

双BMC FLASH镜像功能设计说明

1 修订

版本	内容	负责人	日期
0.1	方案设计说明，自验样例	陈炫任	2022/10/19
0.2	部分内容补充及格式优化	邓伟松	2022/10/22

2 功能概述

本文主要介绍BMC 双BMC FLASH 设计功能目的，功能实现原理，及对应测试样例。

3 目的

BMC备用固件目的主要flash硬件故障时切换。作为冗余FLASH。

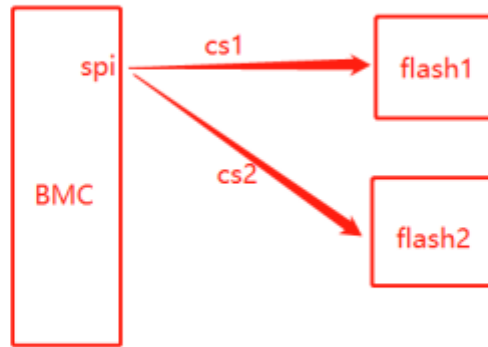
4 依赖

BMC双镜像冗余部分代码可以用在PR2710E和PR2715E上，只要硬件设计保持一致，原则上就没问题（PR2715E原方案是利用器件来片选，和AMI的解决方案冲突）

5 功能实现

双镜像功能用AMI提供的解决方案实现，原理是利用SPI的cs片选来切换不同flash，软件上把两个flash虚拟成一个设备来读写。硬件拓扑如下：

注意：不建议在备区flash上面进行测试，也不建议多次刷新备区flash。备区flash是作为冗余flash的功能，他的BMC版本应该是低于主区的。仅在主区flash损坏时，在备区刷新主区来达到手动恢复的目的，而不是用来跑服务的所以稳定上不可靠。



双flash cs硬件拓扑

目前不支持主动切换BMC，BMC备用固件仅在主要flash硬件故障时切换。

5.1 如何识别flash硬件固件？

利用aspeed 2600芯片上的FMC_WDT2看门狗超时BMC芯片切换cs并reset,使得备区flash加载。

Offset: 64h FMC64: FMC.WDT2 Control/Status Register for Alternate Boot Init = 0		
Bit	R/W	Description
31:16	RO	Reserved (0)
15:8	RO	Watchdog active event counter The counter value can be cleared by writing bit[31:24] = 0xEA.
7	RO	Reserved (0)
6	RO	Alternate Boot Mode that defined by OTP 0: 2 chips mode 1: 1 chip mode
5	RO	Single chip boot mode source select indicator
4	RW	Boot flash source select indicator 0: boot from primary source 1: boot from alternate source This bit can be set to '1' only by FMC.WDT2 or external ABR pin FWSPiABR (OTP trap_en_bspi_auxpin = 1), and cleared to '0' by writing bit[23:16] = 0xEA.
3:1	RO	Reserved (0)
0	RW	Enable watchdog

