UG520: Software Project Generation and Configuration with SLC-CLI

The Silicon Labs Configurator (SLC) example projects describe a single software application (usually made up of multiple components plus application code) that can be used to generate an IDE project. The SLC Command Line Interface (SLC-CLI) tool, among other things, resolves project and component dependencies and generates a project for a specified embedded target and build system (for example, IAR Embedded Workbench or GNU tools via a Makefile). This user's guide provides references to the most common operations done with SLC-CLI.

KEY POINTS

- Installation
- Tool configuration
- Project Operations
- General Options
- Working with SDKs and Extensions
- Creating SDK Extensions

1 Introduction

The Silicon Labs Configurator (SLC) is a metadata specification for the Gecko SDK (GSDK). It also describes methods of creating and configuring embedded software projects for Silicon Labs IoT devices using this metadata. Software is grouped into components (defined by .slcc files) that may provide features and/or require features provided by other components. Example projects (.slcp) describe a single software application (usually made up of multiple components plus application code) that can be used to generate an IDE project. See the SLC Specification for details about SLC.

The SLC Command Line Interface (SLC-CLI) tool resolves project and component dependencies and generates a project for a specified embedded target and build system (for example, IAR Embedded Workbench or GNU tools via a Makefile), among other things.

SLC-CLI is provided as a downloadable .zip file for three operating systems:

- Windows® OS
- MacOS® X
- Linux® OS

SLC-CLI may be used with the following SDKs and platforms:

- Gecko Bootloader
- Gecko Platform
- The Gecko SDK (the suite of Silicon Labs SDKs)

Example projects (defined in .slcp files) are installed with the SDK in a directory under the Gecko SDK (GSDK) installed directory. The location varies depending on the SDK.

- Amazon AWS: <GSDKpath>\app\amazon\example
- Bluetooth SDK: <GSDKpath>\app\bluetooth\example
- Bluetooth Mesh SDK: <GSDKpath>\app\btmesh\example
- OpenThread SDK: <GSDKpath>\protocol\openthread\sample-apps
- 32-Bit MCU SDK: <GSDKpath>\app\mcu_example
- Proprietary (Flex) SDK: <GSDKpath>\app\flex\example\<Connect or RAIL>
- Gecko Bootloader: <GSDKpath>\platform\bootloader\sample-apps
- GSDK Platform: <GSDKpath>\app\common\example
- Wi-SUN SDK: <GSDKpath>\app\wisun\example
- Z-Wave SDK: <GSDKpath>\protocol\z-wave\apps
- Zigbee SDK: <GSDKpath>\protocol\zigbee\app

SLC-compatible SDKs may also support extensions that may include example projects as well as components. By default, extensions are installed into the “extension” folder at the root of an SDK.

Extension: <*GSDKpath*>*extension*\<*extension_name*>

2 Installation

2.1 Requirements

The SLC-CLI .zip files are available here:

- https://www.silabs.com/documents/login/software/slc_cli_windows.zip
- https://www.silabs.com/documents/login/software/slc_cli_mac.zip
- https://www.silabs.com/documents/login/software/slc_cli_linux.zip

In addition to the SLC-CLI .zip file and the Gecko SDK, you will need Java 64-bit JVM version 17 or higher, available through Amazon Correto. Note that some files, such as the Windows .msi files, can be found on the releases page.

2.2 Installing the CLI

1. Unpack the SLC-CLI zip file.
2. (Optional) To call SLC-CLI from anywhere in your system, add the path to the expanded slc-cli to your PATH. If you do not do this step on Mac or Linux systems, you will need to preface all calls to `slc` with `./` as in `./slc`, assuming you are following this procedure in the current directory.
3. (Optional) All project operations require a path to the GSDK installation directory. To make these operations easier, you may want to create an environment variable for the GSDK location.

2.3 Other Tools

SLC-CLI provides a number of options for generating project files. In order to build an application image you also need a compiler toolchain, such as GCC or IAR.

In order to flash the image to a target device you need Simplicity Commander. Simplicity Commander enables you to complete these essential tasks:

- Flash an application.
- Configure the application image.
- Manage the target device.

Download an Operating System-specific Simplicity Commander zip file here: https://www.silabs.com/developers/mcu-programming-options.

