

ESP8266-RTOS-SDK FOTA Introduction



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 - New to New FOTA
 - Old to New FOTA



Introduction

Since the ESP8266 RTOS SDK V3.0, we refactored the SDK to be the ESP-IDF style. And provide an FOTA example in V3.1 to support upgrading from an old SDK to the new SDK.

"Old to New" FOTA:

- Firmware upgrade from an old (NonOS, or V2.x and earlier versions RTOS) SDK to a new (V3.x and later versions) RTOS SDK via Wi-Fi.

"New to New" FOTA:

- Firmware upgrade from a new (V3.x) RTOS SDK to a new (V3.x and later versions) RTOS SDK via Wi-Fi.

For the "Old to New" FOTA, please note that users need to make modifications to the application, because the new APIs are not compatible with the old SDKs', due to underlying changes in the architecture.



It is suggested to use two different OTA urls for the "old to new" FOTA and "new to new" FOTA respectively.

If you have some old version products want to upgrade to the new SDK, and meanwhile you also produce some new version products, it will be much easier if you use different urls to OTA upgrade each of them. Ensure the old version products upgrade to the "old to new" firmware, and the new version products upgrade to the "new to new" firmware.

But if your OTA server does not support multiple OTA urls, we also provide a compatible solution in this doc.

ESP8266 RTOS V3.x and Later versions (New Versions)

Boot0 Partition NVS ota_app_0 ota_app_1

ESP8266 NonOS, or RTOS V2.x and earlier versions (Old Versions)

Old Boot	APP0	User Data	APP1	System Data	
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Part 1. Recommended Solution

- Different OTA URLS



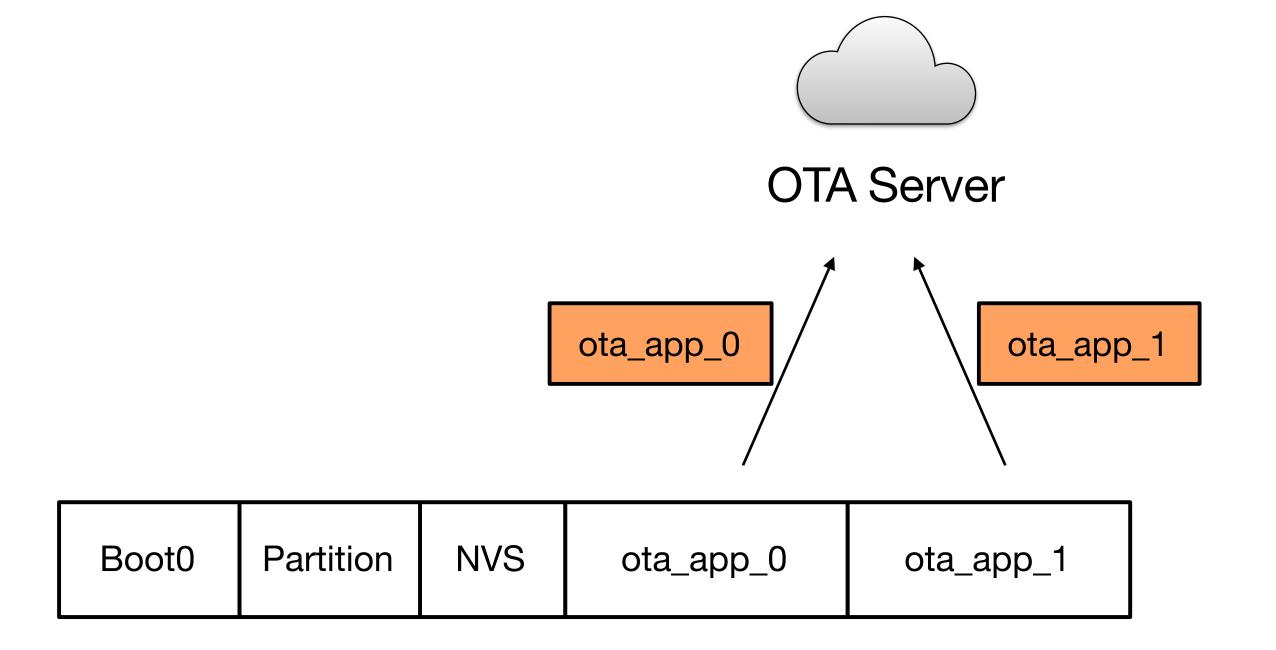
New to New FOTA

- Different OTA URLS



New to New FOTA

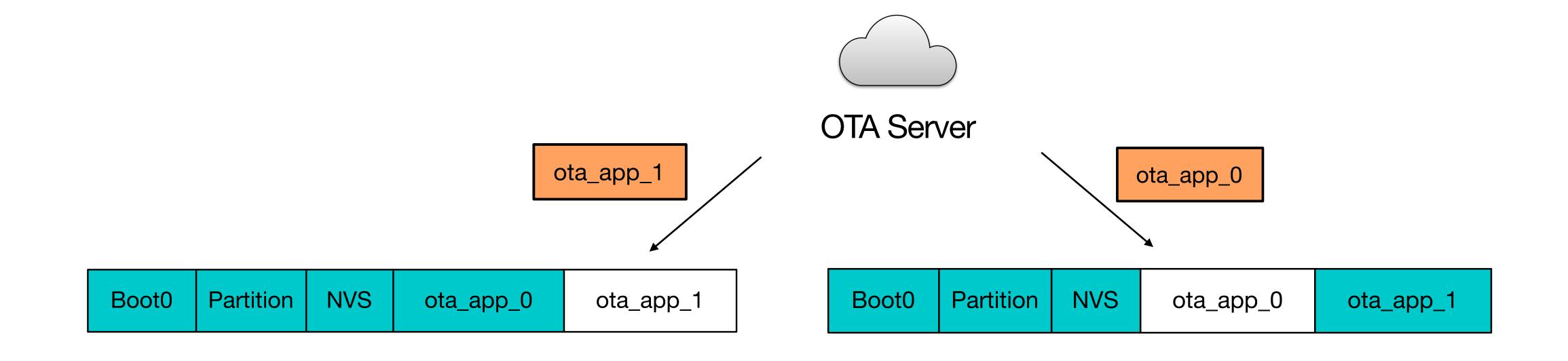
If you can create a new OTA url for your new (V3.x and later) versions product. Need not to use the same one with all old (NonOS, or V2.x and earlier RTOS) products. Then only the ota_app.bin that needs to upload to the server.





New to New FOTA

Download the new ota_app_1 for upgrading if ota_app_0 is running; Or download the new ota_app_0 for upgrading if ota_app_1 is running. Then system reboots to run the new ota_app.