5.2 如何在MDS工程中使用该功能？

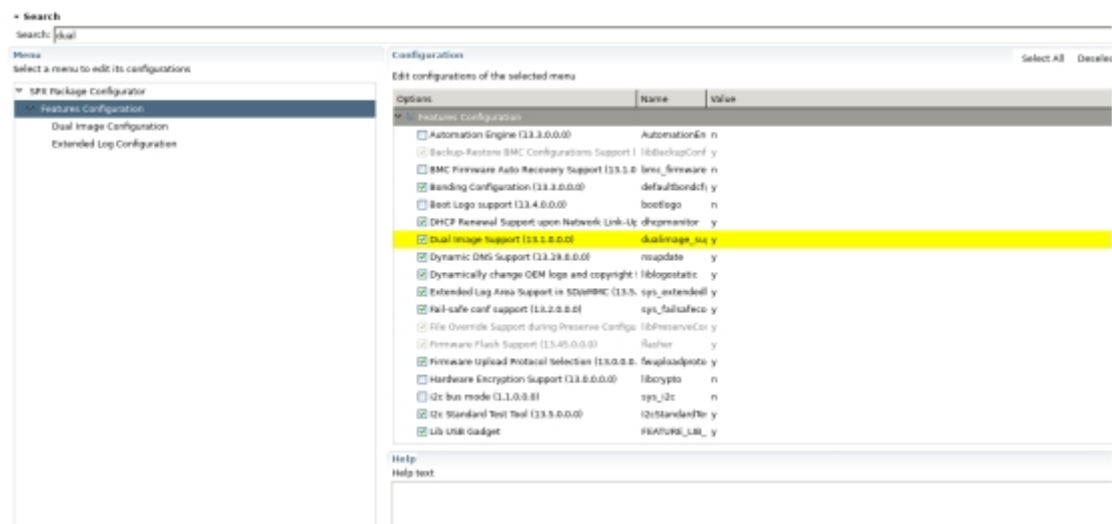


图1

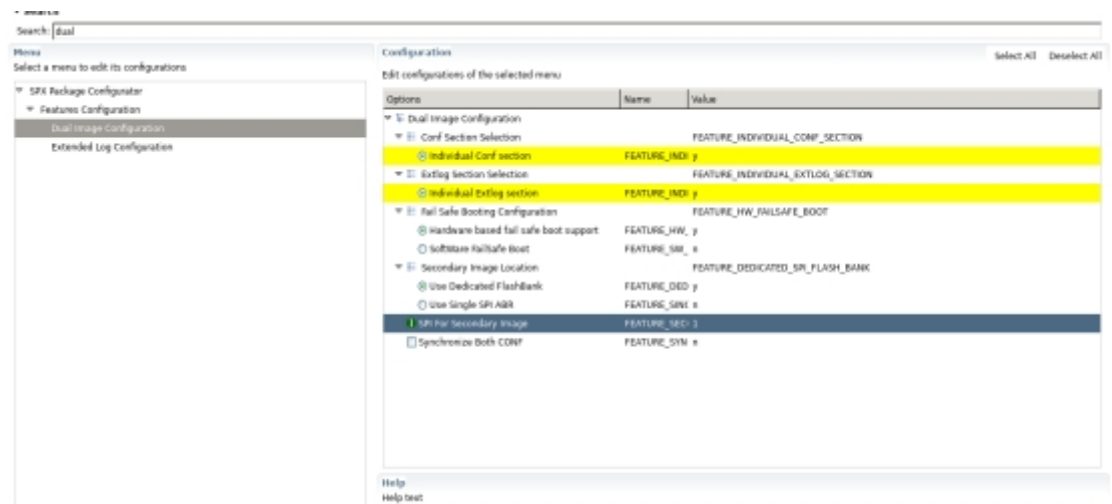


