



AN1209: Dynamic Multiprotocol Development with *Bluetooth*® and Silicon Labs Connect

This application note provides details on developing Dynamic Multiprotocol applications using Bluetooth and Connect. This document describes how to configure applications in Simplicity Studio using Connect in the Silicon Labs Flex SDK. For details on Dynamic Multiprotocol Application development that apply to all protocol combinations, as well as for underlying information specific to 802.15.4 protocols, see *UG305: Dynamic Multiprotocol User's Guide*.

Proprietary is supported on all EFR32FG devices. For others, check the device's data sheet under Ordering Information > Protocol Stack to see if Proprietary is supported. In Proprietary SDK version 2.7.n, Connect is not supported on EFR32xG22.

KEY POINTS

- About the Connect DMP examples.
- Building Connect/Bluetooth example files.
- Creating a DMP project.

1 Introduction

This application note provides details on how to build and configure a Connect/Bluetooth LE Dynamic Multiprotocol application. It is intended to be used when developing your own multiprotocol implementations.

Note: The Connect dynamic multiprotocol solution is currently only supported for SoC architectures. Support for NCP architectures is not yet available. Please contact Silicon Labs Sales for more information on our multiprotocol software roadmap.

1.1 Resources

- *UG305: Dynamic Multiprotocol User's Guide* provides details on:
 - Dynamic Multiprotocol Architecture
 - Radio Scheduler operation (with examples)
 - Task Priority management
- *AN1135: Using Third Generation Non-Volatile Memory (NVM3) Data Storage* explains how NVM3 can be used as non-volatile data storage in Dynamic Multiprotocol applications with Connect and Bluetooth.

1.2 Development Environment Requirements

The required hardware for the example implementation is EFR32xG12xG13 using the sub-gigahertz range.

Along with the Simplicity Studio development environment, required software tools are:

- Silicon Labs Flex SDK version 2.6.0 or higher
- Bluetooth SDK version 2.12.0 or higher
- Micrium OS-5 kernel.

2 Building and Running Connect/Bluetooth Examples

To work with Connect/Bluetooth dynamic multiprotocol applications you must install both the Silicon Labs Flex SDK version 2.6.0.0 or higher, and the Bluetooth SDK version 2.12.0 or higher. The Micrium kernel is installed along with the Flex SDK.

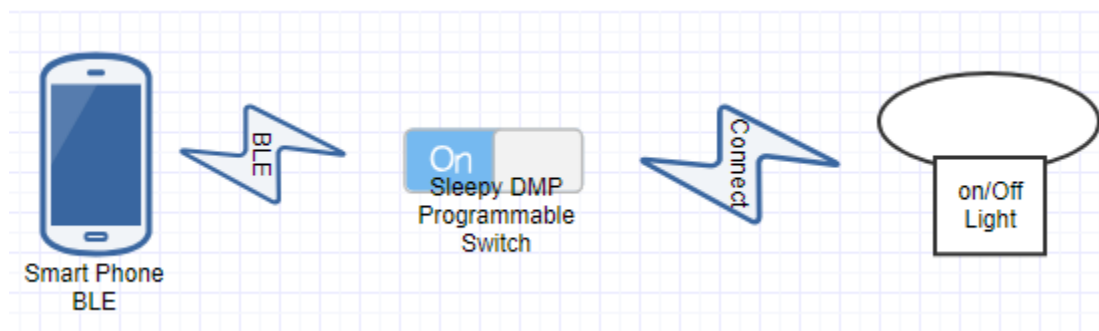
Dynamic multiprotocol applications are generated, built, and uploaded in the same way as other applications. If you are not familiar with these procedures, see *QSG138: Getting Started with the Silicon Labs Flex SDK for the Wireless Gecko (EFR32™) Portfolio* for details.

Note: Two applications are provided that can be used to create a Connect/Bluetooth example setup. The purpose of the examples is show a use case of a dynamic multiprotocol application using the Silicon Labs Connect stack.

- **Connect (SoC): Demo Connect Light:** This is a non-DMP application running the Connect stack only. When in "factory reset" state upon power up (or optionally on a user action), scans all allowed channels for the lowest energy and forms a Connect point-to-point network. Upon user action, it opens its network for another device to join.
- **Connect (SoC): Demo DMP Connect Switch:** On a user action (for example a button press) starts scanning on all allowed channels to find the above open network and connect.

