

## Migrating NuMicro BSP to Arm Compiler 6

Application Note for 32-bit NuMicro® Family

### Document Information

<b>Abstract</b>	This document introduces how to migrate from Arm® Compiler 5 to Compiler 6 for all NuMicro series BSP (Board Support Package).
<b>Apply to</b>	All NuMicro® series

*The information described in this document is the exclusive intellectual property of Nuvoton Technology Corporation and shall not be reproduced without permission from Nuvoton.*

*Nuvoton is providing this document only for reference purposes of NuMicro microcontroller and microprocessor-based system design. Nuvoton assumes no responsibility for errors or omissions.*

*All data and specifications are subject to change without notice.*

*For additional information or questions, please contact: Nuvoton Technology Corporation.*

[www.nuvoton.com](http://www.nuvoton.com)

---

## Table of Contents

---

<b>1</b>	<b>OVERVIEW.....</b>	<b>3</b>
<b>2</b>	<b>DEVELOPMENT ENVIRONMENT .....</b>	<b>4</b>
2.1	Arm Keil MDK Nuvoton Edition .....	4
2.2	DFP Supporting.....	4
<b>3</b>	<b>MIGRATING ARM COMPILER 5 TO COMPILER 6.....</b>	<b>5</b>
3.1	Obtain retarget.c and startup_xxx.s .....	5
3.2	Change Project File to *.uvprojx .....	5
3.3	Switch to Arm Compiler 6 .....	6
3.4	Remove Suppressed Diagnostic Messages.....	7
<b>4</b>	<b>SPECIAL SAMPLE CODE .....</b>	<b>8</b>
4.1	StdDriver/HSOTG_Dual_Role_UMAS .....	8
4.2	StdDrvier/FreeRTOS .....	8
4.3	NuMaker-PFM-M487/LwIP_MQTT .....	9

## 1 Overview

Arm Compiler 6 (AC6) is available in MDK Version 5. Since Arm Compiler 6 is based on new technology, it is only partially compatible with the previous Arm Compiler 5. This application note provides a summary guide for porting your source code.

For more details, please search online for “**Migrate Arm Compiler 5 to Arm Compiler 6**” to obtain the MDK tutorial PDF document.

## 2 Development Environment

### 2.1 Arm Keil MDK Nuvoton Edition

Arm and Nuvoton provide software developers with a free-to-use professional tool suite for commercial use, Keil MDK Nuvoton Edition – Full Cortex-M, including support for all Nuvoton devices based on Arm Cortex-M cores, such as the Arm Cortex-M0, M0+, M23, M33, M4, M55, M7, and M85.

This free service is available for use with Keil MDK Version 5.37 or later and only supports Arm Compiler 6.

The Keil MDK Nuvoton Edition could be downloaded from Nuvoton's official website <https://www.nuvoton.com/tool-and-software/ide-and-compiler/keil-download/>. Follow the steps on the web page to complete installation and activation.

### 2.2 DFP Supporting

In the Pack Installer, click Install to download and install the Device Family Packs (DFP) supplied by Nuvoton. To use Arm Compiler 6, it is recommended to use the following DFP version at least:

