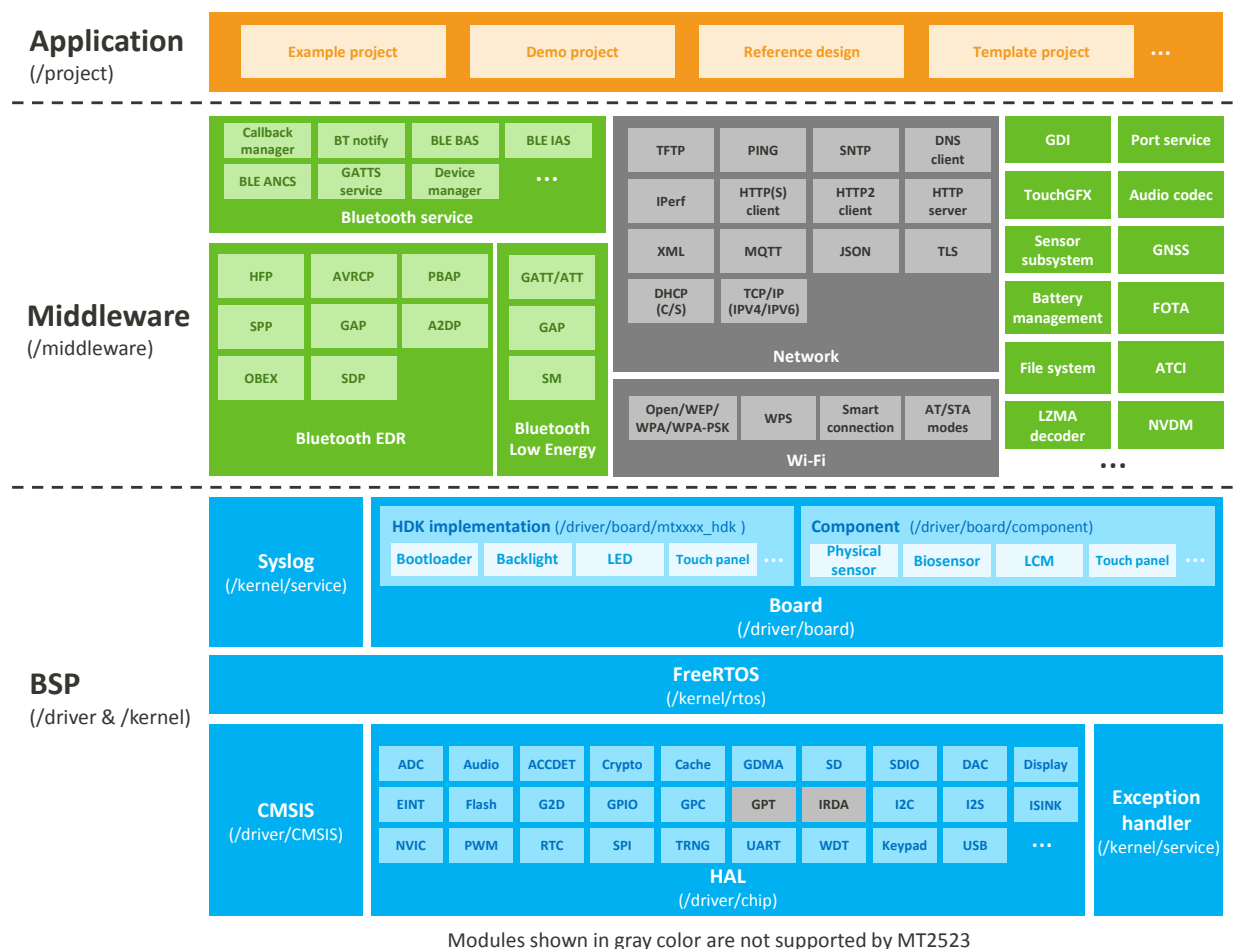


Modules shown in gray color are not supported by MT7687

Figure 1. Architecture layout of the LinkIt SDK v4 for LinkIt 7687 HDK

A functional block in grey means the HDK does not support the feature. The top layer includes the application projects running on the SDK. They are based on Middleware, OS and HAL layers. These layers provide rich features for application development, such as the Middleware provides the network connectivity, Wi-Fi and Bluetooth Low Energy Stack. The FreeRTOS provides the underlying real-time operating system.

The three-layer architecture layout of the SDK for LinkIt 2523 HDK and MT2533D evaluation board includes Applications, Middleware and BSP, as shown in Figure 2.



Modules shown in gray color are not supported by MT2523

Figure 2. Architecture layout of the LinkIt SDK v4 for LinkIt 2523 HDK and MT2533D evaluation board

A functional block in grey means the HDK does not support the feature. The top layer includes the application projects running on the SDK. They are based on Middleware, OS and HAL layers. These layers provide rich features for application development, such as the Middleware provides the Bluetooth Low Energy Stack, GNSS, FOTA, Sensor subsystem, file system and Battery Management. The FreeRTOS provides the underlying real-time operating system.

The three-layer architecture layout of the SDK for MT7682 HDK includes Applications, Middleware and BSP, as shown in Figure 3.

