

ARM[®] Cortex[®]-M 32-bit Microcontroller

NuMicro[®] Family Nu-Link Command Tool User Manual

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1 OVERVIEW

The Nu-Link Command Tool is a Win32 console application consisting of functions to access Flash memory embedded in a NuMicro® MCU via a Nu-link adapter. Besides, it also provide functions to update Nu-Link adapter firmware. All these functions are enabled by input options which will be introduced in Chapter 2.

With the Nu-Link Command Tool, users are able to erase, program and dump Flash according to their requirements. In other words, users can create their customized Flash programming tool. In Chapter 3, a simple Windows application program is introduced for reference.

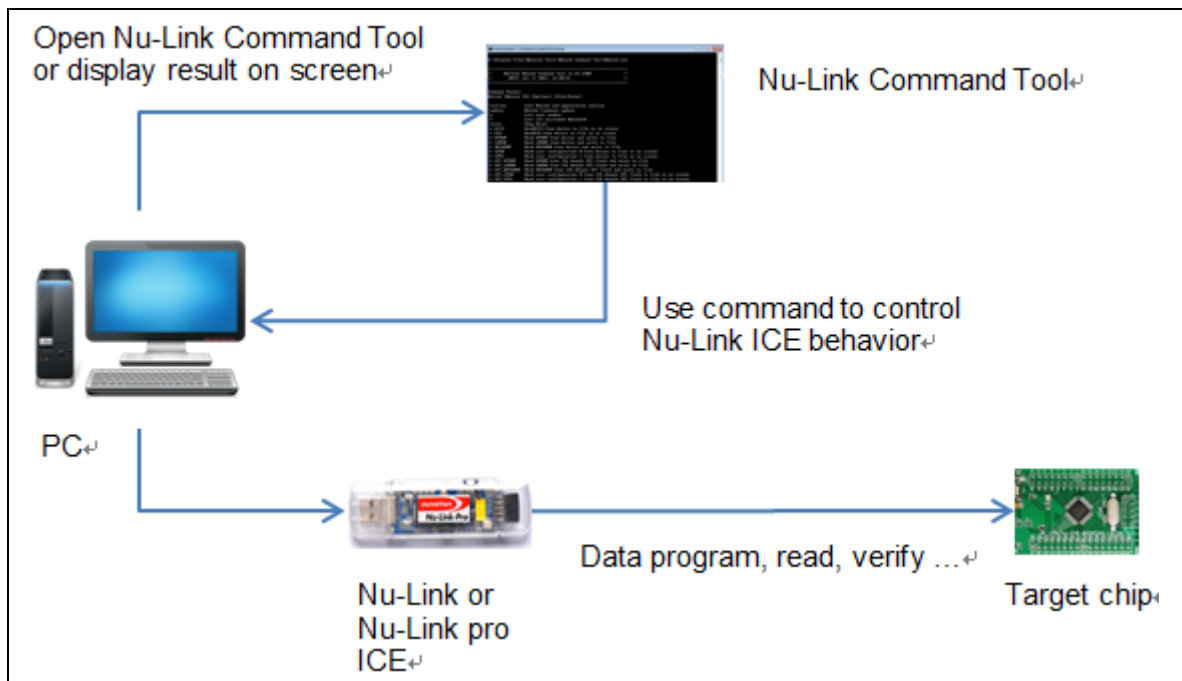


Figure 1.1-1 Nu-Link Command Tool System Block Diagram

1.1 Supported Chips

Download revision history from nuvoton website to see the table of supported devices.

2 NU-LINK COMMAND TOOL

2.1 Installing the Nu-Link Command Tool

Please execute the setup program to install the Nu-Link Command Tool, and follow instructions to complete the installation. The detailed steps are listed below.

