



# AN1326: Transitioning to the Updated Gecko Bootloader in GSDK 4.0 and Higher

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This version of AN1326 has been deprecated with the release of Simplicity SDK Suite 2025.6.1. For the latest version, see [docs.silabs.com](https://docs.silabs.com).

Gecko Bootloader v2.x, introduced in GSDK 4.0, contains a number of changes compared to Gecko Bootloader v1.x. Many of these changes are due to an underlying framework redesign that results in an improved developer experience in Simplicity Studio 5 as well as enhanced compatibility within the GSDK. This document describes the differences between the versions, including how to configure the new Gecko Bootloader within Simplicity Studio 5.

## KEY POINTS

- Gecko Bootloader project structure changes
- Gecko Bootloader configuration changes
- Gecko Bootloader component configurator
- Configuring storage slots in the Gecko Bootloader v2.x
- Adding postbuild steps for Gecko Bootloader v2.x
- New linker file generation system

# 1 Introduction

Gecko Software Development Kit suite (GSDK) version 3 (GSDK v3.0) introduced a new underlying Gecko Platform architecture based on components. Beginning with GSDK 4.0, the Gecko Bootloader now uses this underlying architecture. With Simplicity Studio 5 (SSv5) and GSDK 4.0, developers working with Gecko Bootloader will benefit from the following component-based project configuration features:

- Search and filter to find and discover software components that work with the target device
- Automatically pull in all component dependencies and initialization code
- Configurable software components including peripheral inits, drivers, middleware, and stacks
- All configuration settings are in C header files for usage outside of Simplicity Studio
- Configuration validation to alert developers to errors or issues
- Easily manage all project source via git or other SCM tools
- Managed migration to future component and SDK versions
- Simplified transitions from Silicon Labs development kits to custom hardware

Other features of the SSv5/GSDK 4.x development environment include:

- Project source management options (link to SDK sources or copy all contents to user folder)
- Graphical pin configuration through the Pin Tool
- Redesigned Radio Configurator with a fresh UI that's more intuitive for single- and multi-PHY customization
- Iterative development (configure components, edit sources, compile, debug) using SSv5 configuration tools and third-party IDEs
- GNU makefiles as a build option

This document summarizes the differences between the Gecko Bootloader v2.x in GSDK 4.0 and earlier AppBuilder-based versions. These differences include:

- Differences between AppBuilder and the new component-based Project Configurator
- Comparison of the new Project Configurator components with AppBuilder plugins
- Features of the Pin Tool, now used instead of Hardware Configurator
- Other differences including:
  - Linker file
  - Additional Macros
  - Postbuild steps
  - Main bootloader in main flash
  - Callbacks
  - Storage Slots
  - App Properties

## 2 About Projects

### 2.1 Creating a Project

If you have used earlier versions of SSv5, initial project creation is unchanged. If you are unfamiliar with project creation in SSv5, see the [Simplicity Studio 5 User's Guide](#). This chapter highlights the differences with AppBuilder project creation and configuration.

Once you have selected an example project, an initial configuration dialog opens. Note that the Project Location, which in AppBuilder is shown on the General tab, is defined here.

The screenshot shows the 'New Project Wizard' dialog box, specifically the 'Project Configuration' tab. The dialog has a title bar 'New Project Wizard' and standard window controls. Below the title bar, the tab is labeled 'Project Configuration' with the instruction 'Select the project name and location.' A progress bar at the top shows three steps: 'Target, SDK' (completed), 'Examples' (completed), and 'Configuration' (current step). The main area contains a 'Project name:' text box with the value 'bootloader-uart-xmodem'. Below this is a checked checkbox 'Use default location'. The 'Location:' text box shows the path 'C:\Users\mushamsi\SimplicityStudio\btl\_workspace\bootloader-uart-xmodem' with a 'BROWSE' button to its right. Under the heading 'With project files:', there are three radio button options: 'Link to sources' (unselected), 'Link sdk and copy project sources' (selected), and 'Copy contents' (unselected). At the bottom, there are four buttons: 'CANCEL', 'BACK', 'NEXT', and 'FINISH'.

New Project Wizard

**Project Configuration**  
Select the project name and location.

✓ Target, SDK    ✓ Examples    ✎ Configuration

Project name:

☒ Use default location

Location:

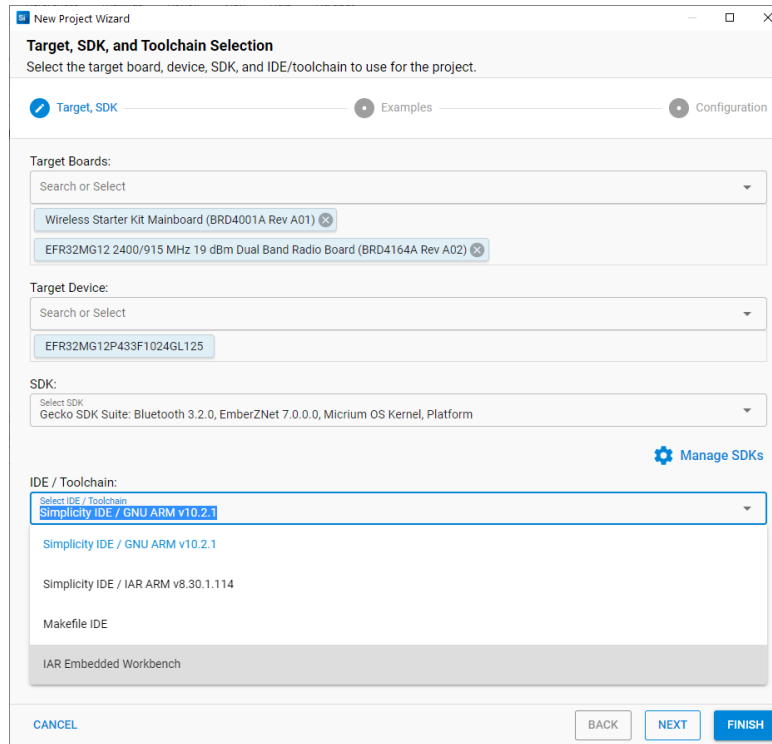
With project files:

☐ Link to sources

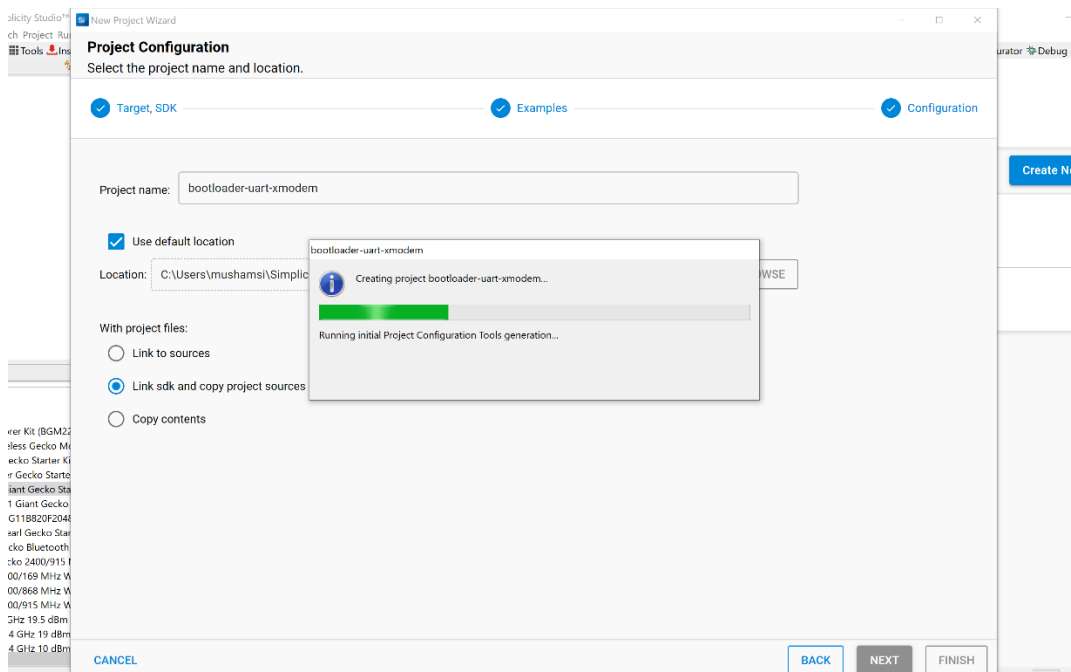
☒ Link sdk and copy project sources

☐ Copy contents

In SSV5, the compiler to use is specified when you create a project and, after that, is difficult to change (see [Simplicity Studio 5 User's Guide Tips & Tricks](#) for a procedure to convert an existing project from GCC to IAR). If you do not want to use the default compiler (GCC unless otherwise specified), click **BACK**, and change it on the first Project Configuration dialog.

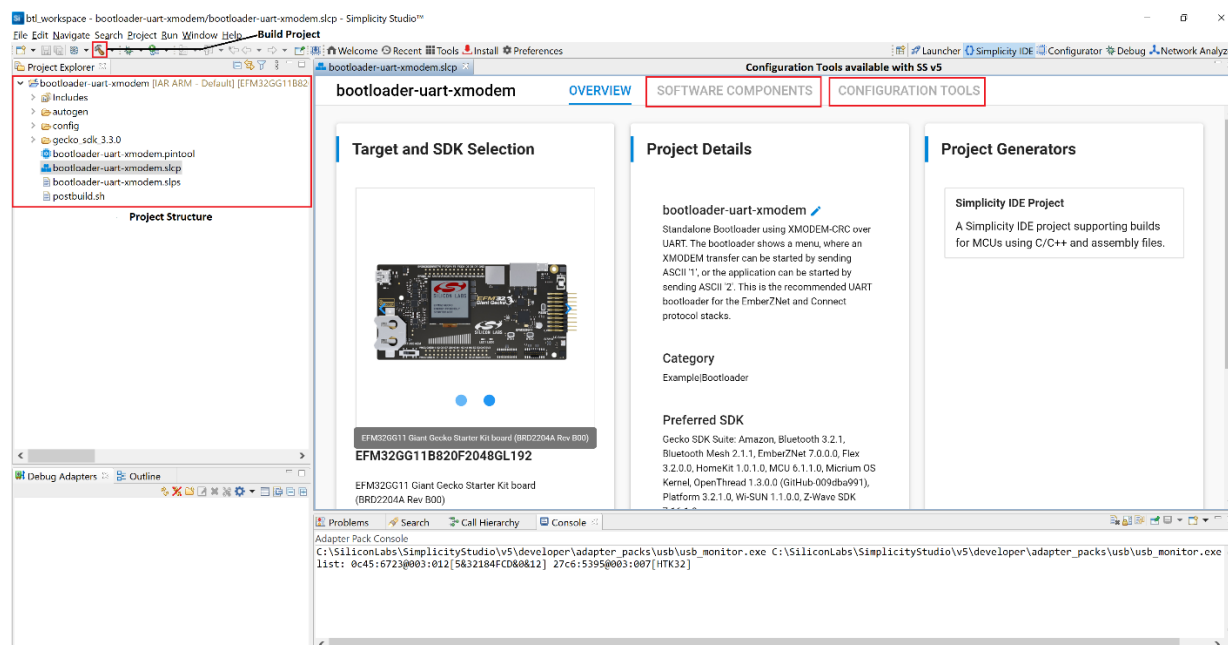


Click **FINISH** and the project will be generated.



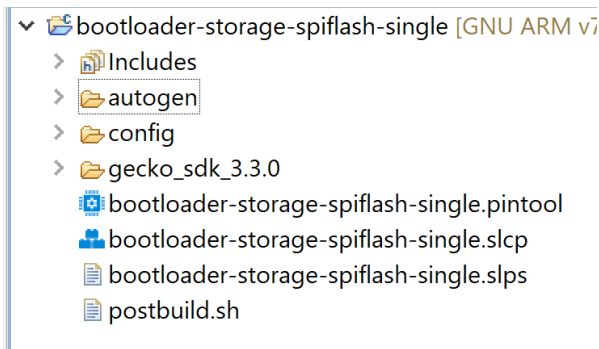
## 2.2 Project File Structure

On project generation, the required project files and folders are created.

