

N723 OpenCPU

SDK Developer Guide

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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
0		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:

SWDownloader 4911 SWDownloader	4_9_1_1 ► Driver ► Win	dows 🕨	✓ 4y S
New folder			== •
Name	Date modified	Туре	Size
\mu Drv	2021/5/21 11:13	File folder	
📅 DrvInstaller.exe	2020/12/4 14:13	Application	1,622 KB
DrvInstaller_x64.exe	2020/12/4 14:11	Application	2,221 KB

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	OpenCPUdedicatedcommissioningUARTport,usedfor 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.

N723-A12-STD-EA_SDK-V1.1.2 >			•	4 9
New folder				:==
Name	Date modified	Туре	Size	
🐌 build 🔹	2022/2/19 9:20	File folder		
퉬 inc	2022/2/19 9:20	File folder		
퉬 nwy_test_cli 🛛 🔍	2022/2/19 9:20	File folder		
퉬 tools	2022/2/19 9:20	File folder		
🚳 build_open_app.bat	2022/2/15 17:31	Windows Batch File		2 KB
👼 cmd	2022/2/15 17:31	Shortcut		2 KB

3.1.2 Compilation

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

	Directory	of D:\N7	23 \N7 23-A:	12-STD-EA_SDK-V1.1.2	
	2022/02/19	09:20 09:20	<dir></dir>		
	2022/02/19	09:20	<dir></dir>	build 1 940 build open app bat	
	2022/02/15	17:31		1,541 cmd.lnk	
	2022/02/19	09:20	<dir></dir>	nwy_test_cli	
1	2022/02/17	2 Fi	le(s)	3,481 bytes	
		6 U1	r(s) 88,2	.204,890,112 bytes free	
	D:\N723\N72	23-812-81	D-FUZDR-	-V1.1.2>build_open_app.bat nwy_test_data	

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.



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

N723-A12-STD-EA_SDK-V1.1.3 Frelease F	•		- 4 <i></i> <i></i> <i></i> <i></i>
New folder			:=: •
Name	Date modified	Туре	Size
퉬 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 <u>K</u> B
🕓 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 	5-
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:



/*	Function Definition			*/
·*·@brief·open·app·log·print				
.∗ ·*·@param·fmt·:·log·format				
eperem that they to mat				
·*·@return····:				
void nwy_open_sdk_log(cha	ar* f∎t,);			
	_			
bout				
	COM Port Satting			
	-com fort Setting			_
COM Port: 10 💌 Baudrate: 11	15200 🔽 StopBits: 🗄	1 <u>–</u> H	Parity: None	-
			dese Des	
ByteSize: 8 Flow Control	No Utrl Flow		Close Por	τ
nwy_net_connect_tcp connect ok				^
00027745:				
top send ok				
00027745:nwy_open_app_entry[195	jend			
00027750: app_entry rtn:245, app e 00027960.	ntry finish			
tcp recv:14:hello world!!!				
00037750:				
top send ok				
00039955:				
tcp recv:14:hello world!!!				
00047745:				
tcp send ok				
00048160: tan nagri14:balla marldill				
00057740:				
top send ok				
00058760:				
tcp recv:14:hello world!!!				
				~

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 *linc* 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.

Local Disk (D:) ► N723 ► N72	▼ 49 Se					
•						
Name		Date modified	Туре	Size		
Falcon_Dload_For_Factory.blf		6/10/2022 10:46 AM	MultiL.Document	15 KB		
Falcon_Dload_For_Update.blf		6/10/2022 10:46 AM	MultiL.Document	15 KB		

- 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.

