

M A R V E L L[®]



PXA1826 BSP

Agenda

- 1.OBM
- 2.Uboot
- 3.Kernel

OBM

- BootRom

- OBM

- 1.Download。

- 2.Boot。

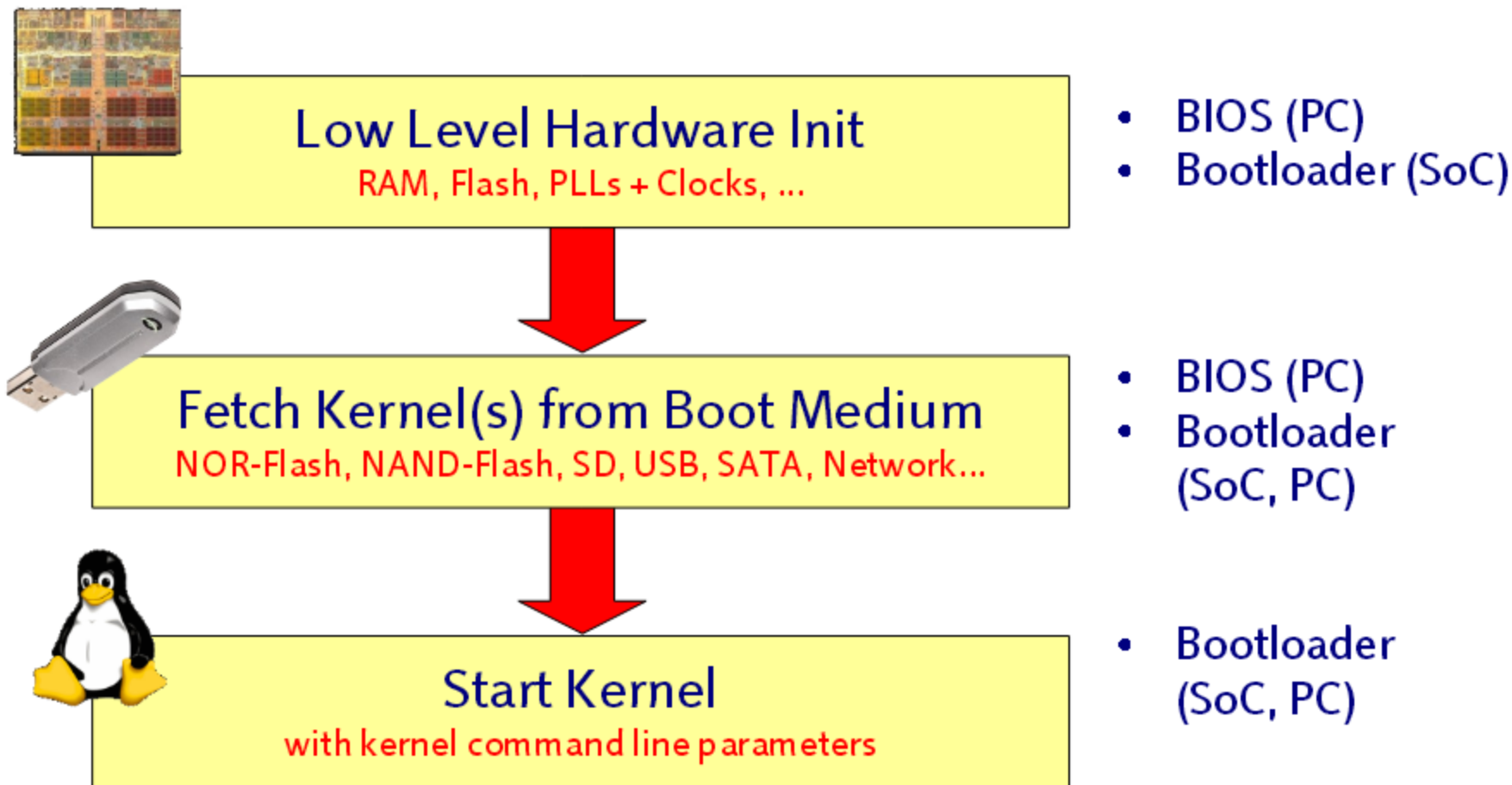
- OBM device

- 1.DDR setting --- blf。

- 2.NAND/SPINAND/SPINOR -- /obm/Common/flash

Openwrt Makefile package/boot/obm-mmp/Makefile

Uboot: what they do...