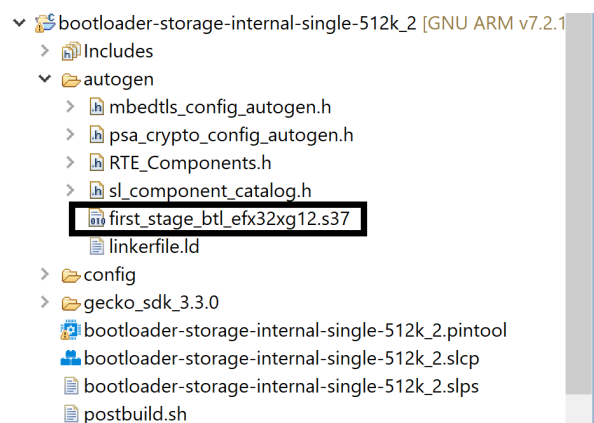


Projects always include the following parts:

- **autogen** folder: Only the autogen folder includes generated code. It includes configuration (mbedtls\_config\_autogen.h), init code, the linker script, and other generated code used by components, like the command descriptors for the CLI interface.
- **config** folder: Component configuration headers are located in this folder. These can be edited with the Simplicity IDE Component Editor, but directly editing the header file is also possible. The Component Editor is available through the Project Configurator's **Configure** control, available only for configurable components.
- **gecko\_sdk** folder (with version number): Contains source and binary files added by components.
- **files in the root folder**: Only the application specific files should be in the root folder, including source files, the project configurator (.slcp) file and the Pin Tool (.pintool) file. For more details, see *UG489: Silicon Labs Gecko Bootloader User's Guide for GSDK 4.0 and Higher*.



The first stage bootloader binary file is copied to the **autogen** folder at the time of project generation. The correct first stage binary file is located in accordance with the target hardware and placed in the **autogen**, which is later used by the postbuild script to generate a combined bootloader binary. The **autogen** folder is shown below with the first stage bootloader binary.



## 2.3 Configuring a Project

Most project configuration can be done through tools in Simplicity Studio. These tools provide the functionality previously provided by AppBuilder.

- **Project Configurator** – the top-level project configuration tool through which you install and uninstall components and change other project parameters. It also provides access to other configuration tools.
- **Component Editor** – provides access to the configurable parameters of an individual component.
- **Pin Tool** – configures peripherals.

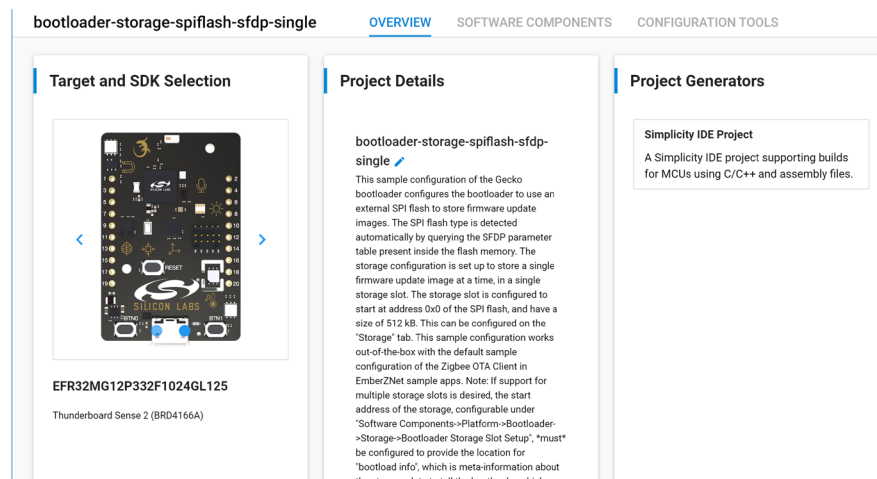
Once you create the project, the Project Configurator tabbed interface is presented, including:

- Overview
- Software Components
- Configuration Tools

You can always re-open the Project Configurator by double-clicking the <projectname>.slcp file. For details on using the Project Configurator and Component Editor, see the [Simplicity Studio 5 User's Guide](#).

### 2.3.1 OVERVIEW Tab

The OVERVIEW tab, like AppBuilder's General tab, shows the target part information, and a description of the project.

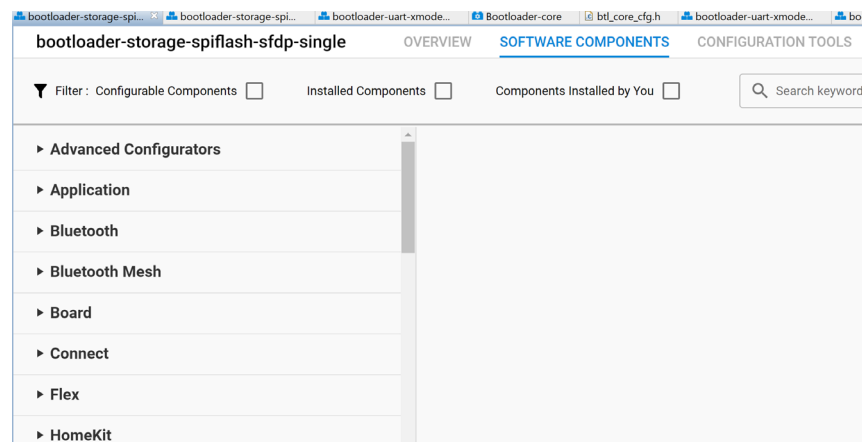


Note that there is no **Generate** control. Changes made through Project Configurator are auto-saved and the project files are auto-generated. The Force Generation control on the Project Details card is provided for use only in the event of a system problem, where auto-generation fails.

The Project Generators interface controls generation of additional files for import into other IDEs. It does not change the compiler used to build the application image.

### 2.3.2 SOFTWARE COMPONENTS Tab

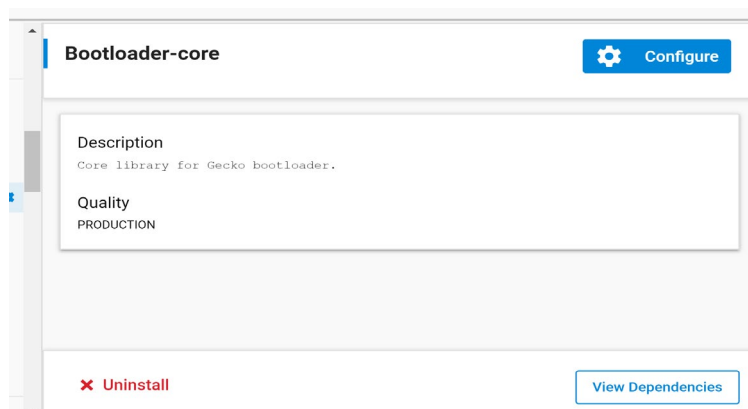
The SOFTWARE COMPONENTS tab shows the available components and those that are already installed in the example code.



