Application Note

Document No.: AN1129

G32R501 Keil Debug Tool User Manual

Version: V1.1

1 Introduction

Due to the chip characteristics of the G32R5xx series MCU, certain simulation data streams need to be configured before simulation. For example, it is necessary to set the BOOT address and DCSM configuration. “keil_dbg_tool” will automate these setting processes and ensure correct configuration of the simulation environment.

Read this instruction document before using the “keil_dbg_tool”.

Operating environment of the tool:

- Windows 10/11
- Python 3.11

Contents

2 About Tool

The keil_dbg_tool tool provides a command line interface for users. Its main function is to automatically modify the debugging initialization scripts (INI file) in MDK-ARM by parsing AXF (ELF) files and INI setting files. These INI files set the key stack pointer (SP) and program counters (PC), in addition to BOOT configuration and DCS key configuration.

keil_dbg_tool is responsible for parsing the stack pointer (SP) and program counter (PC) in AXF files, and modifying the content of the target INI files accordingly. This tool can automate and simplify the environment configuration process during simulation debugging, especially suitable for complex G32R5xx series MCU.

2.1 Supported Commands

The followings are the command line parameters supported by keil_dbg_tool and the corresponding descriptions:

keil_dbg_tool -a <axf(elf) file path> [-r] -d <output debug file path> [-v]

- *-a <axf file path>*: The path of the AXF (ELF) file.
- *-d* <parsed debug file path>: The path of the parsed debug INI file.
- *-r*: (Optional) During debugging, each reset will skip the boot code and directly set the SP and PC of the current firmware.
- *-v*: Display the version and the build date.
- *-h*: Display the help information.

2.2 Use Examples

- Parse AXF files and configure debug INI files:

  keil_dbg_tool -a project.axf -d project_dbg.ini

- Display the version and the build date:

  keil_dbg_tool -v

3 INI File Examples

The basic content of the INI file used for simulation sequences is as follows:

```
FUNC void DCS_KEY_Setup()
{
      // DCS Zone1 CSM
      _WDWORD(0x50024020, DCS_ZONE1_CSM0);
      _WDWORD(0x50024024, DCS_ZONE1_CSM1);
      _WDWORD(0x50024028, DCS_ZONE1_CSM2);
      _WDWORD(0x5002402C, DCS_ZONE1_CSM3);

      // DCS Zone2 CSM
      _WDWORD(0x500240A0, DCS_ZONE2_CSM0);
      _WDWORD(0x500240A4, DCS_ZONE2_CSM1);
      _WDWORD(0x500240A8, DCS_ZONE2_CSM2);
      _WDWORD(0x500240AC, DCS_ZONE2_CSM3);
}

FUNC void Set_SP_PC_Setup(void)
{
      SP= 0x20004000;
      PC= 0x000009F0;
      xPSR |= (1 << 24);
}

FUNC void Setup(void) {
      Init_CPU();
      Set_SP_PC_Setup();
}

FUNC void OnResetExec (void) {     // Executes upon software RESET
      DCS_KEY_Setup();
      Setup();                           // Setup for running
}

DCS_KEY_Setup();

LOAD %L INCREMENTAL

Setup();
```

//g, main

The DCS_KEY_Setup function is used to set the key for DCS (Device Configuration and Security Module). Safe zones for DCS protection and configuration devices:

- Zone1 and Zone2: G32R5xx MCU usually has two DCS zones. Each zone has its own key configuration.
- Key setting: The codes, like "_WDWORD(0x50024020, 0xFFFFFFFF);" , are used to write key values to specific DCS registers.

  where,

  - The register addresses and key values are defined by the chip manuals.
  - The values 0xFFFFFFFF and 0xFFFFFFDC in the example are specific key values.

4 How to Use

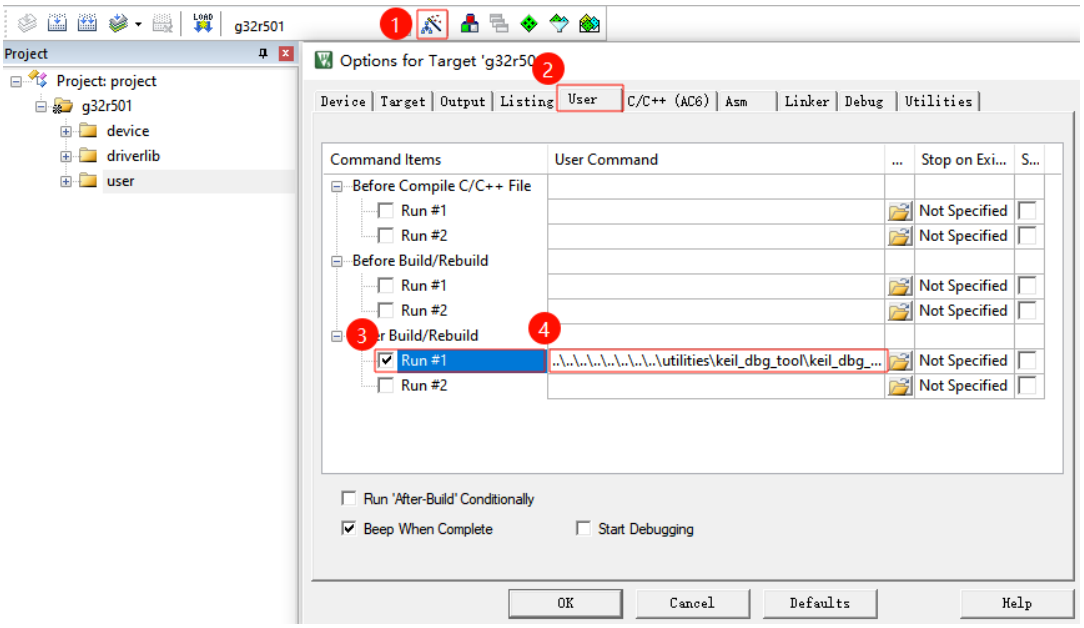
To use keil_dbg_tool in MDK-ARM, add a custom post-build step. The following is an example of how to modify INI files after a project is built.