For instructions on using Simplicity Commander, see UG162: Simplicity Commander Reference Guide.

3 Usage

`slc --help` provides details on usage and a list of available commands. `slc <command> -h` shows all options for the command.

Run `slc <command> <command options>` to use the default Python installation, or `your\python\path slc ...` to use a different version of Python.

3.1 SLC-CLI Configuration

SLC-CLI operations are based on the context of a specific SLC-compatible SDK. It is recommended to first configure SLC-CLI to use a specific SDK by default.

1. Configure SLC-CLI to a specific GSDK location, for example:

   ```
   slc configuration --sdk users\<NAME>\SimplicityStudio\SDKs\gecko_sdk
   ```

   Then all commands that use an SDK will use this configured location. If you do not do this, you must specify the SDK path with the `- -sdk` option each time you issue a command, such as `generate` discussed below.

2. If using GNU toolchain from the command line (for example, with a GNU Make build system), first configure your GCC location.

   ```
   slc configuration -gcc=\path\to\your\GNU\ARM\embedded\toolchain
   ```

   Note, if you do not already have a GNU toolchain installed, you can download the proper version (aligned with what your SDK supports) from here: https://developer.arm.com/tools-and-software/open-source-software/developer-tools/gnu-toolchain/gnu-rm/downloads.

Example SLC-CLI configuration on MacOS for GNU toolchain with default GSDK installation directory:

```
slc configuration --sdk=~/SimplicityStudio/SDKs/gecko_sdk --gcc-toolchain=/Applications/ARM
```

Operation	Example	Description
configuration	`slc configuration --sdk="C:\sdk\sdk.slcs"`	Sets the given SDK to be default available (unless explicitly overridden in other commands). Any command that requires an SDK parameter will no longer require it, and will instead use this configured default. This either points directly to an .slcs file, or it points to a folder containing an .slcs file.
	`--editor`	Sets the external editor used by the editor command. This is mainly intended as a shortcut for loading up .slcc files for components. See the editor documentation in section 3.4.2 SDK Operations for more details. Known supported editors are Atom and Notepad++.
	`-gcc, --gcc_toolchain "C:\path\to\gcc"`	Sets the default GCC toolchain path for use with the Makefile generator. This should point to the directory that contains the bin folder.

3.2 General Options

These options can be specified for any action and must appear after the command. For instance, `slc configuration --cli-config file.cfg –sdk=/sdk/path` is correct.

Option	Example	Description
`-v --verbose`	`-v 1`	Accepts 0 or 1 Sets verbose levels. 0 is no verbosity. Higher levels provide more logging information.
`--cli-config`	`--cli-config /home/myhome/configfile.cfg`	Allows customization of where the configuration information, set via `slc configuration` and subcommands, is stored. Overrides the defaults and can be used for every command if the defaults are not properly working in your environment. This must be a file.
`-wrk, --working-directory`	`--working-directory /work/here`	The working directory that the command line should assume it was called from, such as for relative path resolution. In most cases, this should not need to be overridden.

3.3 Working with Projects

This section assumes you have configured the GSDK location as described above.

`slc generate <path\to\example.slcp>` generates a project from an existing .slcp file, such as an SDK example. The path to the example is either the fully defined path, or the path relative to the calling location.

Key options are:

`-d <destination>` (optional) specifies the destination for the generated project. If not specified, the project is generated to the source.slcp location.

`-np` generates a new project by copying the .slcp file and all files defined in it into the destination location. All file references in the .slcp are updated to point to the destination location. Any sources that should be highlighted are shown in the SLC-CLI output.

`-name=<generated-name>` specifies a different generated project name. Otherwise the name of the source .slcp file is used.

`--with <device|board>` customizes the generated project for the target specified by the full part number or board ID, for example “EFR32BG22C224F512IM40” or “brd4184b”.

