N723 OpenCPU

SDK Developer Guide

Issue 1.0 Date 2022-09-28

Notice

This document provides a guide for users to use N723 OpenCPU.

This document is intended for system engineers (SEs), development engineers, and test engineers.

THIS GUIDE PROVIDES INSTRUCTIONS FOR CUSTOMERS TO DESIGN THEIR APPLICATIONS. PLEASE FOLLOW THE RULES AND PARAMETERS IN THIS GUIDE TO DESIGN AND COMMISSION. NEOWAY WILL NOT TAKE ANY RESPONSIBILITY OF BODILY HURT OR ASSET LOSS CAUSED BY IMPROPER OPERATIONS.

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About This Document

Scope

This document is applicable to N723 OpenCPU and describes basic information, functional interface design, and application commissioning of N723 OpenCPU.

Audience

This document is intended for system engineers (SEs), development engineers, and test engineers.

Change History

Issue	Date	Change	Author
1.0	2022-02	Initial issue.	XueGang1

Conventions

Symbol	Description
	Indicates danger or warning. This information must be followed. Otherwise, a catastrophic module or user device failure or bodily injury may occur.
	Indicates caution. This symbol alerts the user to important points about using the module. If these points are not followed, the module or user device may fail.
	Indicates instructions or tips. This symbol provides advices or suggestions that may be useful when using the module.

1 Overview

This document describes the following information about N723 OpenCPU SDK:

- SDK environment setup
- Application development process
- Application development notes

Requirements for developers:

- Familiar with FreeRTOS system
- Master application development by using standard C programming language
- Familiar with standard TCP/FTP/HTTP/UART and other protocols and the use of peripherals
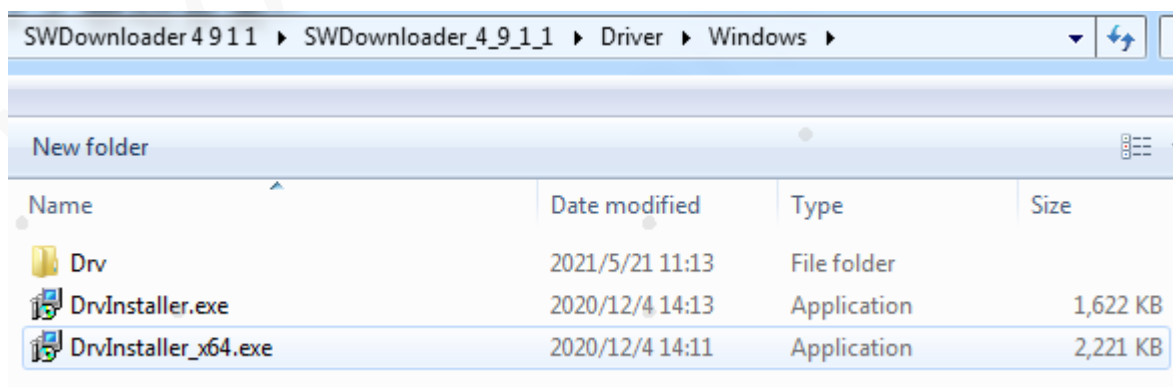
2 Preparations

2.1 Resource List

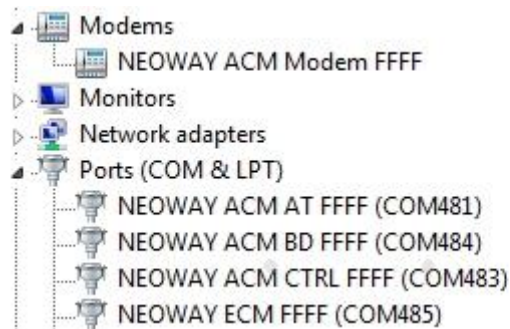| No.	Item	Description
1	Win7/8/10 PC	Operating system
2	N723 OpenCPU SDK development kit	Including header files and cross-compilation chains used by customers for development
3	N723 OpenCPU software version	OpenCPU software version
4	SWDownloader	Burning upgrade tool
5	N723 driver	Driver directory under the SWDownloader tool package directory

2.2 Driver Installation

Sytem requirements: Win7/8/10

Driver storage path:

Driver installation success:

