Out-of-the-Box with Thunderboard BG22 and Simplicity Studio v5

With the introduction of Simplicity Studio v5 (SSv5) there are many aspects of the development process that have changed such as project creation, configuration tools, code structure, etc. From a Bluetooth perspective, there have been quite a few changes from the existing tools that were found in Simplicity Studio v4. This lab focuses on getting started with Bluetooth using SSv5 by building a basic example and extending the capabilities of the projects created.

KEY FEATURES

- Using the new GATT configurator
- Adding Universal Components (UC) and learning how to add them to a project
- Learn how created projects can be interfaced to EFR Connect, the latest Bluetooth App from Silicon Labs

This guide is designed for developers who are new to Simplicity Studio v5 and the Silicon Labs development hardware. It provides instructions to get started using the example applications provided with the Gecko v3 SDK (GSDK).

1 Introduction

The SSv5 Bluetooth lab is split into several sections.

1) Getting started with SoC Empty
2) Adding a customer service and characteristic

1.1 Requirements

The goal of this worksheet is to provide a basic understanding of the new SSv5 and the v3.0 GSDK. Before following the procedures in this worksheet, you must have the following components.

Hardware

- Thunderboard BG22 BRD4184A
- 1 Micro USB to USB Type-A cable (Not included with kit)
  Note: make sure USB provides both data and power
- iOS or Android Mobile device

Software:

- Simplicity Studio v5 (Windows .exe, Mac .dmg, Linux .tar)
  - Bluetooth SDK 3.0.2 or later
  - Gecko SDK Suite 3.0.2 or later
- EFR Connect Mobile App, (Android – China)
- Accept Location Access. "While using the App" is acceptable. This enables Traffic Browser

1.2 Install Tools

If you do not have Simplicity Studio:

1. Install Simplicity Studio v 5 by launching Offline Installer (Windows .exe, Mac .dmg, Linux .tar)
2. You'll need to create or sign in with your www.silabs.com account

If you currently have Simplicity Studio installed:

1. Update existing Simplicity Studio installation
2. Update Protocol SDKs by clicking menu bar **Help -> Update Software**.
   a. Click Package Manager
   b. Click on tab for "SDKs" in Package Manager window
      i. Select and Install Bluetooth SDK – 3.0.2 or later
      ii. Select and Install Gecko Platform – 3.0.2 or later

1.3 Connect your Hardware

Attach the development kit assembly to the PC with Simplicity Studio installed by using a Mini USB cable and connecting between the PC host USB port to the J-link USB port on the kit.

Note: By having the hardware connected via the USB debug connector when Simplicity Studio installs, Simplicity Studio will automatically obtain the relevant additional resources it needs to identify the kit.

2 Getting Started with SoC_Empty

In these instructions you will compile and load the example application, SoC_Empty, to create a simple project that includes the Bluetooth stack using the latest SSv5 GSDK. The SoC_Empty project is a great starting point for new application development. The SSv5 version of the project has the same functionality as the SoC_Empty example application from previous versions of Simplicity Studio and can be used to advertise and connect to a mobile application such as EFR Connect.

When working with example applications in Simplicity Studio, you will execute the following steps:

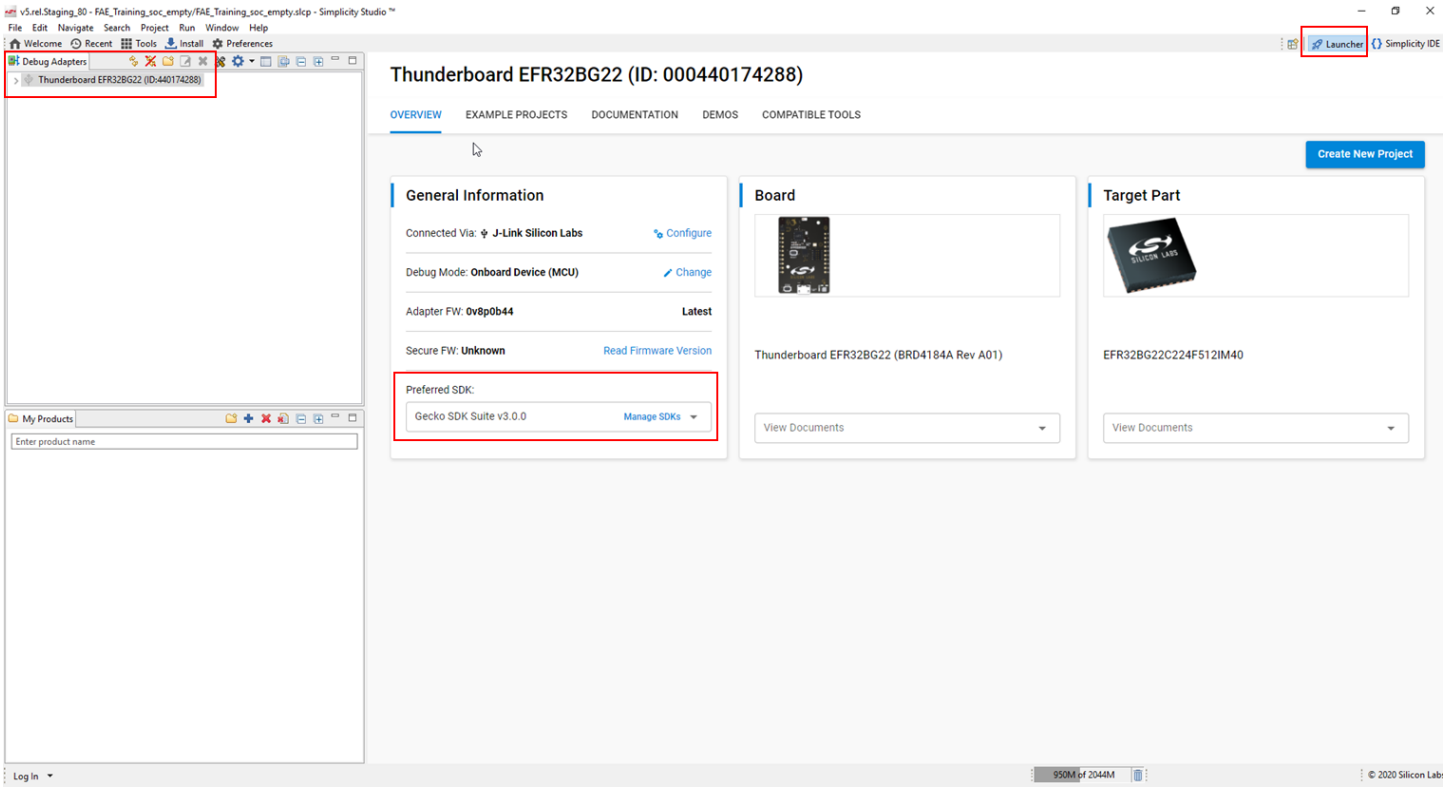
1. Select the SoC_Empty example application
2. Compile and flash the application to the BG22 board
3. Interact with the application using the debugger.

