PHY62XX

OTA Function Introduction

Version 2.0

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PhyPlus

Revision History

Revision	Author	Participant	Date	Description
V1.0	Eagle		06/19/2018	Draft file
V2.0	Eagle		12/29/2018	Support resource OTA mode

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Figures and Tables

1 Introduction

If the OTA process described in this article is not specifically pointed out, it is agreed that BLE Host is the mobile phone App: PHYAPP program.
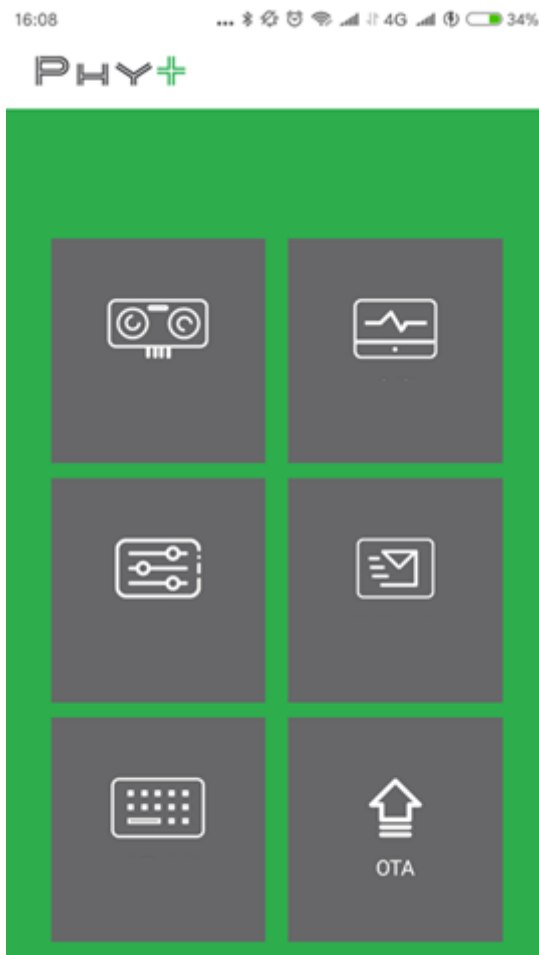

Figure 1: PHYAPP Operation Interface

PHY62XX OTA is used for wireless upgrade of application firmware, resource files and OTA Bootloader itself.

Core of OTA is OTA bootloader. OTA bootloader is a special independent firmware, which is used to load boot application firmware and execute OTA. PHY62XX SDK provides OTA bootloader source code, MDK5 item file and .hex executable file, all of the above can be found in the SDK: "PHY62XX_SDK\example\OTA\OTA_internal_flash".

If the application firmware needs to support the OTA function, the OTA App service needs to be loaded. This service is a special service for interaction between the application firmware and the OTA bootloader and between the BLE Host (such as a mobile phone). BLE Host can obtain the mobile phone's MAC address and OTA bootloader version information through this service; this service can guide the OTA bootloader to enter the application firmware upgrade mode and resource file upgrade mode.