Install the USB driver in the Windows OS. After the driver is installed, the five COM ports are displayed. The followng table describes the five COM ports.
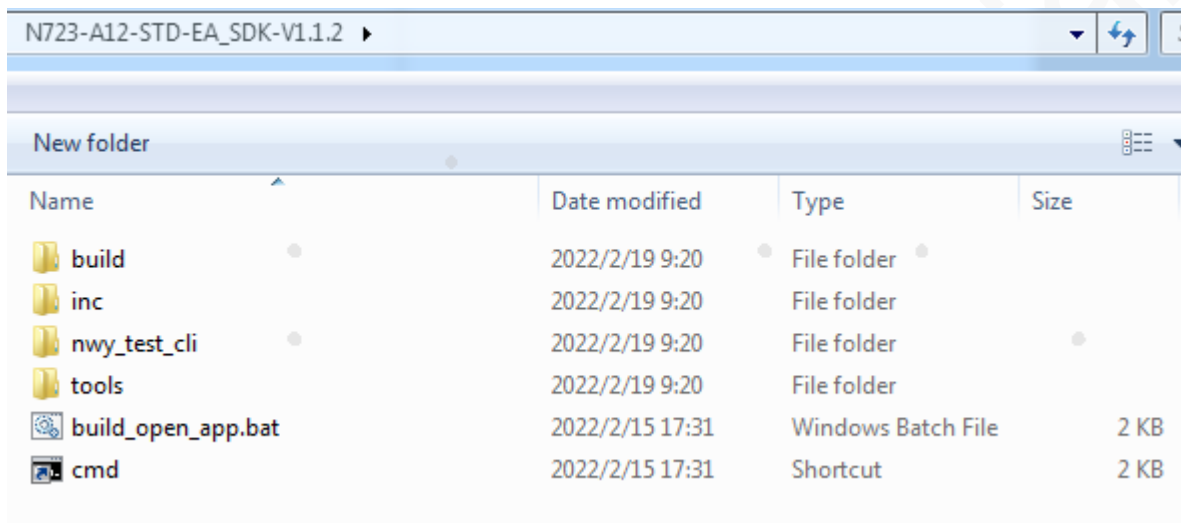
No.	COM Port	Description
1	NEOWAY HS-USB ACM AT FFFF	Used to send and receive AT commands.
2	NEOWAY HS-USB Diagnostics FFFF	Diagnostic port, used to capture device logs.
3	NEOWAY HS-USB ACM CTRL FFFF	OpenCPU dedicated commissioning UART port, used for test case verification.
4	NEOWAY HS-USB ACM Modem FFFF	Modem port of the device, used to support PPP data services and to send and receive AT commands.
5	NEOWAY HS-USB ECM FFFF	Network adapter port.

If the Win10 system always prompts that the driver installation fails, disable the driver digital signature check of the Win10 system, restart the computer, and install the driver again.

3 Environment Setup

3.1.1 Installation

After obtaining the SDK installation package, decompress it directly. After the installation is complete, the directory structure is as shown in the following figure.

3.1.2 Compilation

The SDK provides the DEMO program nwy_test_data, which is convenient for customers' development reference.

Compilation method: Run **build_open_app.bat nwy_test_data** in the **cmd** command line.

