

eMMC Boot information.

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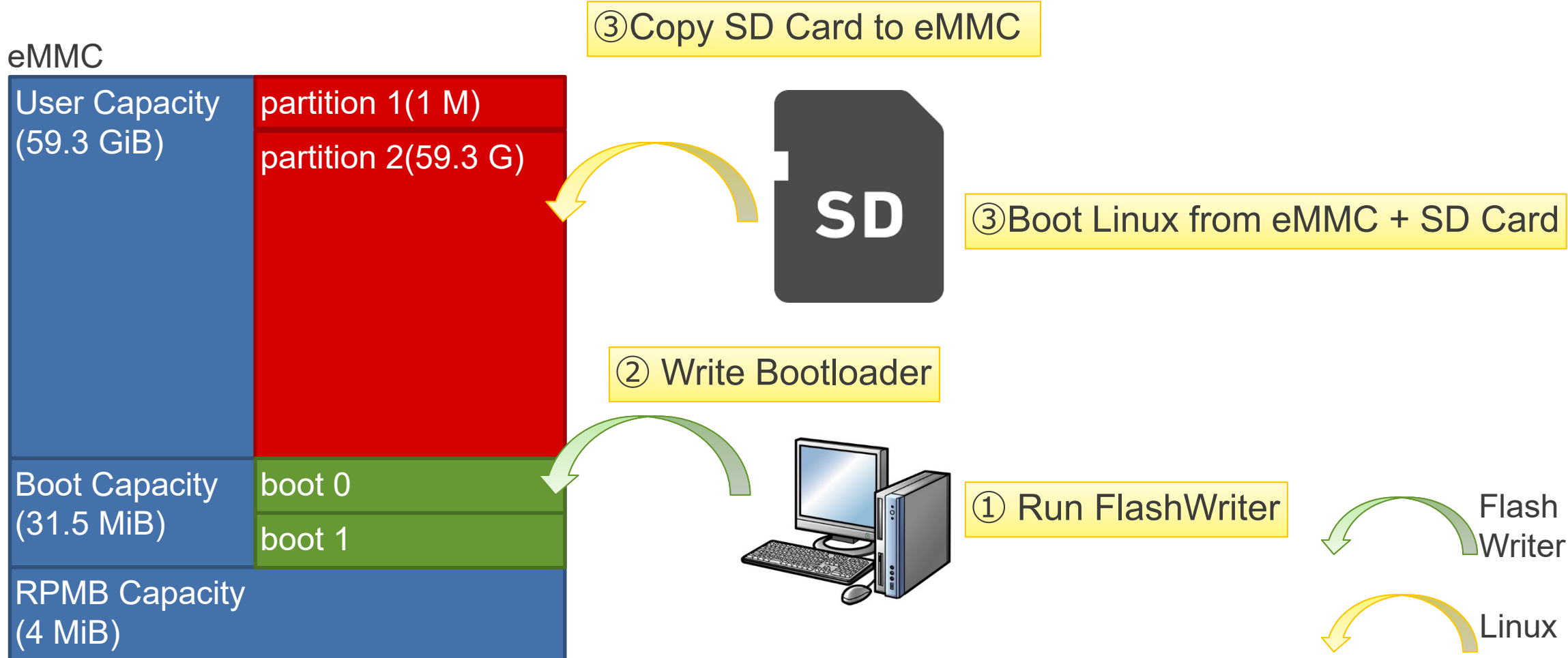
2021/10/22