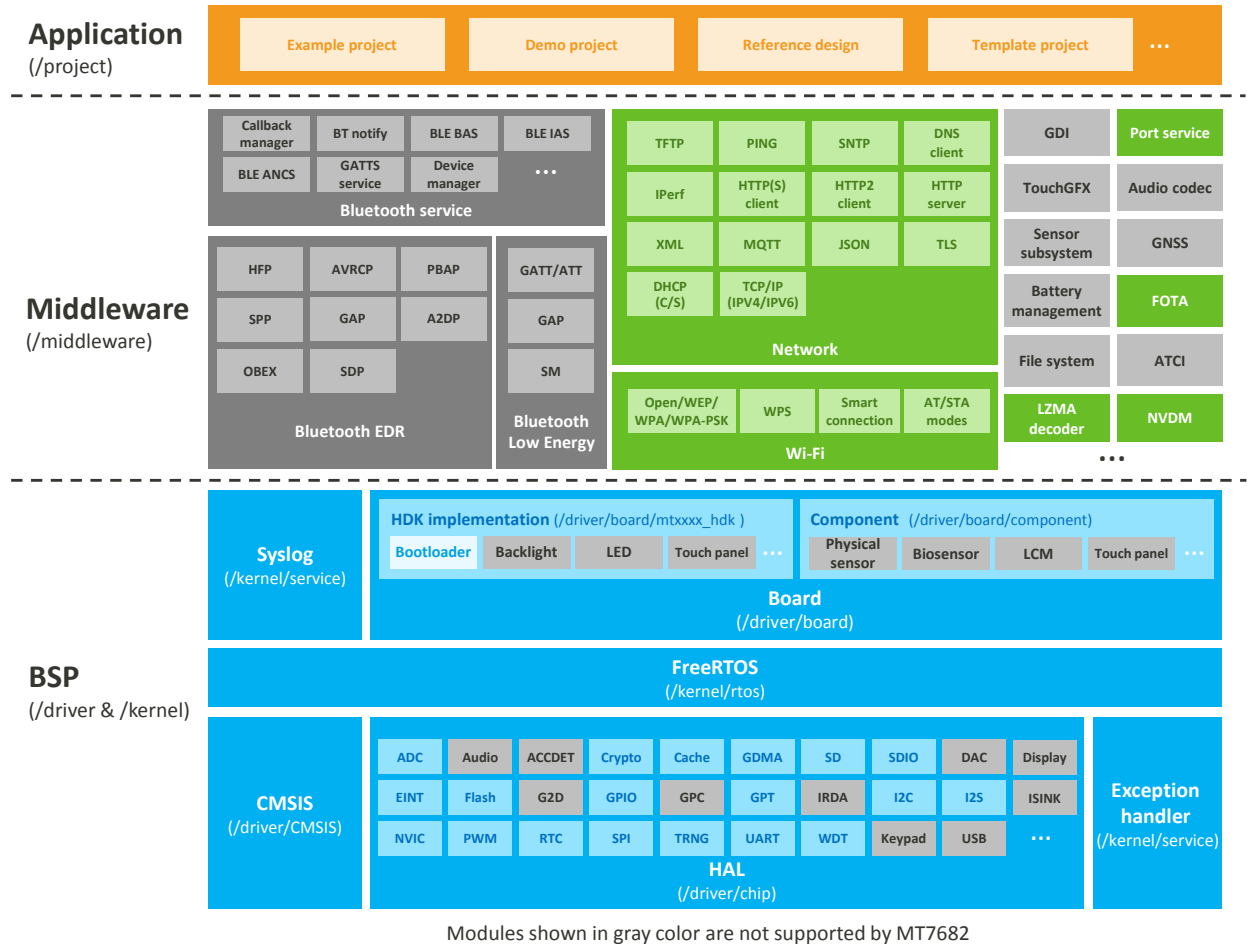


Figure 3. Architecture layout of the LinkIt SDK v4 for MT7682 HDK

A functional block in grey means the HDK does not support the feature. The top layer includes the application projects running on the SDK. They are based on Middleware, OS and HAL layers. These layers provide rich features for application development, such as the Middleware provides the network connectivity, Wi-Fi. The FreeRTOS provides the underlying real-time operating system.

The three-layer architecture layout of the SDK for MT7686 HDK includes Applications, Middleware and BSP, as shown in Figure 4.

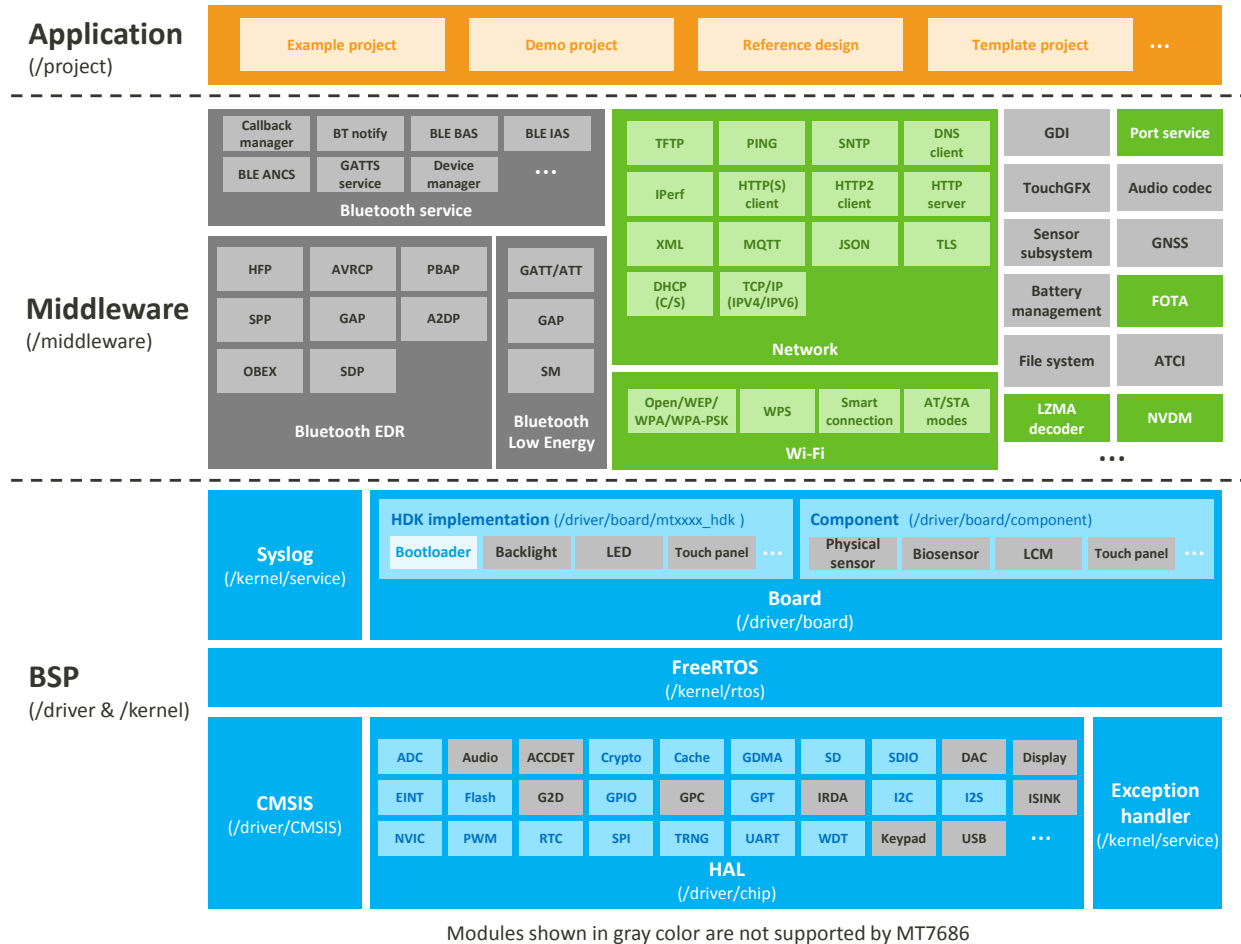


Figure 4. Architecture layout of the LinkIt SDK v4 for MT7686 HDK

The features not supported by the HDK are highlighted in grey. The top layer includes applications running on the SDK. They are based on Middleware, OS and HAL layers. These layers provide rich features for application development, such as the Middleware provides the network connectivity through Wi-Fi. FreeRTOS provides the underlying real-time operating system.

1.2. Knowledgebase

The released SDK includes documentations to guide developers through each module and its features, in a convenient and developer-oriented approach.

The documentations are located under SDK's doc folder.

- MediaTek LinkIt™ Development Platform for RTOS Get Started. This guide covers the SDK features, step-by-step setup of the development environment and its usage.
- MediaTek LinkIt™ Development Platform for RTOS API reference manual. This reference manual provides detailed description of the APIs in the SDK.
- MediaTek LinkIt™ Development Platform for RTOS Open Source Components Guide. This document guides you through the open source modules and the features used in the SDK.

