

# **GR551x Software Development Kit Release Note**

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## 1 SDK V2.0.1

The GR551x Software Development Kit (SDK) V2.0.1 is updated based on the previous version V1.7.0.

## 1.1 Release Overview

## 1.1.1 Release Package

Table 1-1 Release package

Folder	Description
build	Link-related tools and scripts
components	Bluetooth LE API header, library, and source files
documentation	API reference.
	For more documents, visit <u>GR551x Series: Documentation.</u>
drivers	Driver interface source code and header files
external	Third-party library source code and header files
platform	Link-related files
projects	Example project files and source code
tools	Installation packages for mobile or PC tools, including GProgrammer, GRUart, GRPLT Lite Config Tool,
	GRDirect Test Mode Tool and GRToolbox.
	Available at GR551x Series: Software & Tools.

#### 1.1.2 Notices

- Major updates based on the previous version include new features, functional changes, and fixed bugs.
- The whole SDK has been comprehensively retested based on the following environments.

Table 1-2 Item version

Item	Name & Version	
IDE	Keil MDK-ARM Version 5.20	
SoC	GR551x series (GR5515IGND, GR5515IENDU, GR5515IONDA, GR5515RGBD, GR5515GGBD, GR5513BEND, and GR5513BENDU)	
Platform	Windows 7/10	
Tools	<ul> <li>GProgrammer V1.2.36</li> <li>GRUart V2.1</li> <li>GRToolbox V2.16</li> <li>GRPLT Lite Config Tool V1.1.2</li> <li>GRDirect Test Mode Tool V1.4.5</li> <li>GRPLT V1.5.0.0.4</li> </ul>	

#### 1.1.3 Limitations

- The GR551x SDK might not work in versions earlier than Keil V5.20.
- There may be some problems with SEGGER J-Link and Keil.

Visit <a href="https://www.segger.com/IDE\_Integration\_Keil.html#knownproblems">https://www.segger.com/IDE\_Integration\_Keil.html#knownproblems</a> for more details.



## 1.2 New Features

#### 1.2.1 System

N/A

#### 1.2.2 Bluetooth LE

- Added support for BT Link Key derived from LTK.
- Added support for Apple Find My feature, which can be enabled using CFG\_MUL\_LINK\_WITH\_SAME\_DEV in custom config.h.

#### 1.2.3 Drivers

- I2C module: Added app\_i2c\_timing\_get and app\_i2c\_timing\_adjust APIs to adjust I2C timing to adapt to the
  actual load; added app\_i2c\_transmit\_receive\_sync API to adapt to the Microsoft HID Over I2C protocol,
  allowing writing a command before reading data without generating a stop bit.
- BOD module: Added app bod APIs to operate the BOD module (BOD refers to Brown-out Detector).



For specific operations on new APIs, refer to GR5xx APP Driver User Manual.

## 1.2.4 Examples and Libraries

- Added the ble\_app\_multi\_slave example project to achieve multi-slave and multi-connection functionalities.
- In the direct\_test\_mode example project, supported setting the TX power for single carrier wave tests, and added the functionalities of starting and stopping advertising.
- In the app\_rtc example project, supported implementing calendar functionality using the internal RNG2 clock.
- Supported Fault Trace functionality in GCC.

## 1.3 Functional Changes

## **1.3.1 System**

Replaced startup\_gr55xx.s with Startup.S to register the Interrupt Service Routine (ISR) dynamically. In this way,
 ISR is registered only when needed, so as to save resources.

For example, the code snippet to register SPIM ISR is as follows:

```
soc_register_nvic(SPI_M_IRQn, (uint32_t)SPI_M_IRQHandler);
```

- Added support for error codes of SDK\_ERR\_REPEAT\_CID, SDK\_ERR\_CACHE\_NOT\_ENABLE, and SDK\_ERR\_CACHE\_INVALID in the app\_error module, enriching the functionality.
- Upgraded the download algorithm.

Applied the same download algorithm (in GR5xxx\_16MB\_Flash.FLM) to all Bluetooth LE SoCs.

- Optimized the platform initialization process to make it more modularized. The relevant changes are as follows:
  - Modified SystemInit API.
  - Modified system\_platform\_init API.
  - Changed *startup\_gr55xx.s* to *Startup.S*.



- Changed system\_gr55xx.c to gr\_system.c.
- Changed interrupt\_gr55xx.c to gr\_interrupt.c.
- Changed *platform\_gr55xx.c* to *gr\_platform.c* and *gr\_soc.c*.

#### Note:

For more information, refer to the specific SDK in use.

#### 1.3.2 Bluetooth LE

- Optimized the calling method of ble\_gap\_pair\_enable and ble\_gap\_ppcp\_present\_set APIs, from being called by the application layer to being called internally in the SDK.
- Optimized the method of handling Bluetooth LE events at the application layer, from using callback functions to using message event distribution.