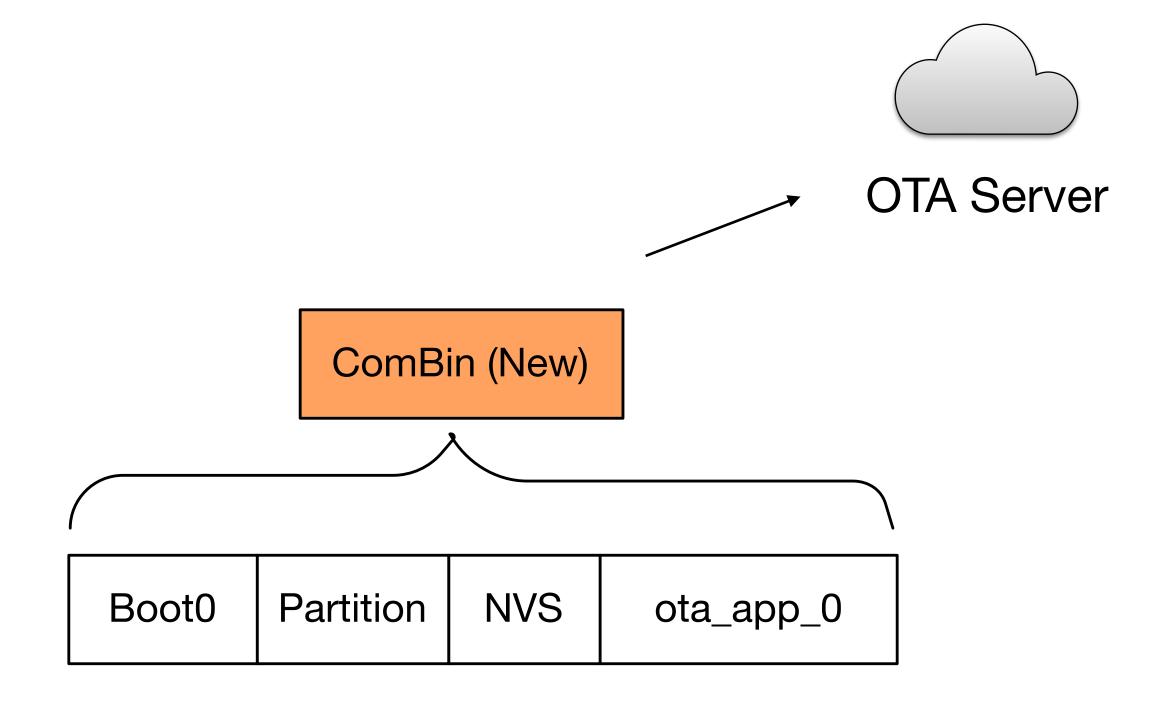




- Different OTA URLS

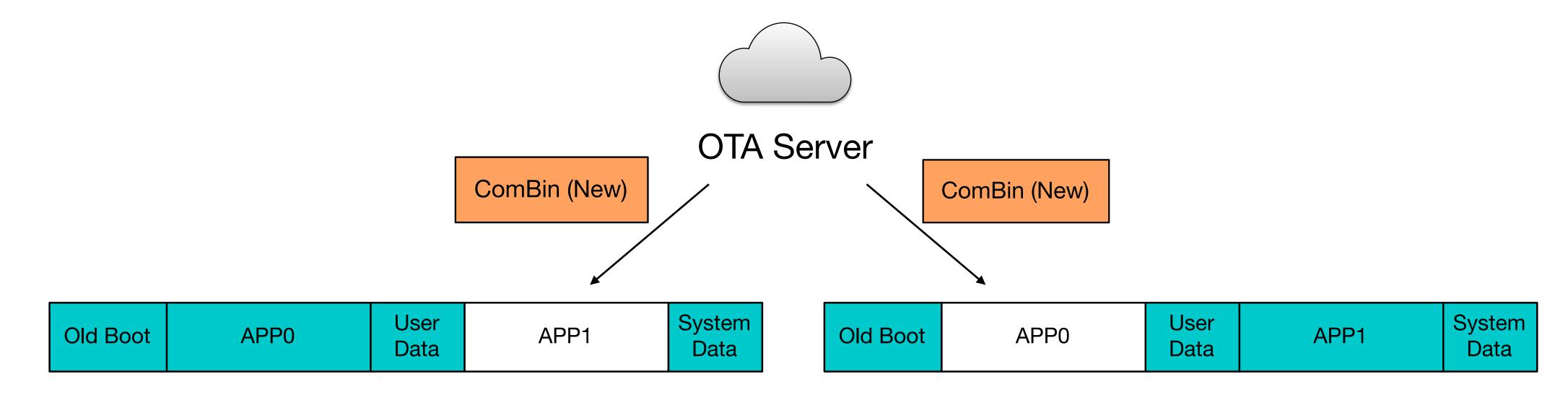
To be compatible with the old SDKs, you need to combine the new version (V3.x and later versions) bins into one bin, and upload it to the OTA server.

Note: Only the ota_app_0 needs to be combined in the "old to new" FOTA.





The old SDK will download the new combined bin from the OTA server.



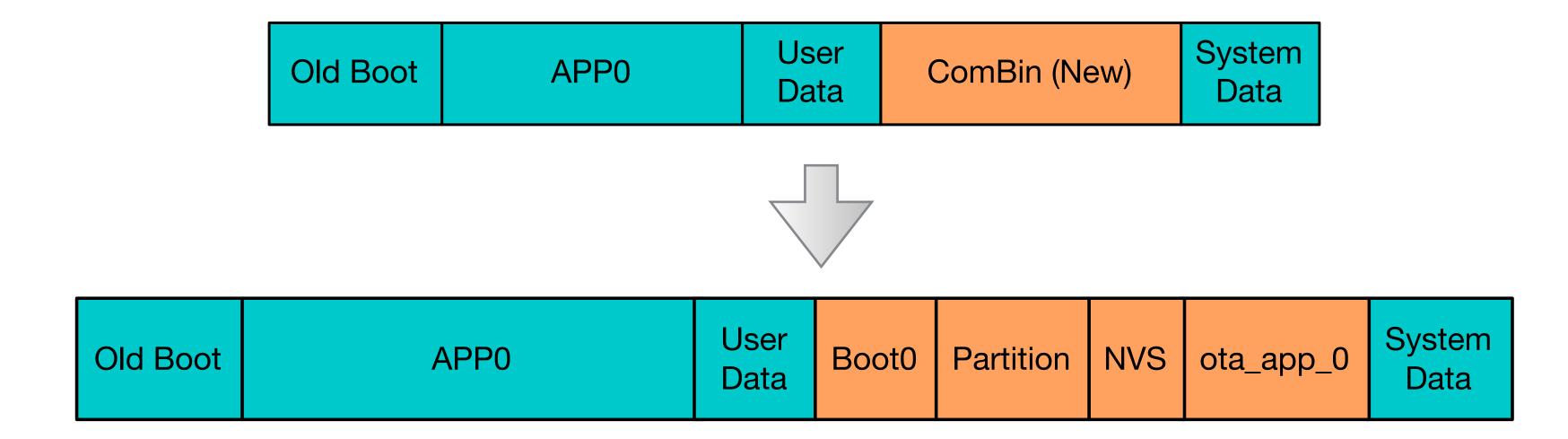
If running the APP0, then download ComBin.bin to the "APP1" area.

In this case, the ComBin will be copied to the "APPO" area to run.

If running the APP1, then download ComBin.bin to the "APP0" area.

In this case, nothing more need to do, the system will reboot to run the ComBin.