- MediaTek LinkIt™ HDK Memory Layout Developer's Guide. This guide provides details on the memory layout of the SDK, and how to adjust the memory layout for a custom application.
- MediaTek LinkIt™ Development Platform for RTOS Wi-Fi Developer's Guide. This document complements the Wi-Fi API reference manual.
- MediaTek LinkIt™ Development Platform for RTOS System Log Developer's Guide. This document guides you through the usage of the system logging feature provided in the SDK.
- MediaTek LinkIt™ Development Platform for RTOS Firmware Update Developer's Guide. This document guides you to use the FOTA and how to adjust the memory usage of FOTA.
- MediaTek LinkIt™ Development Platform for RTOS Internet Middleware API Reference Manual. This reference manual provides details on the usage of internet protocol APIs.
- MediaTek LinkIt™ SDK v4 GCC Build Environment Guide. This document provides details on how to create and build a project, and how to create a module, with the SDK in the GCC build environment.
- MediaTek LinkIt™ Development Platform for RTOS Bluetooth Developer's Guide. This document guides you through the supported Bluetooth library and its usage with reference examples.
- MediaTek LinkIt™ Development Platform for RTOS Power Mode Developer's Guide. This document addresses the MCU system's power mode configuration and power consumption measurement focused on power modes provided by MediaTek LinkIt development platform for RTOS.
- MediaTek LinkIt™ Development Platform for RTOS LCM Porting Guide. This guide provides detailed description on LCM porting, including the LCM driver creation and backlight control.

The related chipsets of each document under <sdk_root>/doc folder are listed in Table 1.

Table 1. Documentation relevance for different chipsets

Document file name	MT7687F/ MT7682S/ MT7686	MT7697/ MT7697D	MT2523D/ MT2523G
LinkIt_for_RTOS_Bluetooth_Developers_Guide.pdf		√	√
LinkIt_for_RTOS_Firmware_Update_Developers_Guide.pdf	√	√	√
LinkIt_for_RTOS_Get_Started_Guide.pdf	√	√	√
LinkIt_for_RTOS_GNSS_Developers_Guide.pdf			√
LinkIt_for_RTOS_Internet_and_Open_Source_Software_Guide.pdf	√	√	√
LinkIt_for_RTOS_LCM_Porting_Guide.pdf			√
LinkIt_for_RTOS_Memory_Layout_Developers_Guide.pdf	√	√	√
LinkIt_for_RTOS_Power_Mode_Developers_Guide.pdf	√	√	√
LinkIt_for_RTOS_System_Log_Developers_Guide.pdf	√	√	√
LinkIt_for_RTOS_WiFi_Developers_Guide.pdf	√	√	
LinkIt_SDK_v4_GCC_Build_Environment_Guide.pdf	√	√	√
LinkIt_for_RTOS_Wi-Fi_Migration_Developers_Guide.pdf	√	√	
LinkIt_SDK_v4_Release_Notes.pdf	√	√	√

2. MediaTek LinkIt™ SDK Version 4.5.1

2.1. Main changes

- Bug fixes
 - [MT2523x, MT2533D] Sometimes the HFP voice is not smooth when transmitting BLE data at the same time.
 - [cord_free_headset_ref_design] Fixed makefile setting of MTK_BT_AT_COMMAND_ENABLE.
 - [headset_ref_design] Fixed inconsistent issue of FOTA_RESERVED_BASE address in memory map.
 - [headset_ref_design] Smartphone APK can't indicate "Update success" sometimes after completing FOTA process.
 - [inear_noodles_headset_ref_design] A2DP music sometimes doesn't resume after ending a voice call.
 - [inear_noodles_headset_ref_design] Cannot play A2DP music after redialing a voice call several times.
 - [inear_noodles_headset_ref_design] DUT crash occurs after plugging in a USB cable to power on the device.
 - [inear_noodles_headset_ref_design] LED indication of Bluetooth connection and A2DP music playback didn't respond timely.
 - [inear_noodles_headset_ref_design] Local MP3 playback didn't resume after receiving a key tone from smartphone.
 - [inear_noodles_headset_ref_design] No "Connected" voice prompt sound while powering on the device by USB.
 - [MT25x3] Local MP3 playback sometimes doesn't resume after rejecting a voice call.
 - [MT25x3] Power consumption of A2DP playback and MP3 local playback is too high.
 - [MT25x3] System cannot reboot successfully when FOTA package size is over 650KB during FOTA process.
 - [MT7682, MT7686] System cannot reboot successfully by using CLI reboot command during FOTA process.
 - [MT7682, MT7686] Sometimes the system doesn't enter deep sleep mode when connecting to a Wi-Fi AP or enabling sleep manager debug log.

3. MediaTek LinkIt™ SDK Version 4.5.0

3.1. Main changes

- Software features and optimization
 - [MT7686] Added support for MT7686 chipset with the same feature set of MT7682S.
 - [MT2523 + MT5932] Added a reference design to provide Wi-Fi connectivity on LinkIt 2523 HDK with MT5932 HDK. (<sdk_root>/project/mt2523_hdk/apps/wifi5932_ref_design)
 - [MT7682] Added a reference design to support MP3 decoding, AMR decoding and AMR encoding. (<sdk_root>/project/mt7682_hdk/apps/audio_ref_design)
 - [MT7682] Added support for W-Fi AP and STA concurrent mode (Repeater mode).
 - [MT25x3] Added support for Audio/Video Remote Control Profile (AVRCP) 1.6 of Bluetooth EDR.
 - [MT25x3] Added support for stereo with two headsets through A2DP and playing from local MP3 file (Advanced Wireless Stereo, AWS).
- Bug fixes
 - [MT25x3] Changing the configuration of connection link in BLE or EDR Piconet might cause receiving data errors.
 - [MT25x3] While inquiry scan and page scan are enabled and EDR link is established, the EDR link might disconnect.
 - [MT25x3] When a headset pauses the local music with AWS and a link is connected between the headset and the host, an incoming mobile terminated (MT) call of the host will result in headset crash.
 - [MT25x3] While debugging with µVision Tools (IAR), suspending the MT25x3 device for over 30 seconds will result in reset by watchdog timer.
 - [MT25x3] If MT call is received from host to the speaker through hands-free profile, the audio source in speaker will not switch to the call, if a Bluetooth speaker is playing MP3 with AWS.
 - [MT7682] Setting Wi-Fi profile with SSID and then setting PSK will result in Wi-Fi connection (in STA mode) failure.
 - [MT7682] In Open-WEP connection, if the connection between MT768x STA and an AP fails, the STA device will not inform the application about the connection failure.
 - [MT7682] If a connection is maintained for over 8 hours between MT768x host in STA mode and an AP with password configuration, the data decryption might be incorrect.
 - [MT7682] In Wi-Fi station mode with special low power state (PS mode is equal to 2), after the connection to an AP is established and DHCP process is complete (AP granted the IP), switching to AP mode will result in system failure.
- Notes
 - MT7682S and MT7686 does not support Keil IDE and IAR embedded workbench IDE in this release.
 - [MT2523x, MT2533D] The power consumption of EDR data transmission as master role will be improved in the future release.

3.2. Known issues

There are known issues in this version of the SDK, avoid the following:

- [MT2523x, MT2533D] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously, might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x, MT2533D] Sometimes the HFP voice is'nt smooth when transmitting BLE data at the same time.

3.3. Migration

Migrate the following module based applications when upgrading the SDK from version 4.3.x to version 4.5.0.

1) API naming changes for the HFP codec driver:

<sdk_root>/driver/board/mt25x3_hdk/bt_codec/src/bt_hfp_codec.c and
<sdk_root>/driver/board/mt25x3_hdk/bt_codec_BA/src/bt_hfp_codec.c.

