



# **Nations Technologies General MCU multi-channel download tool user manual**

V1.1

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## *Version history*

Version	The Date	Note
V1.0	2021.02.20	New document
V1.1	2022.03.30	Modify picture

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# 1 Overview

This document is used to describe and standardize the operation and process of universal MCU multi-channel download tool for Nations Technologies, suitable for management personnel and production operators.

The tool provides the function of multi-channel configuration and download of the program of various types of MCU chips. The tool has beautiful interface and simple operation.

## 2 Systematic review

### 2.1 System Function Introduction

N32G(WB) 45X-FR, N32G(L) 43X, N32L 40X, N32G032, N32G030, N32G031 series of various models of chip program multichannel configuration and download functions.

The main interface of the tool is shown in the following figure. It consists of operation, state, interface selection, advanced configuration, and Help.

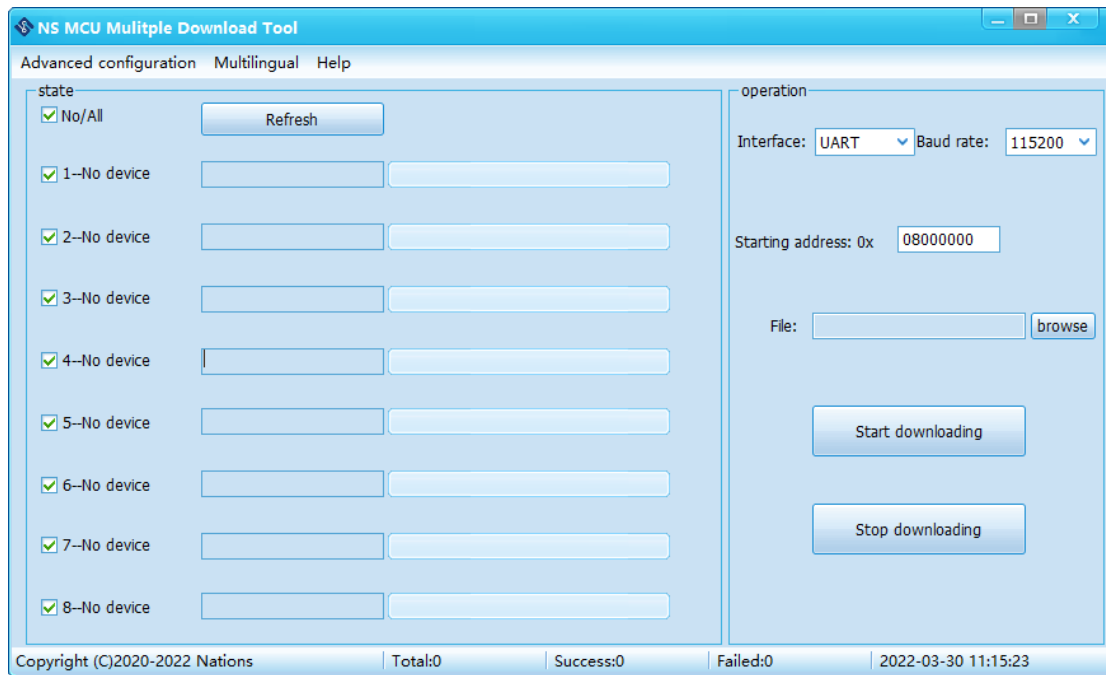


Figure 2-1 Main interface of download tool2-

## 2.2 System performance

The system resource footprint is very small when the program is running, with both CPU usage and memory footprint less than 1% when the program is running at full speed.

## 3 Runtime environment

### 3.1 Hardware Requirements

The following list shows the minimum configuration of the PC hardware required by this software:

1. CPU Celeron 400MHz or Pentium 133MHz or above
2. The minimum memory size is 128 MB (256MB or more is recommended).
3. The hard disk has more than 100MB free space

4. Monitor with a resolution of 800\*600 or above, 1024x768 or higher is recommended

## 3.2 Software requirements

The program can run on the 32-bit operating system Windows XP, and supports both 32-bit and 64-bit Windows7 and Windows 10.

## 4 Tool Operation Instructions

### 4.1 Installation and initialization

The tool supports two communication modes:

- 1、 **UART communication interface**, the computer without install a serial port driver, please install the driver first, and then turn via USB serial port access devices, through the device manager to check the port whether can correctly identify, if there is no recognition to the device, please make sure the driver is properly installed, if properly installed to plug, will refresh the current device ports, the diagram below:

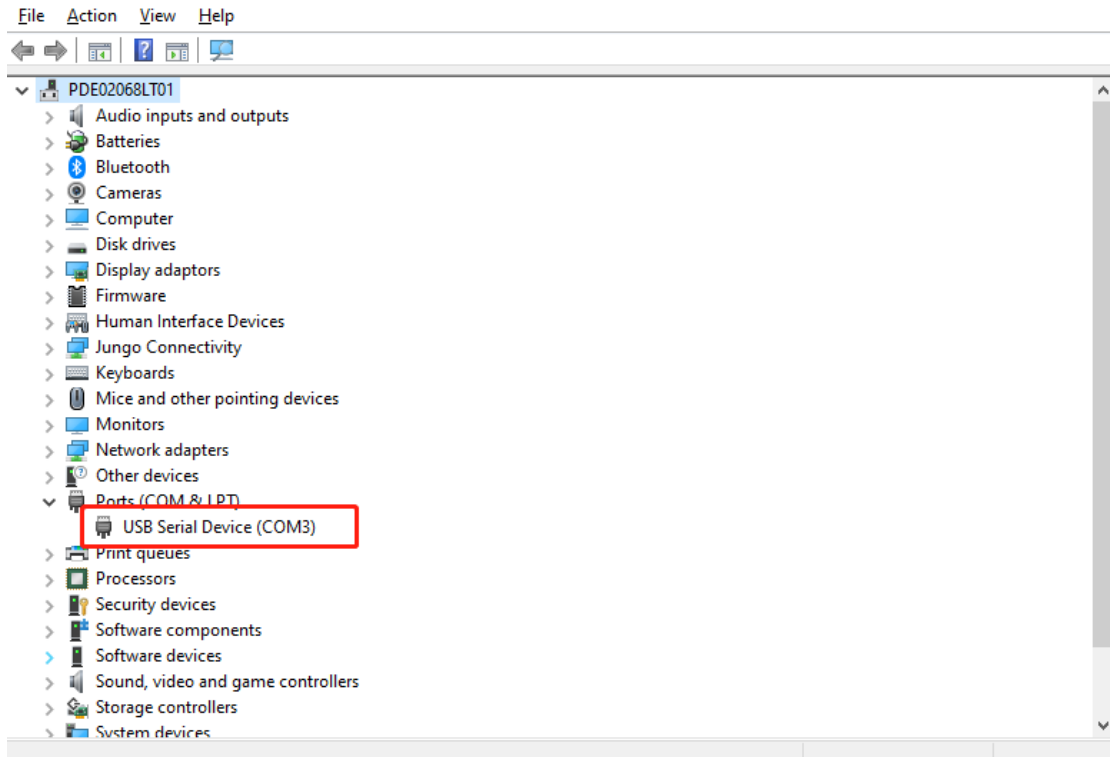


Figure 4-1 Confirming the UART port through device Manager-

2、**DFU USB communication interface** based on USB DFU device type agreement, through the USB port access devices, computer no USB DFU driver, you need to install the driver, after install the driver can use device manager to check the driver name, if there is no recognition to the device, to plug, if not yet, may drive is not installed correctly, For details about how to install the USB DFU driver, see USB DFU Driver Installation Instructions. The correct identification of equipment is shown below:

