

BSP Project Quick Start

For NuMicro 8051 Series

Dec, 2023

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

MS51_BSP_C51_V2.00.000

- Library
- SampleCode
 - RegBased
 - ADC_Bandgap_VDD
 - Template
 - Project_temp
 - Keil
 - IAR
 - SDCC

MS51_Series_BSP_V2.00.000 > MS51FB9AE_MS51XB9AE_MS51XB9BE			
Name	Date modified	Type	Size
Library	12/6/2023 2:23 PM	File folder	
SampleCode	12/6/2023 2:23 PM	File folder	
Readme.pdf	10/16/2023 2:43 PM	Adobe Acrobat D...	1,130 KB

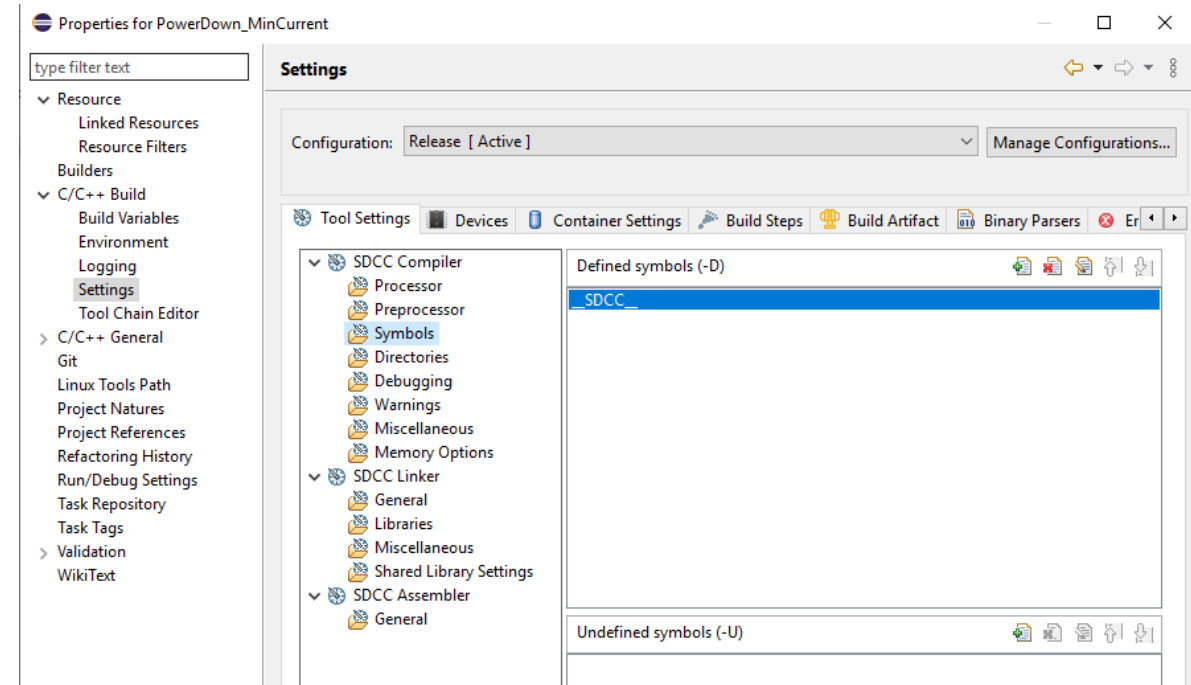
- It is recommended to create a new project folder at the same level as the subfolder within either the "Template" or "RegBased" directory.
- The "Library" folder and all subfolders should always be remained.

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
```

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



NuEclipse defined symbols window

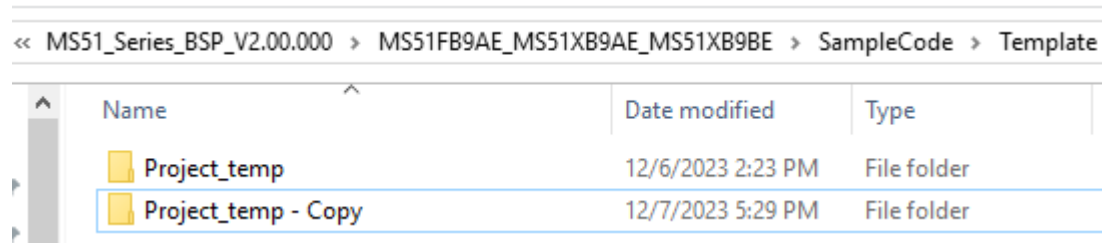
Build Your Project Utilizing BSP - KEIL

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



For KEIL

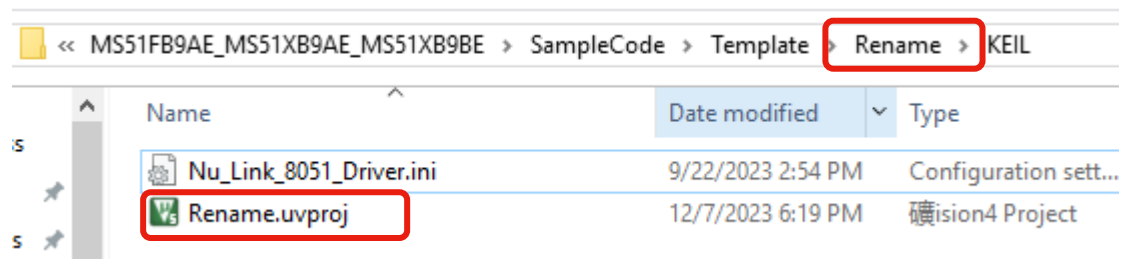
- Copy A Folder From Template “ Project_temp”



Navigation path: << MS51_Series_BSP_V2.00.000 > MS51FB9AE_MS51XB9AE_MS51XB9BE > SampleCode > Template

Name	Date modified	Type
Project_temp	12/6/2023 2:23 PM	File folder
Project_temp - Copy	12/7/2023 5:29 PM	File folder

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

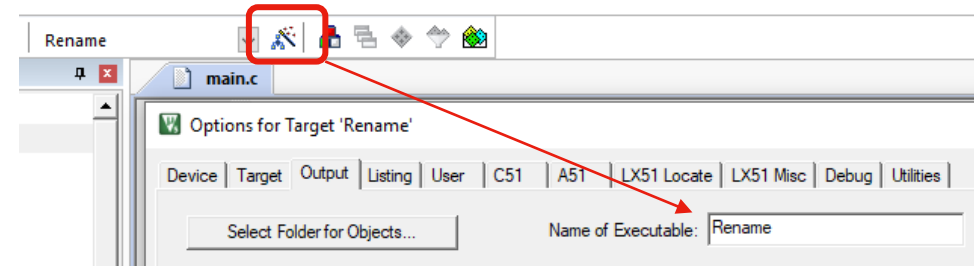
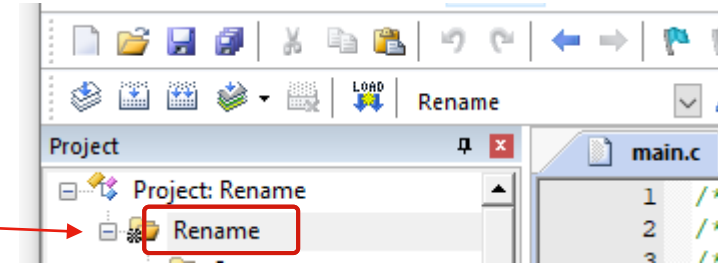
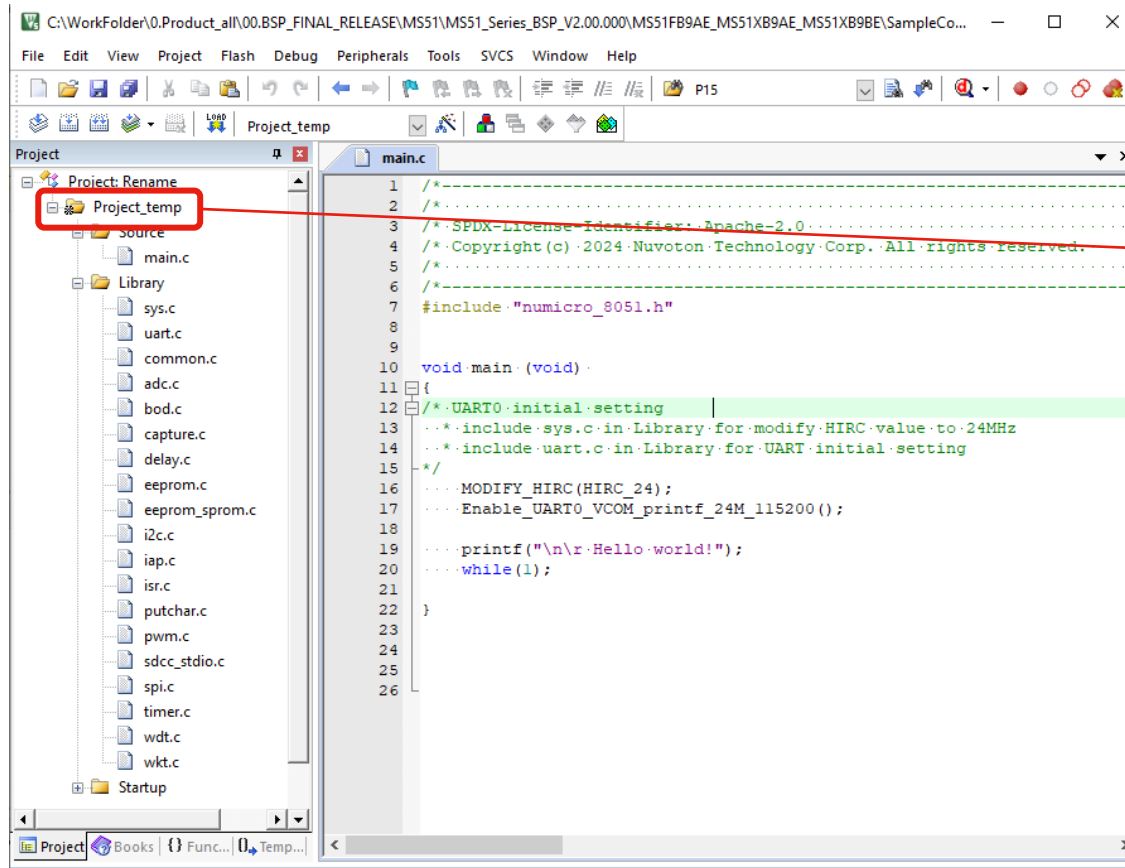


Navigation path: << MS51FB9AE_MS51XB9AE_MS51XB9BE > SampleCode > Template > Rename > KEIL

Name	Date modified	Type
Nu_Link_8051_Driver.ini	9/22/2023 2:54 PM	Configuration sett...
