Dual Bank Firmware Upgrade User Guide

Application Note for 32-bit NuMicro® Family

Document Information

Abstract	介紹如何在M2354的架構下實作Dual Bank Firmware Upgrade。
Apply to	NuMicro® M2354 Series.

For additional information or questions, please contact: Nuvoton Technology Corporation.

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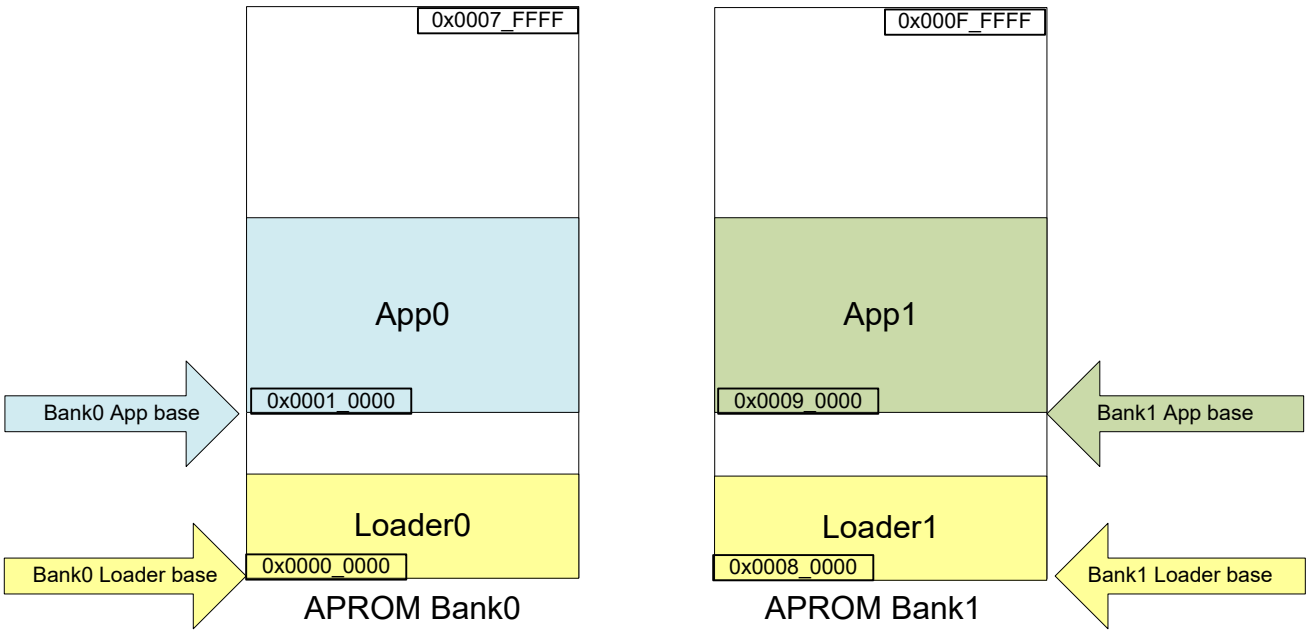
1 Sample Code架構

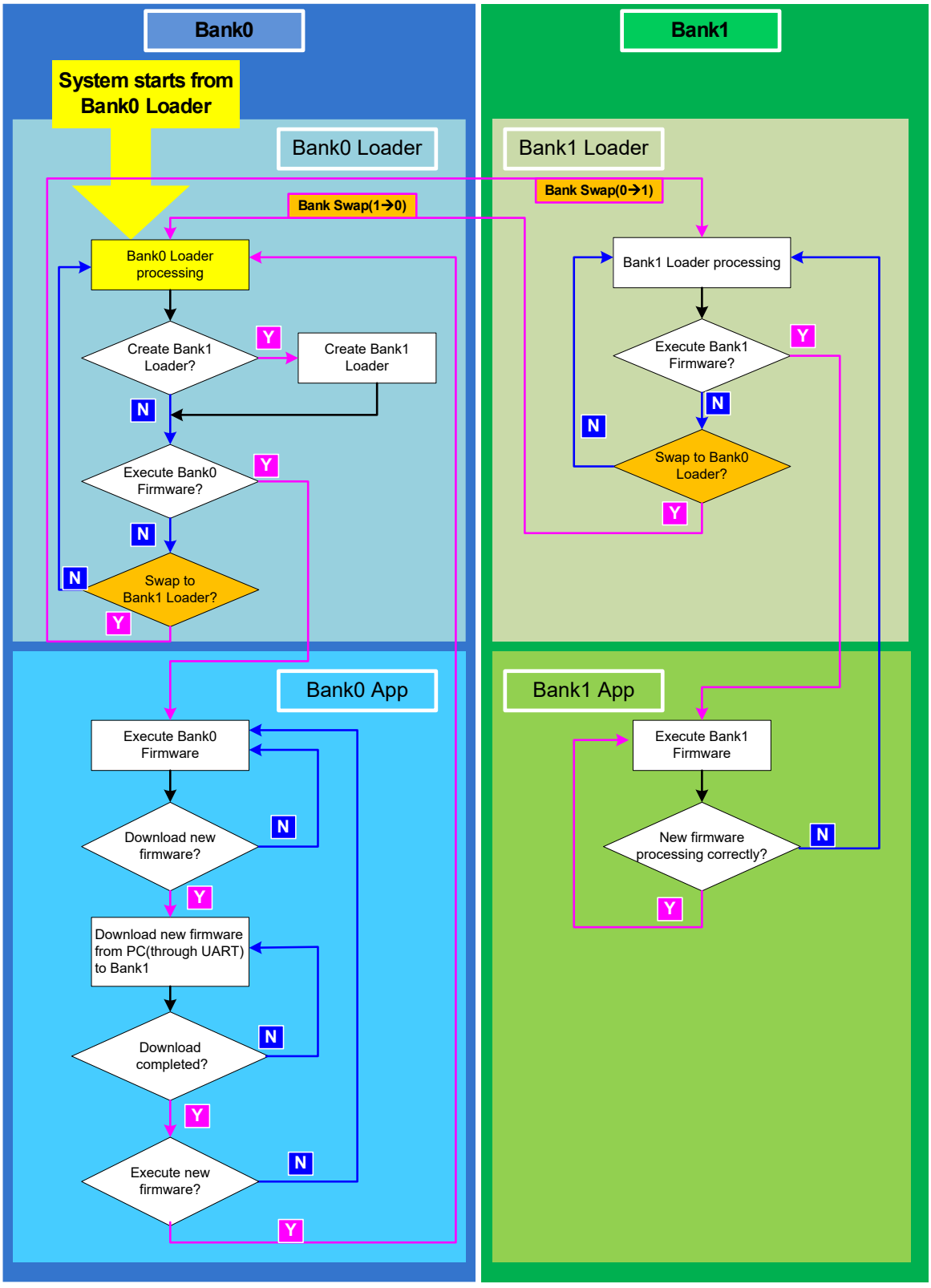
M2354 BSP提供了一個 Dual Bank firmware upgrade的應用程式，位於:
\bsp\SampleCode\StdDriver\FMC_DualBankFwUpgrade。

