



MHL(HDMI) Customization Introduction for Android L



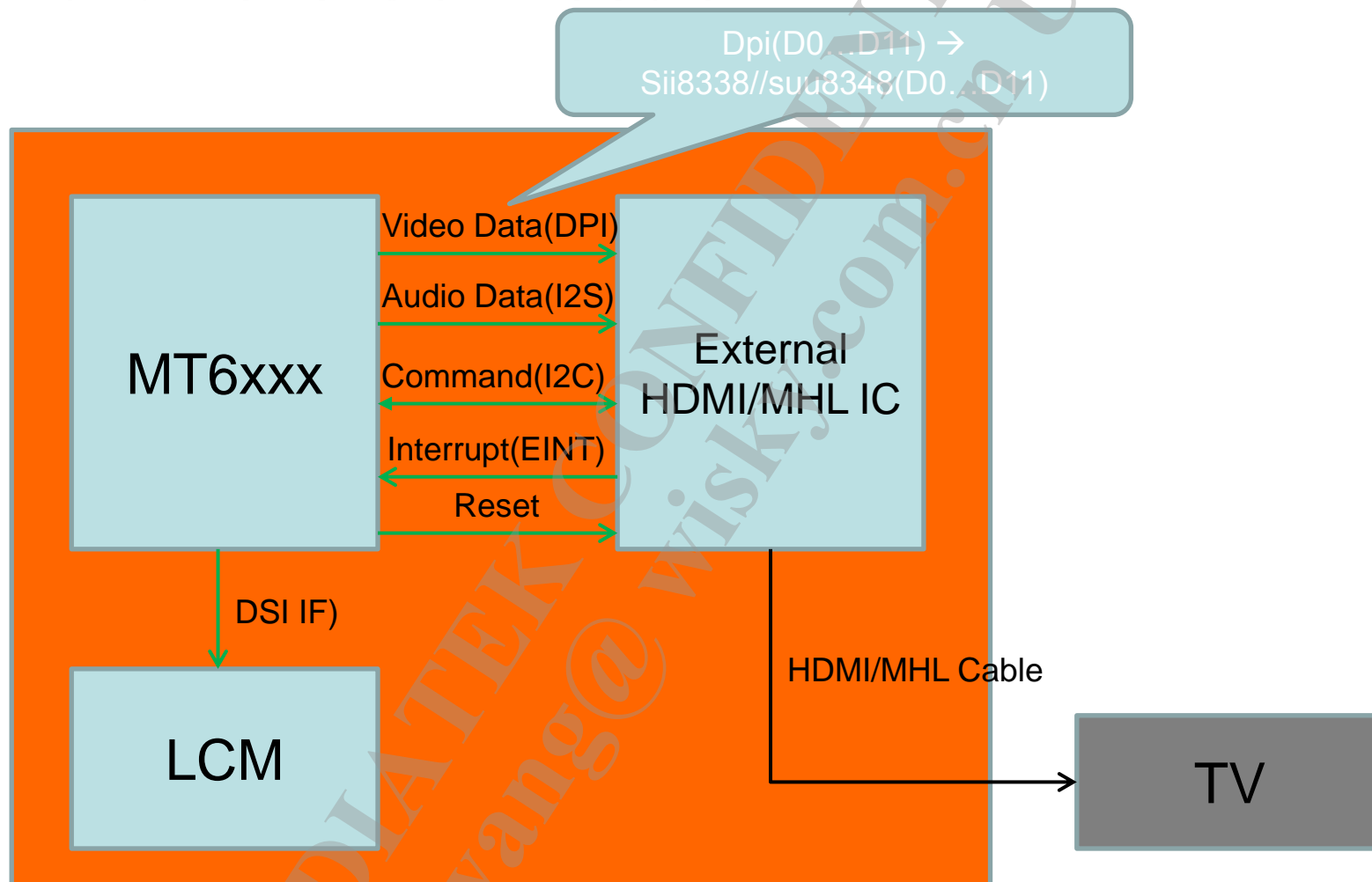
Agenda

- Overview
- Diagram
- Work Flow
 - Power Management
 - Audio/Video Path
 - Others
- Customization