Uboot boot sequence

- 1) set cpu to svc32 mode.
- 2) disable i/d cache and mmu
- 3) jump to lowlevel_init
- 4) enable all clocks
- 5) jump to board_init_f
- 6) copy uboot to ram.(pxa don't)
- 7) jump to ram.
- 8) board_init_r

Uboot boot sequence

- 1) Enable d cache
- 2) Board_init.
- 3) uart init.
- 4) nand init.
- 5) loop, bootdelay
- 6) if no uart input, run bootcmd...
- 7) do_bootm()
- 8) do_bootm_linux
- 9) disable d cache, interrupt.
- kernel_entry(0, machid, bd->bi_boot_params);

U-boot

- PMIC
- Charger
- MMC ---- Ramdump
- LCD/OLED ----- charger-fuel gauge display
- USB-NET ----- tftp download

Openwrt uboot Makefile package/boot/uboot-mmp/Makefile

U-boot new device --- NAND

- 1. NAND --- arch/arm/include/asm/arch-pxa182x/nand_supported.h

```
hynix_timing = {  
    .tCH   = 10,  
    .tCS   = 35,  
    .tWH   = 15,  
    .tWP   = 25,  
    .tRH   = 15,  
    .tRP   = 25,  
    .tR     =  
25000,  
    .tWHR  = 60,  
    .tAR   = 10,  
};  
  
hynix1GbX8 = {  
    .timing           = &hynix_timing,  
    .cmdset          = &largepage_cmdset,  
    .name            = "Hynix 1Gibx8",  
    .page_per_block  = 64,  
    .page_size       = 2048,  
    .flash_width     = 8,  
    .dfc_width       = 8,  
    .num_blocks      = 1024,  
    .chip_id         = 0xa1ad,  
    .chip_id_mask    = 0xffff,  
    .ecc_type        = ECC_HAMMIN,  
    .ecc_strength    = 1,  
};
```


U-boot new device --- OLED/LCD

- OLED
Uboot/driver/misc/oled_ssd1306.c
- LCD
- /board/Marvell/nezha3_dkb/nt35510.c
- Include/configs/nezha3_dkb.h

```
#define CONFIG_LCD_DISP 1
#define CONFIG_NT35510_PANEL 1
#define CONFIG_LCD_LOGO 1
    #define CONFIG_PXA_DMA
    #define CONFIG_LCD_BUS8BIT 1
    #define CONFIG_LCD_CMD 1
```

