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Simplicity Studio Workshop: Overview and Bootloaders

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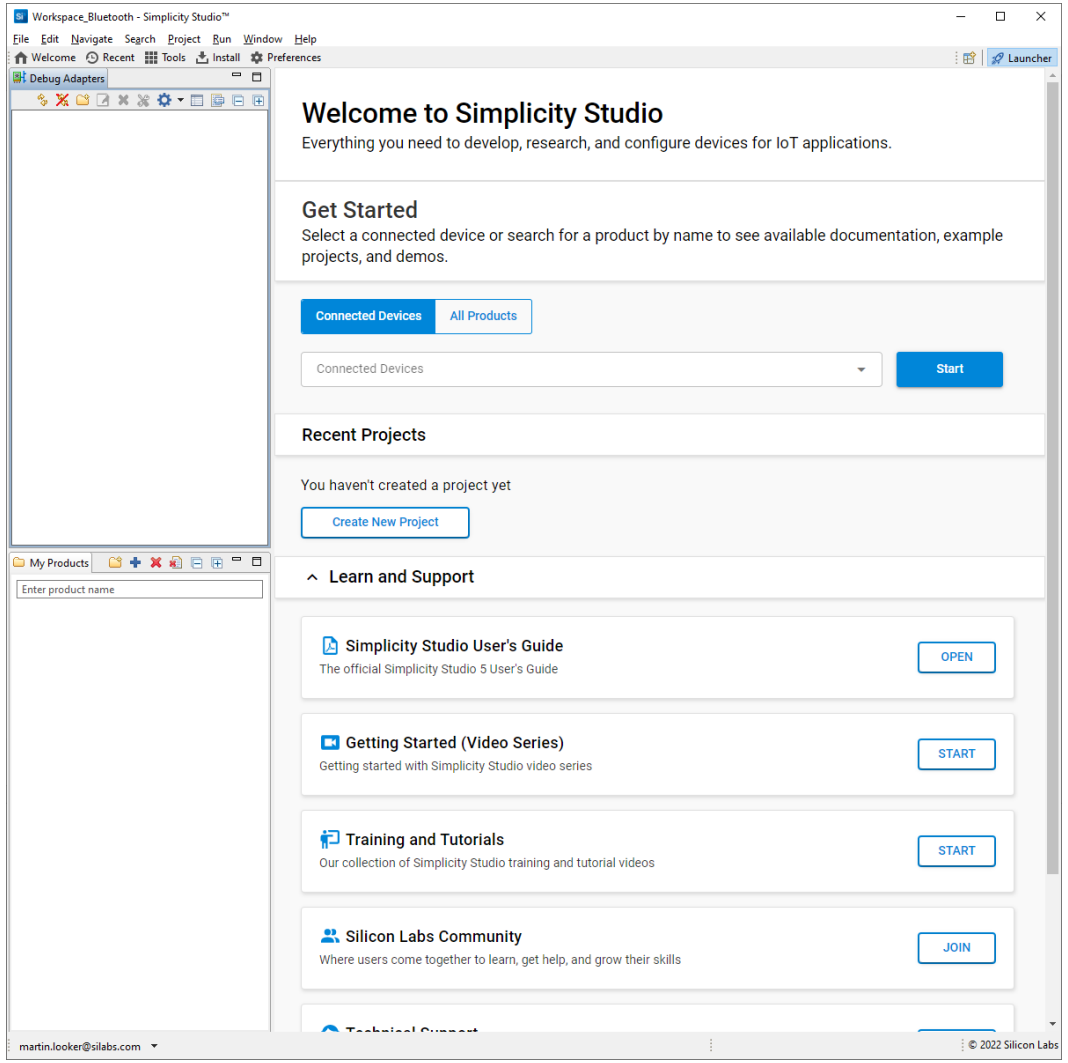
8th March 2023 – v1.2

Overview

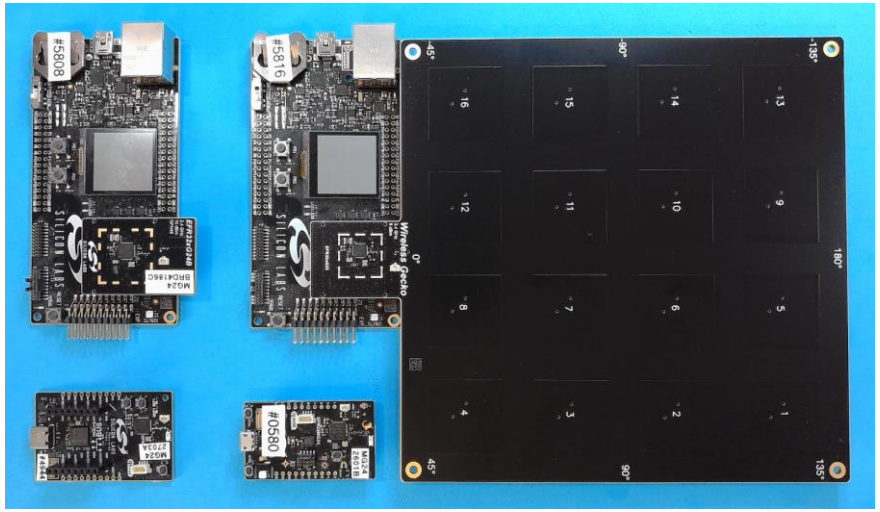
- Simplicity Studio is the unified development environment for all Silicon Labs technologies which provides:
  - Web resources
  - SDKs
  - Configuration tools
  - An IDE
  - Network and power analysers
- In this session you will learn:
  - How to connect boards to Simplicity Studio
  - How to obtain and configure board information
  - How to access documentation
  - How to access demo and example software and bootloaders
  - How to build and flash firmware to boards