These steps are described in detail in the following sections.

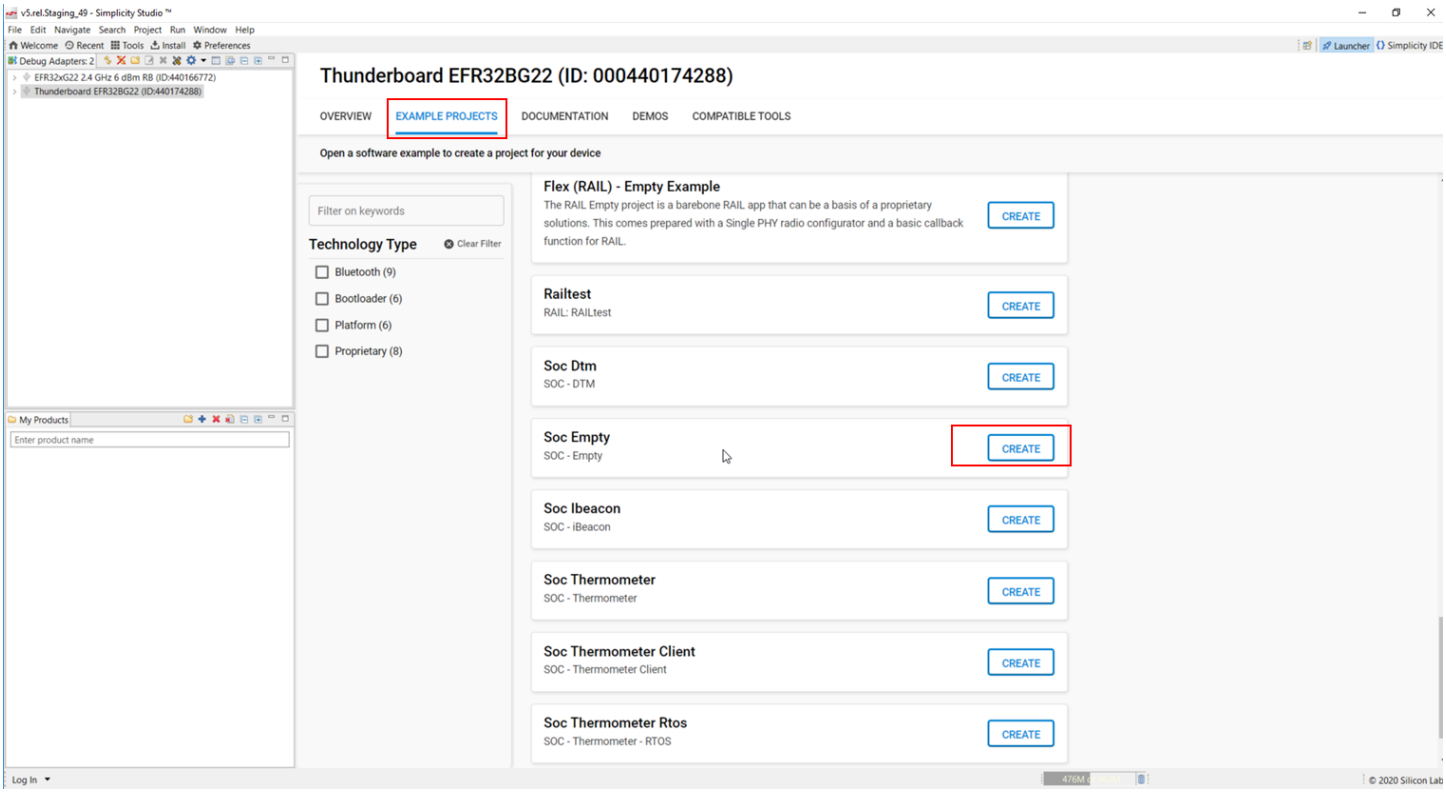
2.1 Selecting the SoC_Empty Example Application

When opening SSv5 for the first time you should be taken to the Launcher perspective. From this perspective you will see several different tiles with information about the target SoC as well as the target hardware being used.