Agenda

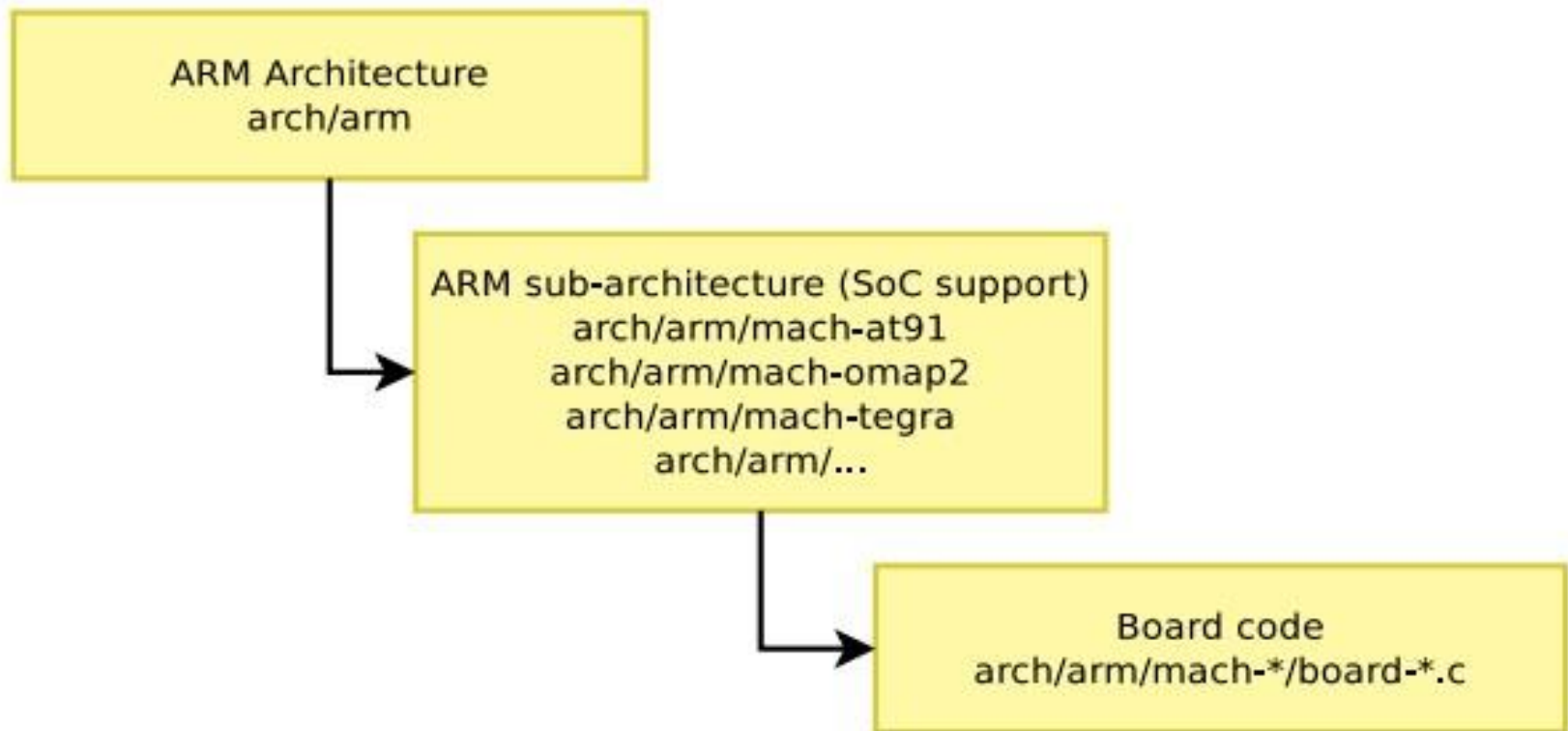
- 1.OBM
- 2.Uboot
- 3.Kernel

Kernel-3.10

- Openwrt kernel 3.10 config. Target/linux/generic/config-3.10
Target/linux/mmp/pxa1826/config-3.10 spinorconfig-3.10.
- Debug kernel.
 - 1.Enable lowlevel debug. make menuconfig-> Global build settings -> Compile the kernel with early printk.
 2. Make kernel_menuconfig -> kernel hacking ->Kernel low-level debugging functions -> via MMP uart2. early printk, early printk direct.
- Openwrt kernel Makefile
target/linux/mmp/imgae/Makefile

Kernel-3.10 device tree

- A lot of very similar C code to support each and every board.
- device trees, a data structure in a device-independent manner, simplifying hardware probing.



Kernel – zImage decompression

- Arch/arm/boot/compressed/head.s
- First code executed, jumped to by the bootloader, at label "start"
- flush cache, turn off cache and MMU
- load registers with stored parameters
 - sp = stack pointer for decompression code
 - r4 = zreladdr = kernel entry point physical address
- call cache_on to turn on cache
 - __armv7_mmu_cache_on
- check to make sure won't overwrite image during decompression; assume not for this trace
- call decompress_kernel to decompress kernel to RAM
- call cache_clean_flush to flush cache contents to RAM
- call cache_off to turn cache off as expected by kernel initialization routines

Kernel boot

- 1. arch/arm/kernel/head.s
- lookup_processor_type. (arch/arm/kernel/head-common.S)
- __vet_atags. ---determine validity of the r2 atags pointer. (cmdline struct)
- __v7_setup (arch/arm/mm/proc-v7.S). Init TLB Cache MMU
- __create_page_tables. – setup the initial page table for mmu.
- __enable__mmu.
- __mmap_switched. – copy data segment, clear bss.
- Start_kernel().

