

u-boot mr1 structure

Training Document

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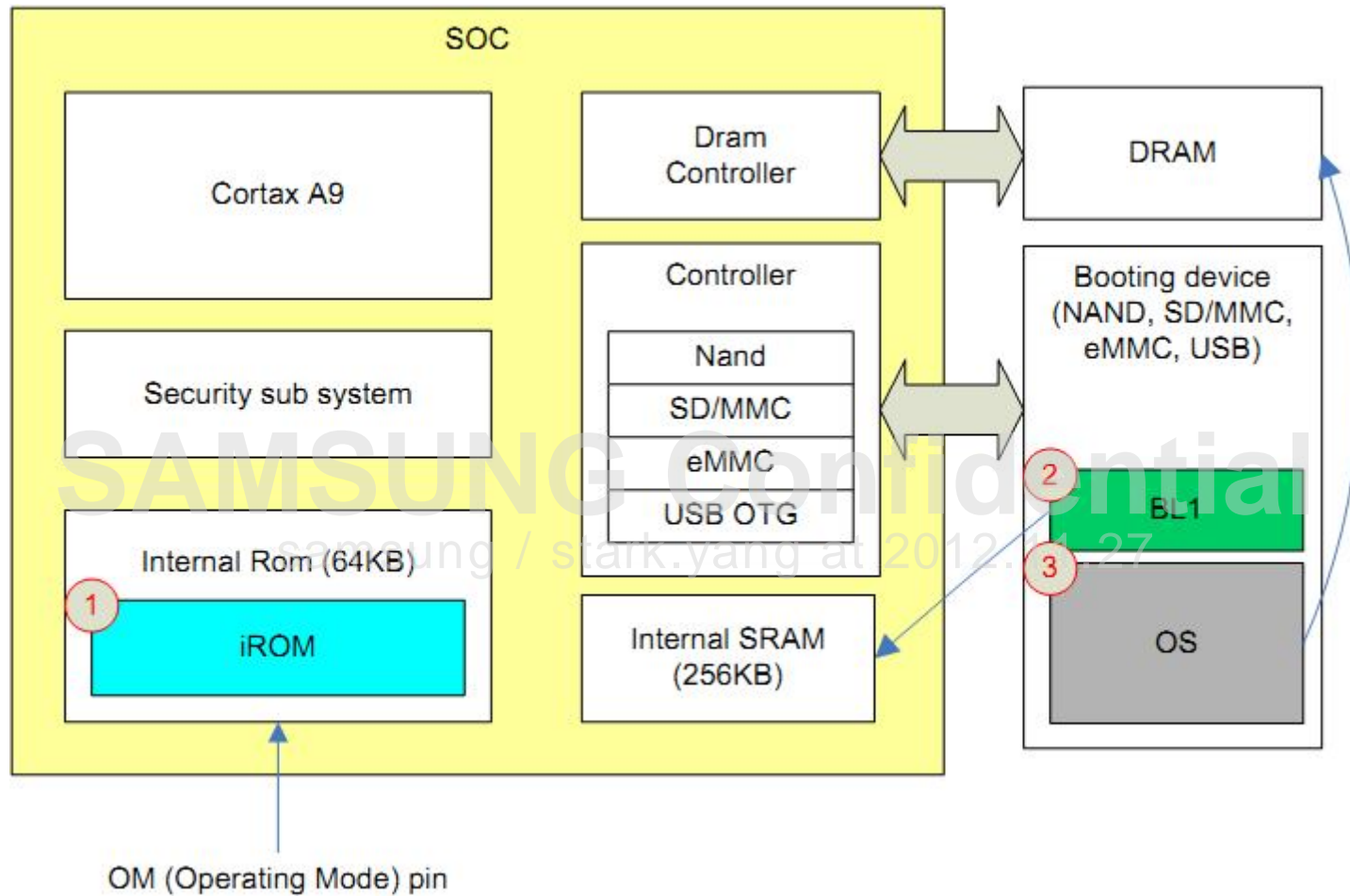
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- Overview
- Booting Flow Chart
- Functions of ISP
- Feature List
- Architecture of ISP Solution
- Android HAL
- H/W Design Guide
- Process of Technical Support