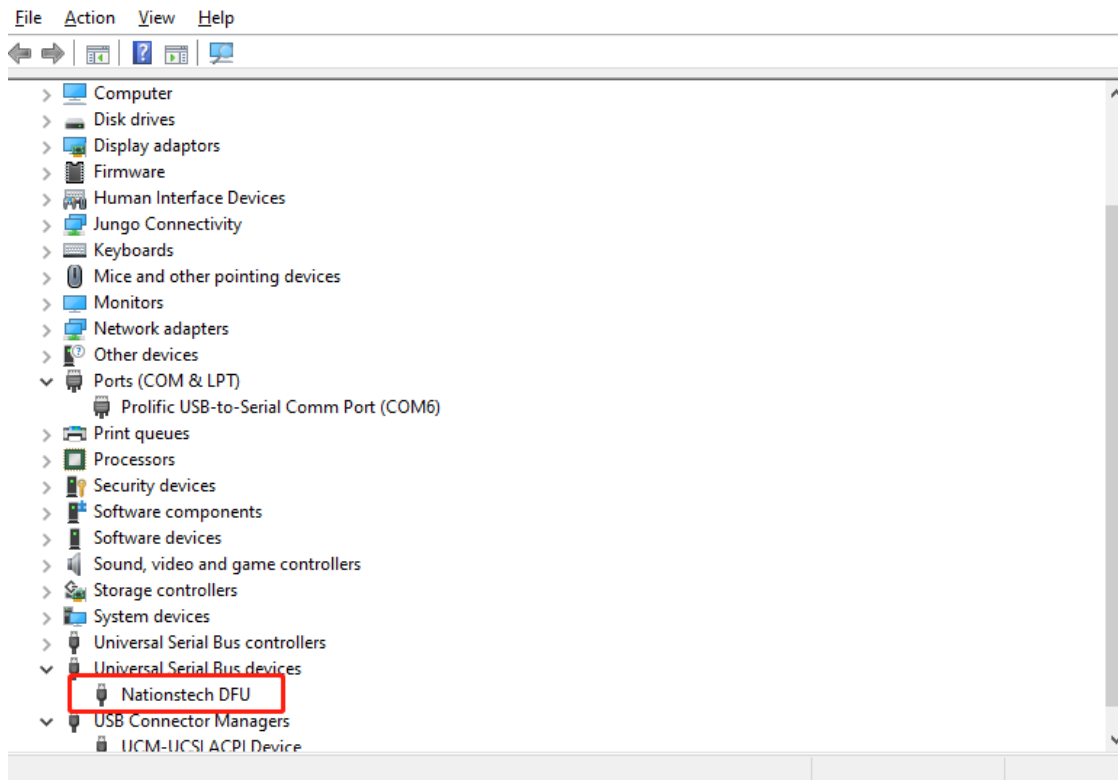


Figure 4-2 Interface for confirming USB DFU devices through device Manager-

After the device is properly connected and the driver is installed, the interface after the program is started is as shown in the figure below:

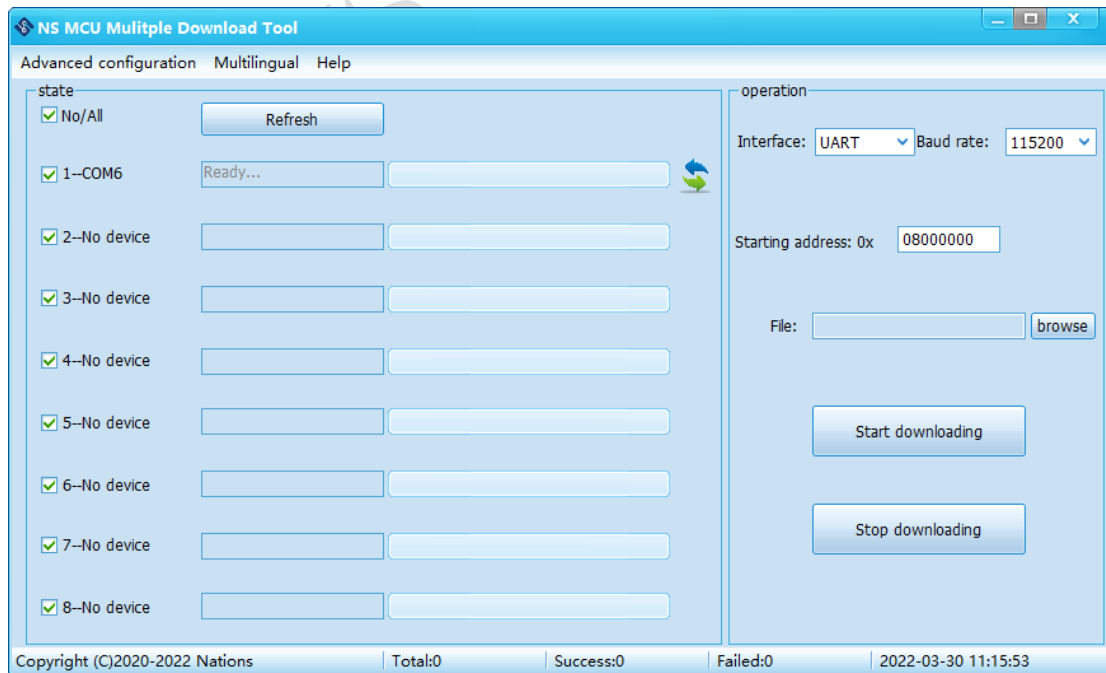


Figure 4-3 Program startup interface (UART interface)4-

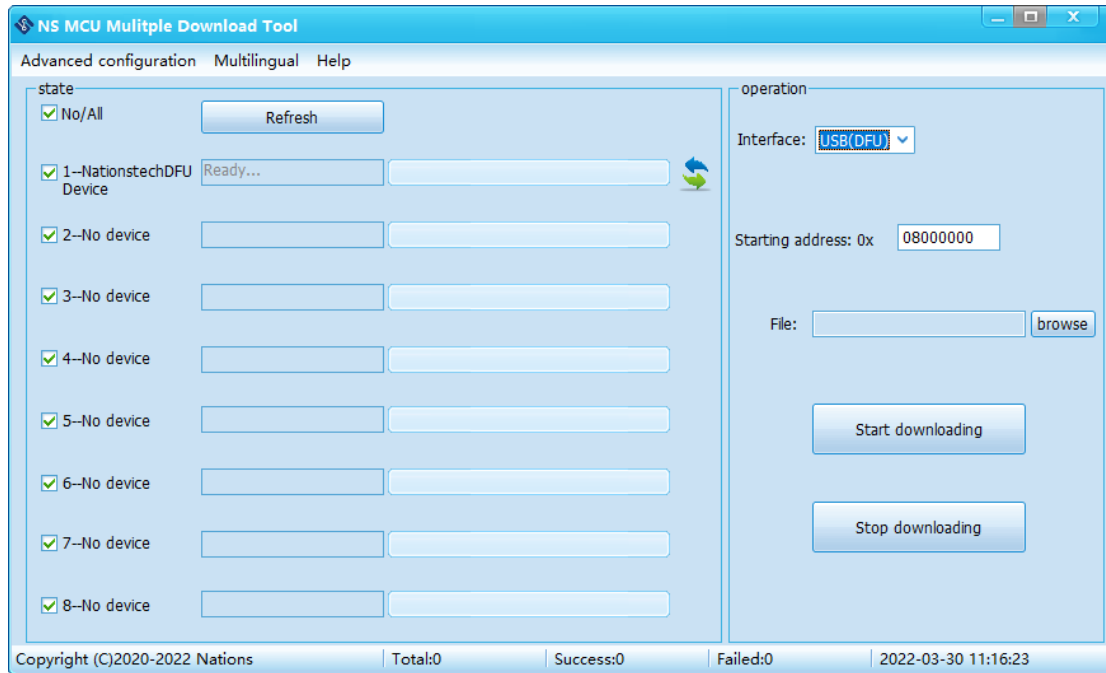


Figure 4-4 Program startup interface (USB DFU interface)4-

## 4.2 Download Process description

### 4.2.1 Identification equipment

Take the UART interface as an example (you can click the interface in the upper left corner to select the replacement interface). After the initialization preparations are complete, identify the device and enter the Ready state, as shown in the following figure:

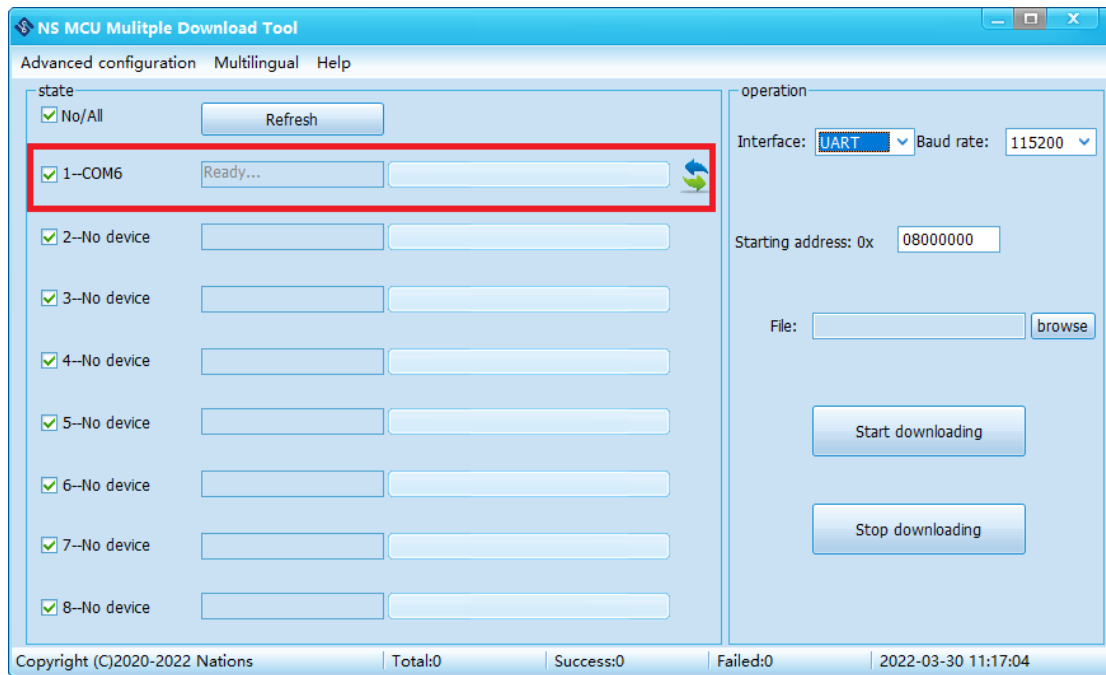
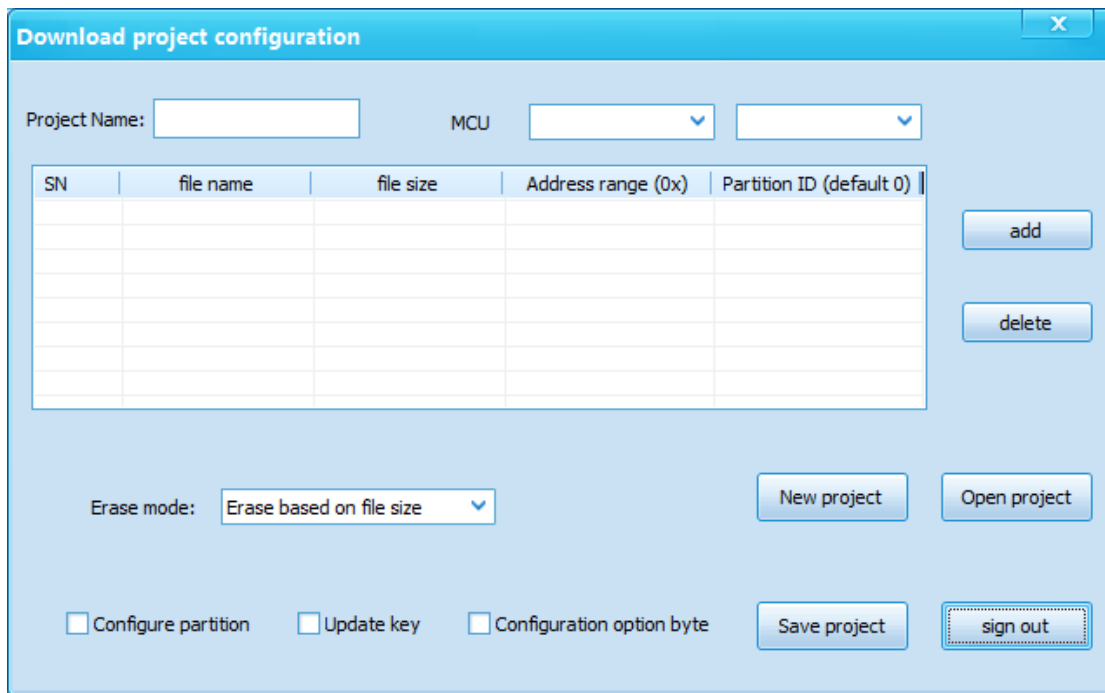


