AN1295: Developing with Thread 1.2

Thread 1.2 builds on Thread 1.1's robust foundation, and defines extensions to the mandatory base specification, low-power enhancements, and optional advanced features, including Commercial Extensions. Thread 1.2 devices and networks are fully interoperable with existing Thread 1.1 devices and networks.

The features of Thread 1.2 are designed to improve the scalability of Thread networks by making them more responsive and capable of higher network density. New low-power features further reduce the power consumption, channel utilization, and communication latency of Sleepy End Devices (SEDs). New features for commercial enterprise networks allow for communication between multiple Thread networks and non-Thread devices in a large infrastructure deployment.

KEY POINTS

- Developing Thread 1.2 SoC applications
- Developing Thread 1.2 RCP applications
- Working with the OpenThread 1.2 Backbone Border Router

Applicable Version Notice: This application note addresses modifying OpenThread SDK sample applications for compatibility with Thread 1.2, and is for use with OpenThread SDK version 3.1.x and earlier. Beginning with OpenThread SDK version 3.2, sample applications are delivered configured for Thread 1.2.

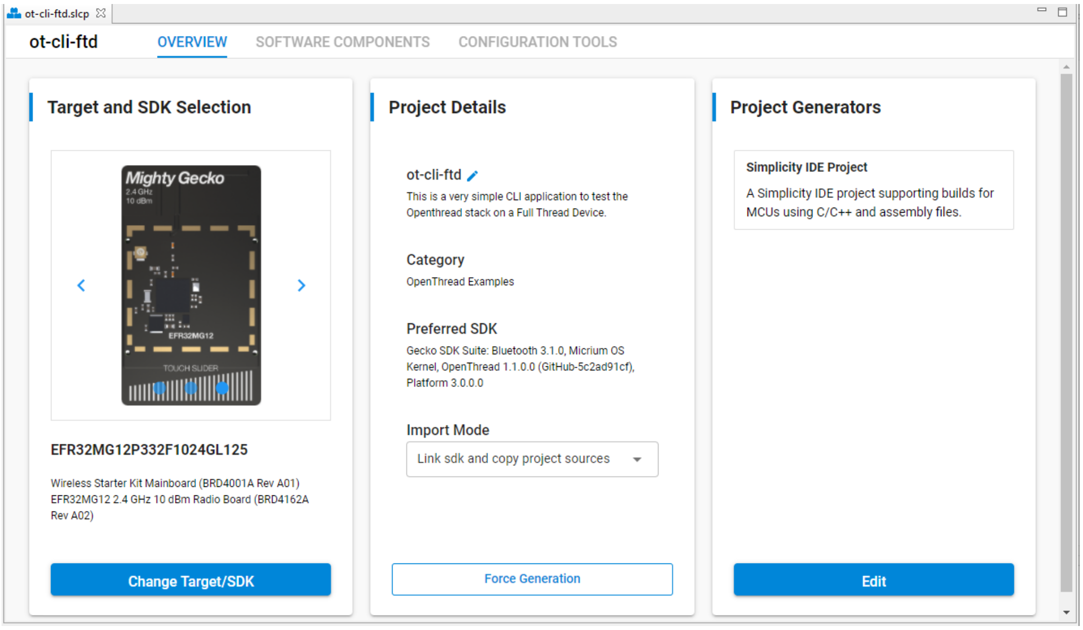
1 Developing Thread 1.2 SoC Applications

Silicon Labs provides a number of sample SoC OpenThread applications. You can modify these to work with Thread 1.2.

1.1 Enable Thread 1.2 Features on the ot-cli-ftd Application

The following example shows how to enable 1.2 features on the ot-cli-ftd application.

1. Select **ot-cli-ftd** as an example for your SoC image.
2. With your target part connected to your computer, open the Simplicity Studio 5 File menu and select **New > Silicon Labs Project Wizard**. The Target, SDK, and Toolchain Selection dialog opens. Click **NEXT**.
3. The Example Project Selection dialog opens. Use the Technology Type and Keyword filters to search for **ot-cli-ftd** as an example for the default SoC image. Select it and click **NEXT**.
4. The Project Configuration dialog opens. Here you can rename your project, change the default project file location, and determine if you will link to or copy project files. Note that if you change any linked resource, it is changed for any other project that references it. Click **FINISH.**
5. The Simplicity IDE Perspective opens with the Project Configurator open to the OVERVIEW tab. See the online *Simplicity Studio 5 User's Guide* for details about the functionality available through the Simplicity IDE perspective and the Project Configurator.