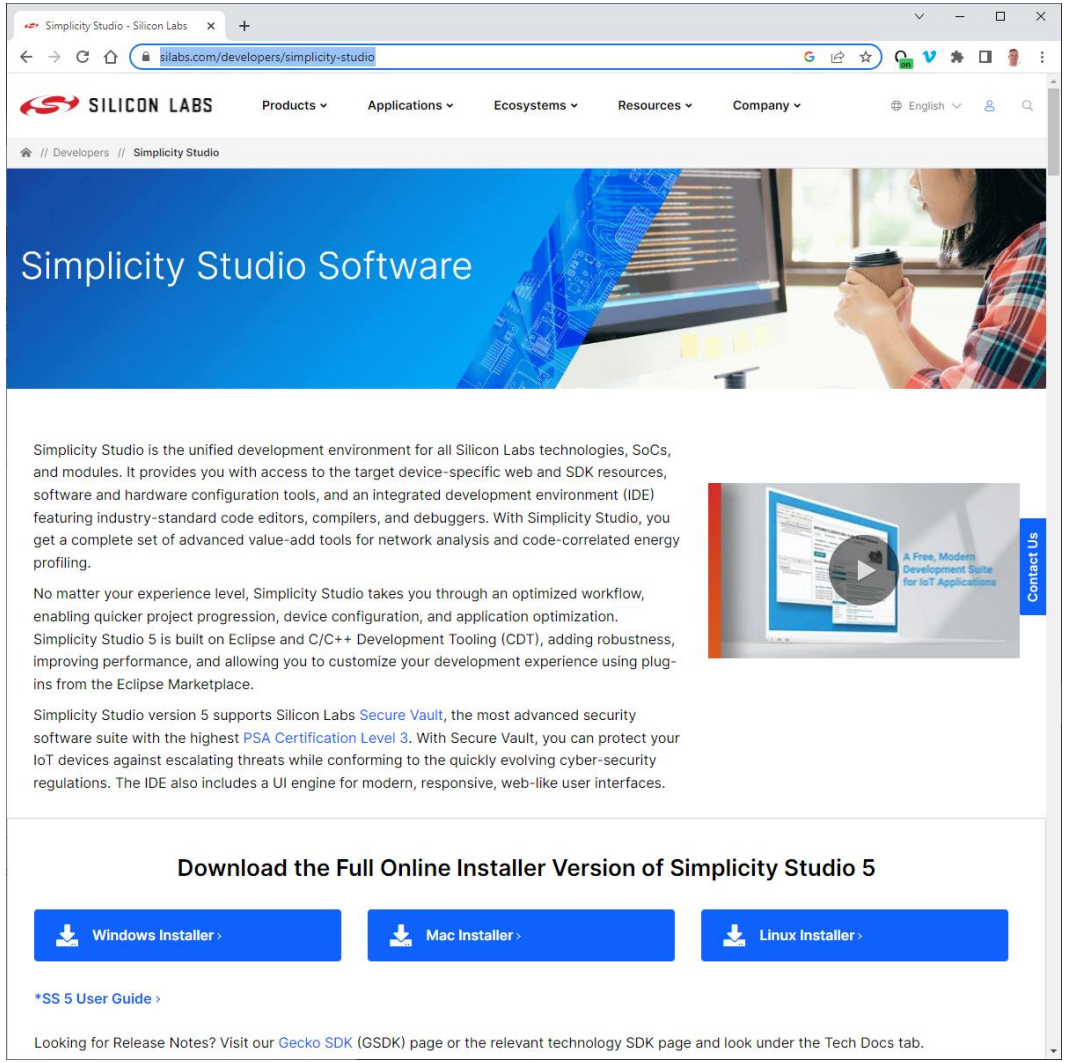


Pre-requisites

- Simplicity Studio v5 installed:
  - Part 1 of this series shows how to download and install Simplicity Studio: https://www.brainshark.com/siliconlabs/EW23-Simplicity-Studio-Install

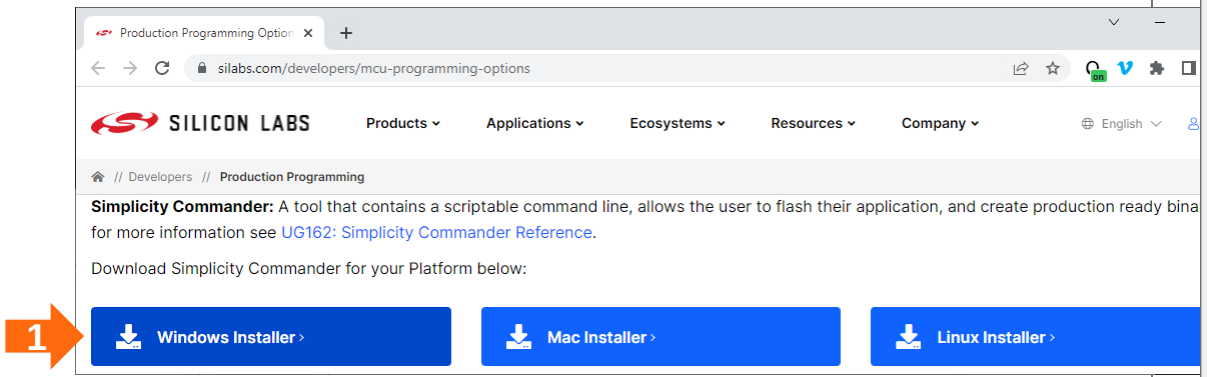
- Silicon Labs Wireless Kits and Boards
  - Information on multi-protocol kits and boards: https://www.silabs.com/wireless/multiprotocol?tab=kits



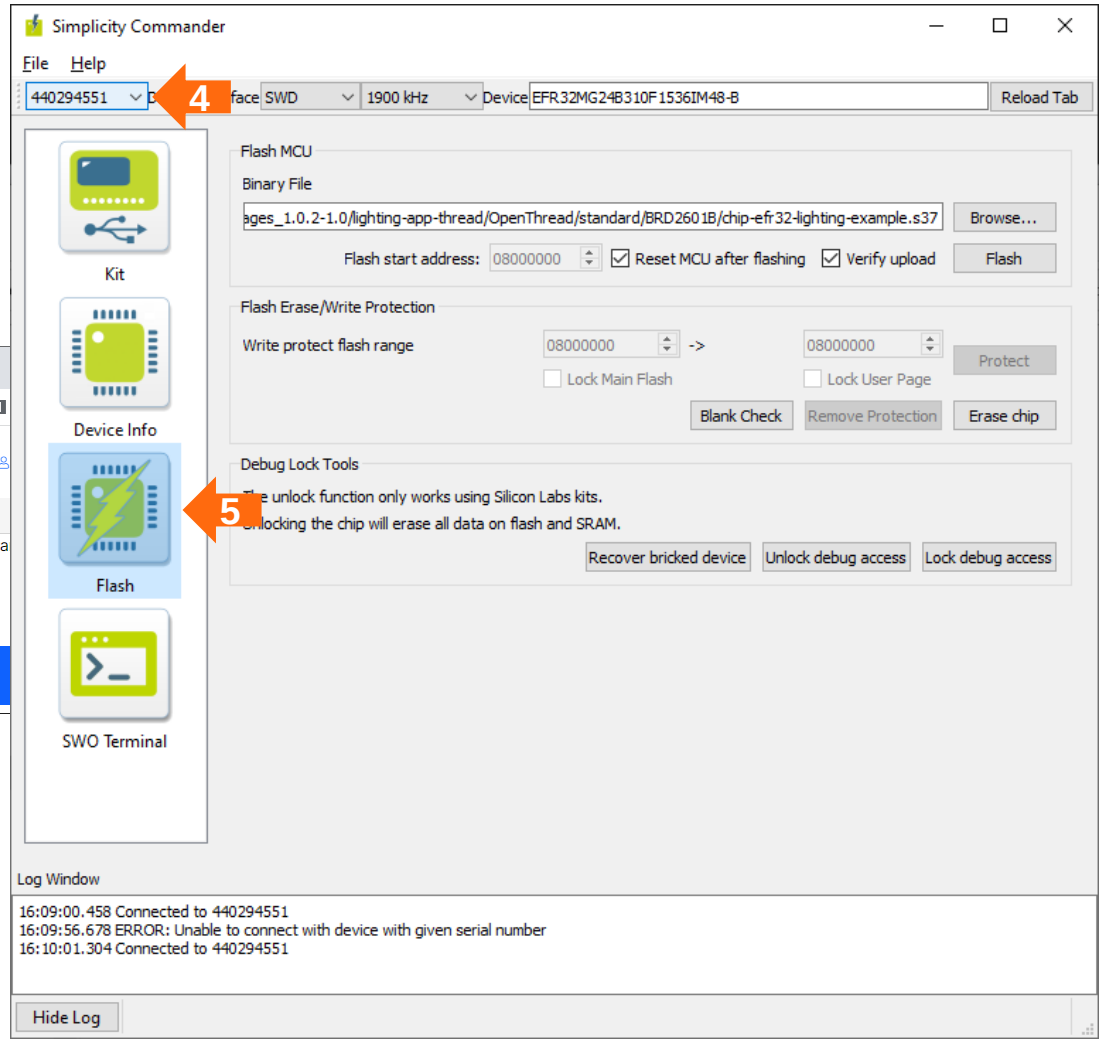


Simplicity Commander

- If Simplicity Studio is not installed, Simplicity Commander can be used to program pre-built binaries:
  1. Download the ZIP file, for your system, towards the bottom of: https://www.silabs.com/developers/mcu-programming-options

