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Horizon Robotics

Horizon Update Tool Manual

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Revision History

This section tracks the significant documentation changes that occur from release-to-release. The following table lists the technical content changes for each revision.

Revision	Date	Description
0.1	2020-04-01	Horizon Update Tool Manual
0.2	2020-04-16	Add some instruction Modify errors in document Applicable update tool v0.7.1
0.3	2020-08-08	Change the fastboot download mode, cancel the file search mode, and add disk.img upgrade Added a description of the multifunction check box 2 Adds a description of a new field in the configuration file Use the download tool V0.7.4
0.4	2020-10-20	Add security chip identification method
0.5	2020-11-10	Add a statement that the content may not be the same as what was actually in the upgrade tool in chapter 3
1.0	2021-02	Release Document

Contents

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1 Update Tool Introduction

1.1 Basic Operation

The update tool supports windows 64 bit system, Mac OS system and Ubuntu 14.04 and above

Users download to the project file in the form of compressed package, which needs to be decompressed in the corresponding platform

After unzipping, open the file:

1. Windows Platform: double click hbupdate.exe to open upgrade tool
2. Mac OS platform: need sudo right to run /hbupdate.app/Contents/MacOS/hbupdate i n the terminal
3. Linux platform: need sudo right to run /hbupdate-Linux/hbupdate in the terminal

If all the previous options are configured properly. Click "Start" button to start upgrade.

Parameter selection will be described later in this chapter. Different downloading methods and corresponding parameter selection will be described in Chapter 2

The main interface is as follows:

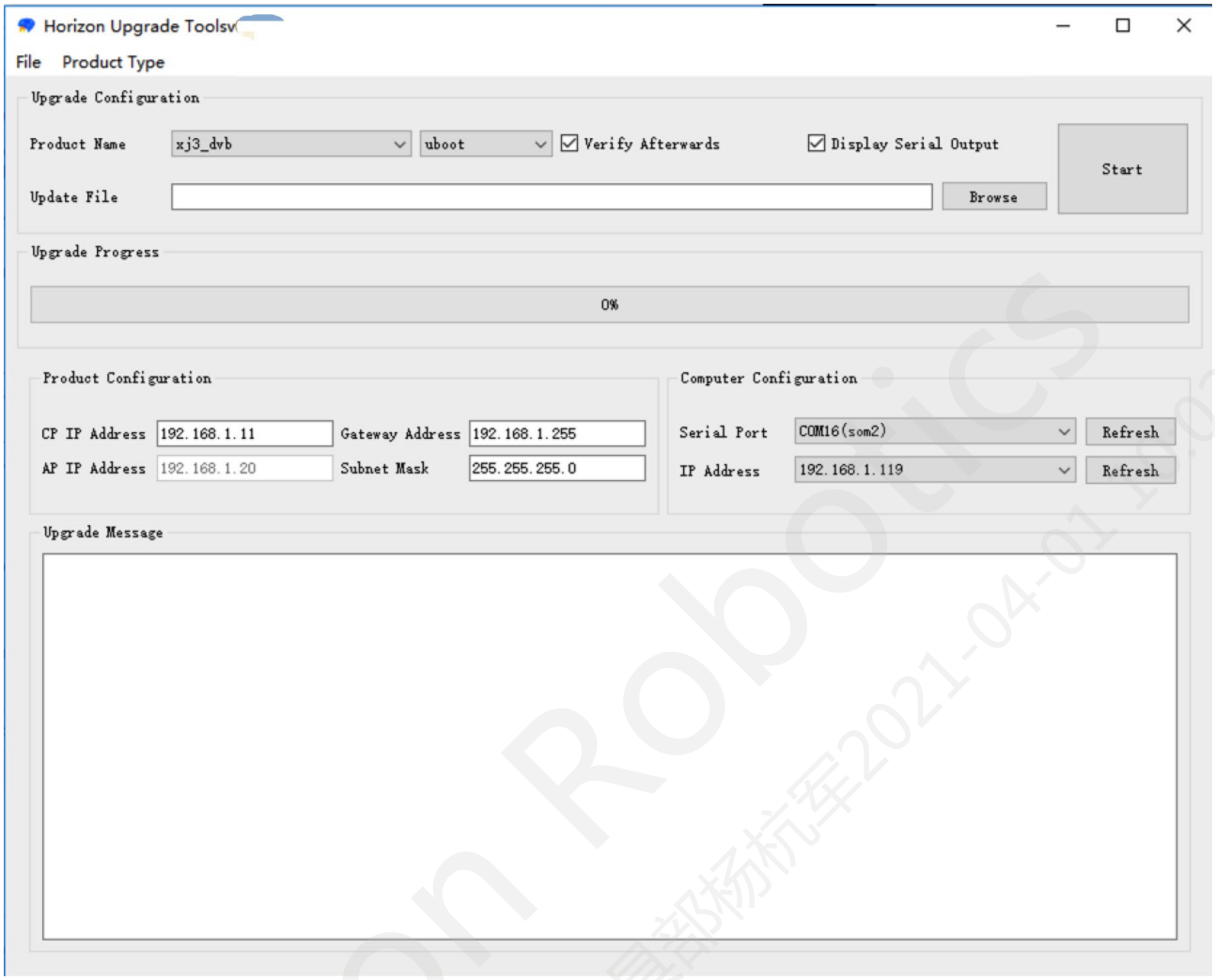

Figure 1-1 Main Interface Diagram

1.2 Menu Introduction

The menu part is shown in Figure 1-2

Figure 1-2 Menu Diagram

Menu includes: “File” and “Product Type”

“File” include:

1. “Language Switch Button” - you can switch between "Chinese" and "English".

2. “Configurations Save Button”- save the current interface. Opening the software next time, all configurations are the same as before.
3. “Exit Button” - shut down the software.

“Product Types” include: "Xj3" series products. After checking, the corresponding sub product name will fill into “Producct name” combobox.

1.3 Upgrade Configuration Introduction

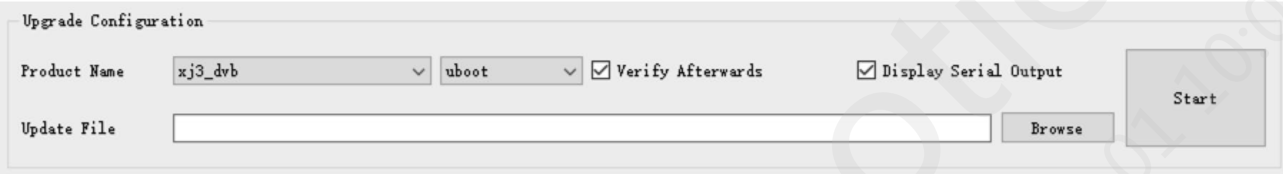

Figure 1-3 Upgrade Configuration Diagram

Product Name

Select your own board and connect them accordingly.

Upgrade Mode

Different product support different upgrade mode. Now support: "ota", "uboot", "uart", "fastboot"

Verify Afterwards

This option is used for U-Boot and UART mode only.

If checked, the tool will send the board to reboot to verify if the board can boot into Linux Shell. If successfully boot into Linux shell, upgrade success, otherwise failure.

If not checked, please verify upgrade manually.

Display Serial Port Output

If checked, the serial output from the board will be displayed under “Upgrade Message”. The messages displayed can be used to debug.

Multi-function Combbox

After selecting the “uart” upgrade mode, you can select the DDR type of the product or the boot related configuration file launched by the serial port. See Chapter 3 for details

多功能复选框 2:

After selecting the “uart” or “uboot” upgrade mode, you will be prompted to select file transfer mode. You can select four modes: “tftp”, “uart”, “fastboot”

After selecting “ota” upgrade mode, you will be prompted to select file transfer mode. You can select four modes: “tftp”, “sftp”, “socket”, “adb”

Upgrade File

Click “Browse” Button to select files used for upgrade.

Start Upgrade

If all the previous options are configured properly. Click “Start” button to start upgrade.

Time required for upgrade is determined by image size and upgrade mode. After upgrade finished, a message box will inform the user if the upgrade has succeeded. Please refer to the messages in “Upgrade message” for debug information if upgrade failed.

1.4 Product Configuration Introduction

Figure 1-4 Product Configuration Diagram

Product Configuration

- CP IP Address

Configure the AP or CP IP address accordingly. Based on your product selected, only one field will be available to you. Make sure PC can reach your product by that address.

Note：Do not manually configure your PC IP address to start with“169.254.”

- AP IP / MAC Address

If the product has a network port at the AP fill in the IP address of the AP here. You need to make sure that the computer can access the board through this IP address.

If the product does not have an AP device, and select "uart" or "uboot" upgrade mode, this input box is used to set MAC address, in the format *:*:*:*:*:* , as in 00:05:01:02:03:04

Note：Do not manually configure your PC IP address to start with“169.254.”