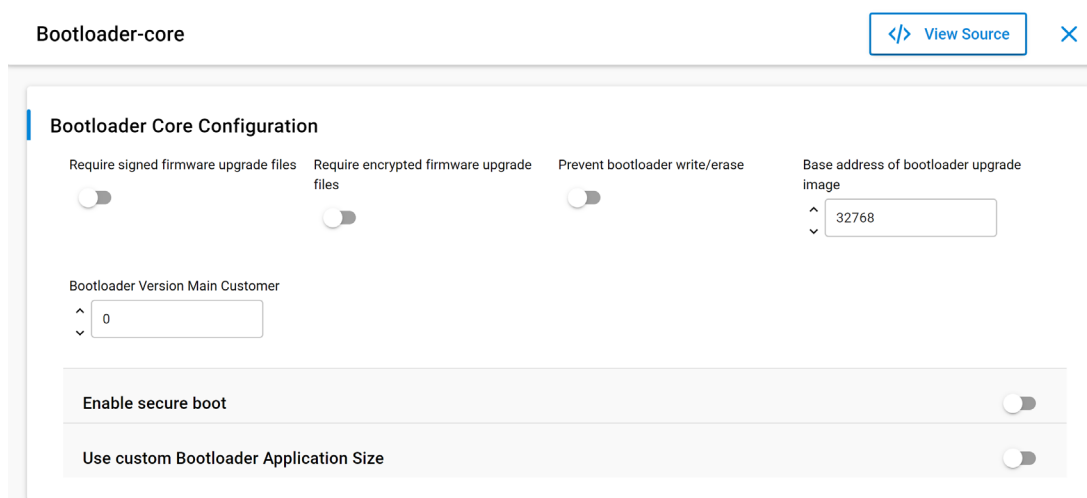
Component groupings are subject to change in SDK releases, as new components are added and organization is updated. The most reliable way to find a specific component is to search for it. You can also filter the displayed components using the checkboxes at the top.

Installed components have a circled checkmark to the left. Configurable components have a gear icon to the right.

Select a component to see details about it. Click **Install** to install the component or **Uninstall** to remove it. If it is configurable, a **Configure** control is shown in the upper right.



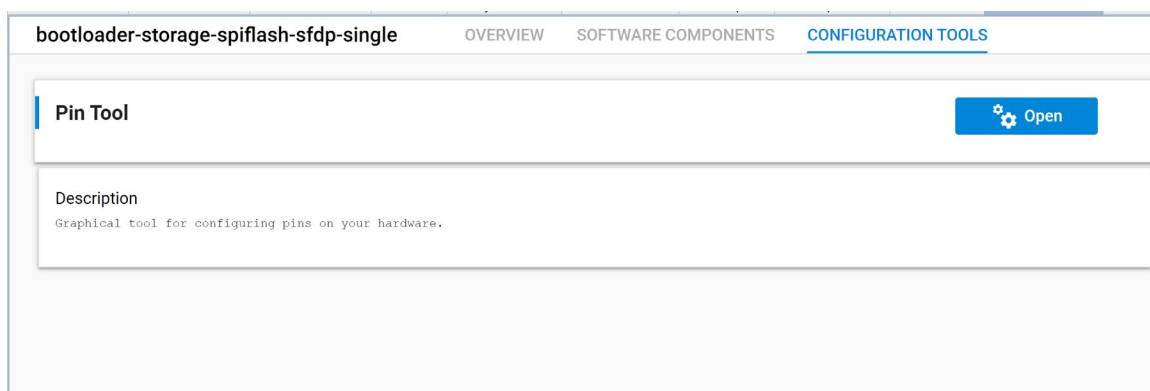
Click that control or the gear icon next to an installed component name to open the Component Editor in a new tab.



Save any changes to trigger file generation.

### 2.3.3 CONFIGURATION TOOLS Tab

The CONFIGURATION TOOLS tab is a quick way of opening useful tools for project development.





### 3 Components

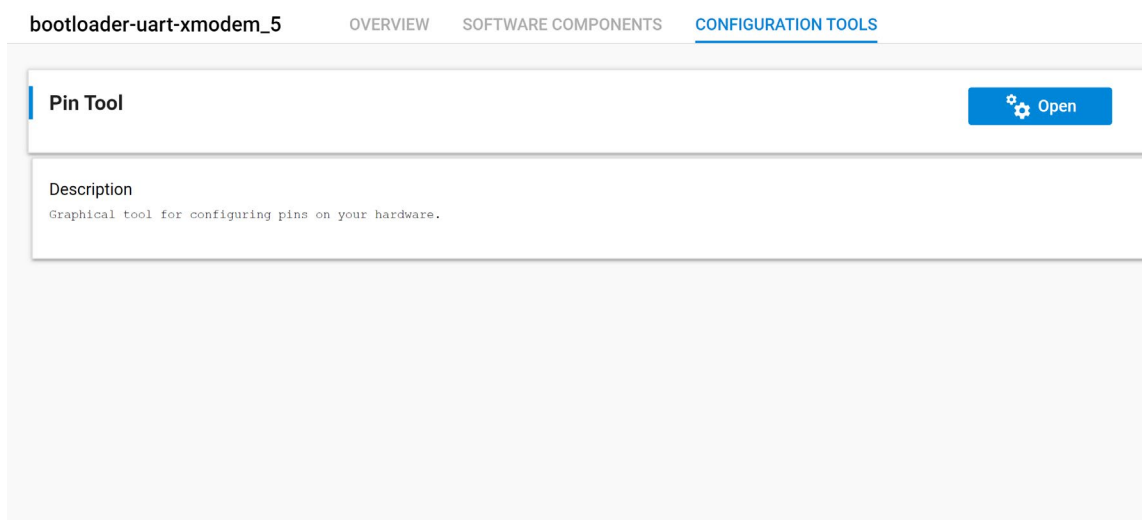
This section maps the various Gecko Bootloader components to the previously available plugins (in the AppBuilder workflow). Although the basic subgroups might remain the same, specific component locations are subject to change across various GSDK versions. Therefore, it is good practice to search for individual components by their names rather than the specific subgroups that they belong to.