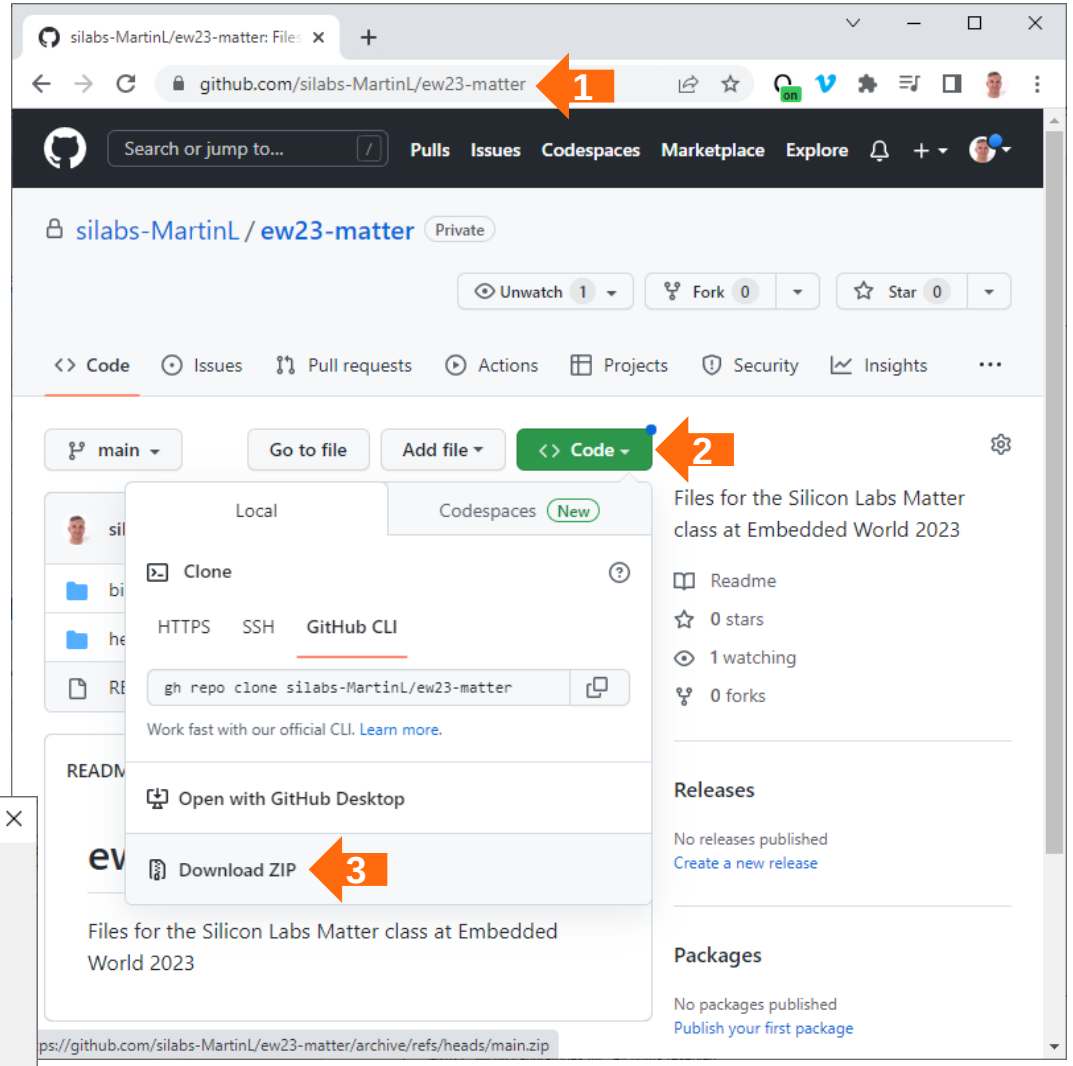


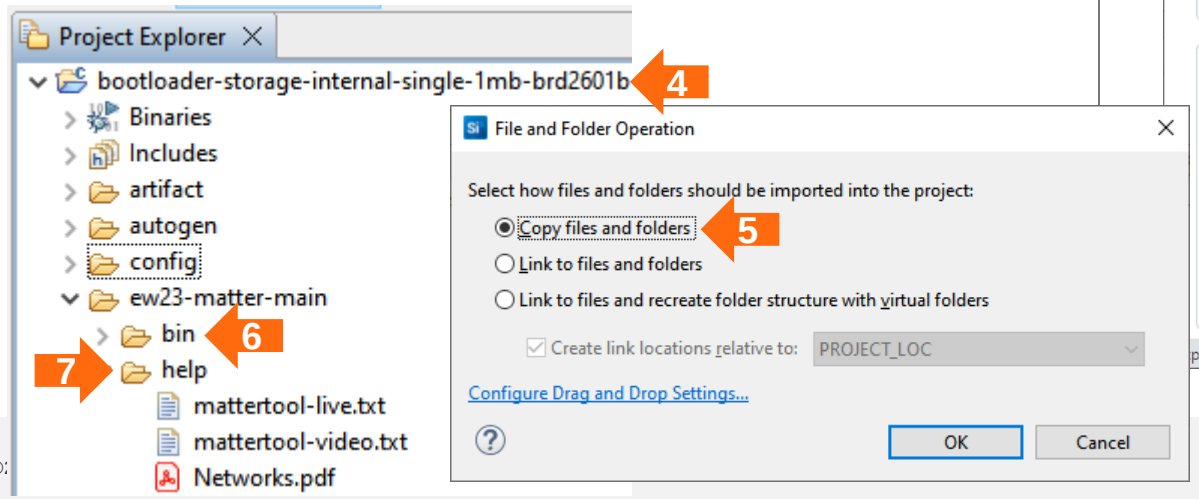
  2. Unzip to a folder on your PC
  3. Locate and run commander.exe
  4. Use the Select Kit dropdown to select a connected board
  5. Flashing controls are available from the Flash tab



Downloads

- Files for the class are available on Github:
  1. Visit https://github.com/silabs-MartinL/ew23-matter
  2. Click the **Code** dropdown
  3. Click **Download ZIP** (or use your preferred git method)
  4. Unzip to your file system, drag and drop the `ew-23-matter-main` folder to your bootloader project in **Simplicity Studio**
  5. When prompted select **Copy files and folders** and select **OK**
  6. Binaries that we will use later are in the `bin` folder
  7. A PDF of this presentation, network settings and text files with commands are in the `help` folder





xG24 and xGM240: Optimized for Battery Powered IoT Mesh Devices

BG24 and MG24 SoC

BGM240S and MGM240S SiP

BGM240P and MGM240P Module

- **High Performance Radio**
  - Up to +19.5 dBm TX
  - -97.6 dBm RX @ BLE 1 Mbps
  - -105.7 dBm RX @ BLE 125 kbps
  - -105.4 dBm RX @ 802.15.4
  - Wi-Fi Coexistence
  - RX Antenna Diversity
- **ARM® Cortex®-M33**
  - 78 MHz (FPU and DSP)
  - TrustZone®
  - Up to 1536kB of Flash
  - Up to 256kB of RAM
- **Low Power**
  - 5.0 mA TX @ 0 dBm
  - 19.1 mA TX @ +10 dBm
  - 4.4 mA RX (BLE 1 Mbps)
  - 5.1 mA RX (802.15.4)
  - 33.4 µA/MHz
  - 1.3 µA EM2 with 16 kB RAM
- **Dedicated Security Core**
  - Secure Vault™ - Mid / High

- **AI/ML**
  - AI/ML Hardware Accelerator
- **Low-power Peripherals**
  - EUSART, USART, I2C
  - 20-bit ADC, 12-bit VDAC, ACMP
  - Temperature sensor +/- 1.5°C
  - 32kHz, 500ppm PLFRCO
- **World Class Software**
  - Matter[1]
  - Thread[1] and Zigbee[1]
  - Bluetooth (1M/2M/LR)
  - Bluetooth mesh
  - Dynamic multiprotocol[1]
  - Proprietary
- **SoCs and Modules**
  - 5x5 QFN40 (26 GPIO) +125ºC
  - 6x6 QFN48 (28/32 GPIO) +125ºC
  - 7x7 SiP Module
  - 12.9x15.0 PCB Module

