Android Jelly Bean BSP Porting Guide

: MSM8960, Fusion Chipset

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목차

Jelly Bean File Download

from Code Aurora Forum

1. Jelly Bean Code Download & Build(1) – ***Android full source***

1) Jelly Bean code download

 # curl https://dl-ssl.google.com/dl/googlesource/git-repo/repo > ~/CAF/bin/repo

 # export PATH= ~/CAF/bin:$PATH

 # repo init -u git://codeaurora.org/platform/manifest.git -b jb -m M8960AAAAANLYA2205.xml --repo-url=git://codeaurora.org/tools/repo.git

 # repo sync -j4

(*) vendor 디렉토리를 제외하면, 상용 버전을 위한 코드와 동일함.

2) Jelly Bean build

 # source build/envsetup.sh

 # choosecombo

1 ← release

msm8960

eng

 # make –j4

➔ *out/target/product/msm8960/emmc_appsboot.mbn, boot.img, cache.img, persist.img, ramdisk.img, recovery.img, system.img, userdata.img*

For more information, see the following site.
➔ *https://www.codeaurora.org/xwiki/bin/QAEP/*

1. Jelly Bean Code Download & Build(2) – ***msm kernel code***

1) Kernel code download

```
# git clone git://codeaurora.org/kernel/msm.git
# cd msm
# git branch
  *android-msm-2.6.29
  jb_chocolate
  msm-3.4
# git checkout jb_chocolate
or
# git checkout msm-3.4
```

Kernel 만 download 할 경우의 예이며, 앞서 Android를 download 받았을 경우, 불필요한 작업임^^

2) Kernel build

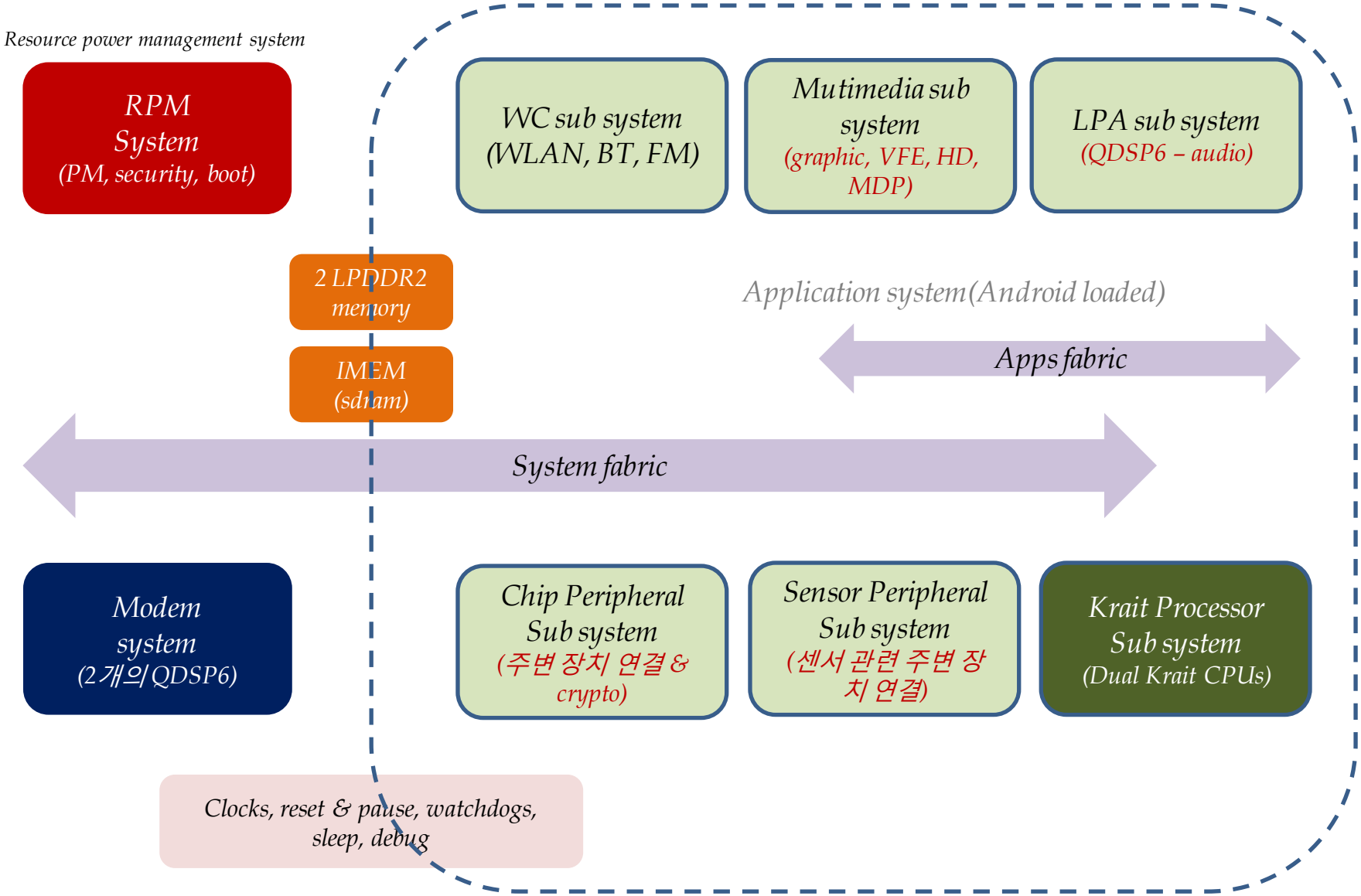
```
# export PATH=$(YOUR_HOME)/mydroid_jb/prebuilt/linux-x86/toolchain/arm-eabi-4.4.3/bin:$PATH
# make ARCH=arm CROSS_COMPILE=arm-eabi- msm8960-perf_defconfig
# make ARCH=arm CROSS_COMPILE=arm-eabi- menuconfig
# make ARCH=arm CROSS_COMPILE=arm-eabi- zImage
# make ARCH=arm CROSS_COMPILE=arm-eabi- modules
```

For more information, See the following site.

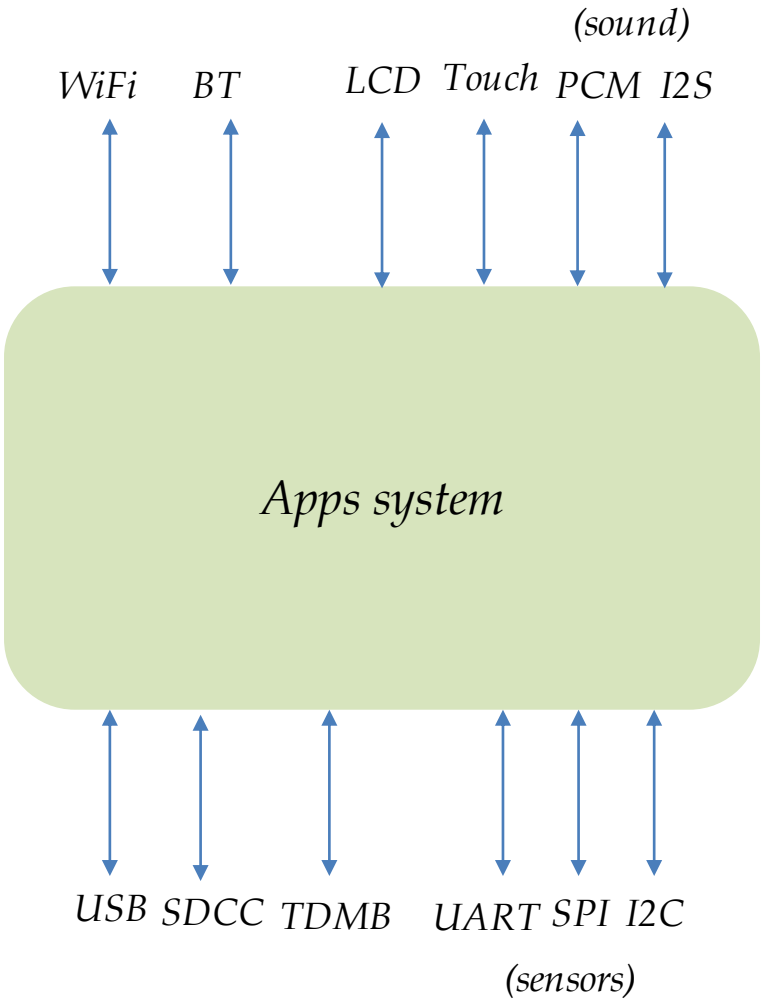
➔ *https://www.codeaurora.org/gitweb/quic/la/?p=kernel/msm.git;a=heads*

Case1: MSM8960

2. MSM8960 Chipset Overview(1)



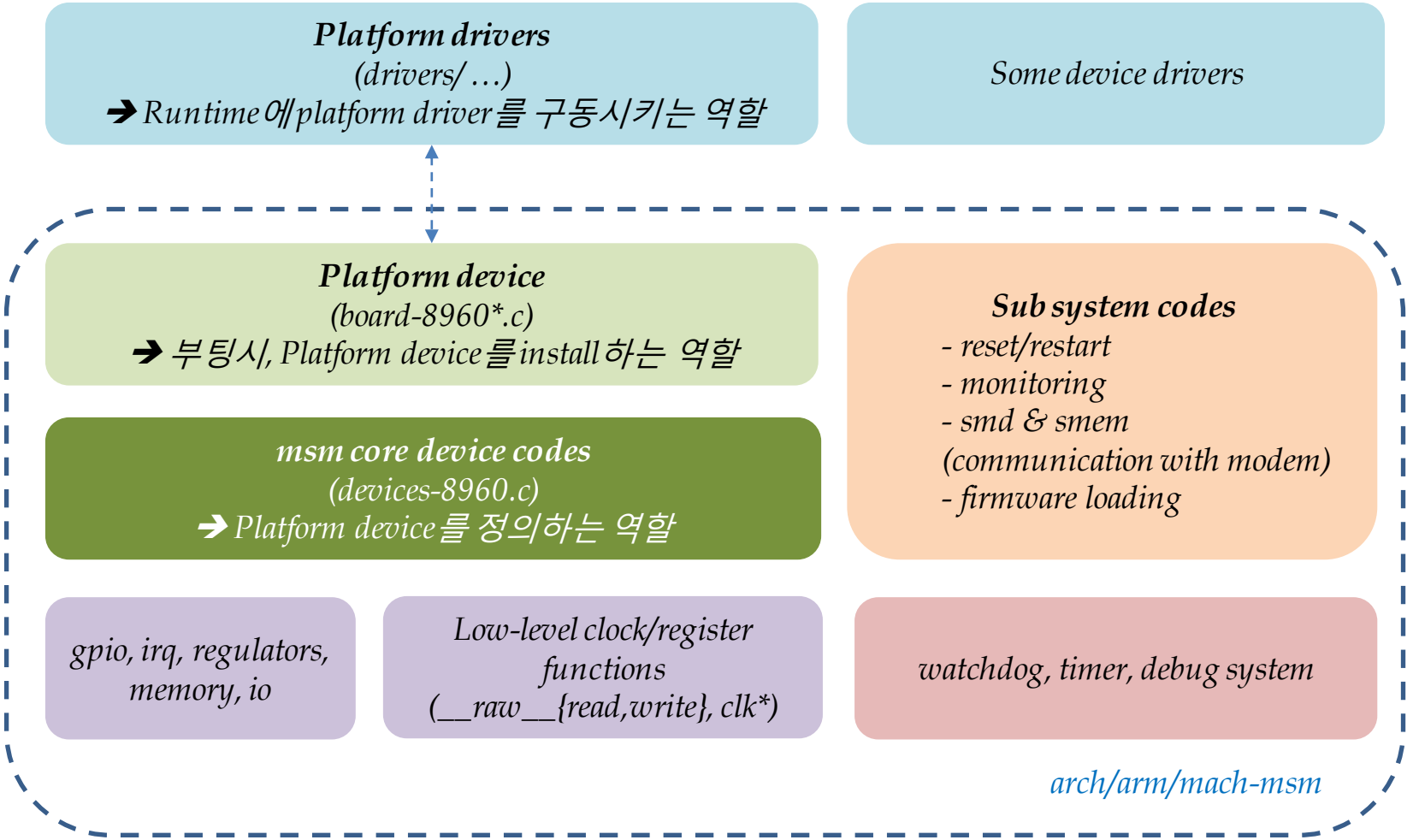
2. MSM8960 Chipset Overview(2)



(*) 옆의 그림에서는 실제 연결(통신) 방식과 기능을 편의상 서로 혼용해서 사용하였음.
➔ 즉, WiFi는 SDIO, BT는 UART를 사용하나…

(*) 옆의 그림을 그린 이유는, 실제로 kernel code에서 이를 기술해 주고 있기 때문임.

3. MSM8960 Machine Code Review(1)



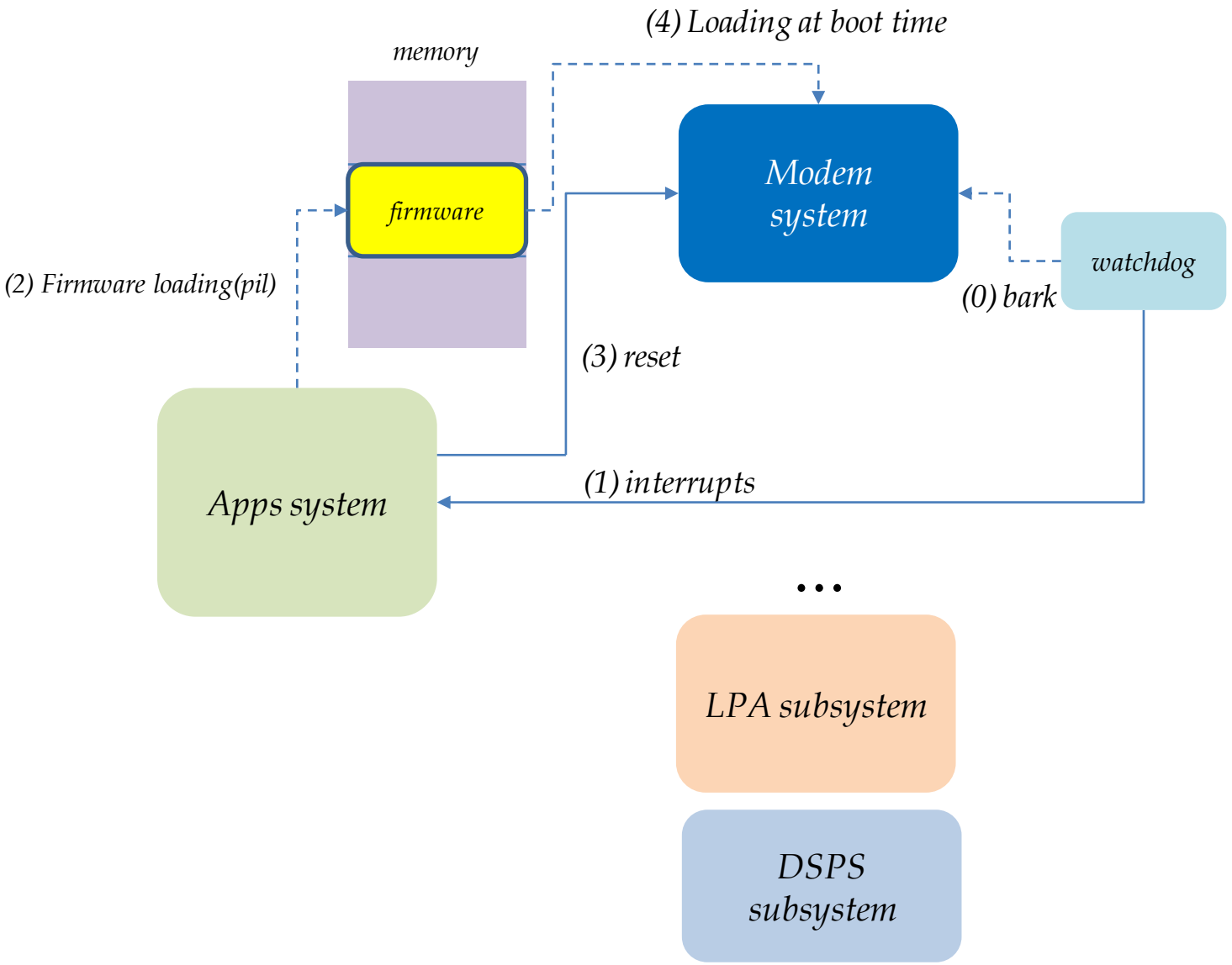
3. MSM8960 Machine Code Review(2)