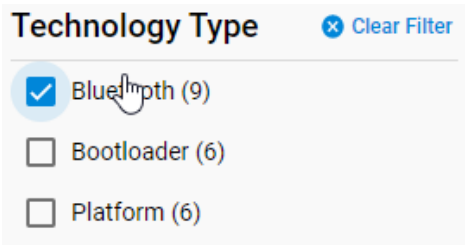
1) Connect a Thunderboard BG22 in using the USB. The kit and debug information should be displayed in the Debug Adapters window.
2) In the “Debug Adapters” window click the Thunderboard EFR32BG22 debug adapter.
3) If SSv5 has not started in the Launcher perspective, click the “Launcher” button in the top right of the main window.
4) From the Launcher perspective you see a lot of information about the target hardware and software that will be used when generating new projects or building exisitng projects. This view is different than the view in SSv4. Take a look around and the layout and what is available on this view with the different tiles.
5) Be sure the “Gecko SDK Suite v3.0.0” is slected as the “Preferred SDK.”



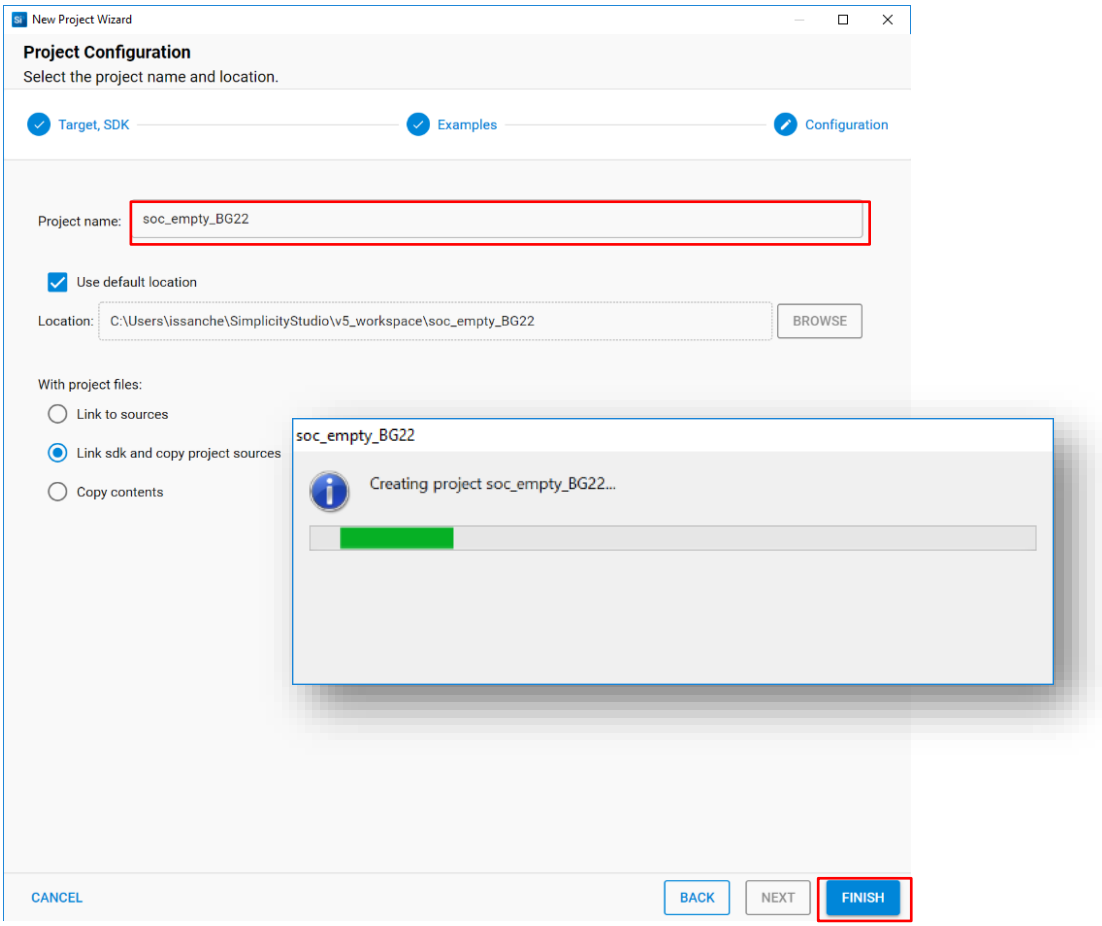
6) Select the “Example Projects” tab to provide a list of the projects available for the target hardware selected.
7) Scroll down to the “SOC - Empty” project and select “Create.”



