

4:00



WIRELESS COMPUTE

- FEB 22ND | Choosing the Best MCU Platform for Your IoT Devices
- MAR 28TH | EFR and EFM: An Optimized Platform for AI/ML at the Edge
- MAY 2ND | Unboxing our New 32-bit Microcontroller
- JUN 6TH | Simplicity Software and Tools

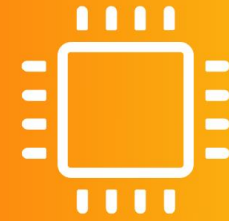
Wireless Tech Talk: Development Tools – Simplicity Studio

Andrew Escamilla – Marketing Product Manager

Martin Looker – Training Applications Manager

June 2024

tech talks



WIRELESS COMPUTE

Agenda

Simplicity Studio Tech Talk

Project Generation

Bluetooth GATT Configurator

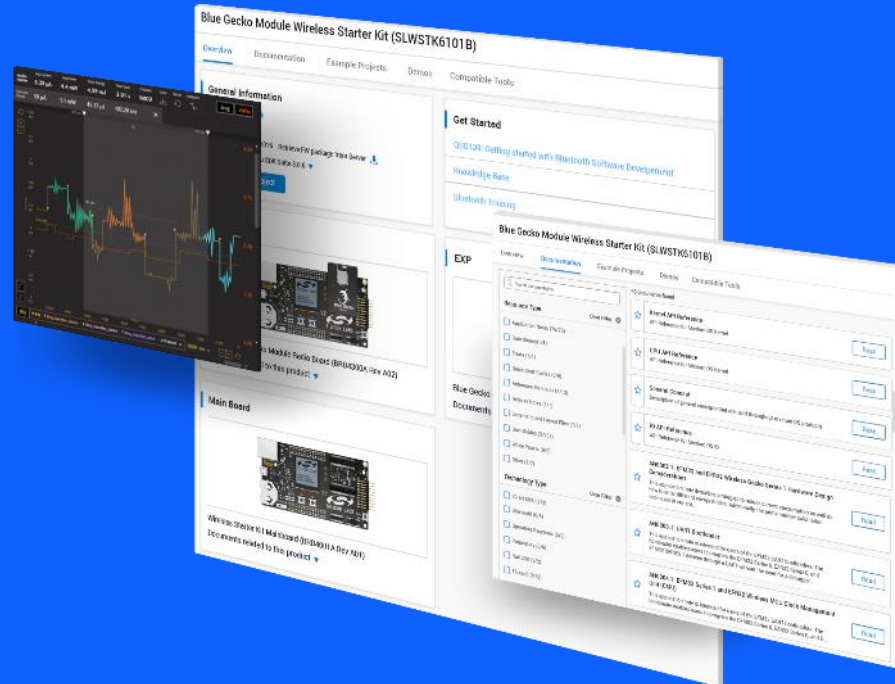
Ease of Development Tools

Energy Profiler

Network Analyzer

Q&A

Simplified Developer Experience



14
Simplicity
Silicon
2019-2024
Studio 5

Simplicity Studio 5

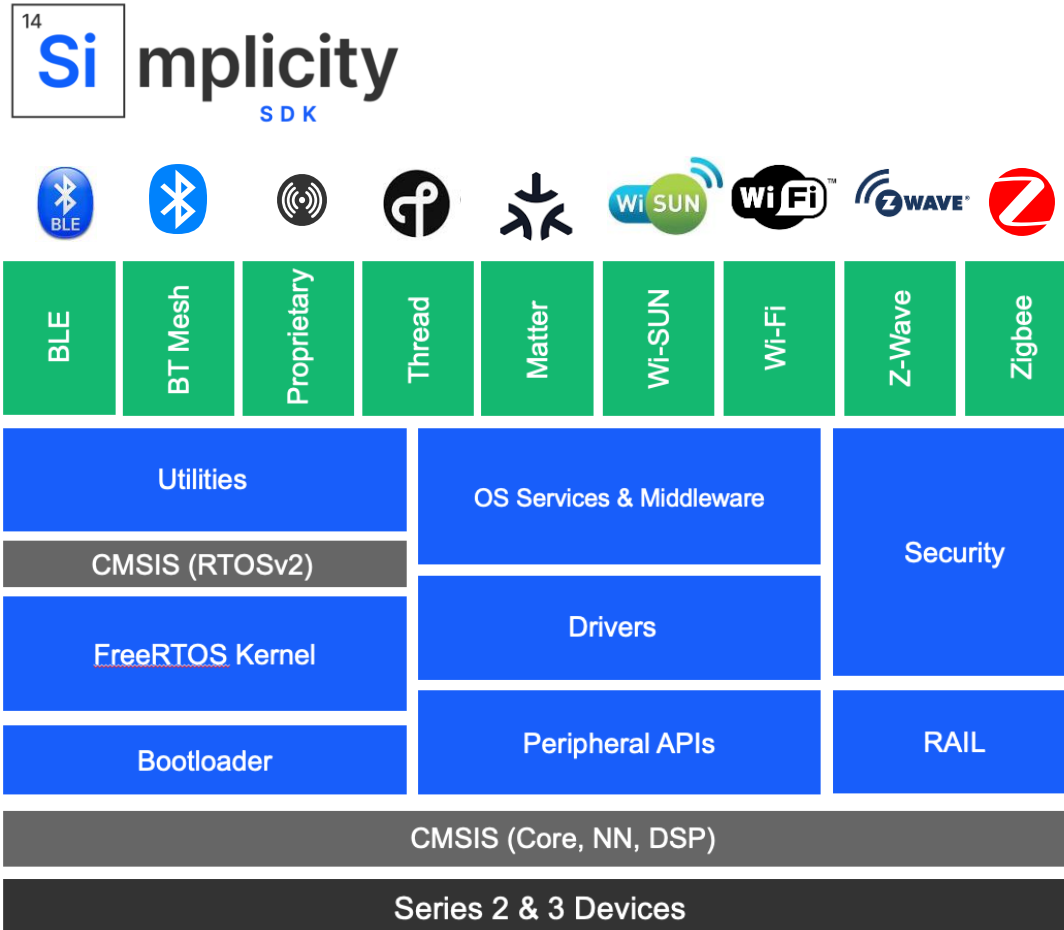
Interface

- Intuitive out-of-the-box experience
- Quick access to developer resources
- Linux, Mac & Windows

Tools

- Configuration Tools
- Graphical Hardware Configurator
- Pin Tool
- Energy Profiler – visual energy analysis
- Network Analyzer – packet capture & decode

Software Solution Differentiators



All wireless stacks integrated into a single SDK

- **Production-ready:** certified, full featured and up-to-date with latest specs
- **Proven:** customer deployment and long-term, large-scale testing
- **Secure:** Integrated with secure vault
- **Quick start:** 100's of sample apps as a starting point

Common software platform for all products

- **Portable:** common APIs across all hardware platforms
- **Low-power:** Power Manager utility enables lowest energy mode
- **Secure:** Secure boot, secure OTA, run-time integrity checking
- **Optimized radio:** RAIL manages the complexity and provides simple APIs to stacks and customer applications

Developer Experience

- Consistent tools and workflows across technologies
- Same SW for all HW: learn it once and reuse on next project