4.1 Add Custom Post-build Steps

Add the custom post-build steps in MDK, and the process is as follows:

1. Place keil_dbg_tool.exe in a known location in the project directory structure (for example, the utilities\ directory).
2. Open MDK project: Enter the MDK project.
3. Enter the project settings window: Click the "Project" in the menu bar or directly select "Options for Target" from the toolbar.
4. Select the "User" tab: In the opened project settings window, switch to the "User" tab.
5. Add custom post-build steps: Locate the "Before Build/Rebuild" option, select "Run #1" or "Run #2," and then enter the corresponding command in the subsequent command line field.
6. Save configuration: Click the "OK" button.

Figure 1 How to Add Custom Post-build Steps



One of the following conditions must be met when using the tool:

（1） The path should not contain any spaces.

（2） If the path contains spaces, enclose the path in double quotation marks (").

Table 1 Examples of Incorrect and Correct Paths

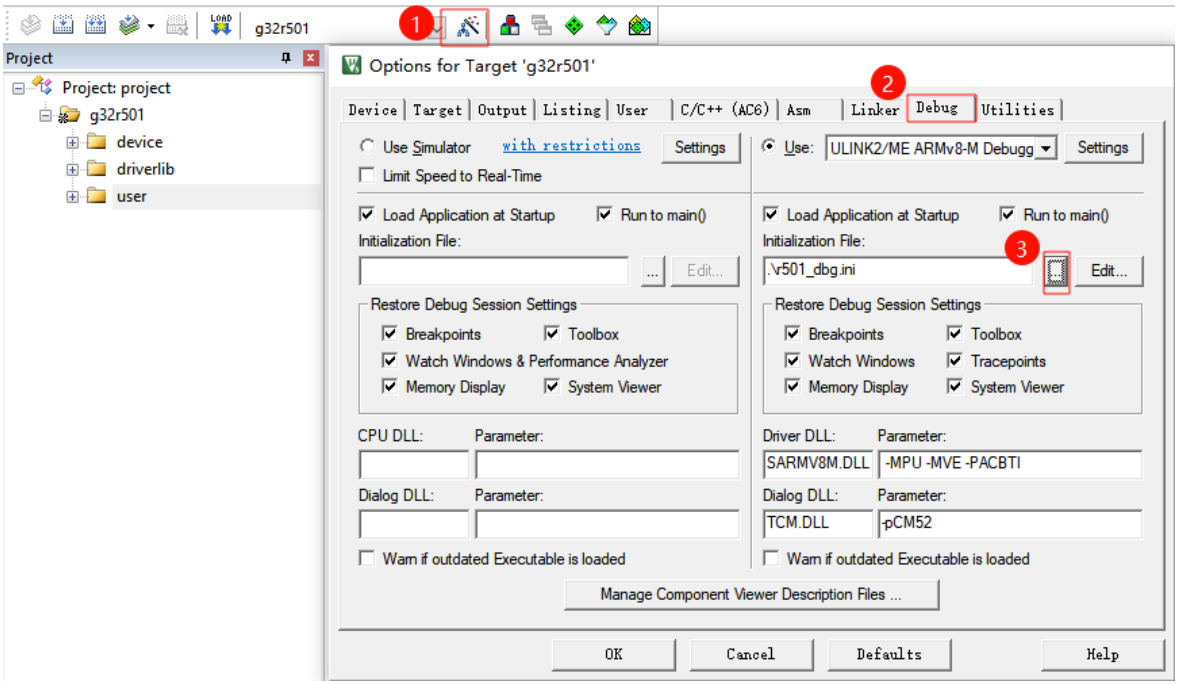
Incorrect	fromelf --bin --output $Loutput.bin #L ..\..\..\..\..\..\..\..\utilities\keil_dbg_tool\keil_dbg_tool -r -a #L -d .\r501_dbg.ini
Correct	fromelf --bin --output "$Loutput.bin" "#L" ..\..\..\..\..\..\..\..\utilities\keil_dbg_tool\keil_dbg_tool -r -a "#L" -d .\r501_dbg.ini

4.2 Simulation Script Selection

After the corresponding simulation script is modified, users need to perform simulation debugging settings in the project so that MDK can run the script during simulation. The setting steps for selecting the simulation debugging scripts in the project are as follows:

1. Open MDK project: Enter the MDK project.
2. Enter the project settings window: Click the "Project" in the menu bar or directly select "Options for Target" from the toolbar.
3. Select the "Debug" tab: In the opened project settings window, switch to the "Debug" tab.
4. Add the debugging script: In the "..." option, select the corresponding "*.ini" file in the pop-up file selection window.
5. Save configuration: Click the "OK" button.

Figure 2 Selecting Simulation Debugging Scripts



5 Revision

Table 2 Document Revision History

Date	Version	Change History
January 2025	1.0	New
April 2025	1.1	In the “Add Custom Post-build Steps” section, add the content that double quotes are required if the path contains spaces.

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