- Nuvoton.NuMicro\_DFP.1.3.25.pack or later

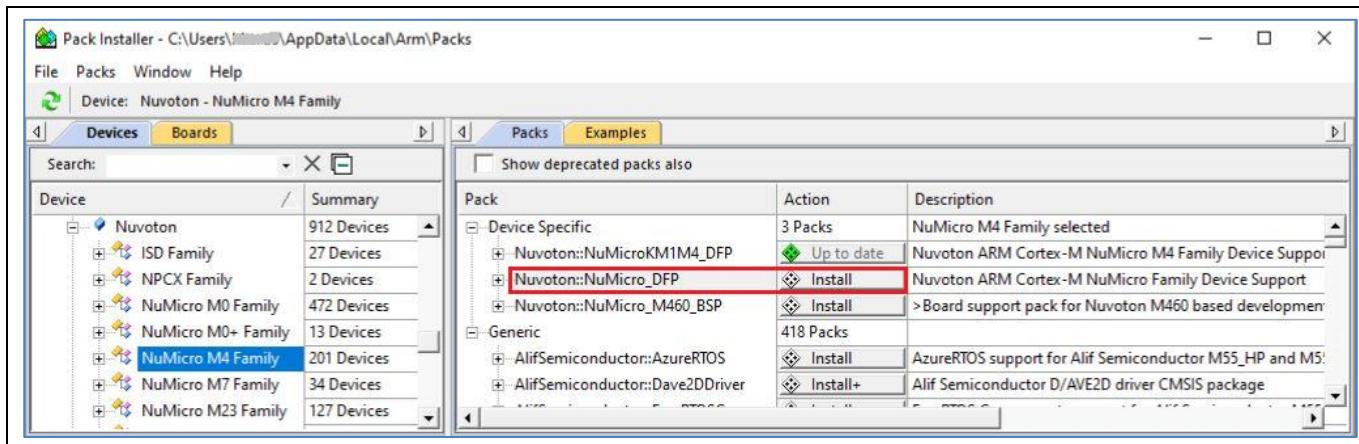


Figure 2-1 Pack Installer

### 3 Migrating from Arm Compiler 5 to Compiler 6

This section shows you the simple process of migrating sample code from Arm Compiler 5 to Compiler 6. For a complete reference of migrating sample code, please refer to Chapter 4.

Arm Compiler 6 offers a wide range of warning messages. In the first step of migration, it is recommended to switch the warning level to “No Warnings” to focus on error messages.

The basic steps of migration are as follows:

- Obtain **retarget.c** and **startup\_xxx.s** from the corresponding NuMicro series BSP (Compiler 6 supported).
- Change the project file extension from \*.uvproj to \*.uvprojx.
- Switch to Arm Compiler 6 in μVision IDE.
- Remove suppressed diagnostic messages in μVision IDE.

If you want to show all warnings that Arm Compiler 5 will show, you can do the following:

- Select “AC5-like Warnings” in μVision IDE.

#### 3.1 Obtain **retarget.c** and **startup\_xxx.s**

Arm Compiler 6 assembly syntax is now compatible with GNU style rather than Arm style. A simple way to solve the compilation errors is to obtain retarget.c and startup\_xxx.s from the latest BSP corresponding to the NuMicro series that supports Arm Compiler 6, and then replace them into your source code. Before you begin, it is recommended that you create a backup copy of your source code.

Please visit the OpenNuvoton website (<https://github.com/OpenNuvoton>) to download the NuMicro series BSP.

#### 3.2 Change Project File to \*.uvprojx

1. Open the original Keil project \*.uvproj.
2. Select **Project > Manage > Migrate to Version 5 Format...** from the main menu bar.
3. After the migration is completed, the project will be saved as \*.uvprojx. Target memory/ Debugger setup may have been changed; please check and update.