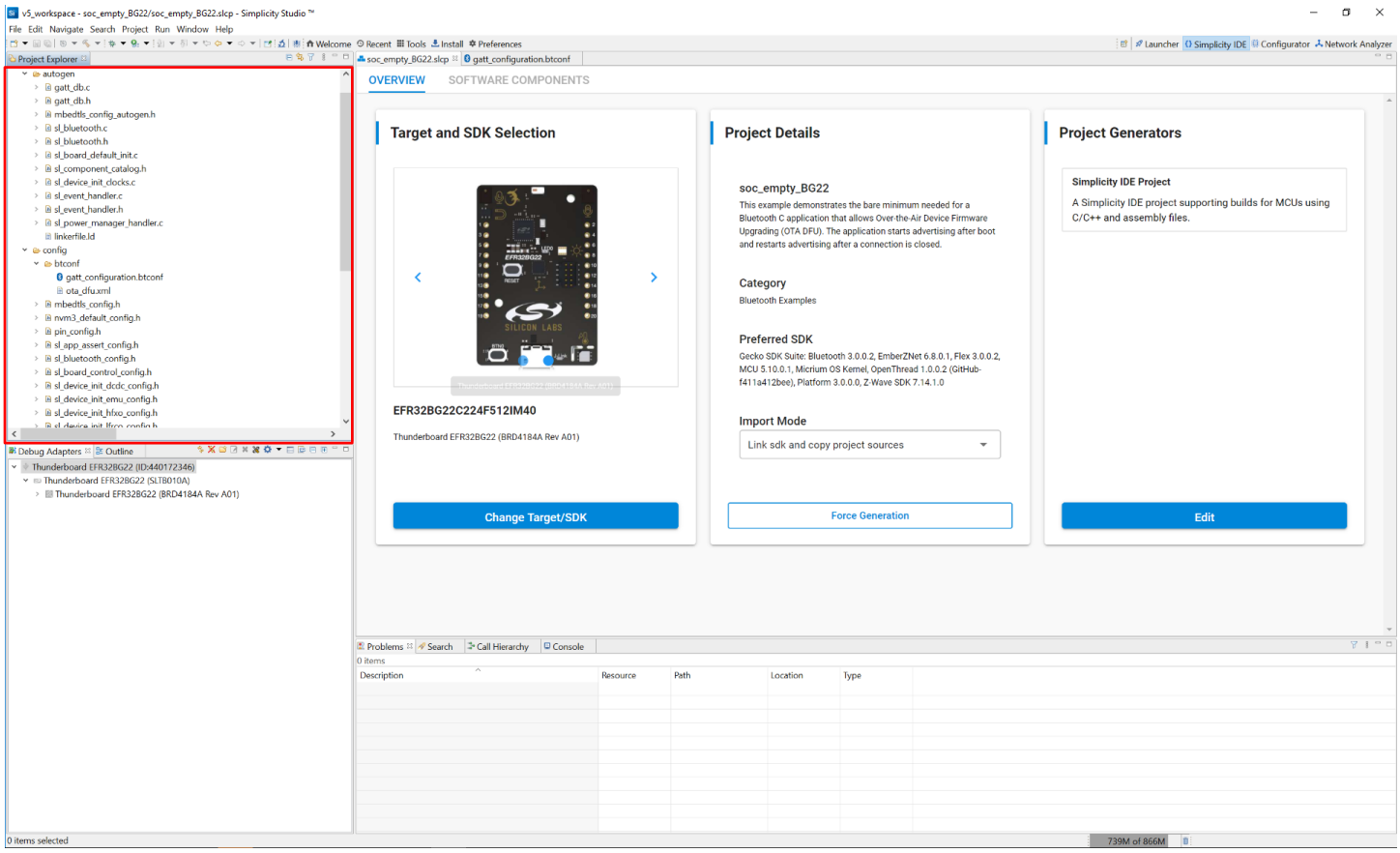
Note: You can select the filters on the left to reduce the number of elements shown to simplify finding the desired project.



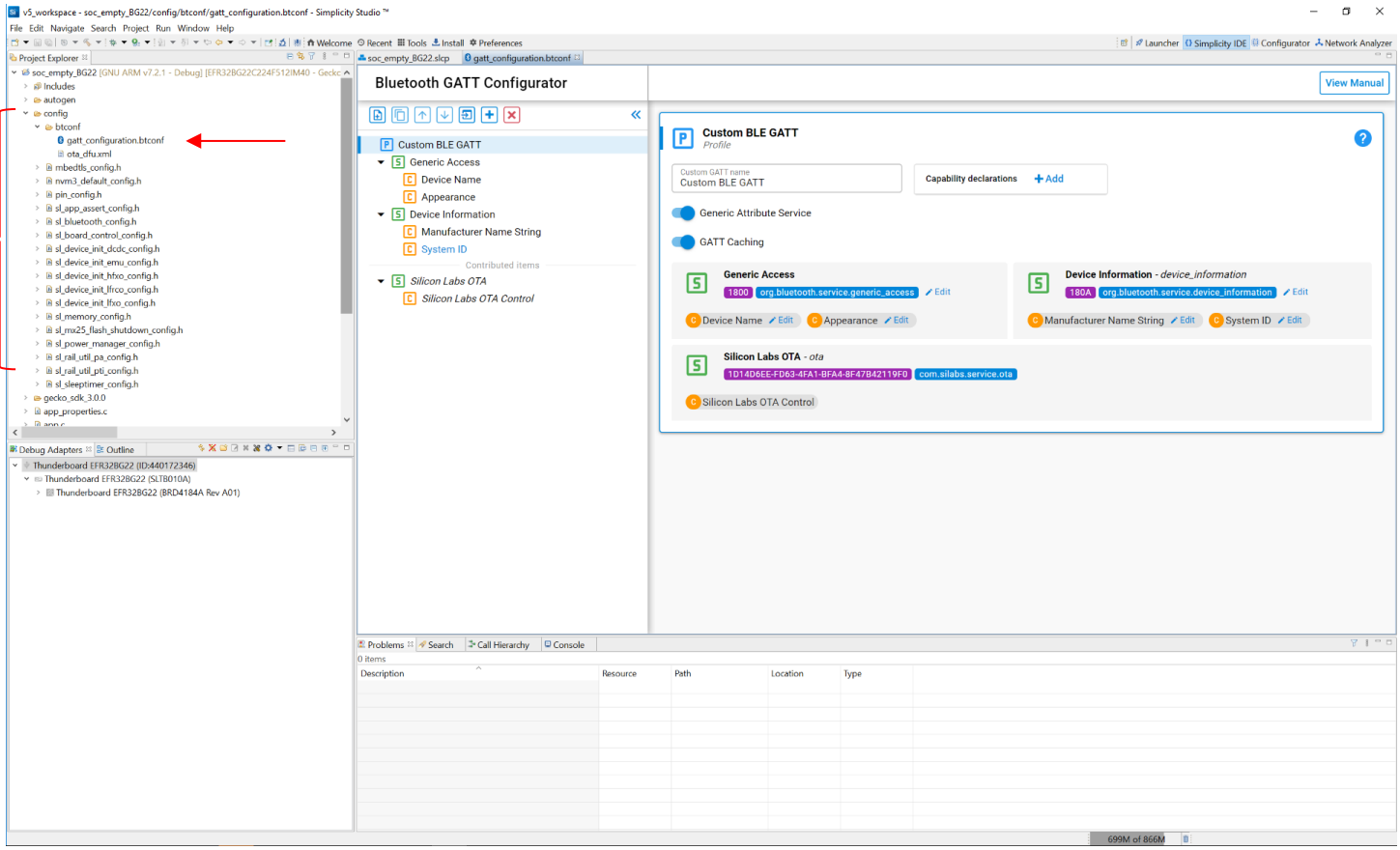
8) Enter the name of the project you want to create. The example used for this example was “soc_empty_BG22.”
9) Click “Finish” to create the new project.