- Subnet Mask

If you are connecting to CP by internet, fill in the subnet mask of CP. If you are connecting AP by internet, this is not required and not configurable.

- Gateway Address

If you are connecting to CP by internet, fill in the gateway address of CP. If you are connecting AP by internet, this is not required and not configurable.

Computer Configuration

- Serial

Select the serial port appeared after you connect your CP to computer. If the serial port is not displayed, use “refresh” button to update the list.

If upgrade mode selected is “OTA”, at same time, chose “tftp”\”sftp”\”socket” in Multi-function Combobox, please make sure to choose “N/A” to indicate serial port not used. Under OTA mode, all upgrade is done through internet.

If the upgrade mode is "fastboot" and the serial port is forced to "N/A", the CP terminal will be operated through the USB cable.

- IP Address/adb device/ fastboot device

If you select fastboot mode or ota + adb mode, select the corresponding adb or fastboot device, Otherwise select the IP address of the computer network card your product is connected to. If your IP address is not listed, use “Refresh” button to update the list.

2 Download Mode Introduction

The update tool supports windows x64 system, MacOS system, Ubuntu 14.04 and above system.

Update tool support upgrade types include "ota", "uboot", "uart", "fastboot"

2.1 Precautions For Initial Use

Notice

1. Please do not include Chinese characters in the decompression path of the update tool
2. The serial port cannot be opened repeatedly, There is a prompt for it after clicking "start download". There may be a situation that the serial port can be opened repeatedly under Ubuntu system, but it will still lead to the failure of download.
3. The update tool will start a tftp service. If the tool cannot apply to port 69, the system software will shut down after an error is reported. At this time, it needs to check (1) whether there are other applications in the system to open the tftp service, or whether the system has its own tftp service, (2) whether to open the update tool multiple times.
4. Most download modes require a network. Please make sure that the device IP and PC IP are in the same network segment. There cannot be duplicate IP in the network segment, and the IP mask on both sides must be the same.

Suggestion

1. When the system can be fully started, the fastboot mode is recommended, which is the fastest way, followed by ota or uboot mode.
2. Only use uart mode when the system is unable to bring up. Pay attention to determine the type of DDR and whether the chip is encrypted.
3. There will be a verification for the image between each partition of the image. Upgrade a single partition separately is not recommended. It is recommended to upgrade a complete image
4. In the case of using network try to connect your computer and product directly with a cable.
5. Check “Display Serial Port Output” as much as possible. If the upgrade fails, it is convenient for troubleshooting.

   Note: The security product is realized by burning the internal EFuse. After connecting the serial port, the following fields will be printed in the power-on log. The lower-case "o" in the red circle is the normal product, and the capital "O" is the security product.

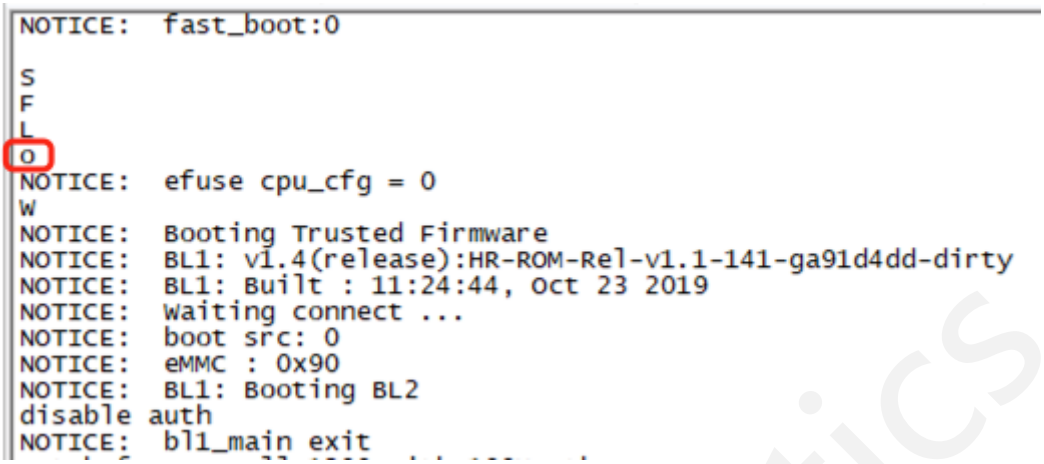

Figure 2-1 romcode power-on log

2.2 “uart” / “uboot” upgrade mode

Brief Description

The principle of Uart download mode is that the PC first sends UART download command through serial port to make X3 chip enter uart download mode, then writes spl and uboot binary files into X3 chip, and then enters uboot download image file by TFTP protocol , then write the required image into EMMC.