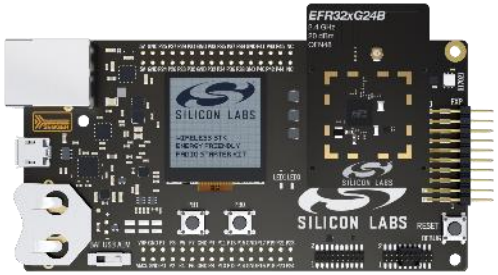
[1]Requires MG24

Getting Started with BG24 and MG24 SoCs and Modules

- **Dev Board**
  - 1x Development board
    - On-board debugger
    - Signal breakouts
    - On-board sensors
    - 20-bit ADC
    - AI/ML hardware accelerator
- **Explorer kit**
  - 1x Explorer board
    - mikroBus socket
    - Qwiic connector

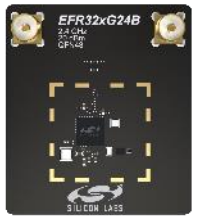
Part Number	Description
xG24-DK2601B	EFR32xG24 2.4 GHz +10 dev board
xG24-EK2703A	EFR32xG24 2.4 GHz +10 explorer board

- **Pro kits**
  - 1x radio board
  - 1 x WSTK main board
    - Modular development platform
    - Advanced development
    - RF measurements
    - Energy profiling
    - External device debug
    - Ethernet for large network test



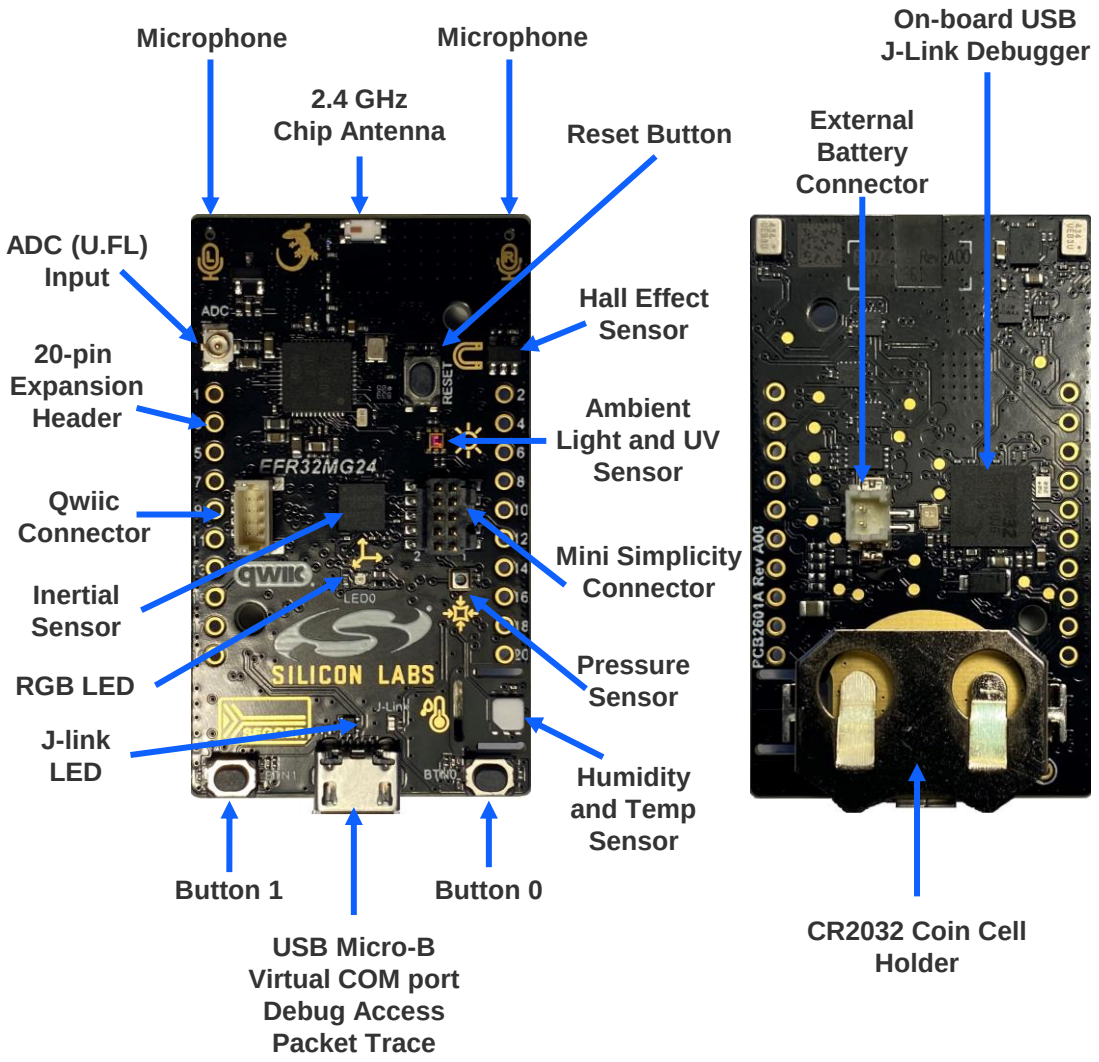
Part Number	Description
xG24-PK6009A	EFR32xG24 2.4 GHz +10 dBm Pro Kit
xG24-PK6010A	EFR32xG24 2.4 GHz +20 dBm Pro Kit

- **Radio Board kits**
  - 1x radio board
    - Uses existing WSTK boards
    - Uses existing software tools



Part Number	Description
xG24-RB4186C	EFR32xG24 2.4 GHz +10 dBm Radio Board
xG24-RB4187C	EFR32xG24 2.4 GHz +20 dBm Radio Board
xG24-RB4188A	EFR32xG24 +20 dBm Antenna Diversity Board
XGM240-RB4316A	xGM240P +10 dBm Module Radio Board
XGM240-RB4317A	xGM240P +20 dBm Module Radio Board
XGM240-RB4318A	xGM240S +10 dBm Module Radio Board