Typical interaction process between PPlus62XX and BLE Host is shown below. For the detailed introduction of Process OTA process, please refer to the subsequent chapters.
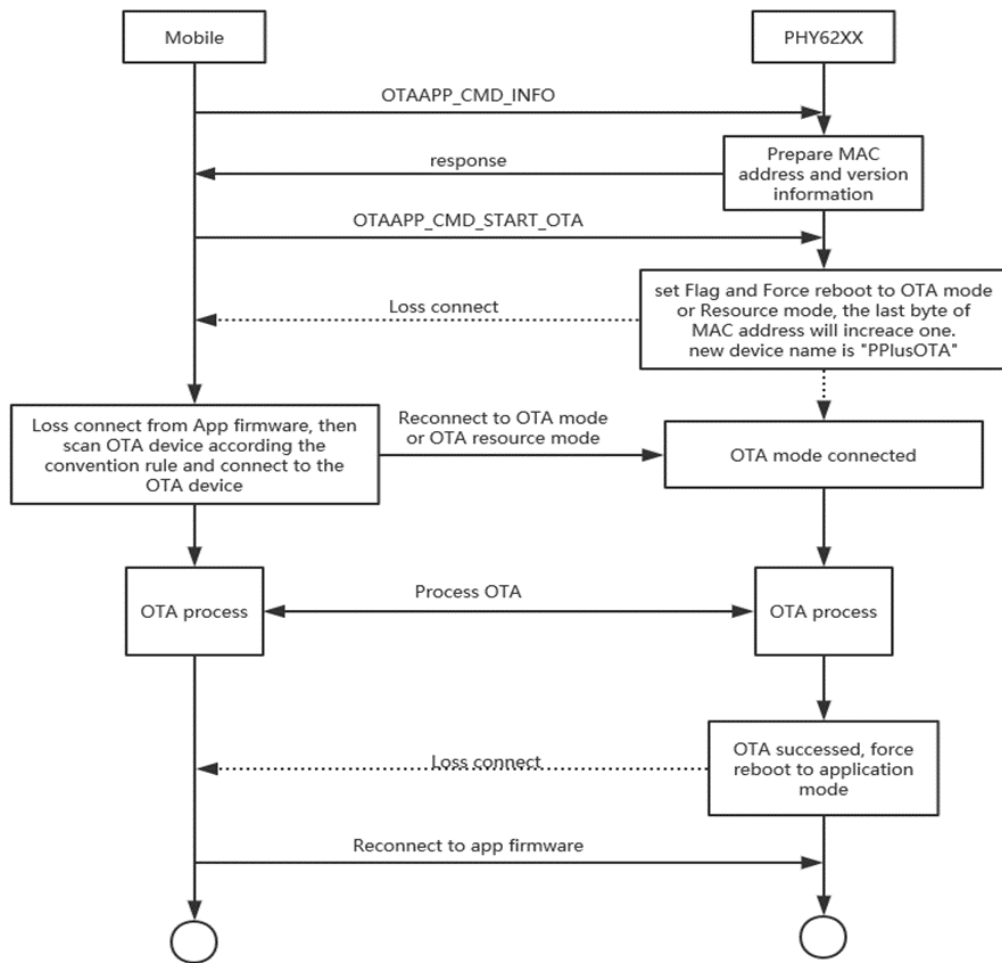
Figure 2: OTA Operation Process

2 OTA operation mode

For PHY62XX devices that support OTA, there are three operating modes:

• Application mode

Normally, the device will run in application mode.

• OTA mode

In OTA mode, the mobile phone can perform application upgrades over the air.

• OTA resource mode

In the OTA resource mode, the mobile phone can upgrade the resource file wirelessly.

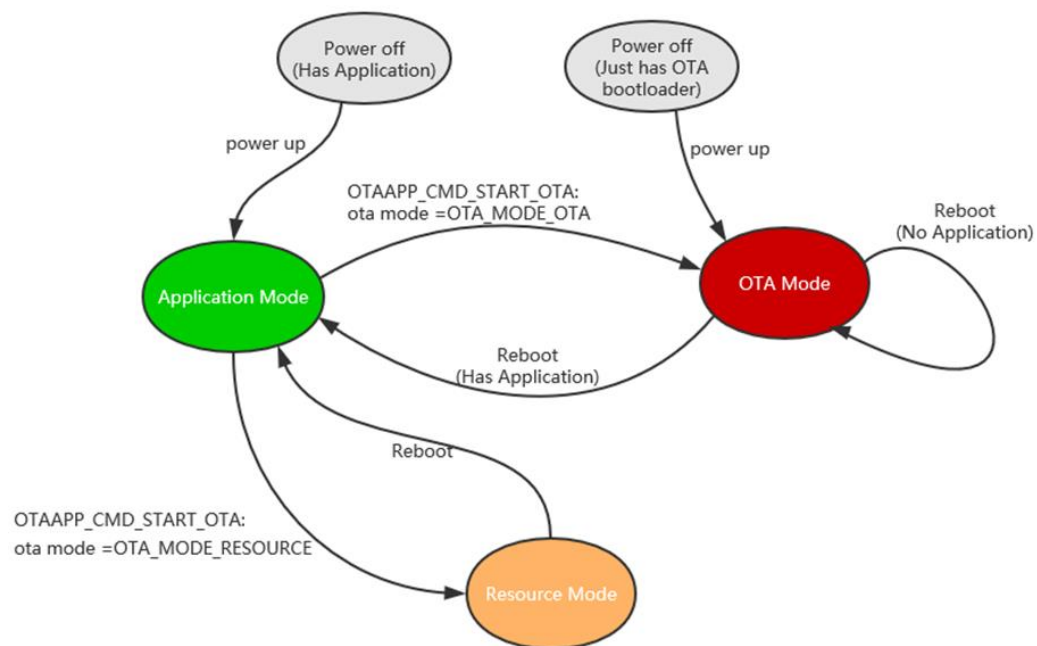State machine transitions of the three working modes and the trigger conditions for state transitions are as follows:

Figure 3: Working Mode Conversion and Its Trigger Conditions

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3 OTA upgrade process

After the Host and the PPlusOTA device are connected, the OTA upgrade process can be started. The process is divided into three stages:

- Start OTA upgrade

Command OTA_CMD_START_OTA can start the OTA process.

- *Application parameter transfer (this step is optional)

If the param_size field of the OTA_CMD_START_OTA command parameter is not 0, it will automatically enter the parameter transfer state to transfer the parameters.

- Application firmware transfer and burning

If the param_size field of the previous OTA_CMD_START_OTA command is 0 or the parameter transfer has been completed, the block data transmission can be started by the OTA_CMD_PARTITION_INFO command.

Usually an application firmware consists of 2~3 partitions. Currently, OTA supports up to 16 partitions.

Please refer to the figure below for the data transfer process during OTA upgrade.
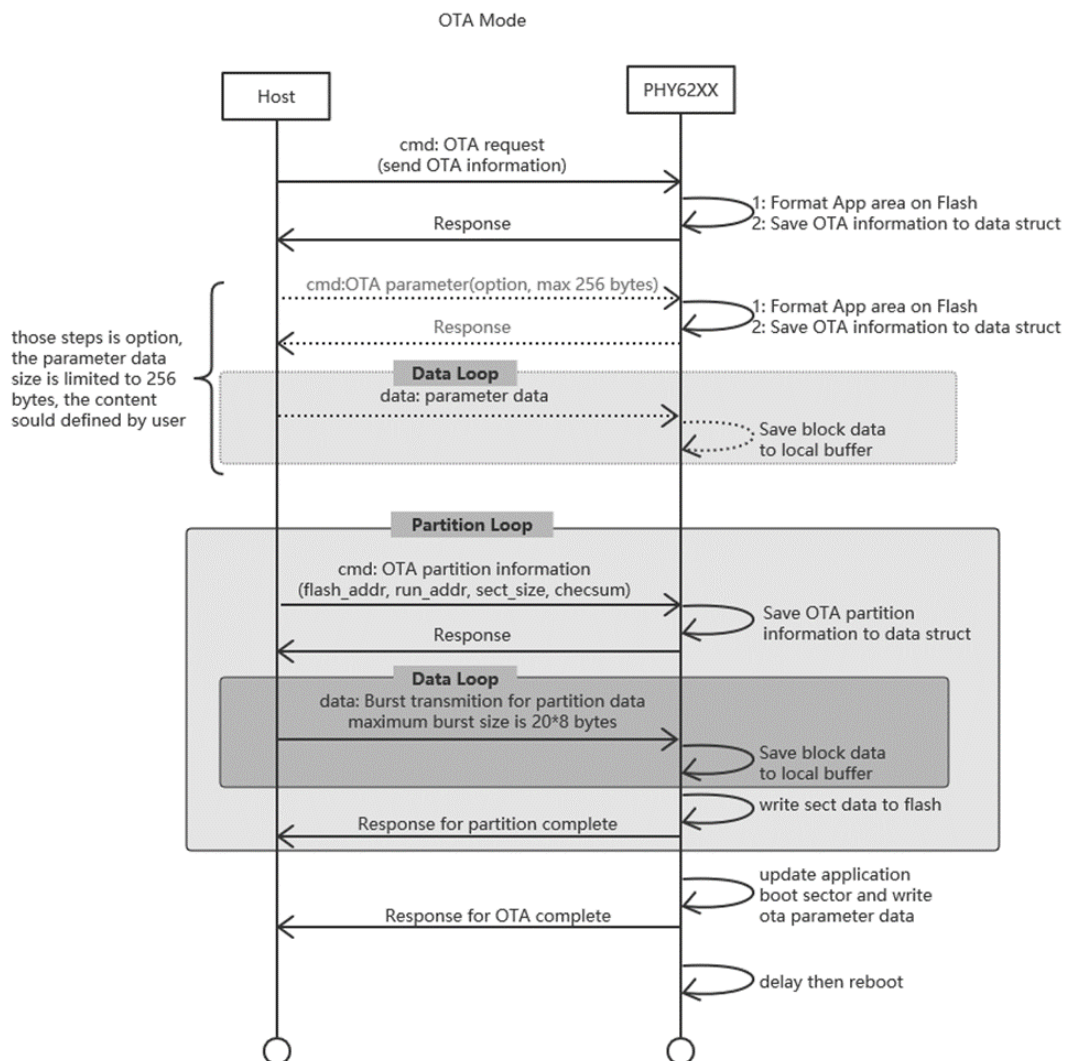

