Harmony OS system panel embedded into KNX system

Introduction

This document demonstrates the installation of the Harmony OS system mirror image using STM32CubeProgrammer and MobaXterm, the execution of the smart home UI with DevEco Studio software, and the communication with the KNX system.

It provides detailed steps for the board firmware operation and includes specific test examples using the ETS tool to test the panel function.

1 Overview

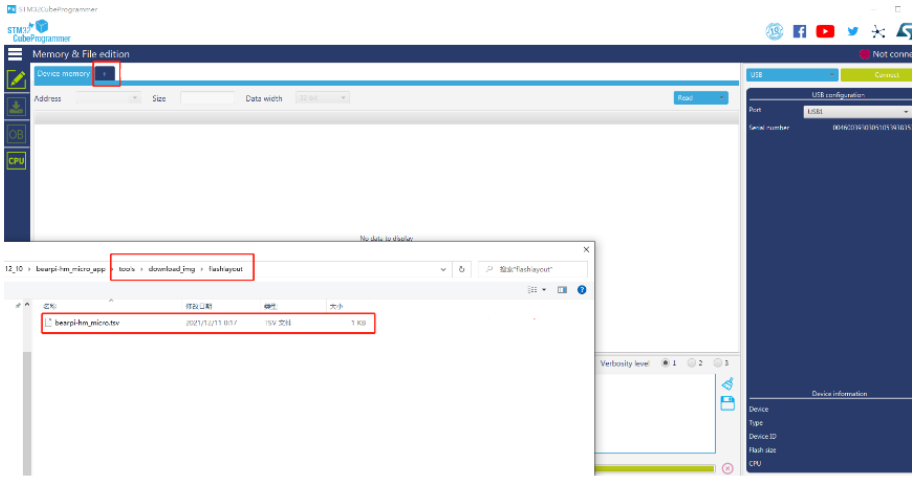
This panel is based on the BearPi-HM micro development board operating the OpenHarmony system board. For embedding the KNX system, it is necessary to develop an API to connect with other devices. The HarmonyOS system runs with the driver and API interface between the physical and application levels. The interface can be called to transmit and receive data from other devices. Download the OS by following these steps:

- Turn the DIP switch of the development board to ”000” programming mode and press the RESET button

Figure 1. Panel view

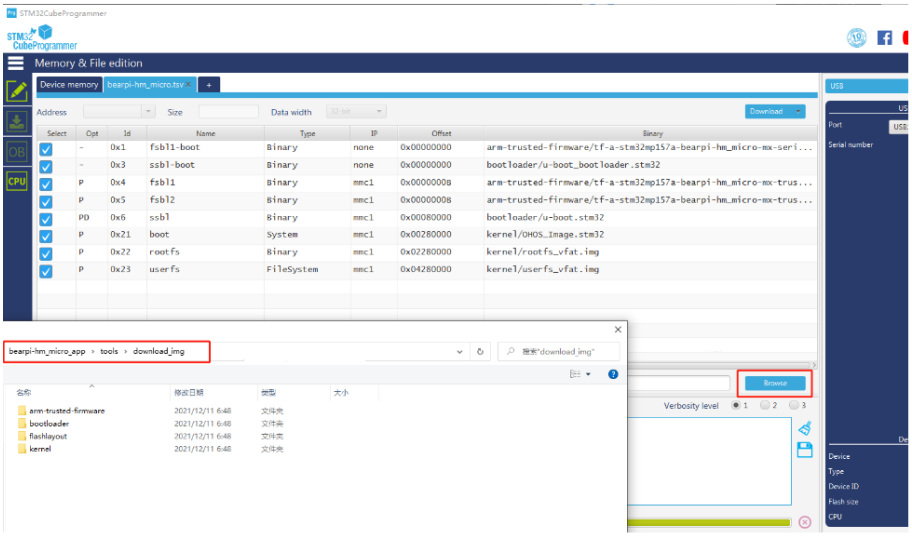
- Open the STM32CubeProgrammer tool and choose the USB-burning way, click the refresh button and click “connect”
- Click the “+” button on the STM32Programmer tool and then choose the burning configuration file “tvs”