- *1) CPU 기술(description) ➔ clock…*
- *2) bus 기술 ➔ system fabric, apps fabric, clocks …*
- *3) memory 기술 & 사용 관련 정의 ➔ pmem, ion mem 등 할당 …*
- *4) CPU와 주변 sub system과의 관계 기술 ➔ interrupt, reset, communication*
- *5) 주변 장치 기술/초기화(i2c, spi, uart, uim, sdcc, usb, …., gpio, irq, regulators) ➔ GSBI & GPIOMux*
- *6) key internal functions 기술 ➔ watchdog, sleep…*
- *7) linux driver model 적용(platform device & driver)*

3. MSM8960 Machine Code Review(3) – ***MACHINE_START macro***

```
MACHINE_START(MSM8960_CDP, "QCT MSM8960 CDP")
    .map_io = msm8960_map_io,
    .reserve = msm8960_reserve,
    .init_irq = msm8960_init_irq,
    .handle_irq = gic_handle_irq,
    .timer = &msm_timer,
    .init_machine = msm8960_cdp_init,
    .init_early = msm8960_allocate_memory_regions,
    .init_very_early = msm8960_early_memory,
    .restart = msm_restart,
MACHINE_END
```

3. MSM8960 Machine Code Review(4) – ***restart subsystem***



3. MSM8960 Machine Code Review(5) – *gpiomux/1*

<gpio operation 정의>

- *drivers/gpio/gpio-msm-common.c*
  - ➔ *msm_gpio_probe( ) 함수에서 gpiochip_add(&msm_gpio.gpio_chip)을 호출하여 msm_gpio.gpio_chip을 등록했으므로, 이후 kernel에서 사용하는 gpio 관련 함수 즉, request, free, set, get, direction_input, direction_output 등은 모두 msm_gpio에서 새로 정의한 함수를 사용하게 될 것임.*
- *drivers/gpio/gpio-msm-v2.c*
- *drivers/gpio/gpiolib.c*
- *drivers/gpio/pm8xxx-gpio.c*

<gpio pin 배치 정의>

- *arch/arm/mach-msm/gpiomux.c*
- *arch/arm/mach-msm/gpiomux-v2.c*
- *arch/arm/mach-msm/board-8960-gpiomux.c*
  - ➔ *여기에서 gpiomux pin 배치 코드 나열함.*

=> *See Documentation/arm/msm/gpiomux.txt*

3. MSM8960 Machine Code Review(6) – *gpiomux/2*

<gpiomux setting example>

```
struct msm_gpiomux_config  gpio123_config __initdata = {
   .gpio = 123,
   .settings = {
      [GPIOMUX_ACTIVE] = {
         .func = GPIOMUX_FUNC_GPIO,
         .drv  = GPIOMUX_DRV_2MA,
         .pull = GPIOMUX_PULL_NONE,
         .dir  = GPIOMUX_OUT_HIGH,
      },
      [GPIOMUX_SUSPENDED] = {
         .func = GPIOMUX_FUNC_3,
         .drv  = GPIOMUX_DRV_8MA,
         .pull = GPIOMUX_PULL_DOWN,
      },
   },
};
```

<gpiomux setting 의미>

- *When the system boots, gpio 123 will be put into the SUSPENDED setting.*
- *When the reference count for gpio 123 rises above 0, the ACTIVE setting will be applied.*
- *When the reference count falls back to 0, the SUSPENDED setting will be reapplied.*

➔ *이렇게 하는(runtime gpio configuration) 이유는 전류 소모를 최대한 줄이기 위함이다 !*

<초기화 - msm8960_init_gpiomux( ) 에서 호출함>

- *msm_gpiomux_init() -> memory 할당*
- *msm_gpiomux_install() -> 해당 gpio pin 주소에 값(drv, func, pull 등의 참조)을 쓰고 있음(초기화 정도)*

3. MSM8960 Machine Code Review(7) – *GSBI 주변 장치 추가 절차*

1) Set the clocks

➔ *arch/arm/mach-msm/clock-8960.c*

2) Create a platform device

➔ *arch/arm/mach-msm/devices.h*

➔ *arch/arm/mach-msm/devices-8960.c*

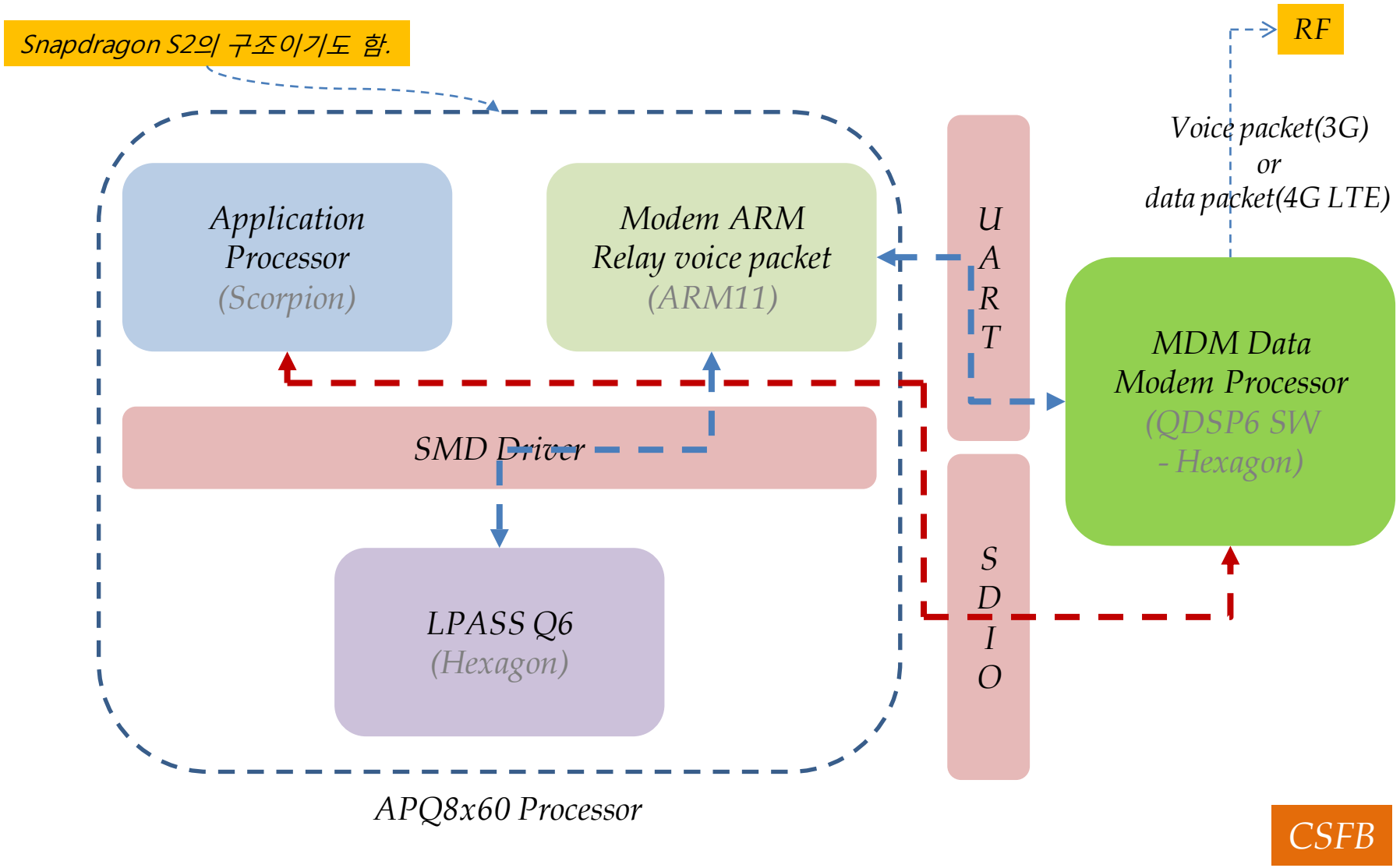
➔ *arch/arm/mach-msm/board-8960.c*

3) Configure GPIO

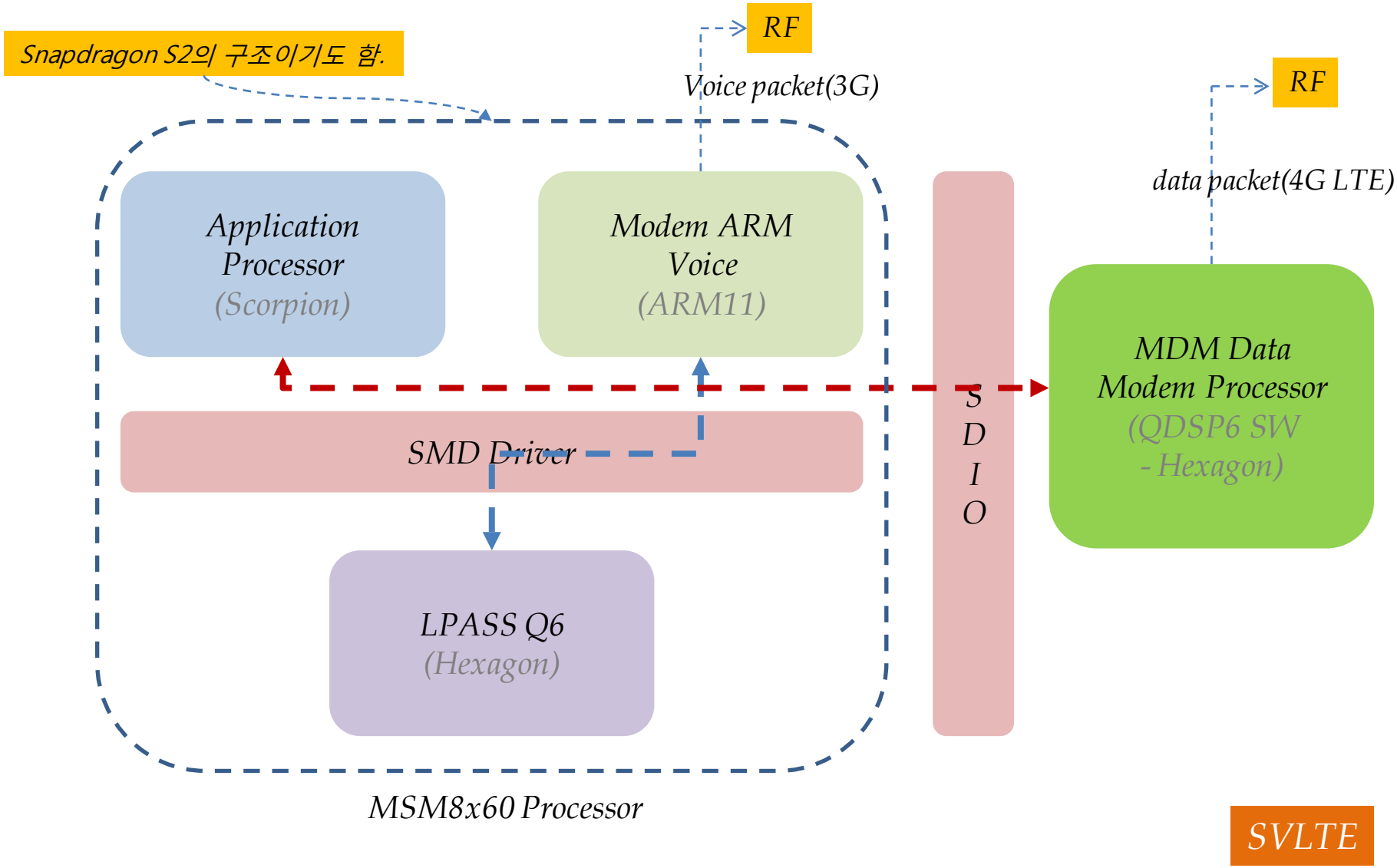
➔ *arch/arm/mach-msm/board-8960-gpiomux.c*