1. Select setup language.



Figure 2.1-1 Language Selection Form

2. Setup wizard form which shows current version number.

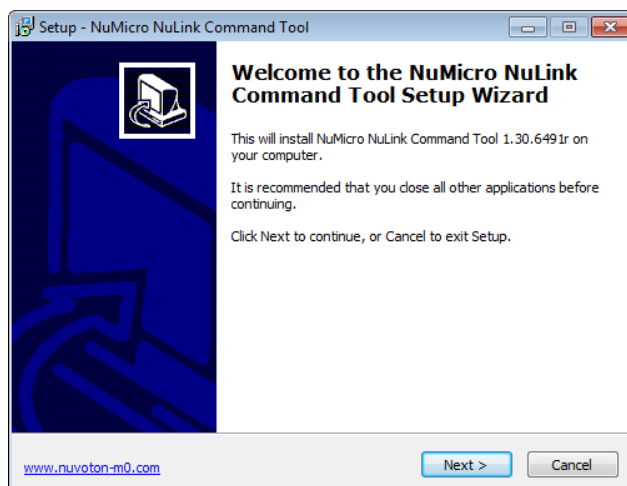


Figure 2.1-2 Setup Wizard Form

3. Browse the installation path.

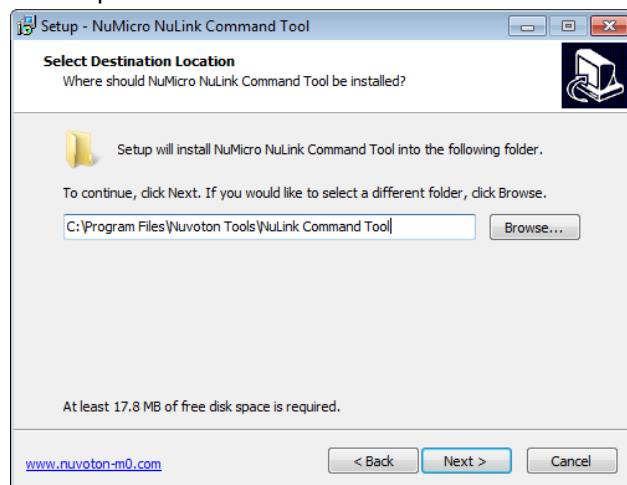


Figure 2.1-3 Install Path Selection Form

4. Specify a shortcut path on "Start Menu".

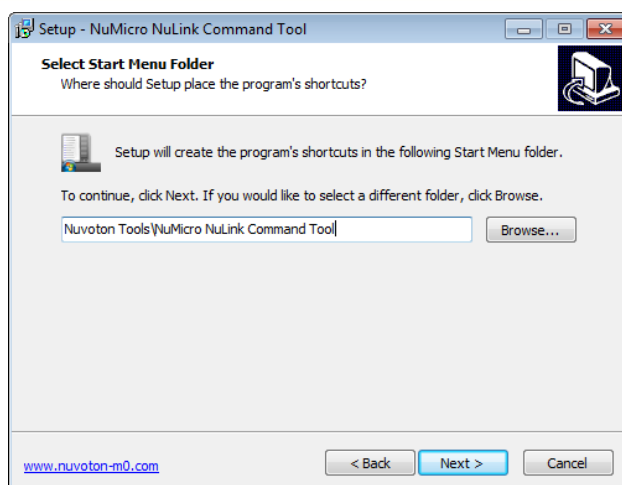


Figure 2.1-4 Shortcut Path Setting Form

5. Confirm the selection.

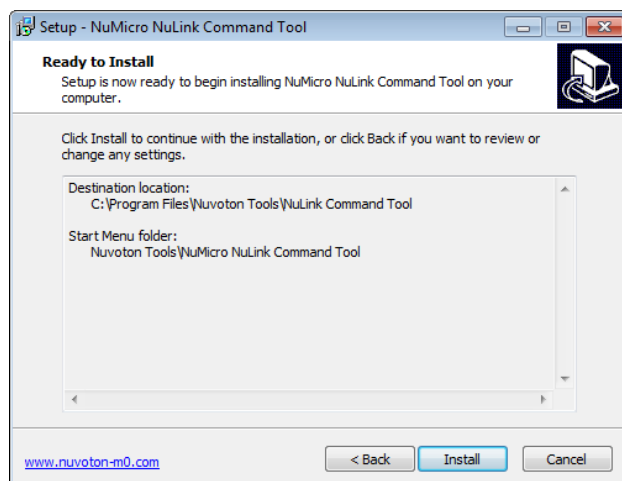


Figure 2.1-5 Installation Information Confirmation Form

6. Finish the Nu-Link Command Tool installation.

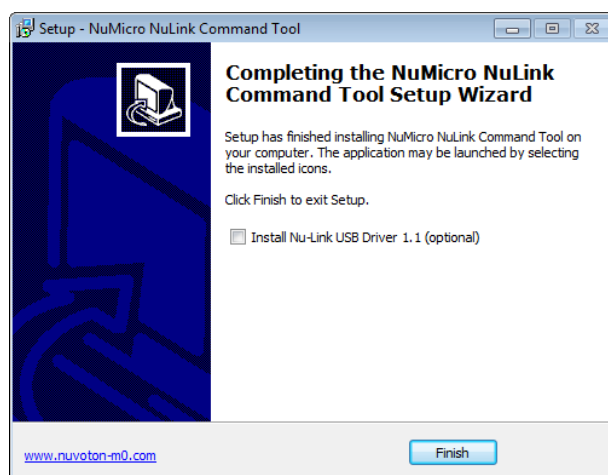


Figure 2.1-6 Setup Completely Form

2.2 Launching the Nu-Link Command Tool

To launch Nu-Link Command Tool, please open the Windows command prompt, and then change the current directory to the install path of Nu-Link Command Tool. Type “NuLink.exe” and press the “Enter” button. The brief description of Nu-Link Command Tool will be displayed in the Windows command prompt.

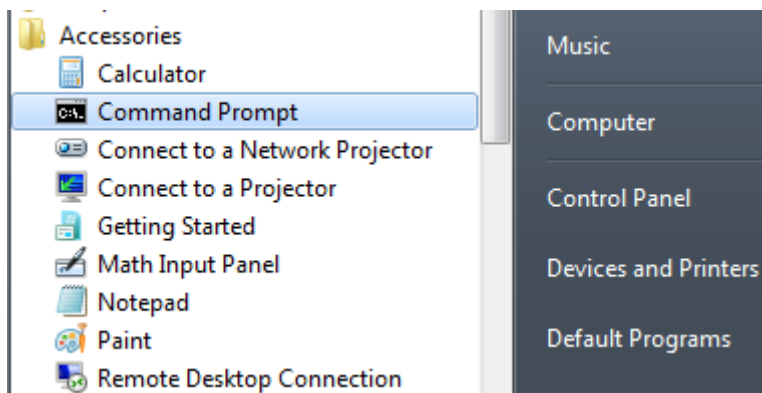


Figure 2.2-1 Open Windows Command Prompt

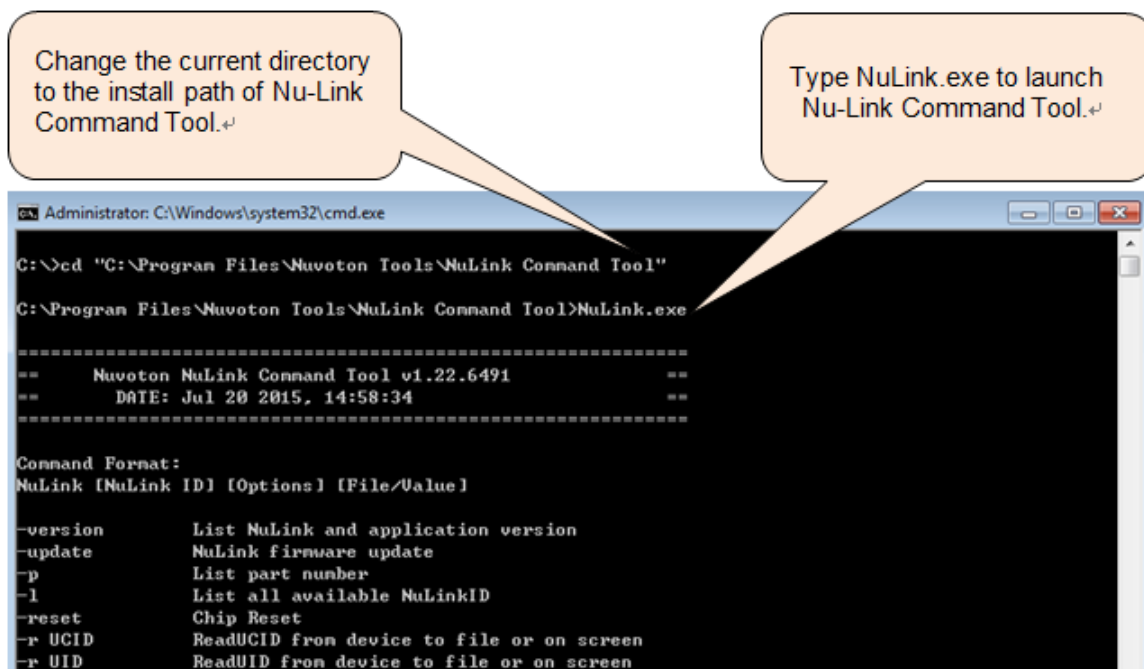


Figure 2.2-2 Launch Nu-Link.exe by Using Windows Command Prompt

2.3 Command Format

User can open a Command Prompt program in Windows and then execute Nu-Link Command Tool as below.

```
>NuLink [Nu-Link ID] [Options] [sections] [File/Value]
```

Note: **NuLink** is the execution name of Nu-Link Command Tool and it is case sensitive.