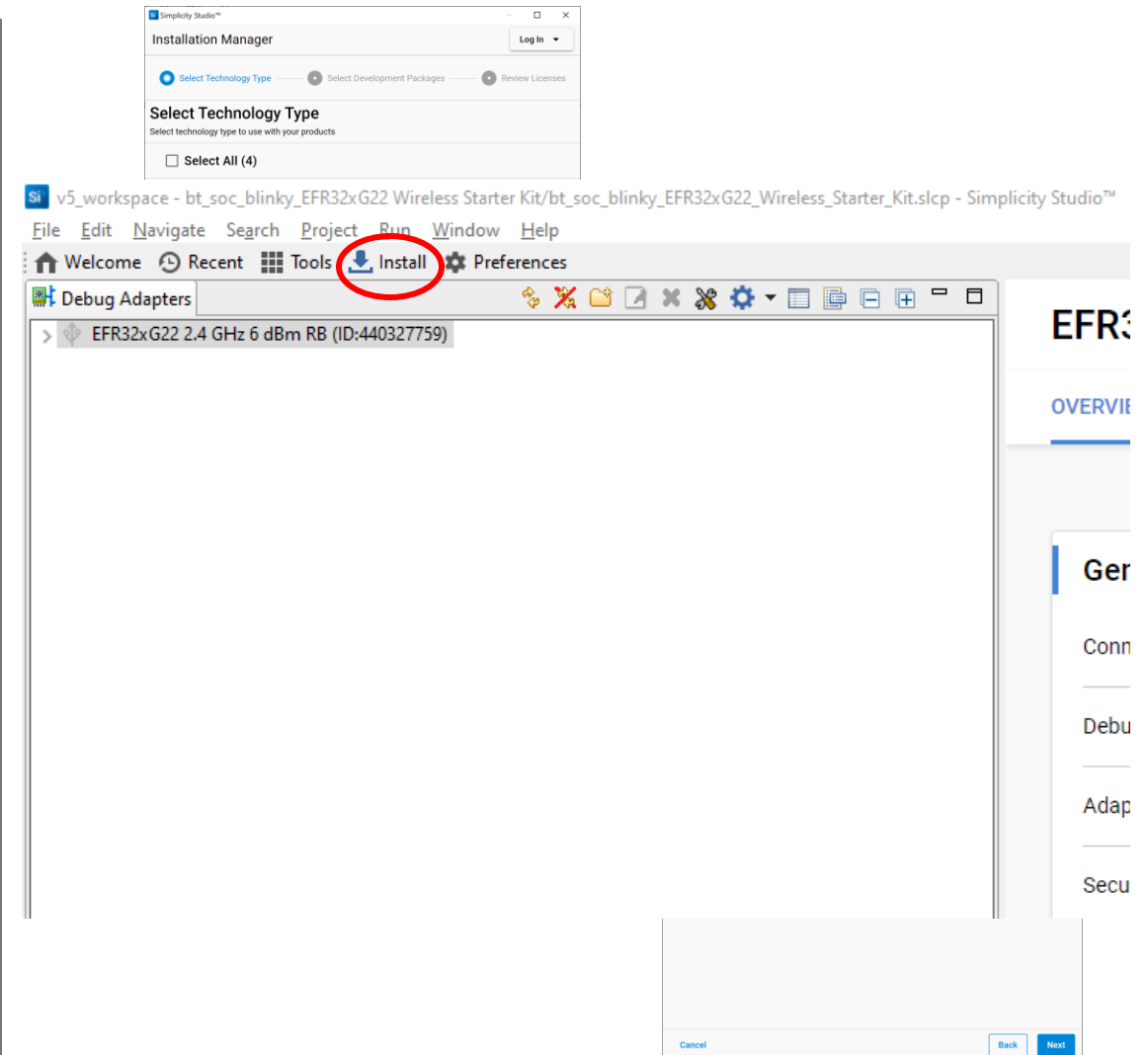
Our SW is tightly coupled with our HW to enable power & performance differentiation

Project Generation



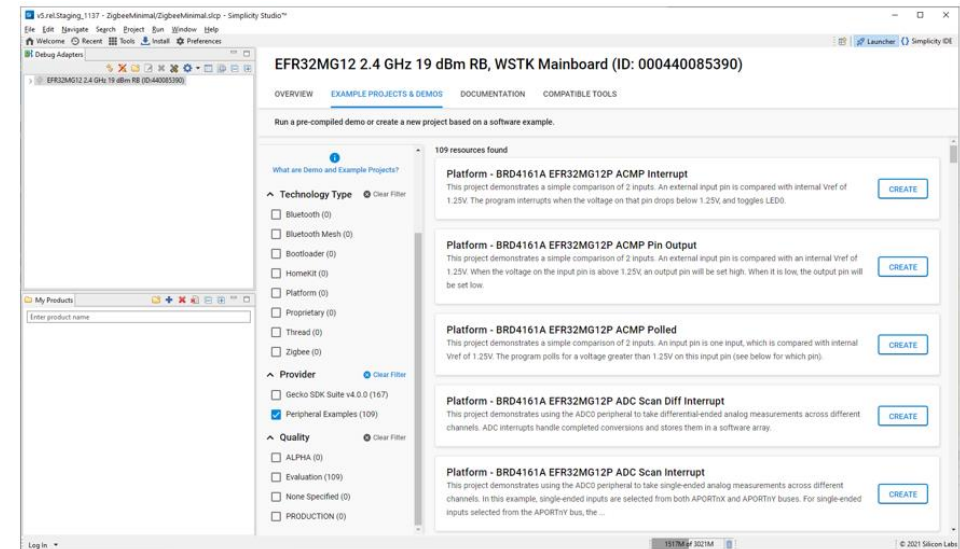
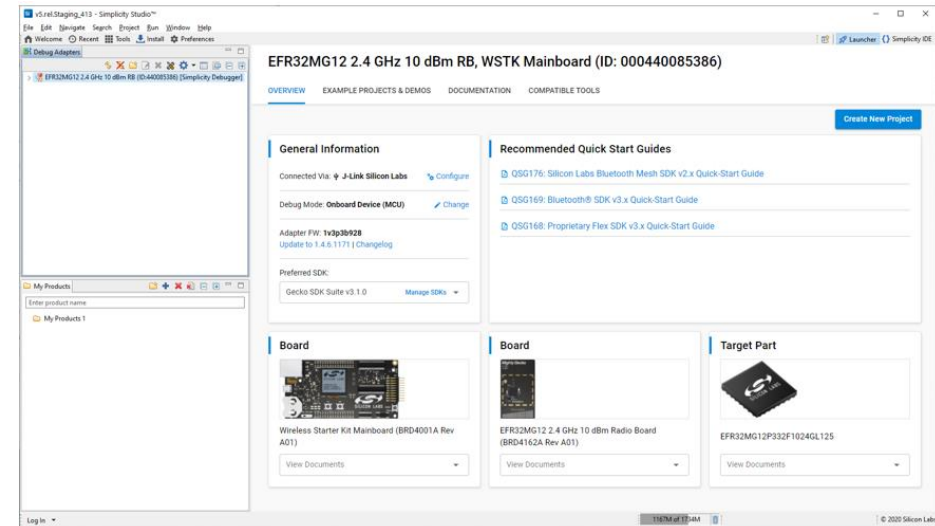
Installation/Package Manager

- **Guided install of SDKs and protocol-specific tools**
 - Kit/Part Detection
 - Technology Type
- **Quick Access to Development Resources**
 - Easy access to guides, tutorial, and documents
 - Pre-filtered for the target device
 - Search and filter for docs, examples and demos
 - Documents synchronized with docs.silabs.com
- **Access Control**
 - Restricted technologies based on user credentials
 - Apple Homekit
 - Beta availability of devices
- **Post-Installation Management**
 - Update existing tools
 - Install newly released SDKs
 - Uninstall unnecessary tools