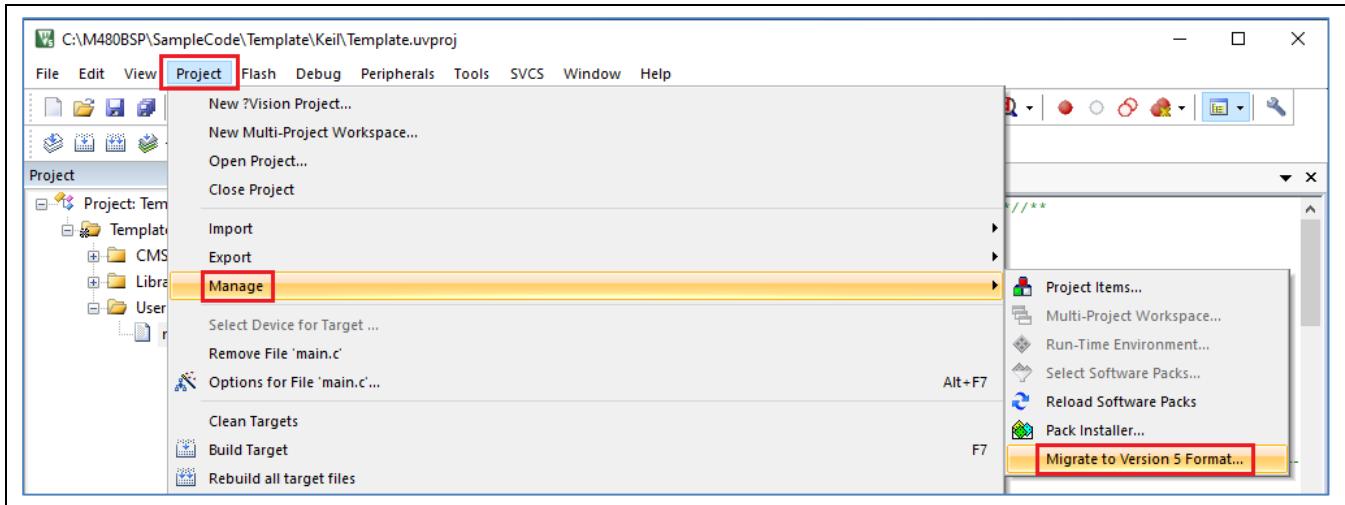


Figure 3-1 Migrate to Version 5 Format

### 3.3 Switch to Arm Compiler 6

1. Open the Keil project and select **Project > Options for Target**.
2. Set the Arm Compiler to Version 6.x included with the MDK.
3. Click **OK** to return to main page.

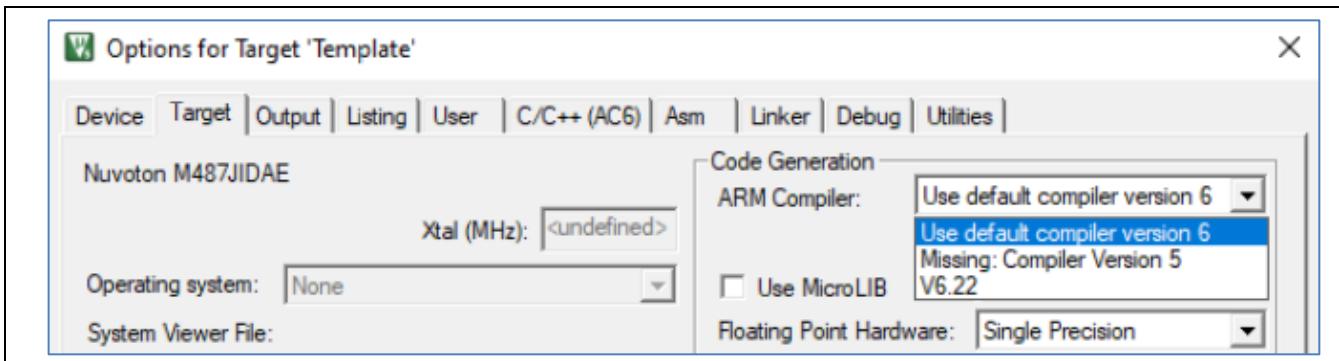


Figure 3-2 Select Compiler Version on Target Tab

### 3.4 Remove Suppressed Diagnostic Messages

1. Open the Keil project and select Project > Options for Target.
2. On the C/C++ (AC6) tab, remove **--diag\_suppress** parameter in the Misc Controls.
3. Click **OK** to return to main page.