Note: If the customer wants to create a compilation directory, replace the **nwy_test_data** parameter with the name of the customer's project directory, and then perform compilation.
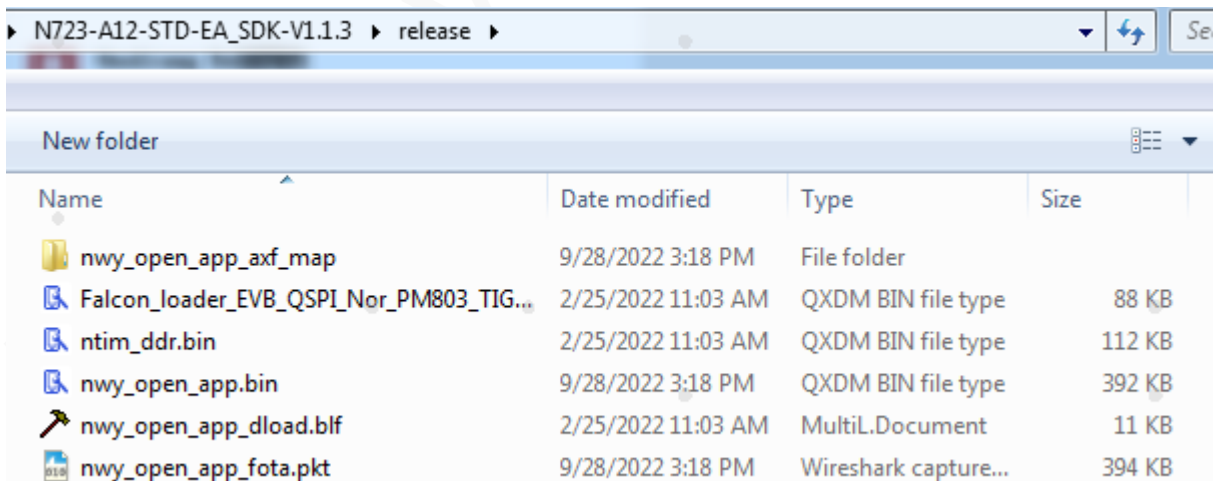
After the compilation success, the system displays SUCCESS.

```
nwy::Info:image_cfg.image_count = 1
nwy::Info:image_cfg.crc_value = 0
nwy::Info:image_cfg.all_image_size = 0
nwy::Info:image_cfg.image_name = aping
nwy::Info:image_cfg.image_addr = 0x310000
nwy::Info:image_cfg.image_addr = 2048
nwy::Info:image_cfg.image_size = 401182
nwy::Info:161
nwy::Info:164
nwy::Info:169
nwy::Info:173
nwy::Info:177
nwy::Info:185
nwy::Info:193
nwy::Info:write package size :403230.
nwy::Info:image_cfg.image_count = 1
nwy::Info:image_cfg.crc_value = 3651432069
nwy::Info:image_cfg.all_image_size = 403230
nwy::Info:image_cfg.image_name = aping
nwy::Info:image_cfg.image_addr = 0x310000
nwy::Info:image_cfg.image_addr = 2048
nwy::Info:image_cfg.image_size = 401182
nwy::Info:file nwy_open_app_fota.pkt size:403230
nwy::Info:file nwy_open_app_fota.pkt md5:46841aed5697ce657d4c57846d75d1c6
nwy::Info:file nwy_open_app_fota.pkt size:403262
        1 file(s) copied.
nwy_open_app.bin
        1 file(s) copied.
build\Falcon_loader_EVB_QSPI_Nor_PM803_TIGX.bin
        1 file(s) copied.
        1 file(s) copied.
        1 file(s) copied.
nwy_open_app.elf
        1 file(s) copied.
nwy_open_app.map
        1 file(s) copied.
if exist nwy_open_app*.bin del nwy_open_app*.bin
if exist nwy_open_app*.map del nwy_open_app*.map
if exist nwy_open_app*.elf del nwy_open_app*.elf
if exist buildlog.txt del buildlog.txt
if exist obj rd /s /q  obj
*************************************************************
*********************  SUCCESS  *****************************
*************************************************************
D:\N723\N723-A12-STD-EA_SDK-V1.1.3>
```

The firmware is in the **release** directory, as shown in the following figure.

Name	Date modified	Type	Size
nwy_open_app_axf_map	9/28/2022 3:18 PM	File folder	
Falcon_loader_EVB_QSPI_Nor_PM803_TIG...	2/25/2022 11:03 AM	QXDM BIN file type	88 KB
ntim_ddr.bin	2/25/2022 11:03 AM	QXDM BIN file type	112 KB
nwy_open_app.bin	9/28/2022 3:18 PM	QXDM BIN file type	392 KB
nwy_open_app_dload.blf	2/25/2022 11:03 AM	MultiL.Document	11 KB
nwy_open_app_fota.pkt	9/28/2022 3:18 PM	Wireshark capture...	394 KB

4 Application Development

Perform application development based on SDK APIs provided by Neoway.