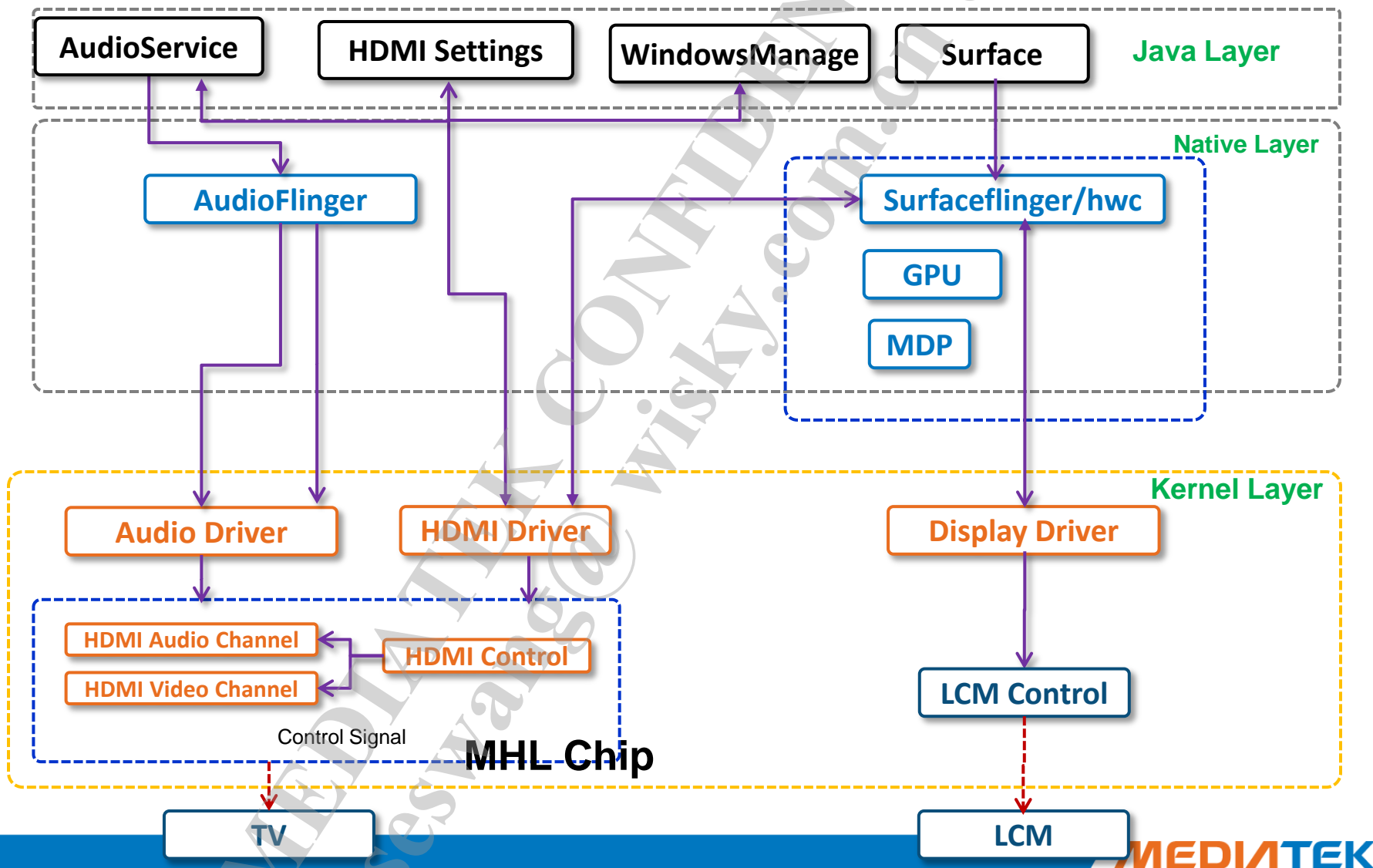
Overview

CPU	Support MHL IC		Maxium Resoluton	Audio Channel	Support Smartbook
	Sii8338	Sii8348			
MT6582	Yes	Yes	—	—	Yes
MT6592	Yes	Yes	1080p@30fps	2	Yes
MT6752	No	Yes	1080p@30fps	2	Yes
MT6595	No	Yes	1080p@60fps	7.1	Yes
MT6795	No	Yes	1080p@60fps	7.1	Yes

