

BSP Project Quick Start

For NuMicro 8051 Series

Jan, 2026

Joy of innovation
nuvoton

| Agenda

- **The Structure Of BSP**
- **Build Your Project Utilizing BSP - KEIL**
- **Build Your Project Utilizing BSP - IAR**
- **Build Your Project Utilizing BSP - NuEclipse**



The BSP Structure

KEIL / IAR / SDCC NuEclipse



Folder structure

```
CM1003_Series_BSP_V2.00.000
  CM1003CF_CM1003BF
    Library
    SampleCode
      RegBased
        ADC_Bandgap_VDD
    Template
      Project_temp
        Keil
        IAR
        SDCC
```

CM1003_Series_BSP_V2.00.000 >				
名称	修改日期	类型	大小	
CM1003CF_CM1003BF	2026/1/21 17:16	文件夹		
CM1003DL_CM1003DJ_CM1003CJ	2026/1/21 17:16	文件夹		
Document	2026/1/21 17:16	文件夹		
LICENSE.txt	2022/1/20 17:27	文本文档	12 KB	
NOTICE.txt	2024/6/4 15:17	文本文档	1 KB	
Readme.pdf	2025/6/17 17:19	PDF 文件	295 KB	

- It is recommended to create a new project folder at the same level as the subfolder within either the "Template" or "RegBased" directory.
- The "Library" folder and all subfolders should always be remained.

The .c File Define For Different Compiler

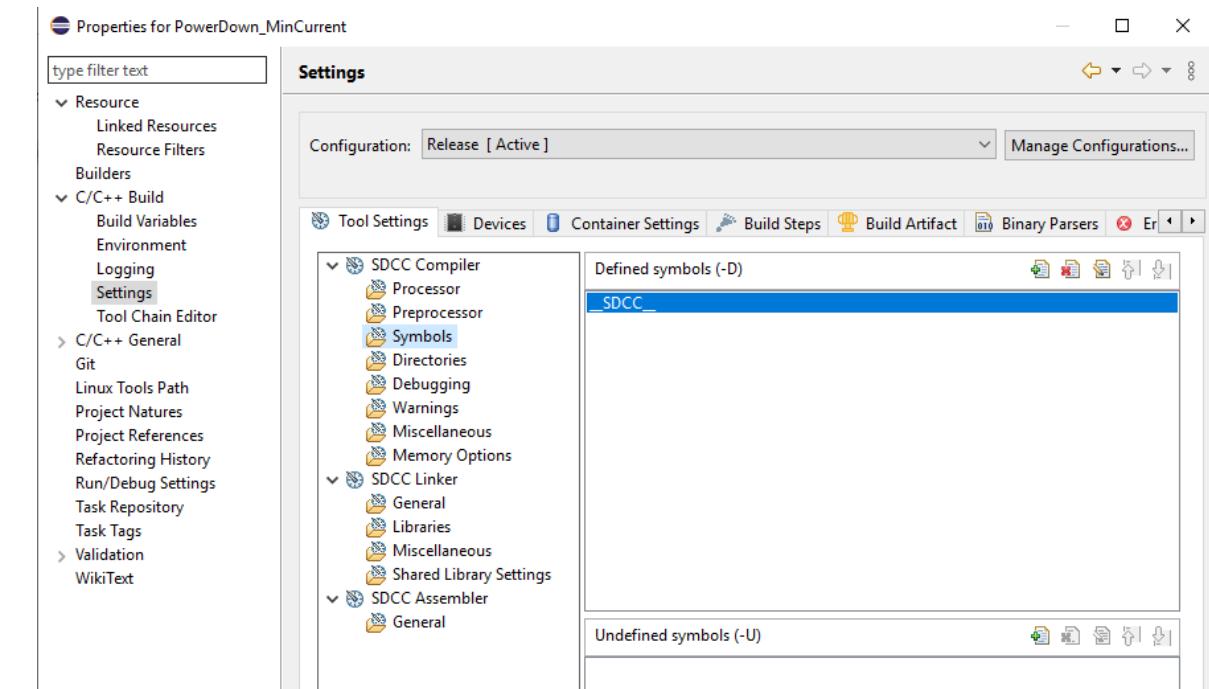
- Different Coding Rule

C51 is for KEIL PK51

ICC8051 is for IAR 8051 workbench

SDCC is for NuEclipse

```
11 #if defined __C51__
12     uint8_t data TA_REG_TMP,BYTE_TMP,SFRS_TMP;
13
14 #elif defined __ICC8051__
15     uint8_t __data TA_REG_TMP,BYTE_TMP,SFRS_TMP;
16
17 #elif defined __SDCC__
18     __data uint8_t TA_REG_TMP,BYTE_TMP,SFRS_TMP;
19 #endif
```



NuEclipse defined symbols window

- Simplify code

When you decide to use a certain compiler, you can remove the definitions of other compilers whole group.

Build Your Project Utilizing BSP - KEIL

**Copying from the existing project
is often more advantageous
than creating a new one**



For KEIL

- Copy A Folder From Template “Project_temp”

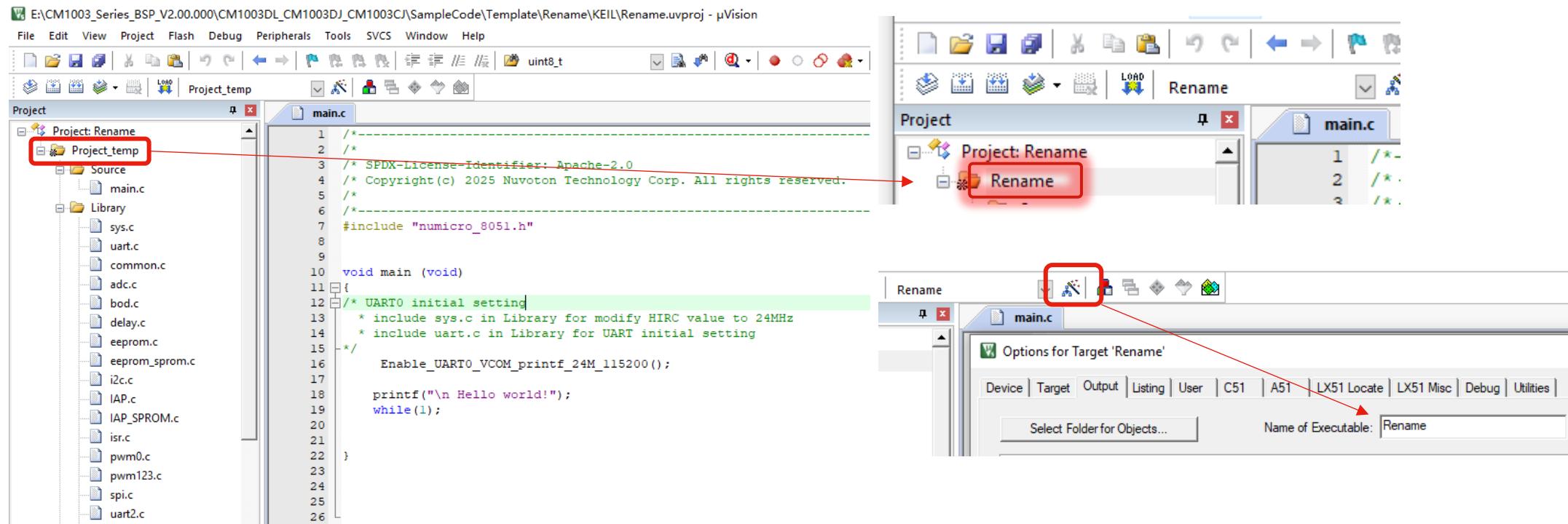
名称	修改日期	类型	大小
Project_temp	2026/1/21 17:16	文件夹	
Project_temp - copy	2026/1/22 14:22	文件夹	

- Rename the “project_temp.uvproj” to “Rename.uvproj”

名称	修改日期	类型	大小
Nu_Link_8051_Driver.ini	2022/11/14 14:26	INI 文件	1 KB
Rename.uvopt	2023/12/1 14:19	UVOPT 文件	15 KB
Rename.uvproj	2025/6/17 17:14	μVision4 Project	19 KB

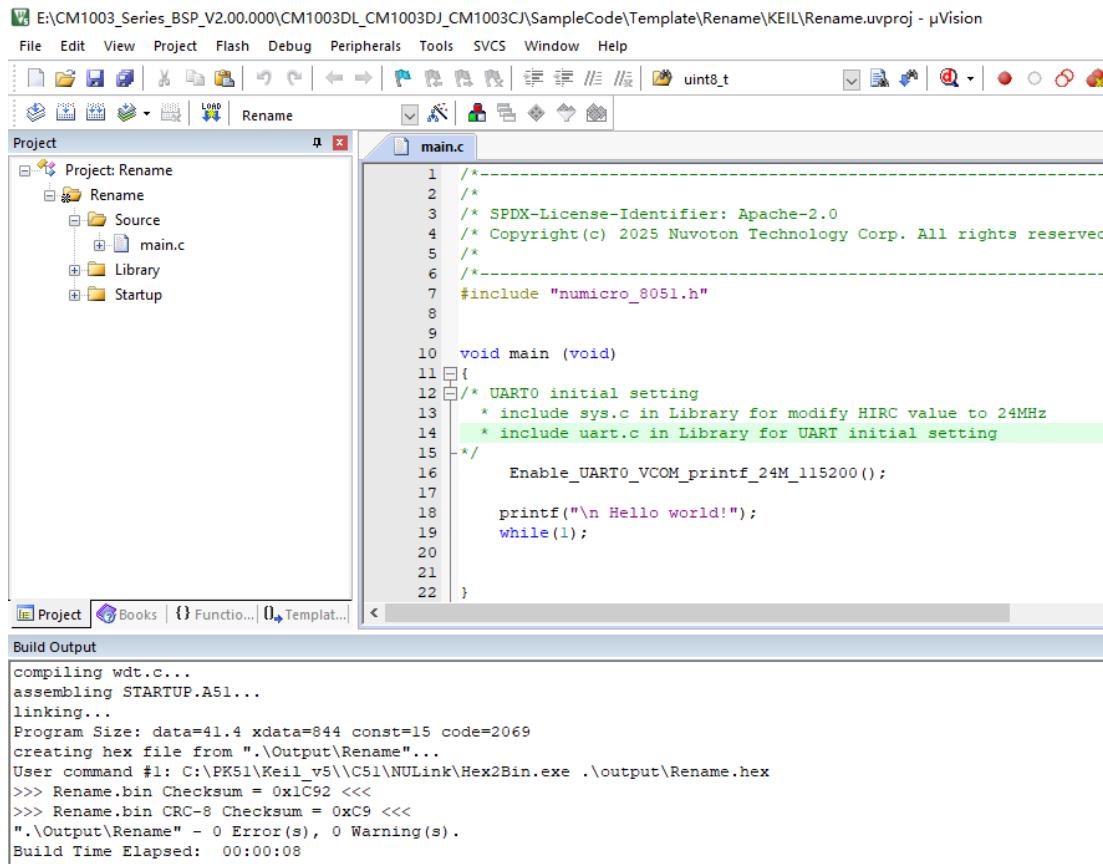
For KEIL

- Modify the Project name in KEIL.



For KEIL

- Compile with the new application .c file. Find the output hex and bin file.