Target and SDK Selection

EFR32MG12P332F1024GL125

Wireless Starter Kit Mainboard (BRD4001A Rev A01)
EFR32MG12 2.4 GHz 10 dBm Radio Board (BRD4162A Rev A02)

Project Details

ot-cli-ftd

This is a very simple CLI application to test the Openthread stack on a Full Thread Device.

Category

OpenThread Examples

Preferred SDK

Gecko SDK Suite: Bluetooth 3.1.0, Micrium OS Kernel, OpenThread 1.1.0.0 (GitHub-5c2ad91cf), Platform 3.0.0.0

Import Mode

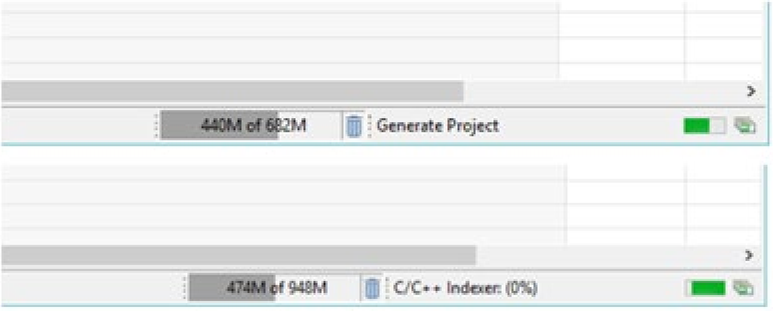
Link sdk and copy project sources

Project Generators

Simplicity IDE Project

A Simplicity IDE project supporting builds for MCUs using C/C++ and assembly files.

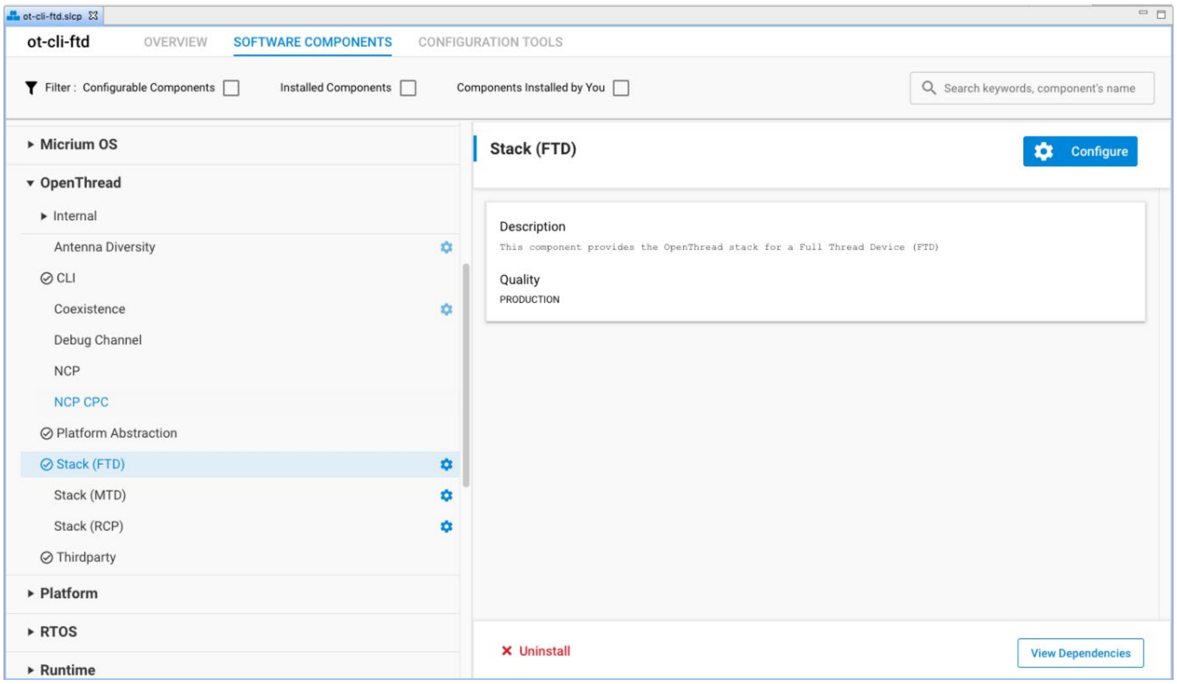
6. Make any configuration changes to the software components, as described in the next section. You can see autogeneration progress in the bottom right of the Simplicity IDE perspective. Make sure that progress is complete before you build.