Hardware Connection



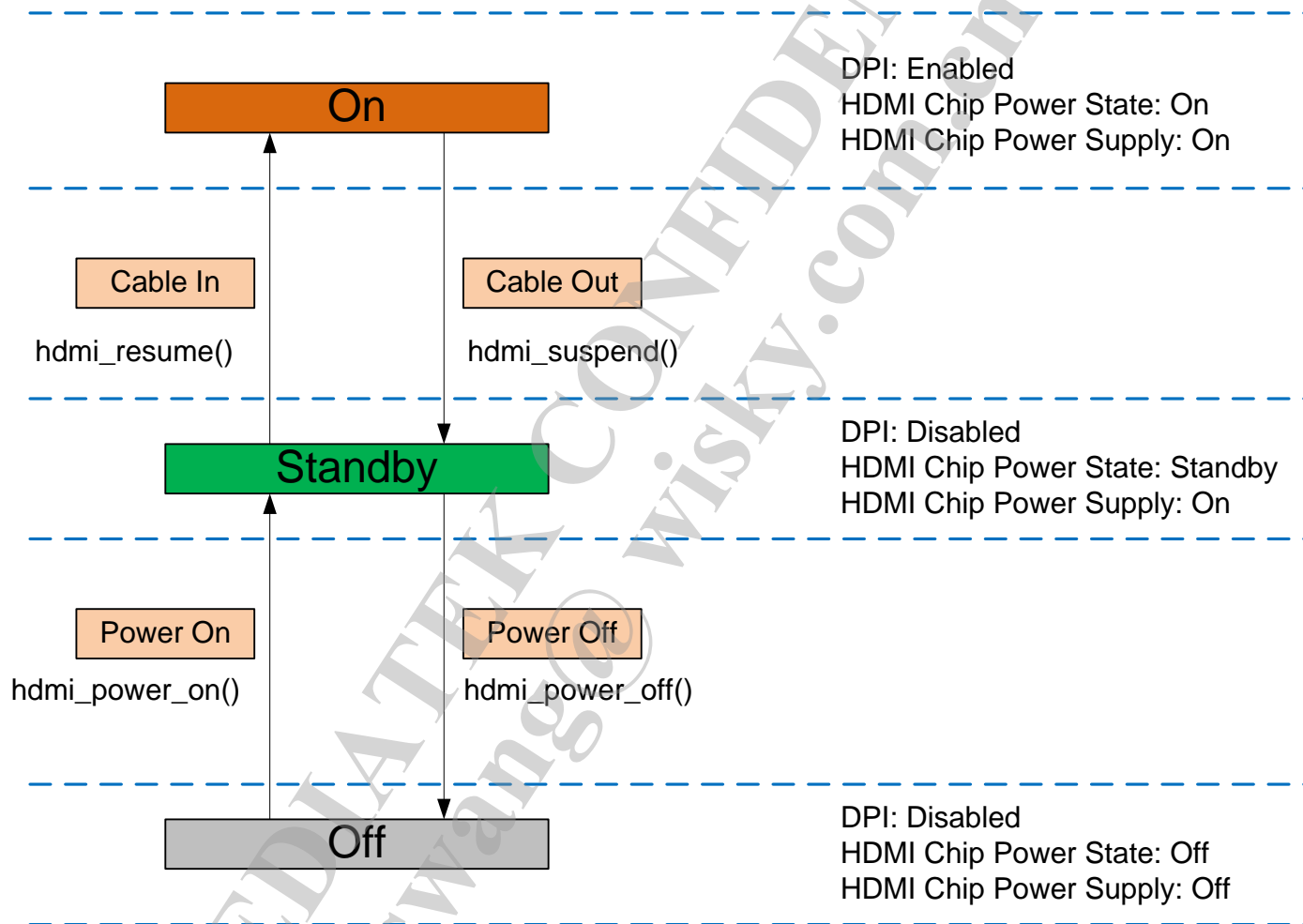
HDMI SW Architecture



HDMI IOCTL

IOCTL Name		Comment
MTK_HDMI_POWER_ENABLE		Power on/off hdmi driver when screen off//on
MTK_HDMI_AUDIO_VIDEO_ENABLE		Enable/disable hdmi
MTK_HDMI_VIDEO_ENABLE		Config video resolution
MTK_HDMI_GET_DEV_INFO		Get hdmi driver information, such as currently resolution, cable type and so on.
mt6582/mt6592	MTK_HDMI_VIDEO_ENABLE	Config video resolution
	MTK_HDMI_PREPARE_BUFFER	Prepare a video buffer: 1. map ion buffer from hwcomposer; 2 create fence
	MTK_HDMI_POST_VIDEO_BUFFER	Post a video buffer to hdmi from hwcomposer.
Other platform	DISP_IOCTL_CREATE_SESSION	Create a MHL session and data path
	DISP_IOCTL_DESTROY_SESSION	Destroy mhl data path and session
	DISP_IOCTL_PREPARE_INPUT_BUFFER	Prepare fence index for the video buffer:
	DISP_IOCTL_SET_INPUT_BUFFER	Set video buffer parameter
	DISP_IOCTL_TRIGGER_SESSION	Trigger video buffer to display out