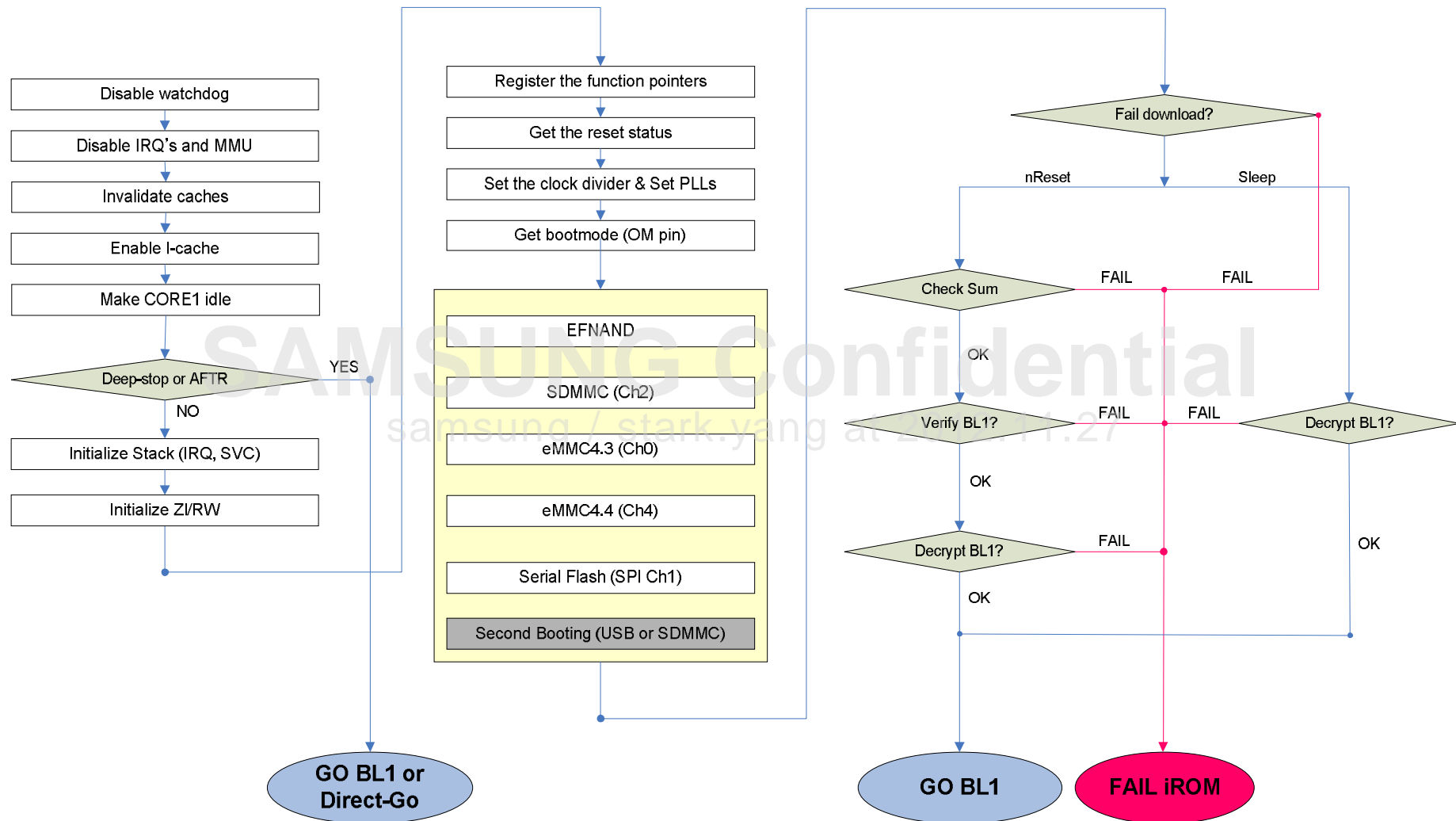
Overview

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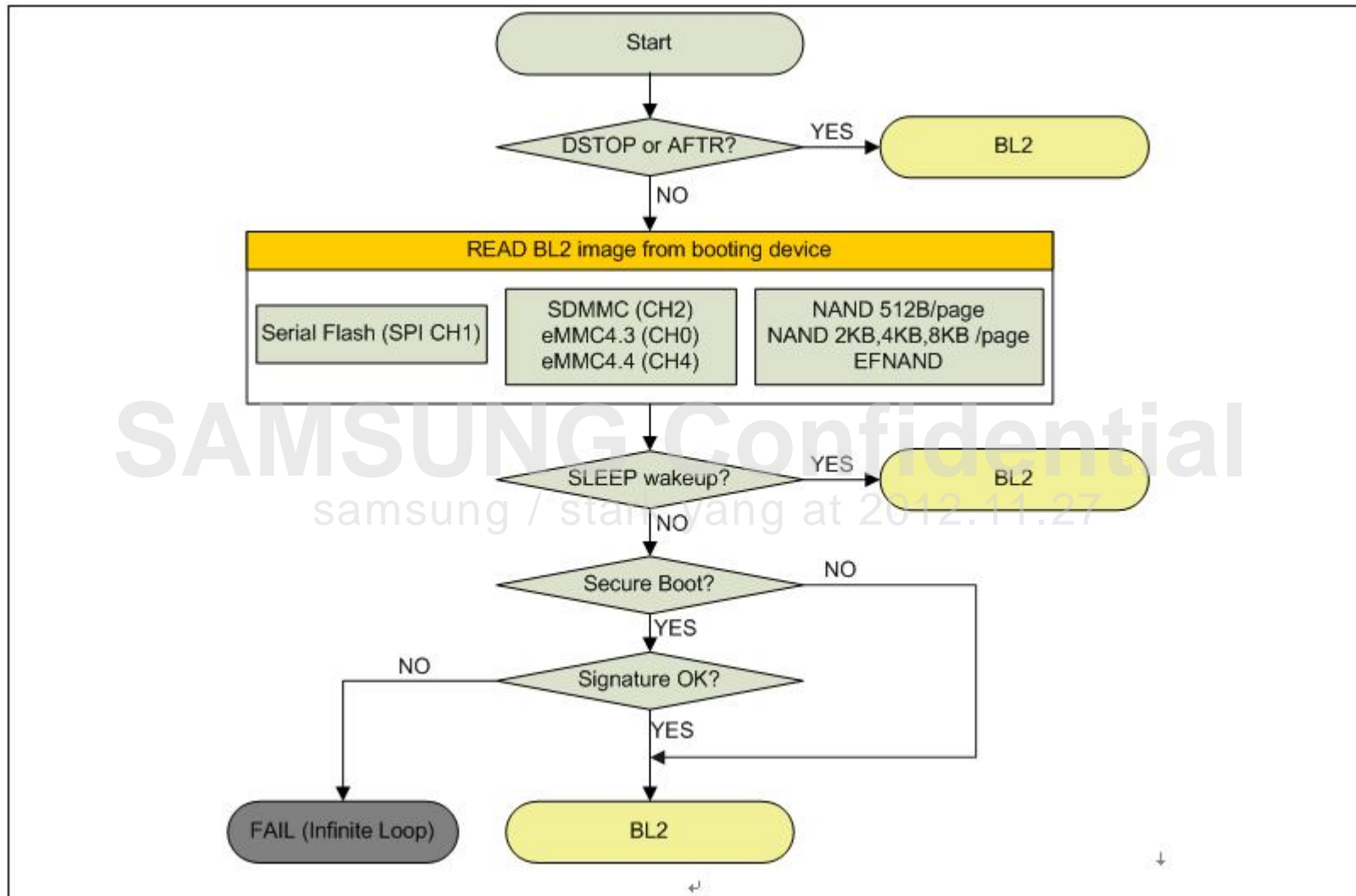
iROM booting flow chart