2	-	Fak	on_Dload_	For_Update	.bif ×					٥
5	P	T	ImgID	Erase	Flash Address	Load Addr	HashAlgm	Size to Ha	ImgType	Img File Path
	1	1	TIMH OBMI		0x0000_0000 0x0000_6000	0xD100_00 0x0780_00	SHA-256 SHA-256	OxFFFF_FFFF OxFFFF_FFFF	RAW RAW	E:\N723-A12-STD-EA_OP-002\ntim_ddr.bin E:\N723-A12-STD-EA_OP-002\Falcon_loader_EVB_QSPI_Nor_PMB
	Loa	ad v	ersion	files	0x0002_0000 0x0003_0000	0x07C4_F0			RAW	E:\N723-A12-STD-EA_OP-002\ReliableData.bin E:\N723-A12-STD-EA_OP-002\ReliableData.bin
3	0	1	FCTY	0x000	0x0004_0000	OxFFFF_FFFF			RAW	E:\N723-A12-STD-EA_OP-002\Factory.bin
	0	1	OSLO	0x005	0x0006_0000	0x0600_00			LZMA	EXN723-A12-STD-EA_OP-002/FALCON_CP_MIFLTX_IMS_TIGX_ID EXN723-A12-STD-EA_OP-002/FALCON_CP_MIFLTX_IMS_TIGX_ID EXN723-A12-STD-EA_OP-002/FALCON_UWG_M12_A0_EAL
	0	1	RFBN	0x000	0x0075_0000	0x07FF_7FC0			LZMA	E:\N723-A12-STD-EA_OP-002\rfizma.bin E:\N723-A12-STD-EA_OP-002\rfizma.bin
đ	0	1	UPTE	0x000	0x0073_0000	0x0600_00			RAW	E:\N723-A12-STD-EA_OP-002\updater.bin
	la La									* *

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.

📲 SWDownloader 4.9.1.1 - [Falcon_Dload_For_Update.blf]											23		
F	File Mode View Edit Options Property Upload EnabledJTAG Help										Sing	le	
	• H		•									-	
4		Eale	• Diead	For Undate	bit v							b	
i c	-0	т	ImailD		Elash Address		Hash Alama	Circ to Hach	ImaTuna	a Jana Eila Dath Ctatus			
3	P	1	ImgiD	Erase SI	Flash Address	Load Address	HashAigm	Size to Hash	ImgType		Status		
1 K	0	1	IIMH		0x0000_0000	0xD100_0000	SHA-256	0xFFFF_FFFF	RAW	D:\N723\N723-A13-STD-EA_OP-002\ntim_ddr.bin	Ready		
1 K	0	1	ORWI	0.0004	0x0000_6000	0x0780_0000	SHA-250	UXFFFF_FFFF	RAW	D:\N723\N723-A13-STD-EA_OP-002\Falcon_loader_EVB_QSPI_Nor_PM803_TIGX.bin	Keady		
1 K	0	1	KELI	0x0001	0x0002_0000	0x07C4_F000			RAW	D:\N/23\N/23-A13-STD-EA_OP-002\ReliableData.bin	Ready		
11×1	0	1	KBLK	0x0001	0x0003_0000	0x07C4_F000			RAW	D:\\V/23\V/23-A13-STD-EA_OP-002\KellableData.bin	Ready		
	0	1	FUTY	0.0001	0x0004_0000	UXFFFF_FFFF			RAW	D:\\N/23\N/23-A13-STD-EA_OP-002\Factory.bin	Disable		
H	0	1	FIYB	0.00001	0x0005_0000	UXFFFF_FFFF			KAW	D:\N723\N723-A13-STD-EA_OP-002\Factory.bin	Disable		
NH N	0	1	CDDI	0x005C	0x0006_0000	0x0800_0000			LZIMA	D:\N/23\N/23-A13-STD-EA_OP-002\FALCON_CP_MIFL_IX_IWS_HGX_IZMA.bin	Ready		
NH	0	1	GKBI	0.0000	0x0062_0000	0x0708_0000			LZIMA	D:\N/23\N/23-A13-STD-EA_OP-002\FALCON_LWG_M13_A0_Flash_Izma.bin	Ready		
1 N N	0	1	ADAU	0x0000	0x0075_0000				LZIVIA	D:(10/25/10/25-A15-51D-EA_OP-002/11/2md.bin	Ready		
1 H	0 0 APNL 0.0000 0xFFF_FFF							STD EA_OP-002 (Additional APIN.bin	Ready				
	0	1	UPTE	0x0002	0x0075_0000	0x0600_0000				-STD-EA_OP-002\updater.bin	Ready		
										•			
									Elanced tim	00.00.22		_	
									ciapsed un	18:00:00:25			
									OK				
- 0								_	_				
Debi	ia Loa											ņх	
[2022	2/09/2	8 15	31:54:42	9] - Devic	e: 1, Target Del	oug Message : \U	astDownload\						
2022	2/09/2	28 15	31:54:45	0] - Devic 0] - Devic	e: 1, Target Deb	oug Message : \])ownload data : Completed Downl	finished\ load file: D:\%	723\SWD.amp1	ander 4 9 1 1\SWDawnlander 4 9 1 1\temp\EBE Ntimbooder him\			
[2022	2/09/2	28 15	31:54:46	0] - Devic	e: 1, Target Deb e: 1, Target Deb	oug Message : \(Getting Version	alla intel blur	1120 GADOWILL	oader + 5 i i Gsbownroader_+_5_i_i (temp (FDF_Rtimneader, Din)			
[2022	2/09/2	8 15	31:54:47	0] - Devic	e: 1, Target Del	ug Message : \	ownLoading fil	Le: D:\N723\SWI)ownloader 4	9 1 1\SWDownloader_4_9_1_1\temp\FBF_h.bin\			
[2022	2/09/2	10 15 18 15	31:54:48] - Device	e: 1, larget Deb : 1. Target Debu	oug message : \l 1g Message : \D	wnload data f:	ini shed`					
[2022	/09/	8 15	31:55:30] - Device	: 1, Target Debu	ng Message : \C	ompleted DownL	ad file: D:\N7	23\SWDownlo	ader 4 9 1 1\SWDownloader_4_9_1_1\temp\FBF_h.bin\			
12022	2/09/2 2/09/2	28 15 28 15	31:55:45	J - Device	1, Target Debu 1 Target Baby	ig Message : \B Message : \P	egin Burning f.	Lash \ z\					
[2022	/09/2	8 15	31:55:45] - Device	: 1, Target Debu	ig Message : \F	lash_Size: 0x10	000000 bytes\		• • •			
[2022	2/09/2	28 15	32:16:31	4] - Devic	e: 1, Target Deb	oug Message : \	Platform is Re-	ady\ Suggesterller					
[2022	2/09/2	28 15	32:17:32	o j - Devid 8] - Devid	se: 1, larget Det se: 1, Target Det	oug message : \ oug Message : \]	Begin to discor	anect \				E	
[2022	2/09/2	8 15	32:17:34	4] - Devic	e: 1, Target Del	oug Message : \	inish disconn	ect \	2100	· · · ·			
12022	:/09/:	8 15	:32:17:34	4 J - Devic	e: 1, Images pro	cessing: Elaps	ed time: 00:00	23:915, Status	E PASS			*	
Set	Setup settings and press 'Start' button												

