ARM® Cortex®-M

32-bit Microcontroller

NuMicro® Family
Nu-Link Command Tool
User Manual

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

www.nuvoton.com

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 dongle. Besides, it also provide functions to update Nu-Link dongle 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.
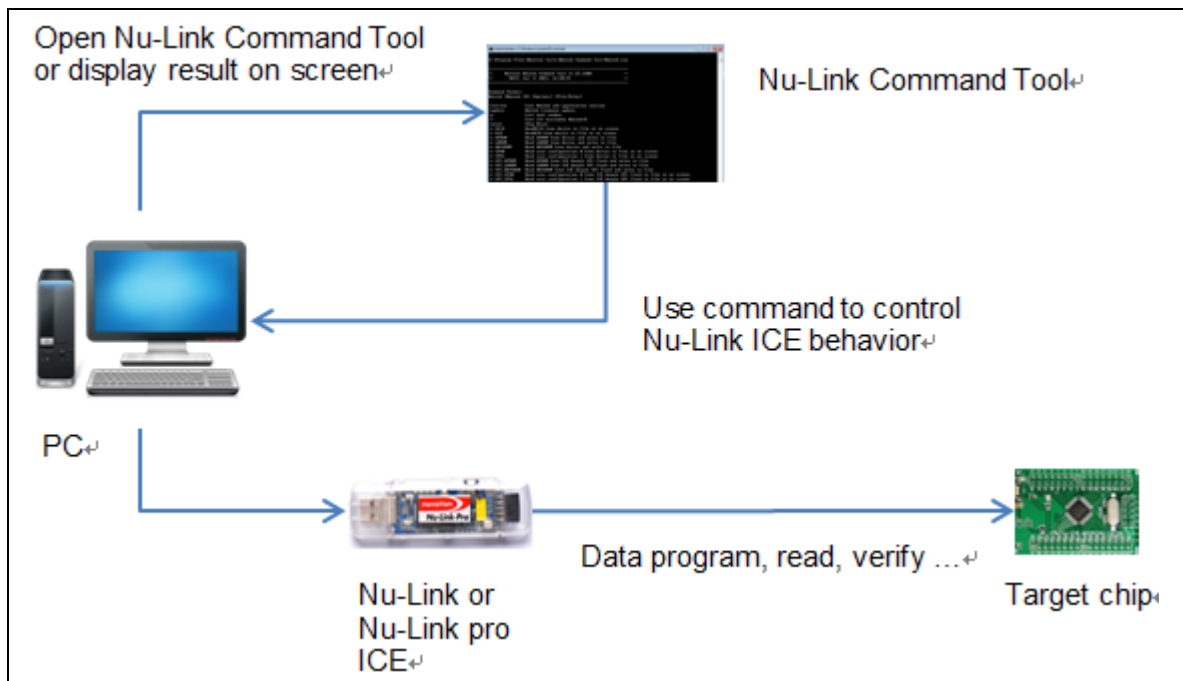
Figure 1.1-1 Nu-Link Command Tool System Block Diagram

1.1   Supported Chips

To see the table of supported devices, click on the following hyperlink: Link of supported devices.

Users can download the datasheet of NuMicro chips from *http://www.nuvoton.com*

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.
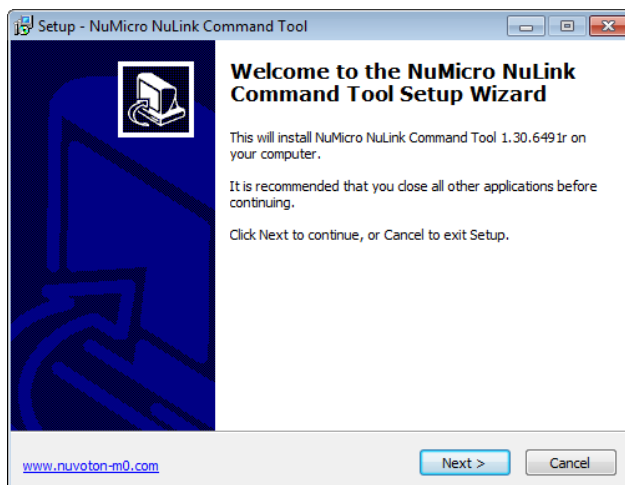
Figure 2.1-2 Setup Wizard Form

