



# Bluetooth<sup>®</sup> LE SDK 3.2.1.0 GA

## Gecko SDK Suite 3.2

### July 21, 2021

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Silicon Labs is a leading vendor in Bluetooth hardware and software technologies, used in products such as sports and fitness, consumer electronics, beacons, and smart home applications. The core SDK is an advanced Bluetooth 5.2-compliant stack that provides all of the core functionality along with multiple API to simplify development. The core functionality offers both standalone mode allowing a developer to create and run their application directly on the SoC, or in NCP mode allowing for the use of an external host MCU.

These release notes cover SDK version(s):

3.2.1.0 released July 21, 2021  
3.2.0.0 released June 16, 2021



#### KEY FEATURES

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- Bluetooth HCI support
- Simultaneous scan on 1M and Coded-PHY
- Dynamic GATT configuration
- Release of pyBGAPI in pypi.org
- New tools for Angle-of-Arrival development

## Compatibility and Use Notices

For information about security updates and notices, see the Security chapter of the Gecko Platform Release notes installed with this SDK or on the [Silicon Labs Release Notes page](#). Silicon Labs also strongly recommends that you subscribe to Security Advisories for up-to-date information. For instructions as well as notes on using Secure Vault features, or if you are new to the Silicon Labs Bluetooth SDK, see [Using This Release](#).

### Compatible Compilers:

IAR Embedded Workbench for ARM (IAR-EWARM) version 8.50.9

- Using wine to build with the IarBuild.exe command line utility or IAR Embedded Workbench GUI on macOS or Linux could result in incorrect files being used due to collisions in wine's hashing algorithm for generating short file names.
- Customers on macOS or Linux are advised not to build with IAR outside of Simplicity Studio. Customers who do should carefully verify that the correct files are being used.

GCC (The GNU Compiler Collection) version 10.2.0, provided with Simplicity Studio.

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## 1 New Items

### 1.1 New Features

#### Added in release 3.2.0.0

##### **Bluetooth Host Controller Interface**

Beginning with this release, the Bluetooth Host Controller Interface is supported. See *AN1328: Enabling a Radio Co-Processor using the Bluetooth HCI Function*.

##### **Dynamic GATT Database**

In the GATT server, the GATT database can be created and managed dynamically with Bluetooth APIs. To use this feature, include the component `bluetooth_feature_dynamic_gattdb`. See the component and configuration documentation, and the Bluetooth API reference.

##### **Simultaneous Scanning**

The Bluetooth stack supports simultaneous scanning on LE 1M and Coded PHY. This feature requires hardware support and is available only on certain devices.

##### **New Example Applications**

- Bluetooth - NCP (with Dynamic GATT support): Recommended instead of Bluetooth - NCP Empty, which has been deprecated.
- Bluetooth - RCP
- Bluetooth - SoC Blinky
- Bluetooth - SoC Light Standard DMP and Bluetooth - SoC Empty Standard DMP for EFR32[B|M]G21 \
- Bluetooth - SoC Throughput
- Bluetooth - SoC Interoperability Test: Demo binary only, no source

##### **Throughput Logging**

NCP host applications support logging the throughput of the application. Use the `-l` option to enable the feature. The throughput value is saved in a CSV format. A logging entry is written once a minute.

##### **pyBGAPI**

The pyBGAPI library, implementing the BGAPI protocol in Python, is released in [pypi.org](https://pypi.org).

##### **New Tools for Angle-of-Arrival (AoA) Development**

**AoA Analyzer:** A new 3D graphical tool integrated into Studio to quickly evaluate AoA calculation with one locator and multiple tags. This tool replaces the previous AoA Compass Demo application.

**AoA Configurator:** A new 3D graphical tool to help customers create a valid multi-locator configuration file for multi-locator use cases.

## 1.2 New APIs

For additional documentation and command descriptions please refer to the Bluetooth API reference in the SDK installation or the online API reference specific to the SDK version you are using. The most up-to-date version is at <https://docs.silabs.com/bluetooth/latest/>.

### Added in release 3.2.0.0

**sl\_bt\_connection\_read\_remote\_used\_features command:** Read link layer features supported by a remote device.

**sl\_bt\_evt\_connection\_remote\_used\_features event:** Indicate the link layer features supported by a remote device.