To generate a new project with a new name for all supported toolchains:

```
slc generate \path\to\example.slcp -np -d <project destination> -name=<new name> --with <board or device_that_supports_project>
```

A number of files are generated that can be used with different tools. For example, to build the project with Make (if Make is in your path):

```
make -f <project>.Makefile
```

Examples:

Windows: Generate for all toolchains, for EFR32MG12P232F512GM68 device:

```
slc generate C:\Users\<user>\SimplicityStudio\SDKs\gecko_sdk\app\bluetooth\example\soc_empty\soc_empty.slcp -np -d c:\test-soc-empty\ -name=test-soc-empty --with EFR32MG12P232F512GM68
```

MacOS: Generate, build (GNU Make/GCC), and flash (Simplicity Commander) project to Thunderboard Sense 2 (BRD4166A):

```
$ GSDK=~/SimplicityStudio/SDKs/gecko_sdk
$ slc configuration --sdk=$GSDK --gcc-toolchain=/Applications/ARM
$ slc generate $GSDK/app/common/example/blink_baremetal -np -d blinky -name=blinky -o Makefile
  --with brd4166a
$ cd blinky
$ make -f blinky.Makefile
$ commander flash build/debug/blinky.hex
```

3.3.1 Project Operation Options

All project-level operations listed in section 3.2.2 Project Operations can accept the same basic arguments enumerated here.

Option	Required	Example	Description

`-p,`
`--project-file`
	yes	`-p blink.slcp`	The actual project file that any project operations will be working against.

`--with`	no	`--with brd3200c,micriumos`
		`--with pwm:led0:led1,brd2200a`
			Comma-separated list of components to include in the project in addition to components enumerated by the .slcp file itself and in addition to any auto-computed dependencies.
			If a component is instantiable, then the instance names must be supplied separated by ':', with the first of the ':' separated list being the actual id, and subsequent ones being instance names.

3.3.2 Project Operations

Project operations always specify an SDK to load from as well as a project file *<project_name>.slcp* to draw from. You must specify an SDK (`-s` or `--sdk`) for every project operation unless you have configured a default SDK.

Operation	Example/Arguments	Description
generate	`generate -p="blink/blink.slcp" -d="blink/out-put/blink_project"`	Generates the project to the given destination. By default this links all sources. Destination is not required. If not specified, then the slcp directory is used.
	`--require-clean-project`	If the slcp parser finds a potential problem and issues a warning, generation is halted. Examples: a project refers to a component not in the SDK , or a project uses deprecated names (like name instead of id for component listing, or name instead of project_name for the project's default name)
	`-cp, --copy-sources`	Copies all files referenced by this project, selected components, and any other running tools (Pin Tool, etc.). By default, no files are copied.
	`-cpproj, --copy-proj-sources`	Copies all files referenced by the project and links any SDK sources. This can be combined with `-cpsdk`.
	`-cpsdk, --copy-sdk-sources`	Copies all files referenced by the selected components and links any project sources. This can be combined with `-cpproj`.
	`-np, --new-project`	Runs the new project creation layout. This runs a standard generation step and then copies over any project sources (slcp, config folder, etc.), fixing any paths in the slcp file to point to the new location of the files. This defaults to `-cpproj`.
	`-name, --project-name`	Overrides the project name in the slcp. This determines some output file names and the generated binary names.
	`-tlcn, --toolchain`	Generates for the specified toolchain. The toolchains are not treated in the same way as components and so do not appear selected in the project. The current valid selections are `gcc` and `iar`.