Rename.uvproj	12/7/2023 6:19 PM	Revision4 Project

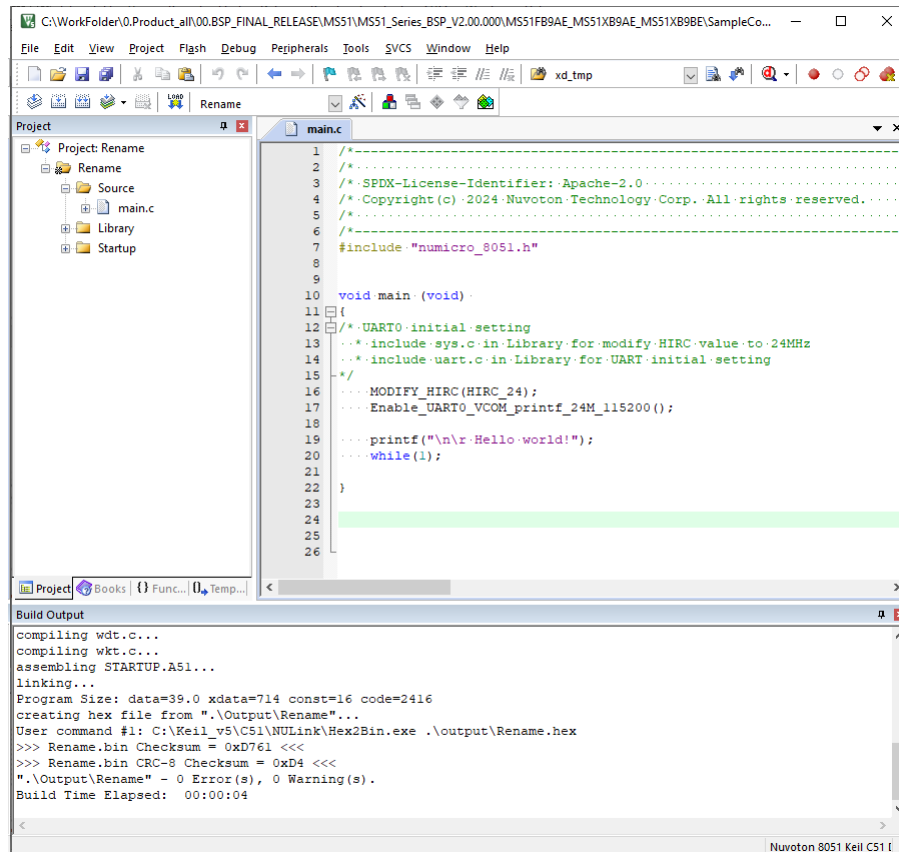
| For KEIL

- Modify the Project name in KEIL.



| For KEIL

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

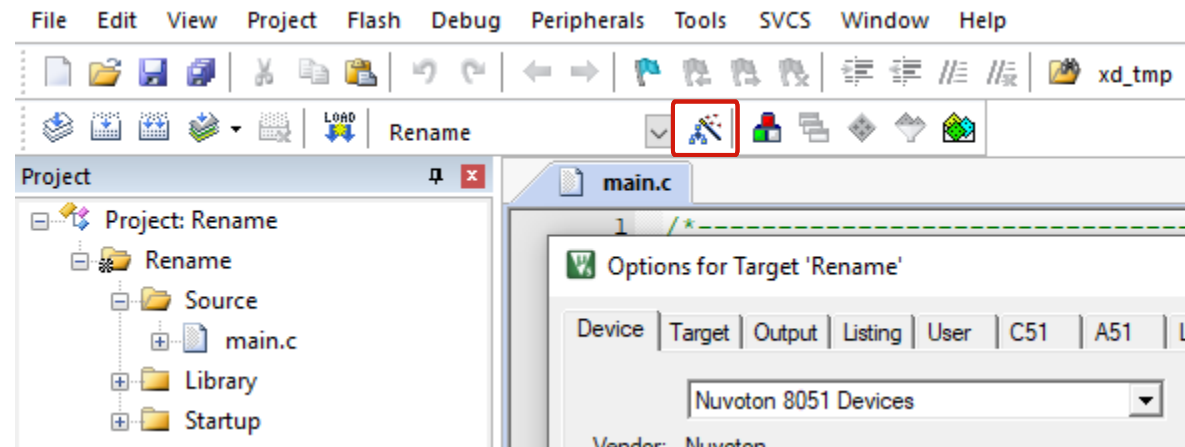


SampleCode > Template > Rename > KEIL > Output								
	Name	Date modified	Type	Size				
	wkt.obj	12/8/2023 2:17 PM	OBJ File	175 KB				
	wdt.obj	12/8/2023 2:17 PM	OBJ File	174 KB				
	uart.obj	12/8/2023 2:17 PM	OBJ File	178 KB				
	timer.obj	12/8/2023 2:17 PM	OBJ File	180 KB				
	sys.obj	12/8/2023 2:17 PM	OBJ File	179 KB				
	STARTUP.obj	12/8/2023 2:17 PM	OBJ File	1 KB				
	spi.obj	12/8/2023 2:17 PM	OBJ File	173 KB				
	Rename.SBR	12/8/2023 2:17 PM	SBR File	3,187 KB				
	Rename.lnp	12/8/2023 2:17 PM	LNP File	1 KB				
	Rename.hex	12/8/2023 2:17 PM	HEX File	7 KB				
le:	Rename.build_log.htm	12/8/2023 2:17 PM	Microsoft Edge H...	2 KB				
Ap	Rename.bin	12/8/2023 2:17 PM	BIN File	3 KB				
	Rename	12/8/2023 2:17 PM	File	3,336 KB				

Options of KEIL PK51

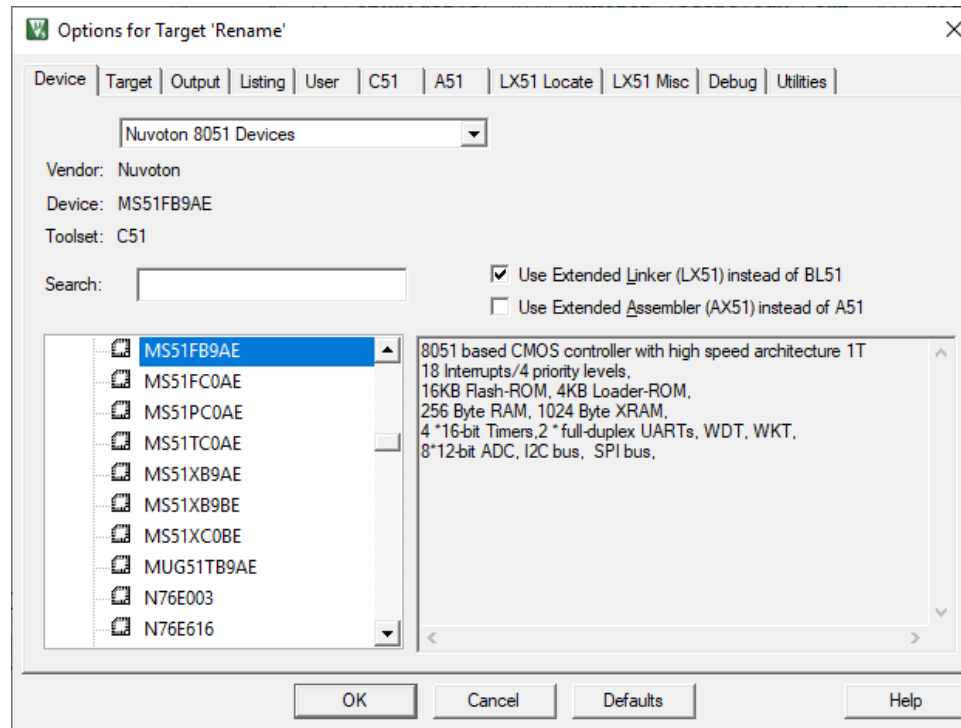
- The following introduction focuses on the special definition of Nuvoton 8051 series.
- For a comprehensive description of all options, please consult the official Keil documentation.

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



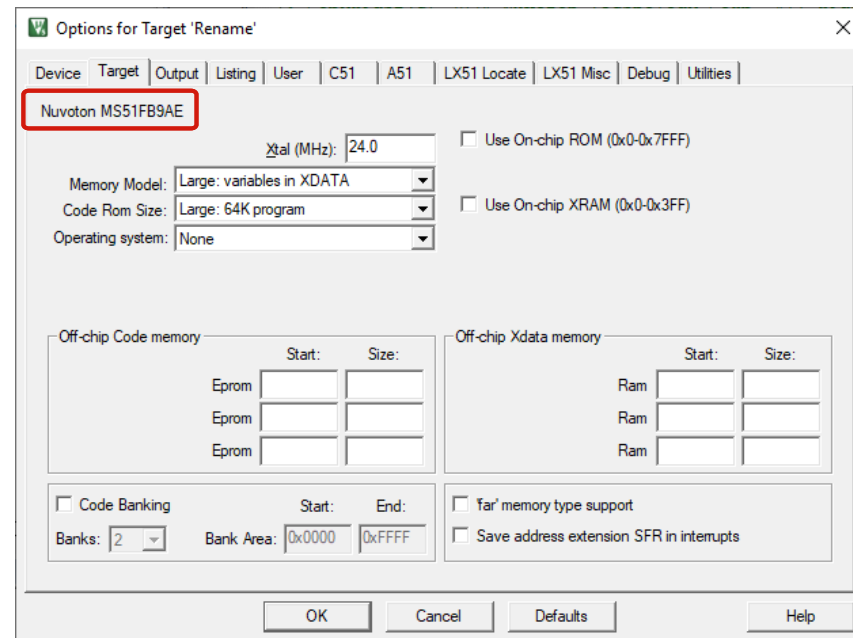
| For KEIL - Device

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