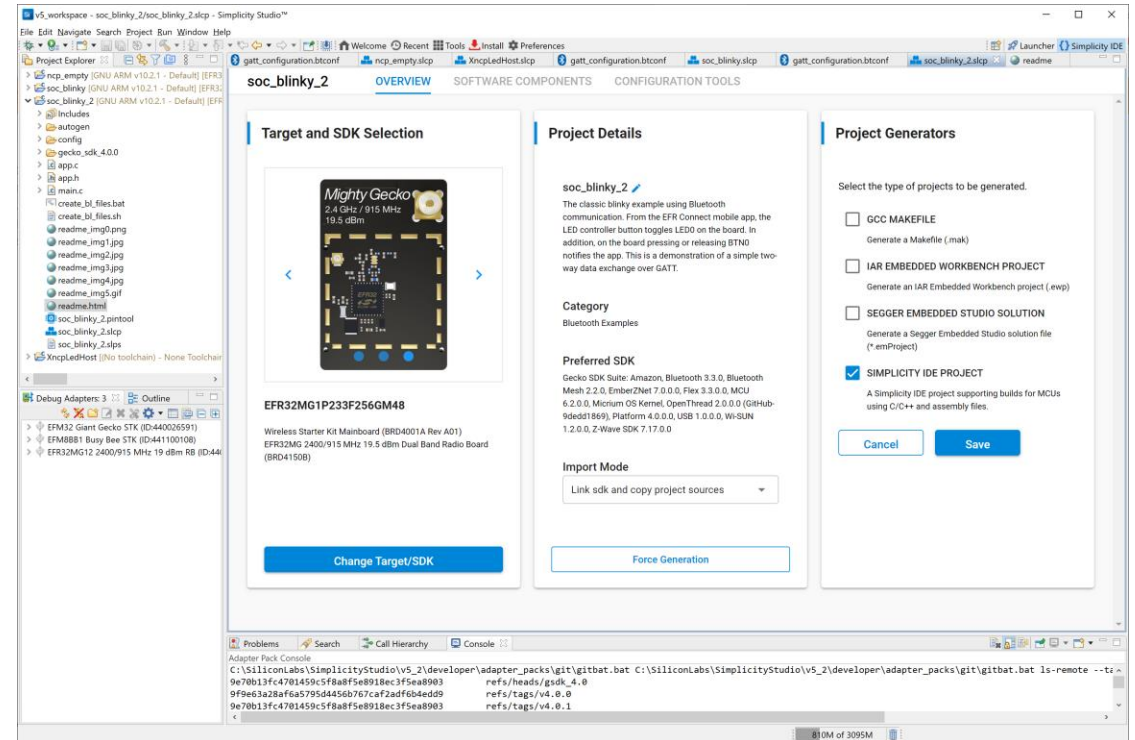
Launcher Overview

- **Central hub for device-specific information**
 - Examples, documents, and tools
- **Context-Filtered Information**
 - Filtering options by technology (Bluetooth, Zigbee, etc)
- **Enables exploration of technology with or without a connected device**
- **Facilitates efficient project development**
 - Reduces time spent searching for device-specific information



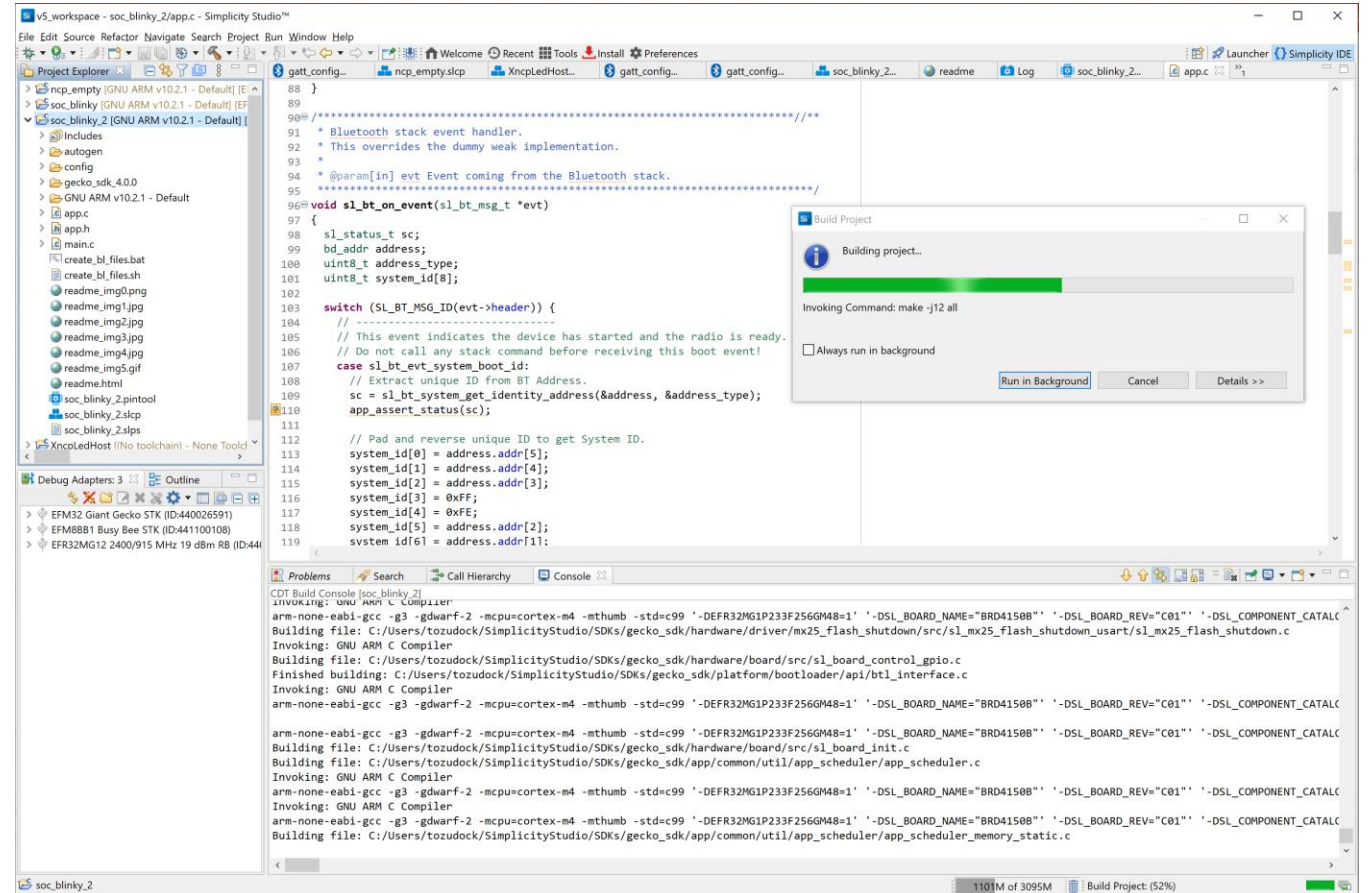
Project Configurator

- Central hub for managing project configurations
- Allows to switch between different target devices
- Enables SDK Management
- Supports project generation for Studio IDE and other (if desired)
- Project Customization



Simplicity Studio Eclipse IDE

- **Simplicity Studio v5 features an Eclipse based IDE environment**
 - **Code Editor:** For writing and editing software
 - **Build System:** Supports compiling and building projects
 - **Flash Tools:** Allows programming firmware onto devices
 - **Debugging:** Provides debugging capabilities for identifying and fixing issues



Project Generation Demo

SILICON LABS Products ▾ Applications ▾ Ecosystems ▾ Resources ▾ Company ▾ English ▾

Home // Developers // Simplicity Studio

Simplicity Studio Software

Simplicity Studio is the unified development environment for all Silicon Labs technologies, SoCs, and modules. It provides you with access to the target device-specific web and SDK resources, software and hardware configuration tools, and an integrated development environment (IDE) featuring industry-standard code editors, compilers, and debuggers. With Simplicity Studio, you get a complete set of advanced value-add tools for network analysis and code-correlated energy profiling.