7. Compile and flash the application image as described in *QSG170: Silicon Labs OpenThread Quick Start Guide*.

1.2 Configure OpenThread Options in the SoC Images Using Simplicity Studio 5

1. Under the SOFTWARE COMPONENTS tab in your FTD project (.slcp), expand the OpenThread group. Select the **Stack (FTD)** entry for an FTD build. If building an MTD application, select Stack (MTD) and follow similar steps as shown below.

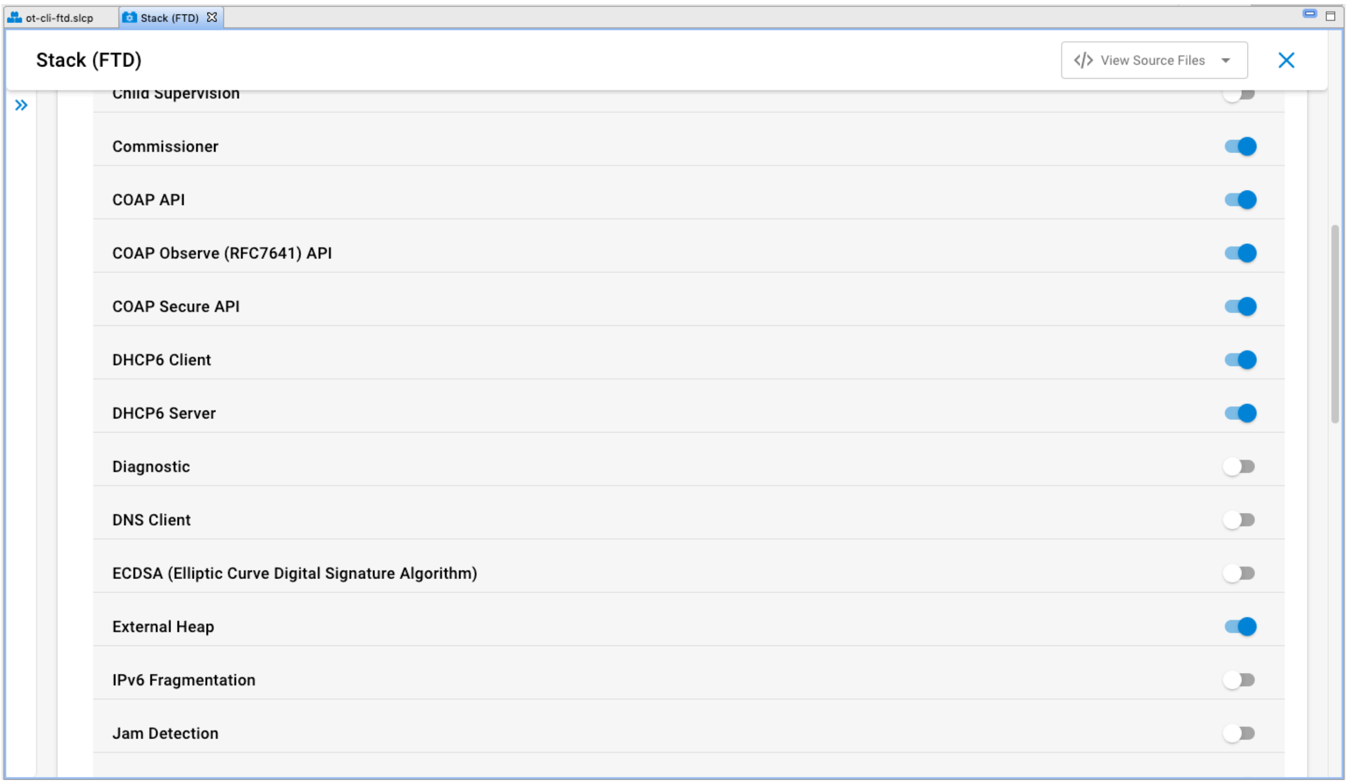


Description
This component provides the OpenThread stack for a Full Thread Device (FTD)

Quality
PRODUCTION

Note: You can select the Configurable Components and Installed Components checkboxes to filter to only those components you can configure successfully.