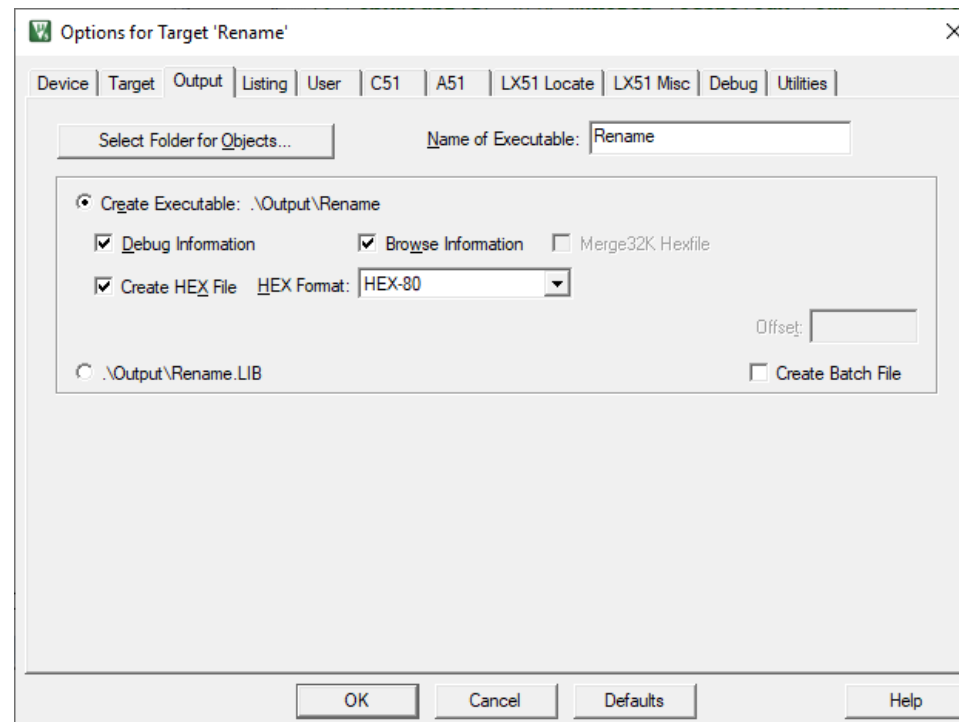
| For KEIL - Target

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



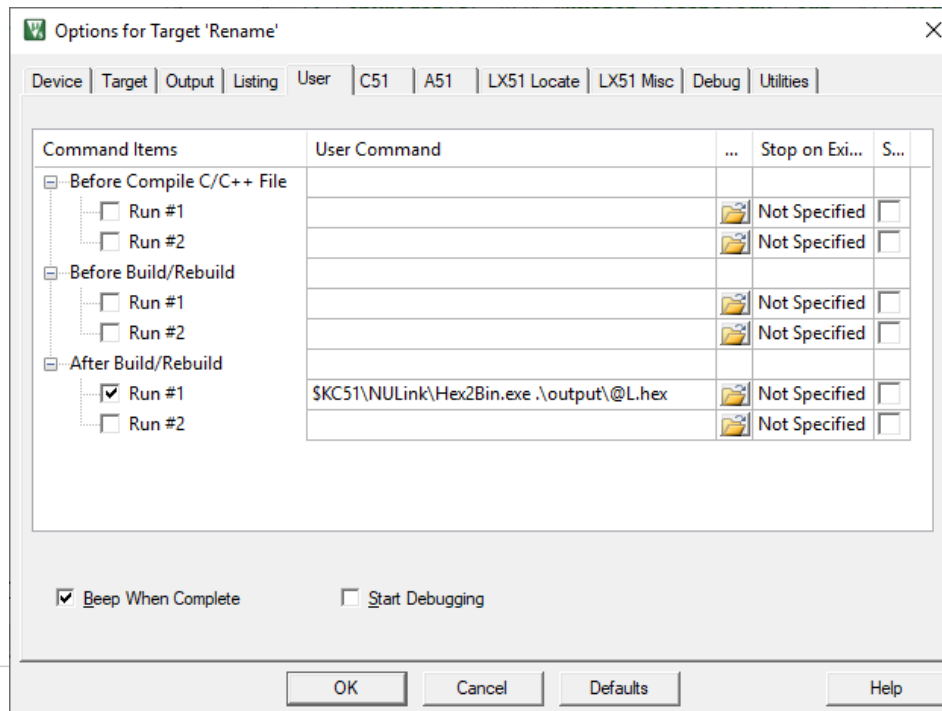
| For KEIL - Output

- “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

=====
==  Nuvoton HexToBin for 8051 Series v1.06  ==
=====

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

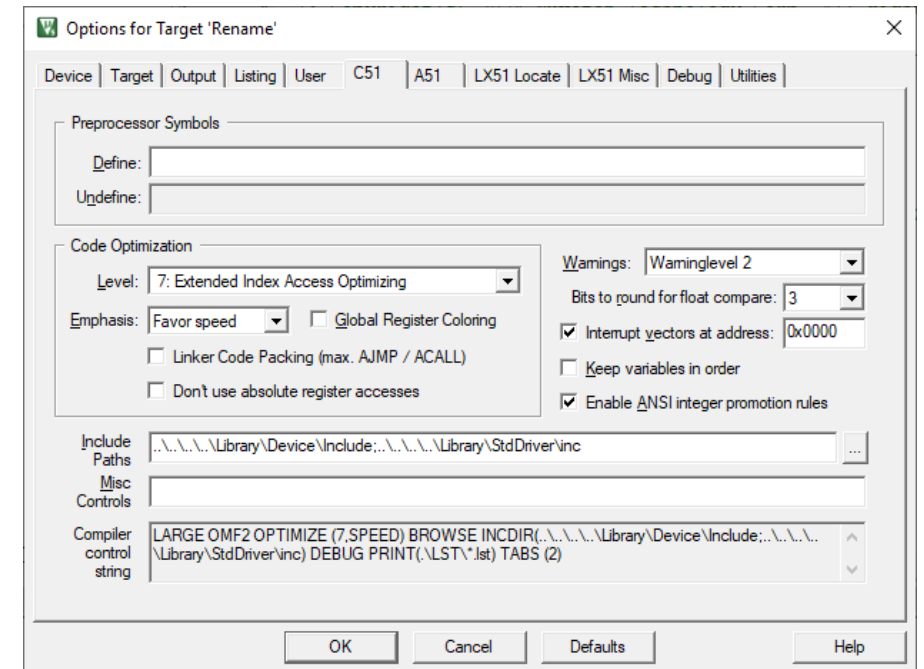
- Code Optimization

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

- Include Paths

Defined the header file path of device and library.

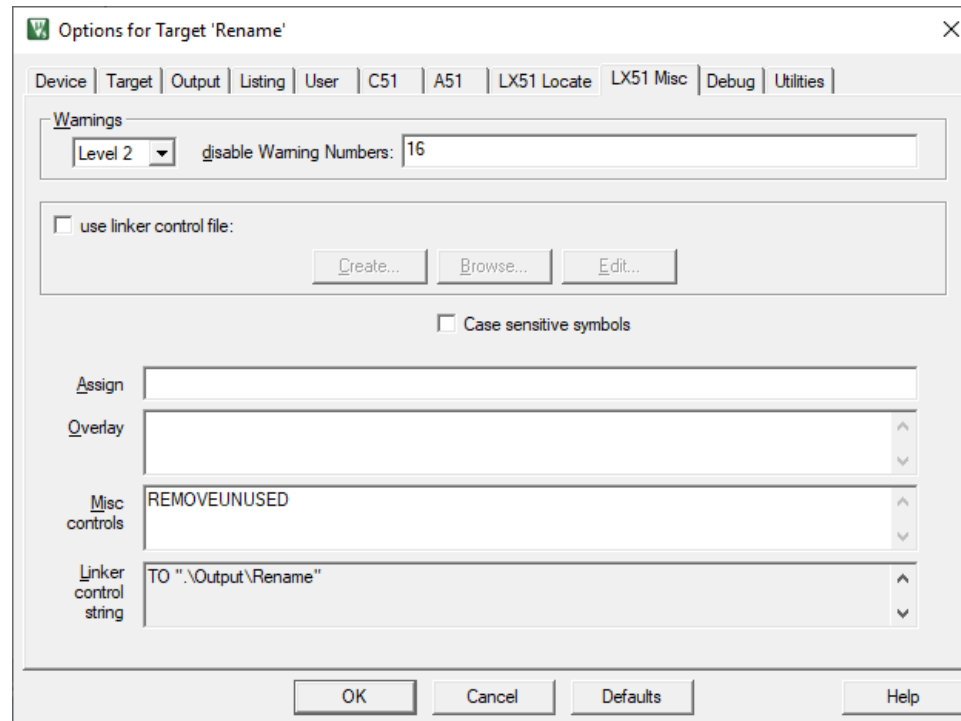
- Following shows the most popular define



| For KEIL – LX51 Misc

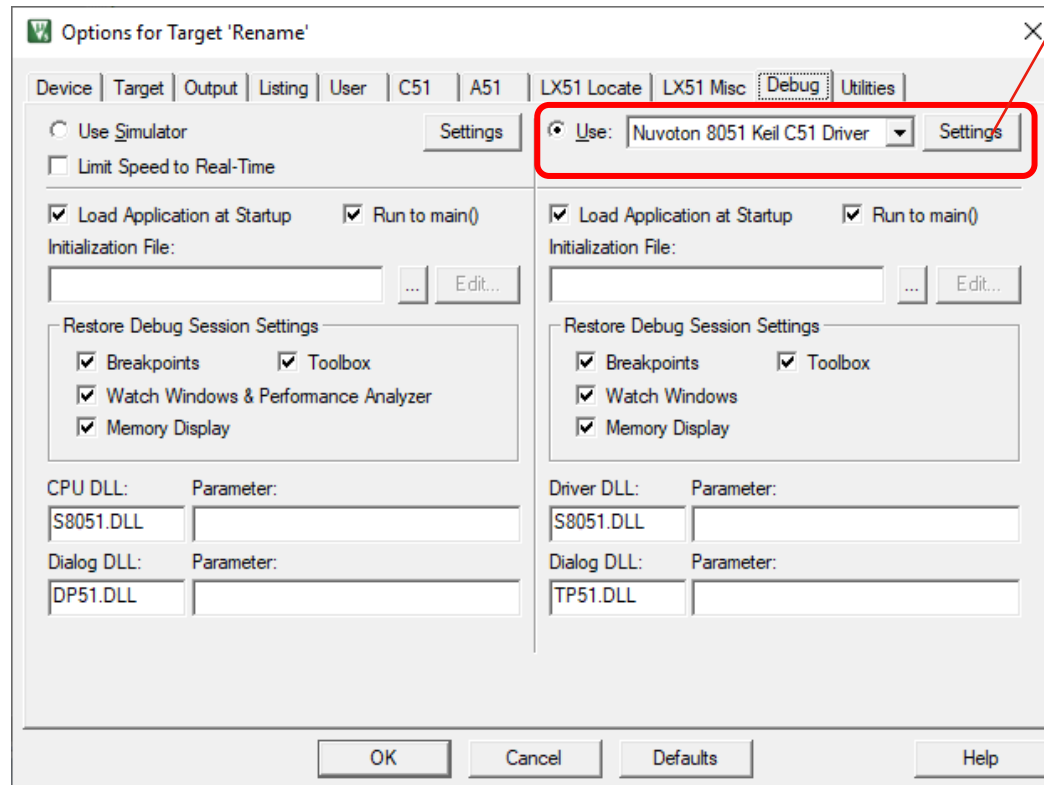
- The Parameter for code size.

“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



The 'Options for Target 'Rename'' dialog box is shown with the 'Debug' tab selected. A red box highlights the 'Use: Nuvoton 8051 Keil C51 Driver' dropdown menu and its 'Settings' button. The 'Settings' button is also highlighted by a red arrow pointing to the 'Config Setup for MS51 Series' dialog box on the right.

Options for Target 'Rename'

Device | Target | Output | Listing | User | C51 | A51 | LX51 Locate | LX51 Misc | **Debug** | Utilities

☐ Use Simulator Settings

☐ Limit Speed to Real-Time

☒ Load Application at Startup ☒ Run to main()

Initialization File: ... Edit...