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.

► Local Disk (D:) ► N723 ► N723-A12-STD-EA	SDK-V1.1.3 ► release	e 🕨 ,	- 4- 5
r			
Name *	Date modified	Туре	Size
Inwy_open_app_axf_map nwy_open_app_dload.blf	9/28/2022 3:18 PM 2/25/2022 11:03 AM	File folder MultiL.Document	11 KB

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



	5	WDo	wnlo	oader 4.9	.1.1 - (nwy	open app dload	.ыŋ					– 🗆 X	
1	Fil	. 1	lode	View	Edit Opti	ons	Deset		Durmin			Single	
Î	a de la comercia de l	H	•	8		Select	Resetu	EAtter	Burning	1			i
4	/	-	nwy	r_open_ap	p_dload.bif	×						Þ	ī
S	1	P	T	ImgID	Erase	Flash Address	Load Addr	HashAlgm	Size to Ha	ImgType	Img File Path		1
]	0	1	TIMH		0x0000_0000	0xD100_00	SHA-256	OxFFFF_FFFF	RAW	E:\N723-A12-STD-EA_SDK-V1.1.2\release	ntim_ddr.bin	
E		0	1	OBMI	0.000	0x0000_6000	0x0780_00	SHA-256	OxFFFF_FFFF	RAW	E:\N723-A12-STD-EA_SDK-V1.1.2\release	Falcon_loader_EVB_QSI	PI
E	-	0	0	OPAP	0x000	0x00F0_0000	007777_7777			RAW	E:\N723-A12-S1D-EA_SDK-V1.1.2\release	nwy_open_app.bin	
E													
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0	bug	Log										w 8.5	3
22	122/ 122/	02/2	4 9:4	41:39:472 41:40:474	- Device	e: 1. Target Debu e: 1. Target Debu	ig Message : \2) ig Message : \20	atform is Rea mning flash S	dy\ wroessfully \				^
22.2	122/	02/2	4 9:4	41 40 479	- Device	e: 1, Target Debu	g Message : \Be	gin to discon	nect \				
18	227	274	4 9:4	41:40:510] - Device	e: 1, Inages pro-	essing: Elepsed	time: 00.00:	22:665, Status	TASS			v
<					Marcal Inc.							>	
	recup	b 244	ungs	and press	Start Dutto	in							