- Reference document: Neoway_N723-EA_OpenCPU_API_Notes
- Development language: C/C++ programming language

4.1 API Introduction

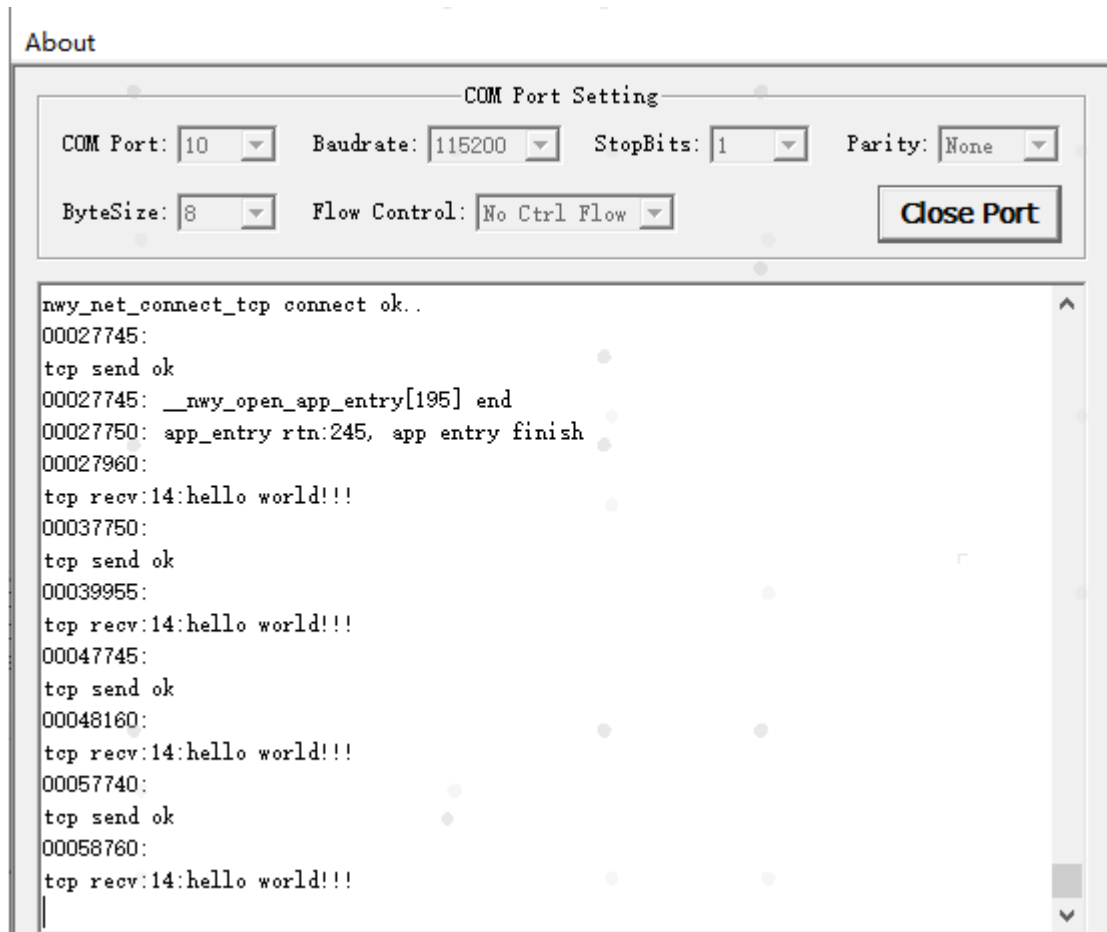| API Category	Function	Remarks
Device	- GPIO - PM - UART	-
Service	- DATA (data dial-up service) - DM (Device Manager) - File (file read and write) - Socket - Network - TCP/UDP - HTTP - FOTA - SIM - SMS - Virtual AT	-
Common	Thread/Mutex/Queue/Semaphore/Time/Timer	-

4.2 Log Addition

The N723 OpenCPU SDK provides the log system that is used for log output and debugging. Logs can be ouput by using the debug UART interface of the EVB.