No matter your experience level, Simplicity Studio takes you through an optimized workflow, enabling quicker project progression, device configuration, and application optimization. Simplicity Studio 5 is built on Eclipse and C/C++ Development Tooling (CDT), adding robustness, improving performance, and allowing you to customize your development experience using plug-ins from the Eclipse Marketplace.

Simplicity Studio version 5 supports Silicon Labs [Secure Vault](#), the most advanced security software suite with the highest [PSA Certification Level 3](#). With Secure Vault, you can protect your IoT devices against escalating threats while conforming to the quickly evolving cyber-security regulations. The IDE also includes a UI engine for modern, responsive, web-like user interfaces.

Download the Full Online Installer Version of Simplicity Studio 5

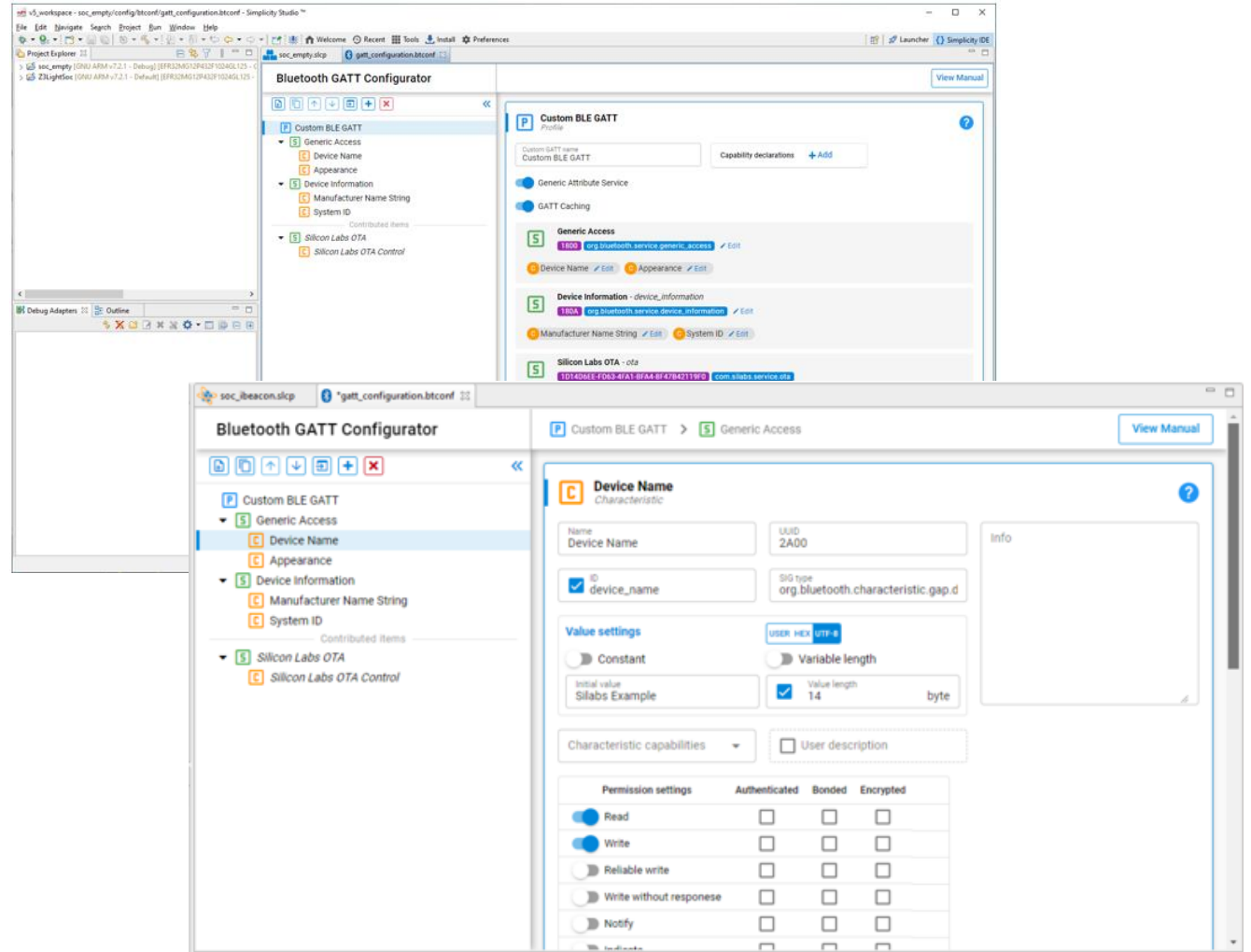
Contact Us

Bluetooth GATT Configurator



Bluetooth GATT Configurator

- **Enhanced visualization of GATT design**
 - simplifies building customized Bluetooth GATT database for projects
- **Allows import and adoption of standard GATT Profiles**
 - Services, and Characteristics (e.g. Heart Rate)
- **More user-friendly than managing Services and Characteristics in source code**
- **Integrated access to information on Bluetooth SIG defined elements**
 - Profiles, Services, Characteristics
- **Allows defining custom Services and Characteristics**
 - [UG438: GATT Configurator User's Guide for Bluetooth® LE and Bluetooth Mesh](#)



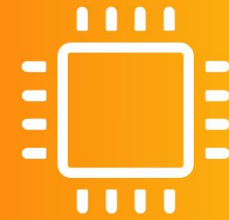
Bluetooth GATT Configurator Demo

The screenshot displays the Simplicity Studio IDE interface for the `brd4186c_bt_soc_blinky` project. The main workspace is divided into several panels:

- Target and Tool Settings:** Shows a photograph of the `EFR32xG24B` development board. Below the image, the board is identified as `EFR32MG24B210F1536IM48` (Wireless Pro Kit Mainboard) and lists the **Selected SDK** as `Gecko SDK Suite v4.4.3`.
- Project Details:** Provides a description of the project as a classic blinky example using Bluetooth communication. It lists the **Category** as `Bluetooth Examples` and the **Preferred SDK** details, including Gecko SDK Suite v4.4.3, Bluetooth 7.1.1, and various other components. The **Import Mode** is set to `Link sdk and copy project sources`.
- Quick Links:** Offers shortcuts to `Software Components`, `app.c`, `main.c`, `readme.md`, `Bluetooth GATT Configurator`, and `Pin Tool`.
- Debug Adapters:** Shows the selected adapter as `EFR32xG24 2.4 GHz 10 dBm RB (ID:440306839)`.
- Adapter Pack Console:** Displays the following JSON output:

```
Adapter Pack Console
inferPart[0]=yes
boardId[1]=4186C
boardName[1]=BRD4186C Rev. A01
boardDescription[1]=EFR32xG24 2.4 GHz 10 dBm Radio Board
boardRevision[1]=A01
boardSerial[1]=220808447
boardDate[1]=2022/3/30
inferPart[1]=yes
}
DONE
```

Q&A



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Ease of Development

- Software Components/ Pin Tool
- Visual Studio Code Project Generation
- Simplicity Connect Mobile App