3. Browse the installation path.
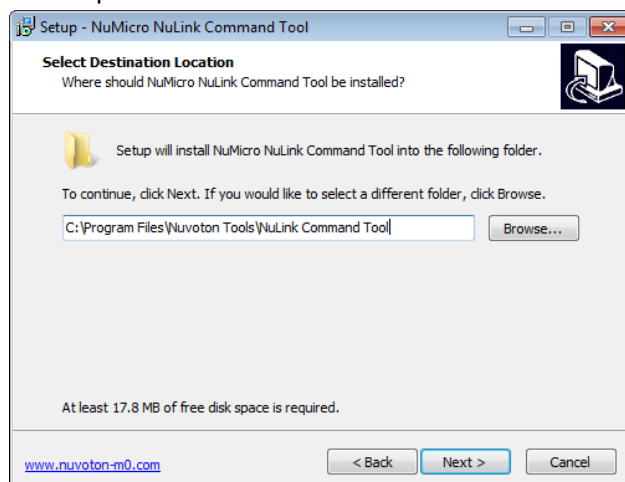
Figure 2.1-3 Install Path Selection Form

<div style="writing-mode: vertical-rl;">NU-LINK COMMAND TOOL USER MANUAL</div>

4. Specify a shortcut path on "Start Menu".
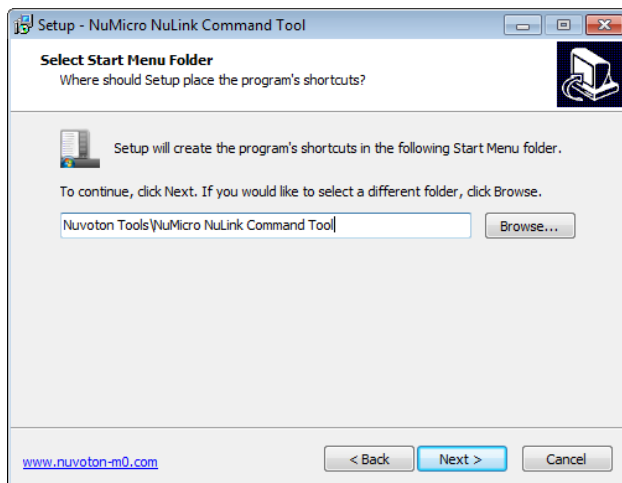
Figure 2.1-4 Shortcut Path Setting Form

5. Confirm the selection.
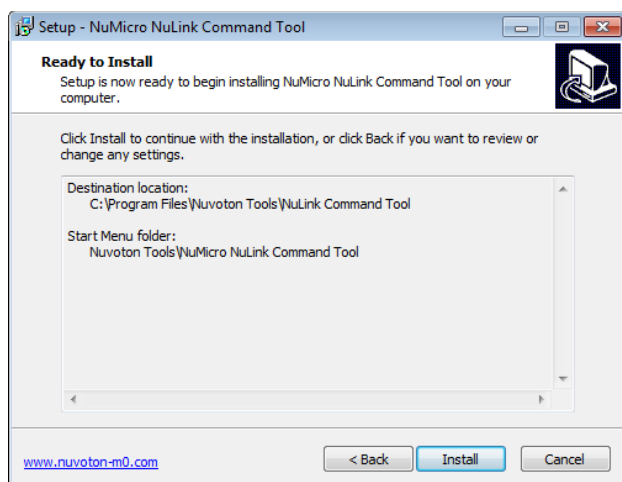
Figure 2.1-5 Installation Information Confirmation Form

6. Finish the Nu-Link Command Tool installation.
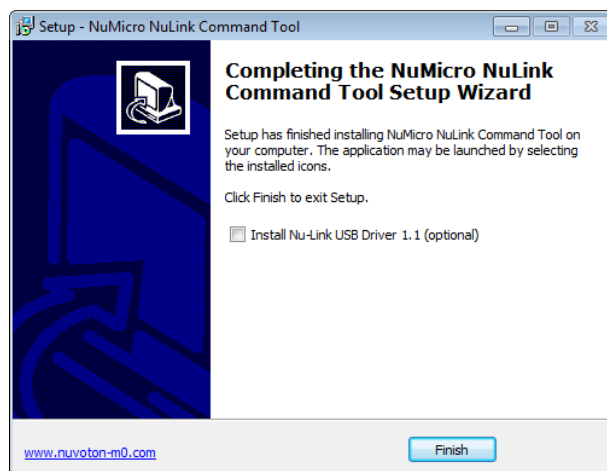
Figure 2.1-6 Setup Completely Form