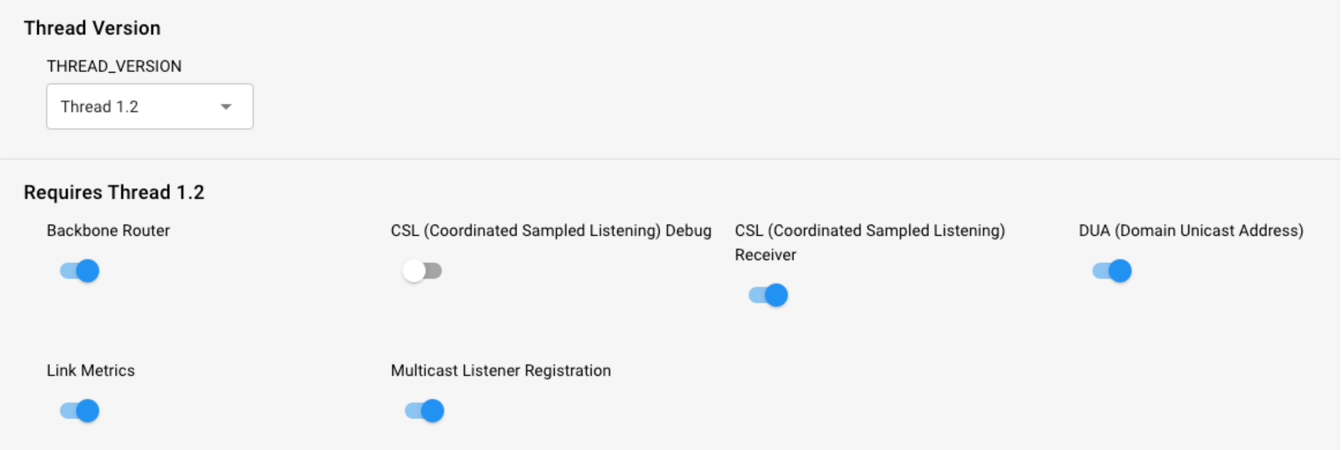
2. Click **Configure** to change the settings associated with the OpenThread build. The various build options are explained in the OpenThread documentation at https://openthread.io/guides/build.



Child Supervision	
Commissioner	●
COAP API	●
COAP Observe (RFC7641) API	●
COAP Secure API	●
DHCP6 Client	●
DHCP6 Server	●
Diagnostic	○
DNS Client	○
ECDSA (Elliptic Curve Digital Signature Algorithm)	○
External Heap	●
IPv6 Fragmentation	○
Jam Detection	○

3. **For Thread 1.2 features only**:

- Under **Thread Version**, select Thread 1.2. Thread 1.2 must be selected as the Thread version for Thread 1.2 features to function. A list of Thread 1.2 features is displayed, with recommended features turned on. The description for each feature indicates whether it is mandatory, optional, or recommended. **Do not enable** these features for a Thread 1.1 application.



Thread Version

THREAD_VERSION

Thread 1.2 ▾

Requires Thread 1.2

Backbone Router ☑

CSL (Coordinated Sampled Listening) Debug ☐

CSL (Coordinated Sampled Listening) Receiver ☑

DUA (Domain Unicast Address) ☑

Link Metrics ☑

Multicast Listener Registration ☑

- **Backbone Router** (recommended for a border router): If enabled, **Border Agent** (optional but recommended) and **Border Router** (mandatory) should be enabled.
- **Csl (Coordinated Sampled Listening) Debug** (optional): Enable for debugging CSL features.
- **Csl (Coordinated Sampled Listening) Receiver** (optional but recommended): If enabled, low-power Coordinated Sampled Listening (CSL) features are available for use with Wake-on End devices (WEDs). A SED with this option selected is called a Synchronized SED (SSED).
- **DUA (Domain Unicast Address)** (mandatory): Enable Thread 1.2 Domain Unique Address feature for use in Thread domains. For more information, see *UG103.11 Thread Fundamentals*.
- **Link Metrics** (recommended): Enable low-power link metrics and link metric probing features.
- **Multicast Listener Registration** (mandatory): Enable Multicast Listener Registration features in Thread 1.2 to enable off-mesh multicasts and multicasts in Thread domains. For more information, see *UG103.11 Thread Fundamentals*.

