ASR6601

OTA upgrade manual

Version: 1.2.0

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About this document

This document describes the OTA upgrade Demo program in the SDK for ASR6601 IoT LPWAN SoC.

Target Audience

This document is intended for the following engineers:

- hardware development engineer
- software engineer
- technical support engineer

Product numbering

Product models corresponding to this document:

Model	Flash	SRAM	Core	Package	Frequency
ASR6601SE	256 KB	64 KB	32-bit 48 MHz ARM STAR	QFN68, 8*8 mm	150 ~ 960 MHz
ASR6601CB	128 KB	16 KB	32-bit 48 MHz ARM STAR	QFN48, 6*6 mm	150 ~ 960 MHz

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Document Revision History

Date	Version	Release Notes
2020.06	V0.1.0	Initial Release.
2020.10	V0.2.0	Updated the hardware connection example diagram in Section 1.1.
2021.01	V1.1.0	Removed the Overview in Chapter 1 and merged its contents into the "About This Document" section of the Preface.
2021.06	V1.2.0	Added verified Android phone models in section 1.1.

Table of contents

List of tables

List of figures

1. Prepare

1.1 Hardware Preparation

The required hardware list:

(1) ASR6601 demo board 2 pcs

(2) Antenna 2 pcs

(3) USB cable 2 pcs

(4) USB adapter 1 pc

(5) Android phone 1 pc

Verified Android phone models:

- Huawei Mate 20 Pro, Android version 10, EMUI version 11.0.0
- Huawei nova, Android version 10, EMUI version 11.0.0
- Huawei Maimang 6, Android version 8, EMUI version 8.0.0
- Xiaomi MIX 2S, Android version 9, MIUI version 11.0.3

(6) PC 1 pc

Figure 1-1 Mobile phone connection diagram

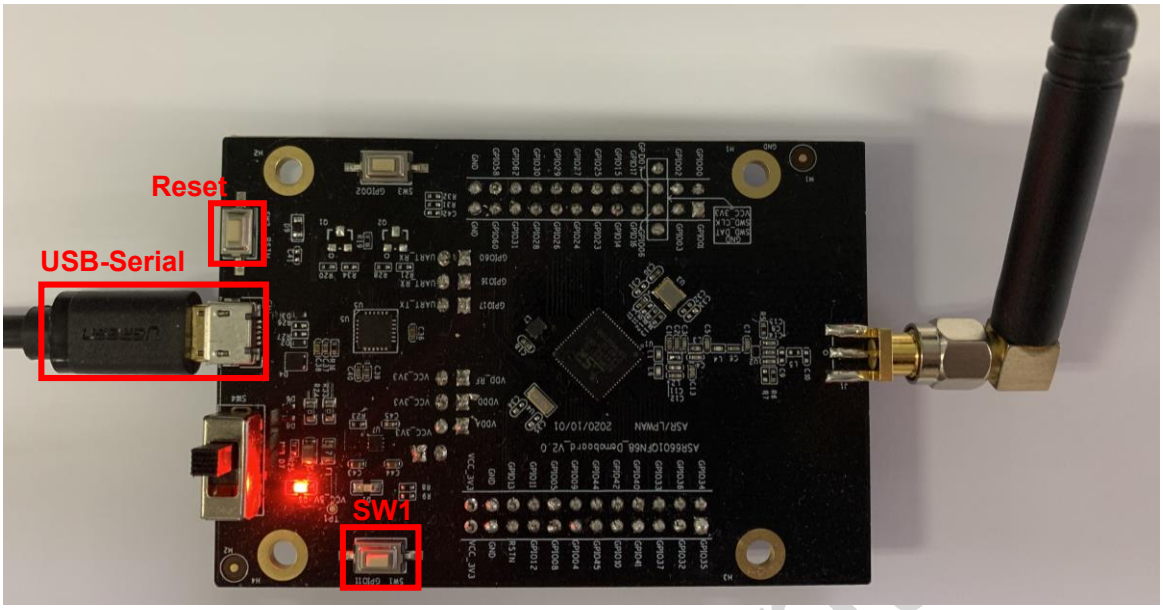

Figure 1-2 Target board connection diagram

1.2 Software Preparation

1.2.1 OTA Dongle Software Preparation

The OTA dongle code is in the projects\${DEMO_BOARD}\examples\ota\dongle directory, where ${DEMO_BOARD} is the board name of the OTA dongle, such as ASR6601SE-EVAL for the ASR6601SE development board and ASR6601CB-EVAL for the ASR6601CB development board.