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.
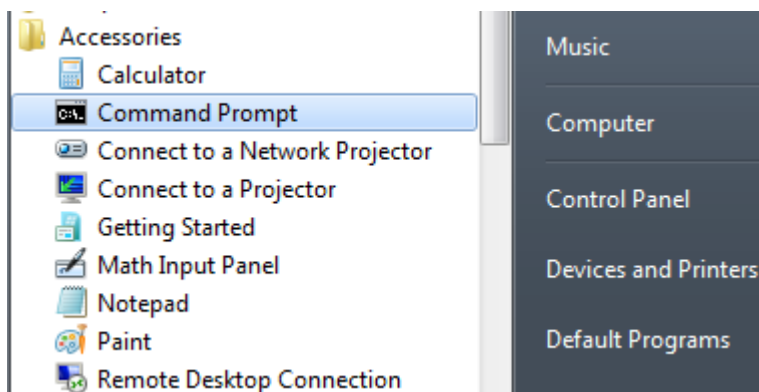
Figure 2.2-1 Open Windows Command Prompt
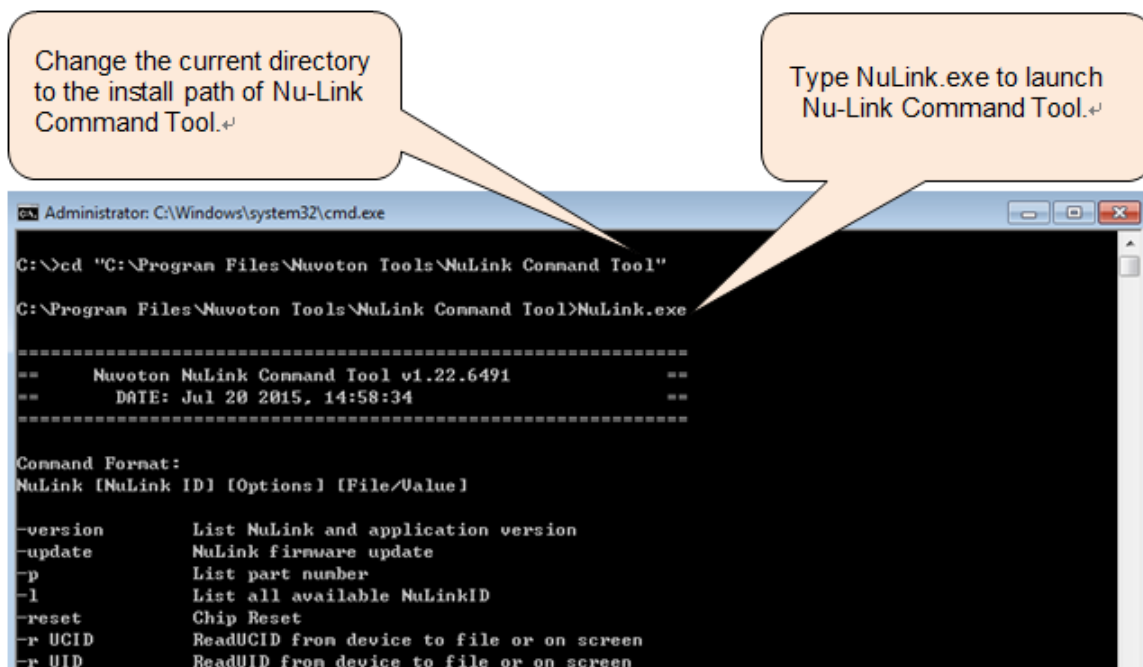
Figure 2.2-2 Launch Nu-Link.exe by Using Windows Command Prompt

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 dongle.

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
-disconnect	Disconnect from target chip and quit ICE mode
-e	Erase chip or flash ROM
-l	Display all available Nu-Link IDs
-p	Display the part number of target device
-r	Read data from chip
-reset	Reset taget device
-update	Update firmware of Nu-Link ICE dongle
-v	Verify chip data with source file/value
-version	Display Nu-Link Command Tool and firmware of Nu-Link ICE dongle version
-w	Write data to chip with source file/value

2.3.2.1   Display All Available Nu-Link IDs

Command: Display all availiable Nu-Link ICE IDs.