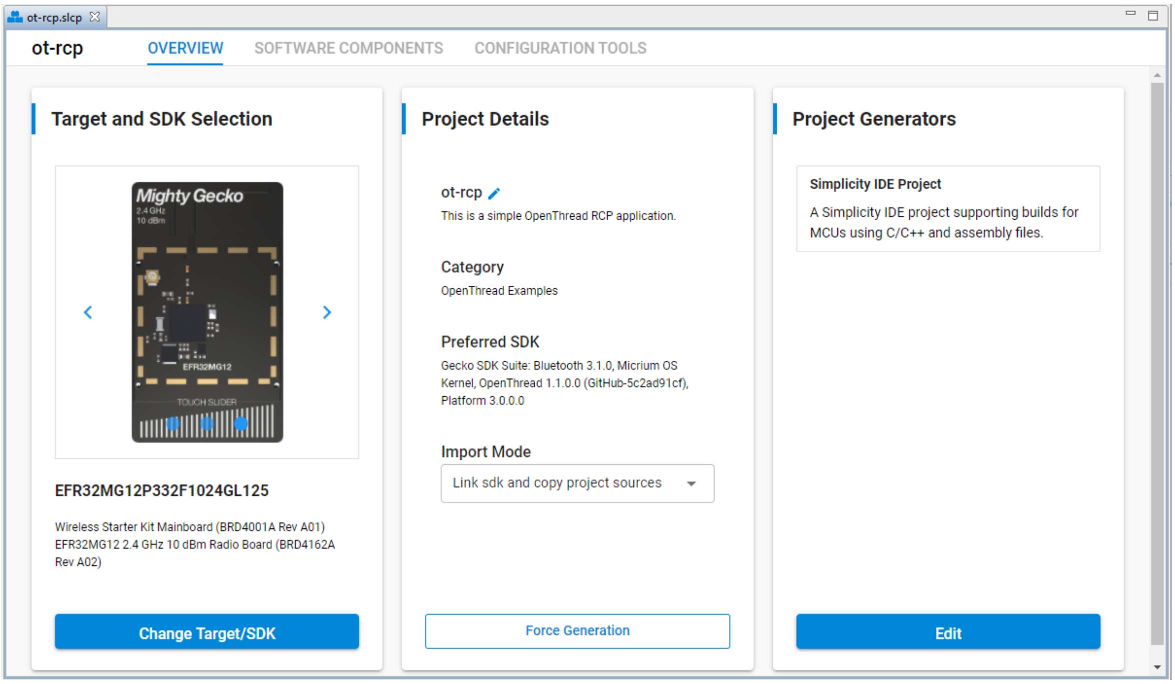
2 Developing Thread 1.2 RCP Applications

Silicon Labs provides a sample OpenThread RCP application. You can modify it to work with Thread 1.2.

2.1 Enable Thread 1.2 Features on the ot-rcp Application

The following example shows how to enable Thread 1.2 features on the ot-rcp application.

1. Select **ot-rcp** as an example for your RCP image.
2. With your target part connected to your computer, open SSv5's File menu and select **New > Silicon Labs Project Wizard**. The Target, SDK, and Toolchain Selection dialog opens. Click **NEXT**.
3. The Example Project Selection dialog opens. Use the Technology Type and Keyword filters to search for **ot-rcp** as an example for the default SoC image. Select it and click **NEXT**.
4. The Project Configuration dialog opens. Here you can rename your project, change the default project file location, and determine if you will link to or copy project files. Note that if you change any linked resource, it is changed for any other project that references it. Click **FINISH.**
5. The Simplicity IDE Perspective opens with the Project Configurator open to the OVERVIEW tab. See the online *Simplicity Studio 5 User's Guide* for details about the functionality available through the Simplicity IDE perspective and the Project Configurator.



EFR32MG12P332F1024GL125

Wireless Starter Kit Mainboard (BRD4001A Rev A01)
EFR32MG12 2.4 GHz 10 dBm Radio Board (BRD4162A Rev A02)

ot-rcp

This is a simple OpenThread RCP application.