Software Components

■ Software Components Tab

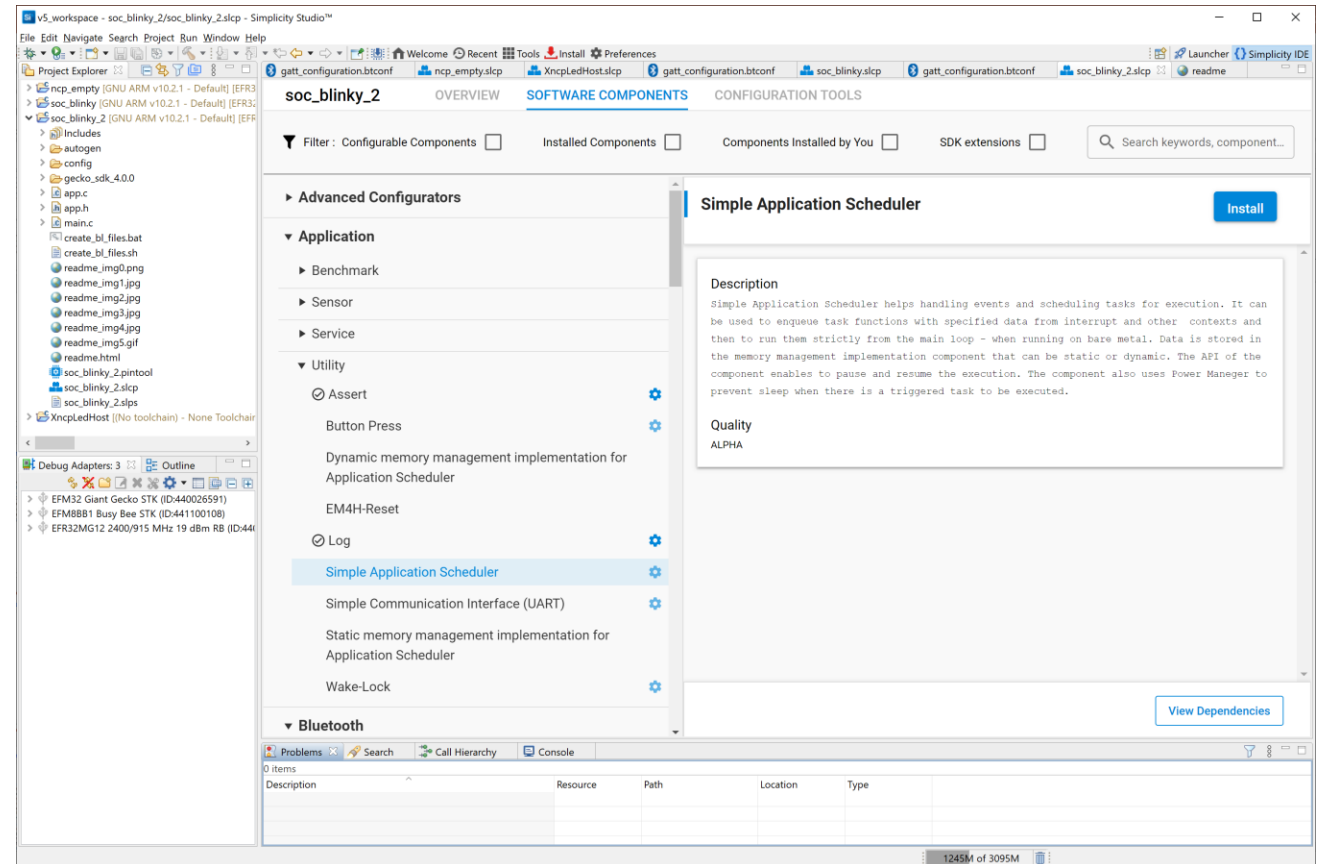
- Developers can search for desired technologies
- Components can be easily added to an application
- Modular and adjustable for specific needs of a project

■ Covers Various Functionalities

- Peripheral drivers, middleware, and application-specific features
- Supports a wide array of Silicon Labs devices, including microcontrollers and wireless SoCs

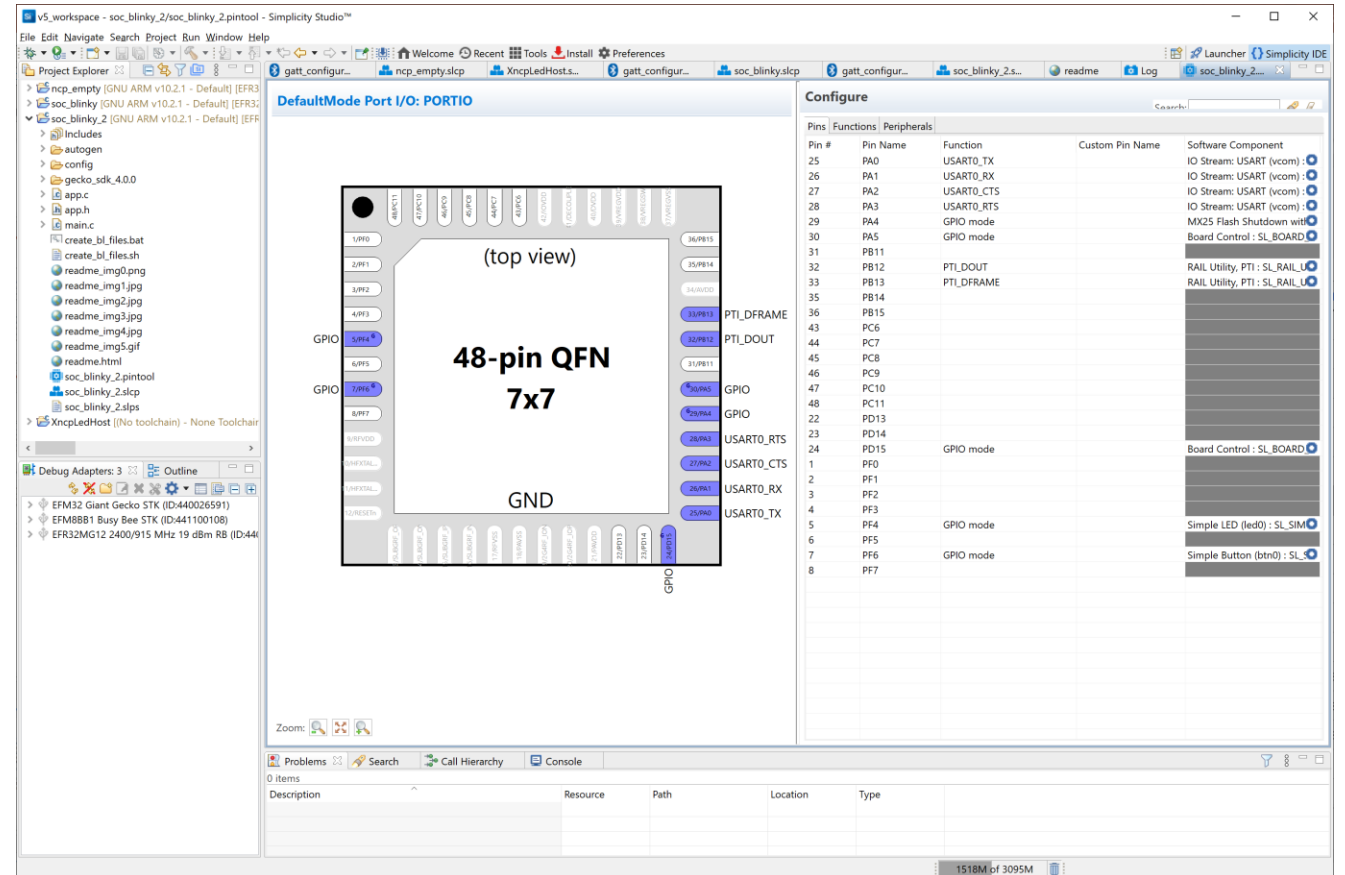
■ Improved Workflow

- Streamlines the addition of new functionalities to projects
- Flexible way to customize software and hardware solutions
- Simplifies the development process by reducing the need for manual coding