The usage of each parameter is described in following sections.

2.3.1 Nu-Link ID

Each Nu-Link has one ID. User can select a corresponding ID to control a specified Nu-Link adapter.

By using keyword argument "all_nulink" instead of Nu-Link ID, Nu-Link command tool will do the same command to target chip for each connected Nu-Link and all of connected target chip must be the same part no.

Note: During execution, the process message will be displayed quickly, and only display the last executed command on the screen. User can use "> file.txt" to output the complete information in the file.

2.3.2 Options

Nu-Link command types are listed in the following table.

| Options | Description |
|--------------------|--|
| <u>-d</u> | Dump bin data to device with specific range |
| <u>-l</u> | Display all available Nu-Link IDs |
| <u>-r</u> | Read data from chip |
| <u>-w</u> | Write data to chip with source file/value |
| <u>-v</u> | Verify chip data with source file/value |
| <u>-e</u> | Erase chip or flash ROM |
| <u>-reset</u> | Reset target device |
| <u>-p</u> | Display the part number of target device |
| <u>-version</u> | Display Nu-Link Command Tool and firmware of Nu-Link ICE adapter version |
| <u>-update</u> | Update firmware of Nu-Link ICE adapter |
| <u>-disconnect</u> | Disconnect from target chip and quit ICE mode |
| <u>-cks</u> | Display the file size and checksum |

2.3.2.1 Dump bin data

Command: Dump bin data from device with specific range.

```
>NuLink [Nu-Link ID] -d [start_address] [end_address] [file]
```

[Nu-Link ID] Optional.

[start_address] Required. Start address of dump range.

[end_address] Required. End address of dump range.

[file] Required. A file path name for outputting result.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Dump bin data to device with specific range.

```
>NuLink -d 0x1000 0x2000 C:\Range.bin
```

```
Administrator: C:\Windows\system32\cmd.exe
>>> Start dump data.
100%
>>> Dump data to FILE: C:\Range.bin Finish.

***** Excute operation ending *****
C:\Program Files\Nuvoton Tools\NuLink Command Tool>
```

Figure 2.3-1 Use -d Command to Dump Data from Device to File

2.3.2.2 Display All Available Nu-Link IDs

Command: Display all available Nu-Link ICE IDs.

```
>NuLink -l
```

Example:

```
>NuLink -l
```

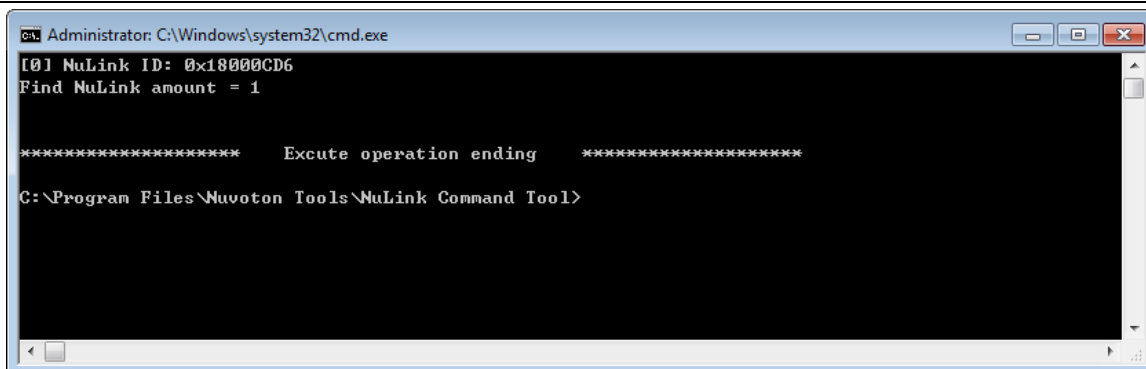


Figure 2.3-2 Use -l Command to Display Nu-Link ID

2.3.2.3 Read Data from Chip

Command: Read data of specific region from target chip.

```
>NuLink [Nu-Link ID] -r [sections] [file]
```

[Nu-Link ID] Optional.

[sections] Required. Argument names are case insensitive as shown below.

Read data from target chip: CFG0, CFG1, CFG2, CFG3, LDROM, APROM, DATAROM, SPROM, SPROM2, SPROM3, KPROM, UID, UCID.

[file] Required. But reading config0 and config1 can be optional.

A file path name for outputting result.

```
>NuLink [Nu-Link ID] -r SPIFLASH [file] address [value1] size [value2] channel [value3]
```

[value1] The start address of reading SPI flash.

[value2] The size of reading SPI flash.

[value3] The SPIM channel. The option is optional.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Display UCID value from chip on screen.

```
>NuLink -r UCID
```

Display config0 value from chip with Nu-Link ID 0x12345678 on screen.

```
>NuLink 0x12345678 -r CFG0
```

Read APROM data of target chip and save data to file.

```
>NuLink -r APROM C:\APROM.bin
```

Read APROM data of target chip with Nu-Link ID 0x12345678 and save data to file.

```
>NuLink 0x12345678 -r APROM C:\APROM.bin
```

Read SPI flash data of target chip with range (0x0~0x1000) and save data to file.

```
>NuLink -r SPIFLASH C:\SPIFLASH.bin address 0x0 size 0x1000
```

Read APROM data of target chip for each connected target chip and save data to file.

```
>NuLink all_nulink -r APROM C:\APROM.bin
```

Display config0 value on screen.