Dev Board Features

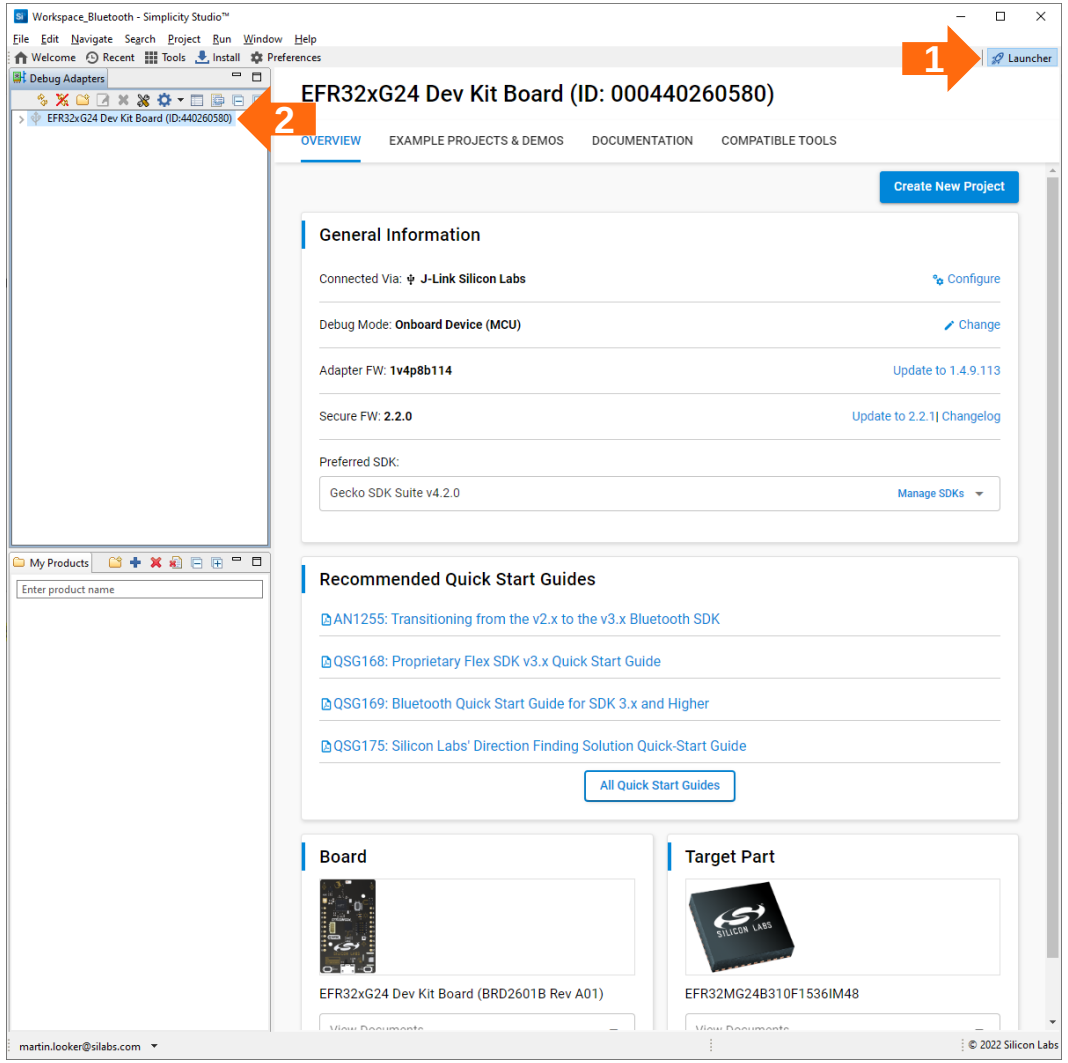


- **Features**
  - EFR32MG24B
  - Wireless SoC with multi-protocol radio
  - Cortex-M33, 1536 kB Flash and 256 kB RAM
- **Advanced Features**
  - AI/ML Hardware Accelerator
  - 20-bit ADC
- **Expansion and User Interface**
  - Breakout pads
  - Qwiic connector
  - LEDs and Push Buttons
- **Broad Range of Sensors**
  - 9-axis Inertial Sensor
  - 2 Digital Microphones
  - Pressure Sensor
  - Relative Humidity and Temperature Sensor
  - UV and Ambient Light Sensor
  - Hall-effect Sensor

https://www.silabs.com/documents/public/user-guides/ug524-brd2601b-user-guide.pdf

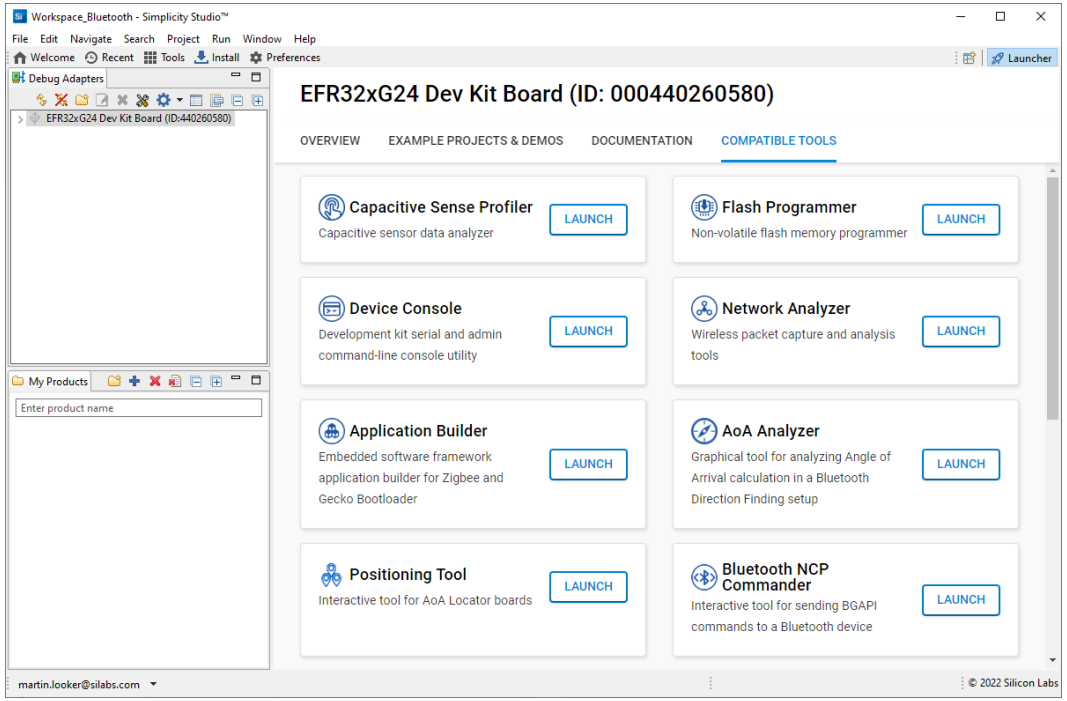
Launcher – Overview

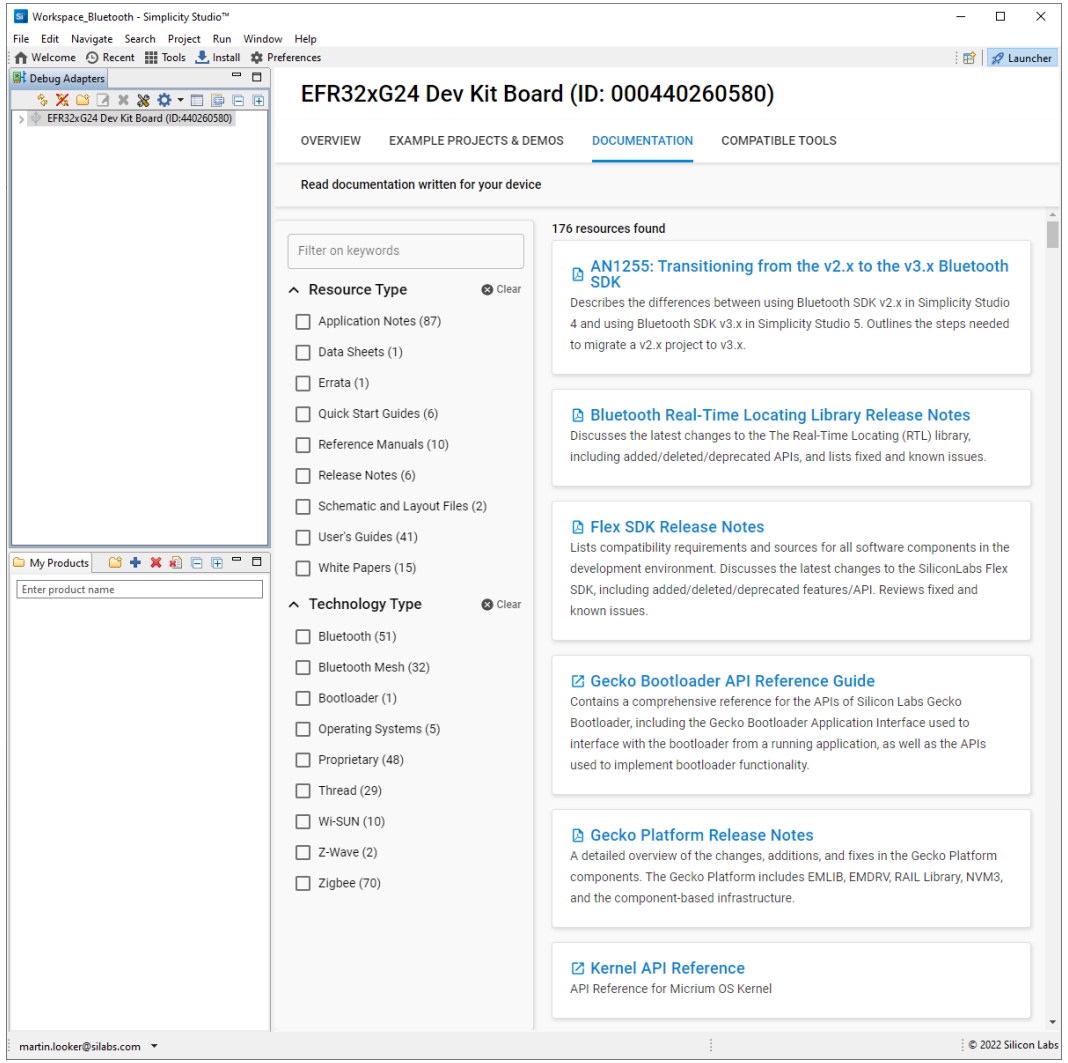
- Connect board via USB
  1. Switch to Launcher perspective
  2. Select **EFR32xG24 Dev Kit Board** from **Debug Adapters** panel
- **Overview**:
  - Information on device
  - Firmware updates
  - SDK version selection
  - Recommended documentation