Kernel boot

- Start_kernel(). /init/main.c

```
DT_MACHINE_START(PXA182X_DT, "Marvell PXA182X (Device Tree Support)")
    .map_io      = mmp_map_io,
    .init_irq    = irqchip_init,
    .init_time   = pxa182x_timer_init,
    .reserve     = pxa182x_reserve,
    .init_machine = pxa182x_dt_init_machine,
    .dt_compat   = pxa182x_dt_board_compat,
    .restart     = mmp_arch_restart,
MACHINE_END
```

Driver – NAND

- Source code. drivers/mtd/nand/pxa3xx_nand.c
drivers/mtd/pxa3xx_bbm.c
- New nand – include/linux/platform_data/mtd-nand-pxa3xx.h

```
nand0: nand@0xd4283000 {
    status = "okay";

    partition@0 {
        label = "bootloader";
        reg = <0x0 0x20000>;
        read-only;
    };

    partition@20000 {
        label = "reliabledata";
        reg = <0x20000 0x20000>;
    };

    partition@40000 {
        label = "reliabledata2";
        reg = <0x40000 0x20000>;
    };

    partition@60000 {
        label = "mep2";
        reg = <0x60000 0x40000>;
    };

    partition@a0000 {
        label = "dtim";
        reg = <0xa0000 0x40000>;
    };

    partition@e0000 {
        label = "cpimage";
        reg = <0xe0000 0x1c80000>;
    };
};
```


Driver – NAND

```
[ 1.573760] marvell,pxa3xx-nand pxa3xx-nand.0: Detect a flash id aaad
[ 1.580474] NAND device: Manufacturer ID: 0xad, Chip ID: 0xaa (Hynix Hynix 2Gibx8), 256MiB, page size: 2048, OOB size: 64
[ 1.606414] Max capacity of BBM is 40 blocks!!
[ 1.610870] relocation table at page:63
[ 1.614776] The reloc table is empty now
[ 1.618774] 13 ofpart partitions found on MTD device pxa3xx_nand-0
[ 1.624999] Creating 13 MTD partitions on "pxa3xx_nand-0":
[ 1.630523] 0x000000000000-0x000000020000 : "bootloader"
[ 1.636840] 0x000000020000-0x000000040000 : "reliabledata"
[ 1.643249] 0x000000040000-0x000000060000 : "reliabledata2"
[ 1.649841] 0x000000060000-0x0000000a0000 : "mep2"
[ 1.655670] 0x0000000a0000-0x0000000e0000 : "dtim"
[ 1.661407] 0x0000000e0000-0x0000001d60000 : "cpimage"
[ 1.667480] 0x0000001d60000-0x0000001e60000 : "NVM"
[ 1.673065] 0x0000001e60000-0x0000001ee0000 : "u-boot"
[ 1.679046] 0x0000001ee0000-0x00000022e0000 : "kernel"
[ 1.684967] 0x00000022e0000-0x0000005780000 : "rootfs"
[ 1.690917] mtd: device 9 (rootfs) set to be root filesystem
[ 1.696929] mtd: partition "rootfs_data" created automatically, ofs=0x32e0000, len=0x24a0000
[ 1.705444] 0x00000032e0000-0x0000005780000 : "rootfs_data"
[ 1.711822] 0x0000005780000-0x0000005c80000 : "mdb"
[ 1.717590] 0x0000005c80000-0x0000005d80000 : "misc"
[ 1.723327] 0x0000005d80000-0x0000007d80000 : "OTA"
```