The light is a coordinator and the DMP Switch is an end device. The light and switch go through a key exchange session to establish a symmetric key and all the further communication is secured with this key between the nodes.

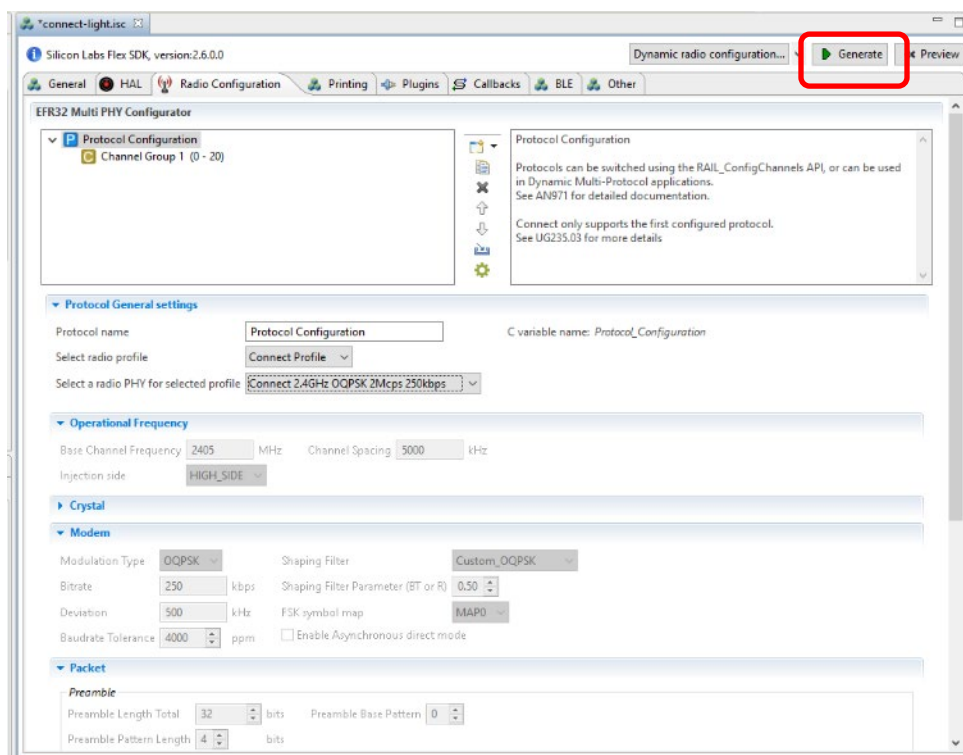
A mobile phone can join on Bluetooth interface with the switch and can control the light. Similarly, when the switch operates the light, the mobile phone gets updates on the status through Bluetooth notification.



A **Connect (SoC): Empty Example - DMP** sample application is also included in the Flex SDK. This is a minimal project structure that can be used as a starting point for custom applications that will run both Connect and Bluetooth LE protocols.

The following summary procedure uses the Connect (SoC): Demo Connect Light example application.

1. In the Simplicity Studio launcher perspective, click **New Project**.
2. In the new project dialog, select Silicon Labs Flex SDK and click **Next**.
3. Select the Connect (SoC): Demo Connect Light and click **Next**.
4. Name the project and, if desired, change the default location. Click **Next**.
5. In project setup, select a board, part, and compiler if your choices aren't already populated. Click **Finish**.
6. AppBuilder opens. Depending on the board you selected, you may need to choose a radio PHY on the Radio Configuration tab (for example for BRD4162A the radio PHY is '2.4GHz', as shown in the following figure). Click **Generate**.