Figure 2. Image configuration download



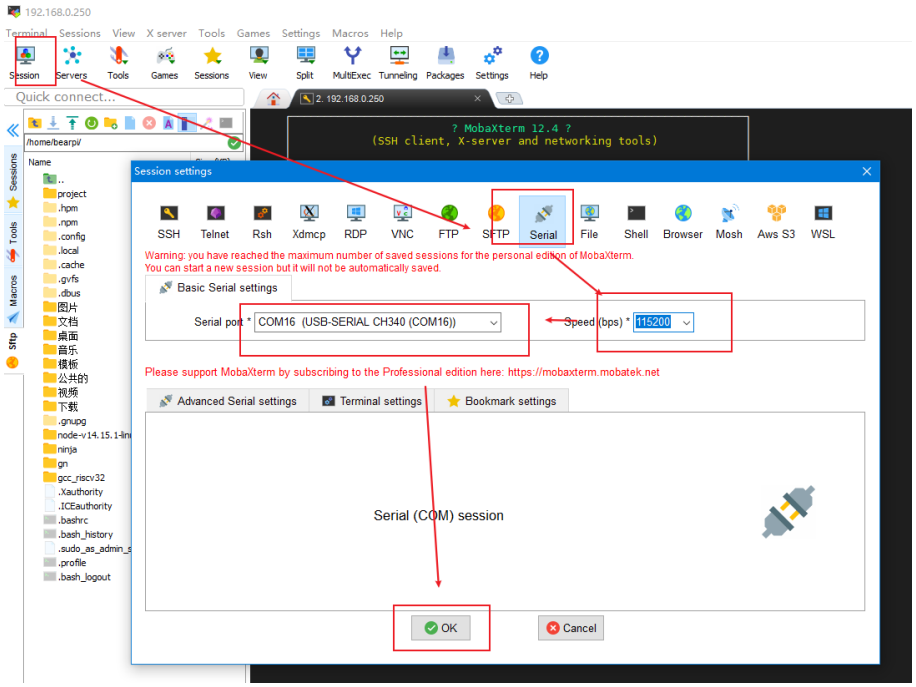
- Then click the browse button and choose the image file path

Figure 3. Image download



- Click the download button and start burning and wait for the end.
- Open the MobaXterm software, click the session and serial button
- Set port and speed

Figure 4. COM configuration



- Turn the DIP switch to “010” mode of the panel, and press the RESET button.
- Wait for log end of the run and press the enter button to go into shell