Figure 4-5 Device identification succeeded-

## 4.2.2 Advanced configuration

### 4.2.2.1 Download project Configuration

Open the menu item "Advanced Configuration" in the upper left corner and select Download project configuration. The page mainly displays and configures the content of the downloaded project, as shown in the figure:



Download project configuration

Project Name:  MCU

SN	file name	file size	Address range (0x)	Partition ID (default 0)

add delete

Erase mode:  Erase based on file size

New project Open project

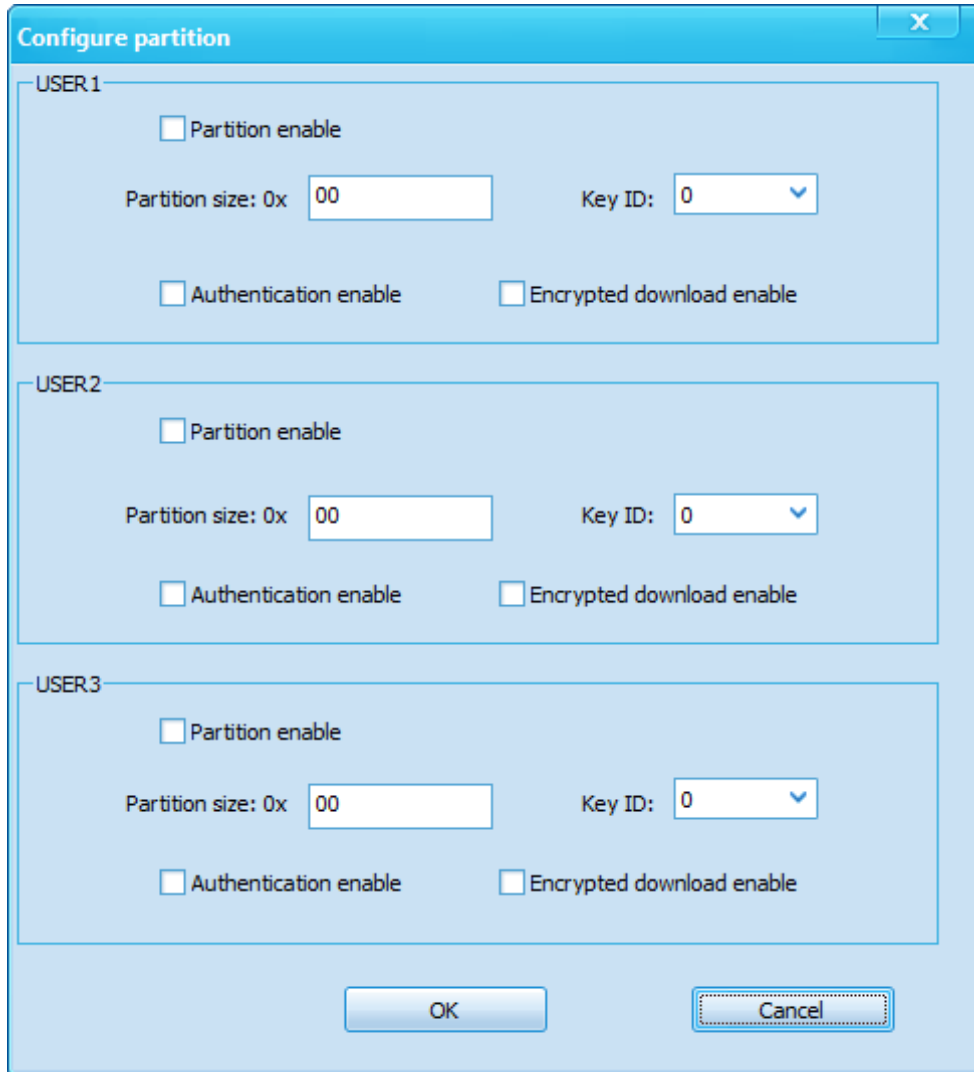
☐ Configure partition ☐ Update key ☐ Configuration option byte

Save project sign out

Figure 4-6 Downloading the project configuration-

- **Project name:** User-defined project name when creating a project. The value can contain a maximum of 32 bytes.
- **MCU model:** When a new project is created, only the current series of MCU target boards are allowed to download when the option byte configuration is selected.
- **Add or Delete files:** When creating a new project, add/delete files that need to be downloaded. The format supports bin, hex, enc files, and a maximum of 9 files are supported. The download address of each file cannot be overlapped, and the file name length supports a maximum of 32 bytes.
- **Erasing mode:** Erases the Flash before downloading as required
- **Configure the partition:** This operation means to configure the size of the partition

user1/2/3. Check it and a dialog box will pop up, as shown in the figure:



The image shows a 'Configure partition' dialog box with three sections for USER1, USER2, and USER3. Each section contains the following controls:

- ☐ Partition enable
- Partition size: 0x
- Key ID:  (dropdown arrow)
- ☐ Authentication enable
- ☐ Encrypted download enable

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

Figure 4-7 Configuring partitions-

- ✧ **Enable partition download:** Indicates whether to configure the current partition
- ✧ **Partition size:** indicates the size of the configuration partition.
- ✧ **Key ID:** 0x00-0x1F ID of the encryption download/Partition authentication key index
- ✧ **Zone authentication Enable:** Indicates whether zone authentication is enabled
- ✧ **Encrypted download Enable:** Indicates whether to enable encrypted download

Recommended partition configuration process:

1. If you need to divide two areas, configure USER3 (automatic sealing is complete). If you want to also seal USER1, configure USER1 again. The size of USER1 + USER3 must be the size of the entire FLASH;
2. To divide three zones, configure USER3 (automatic sealing is configured) and then USER2 (automatic sealing is configured). If you want to also seal USER1, configure USER1 again. The size of USER1 + USER2 + USER3 must be the size of the entire FLASH.

- **Update key:** This operation means to update the key of encrypted download and partition authentication. After checked, a dialog box will pop up as shown in the figure:

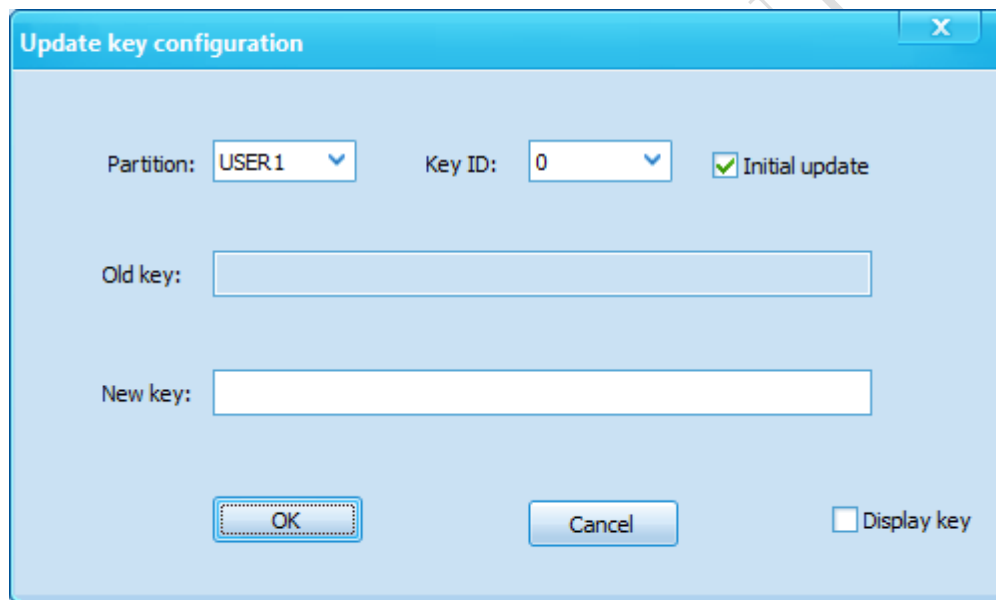
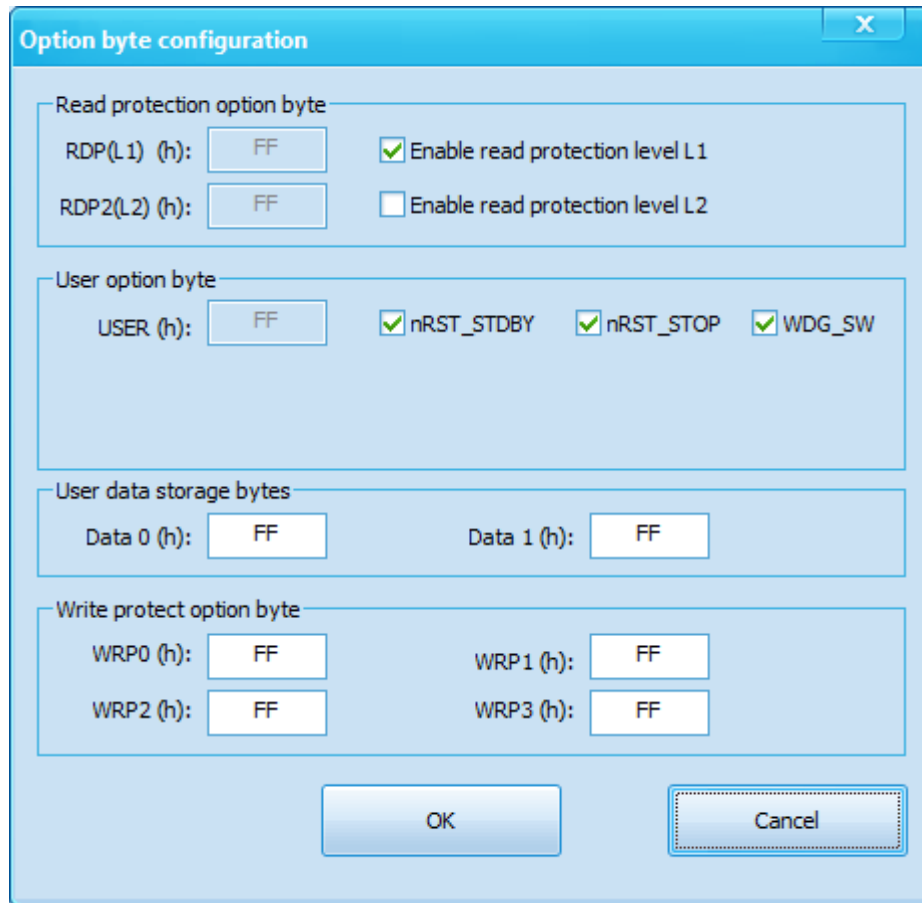


Figure 4-8 Updating a key-

- ✧ Partition: indicates the partition user1/2/3
- ✧ Key ID: 0x00-0x1F ID of the encryption download/Partition authentication key index
- ✧ Initial Update: The key is updated for the first time
- ✧ Old key: If the key is updated for the first time, the default password is one of the 32 sets of passwords. Otherwise, the password is the password updated last time
- ✧ New key: Indicates the current key to be updated

- **Configuration option byte:** This operation indicates the configuration option byte

(including read protection level, FLASH page write protection, datA0/1 configuration, and USER configuration).N32G(WB)45x\_FR series is selected because of the different option bytes of each series of chips. Click configure Option bytes and the dialog box will pop up as shown in the figure:



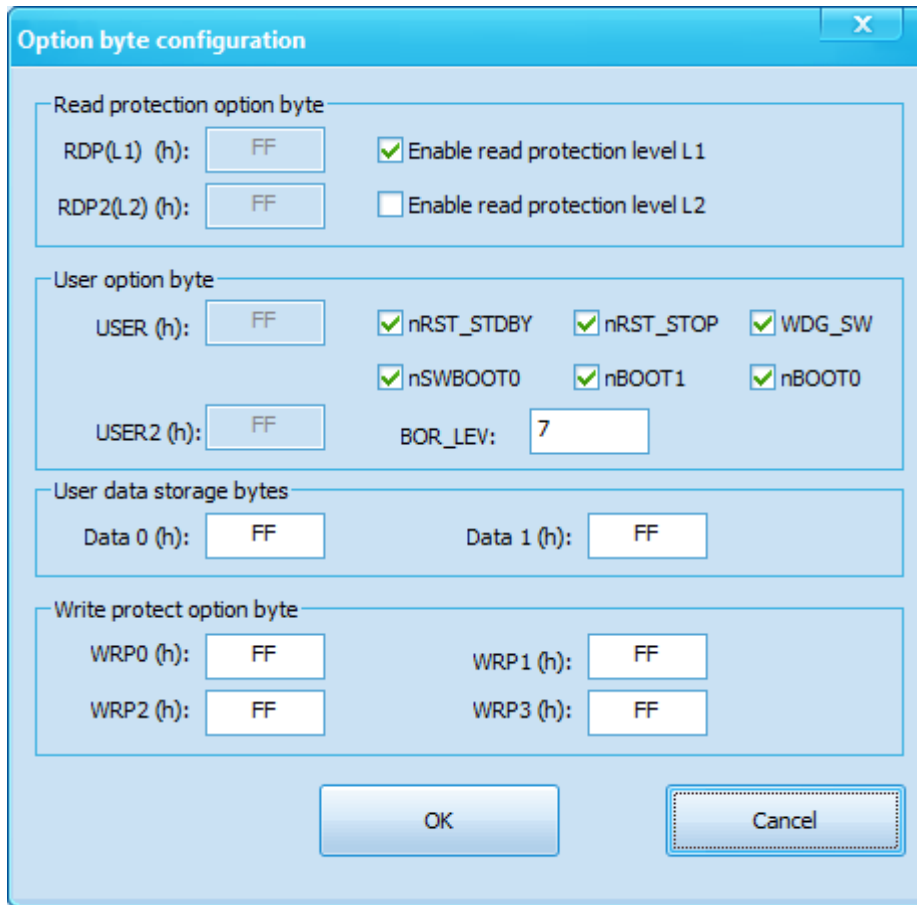
The dialog box is titled "Option byte configuration" and contains four sections:

- Read protection option byte:**
  - RDP(L1) (h):  ☒ Enable read protection level L1
  - RDP2(L2) (h):  ☐ Enable read protection level L2
- User option byte:**
  - USER (h):  ☒ nRST\_STDBY ☒ nRST\_STOP ☒ WDG\_SW
- User data storage bytes:**
  - Data 0 (h):  Data 1 (h):
- Write protect option byte:**
  - WRP0 (h):  WRP1 (h):
  - WRP2 (h):  WRP3 (h):

At the bottom are "OK" and "Cancel" buttons.