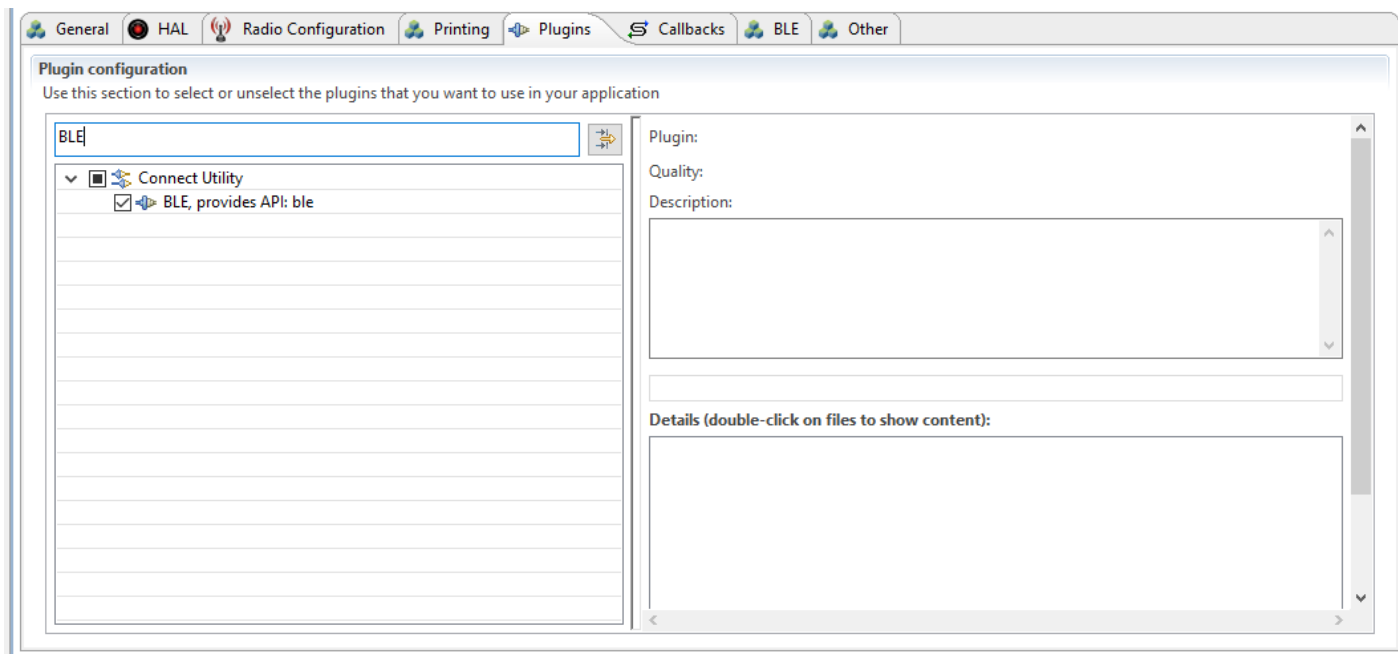


7. Compile and flash the project.

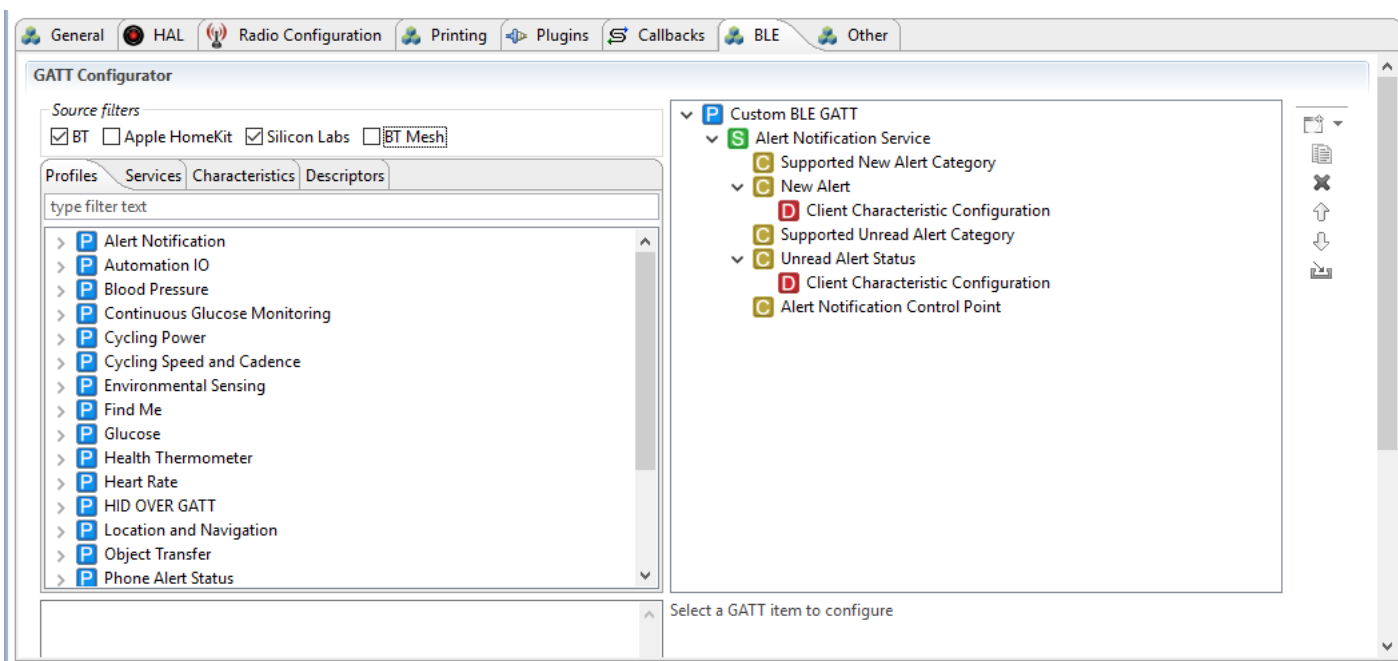
3 Creating a Dynamic Multiprotocol Application in Connect