Launcher – Documentation and Tools

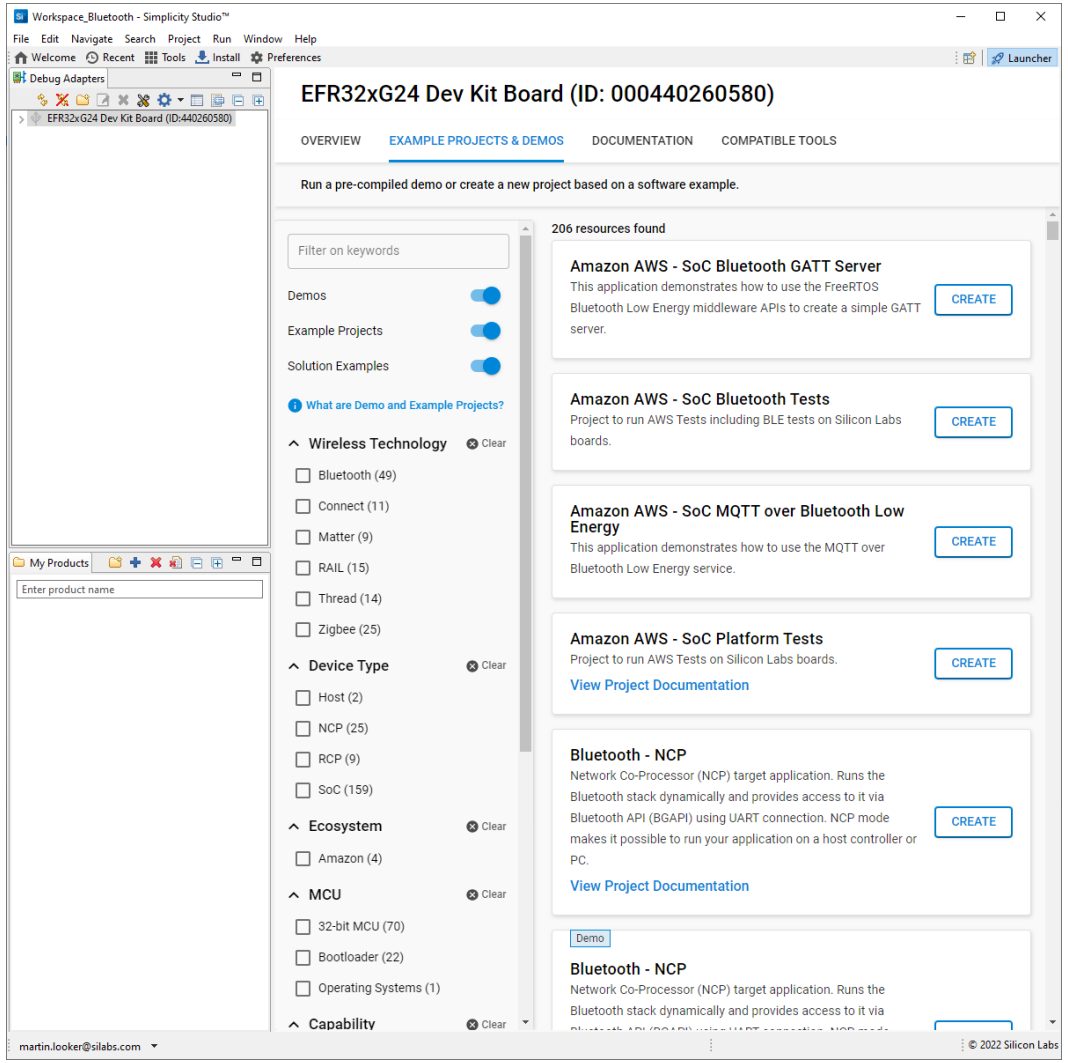
- **Documentation**: a more comprehensive list of documentation
- **Compatible Tools**: has useful tools relevant to the board





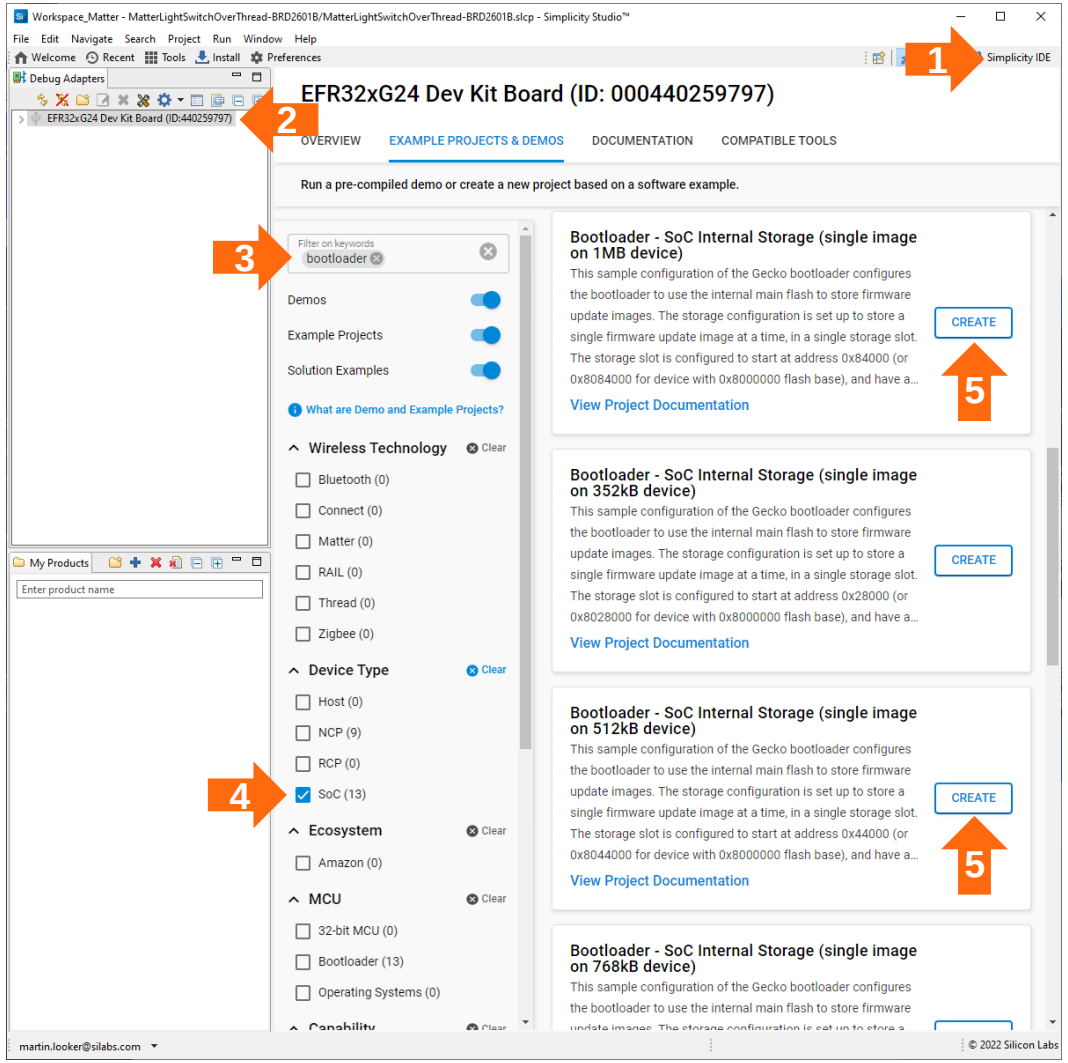
Launcher – Example Projects and Demos

- **Example Projects & Demos** tab:
  - Examples create a project with source code in Simplicity Studio
  - Demos program and run a pre-built binary (and bootloader)
  - Can filter and search examples