Restore Debug Session Settings

☒ Breakpoints ☒ Toolbox

☒ Watch Windows & Performance Analyzer

☒ Memory Display

CPU DLL: Parameter:

S8051.DLL

Dialog DLL: Parameter:

DP51.DLL

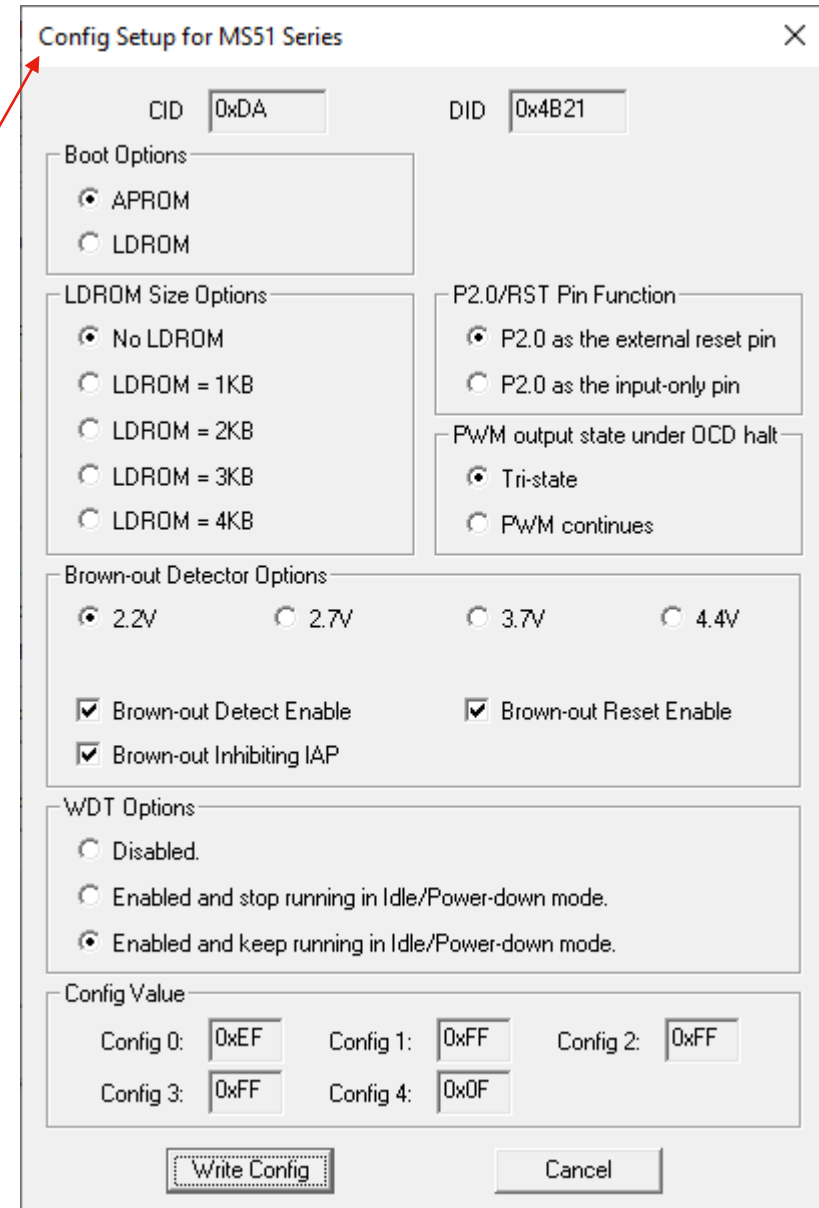
Driver DLL: Parameter:

S8051.DLL

Dialog DLL: Parameter:

TP51.DLL

OK Cancel Defaults Help



The 'Config Setup for MS51 Series' dialog box is shown. It contains various configuration options for the target device, including CID, DID, Boot Options, LDRom Size Options, P2.0/RST Pin Function, PWM output state under OCD halt, Brown-out Detector Options, WDT Options, and Config Value.

Config Setup for MS51 Series

CID: 0xDA DID: 0x4B21

Boot Options

☒ APROM

☐ LDRom

LDRom Size Options

☒ No LDRom

☐ LDRom = 1KB

☐ LDRom = 2KB

☐ LDRom = 3KB

☐ LDRom = 4KB

P2.0/RST Pin Function

☒ P2.0 as the external reset pin

☐ P2.0 as the input-only pin

PWM output state under OCD halt

☒ Tri-state

☐ PWM continues

Brown-out Detector Options

☒ 2.2V ☐ 2.7V ☐ 3.7V ☐ 4.4V

☒ Brown-out Detect Enable ☒ Brown-out Reset Enable

☒ Brown-out Inhibiting IAP

WDT Options

☐ Disabled

☐ Enabled and stop running in Idle/Power-down mode.

☒ Enabled and keep running in Idle/Power-down mode.

Config Value

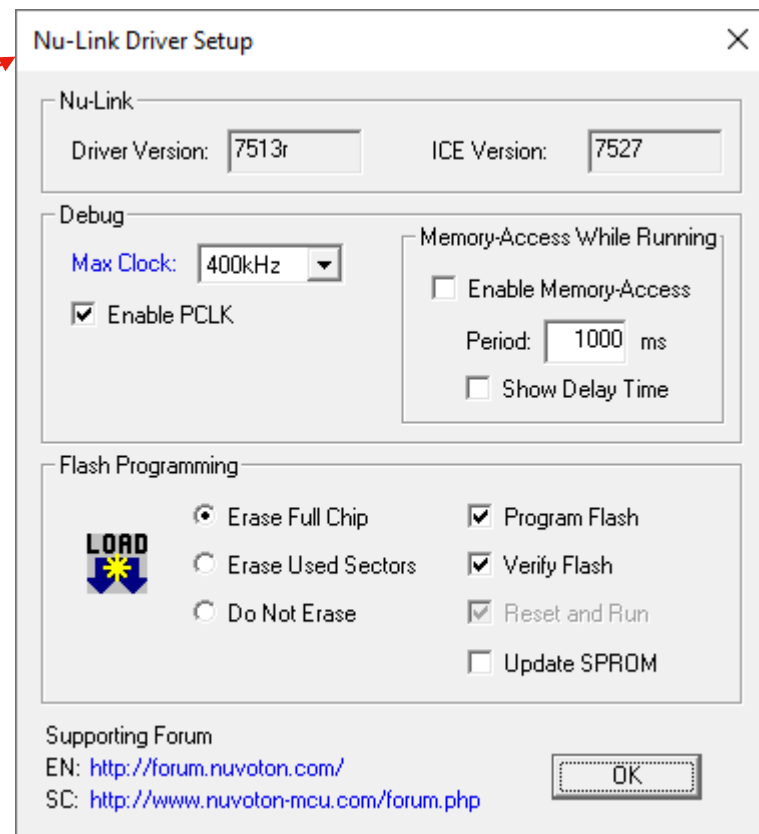
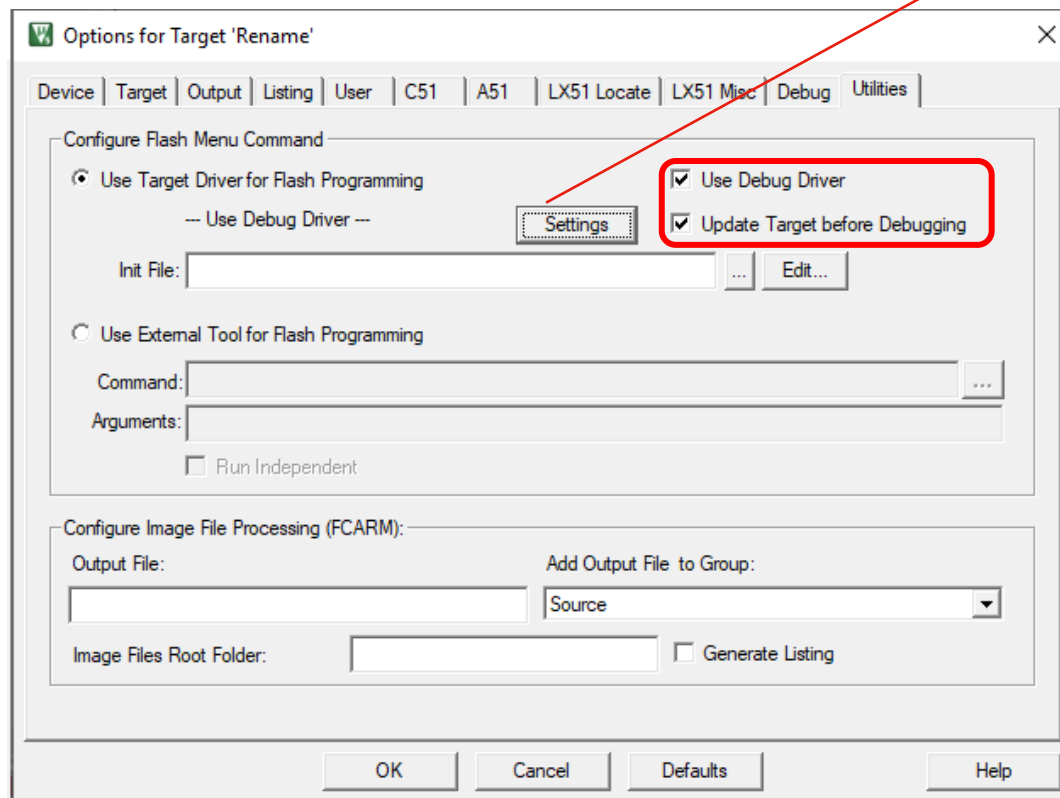
Config 0: 0xEF Config 1: 0xFF Config 2: 0xFF

Config 3: 0xFF Config 4: 0x0F

Write Config Cancel

For KEIL – Utilities

Nu-Link setup



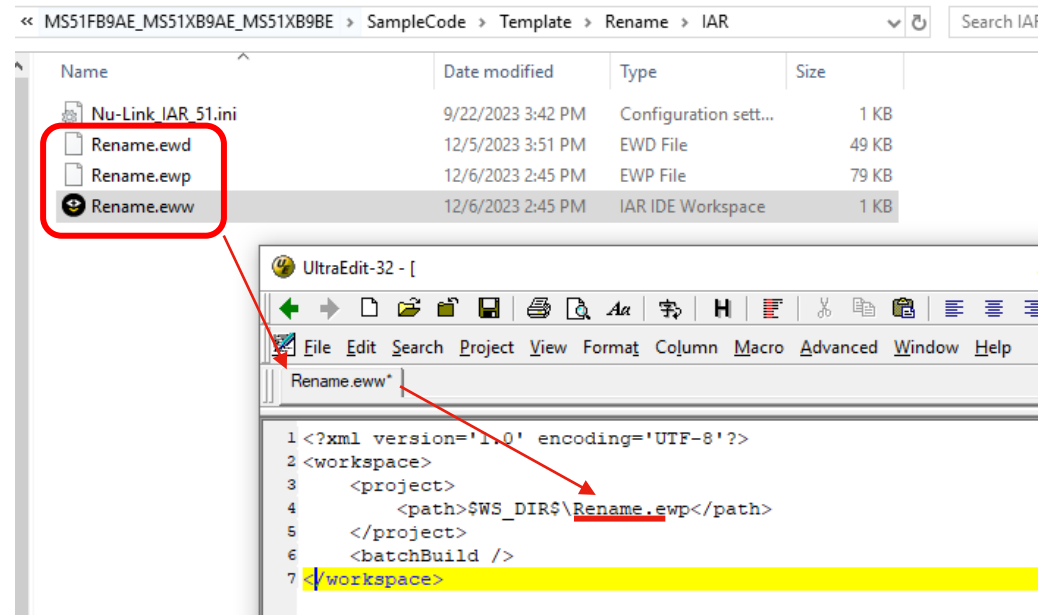
Build Your Project Utilizing BSP - IAR

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



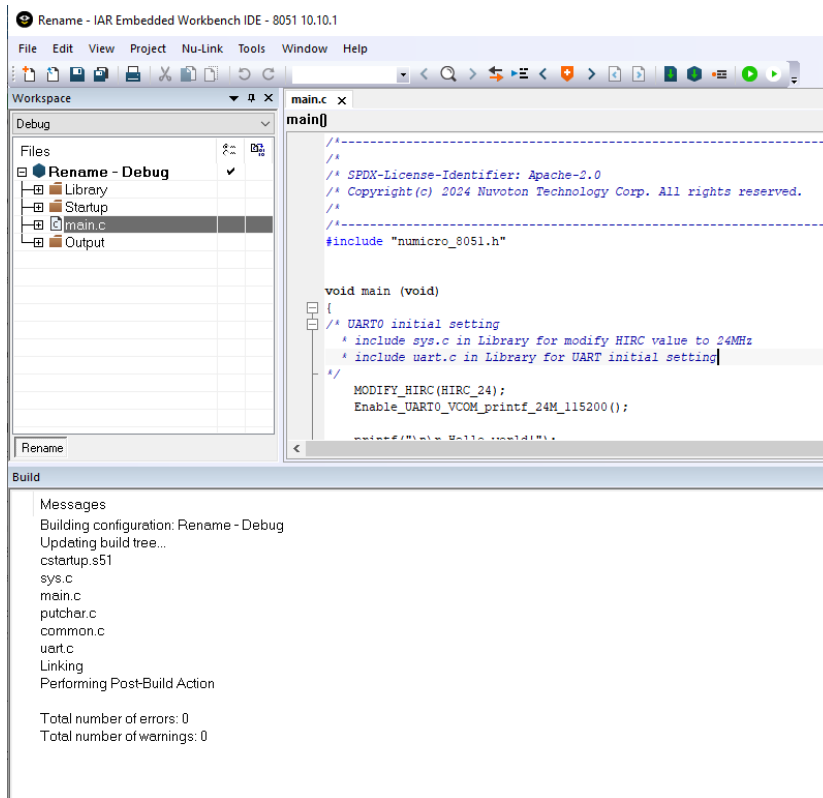
For IAR




- 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.