| AppBuilder Plugin                         | Simplicity Studio v5 Component            | Additional Comments                                                                                              |
|-------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Communication</b>                      |                                           |                                                                                                                  |
| BGAPI UART DFU                            | BGAPI UART DFU                            |                                                                                                                  |
| EZSP-SPI                                  | EZSP-SPI                                  |                                                                                                                  |
| UART XMODEM                               | UART XMODEM                               |                                                                                                                  |
| XMODEM Parser                             | XMODEM Parser                             |                                                                                                                  |
| <b>Core</b>                               |                                           |                                                                                                                  |
| Application Upgrade Version Check         | Application Upgrade Version Check         |                                                                                                                  |
| Bootloader Core                           | Bootloader Core                           |                                                                                                                  |
| GBL Compression (LZ4)                     | GBL Compression (LZ4)                     |                                                                                                                  |
| GBL Compression (LZMA)                    | GBL Compression (LZMA)                    |                                                                                                                  |
| Image Parser                              | Image Parser                              |                                                                                                                  |
| Image Parser with legacy EBL support      | Image Parser with legacy EBL support      |                                                                                                                  |
| Image Parser without encryption support   | Image Parser without encryption support   |                                                                                                                  |
| "                                         | Bootloader Include Parser                 | New component that includes common Image Parser header files                                                     |
| "                                         | Bootloader in Main Flash                  | New component that enables the user to place bootloader in main flash for xG13 and xG14 devices                  |
| <b>Drivers</b>                            |                                           |                                                                                                                  |
| Delay                                     | Bootloader Delay Driver                   |                                                                                                                  |
| SPI Master                                | Bootloader SPI Controller USART Driver    |                                                                                                                  |
| SPI Slave                                 | Bootloader SPI Peripheral USART Driver    |                                                                                                                  |
| UART                                      | Bootloader UART Driver                    |                                                                                                                  |
| EUART                                     | Bootloader EUART Driver                   |                                                                                                                  |
| "                                         | Bootloader SPI Controller EUSART Driver   | New component supporting SPI EUSART driver. This component can be used with devices supporting EUSART interface. |
| "                                         | Bootloader SPI Peripheral EUSART Driver   | New component supporting SPI EUSART driver. This component can be used with devices supporting EUSART interface. |
| <b>Storage</b>                            |                                           |                                                                                                                  |
| Common Storage                            | Common Storage                            |                                                                                                                  |
| Common Storage (single storage slot only) | Common Storage (single storage slot only) |                                                                                                                  |
| Internal Storage                          | Internal Storage                          |                                                                                                                  |
| SPI Flash Storage                         | SPI Flash Storage                         |                                                                                                                  |
| "                                         | Bootloader Storage Slot Setup             | New component that facilitates configuring storage slots for Internal and SPI Flash based bootloaders            |
| <b>Utils</b>                              |                                           |                                                                                                                  |
| Crypto                                    | Crypto                                    |                                                                                                                  |
| Cyclic Redundancy Check                   | Cyclic Redundancy Check                   |                                                                                                                  |

|                             |                                  |                                                                                                                                        |
|-----------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Debug                       | Debug                            |                                                                                                                                        |
| EMLIB                       | EMLIB Peripheral HAL             | This component is no longer part of the Bootloader module. EMLIB component(s) can be found under Platform > Peripheral                 |
| EZSP GPIO Activation        | EZSP GPIO Activation             |                                                                                                                                        |
| GPIO Activation             | GPIO Activation                  |                                                                                                                                        |
| SE Manager                  | SE Manager                       | This component is now available under Platform > Security. This component is only applicable for Series 2 devices.                     |
| Token Management            | Token Management                 |                                                                                                                                        |
| MBED TLS                    | Mbed TLS ...                     | These components are available under Platform > Security                                                                               |
| <b>Bootloader Interface</b> |                                  |                                                                                                                                        |
|                             | App Properties                   | A new component to configure application properties (version), which is used during creation of a GBL file using Simplicity Commander. |
| Bootloader-interface        | Bootloader Application Interface |                                                                                                                                        |

## 4 Pin Tool

In contrast to the AppBuilder workflow, Simplicity Studio v5 offers the **Pin Tool** configuration tool, which can be used to configure the various pins of the MCU used in the project. Pin Tool can be used in standalone mode through the tile on the **Configuration Tools** tab.



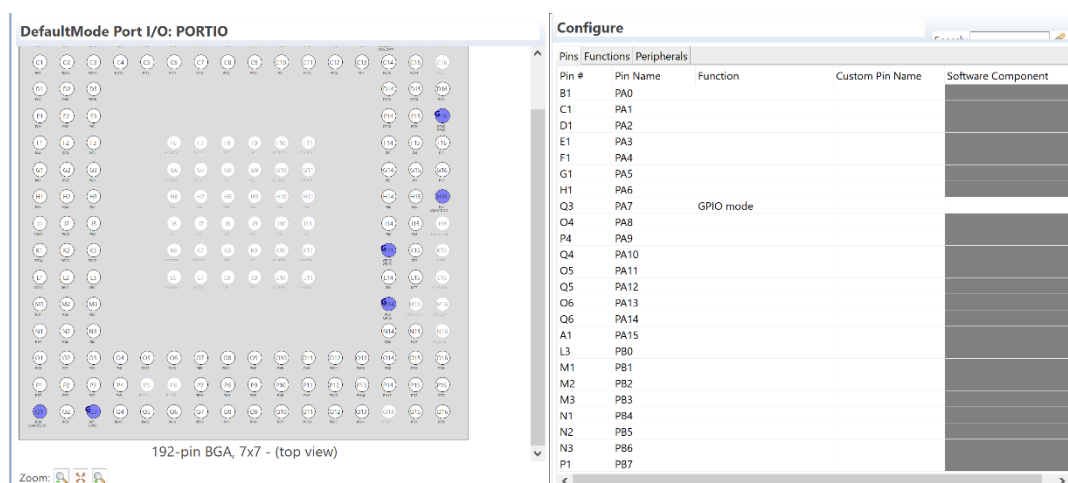
Pin Tool-related configuration is also available through the Component Editor of all applicable configurable components, making it a one-stop solution for configuring pin details and setting user configuration details. Following is the list of configurable components that also include Pin Tool configuration (wherever applicable) in their configuration wizard.