>**NuLink** -r CFG0

```
Administrator: C:\Windows\system32\cmd.exe
>>> Start to read CFG0.
>>> Config 0: 0xFFFFFFFF

***** Excute operation ending *****

C:\Program Files\Nuvoton Tools\NuLink Command Tool>
```

Figure 2.3-3 Use -r Command to Read Config 0 Value

2.3.2.4 Write Data to Chip

Command: Write data of specific region to target chip.

```
>NuLink [Nu-Link ID] -w [sections] [file/value]
```

[Nu-Link ID] Optional.

[sections] Required. Argument names are shown as following and case insensitive.

Write data to target chip: CFG0, CFG1, CFG2, CFG3, LDROM, APROM, DATAROM, SPROM, SPROM2, SPROM3, SBKEY, IB.

[file/value] Required.

A file path name or value for data writing.

```
>NuLink [Nu-Link ID] -w SPIFLASH [file/value] address [value1] channel [value2] key0 [value3] key1 [value4]
```

[value1] The start address of programming SPI flash.

[value2] The SPIM channel. The option is optional.

[value3] The option is optional.

The secure key0 of SPI flash encrypt file data. Value is 0 : file data does not to encrypt.

[value4] The option is optional.

The secure key1 of SPI flash encrypt file data. Value is 0 : file data does not to encrypt.

```
>NuLink [Nu-Link ID] -w SN number [value1] address [value2]
```

[value1] The programming value of serial number.

[value2] The programming address of serial number.

```
>NuLink [Nu-Link ID] -w KPROM [value1] [value2] [value3] [value4] [value5] [value6]
```

[value1] The programming key0 value of KPROM.

[value2] The programming key1 value of KPROM.

[value3] The programming key2 value of KPROM..

[value4] The power-on maximum number of error key retry counts.

[value5] The maximum number of error key retry counts for each power-on.

[value6] The data write protection.

Value: 0 = APROM and KPROM protection.

Value: 1 = APROM, KPROM and configuration protection.

Value: 2 = APROM, KPROM and SPROM protection.

Value: 3 = APROM, KPROM, SPROM and configuration protection.

Value: others = APROM and KPROM protection.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Program 0xFFFFFFFF value to config0 through Nu-Link ID 0x12345678.

Remark: The config value is 32bit data length. To program config value of 8bit data length for 8051 series, users need to combine four config value into one.

In 8051 series: Config0 = 0xDB, Config1 = 0xFB, Config2 = 0x67, Config3 = 0xFF, Config4 = 0x5F.

In command config value: CFG0 = 0xFF67FBDB, CFG1 = 0xFFFFFFFF5F.

```
>NuLink 0x12345678 -w CFG0 0xFFFFFFFF
```

Program APROM data of target chip from file.

```
>NuLink -w APROM C:\APROM.bin
```

Program APROM data of target chip with Nu-Link ID 0x12345678 from file.

```
>NuLink 0x12345678 -w APROM C:\APROM.bin
```

Program APROM data of target chip for each connected target chip from file.

```
>NuLink all_nulink -w APROM C:\APROM.bin
```

Program SPI flash data of target chip with base address 0x0 from file.

Remark: Secure key0 of SPI flash is 0x123 and Secure key1 of SPI flash is 0x456. Use non-zero value of secure key to encrypt file data and program encrypted data to SPI flash. Use zero value of secure key to program file data to SPI flash without encrypted.

```
>NuLink -w SPIFLASH C:\SPIFLASH.bin address 0x0 key0 0x123 key1 0x456
```

Program serial number 0x18000000 to address 0x100010.

```
>NuLink -w SN number 0x18000000 address 0x100010
```

Program 0xFFFFFFFF value to config0.

```
>NuLink -w CFG0 0xFFFFFFFF
```

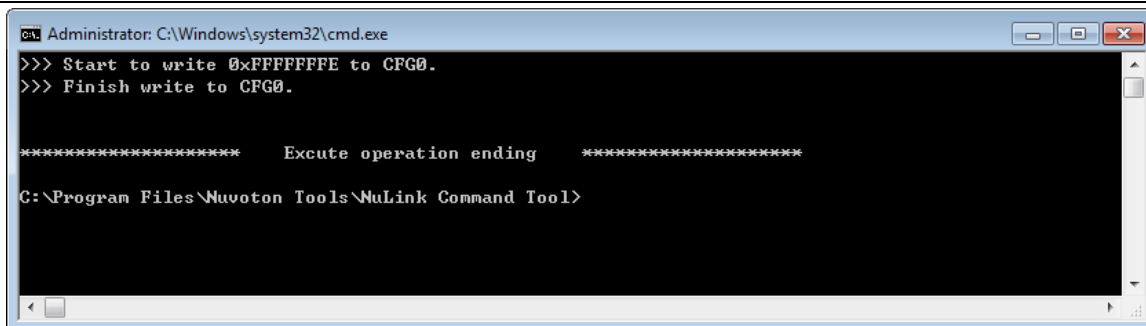


Figure 2.3-4 Use -w Command to Write Config 0 Value

2.3.2.5 Verify Chip Data with Source File/Value

Command: Verify data of specific region from target chip with source file or value.

```
>NuLink [Nu-Link ID] -v [sections] [file/value]
```

[Nu-Link ID] Optional.

[sections] Required. Argument names are shown as following and case insensitive.

Verify data from target chip : CFG0, CFG1, CFG2, CFG3, LDROM, APROM, DATAROM, SPROM, SPROM2, SPROM3.

[file/value] Required.

A file path name or value for data verifying.

```
>NuLink [Nu-Link ID] -v SPIFLASH [file/value] address [value1] channel [value2]
```

[value1] The start address of verifying SPI flash.

[value2] The SPIM channel. The option is optional.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Verify Config0 with data 0xFFFFFFFF through Nu-Link ID 0x12345678.

```
>NuLink 0x12345678 -v CFG0 0xFFFFFFFF
```

Verify LDROM data of target chip from file.

```
>NuLink -v LDROM C:\LDROM.bin
```

Verify LDROM data of target chip with Nu-Link ID 0x12345678 from file.

```
>NuLink 0x12345678 -v LDROM C:\LDROM.bin
```

Verify LDROM data of target chip for each connected target chip from file.

```
>NuLink all_nulink -v LDROM C:\LDROM.bin
```

Verify SPI flash data of target chip from file.

```
>NuLink -v LDROM C:\LDROM.bin
```

Verify SPI flash data of target chip with base address 0x0 from file.

```
>NuLink -v SPIFLASH C:\SPIFLASH.bin address 0x0
```

Verify config0 with 0xFFFFFFFF value.