Operation	Example/Arguments	Description
	`-o, --output-type`	The output of the generation, effectively what kinds of files should be generated, and for what tools/IDEs. You may list more than one type, separated by commas.
	`-lfewp, --list-files-ewp`	Forces the IAR EWP generator to define all SLC contributed sources in the *.ewp file as well as the *.ipcf file. This mimics the IAR Project Connection support in IAR Embedded Workbench and is useful for Linux builds of IAR, which do not support *.ipcf files.
	`--generator-timeout`	Overrides the default 30s timeout for each generation cycle. One call to `generate` may include multiple generation cycles, so this total generation time could be multiples of this timeout.
validate-project	`validate-project -p="blink/blink.slcp"`	Validates if a project would generate, essentially a dry run of generation. If the project is invalid, more information (such as a dependency tree) is output, indicating what and why it failed to auto-select all required dependencies, and what was missing. Python validation is not run by default.
	`--config-location <cfg_location>`	Tells the configuration validation scripts to run using the specified config folder for the project. Configuration files on that path will contribute their configuration values. The rule is that, if a configuration value appears in a config file on this path, it is considered the ultimate user configuration and overrides any default values.
summarise	`summarise --project blink.slcp`	Shows a summary of all components that make up a project, including both those explicitly set in the .slcp, and those implicitly brought in via dependency resolution.
	`--why`	Summary of implicit components will be replaced with a long list of implicit components that include why they were brought in (the component that needed them, and the API rule.) In many cases, the component name and API ID are identical, but essentially the left side of 'for' is the component ID, and the right side is the API(s).
	`--api`	An additional list is provided at the end of the summary showing every API that is provided by the project. In other words, every selected component put together will form a total set of available API.
choices	`choices --project blink.slcp -max 42`	Shows a list of potential candidate components that provide missing APIs required by the project that could not otherwise be solved by auto-selection, and draws attention to any that are recommended (color consoles will be in green, plain consoles will show an '*' asterisk). Candidates are split between those that provide the APIs unconditionally and those that provide conditionally. Always use `slc examine` for more detailed information. Components are sorted according to what provides the most, although this can mean that a completely different kind of choice with fewer APIs may be hidden by having too low a 'max' value.
	`-max`	Indicates that the `choices` command shows only 'max' choices (separate maximums for conditionally/unconditionally provided lists). If set to 0 or negative values, shows all choices. By default, if left unspecified = 20.

graph	`graph --project blink.slcp`
	`graph --project blink.slcp --validate --focus "emlib_common, cmsis_core"`
		Shows a dependency graph instead of the inverted dependency system that `summarise --why` shows. This dependency graph is represented as a tree, where the first occurrence of a component shows that component's dependencies as well, but subsequent occurrences show only a '^', indicating that a deeper dive has been done earlier in the tree. This is essentially a compromise solution, since dependency graphs can otherwise be very web-like. Color and non-color systems both support drawing attention in their own way to different things.
		Any component that provides an API other than itself will have that API listed after its name if that API is responsible for providing something another component in this project required.
		Any component that appears as a 'child' to itself will show a green '[Cycle]' phrase. Cycles do not prevent dependency management from working. This merely calls attention to them.

Operation	Example/Arguments	Description
	`--validate`	Option to show validation issues in-line with the dependency graph. Validation issues are prefaced with an '!' and, if color is supported, are red.
	`--focus`	Draws attention to a specific component/component(s) via either color or text, wherever they appear in the tree.
clone	`clone --project blink.slcp --target micriumos_kernel`	Clones the `--target` component into a custom components folder (either uses the first enumerated path in the .slcp, or creates and adds a default custom folder, if one does not already exist) and adds it to the project's selected components. The .slcc is copied and transformed to add clone information such as the timestamp of the clone, and the author field is populated if one is provided. Cloned components have all relevant file references copied over. This includes Configuration Files, Source Files, Includes (only those listed in file_list), Validation Scripts and Libraries, Template Files, and Local Libraries. Cloned component IDs are auto-assigned and will be unique across the current SDK and any other custom components that may exist, but labels and description data are unchanged.
	`--author "Fozzy Bear"`	If the optional author option is specified, the cloned component's author field in the .slcc is updated.
	`--clone-folder wakawaka`	If the optional `clone-folder` option is specified, it clones into that specific custom component directory (and adds it to the .slcp custom search paths).
upgrade	`upgrade blink.slcp`	Upgrades the given project in place. If no upgrade rules report verification is needed or an upgrade is impossible, this modifies the project and the config folder in the same folder as the project. Does nothing no config folder exists or the upgrade cannot complete properly. .bak files are created as backups for all files affected by the upgrade.
	`--dry-run`	Runs the upgrade up to the point where the temporary configuration files that have been modified would be merged into the project, but stops short. It reports any issues upgrading, but even if there none, it will not actually modify the project.
	`--verified`	If any upgrade rules indicate that 'verification is required', passing this allows the upgrade to take place.

3.4 General Options

These options can be specified for any action and must appear after the command. For instance, `slc configuration --cli-config file.cfg -sdk=/sdk/path` is correct.