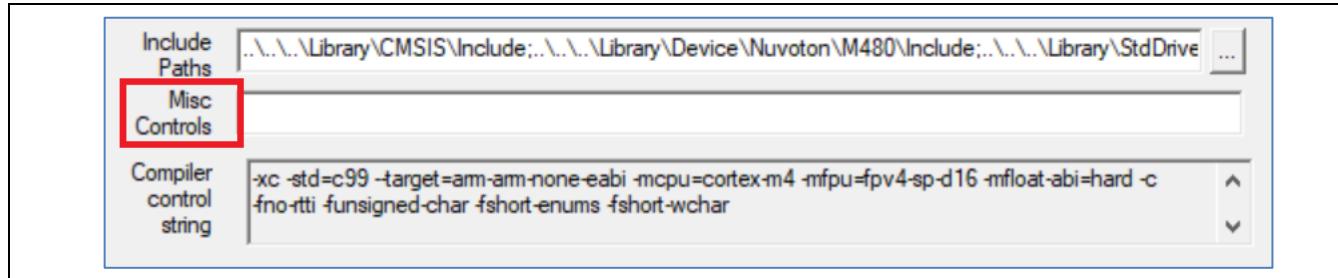


Figure 3-3 Remove Parameter in Misc Controls

## 4 Special Sample Code

In addition to the basic methods mentioned in Chapter 3, the migration steps also include additional settings to resolve potential compilation errors. This chapter will take several sample codes in M480 BSP as examples to demonstrate how to migrate from Arm Compiler 5 to Compiler 6 using MDK version 5.41. Please note that each sample code may have some differences in settings.

### 4.1 StdDriver/HSOTG\_Dual\_Role\_UMAS

1. Replace **retarget.c** and **startup\_M480.s**.
2. Change project file extension to **\*.uvprojx**.
3. Switch to Arm Compiler 6.
4. On the C/C++ (AC6) tab, add **-Wno-format** in the Misc Controls to suppress warnings related to format strings in C and C++ code.
5. Rebuild the project.

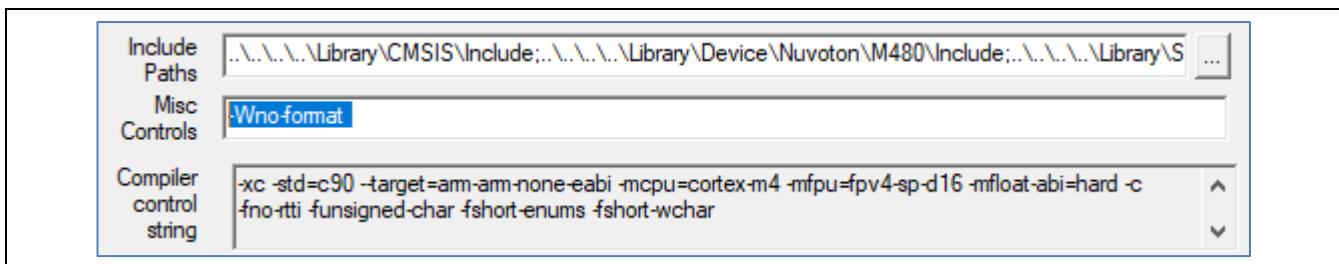


Figure 4-1 Use Misc Controls to Disable Custom Warnings

### 4.2 StdDrvier/FreeRTOS

1. Replace **retarget.c** and **startup\_M480.s**.
2. Change project file extension to **\*.uvprojx**.
3. Switch to Arm Compiler 6.
4. Change **port.c** from RVDS to GCC version. Also modify the compiler include path. (ThirdParty\FreeRTOS\Source\portable\GCC\ARM\_CM4F)
5. On the C/C++ (AC6) tab, set the Language C to **C99**.
6. Rebuild the project.