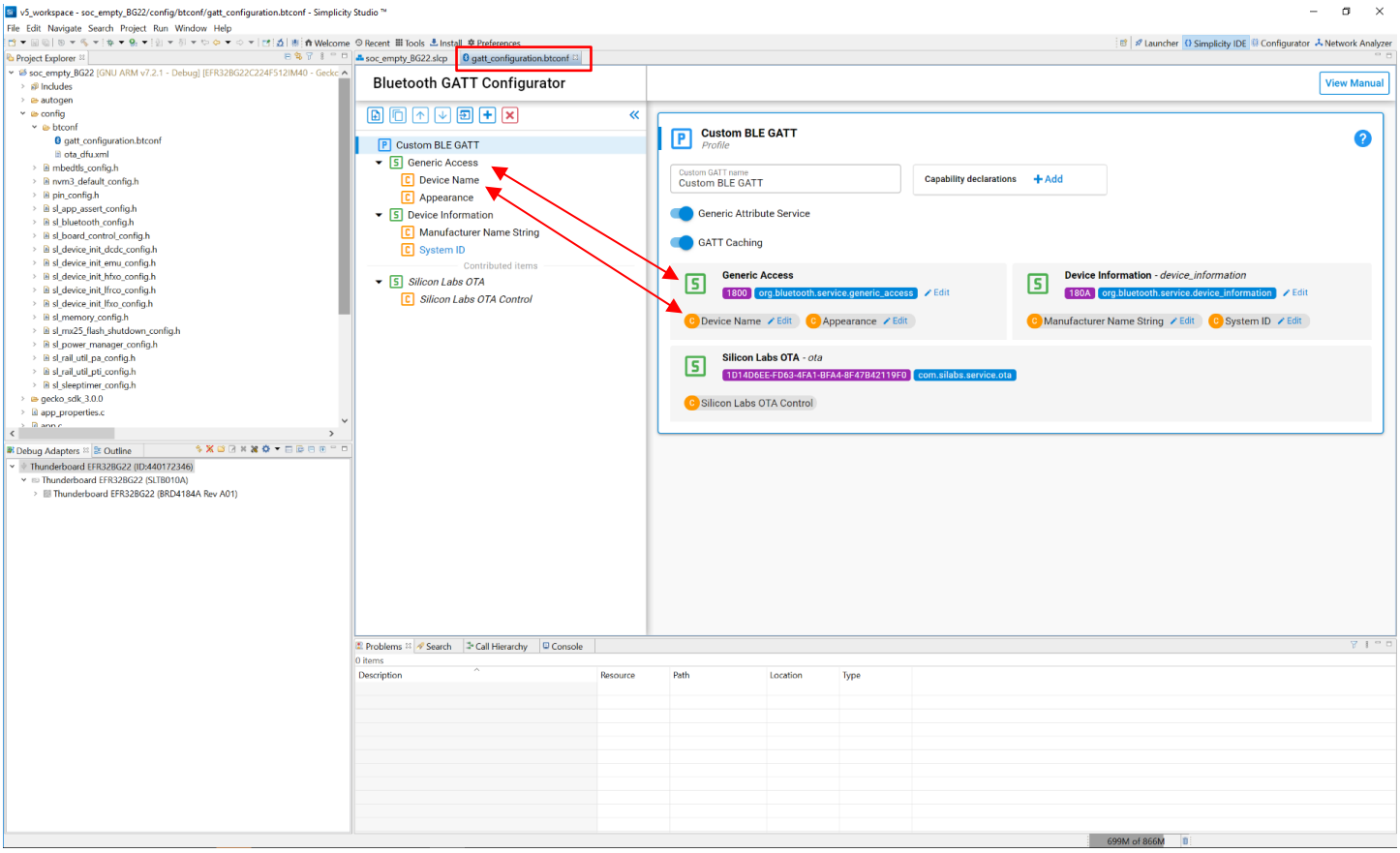
10) Once the project is created SSv5 takes you to the “Simplicity Studio” perspective. From the “Project Explorer” window you can see the project files that have been generated. The project structure follows the same format that was adopted in SSv4 with the main.c and app.c/h files.
11) Note the “autogen” folder that contains all of the files that are automatically created by the SSv5 tools. The files within this folder automatically get updated when you add or delete items from the project. This is different from SSv4 where the user had to “generate” after changes were made.



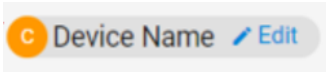
12) The GATT configuration is now part of the “config” section of the project. Click the “**gatt_configuration.btconf**” file under the “btconf” folder.