Figure 4: OTA Upgrade Process

4 OTA Resource upgrade process

After the Host is connected to the PPlusOTA device (you need to ensure that the device is in OTA Resource mode), you can start the OTA upgrade process.

The process is divided into three stages:

• Start OTA upgrade

Command OTA_CMD_START_OTA can start the OTA process.

• Erase command

Erase according to the flash block occupied by the resource file. Minimum erase unit is 4K Byte.

• Application firmware transfer and burning

Currently OTA Resource supports up to 16 partitions

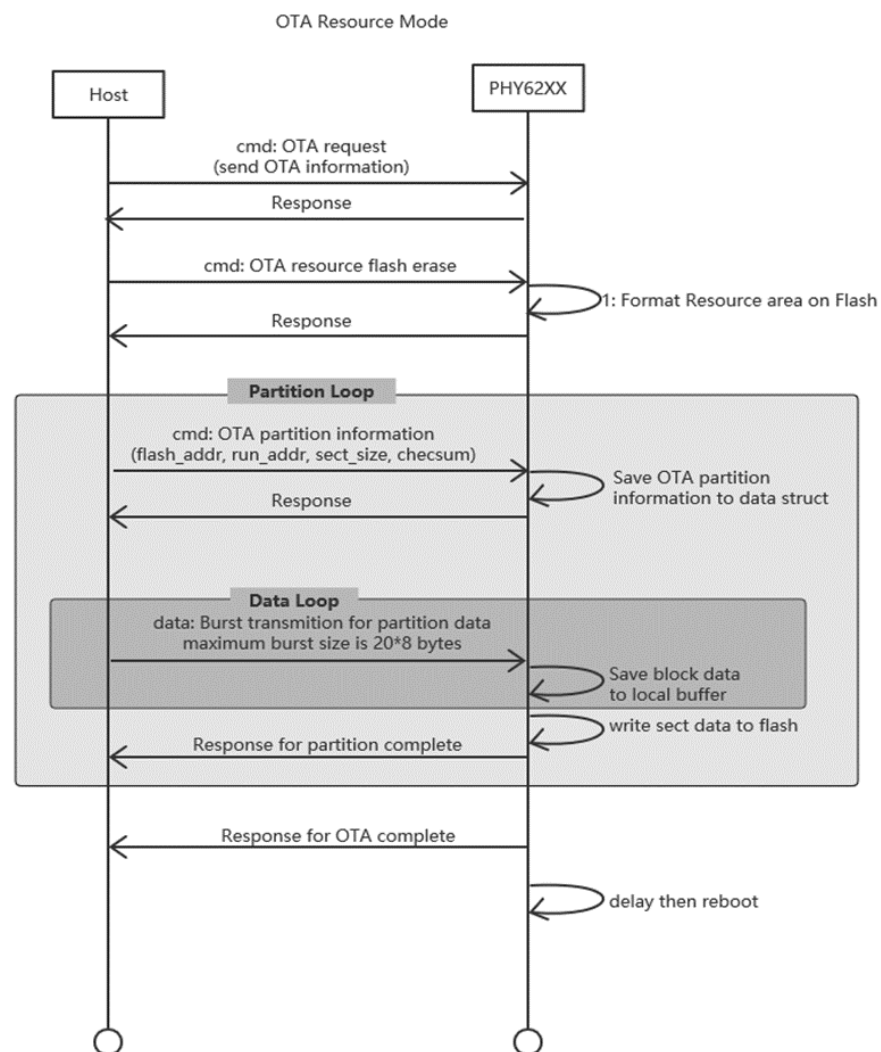Please refer to the figure below for the data transmission process during OTA Resource upgrade.