>**NuLink** -v CFG0 0xFFFFFFFF

```

Administrator: C:\Windows\system32\cmd.exe
>>> Start to read CFG0.
>>> Verify REG_CFG0 0xFFFFFFFF success. <<<

*****      Excute operation ending      *****

C:\Program Files\Nuvoton Tools\NuLink Command Tool>
    
```

Figure 2.3-5 Use -v Command to Verify Config 0 Value

2.3.2.6 Erase Chip/Flash ROM

Command: Erase data of specific region from target chip.

```
>NuLink [Nu-Link ID] -e [sections]
```

[Nu-Link ID] Optional.

[sections] Required. Argument names are shown as following and case insensitive.

Erase data from target chip : all, LDROM, APROM, DATAROM, SPROM, SPROM2, SPROM3, KPROM.

```
>NuLink [Nu-Link ID] -e SPIFLASH address [value1] size [value2] channel [value3]
```

[value1] The start address of erasing SPI flash.

[value2] The size of erasing SPI flash.

[value3] The SPIM channel. The option is optional.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Erase LDROM data of target chip.

```
>NuLink -e LDROM
```

Erase APROM data of target chip.

```
>NuLink -e APROM
```

Erase DATAROM data of target chip.

```
>NuLink -e DATAROM
```

Erase LDROM data of target chip with Nu-Link ID 0x12345678.

```
>NuLink 0x12345678 -e LDROM
```

Erase APROM data of target chip with Nu-Link ID 0x12345678.

```
>NuLink 0x12345678 -e APROM
```

Erase APROM data of target chip for each connected target chip.

```
>NuLink all_nulink -e APROM
```

Erase DATAROM data of target chip with Nu-Link ID 0x12345678.

```
>NuLink 0x12345678 -e DATAROM
```

Erase SPI flash data of target chip with range (0x0~0x1000).

```
>NuLink -e SPIFLASH address 0x0 size 0x1000
```

Erase whole chip data for each connected target chip.

```
>NuLink all_nulink -e all
```

Add part no. argument to erase whole chip data to unlock target chip.

```
>NuLink -e all M483KGCAE
```

Erase whole chip data including config0, config1, config2, config3, LDROM, APROM, DATAROM, KPROM.

```
>NuLink -e all
```

```
Administrator: C:\Windows\system32\cmd.exe
>>> Start erase all ROM & CFG0, CFG1.
>>> Erase chip all ROM & CFG0, CFG1 finish.

***** Excute operation ending *****

C:\Program Files\Nuvoton Tools\NuLink Command Tool>
```

Figure 2.3-6 Use -e Command to Erase Chip

2.3.2.7 Reset Target Chip

Command: Reset target chip.

```
>NuLink [Nu-Link ID] -reset
```

[Nu-Link ID] Optional.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Reset target chip with Nu-Link ID 0x12345678.

```
>NuLink 0x12345678 -reset
```

Reset for each connected target chip.

```
>NuLink all_nulink -reset
```

Reset target chip.

```
>NuLink -reset
```

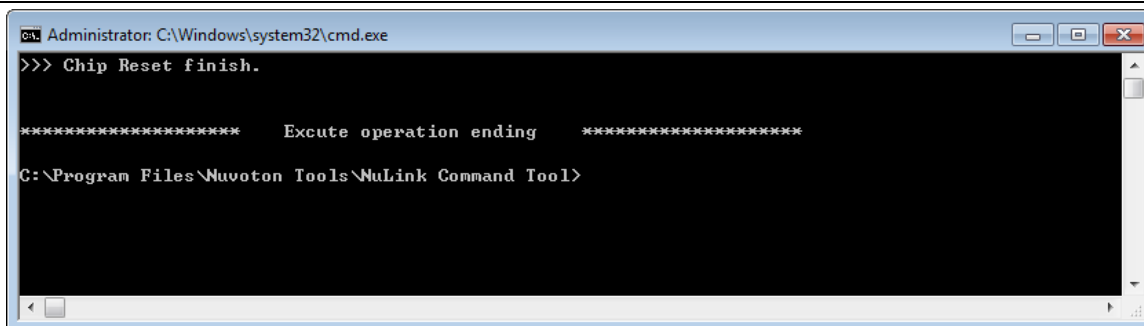


Figure 2.3-7 Use -reset Command to Reset Target Chip

2.3.2.8 Display the Part Number of Target Chip

Command: Display the part number of target chip.

```
>NuLink -p
```

Remark:

This command only supports one Nu-Link ICE adapter plugged into one PC.

Example:

Display the part number of target chip.

```
>NuLink -p
```

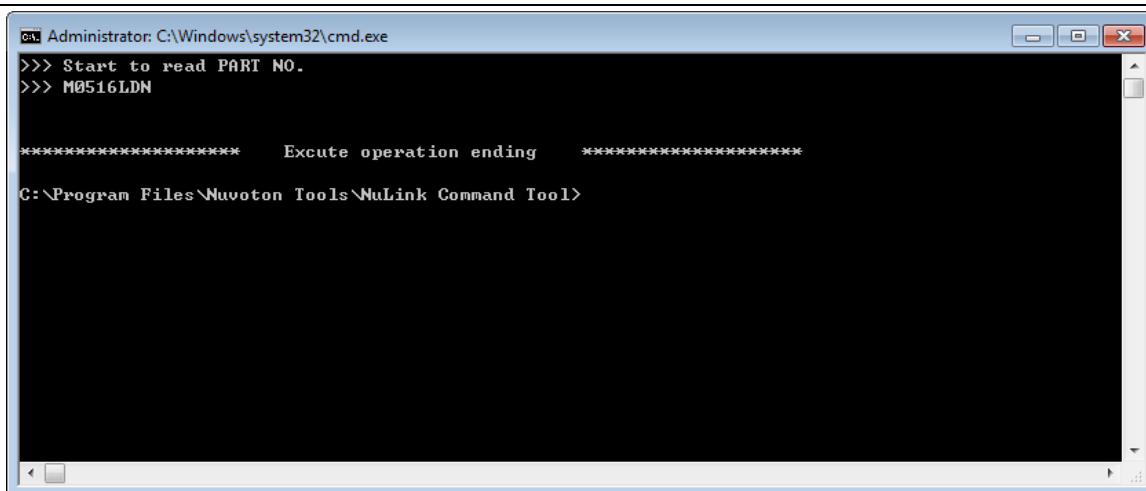


Figure 2.3-8 Use -p Command to Display the Part Number of Target Chip

2.3.2.9 Display Nu-Link Command Tool and Firmware Version of Nu-Link ICE Adapter

Command: Display Nu-Link Command Tool and firmware of Nu-Link ICE version.

```
>NuLink -version
```

Remark:

This command only supports one Nu-Link ICE adapter plugged into one PC.