> >*NuLink* –l

Example:
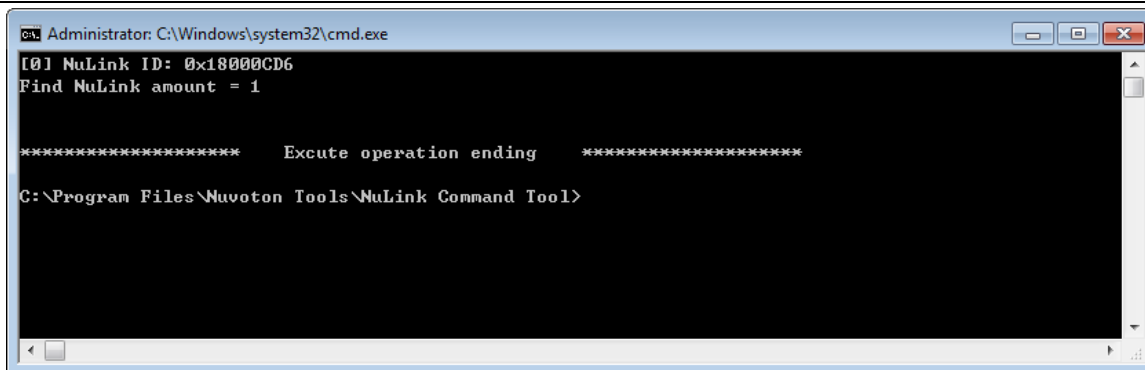
> >*NuLink* –l

Figure 2.3-1 Use -l Command to Display Nu-Link ID

2.3.2.2   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 dongles 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.
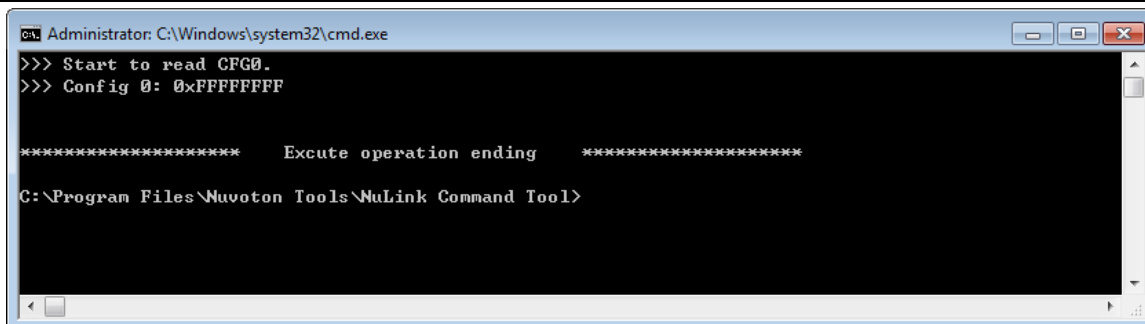
>**NuLink** –r CFG0

Figure 2.3-2 Use -r Command to Read Config 0 Value

2.3.2.3 Write Data to Chip

Command: Write data of specific region to target chip.

> >***NuLink*** [Nu-Link ID] -w [sections] [file/value] [offset] [offset 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.

[offset] Optional. The offset keyword.

[offset value] Optional. The offset value of write data to target chip.

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 porgramming key0 value of KPROM.

[value2] The porgramming key1 value of KPROM.

[value3] The porgramming 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 dongles plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

Program 0xFFFFFFFE 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 = 0xFFFFFF5F.

> *NuLink* 0x12345678 –w CFG0 0xFFFFFFFE

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 APROM data of target chip from file with offset 0x1000.

> *NuLink* –w APROM C:\APROM.bin offset 0x1000

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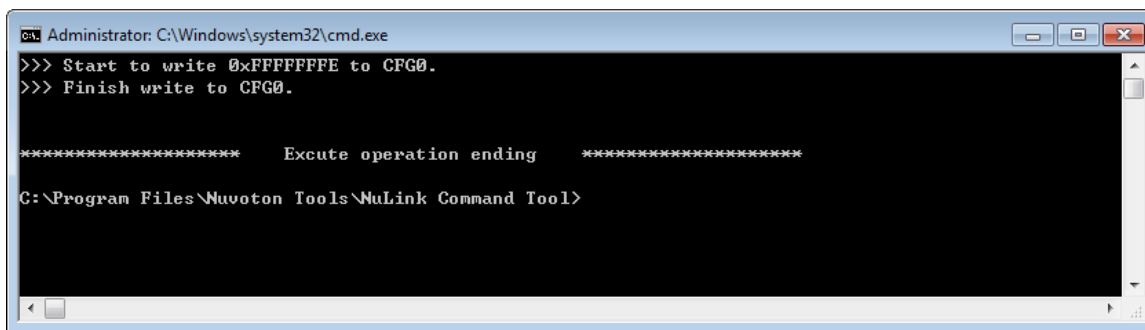
> *NuLink* –w SPIFLASH C:\SPIFLASH.bin address 0x0 key0 0x123 key1 0x456

Program serial number 0x18000000 to address 0x100010.

> *NuLink* –w SN number 0x18000000 address 0x100010

Program 0xFFFFFFFE value to config0.

> *NuLink* –w CFG0 0xFFFFFFFE

Figure 2.3-3 Use -w Command to Write Config 0 Value

2.3.2.4   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] [offset] [offset 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.

[offset] Optional. The offset keyword.

[offset value] Optional. The offset value of verify data from target chip.

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 dongles plug into one PC and no Nu-Link ID is specified, the command might not work.

Example:

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

> >**NuLink** 0x12345678 –v CFG0 0xFFFFFFFE

Verify LDROM data of target chip from file.

> >**NuLink** –v LDROM C:\LDROM.bin

Verify APROM data of target chip from file with offset 0x1000.