Power Management Model



Power Management

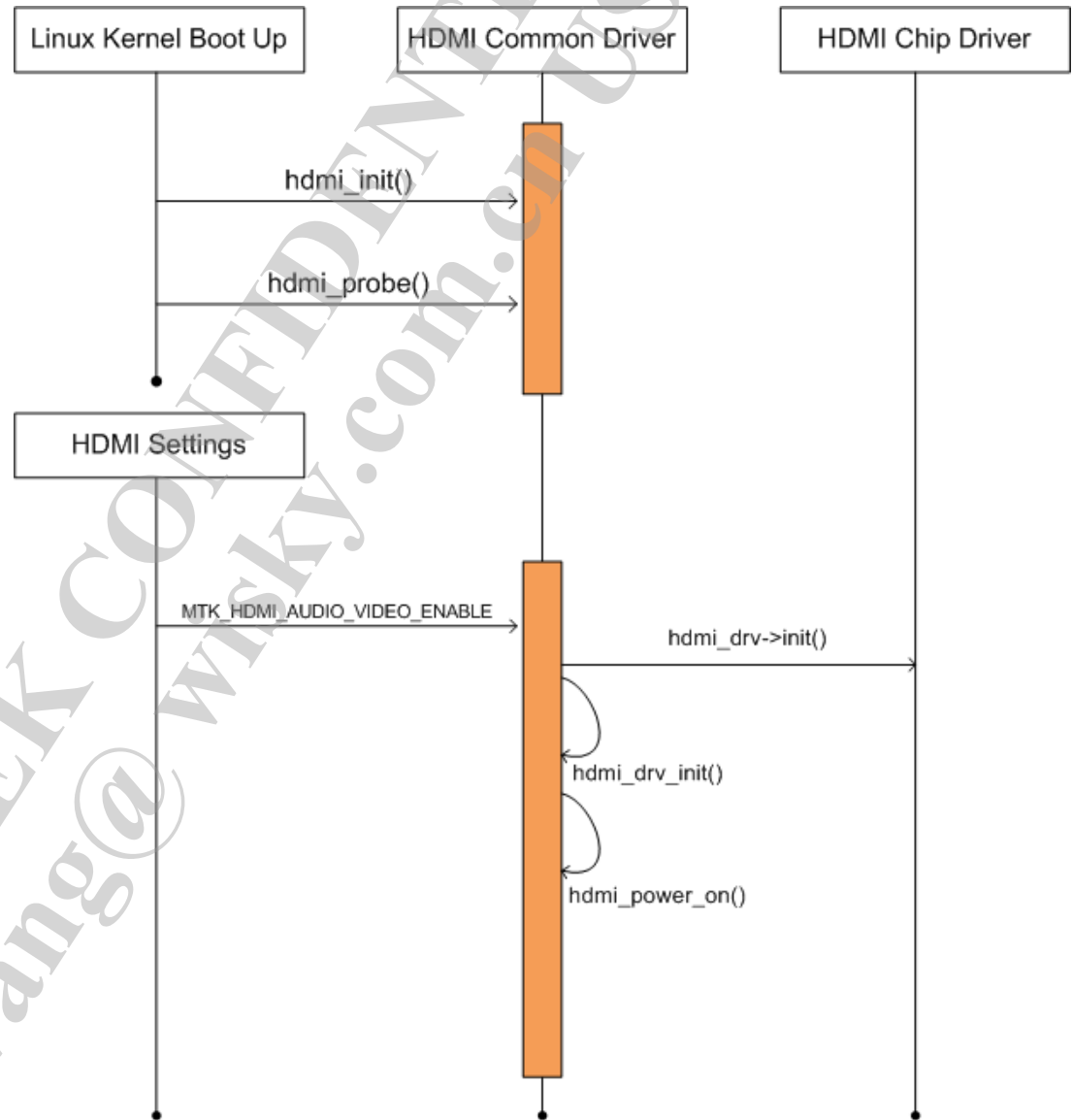
- For power management, each function has defined the availability for each power state;
- Functions which can change power state could only be called from the correct state, for example, `hdmi_resume()` could only be called in standby state.