| Configurable Component                                   | Configuration Options                                                                                                                                                                                              |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| UART XMODEM                                              | Menu Idle Timeout                                                                                                                                                                                                  |
| Bootloader Core                                          | All options that were available for the bootloader plugin are now available in the Bootloader Core component. Options include: Enable Secure Boot, Enable certificate support, Prevent bootloader write/erase, etc |
| Bootloader UART/EUART Driver                             | Configuration options include: USART settings, USART peripheral, Serial VCOM Enable/Disable                                                                                                                        |
| Bootloader SPI Controller USART/EUSART Driver            | Configuration options include: Frequency, Peripheral and SPI Port Settings                                                                                                                                         |
| Bootloader SPI Peripheral USART/EUSART Driver            | Configuration options include: Tx Buffer Size, Rx Buffer Size, Peripheral and Port Settings                                                                                                                        |
| Bootloader Storage Slot Setup                            | Supports configuration of storage slot (start addresses and slot lengths) up to a maximum of 3 slots                                                                                                               |
| Common Storage/Common Storage (single storage slot only) | Configuration options include: Start address of bootload info                                                                                                                                                      |
| Internal Storage                                         | Configuration options include: Enable DMA based MSC Write, DMA channel to reserve                                                                                                                                  |
| SPI Flash Storage                                        | Enables configuration of the list of SPI flash devices that must be enabled in the bootloader image                                                                                                                |
| Debug                                                    | Enable/disable Debug prints/asserts                                                                                                                                                                                |
| EZSP GPIO Activation                                     | Configuration options include: Properties of SPI NCP, WAKE INT Pin, HOST INT Pin                                                                                                                                   |
| GPIO Activation                                          | Configuration options include: Properties of Bootloader entry, Button Pin configuration                                                                                                                            |

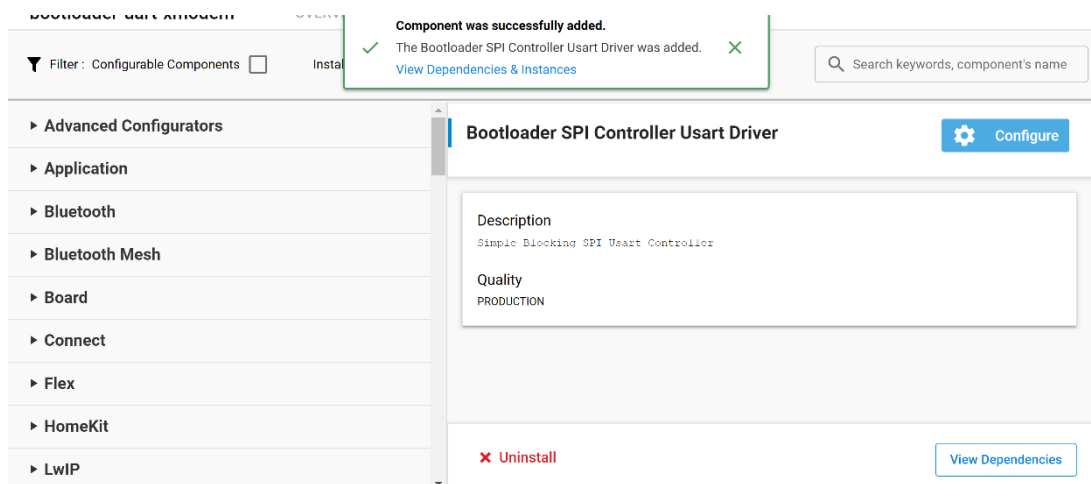
The configuration options of any installed configurable component can be accessed by clicking **Configure**. Refer to section 2 [Project Creation](#) for more details on the Component Editor.

As an example, in the following procedure the Bootloader SPI Controller USART Driver is configured using the Component Editor and the pin configuration is verified using the Pin Tool.

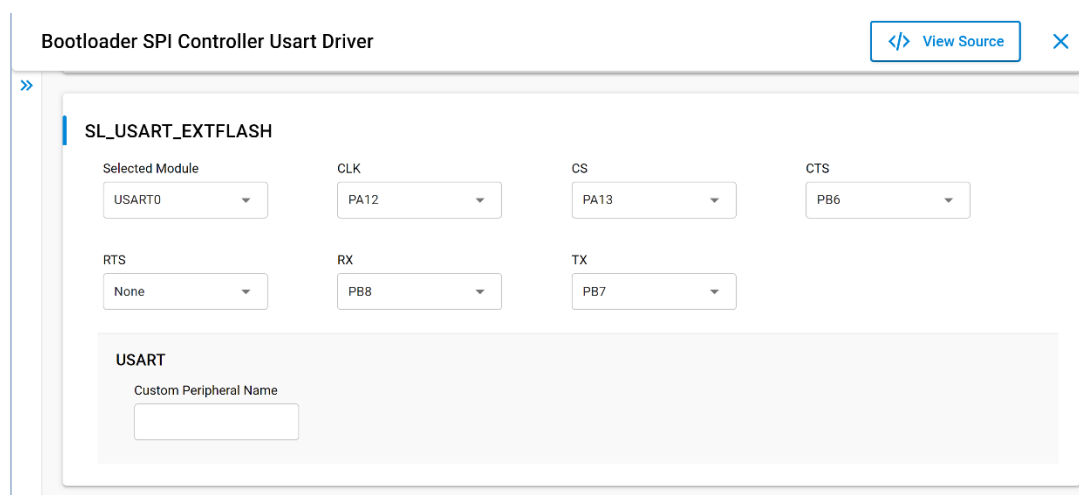
1. Pin Tool configuration before installing the SPI Controller component. The device used for this example is the EFM32GG11 Giant Gecko Starter Kit board (BRD2204A Rev B00).



