AN14690

Adding a different toolchain to be used by S32 Design Studio

Rev. 1.0 — 4 November 2025 Application note

Document information

Information	Content
Keywords	Compiler version, libc version, change compiler, change toolchain, S32 Design Studio, a53
Abstract	The GCC compiler version - and by extension, the associated libc version - can vary across different deliverables, such as the NXP Automotive Linux BSP, which relies on the version provided by Yocto. This variability may lead to compatibility issues, particularly when linking against library binaries built with a newer libc version while using an older one. To address this, a mechanism should be provided to update the toolchain used by S32 Design Studio, either by integrating a version from the Arm® website or aligning it with the toolchain used in the NXP Automotive Linux BSP.

1 Introduction

When linking against prebuilt libraries, it is important to use the same version of libc that was used to build those libraries to ensure compatibility and stability. This application note explains how to change the toolchain in S32 Design Studio, which is particularly useful when integrating prebuilt libraries from the Automotive Linux BSP. These libraries may be included in the target filesystem, and proper toolchain alignment is essential for successful linking.

2 Using the toolchain generated from Automotive Linux BSP

The following steps begin with building the Linux BSP SDK, followed by instructions for integrating the resulting toolchain as a compiler option within S32 Design Studio. Since the Automotive Linux BSP is based on Yocto and can only be built on a Linux system, S32 Design Studio must also be run on a Linux machine - ideally the same one used to build the toolchain. This ensures consistency and simplifies the integration process.

2.1 Building the Yocto cross-development toolchain

The instructions provided in the "**Build the Linux BSP**" chapter of the Automotive Linux BSP User Manual must be followed as an initial step. Upon completion, the following command can be executed to proceed with the process:

bitbake fsl-image-base -c populate_sdk

This will create a Software Development Kit (SDK) installer in *<build_directory>/tmp/deploy/sdk*, where *<build_directory>* is the root of the Yocto build environment.

2.2 Installing the Yocto cross-development toolchain

The SDK can be installed by running the generated script:

./fsl-auto-glibc-x86_64-cortexa53-crypto-toolchain-43.0.sh

After installing the SDK, navigate to the installation folder, then in *sysroots/x86_64-fslbsp-linux/usr/bin/aarch64-fsl-linux* the cross-development toolchain (*aarch64-fsl-linux-**) can be found:

```
sysroots/x86_64-fslbsp-linux/usr/bin/aarch64-fsl-linux @ nxp:~$
aarch64-fsl-linux-addr2line aarch64-fsl-linux-gcc-nm       aarch64-fsl-linux-ld.gold
aarch64-fsl-linux-ar        aarch64-fsl-linux-gcc-ranlib   aarch64-fsl-linux-lto-dump
aarch64-fsl-linux-as        aarch64-fsl-linux-gcov         aarch64-fsl-linux-nm
aarch64-fsl-linux-c++filt   aarch64-fsl-linux-gcov-dump    aarch64-fsl-linux-objcopy
aarch64-fsl-linux-cpp       aarch64-fsl-linux-gcov-tool    aarch64-fsl-linux-objdump
aarch64-fsl-linux-dwp       aarch64-fsl-linux-gdb          aarch64-fsl-linux-ranlib
aarch64-fsl-linux-elfedit   aarch64-fsl-linux-gdb-add-index aarch64-fsl-linux-readelf
aarch64-fsl-linux-g++       aarch64-fsl-linux-gprof        aarch64-fsl-linux-size
aarch64-fsl-linux-gcc       aarch64-fsl-linux-ld           aarch64-fsl-linux-strings
aarch64-fsl-linux-gcc-ar    aarch64-fsl-linux-ld.bfd       aarch64-fsl-linux-strip
```

Figure 1. List of executables that are part of cross-development toolchain

2.3 Configure the S32 Design Studio to use the Yocto cross-development toolchain

1. Open S32 Design Studio, create a new S32 Design Studio Application Project for *Cortex-A53 Linux*, then right-click on the project and click on *Properties*:

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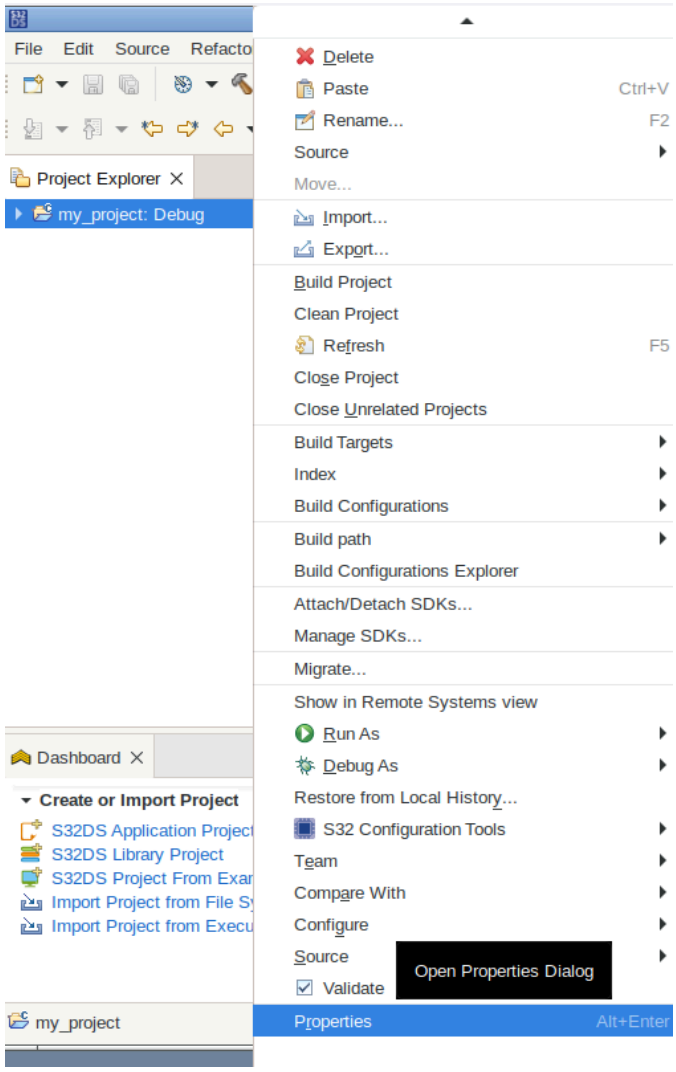

Figure 2. Context Menu Options for Project

2. Navigate to *Settings -> Cross Settings*. Choose one of the configurations: *Debug*, *Release* or All configurations:

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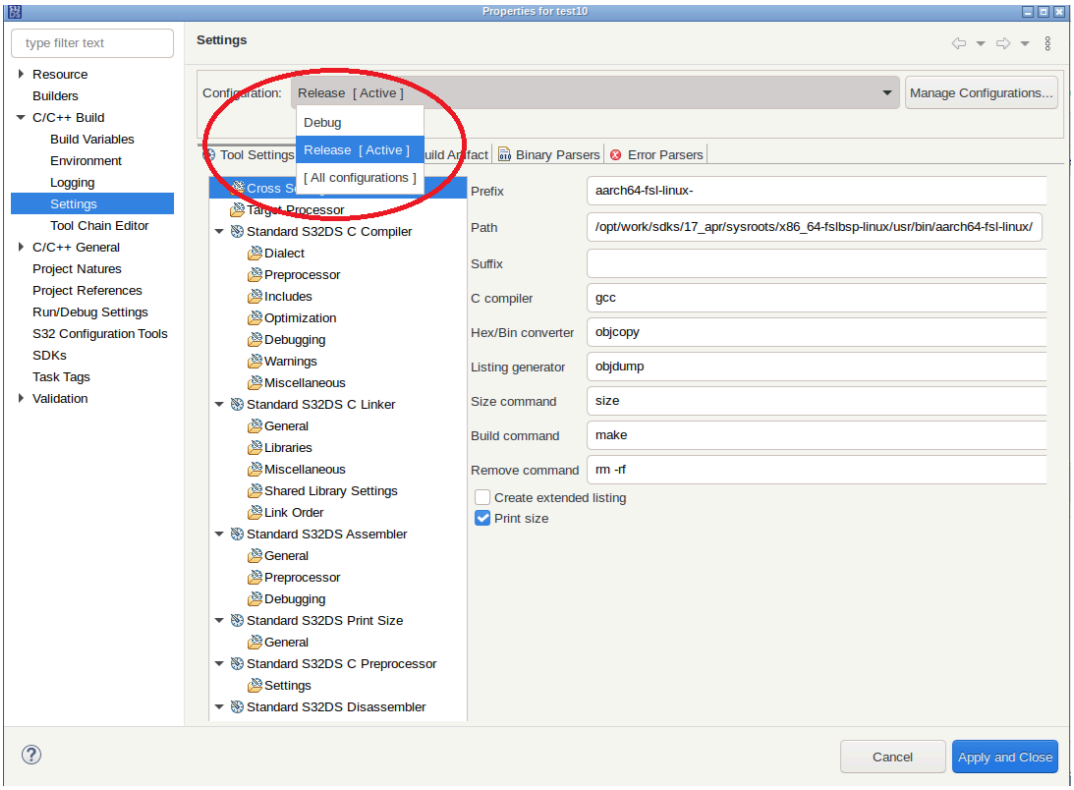