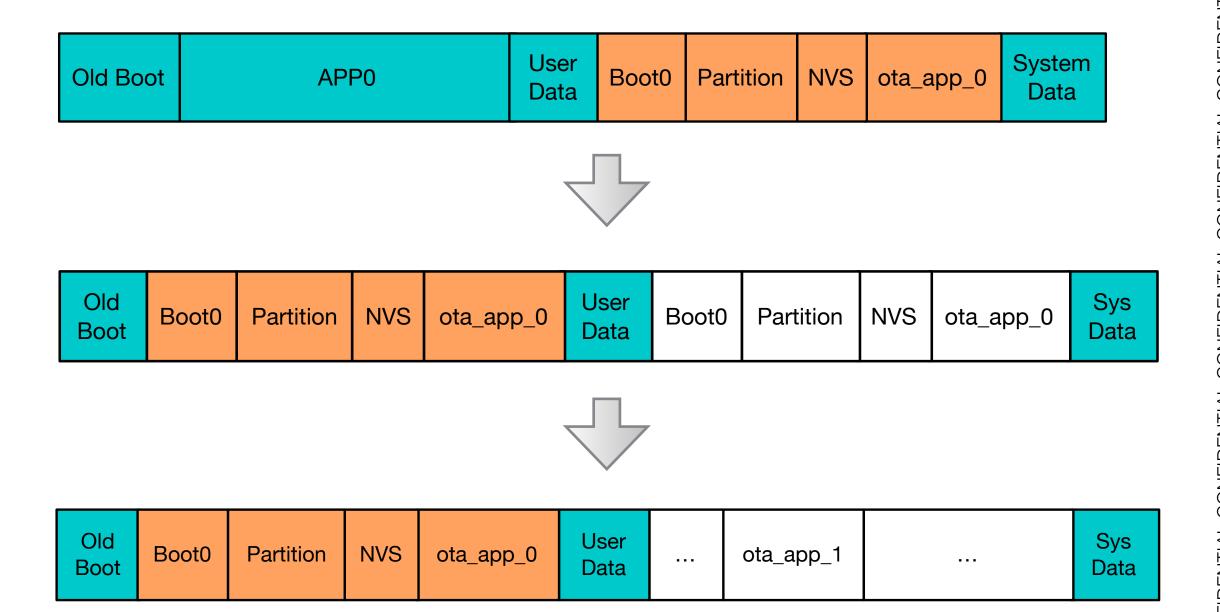
Running the APP0 and downloading the new ComBin is as the following picture.



Then system reboots after FOTA, the Boot0 will copy each part to the target partition address (APP0 area).

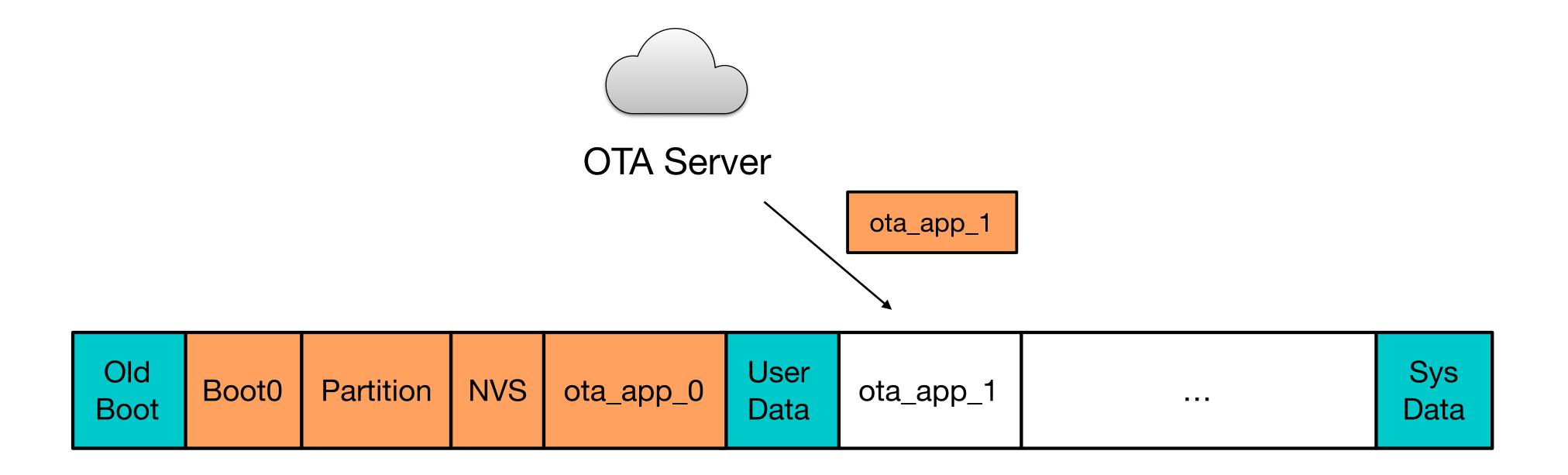
The first start-up flow after the "old to new" FOTA is as:

- Run Old Boot, check "System Data" -> Run Boot0
- Boot0 checks "System Data" whether APP1 running now -> If it is, Boot0 will copy other parts to the APP0 and revise "System Data" to APP0 -> System reboot
- Run Old Boot, check "System Data" -> Run Boot0 in APP0 -> Run ota_app_0 in APP0.





When running the ota_app_0 in APP0, it is actually the new version firmware, then it will download from the "new to new" FOTA url in next upgrade.





Old to New FOTA Limitations

- There are about 40KB (4KB old boot + 16KB new boot + 4KB new partition table
 + 16KB old system parameter) flash size cannot be used by users.
- The size of the ComBin (new boot + new partition + new NVS + new ota_0) should be less than the max limitation of the old APPO.
- The original old APP0/APP1 will be completely erased in the "old to new" FOTA.
- After "old to new" FOTA, the old system parameters cannot be used, users need to re-initialize the system, and deal with the old user parameters if needed.
- If you need to develop your own "old to new" FOTA function, please refer to our boot loader source code, the last 4 sectors have to be reserved for the system parameters.