The uboot download method is to download the required image in DDR through TFTP protocol and then write it to EMMC.

After entering the uboot, you can download the complete image of the system or the partition image of the uboot \ boot \ system separately. Since the uart download mode is usually used when the system is unrecoverable, the download image is limited to the complete image.

Connection Mode And Equipment Requirements

Connection mode:

Connection mode:

1. **Serial port + network cable:** command can be sent through the serial port, and upgrade package is transferred by TFTP protocol.

   The interface options: Fill in the product IP address and PC IP address, and select the product serial port, Interface -> Upgrade Configuration -> Multi-function Combobox2 select 'TFTP'

2. **Serial port + USB cable:** command can be sent through the serial port, and upgrade package is transferred by fastboot.

   The interface options: Interface -> Ptoduct Configuration -> Serial Port does not select “N/A”,

   Interface -> Upgrade Configuration -> Multi-function Combobox2 select 'fastboot'

3. **Separate Serial cable:** command can be sent through the serial port, and upgrade package is transferred by ymodem.

   The interface options: Interface -> Ptoduct Configuration -> Serial Port does not select “N/A”,

   Interface -> Upgrade Configuration -> Multi-function Combobox2, select 'uart'

In "UART" mode, some products can select DDR type or boot related configuration files of serial port through Interface > Upgrade Configuration > Multi-function Combobox2. See Chapter 3 for details.

Equipment requirements:

For "UART" mode, the chip is required to be able to operate normally in boot-rom code. If the boot-rom code is working normally , "Notice" will output by serial port after power on.

For the "uboot" mode, it is required that the chip can launch to the uboot command line mode normally.

Image types:

"uart" mode only supports full image: “disk*.img”

"Uboot" mode supports full image: “disk*.img”, And each partition images: “gpt_ main*.img”, “sbl*.img”, “ddr*.img”, “uboot.img”, “boot.img”, “system.img”, “app*.img”, “gpt_ backup*.img”

Notice

1. Make ensure that the CP IP address and the PC IP address can be pinged.
2. Try to connect your computer and product directly with a cable, because TFTP transmission protocol is more unstable than TCP protocol.
3. The verification relationship of each partition of the image is very strong. The update tool retains the partition download function, but it is not recommended to download the image separately. Download the complete image recommended.

2.3 “ota” upgrade mode

Brief Description

Ota download mode requires a upgrade package containing the image and upgrade scripts. First transfer compressed files into X3 chip, Second send upgrade command.

Connection Mode And Equipment Requirements

Connection mode:

4. **Serial port + network cable:** command can be sent through the serial port, and upgrade package is transferred by TFTP / SFTP / SOCKET protocol.

   The interface options: Interface -> Ptoduct Configuration -> Serial Port does not select “N/A”,

Interface -> Upgrade Configuration -> Multi-function Combobox2 select 'TFTP' / 'SFTP' / 'SOCKET'

5. **Serial port + USB cable:** command can be sent through the serial port, and upgrade package is transferred by ADB push.

   The interface options: Interface -> Ptoduct Configuration -> Serial Port does not select “N/A”,

   Interface -> Upgrade Configuration -> Multi-function Combobox2/ select 'ADB'

6. **Separate network cable:** command can be sent through Telnet, and upgrade package is transferred by TFTP / SFTP / SOCKET protocol.

   The interface options: Interface -> Ptoduct Configuration -> Serial Port select “N/A”,

   Interface -> Upgrade Configuration -> Multi-function Combobox2, select 'TFTP' / 'SFTP' / 'SOCKET'

7. **Separate USB cable:** command can be sent through ADB shell, and upgrade package is transferred by ADB.