E:\CM1003_Series_BSP_V2.00.000\CM1003DL_CM1003DJ_CM1003CJ\SampleCode\Template\Rename\KEIL\Rename.uvproj - µVision

File Edit View Project Flash Debug Peripherals Tools SVCS Window Help

Project Rename

Source main.c

main.c

```
1 /*-----  
2 *  
3 * SPDX-License-Identifier: Apache-2.0  
4 * Copyright(c) 2025 Nuvoton Technology Corp. All rights reserved.  
5 */  
6 /*-----  
7 #include "numicro_8051.h"  
8  
9  
10 void main (void)  
11 {  
12     /* UART0 initial setting  
13      * include sys.c in Library for modify HIRC value to 24MHz  
14      * include uart.c in Library for UART initial setting  
15     */  
16     Enable_UART0_VCOM_printf_24M_115200();  
17  
18     printf("\n Hello world!");  
19     while(1);  
20  
21 }  
22 }
```

Build Output

```
compiling wd़.c...  
assembling STARTUP.A51...  
linking...  
Program Size: data=41.4 xdata=844 const=15 code=2069  
creating hex file from ".\Output\Rename"...  
User command #1: C:\PK51\Keil_v5\CS1\NULink\Hex2Bin.exe ./output\Rename.hex  
>>> Rename.bin Checksum = 0xC92 <<  
>>> Rename.bin CRC-8 Checksum = 0xC9 <<  
.\"Output\Rename" - 0 Error(s), 0 Warning(s).  
Build Time Elapsed: 00:00:08
```

名称	修改日期	类型	大小
adc.obj	2026/1/23 11:12	3D Object	543 KB
bed.obj	2026/1/23 11:12	3D Object	540 KB
common.obj	2026/1/23 11:12	3D Object	543 KB
delay.obj	2026/1/23 11:12	3D Object	548 KB
eeprom.obj	2026/1/23 11:12	3D Object	552 KB
eeprom_srom.obj	2026/1/23 11:12	3D Object	546 KB
gpio.obj	2026/1/23 11:12	3D Object	549 KB
i2c.obj	2026/1/23 11:12	3D Object	544 KB
IAP.obj	2026/1/23 11:12	3D Object	566 KB
IAP_SPROM.obj	2026/1/23 11:12	3D Object	545 KB
isr.obj	2026/1/23 11:12	3D Object	551 KB
main.obj	2026/1/23 11:12	3D Object	539 KB
pwm0.obj	2026/1/23 11:12	3D Object	548 KB
pwm123.obj	2026/1/23 11:12	3D Object	552 KB
Rename	2026/1/23 11:13	文件	12,481 KB
Rename.bin	2026/1/23 11:13	BIN 文件	3 KB
Rename.build_log.htm	2026/1/23 11:13	Microsoft Edge ...	2 KB
Rename.hex	2026/1/23 11:13	HEX 文件	6 KB
Rename.lnp	2026/1/23 11:13	LNP 文件	1 KB
Rename.SBR	2026/1/23 11:13	SBR 文件	12,240 KB
spi.obj	2026/1/23 11:12	3D Object	540 KB
STARTUP.obj	2026/1/23 11:13	3D Object	1 KB
sys.obj	2026/1/23 11:12	3D Object	550 KB
timer.obj	2026/1/23 11:12	3D Object	547 KB
uart.obj	2026/1/23 11:12	3D Object	545 KB
uart2.obj	2026/1/23 11:12	3D Object	543 KB
uart3.obj	2026/1/23 11:12	3D Object	543 KB
uart4.obj	2026/1/23 11:12	3D Object	543 KB

Options of KEIL PK51

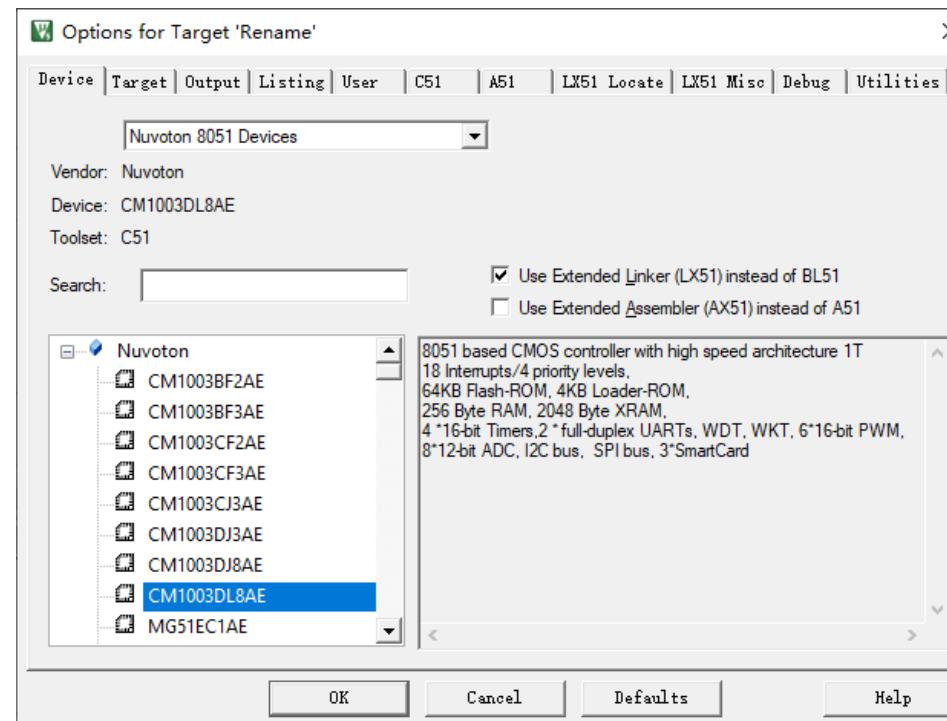
- The following introduction focuses on the special definition of Nuvoton 8051 series.
- For a comprehensive description of all options, please consult the official Keil documentation.

https://www.keil.com/support/man/docs/uv4cl/uv4cl_dg_options.htm



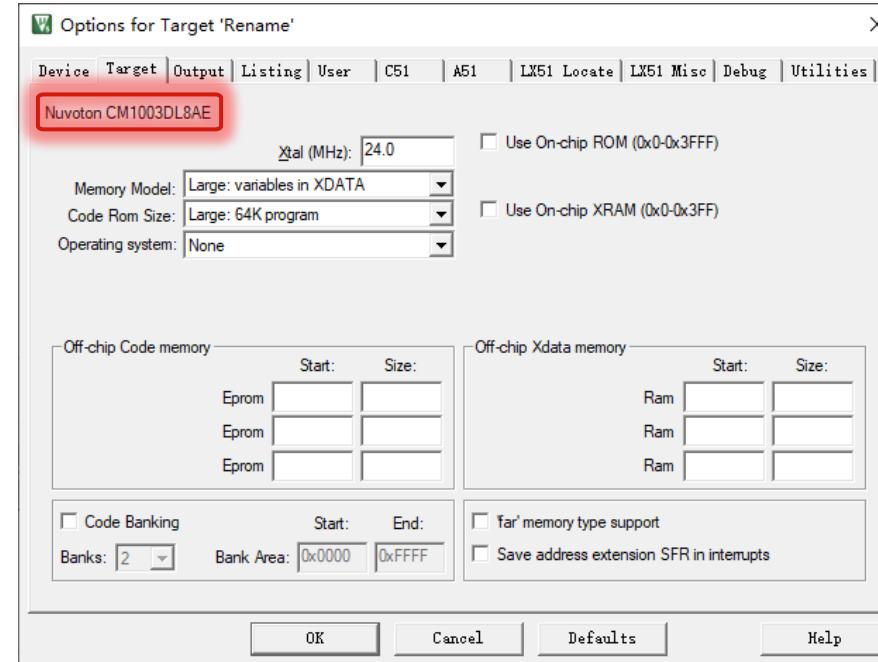
| For KEIL - Device

- Confirm "Nuvoton 8051 Device" is selectable.
- If this option is unavailable, please install the Nuvoton Keil driver package.



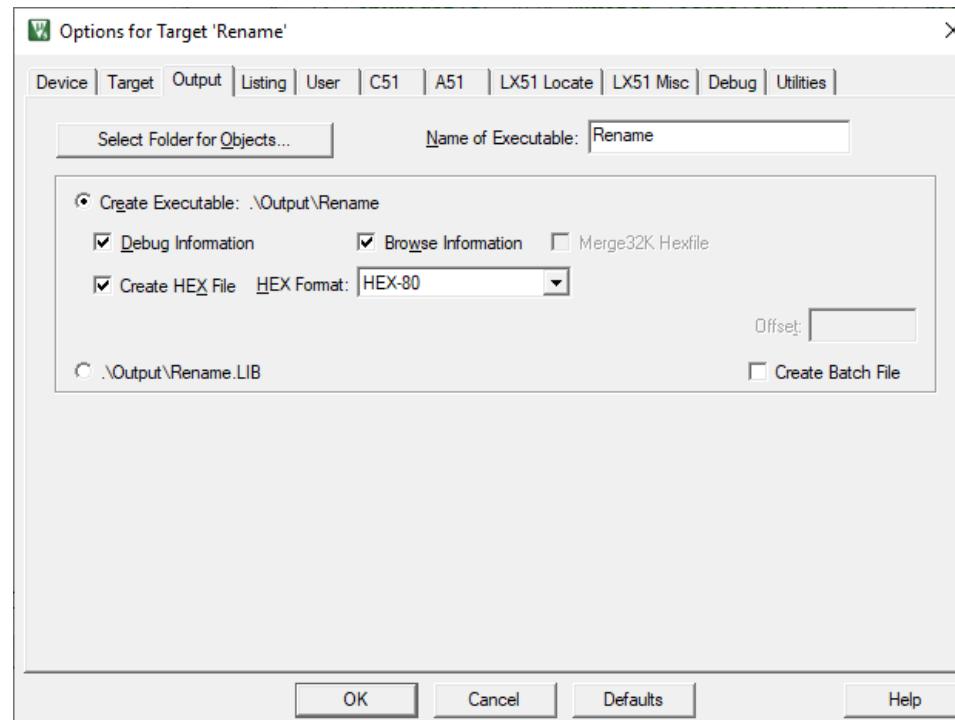
| For KEIL - Target

- Check with the device. If not match, select the correct device in “Device” page.
- Memory Model: Large for variable default using XDATA



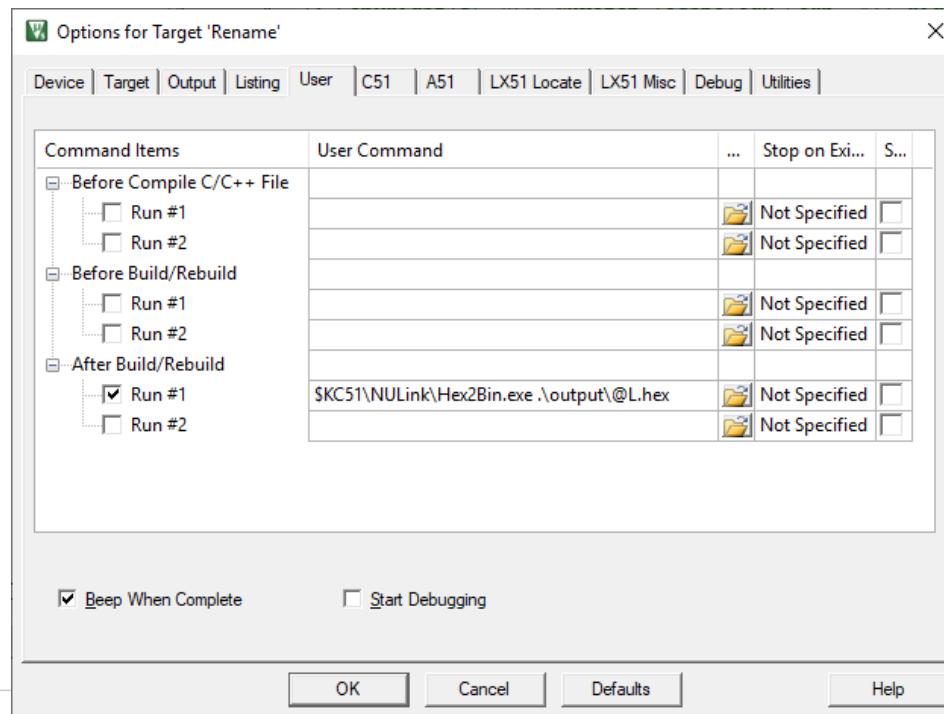
| For KEIL - Output

- “Name of Executable” define the output .hex file name
- Keil exclusively generates HEX format files, while BIN files are produced using the Nuvoton command line. The command line we introduce in next page.