**sl\_bt\_gatt\_server\_read\_client\_supported\_features command:** Read GATT client supported features.

**sl\_bt\_gattdb\_new\_session command:** Start a new GATT database update session.

**sl\_bt\_gattdb\_add\_service command:** Add a service into the GATT database.

**sl\_bt\_gattdb\_remove\_service command:** Remove a service from the GATT database.

**sl\_bt\_gattdb\_add\_included\_service command:** Add an included-service attribute into a service.

**sl\_bt\_gattdb\_remove\_included\_service command:** Remove an included-service attribute from a service.

**sl\_bt\_gattdb\_add\_uuid16\_characteristic command:** Add a 16-bit UUID characteristic into a service.

**sl\_bt\_gattdb\_add\_uuid128\_characteristic command:** Add a 128-bit UUID characteristic into a service.

**sl\_bt\_gattdb\_remove\_characteristic command:** Remove a characteristic from a service.

**sl\_bt\_gattdb\_add\_uuid16\_descriptor command:** Add a 16-bit UUID descriptor into a characteristic.

**sl\_bt\_gattdb\_add\_uuid128\_descriptor command:** Add a 128-bit UUID descriptor into a characteristic.

**sl\_bt\_gattdb\_remove\_descriptor command:** Remove a descriptor from a characteristic.

**sl\_bt\_gattdb\_start\_service command:** Start a service so that it becomes visible to remote GATT clients.

**sl\_bt\_gattdb\_stop\_service command:** Stop a service so that it becomes invisible to remote GATT clients.

**sl\_bt\_gattdb\_start\_characteristic command:** Start a characteristic so that it becomes visible to remote GATT clients.

**sl\_bt\_gattdb\_stop\_characteristic command:** Stop a characteristic so that it becomes invisible to remote GATT clients.

**sl\_bt\_gattdb\_commit command:** Save all changes performed in the current session to the GATT database and close the session.

**sl\_bt\_gattdb\_abort command:** Abort all changes performed in the current session to the GATT database and close the session.

**sl\_bt\_sm\_get\_bonding\_handles command:** Get the handles in the bonding database.

**sl\_bt\_sm\_get\_bonding\_details command:** Get the detailed information about a bonding.

**sl\_bt\_sm\_find\_bonding\_by\_address command:** Find the bonding information by a Bluetooth device address.

**sl\_bt\_sm\_set\_legacy\_oob command:** Set the OOB data for legacy pairing.

**sl\_bt\_sm\_set\_oob command:** Enable the use of OOB data for secure connections pairing.

**sl\_bt\_sm\_set\_remote\_oob command:** Set the OOB data and confirmation values received from the remote device for secure connections pairing.

**SL\_BT\_COMPONENT\_CONNECTIONS configuration:** can be used by a component to configure the amount of Bluetooth connections it additionally needs.

## 2 Improvements

### 2.1 Changed APIs

#### Changed in release 3.2.1.0

**sl\_bt\_gattdb\_commit() command:** Previously, the stack removed the client characteristic configurations of all GATT clients except the service-changed configuration when the local GATT database was changed. This behavior has been changed so that, for connected GATT clients, the stack only removes the configurations of the removed characteristics.

#### Changed in release 3.2.0.0

**SL\_BT\_CONFIG\_MAX\_CONNECTIONS configuration:** Moved to the bluetooth\_feature\_connection component configuration file sl\_bluetooth\_connection\_config.h.

**SL\_BT\_CONFIG\_USER\_ADVERTISERS configuration:** Moved to the bluetooth\_feature\_advertiser component configuration file sl\_bluetooth\_advertiser\_config.h.

**SL\_BT\_CONFIG\_MAX\_PERIODIC\_ADVERTISING\_SYNC configuration:** Moved to the bluetooth\_feature\_sync component configuration file sl\_bluetooth\_periodic\_sync\_config.h.

**CTE Service UUIDs:** values are updated according to the Bluetooth SIG specification.

### 3 Fixed Issues

#### Fixed in release 3.2.1.0

ID #	Description
<b>707252</b>	Improvements in LE Power Control feature.
712526	Fix an issue with CTE (AoA/AoD) where device may enter into a hard fault if connectionless CTE or Silicon Labs CTE was enabled before connection creation.
714406	Fix for LL/DDI/SCN/BV-25-C.
715016	Fixed LE Power Control initialization.
715286	Now raising an error when subscribing to notifications or indications fail on characteristics that do not support those.
715414	Fix an issue in the HCI that advertisers cannot be disabled with number of sets setting to 0 in the LE Set Extended Advertising Enable command.
717381	Fix for Throughput example application to handle indication data correctly.
718466	Bluetooth 'NCP Interface' Component now defines the SL_BT_API_FULL macro, enabling all BGAPI command tables to be linked. This is needed by NCP target applications.
718867	Re-enabled whitelisting component support for soc_empty example app.
723935	Improvements in SoC Throughput example app.