图2

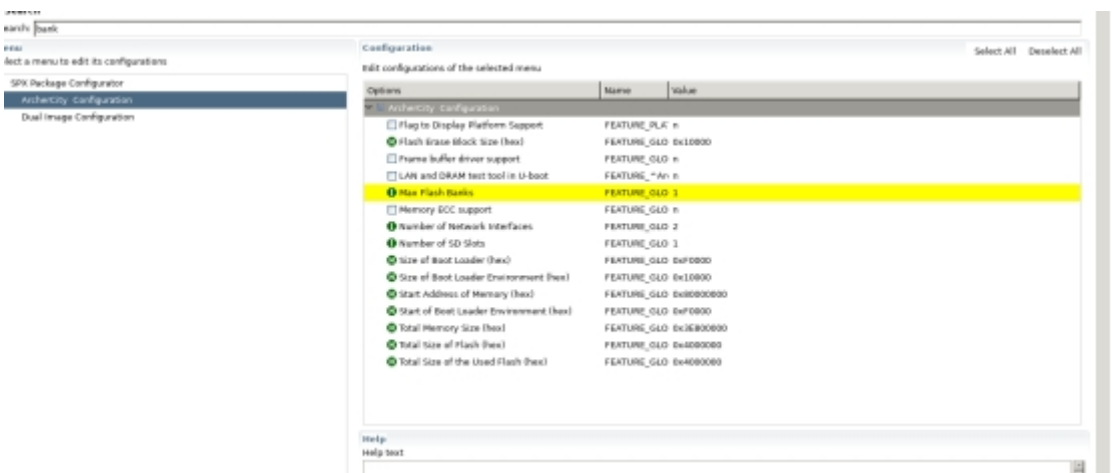
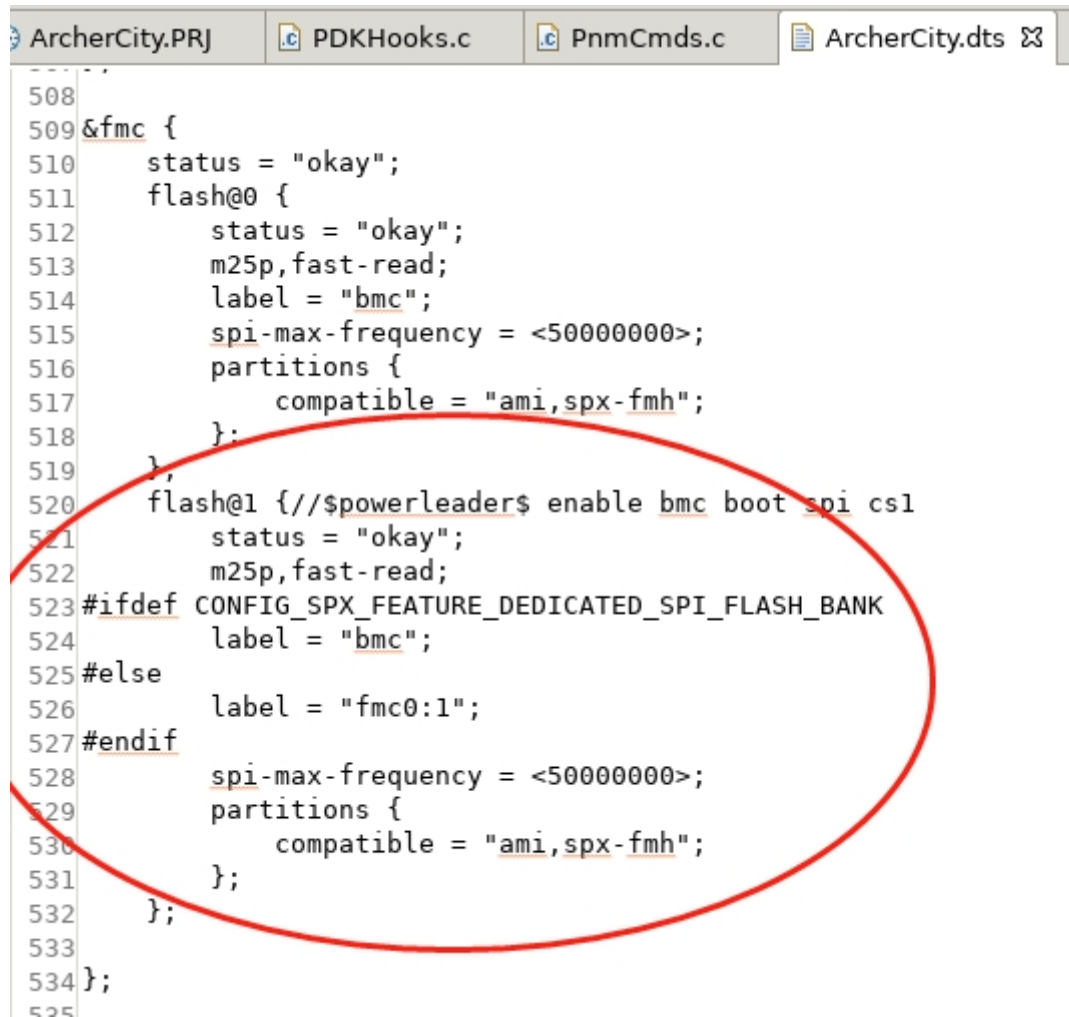