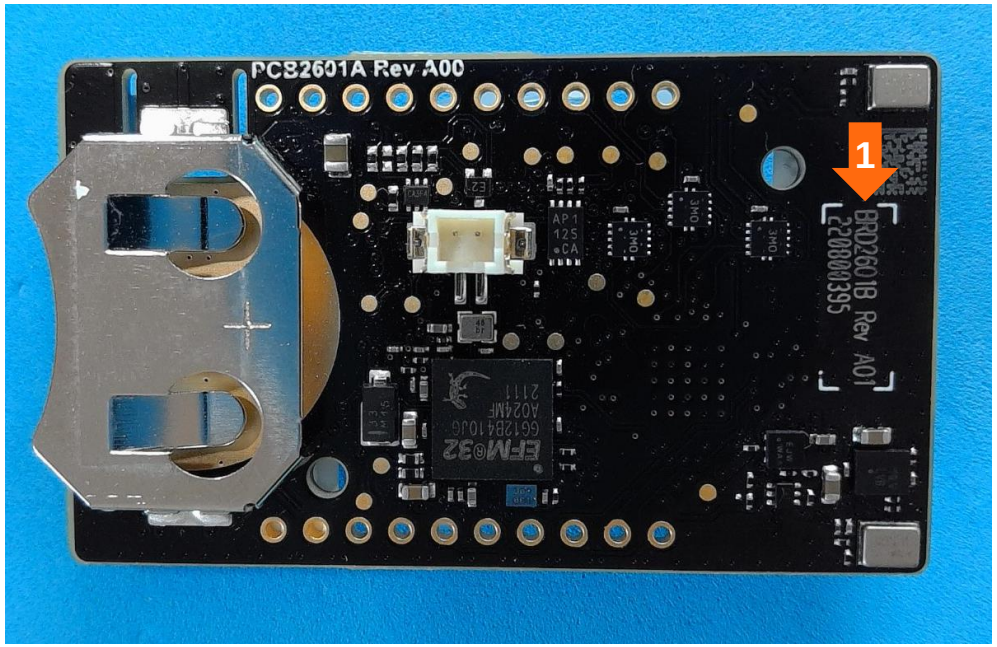
Matter Bootloader – Create Example

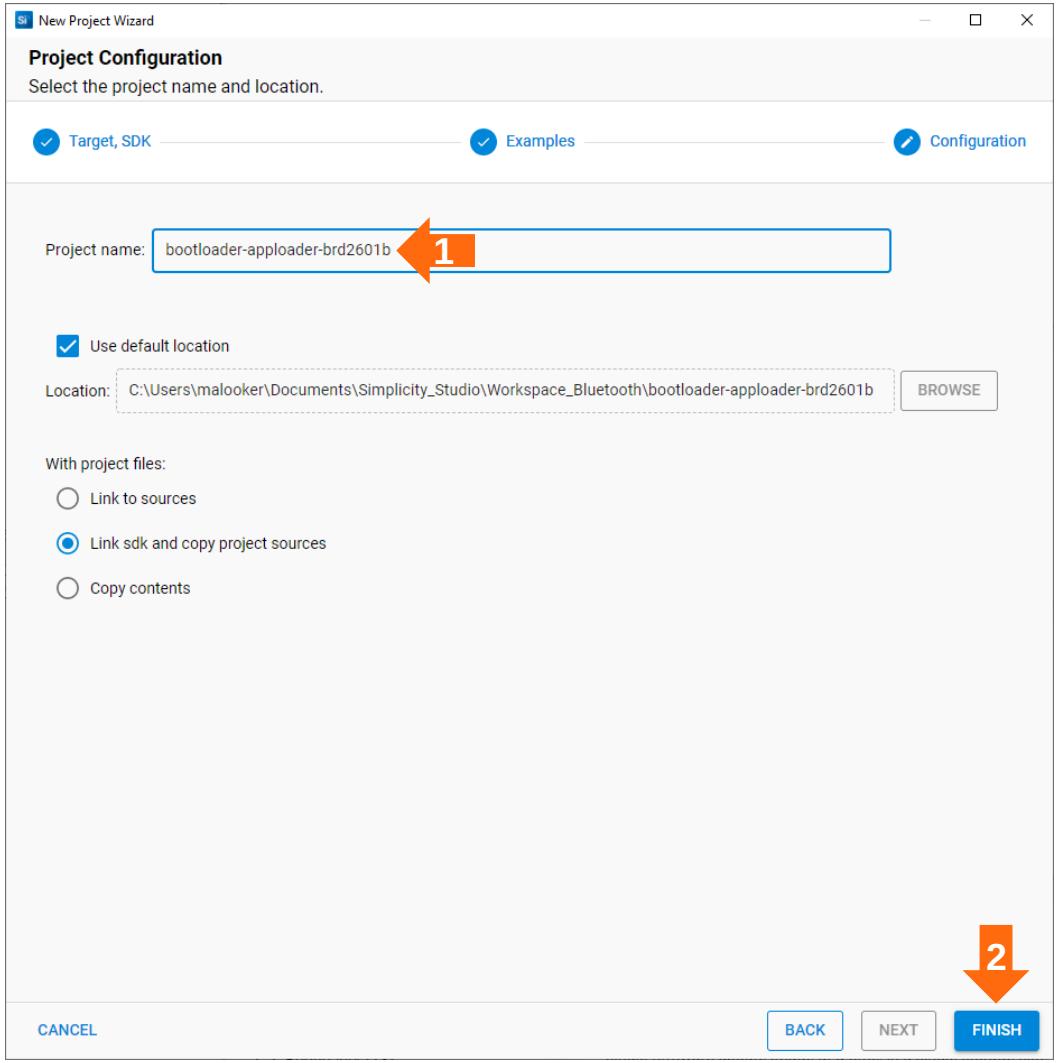
- Examples use different bootloaders
  - The Matter documentation specifies the bootloader to use: https://docs.silabs.com/matter/1.0.1/matter-overview-guides/ota-bootloader
  - Matter SoC projects use:
    Bootloader - SoC Internal Storage (single image on 1MB device)
    or
    Bootloader - SoC Internal Storage (single image on 512kB device)
- To create the bootloader project:
  1. Select the **Launcher** perspective
  2. Select the connected board in the **Debug Adapters**
  3. Type `bootloader` into the **Filter on keywords** box
  4. Check **SoC** under **Device Type**
  5. In **Bootloader - SoC Internal Storage (single image on 1MB device)**
     or **Bootloader - SoC Internal Storage (single image on 512kB device)** example,
     click the **CREATE** button to open the **New Project Wizard**