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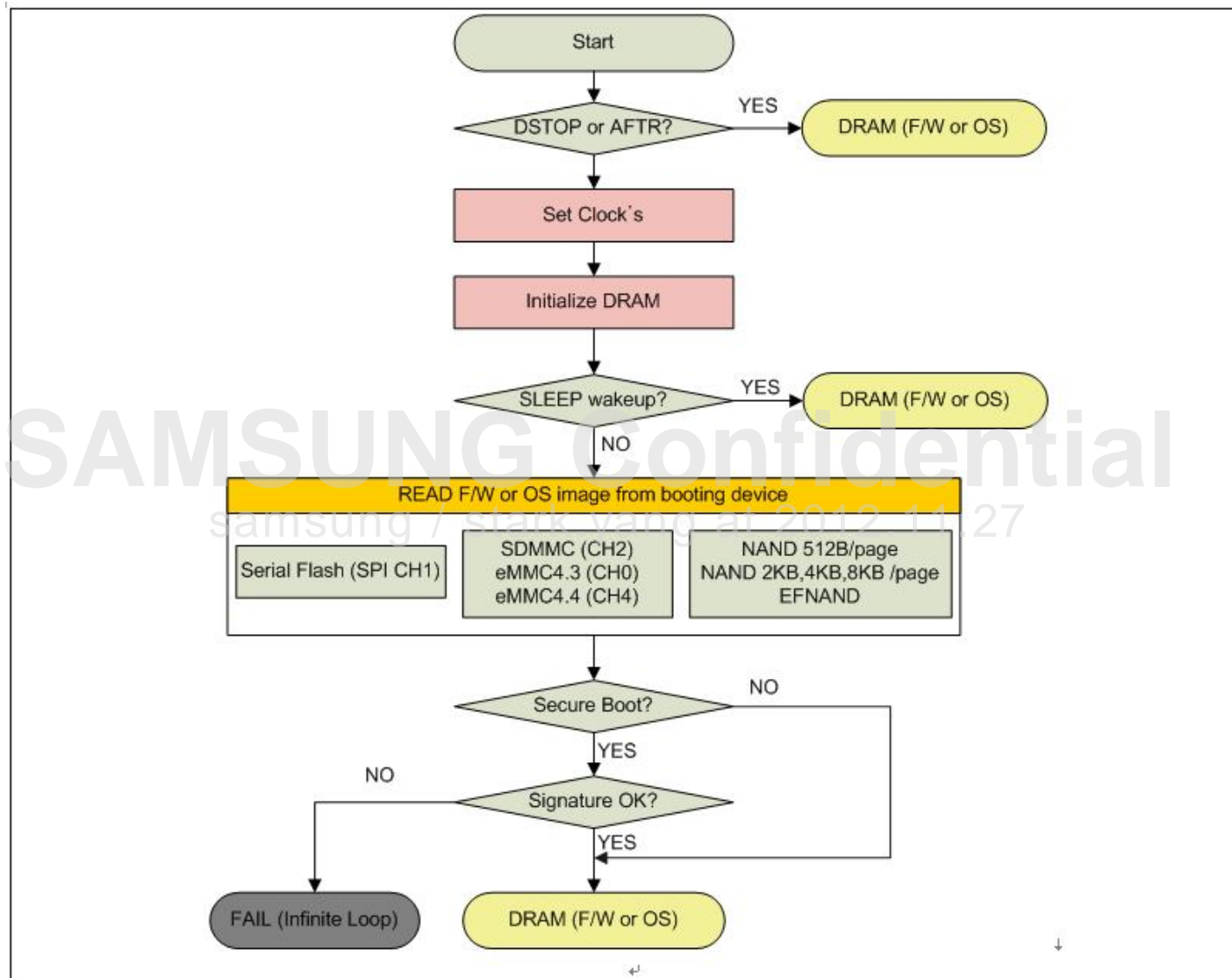
BL1 booting flow chart

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BL2 booting flow chart

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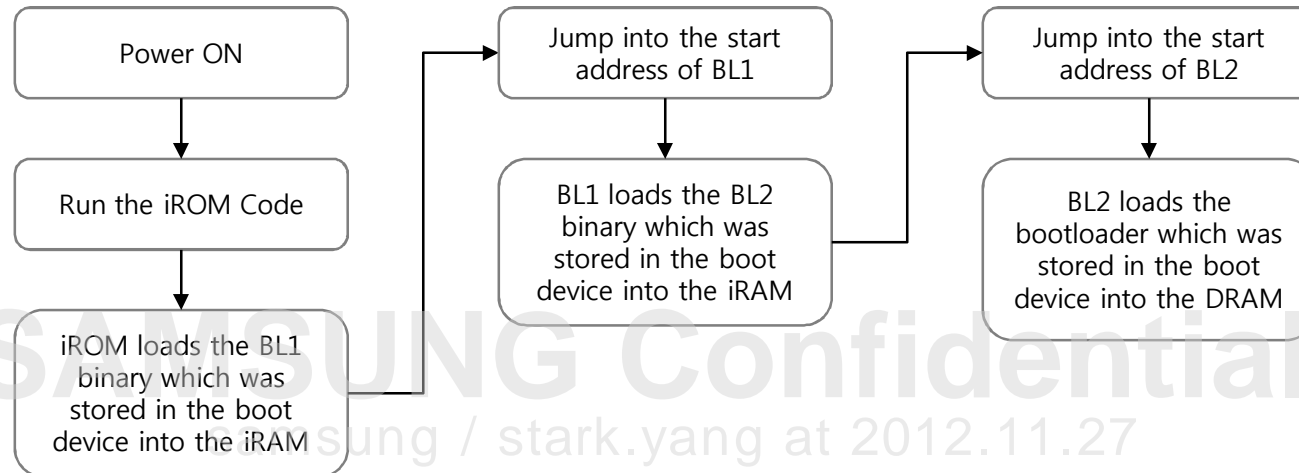


- Secure Boot?
 - Purpose
 - Prevent the bootloader/kernel/android image from being changed with an image which can be used for malicious purpose
 - How
 - Encrypt/Decrypt the image using public/private key
 - RSA (Rivest–Shamir–Adleman) Public–Key Encryption Algorithm
 - AES (Advanced Encryption Standard) Block Encryption Algorithm