Part 2. Compatible Solution

- One OTA URLS



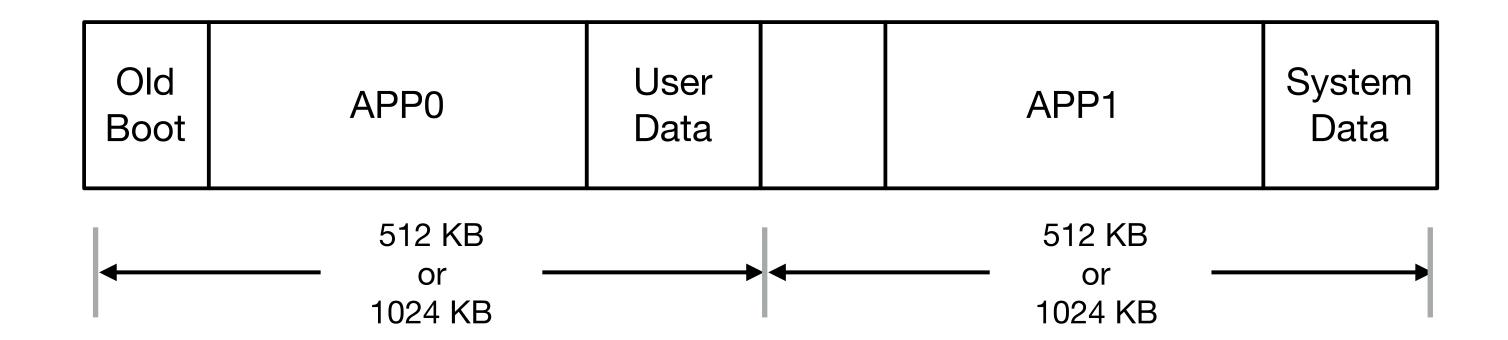
Introduction

- It is much more clear and easier if the OTA server supports multiple OTA urls. The old version products upgrade to the "old to new" firmware, and the new version products upgrade to the "new to new" firmware.
- But if your OTA server does not support multiple OTA urls, we also provide a compatible solution. In order to be compatible with the "old to new" FOTA, it becomes complicated. There will be four different FOTA situations:
 - 1024+1024 map, old to new FOTA
 - 1024+1024 map, new to new FOTA
 - 512+512 map, old to new FOTA
 - 512+512 map, new to new FOTA



Old SDK's Flash Map

ESP8266 NonOS, or RTOS V2.x and earlier versions (Old Versions)



The old SDK supports two different flash map, 512+ 512 and 1024+1024. And the minimum size of cache map is 1024 KB. So,

- with the 512+512 map, APP0 ≠ APP1.
- with the 1024+1024 map, APP0 = APP1.



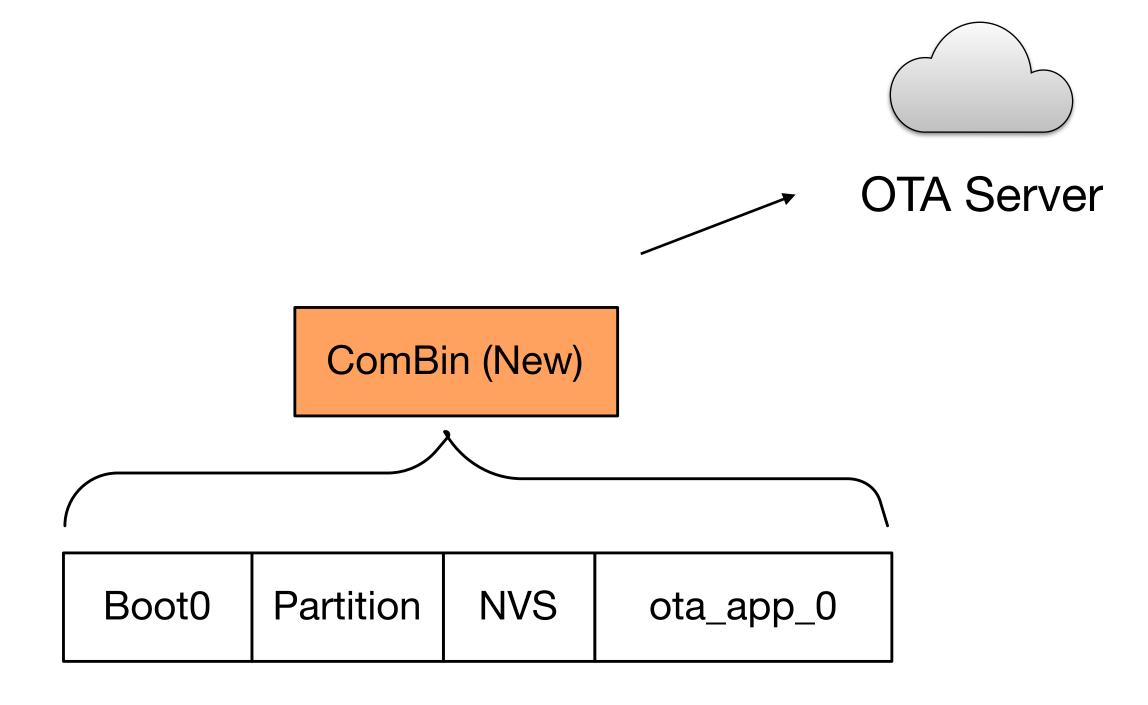
1024 + 1024 Flash Map

- One OTA URLS



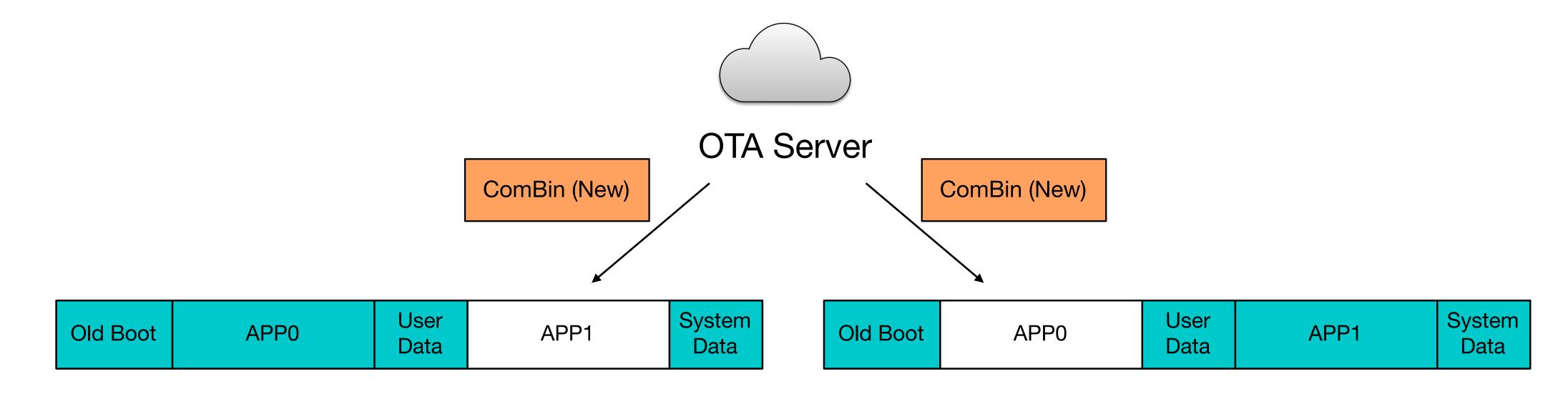
Combine the new version (V3.x and later versions) bins to one bin, and upload it to the OTA server.

For 1024+1024 map, ota_app_0 = ota_app_1.





The old SDK will download the new combined bin from the OTA server.



If running the APP0, then download ComBin.bin to the "APP1" area.