For KEIL - User

- This file is located within the Keil setup folder. For example: C:\Keil_v5\C51\NULink
 - By default, unused locations will be filled with 0xFF.
 - Users can also include the parameter –P 0x00 means unused locations are filled with zeros.
 - Parameter <start address> <data length>



```
C:\Keil_v5\C51\NULink>hex2bin.exe  
===== Nuvoton HexToBin for 8051 Series v1.07 =====  
  
Command Format:  
Hex2Bin [File] [Arg0] [Arg1] [Arg2] [Arg3] [Arg4] [Arg5]  
  
C:\>Hex2Bin C:\File.hex  
C:\>Hex2Bin C:\File.hex -P 0xFF  
C:\>Hex2Bin C:\File.hex -P 0xFF 0x00 0x1000  
C:\>Hex2Bin C:\File.hex 0x00 0x1000  
C:\>Hex2Bin C:\File.hex -P 0xFF 0x00 0x1000 0x2000 0x800  
C:\>Hex2Bin C:\File.hex 0x00 0x1000 0x2000 0x800  
C:\>Hex2Bin C:\File.hex -S 0xFF 0x1000 0x800
```

| For KEIL – C51

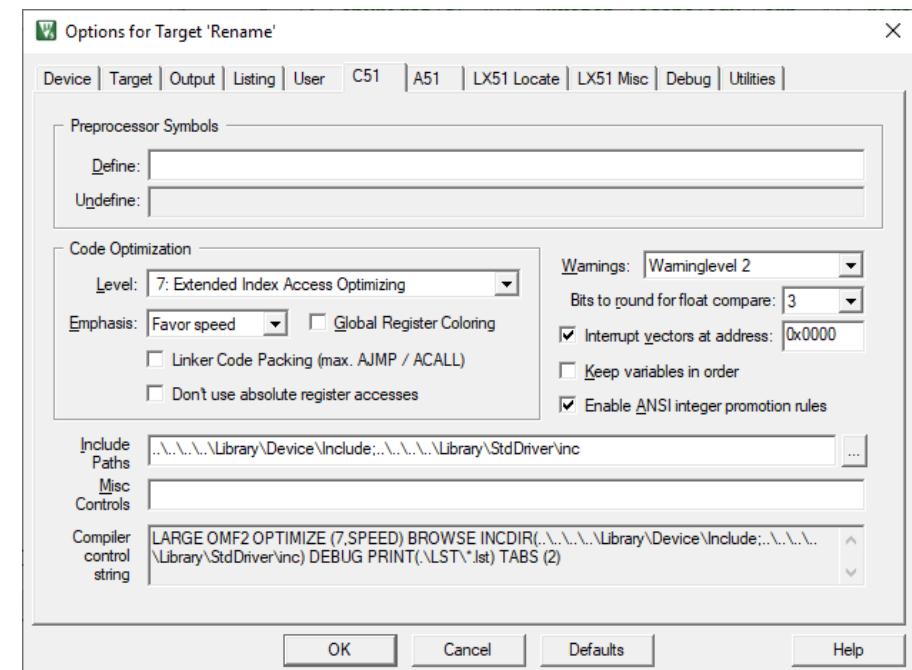
- Code Optimization

Levels 7 and 4 are recommended especially when considering code size.

- Include Paths

Defined the header file path of device and library.

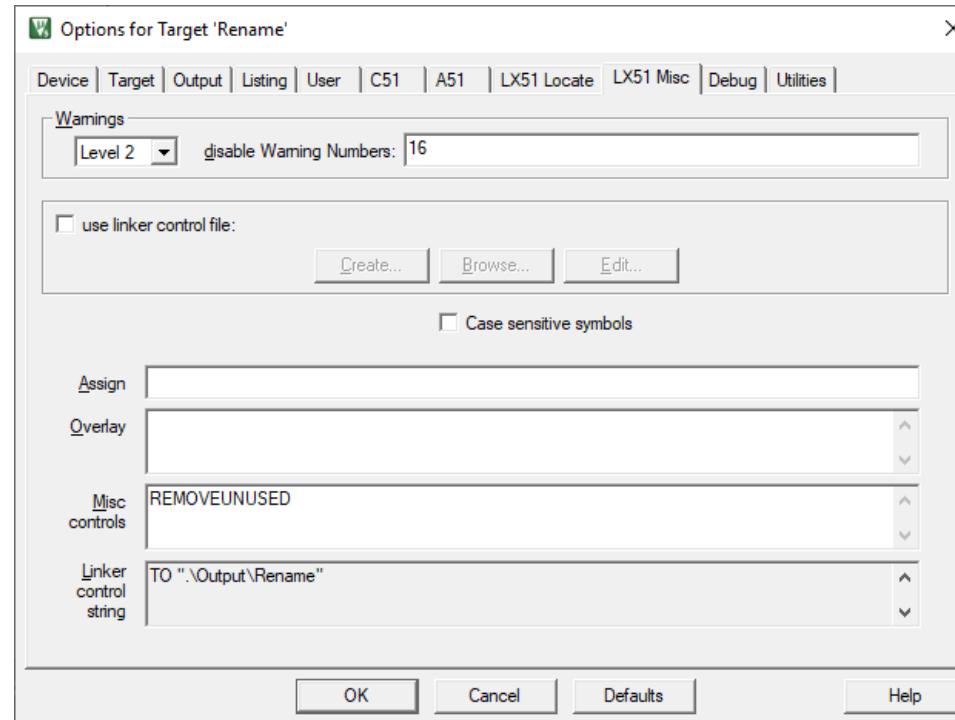
- Following shows the most popular define



| For KEIL – LX51 Misc

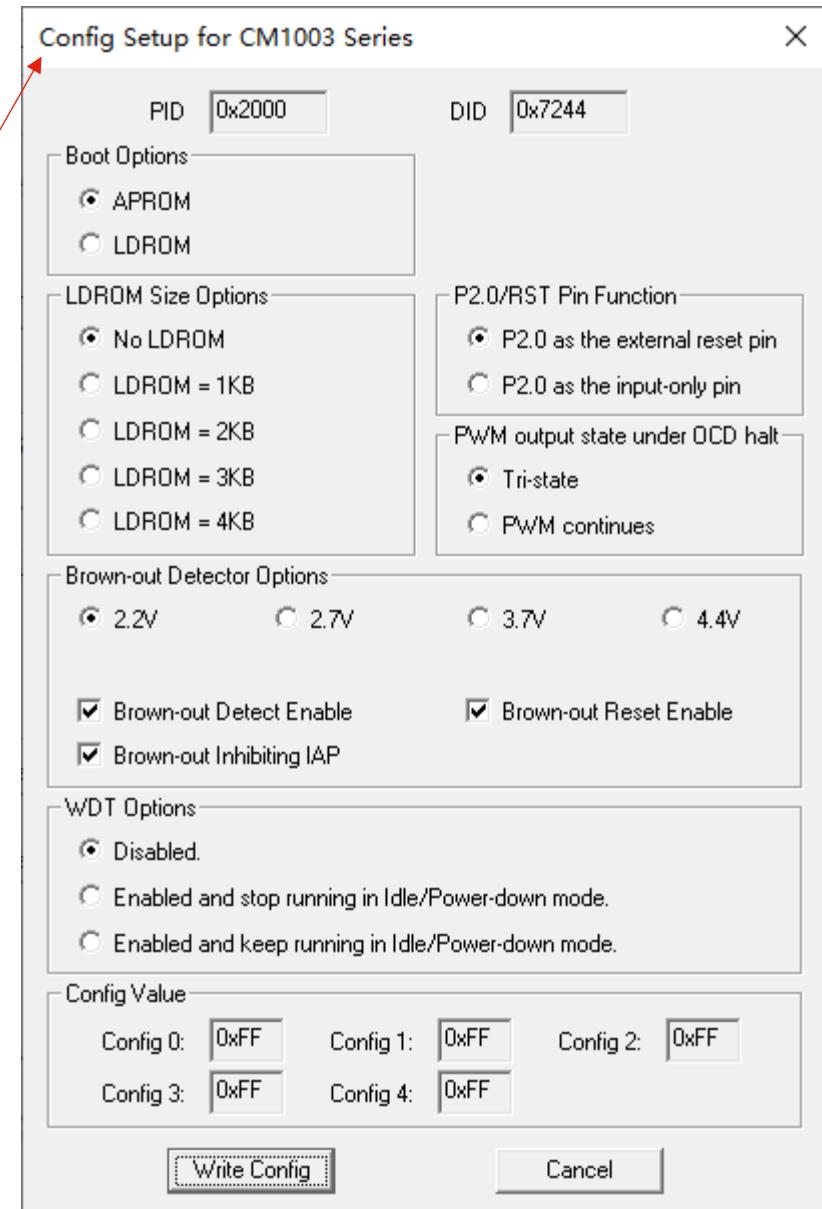
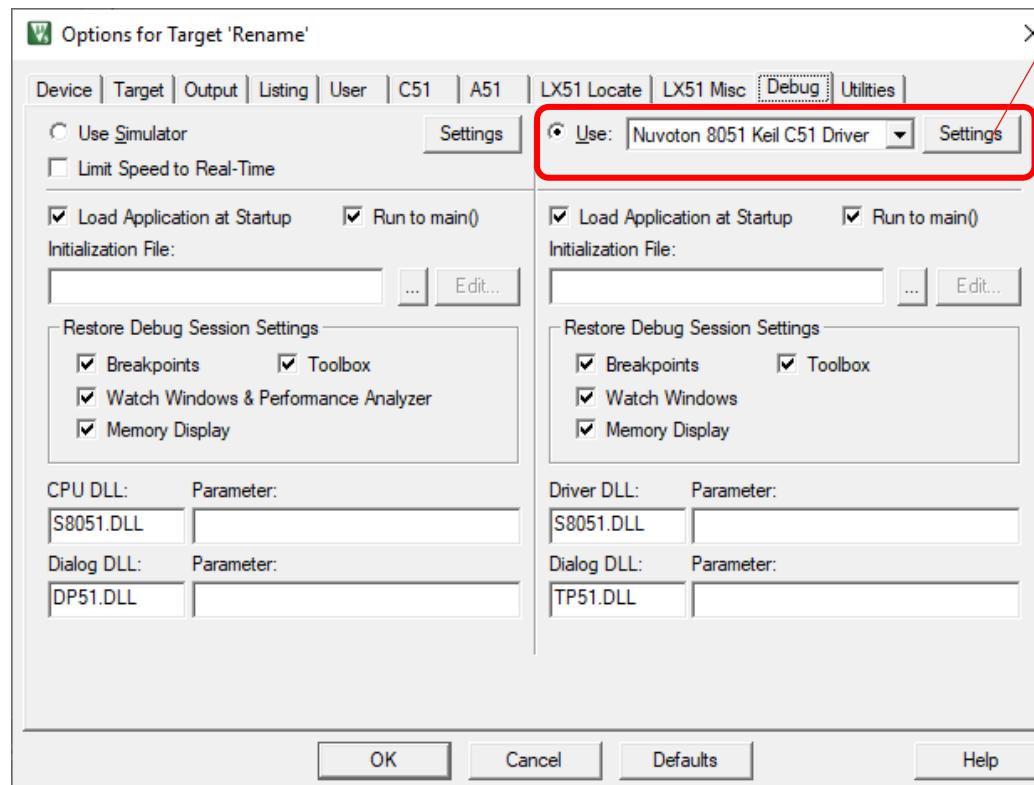
- The Parameter for code size.