這個應用程式主要是在M2354的Dual Bank APROM架構下，實作Dual Bank firmware upgrade，以演示在Dual Bank的架構下如何做firmware upgrade。主要有以下兩個程式：

- Loader:
  執行系統啟動和 firmware upgrade 的控制流程，分別放置於 APROM Bank0 和 Bank1 的起始位址，亦即下圖中的 Bank0 Loader base 和 Bank1 Loader base。
- App:
  可執行程式，分別放置於 APROM Bank0 和 Bank1 的程式執行區，亦即下圖中的 Bank0 App base 和 Bank1 App base；可能為 active firmware 或 new firmware。



系統控制流程如下:

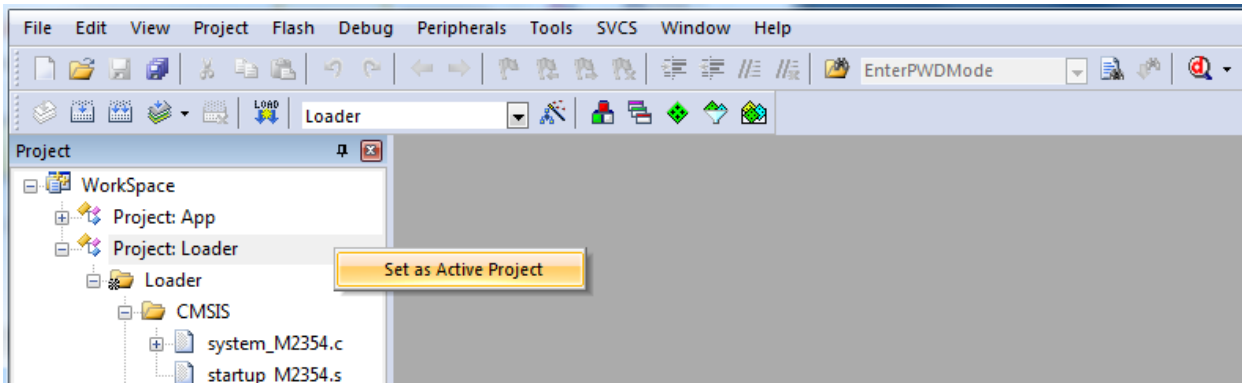

Bank0
Bank1
System starts from Bank0 Loader
Bank0 Loader
Bank1 Loader
Bank Swap(1→0)
Bank Swap(0→1)
Bank0 Loader processing
Create Bank1 Loader?
Y
Create Bank1 Loader
N
Execute Bank0 Firmware?
Y
N
Swap to Bank1 Loader?
N
Y
Bank1 Loader processing
Execute Bank1 Firmware?
Y
N
N
Swap to Bank0 Loader?
Y
Bank0 App
Bank1 App
Execute Bank0 Firmware
Download new firmware?
N
Y
Download new firmware from PC(through UART) to Bank1
Download completed?
N
Y
Execute new firmware?
N
Y
Execute Bank1 Firmware
New firmware processing correctly?
N
Y