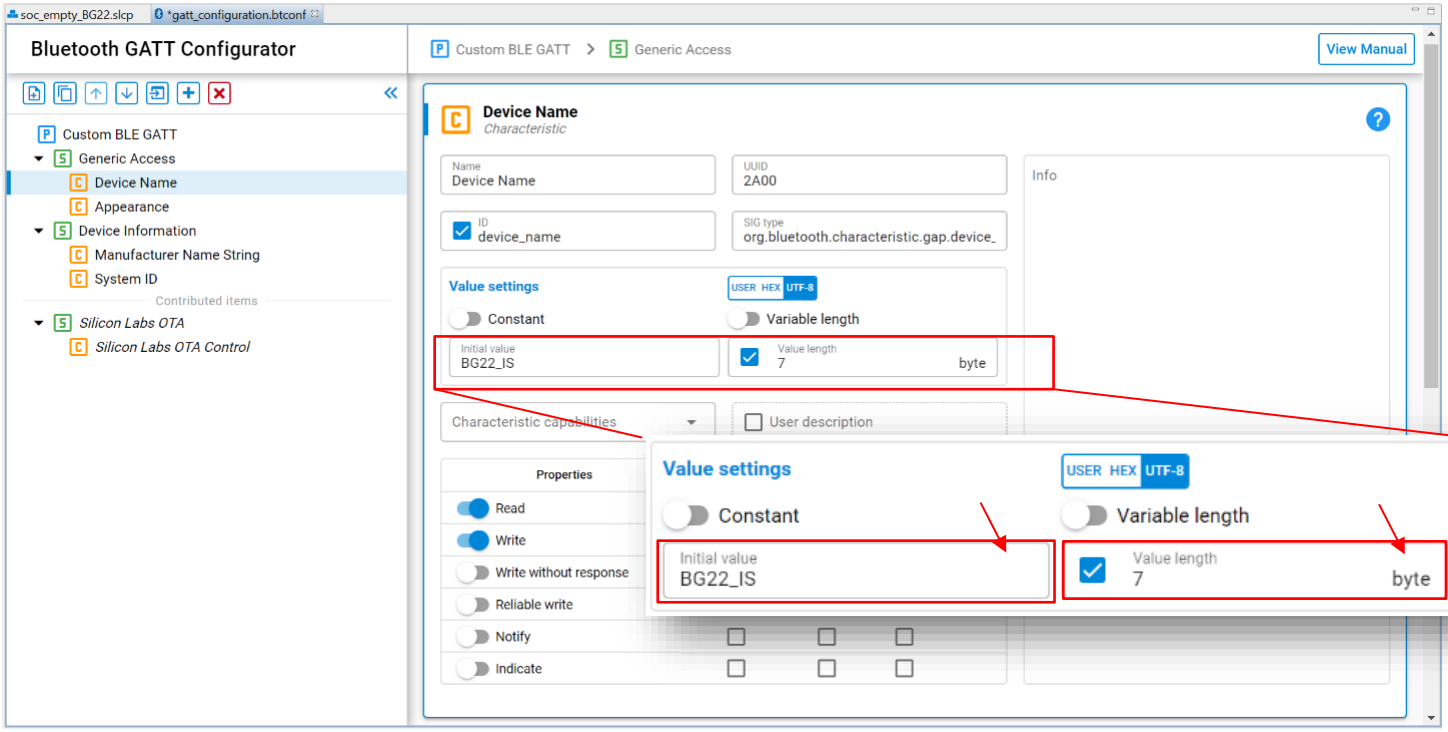
13) Take a moment to review the fields in the “Bluetooth GATT Configurator.” Within this tool the Bluetooth service and characteristic parameters can be added, removed, edited, etc. The default services and characteristics for the soc_empty project are shown in the figure below. The Bluetooth parameters are shown logically in a folder type view as well as a window to enable editing the configuration.



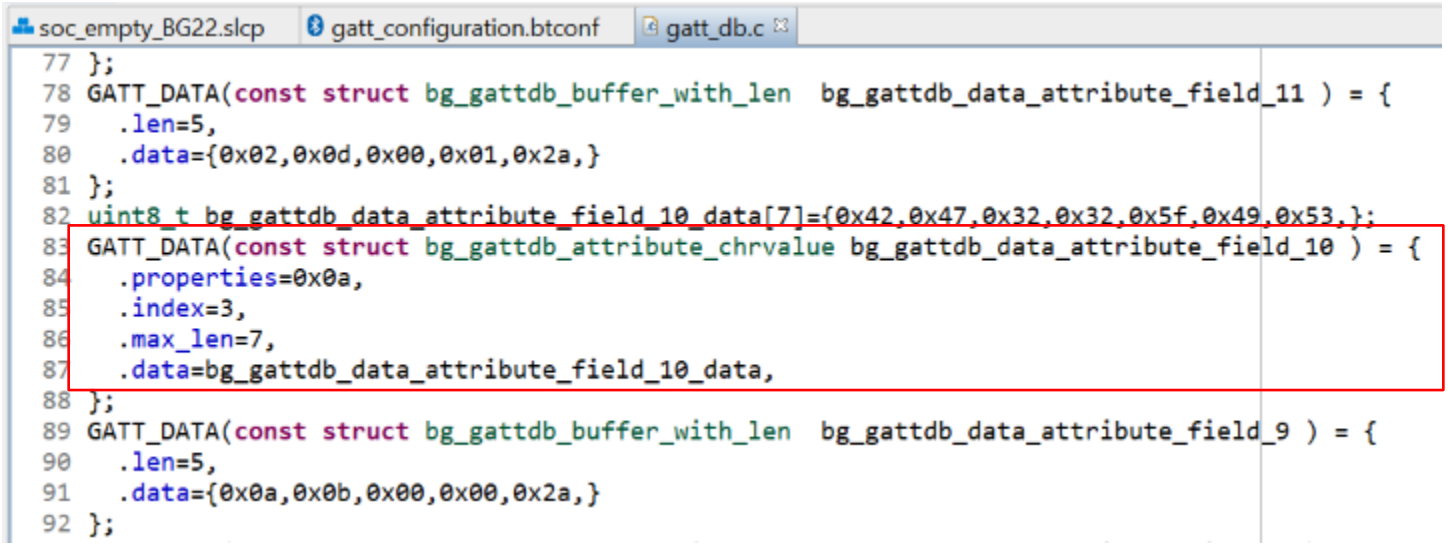
14) Click the “Edit” button of the “Device Name” characteristic found within the “Generic Access” service.