Every Connect sample application can be turned into a DMP Connect+BLE sample application by following the steps below. The illustrations are from the Connect (SoC): Empty Example - DMP sample application, which is already configured for you.

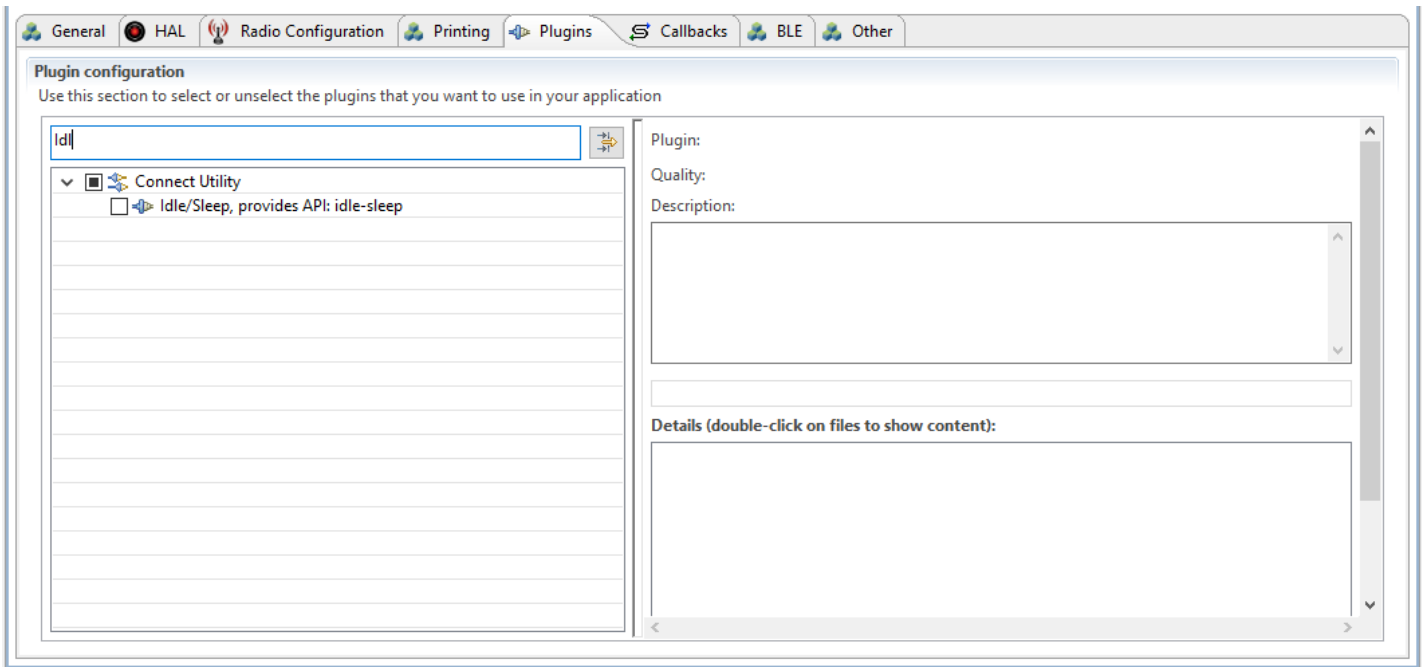
Enable the **BLE** plugin.