- Related examples
 - bt_headset_23alpha, bt_headset_wifi5931, headset_ref_design, iot_sdk_demo, mp3_local_playback, watch_ref_design under mt2523_hdk folder.
 - watch_ref_design under mt2523_watch folder.
 - bt_headset_23alpha, bt_headset_wifi5931 under mt2523s_headset folder.
 - headset_gui_ref_design, headset_ref_design under mt2533_evb folder.
- How to migrate — Replace bt_codec_task_main() with bsp_bt_codec_task_main().

2) API naming changed for io_def_uart_init().

- Related examples — all example projects under the following folders:
 - <sdk_root>/project/linkit7697_hdk/apps
 - <sdk_root>/project/linkit7697_hdk/hal_examples
 - <sdk_root>/project/linkit7697_hdk/templates
 - <sdk_root>/project/mt7687_hdk/apps
 - <sdk_root>/project/mt7687_hdk/hal_examples
 - <sdk_root>/project/mt7687_hdk/templates
- How to migrate — Replace io_def_uart_init() with bsp_io_def_uart_init().

3) API naming changed for BSP LCD and backlight driver.

<sdk_root>/driver/board/mt25x3_hdk/lcd/mt25x3_hdk_lcd.c
<sdk_root>/driver/board/mt25x3_hdk/lcd/mt25x3_hdk_lcd.c
<sdk_root>/driver/board/mt25x3_hdk/backlight/mt25x3_hdk_backlight.c and
<sdk_root>/driver/board/mt25x3_hdk/backlight/mt25x3_hdk_backlight.c

- Related examples — audio_mp3_play, gnss_get_location, display_drawing_image, iot_sdk_demo, sensor_subsys_accelerometer, modem_wifi5931_ref_design, mp3_local_playback, watch_ref_design, gdi_display_helloworld.
- How to migrate — Replace the APIs as shown below:

BSP_LCD APIs:

Original API name	Modified API name
-------------------	-------------------

Original API name	Modified API name
BSP_LCD_Init	bsp_lcd_init
BSP_LCD_SetLayerToDefault	bsp_lcd_set_layer_to_default
BSP_LCD_DisplayOn	bsp_lcd_display_on
BSP_LCD_DisplayOff	bsp_lcd_display_off
BSP_LCD_EnterIdle	bsp_lcd_enter_idle
BSP_LCD_ExitIdle	bsp_lcd_exit_idle
BSP_LCD_UpdateScreen	bsp_lcd_update_screen
BSP_LCD_ClearScreen	bsp_lcd_clear_screen
BSP_LCD_ClearScreenBW	bsp_lcd_clear_screen_bw
BSP_LCD_GetParam	bsp_lcd_get_parameter
BSP_LCD_ConfigROI	bsp_lcd_config_roi
BSP_LCD_ConfigLayer	bsp_lcd_config_layer
BSP_LCD_set_index_color_table	bsp_lcd_set_index_color_table
BSP_LCD_register_callback	bsp_lcd_register_callback

BSP_Backlight APIs:

Original API name	Modified API name
BSP_Backlight_enable	bsp_backlight_enable
BSP_Backlight_init	bsp_backlight_init
BSP_Backlight_deinit	bsp_backlight_deinit
BSP_Backlight_init_isink	bsp_backlight_init_isink
BSP_Backlight_set_clock_source_isink	bsp_backlight_set_clock_source_isink
BSP_Backlight_set_step_current_isink	bsp_backlight_set_step_current_isink
BSP_Backlight_set_double_current_isink	bsp_backlight_set_double_current_isink
BSP_Backlight_init_display_pwm	bsp_backlight_init_display_pwm
BSP_Backlight_set_clock_source_display_pwm	bsp_backlight_set_clock_source_display_pwm
BSP_Backlight_set_duty_display_pwm	bsp_backlight_set_duty_display_pwm
BSP_Backlight_set_width_display_pwm	bsp_backlight_set_width_display_pwm
BSP_Backlight_init_lcm_brightness	bsp_backlight_init_lcm_brightness
BSP_Backlight_deinit_lcm_brightness	bsp_backlight_deinit_lcm_brightness
BSP_Backlight_set_step_lcm_brightness	bsp_backlight_set_step_lcm_brightness

- 4) To migrate USB task definition and configuration in task_def.h under
<sdk_root>/gva/project/mt2523_hdk/<project>/inc

```
#ifndef MTK_USB_DEMO_ENABLED
/* USB */
#define USB_TASK_NAME "USB"
#define USB_TASK_STACKSIZE 4096
#define USB_TASK_PRIO TASK_PRIORITY_HIGH
#define USB_QUEUE_LENGTH 500
#endif
```

5) Enable HAL_DWT_MODULE_ENABLED for task stack overflow verification.

- Related examples — all example projects under <sdk_root>/project/mtxxxx_xxx/apps and <sdk_root>/project/mtxxxx_xxx/apps/templates folders.
- How to migrate — add HAL_DWT_MODULE_ENABLED definition in <sdk_root>/project/mtxxxx_xxx/apps/<project>/inc/hal_feature_config.h or <sdk_root>/project/mtxxxx_xxx/templates/<project>/inc/hal_feature_config.h

```
#define HAL_WDT_MODULE_ENABLED
```

And add the configPOST_SLEEP_PROCESSING macro in
<sdk_root>/project/mtxxxx_xxx/apps/<project>/inc/FreeRTOSConfig.h or
<sdk_root>/project/mtxxxx_xxx/templates/<project>/inc/FreeRTOSConfig.h

```
#if (configUSE_TICKLESS_IDLE >= 1)
#if (configCHECK_FOR_STACK_OVERFLOW > 0)
/* restore dwt stack overflow check after deep sleep */
#undef configPOST_SLEEP_PROCESSING
#define configPOST_SLEEP_PROCESSING(x)
\
{
\
extern void hal_dwt_init(void);
\
extern void vPortCurrentTaskStackOverflowCheck(void);
hal_dwt_init();
\
vPortCurrentTaskStackOverflowCheck();
\
}
#endif /* (configCHECK_FOR_STACK_OVERFLOW > 0) */
#endif /* (configUSE_TICKLESS_IDLE >= 1) */
```

6) Migrate HAL example projects and app projects when an error occurs

“kernel/service/src/memory_regions.o not found”.

- All example projects under <sdk_root>/project/mtxxxx_xxx/apps and no_rtos_initialize_system project in <sdk_root>/project/mtxxxx_xxx/apps/templates folder
 - remove C_FILES += kernel/service/src/memory_region.c in project's Makefile
- Other <sdk_root>/project/mtxxxx_xxx/apps/templates folder (except no_rtos_initialize_system project) and all app project
 - Add iot_sdk_demo project's regions_init.c in the app/src folder.
 - Add regions_init.c path in Makefile:
 - APP_FILES += \$(APP_PATH_SRC)/regions_init.c
- For KEIL and IAR app project
 - Add regions_init.c in src file when project is opened in KEIL/IAR.
 - Remove memory_region.c file when project is opened in KEIL/IAR.
- For KEIL and IAR HAL example project
 - Remove memory_region.c file when project is opened in KEIL/IAR.