Figure 4-9 Configuration option bytes-

After selecting N32G(L) 43X 、 N32L40X series, click configuration Option byte and the dialog box will pop up as shown in the picture:



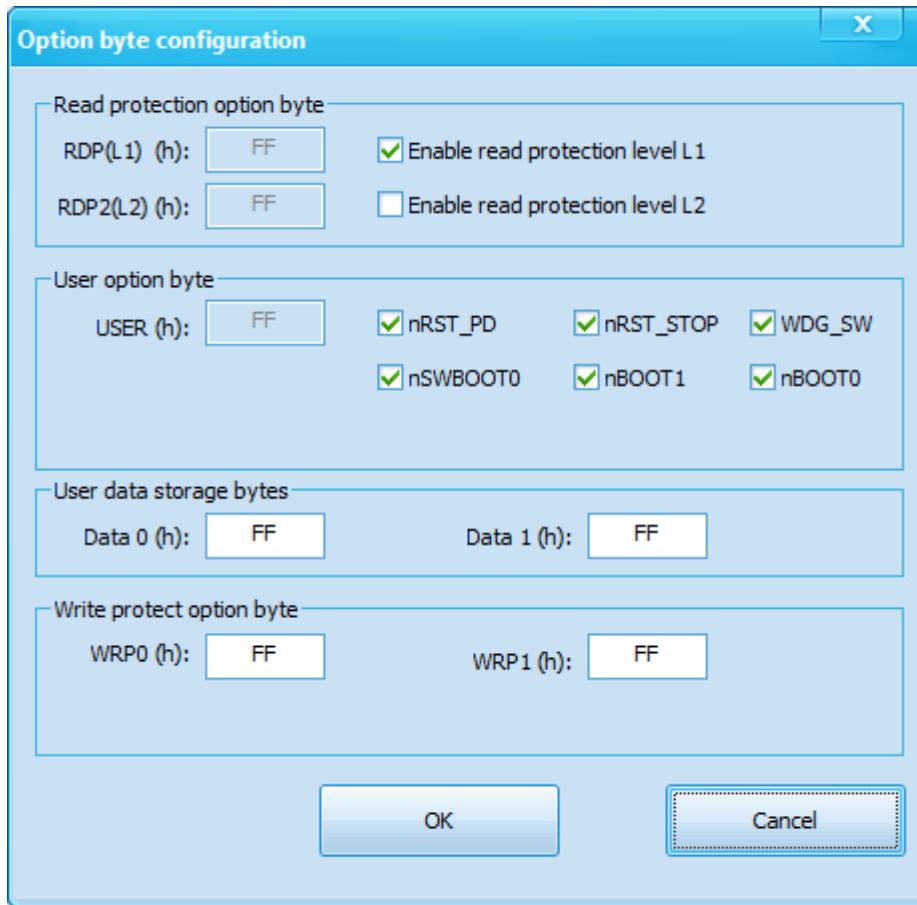
The dialog box is titled "Option byte configuration" and contains several sections for configuring various option bytes. Each section has input fields for hexadecimal values and checkboxes for enabling specific features.

Section	Field	Value	Feature	Status
Read protection option byte	RDP(L1) (h):	FF	Enable read protection level L1	Checked
	RDP2(L2) (h):	FF	Enable read protection level L2	Unchecked
User option byte	USER (h):	FF	nRST_STDBY	Checked
			nRST_STOP	Checked
			WDG_SW	Checked
			nSWBOOT0	Checked
User option byte	USER2 (h):	FF	nBOOT1	Checked
			nBOOT0	Checked
User data storage bytes	Data 0 (h):	FF	BOR_LEV:	7
	Data 1 (h):	FF		
Write protect option byte	WRP0 (h):	FF	WRP1 (h):	FF
	WRP2 (h):	FF	WRP3 (h):	FF

Buttons: OK, Cancel

Figure 4-10 Configuration option bytes-

After selecting N32G032 series/N32G030 series, click configuration option byte and the dialog box will pop up as shown in the picture:



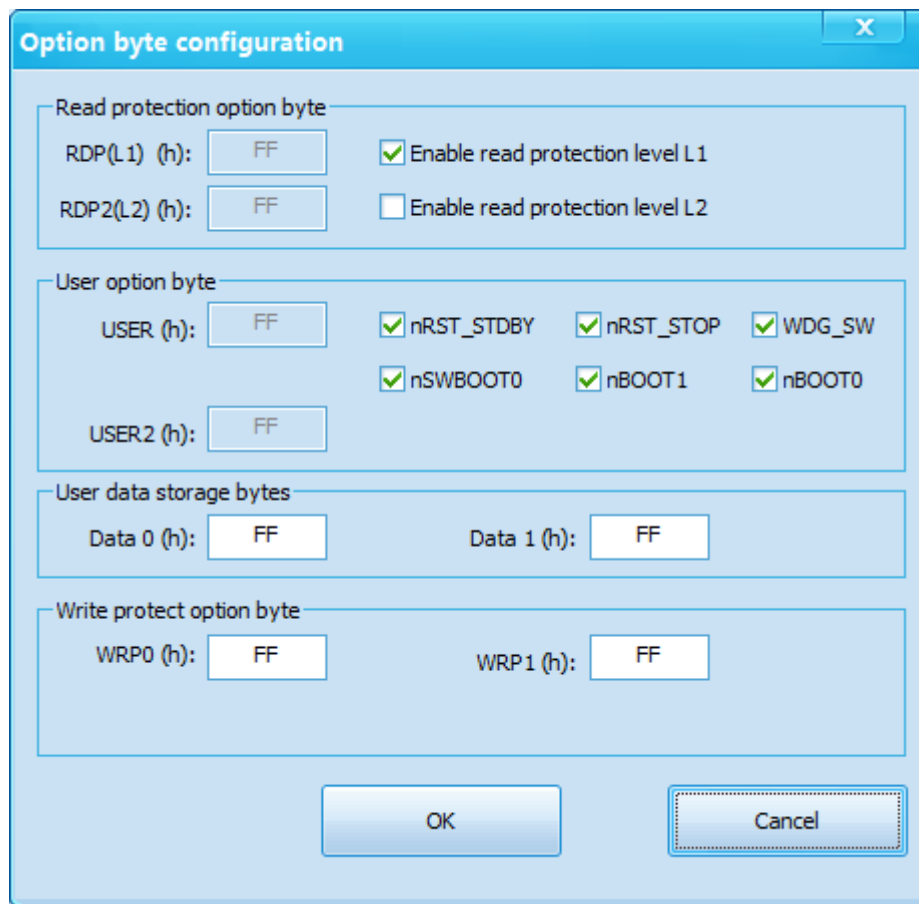
The dialog box is titled "Option byte configuration" and contains the following sections:

- Read protection option byte:**
  - RDP(L1) (h):  ☒ Enable read protection level L1
  - RDP2(L2) (h):  ☐ Enable read protection level L2
- User option byte:**
  - USER (h):
  - ☒ nRST\_PD ☒ nRST\_STOP ☒ WDG\_SW
  - ☒ nSWBOOT0 ☒ nBOOT1 ☒ nBOOT0
- User data storage bytes:**
  - Data 0 (h):  Data 1 (h):
- Write protect option byte:**
  - WRP0 (h):  WRP1 (h):

At the bottom, there are "OK" and "Cancel" buttons.