Agenda

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Outline

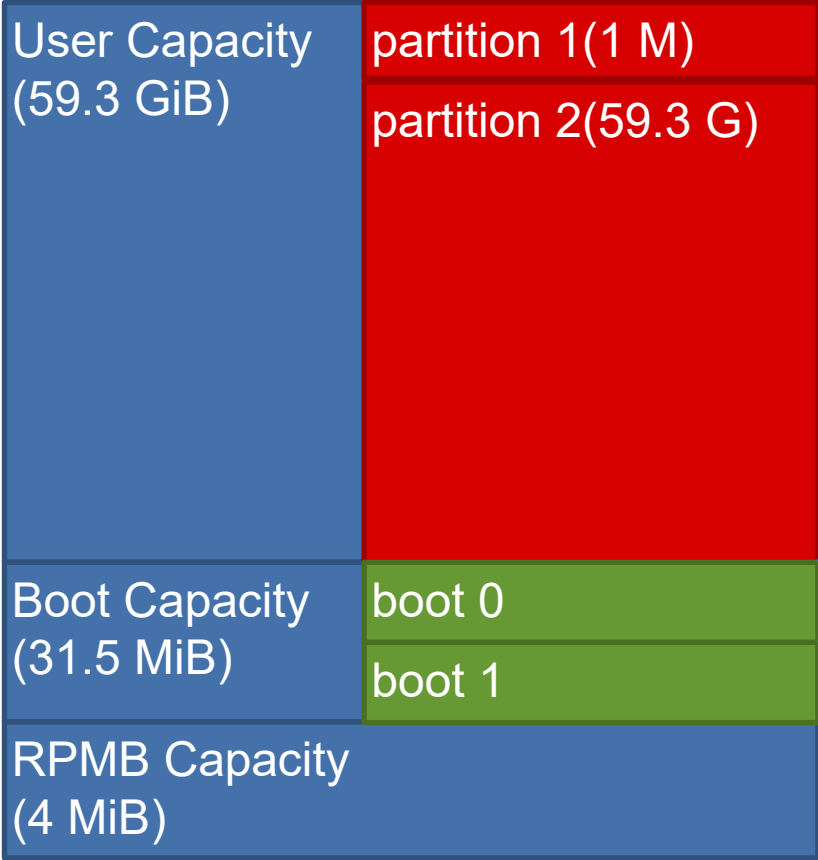
Outline



Write Bootloader

Memory Map(Boot area)

- Write Bootloader from PC by FlashWriter.
eMMC



Flash Writer

- compile with EMMC=ENABLE

```
CROSS_COMPILE=/mnt/build01/sdk/gcc-arm-9.2-2019.12-x86_64-aarch64-none-elf/bin/aarch64-none-elf-  
export CROSS_COMPILE  
make -f makefile.linaro BOARD=RZG2L_15MMSQ_DEV EMMC=ENABLE
```

- Flash Writer download on Evaluation board

```
SCIF Download mode  
(C) Renesas Electronics Corp.  
-- Load Program to System RAM -----  
please send !
```

Download FlashWriter Motorola hex file.

```
Flash writer for RZ/G2 Series V1.00 Sep. 17, 2021  
Product Code : RZ/G2L
```

- If the compilation is successful, display this list with the 'h' command.

EM_DCID	display register CID
EM_DCSD	display register CSD
EM_DECSD	display register EXT_CSD
EM_SECS	change register EXT_CSD byte
EM_W	write program to eMMC
EM_WB	write program to eMMC (Binary)
EM_E	erase program to eMMC

Flash Writer

- display register EXT_CSD (Before change)

>EM_DECS							
[EXT_CSD	[301:270]	[239:239]	[218:218]	[192:192]	EXT_CSD_REV	0x08	
[505:505]		[238:238]	[217:217]	[191:191]	CMD_SET	0x00	
[504:504]		[237:237]	[216:216]	[189:189]	CMD_SET_REV	0x00	
[503:503]	[269:269]	[236:236]	[215:212]	[187:187]	POWER_CLASS	0x00	
[502:502]	[268:268]	[235:235]	[210:210]	[185:185]	HS_TIMING	0x01	
[501:501]	[267:267]	[234:234]	[209:209]	[183:183]	BUS_WIDTH	0x02	
[500:500]	[266:266]	[232:232]	[208:208]	[181:181]	ERASED_MEM_CONT	0x00	
[499:499]	[265:265]	[231:231]	[207:207]	[179:179]	PARTITION_CONFIG	0x00	
[498:498]	[264:264]	[230:230]	[206:206]	[178:178]	BOOT_CONFIG_PROT	0x00	
[497:497]	[263:262]	[229:229]	[205:205]	[177:177]	BOOT_BUS_CONDITIONS	0x00	
[496:496]	[261:254]	[228:228]	[203:203]	[175:175]	ERASE_GROUP_DEF	0x00	
[495:495]	[253:253]	[226:226]	[202:202]	[173:173]	BOOT_WP	0x00	
[494:494]	[252:249]	[225:225]	[201:201]	[171]	[163:163] BKOPS_EN	0x00	
[493:493]	[248:248]	[224:224]	[200:200]	[169]	[162:162] RST_n_FUNCTION	0x00	
[492:492]	[247:247]	[223:223]	[199:199]	[168]	[161]	[154:143] GP_SIZE_MULT	0x0000000000000000
[491:491]	[246:246]	[222:222]	[198:198]	[167]	[160]		00000000
[490:487]	[245:242]	[221:221]	[197:197]	[166]	[159]	[142:140] ENH_SIZE_MULT	0x000000
[305:302]	[241:241]	[220:220]	[196:196]	[165]	[156]	[139:136] ENH_START_ADDR	0x00000000
		[219:219]	[194:194]	[164]	[155]	[134:134] SEC_BAD_BLK_MGMNT	0x00