The Nu-Link firmware version is the firmware version of Nu-Link ICE adapter plugged into current PC.

The current application version is the version of Nu-Link Command Tool.

Example:

Display Nu-Link Command Tool and Firmware of Nu-Link ICE Adapter Version.

```
>NuLink -version
```

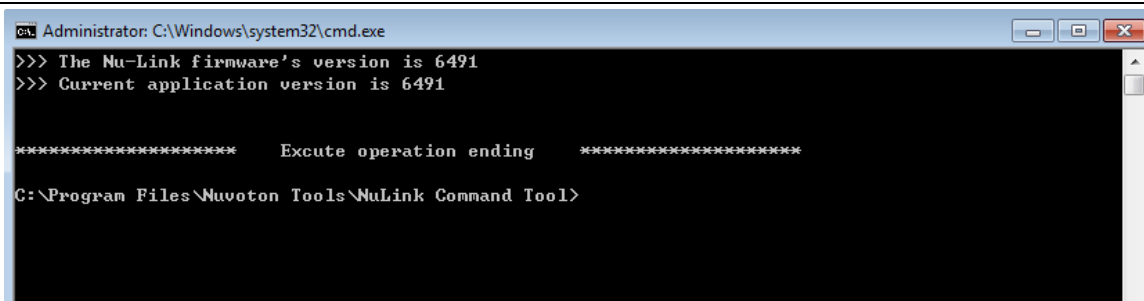


Figure 2.3-9 Use -version Command to Display Application and Nu-Link Firmware Version

2.3.2.10 Update Firmware of Nu-Link ICE Adapter

Command: Update firmware of Nu-Link ICE adapter.

```
>NuLink -update
```

Remark:

This command only supports one Nu-Link ICE adapter plug into one PC.

If the Nu-Link firmware version and the current application version are different, the firmware version will be updated to current application version by executing the command.

Example:

Update firmware of Nu-Link ICE adapter.

```
>NuLink -update
```

```
Administrator: C:\Windows\system32\cmd.exe
Verify firmware binary file status: 100 %
Wait bootloader ...
Update firmware status: 10 %
Update firmware status: 20 %
Wait reboot from bootloader ...
Update firmware's configuration ...
Erase old firmware, please wait for a while...
Update firmware status: 80 %
Update firmware status: 100%
Update firmware ok
The Nulink firmware is the latest version

*****      Excute operation ending      *****

C:\Program Files\Nuvoton Tools\NuLink Command Tool>
```

Figure 2.3-10 Use -update Command to Update Nu-Link Firmware

2.3.2.11 Disconnect from Target Chip

Command: Disconnect from target chip and quit ice mode.

```
>NuLink [Nu-Link ID] -disconnect
```

[Nu-Link ID] Optional.

Remark:

If more than one Nu-Link ICE adapters plug into one PC and no Nu-Link ID is specified, the command might not work.

Must to use the command after programming flash.

Example:

Disconnect from target chip with Nu-Link ID 0x12345678.

```
>NuLink 0x12345678 -disconnect
```

Disconnect for each connected target chip.

```
>NuLink all_nulink -disconnect
```

Disconnect from target chip.

```
>NuLink -disconnect
```

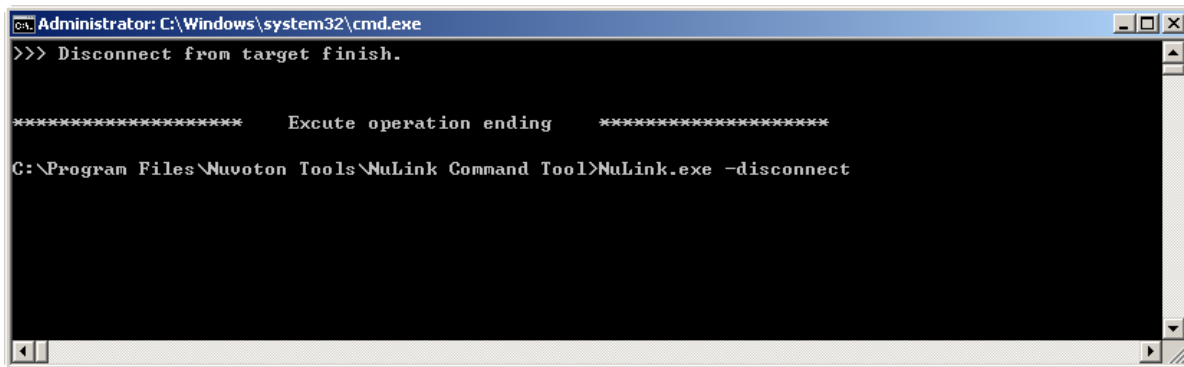


Figure 2.3-11 Use -disconnect Command to Disconnect from Target Chip

2.3.2.12 Display the File Size and Checksum

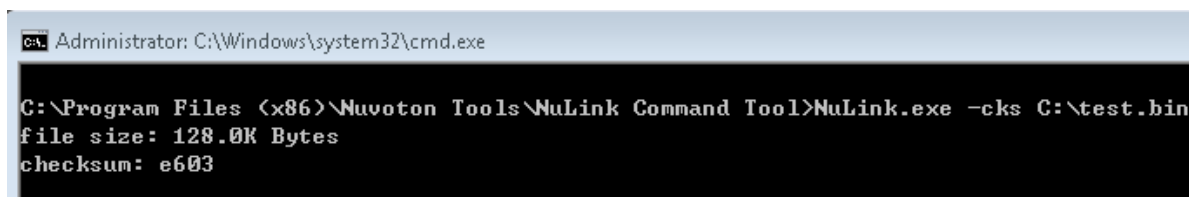
Command: Display the file size and checksum.

```
>NuLink -cks [file]
```

Example:

Display the file size and checksum.

```
>NuLink -cks C:\test.bin
```



```
C:\Program Files (x86)\Nuvoton Tools\NuLink Command Tool>NuLink.exe -cks C:\test.bin
file size: 128.0K Bytes
checksum: e603
```

Figure 2.3-12 Use -cks Command to Display the File Size and Checksum

2.3.3 Example for Programming APROM

The following step is an example about writing “APROM.bin” file data to APROM of target chip and verifying and reading data after writing APROM data. Finally, the target chip will be reset.

| |
|---|
| >NuLink -e APROM |
| >NuLink -w APROM C:\APROM.bin |
| >NuLink -v APROM C:\APROM.bin |
| >NuLink -r APROM C:\R_APROM.bin |
| >Nulink -reset |

Note: User needs to erase flash before programming data.