Compile and download the corresponding code to the OTA dongle board.

1.2.2 Target board software preparation

The target board software is divided into two parts: OTA bootloader and app code.

(1) **OTA bootloader**

The OTA bootloader code is in the directory projects\${DEMO_BOARD}\examples\ota \bootloader, where ${DEMO_BOARD} is the name of the target board, such as ASR6601SE-EVAL for the ASR6601SE development board, and ASR6601CB-EVAL for the ASR6601CB development board. Compile and download the corresponding code to the 0x08000000 address of the target board.

(2) **APP**

The App code is the code to be upgraded in the end. You can use any code. In this document, the uart_printf project is used as an example.

Modify the gcc.ld file of the uart_printf project, change the FLASH start address to 0x0800D000, and compile the modified project. After the compilation is complete, copy the generated project file to the mobile phone.

```
/* Generate a link error if heap and stack don't fit into RAM */
_HEAP_SIZE = 0x1000;      /* required amount of heap  */
_STACK_SIZE = 0x1000; /* required amount of stack */

/* Specify the memory areas */
MEMORY
{
    FLASH (rx)      :  ORIGIN = 0x0800D000, LENGTH = 204K
    RAM (xrw)       :  ORIGIN = 0x20000000, LENGTH = 64k
}

/* Define output sections */
SECTIONS
{
```

Figure 1-3 Linker Script File

1.2.3 Mobile phone preparation

The corresponding code of LoRa OTA APP is in the directory of projects\ASR6601SE-EVAL \examples\ota\android_app (the APP has no board distinction, and the codes in the directories of ASR6601SE-EVAL and ASR6601CB-EVAL are the same).

Copy the apk package to your phone and install it.

2. Upgrade Process

2.1 Entering OTA bootloader

Press and hold the SW1 button on the target board and then reboot to put the target board into the OTA bootloader.