Flash Writer

- change register EXT_CSD byte (Enable Boot Option)

```
>EM_SECS  
Please Input EXT_CSD Index(H' 00 - H' 1FF) :b1 177  
EXT_CSD[B1] = 0x00  
Please Input Value(H' 00 - H' FF) :2  
EXT_CSD[B1] = 0x02  
>EM_SECS  
Please Input EXT_CSD Index(H' 00 - H' 1FF) :b3 179  
EXT_CSD[B3] = 0x00  
Please Input Value(H' 00 - H' FF) :8  
EXT_CSD[B3] = 0x08
```

PARTITION_CONFIG

Bit	Field	Description
[6]	BOOT_ACK	0x0 = No boot acknowledge 0x1 = Boot acknowledge during boot
[5:3]	BOOT_PARTITION_ENABLE	0x0 = Not boot enabled 0x1 = Boot partition 1 enabled for boot 0x2 = Boot partition 2 enabled for boot 0x7 = User area enabled for boot
[2:0]	BOOT_PARTITION_ACCESS	0x0 = No access to boot partition 0x1 = Read/Write boot partition 1 0x2 = Read/Write boot partition 2

BOOT_BUS_CONDITIONS

Bit	Field	Description
[4:3]	BOOT_MODE	SDR, backward compatible timings
[2]	RESET_BOOT_BUS_CONDITIONS	0x0 = Reset bus width to x1 after boot operation 0x1 = Retain boot bus width after boot operation
[1:0]	BOOT_BUS_WIDTH	0x0 = x1 bus width in boot operation mode 0x1 = x4 bus width in boot operation mode 0x2 = x8 bus width in boot operation mode 0x3 = Reserved

Flash Writer

- display register EXT_CSD (After change)

>EM_DECS							
[EXT_CSD	[301:270]	[239:239]	[218:218]	[192:192]	EXT_CSD_REV	0x08	
[505:505]		[238:238]	[217:217]	[191:191]	CMD_SET	0x00	
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[503:503]	[269:269]	[236:236]	[215:212]	[187:187]	POWER_CLASS	0x00	
[502:502]	[268:268]	[235:235]	[210:210]	[185:185]	HS_TIMING	0x01	
[501:501]	[267:267]	[234:234]	[209:209]	[183:183]	BUS_WIDTH	0x02	
[500:500]	[266:266]	[232:232]	[208:208]	[181:181]	ERASED_MEM_CONT	0x00	
[499:499]	[265:265]	[231:231]	[207:207]	[179:179]	PARTITION_CONFIG	0x08	
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[492:492]	[247:247]	[223:223]	[199:199]	[168]	[161]	[154:143] GP_SIZE_MULT	0x0000000000000000
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[305:302]	[241:241]	[220:220]	[196:196]	[165]	[156]	[139:136] ENH_START_ADDR	0x00000000
		[219:219]	[194:194]	[164]	[155]	[134:134] SEC_BAD_BLK_MGMNT	0x00