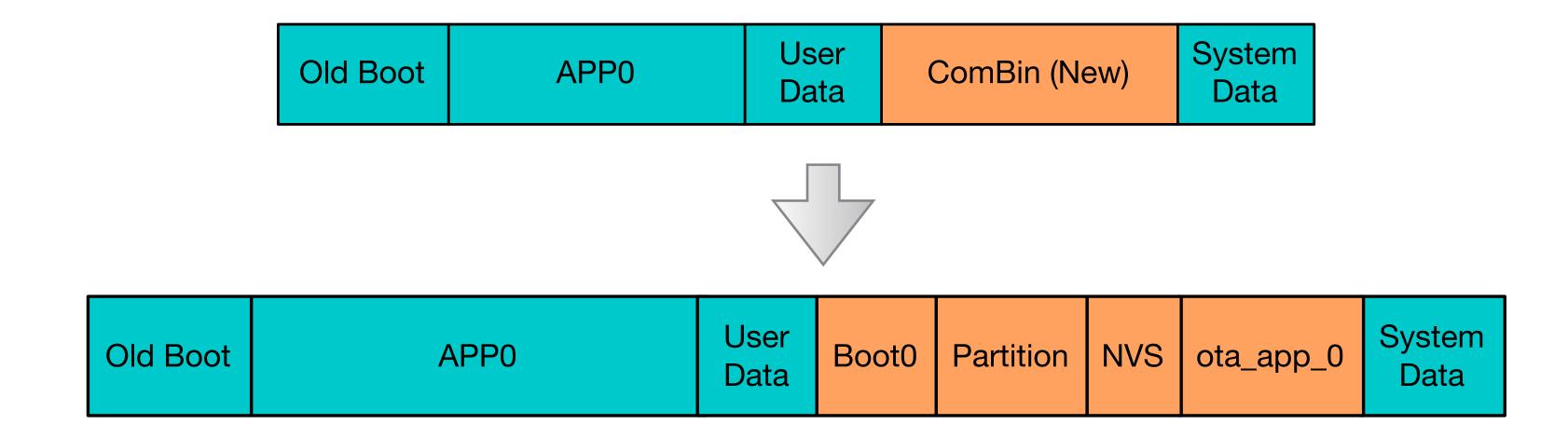
In this case, the ComBin will be copied to the "APPO" area to run.

If running the APP1, then download ComBin.bin to the "APP0" area.

In this case, nothing more need to do, the system will reboot to run the ComBin.



Running the APP0 and downloading the new ComBin is as the following picture.

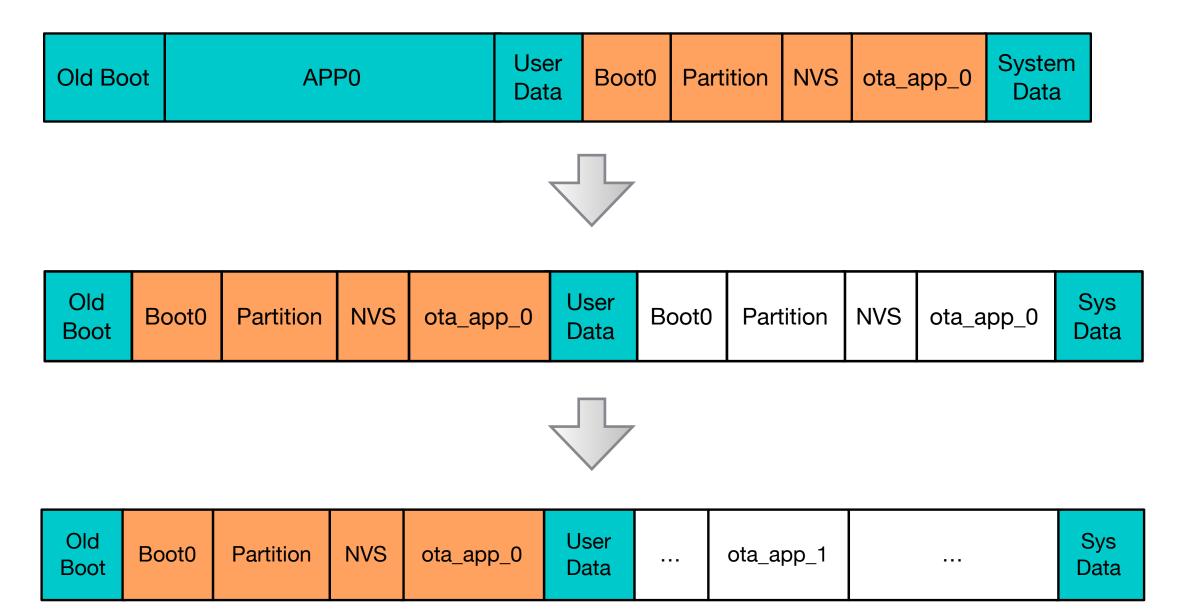


Then system reboots after FOTA, the Boot0 will copy each part to the target partition address (APP0 area).



The first start-up flow after the "old to new" FOTA is as:

- Run Old Boot, check "System Data" -> Run Boot0
- Boot0 checks "System Data" whether APP1 running now -> If it is, Boot0 will copy other parts to the APP0 and revise "System Data" to APP0 -> System reboot
- Run Old Boot, check "System Data" -> Run Boot0 in APP0 -> Run ota_app_0 in APP0.





Old to New FOTA Limitations

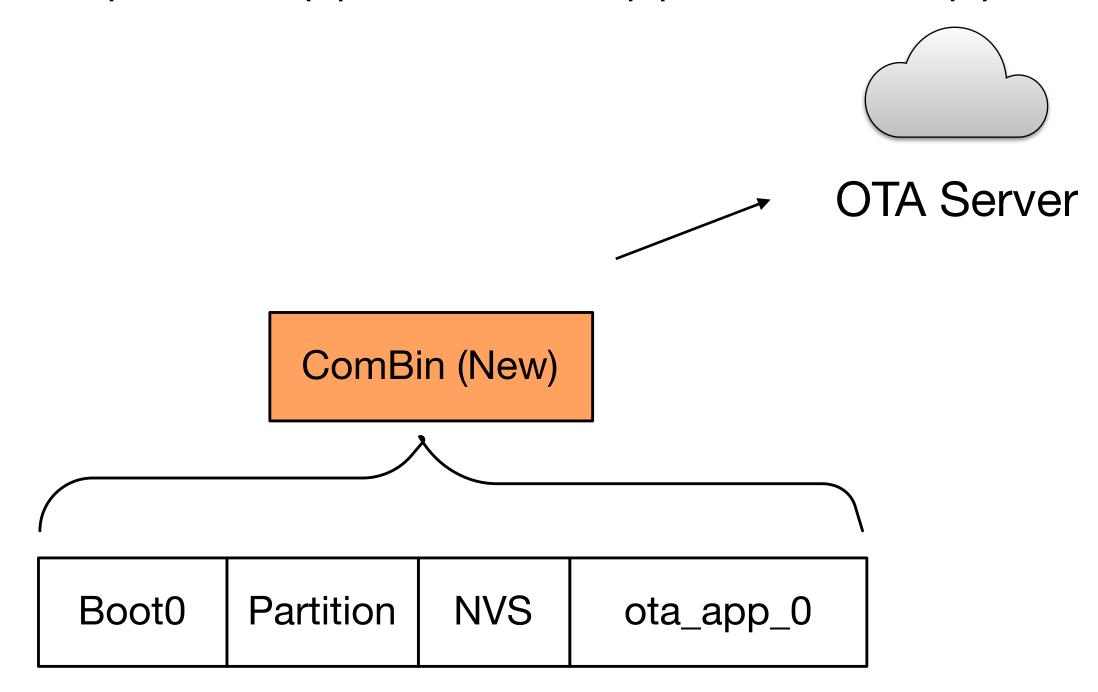
- There are about 40KB (4KB old boot + 16KB new boot + 4KB new partition table
 + 16KB old system parameter) flash size cannot be used by users.
- The size of the ComBin (new boot + new partition + new NVS + new ota_0) should be less than the max limitation of the old APPO.
- The original old APP0/APP1 will be completely erased in the "old to new" FOTA.
- After "old to new" FOTA, the old system parameters cannot be used, users need to re-initialize the system, and deal with the old user parameters if needed.
- If you need to develop your own "old to new" FOTA function, please refer to our boot loader source code, the last 4 sectors have to be reserved for the system parameters.