Case2: APQ/MSM8x60 + MDM9x00 fusion chipset

4. Fusion Chipset Overview(1)

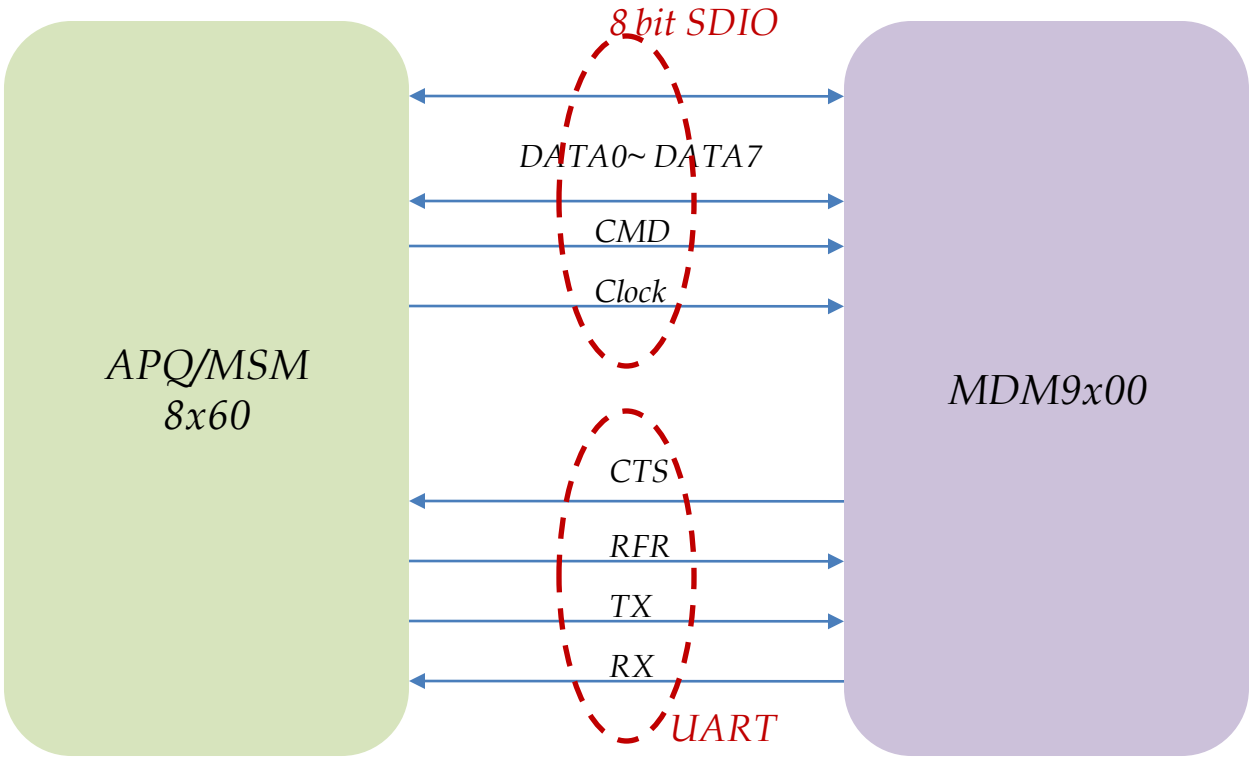


4. Fusion Chipset Overview(2)

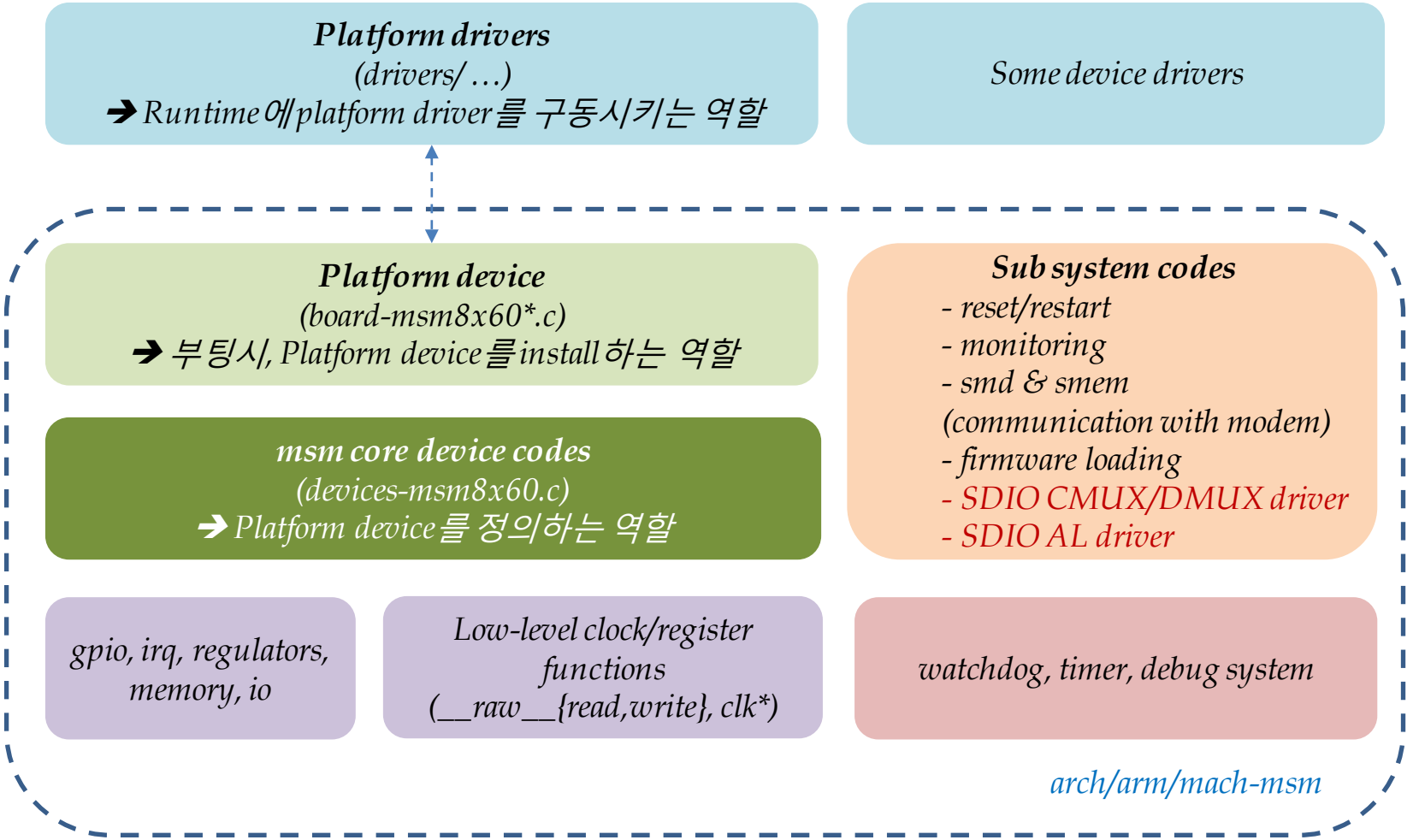


4. Fusion Chipset Overview(3)

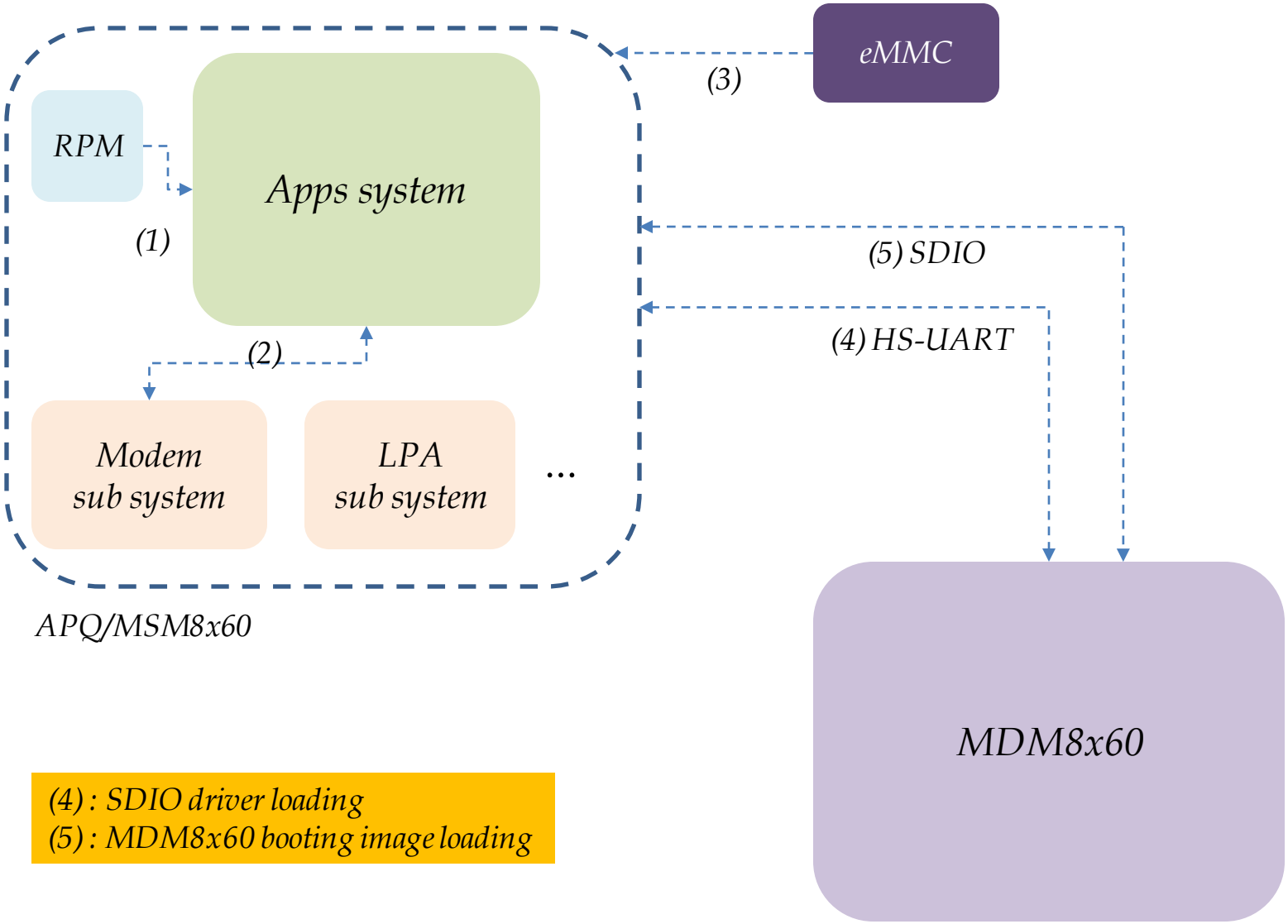
- ***SDIO***: *QMI, RmNet, RPC, Diag*
  - ➔ *주로 LTE data 전송을 위해 사용됨(고속 data 전송).*
- ***HS-UART***: *QMI control, voice, boot*
  - ➔ *주로 voice data를 전송하기 위해 사용됨.*



5. APQ/MSM8x60 Machine Code Review

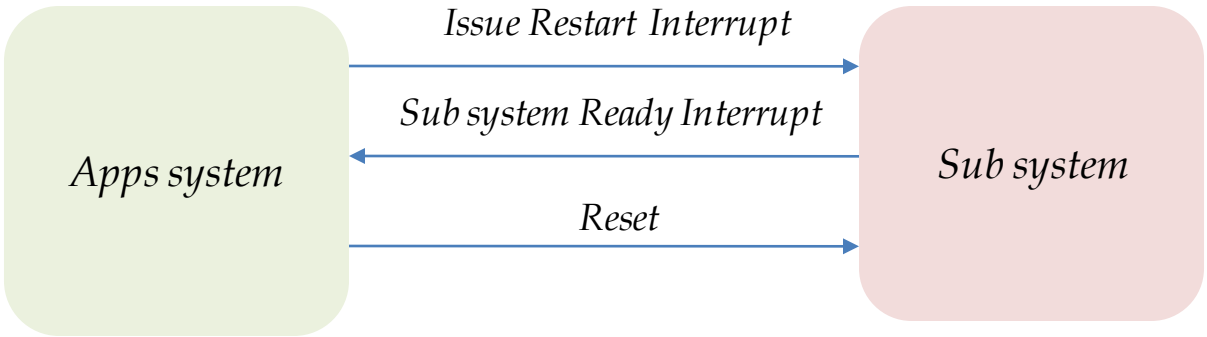


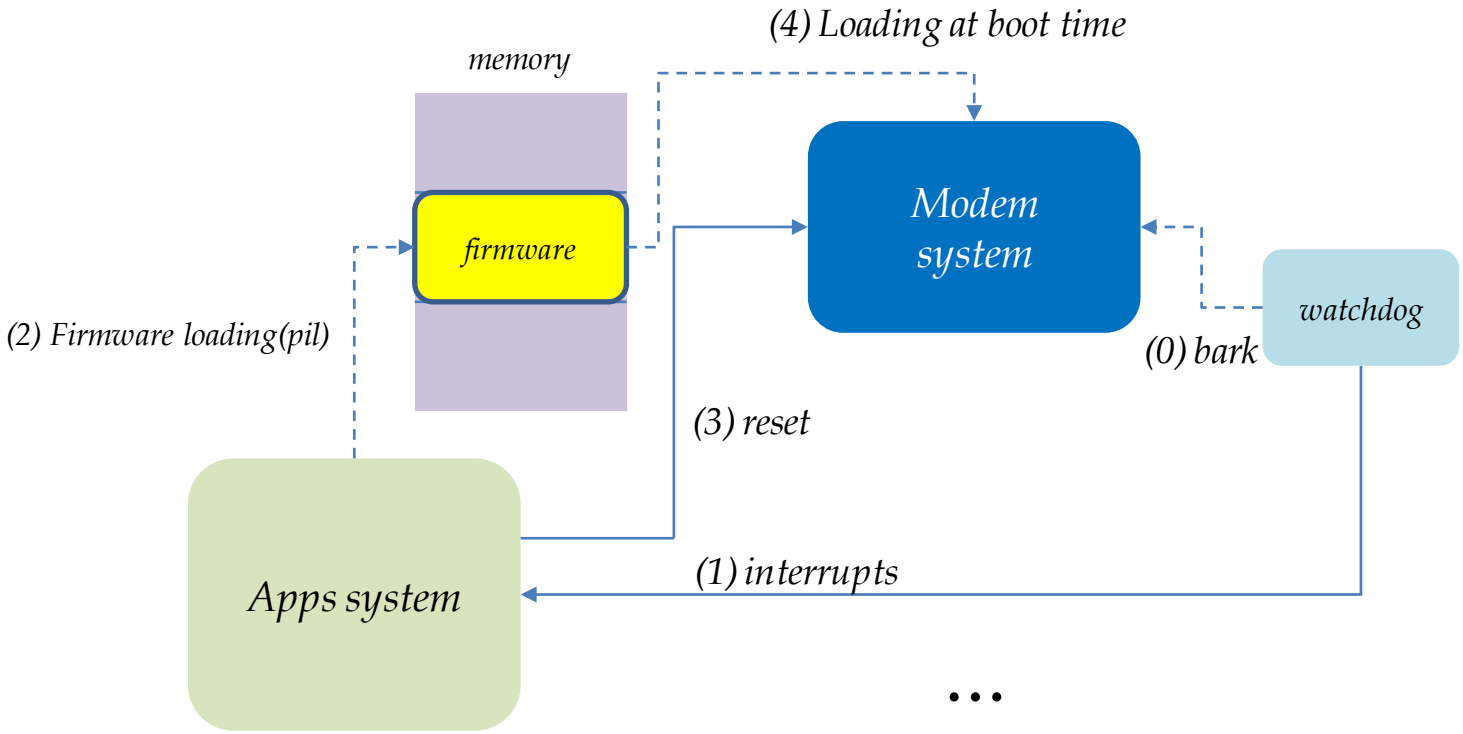
5. APQ/MSM8x60 Machine Code Review – ***Boot Flow***



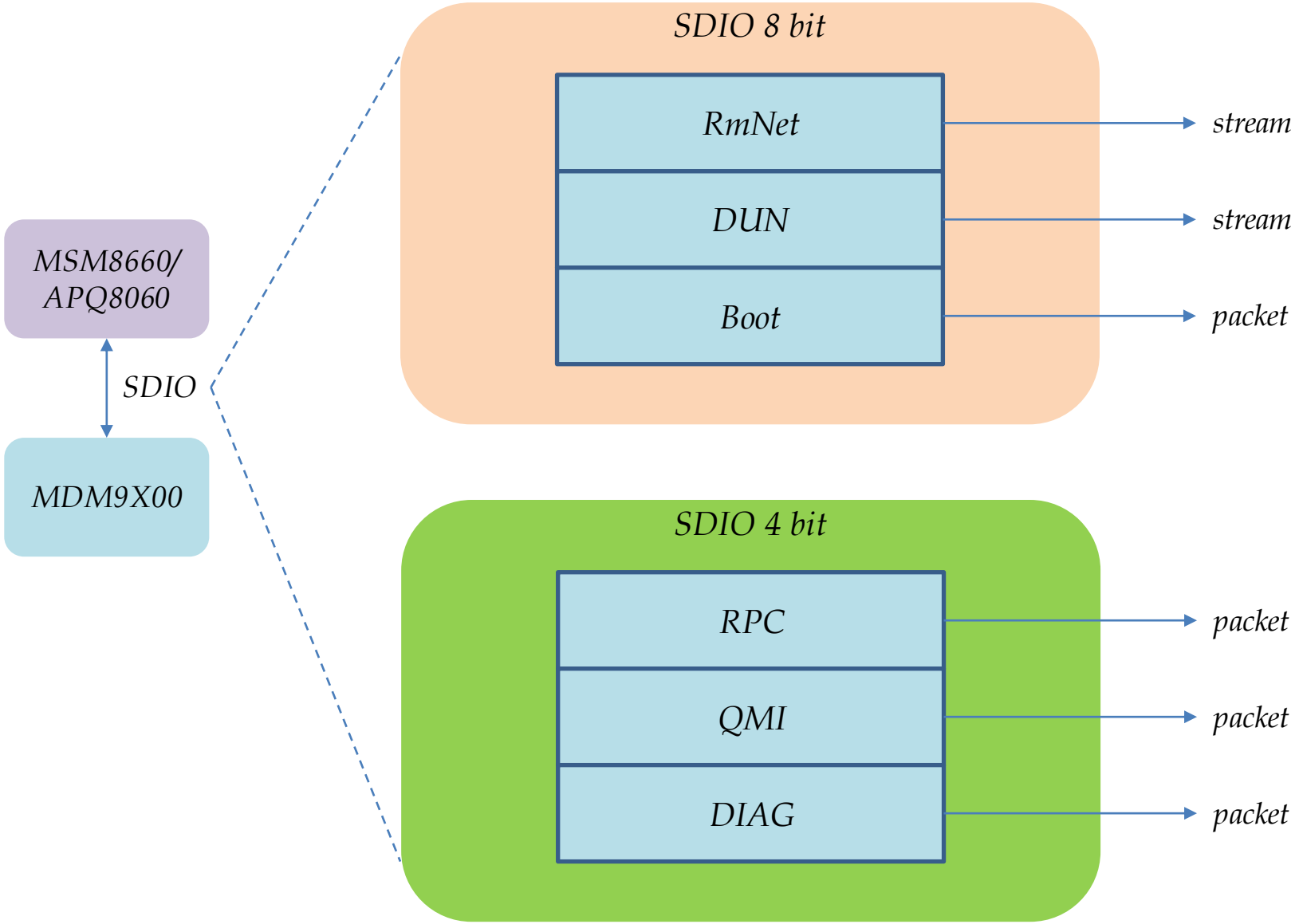
(4) : SDIO driver loading
(5) : MDM8x60 booting image loading