> >**NuLink** –v APROM C:\APROM.bin offset 0x1000

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
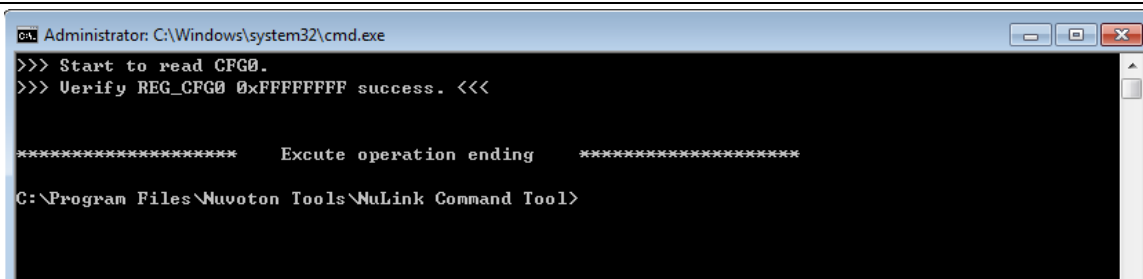
Verify SPI flash data of target chip from file.

> >**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 0xFFFFFFFE value.

> >*NuLink* –v CFG0 0xFFFFFFFE

Figure 2.3-4 Use -v Command to Verify Config 0 Value

2.3.2.5   Erase Chip/Flash ROM

Command: Erase data of specific region from target chip.

> >**NuLink** [Nu-Link ID] –e [sections] [offset] [offset value]

[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.

[offset] Optional. The offset keyword.

[offset value] Optional. The offset value of erase data from target chip.

> >**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 dongles 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 APROM data of target chip with offset 0x1000.

> >**NuLink** –e APROM offset 0x1000

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
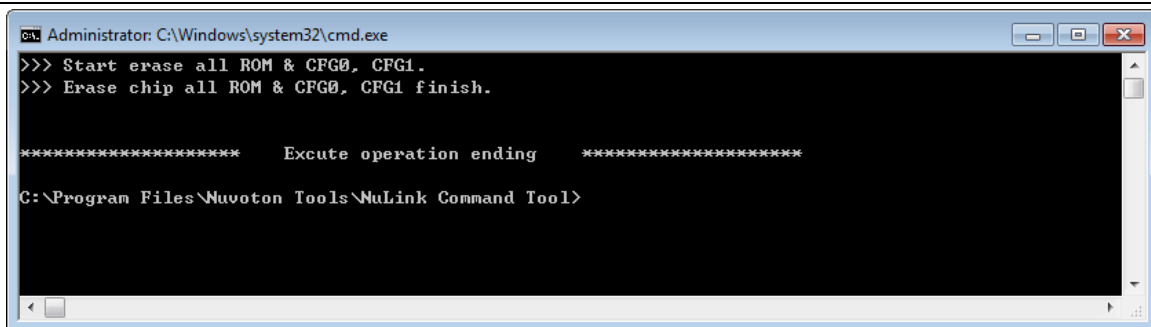
Figure 2.3-5 Use -e Command to Erase Chip

2.3.2.6   Reset Target Chip

Command: Reset target chip.

> >*NuLink* [Nu-Link ID] –reset

[Nu-Link ID] Optional.

Remark:

If more than one Nu-Link ICE dongles 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 2.3-6 Use -reset Command to Reset Target Chip

2.3.2.7   Display the Part Number of Target Chip

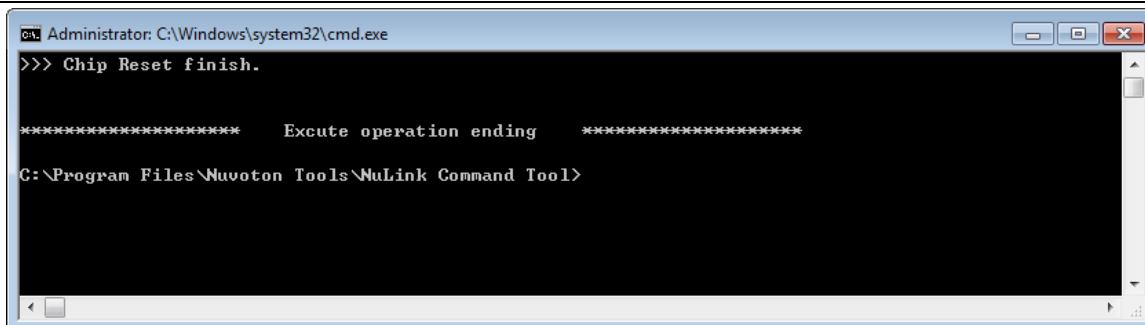**Command:** Display the part number of target chip.