Option	Example	Description
`-v --verbose`	`-v 1`	Accepts 0 or 1 Sets verbose levels. 0 is no verbosity. Higher levels provide more logging information.
`--cli-config`	`--cli-config /home/myhome/configfile.cfg`	Allows customization of where the configuration information, set via `slc configuration` and subcommands, is stored. Overrides the defaults and can be used for every command if the defaults are not properly working in your environment. This must be a file.
`-wrk, --working-directory`	`--working-directory /work/here`	The working directory that the command line should assume it was called from, such as for relative path resolution. In most cases, this should not need to be overridden.

3.5 Working with SDKs and Extensions

These commands provide information about the components (.slcc files) included in an SDK or extension.

3.5.1 SDK Options

These options are shared among all SDK commands.

Option	Example	Description
`-s --sdk`	`-s '/sdk/gsdk'`	Indicates the location of the primary SDK to use. This option overrides the global SDK configuration. If no SDK is configured (see above for **Configuration**) then this option becomes required. This either points directly to the .slcs file, or it points to a folder containing that file.
`--slccverify-release`		Turns on release verification, which is a stricter form of .slcc checking. By default, certain warnings are suppressed in dev mode for one reason or another but will appear in this mode. Library files that are missing will be reported.

3.5.2 SDK Operations

Operation	Example/Arguments	Description
where	`where micriumos`	Displays the location of a component based on the name. This is a subset of the information in **examine**.
examine	`examine micriumos`	Displays information about a component, such as where it is defined in the SDK, sources, provided APIs, and all additional metadata defined in the yaml itself.
validate	`validate sdk/platform/component/rtx.slcc`	Validates the .slcc file only, without validating anything else in the SDK. This ensures it is both proper yaml, and that it makes no semantic errors (such as missing required fields, misnamed fields, junk fields, or incorrect types).
show-available	`show-available toolchains [component option]`	Shows available toolchains and/or project types to use with **generate** or all distinct values for a component option (quality, provides, category, etc.).
editor	`editor emlib_emu`	Opens the configured external editor (see **configuration**) to the .slcc file that houses the component in question. An editor must be configured first for this to work.
prune	`prune --with brd2204a,EFM32GG11B820F2048GL192`	Returns a list of component IDs that are not conflicting with the given components. This is most effectively used to filter out components that would not work on certain hardware. Unlike **slc choices**, this is not intended to help fix validation errors, but rather to show everything that one could possibly add to a project given the current constraints. This uses the `project-level --with` commands. A project may still be specified, however, in which case the total components in the project are treated as the input to this command. Note: Using `--with` instead of an .slcp means including the components on the command line only. No dependencies are automatically resolved! If used directly with .slcp files, project dependencies are resolved as normal.
	`--trace`	After displaying all available components that could be added, shows a (typically very long) section afterwards of everything that was filtered out due to conflicts of dependencies, and then a list of APIs that are subsequently unavailable. The unavailable API list includes 1 to many OR-listings of requirements that would have had to have existed for the API to be acceptable for this project.

3.6 Creating SDK Extensions

This section discusses what constitutes an SDK extension and how to create one, as well as collating any information from the primary specification that pertains to SDK extensions. Note that this document is updated separately from the specification. In the event that the specification and this document do not align, the specification supersedes this document.

3.6.1 What Makes Up an SDK Extension?

To be used as an SDK extension, all you need initially is an `.slce` file and a folder that contains it. This becomes the container for the SDK extension.

Additionally, if you intend to install an SDK extension into an SDK manually (as opposed to letting the Simplicity Studio UI handle it), make sure the folder containing the `.slce` file is in a folder called `extension` inside of the SDK you intend to install it into.

3.6.2 Creating the Empty SDK Extension

First you will create an empty SDK extension for the sole purpose of testing that the integration of the SDK extension into the SDK is successful. So you can test as you go, you will create an SDK extension such that you do not need to go to the Simplicity Studio UI to install it.

1. Name your base folder anything you like.
2. Ensure your base folder is in the `extension` directory of the SDK. If the folder does not exist, create it. By default, it is likely you will not have it if you have yet to install extensions into a particular SDK.
    1. Because you will be using the `slc cli` later to verify your SDK extension is installed properly, make sure you are creating your SDK extension in the same SDK that is configured with `slc configuration --sdk`.
    2. If you are performing these steps with an sdk you downloaded using the Simplicity Studio installation, you will typically find the sdk in your user home folder. Navigate to **SimplicityStudio** → **SDKs** → **gecko_sdk** to find your installed sdk. You can also see where you installed the sdk from Simplicity Studio by checking the installation manager. Go to **Launcher View**, select **Install** at the top, and select the **SDKs** tab. Then, find the **Gecko SDK - 32-bit and Wireless MCUs** installation card and check the path indicated there.