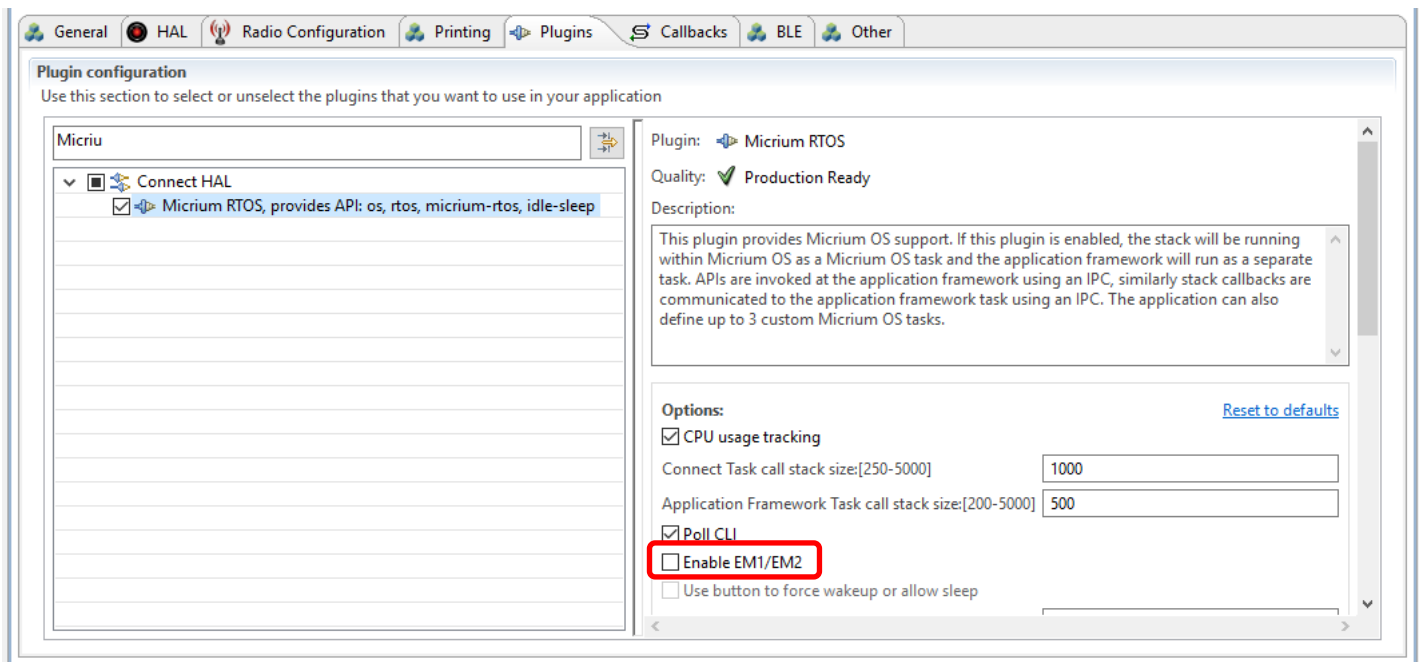
Configure your Bluetooth LE application using the GATT Configurator in the BLE tab. At minimum, you should add one item among “Profiles”, “Services”, “Characteristics” or “Descriptors” to your configuration. For more information, refer to *UG365: GATT Configurator User’s Guide* supplied with the Bluetooth SDK documentation. .