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.



	swD	ownloa	ader 4.9.1.1	- [nwy_oper	n_app_dload.blf]		_				_ 0	23
	File	Mod	le View	Edit Optio	ons Property (Ipload Enabled	IJTAG Help				Sing	gle
I	2											Ŧ
-	-	📒 nw	vy_open_ap	p_dload.blf	×					0 0 0		Þ
	S P.	. T	ImgID	Erase Si	Flash Address	Load Address	HashAlgm	Size to Hash	ImgType	Img File Path	Status	
	0	1	TIMH		0x0000_0000	0xD100_0000	SHA-256	0xFFFF_FFFF	RAW	D:\N723\N723-A12-STD-EA_SDK-V1.1.3\release\ntim_ddr.bin	Disable	
	7 0	0	OPAP	0x0008	0x0000_8000	0xFFFF_FFFF	5HA-230	UXFFFF_FFFF	RAW	D:\N723\N723-A12-STD-EA_SDK-V1.1.3\release\raicon_loader_evb_QSP1_Nor_PM805_11GA D:\N723\N723-A12-STD-EA_SDK-V1.1.3\release\nwy_open_app.bin	Ready	
ľ	-				-	-					ĺ,	
1	SWDownloader SWDownloader											
									Elapsed tin	ne: 00:00:04		
										<u>OK</u>		
ľ	ebua L	ρα									<u> </u>	- 4 X
Ę	2022/09	/28 15	5:36:44:91	1] - Devic	e: 1, Target De	oug Message : \	astDownload\	···· • • • •				
ļ	2022/09	/28 15	5:36:44:93	2] - Devic 2] - Devic	e: 1, larget De e: 1, Target De	oug Message : V oug Message : V	Completed DownI	.oad_file: D:\M	723\SWDownl	oader 4 9 1 1\SWDownloader_4_9_1_1\temp\FBF_Ntimheader.bin\		
ļ	2022/09	/28 15	5:36:44:95	2] - Devic 2] - Devic	e: 1, larget De e: 1, Target De	oug Message : V oug Message : \	JownLoading fil	e: D:\N723\SWI	lownloader 4	9 1 1\SWDownloader_4_9_1_1\temp\FBF_h.bin\		
ļ	2022/09	/28 15	5:36:44:96 5:36:44:99	2] - Devic 2] - Devic	e: 1, Target De e: 1, Target De	oug Message : \. oug Message : \.	(astBownLoad) Download data f	inished\				
	2022/09	/28 15	5:36:44:99 5:36:44:99	2] - Devic 2] - Devic	e: 1, Target De e: 1, Target De	oug Message : \ oug Message : \]	Completed DownL Begin Burning f	load file: U:A lash \	1723\SWDownL	oader 4 9 1 1\SWJownLoader_4_9_1_1\temp\FBF_h.bin\		
	2022/09	/28 15 /28 15	5:36:45:2 5:36:45:2] - Device:] - Device:	1, Target Debu 1, Target Debu	g Message : \Pl g Message : \Fl	attorm is busy\ ash_Size: 0x100	0000 bytes\				
	2022/09	/28 19	5:36:47:32 5:36:48:46] - Device] - Device	: 1, Target Deb : 1, Target Deb	1g Message : \P: 1g Message : \B	latform is Read mning flash Su	ly∖ accessfully \		•		
	2022/09	/28 15	5:36:48:46 5:36:48:62] - Device] - Device	: 1, Target Deb : 1, Target Deb	1g Message : \B 1g Message : \F	egin to disconm inish disconnec	ect \ t \				
-	2022/09	/28 19	5:36:48:77] - Device	: 1, Images pro	cessing: Elapse	1 time: 00:00:0	4:167, Status:	PASS			-
	Setup settings and press 'Start' button											

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.