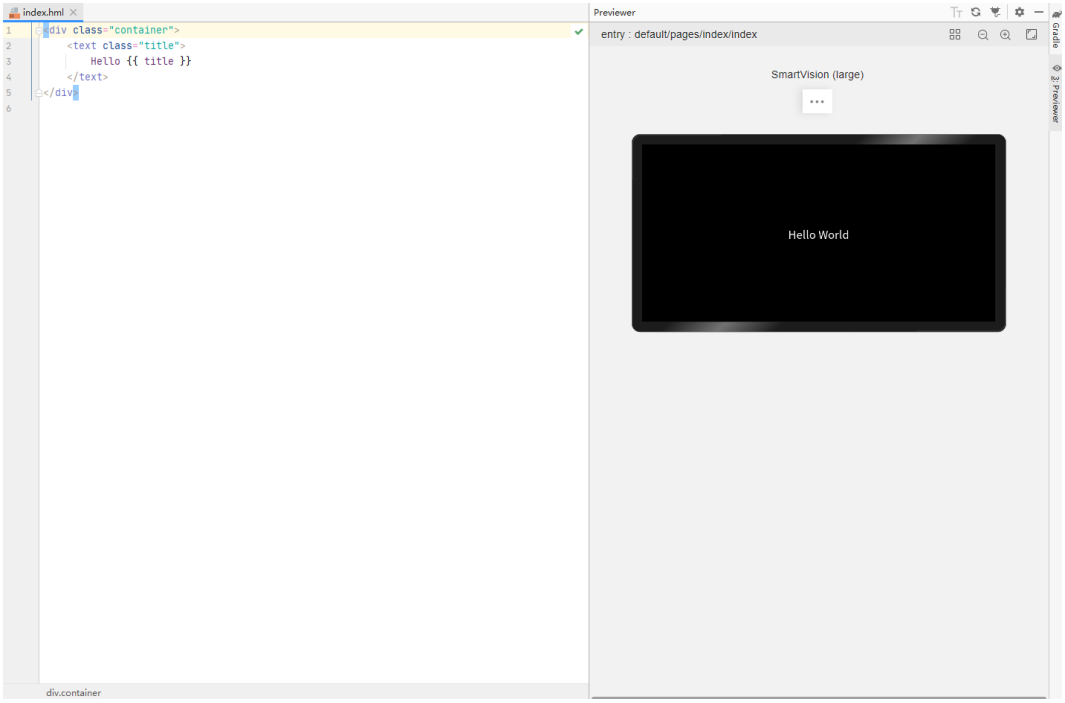
2 UI install and operation

The UI is designed to meet the need of the KNX system including home page, lighting control, curtain control, RGB light, HVAC control and sensor control page. The UI designing tool is DevEco studio. The following steps are processed:

- Open the tool and choose an empty ability project. Then configure the project, set the type as application, choose the language JS and set the device type as smart vision. Next the project displays three files in the index directory including CSS, HML, and JS. The CSS file is aim to adjust the location and size of the element. The HML file is aimed at layout page elements. The JS file is aimed at designing functions.

After these steps, the development interface and program interface will display at the same time. So, the development will be easier.

Figure 5. UI development interface



- Compile the code to hap file before downloading it to the panel. And it is necessary to set some parameters. Set OhosBuild variants on the bottom left of the windows and choose release mode, then click the build->build Hap(s)/App(s)->build Hap(s). Get the hap file after the building process.
- The next step is installing the HAP application:
  - Press the RESET button on the panel board.
  - When you see the message “Hit any key to stop autoboot”, press the [Enter] key.
  - A hint displays.
  - Input the command `ums 0 mmc 1`.
  - Several U disks appear in the windows.
  - Ignore the format and choose the directory below.
  - Copy the HAP file into the directory.
  - Restart the panel board.