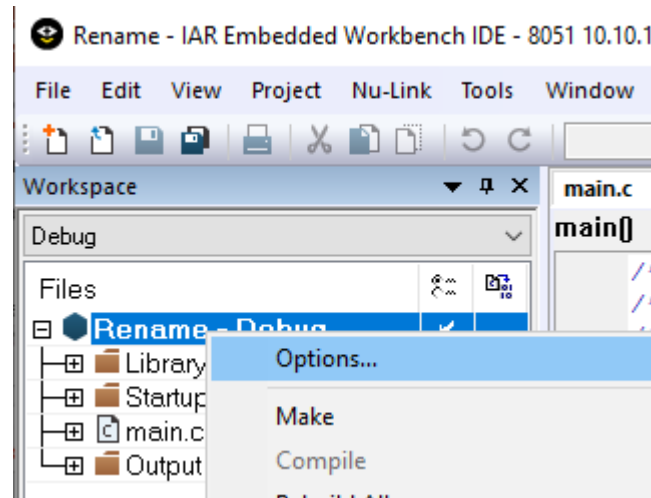


<< SampleCode > Template > Rename > IAR > Debug > Exe	
Name	Date modified
 Rename.a51	12/8/2023 2:54 PM
 Rename.bin	12/8/2023 2:54 PM
 Rename.d51	12/8/2023 2:54 PM

Options of IAR workbench

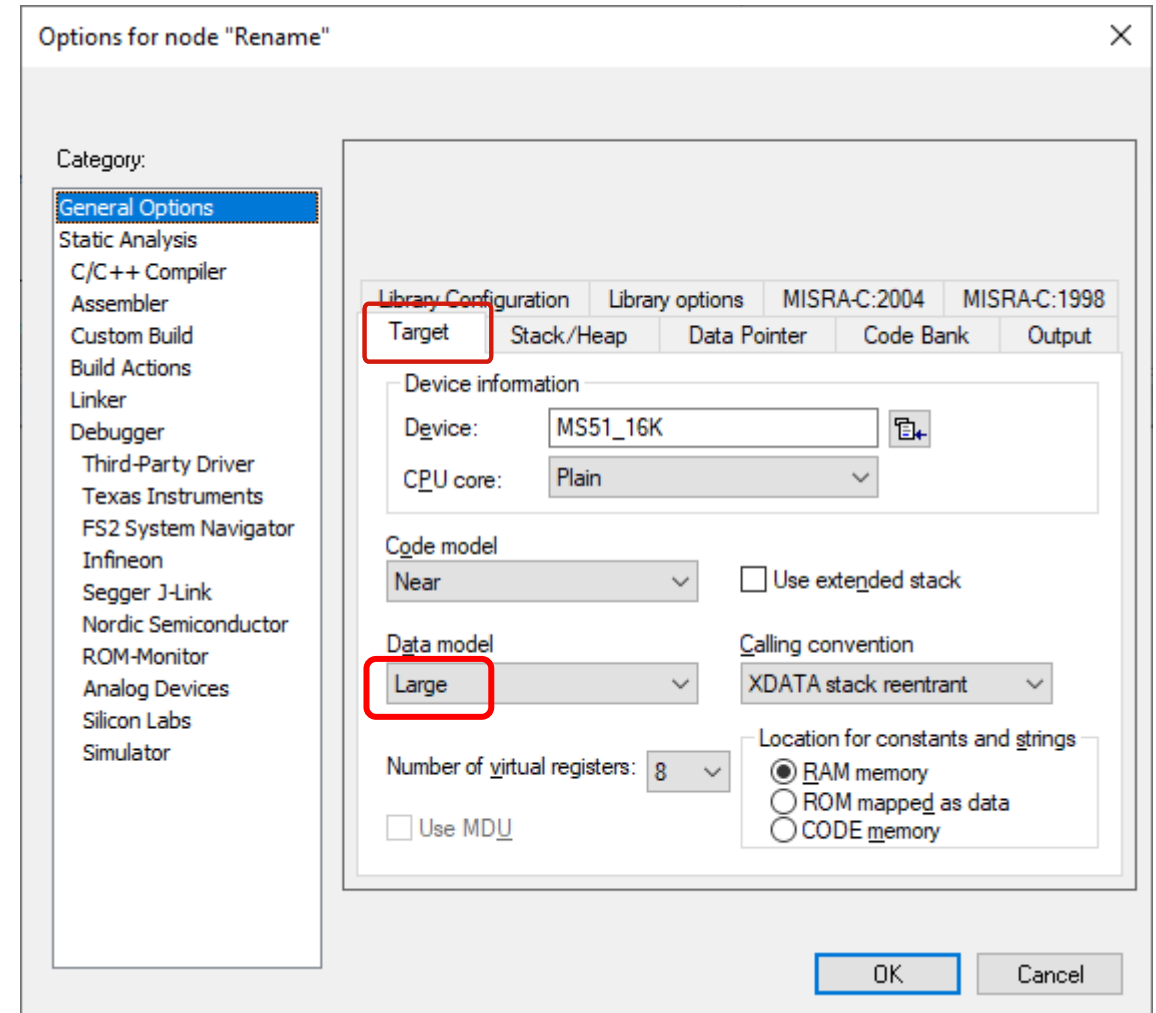
- The following introduction focuses on the special definition of nuvoton 8051 series.
- For a comprehensive description of all options, please consult the official IAR documentation.

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

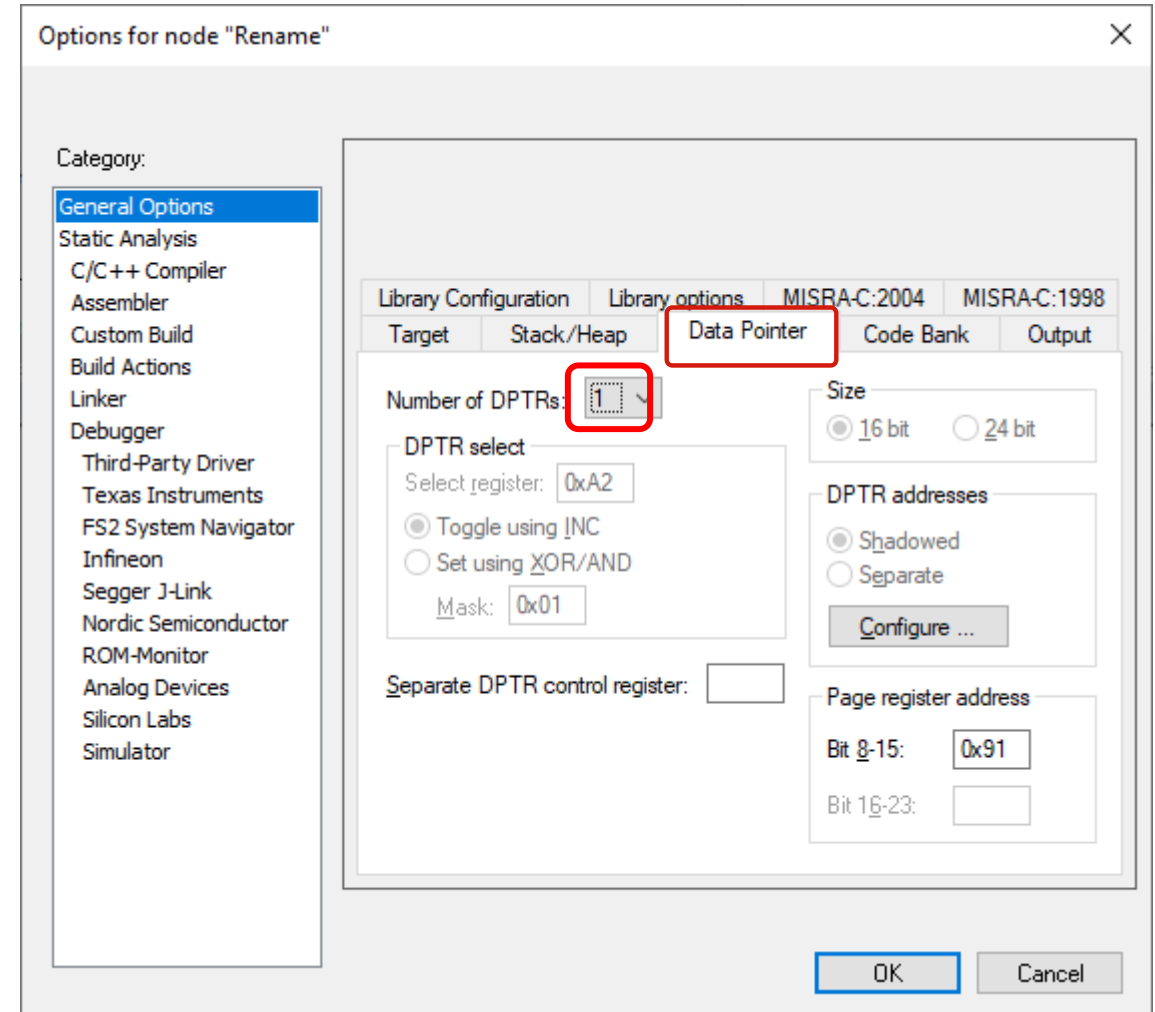
- Stack / Heap
 - XDATA value is important to printf

The screenshot shows the 'Options for node "Rename"' dialog box. On the left, a list of categories is shown, with 'General Options' selected. The main area displays the 'Stack/Heap' tab, which is highlighted with a red box. This tab contains settings for stack and heap sizes. The 'XDATA' value is set to '0x1FF' and is also highlighted with a red box. Other settings include 'I\$DATA' (0x40), 'P\$DATA' (0x80), 'Extended' (0x3FF), 'Heap sizes' (XDATA: 0xFF, Ear: 0xFFF, Far22: 0xFFF, Huge: 0xFFF), and 'Extended stack' (Extended stack pointer address: 0x9B, Extended stack pointer mask: 0x03, Extended stack pointer is an offset: unchecked, Extended stack pointer start address: 0x002000). The 'OK' and 'Cancel' buttons are at the bottom right.