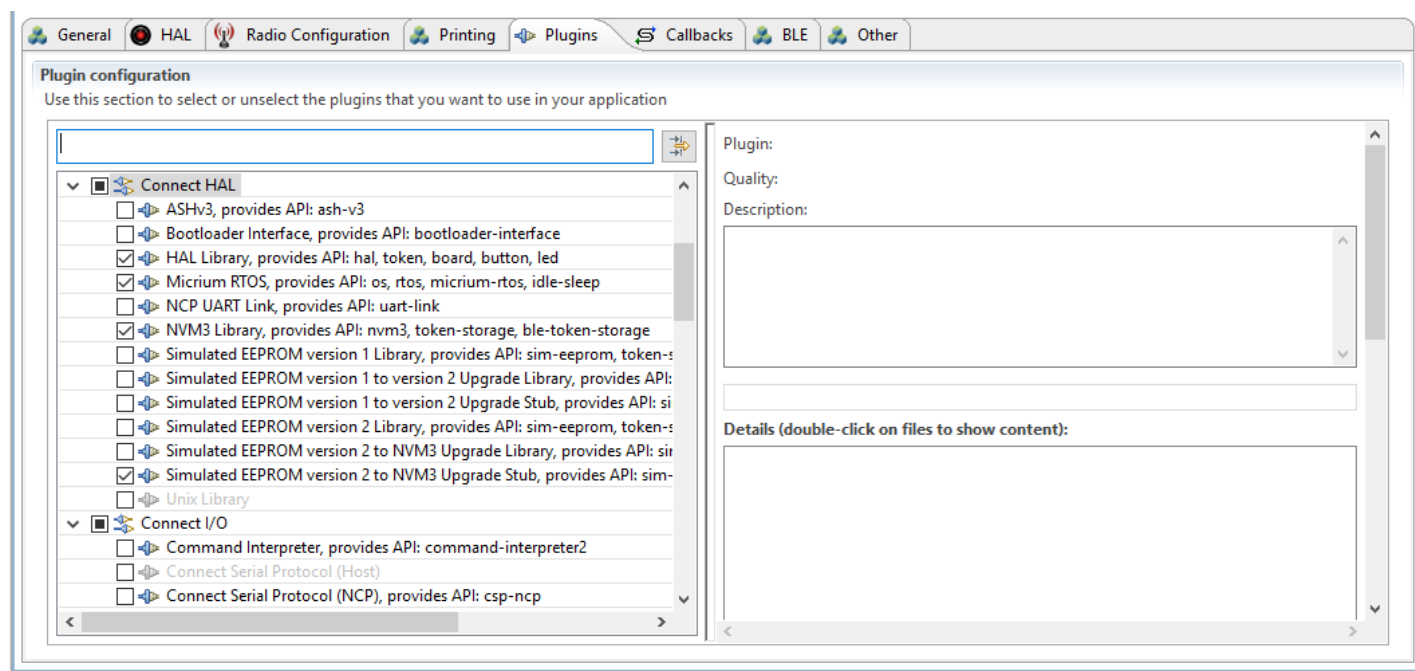
If the **Idle/Sleep** plugin is enabled, it should be disabled.



Enable the **Micrium RTOS** plugin. You could also optionally enable the plugin option **Enable EM1/EM2**, which will allow your DMP node to enter a low power mode whenever possible.