“REMOVEUNUSED” to uncalled subroutine not linked into the project to compile. This can reduce the bin file code size.



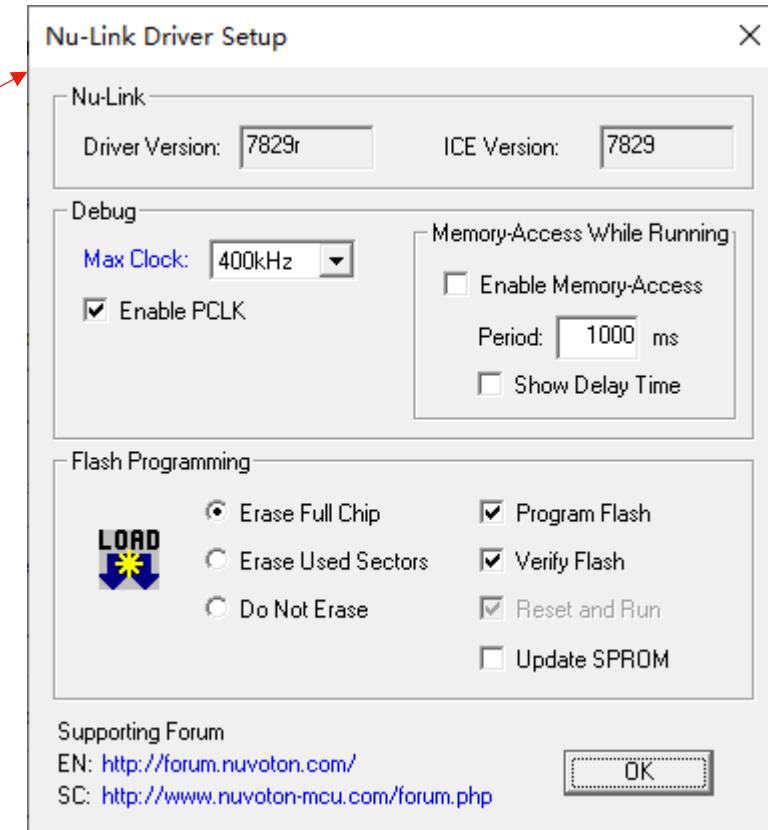
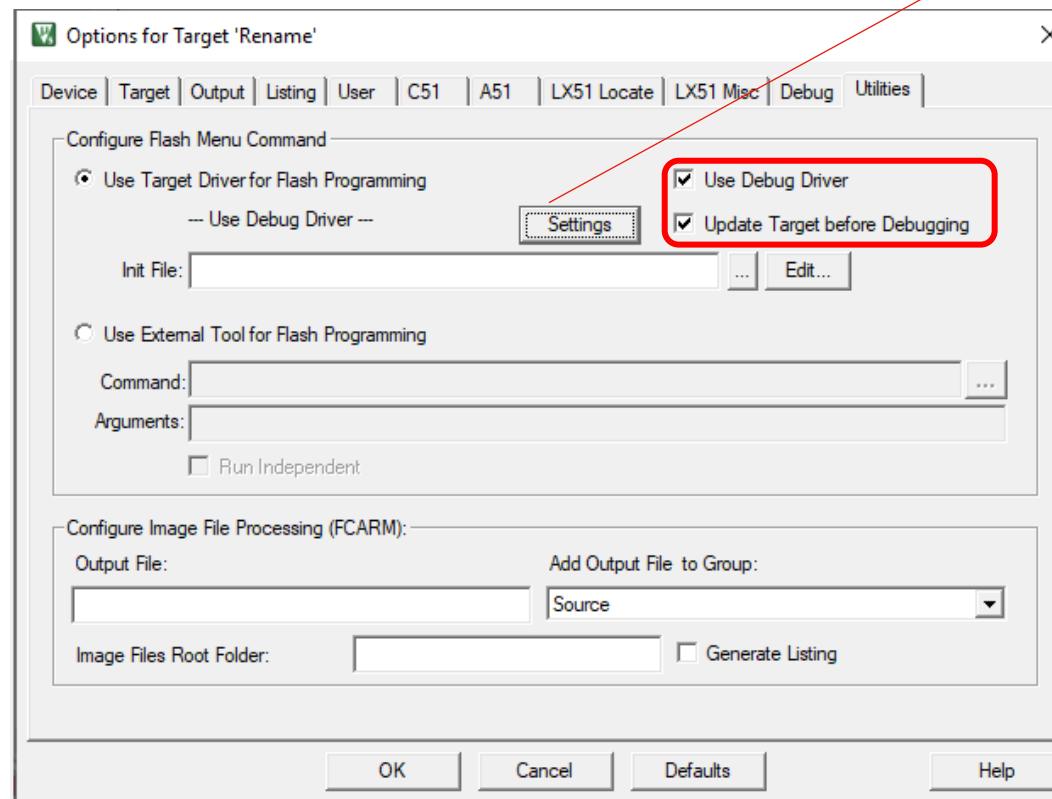
For KEIL – Debug

CONFIG setup page



For KEIL – Utilities

Nu-Link setup



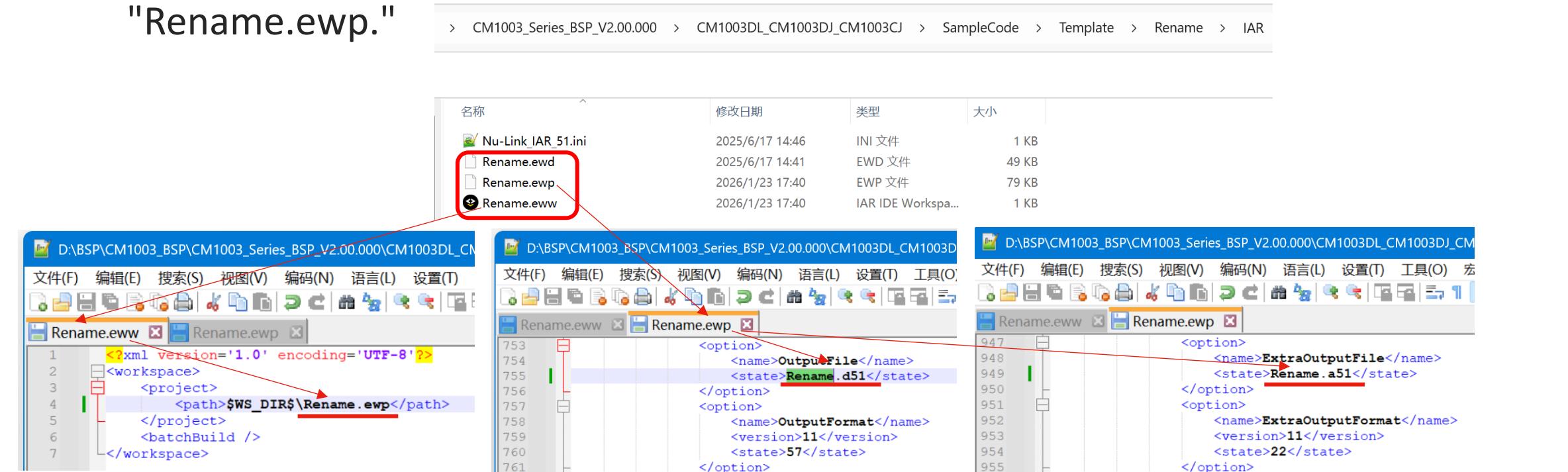
Build Your Project Utilizing BSP - IAR

**Copying from the existing project
is often more advantageous
than creating a new one**



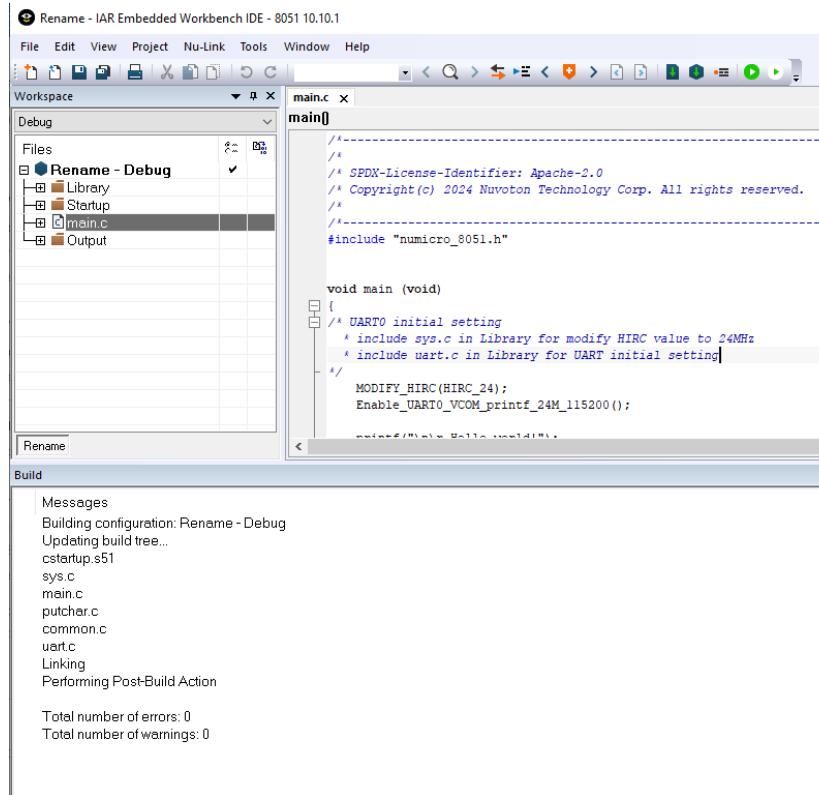
For IAR

- Duplicate a folder from the template "Project_temp"
- then rename the ".ewd," ".ewp," and ".eww" file names accordingly.
- Open the ".eww" file and modify the project <path>to reflect the new name, "Rename.ewp."



| For IAR

- Compile with the new application .c file. Find the output hex and bin file.



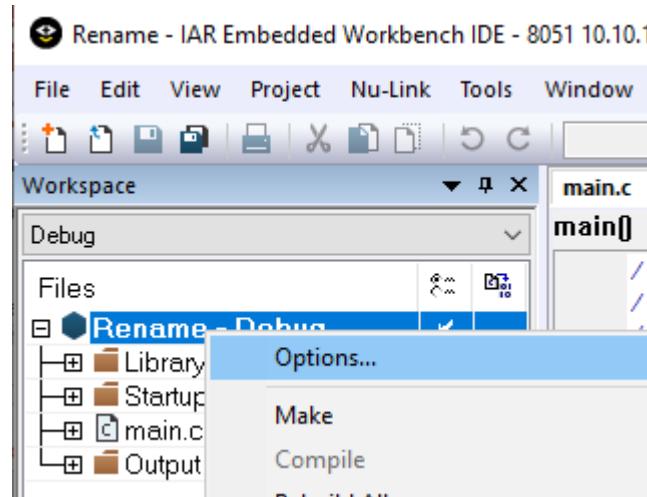
The screenshot shows the IAR Embedded Workbench IDE interface. The workspace contains a project named "Rename - Debug" with files: Library, Startup, main.c, and Output. The main.c file is open, displaying C code for a main function that includes UART0 initial settings and enables VCOM printf. The build messages indicate the configuration is "Rename - Debug", and it is performing post-build actions. The build results show three files generated: Rename.a51, Rename.bin, and Rename.d51, all modified on 12/8/2023 at 2:54 PM.