Log header file: nwy_log.h. Function definition:

```
26: /*------------------------Function Definition----------------------*/
27: /**
28:  * @brief open app log print
29:  *
30:  * @param fmt : log format
31:  *
32:  * @return    :
33:  */
34: void nwy_open_sdk_log(char* fmt, ...);
35:
```
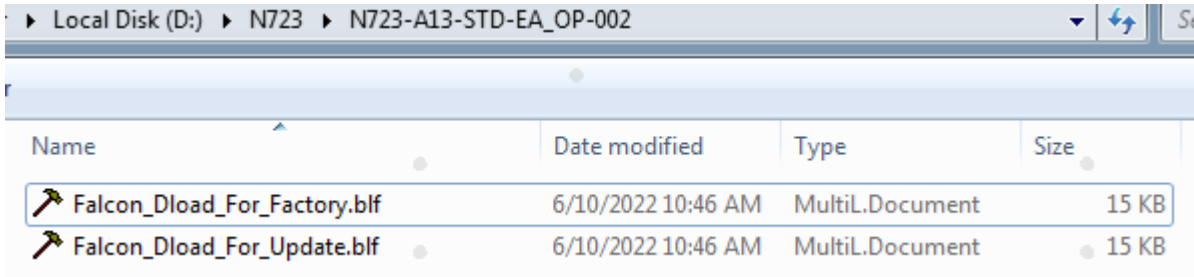

4.3 Development by Customers

In the N723 OpenCPU SDK directory, customers can refer to nwy_test_data for application development, and can create their own program files and **Makefile.mk** files in the same level directory.

The available header files are in the **/inc** directory. For specific available APIs, see *Neoway_N723-EA_OpenCPU_API_Notes*.
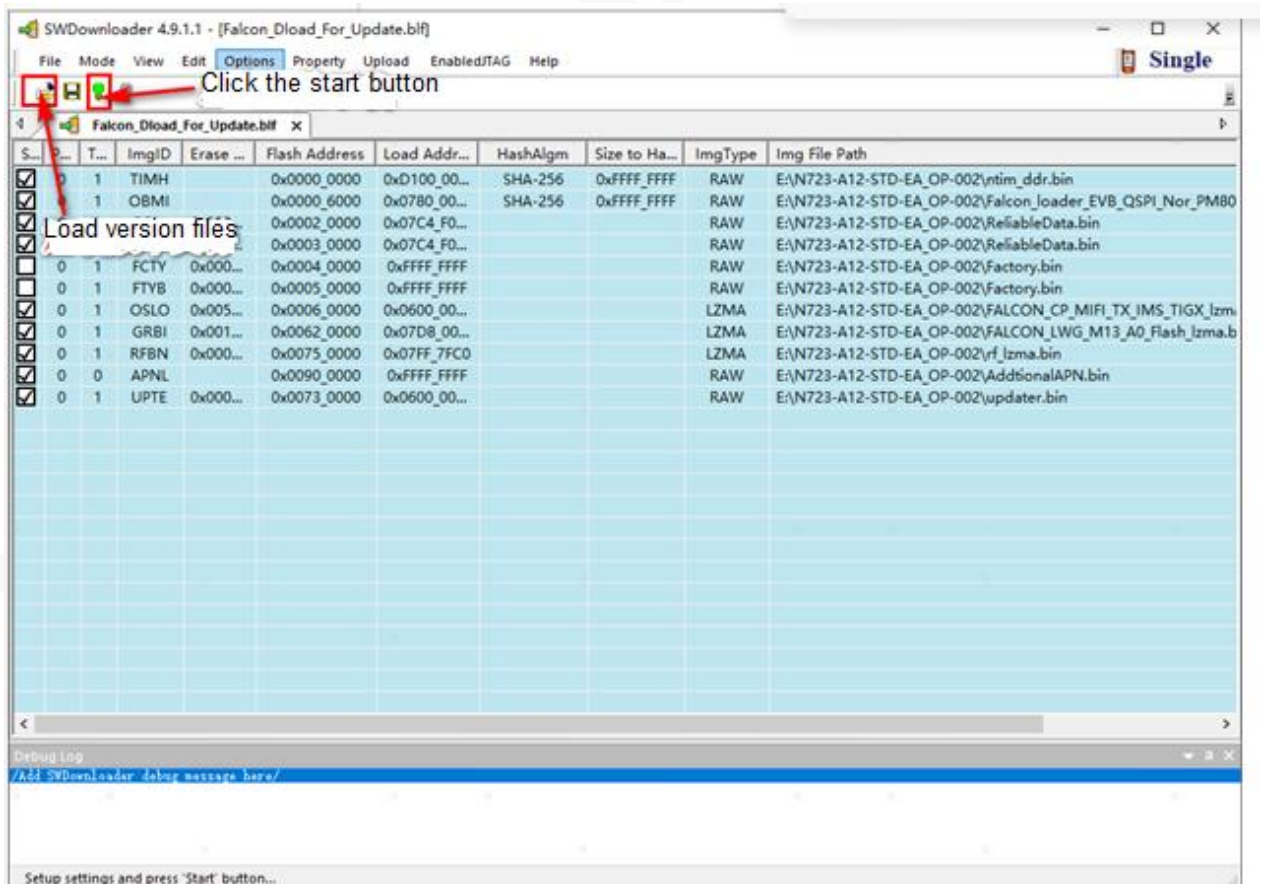
4.4 Burning