Driver – SPINAND

- Source code. drivers/linux/mtd/nand/spinand_1ld.c.
drivers/spi/spi-pxa2xx.c drivers/spi/spi-pxa2xx-pxadma.c
- New SPINAND. drivers/mtd/nand/nand_ids.c

```
        SZ_8K, SZ_4K, SZ_1M, 0, 0, 640},  
{"TC58NVG6D2 64G 3.3V 8-bit",  
    { .id = {0x98, 0xde, 0x94, 0x82, 0x76, 0x56, 0x04, 0x20} },  
    SZ_8K, SZ_8K, SZ_2M, 0, 8, 640},  
{"SPINAND 128MiB 3,3V 8-bit",  
    { .id = {0x2c, 0x11} }, 2048, 128, 0x20000, LP_OPTIONS, 2, 64},  
{"SPINAND 128MiB 3,3V 8-bit",  
    { .id = {0x2c, 0x12} }, 2048, 128, 0x20000, LP_OPTIONS, 2, 64},  
{"SPINAND 128MiB 1.8V 8-bit",  
    { .id = {0xc8, 0xe1} }, 2048, 128, 0x20000, LP_OPTIONS, 2, 64},  
  
LEGACY_ID_NAND("NAND 4MiB 5V 8-bit",    0x6B, 4, SZ_8K, SP_OPTIONS),  
LEGACY_ID_NAND("NAND 4MiB 3,3V 8-bit",  0xE3, 4, SZ_8K, SP_OPTIONS),
```

Driver – SPINOR

- source code drivers/mtd/devices/m25p80.c

```
/* Intel/Numonyx -- xxxs33b */
{ "160s33b", INFO(0x898911, 0, 64 * 1024, 32, 0) },
{ "320s33b", INFO(0x898912, 0, 64 * 1024, 64, 0) },
{ "640s33b", INFO(0x898913, 0, 64 * 1024, 128, 0) },

/* Macronix */
{ "mx25l2005a", INFO(0xc22012, 0, 64 * 1024, 4, SECT_4K) },
{ "mx25l4005a", INFO(0xc22013, 0, 64 * 1024, 8, SECT_4K) },
{ "mx25l8005", INFO(0xc22014, 0, 64 * 1024, 16, 0) },
{ "mx25l1606e", INFO(0xc22015, 0, 64 * 1024, 32, SECT_4K) },
{ "mx25l3205d", INFO(0xc22016, 0, 64 * 1024, 64, 0) },
{ "mx25l6405d", INFO(0xc22017, 0, 64 * 1024, 128, 0) },
{ "mx25l12805d", INFO(0xc22018, 0, 64 * 1024, 256, 0) },
{ "mx25l12855e", INFO(0xc22618, 0, 64 * 1024, 256, 0) },
{ "mx25l25635e", INFO(0xc22019, 0, 64 * 1024, 512, 0) },
{ "mx25l25655e", INFO(0xc22619, 0, 64 * 1024, 512, 0) },
{ "mx66l51235l", INFO(0xc2201a, 0, 64 * 1024, 1024, 0) },

/* Micron */
{ "n25q064", INFO(0x20ba17, 0, 64 * 1024, 128, 0) },
{ "n25q128a11", INFO(0x20bb18, 0, 64 * 1024, 256, 0) },
{ "n25q128a13", INFO(0x20ba18, 0, 64 * 1024, 256, 0) },
{ "n25q256a", INFO(0x20ba19, 0, 64 * 1024, 512, SECT_4K) },

{ "mt25wu256a", INFO(0x2ccb19, 0, 64 * 1024, 512, SECT_4K) },
```