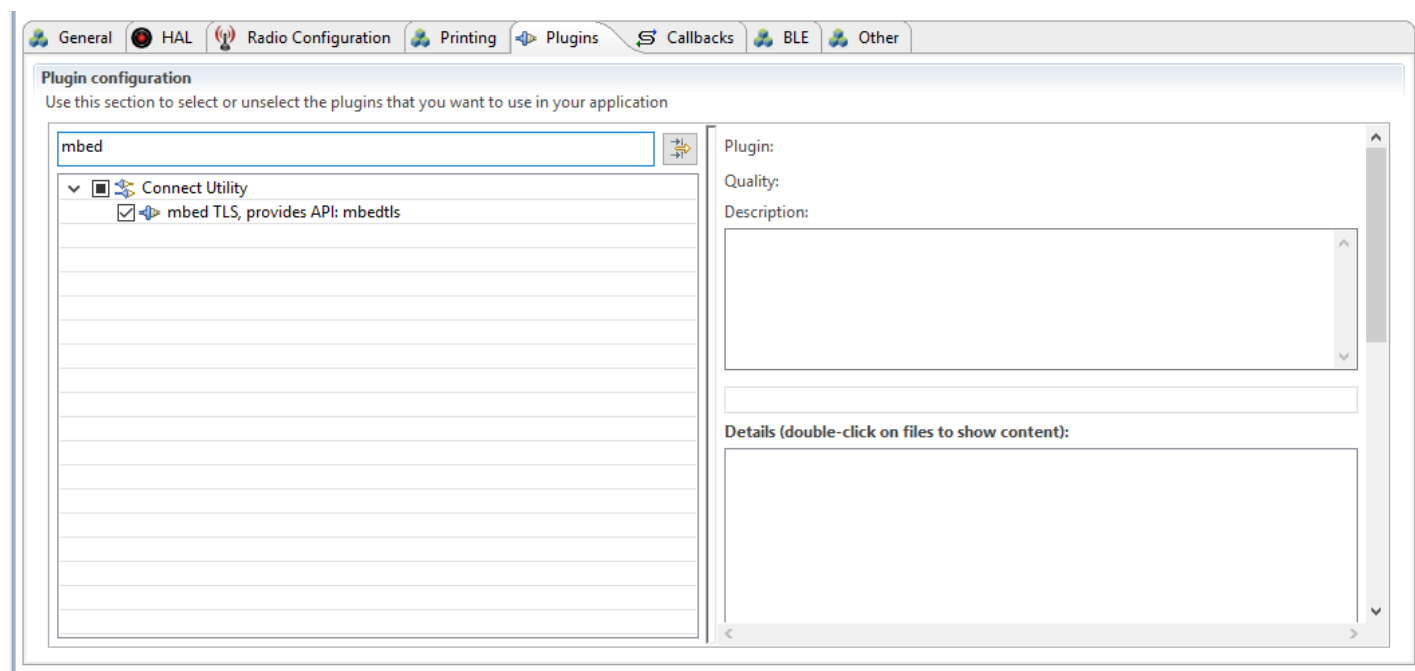


Enable the **NVM3 Library** plugin. A DMP application can only be run using the NVM3 non-volatile memory storage system. Disable the **Simulated EEPROM version 1 Library** or the **Simulated EEPROM version 2 Library** plugin, whichever was enabled.