2 Firmware Upgrade Sample Code操作步驟

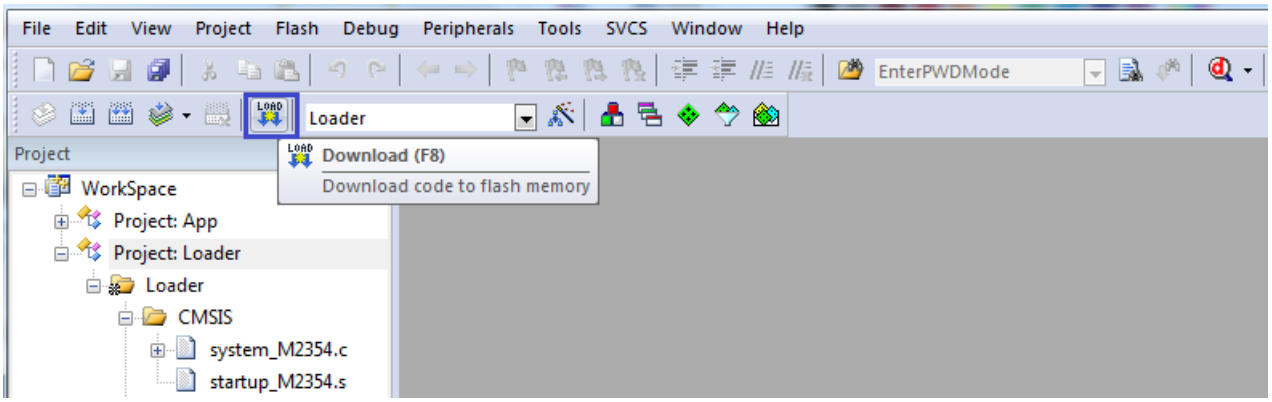
在執行程式前，先定義操作步驟中所使用到的firmware名詞：

- Active firmware： 一開始放置於 Bank0 App 區的 firmware，也是在一般情況下系統執行的 firmware。
- New firmware：
  執行 firmware upgrade 所載入的新版 firmware，放置於 Bank1 App 區。

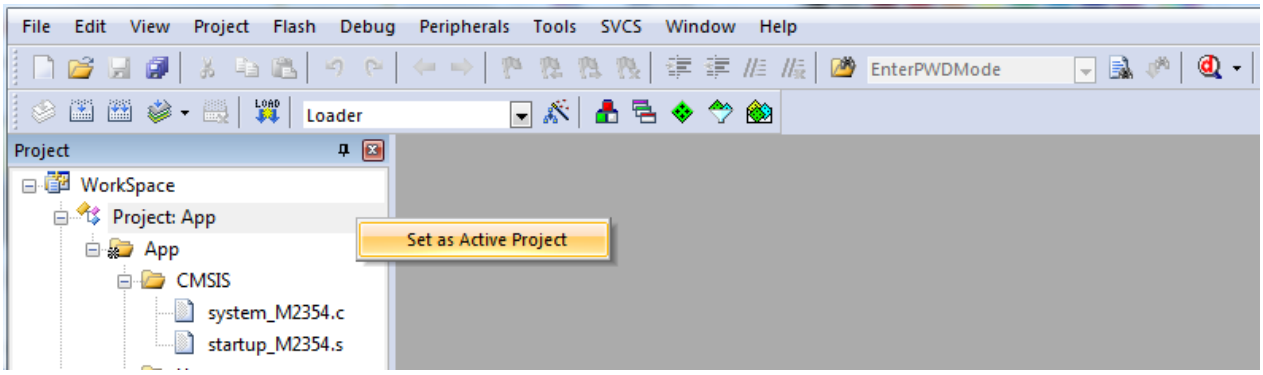
在 \bsp\SampleCode\StdDriver\FMC_DualBankFwUpgrade 目錄下，開啟專案FMC_DualBankFwUpgrade.uvmpw；這個專案有有兩個target，分別為Loader和App。首先先選取Loader這個target，如下圖所示：



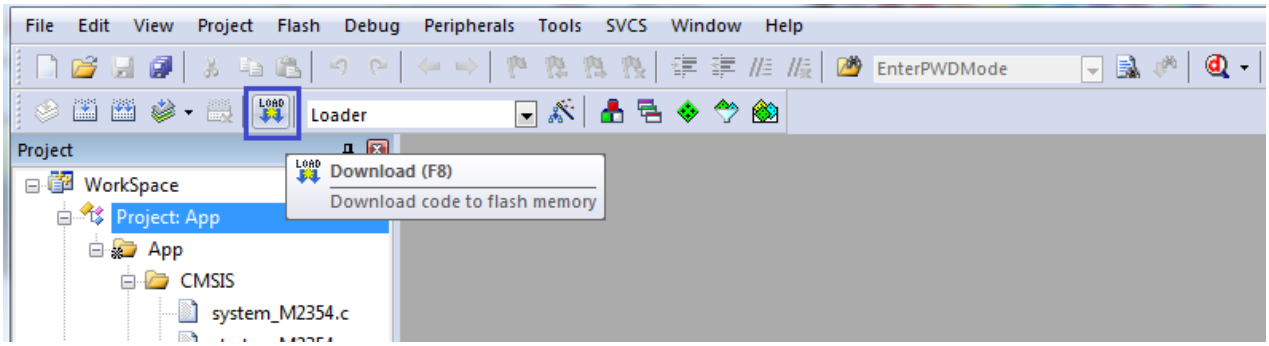
編譯完成後，按下Download按鈕，將loader載入到Bank0 Loader執行區，如下圖所示：