> >*NuLink* –p

Remark:

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

Example:

Display the part number of target chip.
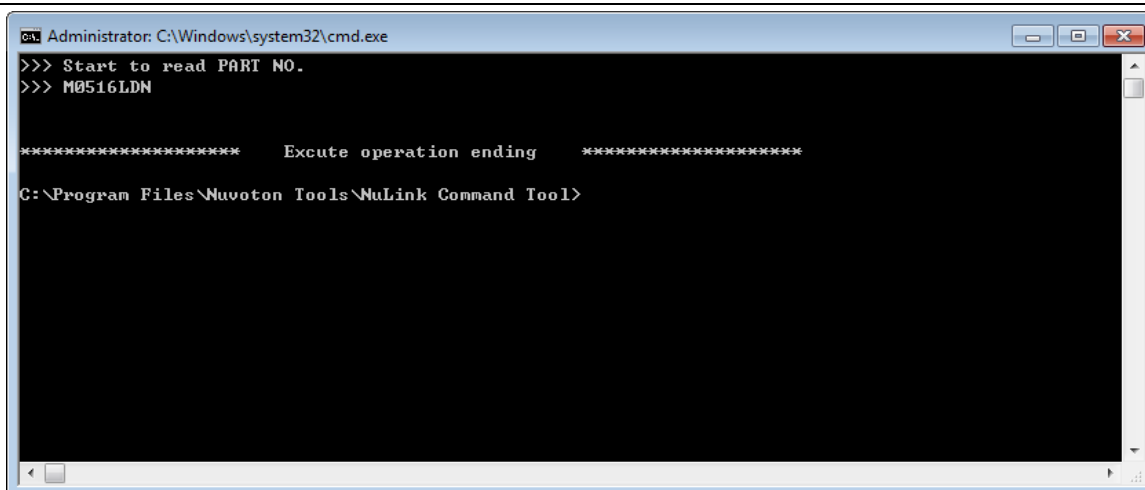
> >*NuLink* –p

Figure 2.3-7 Use -p Command to Display the Part Number of Target Chip

2.3.2.8   Display Nu-Link Command Tool and Firmware Version of Nu-Link ICE Dongle

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

> >*NuLink* –version

Remark:

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

The Nu-Link firmware version is the firmware version of Nu-Link ICE dongle 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 Dongle Version.

> >*NuLink* –version
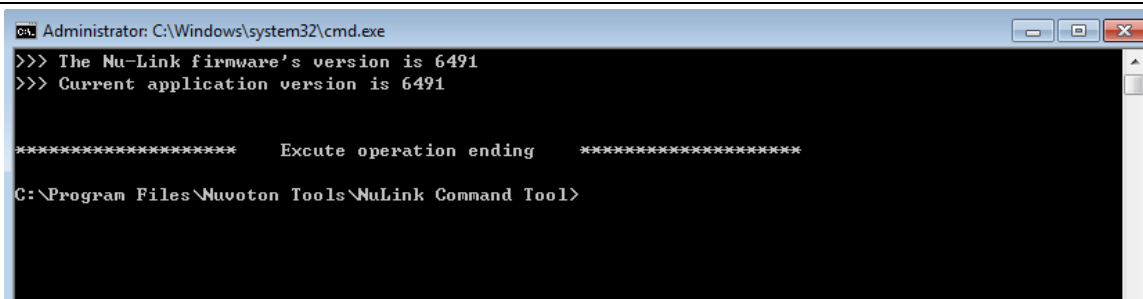
Figure 2.3-8 Use -version Command to Display Application and Nu-Link Firmware Version

2.3.2.9   *Update Firmware of Nu-Link ICE Dongle*

Command: Update firmware of Nu-Link ICE dongle.

> >**NuLink** –update

Remark:

This command only supports one Nu-Link ICE dongle 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 dongle.

> >**NuLink** –update

Figure 2.3-9 Use -update Command to Update Nu-Link Firmware

2.3.2.10 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 dongles 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.
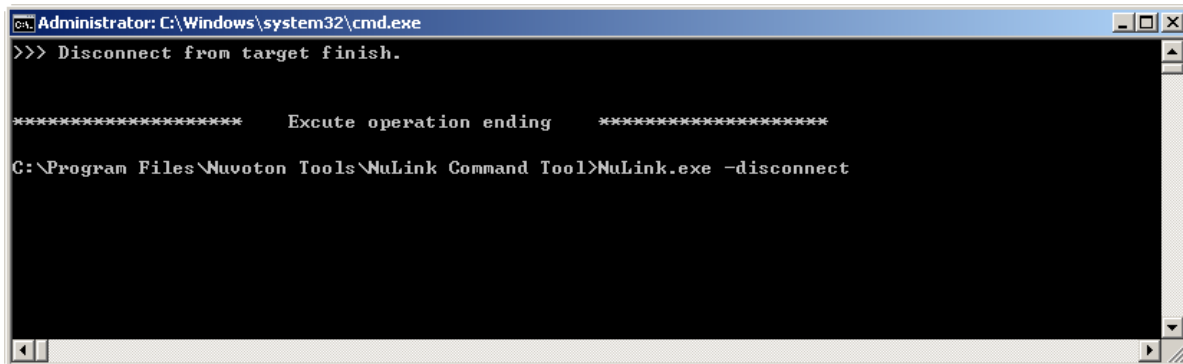
>**NuLink** –disconnect

Figure 2.3-10 Use -disconnect Command to Disconnect from Target Chip

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

Note. Parallel execution command does not support for specific series.