图3

图2的Use Dedicated FlashBank意义是使用两个物理上的flash，Use Single SPI ABR是单flash双分区，同时还要注意修改Max Flash Banks为2，否则启动不了BMC

5.3 DTS设置

同时在dts设备树的fmh节点打开flash@2表示驱动使用cs2信号



```
508
509 &fmc {
510     status = "okay";
511     flash@0 {
512         status = "okay";
513         m25p,fast-read;
514         label = "bmc";
515         spi-max-frequency = <50000000>;
516         partitions {
517             compatible = "ami,spx-fmh";
518         };
519     },
520     flash@1 {//$powerleaders$ enable bmc boot spi cs1
521         status = "okay";
522         m25p,fast-read;
523         #ifdef CONFIG_SPX_FEATURE_DEDICATED_SPI_FLASH_BANK
524             label = "bmc";
525         #else
526             label = "fmc0:1";
527         #endif
528         spi-max-frequency = <50000000>;
529         partitions {
530             compatible = "ami,spx-fmh";
531         };
532     };
533
534 };
535
```

6 用例

该自验测试在PR2715E V2平台上测试

6.1 web接口升级BMC的ima文件

上传ima文件，点击开始固件更新，选择要更新的flash

- MSCC RAID
- BRCM RAID
- CPLD
- BIOS固件更新

选择镜像档

rom.ima



开始固件更新

Protocol Type:

HTTPS

The dual image formation to be used for firmware update is displayed as follows. To configure image to be booted from upon Reset, choose 'Dual Image Configuration' under Maintenance.

当前活动的镜像

Image-1

更新的镜像

无效的镜像



无效的镜像

镜像 1

镜像 2

2 个镜像

☐ 保存所有配置。在固件更新，这将保存所有配置设置 - 不论个别项目标记为保存/覆盖在下面的表格。

所有配置下列项目将作为默认配置恢复操作期间保存。 点击 "Edit Preserve Configuration" 修改保存状态设置。

[Edit Preserve Configuration](#)

S.No	Preserve Configuration Item	Preserve Status
1	SDR	Overwrite
2	FRU	Overwrite

11	SYSLOG	Overwrite
12	WEB	Overwrite
13	EXTLOG	Overwrite
14	REDFISH	Overwrite

基于部分的固件更新

现有映像和上传映像中的所有模块部分版本相同。

☐ 比较flash版本

☒ 全选 Flash

部分名称	现有的版本	上传的版本	升级/不升级
boot	13.4.000000	13.4.000000	<input type="checkbox"/>
conf	13.4.000000	13.4.000000	<input type="checkbox"/>
bkupconf	13.4.000000	13.4.000000	<input type="checkbox"/>
root	13.4.000000	13.4.000000	<input type="checkbox"/>
osimage	13.4.000000	13.4.000000	<input type="checkbox"/>
www	13.4.000000	13.4.000000	<input type="checkbox"/>
extlog	13.4.000000	13.4.000000	<input type="checkbox"/>
extlog	13.4.000000	13.4.000000	<input type="checkbox"/>
arcity	0.0.6	0.0.6	<input type="checkbox"/>