Boot Sequence : Normal

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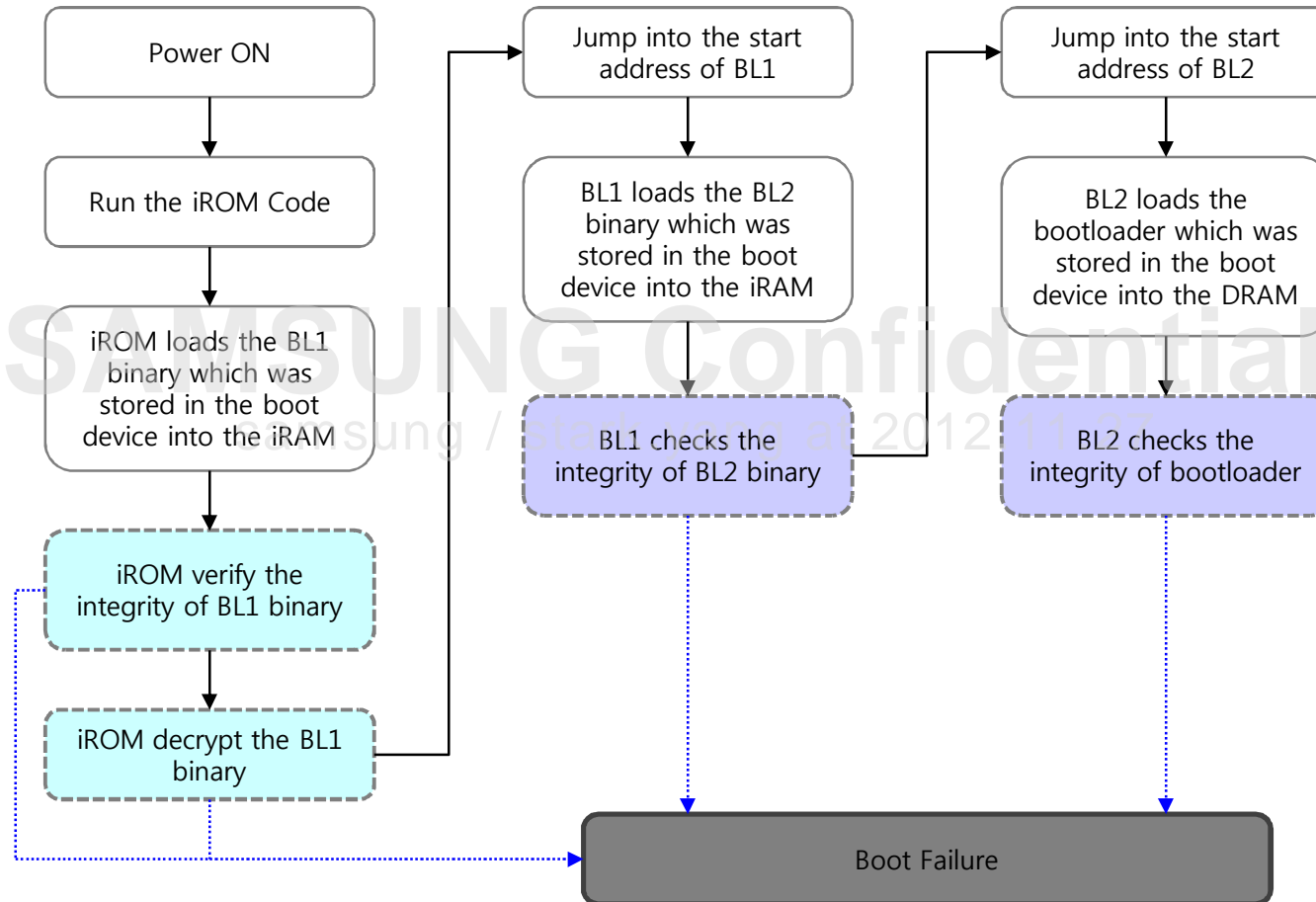
- Normal Boot Sequence



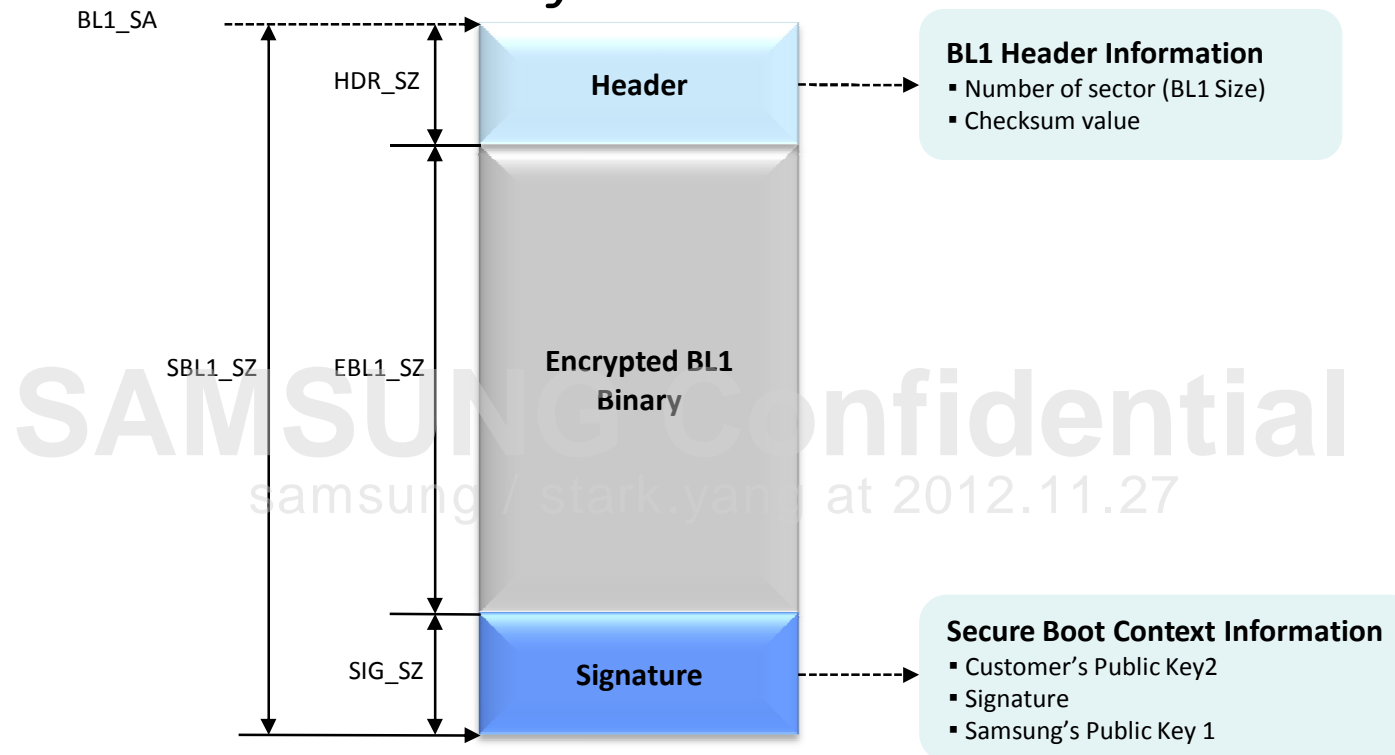
Boot Sequence : Security Featured

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- Security Featured Boot Sequence