Pin Tool

- **Enables developers to:**
 - Assign peripheral function to designated pins
 - Enable/Disable pins
 - Define pin function
- **Data-Driven Approach:**
 - Identifies compatible SW components dynamically using SDK metadata
- **Reduces time spent on HW configuration**
 - Streamlines the definition of pin functions
 - Assists in prototyping during board bring-up
 - Select and assign compatible SW components to specific pins/peripherals



Simplicity Studio for VS Code

- **Modern and Lightweight**
 - Providing a smoother experience
- **Simplicity Studio for VS Code Extension**
 - Available on Visual Studio Code Marketplace
- **Powerful and user-friendly Debugging Tools**
 - Enables Build/Flash/Debug from within VS Code
- **Integrated Terminal**
 - Enables users to run command line tools and scripts without leaving the IDE
- **Cross-Platform Support**
 - Windows, macOS, and Linux



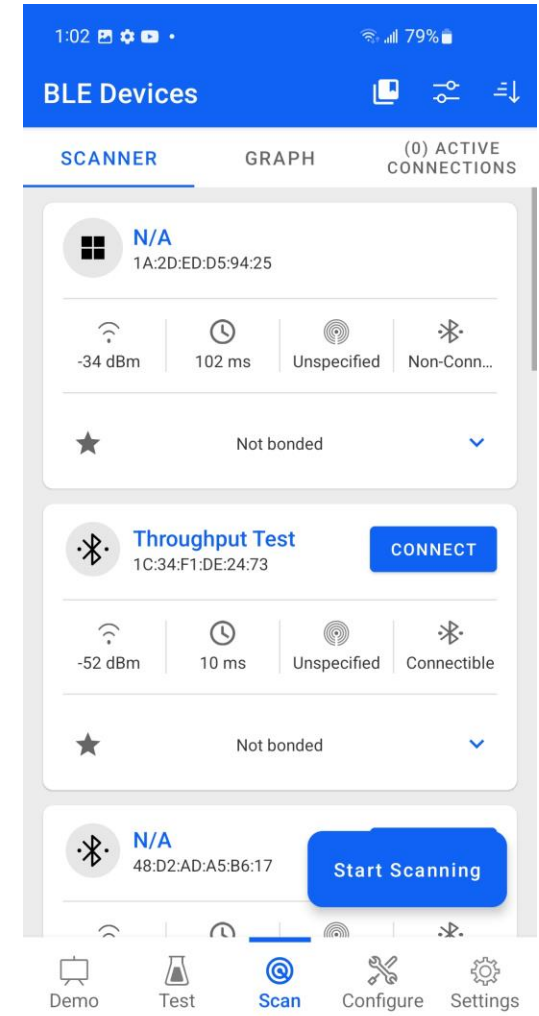
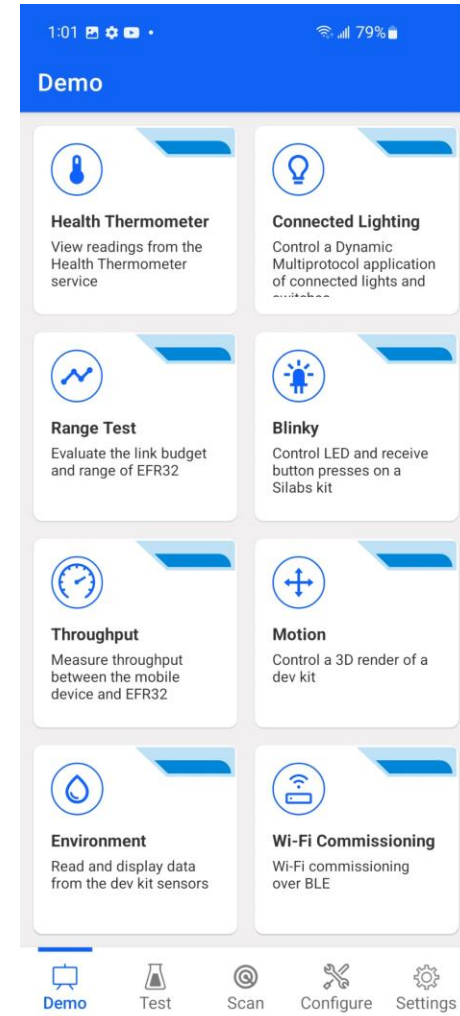
Simplicity Connect Mobile App

Test and Debug

- BLE embedded application code, OTA FW updates, data throughput, and interoperability with Android and iOS mobile devices

Main Navigation Bar w/ distinct purpose views

- Demo:** Ready-to-go demos with a matching sample app on Simplicity SDK pre-compiled for numerous kits
- Scan:** for searching, connecting and interacting with remote devices
- Configure:** Local Advertise and GATT Configurator for mobile phone
- Test:** (IOP) to assess behavior against Silicon Labs' Bluetooth SW and HW
- Settings:** For System configuration and app information



Ease of Development Tools Demo

The screenshot displays the SImplicity Studio IDE interface for a project named 'brd4186c_bt_soc_blinky'. The interface is divided into several panels:

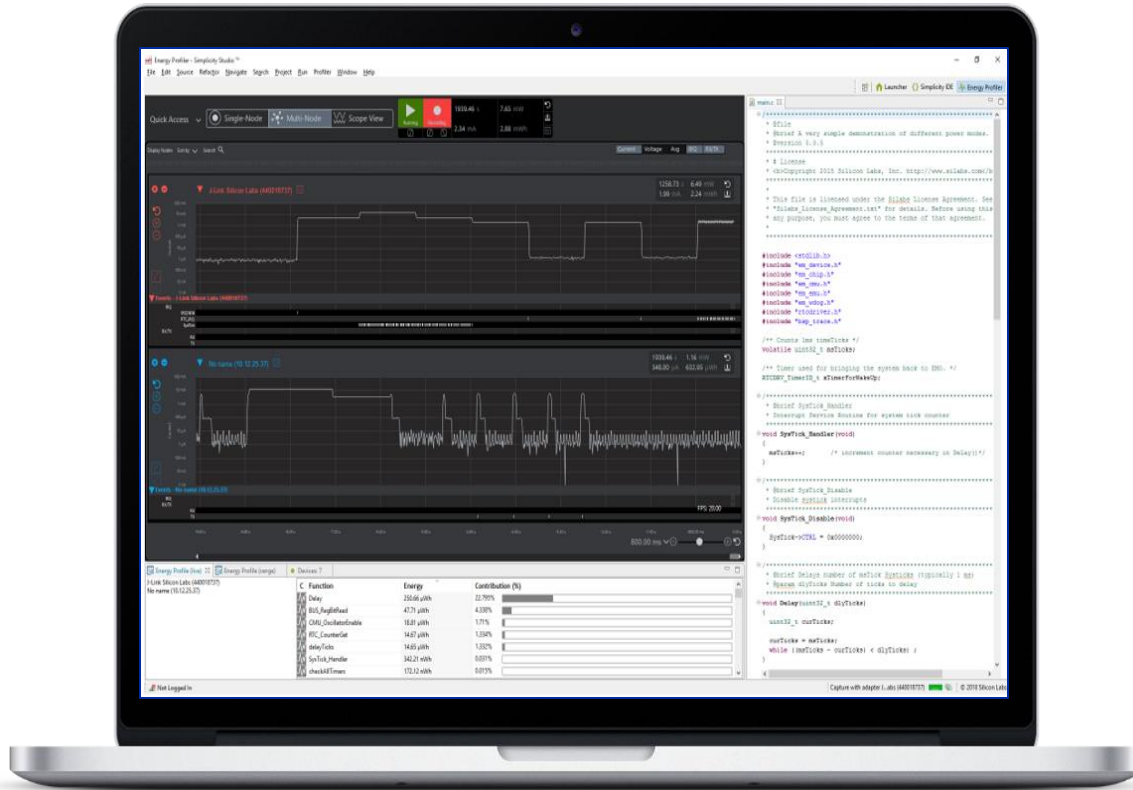
- Project Explorer:** Shows the project's file structure, including folders like 'Binaries', 'Includes', 'autogen', 'config', 'gecko_sdk_4.4.3', and 'GNU ARM v12.2.1 - Default'. It also lists various source files and build artifacts.
- Target and Tool Settings:** Features a central image of the EFR32xG24B development board. Below the image, it specifies the target: 'EFR32MG24B210F1536IM48' (EFR32xG24 2.4 GHz 10 dBm Radio Board [BRD4186C Rev A01] Wireless Pro Kit Mainboard [BRD4002A Rev A06]). It also lists the 'Selected SDK' as 'Gecko SDK Suite v4.4.3' with various Bluetooth and mesh protocols.
- Project Details:** Provides a description of the project as a 'classic blinky example using Bluetooth communication' and lists 'Bluetooth Examples' as the category. It includes a 'Preferred SDK' section and an 'Import Mode' dropdown set to 'Link sdk and copy project sources'.
- Quick Links:** Offers shortcuts to 'Software Components', 'main.c', 'Pin Tool', 'app.c', 'Bluetooth GATT Configurator', and 'readme.md'.
- Console:** Shows the output of the build process, including a table of build statistics and a final message: '16:56:32 Build Finished. 0 errors, 0 warnings. (took 47s.372ms)'.