选择部分 Flash

Uploading 100%

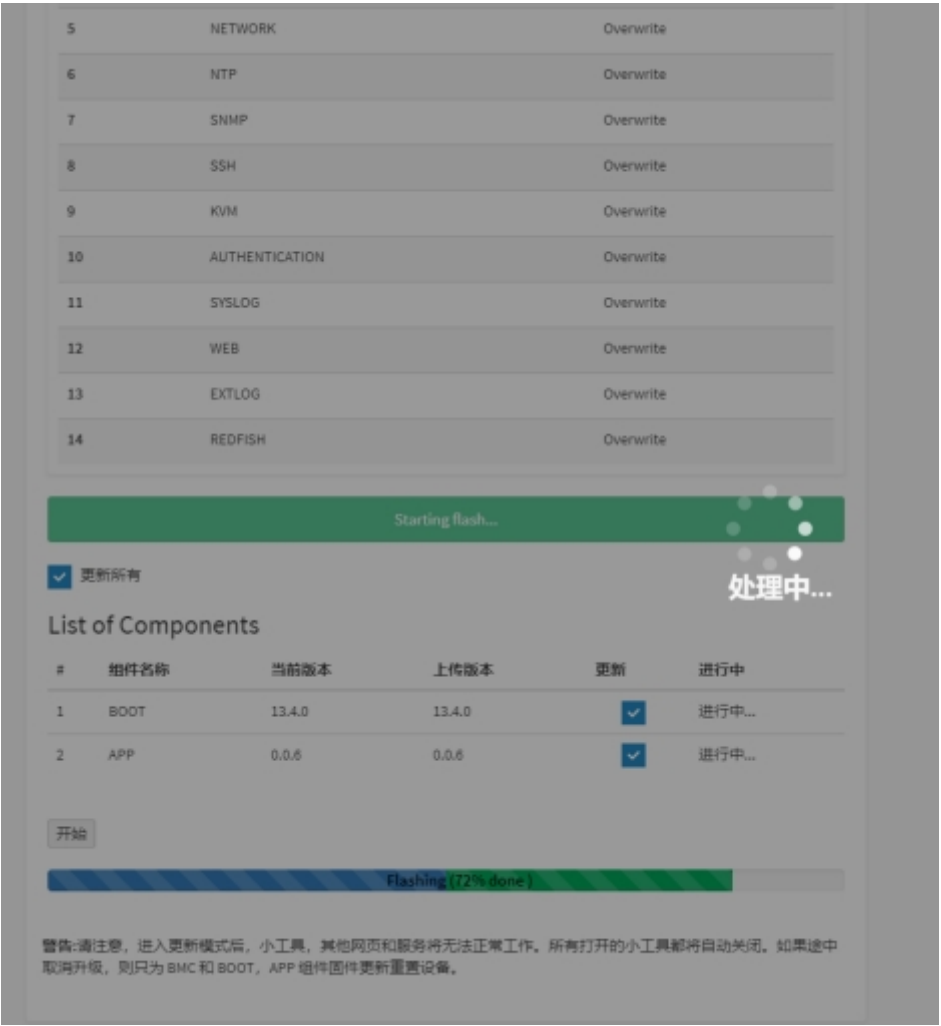
升级后双固件在位可以启动

```
9.782775: simple-reset: Enable LPC mode: 0
9.782822: Ser: E256/1958: driver, 8 ports, 200 sharing enabled
9.789061: [a378000.serial]: try1 at HWIO 0x378000 (irq = 52, base_addr = 135384) to a 18558A
9.789061: [a378000.serial]: try2 at HWIO 0x378000 (irq = 53, base_addr = 135384) to a 18558A
1.488412: serial console (ttyS4) enabled
1.411044: [a378000.serial]: try1 at HWIO 0x378000 (irq = 70, base_addr = 135384) to a 18558A
1.422263: [a378000.serial]: try2 at HWIO 0x378000 (irq = 70, base_addr = 135384) to a 18558A
1.422080: [a378000.serial]: try3 at HWIO 0x378000 (irq = 80, base_addr = 135384) to a 18558A
1.442637: random fast init done
1.442684: aspeed-gfx 1866000.display: assigned reserved memory node framebuffer
1.442684: rng init done
1.466434: [drm] Supports vblank timestamp caching Rev 2 (21.10.2013).
1.472681: [drm] No driver support for vblank timestamp query.
1.482589: aspeed-gfx 1866000.display: 90: aspeed-gfx-drm frame buffer device
1.481265: [drm] Initialized aspeed-gfx-drm 1.0.0 20180319 for 1866000.display on minor 0
1.588039: vrf module loaded
1.538254: loop: module loaded
1.520774: aspeed-smc 1862000.spl: bus_width 2, using 50 Mhz SPI frequency
1.544786: aspeed-smc 1862000.spl: wdr031225f (65536 bytes)
1.541488: aspeed-smc 1862000.spl: C8 window ( 8x2000000 - 8x2400000 ) 50%
1.548708: aspeed-smc 1862000.spl: C8 window ( 8x2400000 - 8x2800000 ) 0% (disabled)
1.558911: aspeed-smc 1862000.spl: read control register: [2030641]
1.627679: aspeed-smc 1862000.spl: bus_width 2, using 50 Mhz SPI frequency
1.626647: aspeed-smc 1862000.spl: wdr031225f (65536 bytes)
1.642268: aspeed-smc 1862000.spl: C8 window ( 8x2400000 - 8x2800000 ) 50%
1.650522: aspeed-smc 1862000.spl: C8 window ( 8x2800000 - 8x3200000 ) 0% (disabled)