Figure 4-11 Configuration option bytes-

After selecting N32G430 series, click configuration option byte and the dialog box will pop up as shown in the picture:



The dialog box titled "Option byte configuration" contains several sections for configuring memory protection and user options. The "Read protection option byte" section has two input fields for RDP(L1) and RDP2(L2), both set to "FF", and two checkboxes: "Enable read protection level L1" (checked) and "Enable read protection level L2" (unchecked). The "User option byte" section has two input fields for USER and USER2, both set to "FF", and six checkboxes: nRST\_STDBY, nRST\_STOP, WDG\_SW, nSWBOOT0, nBOOT1, and nBOOT0, all of which are checked. The "User data storage bytes" section has two input fields for Data 0 and Data 1, both set to "FF". The "Write protect option byte" section has two input fields for WRP0 and WRP1, both set to "FF". At the bottom are "OK" and "Cancel" buttons.

Figure 4-12 Configuration option bytes-

- **Read protection option byte:** Sets read protection to prevent unauthorized reads. Read protection mainly protects the access operation of the main memory area and option byte block after the chip is sealed. Read protection is set by RDP bytes in the configuration option byte block. Three different read protection levels can be configured, as shown in the following table:

Read protection configuration list

RDP	nRDP	RDP2	nRDP2	Read protected state
0xFF	0xFF	RDP2!=0xCC    nRDP!=0x33		L1 level
0xA5	0x5A	RDP2!=0xCC    nRDP!=0x33		L0 level

				(Unprotected)
0xXX	0xXX	0xCC	0x33	L2 level
None of the preceding three configurations				L1 level

■ Level of L0:

- ✧ Main storage and option byte blocks can be read arbitrarily
- ✧ When booting from System memory, if the System information area is in the sealed state (0x1FFF\_F100 address is not all 1), mmU usr Config of the System information area is write-protected. Otherwise, only System memory programs can write to mmu usr config in the System information area.
- ✧ When booting from Flash Main or Sram, mmU usr Config in the system information area is write-protected regardless of whether the system information area is sealed (0x1FFF\_F100 address is not fully F is sealed).

■ L1 level (RDP valid) :

- ✧ Pages 0 to 1 in the Flash main area are automatically write protected
- ✧ JTAG/SWD debugging interface no permission page eraser, read and write Flash main area
- ✧ When booting from Sram, the Sram program has no permission to page wipe and read and write the Flash main area
- ✧ When booting from Sram, none of the zone programs has access to the System memory zone
- ✧ When booting from System memory, if the System information area is in the sealed state (0x1FFF\_F100 address is not all 1), mmU usr Config of the System information area is write-protected. Otherwise, only System memory programs can write to mmu usr config in the System information area.
- ✧ When booting from Flash Main or Sram, mmU usr Config in the system information area is write-protected regardless of whether the system information area is sealed (0x1FFF\_F100 address is not fully F is sealed).

■ Level L2 (valid in RDP2) :

- ✧ The Option byte in the system information area is write protected. The L2 level is irreversible.
- ✧ The JTAG/SWD debugging interface cannot wipe the Flash main area.
- Reduced level L1 to L0:
  - ✧ When read protected option bytes are overwritten to the unprotected L0 level, the entire Flash main area is automatically erased as follows : (erasing option byte blocks does not result in an automatic whole erase operation, because the result of erasing is 0xFF, which is equivalent to still being protected at L1 level)
    - low Write the correct sequence of key values in OPTKEYR to unlock the option byte area
    - low Bus initiates command to erase the entire option byte area (Page erase)
    - low Bus write read protection option byte 0xA5
    - low Internal automatic erasure of all Flash main areas,
    - low Internally write 0xA5 to read protection option bytes
    - low System reset (such as software reset, etc.), option byte blocks (including the new RDP value 0xA5) are reloaded into the system, and read protection is removed

Note: When a partition is configured, it is not allowed to change the read protection level from L1 to L0, because this will cause mass erase in the user area.

### ➤ User option bytes:

USER:

- ✧ The USER [and] : Reserved
- ✧ USER[2] : nRST\_STDBY configuration option
  - 0: A reset occurs when the standby mode is entered
  - 1: The standby mode does not reset
- ✧ USER[1] : nRST\_STOP configuration option
  - 0: reset occurs when entering STOP mode
  - 1: No reset occurs when entering the STOP mode
- ✧ USER[0] : WDG\_SW configuration option

1: hardware watchdog

0: software watchdog

USER2:

- ✧ USER2 [7] : Reserved
- ✧ USER2[6:4] : BOR\_LEV[3:0], default is 0
- ✧ USER2 [3] : Reserved
- ✧ USER2[2] : nSWBOOT0 configuration option, default is 1
- ✧ USER2[1] : nBOOT1 configuration option, default is 1
- ✧ USER2[0] : nBOOT0 configuration option, default is 1

**Write protection option bytes:**

- ✧ WRP0: write protection for pages 0 to 15
- ✧ WRP1: write protection for pages 16 to 31
- ✧ WRP2: write protection for pages 32 to 47
- ✧ WRP3: write protection for pages 48 to 255

- **New project:** Create a new project and initialize the parameters of the project
- **Open project:** Open an existing project. It can only be opened for viewing, but cannot be modified
- **Save items:** Save the current configured items in a \*. NSPF format

#### 4.2.2.2 Making an encrypted file

To encrypt the downloaded file, open the menu item "Advanced Configuration" in the upper left corner and select "Make encrypted File". The dialog box pops up as shown in

the figure below:

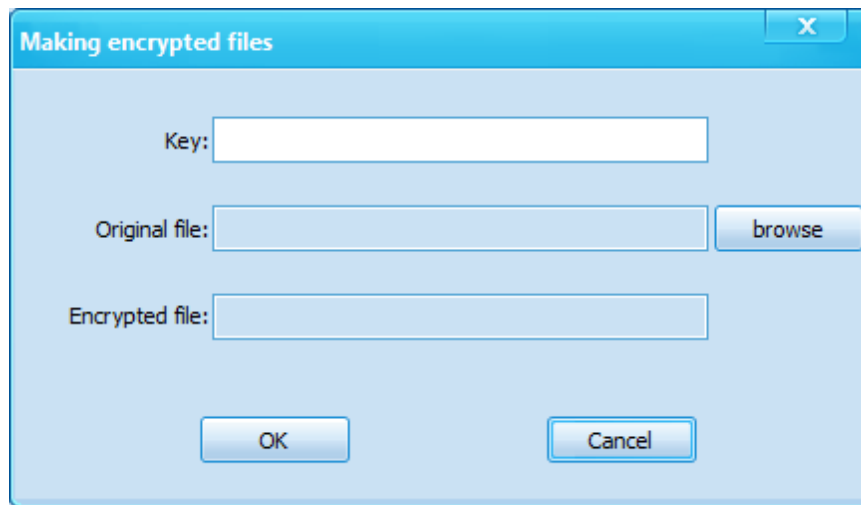


Figure 4-13 Making an encrypted file-

Key: The key is 16 bytes long

Original file: the file to be encrypted and its path

Encrypted file: encrypted file and its path

### 4.2.3 Start the download

Take downloading through the UART interface as an example. In the "Ready" state, click "Browse" to select the project file to be downloaded (\*.nspf), and then click "Start Downloading".

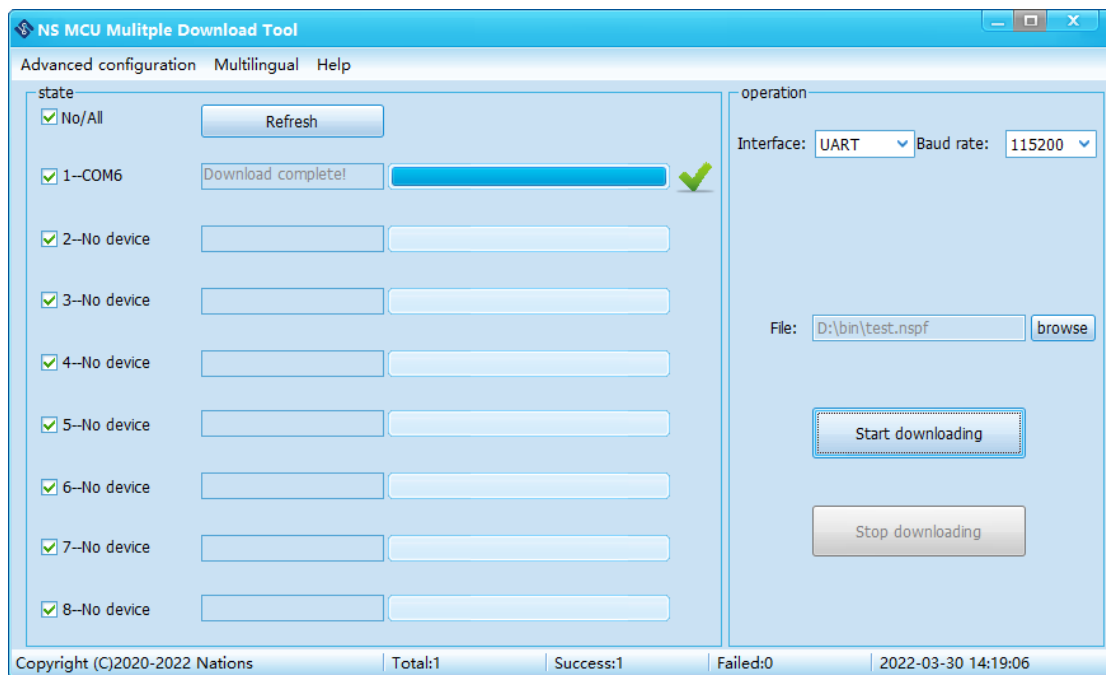


Figure 4-14 Successful download page

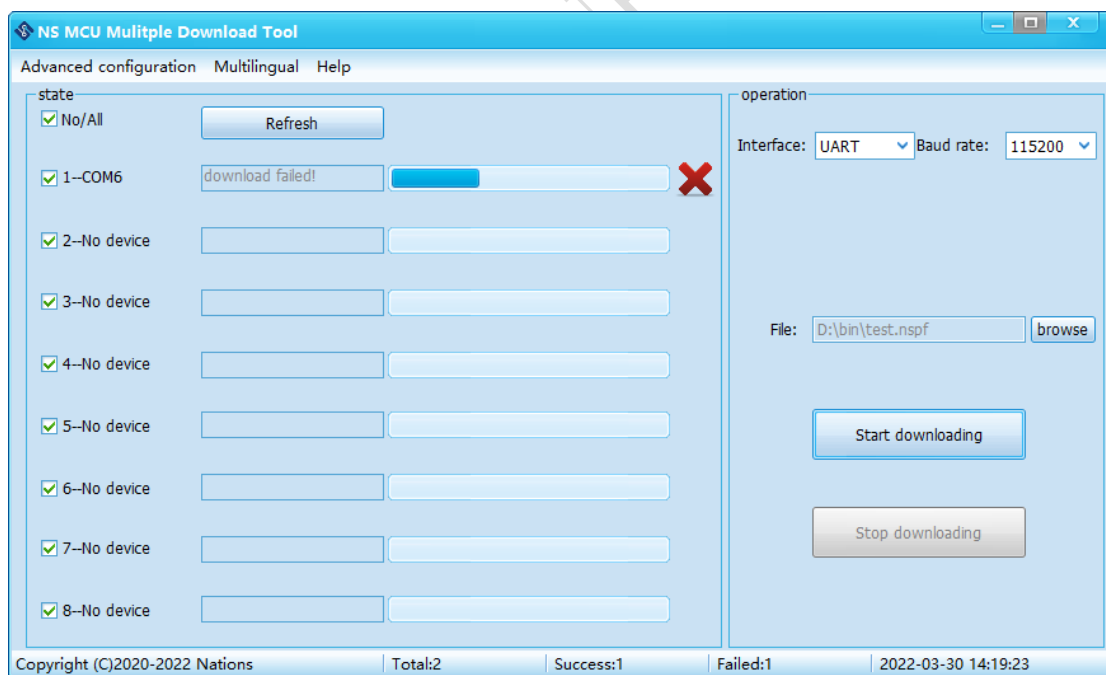


Figure 4-15 Download failure screen

- ✧ If you do not need to configure partitions, update keys, and option bytes for production, you can skip advanced configuration and download files (\*. Bin, \*.hex) in plaintext only.

- ✧ In remote production, customer A makes A project file (\*.nspf) and sends it to terminal B. Terminal B receives the project file (\*.nspf), and directly downloads the production file.

## 4.3 Help

Click "Manual" in "Help" in the upper left corner to open the manual for downloading the tool.

## 4.4 Error handling and recovery

Operation fails, there will be a relevant error messages, or check the tools directory ErrorLog error diary, according to the error message to check related configuration, if there is some unknown error occurred to crash the program, you can close the window, or to plug the device, and then restart the program to operate according to the above instruction.

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