Name	Date modified
Rename.a51	12/8/2023 2:54 PM
Rename.bin	12/8/2023 2:54 PM
Rename.d51	12/8/2023 2:54 PM

Options of IAR workbench

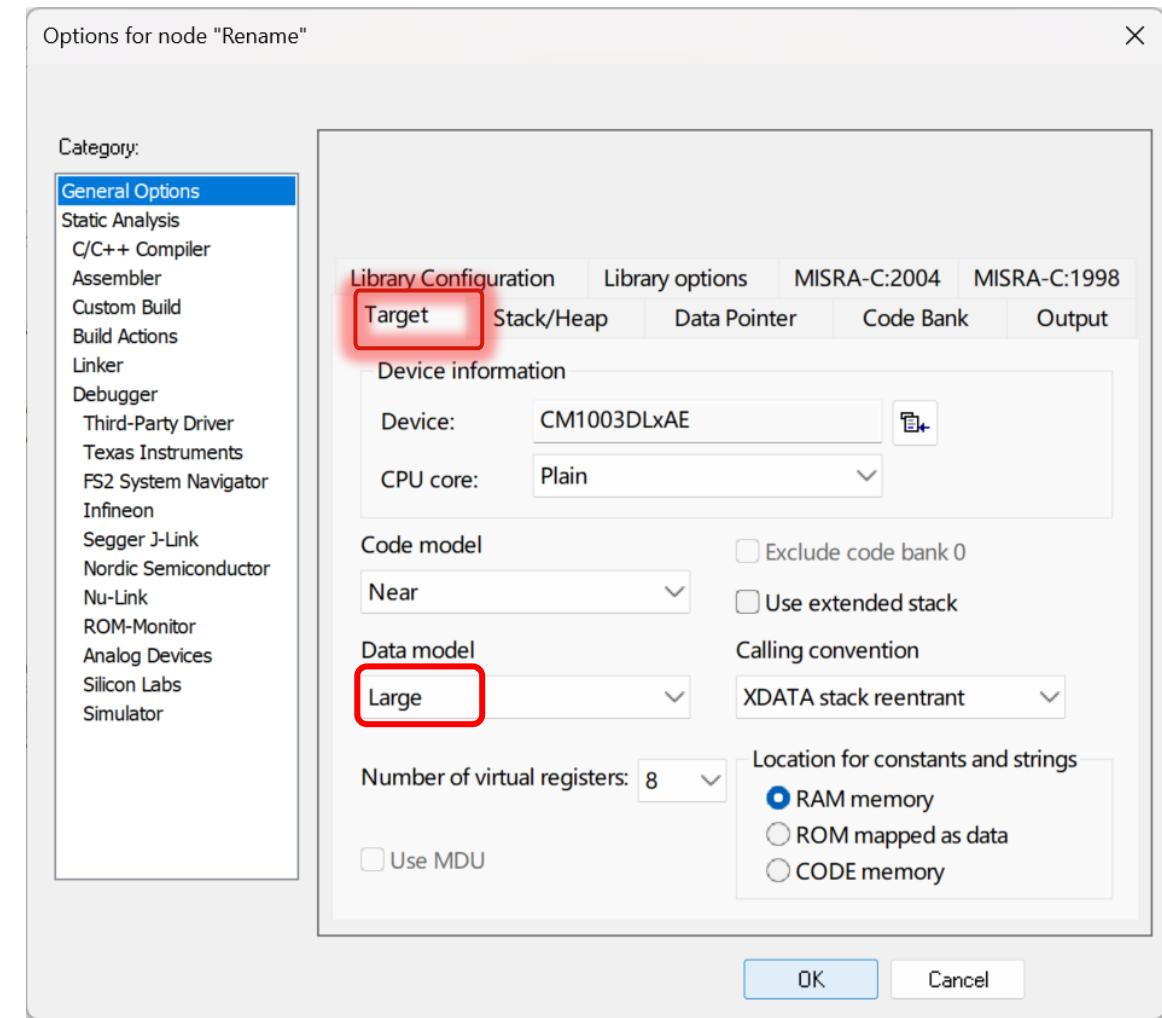
- The following introduction focuses on the special definition of nuvoton 8051 series.
- For a comprehensive description of all options, please consult the official IAR documentation.