Category

OpenThread Examples

Preferred SDK

Gecko SDK Suite: Bluetooth 3.1.0, Micrium OS Kernel, OpenThread 1.1.0.0 (GitHub-5c2ad91cf), Platform 3.0.0.0

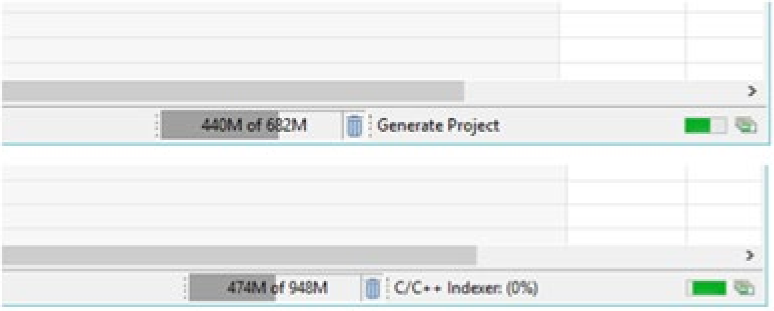
Import Mode

Link sdk and copy project sources

Simplicity IDE Project

A Simplicity IDE project supporting builds for MCUs using C/C++ and assembly files.

6. Make any configuration changes to the software components, as described in the next section. You can see autogeneration progress in the bottom right of the Simplicity IDE perspective. Make sure that progress is complete before you build.



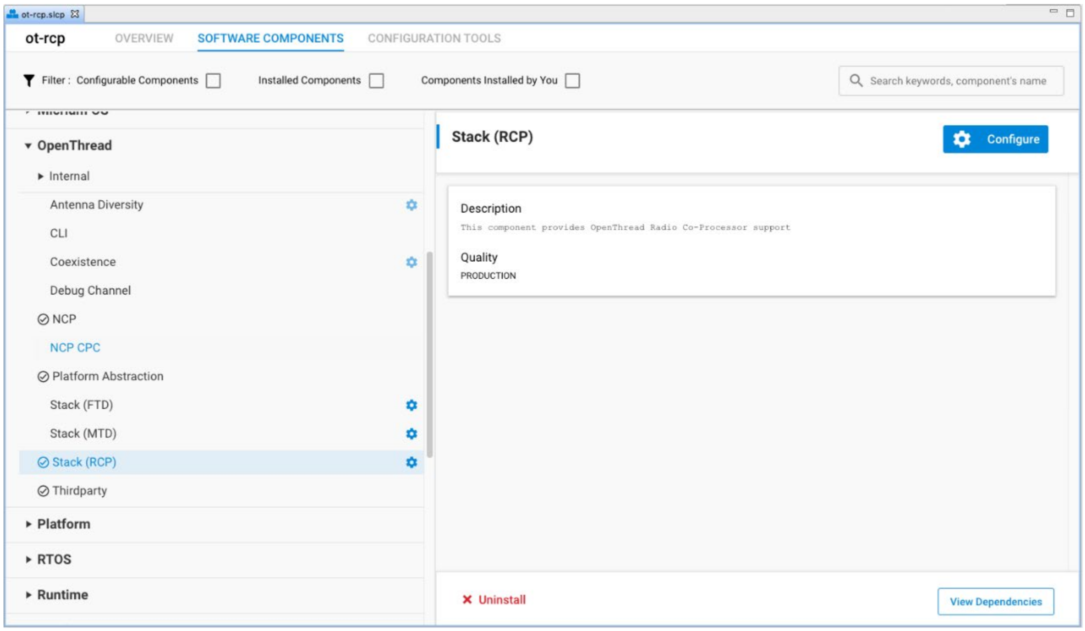
440M of 682M
Generate Project

474M of 948M
C/C++ Indexer: (0%)

7. Compile and flash the application image as described in *QSG170: Silicon Labs OpenThread Quick Start Guide*.

2.2 Configure OpenThread Options in the RCP Images Using Simplicity Studio 5

1. Under the SOFTWARE COMPONENTS tab in your RCP project (.slcp), expand the OpenThread group. Select the **Stack (RCP)** entry for an RCP build.