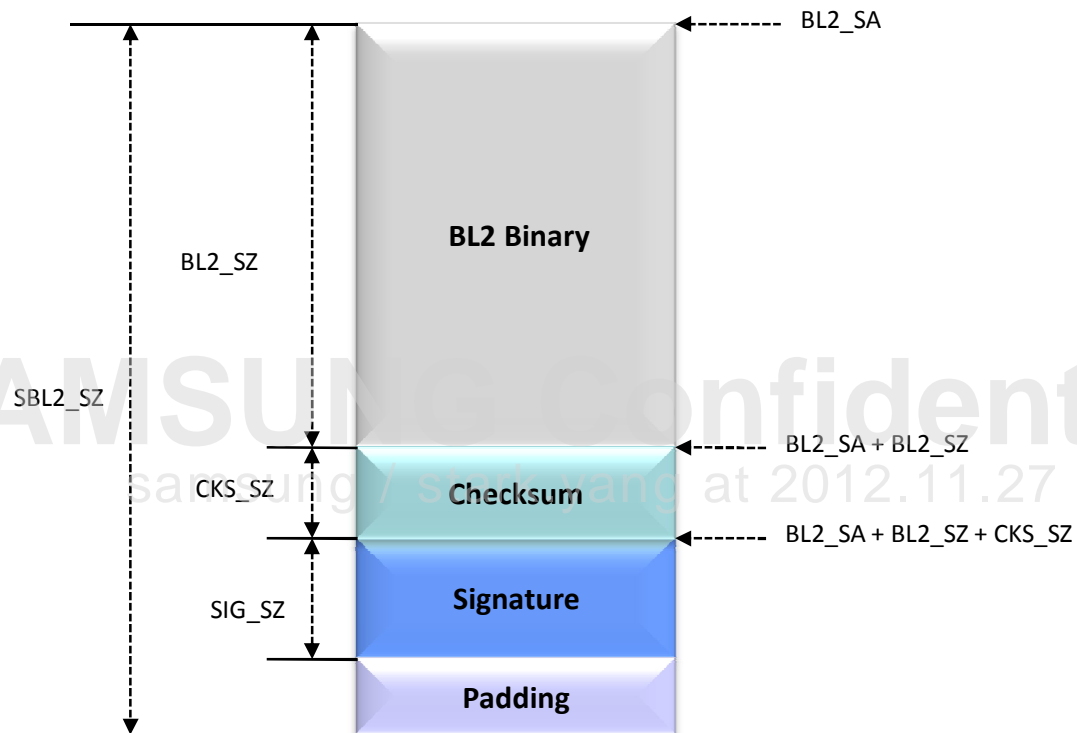


• Signed BL1 Binary Structure



	BL1 Start Address (BL1_SA)	Header Size (HDR_SZ)	Encrypted BL1 Size (EBL1_SZ)	Signature Size (SIG_SZ)	Signed BL1 Size (SBL1_SZ)
uboot	02021400h	16Byte	7152Byte	1024Byte	8KB
uboot_mr1	02021400h	16Byte	14336Byte	1024Byte	15KB

- Signed BL2 Binary Structure

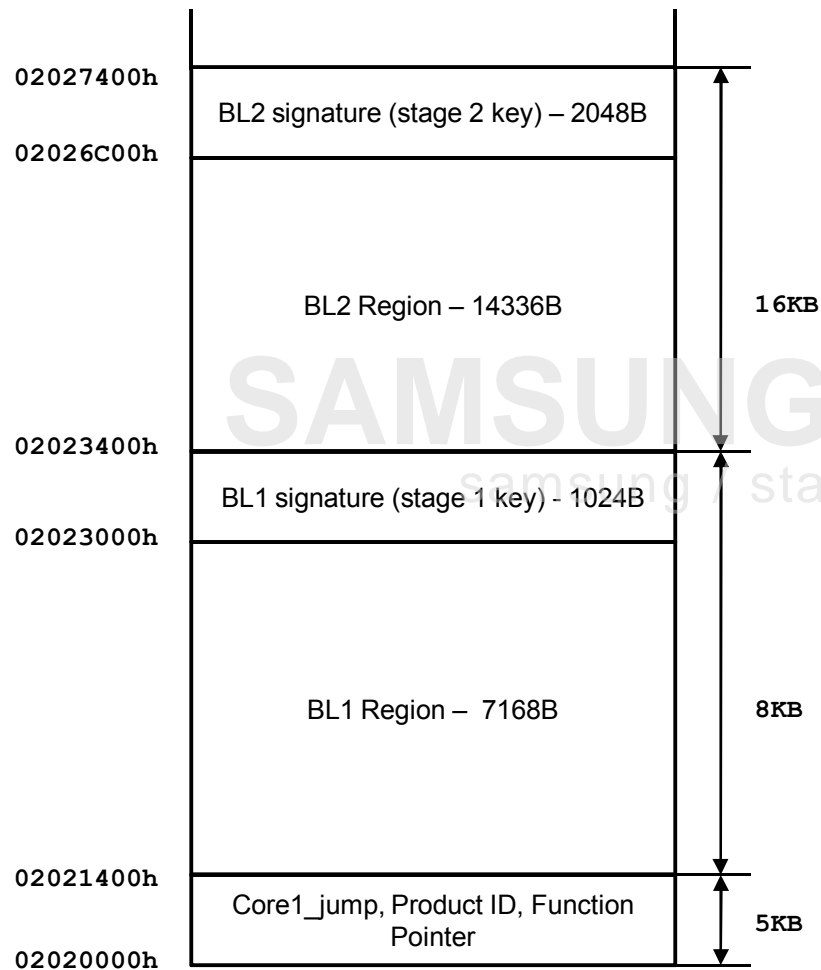


	BL2 Start Address (BL1_SA)	BL2 Size (HDR_SZ)	CheckSum Size (CKS_SZ)	Signature Size (SIG_SZ)	Signed BL2 Size (SBL2_SZ)
uboot	02023400h	14332Byte	4Byte	256Byte	16KB
uboot_mr1	02025000h	14332Byte	4Byte	256Byte	16KB