Driver -- LED

```
leds {
    #address-cells = <1>;
    #size-cells = <0>;
    compatible = "gpio-leds";
    status = "disabled";
    pinctrl-names = "default";
    pinctrl-0 = <&leds_pmx_func>;
    led@1 {
        label = "yellow";
        gpios = <&gpio 23 0>;
        linux,default-trigger = "default-on";
        reg = <0>;
    };

    led@2 {
        label = "red";
        gpios = <&gpio 24 0>;
        linux,default-trigger = "rfkill10";
        reg = <1>;
    };

    led@3 {
        label = "green";
        gpios = <&gpio 25 0>;
        default-trigger = "heartbeat";
        reg = <2>;
    };
};
```

```
leds_pmx_func: leds_pmx_func {
    pinctrl-single,pins = <
        DF_IO10 AF1
        DF_IO11 AF1
        DF_IO12 AF1
    >;
    DS_MEDIUM;PULL_FLOAT;EDGE_NONE;LPM_NONE;
```

Driver -- Key

```
gpio_keys {  
    compatible = "gpio-keys";  
    #address-cells = <1>;  
    #size-cells = <0>;  
    status = "okay";  
    /* autorepeat; */  
    pinctrl-names = "default";  
    pinctrl-0 = <&gpiokey_pmx_func>;  
    button@1 {  
        label = "uAP_Key";  
        linux,code = <0x211>;  
        gpios = <&gpio 55 1>;  
    };  
    button@2 {  
        label = "Cell_Key";  
        linux,code = <246>;  
        gpios = <&gpio 56 1>;  
    };  
    button@3 {  
        label = "WIFI_Key";  
        linux,code = <247>;  
        gpios = <&gpio 59 1>;  
    };  
};
```

```
gpiokey_pmx_func: gpiokey_pmx_func {  
    pinctrl-single,pins = <  
        TDS_LNACTRL AF1  
        TDS_MIXCTRL AF1  
        TDS_TXREV AF1  
    >;  
    DS_MEDIUM;PULL_DOWN;EDGE_NONE;LPM_NONE;  
};
```

Driver -- LCD

- Source code. drivers/video/pxa1826fb.c.

dkb panel driver: drivers/video/backlight/nt35510.c

```
disp: disp@d4013000 {
    marvell,panel = "nt35510";
    pinctrl-names = "default";
    pinctrl-0 = <&disp_pmx_func>;
    marvell,bus-width = <8>;
    marvell,entries = <2>;
    status = "okay";
};
```

```
panel: nt35510 {
    compatible = "marvell,nt35510";
    pinctrl-names = "default";
    pinctrl-0 = <&panel_rst_func>;
    panel-bus-width = <8>;
    rst_gpio = <&gpio 86 0>;
    iovdd-supply = <&ldo8>;
};
```

Driver -- LCD

- nt35510_panel_power – turn on LDO, reset panel.
- nt35510_panel_onoff --- send command to init and turn on panel/ turn off panel
- nt35510_set_panel -- power on -> panel on / panel off-> power off.

```
static void nt35510_power(int power, int skip_on, int *id_match);
struct pxa1826fb_mach_info pxa1826_nt35510_info = {
    .pix_fmt          = NT35510_FORMAT,
    .pxa1826fb_lcd_power = nt35510_power,
    .xres             = NT35510_XRES,
    .yres             = NT35510_YRES,
};
```

Driver – touch panel

- DKB touch panel SSD2531 driver source code:
drivers/input/touchscreen/ssd2531_touch.c

```
twsi0: i2c@d4011000 {  
  
    touch1 {  
        compatible = "solomon,ssd2531-touch";  
        pinctrl-names = "default";  
        pinctrl-0 = <&touch_pins>;  
        reg = <0x5c>;  
        interrupt-parent = <&gpio>;  
        interrupts = <123 0x1>;  
        irq-gpios = <&gpio 123 0>;  
        reset-gpios = <&gpio 77 0>;  
        ssd2531,cfg-group = <0>;  
        ssd2531,max-height = <800>;  
        ssd2531,max-width = <480>;  
        avdd-supply = <&ldo8>;  
  
    };  
};
```