https://wwwfiles.iar.com/8051/webic/doc/EW8051_MigrationGuide_v7.pdf



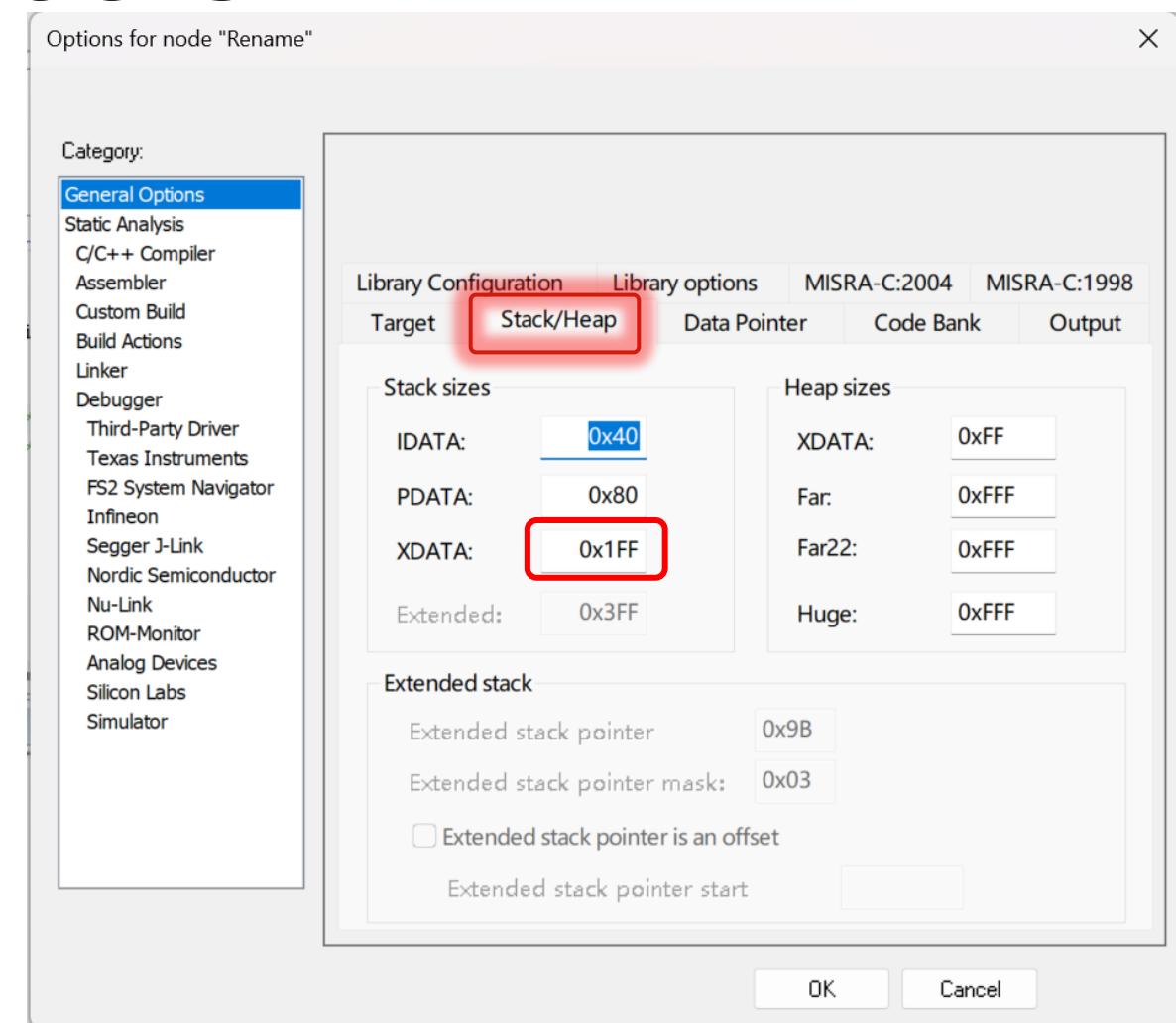
| For IAR – General Options

- Check with the device.
- Data Model: Large for variable default using XDATA



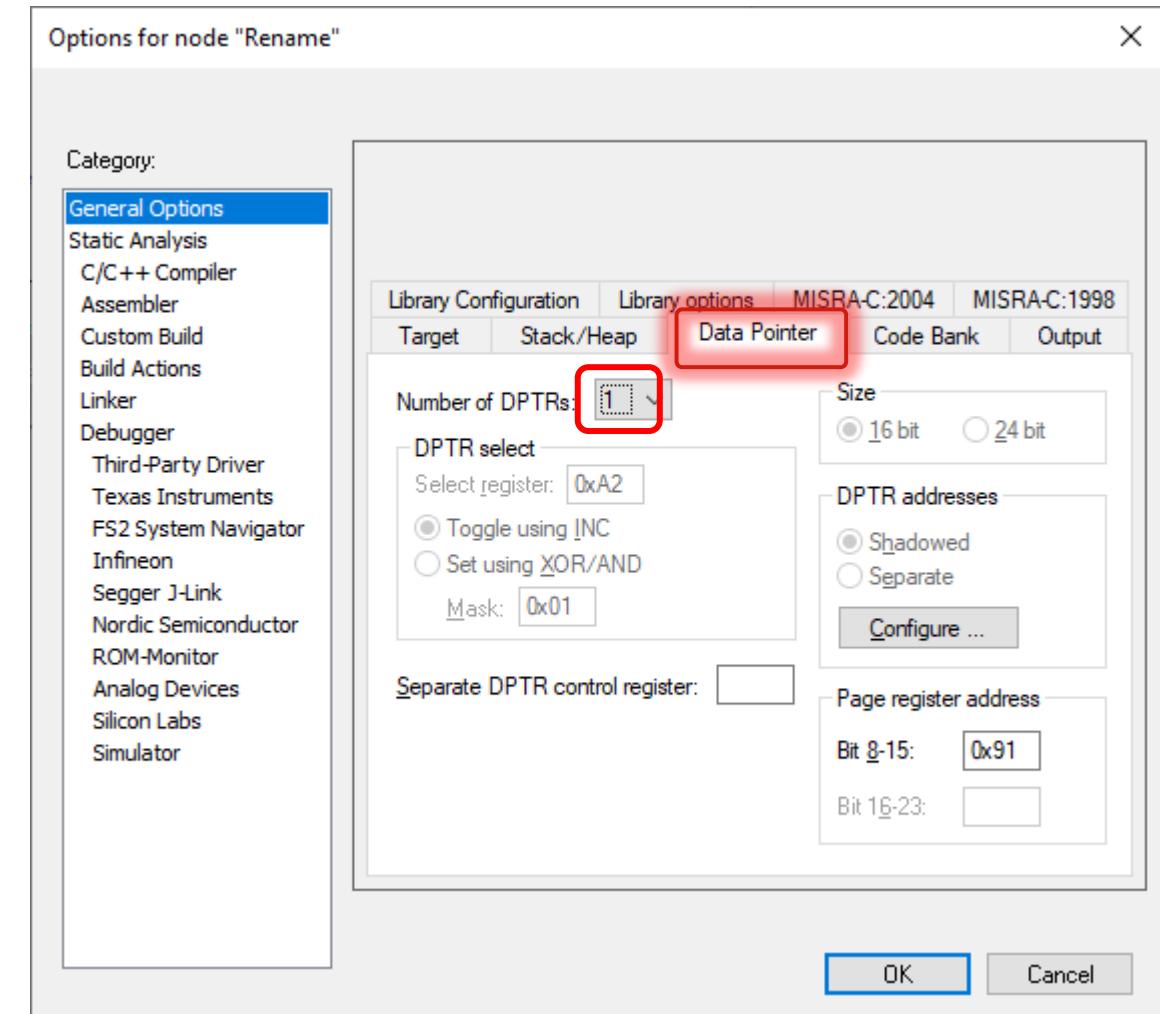
| For IAR – General Options

- Stack / Heap
 - XDATA value is important to printf



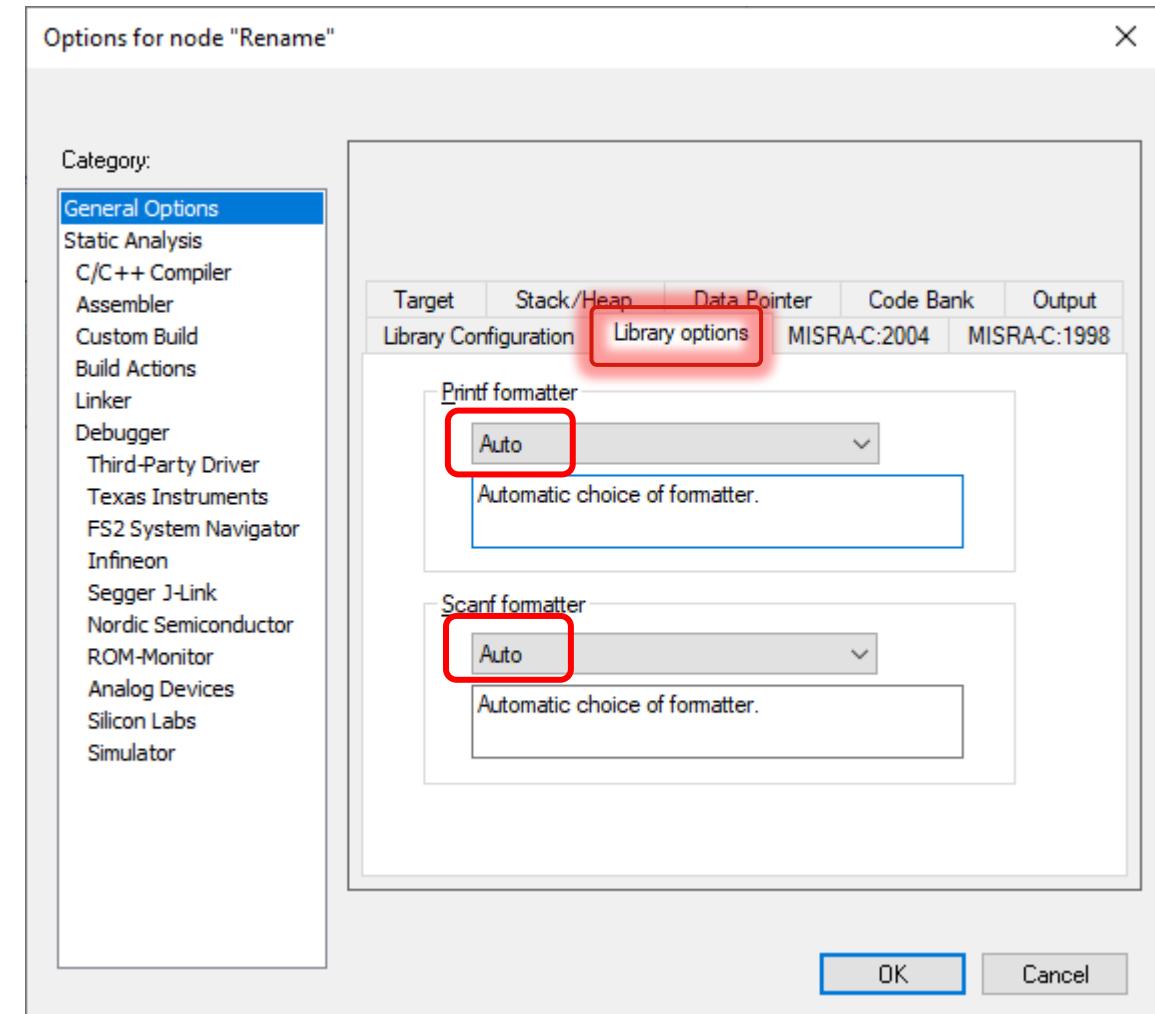
For IAR – General Options

- DPTRs
 - Always use 1 DPTR.



| For IAR – General Options

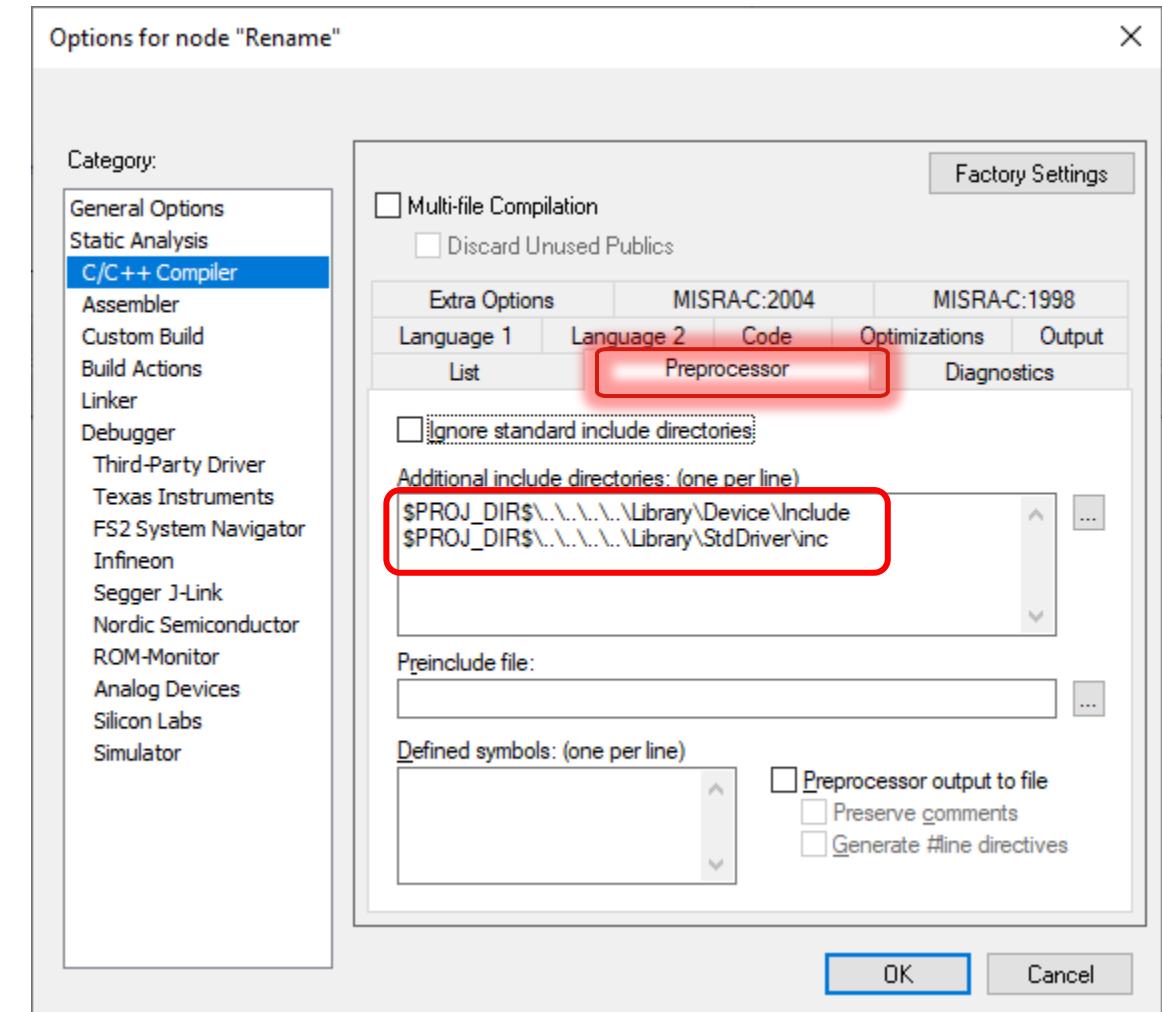
- Auto for Printf formatter



| For IAR – C/C++ Compiler

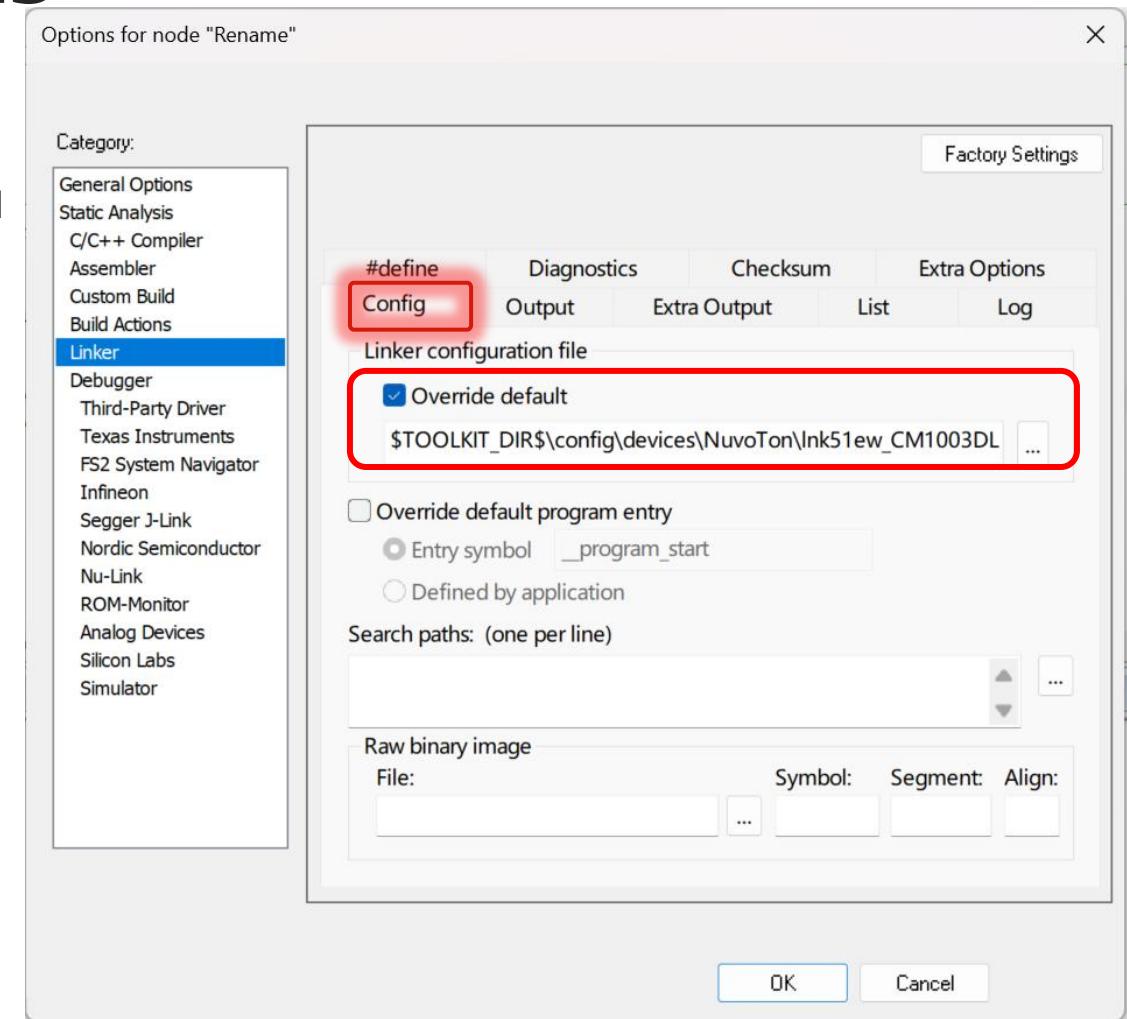
- Include Paths

Defined the header file path of device and library.