New to New FOTA (1024+1024)

Combine the new version (V3.x and later versions) bins to one bin, and upload it to the OTA server.

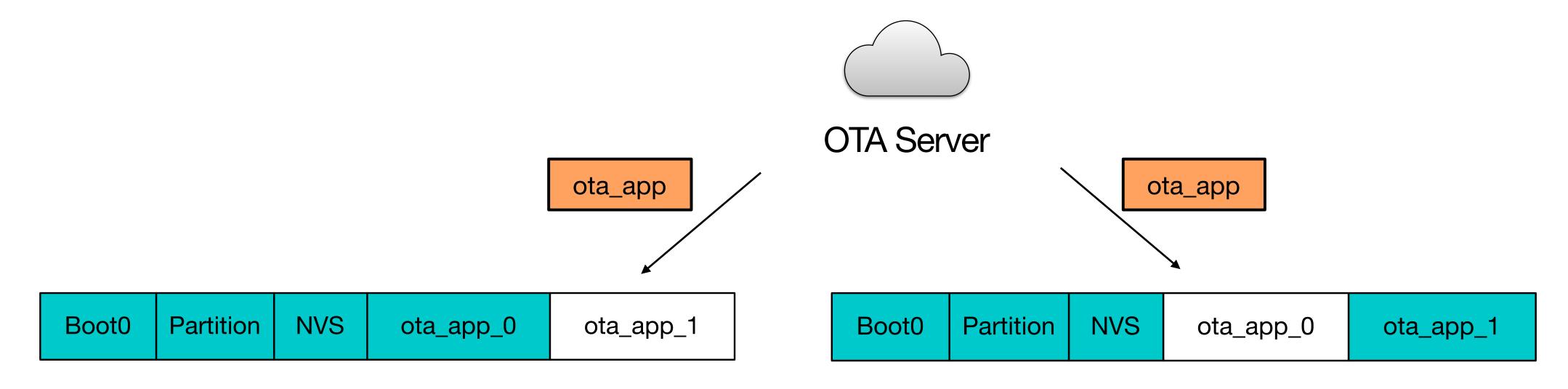
For 1024+1024 map, $ota_app_0 = ota_app_1 = ota_app$.





New to New FOTA (1024+1024)

For "new to new" FOTA, the new SDK needs to get the offset of the ota_app in the compilation result, only downloads the ota_app part accordingly. And then reboot to run the new ota_app.





512 + 512 Flash Map

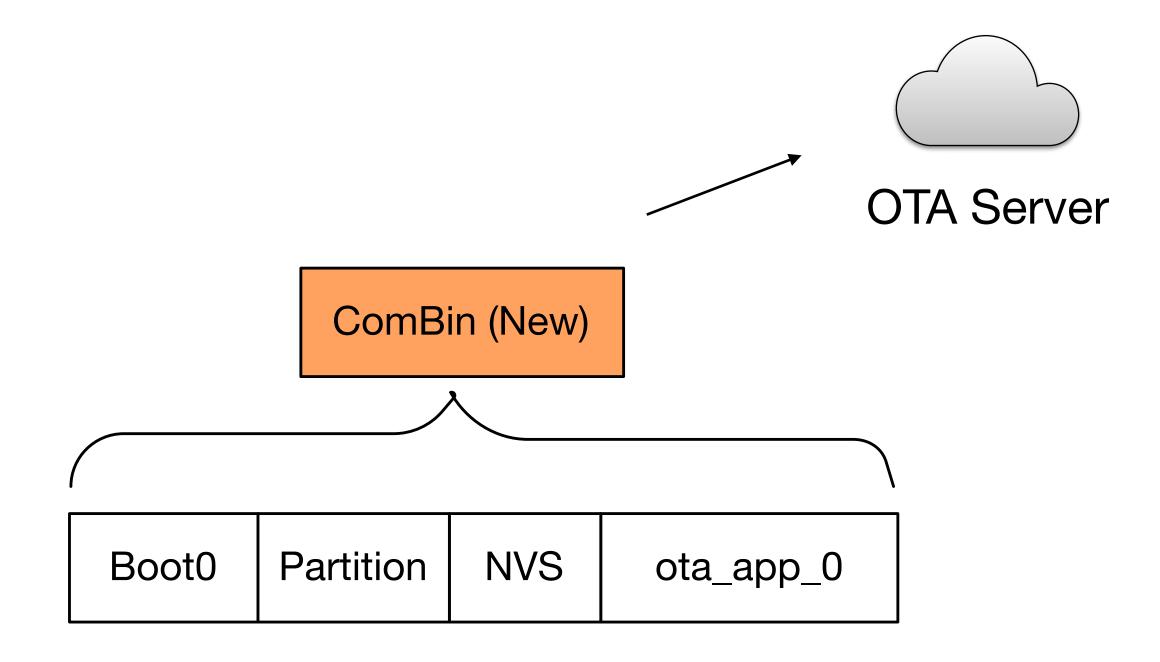
- One OTA URLS



Combine the new version bins to one bin, and upload it to the OTA server.

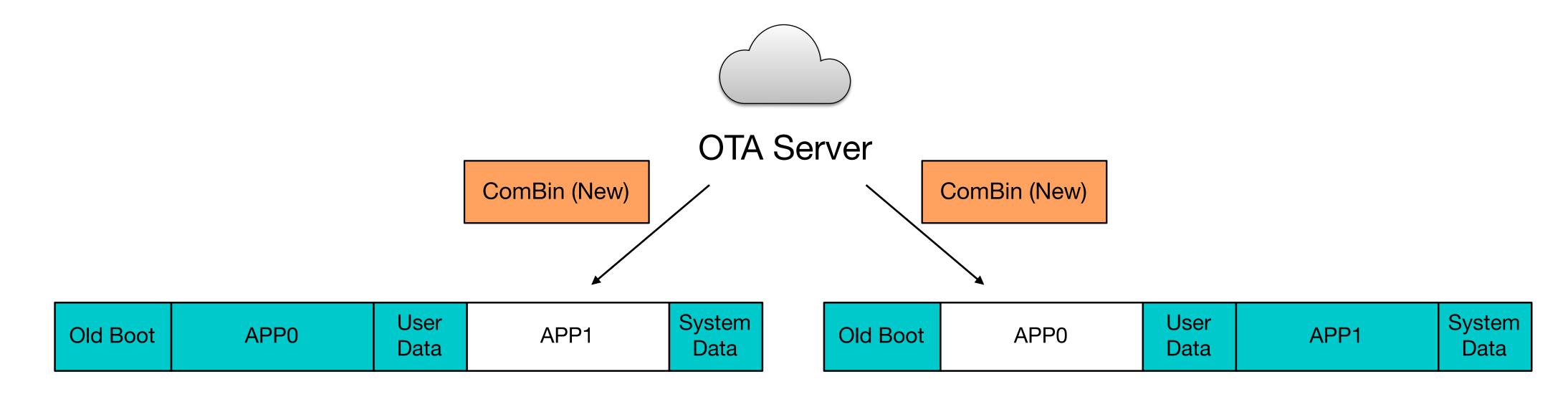
For 512+512 map, ota_app_0 \neq ota_app_1.