Bootloader – New Project Wizard

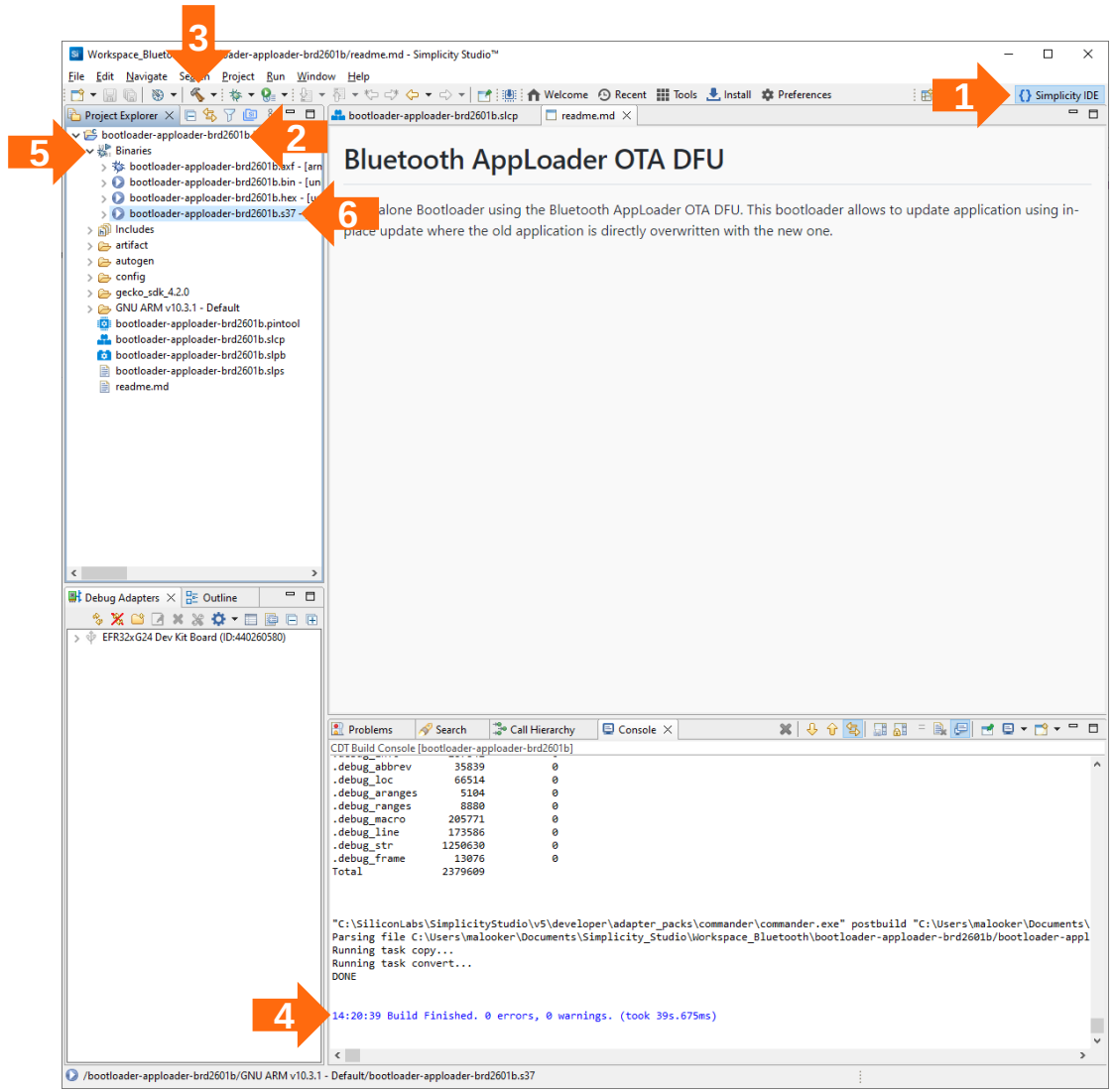
- To complete the wizard:
  1. (Optional) append the board number to the default **Project Name**
     - Board numbers are printed on each board
     - This helps when the same example is created for different boards
  2. Click the **FINISH** button





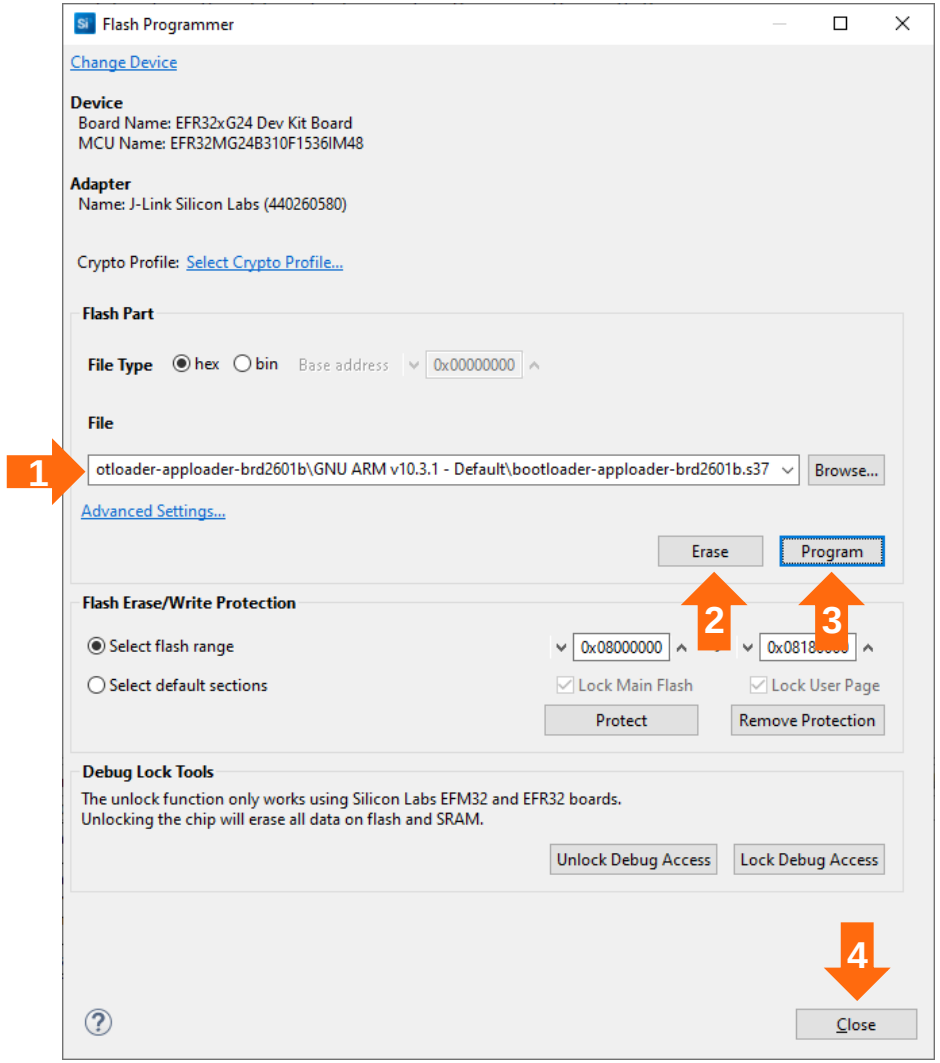
Bootloader – Build

- To build the bootloader:
  1. Switch to the **Simplicity IDE** perspective
     This will happen automatically after creating an example project
  2. Select the project in the **Project Explorer**
  3. Click the hammer button in the toolbar to build
  4. Check the build completes successfully in the **Console**
  5. Expand the `Binaries` folder in the **Project Explorer**
  6. Right-click the `.s37` file in the `Binaries` folder then select **Flash to Device…** to open the **Flash Programmer**



Bootloader – Erase and Flash

- To erase and flash the bootloader using the **Flash Programmer**:
  1. Check the `.s37` binary file is displayed in the **File** edit box
  2. Erase the chip using the **Erase** button
  3. Flash the binary using the **Program** button
  4. Close the **Flash Programmer** using the **Close button**



Thank You

- This is part 2/3 of the Silicon Labs Matter-over-Thread workshop series for Embedded World 2023
  View online at:
  1. https://www.brainshark.com/siliconlabs/EW23-Simplicity-Studio-Install
  2. https://www.brainshark.com/siliconlabs/EW23-Bootloader-SS
  3. https://www.brainshark.com/siliconlabs/EW23-Matter-SS
- Presentations and other files can be found alongside the online videos in the **Attachments** tab