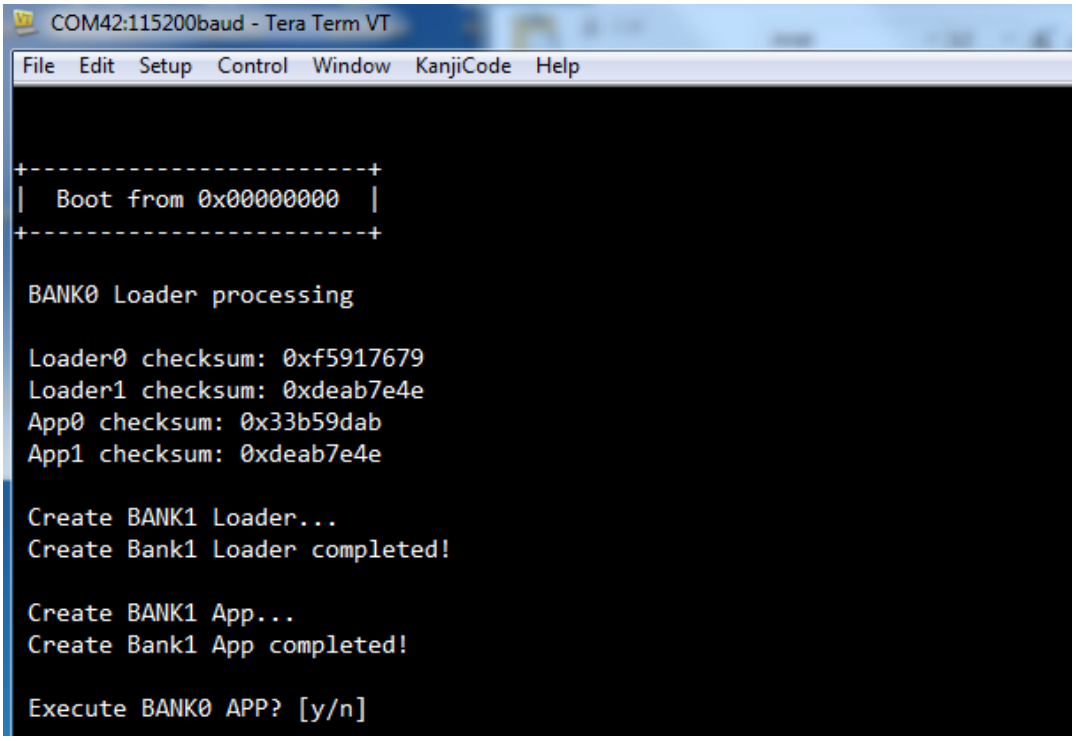
接下來選取App這個target，如下圖所示：



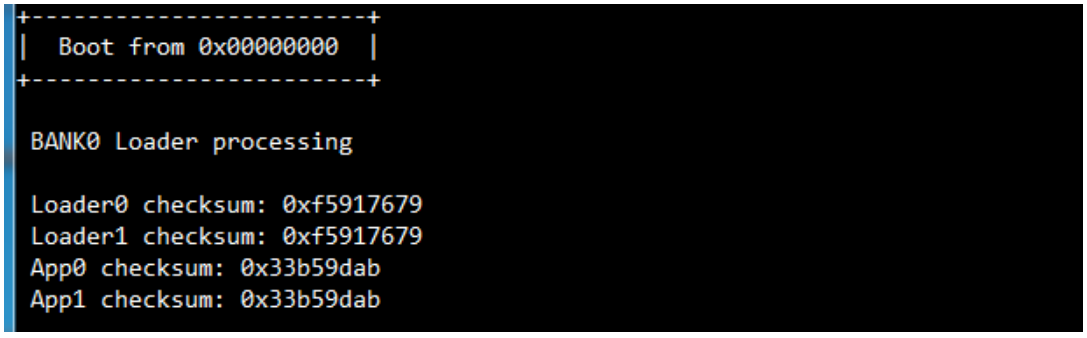
編譯完成後，按下Download按鈕，將App載入到Bank0 App執行區，如下圖所示：