5. APQ/MSM8x60 Machine Code Review – ***Sub system Restart***

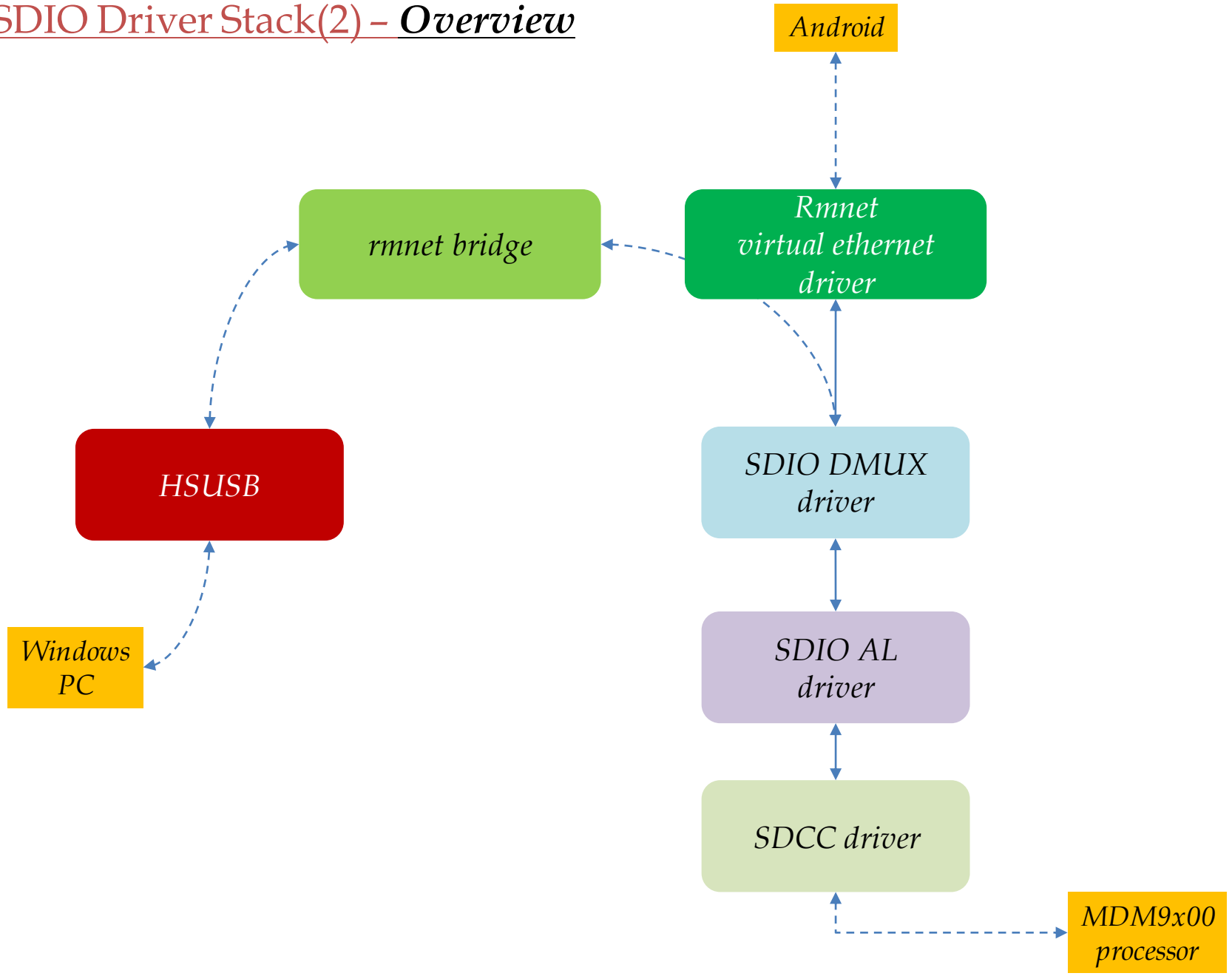




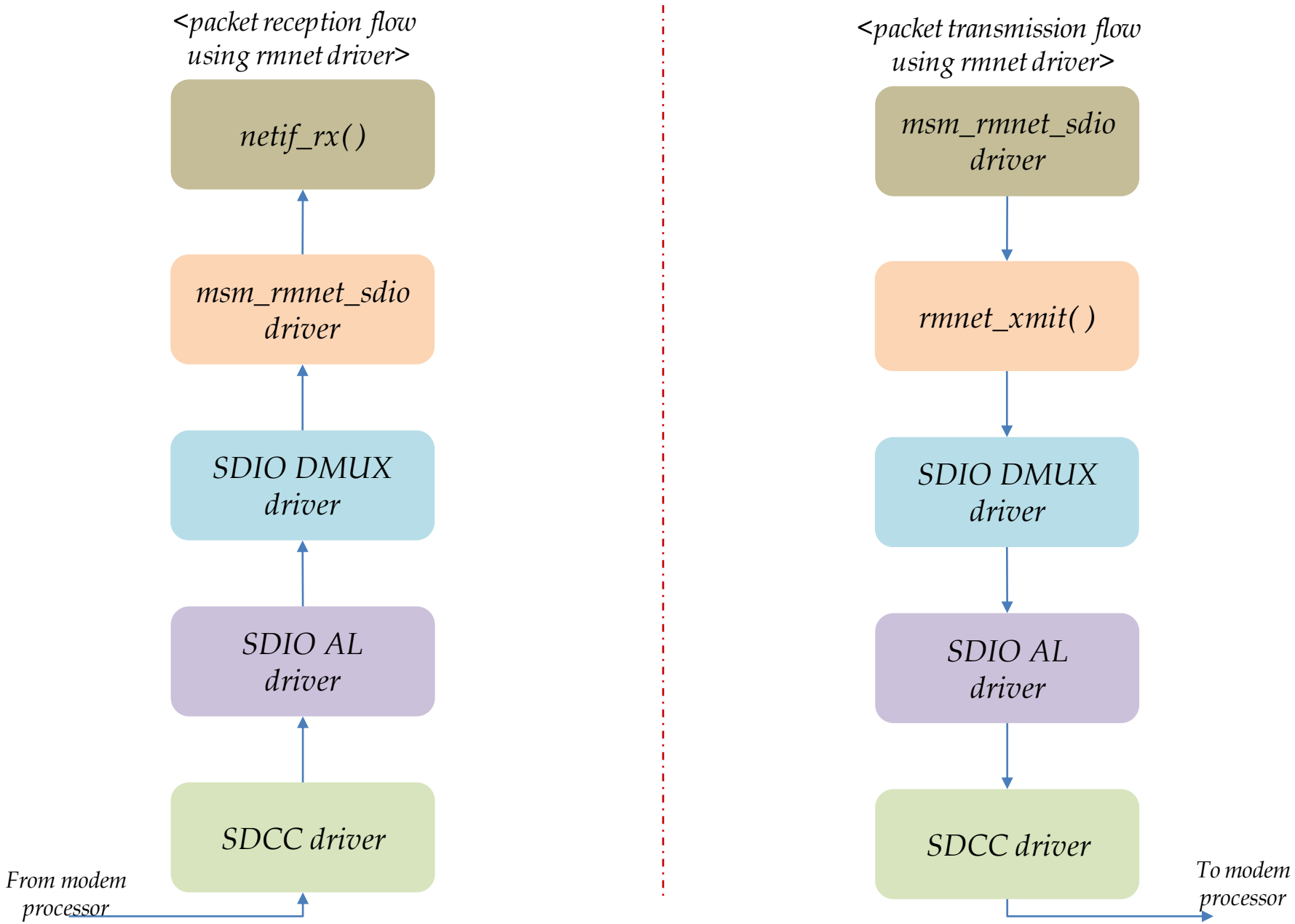
6. SDIO Driver Stack(1) – ***SDIO 8/4 pins***



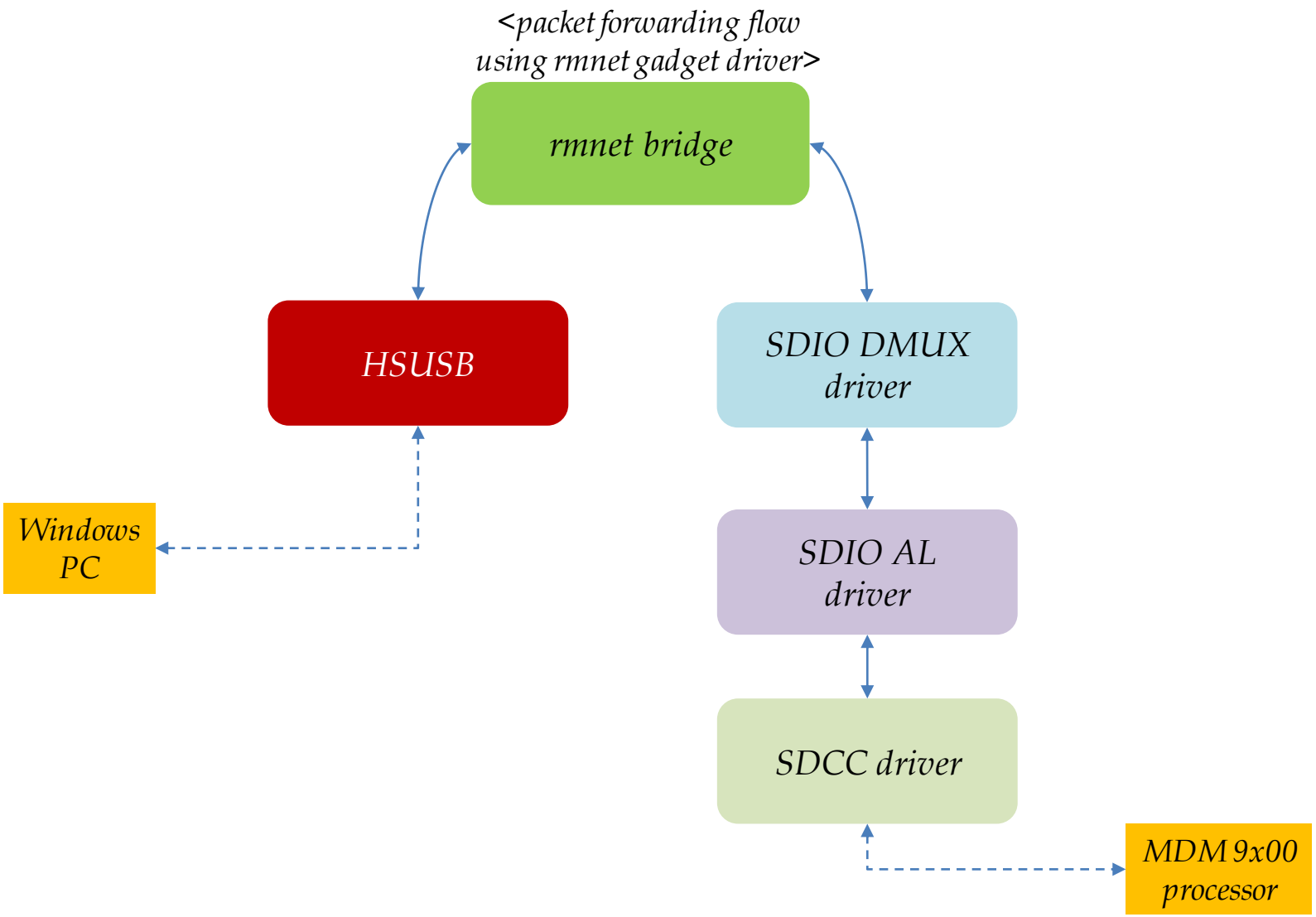
6. SDIO Driver Stack(2) – ***Overview***



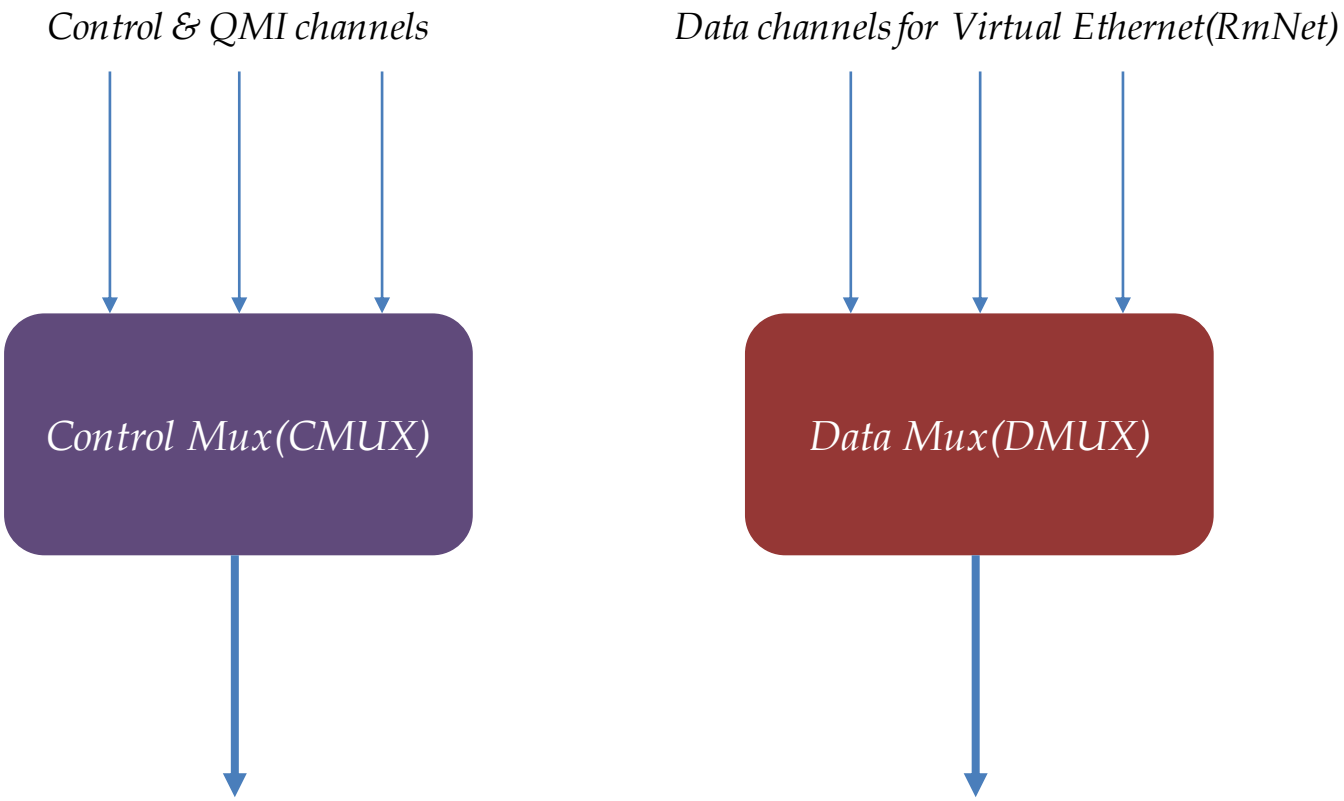
6. SDIO Driver Stack(3) – ***LTE data packet flow***



6. SDIO Driver Stack(4) - ***LTE data packet flow under Tethering Env.***



6. SDIO Driver Stack(5) – ***Mux Driver***



(*) 위의 그림은 MUX를 통해 control 및 data packet이 하나로 묶여 전달되는 것을 그림으로 표현한 것으로, 패킷 수신 시에는 반대의 과정을 거치게 된다.
➔ framing/deframing, multiplexing of multiple logical SDIO ports over a single SDIO function