The following step is writing “APROM.bin” file data to APROM of target chip and verifying and reading data for all connected target chip. Finally, all of the target chip will be reset.

| |
|--|
| >NuLink all_nulink -e APROM |
| >NuLink all_nulink -w APROM C:\APROM.bin |
| >NuLink all_nulink -v APROM C:\APROM.bin |
| >NuLink all_nulink -r APROM C:\R_APROM.bin |
| >Nulink all_nulink -reset |

2.3.4 Parallel Execution Command with Multiple Nu-Link

Please note that the following item must be ready in advance.

1. Connect all of Nu-Link and target chip to your PC.
2. Confirm that each Nu-Link ID is different and each target chip is the same.
3. Uninstall Nuvoton USB driver if you have installed.

The following shows the steps of parallel execution command.

1. Nulink -parallel [part no.] (eg: NuLink -parallel M483KGCAE).
2. Add your command in each batch file and add -parallel argument to each command.
3. Run each batch file to execute command parallel.

Give a practical batch file example for step 2 :

NuLink 0x18000000 -e APROM -parallel

NuLink 0x18000000 -w APROM test.bin -parallel

NuLink 0x18000000 -v APROM test.bin -parallel

NuLink 0x18000000 -reset -parallel

3 CUSTOMIZED FLASH PROGRAMMING TOOL

This chapter introduces an example Windows application program which is based on the Nu-Link Command Tool. This program invokes the Nu-Link Command Tool to access Flash memory embedded in a NuMicro® MCU. It supports to update multiple NuMicro® MCUs concurrently and supports to dynamic scan all connected NuMicro® MCUs.

The example source code is stored in the installation folder. Users can refer to the source code to create their customized Flash programming tool.

3.1 Environment

The Vendor UI Tool is based on the Nu-Link Command Tool. Therefore, user needs to install the Nu-Link Command Tool before executing Vendor UI.

The default path of execution file of the Nu-Link Command Tool is “C:\Program Files\Nuvoton Tools\NuLink Command Tool”.

A prebuilt execution version is located at “C:\Program Files\Nuvoton Tools\NuLink Command Tool\NuLinkVendorUI.exe”.

3.2 Nu-Link Vendor UI Usage

The following shows the steps of executing NuLinkVendorUI.

Step1:

Connect Nu-Link ICE adapters to PC.

Step2:

Execute NuLinkVendorUI.exe.

Figure 3.2-1 Nu-Link Vendor UI Form

Step3:

Click the “LDROM”, “APROM” or “Data” button to select a bin file from disk.

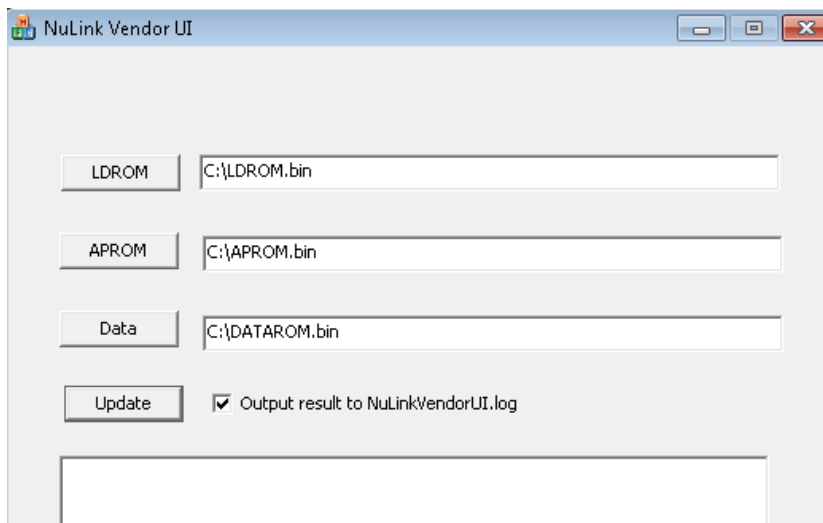


Figure 3.2-2 Select Bin File

The command of cmd.exe has length limit. For Microsoft Windows XP or later, the maximum length of the string that you can use at the command prompt is 8191 characters. For Microsoft Windows 2000 or Windows NT 4.0, the maximum length of the string that you can use at the command prompt is 2047 characters.

For example, if the command length is over the limit, the cmd.exe will display “Command format Error!!!” message.

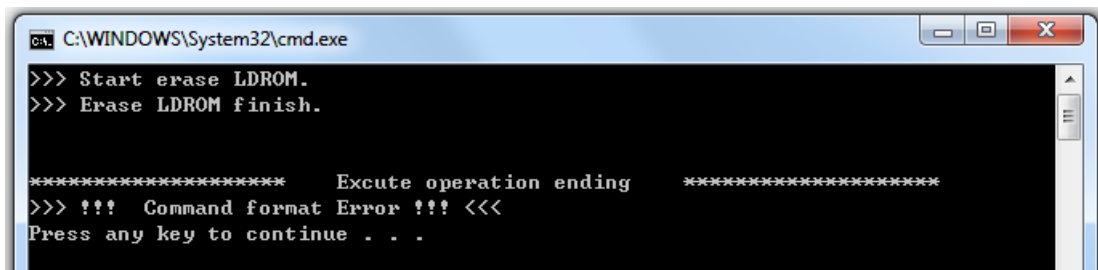


Figure 3.2-3 Display Error Message Due to Command Length is Too Long

Step 4:

Click the “Update” button and start to update program through all connected Nu-Link devices.