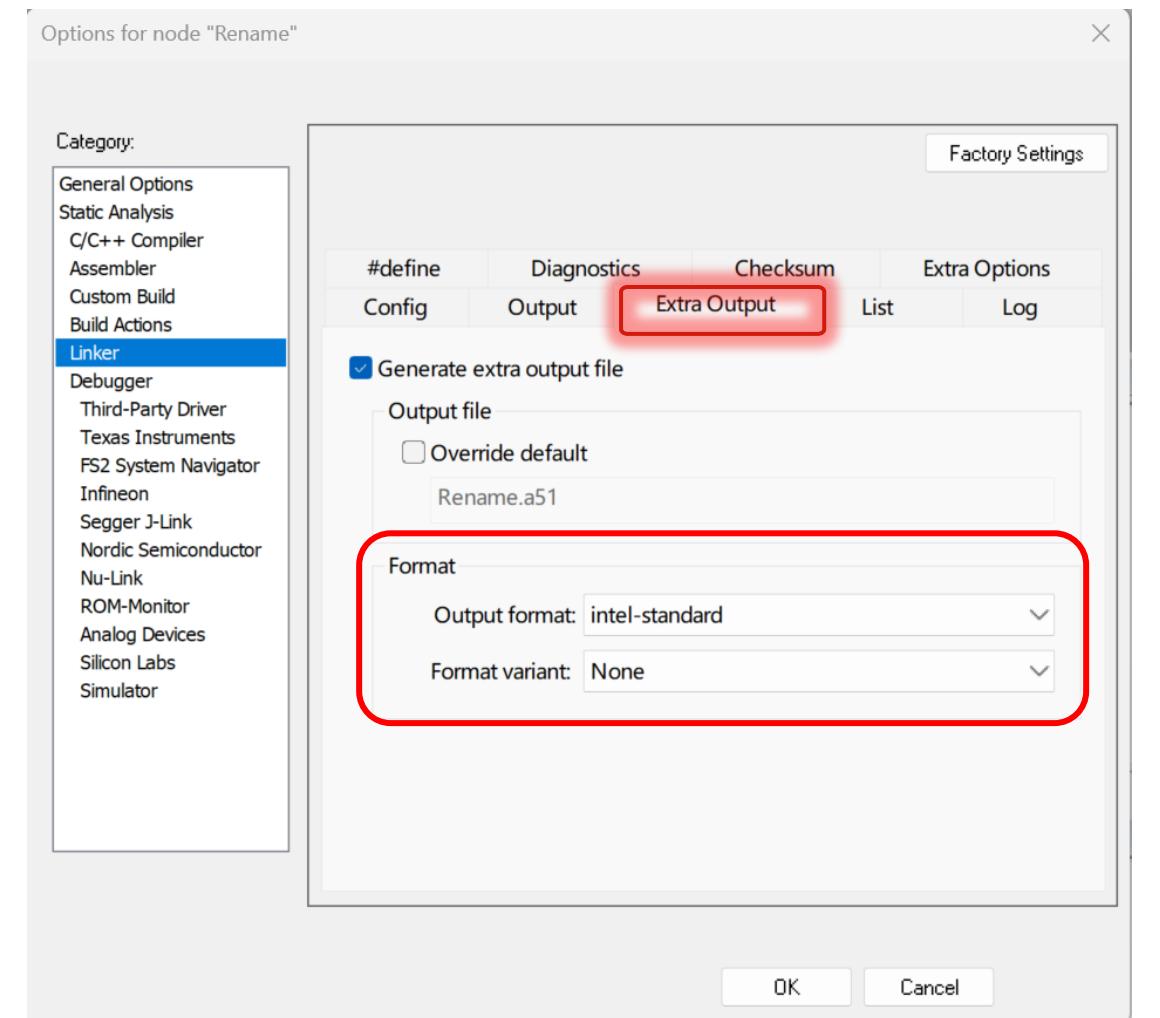
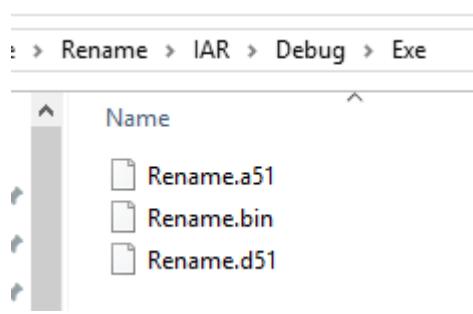
For IAR – Build Actions

- Linker configuration file
 - Derived from the device definition manually adjusted by Nuvoton (rather than automatically selected by the IAR tool).
 - **Do not modify the value in this area under any circumstances.**



For IAR – Build Actions

- Build with hex format output
- Bin format use nuvoton command line. Introduce in next page.
- After compiler with following
 - .a51 hex format
 - .bin bin format
 - .d51 debug file for IAR



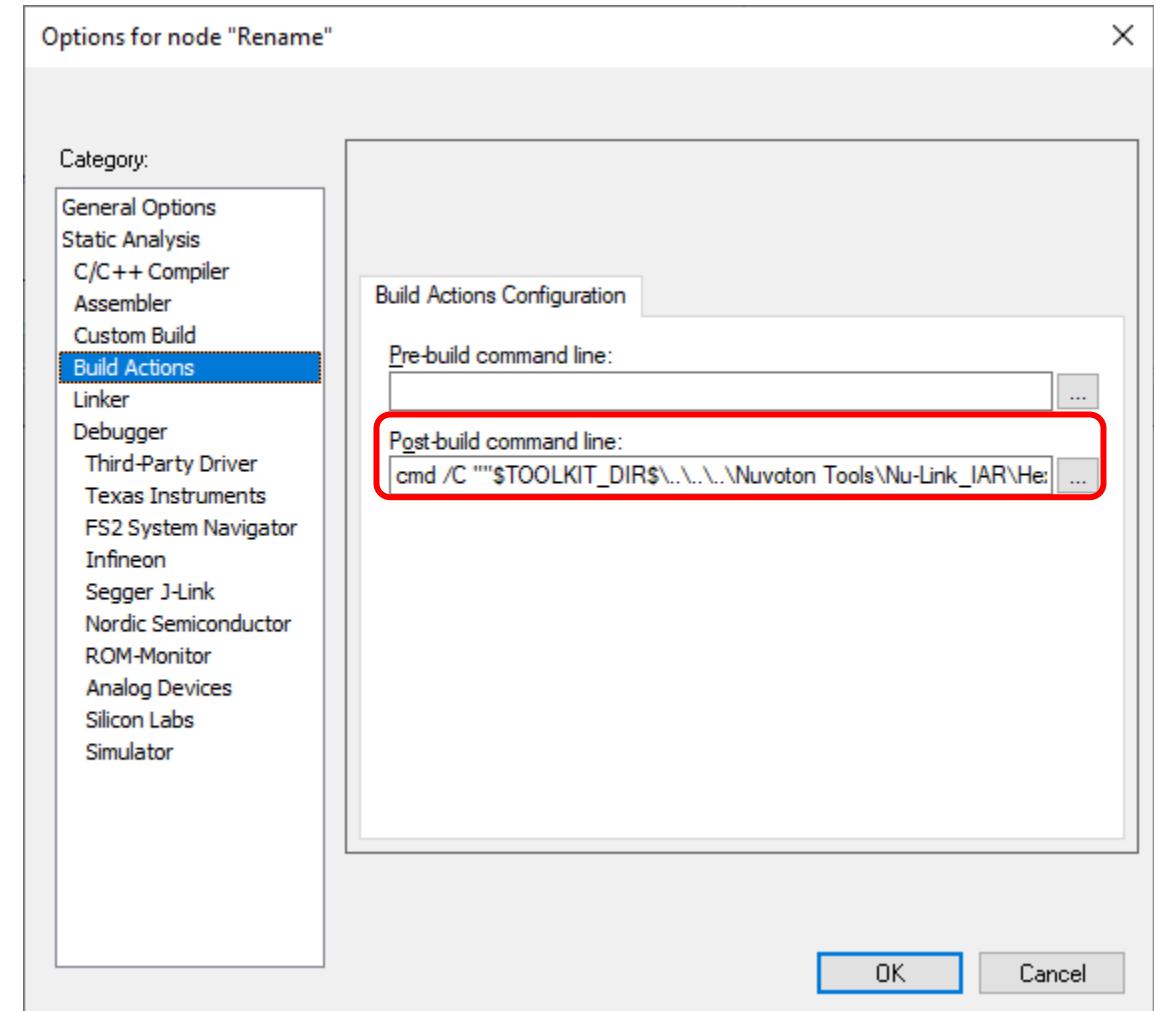
| For IAR - C/C++ Compiler

- Hex2bin

This file is located within the Nuvoton IAR driver folder.

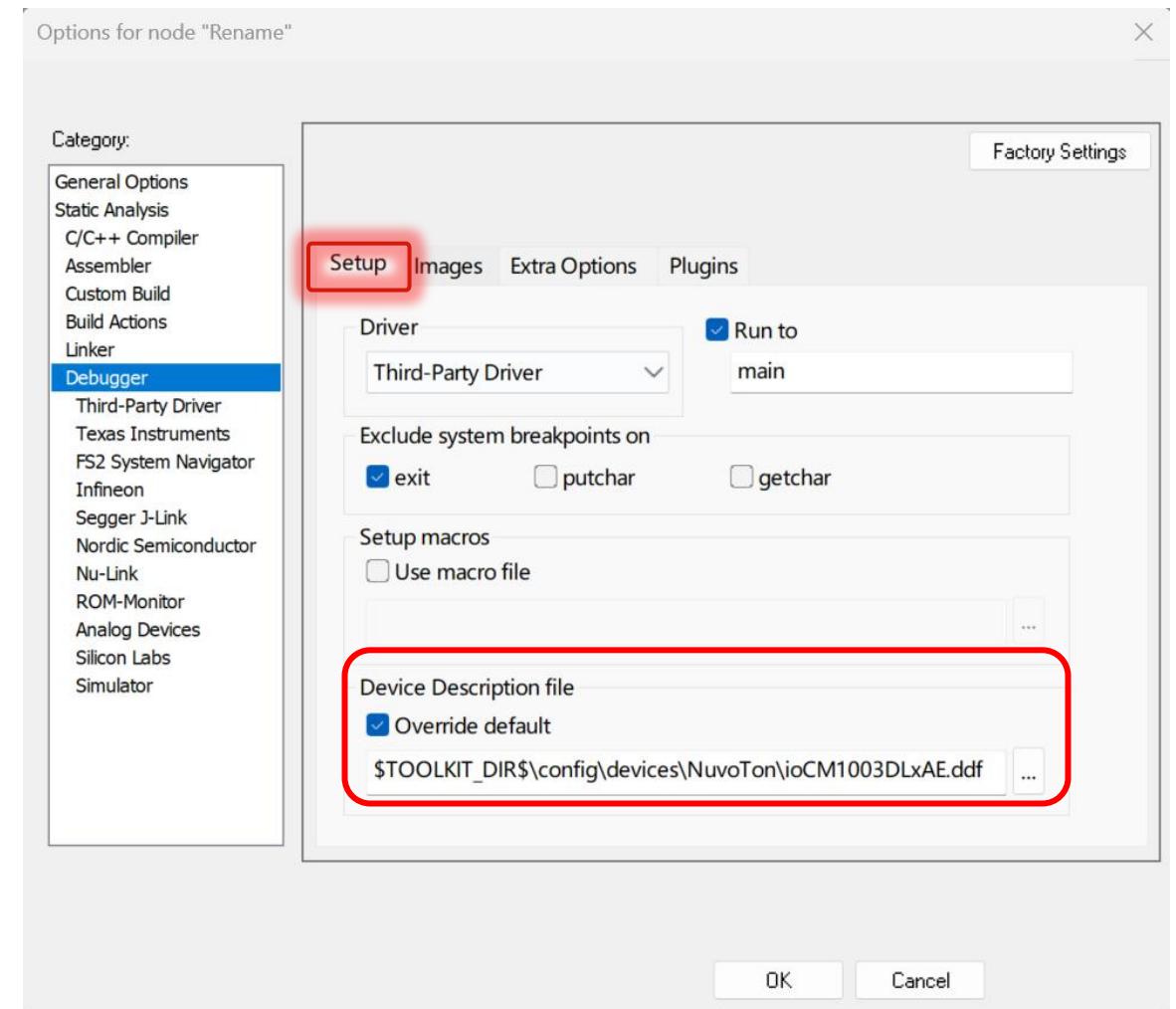
. \Nuvoton Tools\Nu-Link_IAR\Hex2Bin.exe