Driver – SD/MMC

- Source code drivers/mmc/host/sdhci-pxav3.c

```
sdh1: sdh@d4280000 {
    pinctrl-names = "default", "fast";
    pinctrl-0 = <&sdh1_pmx_func1 &sdh1_pmx_func2 &sdh1_pmx_func3 &sdh1_pmx_func4>;
    pinctrl-1 = <&sdh1_pmx_func1 &sdh1_pmx_func2_fast &sdh1_pmx_func3_fast &sdh1_pmx_func4>;
    vmmc-supply = <&lido13>;
    vqmmc-supply = <&lido12>;
    bus-width = <4>;
    non-removable;
    broken-cd;
    wp-inverted;
    marvell,sdh-pm-runtime-en;
    marvell,sdh-host-caps-disable = <(MMC_CAP_UHS_SDR104)>;
    marvell,sdh-quirks = <(
        SDHCI_QUIRK_INVERTED_WRITE_PROTECT |
        SDHCI_QUIRK_BROKEN_CARD_DETECTION
    )>;
    marvell,sdh-quirks2 = <(
        SDHCI_QUIRK2_SET_AIB_MMC |
        SDHCI_QUIRK2_TUNING_ADMA_BROKEN |
        SDHCI_QUIRK2_TIMEOUT_SHORT |
        SDHCI_QUIRK2_DMA_CLOCK_FORCE_ON |
        SDHCI_QUIRK2_BUS_CLK_GATE_ENABLED
    )>;
    marvell,sdh-flags = <(
        PXA_FLAG_NEW_RX_CFG_REG |
        PXA_FLAG_TX_SEL_BUS_CLK |
        PXA_FLAG_ENABLE_CLOCK_GATING
    )>;
    /* prop "sdh-dtr-data": <timing preset_rate src_rate tx_delay rx_delay rx_sdclk_sel0 rx_sdclk_sel1 f
    marvell,sdh-dtr-data = <PXA_MMC_TIMING_LEGACY PXA_SDH_DTR_26M PXA_SDH_DTR_104M 0 0 0 0 0 0>,
        <PXA_MMC_TIMING_SD_HS PXA_SDH_DTR_52M PXA_SDH_DTR_104M 0 0 0 0 0 0>,
        <PXA_MMC_TIMING_UHS_DDR50 PXA_SDH_DTR_52M PXA_SDH_DTR_104M 0 0 0 0 0 0>,
        <PXA_MMC_TIMING_UHS_SDR50 PXA_SDH_DTR_104M PXA_SDH_DTR_208M 0 0 0 0 0 0>,>
```

USB/OTG/HSIC

USB3 client

- usb3 source code. drivers/usb/mvc2/

Flash Layout –SPINOR(16M)

Partition#	PXA1822 partition	Partition name	Flash offset	Partition End	Decimal offset	Size (MB)	Size	Size Hex	Blocks	Format
0	TIM	bootloader	0	0	0	0.00	00		0	Raw
	OBM		0	20,000	0	0.13	131,072	20000	2	Raw
1	MRD	reliabledata	20000	40000	131,072	0.125	131,072	20000	2	Raw
2	MRD Backup	reliabledata2	40000	60000	262,144	0.125	131,072	20000	2	Raw
3	MEP2	mep2	60000	80000	393,216	0.13	131,072	20000	2	Raw
	OEM secure data		80000	A0000	524,288	0.13	131,072	20000	2	Raw
4	RF	LWG	A0000	B0000	655360	0.0625	65536	10000	1	Raw
	MSA		B0000	1D0000	720896	1.125	1179648	120000	18	Raw
	Arbel		1D0000	6A0000	1900544	4.8125	5046272	4D0000	77	Raw
5	NVM	NVM	6A0000	7A0000	6946816	1	1048576	100000	16	jffs2
6	uboot and env	uboot	7A0000	7F0000	7995392	0.3125	327680	50000	5	Raw
7	zImage	kernel	7F0000	A70000	8323072	2.5	2621440	280000	40	Raw
8	rootfs	rootfs	A70000	F70000	10944512	5	5242880	500000	80	squashfs
	rootfs_data		F70000	1000000	16187392	0.5625	589824	90000	9	jffs2
	End of flash			1000000	16777216	16	00		0	

Flash Layout – NAND/SPINAND(128M)