#### Fixed in release 3.2.0.0

ID #	Description
649254	Previously user applications could set TX power higher than +10dBm even if the AFH (Adaptive Frequency Hopping) is not enabled. This has been fixed that the maximum usable TX power level is properly set and returned back to the user application if the AFH has not been enabled.
651247	Previously the Bluetooth stack on EFR32MG21 occasionally did not recognize a disconnection. This is a very rare case and the probability may increase with more RF noise in the environment. This issue has been fixed.
679431	Previously the DEBUG_EFM assert was triggered in Series 2 devices when creating a Bluetooth application from an empty project. This issue no longer exists in this release.
686213	Previously the Bluetooth stack occasionally could get stuck in an eternal loop. Assume an application has multiple GATT client connections performing simultaneous GATT procedures from both the sleep-timer interrupt context and the application main loop. In this case, a rare race condition might cause a stack memory corruption, which in turn causes a GATT procedure to fail to start. The issue does not exist if Bluetooth APIs are only called from the main loop (in bare metal mode) or an OS task (in RTOS mode). The memory corruption issue in the use case above has been fixed. However, Bluetooth API commands cannot be called from interrupt contexts. Doing this might result in other unknown problems. This is described in <i>UG434: Silicon Labs Bluetooth® C Application Developers Guide for SDK v3.x</i> .
696220	Fix an initialization issue that may cause another protocol using wrong RAIL configurations in a dynamic multiple protocol application.
696283	Fix a connection opening issue with an extended advertiser while the scanning is enabled.
697200	Fix a notation error in the Bluetooth stack RTOS configuration.
698227	Fix an issue that a task in Link Layer does not complete when radio gets stuck. This issue occurs very rarely and it could be reproducible in a busy environment with many advertisers, scanners and Bluetooth connections. The solution to the issue is the introduction of a radio watchdog (new feature component bluetooth_feature_radio_watchdog). A task will be aborted if the watchdog detects that the radio gets stuck. By default this feature is disabled to save memory.
700422	Fix a connection opening issue in central role when scanning simultaneously on different LE PHYs.
703303	Fix the firmware image filename extension in Bluetooth API sl_bt_dfu_flash_upload documentation.
703613	Fix compilation warnings using IAR, which are related to the usage of mbedTLS component in Bluetooth applications.
705969	Now the Radio can be initialized with VSCALE enabled on EFR32[B M]G22 devices.
708029	Fix a Bluetooth connection issue that was caused by a defect on EFR32[B M]G2[1 2] where the Power Manager fails to wake up from EM2 in certain situations.
714411	Fix an issue where connectionless CTE was transmitted on both AUX_ADV_IND and AUX_SYNC_IND packets. The correct behavior is to transmit it only on AUX_SYNC_IND packets.

## 4 Known Issues in the Current Release

Issues in bold were added since the previous release. If you have missed a release, recent release notes are available on <https://www.silabs.com/products/software>.

ID #	Description	Workaround
337467	MGM12P has poor signal strength when doing OTA with Uploader.	None
361592	The sync_data event does not report TX power.	None
368403	If setting CTE interval to 1, a CTE request should be sent in every connection interval. But it is sent only in every second connection interval.	None
641122	The Bluetooth stack component does not provide a configuration for RF antenna path.	This is an issue specifically for BGM210P. One workaround is to manually update the configuration in sl_bluetooth_config.h in text edit mode. If the OTA with Uploader is used, include the bluetooth_feature_ota_config component in application project. Call command sl_bt_ota_set_rf_path() to set the RF path for OTA mode.
650079	LE 2M PHY on EFR32[B M]G12 and EFR32[B M]G13 doesn't work with smartphones using the Mediatek Helio chip due to an interoperability issue.	No workaround exists. For application development and testing, the disconnection can be avoided by disabling 2M PHY with sl_bt_connection_set_preferred_phy() or sl_bt_connection_set_default_preferred_phy().
682198	The Bluetooth stack has an interoperability issue on the 2M PHY with a Windows PC.	No workaround exists. For application development and testing, the disconnection can be avoided by disabling 2M PHY with sl_bt_connection_set_preferred_phy() or sl_bt_connection_set_default_preferred_phy().
683223	The TX power value passed to the sl_bt_test_dtm_tx_v4() command has no effect when testing the unmodulated carrier mode. The maximum TX power in the global setting is used instead.	Use the sl_bt_system_set_tx_power() command to set the maximum TX power before the testing starts.
695148	Bluetooth soft timer doesn't work when Bluetooth on-demand start feature is enabled.	Use the simple timer component in the Bluetooth SDK or the sleptimer platform service.
708049	DTM commands for unmodulated carrier wave transmission does not work before a DTM TX command for a modulated signal has been used.	Start DTM testing for a modulated signal and then start unmodulated carrier wave testing.
<b>725480</b>	<b>The connectionless aoa_locator app sometimes fails with error [E: 0x2524] Failed to synchronize to tag.</b>	<b>When using Raspberry Pi, this issue does not happen.</b>
<b>725498</b>	<b>The connection based aoa_locator application sometimes crashes with error message Failed to enable CTE.</b>	<b>None</b>

## 5 Deprecated Items

### **Deprecated in release 3.2.1.0**

#### **API enum `sl_bt_gap_phy_type_t`**

This enum type is replaced by `sl_bt_gap_phy_t`.