       This is an example folder structure:

       ```
       + - SimplicityStudio
             |
             + - SDKs
                   |
                   + - gecko_sdk
                         |
                         + - extension
                               |
                               + - your_extension
       ```

       Note: This is `extension` singular, **not** `extensions` plural.
3. Create an `.slce` file at the base folder you wish to use. If starting from scratch completely, your folder may be empty.
4. Substituting `<text>` where appropriate, enter the following into the `.slce` file.

   .slce minimum working data

   ```
   id: "<your_extension_id>"
   label: "<your_extension_label>"
   version: <your_extension_version>
   sdk:
     id: "gecko_sdk"
     version: 4.1.0
   component_path:
     - path: <your_component_path>
   ```

   - `<your_extension_id>` is a unique id for this SDK extension and how SLC internally recognizes it as distinct from another vendor. The SLC specification for `id` indicates which characters are allowed. Generally, this means no spaces, all lowercase, and _ (underscore character) are permitted.
   - `<your_extension_label>` a human-readable name for the SDK extension. This may contain spaces.

- `<your_extension_version>` the starting version. This must follow semantic versioning rules – for example, `1.0.0, 0.0.1`.
- `<your_component_path>` is the folder at the same level as the `.slce` file where the SDK extension can find your `.slcc` files. If you do not know, the `.slcc` file defines an installable component into an SLC project. You may define multiple paths here as well. This procedure assumes the path is `.` , as in

  ```
  component_path:
    - path: .
  ```

- The sdk definition is typically `gecko_sdk` because that is the only SLC aware Silicon Labs sdk at this time. You may need to change the version number if you have a later version of the GSDK.
  - If you want to learn your `gecko_sdk` version without opening Simplicity Studio, open the `gecko_sdk.slcs` file inside the sdk folder and check the `sdk_version` metadata.

5. You now have a valid `.slce` file. If you already have some `.slcc` files and they are targeted by `component_path`, skip to step 6. Otherwise:
   1. Make a new `.slcc` file in the same directory as the `.slce` (or in one of the directories pointed to by `component_path`).
   2. Add a bare minimum amount of text for the `.slcc` to be considered valid.

      For example:

      ```
      id: neopolitan_icecream
      label: Neopolitan Icecream
      package: "ext-comp"
      description: Neopolitan Icecream
      category: Melting|Icecream
      quality: alpha
      ```

      The above is an absolute minimum set of required keys for an `.slcc` file to be considered a valid component.
6. Ensure that your `slc` command line is installed and available.
7. Ensure that `slc configuration` is set to use the sdk you are installing the SDK extension for.
8. Run `slc signature trust -extpath <path_to_your_extension_sdk>` so it is trusted. Otherwise, none of its contents will be parsed, and will therefore not be found in later steps. This should be the path to the *folder containing the .slce* , not to the `.slce` itself.

   Note: This is different from `slc signature trust -extid <your_extension_id>:<your_extension_version>` which installs trust for your SDK extension based on its `id` and `version` regardless of where it ends up moving. The former method will trust the SDK extension location allowing you to rename or reversion it without losing trust. If you are following this procedure and manually installed the SDK extension in with your GSDK, you will likely vastly prefer the `-extpath` option.
9. Run `slc signature trust --sdk <path_to_the_gecko_sdk>` if you have not yet trusted your SDK.
10. Run `slc examine <your_slcc_component_id> -ext <your_extension_id>:<your_extension_version>` where the `id` is either the dummy `id` you created for the test component (in the above example, that would be `neopolitan_icecream`), or the `id` of some component that should exist in your SDK extension. The `-ext` part tells `examine` to look in a specific SDK extension and you must supply both the `id` and `version` so it knows where to look (since the same `id` could be used in different places).
11. The SLC command line will report the component is found and the information about it will be displayed on the console. If it does not appear, recheck the above steps. Otherwise, you have installed your SDK extension.

    Note: The most common error here is not trusting the SDK extension. If it is not trusted, you will not receive any notification, it will just not load and not find the component.