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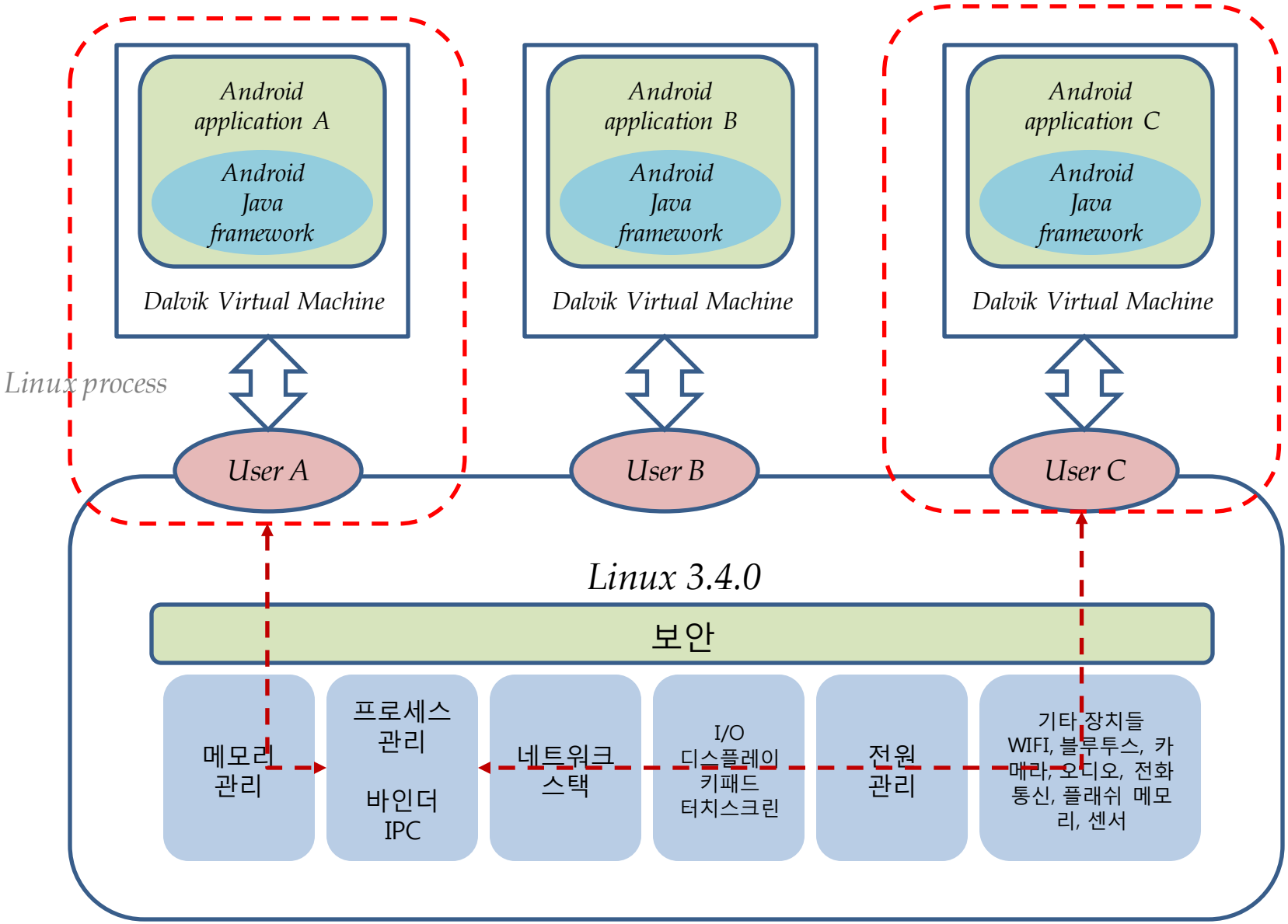
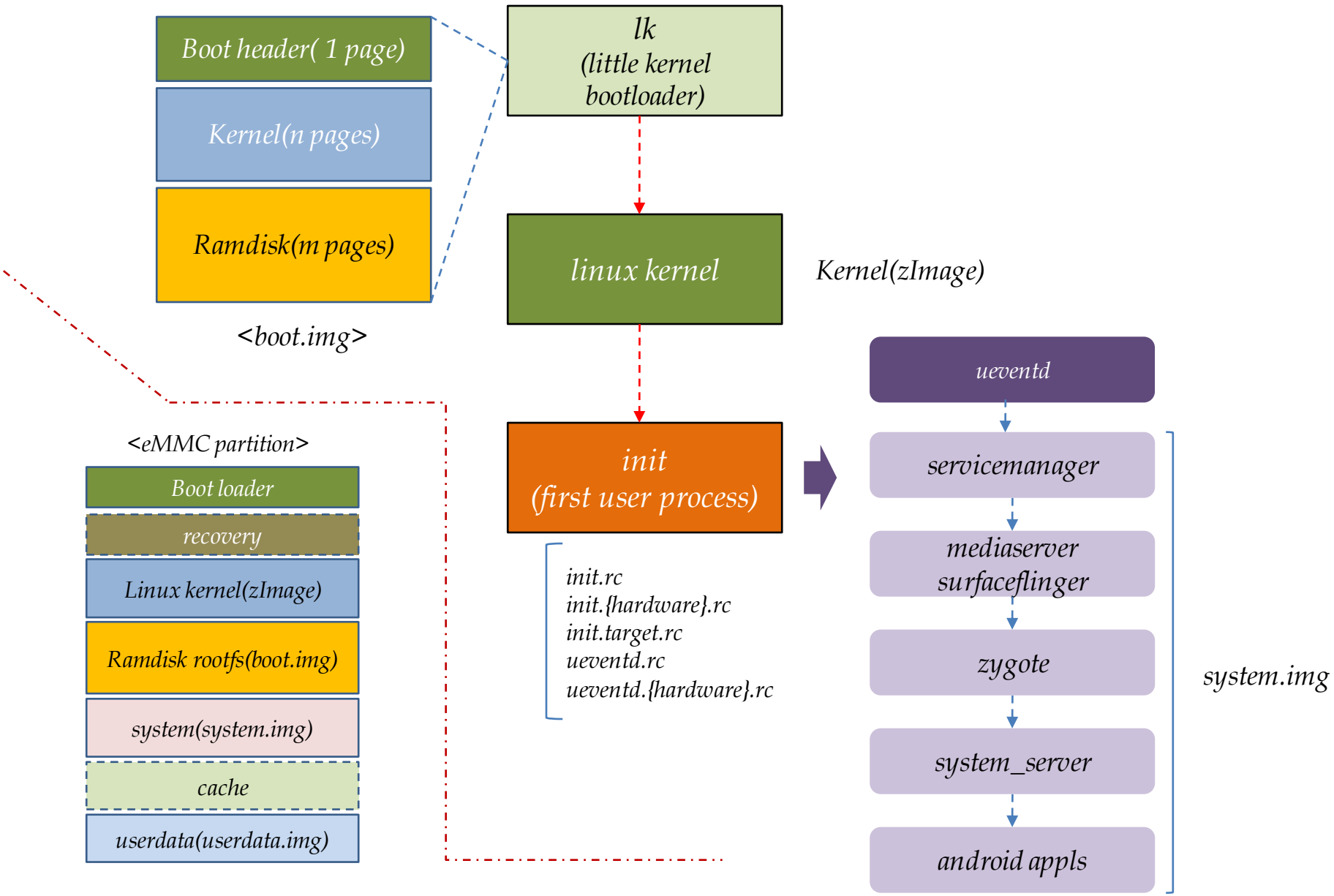
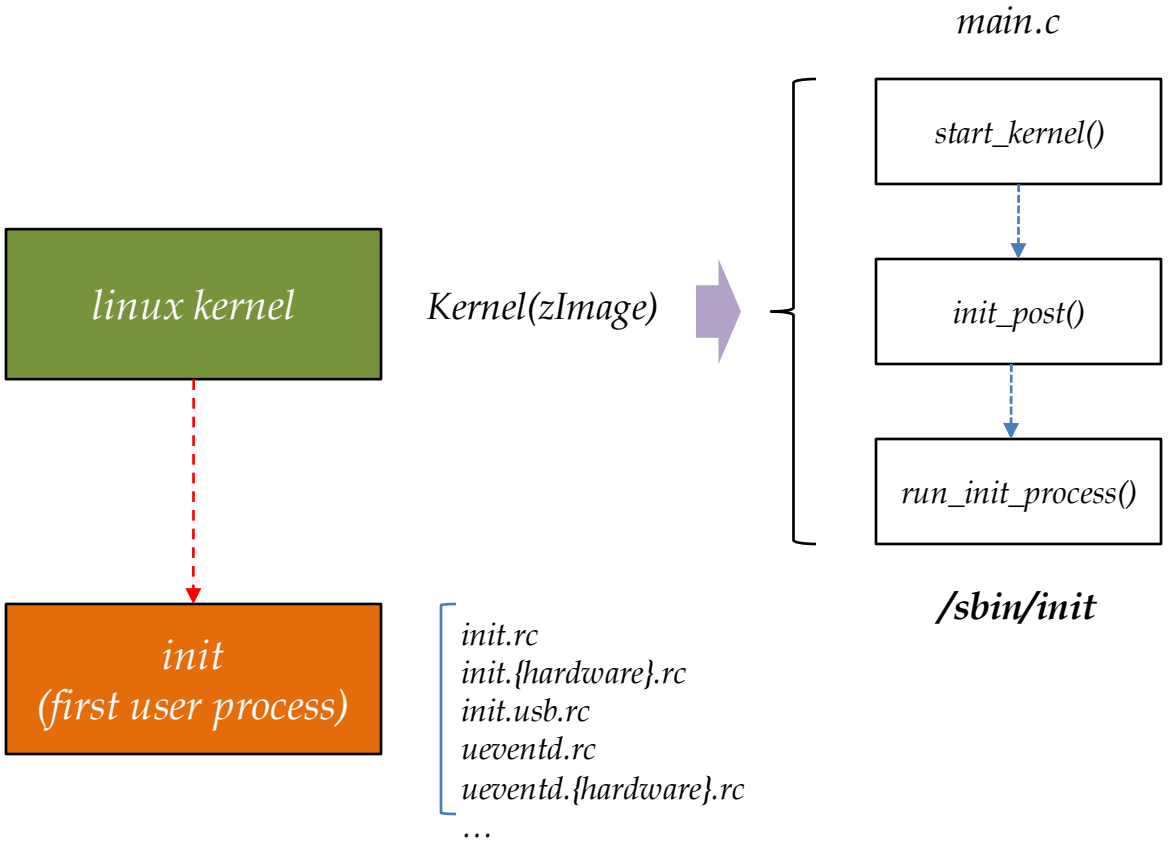
7. Jelly Bean Android Boot Flow(1)



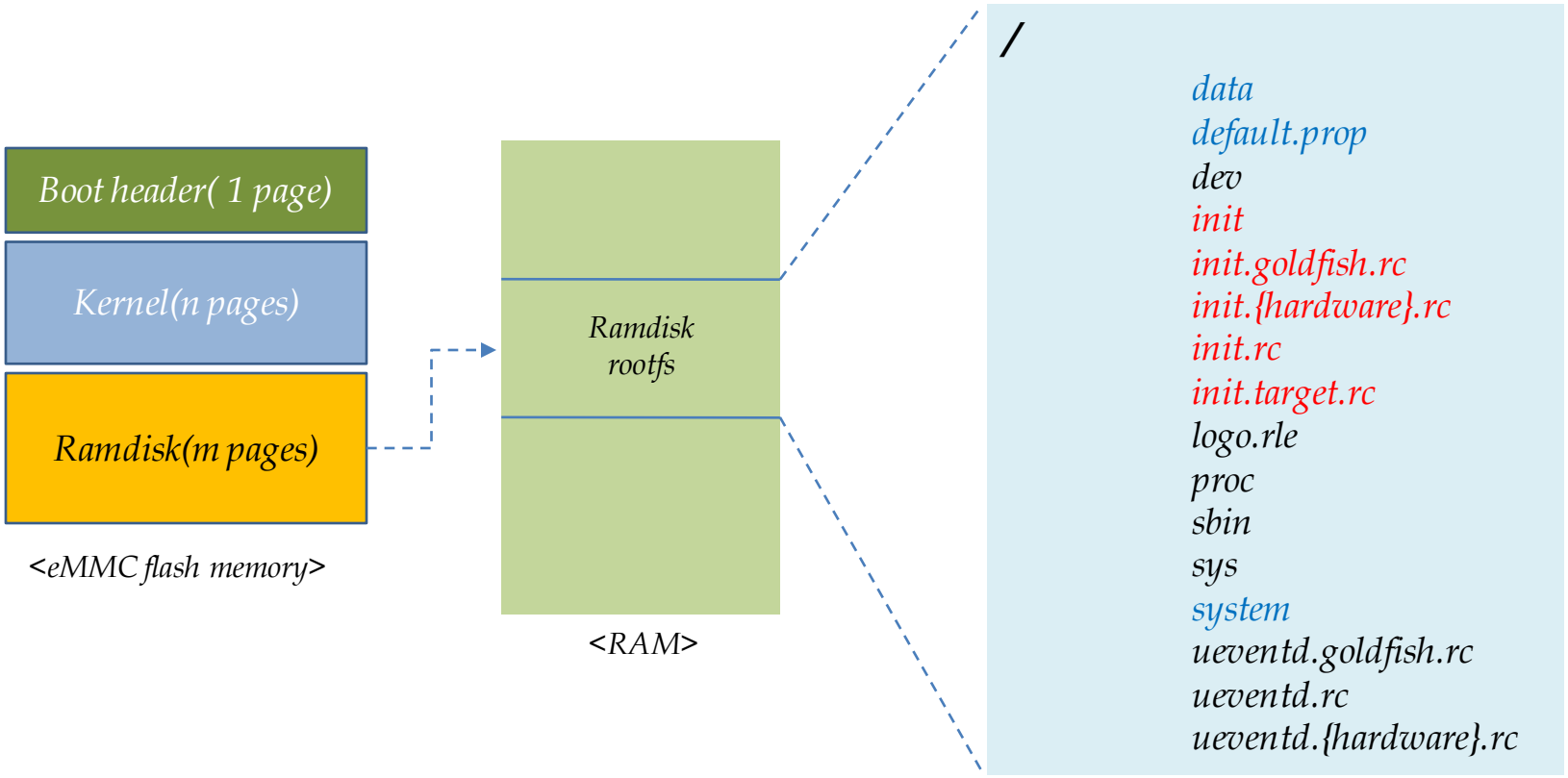
7. Jelly Bean Android Boot Flow(2)



7. Jelly Bean Android Boot Flow(3)



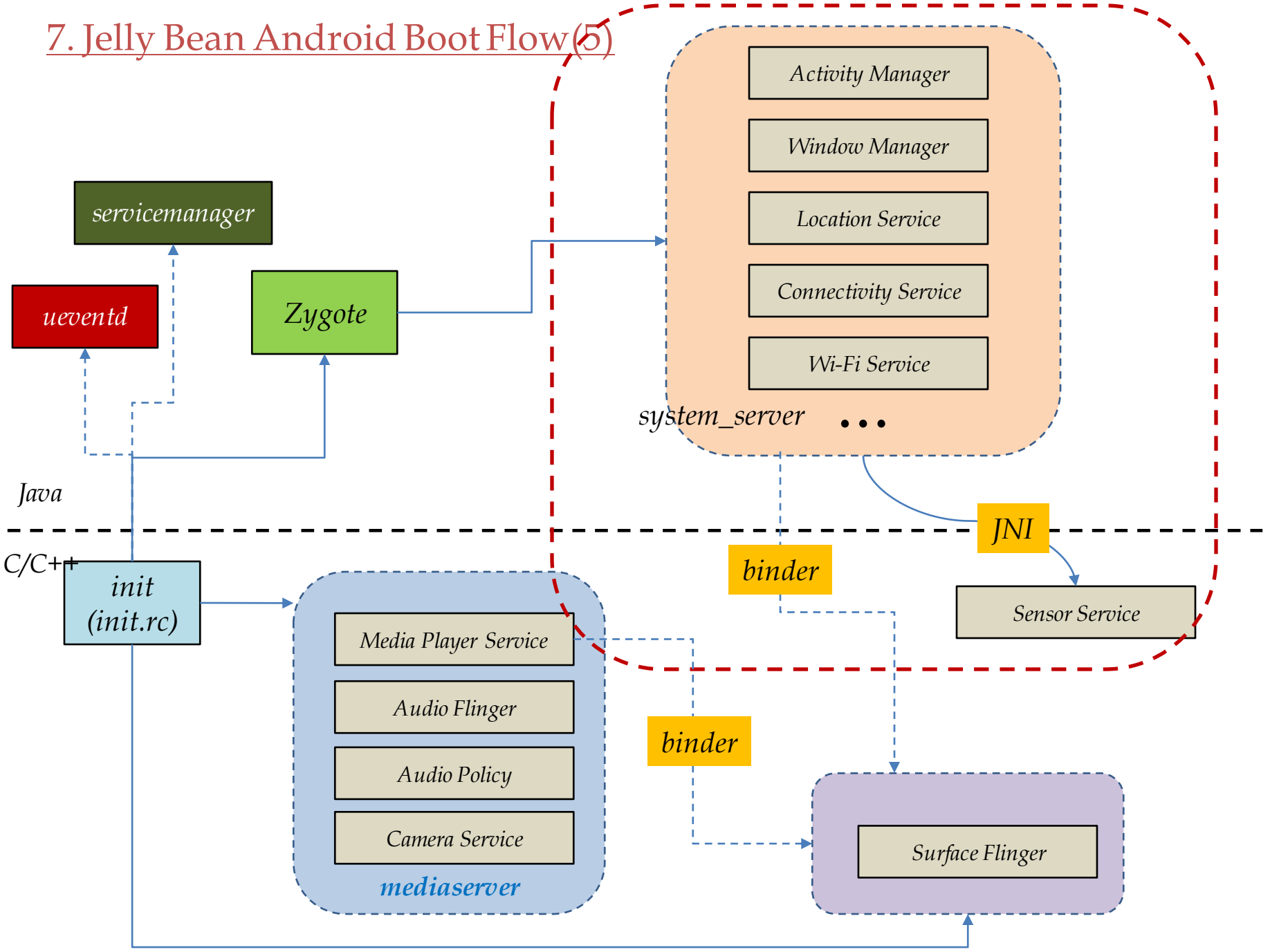
7. Jelly Bean Android Boot Flow(4)