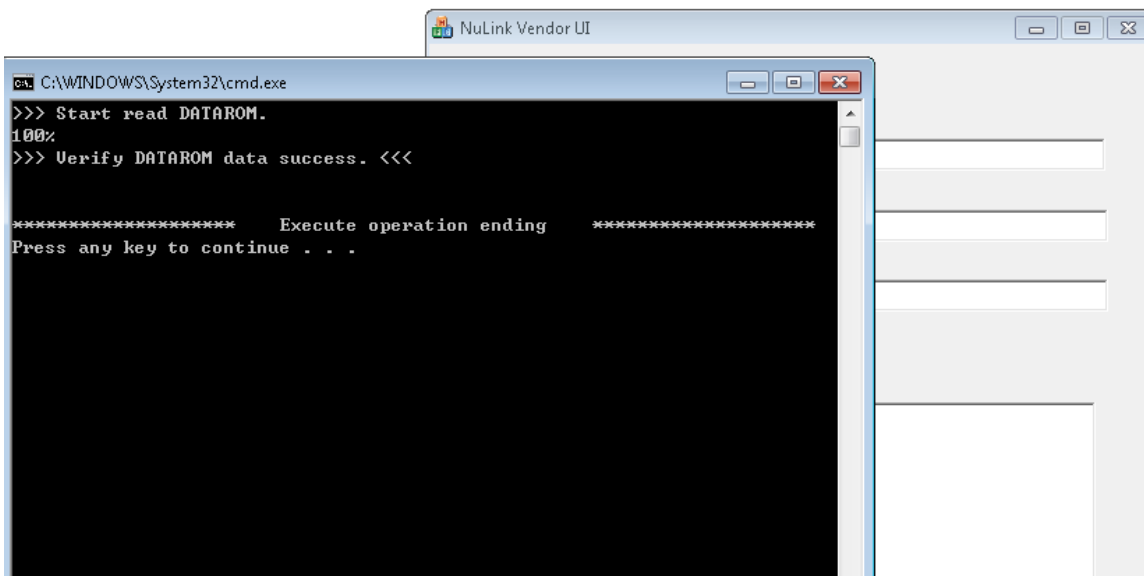


Figure 3.2-4 Program Data to Target Chip with Nu-Link Vendor UI

All connected Nu-Link device ID will be listed in the list section below the “Update” button.

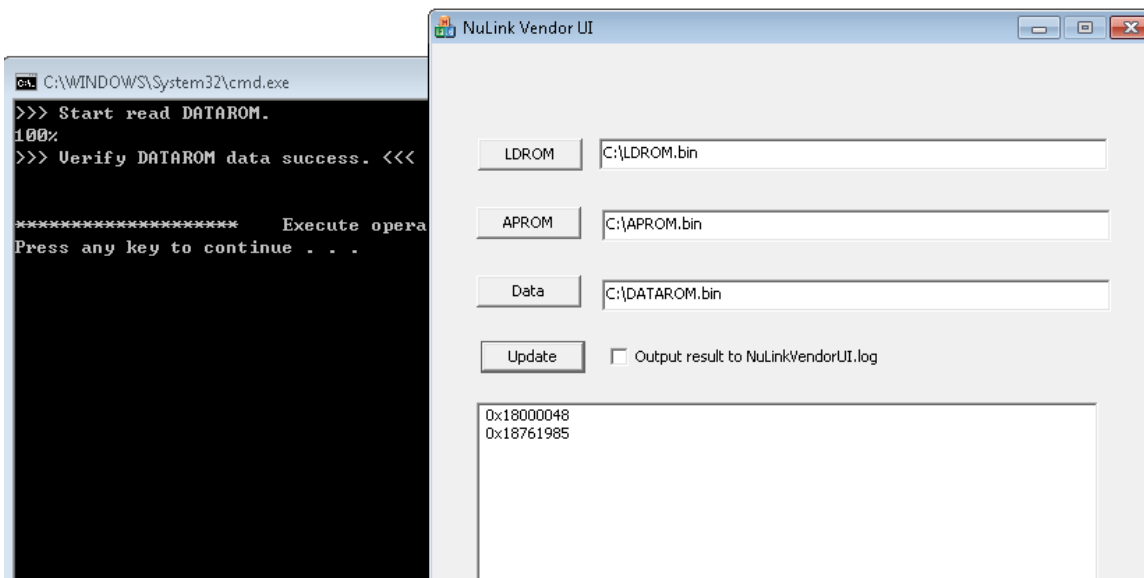


Figure 3.2-5 List All Connected Nu-Link Device IDs

The update flow for each bin file is erase -> program -> verify.

So, the update flow of above example: erase LDROM -> program LDROM -> verify LDROM -> erase APROM -> program APROM -> verify APROM -> erase DATAROM -> program DATAROM -> verify DATAROM.

Remark:

To record the result message of update flow, it just enable the output result checkbox.

4 SPECIFIC SERIES

4.1 Support for Specific Series

There are some different command format to use Nu-Link command tool for Specific series, please follow instructions to get the usage below.

1. Open a Command Prompt program in Windows and find installation path of Nu-Link command tool.
2. Find the specific file name to execute tool, and show the command format and example.

| Execution File Name | Chip Series |
|-----------------------|------------------------------|
| NuLink_M2354.exe | M2354 series |
| NuLink_M2351_M261.exe | M2351 series and M261 series |
| NuLink_8051OT.exe | 8051 1T series |
| NuLink_KM1M7.exe | KM1M7 series |
| NuLink_M460.exe | M460 series |

5 REVISION HISTORY

| Date | Revision | Description |
|------------|----------|---|
| 2015.07.21 | 1.30 | Preliminary version. |
| 2016.03.16 | 1.31 | Added dump bin data command. |
| 2016.07.22 | 2.00 | Added –disconnect command to disconnect from target. |
| 2017.01.13 | 2.01 | Added SPROM, KPROM erasing, programming and verifying. |
| 2017.06.23 | 2.02 | Added SPI flash erasing, programming and verifying. |
| 2018.06.22 | 2.04 | Supported M2351 Series. |
| 2018.07.25 | 2.05 | Updated SPI flash command format content. |
| 2020.04.30 | 3.02 | Added –SN command to write serial number to target. |
| 2020.06.29 | 3.03 | 1. Added all_nulink argument to execute same command to each connected target. 2. Updated Nu-Link Vendor UI content. |
| 2020.09.14 | 3.04 | Supported M2354 Series. |
| 2021.06.04 | 3.07 | Added parallel argument to execute same command to each connected target. |
| 2021.12.06 | 3.08 | Supported M460 Series. |

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