7) Move MTK_FW_VERSION information from project makefile to <sdk_root>/middleware/MTK/verno/inc/verno.h.

- a) Related examples — all projects.
- b) How to migrate — migrate the project when an error or warning occurs: "MTK_FW_VERSION" redefined.
 - i. Remove the codes in project's Makefile.

```
ifdef MTK_FW_VERSION
CFLAGS += -DMTK_FW_VERSION=\"$(MTK_FW_VERSION)\"
endif
```


4. MediaTek LinkIt™ SDK Version 4.3.1

4.1. Main changes

- Bug fixes
 - [MT25x3] Sliding the touch panel for over 20 minutes might stall the system.
 - [MT25x3] Playing music with A2DP over 30 minutes results in system crash.

4.2. Known issues

There are known issues in this version of the SDK, avoid the following:

- [MT2523x, MT2533D] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously, might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x, MT2533D] During two EDR and two Bluetooth LE multi-link transmission, the link connections might be unstable.
- [MT7682] In Wi-Fi station mode with special low power state (PS mode is equal to 2), after the connection to an access point (AP) is established and DHCP process is complete (AP granted the IP), switching to AP mode will result in system failure.

5. MediaTek LinkIt™ SDK Version 4.3.0

5.1. Main changes

- Software features and optimization
 - [MT7682S] Added support for MT7682S chipset, including drivers and board support package. MediaTek MT7682S is based around a highly integrated chipset containing a microcontroller unit (MCU), a low power 1x1 2.4GHz 11b/g/n single-band Wi-Fi subsystem and a power management unit (PMU). The MCU is an ARM Cortex-M4 processor with floating point unit, integrated with 1MB flash memory. It also provides the following features and capabilities.
 - Soft AP
 - STA
 - WPA/WPA2 Security
 - MediaTek Smart Connection
- Bug fixes
 - [MT7697x, MT25x3] After disconnecting and re-connecting Bluetooth LE connection, the connection may not be established, if master and slave modes are switched.
 - [MT7697x, MT25x3] When a device is connected with Bluetooth LE data connection with another device and triggers a page scan at the same time, the connection might be lost.
 - [MT7697x] Bluetooth HFP has noise sound in the very beginning 400ms to 500ms right after connection is established.
 - [MT7697x] In the Bluetooth EDR low power mode, the time of voice connection establishment might be up to 2 seconds.
 - [MT7697x] In the state of low power mode without CPU clock tick (tickless mode), Bluetooth EDR link might be lost.
- Notes
 - The name of MT2523 Flash Tool is changed to IoT flash tool supporting 2523x and 768x chipsets.
 - MT7682S does not support Keil IDE and IAR embedded workbench IDE in this release.
 - The deprecated Bluetooth middleware under <sdk_root>/middleware/MTK/bluetooth_BA will be removed from this version.

5.2. Known issues

There are known issues in this version of the SDK, avoid the following:

- [MT2523x, MT2533D] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously, might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x, MT2533D] During two EDR and two Bluetooth LE multi-link transmission, the link connections might be unstable.

- [MT7682] In Wi-Fi station mode with special low power state (PS mode is equal to 2), after the connection to an access point (AP) is established and DHCP process is complete (AP granted the IP), switching to AP mode will result in system failure.

5.3. Migration

Migrate the following module based applications when upgrading the SDK from version 4.2.x to version 4.3.0.

- 1) Modify the SDK folder structure for more coherent view in SDK v4.3.0.
 - a) Apply the modifications for folder structure through a script located at `<V430_codebase_root>/tools/scripts/migration/update_420proj_to_430.pl`. Please run the script under Linux environment to migrate the folders and files listed in Table 2.
 - b) Copy `ffconf.h` from `<sdk_roo>/project/mt2523_hdk/apps/atci_register_command/inc/ffconf.h` in v4.3.0 to `inc` folder of the project in v4.2.x and modify the path settings.
 - c) Usage:
 - i. Copy example projects in v4.2.x to a new path.
 - ii. `cd <V430_codebase_root>/tools/scripts/migration`
 - iii. `perl update_420proj_to_430.pl <your_example_project_path>`
 - d) Limitations
 - iv. Must install PERL v5.18.4 or higher.
 - v. Must run on Ubuntu 14.01.1 or higher

Table 2. Folders and files to migrate

Folder structure in SDK v4.2.x	Folder structure in SDK v4.3.0
driver/board/mt76x7_hdk/wifi	middleware/MTK/wifi_service
driver/chip/mt2523/lib	prebuilt/driver/chip/mt2523/lib
driver/chip/mt7687/lib	prebuilt/driver/chip/mt7687/lib
middleware/MTK/ble_ancs	prebuilt/middleware/MTK/ble_ancs
middleware/MTK/ble_notify/lib	prebuilt/middleware/MTK/ble_notify/lib
middleware/MTK/homekit	prebuilt/middleware/MTK/homekit
middleware/MTK/minicli/lib	prebuilt/middleware/MTK/minicli/lib
middleware/MTK/minisupp	prebuilt/middleware/MTK/minisupp
middleware/MTK/minorsupc	prebuilt/middleware/MTK/minorsupc
middleware/MTK/nvdm/lib	prebuilt/middleware/MTK/nvdm/lib
middleware/MTK/slp	prebuilt/middleware/MTK/slp
middleware/MTK/sensor_subsys/fusion_algo	prebuilt/middleware/MTK/sensor_subsys/fusion_algo
driver/board/component/audio	prebuilt/driver/board/component/audio
driver/board/component/bt_codec	prebuilt/driver/board/component/bt_codec
middleware/MTK/audio/mp3_codec/lib	prebuilt/middleware/MTK/audio/mp3_codec/lib
middleware/MTK/audio/amr_codec/lib	prebuilt/middleware/MTK/audio/amr_codec

Folder structure in SDK v4.2.x	Folder structure in SDK v4.3.0
	/lib
middleware/MTK/battery_management/port/mt2523/lib/fuelgauge	prebuilt/middleware/MTK/fuelgauge
middleware/MTK/bluetooth/lib	prebuilt/middleware/MTK/bluetooth/lib
middleware/third_party/dhcpd	middleware/MTK/dhcpd
kernel/service open source	

- 2) To migrate Wi-Fi related applications from MT76x7 to MT7682 and from SDK 4.2.x to SDK 4.3.0, please refer to the Wi-Fi migration guide under <sdk_root>/doc folder.
- 3) XML at <sdk_root>/middleware/third_party/xml.
 - XML middleware folder includes a header file config.h. To eliminate the ambiguity, this file is moved from "middleware/third_party/xml/inc/config.h" to "middleware/third_party/xml/inc/xml/config.h".
 - Applications that include "config.h" in the XML middleware should be replaced with "xml/config.h".
- 4) Bootloader function names are changed only for MT2523 HDK at <sdk_root>/driver/board/mt25x3_hdk/bootloader/core/src/bl_main.c
 - Replace the function name "bl_main" with "main" in <sdk_root>/project/mt2523_hdk/apps/bootloader/GCC/startup_bootloader.s.
 - Then replace the function name "main" with "__main" in for Keil build at <sdk_root>/project/mt2523_hdk/apps/bootloader/MDK-ARM/startup_bootloader.s.