- OpenThread
  - Internal
  - Antenna Diversity
  - CLI
  - Coexistence
  - Debug Channel
  - NCP
  - NCP CPC
  - Platform Abstraction
  - Stack (FTD)
  - Stack (MTD)
  - Stack (RCP)
  - Thirdparty
- Platform
- RTOS
- Runtime

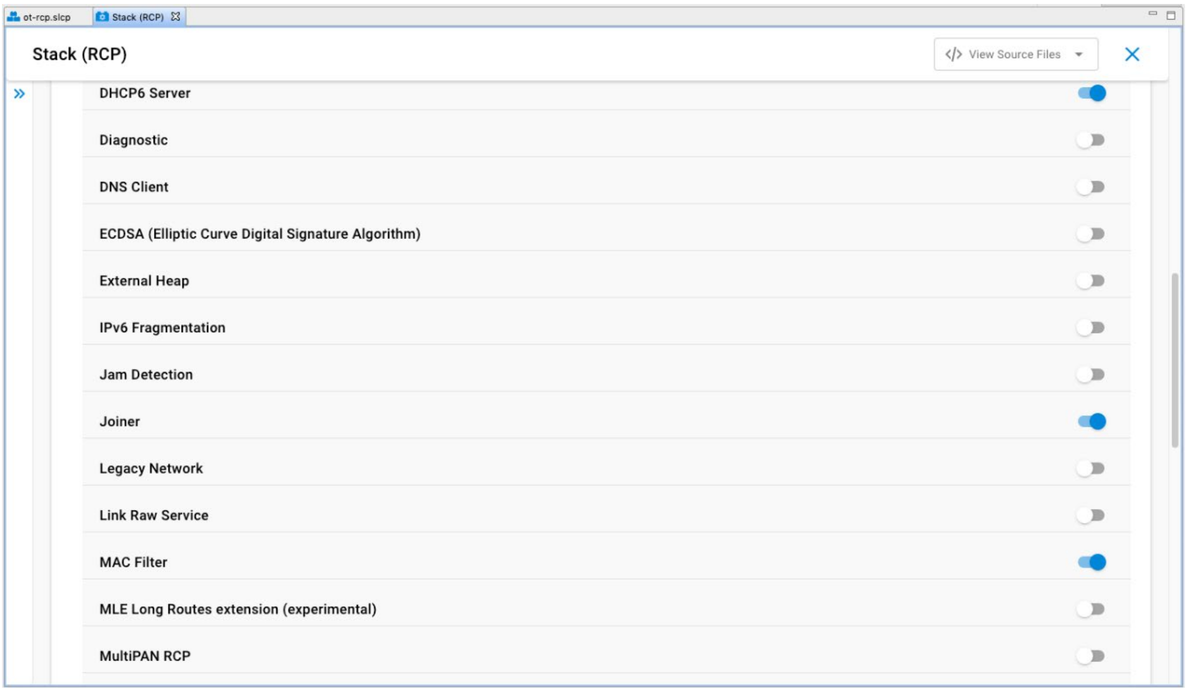
Stack (RCP)

Description
This component provides OpenThread Radio Co-Processor support

Quality
PRODUCTION

Note: You can select the Configurable Components and Installed Components checkboxes to filter down to only those components you can configure successfully.