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 Fash 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:

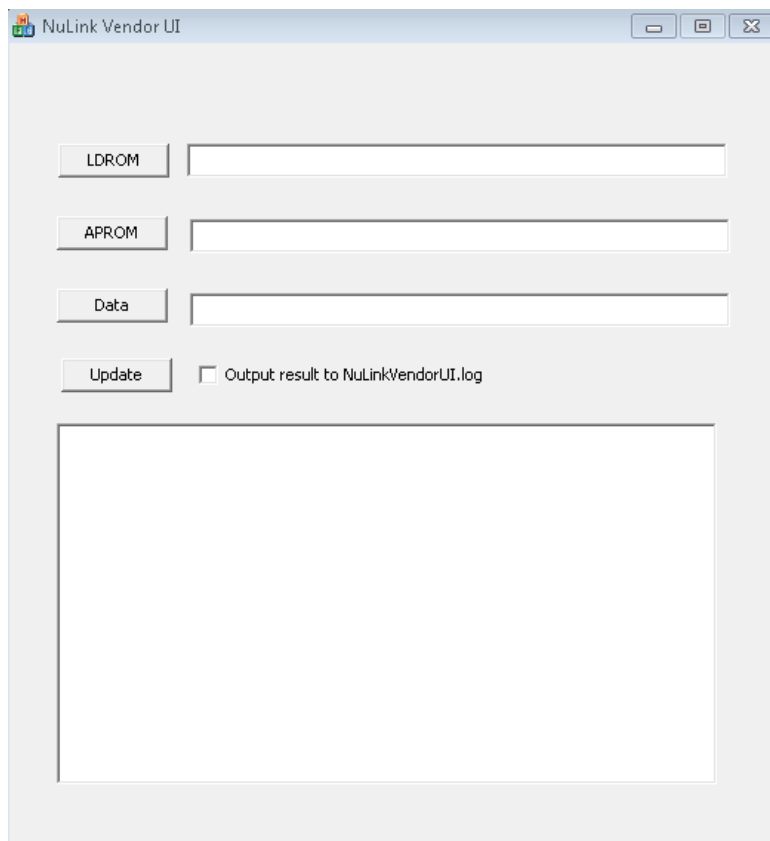Connect Nu-Link ICE dongles to PC.

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.
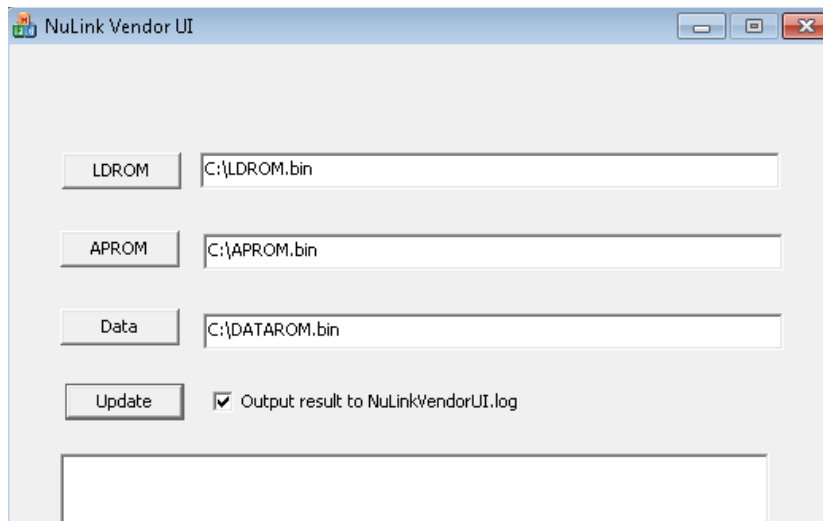

Figure 3.2-2 Select Bin File

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.
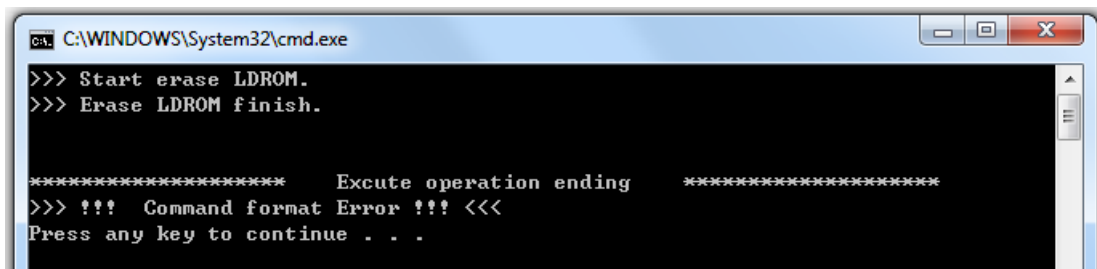