File	Count	Size
.debug_str	214389	0
.debug_frame	84676	0
.debug_loclists	96890	0
.debug_rnglists	24960	0
Total	2510717	

Energy Profiler



Energy Profiler



- **Analyze real-time current consumption**
 - Peak current consumption
 - Sleep mode current measurement.
- **Correlate energy consumption to code**
 - Enabling application developers to focus their efforts where they will have the greatest impact
- **Simple Logic Analyzer**
 - Interfaces with pins, buttons and/or LEDs
 - Set triggers to pause the graph of an event you wish to capture or to start and stop recording
- **Ability to monitor multiple nodes**
- **Improve battery life**

Advanced real-time energy profiling tools for optimization and debugging

Energy Profiler Demo

The screenshot displays the Energy Profiler application in Simplicity Studio. The main window shows a current waveform for channel CH4, with a scale of 1 mA. The waveform shows a series of pulses. The top status bar indicates the device is in a 'Receiving' state with a total energy consumption of 5.61 mWh and an average current of 1.72 mA. The bottom status bar shows the device is 'Running' with a total energy consumption of 5.64 mWh and an average current of 1.73 mA.

The Energy Profile table at the bottom of the window shows the following data:

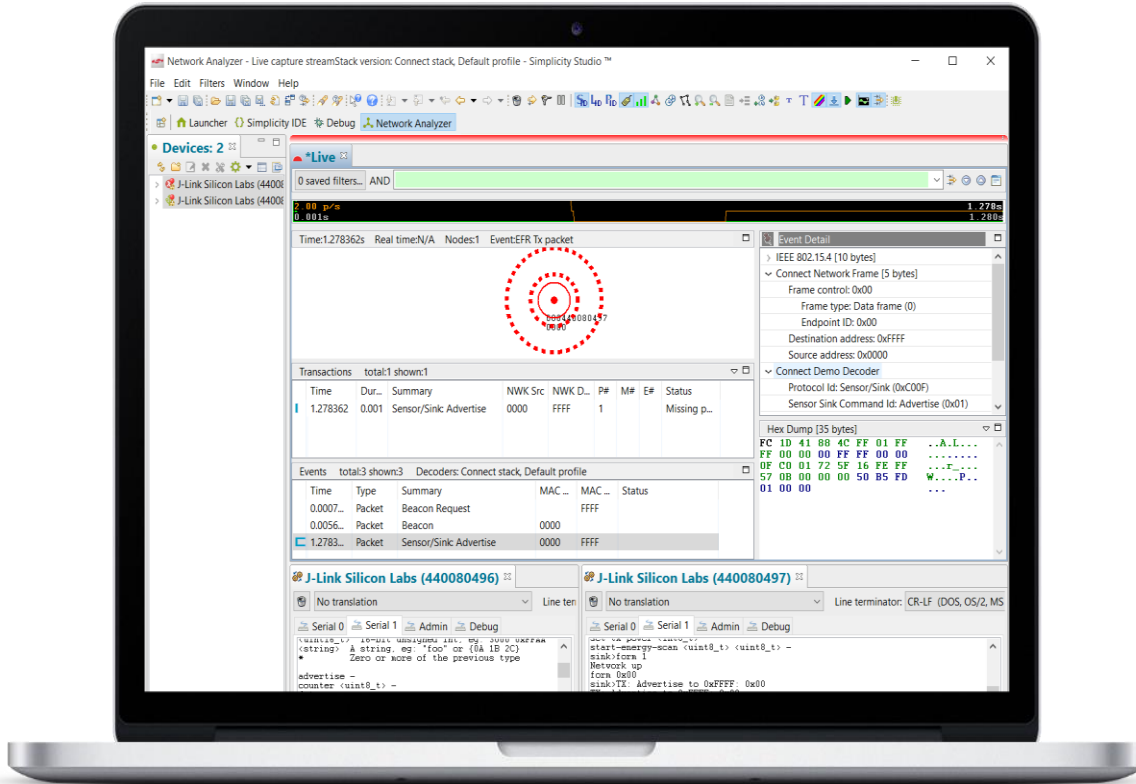
C	Function	Energy	Contribution (%)
RAILINT_23dd967899ef3ae217741def63f11...		0.00 Wh	0.0%
RAILINT_2c0c7ba0065447faa0ab7205349f5...		0.00 Wh	0.0%
RAILINT_3209015e469feb3aebf12c10b838...		0.00 Wh	0.0%
RAILINT_960a202b0ca4435a53f5e11987d8...		0.00 Wh	0.0%
RAILINT_b693f7d424389daf06cac15e5c7b8...		0.00 Wh	0.0%
RAILINT_eff06dff73e0f32be1552c4011c2de...		0.00 Wh	0.0%

```
1 @file
2 * @brief Core application logic.
3 * @brief Core application logic.
4 *
5 * # License
6 * <b>Copyright 2021 Silicon Laboratories I
7 *
8 *
9 * SPDX-License-Identifier: Zlib
10 *
11 * The licensor of this software is Silicon
12 *
13 * This software is provided 'as-is', with
14 * warranty. In no event will the authors b
15 * arising from the use of this software.
16 *
17 * Permission is granted to anyone to use t
18 * including commercial applications, and t
19 * freely, subject to the following restric
20 *
21 * 1. The origin of this software must not
22 * claim that you wrote the original sof
23 * in a product, an acknowledgment in th
24 * appreciated but is not required.
25 * 2. Altered source versions must be plain
26 * misrepresented as being the original
27 * 3. This notice may not be removed or alt
28 *
29 *
30 #include "em_common.h"
31 #include "app_assert.h"
32 #include "app_log.h"
33 #include "sl_bluetooth.h"
34 #include "gatt_db.h"
35 #include "app.h"
36 #include "sl_simple_button_instances.h"
37 #include "sl_simple_led_instances.h"
38
39 // The advertising set handle allocated fro
40 static uint8_t advertising_set_handle = 0xf
41
42 static bool report_button_flag = false;
43 static bool battery_level_flag = false;
44
45 // Updates the Report Button characteristic
46 static sl_status_t update_report_button_cha
47 // Sends notification of the Report Button
48 static sl_status_t send_report_button_notif
49
50 // Updates the Battery Level characteristic
51 static sl_status_t update_battery_level_cha
52 // Sends notification of the Battery Level
53 static sl_status_t send_battery_level_notif
54
55 //*****
56 * Application Init.