1.658173: aspeed-smc 1862000.spl: read control register: [2030641]
1.728459: Concatenating MTD devices:
1.728537: [1]: "smc"
1.735267: [1]: "smc"
1.737889: Uata device "ahb:ahbconcat0"
1.748889: MTD Partition 0 : conf 0 0x10000 of size 0x10000
1.758386: MTD Partition 1 : conf 0 0x10000 of size 0x10000
1.759057: MTD Partition 2 : conf 0 0x10000 of size 0x2190000
1.763611: MTD Partition 3 : conf 0 0x300000 of size 0x70000
1.778129: MTD Partition 4 : conf 0 0x1000000 of size 0x10000
1.779048: MTD Partition 5 : conf 0 0x100000 of size 0x10000
1.785329: MTD Partition 6 : conf 0 0x410000 of size 0x10000
1.792485: MTD Partition 7 : conf 0 0x410000 of size 0x10000
1.794822: MTD Partition 8 : conf 0 0x410000 of size 0x10000
1.815247: MTD Partition 9 : conf 0 0x600000 of size 0x70000
1.823084: MTD Partition 10 : conf 0 0x700000 of size 0x40000
1.831177: MTD Partition 11 : conf 0 0x700000 of size 0x40000
1.849572: 12 spi-flash partitions found on MTD device ahb:ahbconcat0
1.847786: Creating 12 MTD partitions on "ahb:ahbconcat0":
1.854063: 0x0000010000-0x0000100000 : "root"
1.868343: 0x0000010000-0x0000050000 : "conf"
1.880701: 0x0000010000-0x0000100000 : "root"
1.871088: mtd: partition "root" doesn't end on an erase/write block -- force read-only
1.881711: 0x0000100000-0x00001070000 : "smc"
1.887605: mtd: partition "smc" doesn't end on an erase/write block -- force read-only
1.898733: 0x0000100000-0x0000120000 : "extlog"
1.909702: 0x0000120000-0x0000100000 : "extlog"
1.909702: 0x00000410000-0x00000410000 : "root"
1.912453: 0x00000410000-0x00000410000 : "conf"
1.921198: 0x00000410000-0x00000410000 : "root"
1.926945: mtd: partition "root" doesn't end on an erase/write block -- force read-only
1.935145: 0x0000050000-0x0000070000 : "smc"
```