3.6.3 Making a Project Use an SDK Extension (Command Line)

Normally, you can add an SDK extension to a project using the Component Selector in the Simplicity Studio User Experience (UX). Without that, you must do this manually. You add an SDK extension to a project by modifying its `.slcp` file to refer to the SDK extension. Components within that SDK extension are included using a special syntax.

1. Make a new project. This is beyond the scope of this document, but you can take an existing Simplicity Studio project you have or use `slc generate -np` on an example project in the SDK to create a new one to work with if you do not have one already. Refer to the relevant `slc` documentation on how to find and generate an example.
2. Inside the `.slcp` file, add a section as shown below. Add to the same level as other root metadata tags:

```
sdk_extension:
  - id: <your_extension_id>
    version: <your_extension_version>
```

3. This tells the project that it will use that SDK extension with specifically that version. You may define multiple SDK extensions to use in a project, but for a given `id`, you may only choose one version.
4. Now, tell the project to use one of the components in the SDK extension. There is a `component` key at the root of the yaml with a list of components selected in a project. Observe the difference between referring to a component from the SDK and a component from the SDK extension as shown below.

```
component:
  - id: emlib
  - id: neopolitan_icecream
    from: <your_extension_id>
```

- `emlib` comes from the GSDK. Any component from the GSDK needs only the `id` field. You do not need to have this specific component. This is just an example of what using a component from the main SDK looks like compared to the SDK extension.
- `neopolitan_icecream`, or whatever `id` of a component in your `sdk` extension, comes from that SDK extension. As such, you need to tell SLC that this component comes from a different location. Note that the version is not included next to the `from` field. This is why `sdk_extension` field exists earlier. `sdk_extension` indicates what specific SDK extension to pick out. You cannot have multiple SDK extensions with the same `id` even if the versions are different, in the same project. The component listing will always refer to whatever version of that SDK extension is being brought in at the time.

5. You can now use `slc summarise` on the project to view and ensure that your project is seeing the component.

3.6.4 Using Your SDK Extension with the Simplicity Studio IDE

The Simplicity Studio Integrated Development Environment (IDE) provides a User Interface (UI) for adding SDK extensions from anywhere on your system. However, if you are actively developing SDK extensions, it is important to be aware of a few limitations. This section discusses how to add your custom SDK extension to Simplicity Studio in this way and what to look out for as an SDK extension developer.

First, if you have followed the above procedures up to this point and used a project that is already part of a Simplicity Studio workspace, it is already connected. You need only launch Simplicity Studio and open the project. The SDK extension will already be installed and you can browse components within it.

If you followed the above procedures but did not use a project in a Simplicity Studio workspace, follow these steps

Using an already installed and trusted SDK extension with a project:

1. Create a new project or pick an existing one using the same `sdk` you installed the SDK extension for.
2. Open the `.slcp` file.
3. Navigate to the Component Selector by clicking the **Software Components** tab.
4. Search for a component in your SDK extension.
5. After you find it, Simplicity Studio prompts you to add the SDK extension to the project before you install the component.
6. Install the component and your project is now connected to that SDK extension.