Figure 6. **Uboot phase**

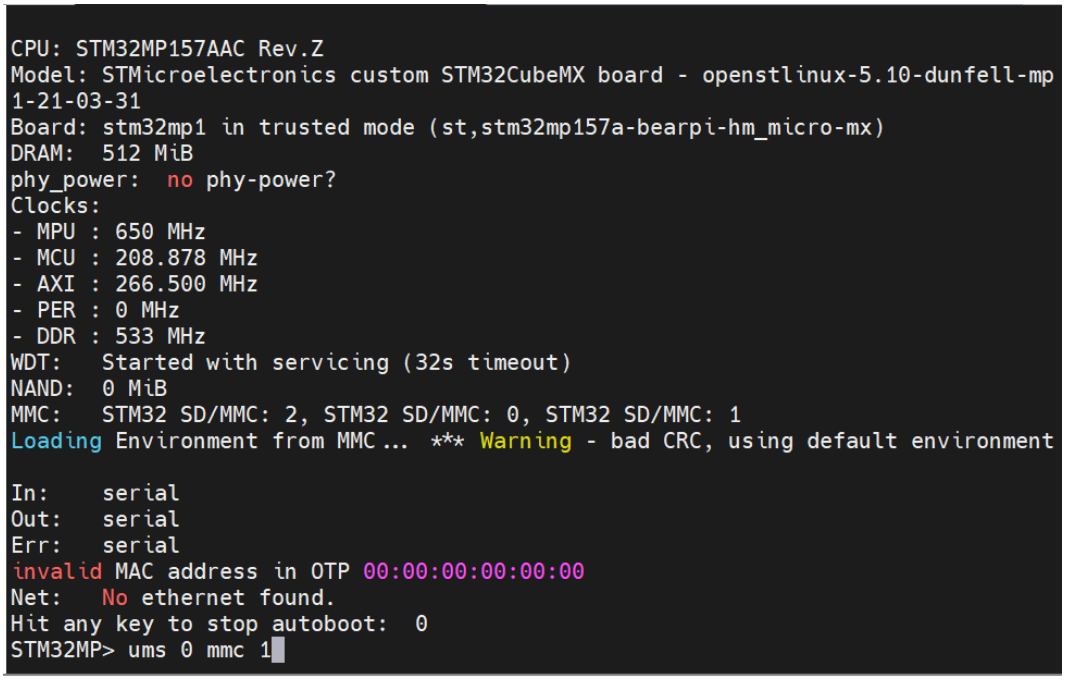
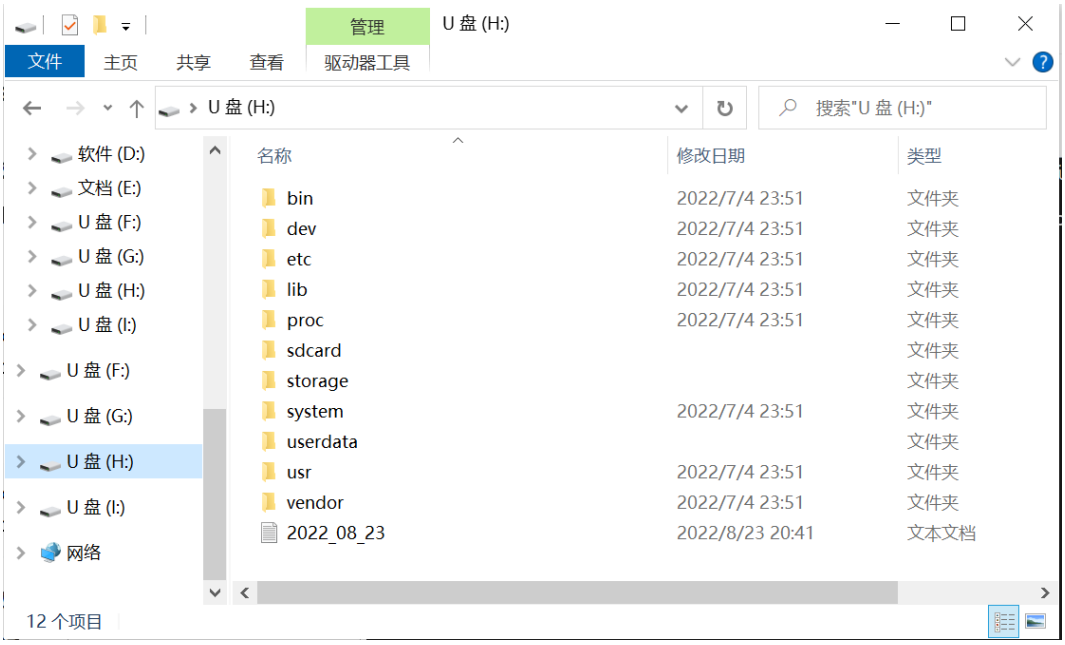


Figure 7. **Mount file phase**



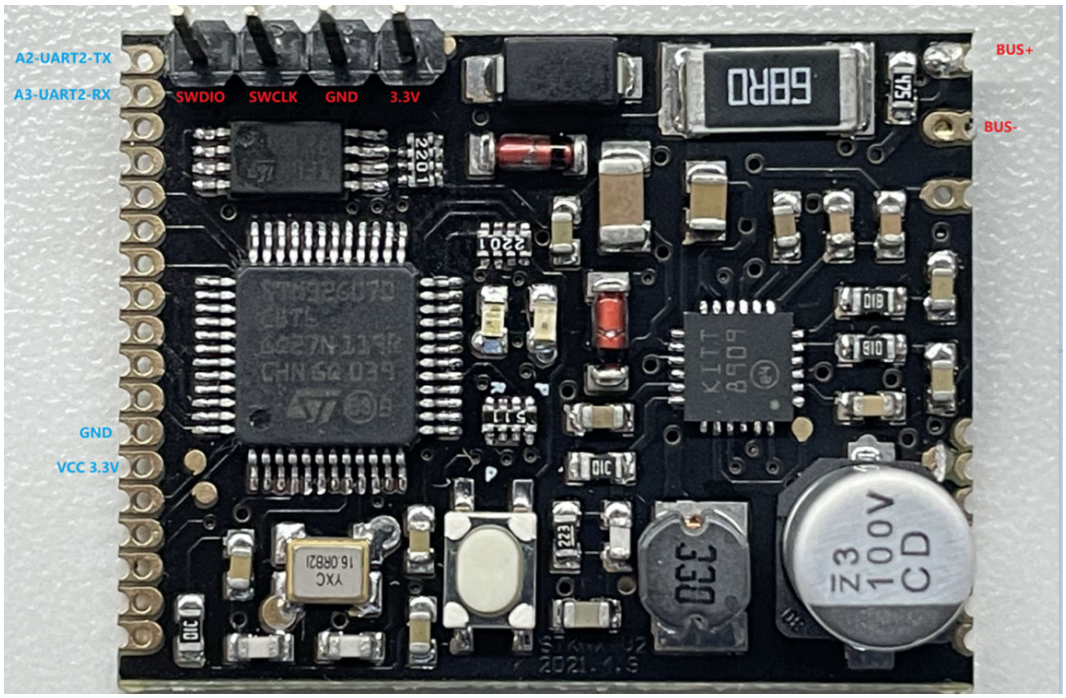
- Input command line “./bm set –s disable”,”./bm set –d enable”,”./bm install –p xxxx.hap”, the hap file is built file before, and xxx is a special name. Click the app image on the panel to access different function pages on the home page. The interface is shown below:

Figure 8. **User interface**

3 KNX communication

It is necessary to link the KNX module to the Harmony OS panel to realize KNX communication. KNX module is as below. Communication between panel and KNX module uses UART. Connect the VCC, GND, TX, RX to the panel pins. Connect the BUS+ and BUS-with KNX power then download the hex file with the SWD port and use the ETS tool to download the database into the KNX module.

Figure 9. KNX board

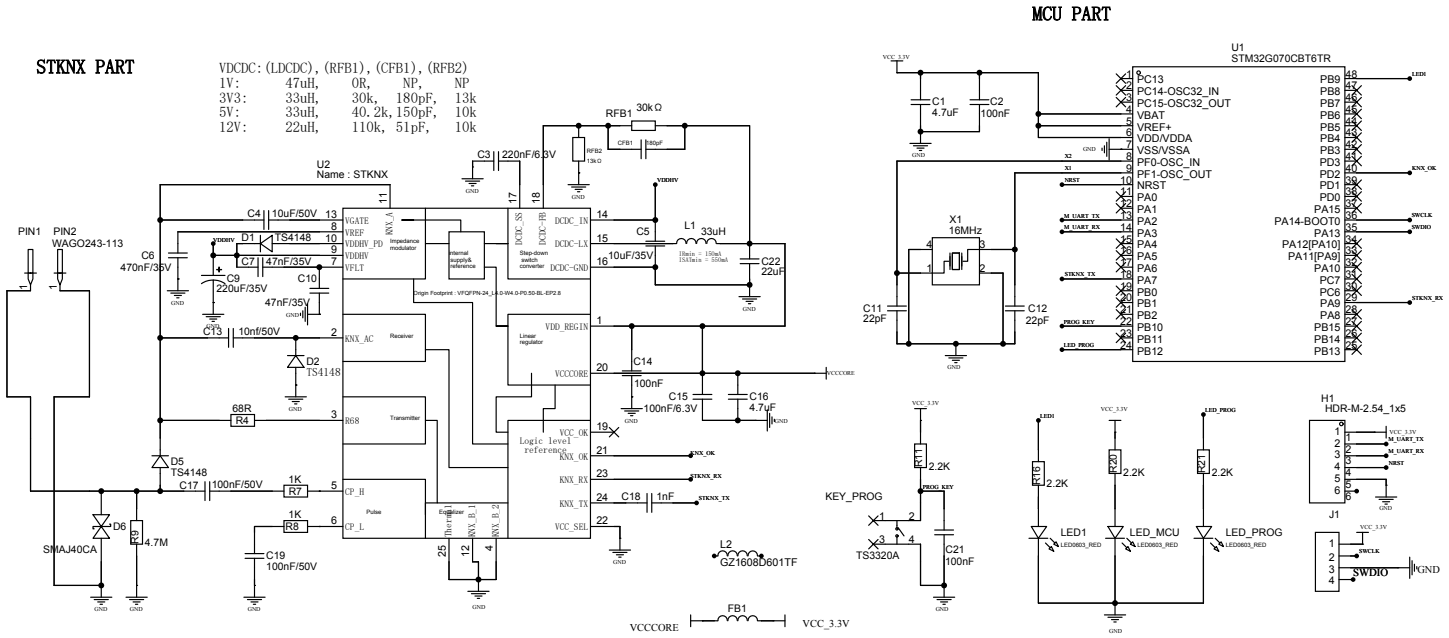


Up to now, operate the application interface and send data to KNX bus and corresponding group items are controlled and the status is displayed in the panel when KNX bus appears item status updates. The following is the function operation interface.

Figure 10. Function interface

4 Schematic diagrams

Figure 11. **STDES-HARMONYKNX circuit schematic**



5 Bill of materials

Table 1. **STDES-HARMONYKNX bill of materials**

Item	Q.ty	Ref.	Part / Value	Description	Manufacturer	Order code
1	2	C1,C16	4.7uF		SAMSUNG	CL10A475KO8NNNC
2	3	C2,C14,C21	100nF		YAGEO	CC0603KRX7R9BB104
3	1	C3	220nF/6.3V		SAMSUNG	CL10B224KA8NNNC
4	1	C4	10uF/50V		SAMSUNG	CL31A106KBHNNNE
5	1	C5	10uF/35V		SAMSUNG	CL31A106KBHNNNE
6	1	C6	470nF/35V		SAMSUNG	CL21B474KBFNNNE
7	2	C7,C10	47nF/35V		SAMSUNG	CL10B473KB8NNNC
8	1	C9	220uF/35V		PANASONIC	EEET1H221GP
9	2	C11,C12	22pF		SAMSUNG	CL10C220JB8NNNC
10	1	C13	10nf/50V		FH	0603B103K500NT
11	1	C15	100nF/6.3V		YAGEO	CC0603KRX7R9BB104
12	2	C17,C19	100nF/50V		YAGEO	CC0603KRX7R9BB104
13	1	C18	1nF		SAMSUNG	CL10B102KB8NNNC
14	1	C22	22uF		muRata	GRM31CR61E226KE15L
15	1	CFB1	180pF		TDK	CGA3E2C0G1H181JT0Y0N
16	3	D1,D2,D5	TS4148		ST	LL4148
17	1	D6	SMAJ40CA	SMA	ST	SMAJ40CA-TR
18	1	FB1	600Ω@100MHz		Sunlord	GZ1608D601TF
19	1	H1	HDR-M-2.54_1x5		Ckmtw	210S-1*5P L=11.6MMGold-plated black
20	1	J1	HDR-M-2.54_1x4		LCSC	C124378
21	1	KEY_PROG	TS3320A		SHOU HAN	TS3320A
22	1	L1	33uH		TDK	VLS6045EX-330M
23	1	L2	GZ1608D601TF		Sunlord	GZ1608D601TF
24	3	LED1,LED_MCU,LED_PROG	LED0603_RED		EVERLIGHT	19-217/R6C-AL1M2VY/3T
25	2	PIN1,PIN2	WAGO243-113		WAGO	WAGO243-113
26	1	R4	68R		YAGEO	AC2512FK-0768RL
27	2	R7,R8	1K		UNI-ROYAL	0603WAF1001T5E
28	1	R9	4.7M		UNI-ROYAL	0603WAF4704T5E
29	4	R11,R16,R20,R21	2.2K		UNI-ROYAL	0603WAF2201T5E
30	1	RFB1	30kΩ		Viking	AR03BTCX3002
31	1	RFB2	13kΩ		YAGEO	RT0603BRB0713KL
32	1	U1	STM32G070CBT6TR	LQFP 48 7x7x1.4 mm	ST	STM32G070CBT6TR
33	1	U2	STKNX	QFN-24L	ST	STKNX
34	1	X1	16MHz		EPSON	X1E000021011900

6 Reference design warnings, restrictions and disclaimer

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Revision history

Table 2. **Document revision history**

Date	Revision	Changes
21-Oct-2024	1	Initial release.

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