6.2 BMC hpm包在web下升级



选择要升级的flash映像



选择要更新的组件后点开始,进行固件升级

6.3. IPMI接口下BMC hpm包升级

>ipmitool.exe -I lanplus -U admin -P Admin@9000 -H -z 0x7fff hpm upgrade force

输入上述命令进行升级,表示hpm文件位置。表示要升级的flash, 1代表第一个flash,2表示第二个flash

E.g.* ipmitool.exe -I lanplus -U admin -P Admin@9000 -H 192.168.43.95 -z 0x7fff hpm upgrade C:\Users\28020\Desktop\bmc.hpm* *2* *force

```
C:\Users\28020\Desktop\ipmitool-1.8.18-windows>ipmitool.exe -I lanplus -U admin -P Admin@9000 -H 192.168.43.103 -z 0x7fff hpm upgrade C:\Users\28020\Desktop\bmc.hpm 2 force
Setting large buffer to 32767

PICMG HPM 1 Upgrade Agent 1.0.9:

Validating firmware image integrity...OK
Performing preparation stage...
  Invalid image file for product 514

Image Information
  Device Id : 0x20
  Prod Id : 0x0001
  Manuf Id : 0x000000
Board Information
  Device Id : 0x20
  Prod Id : 0x0002
  Manuf Id : 0x000000
Continue ignoring DeviceID/ProductID/ManufacturingID (Y/N): y
Services may be affected during upgrade. Do you wish to continue? (y/n): y
OK

Performing upgrade stage:

+-----+-----+-----+-----+-----+
| ID | Name | Active | Versions | File | % |
+-----+-----+-----+-----+-----+
| * 0 | BOOT | 13.04 00000000 | --- -- ----- | 13.04 00000000 | 100% |
|   |   |   | Image Size: 1048592 bytes |   |   |
| * 1 | AFP | 0.00 06000000 | --- -- ----- | 0.00 06000000 | 100% |
|   |   |   | Image Size: 86060304 bytes |   |   |
+-----+-----+-----+-----+-----+

(*) Component requires Payload Cold Reset

Firmware upgrade procedure successful
```


6.4 YafuFLASH接口升级BMC hpm包

`./Yafuflash -nw -ip -u admin -p Admin@9000 -mse`

E.g.

`*. **/Yafuflash -nw -ip 192.168.43.103 -u admin -p Admin@9000 -mse 2 ~/hpm/bmc.hpm*`

上述命令用于在YafuFlash工具下升级BMC固件 mse参数表示要升级的flash, hpmfile表示hpm文件位置

```
cxr@bmcdev:~/Yafu_v7/Linux_x86_64$ ./Yafuflash -nw -ip 192.168.43.103 -u admin -p Admin@9000 -mse 2 ~/hpm/bmc.hpm
INFO: Yafu INI Configuration File not found... Default options will not be applied ...

Creating IPMI session via network with address 192.168.43.103 ... Done

+-----+
| YAFUFlash - Firmware Upgrade Utility v7.01.0064 |
| Copyright (c) 2020 American Megatrends International, LLC |
+-----+
Image to be updated is (Image-2)

=====
Firmware Details
=====

```

		RonImage	Image 2	Image 1
1.	boot	BootLoader	13.4.000000	13.4.000000
2.	conf	ConfigParams	13.4.000000	13.4.000000
3.	bkupconf		13.4.000000	13.4.000000
4.	root	Root	13.4.000000	13.4.000000
5.	osImage	Linux OS	13.4.000000	13.4.000000
6.	www	Web Pages	13.4.000000	13.4.000000
7.	extlog	ExtendedLog	13.4.000000	13.4.000000
8.	extlog	ExtendedLog	13.4.000000	13.4.000000
9.	arcity		0.0.600000	0.0.600000

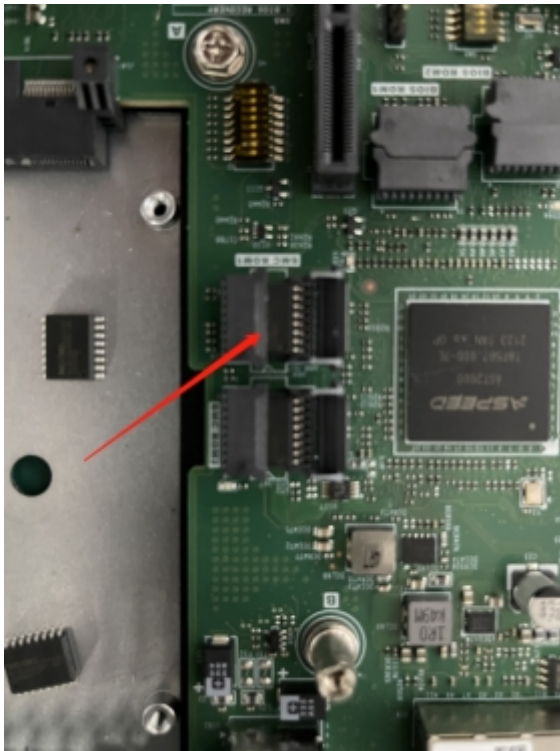
```
Existing Image and Current Image are Same

*****
WARNING!
FIRMWARE UPGRADE MUST NOT BE INTERRUPTED ONCE IT IS STARTED.
PLEASE DO NOT USE THIS FLASH TOOL FROM THE REDIRECTION CONSOLE.
*****
Preserving Env Variables ... done
[518322 (null)][ .. / .. /source/libipmi/data/libipmi_session.c:569]Encountered what may be socket closure..will close session here
```