   The interface options: Interface -> Ptoduct Configuration -> Serial Port select “N/A”,

   Interface -> Upgrade Configuration -> Multi-function Combobox2, select 'ADB'

E**quipment requirements:**

1. It is required that the chip system can be started normally
2. System image includes recovery system
3. Sufficient space in the / tmp or / UserData directory of the system
4. The system version is lower than or the same as the newer image version

Image types:

OTA upgrade supports full upgrade package: “all *. Zip”

Unlike uboot upgrades, OTA upgrades only open the following partition upgrades: “uboot.zip”, “boot.zip”, “system.zip”, “app*.zip”

Notice

1. When connecting through the network cable, It is necessary to ensure that the CP IP address and the PC IP address can be pinged
2. It is recommended to use the mode of direct connection network cable, because TFTP protocol is more unstable than TCP protocol.
3. When transmitting through the ADB push, the PC can only connect one development board. Connecting multiple boards will resulting in the ADB command failure.
4. The verification relationship of each partition of the image is very strong. The update tool retains the partition download function, but it is not recommended to download the image separately. Download the complete image recommended.
5. Downgrade can only use all_disk.zip package

2.4 “fastboot” download mode

Brief Description

Fastboot is a bootloader mode in which you can flash a device, Under uboot, the fastboot command make the X3 chip as a USB slave device. After connecting, the PC will recognize device as an Android device. The PC can communicate with the X3 chip through fastboot software.

Connection Mode And Equipment Requirements

Connection mode: Separate USB cable.

The interface options: Interface -> Upgrade Configuration -> Browse, select the folder where the upgrade image is located, Interface -> PC Configuration -> fastboot device capacity cannot be empty

E**quipment requirements:** The system can start normally and the computer shows that there are ADB devices or the system has entered the fastboot mode already (manual command or boot-sel pin)

Image types:

There are two upgrade methods:

1. Choose config file: In this mode, need select a json file that records the relative position of the image.

Images required for upgrade include: “MBR *. Bin”, “GPT"_ main*.img”, “bl31*.img”, “sbl*.img”, “uboot.img”, “vbmate*.img”, “boot.img”, “recovery*.img”, “ystem.img ".

The fastboot configuration file needs to be placed in the same directory as the partition images. If the images is placed under the fastboot configuration file, Please fill in the relative position of the mirror image in the file.

```
{
    "mbr": "fastboot/mbr.bin",
    "gpt": "fastboot/gpt_main.img",
    "sbl": "fastboot/sbl.img",
    "bl31": "fastboot/bl31.img",
    "vbmeta": "fastboot/vbmeta.img",
    "uboot": "fastboot/uboot.img",
    "boot": "fastboot/boot.img",
```

```
    "recovery": "fastboot/recovery.img",

    "system": "fastboot/system.img"

}
```

2. Complete image: In this mode, you can only select a image named as “disk*.img”.

3 Profile introduction

There is json file in the update-tool's package, which contains the upgrade configuration of all the products. It is not recommended to modify it by the customer.

Take the x3_dvb product profiles as an example. The relationship between profiles is as follows:

data/config.json("products") ->

data/board_config/xj3/xj3_dvb.json("boot_config") ->

data/board_config/xj3/boot_config/xj3_dvb_hynix_boot.json

This chapter describes some key configurations. The content may not be the same as what was actually in the upgrade tool

3.1 Basic Settings of Update Tool

In data/config.json:

```
"compress_img": true,
```

In order to speed up the transmission and ensure that the AP side space meets the requirements, the upgrade tool could compress the system image for transmission , "True" means compress the image, and "false" means compress the image.

```
"external_tftp": "",
```

To set external TFTP path for upgrading. If there is no content in dict "external_tftp", The upgrade tool will open a TFTP service

Note: after opening the upgrade tool, sometimes it will prompt "TFTP service failed to start". At this time, there are two situations: (1) opening two update tools at the same time, (2) there are other local applications occupying the standard port of TFTP service. If you want to keep the local TFTP service, please set "external_tftp".

3.2 Settings of Product

In data/config.json "products":

```
"user": "root",
```

```
"pwd": "",
```

Login user name and password for X3 system

```
"uboot_prompt": "Hobot>",
```

```
"login_prompt": "Horizon Robotic",

"shell_prompt": "root@",
```

It is used for shell printing under different states of X3 system to judge the current state of X3 system

```
"boot_timeout": 120,

"ota_update_timeout": 300,
```

OTA upgrade restart time limit, after the upgrade operation is completed, it is necessary to restart the system and check whether the system is abnormal. If the time limit is exceeded, the upgrade is failed.

```
"boards_config": "data/board_config/xj3
```

Folder for product configuration files

3.3 Settings of each Board

In data/board_config/xj3/xj3_dvb.json:

```
 "name": "xj3_dvb"
```

Product name.

```
"ota_mode":["sftp", "tftp", "adb"]
```

Ways to download OTA package.

```
"support_mode": ["ota", "uboot", "uart", "fastboot"],
```