4.4.1 Software Version Burning

Step 1: Obtain the download tool SWDownloader, run **SWDownloader.exe**, and open the firmware directory of the version to be downloaded in the menu. The menu is displayed, as shown in the following figure.
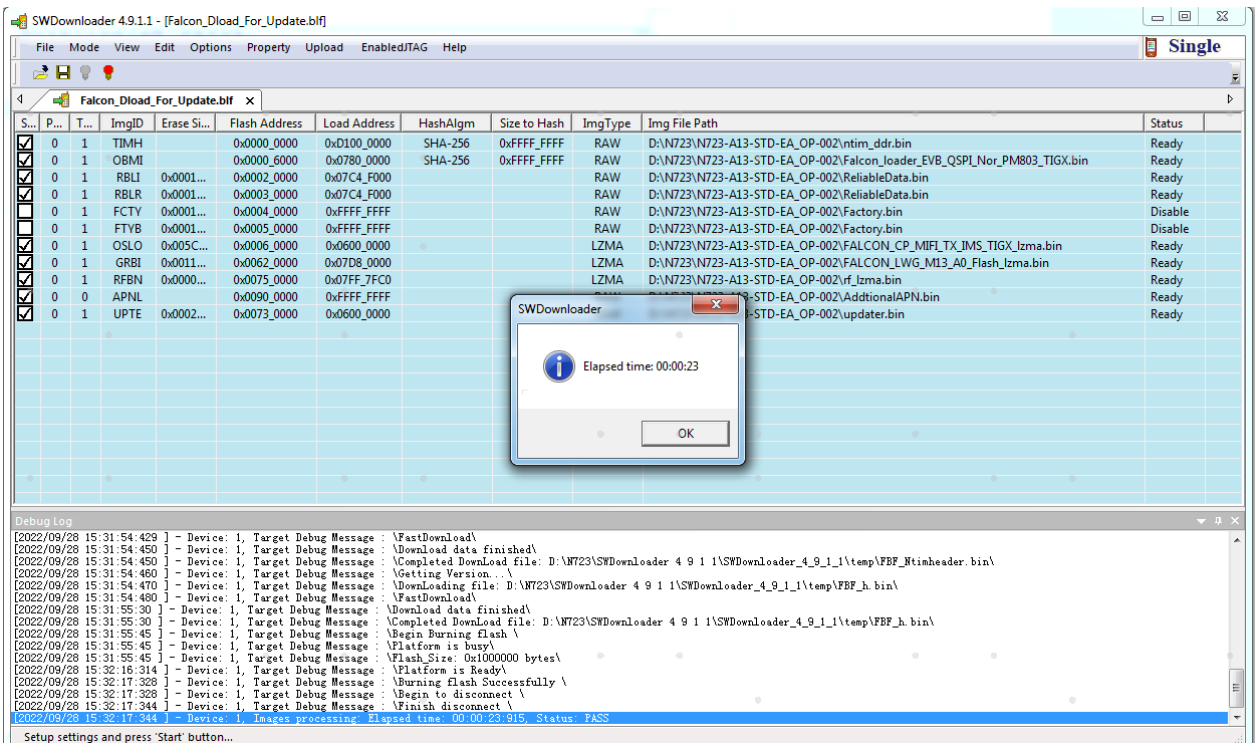

- Falcon_Dload_For_Factory.blf: Select this configuration file for factory production or full erase upgrade.
- Falcon_Dload_For_Update.blf: Select this configuration file for reserving calibration parameters for upgrades only.