Flash Writer

- BL2 write program to eMMC (s-record)

```
>em_w
EM_W Start -----
-----
Please select, eMMC Partition Area.
0:User Partition Area   : 62160896 KBytes
  eMMC Sector Cnt : H'0 - H'0768FFFF
1:Boot Partition 1     : 32256 KBytes
  eMMC Sector Cnt : H'0 - H'0000FBFF
2:Boot Partition 2     : 32256 KBytes
  eMMC Sector Cnt : H'0 - H'0000FBFF
-----

Select area(0-2)>1_____ select boot partition 1
-- Boot Partition 1 Program -----
Please Input Start Address in sector :1_____ select sector 1 (sector 0 was free area)
Please Input Program Start Address : 00011E00_____ Start Address
Work RAM(H'50000000-H'50FFFFFF) Clear....
please send ! ( '.' & CR stop load) _____ send s-record file
SAVE -FLASH.....
EM_W Complete!
```

Flash Writer

- FIP write program to eMMC (s-record)

```
>em_w
EM_W Start -----
-----
Please select, eMMC Partition Area.
0:User Partition Area   : 62160896 KBytes
  eMMC Sector Cnt : H'0 - H'0768FFFF
1:Boot Partition 1     : 32256 KBytes
  eMMC Sector Cnt : H'0 - H'0000FBFF
2:Boot Partition 2     : 32256 KBytes
  eMMC Sector Cnt : H'0 - H'0000FBFF
-----

Select area(0-2)>1_____
-- Boot Partition 1 Program -----
Please Input Start Address in sector :100_____
Please Input Program Start Address : 00000000_____
Work RAM(H'50000000-H'50FFFFFF) Clear....
please send ! ( '.' & CR stop load) _____
SAVE -FLASH.....
EM_W Complete!
```