Partition#	PXA1822 partition	Partition name	Flash offset	Partition End	Decimal offset	Size (MB)	Size	Size Hex	Blocks
0	TIM	Bootloader	0	0	0	0.00	00		0
	OBM		0	20,000	0	0.13	131,072	20000	1
1	MRD	Reliabledata	20000	40000	131,072	0.13	131,072	20000	1
2	MRD Backup	Reliabledata2	40000	60000	262,144	0	131,072	20000	1
3	MEP2	MEP2	60000	80000	393,216	0.13	131,072	20000	1
	OEM secure data		80000	A0000	524,288	0.13	131,072	20000	1
4	DTIM	dtim	A0000	E0000	655,360	0.25	262,144	40000	2
5	RF	LWG	E0000	120000	917504	0.25	262144	40000	2
	MSA		120000	520000	1179648	4	4194304	400000	32
	Arbel		520000	F20000	5373952	10	10485760	A00000	80
	RF2	LTG	F20000	F60000	15859712	0.25	262144	40000	2
	MSA2		F60000	1360000	16121856	4	4194304	400000	32
	Arbel2		1360000	1D60000	20316160	10	10485760	A00000	80
6	NVM	NVM	1D60000	1E60000	30801920	1	1048576	100000	8
7	uboot and env	uboot	1E60000	1EE0000	31850496	0.5	524288	80000	4
8	zImage	kernel	1EE0000	22E0000	32374784	4	4194304	400000	32
9	rootfs	rootfs	22E0000	32E0000	36569088	16	16777216	1000000	128
	rootfs_data		32E0000	5780000	53346304	36.625	38404096	24A0000	293
10	mdb file	MDB	5780000	5C80000	91750400	5	5242880	500000	40
11	MISC	MISC	5C80000	5D80000	96993280	1	1048576	100000	8
12	OTA reserved	OTA	5D80000	7D80000	98041856	32	33554432	2000000	256
	MRVL BBM	MRVL BBM	7D80000	8000000	131,596,288	3	2,621,440	280000	20
	End of flash	M A R V E L L®	8000000	8000000	134,217,728	128	00		0

DDR – layout SPINOR(64M DDR)

Type	Size	Used Area	Load OBM	Load Uboot	Load Kernel	Extact Kernel	Init Kernel	System Start
SRAM	64KB	0xD1000000	TIM					
			Bootrom					
		0x		ATAG				
64M DDR		0x00003FFF						
		0x00004000						
		0x00007FC0					MMU-Table	MMU-Table
	~7MB	0x00008000			zImage	vmlinux		vmlinux
		0x000A8000						
		0x000FFFFFF						
		0x0027FFFF						
		0x00280000		obm2osl				
		0x00287FFF						
		0x00288000		Uboot				
		0x00380000	OBM					
		0x00420000						
		0x00440000						
		0x009FFFFFF						
	4KB	0x00A00400						
		0x00A013FF						Crash kernel
	7MB+1020K	0x00A01000						Kernel usable
		0x017FFFFFF						
	40MB	0x01800000						CP Reserved
		0x03FFFFFF						

DDR layout – NAND/SPINAND(128M DDR)

Type	Size	Used Area	Load OBM	Load Uboot	Load Kernel	Extact Kernel	Init Kernel	System Start	
SRAM	64KB	0xD1000000	TIM						
			Bootrom						
		0x00000000		ATAG					
		0x00004000							
		0x00007FC0							
DDR 128M		0x00008000			zImage	vmlinux	MMU-Table	MMU-Table	
		0x003FFFFFFF							
		0x004000000		obm2osl					
	0x00407FFF								
	0x00408000		Uboot						
	0x00480000	OBM							
	0x00520000								
	0x00580000								
	0x006FFFFFFF								
	0x009FFFFFFF						Kernel usable		
	4KB	0x00A00400							Crash kernel
		0x00A013FF							
	77MB+1020K	0x00A01000							Kernel usable
		0x057FFFFFFF							
	40MB	0x05800000							CP Reserved
		0x05900000							
		0x05C00000							
		0x07FFFFFFF							

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