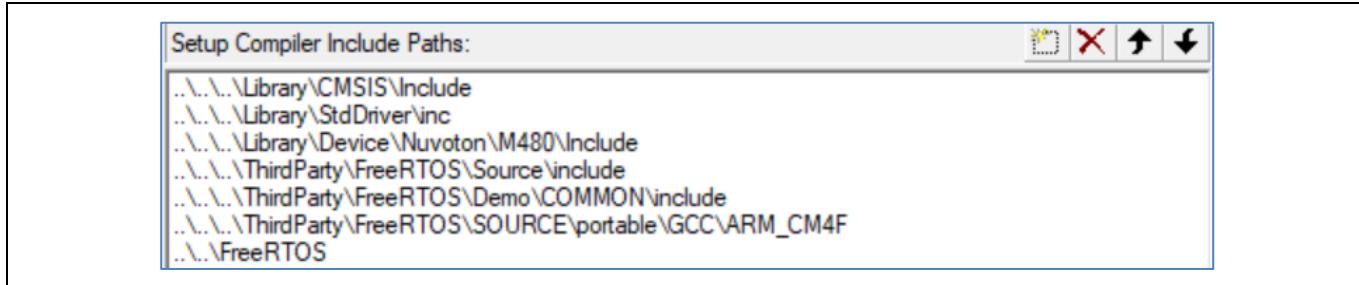


Figure 4-2 Setup Compiler Include Paths

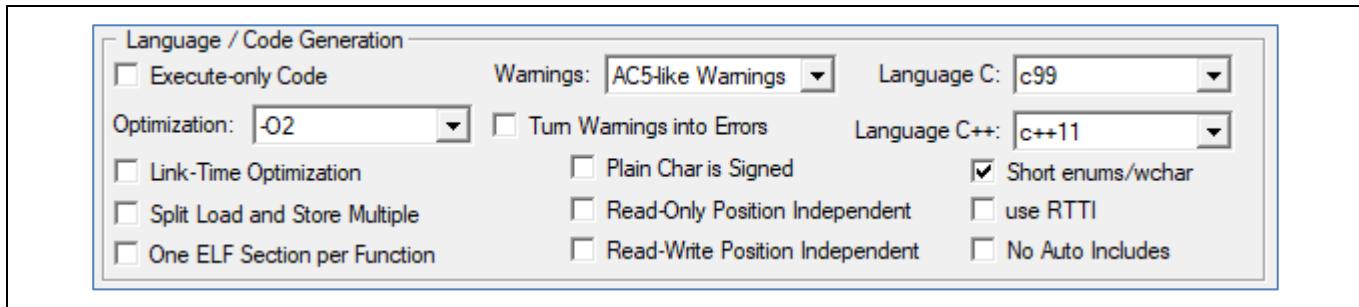


Figure 4-3 Set the C Language

### 4.3 NuMaker-PFM-M487/LwIP\_MQTT

1. Replace **retarget.c** and **startup\_M480.s**.
2. Change project file extension to **\*.uvprojx**.
3. Switch to Arm Compiler 6.
4. On the C/C++ (AC6) tab, remove **--diag\_suppress** in the Misc Controls.
5. Change **port.c** from RVDS to GCC version. Also modify the compiler include path. (ThirdParty\FreeRTOS\Source\portable\GCC\ARM\_CM4F)
6. On the C/C++ (AC6) tab, set the Language C to **C99**.
7. Modify the **\_\_GNUC\_\_** macro detection in **lwipopts.h**.

**Note:** Arm compiler 6 defines **\_\_GNUC\_\_** macro may cause incorrect code to be compiled.

```
#if defined (__GNUC__) && !defined(__ARMCC_VERSION)
#define LWIP_TIMEVAL_PRIVATE          0
#endif
```

Figure 4-4 Arm Compiler 6 defines \_\_GNUC\_\_

**Revision History**

Date	Revision	Description
2024.12.18	1.00	Initial version.

### Important Notice

Nuvoton Products are neither intended nor warranted for usage in systems or equipment, any malfunction or failure of which may cause loss of human life, bodily injury or severe property damage. Such applications are deemed, "Insecure Usage".

Insecure usage includes, but is not limited to: equipment for surgical implementation, atomic energy control instruments, airplane or spaceship instruments, the control or operation of dynamic, brake or safety systems designed for vehicular use, traffic signal instruments, all types of safety devices, and other applications intended to support or sustain life.

All Insecure Usage shall be made at customer's risk, and in the event that third parties lay claims to Nuvoton as a result of customer's Insecure Usage, customer shall indemnify the damages and liabilities thus incurred by Nuvoton.

---

Please note that all data and specifications are subject to change without notice.  
All the trademarks of products and companies mentioned in this datasheet belong to their respective owners.