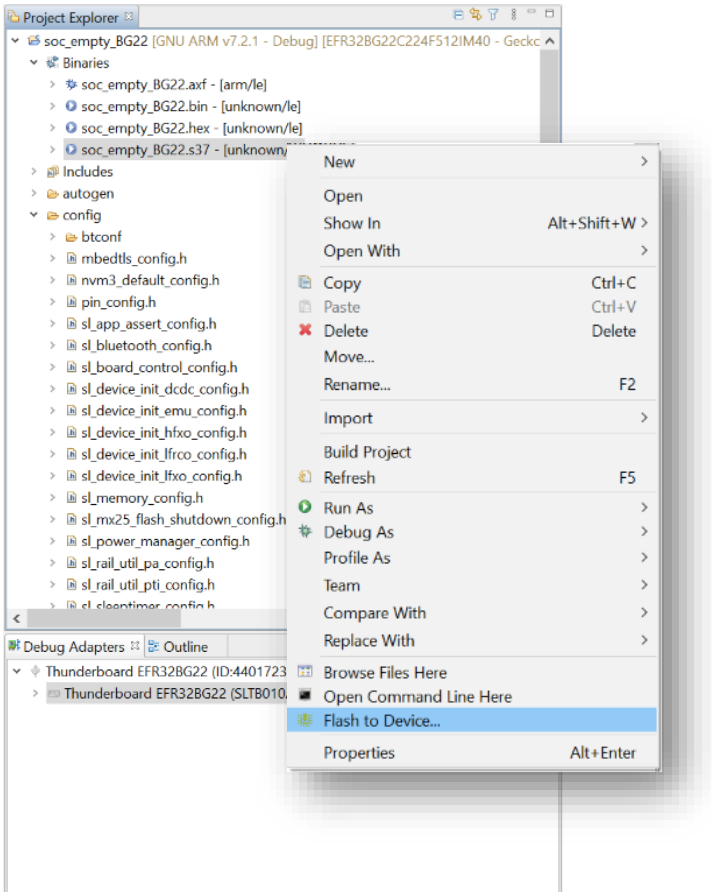
15) Enter a new device name so that it is identifiable from other devices within range of the mobile device that will be used. In the example below the new name given was “BG22_IS”, where “IS” can be replaced with your initials.
16) Note that the “Value Length” of the name must match what was entered. The original “Empty Example” name had 13 bytes. If the length does not match the configurator will flag the issue and highlight it as shown in the pop-out figure.
17) Enter the correct number of bytes in the new name entered. BG22_IS has 7 bytes as shown.



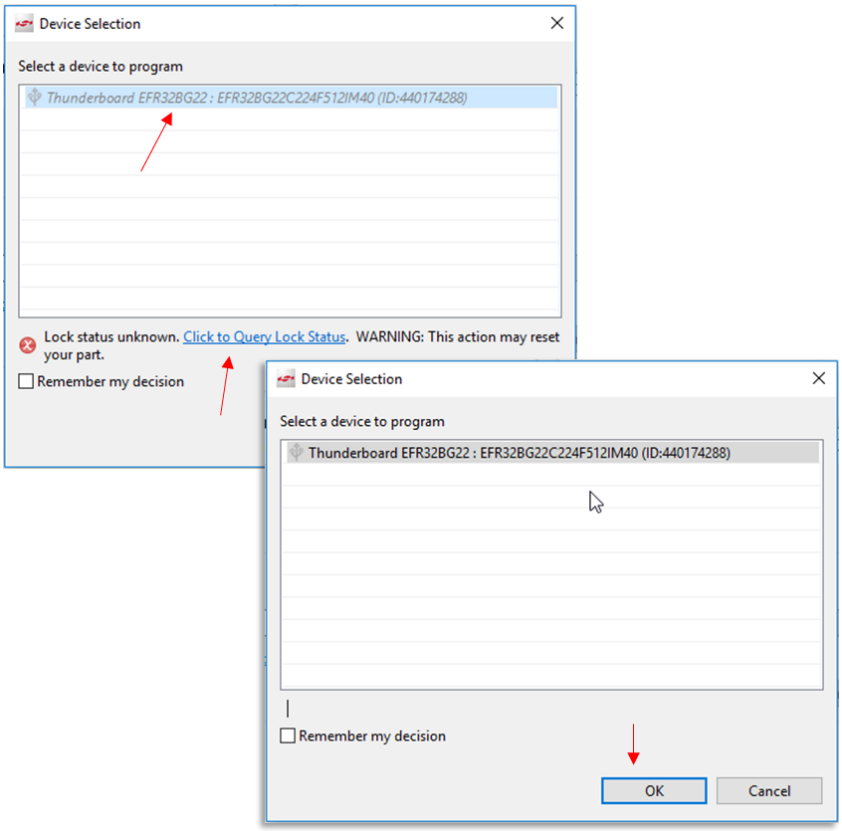
18) Note that the changes made to the Device Name and the variable length field are automatically updated in the autogenerated files when the *btconf* file is saved. To verify, open the "gatt_db.c" file and navigate to the bg_gattdb_data_attribute_field_10_data[] parameter and note the variable length and the Device Name entered (the Device Name is in hex).