57 *
58 #SL_WEAK void app_init(void)
59 {
60 // Make sure there will be no button even
61 sl_button_disable(SL_SIMPLE_BUTTON_INSTAN
62
63
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```


Network Analyzer



Network Analyzer



■ Debugging of Complex Wireless Systems

- Captures a trace of wireless activity
- Can be examined in detail; either live or at a later time

■ More than a packet sniffer

- Works with the packet trace interface (PTI)
- Provides Network wide view of what's happening
- Available on the PTI-enabled Silicon Labs Wireless SoCs and modules

■ Direct Feedback from radio device(s)

- Detailed package Tx/Rx data
- Timestamps
- Link Quality (LQI)
- Receive Sensitivity (RSSI)
- CRC pass/fail results

Advanced system-wide network debug and support

Network Analyzer with Packet Trace Interface

- **Network Analyzer works with Packet Trace Interface**
 - Outputs every packet TX/RX with link quality
 - Can be used to output application debug statements
- **Easy to enable on Silicon Labs HW Kits and Custom Hardware**
 1. Connect the PTI signals from the EFR device to the Silicon Labs Debug Adapter
 2. Enable PTI in the Firmware through Simplicity Studio
 3. Launch the Network Analyzer
- **Silicon Labs Debug Adapters with PTI**
 - Si-MB4002A Wireless Pro Kit Mainboard
 - Si-DBG1015A Simplicity Link Debugger

Setup for Customer PCB

Si-MB4002A

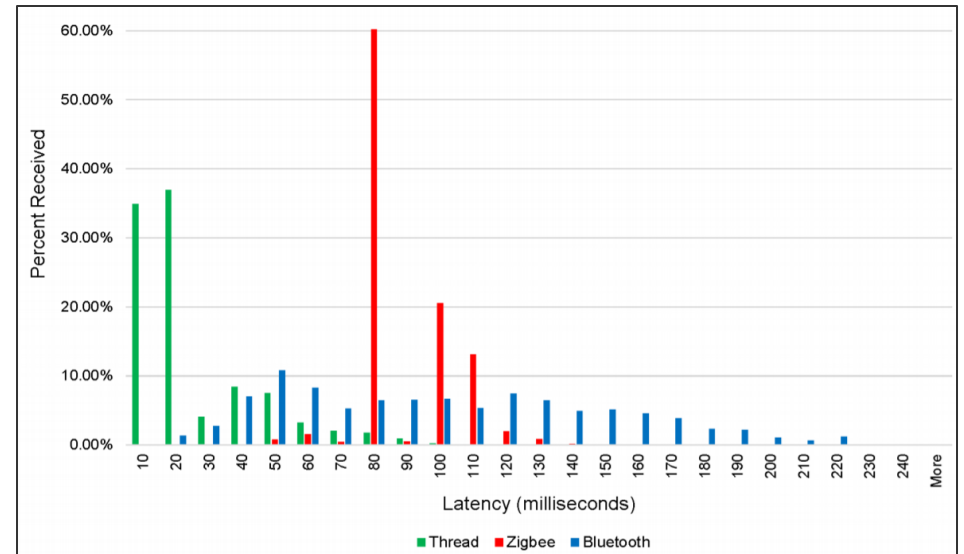
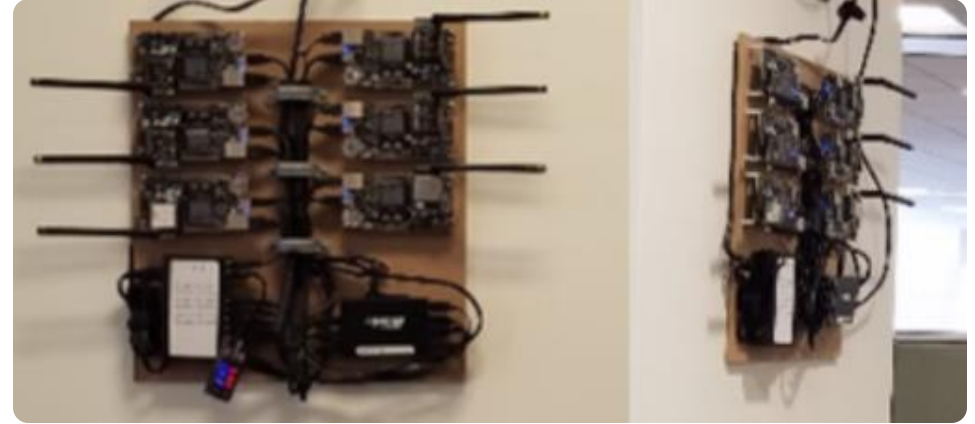


PTI_DATA
PTI_SYNC
PTI_CLK

Custom
PCB

Network Analyzer enables Large Network Testing

- **Multi-Node Monitoring**
 - Via ethernet to allow evaluation of large/Distributed networks
- **Ethernet interface on Silicon Labs Wireless Pro Kit Mainboard (Si-MB4002A) allows scalability for large networks**
 - Used externally by some of our largest customers for test automation
- **We are the only company publicly publishing mesh network performance data**
 - [Zigbee](#)
 - [Thread](#)
 - [Bluetooth Mesh](#)
 - [Comparison](#)



Network Analyzer Demo

The screenshot displays the Network Analyzer interface with a live capture stream. The main window shows a signal waveform at the top, followed by a list of events. A red arrow points to a specific event at Time: 0.001094s, identified as a BLE Advertisement. The event details pane on the right shows the structure of the advertisement, including the BLE Advertisement Header (14 bytes) and Radio Info EFR32 (12 bytes). Below this, a hex dump of the captured data is visible, showing the raw bytes of the advertisement packet.

2 saved filters... AND transaction.type != BleAdv

Time: 0.001094s Real time: N/A Nodes: 2 Event: BLE Advertisement

000440306839

Time	Duration	Summary	NWK Src	NWK Dest	P#	M#	E#	Error Status	Warning Sta...
------	----------	---------	---------	----------	----	----	----	--------------	----------------

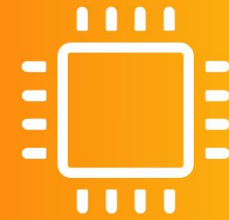
Hex Dump [27 bytes]

```
F0 03 0C 2D 7F 4F F3 13 60 B7 20 DE F1 ... 0...h (...  
34 1C C9 23 00 F9 D3 D6 BE 89 8E 00 03 4...#.....  
69                                     i
```

Additional Resources

- [Download Simplicity Studio](#)
- [Simplicity Studio 5 Users Guide](#)
- [Energy Profiler Users Guide](#)
- [Network Analyzer Users Guide](#)
- [GATT Configurator User Guide](#)
- [Community - Silicon Labs \(silabs.com\)](#)

Q&A



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