#### 1.3.3 Drivers

- The following modifications have been made to DMA:
  - DMA architecture: The DMA-related implementation has been extracted in app\_xx\_dma.c, such as app\_uart\_dma.c and app\_i2c\_dma.c, to optimize the driver architecture. To use DMA-related APIs, you need to add the corresponding app\_xx\_dma.c.
  - Modified the way to use DMA: You need to call app\_xx\_dma\_init API to initialize the DMA functionality
    of the peripheral.
  - Modified peripheral transmission APIs: Peripheral transmission APIs in SDK V2.0.1 have been categorized into three groups: polling transmission APIs, interrupt transmission APIs, and DMA transmission APIs, corresponding to app\_xxx\_transmit\_sync, app\_xxx\_transmit\_async, and app\_xxx\_dma\_transmit\_async APIs, respectively. For specific operations on the APIs, refer to GR5xx APP Driver User Manual.
  - Modified DMA parameter configurations: Renamed the DMA configuration structure; for example, app\_i2c\_mode\_t has been changed to app\_i2c\_dma\_cfg\_t. Removed the transfer type member from the initialization parameter structure; for example, the app\_i2c\_type\_t member has been removed from the I2C DMA configuration structure. The same rules apply to other peripherals.
- Modified peripheral parameters: In SDK V1.7.0 and earlier versions, the device memory for app\_driver was
  maintained by internal static variables in app\_driver. Now, the device memory is passed in by the application
  layer, to occupy less memory. That is, in SDK V1.7.0 and earlier versions, the formal parameters of the
  configuration parameters for app\_driver initialization could be local variables; whereas, in SDK V2.0.1, the
  formal parameters of the configuration parameters for peripherals except for app\_io and app\_gpiote must be
  global variables.
- Simplified driver usage: The HAL drivers have been placed in *ble\_sdk.lib*, so users do not need to add *gr55xx\_hal\_xxx.c*. They only need to add *app\_xxx.c*.
- Removed all signal amount APIs, such as app\_adc\_conversion\_sem\_sync API, which will no longer be maintained.
- Removed all app aes and app hmac APIs, and adapted security modules to the Mbed TLS library.
- Removed all app systick and app rtos cfg APIs.
- Removed Flash suspend and resume APIs, allowing the SDK to be compatible with Flash that does not support suspend and resume commands.



#### Note:

- Significant changes have been made to DMA, peripheral parameters, and driver usage, which are different from those in SDK V1.7.0 and earlier versions and require special attention.
- The RTC-related APIs do not support millisecond-level data and are for internal calculation only.

## 1.3.4 Examples and Libraries

- Deleted the GUI functionality in example projects.
- Deleted the HAL driver example projects and the FreeRTOS driver example projects; moved the APP driver example projects to SDK Folder\projects\peripheral.
- Deleted the example projects in the ble basic example folder.
- Deleted ble app hrs gh3011 and ble app wechat example projects in the ble peripheral folder.
- Applied the same firmware upgrade solution to all Bluetooth LE SoCs; added the app\_bootloader example project to replace the ble\_dfu\_boot, ble\_dfu\_fast, and second\_boot example projects. Refer to *GR5xx DFU Development Application Note* for more information.
- Added the functionality of issuing control commands via mobile phone and serial port for the ble\_app\_cts and ble\_app\_cts\_c example projects.
- Removed OTA functionality from ble\_app\_hrs, ble\_app\_hts, and ble\_app\_throughput example projects.
- Deleted vs1005, gyc32, and sim card components.
- Optimized NVDS APIs:
  - Added nvds\_get\_avail\_size API to obtain the size of available NVDS space.

## 1.4 Fixed Bugs

#### **1.4.1 System**

• Fixed the bug that caused an error on critical protection in the ring buffer.

#### 1.4.2 Bluetooth LE

- Fixed the bug that caused memory leak in the 2.4G private protocol module.
- Fixed the bug that caused an error on timing configuration in the 2.4G private protocol module.
- Fixed the bug that caused an error on single carrier wave register configuration.

#### 1.4.3 Drivers

- Fixed the bug of not supporting setting the timer to a value longer than 1 hour in the app\_timer module.
- Fixed the bug that might cause a timeout error in the app\_spi module when data was received using the SPI polling API in RTOS environment.
- Fixed the bug that caused a significant counting error in the RTC module.
- Fixed the bug that caused an error in data collection in DMA or polling mode in the ADC module when the sampled data length was configured as one data.

#### 1.4.4 Examples and Libraries

Fixed the bug that caused the mute mode invalid in the ble\_app\_hids\_keyboard example project.



• Fixed the bug that caused NVDS configuration parameters in the ble\_app\_wss example project inconsistent with the actual parameters used.

#### 1.5 Structural Modification

- Adjusted the project directory by removing the toolchain directory and adding the platform directory. Refer to GR551x Developer Guide for the specific directory structure.
- Modified the contents in the drivers directory to APP DRV drivers and HAL header files.
- Adjusted the structure of the peripheral driver example projects. Refer to GR551x Developer Guide for details.

#### 1.6 Known Issues

- Issue 1:
  - Description: In the case of concurrent processing of multiple peripherals, I2C DMA fails to transfer data in a timely manner due to its low priority, resulting in I2C RX FIFO overflow and consequent DMA failure in transferring the expected amount of data, thus no completion interrupt will be generated.
  - Solution: Adjust the DMA interrupt priority.

#### Issue 2:

- Description: Setting ENABLE\_BACKTRACE\_FEA to 1 in *custom\_config.h* results in a compilation error in GCC.
- Solution: Add a start label to the code in the .lds file in SDK\_Folder\platform\soc\linker\gcc;
   for example: stext = 0x01002000.

#### • Issue 3:

- Description: Serial port printing for the ble\_app\_idt and ble\_app\_idt\_c example projects does not work.
- Solution: Modify the local variables used for peripheral initialization to global variables.