#### **API enum `sl_bt_gap_phy_and_coding_type_t`**

This enum type is replaced by `sl_bt_gap_phy_coding_t`.

Old types are still valid and can be used in applications. It is recommend to migrate to the new types as soon as possible. Old types will be removed in no less than one year in a future major SDK release.

### **Deprecated in release 3.2.0.0**

#### **API command `sl_bt_sm_list_bonding_entry`**

This command is replaced by `sl_bt_sm_get_bonding_handles` and `sl_bt_sm_get_bonding_details` commands.

#### **API command `sl_bt_sm_set_oob_data`**

This command is replaced by the command `sl_bt_sm_set_legacy_oob`.

#### **API command `sl_bt_sm_use_sc_oob`**

This command is replaced by the command `sl_bt_sm_set_oob`.

#### **API command `sl_bt_sm_set_sc_remote_oob_data`**

This command is replaced by the command `sl_bt_sm_set_remote_oob`.

#### **API commands `sl_bt_system_set_soft_timer` and `sl_bt_system_set_lazy_soft_timer`**

Bluetooth APIs do not provide a replacement. Use the simple timer component in the Bluetooth SDK or the sleeptimer platform service for timers.

#### **AoA Compass Demo**

To be removed in a future release. This demo is replaced by the AoA Analyzer.

#### **`ncp_empty` example application**

To be removed in a future release. This example is replaced by the **`ncp`** example.



## 6 Removed Items

### Removed in release 3.2.0.0

#### **BGTool**

BGTool is removed in this release and replaced by the Bluetooth NCP Commander which includes a modern, intuitive, web-based user interface as well as a smart console with IntelliSense and built-in API documentation.

## 7 Using This Release

This release contains the following

- Silicon Labs Bluetooth stack library
- Bluetooth sample applications

For more information about the Bluetooth SDK see [QSG169: Bluetooth® SDK v3.x Quick Start Guide](#). If you are new to Bluetooth see [UG103.14: Bluetooth LE Fundamentals](#).

### 7.1 Installation and Use

A registered account at Silicon Labs is required in order to download the Silicon Labs Bluetooth SDK. You can register at [https://siliconlabs.force.com/apex/SL\\_CommunitiesSelfReg?form=short](https://siliconlabs.force.com/apex/SL_CommunitiesSelfReg?form=short).

Stack installation instruction are covered in the [Simplicity Studio 5 online User's Guide](#).

Use the Bluetooth SDK v3.x with the Silicon Labs Simplicity Studio 5 development platform. Simplicity Studio ensures that most software and tool compatibilities are managed correctly. Install software and board firmware updates promptly when you are notified. Only use Simplicity Studio 4 with Bluetooth SDK v2.13.x and lower.

Documentation specific to the SDK version is installed with the SDK. Additional information can often be found in the [knowledge base articles \(KBAs\)](#). API references and other information about this and earlier releases is available on <https://docs.silabs.com/>.

### 7.2 Security Information

#### Secure Vault Integration

When deployed to Secure Vault High devices, sensitive keys such as the Long Term Key (LTK) are protected using the Secure Vault Key Management functionality. The table below shows the protected keys and their storage protection characteristics.

Wrapped Key	Exportable / Non-Exportable	Notes
Remote Long Term Key (LTK)	Non-Exportable	
Local Long Term Key (legacy only)	Non-Exportable	
Remote Identity Resolving Key (IRK)	Exportable	Must be Exportable for future compatibility reasons
Local Identity Resolving Key	Exportable	Must be Exportable because the key is shared with other devices.

Wrapped keys that are marked as “Non-Exportable” can be used but cannot be viewed or shared at runtime.

Wrapped keys that are marked as “Exportable” can be used or shared at runtime but remain encrypted while stored in flash.

For more information on Secure Vault Key Management functionality, see [AN1271: Secure Key Storage](#).

## Security Advisories

To subscribe to Security Advisories, log in to the Silicon Labs customer portal, then select **Account Home**. Click **HOME** to go to the portal home page and then click the **Manage Notifications** tile. Make sure that 'Software/Security Advisory Notices & Product Change Notices (PCNs)' is checked, and that you are subscribed at minimum for your platform and protocol. Click **Save** to save any changes.

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## 7.3 Support

Development Kit customers are eligible for training and technical support. Use the [Silicon Labs Bluetooth LE web page](#) to obtain information about all Silicon Labs Bluetooth products and services, and to sign up for product support.

You can contact Silicon Laboratories support at <http://www.silabs.com/support>.

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