Note: Only the ota_app_0 needs to be combined in the "old to new" FOTA.





The old SDK will download the new combined bin from the OTA server.



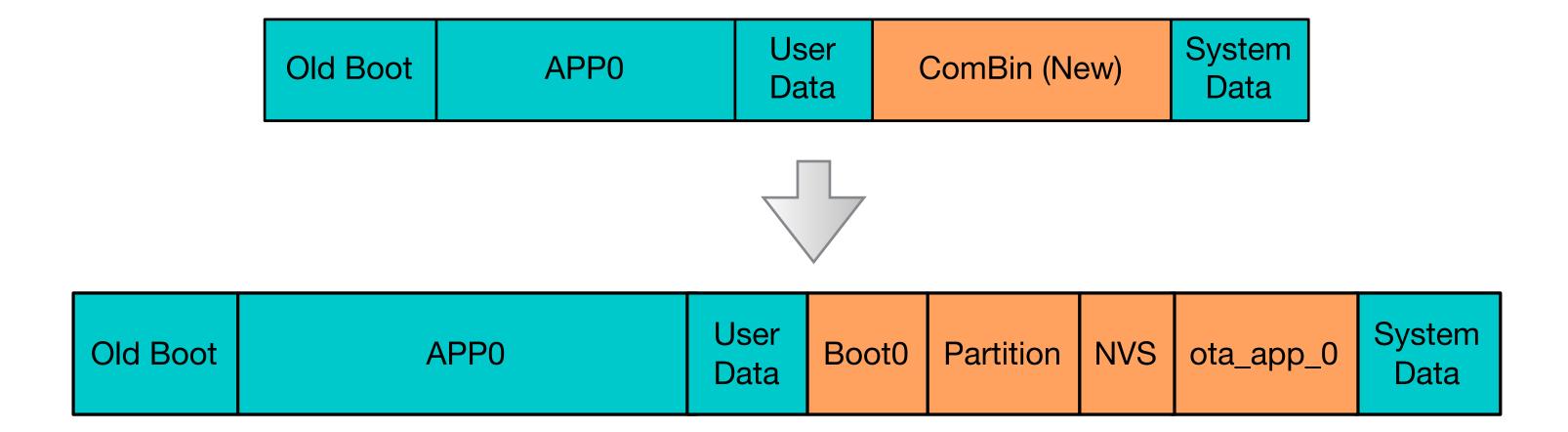
If running the APP0, then download ComBin.bin to the "APP1" area.

In this case, the ComBin will be copied to the "APPO" area to run.

If running the APP1, then download ComBin.bin to the "APP0" area.

In this case, nothing more need to do, the system will reboot to run the ComBin.

Running the APPO and downloading the new ComBin is as the following picture.

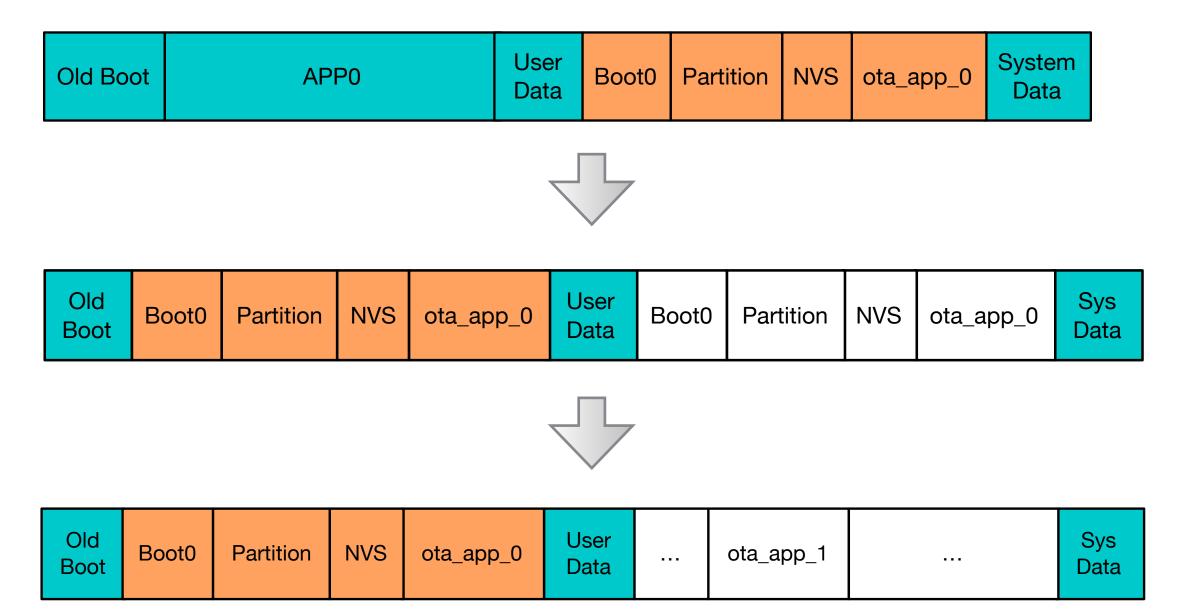


Then system reboots after FOTA, the Boot0 will copy each part to the target partition address (APP0 area).



The first start-up flow after the "old to new" FOTA is as:

- Run Old Boot, check "System Data" -> Run Boot0
- Boot0 checks "System Data" whether APP1 running now -> If it is, Boot0 will copy other parts to the APP0 and revise "System Data" to APP0 -> System reboot
- Run Old Boot, check "System Data" -> Run Boot0 in APP0 -> Run ota_app_0 in APP0.