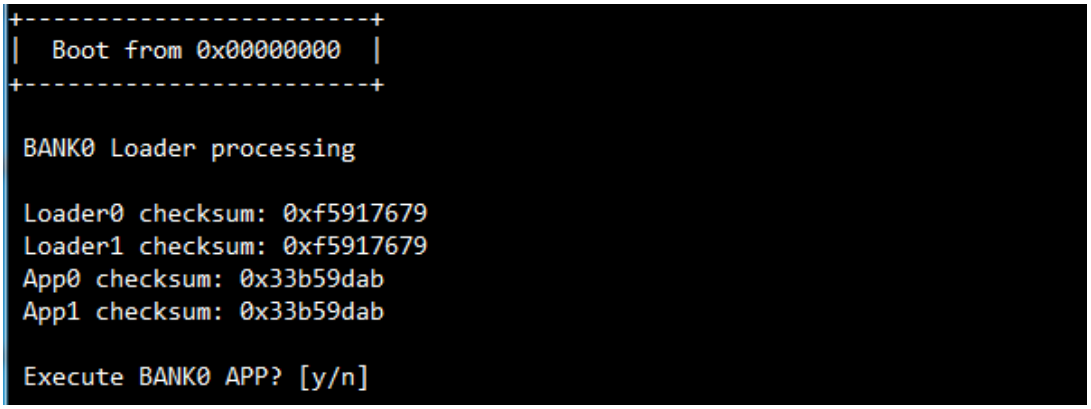
在兩個程式download完畢後，按下M2354上的Reset 鍵啟動系統。系統第一次啟動時，會執行建立Bank1的loader和Bank1的App，如下圖所示：



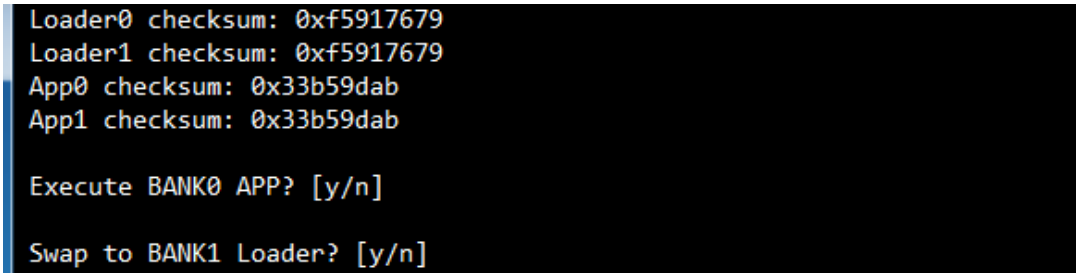
承上，重新啟動系統後，Bank0和Bank1則會有相同的loader和app。如下圖所示(Bank0的Loader定義為Loader0，Bank1的Loader定義為Loader1；Bank0的App定義為App0，Bank1的App定義為App1。Loader0和Loader1的checksum值相同，而App0和App1的checksum值也相同)：



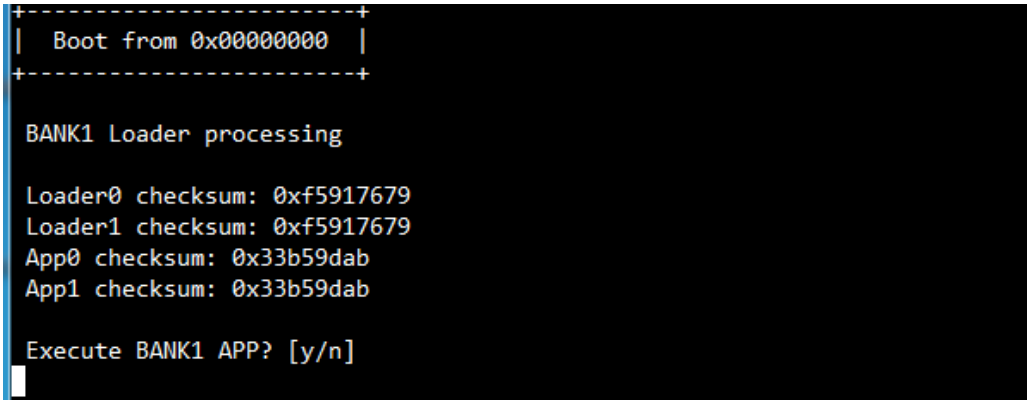
接著先介紹在這樣的架構下，Bank Swap 功能如何運作。當系統啟動後，會出現一個對話訊息，讓使用者決定是否要執行Bank0的firmware(Active firmware)。如下圖所示：



當使用者選擇(n) 不執行Bank0的firmware，則會出現執行Bank Swap的則對話。如下圖所示：



當使用者選擇(y)執行Bank Swap，CPU隨即切換到Bank1，執行Bank1 Loader。如下圖所示：



此時在Bank1 Loader執行的選項，和Bank0 Loader執行時類似，使用一樣可以選擇是否執行該Bank的App。當使用者選擇(n)不執行Bank1的firmware，則會出現執行Bank Swap的則對話。如下圖所示：

```
Loader0 checksum: 0xf5917679
Loader1 checksum: 0xf5917679
App0 checksum: 0x33b59dab
App1 checksum: 0x33b59dab

Execute BANK1 APP? [y/n]

Swap to BANK0 Loader? [y/n]
```

當使用者選擇(y)執行Bank Swap，CPU隨即切換回到Bank0，執行Bank0 Loader。如下圖所示：

```
+-----------------------+
|  Boot from 0x00000000  |
+-----------------------+

 BANK0 Loader processing

 Loader0 checksum: 0xf5917679
 Loader1 checksum: 0xf5917679
 App0 checksum: 0x33b59dab
 App1 checksum: 0x33b59dab

 Execute BANK0 APP? [y/n]
```