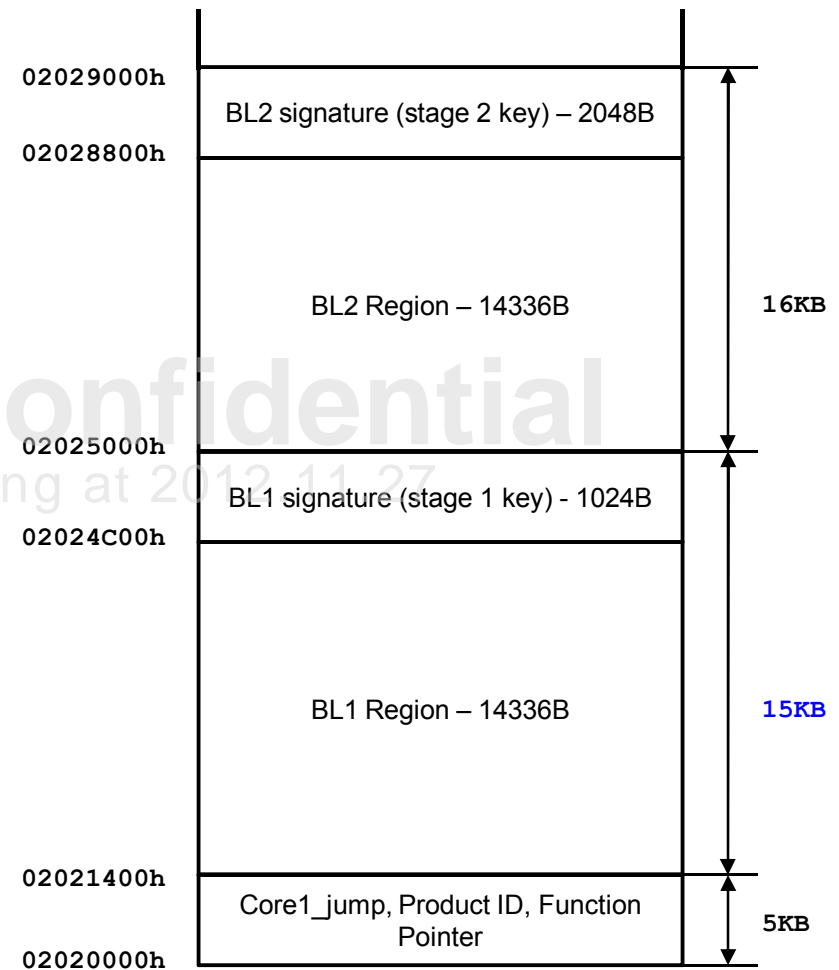
Internal Memory Map

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- Exynos4412



- Exynos4412 Prime



Bootloader Conclusion

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[1] CodeSigner_V21 -v2.1 Exynos4412 -STAGE2_KEYGEN
->Exynos4412_V21.prv + Exynos4412_V21.spk

[2] BL1: Realse binary code by HQ

[sbl1]public key + raw BL1 binary -> encrypted binary file

8K → 15K

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[3] BL2:

- 1) split -b 14336 u-boot.bin bl2 (14336 = 14K)
- 2) 1-word Checksum : \$(tc4_uboot)/ sdfuse_q/chksum.
C
- 3) Signature: use Exynos4412_V21.prv (+256B)
- 4) Add padding to 16384 = 16K

Bootloader Conclusion

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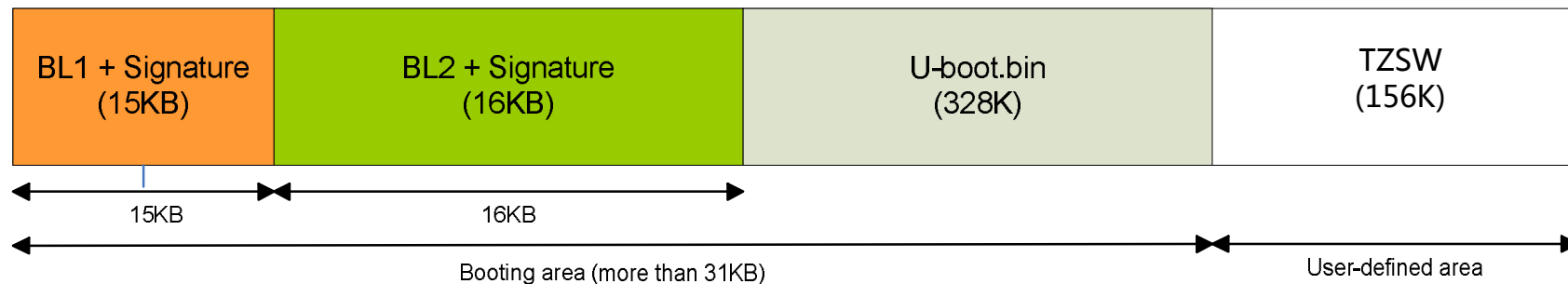
[4] uboot.bin

Add padding

uboot.bin 335872 = 328K

[5] TrustZone = 92K → 156K

BL1(15K) + BL2(16K) + uboot.bin(328K) + TZ(156K)
= u-boot-mr-exynos4412-evt2-efused-tz.bin(515K)



New SBL1 & TZSW Feature

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- 15K SBL1
 - fix the LPA bug (HQ, SSCR没有重现过)
 - support 156K TZSW