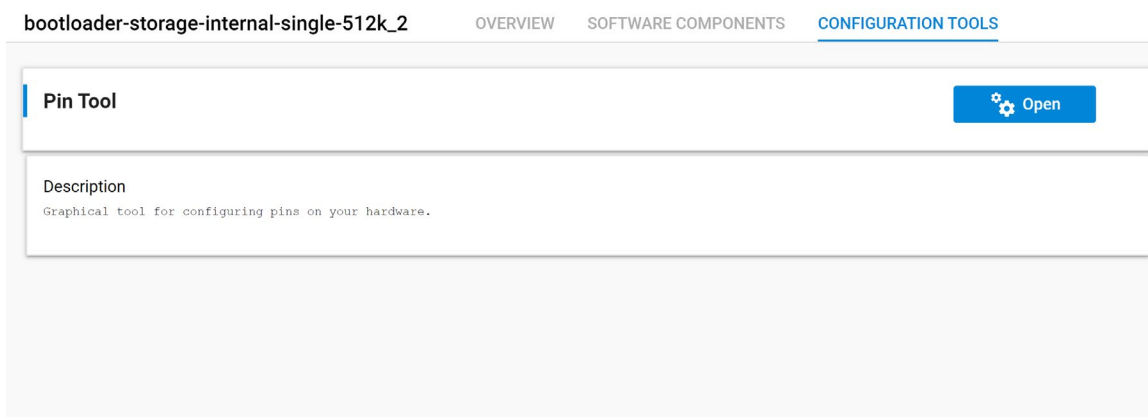
2. Install the Bootloader SPI Controller USART driver component.



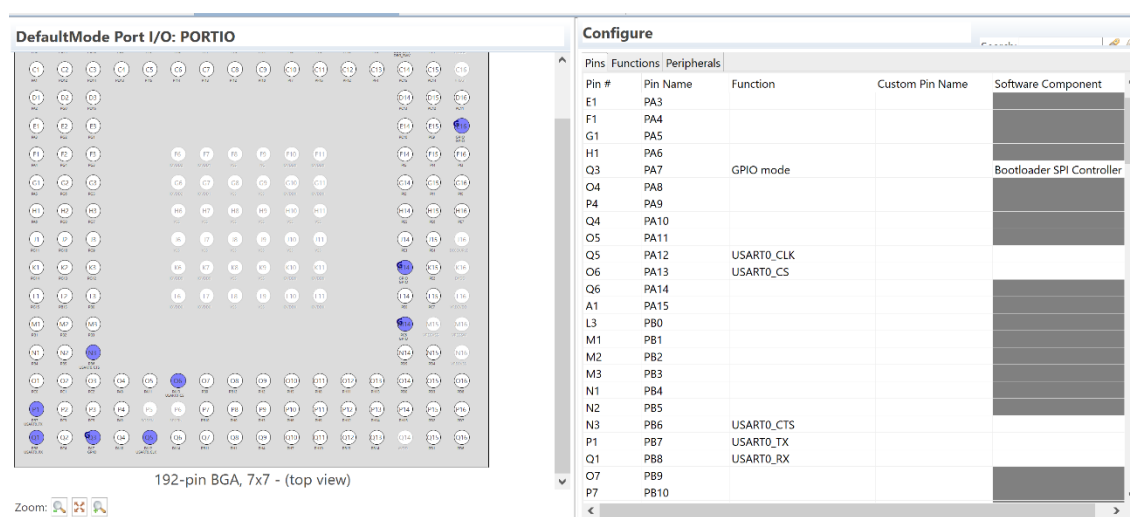
3. Click **Configure** to open the Component Editor and configure the USART peripheral as shown.



#### 4. Open the Pin Tool.



#### 5. The pin configurations are shown. Notice that pins PA12, PA13, PB6, PB7, and PB8 are reserved for USART0.



## 5 Linker File

The linker files for GCC and IAR are now generated during the project generation step. The linker files for the bootloader are generated from template files using the Jinja template engine. The template files are included with the Gecko SDK Suite (GSDK), which is installed through Simplicity Studio. The jinja template files are located at **<path-to-simplicity-studio-installation>\v5\development\sdk\gecko\_sdk\_suite\<gecko\_sdk\_version>\platform\common\toolchain\**. This path contains folders for both **gcc** and **iar**.

## 6 Additional Macros

In the AppBuilder workflow, the user could define additional compiler macros used during compilation of the bootloader application. In Gecko Bootloader v2.x, these additional macros are now part of the various components. These components have these macros defined internally, and those macros which require user intervention are available to the user as configuration options through the Component Editor.

## 7 Postbuild Steps

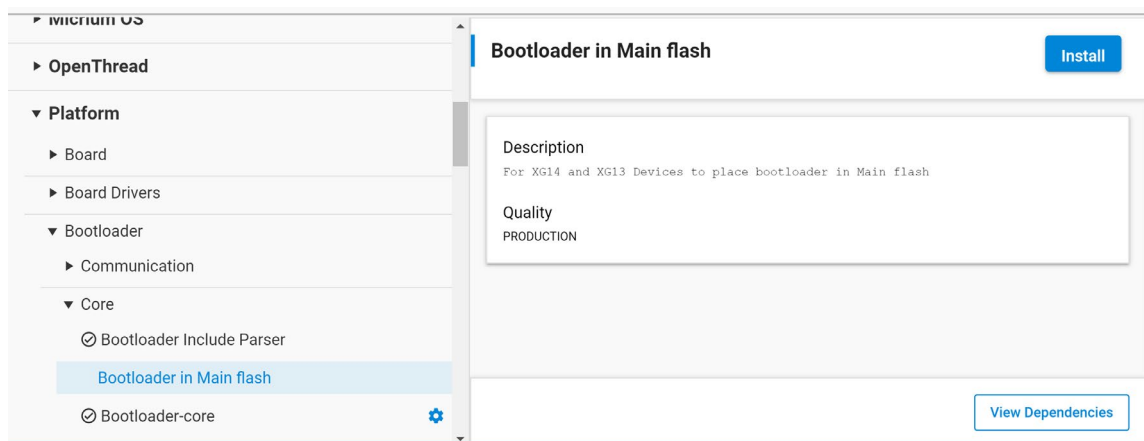
For Series 1 devices, the main stage bootloader needs to be combined with the first stage bootloader, which results in a combined bootloader binary. To accomplish this, a postbuild script is made available with the GSDK, which combines the appropriate first stage bootloader with the main stage bootloader to produce a combined bootloader binary. A postbuild step must be explicitly added through the Project's settings so that the postbuild script can be run after the bootloader build is complete. For more details, see *UG489: Silicon Labs Gecko Bootloader User's Guide for GDSK 4.0 and Higher*.