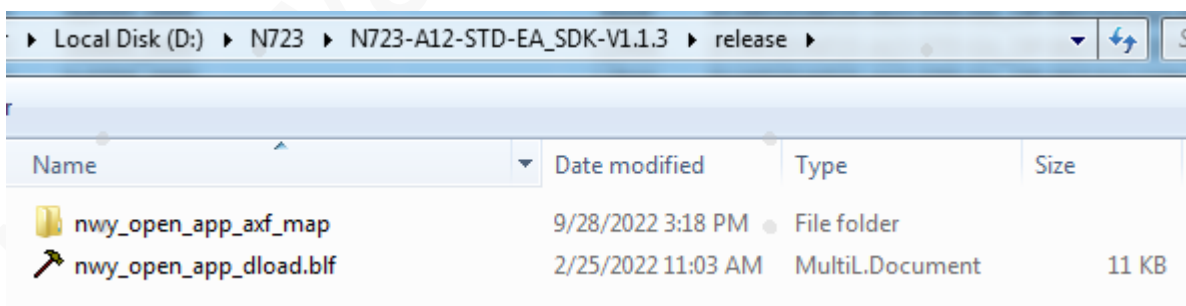**Step 2:** Click the start button.

Step 3: Send **AT$MYDOWNLOAD=1** by using the PC UART interface tool and the USB AT interface. After the command is successfully sent, the download will start automatically until the tool prompts success.
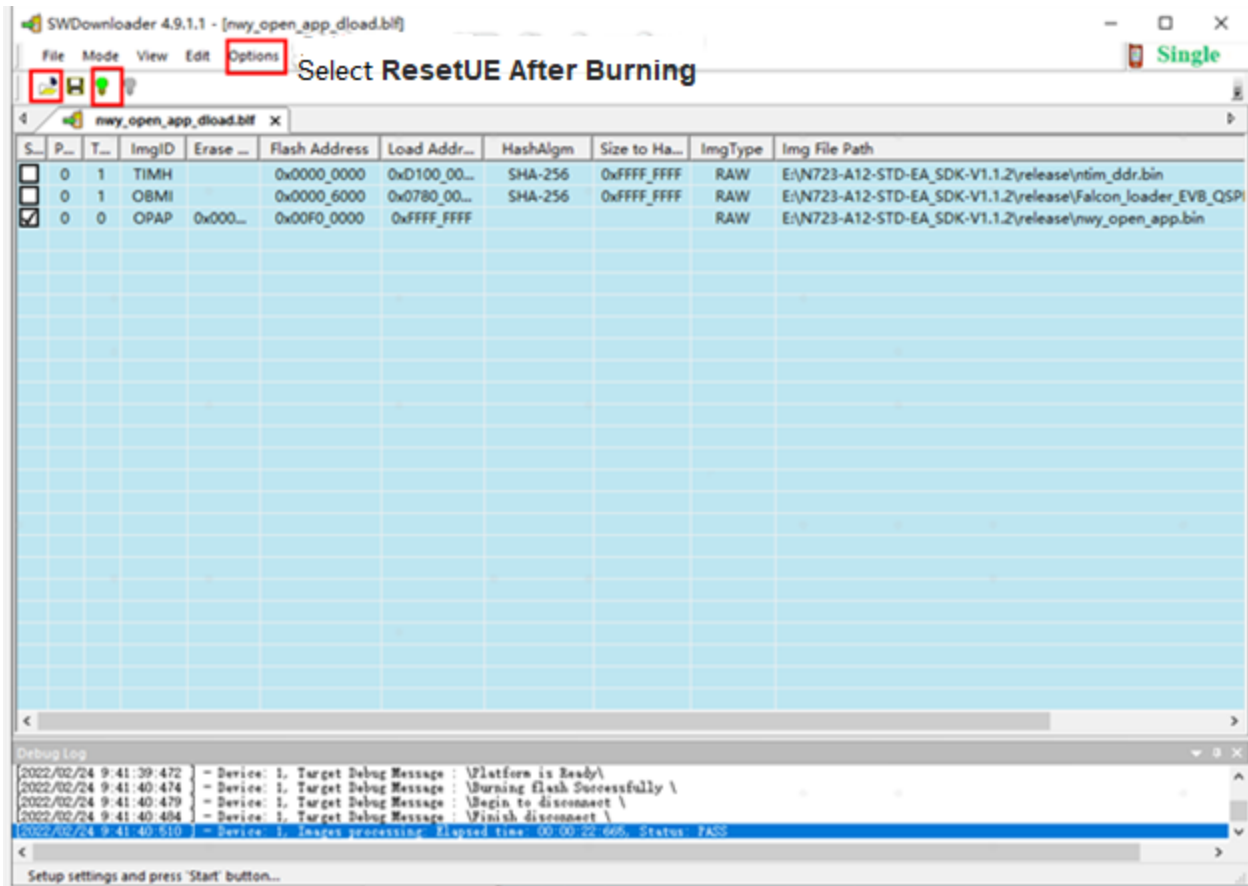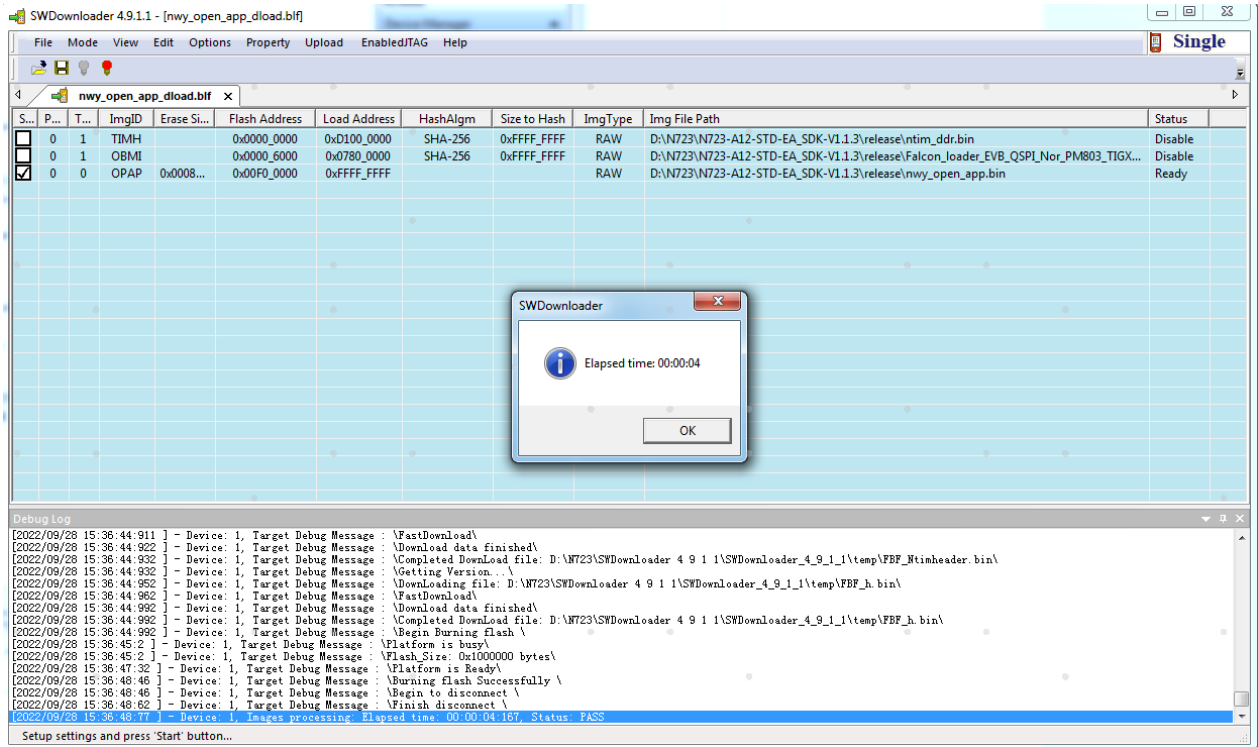

4.4.2 Customer App Burning

Step 1: Obtain the download tool SWDownloader, run **SWDownloader.exe**, and open the firmware directory of the customer app version to be downloaded in the menu. The menu is displayed, as shown in the following figure.

Step 2: In the **Options** menu, select **ResetUE After Burning**, and click the start button.

Step 3: Send **AT$MYDOWNLOAD=1** by using the PC UART interface tool and the USB AT interface. After the command is successfully sent, the download will start automatically until the tool prompts success.

If the module does not start up automatically after the download is complete, it may be that **ResetUE After Burning** is not selected in the **Options** menu. In this case, power off and then power on the module.