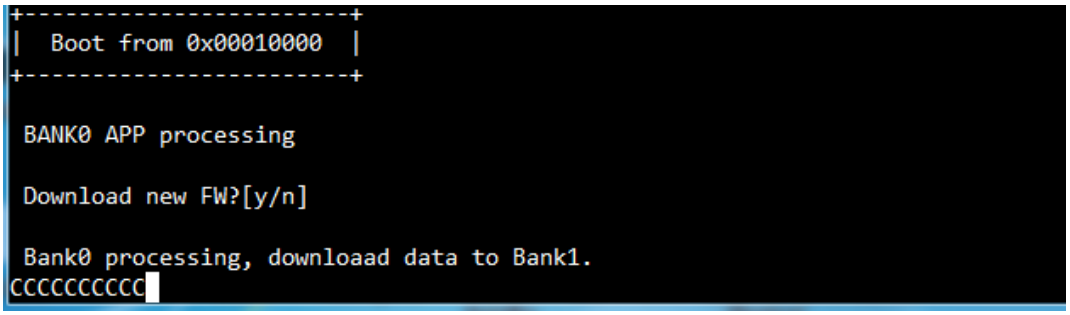
重複上述的步驟，則可以在Bank0和Bank1之間做切換，以檢驗Bank Swap功能是否正常。

接下來則介紹如何操作執行firmware upgrade。首先，系統啟動執行Bank0 loader，如下圖所示：

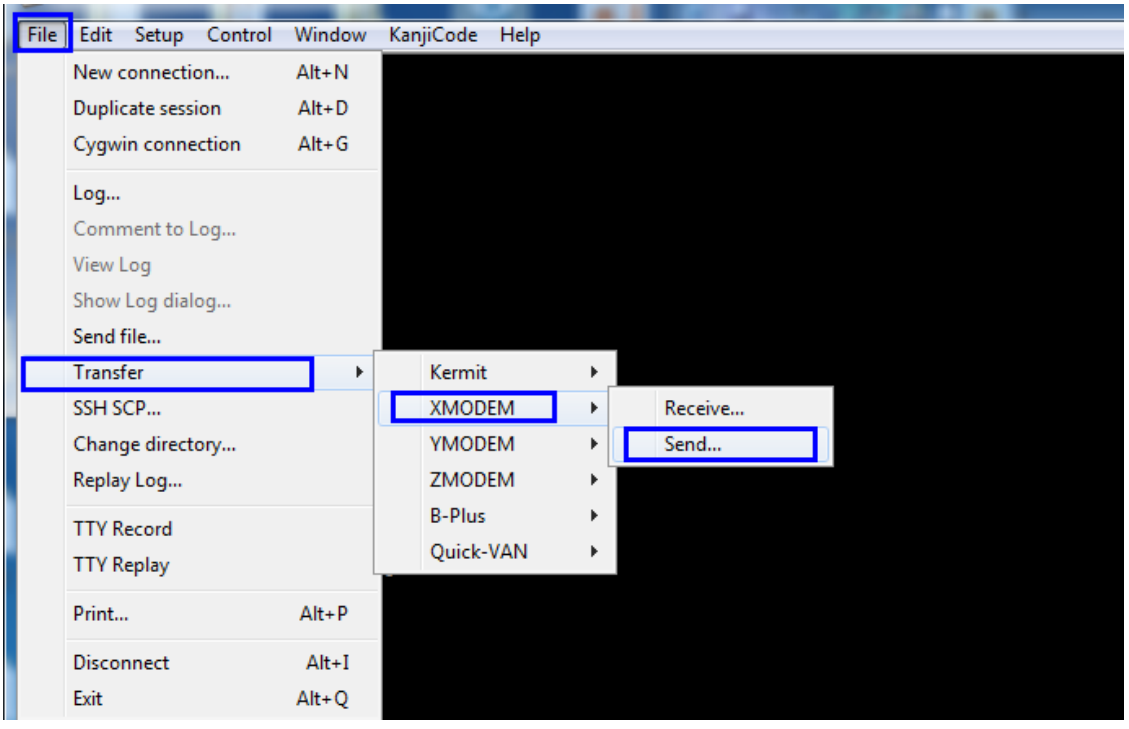
```
+-----------------------+
|  Boot from 0x00000000  |
+-----------------------+

 BANK0 Loader processing

 Loader0 checksum: 0xf5917679
 Loader1 checksum: 0xf5917679
 App0 checksum: 0x33b59dab
 App1 checksum: 0x33b59dab

 Execute BANK0 APP? [y/n]
```