**Note:** Adding the postbuild steps is mandatory when building bootloader binaries for Series 1 devices. If the postbuild step is not configured correctly, Simplicity Studio cannot build a combined bootloader binary image.



## 8 Main Bootloader in Main Flash

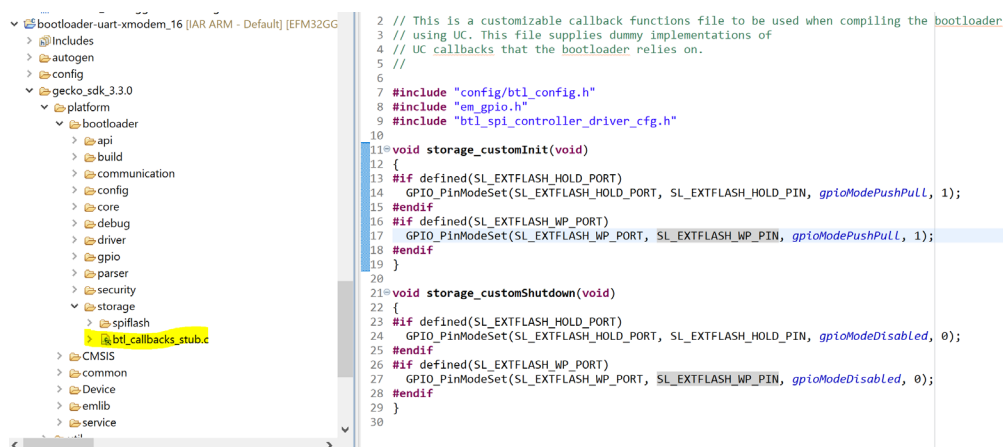
For xG13 and xG14 devices, the entire main stage bootloader might not fit into the bootloader flash if the user installs some extra components. In such scenarios, the main stage bootloader can be placed in the main flash by installing the **Bootloader in Main Flash** core component in the bootloader project.



For more information on this component, see *UG489: Silicon Labs Gecko Bootloader User's Guide for GDSK 4.0 and Higher*.

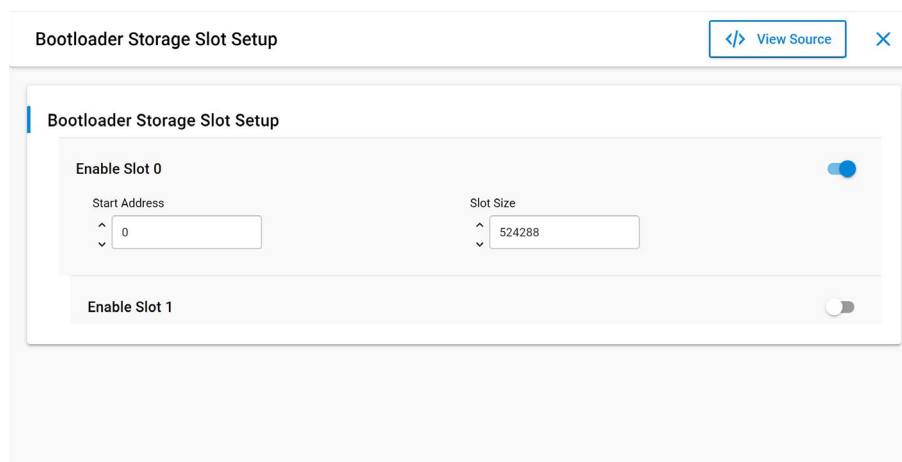
## 9 Callbacks

In contrast to the AppBuilder workflow, callbacks are now part of **btl\_callbacks\_stub.c**. This file is added to the project when the **SPI Flash Storage** component is installed. This file contains dummy implementation of callbacks that the bootloader relies on. This file can be found in **gecko\_sdk\_<version> > platform > bootloader > storage > btl\_callbacks\_stub.c** as shown.



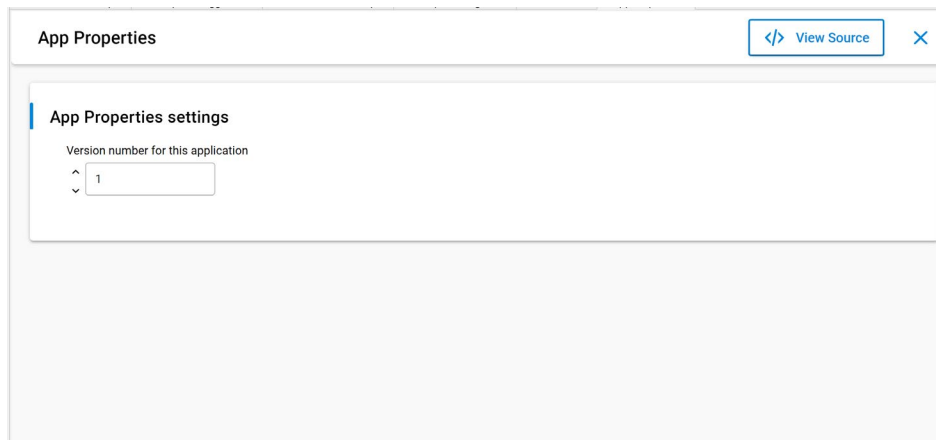
## 10 Storage Slots

Gecko Bootloader supports the Application Bootloader mode. This mode supports single/multiple storage slots that can be configured at compile time. In Gecko Bootloader v2.x, the storage slots can now be configured in the **Bootloader Storage Slot Setup** component using the Component Editor. A maximum of 3 storage slots can be configured.



## 11 App Properties

Previously, in the AppBuilder workflow, a variable of type **AppProperties\_t** had to be configured to add application properties to the application. This was then later used by Simplicity Commander during gbl file creation. Beginning with Gecko Bootloader version 2.x, a new configurable component named **App Properties** can be used to configure the application properties. This component can be installed using the Component editor which is available as part of Simplicity Studio. It is also installed automatically as a dependency on installing the **Bootloader Application Interface** component in the project. The component allows the user to configure the application version using Simplicity Studio's Component Editor as shown below.



For more details on how to configure this component, see *UG489: Silicon Labs Gecko Bootloader User's Guide for GSDK 4.0 and Higher*.