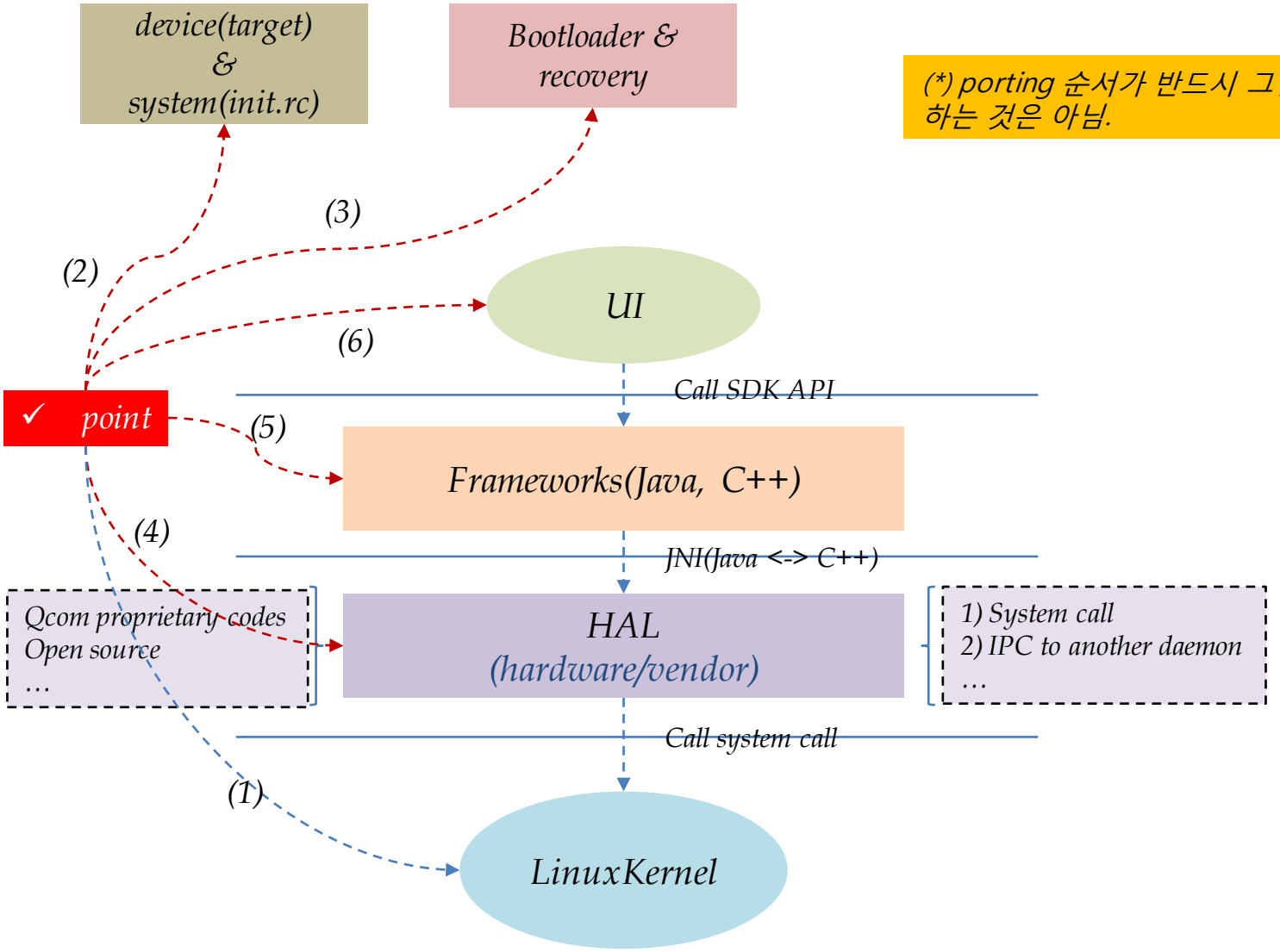

```
# mount –o remount,rw –t ext4 /dev/block/mtdblockX  /system
# mount –o remount,rw –t ext4 /dev/block/mtdblockX  /data
```

(*) rootfs 이외의 file system은 위와 같은 형태로 mount 가능

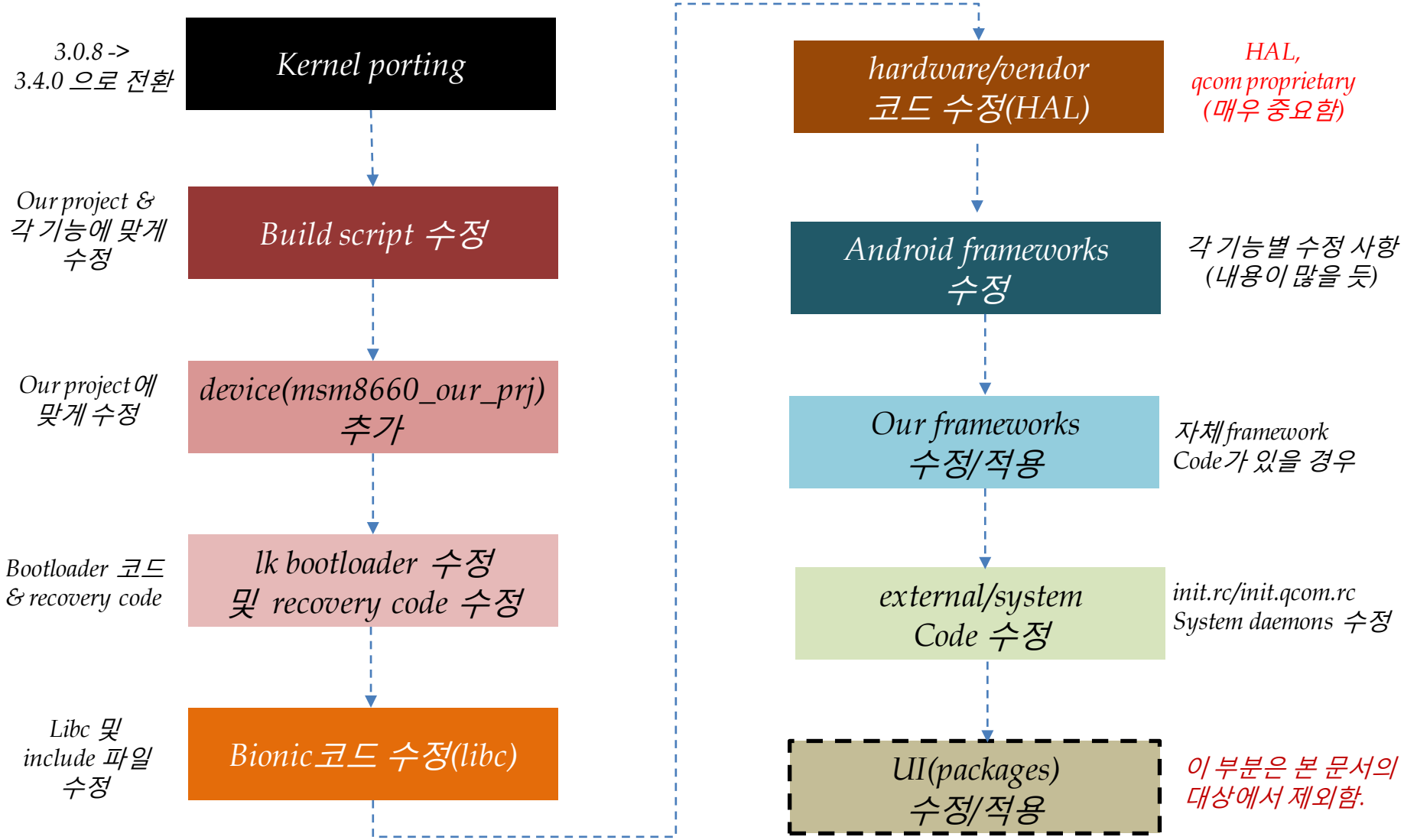
7. Jelly Bean Android Boot Flow(5)



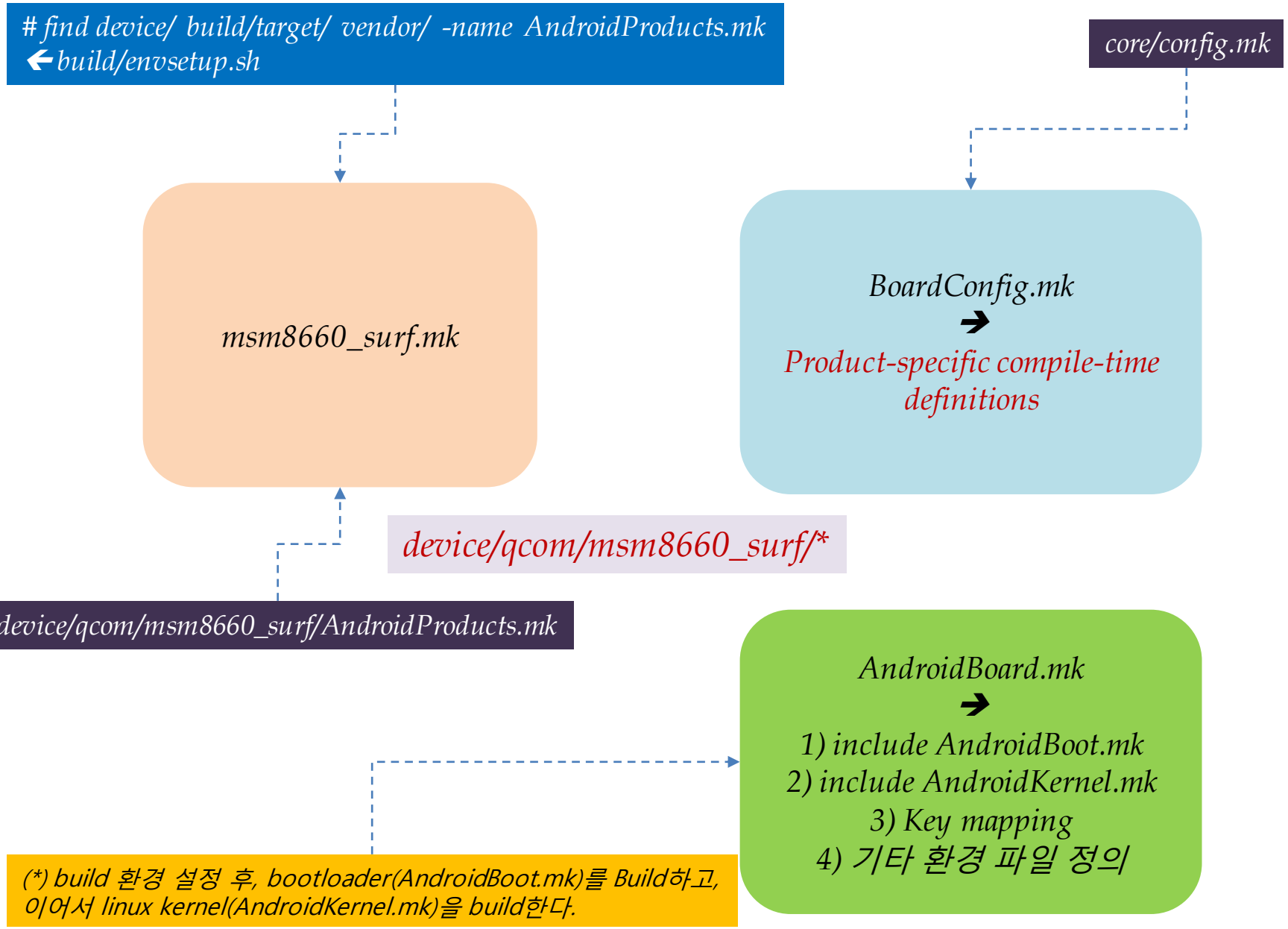
8. Jelly Bean BSP Porting Scope(1) – ***Android/1***



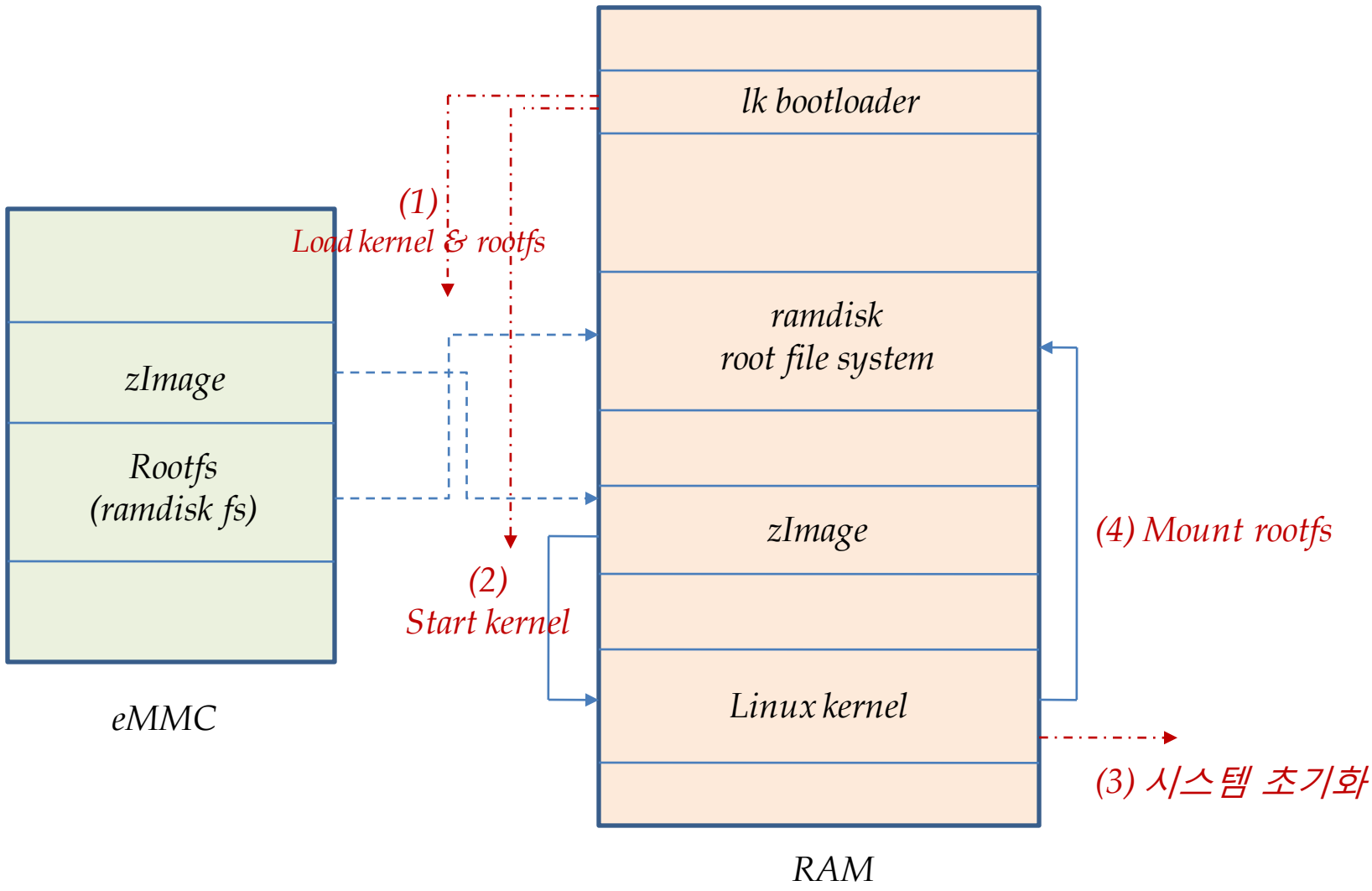
8. Jelly Bean BSP Porting Scope(1) – ***Android/2***