此時，可用者可以選擇(y)以執行Bank0 firmware。如下圖所示：

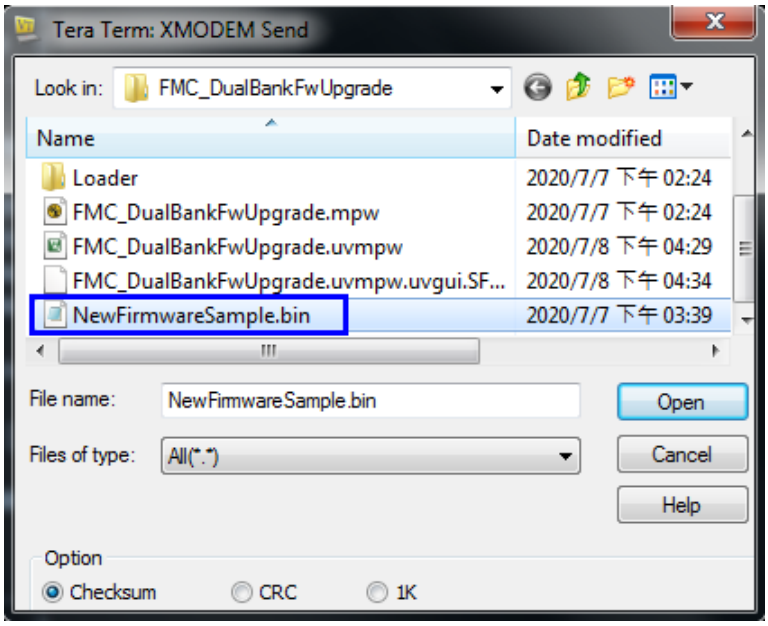
此時畫面上可看到"Boot from "0x10000"和”BANK0 APP processing”的訊息。接著會出現一個選擇對話，讓使用者決定是否要做firmware upgrade。當使用者選擇(y)以執行firmware upgrade，會出現Xmodem傳輸啟動的字元’C’，如下圖所示：



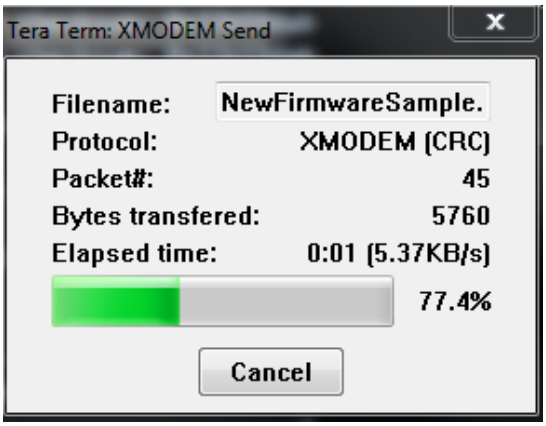
接著在UART的視窗選擇”File→Transfer→XMODOM→Send”來啟動Xmodem的傳輸，如下圖所示：



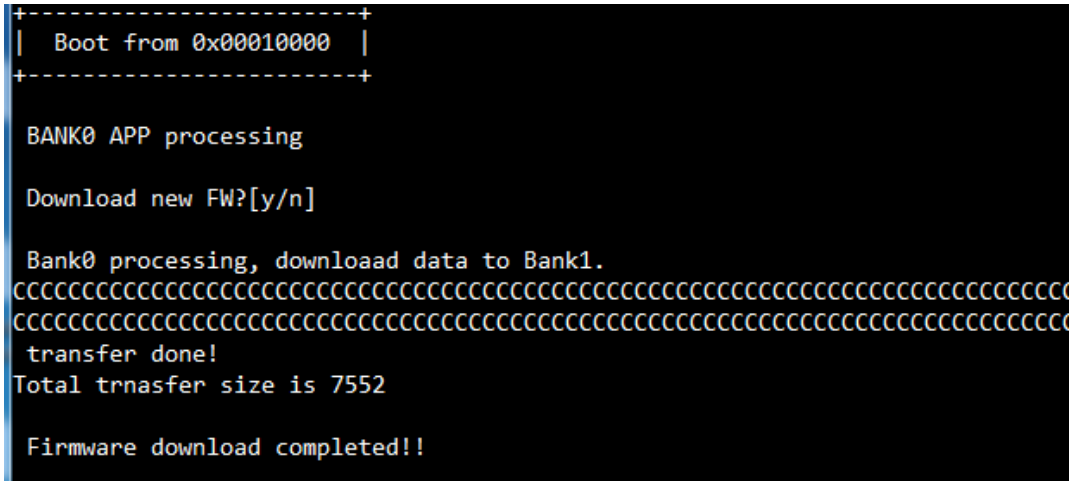
而後會出現一個XMODEM Send 的視窗，在該視窗中選取Sample code中提供的NewFirmwareSample.bin(位於\bsp\SampleCode\StdDriver\FMC_DualBankFwUpgrade)，如下圖所示：