Figure 5: OTA Resource Upgrade Process

5 OTA Bootloader upgrade

OTA bootloader upgrade is a special OTA application firmware upgrade, the process is the same as OTA application upgrade. Bootloader upgrade source code can be found in the SDK: "PHY62XX_SDK\example\OTA\OTA_upgrade_2ndboot".

Principle of this application is to burn a new OTA Bootloader through the application firmware, which is different from the normal OTA application firmware upgrade. Firmware upgrade process does not allow power off. After the firmware upgrade is completed, the new OTA bootloader will start, and the old application firmware will become invalid. You need to re-OTA to upgrade the application firmware.

Operating steps:

- Copy the OTA bootloader to be upgraded to the Source directory of the OTA_upgrade_2ndboot routine, run the Python script, and convert the OTA bootloader to otaboot_hex.c
- Open the routine item through MDK5, compile, and generate otaupgrade.hex file
- Connect the device through PHYAPP, enter the OTA page, select otaupgrade.hex to upgrade, until the upgrade is completed.
- Reconnect the PPlusOTA device, and then select the appropriate application firmware to upgrade again until it is completed, at which time the device can automatically reconnect, and the whole process is complete!
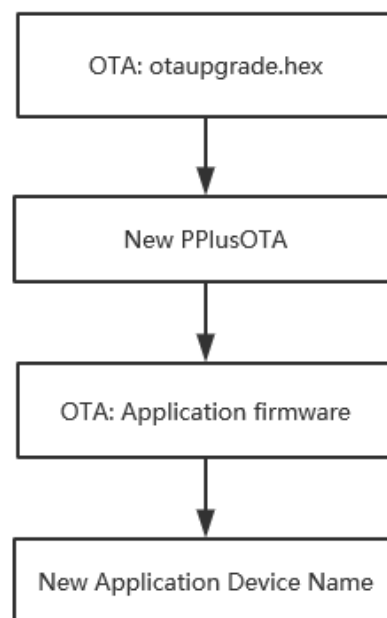
The flow chart is as follows:

Figure 6: Bootloader Upgrade Process

6 OTA upgrade via PHYAPP

Through the mobile phone APP: PHYAPP can support the above three modes of OTA.

6.1 Application firmware OTA

1. Install the latest version of PHYAPP on your phone
2. Copy the application firmware that needs to be upgraded to the root directory of the phone storage
   - For non-encrypted firmware, the firmware file is in .hex format
   - For firmware encrypted by IV or ChipID, the firmware file is in .hexe format.
   - For the method of generating encrypted firmware, please refer to < PhyPlusKit_User_Guide.pdf>
3. After connecting the device, the main page will display the OTA Boot version information, enter the OTA page
   - If the device is working in OTA mode, there will be a reboot button after connection. After clicking it, you can reboot back to application mode.
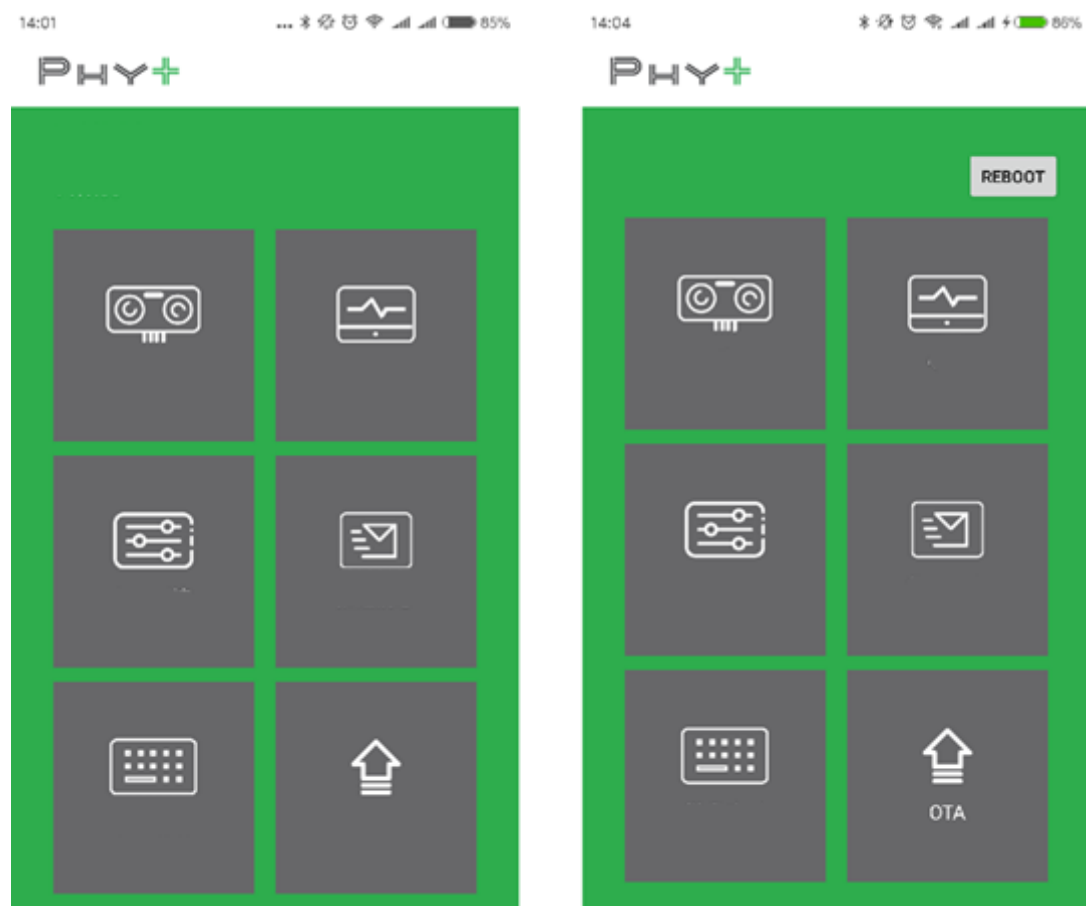