Which upgrade mode support in board.

```
"boot_choose": ["lpddr4-hynix", "lpddr4-hynix-sec", "lpddr4-samsung", "lpddr4-samsung-sec","lpddr4-micron",
"lpddr4-micron-sec", "ddr4-micron", "ddr4-micron-sec", "ddr4-samsung", "ddr4-samsung-sec", "choose"],
```

DDR types supported in uart mode and whether support user selected.

```
"uart_mode": ["tftp", "uart", "fastboot"],
```

Option to upgrade packages in uart/uboot mode.

```
"erase_part":["all", "veeprom", "sbl", "ddr", "bl31", "uboot", "vbmeta", "boot", "recovery", "system", "bpu", "app",
"userdata"],
```

Option to set which partition can be erase

```
"baudrate":921600,
```

Baud rate of product.

```
"support_os": ["Linux", "Darwin", "Windows"],
```

Available system

```
"ddr_size": "0x40000000",
```

Product DDR size

```
"load_address": "0x04000000"
```

The start DDR address of the image in uboot .

```
"download_root": "/userdata"
```

Ota package's location

```
"download_speed": 200,
```

The slowest download speed. When the average speed of the image downloading below the limit, an error will be reported

```
"boot_config":{
                "hynix":"data/board_config/xj3/boot_config/xj3_dvb_hynix_boot.json",
                "micron":"data/board_config/xj3/boot_config/xj3_dvb_micron_boot.json"
               "hynix-scy":"data/board_config/xj3/boot_config/xj3_dvb_hynix_secure_boot.json",
                "micron-scy":"data/board_config/xj3/boot_config/xj3_dvb_micron_secure_boot.json"
        }
```

Uart mode to support the boot required file configuration file

3.4 Custom Boot File

In data/board_config/xj3/boot_config/xj3_dvb_hynix_boot.json:

```
[
```

```
    {
        "file": "data/board_config/xj3/boot_config/boot_file/spl-dvb-hynix-uart-2666.bin",
        "method": "xmodem"
    },
    {
        "file": "data/board_config/xj3/boot_config/boot_file/boot_uart.pkg",
        "method": "ymodem"
    }
]
```

The files needed for uart bringup are spl*.bin, ddr*.bin and boot_uart.pkg files, Those files are transfer by X/YMODEM protocol. Customers can define json files by themselves, and select "choose" mode in the startup Interface -> Upgrade Configuration -> Multi-Function Combobox, and then select json files to bringup their own system. The selection interface is shown in Figure 3-1

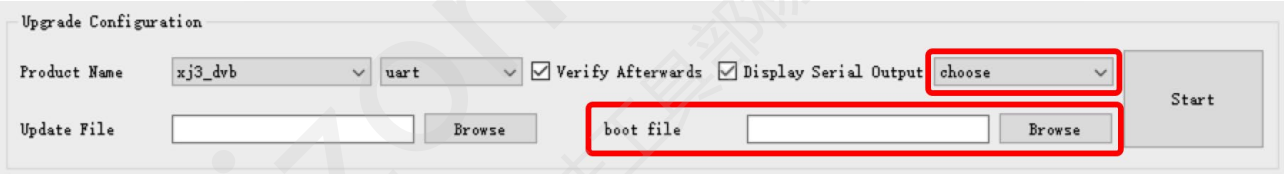

Figure 3-1 Product Configuration Diagram

4 Image Packaging Introduction

The publishing image contains partition images and “gen_ disk.sh”package script. The following describes the package script:

Run: ./gen_disk.sh <-b board> [-s] [-u] [-o output file]

Where - b parameter is the version of packaged image, and currently supports Xj3 / Xj3_ DDR4 images of two products, and the - b parameter must be filled in

Where - S parameter is whether the product is a security image, which needs to be added to burn eFuse's chip image

Where - U parameter is whether to take app partition image or not, adding the - U parameter will app.img Package to the image app partition and load automatically after system startup

Where - O parameter is the output image name. To use with the update tool, please start the

image name with "disk"

Example：

build xj3 UT disk image: ./gen_disk.sh -b xj3 -u

build xj3 disk image: ./gen_disk.sh -b xj3

build xj3 secure disk image: ./gen_disk.sh -b xj3 -s secure

build xj3 secure disk image: ./gen_disk.sh -b xj3 -s secure –o disk_example.img

Note: gen_disk.sh only applies to the directory structure of the provided image package and not to the directory structure in PlatformSDK after compilation. Please compiling a specific image in the way of adding compilation parameters