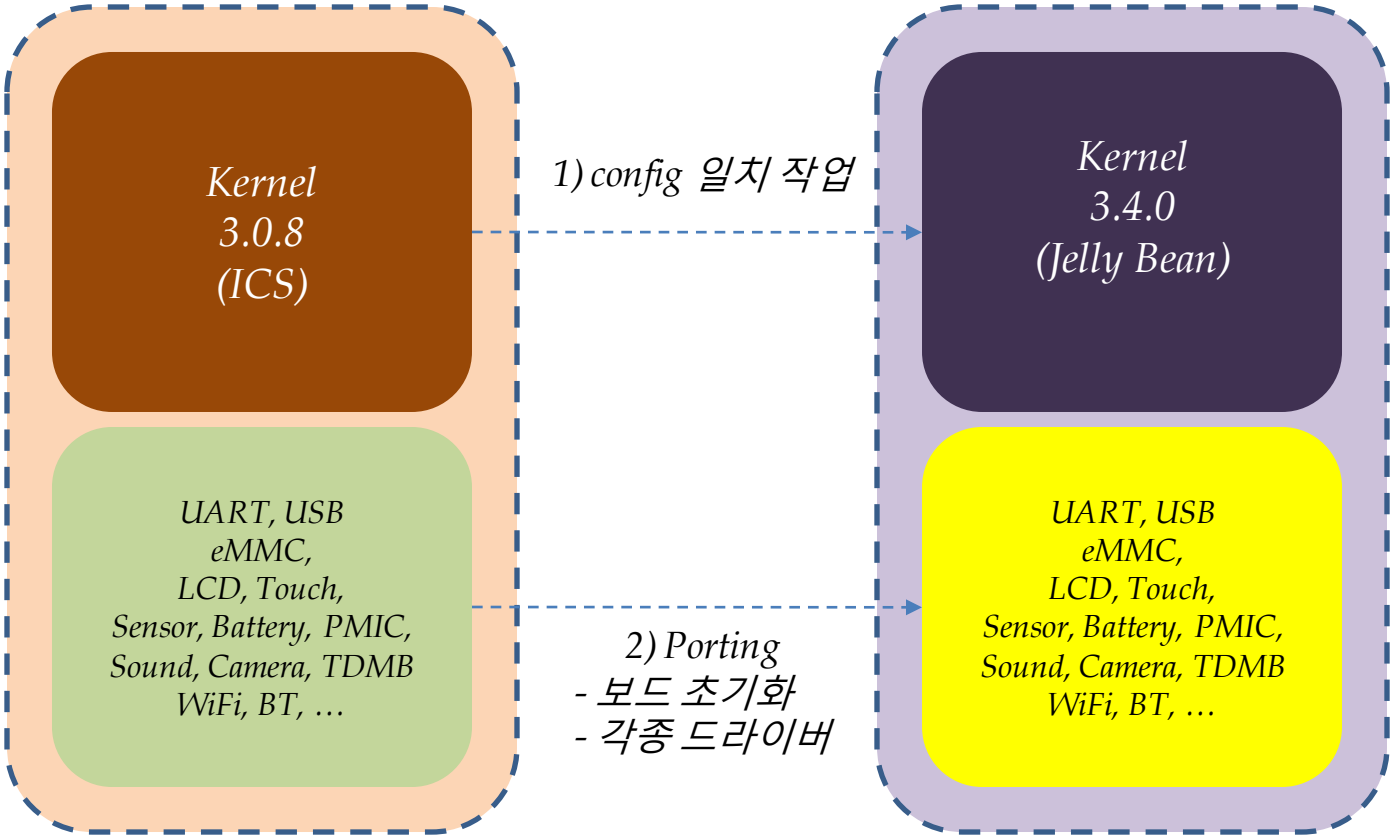
8. Jelly Bean BSP Porting Scope(2) - *Target Board 파일 분석*



8. Jelly Bean BSP Porting Scope(3) - ***lk bootloader***

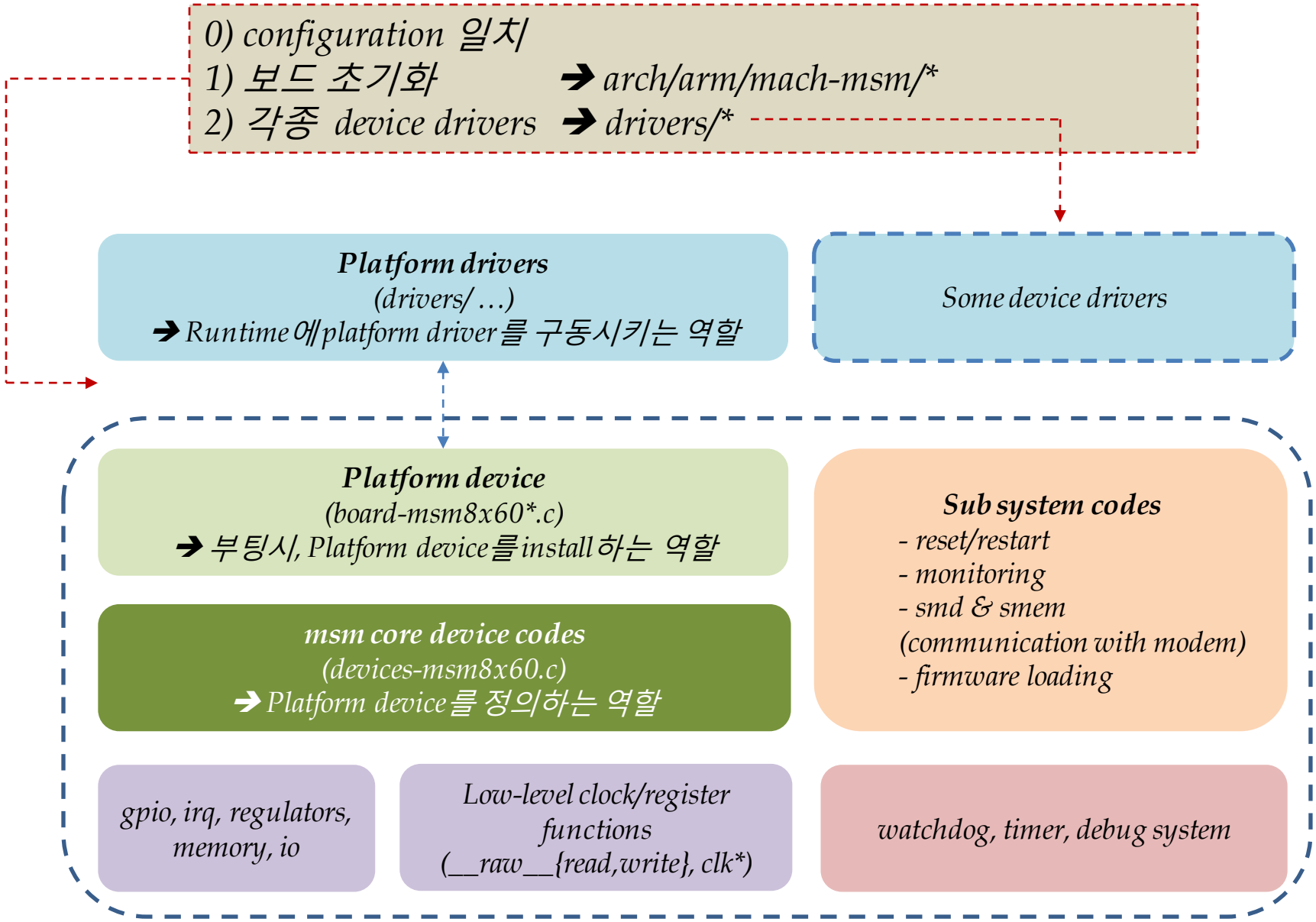


8. Jelly Bean BSP Porting Scope(4) – ***Linux Kernel/1***

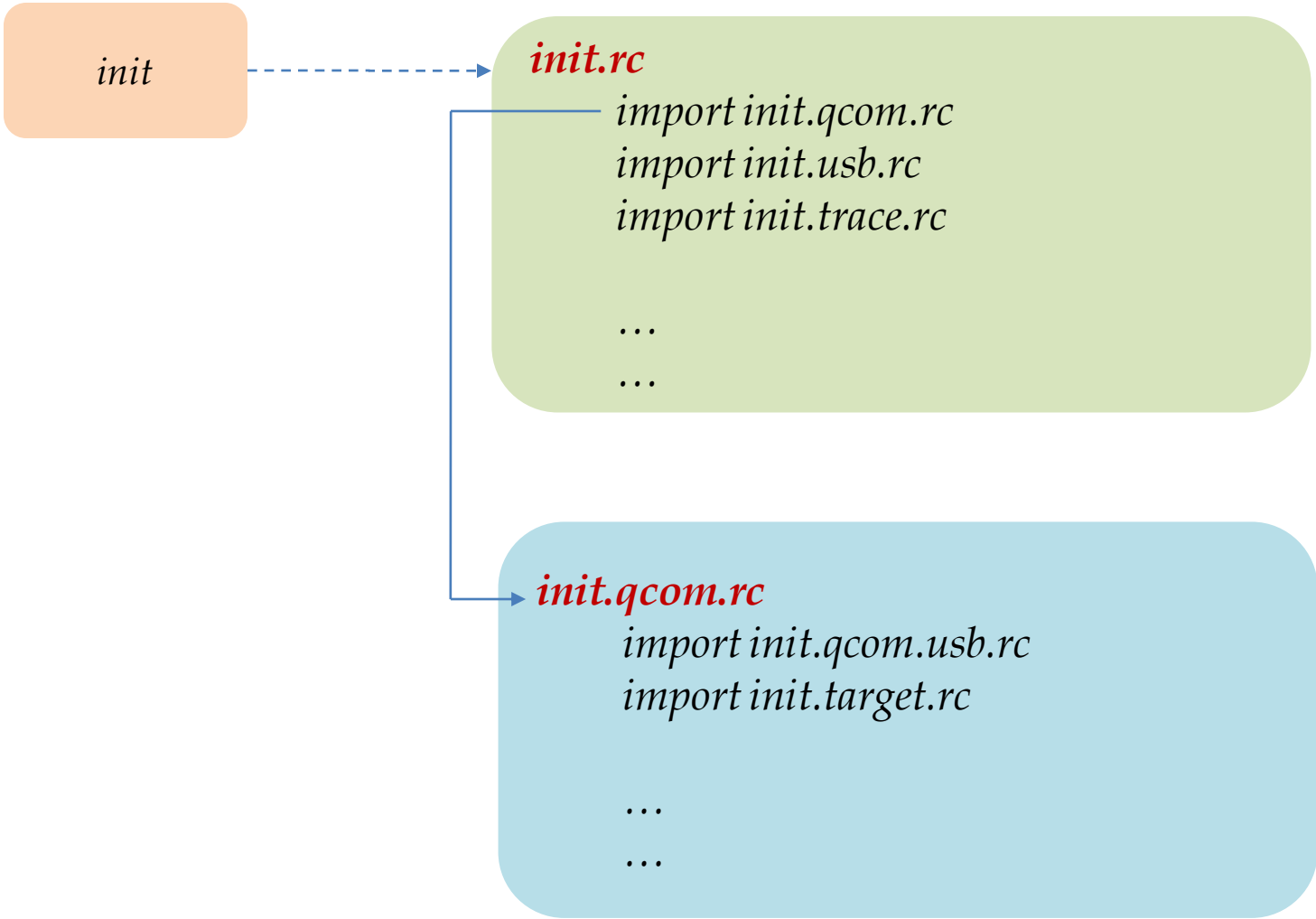


(*) 여기서 말하는 포팅은 ICS kernel에 대해 신규로 추가한 모든 내용(디바이스 드라이버 등)을 Jelly Bean kernel 기반으로 옮기는 작업을 뜻한다.
(*) 따라서, 1차적으로 kernel configuration을 일치시키는 작업을 진행해야 하며, 이후 신규로 추가한 코드 부분을 Jelly Bean kernel로 옮기는 작업을 진행해야 한다.

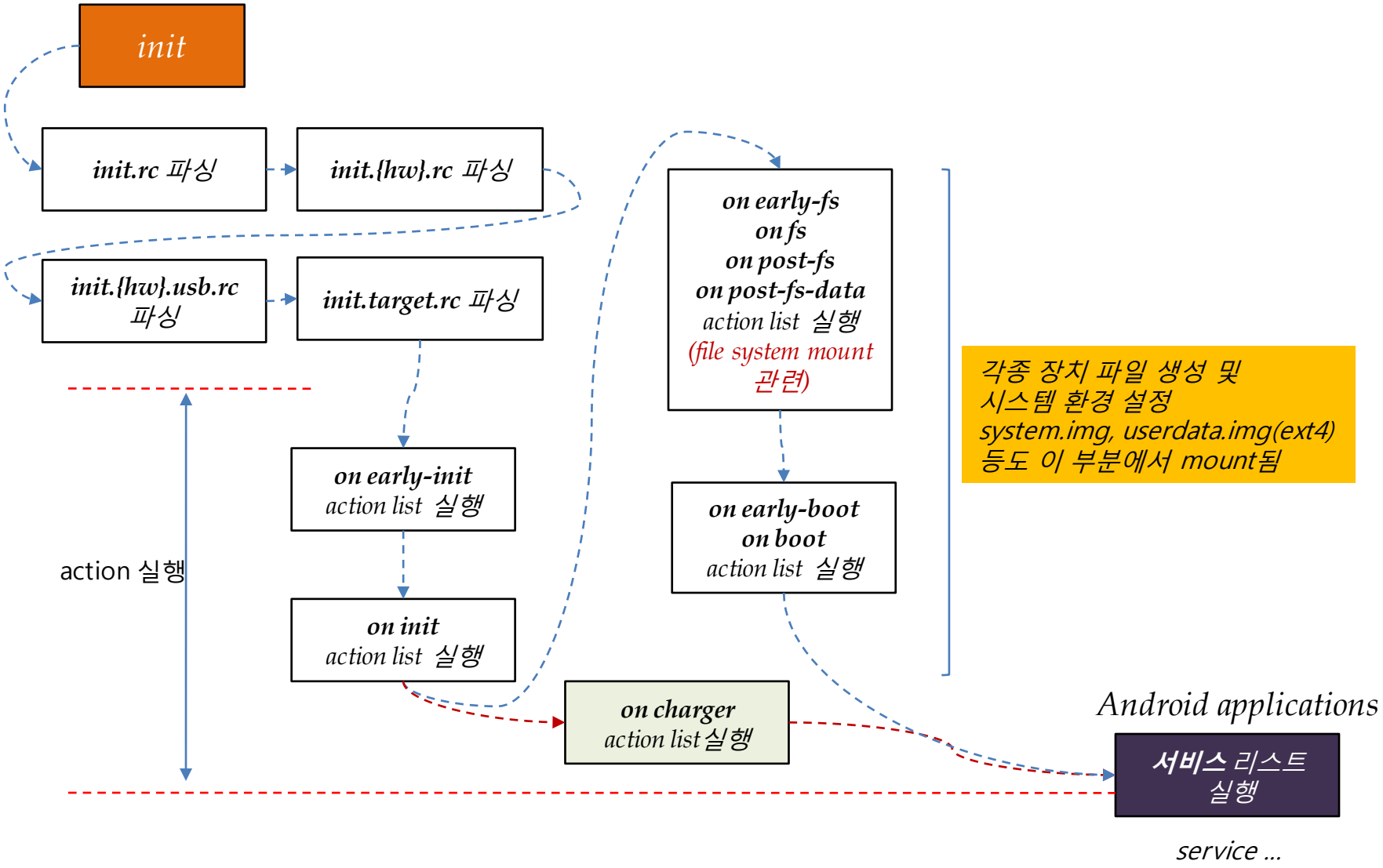
8. Jelly Bean BSP Porting Scope(4) – ***Linux Kernel/2***