Category	Value
I\$DATA	0x40
P\$DATA	0x80
XDATA	0x1FF
Extended	0x3FF
Heap sizes XDATA	0xFF
Heap sizes Ear	0xFFF
Heap sizes Far22	0xFFF
Heap sizes Huge	0xFFF
Extended stack pointer address	0x9B
Extended stack pointer mask	0x03
Extended stack pointer start address	0x002000

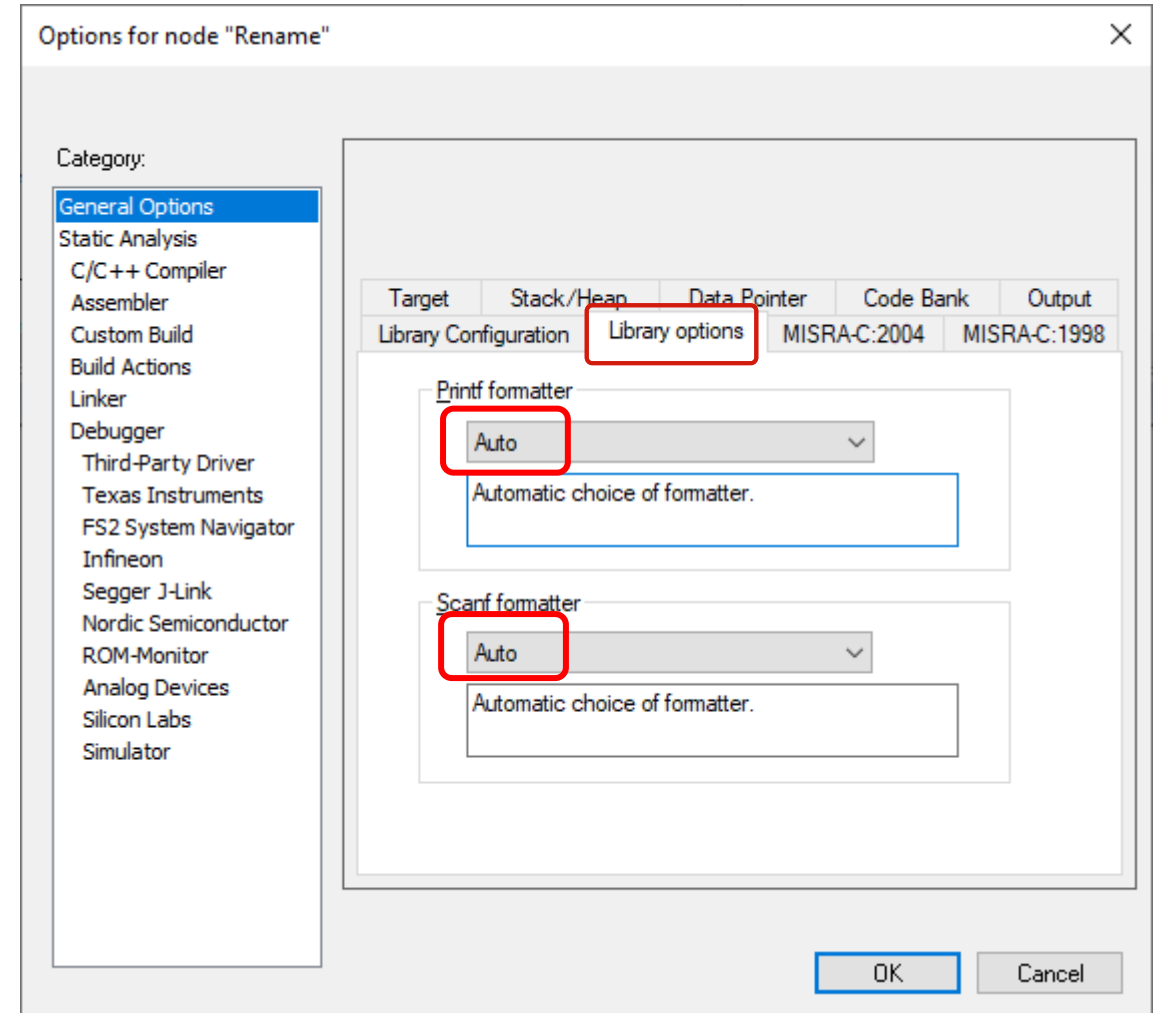
| For IAR – General Options

- DPTRs
 - Always use 1 DPTR.



| For IAR – General Options

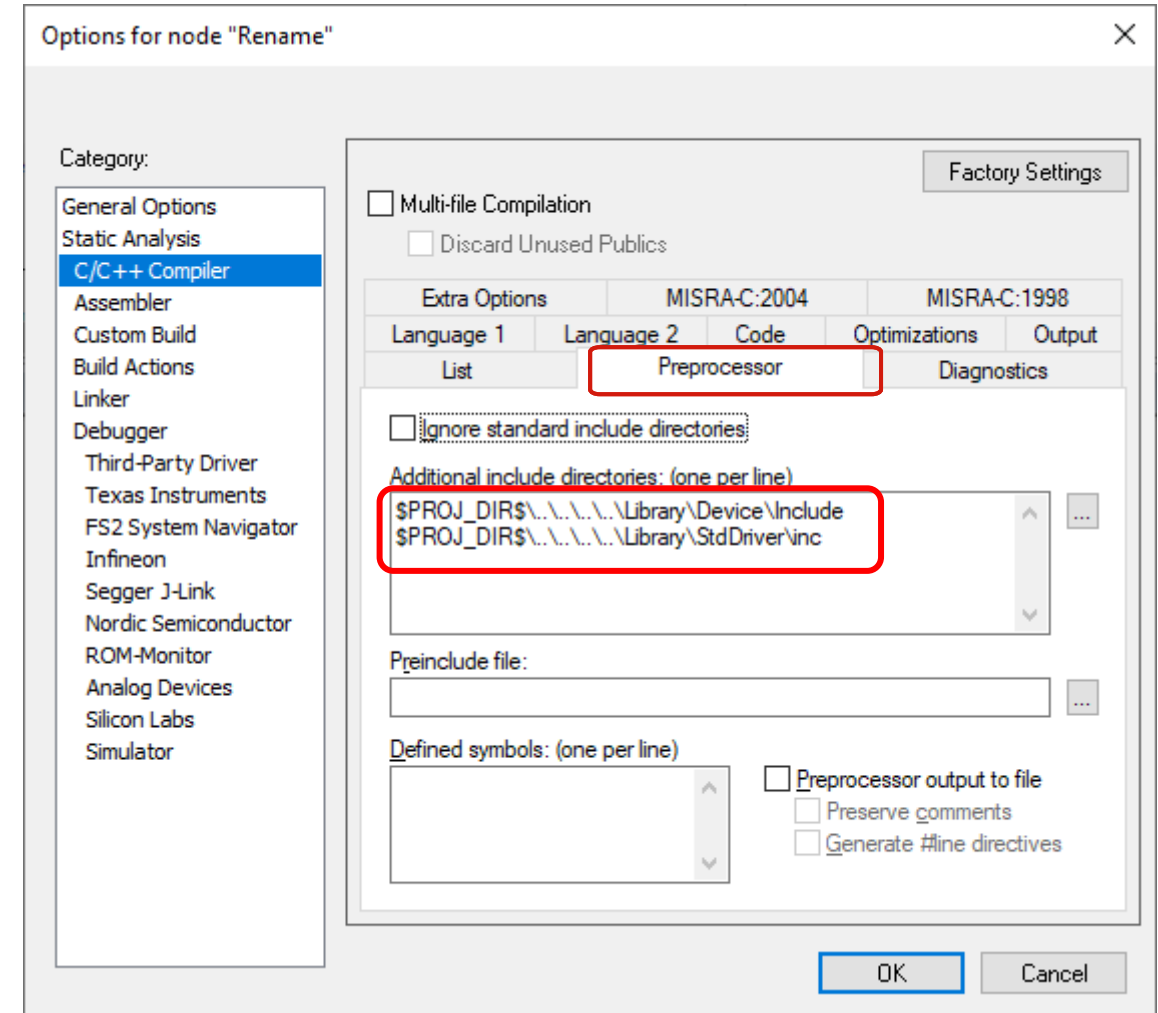
- Auto for Printf formatter



| For IAR – C/C++ Compiler

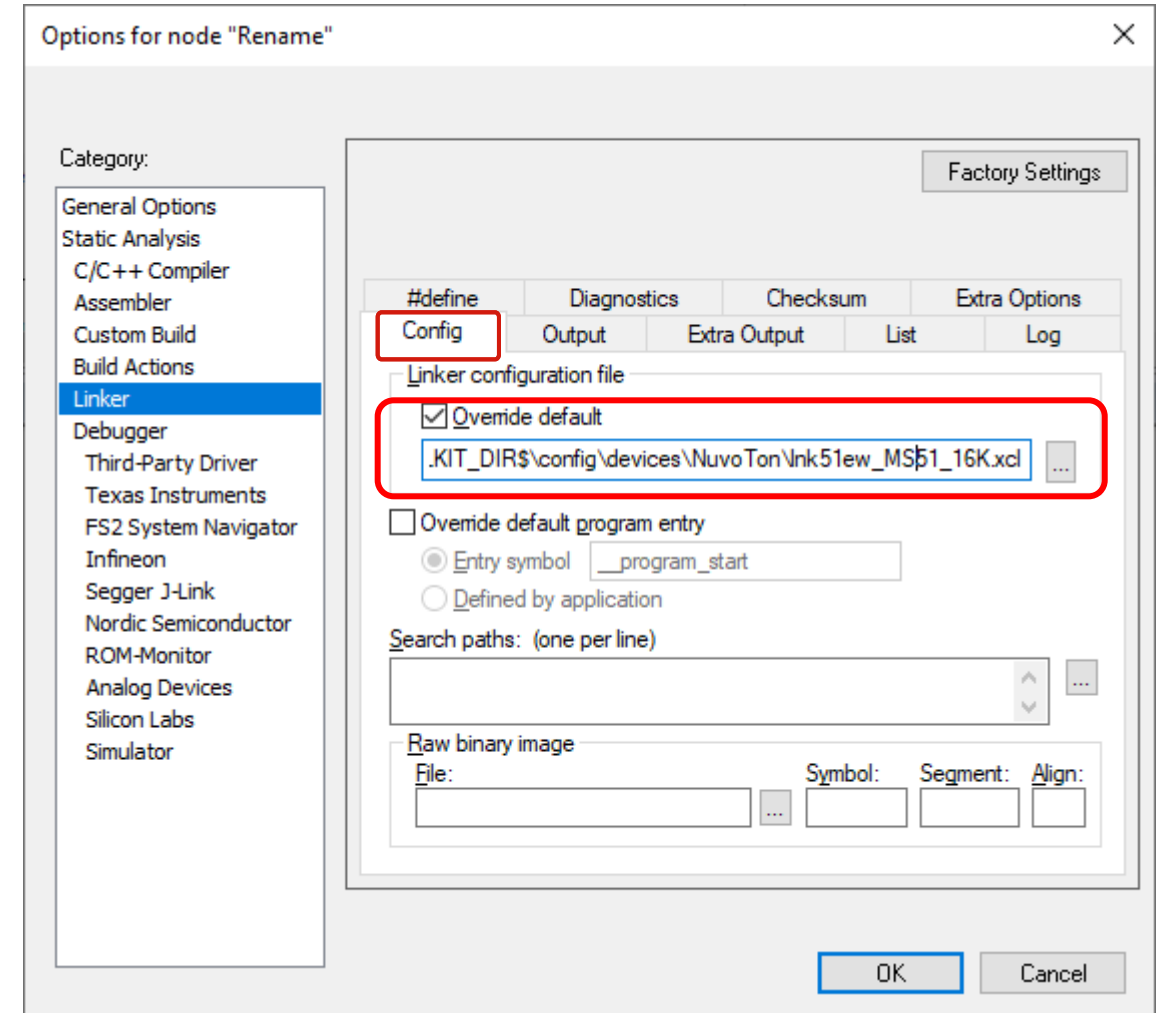
- Include Paths

Defined the header file path of device and library.