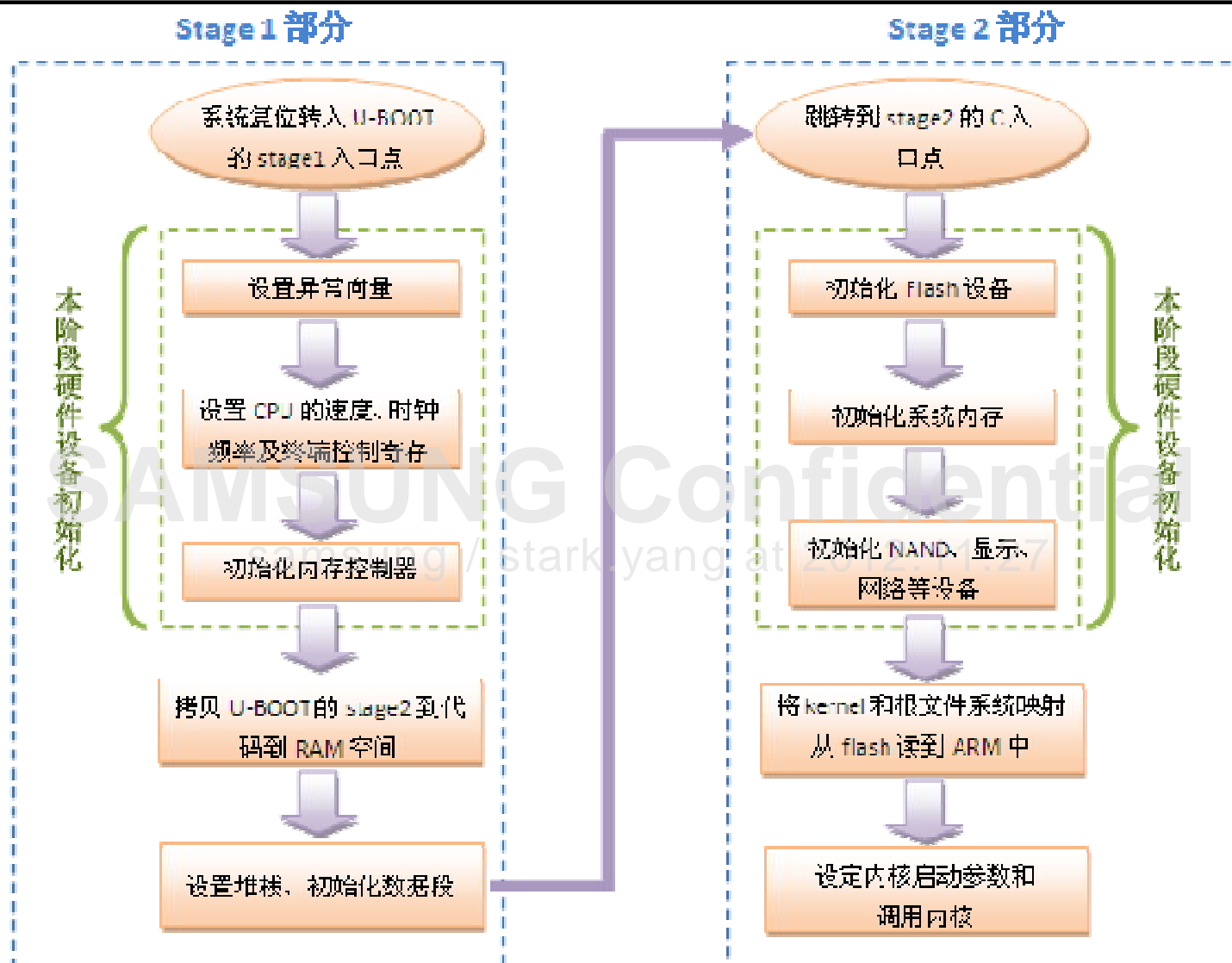
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- 156K TZSW
 - support 2G DRAM
 - 寄存器的访问策略 → Kernel

u-boot Boot Sequence

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U-BOOT 启动流程图

- u-boot version 2010.03 → 2010.12

➤ 代码结构不变

➤ (函数的名称, 接口)

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- 文件目录结构上的主要改变: 把处理器架构体系相关的内容合并, 移到arch目录下.
 - lib_xxx/ → arch/xxx/lib/
 - cpu/xxx/ → arch/xxx/cpu/
 - include/asm-xxx/ → arch/xxx/include/
 - lib_[arch]通用 → lib/
- 移植工作主要在 arch/xxx 和board 目录 (以前是cpu/xxx/和board)

Main Procedures

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- ◆ Uboot/cpu/arm_cortexa9/start.S
- ◆ Uboot/board/samsung/smdkc210/lowlevel_init.S

- ◆ Uboot_mr/arch/arm/cpu/armv7/start.S
- ◆ Uboot_mr/board/samsung/smdk4212/
lowlevel_init.S
clock_init_smdk4212.S
mem_init_smdk4212.S
- ◆ Uboot/lib_arm/board.c

- ◆ Uboot_mr/arch/arm/lib/board.c

- ◆ ./common/main.c

u-boot Command

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- ◆ `./common/cmd_*.c`
- ◆ `U_BOOT_CMD(name,maxargs,rep,cmd,usage,help)`

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U_BOOT_CMD

UBoot是利用U_BOOT_CMD保存用户名和相对应要处理的函数 (includeWcommand.h)