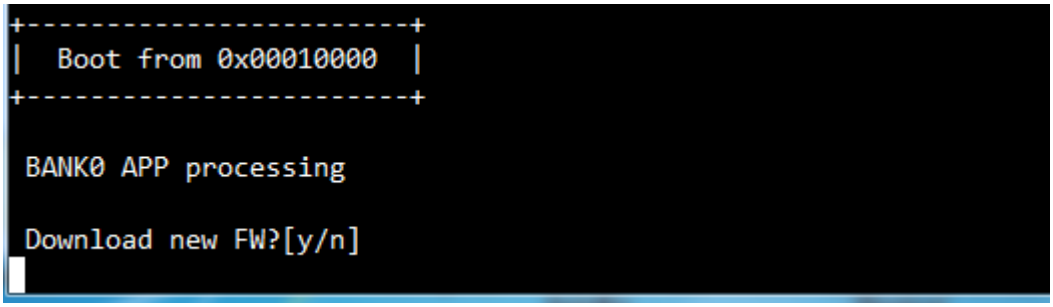
在該bin檔上雙擊後，該檔案即開始傳輸，如下圖所示：



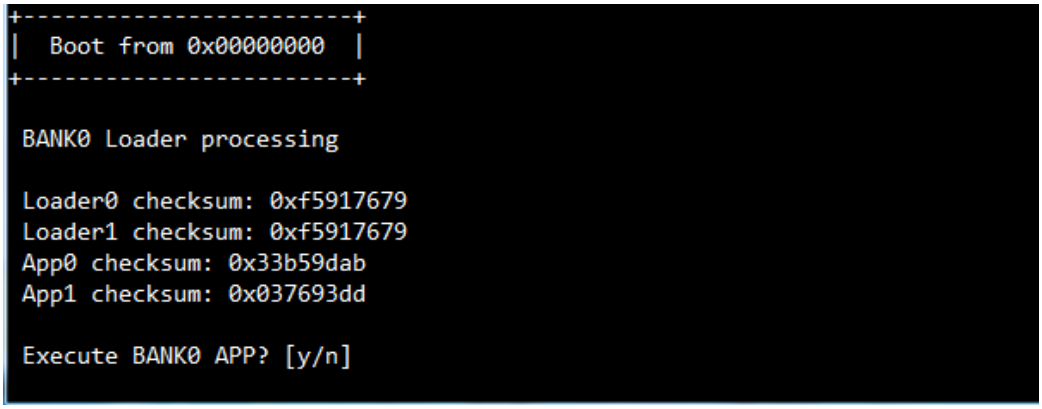
傳輸完成後，回到原先的debug視窗，會出現”Firmware download completed!!” 訊息，表示firmware更新完畢。如下圖所示：



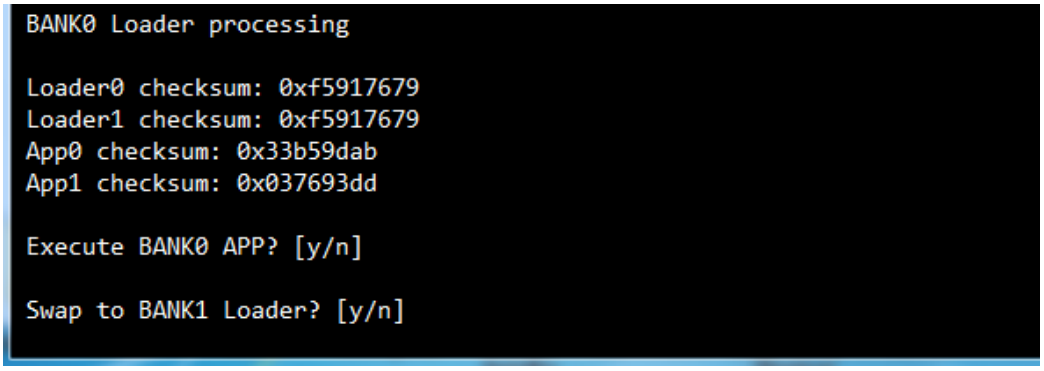
接著會回到Bank0 firmware執行的畫面，如下圖所示：



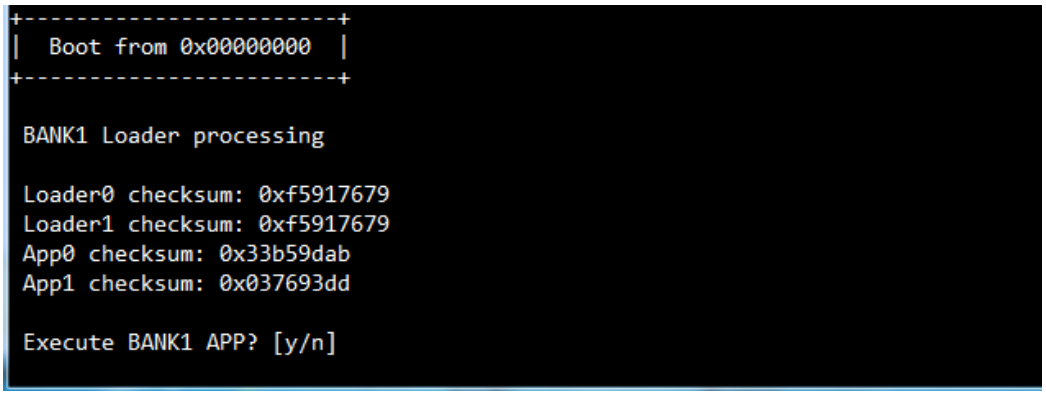
此時，新版的firmware放置於Bank1 App base，所以如果使用者愈執行新版firmware，則需選擇(n)，讓系統回到Bank0 Loader執行。如下圖所示：



而後再選擇(n)不執行Bank0 firmware，如下圖所示：



而後再選擇(y)讓系統切換到Bank1 Loader，如下圖所示：



最後，再選擇(y)讓系執行Bank1 App base的程式，也就是執行新版的firmware，如下圖所示：

Revision History

Date	Revision	Description
2020.07.10	1.00	1. Initially issued.

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