Figure 3.2-3 Display Error Message Due to Command Length is Too Long

Step 4:

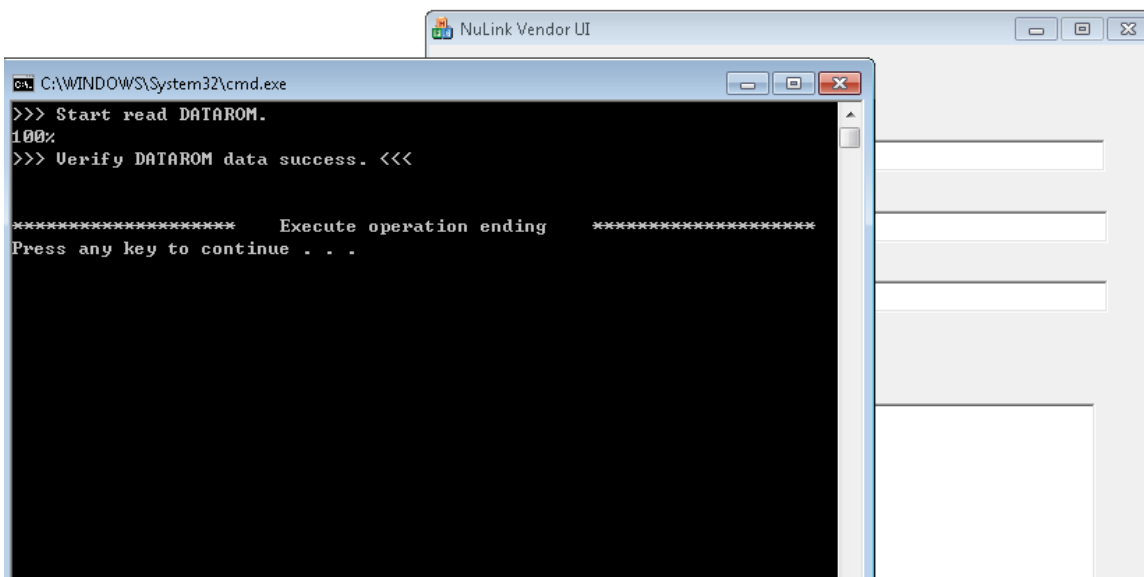Click the "Update" button and start to update program through all connected Nu-Link devices.

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.

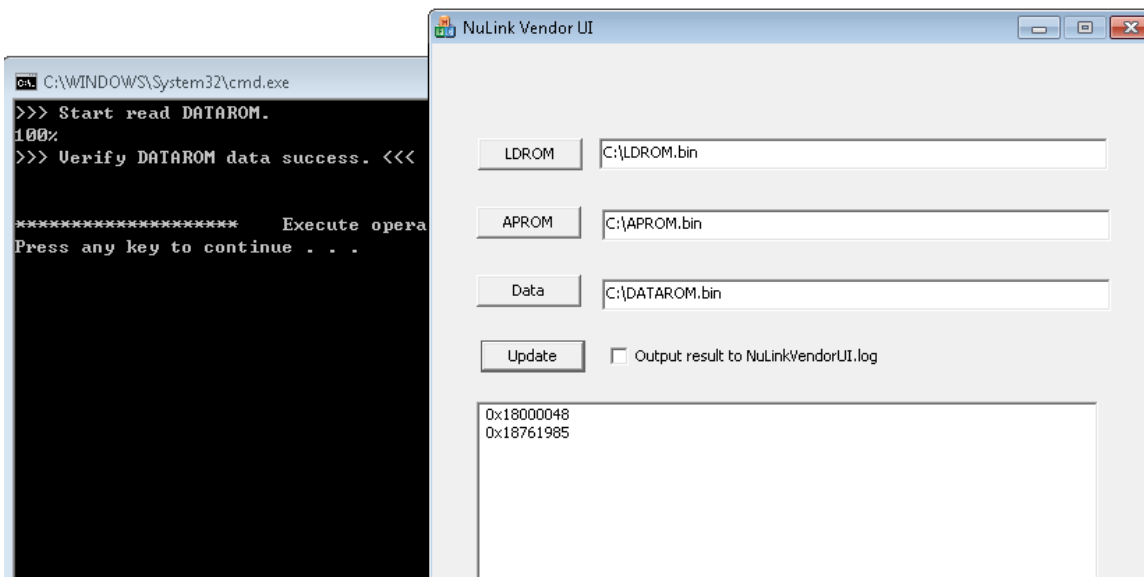Figure 3.2-5 List All Connected Nu-Link Device IDs

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_KM1Mx.exe	KM1M7A/B/C series and KM1M4B series
NuLink_M460_M2L31_M2U51.exe	M460 series, M2L31 series and M2U51 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.
2023.05.02	3.12	Supported M2L31 series and update command options.
2024.05.31	3.16	Supported M55M1 series.

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.