select boot partition 1

select sector 256

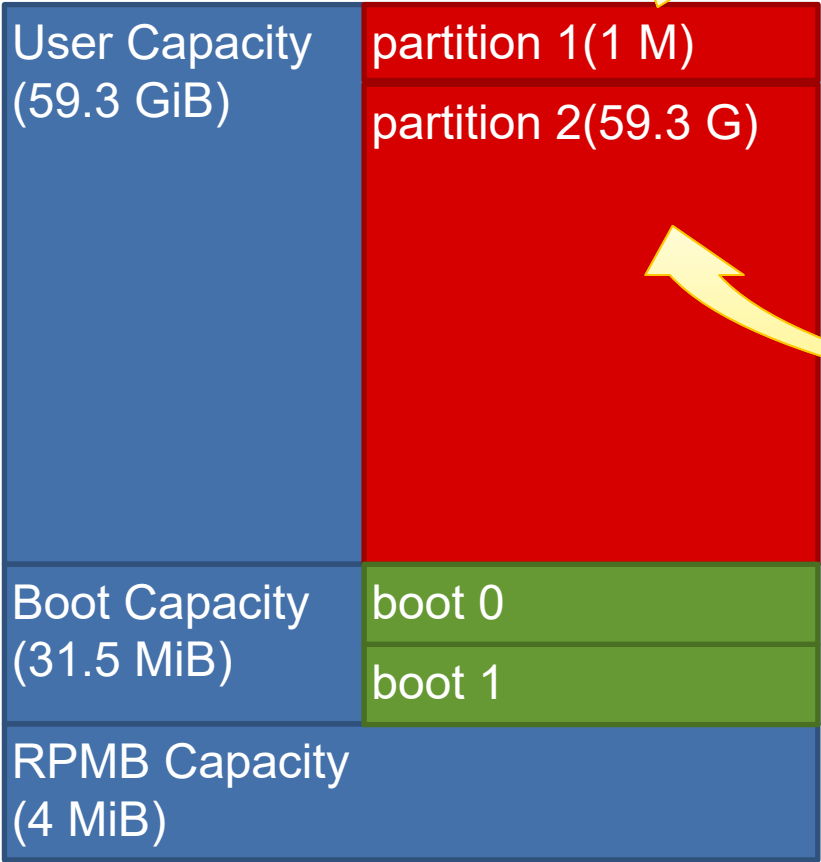
Start Address

send s-record file

Create eMMC partition

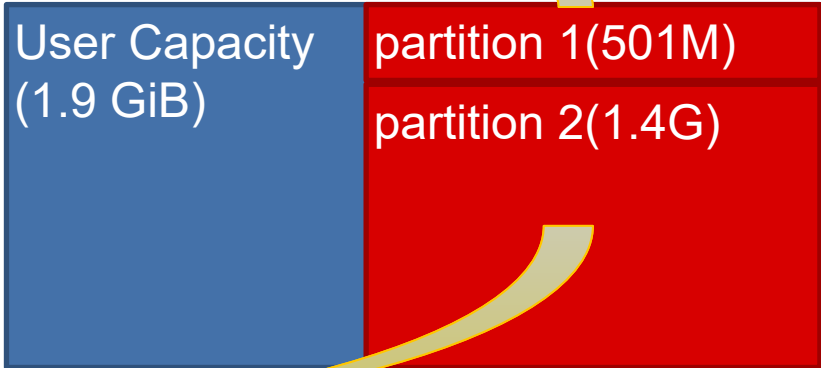
Memory Map(User area)

- Memory map eMMC



boot Image / device tree

SD card



root files



boot from SD

- input from u-boot command prompt

```
setenv bootcmd_sd 'setenv bootargs rw rootwait earlycon root=/dev/mmcblk1p2; ext4load mmc 1:1 0x48080000 Image; ext4load mmc 1: 0x48000000 r9a07g044l2-dev-rzg2l-dev.dtb; booti 0x48080000 - 0x48000000'  
setenv bootcmd 'run bootcmd_sd'  
boot
```

device list

- fdisk --list

device	partition	size	start	end	note
mtdblock0		512 KiB			
	mtdblock0p1				
	:				
	mtdblock0p4				
:					
mtdblock4					
mmcblk0		59.3 GiB			eMMC
	mmcblk0p1	1M	2048	1026047	create this partition
	mmcblk0p2	59.3G	1026048	124321791	create this partition
mmcblk1		1.9 GiB			SD card
	mmcblk1p1	501M	128	1026047	Image + device tree
	mmcblk1p2	1.4G	1026048	3970047	root

create partition

- fdisk command

```
oot@rzg2l-dev:~# fdisk /dev/mmcblk0
```

```
Welcome to fdisk (util-linux 2.33.1).  
Changes will remain in memory only, until you decide to write them.  
Be careful before using the write command.
```

```
Device does not contain a recognized partition table.  
Created a new DOS disklabel with disk identifier 0x1068df53.
```

- print

```
Command (m for help): p  
Disk /dev/mmcblk0: 59.3 GiB, 63652757504 bytes, 124321792 sectors  
Units: sectors of 1 * 512 = 512 bytes  
Sector size (logical/physical): 512 bytes / 512 bytes  
I/O size (minimum/optimal): 512 bytes / 512 bytes  
Disklabel type: dos  
Disk identifier: 0x1068df53
```

create partition

- new partition

```
Command (m for help): n
Partition type
  p primary (0 primary, 0 extended, 4 free)
  e extended (container for logical partitions)
Select (default p): ↵

Using default response p.
Partition number (1-4, default 1): ↵
First sector (2048-124321791, default 2048): ↵
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-124321791, default 124321791): 1026047

Created a new partition 1 of type 'Linux' and of size 500 MiB.
```

```
Command (m for help): n
Partition type
  p primary (1 primary, 0 extended, 3 free)
  e extended (container for logical partitions)
Select (default p): ↵

Using default response p.
Partition number (2-4, default 2): ↵
First sector (1026048-124321791, default 1026048): ↵
Last sector, +/-sectors or +/-size{K,M,G,T,P} (1026048-124321791, default 124321791): ↵

Created a new partition 2 of type 'Linux' and of size 58.8 GiB.
```

create partition

- print

```
Command (m for help): p
Disk /dev/mmcblk0: 59.3 GiB, 63652757504 bytes, 124321792 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x1068df53
```

Device	Boot	Start	End	Sectors	Size	Id	Type
/dev/mmcblk0p1		2048	1026047	1024000	500M	83	Linux
/dev/mmcblk0p2		1026048	124321791	123295744	58.8G	83	Linux