6. MediaTek LinkIt™ SDK Version 4.2.2

6.1. Main changes

- Bug fixes
 - [MT2523] Fixed the issue that the charging current might be up to 500mA for around 500ms after waking up from sleep mode.
 - [MT2523] Improved the transmission power and receiving sensitivity for Bluetooth Enhanced Data Rate (EDR) and with Low Energy (LE).
 - [MT2523] Fixed the issue that software initialization fails on µVision® IDE, due to improper initialization of variables with 0s.
 - [MT2523, MT2511] Fixed the issue that heart rate measurement might be inaccurate for a short period after a prolonged use (6 to 8 hours).
 - [MT2523] It's rare to receive incorrect data, if the host, such as PC, transfers over 2KB of data to the device through USB.

6.2. Known issues

There are known issues in this version of the SDK, avoid the following:

- [MT2523x, MT2533D] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x, MT2533D] During two EDR and two Bluetooth LE multi-link transmission, the link connections might be unstable.

7. MediaTek LinkIt™ SDK Version 4.2.1

7.1. Main changes

- Bug fixes
 - [MT76x7] Fixed the issue that in-target-reset (reset Cortex-M4 only) fails in debugging mode.
 - [modem_wifi5931_ref_design] Fixed the issue of failing in Wi-Fi initialization.
 - [bioband_ref_design] Improve the blood pressure range of Systolic blood pressure (SBP) value.

7.2. Known issues

There are known issues in this version of the SDK, avoid the following:

- [MT2523x, MT2533D] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x, MT2533D] During two EDR and two Bluetooth LE multi-link transmission, the link connections might be unstable.

8. MediaTek LinkIt™ SDK Version 4.2.0

8.1. Main changes

- Software features and optimization
 - Added support for MT2533D chipset, including drivers and board support package.
 - [Watch reference design] Enabled Bluetooth LE Find Me profile (FMP) on a watch reference design (for licensed customers only).
 - [Watch reference design] Enabled sport application related features, such as heart rate, GNSS and pedometer on watch reference design (for licensed customers only).
 - [MT76x7] Enhanced the Flash Tool to support Ubuntu Linux.
 - [MT2523x, MT2533D] Added the console mode for Flash Tool in Ubuntu Linux and Windows.
 - Added Easy PinMux Tool support in Ubuntu Linux.
 - [MT7697x] Added the support for Bluetooth, Wi-Fi, Bluetooth LE and Wi-Fi Bridge in `iot_sdk_demo` example application.
 - [MT76x7] Added the RSSI sorting to match the SSID in scan table.
- Bug fixes
 - [MT2523x, MT2533D] Fixed the system crash issue while establishing A2DP connection with certain Bluetooth dongle and PCs.
 - [MT2523x, MT2533D] Fixed the system timer ([SysTick](#)) drifting when the clock (CLK) is at 104 MHz and the clock source is High Frequency Oscillator (HFOSC). SysTick is used by FreeRTOS as a basic timer
 - [Watch reference design] Using any undefined character in a drawing function of watch reference UI will cause a system error.
 - [MT76x7] Fixed the issue that occurs when the power consumption value is higher than the one defined in the specification in DTIM10 mode.
- DTIM 10 mode: DTIM interval = 10, Wi-Fi wakes up every 10 beacon period (1000ms).
- [MT76x7] Fixed the issue of drifting system tick during frequent interrupts in idle mode.
- [MT76x7] Fixed the uneven throughput between transmit and receive operations, the transmitting throughput was much higher than the receiving throughput, when the throughput was set at maximum for both operations at the same time.

8.2. Known issues

There are known issues in this version of the SDK, avoid the following:

- [MT2523x, MT2533D] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x, MT2533D] During two EDR and two Bluetooth LE multi-link transmission, the link connections might be unstable.

8.3. Migration

Migrate the following module based applications when upgrading the SDK from version 4.1.0 to version 4.2.0 and higher.

- 1) Bluetooth notification services at <sdk_root>/middleware/MTK/bt_notify.
 - Related structures — the related structures and enumerations are listed in Table 3.
 - Related examples — bt_android_notification, fota_download_manager and gnss_get_location under mt2523_hdk folder, watch_demo under mt2523_watch folder.
 - How to migrate — replace the structures and enumerations of SDK v4.1.0 with the corresponding ones in SDK v4.2.0, as described in Table 3.

Table 3. Structures and enumerations migration for Bluetooth notification services

Structures and enumeration in SDK v4.1.0 (struct or enum name. field name)	Structures and enumeration in SDK v4.2.0 (struct or enum name. field name)
bt_notify_indication_event_t. BT_NOTIFY_EVENT_NEW_MSG	bt_notify_event_t. BT_NOTIFY_EVENT_NONE
bt_notify_indication_event_t. BT_NOTIFY_EVENT_DATA	bt_notify_event_t. BT_NOTIFY_EVENT_DATA_RECEIVED
bt_noti_data_t. err_code	bt_notify_event_data_t. error_code
bt_noti_data_t. len	bt_notify_event_data_t. length
bt_notify_remote_system_t	bt_notify_remote_system_type_t
bt_notify_notification_action_t. BT_NOTIFY_NOTIFICATION_NEW	bt_notify_action_type_t. BT_NOTIFY_ACTION_TYPE_NEW
bt_notify_notification_action_t. BT_NOTIFY_NOTIFICATION_DELETE	bt_notify_action_type_t. BT_NOTIFY_ACTION_TYPE_DELETE
bt_notify_page_content_t	bt_notify_page_content_list_t
bt_notify_noti_t. noti_action	bt_notify_notification_t. action_content
bt_notify_sms_t. send_number	bt_notify_sms_t. sender_number
bt_notify_call_t. send_number	bt_notify_missed_call_t. sender_number
bt_notify_remote_system_t	bt_notify_remote_system_type_t
bt_notify_callback_t. noti_data	bt_notify_callback_data_t . event_data
bt_notify_result_t. BT_NOTIFY_NO_SUPPORT	bt_notify_result_t. BT_NOTIFY_RESULT_NOT_SUPPORTED
bt_notify_result_t. BT_NOTIFY_REGISTER_RET_INVALID_PARAMETER	bt_notify_result_t. BT_NOTIFY_RESULT_REGISTER_INVALID_PARAMETER
bt_notify_result_t. BT_NOTIFY_REGISTER_RET_SYSTEM_REGISTER	bt_notify_result_t. BT_NOTIFY_RESULT_REGISTER_SYSTEM_ALREADY