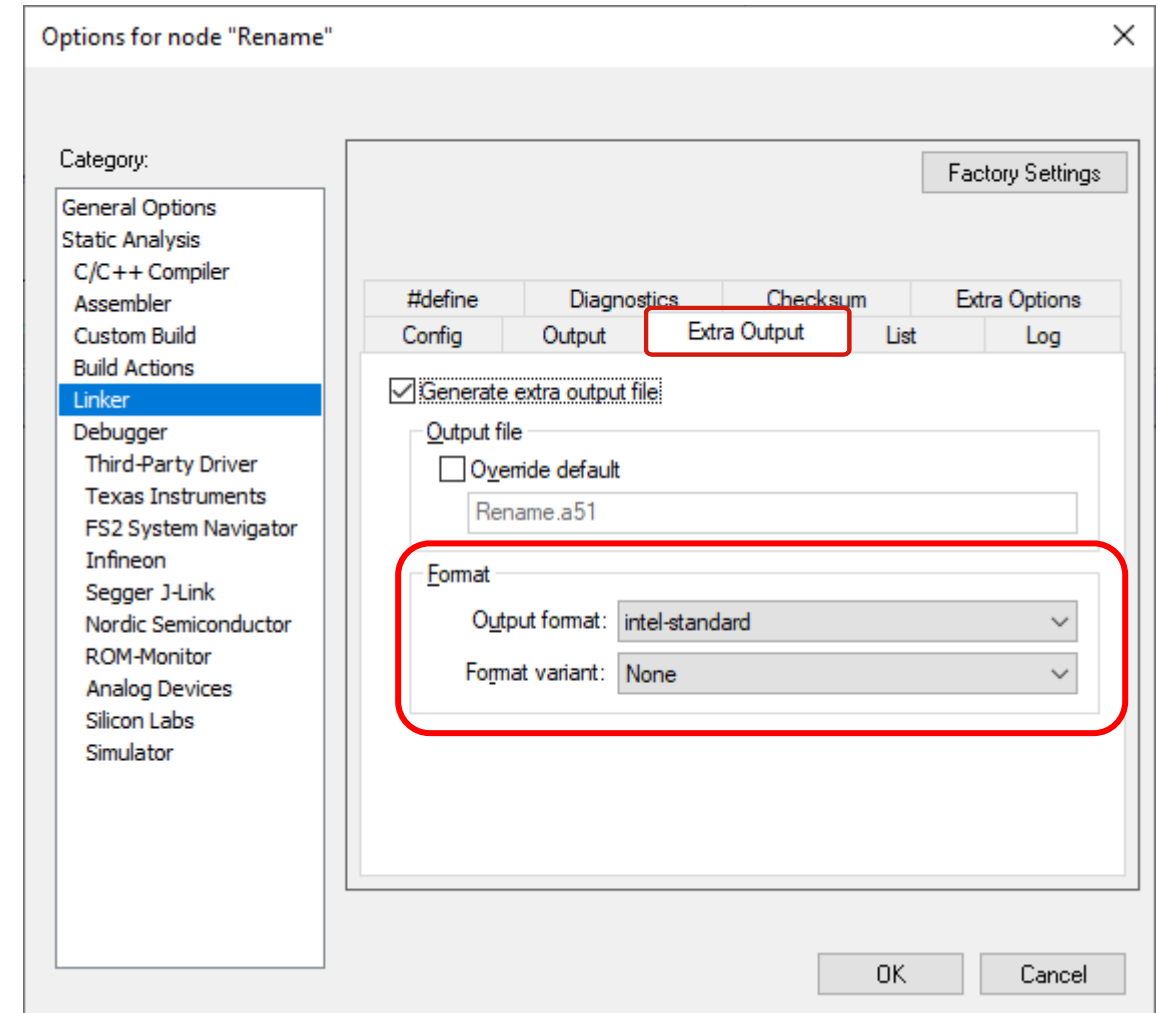
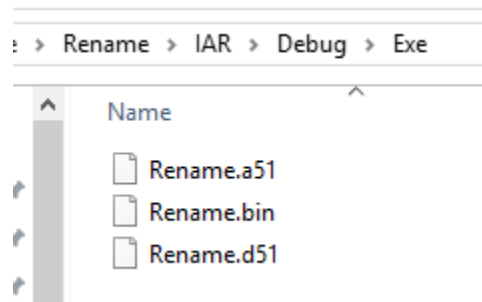
| For IAR – Build Actions

- 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



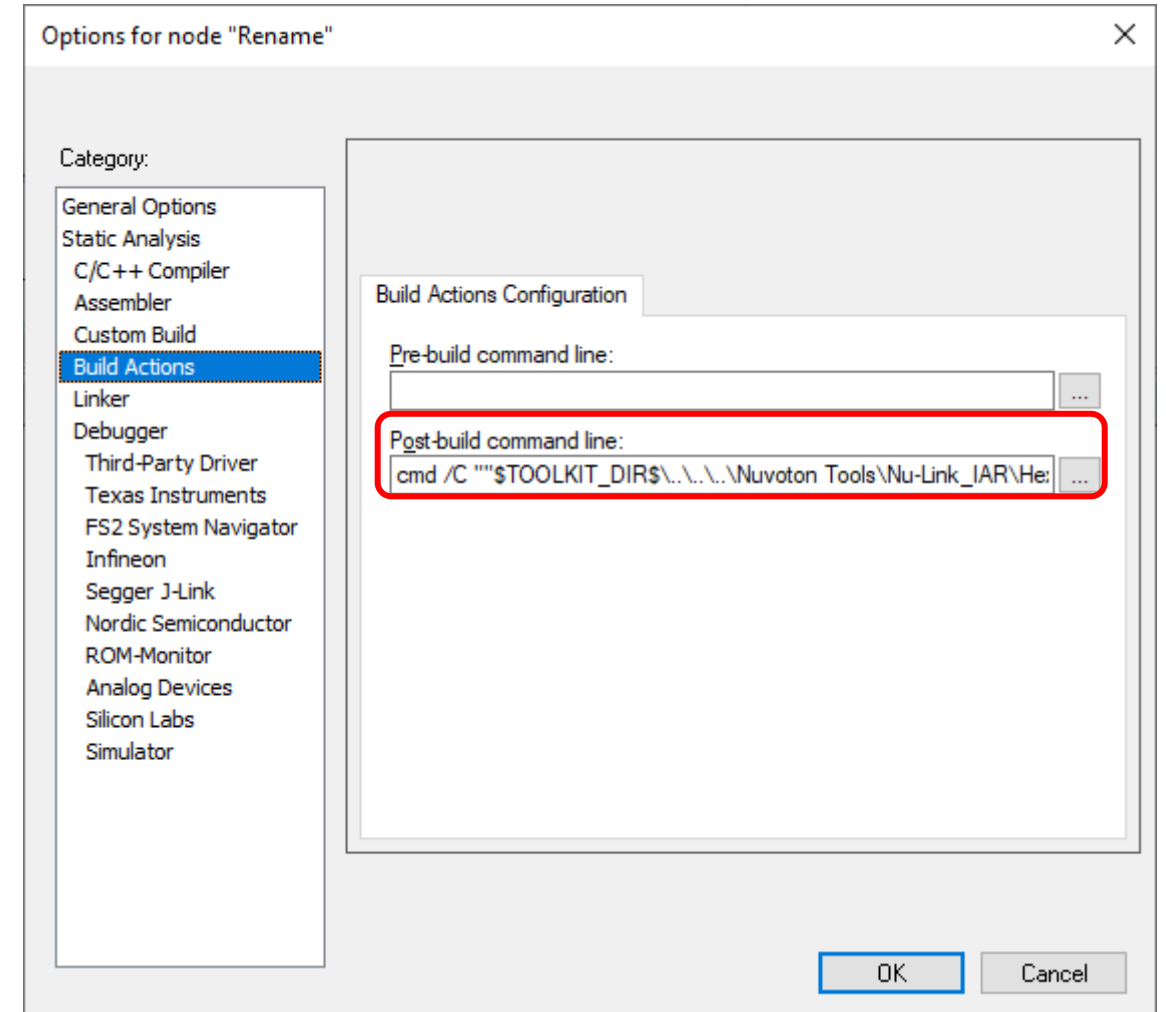
| For IAR – C/C++ Compiler

- Hex2bin

This file is located within the Nuvoton IAR driver folder.