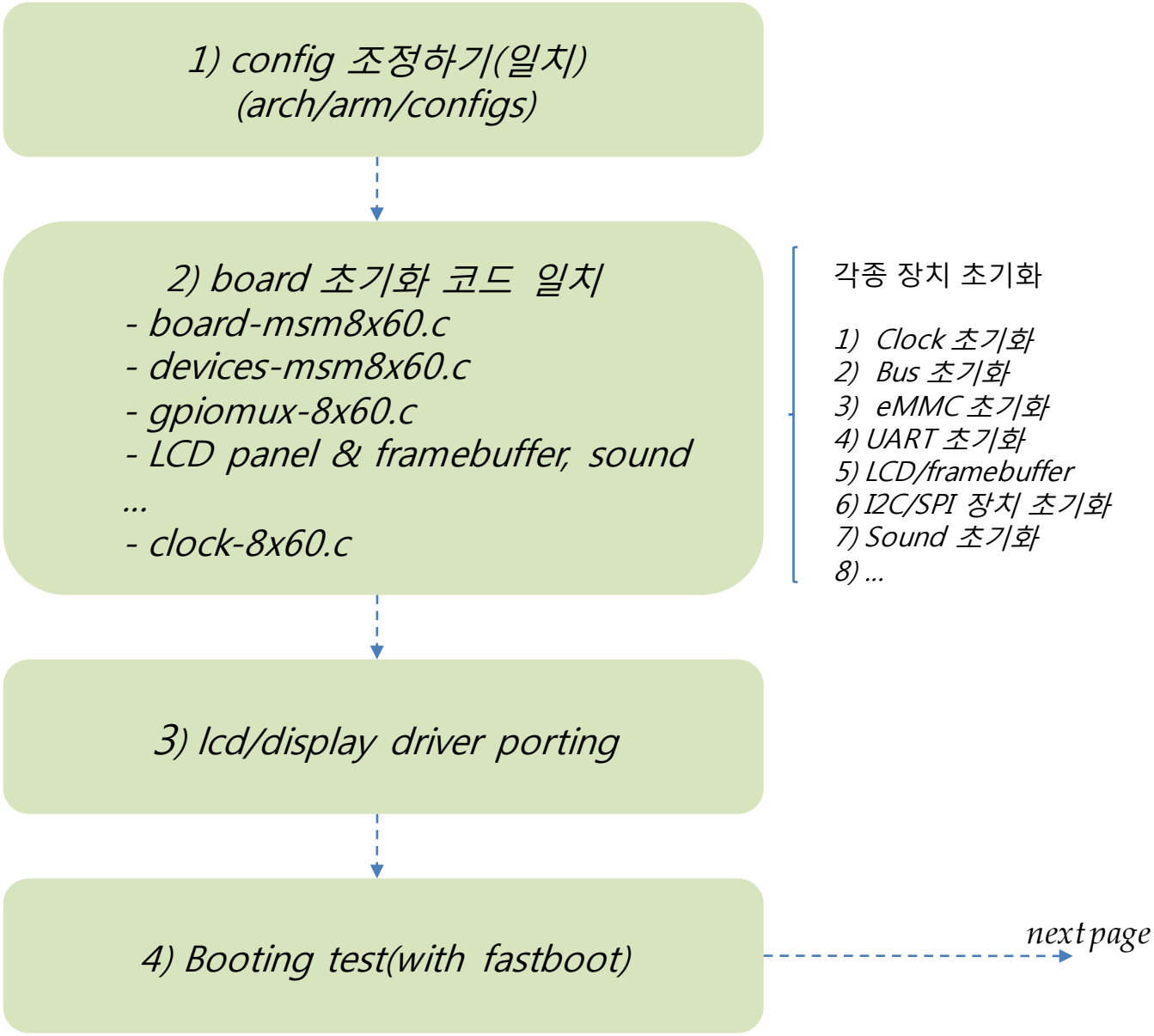
8. Jelly Bean BSP Porting Scope(5) – *init & init.rc/1*



8. Jelly Bean BSP Porting Scope(5) – *init & init.rc/2*

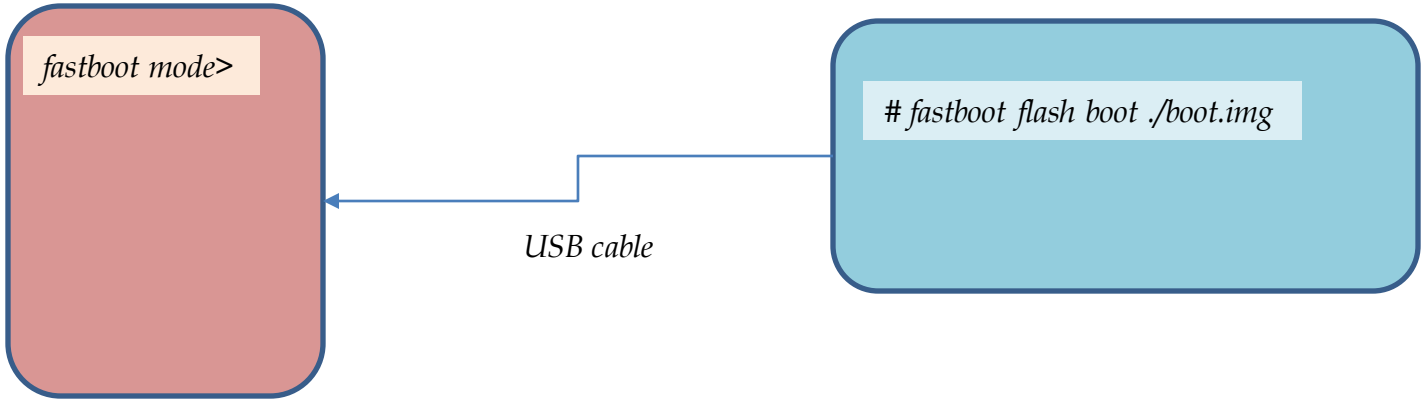


9. BSP Porting(1) – 1단계



9. BSP Porting(2) – 2단계 : fastboot로 image write 하기

- # adb reboot-bootloader ← fastboot mode로 전환(혹은 시스템에서 정의한 key 조합으로도 진입 가능)
- # fastboot flash boot ./boot.img
- # fastboot flash system ./system.img
- # fastboot erase userdata
- # fastboot flash userdata ./userdata.img
- # fastboot flash persist ./persist.img
- # fastboot flash cache ./cache.img



9. BSP Porting(3) – ***3 단계***

5) Debugging
➔ kernel panic 등 다양한 문제 해결 과정 필요

6) USB gadget driver porting
➔ adb가 동작하도록 …

7) mach-msm/ 나머지 부분 porting
- mdm
- sub system restart
- Reset
➔ Power off 시 정상 동작하도록 …

8) Battery/Charger driver porting
➔ 충전이 안되어 booting이 안될 경우 대비

9. BSP Porting(4) – ***4 단계: android target porting***

- *device/qcom/msm8660_surf/AndroidBoard.mk*
- *device/qcom/msm8660_surf/BoardConfig.mk*
- *device/qcom/msm8660_surf/init.qcom.mdm_links.sh*
- *device/qcom/msm8660_surf/init.target.rc*
- *device/qcom/msm8660_surf/msm8660_surf.mk*
- *device/qcom/msm8660_surf/recovery.fstab*
- *device/qcom/msm8660_surf/*.kl*
- *device/qcom/msm8660_surf/**

- *device/qcom/common/rootdir/etc/init.qcom.rc*
- *device/qcom/common/rootdir/etc/init.qcom.usb.rc*
- *device/qcom/common/rootdir/etc/ueventd.qcom.rc*
- *device/qcom/common/rootdir/etc/**

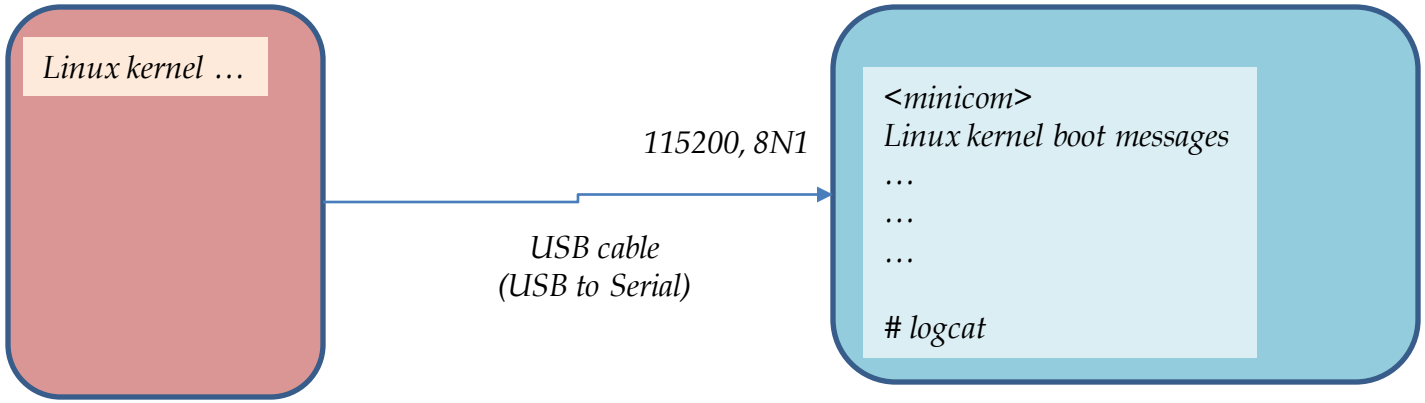
- *system/core/rootdir/init.rc*
- *system/core/rootdir/ueventd.rc*

9. BSP Porting(5) – *5 단계: debugging*

- 1) console
  - minicom – 115200, 8N1

- 2) adb
  - adb shell
  - logcat 으로 문제점 debugging

➔ *Board bring-up 단계에서는 모든 기능을 porting 한 것이 아니므로, 의외의 곳에서 시스템이 죽을 수 있음(주요 대상: surfaceflinger, system_server, mediaserver 등)*



9. BSP Porting(6) – *Kernel Boot Messages*

```
<6>[    0.000000] Booting Linux on physical CPU 0
<6>[    0.000000] Initializing cgroup subsys cpu
<5>[    0.000000] Linux version 3.4.0-perf-g49f91a2-dirty (chunghan.yi@gmail.com) (gcc version 4.6.x-google 20120106
 (prerelease) (GCC) ) #26 SMP PREEMPT Fri Oct 5 10:52:50 KST 2012
<4>[    0.000000] CPU: ARMv7 Processor [510f02d2] revision 2 (ARMv7), cr=10c5387d
<4>[    0.000000] CPU: PIPT / VIPT nonaliasing data cache, VIVT ASID tagged instruction cache
<4>[    0.000000] Machine: SLOWBOOT SLOWBOOT BOARD MSM8X60
<6>[    0.000000] memory pool 0 (start 38000000 size 600000) initialized
<6>[    0.000000] memory pool 1 (start 38600000 size 3802000) initialized
<6>[    0.000000] memory pool 3 (start 79400000 size 6c00000) initialized
<4>[    0.000000] Memory policy: ECC disabled, Data cache writealloc
<6>[    0.000000] socinfo_init: v6, id=71, ver=2.0, raw_id=1329, raw_ver=1, hw_plat=0,  hw_plat_ver=65537
<6>[    0.000000]  accessory_chip=58 hw_plat_subtype=0
<7>[    0.000000] On node 0 totalpages: 212992
<7>[    0.000000] free_area_init_node: node 0, pgdat c0cc7b80, node_mem_map c18eb000
<7>[    0.000000]   Normal zone: 992 pages used for memmap
<7>[    0.000000]   Normal zone: 0 pages reserved
<7>[    0.000000]   Normal zone: 104992 pages, LIFO batch:31
<7>[    0.000000]   HighMem zone: 1052 pages used for memmap
<7>[    0.000000]   HighMem zone: 105956 pages, LIFO batch:31
<6>[    0.000000] allocating 30175232 bytes at c7e00000 (48000000 physical) for fb
<6>[    0.000000] PERCPU: Embedded 9 pages/cpu @c9aca000 s15296 r8192 d13376 u36864
<7>[    0.000000] pcpu-alloc: s15296 r8192 d13376 u36864 alloc=9*4096
<7>[    0.000000] pcpu-alloc: [0] 0 [0] 1
<4>[    0.000000] Built 1 zonelists in Zone order, mobility grouping on.  Total pages: 210948
<5>[    0.000000] Kernel command line: console=ttyDCC0,115200,n8 console=ttyHSL0,115200,n8 androidboot.hardware=qcom
 kgsl.mmutype=gpummu vmalloc=512M uart_console=disable slowboot.rev=rev_b slowboot.hreset=off slowboot.reboot=pwroff
 slowboot.lcd=off slowboot.batt_info=<null> slowboot.pwron=usb_chg slowboot.reset=rst_etc slowboot.usb_cable=normal
kcal= 0 0 0 0 0 0 mdm_force_dump_enabled idv2 androidboot.emmc=true androidboot.serialno=64005dc3 slowboot.signed_im
age=true androidboot.baseband=svlte2a
<6>[    0.000000] BOARD : SLOWBOOT rev_b
<6>[    0.000000] BOARD : SLOWBOOT target 2
<6>[    0.000000] usb_cable_info : normal (8)
<6>[    0.000000] ####kcal=, r=0, g=0, b=0  sign=0,0,0
<6>[    0.000000] PID hash table entries: 2048 (order: 1, 8192 bytes)
<6>[    0.000000] Dentry cache hash table entries: 65536 (order: 6, 262144 bytes)
<6>[    0.000000] Inode-cache hash table entries: 32768 (order: 5, 131072 bytes)
<6>[    0.000000] Memory: 44MB 788MB = 832MB total
<5>[    0.000000] Memory: 794416k/794416k available, 168144k reserved, 428032K highmem
<5>[    0.000000] Virtual kernel memory layout:
<5>[    0.000000]     vector  : 0xffff0000 - 0xffff1000   (   4 kB)
<5>[    0.000000]     fixmap  : 0xfff00000 - 0xfffe0000   ( 896 kB)
<5>[    0.000000]     vmalloc : 0xdf800000 - 0xff000000   ( 504 MB)
<5>[    0.000000]     lowmem  : 0xc0000000 - 0xdf000000   ( 496 MB)
<5>[    0.000000]     pkmap   : 0xbfe00000 - 0xc0000000   (   2 MB)
                                                                                40,1          꼭대기
```

9. BSP Porting(7) – *ps result(busybox ps)*

```
  100 0             0 SW<  [krfcommd]
  101 0             0 SW<  [msm-cpufreq]
  102 0             0 SW<  [rq_stats]
  103 0             0 SW<  [deferwq]
  104 0             0 SW<  [fsa8008]
  105 0             0 SW   [irq/639-fsa8008]
  106 0             0 SW   [irq/640-fsa8008]
  107 0           376 S    /sbin/ueventd
  108 0             0 SW   [jbd2/mmcblk0p26]
  109 0             0 SW<  [ext4-dio-unwrit]
  110 0             0 SW   [jbd2/mmcblk0p20]
  111 0             0 SW<  [ext4-dio-unwrit]
  112 0             0 SW   [jbd2/mmcblk0p29]
  113 0             0 SW<  [ext4-dio-unwrit]
  114 0             0 SW   [jbd2/mmcblk0p28]
  115 0             0 SW<  [ext4-dio-unwrit]
  116 0             0 SW   [jbd2/mmcblk0p12]
  117 0             0 SW<  [ext4-dio-unwrit]
  118 0             0 SW   [jbd2/mmcblk0p27]
  119 0             0 SW<  [ext4-dio-unwrit]
  120 0             0 SW   [jbd2/mmcblk0p23]
  121 0             0 SW<  [ext4-dio-unwrit]
  123 1000        916 S    /system/bin/servicemanager
  125 0          4184 S    /system/bin/vold
  128 0         10040 S    /system/bin/netd
  129 0          1212 S    /system/bin/debuggerd
  133 1019       8884 S    /system/bin/drmserver
  134 1013      29740 S    /system/bin/mediaserver
  135 1002       1428 S    /system/bin/dbus-daemon --system --nofork
  136 0           928 S    /system/bin/installd
  138 1017       1944 S    /system/bin/keystore /data/misc/keystore
  144 2000        844 S    /system/bin/sh
  145 9999        908 S    /system/bin/rmt_storage
  146 0          8892 S    /system/bin/time_daemon
  147 0          5504 S    /sbin/adbd
  170 1001       4048 S    /system/bin/qmuxd
  173 1001       5204 S    /system/bin/qmiproxy
  176 0          4148 S    /system/bin/netmgrd
  903 0          5264 S <  /system/bin/mpdecision --no_sleep --avg_comp
  983 1000       6096 S    /system/bin/mm-pp-daemon
 1238 0          440m S    zygote /bin/app_process -Xzygote /system/bin --zygot
 1239 1000      74312 S    /system/bin/surfaceflinger
 1279 1000       554m S    system_server
 1430 10042      471m S    {ndroid.systemui} com.android.systemui
 1487 10012      453m S    {d.process.media} android.process.media
 1492 10019      452m S    {putmethod.latin} com.android.inputmethod.latin
 1519 1001       460m S    {m.android.phone} com.android.phone
 1530 10020      482m S    {ndroid.launcher} com.android.launcher
```

Thanks a lot !

SlowBoot