Structures and enumeration in SDK v4.1.0 (struct or enum name. field name)	Structures and enumeration in SDK v4.2.0 (struct or enum name. field name)
RED	Y_REGISTERED
bt_notify_result_t. BT_NOTIFY_REGISTER_RET_REPEAT_REGISTER	bt_notify_result_t. BT_NOTIFY_RESULT_REGISTER_REPEATED_REGISTRATION
bt_notify_result_t. BT_NOTIFY_REGISTER_RET_NOT_IMPLEMENT	bt_notify_result_t. BT_NOTIFY_RESULT_REGISTER_NOT_IMPLEMENT
bt_notify_result_t. BT_NOTIFY_RET_INVALID_PARAMETER	bt_notify_result_t. BT_NOTIFY_RESULT_INVALID_PARAMETER
bt_notify_result_t. BT_NOTIFY_RET_PARSE_PARAMETER_ERROR	bt_notify_result_t. BT_NOTIFY_RESULT_PARSING_ERROR
bt_notify_result_t. BT_NOTIFY_RET_NO_CHANNEL	bt_notify_result_t. BT_NOTIFY_RESULT_CHANNEL_UNAVAILABLE
bt_notify_result_t. BT_NOTIFY_RET_FAIL	bt_notify_result_t. BT_NOTIFY_RESULT_FAILED
bt_notify_result_t. BT_NOTIFY_REGISTER_RET_OK	bt_notify_result_t. BT_NOTIFY_RESULT_REGISTER_OK
bt_notify_data_source_t. BT_NOTIFY_DATA_SOURCE_UNKNOWN	bt_notify_data_source_t. BT_NOTIFY_DATA_SOURCE_INVALID

- 5) Bluetooth callback manager service at <sdk_root>/middleware/MTK/bt_callback_manager.
- Related structures — the related structures and enumerations are listed in Table 4.
 - Related examples — bt_android_notification, fata_download_manager and gnss_get_location under mt2523_hdk folder.
 - How to migrate — replace the structures and enumerations of SDK v4.1.0 with the corresponding ones in SDK v4.2.0, as described in Table 4.

Table 4. Structures and enumerations migration for Bluetooth callback manager services

Structure and enumeration in SDK 4.1.0 (struct or enum name. field name)	Structure and enumeration in SDK 4.2.0 (struct or enum name. field name)
bt_callback_type_t. bt_callback_type_gatts_get_execute_write_result	bt_callback_type_t. bt_callback_type_gatts_get_execute_write_result
Implement the function bt_sdps_get_customized_record() and return the record array.	Bt_status_t bt_callback_manager_add_sdp_customized_record (const bt_sdps_record_t * record); Call this function to add your own record.

- 6) Bluetooth LE Apple Notification Center Service (ANCS) at <sdk_root>/middleware/MTK/ble_ancs.
- Related differences — ble_ancs_gprot.h in SDK v4.1.0 and ble_ancs.h in SDK v4.2.0. The related structures, enumerations and APIs are listed in Table 5.

- Related examples — ble_ancs_ios_notification under the mt2523_hdk folder and watch_demo under the mt2523_watch folder of SDK v4.1.0.
- How to migrate — replace the header file name, structures, enumerations and APIs as described in Table 5.

Table 5. Structures and enumerations migration for Bluetooth LE ANCS

Structure , enumeration and API in SDK 4.1.0 (struct or enum name. field name)	Structure, enumeration and API in SDK 4.2.0 (struct or enum name. field name)
ANCS_EVENT_ID_NUM	BLE_ANCS_MAX_EVENT_ID_NUMBER
ANCS_CATEGORY_ID_NUM	BLE_ANCS_MAX_CATEGORY_ID_NUMBER
ANCS_NOTIFICATION_ATTR_NUM	BLE_ANCS_MAX_NOTIFICATION_ATTR_NUMBER
BLE_ANCS_CHAR_NUM	BLE_ANCS_MAX_CHARC_NUMBER
ble_ancs_uuid_type_t. BLE_ANCS_PRIMARY_SERVICE_UUID BLE_ANCS_NOTIFICATION_SOURCE_UUID BLE_ANCS_CONTROL_POINT_UUID BLE_ANCS_DATA_SOURCE_UUID	ble_ancs_uuid_t . BLE_ANCS_UUID_PRIMARY_SERVICE BLE_ANCS_UUID_NOTIFICATION_SOURCE BLE_ANCS_UUID_CONTROL_POINT BLE_ANCS_UUID_DATA_SOURCE
ancs_msg_type_t. BT_ANCS_GAP_LE_DISCONNECT_IND BT_ANCS_GATTC_WRITE_CHARC	bt_msg_type_t. BT_GAP_LE_DISCONNECT_IND BT_GATTC_WRITE_CHARC
bt_status_t ble_ancs_event_callback(ancs_msg_type_t msg, bt_status_t status, void *buff);	bt_status_t ble_ancs_event_callback(bt_msg_type_t msg, bt_status_t status, void *buffer);
bt_status_t ble_ancs_parse_notification_source(ble_ancs_event_notification_t *notif_source, const uint16_t length, uint8_t *data);	bt_status_t ble_ancs_parse_notification(ble_ancs_event_notification_t *notification, uint16_t length, uint8_t *data);

7) Bluetooth sink service at <sdk_root>/middleware/MTK/bt_sink.

- Related structures — bt_sink_srv_am_files_format_t.path of SDK v4.1.0 and bt_sink_srv_am_files_format_t.file_type of SDK v4.2.0.
- Related examples — mp3_local_playback under the mt2523_hdk folder.
- How to migrate — replace the bt_sink_srv_am_files_format_t.path in mp3_local_playback with bt_sink_srv_am_files_format_t.file_type.

8) Memory stick and SD memory card controller configuration file (msdc_custom_config.h).

- Symptom: An error occurs “Build... hal_msdc.o FAIL” when building the projects.
- Related examples — all example projects under mt2523_hdk folder.
- How to migrate — add
<sdk_root>/project/mt2523_hdk/apps/atci_register_command/inc/msdc_custom_config.h in SDK v4.2.0 to the inc folder of the target application of SDK v4.1.0.

9) Common folder at <sdk_root>/project/common.

- Related examples — all projects using Command Line Interface (CLI) commands.
- How to migrate — use the <sdk_root>/project/common folder of SDK v4.2.0, do not replace the folder with SDK v4.1.0.

10) Port service at <sdk_root>/middleware/MTK/port_service.

- Symptom — An error occurs “multiple definition of `log_control_block_atci_serialport'” when building the projects.
- Related examples — bt_headset_23alpha, iot_sdk_demo, iot_sdk_dev, low_power_without_psram, modem_wifi5931_ref_design, mp3_local_playback under mt2523_hdk, bt_headset_23alpha, bt_headset_wifi5931 under mt2523s_headset and headset_gui_ref_design, headset_ref_design under mt2533_evb folders.
- How to migrate — remove the at_command_serial_port.c file from the src folder of a project and modify the related Makefiles and configure files for Keil IDE and IAR embedded workbench IDE.

9. MediaTek LinkIt™ SDK Version 4.1.0

9.1. Main changes

Software features and optimization

- [MT2523x] Added a reference design for watch supporting heart rate, GNSS and Bluetooth notification. (<sdk_root>/project/mt2523_hdk/apps/watch_ref_design)
- [MT2523x] Added the support to update the firmware of LinkIt 2523 HDK through GATT profile using Mediatek Smart Device, an Android app on a hand-held device.
- [MT2523x] Added the support for USB mass storage protocol (reference application at <sdk_root>/project/project/mt2523_watch/apps/watch_demo).
- [MT2523x] Added the support for MP3 audio playback from an SD card.
- [MT7697x] Added support to Wi-Fi and Bluetooth LE coexistence. Application can control all the links of the two protocols without any interference.