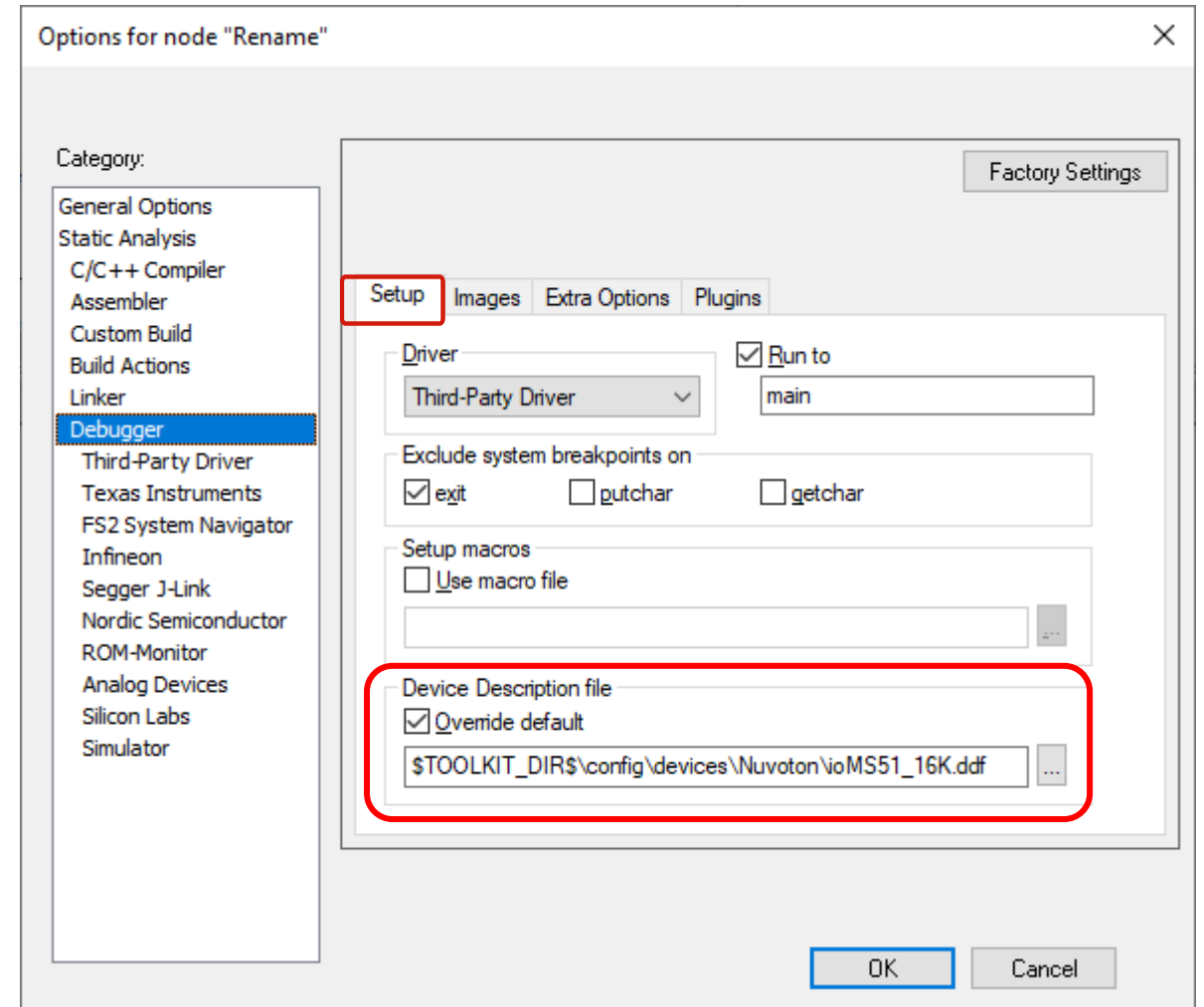
. \Nuvoton Tools\Nu-Link_IAR\Hex2Bin.exe

- 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>



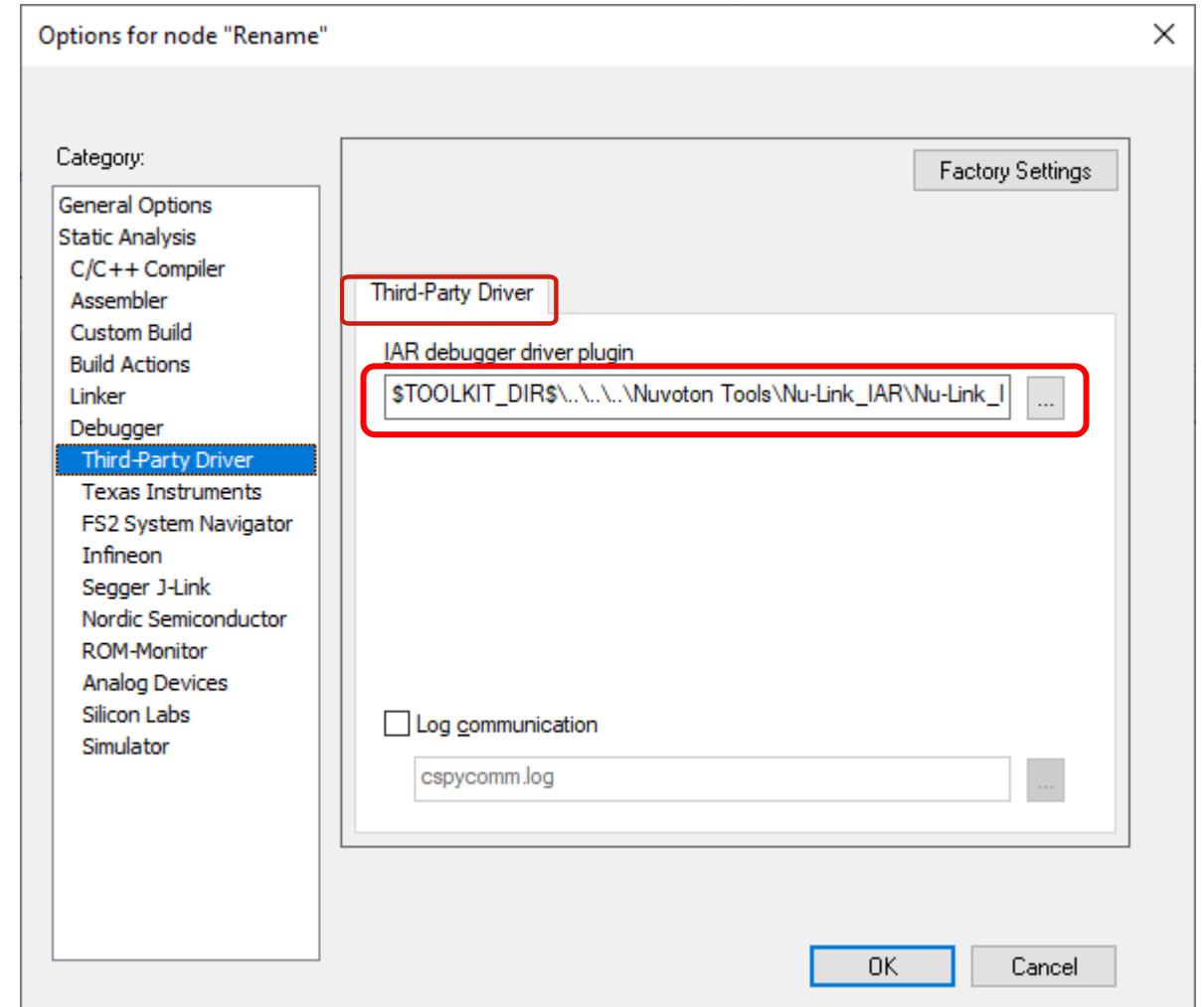
| For IAR – Debugger

- 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.**



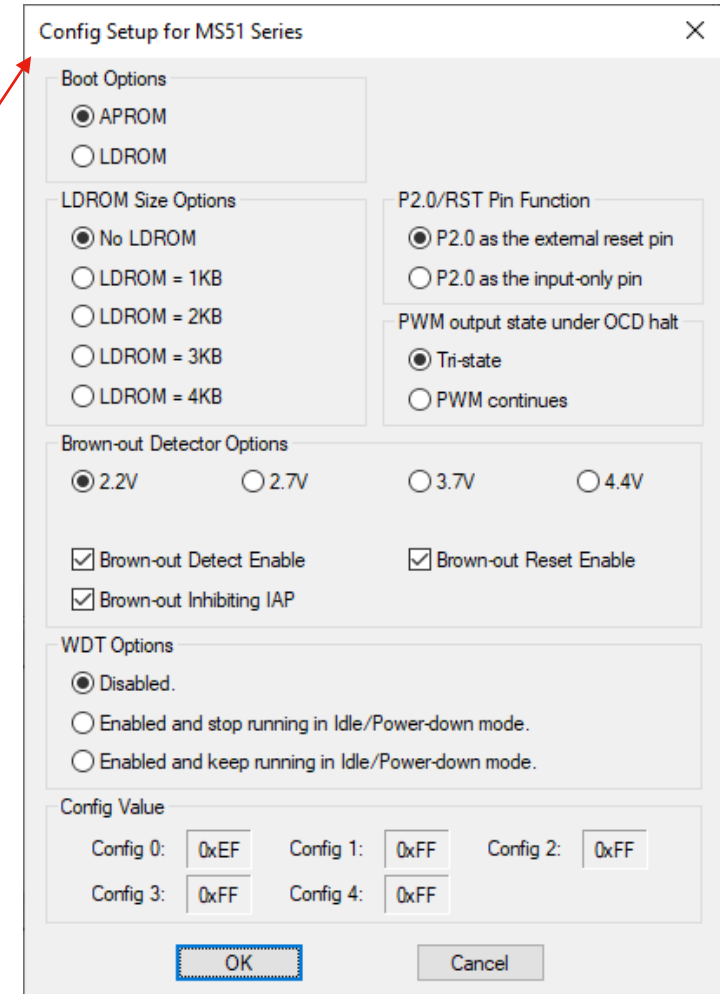
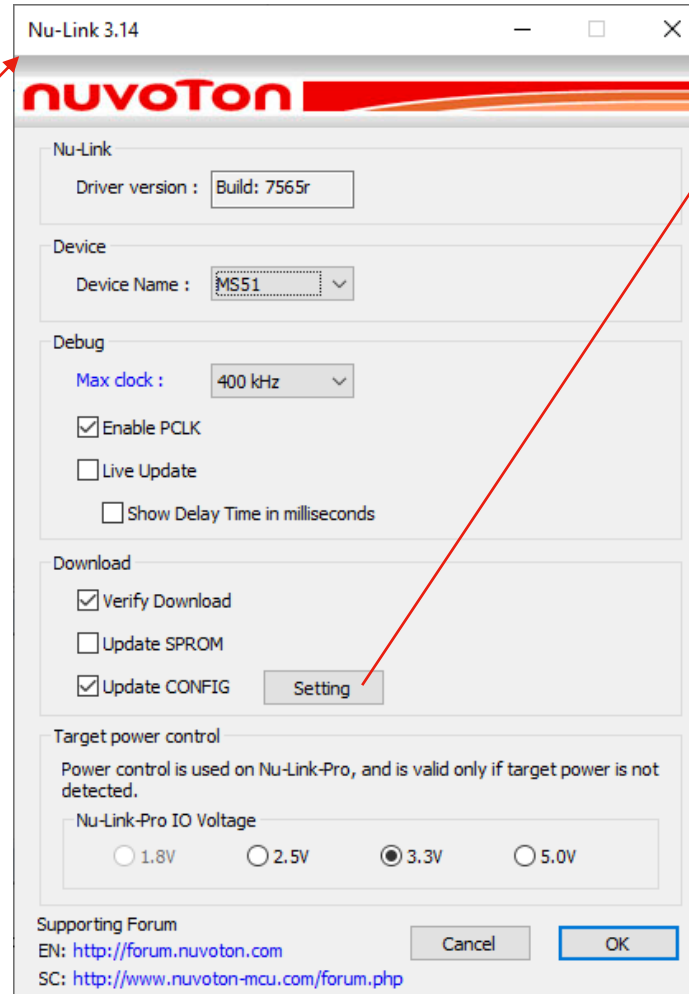
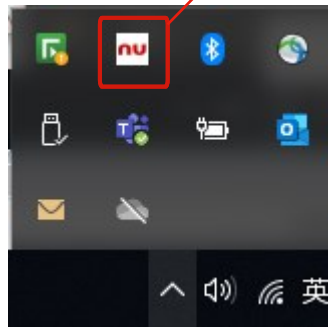
| For IAR – Third Party Driver

- 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 project9
 - 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

Joy of innovation
nuvoTon

Thank You

Danke

Merci

ありがとう

Gracias

Kiitos

감사합니다

धन्यवाद

كل ارکش

הודות