- write

```
Command (m for help): w
The partition table has been altered.
Calling ioctl() [ 1273.404827] mmcblk0: p1 p2
to re-read partition table.
Syncing disks.
```

```
[ 1273.415749] mmcblk0: p1 p2
root@rzg2l-dev:~#
```

format device in ext4

- `mkfs -f ext /dev/mmcblk0p1`

```
root@rzg2l-dev:/mnt# mkfs -t ext4 /dev/mmcblk0p1
mke2fs 1.45.4 (23-Sep-2019)
Discarding device blocks: done
Creating filesystem with 512000 1k blocks and 128016 inodes
Filesystem UUID: 27c2e7d4-2ed6-4fe9-b7b4-202386d590e4
Superblock backups stored on blocks:
    8193, 24577, 40961, 57345, 73729, 204801, 221185, 4

Allocating group tables: done
Writing inode tables: done
Creating journal (8192 blocks): done
Writing superblocks and filesystem accounting information:
```

- `mkfs -f ext /dev/mmcblk0p2`

```
root@rzg2l-dev:/mnt# mkfs -t ext4 /dev/mmcblk0p2
mke2fs 1.45.4 (23-Sep-2019)
Discarding device blocks: done
Creating filesystem with 15411968 4k blocks and 3858432 inodes
Filesystem UUID: bc99f2a8-b234-4dc0-9af9-ba7c34c3c7df
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736,
    1605632, 2654208,
    4096000, 7962624, 11239424

Allocating group tables: done
Writing inode tables: done
Creating journal (65536 blocks): done
Writing superblocks and filesystem accounting information: done

root@rzg2l-dev:/mnt#
```

mount & copy

mount & copy

- mount eMMC and SD card ~ copy files ~ umount

```
root@rzg2l-dev:~# cd /mnt
root@rzg2l-dev:/mnt# mkdir mmcblk0p1
root@rzg2l-dev:/mnt# mkdir mmcblk0p2
root@rzg2l-dev:/mnt# mkdir mmcblk1p1
root@rzg2l-dev:/mnt# mkdir mmcblk1p2
root@rzg2l-dev:/mnt# ls
mmcblk0p1 mmcblk0p2 mmcblk1p1 mmcblk1p2
root@rzg2l-dev:/mnt# mount /dev/mmcblk0p1 /mnt/mmcblk0p1
[ 5154.622789] EXT4-fs (mmcblk0p1): mounted filesystem with ordered data mode. Opts: (null)
root@rzg2l-dev:/mnt# mount /dev/mmcblk0p2 /mnt/mmcblk0p2
[ 5162.471950] EXT4-fs (mmcblk0p2): mounted filesystem with ordered data mode. Opts: (null)
root@rzg2l-dev:/mnt# mount /dev/mmcblk1p1 /mnt/mmcblk1p1
[ 5182.731500] EXT4-fs (mmcblk1p1): mounted filesystem with ordered data mode. Opts: (null)
root@rzg2l-dev:/mnt# mount /dev/mmcblk1p2 /mnt/mmcblk1p2
root@rzg2l-dev:/mnt# cp -r -a mmcblk1p1/* mmcblk0p1/
root@rzg2l-dev:/mnt# cp -r -a mmcblk1p2/* mmcblk0p2/
root@rzg2l-dev:/mnt# umount /mnt/mmcblk0p1/
root@rzg2l-dev:/mnt# umount /mnt/mmcblk0p2/
root@rzg2l-dev:/mnt# umount /mnt/mmcblk1p1/
root@rzg2l-dev:/mnt# umount /mnt/mmcblk1p2/
```

create mount directry

mount device

copy files

unmount device

Boot from eMMC

boot from eMMC

- input from u-boot command prompt

```
setenv bootcmd_mmc 'setenv bootargs rw rootwait earlycon root=/dev/mmcblk0p2; ext4load mmc 0:1 0x48080000 Image; ext4load  
mmc 0: 0x48000000 r9a07g044l2-dev-rzg2l-dev.dtb; booti 0x48080000 - 0x48000000'  
setenv bootcmd 'run bootcmd_mmc'  
boot
```

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