Bug fixes

- [MT2523x] Fixed the issue that the A2DP connection between MT2523x-based device (Client) and certain dedicated device (Server) gets disconnected when the audio transfer is paused, waits for a while, and resumes the playback again.
- [MT2523x] Fixed the issue that LinkIt 2523 HDK cannot establish Bluetooth audio connection (A2DP) with an iPhone with iOS 10 or later versions of OS.
- [MT2523x] Fixed the issue in multiple links where one link (eSCO link) is on call, the other idle link (ACL link) gets disconnected.
- [MT2523x, MT7697x] Fixed the issue in multiple links when master and slave roles coexist at the same time, one of the links might be disconnected.
- [MT76x7] Fixed the issue that the system hangs when an application listens to the Wi-Fi traffic in sniffer mode.

Notes

- This version introduces a new method to add a module. To handle the migration of your application to this SDK, see section 6.2, “Adding a module to the build flow of the project” in <sdk_root>/doc/LinkIt_SDK_v4_GCC_Build_Environment_Guide.pdf.

9.2. Known issues

There are known issues in this version of the SDK; developer needs to avoid the following scenarios.

- [MT2523x] Using any undefined character in a drawing function of watch reference UI will cause a system error.
- [MT2523x] Creating an eSCO HFP and a Bluetooth LE GATT profile simultaneously might add noise during a phone call when GATT is streaming a large amount of data.
- [MT2523x] In two BDR and two Bluetooth LE multi-link transmission, the links might be unstable.

10. MediaTek LinkIt™ SDK Version 4.0.0

10.1. Main changes

Software features and optimization

- The SDK includes a new Bluetooth stack. The Bluetooth stack prior to v4.0.0 will be deprecated in SDK 4.0 and removed after 2016. The new stack has the following characteristics compared to the prior versions of the API.
- The footprint is reduced significantly with the same profile support: GAP, HFP (HF), A2DP (SINK), AVRCP (CT), SPP (Server and Client), PBAP (Client), GATT and SM.
 - Current footprint: 70kB ROM and 20kB RAM.
 - Prior footprint: 330kB ROM and 130kB RAM.
- RAM is configurable and memory usage could be optimized to fit the application requirements according to the section “Memory management” of “LinkIt for RTOS Bluetooth Developer's Guide” in the <sdk_root>/doc folder.
- The Bluetooth API in SDK v4.0.0 is not backward compatible with the prior versions of the API.
- [MT2523x] LCM driver and `iot_sdk_demo` demo project based on LinkIt 2523 HDK by SAC support 320 x 320 pixel resolutions.
- Merged RTOS tasks to save resources. Refined the task priority and collected the task configurations into one header file for clarity and better maintainability.
- [MT2523x] Supports logging from USB (USB2 COM port) in the `iot_sdk_demo` project on the LinkIt 2523 HDK by SAC.
- [MT2523x] Supports MP3 audio file local playback.

Bug fixes

- [MT76x7] Fixed the connection failure issue in security establishment phase when connecting to a legacy AP (802.11a, 802.11g, or 802.11b).

Notes

- Please format the whole flash with the MT76x7 flash tool when flashing the SDK 4.0.0 binary to LinkIt 7687 and 7697 HDK for the first time, as described in the “Formatting the storage” section of MT76x7 Flash Tool Users Guide in the root folder of MT76x7 Flash tool.

10.2. Known issues

There is one known issue when using the SDK; developer needs to avoid the following scenario.

- [MT76x7] The peak throughput may drop from 1 to 5Mbps when connecting to a 40Mhz bandwidth (HT40) AP in repeater mode.

11. MediaTek LinkIt™ SDK Version 3.3.2

11.1. Main changes

Bug fixes for LinkIt 76x7 HDK

- Fixed the Wi-Fi throughput drop when the external interrupt has not been received for more than 30 seconds.
- Fixed the Wi-Fi throughput drop in the mid-range signal strength (the RSSI is between -60 to -80dbm), improved the connection stability and ping in long-range (the RSSI is less than -80dbm).

12. MediaTek LinkIt™ SDK Version 3.3.0

12.1. Main changes

- Software features and optimization
 - [MT2523x] Support LCM with DBI and DSI interfaces in the same firmware. Provide an auto-detection mechanism to select RM69032 (DSI) or ST7789H2 (DBI) LCM.
 - [MT2523x] Support 2D graphics drawing with HAL G2D API.
 - [MT7697x] Support setting Bluetooth radio transmission power.
 - [MT7697D] Support Wi-Fi 5G AP/STA (excluding DFS).
 - [MT76x7] Support Wi-Fi repeater mode.
 - [MT76x7] Provide easy-to-use Wi-Fi initialization API to address the requirement of reading implicit configurations from NVDM.
 - [MT76x7] Support auto-detection of AP's authentication mode and encryption type.
- Tool features and optimization
 - [MT2523G] Enhance the upgrade speed of GNSS firmware on MT2523 flash tool
- Bug fixes
 - [MT76x7] Reduced the time to connect to an access point, where two Wi-Fi access points exist with the same SSID within the Wi-Fi RF visible range.

12.2. Known issues

There is one known issue when using the SDK; developer needs to avoid the scenario listed as below.

- [MT2523x] In multi-link and one of them is on call (eSCO link), the idle link (ACL link) might be disconnected.

13. MediaTek LinkIt™ SDK Version 3.2.0

13.1. Main changes

- Features and optimization
 - New BLE stack is available for MT7697 with small footprint and support Bluetooth 4.2.
 - Add the capabilities of configuring and retrieving the CPU frequency with DVFS APIs.
 - Support SPI slave on MT76x7 with new HAL SPI APIs.
 - Reduce the interrupt latency in flash read or write operation.
 - IAR tool chain support, pre-integrate HAL, FreeRTOS, Bluetooth, FOTA, GNSS example projects and the IoT demonstration project with IAR IDE tool.
- Bug fixes
 - The MacAddr, IpAddr, IpGateWay, and IpNetmask attributes in access point (AP) profile is not workable and those values must be stored in station (STA) profile for both AP and STA modes.
 - The Wi-Fi driver will obtain Wi-Fi MAC address from NVRAM, but not eFuse of the MT76x7.
 - Every event passed to `wifi_connection_register_event_notifier()` can only register one corresponding function handler.

14. MediaTek LinkIt™ SDK Version 3.1.0

14.1. Main changes

- SDK supports LinkIt 2523 HDK, including peripheral drivers, middleware and demonstration applications.

14.2. Known issues

There are some known issues when using the SDK; developer needs to avoid these scenarios listed as below.

- The MacAddr, IpAddr, IpGateWay, and IpNetmask attributes in access point (AP) profile is not workable and those values must be stored in station (STA) profile for both AP and STA modes.
- The Wi-Fi driver will obtain Wi-Fi MAC address from NVRAM, but not eFuse of the MT76x7.
- Every event passed to `wifi_connection_register_event_notifier()` can only register one corresponding function handler.

15. MediaTek LinkIt™ SDK Version 3.0.0

15.1. Known issues

There are some known issues when using the SDK; developer needs to avoid these scenarios listed as below.

- The MacAddr, IpAddr, IpGateWay and IpNetmask attributes in access point (AP) profile are not workable and those values must be stored in station (STA) profile for both AP and STA modes.
- The Wi-Fi driver will obtain the Wi-Fi MAC address from NVRAM, but not from eFuse for MT76x7.
- Every event passed to `wifi_connection_register_event_notifier` can only register one corresponding function handler.