Figure 3. Switching between Debug and Release for configuration

3. Update the *Prefix* field with the prefix value for the cross-development toolchain built from the Linux BSP (*aarch64-fsl-linux-*). Then, update the *Path* field with the cross-development toolchain location:

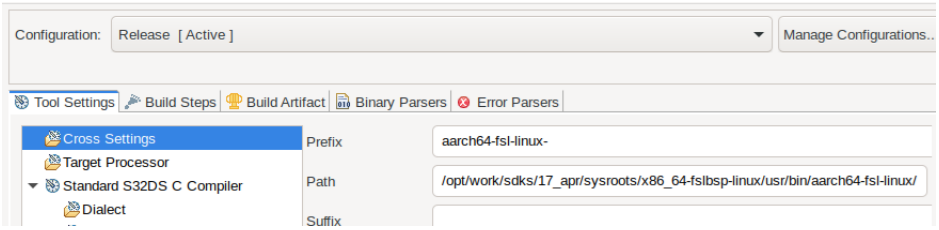

Figure 4. Fields Prefix and Path set the cross-development toolchain to be used

4. Navigate to *StandardS32DS C Linker -> Miscellaneous* and add the following to *Linker flags*: *--sysroot=[sdk-location]/sysroots/cortexa53-crypto-fsl-linux/*

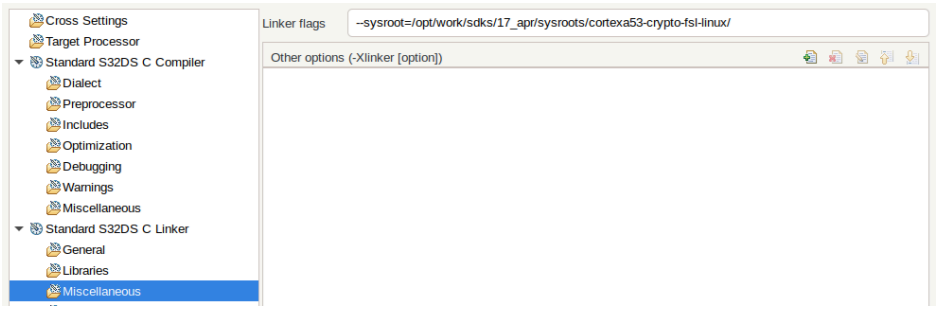

Figure 5. Linker flags

5. Click *Apply* and *Close* then build the project. Make sure the expected type of build (*Release* or *Debug*) is set before building.

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3 Using the toolchain from Arm on Linux or Windows

Building a toolchain using Yocto ensures reproducibility and flexibility, but it requires a dedicated environment where the entire compilation process must take place. This limitation can be addressed by using a prebuilt toolchain available for download from the official Arm website. While Arm provides a variety of toolchain versions, not all are compatible with a given Linux BSP release. Therefore, selection should be guided by the recommendations outlined in the Automotive Linux BSP User Manual, which specifies the compatible versions. Choosing the appropriate version ensures that the same libc version is used in both the toolchain and the target filesystem, maintaining compatibility and minimizing potential runtime issues.