Figure 7: OTA Operation Schematic of Application Firmware

- Enter the OTA page, select the target file to be upgraded, and wait for the progress bar to complete.

6.2 Resource file OTA

Resource files only support plaintext upgrade. For PHYAPP, the identifiable resource file is a file with .res extension. File format is intel hex format, directly mapping to flash address, and the 0 address corresponds to the 0 address of the on-chip flash.

Resource file upgrade needs to make sure that the device is in application mode (resource OTA mode can only be entered by application mode through commands)

Upgrade steps are as follows:

1. Install the latest version of PHYAPP on your phone
2. Copy the resource files that need to be upgraded to the root directory of the phone storage.
3. Connect to the application mode device and click on the OTA page to enter.
4. Select the res file that needs to be upgraded. In this case, a small window will inform you the size of the upgrade file and the target address of the upgrade.
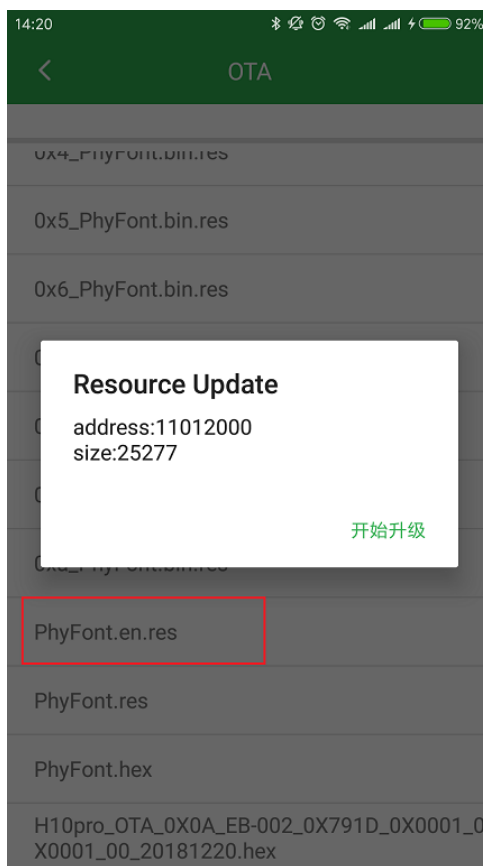

Figure 8: OTA Operation Schematic of Resource File

5. After confirmation, start the upgrade process and wait for the progress bar to complete.

6.3 OTA bootloader upgrade

The OTA bootloader upgrade process is exactly the same as the application firmware upgrade, but after the upgrade is completed, the application firmware will be erased, so the application firmware needs to be upgraded via OTA.