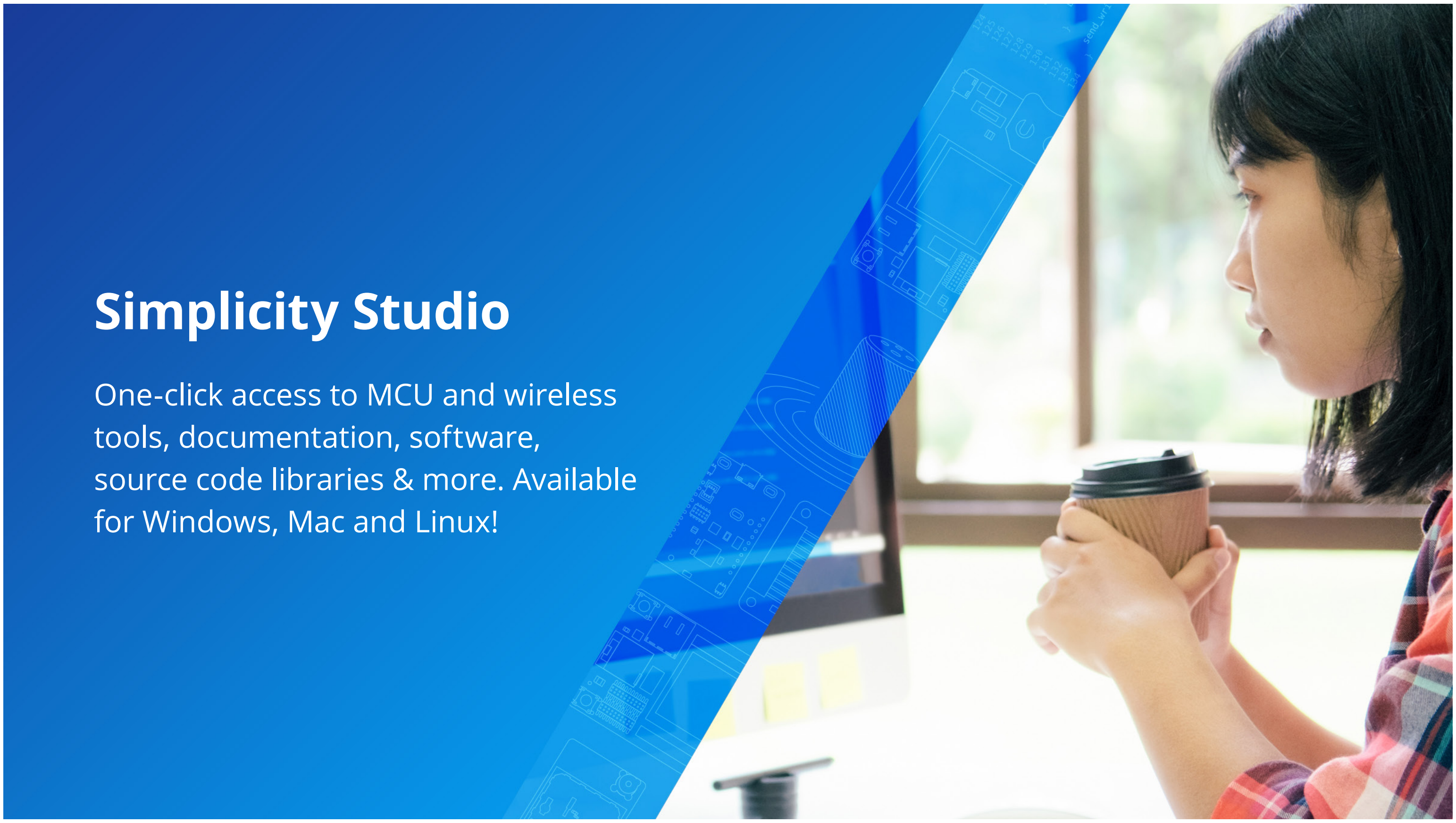
For the above steps, you do not need to install the SDK extension at a preference level to be globally accessible. By placing it in the GSDK`'s extension folder` you already did that manually and Simplicity Studio has detected that.

However, if you did not install the SDK extension or you are using a different GSDK that does not have the SDK extension, your flow will be a bit more involved. If you wish to use your SDK extension with a different SDK or you have distributed it and another SDK wishes to use it, follow these steps:

1. In Simplicity Studio go to **Preferences** → **Simplicity Studio** → **SDKs** and select the Gecko SDK Suite to which the SDK extension will be added. Click **Add Extension…**
2. Click **Browse** and navigate to the root folder of the new SDK extension and click **Select Folder**.
3. The SDK extension should be displayed in the Detected SDK Extension window with the correct name, version, and path. Click **OK** and then **Trust** and **Apply and Close**.

   Important: Be aware that installing an SDK extension like this will copy the SDK extension from wherever it was into the proper folder structure and rename it so it is detected as an SDK extension. Because this is a *copy*, changes you make to your original SDK extension will **not** be reflected until you remove and add the SDK extension again. This is why the earlier part of the above procedures recommend starting from the correct installation location of the GSDK you want to test with because this shields you from this complication.

4. You can now follow the above steps in **Using an already installed and trusted SDK extension with a project**.



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SILICON LABS

Silicon Laboratories Inc.
400 West Cesar Chavez
Austin, TX 78701
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