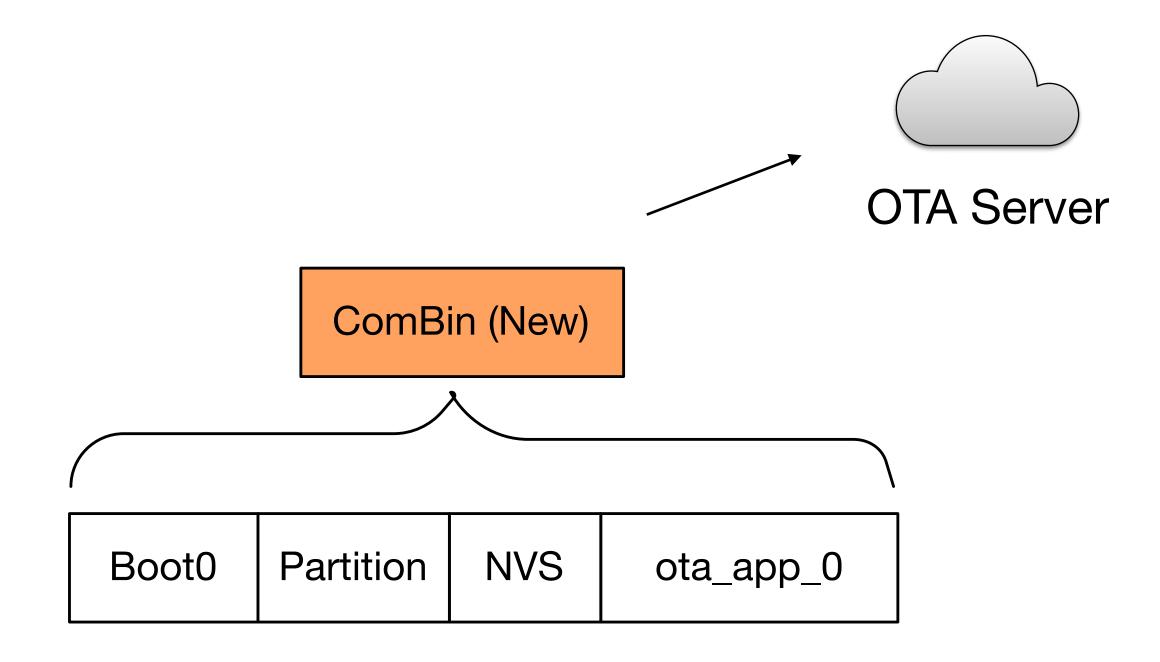


New to New FOTA (512+512)

Combine the new version bins to one bin, and upload it to the OTA server.

For 512+512 map, ota_app_0 \neq ota_app_1.

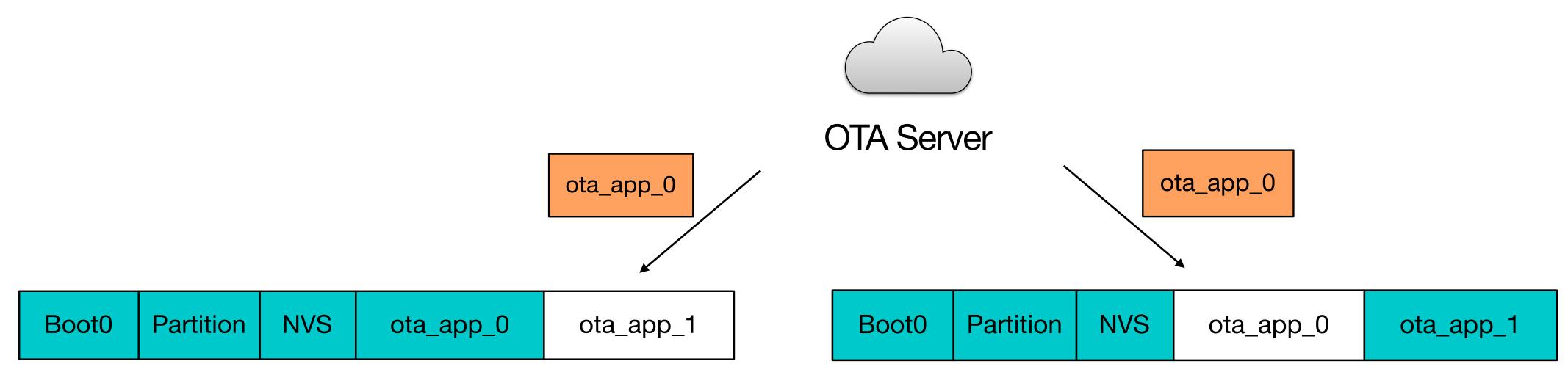
Note: Only the ota_app_0 needs to be combined in the "new to new" FOTA.





New to New FOTA (512+512)

For "new to new" FOTA, the new SDK needs to get the offset of the ota_app in the compilation result, only downloads the ota_app part accordingly.



If running the ota_app_0, then download the new ota_app_0 to the "ota_app_1" area.

In this case, the new ota_app_0 will be copied to the "ota_app_0" area to run.

If running the ota_app_1, then download ota_app_0 to the "ota_app_0" area. In this case, nothing more need to do, the system will reboot to run the ota_app_0.

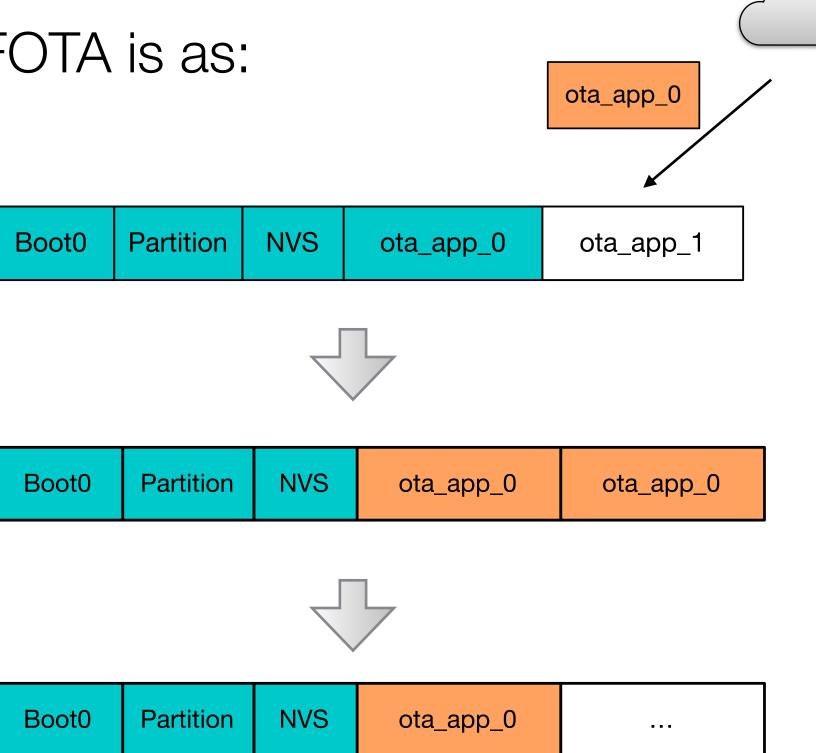


New to New FOTA (512+512)

The first start-up flow after the 512+512 "new to new" FOTA is as:

Run Boot, check ota_data whether to run the "ota_app_1" area If it is, the Boot will copy the downloaded new "ota_app_0"
 from "ota_app_1" area to "ota_app_0" area, then revise ota_data
 to run "ota_app_0" area -> System reboot

Run Boot, check ota_data -> Run ota_app_0 in "ota_app_0" area.





Conclusion

- To be compatible with the old SDKs, the "old to new" FOTA always needs to upload a combined bin to the OTA server.
 - And if the new bin is downloaded to the "APP1" area, it always needs to be copied to the "APP0" area, then run. This will make the first start-up after FOTA take a lot of time.
- If the OTA server supports multiple OTA urls, it is suggested that refer to the "Part 1. Recommended Solution".
- If the OTA server does not support multiple OTA urls, you have to share the same OTA url with both old products and new version products, then you can refer to the "Part 2. Compatible Solution".



Thanks