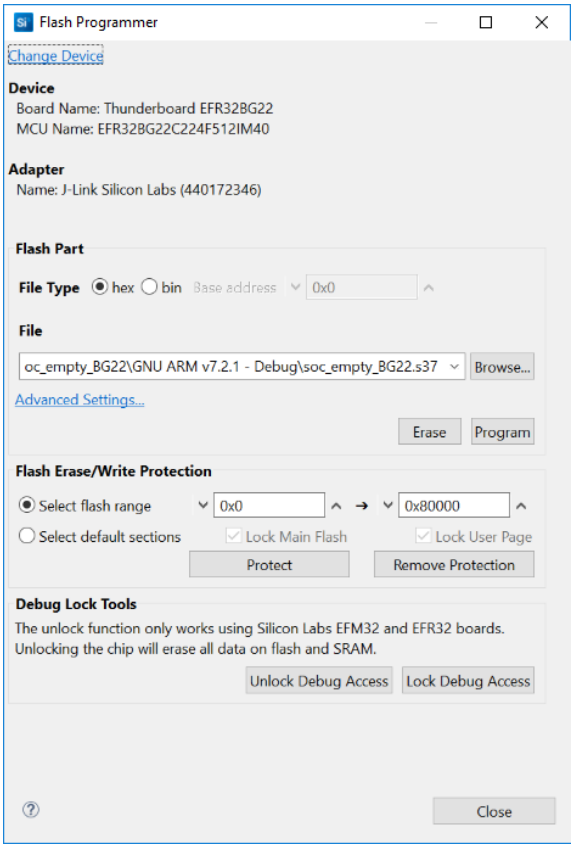
19) Build the project by clicking the hammer toolbar button ( ).
20) Once built, flash the generated hex file to the target by right clicking the <*project name*>.hex file in the "GNU ARM v7.2.1 – Debug" folder.
21) Select "Flash to Device…"



22) The BG22 has additional security features and in some cases (i.e. when the board is first plugged in), the tools will prompt to query the Debug Challenge Interface (DCI). Select the connected device and then the link for "Click to Query Lock Status." The device target to program text will no longer be greyed out and then select "OK."

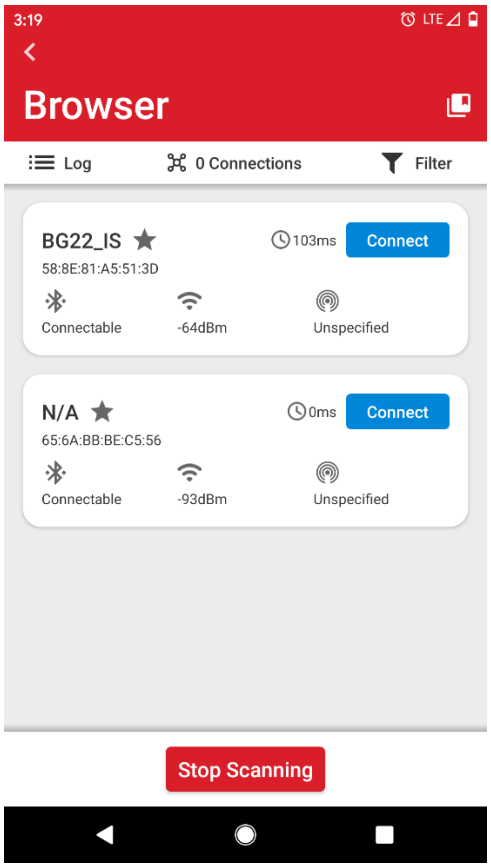


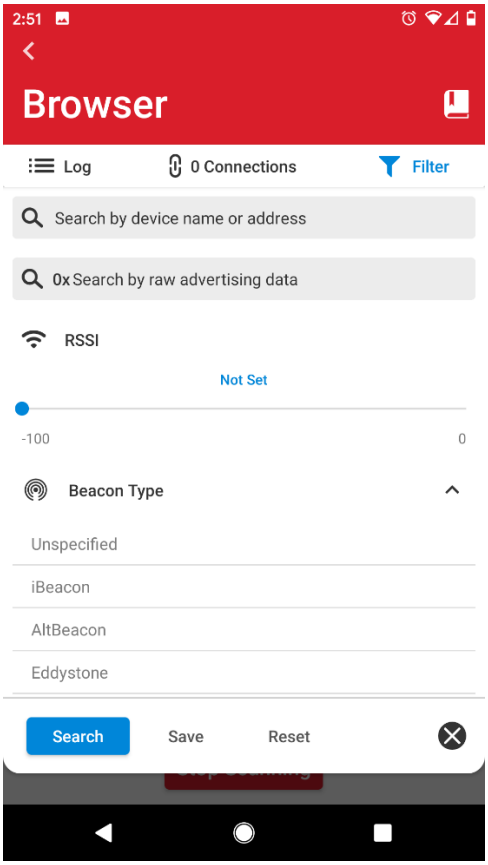
23) The Flash Programmer will open. Click “Program” to download the code to the target.



Note: There may be times where the specific debug adapter needs to be selected. If prompted select the Thunderboard kit and click to query before clicking okay.

24) Open the mobile app “EFR Connect” and select the “Browser.”
25) The newly downloaded SoC_Empty application should be issuing Bluetooth advertisements. Start scanning in the mobile application If you cannot see the advertising packets.
26) Since there are so many Bluetooth devices broadcasting at any given time, try using the filter settings in the app to isolate the app flashed to the board.





Note: If the board is not found, try pressing the reset button on the BG22 or restart scanning in the app. In some cases the bootloader may be missing from the device if it has been completely erased. If that happens, open the Flash Programmer and program the bootloader found here:

C:\SiliconLabs\SimplicityStudio_v5\developer\sdks\gecko_sdk_suite\v3.0\platform\bootloader\sample-apps\bootloader-storage-internal-single-512k\efr32mg22c224f512im40-brd4182a\bootloader-storage-internal-single-512k.s37

2.2 Recap of the SoC_Empty Example Application

Congratulations! Lab 1 was a basic introduction to SSv5 and demonstrated many new features of SSv5 and compared them to SSv4 and covered these topics:

1) Creating a new project
2) Using the GATT configurator to edit characteristics
3) Viewing autogenerated files
4) Build and download an application to a target
5) Introduced EFR Connect mobile app