- By default, unused locations will be filled with 0xFF.
 - Users can also include the parameter –P 0x00 means unused locations are filled with zeros.
 - Parameter <start address> <data length>



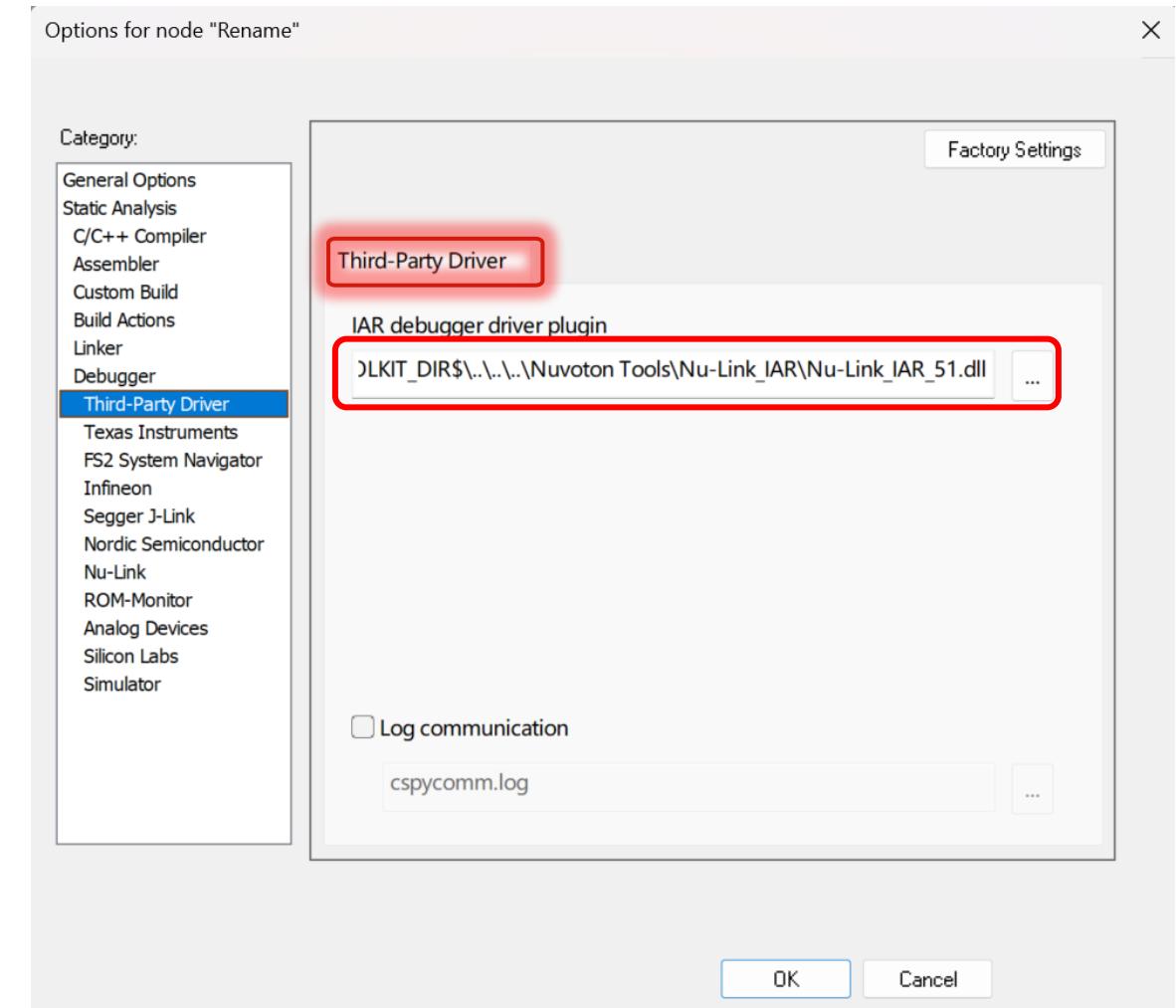
| For IAR – Debugger

- Third-Party Driver
 - Manually adjusted by Nuvoton (rather than automatically selected by the IAR tool).
 - **Do not modify the value in this area under any circumstances.**



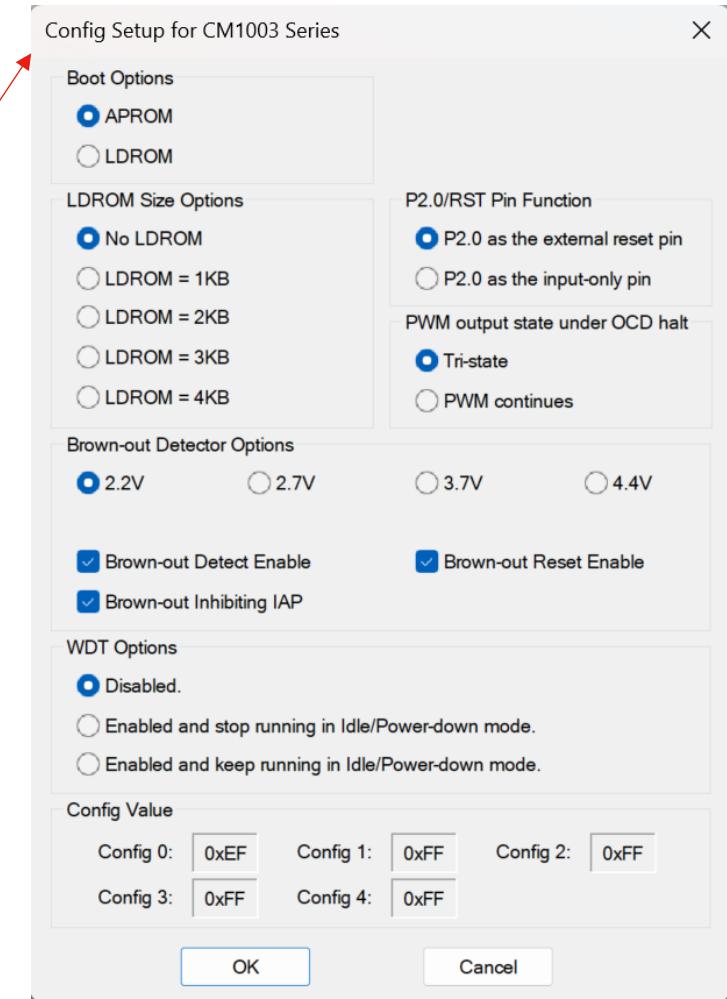
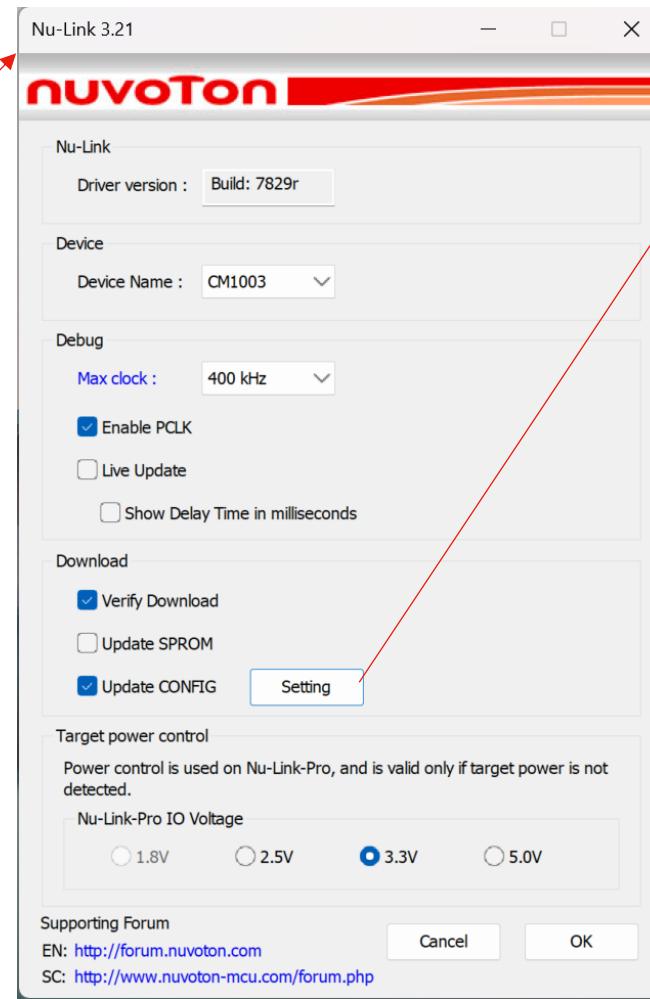
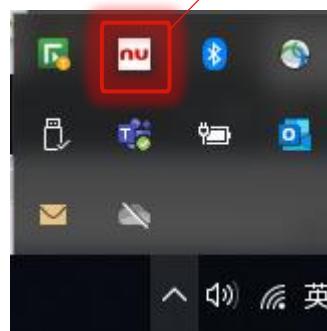
| For IAR – Third Party Driver

- Third-Party Driver
 - Manually adjusted by Nuvoton (rather than automatically selected by the IAR tool).
 - **Do not modify the value in this area under any circumstances.**



For IAR – Nu-Link Setup & CONFIG define

- Third-Party Driver



Build Your Project Utilizing BSP - KEIL

**Copying from the existing project
is often more advantageous
than creating a new one**



| For NuEclipse SDCC

- Refer to the "Nu Eclipse SDCC Quick Start_EN.pdf" for guidance.

1.2	1.2 Create a new Project from an existing BSP project	9
1.2.1	Copy the existing SDCC project folder to the new Project folder	9
1.2.2	1.2.2 Import this project in Workspace	9
1.2.3	Rename Project	9



Thank You

Danke

Merci

ありがとう

Gracias

Kiitos

감사합니다

ধন্যবাদ

كل اركش

הודות