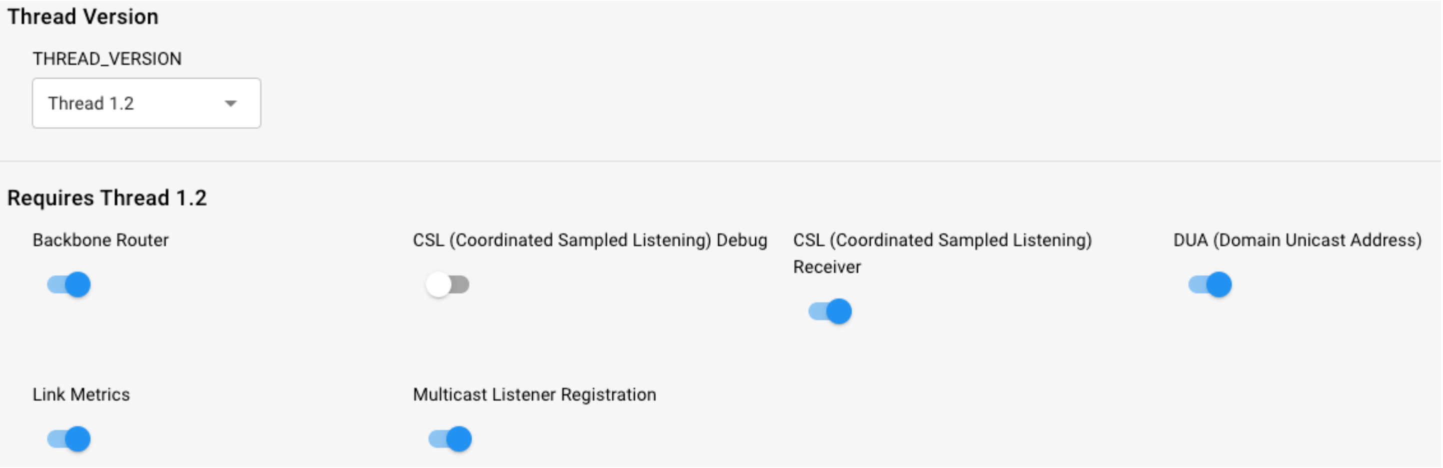
2. Click **Configure** to change the settings associated with the OpenThread build. The various build options are explained in the OpenThread documentation at https://openthread.io/guides/build.



Stack (RCP)

DHCP6 Server	●
Diagnostic	○
DNS Client	○
ECDSA (Elliptic Curve Digital Signature Algorithm)	○
External Heap	○
IPv6 Fragmentation	○
Jam Detection	○
Joiner	●
Legacy Network	○
Link Raw Service	○
MAC Filter	●
MLE Long Routes extension (experimental)	○
MultiPAN RCP	○

3. **For Thread 1.2 features only:**
   - Under **Thread Version**, select Thread 1.2. Thread 1.2 must be selected as the Thread version for Thread 1.2 features to function.
   - A list of Thread 1.2 features is displayed, with recommended features turned on. The description for each feature indicates whether it is mandatory, optional, or recommended. **Do not enable** these features for a Thread 1.1 application.



Thread Version

THREAD_VERSION: Thread 1.2

Requires Thread 1.2

- Backbone Router ☑
- CSL (Coordinated Sampled Listening) Debug □
- CSL (Coordinated Sampled Listening) Receiver ☑
- DUA (Domain Unicast Address) ☑
- Link Metrics ☑
- Multicast Listener Registration ☑

- **Backbone Router** (mandatory for RCP): If enabled, **Border Agent** (optional but recommended) and **Border Router** (mandatory) should be enabled.
- **Csl (Coordinated Sampled Listening) Debug** (optional): Enable for debugging CSL features.
- **Csl (Coordinated Sampled Listening) Receiver** (optional but recommended): If enabled, low-power Coordinated Sampled Listening (CSL) features are available for use with Wake-on End devices (WEDs). A SED with this option selected is called a Synchronized SED (SSED).
- **DUA (Domain Unicast Address)** (mandatory): Enable Thread 1.2 Domain Unique Address feature for use in Thread domains. For more information, see *UG103.11 Thread Fundamentals*.
- **Link Metrics** (recommended): Enable low-power link metrics and link metric probing features.
- **Multicast Listener Registration** (mandatory): Enable Multicast Listener Registration features in Thread 1.2 to enable off-mesh multicasts and multicasts in Thread domains. For more information, see *UG103.11 Thread Fundamentals*.

3 Working with the OpenThread 1.2 Backbone Border Router

Refer to *AN1256: Using the Silicon Labs RCP with the OpenThread Border Router* for detailed instructions on how to build an OpenThread Border Router for Raspberry Pi 3B+ or above. You have to use a Thread 1.2 RCP with an OpenThread 1.2 Backbone Border Router.

You can install a pre-built Docker container with OpenThread Border Router (tag gsdk-3.2.0 will be a 1.2 Border Router by default):

https://hub.docker.com/r/siliconlabsinc/openthread-border-router/tags

You can also manually install an OpenThread 1.2 Border Router by following the steps in *AN1256: Using the Silicon Labs RCP with the OpenThread Border Router* or https://openthread.io/guides/border-router/build.

Simplicity Studio

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