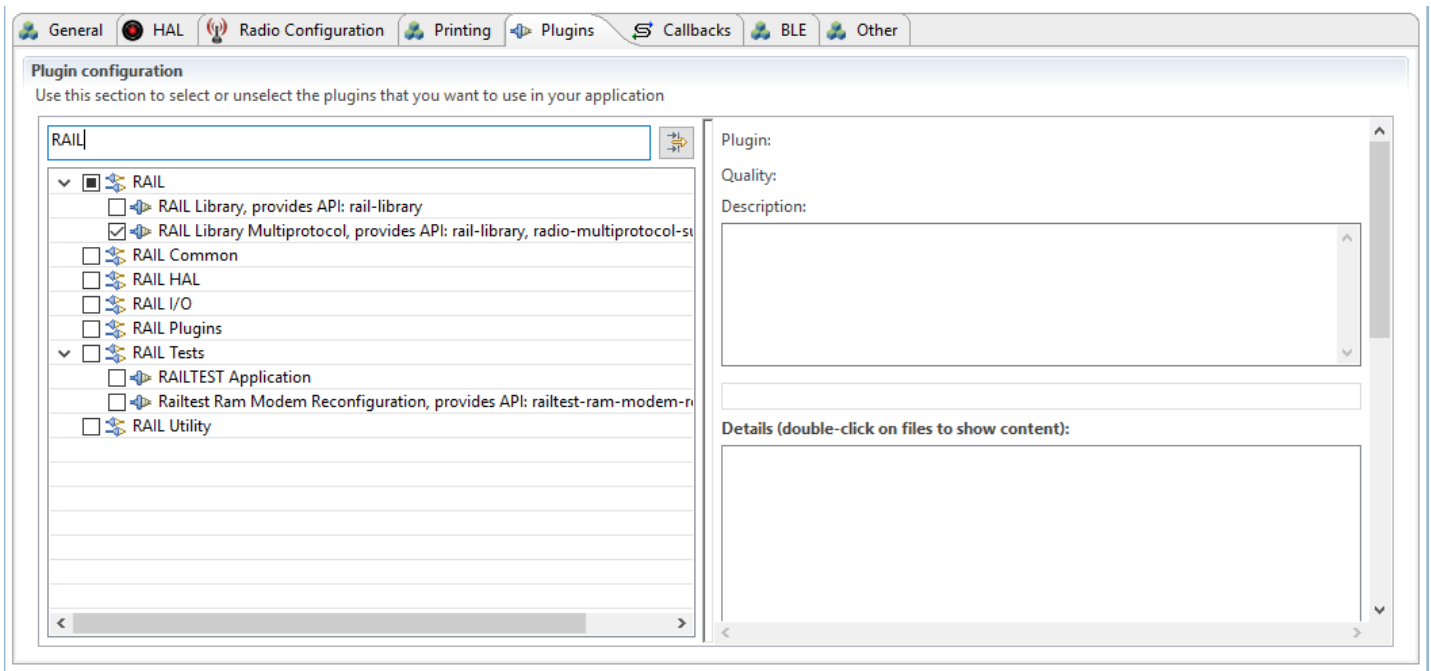


Enable either the **Simulated EEPROM version 2 to NVM3 Upgrade Library** or **Simulated EEPROM version 2 to NVM3 Upgrade Stub**. If you are performing a field upgrade of an existing application and wish to retain the information stored in the device non-volatile memory, the former should be selected, otherwise you can use the latter, as shown above.

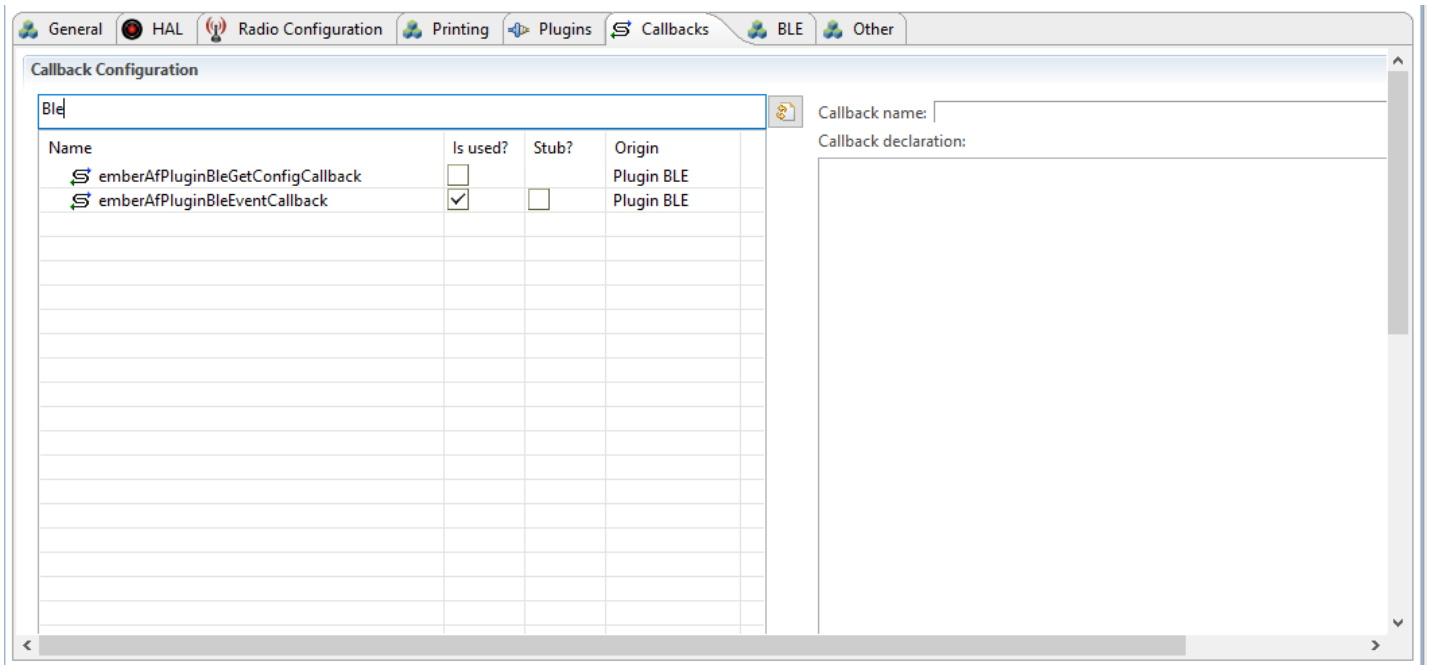
Enable the **mbed TLS** plugin. Because in DMP you have two stacks both trying to access the crypto acceleration blocks, using mbed TLS for your crypto guarantees that the hardware is correctly arbitrated among the two stacks.



Disable the **RAIL Library** plugin and enable the **RAIL Library Multiprotocol** plugin.



In the Callbacks tab you can optionally enable the **emberAfPluginBleEventCallback()** callback, which allows the application to react to any occurring Bluetooth LE event.



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