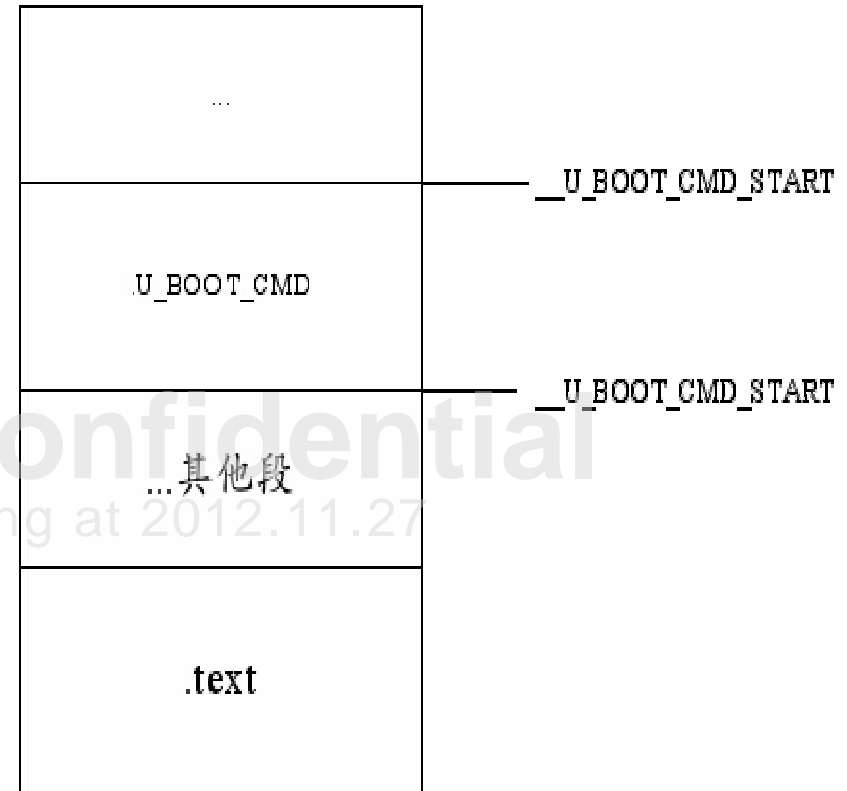
```
struct cmd_tbl_s {
    char      *name; /* Command Name */
    int       maxargs; /* maximum number of arguments */
    int       repeatable; /* autorepeat allowed? */
    /* Implementation function */
    int       (*cmd)(struct cmd_tbl_s *, int, int, char *[]);
    char      *usage; /* Usage message (short) */
#ifdef CONFIG_SYS_LONGHELP
    char      *help; /* Help message (long) */
#endif
#ifdef CONFIG_AUTO_COMPLETE
    /* do auto completion on the arguments */
    int       (*complete)(int argc, char *argv[], char last_char, int maxv, char *cmdv[]);
#endif
};

#define Struct_Section __attribute__((unused,section (".u_boot_cmd")))

#define U_BOOT_CMD(name,maxargs,rep,cmd,usage,help) \
cmd_tbl_t __u_boot_cmd_##name Struct_Section = {#name, maxargs, rep, cmd, usage, help}
```

查看lds链接脚本发现的.u_boot_cmd放在了一起。而起还定义了两个常量__u_boot_cmd_start和__u_boot_cmd_end还表示所有命令的起始位置和结束位置。

所以只需对该段进行遍历就可以得到所有的命令了。



- 进入main_loop之前判断
- ./arch/arm/cpu/armv7/exynos/recovery.c
- 寄存器状态 →
 1. Factory data reset
 - erase userdate & cache
 - format fat_partition
 - (预装应用)

- 开机时,使用(电源键+音量键)的组合

- 检查按键状态 →

2. Update from sd/mmc

类似于fastboot flash, 源(usb → sdcard)不同

./common/cmd_fastboot.c sdfuse命令

./common/cmd_movi.c movi命令

3. Recovery mode

Kernel + Recovery-ramdisk

bootm 参数 → BOOTCMD

- 在Kernel起来之前, uboot第二阶段显示Logo

0. Logo data r/w.

fastboot / movi / partition~

1. Display Controller / MIPI-DSI driver

2. LCD driver

3. PMIC – LCD Power

4. Display funtion

- ./arch/arm/cpu/armv7/exynos/fimd.c

Add Partitions

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- Need more partitions
- Already have 4 primary partitions
- 改动最少 → P + P + P + E 方案
- ./common/cmd_mmc_fdisk.c 分区创建, fdisk命令
EMBR的写和读
- ./common/cmd_fat.c & cmd_ext2.c
分区的格式化, fatformat & ext3format命令
Logical Partitioin的start_block和block_cnt
- ./common/cmd_fastboot.c Image写入, fastboot命令
分区与sd/mmc地址的映射

Add Partitions

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```

|-----|
|      主扩展分区      |
|      (dev/hda4)      |
|-----|
|  扩  展  |  分区项 1  |--\
|            |-----|
|  分区表  |  分区项 2  |--+--\
|-----|
|  逻辑盘 1 (/dev/hda5) |<-/
|            |
|-----|
|      扩展分区 2      |<----/
|-----|
|  扩  展  |  分区项 1  |--\
|            |-----|
|  分区表  |  分区项 2  |--+--\
|-----|
|  逻辑盘 2 (/dev/hda6) |<-/
|            |
|-----|
|      扩展分区 3      |<----/
|-----|
|  扩  展  |  分区项 1  |--\
|            |-----|
|  分区表  |  分区项 2  |
|-----|
|  逻辑盘 3 (/dev/hda7) |<-/
|-----|

```

主
扩
展
分
区

```

|-----|
|      主扩展分区      |
|      (dev/hda4)      |
|-----|
|  扩  展  |  分区项 1  |--\
|            |-----|
|            |  分区项 2  |--+--\
|            |-----|
|            |  分区项 3  |--+--+--\
|            |-----|
|  分区表  |  分区项 4  |
|-----|
|  逻辑盘 1 (/dev/hda5) |<-/
|            |
|-----|
|  逻辑盘 2 (/dev/hda6) |<----/
|            |
|-----|
|  逻辑盘 3 (/dev/hda7) |<-----/
|            |
|-----|

```

- 扩展分区表中相对扇区地址

Add Partitions

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```
for(i=0; i<=CFG_MORE_PARTITIONS_NUM; i++)    {
    block_start = 0x3F;
    block_offset = calc_unit(Logical_Part_Size[i], sdInfo) - 0x3F;
    partInfo[0].bootable          = 0x00;
    partInfo[0].partitionId       = 0x83;
    make_partitionInfo(block_start, block_offset, sdInfo, &partInfo[0]);
    //////////////////////////////////////
    block_remain -= (block_offset + 0x3F);
    //////////////////////////////////////
    block_offset = block_remain;
    block_start = partInfoEx.block_count - block_remain;
    partInfo[1].bootable          = 0x00;
    partInfo[1].partitionId       = 0x05;
    make_partitionInfo(block_start, block_offset, sdInfo, &partInfo[1]);
    //////////////////////////////////////
    memset(embr, 0x00, 512);
    embr[510] = 0x55; embr[511] = 0xAA;
    encode_partitionInfo(partInfo[0], &embr[0x1BE]);
    encode_partitionInfo(partInfo[1], &embr[0x1CE]);
    //////////////////////////////////////
    embr += 512;
}
```



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