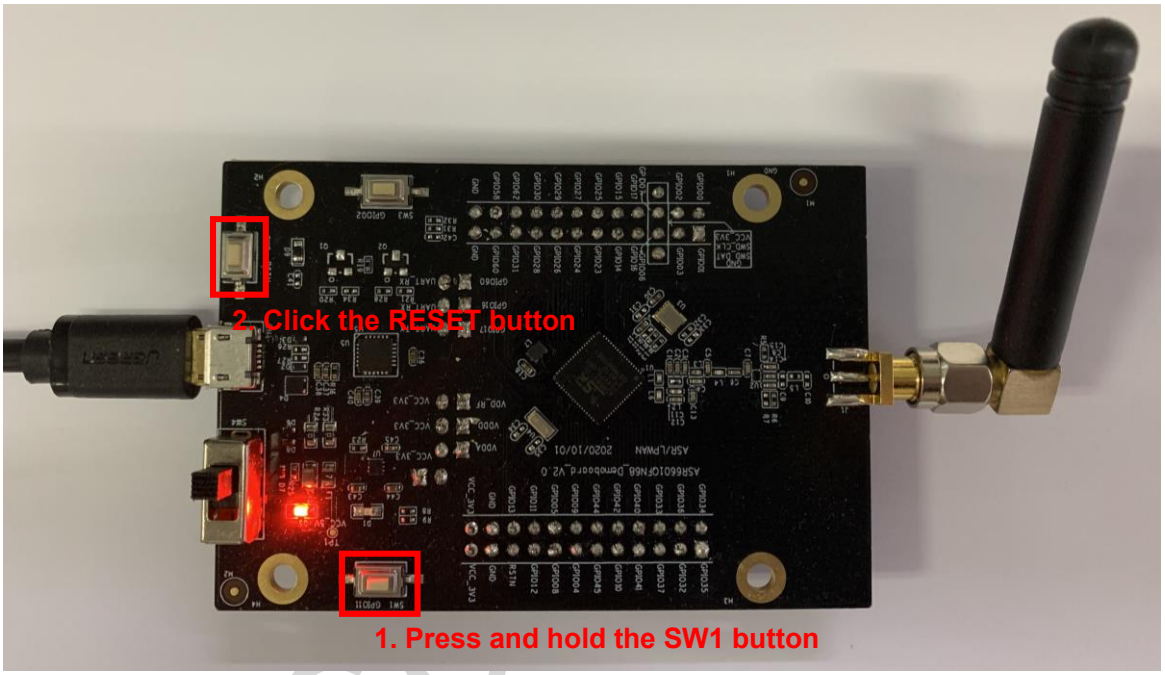

Figure 2-1 Entering OTA bootloader mode

2.2 Open the app

After connecting the mobile phone and OTA dongle with a USB adapter, open the APP and the interface will be as shown in Figure 2-2:

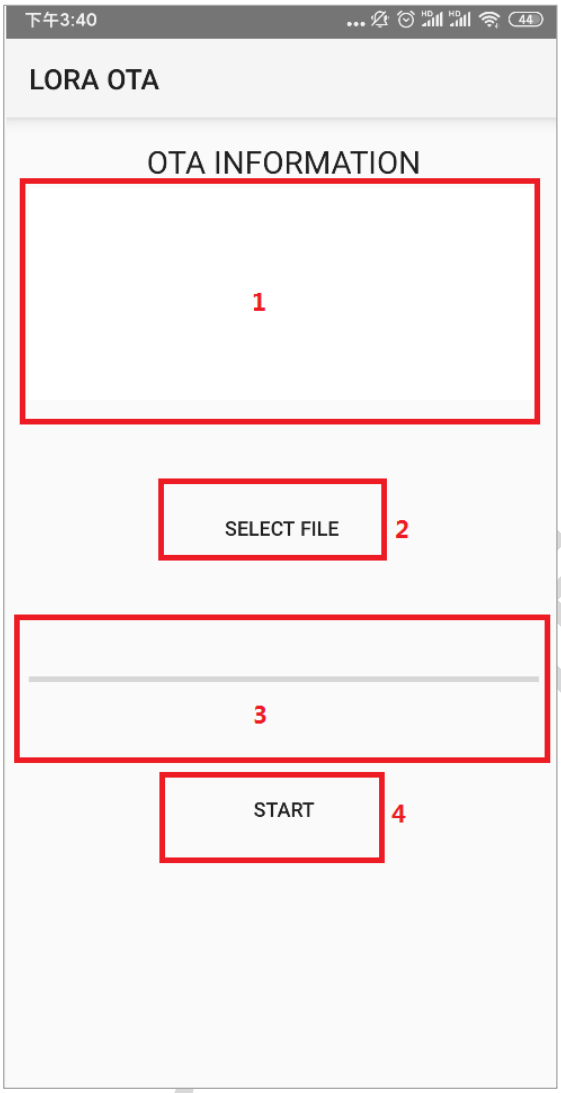

Figure 2-2 Main interface

Note: When connecting the OTA dongle, if the prompt box in Figure 2-3 appears, please click "Confirm".

Figure 2-3 USB access prompt

The annotations in Figure 2-2 are explained as follows:

- Annotation 1: This area will display information during the OTA upgrade process.
- Annotation 2: Button for selecting the upgrade file.
- Annotation 3: Progress bar, indicating the progress of the OTA.
- Annotation 4: Button for starting the OTA upgrade.

2.3 Upgrade file selection

(1) Click the "SELECT FILE" button in Figure 2-2, and the following interface will appear:

Figure 2-4 File browsing

(2) Go to the bin directory and select the bin file ss shown in Figure 2-5:

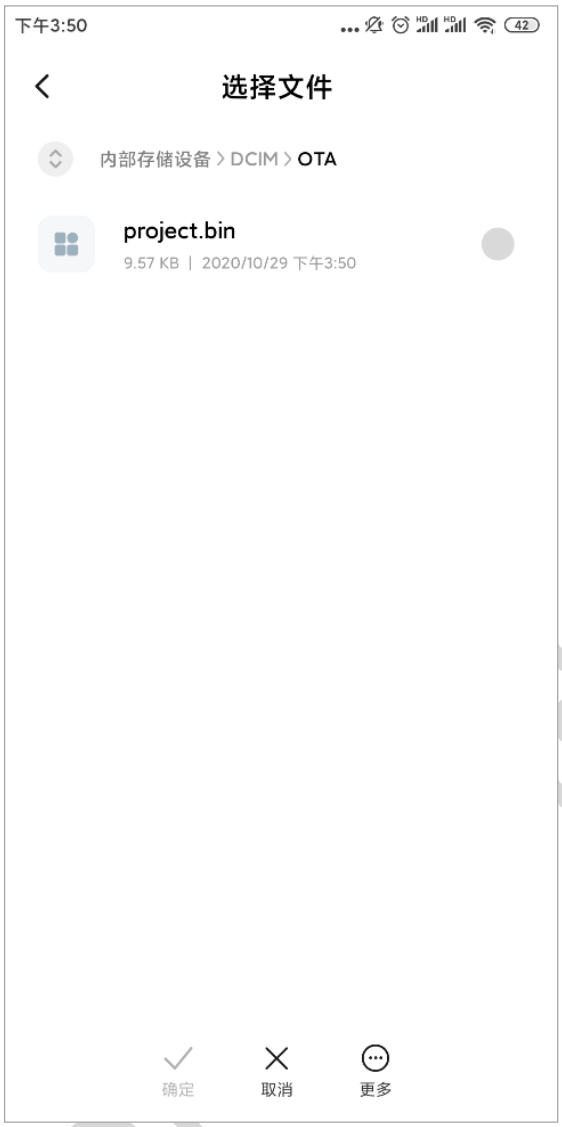

Figure 2-5 Select bin file

(3) After selecting the bin file, return to the main interface, and the interface will show a prompt that the upgrade file has been selected:

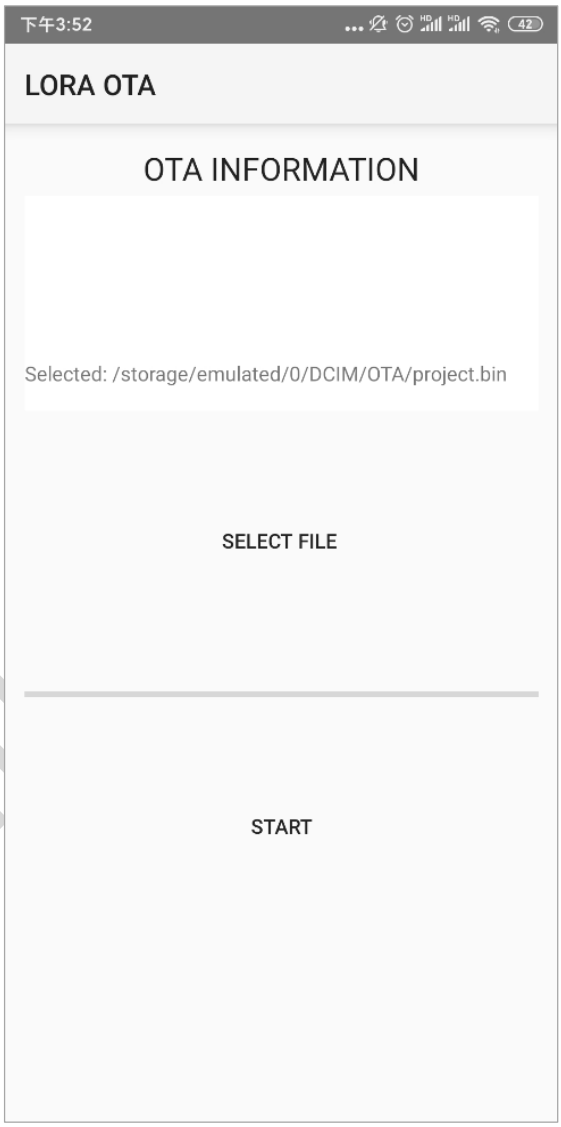

Figure 2-6 Prompt of the selected upgrade file

2.4 Start upgrading

(1) 点击“START”按钮开始升级：

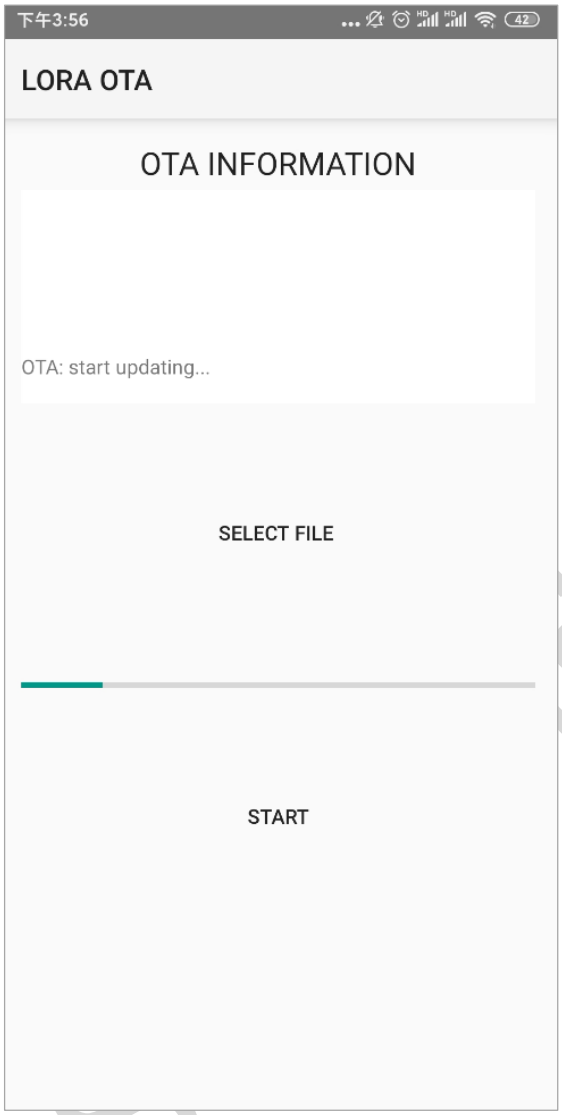

Figure 2-7 Start Upgrading

(2) 升级成功后，APP 提示“OTA: done”：

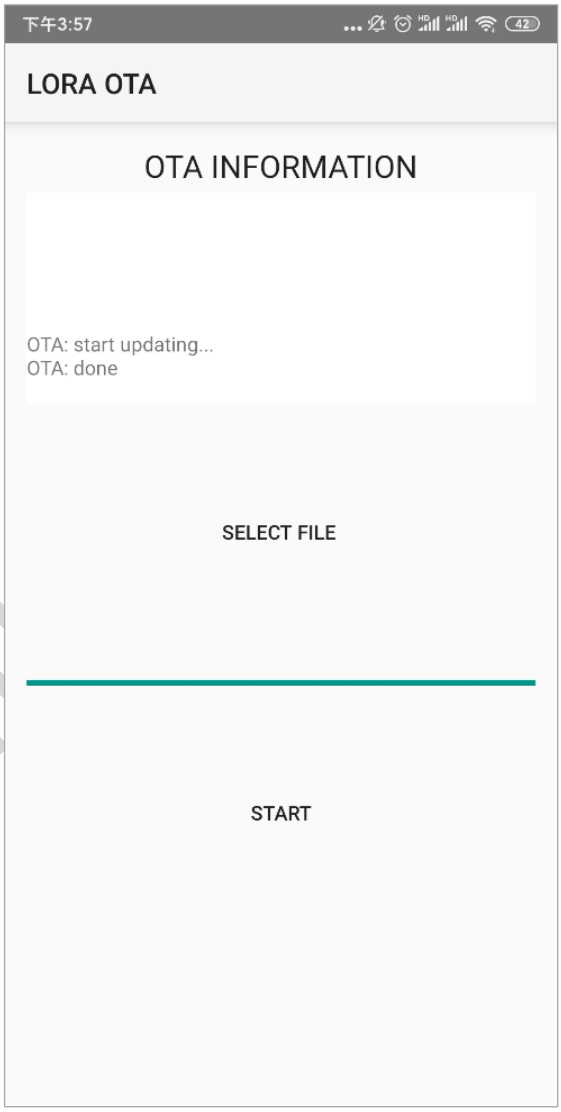

Figure 2-8 Upgrade successful

同时，目标板端打印：hello world

3. OTA dongle AT command description

3.1 AT command list

主要的 AT 命令有:

Table 3-1 OTA dongle main AT commands

命令	说明
AT+FREQ	设置频率
AT+CFG	配置参数
AT+TX	发送数据
AT+RX	进入接收模式
AT+DATA	收到数据后，上报数据

3.2 AT command description

3.2.1 AT+FREQ

命令及响应	AT+FERQ=<freq>	OK 或者 +CME ERROR:<err>
参数及返回值说明	该命令用于设置频率。 **freq**：150000000-960000000	
示例	AT+FREQ=470000000	

3.2.2 AT+CFG

命令及响应	AT+CFG=<modem>,<p1>,<p2>,<p3>,<p4>,<p5>,<txp>	OK 或者 +CME ERROR:<err>
参数及返回值说明	该命令用于配置参数。 **modem**：调制类型（0：FSK；1：LORA） ● 如果 modem 为 0： **P1**：fsk bandwith **P2**：fsk datarate **P3**：fsk dev **P4**：fsk preamble length **P5**：fsk afc bandwith ● 如果 modem 为 1： **P1**：lora bandwith， – 0：125K – 1：250K – 2：500K **P2**：lora sf（5-12） **P3**：lora cr – 1：4/5 – 2：4/6 – 3：4/7 – 4：4/8 **P4**：lora preamble length **P5**：lora iqi（0：false；1：true） **txp**：tx power（0-22）	
示例	AT+CFG=1,0,7,1,8,0,22	

3.2.3 AT+TX

命令及响应	AT+TX=<len>,<data>	OK+SEND 或者 ERR+SEND:1
参数及返回值说明	该命令用于发送数据。 **len**：数据长度 **data**：发送二进制数据的 hex 格式	
示例	AT+TX=3,123456	

3.2.4 AT+RX

命令及响应	AT+RX=<timeout>	OK 或者 +CME ERROR:<err>
参数及返回值说明	该命令用于接收数据。 **timeout**：超时时间（ms），0 为一直接收	
示例	AT+RX=0	

3.2.5 AT+DATA

命令及响应	AT+DATA=<status>,<snr>,<rssi>,<len>,<data>	N/A
参数及返回值说明	该命令为数据上报，dongle 收到数据后会发送此命令。 **status**：数据上报状态 ● 0：正常 ● 1：rx_timeout ● 2：rx_error **snr**：数据包信噪比 **rssi**：信号强度 **len**：数据长度 **data**：二进制数据的 hex 格式	
示例	AT+DATA=0,9,-45,3,123456	

4. OTA bootloader command description

4.1 Command list

Table 4-1 OTA bootloader related commands

命令	命令编号	说明
SYNC	1	SYNC 命令，判断是否连接正常
JUMP	2	跳转命令
FLASH	3	烧录命令
ERASE	4	擦除命令
VERIFY	5	验证命令
REBOOT	12	重启命令
SN	13	读序列号命令

4.2 Format

4.2.1 Request

Figure 4-1 OTA bootloader request command format

其中，Command 为命令编号，Checksum 算法为 CRC32。

4.2.2 Response

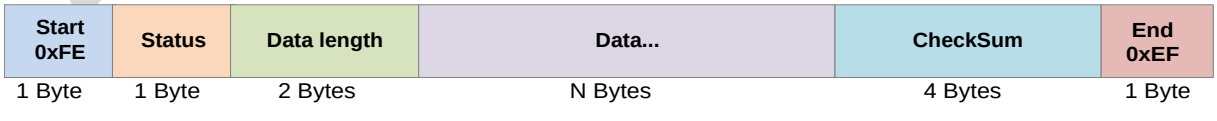

Figure 4-2 OTA bootloader response command format

4.3 Command payload format

Table 4-2 Payload formats of various types of commands

命令类型	负载格式
SYNC 命令	无
JUMP 命令	**Addr**：4 Bytes，跳转地址
FLASH 命令	**Addr**：4 Bytes，烧录地址 **Size**：4 Bytes，烧录数据长度 **Data**：N Bytes，烧录数据
ERASE 命令	**Addr**：擦除地址 **Size**：擦除区域大小
VERIFY 命令	**Addr**：验证起始地址 **Size**：验证区域大小 **Checksum**：验证校验值
REBOOT 命令	**Mode**：reboot 模式，0：重启进入 app；1：重启进入 ota bootloader
SN 命令	无