6.5 BMC fail-safe启动测试

在第一个flash损坏或不在位情况下，aspeed2600芯片FMC_WDT2超时会自动切换到spi cs2下的flash启动（备区fail-safe启动）

通过移除第一颗flash来模拟flash损坏进行fail-safe功能测试



移除箭头所在的flash后，上电启动

```

BMC00

U-Boot 2019.04 (Oct 20 2022 - 09:38:02 +0800)

MMC: AST2600-A3
RST: Power On
PMC 2nd Boot (ABR): Enable, Dual flashes, Source: Primary
eSPI Mode: SIO/Enable : SuperIO-2e
eth: MMC2: RMII/NC51, MAC1: RMII/NC51, MAC2: RMII/NC51, MAC3: RMII/NC51
Model: AST2600 EVB
DRAM: already initialized, 406 MiB (capacity:512 MiB, WDA:16 MiB, ECC:off)
enable onboard tpm
MMC:
sdhci slot0@100: 0, emmc slot0@100: 1
Loading Environment from SPI Flash... speed_spt: invalid CS 1
SF: Detected mtd01512351 with page size 256 Bytes, erase size 64 KiB, total 64 MiB
SF: Detected mtd01512351 with page size 256 Bytes, erase size 64 KiB, total 64 MiB
OK
In: serial@1e704000
Out: serial@1e704000
Err: serial@1e704000
Model: AST2600 EVB
Net: PHY reset timed out

Warning: ftgmac@1e600000 (eth0) using random MAC address - be:bc:46:46:06:e0
eth0: ftgmac@1e600000
Warning: ftgmac@1e600000 (eth1) using random MAC address - e2:c6:0d:ff:4b:ea
eth1: ftgmac@1e600000
Use NC51 Interface :
Warning: ftgmac@1e600000 (eth3) using random MAC address - 9e:0b:ef:bd:cc:0b
eth3: ftgmac@1e600000
[OTP] Enable boot ABR
ftmcf00x11[0x0] = 1
No need to program
Hit any key (except Enter/Return) to stop autoboot: 0
SF: Detected mtd01512351 with page size 256 Bytes, erase size 64 KiB, total 64 MiB
speed_spt: invalid CS 1

spi_flash_probe failed for cs01
Image to be booted is 1
conf @ /dev/mtdblock1 Address 110000
conf @ /dev/mtdblock2 Address 310000
Found Root File System @ /dev/mtdblock3
Root File System is SQUASHFS
root @ /dev/mtdblock3 Address 510000
mem @ /dev/mtdblock4 Address 2b00000
extlog @ /dev/mtdblock5 Address 1000000
extlog @ /dev/mtdblock6 Address 1500000
Booting from Primary side
Booting from MODULE_PIMAGE ...
Bootargs = [root=/dev/mtdblock3 ro ipmon console=ttyS4,115200 rootfstype=squashfs imagebooted=1]
## Loading kernel from FIT Image at 82000040 ...
Using 'conf@kerntegrity.db' configuration
Verifying Hash Integrity ... OK
Trying 'kernel@1' kernel subimage
Description: Linux kernel

```

在第一个Flash不在位情况，BMC触发fail-safe，成功从第二个flash启动BMC