Figure 6. Toolchain versions (GCC) that are available for download on Arm website

The Arm toolchain is available for both Linux and Windows. While the following steps are made on a Windows machine, they can be also applied on Linux with minor adjustments. With the appropriate version selected, the following steps will guide through the installation and integration process:

1. Download toolchain from Arm website.
2. Extract the archive to a folder of choice. In this demo, *C:\SDK* is used as an example. Navigate to *C:\sdks\arm-gnu-toolchain-14.2.rel1-mingw-w64-x86_64-aarch64-none-linux-gnu\bin*:

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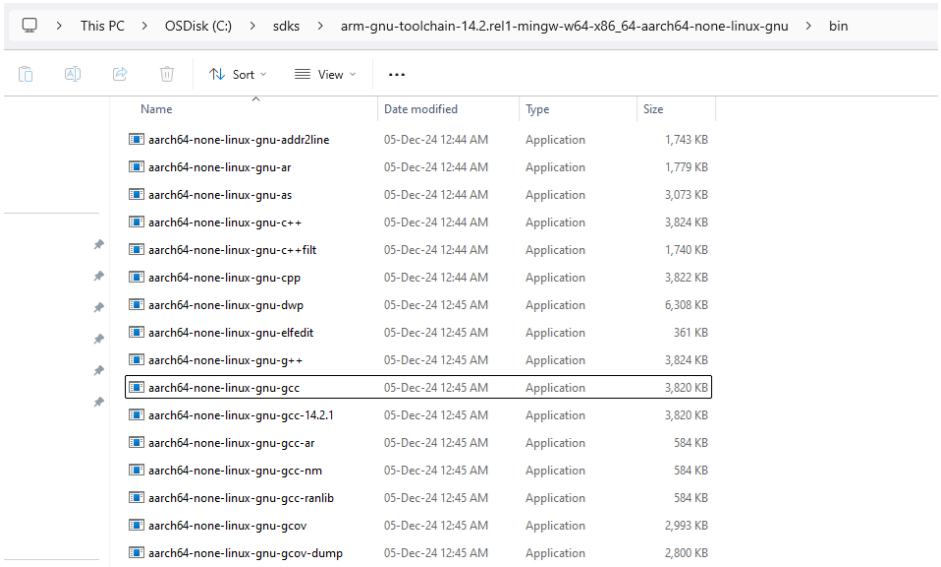

Figure 7. List of executables that are part of toolchain

3. Open S32 Design Studio, create a new S32 Design Studio Application Project for Cortex-A53 Linux, then right click on the project. Navigate to the bottom of the drop-down menu and then click on *Properties*:

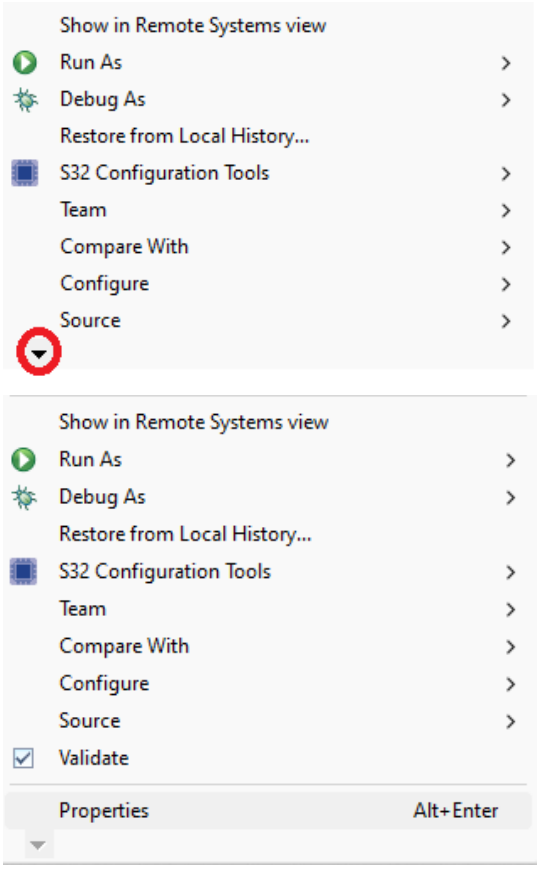

Figure 8. Context Menu Options for Project

4. Navigate to *Settings* -> *Cross Settings*. Choose one of the configurations: *Debug*, *Release* or All configurations:

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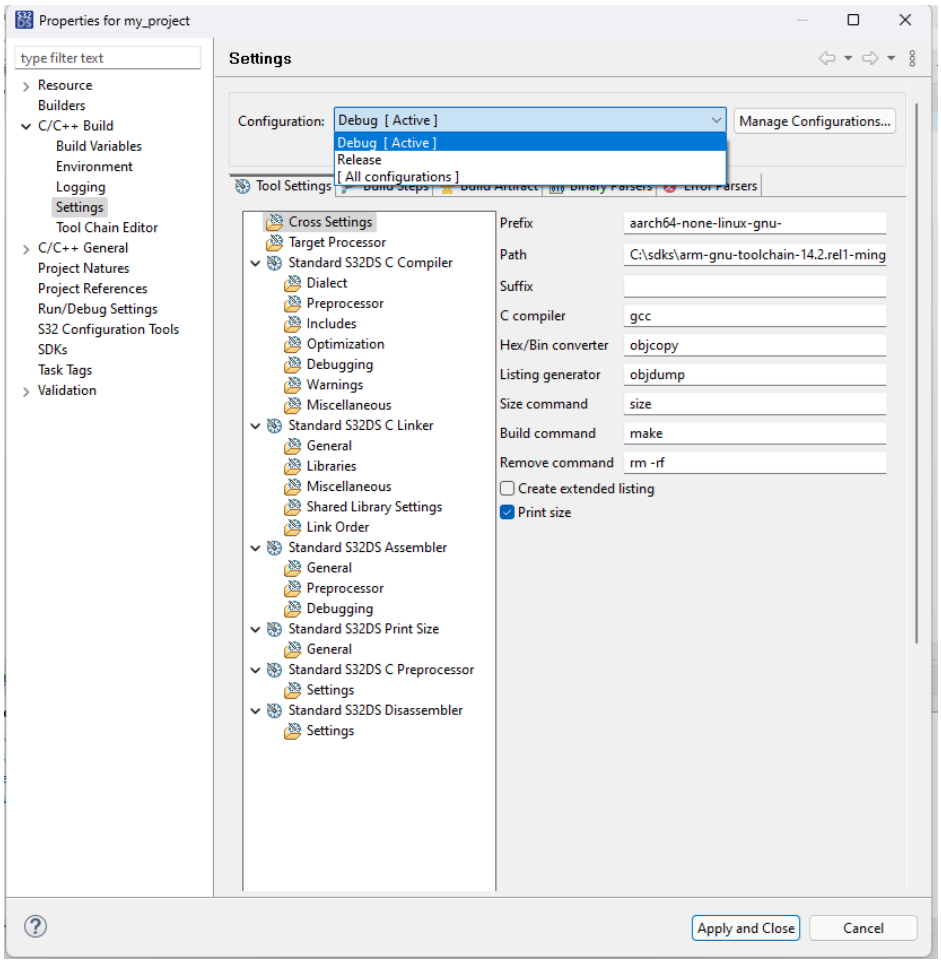

Figure 9. Switching between Debug and Release for configuration

5. Update the *Prefix* field with the prefix value for the SDK toolchain (*aarch64-fsl-linux-*). Then, update the *Path* field with the toolchain location:

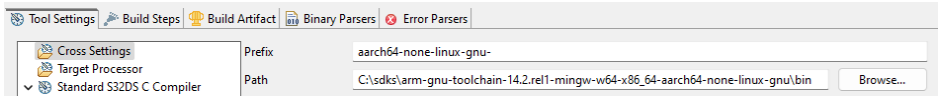

Figure 10. Fields Prefix and Path set the toolchain to be used

Click *Apply and Close* then *Build* the project. Make sure the expected type of build (*Release* or *Debug*) is set before building.

4 Links

Table 1. Reference links

Description	Link
BSP for S32 MCUs and Processors	https://www.nxp.com/design/design-center/software/embedded-software/linux-software-and-development-tools/bsp-for-s32-microcontrollers-and-processors:BSP-S32
S32 Design Studio IDE	https://www.nxp.com/design/design-center/software/automotive-software-and-tools/s32-design-studio-ide:S32-DESIGN-STUDIO-IDE

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Table 1. Reference links*...continued*

Description	Link
Yocto Software Development Kit	https://docs.yoctoproject.org/5.0.10/singleindex.html#cross-development-toolchain-generation
Arm GNU Toolchain Downloads	https://developer.arm.com/downloads/-/arm-gnu-toolchain-downloads
GitHub - Automotive Linux BSP	https://github.com/nxp-auto-linux/meta-alb

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6 Revision history

Table 2. Revision history

Document ID	Date	Description
AN14690 v.1.0	4 Nov 2025	Initial release

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