API Name	On	Off	Standby
<code>hdmi_resume</code>	no	no	yes
<code>hdmi_suspend</code>	yes	no	no
<code>hdmi_power_on</code>	no	yes	no
<code>hdmi_power_off</code>	yes	no	yes
<code>hdmi_state_callback</code>	yes	no	yes
<code>hdmi_state_reset</code>	yes	yes	yes
<code>hdmi_video_enable</code>	yes	no	no
<code>hdmi_audio_enable</code>	yes	no	no
<code>hdmi_video_config</code>	yes	no	no
<code>hdmi_audio_config</code>	yes	no	no

Work Flow

Boot up:

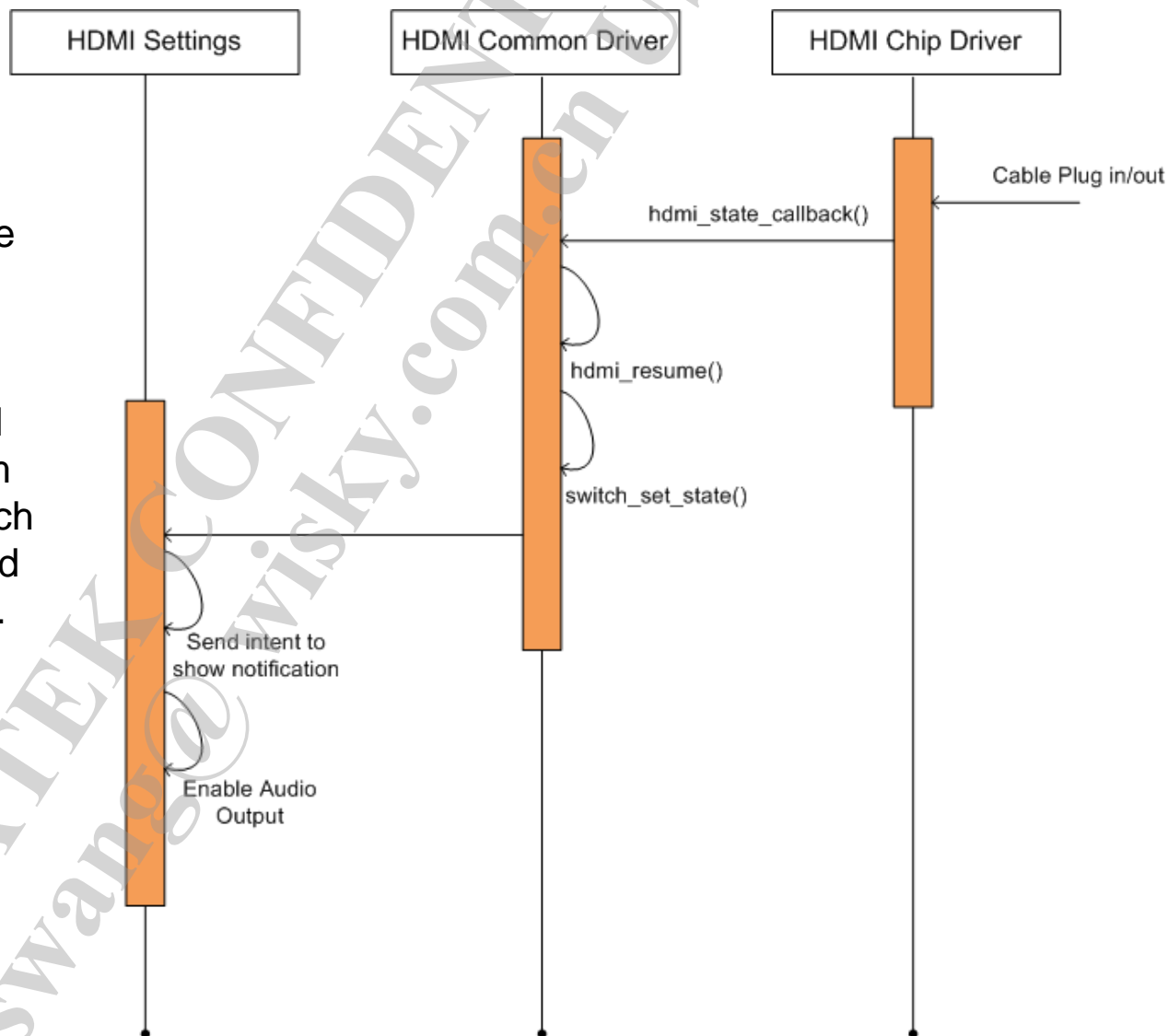
- ✓ Before HDMI Settings init, the hdmi driver will stay in power off mode;
- ✓ HDMI Settings will enable HDMI Driver after the system boot up, then HDMI external chip is power on into standby mode, and waiting for hdmi cable plugging in;



Work Flow

Cable Plug in/out:

- ✓ `hdmi_resume()` will disable DPI power and output, set hdmi external chip into standby mode;
- ✓ `switch_set_state()` is used to notify the application from kernel. It use android's switch device driver, which is based on linux uevent mechanism.

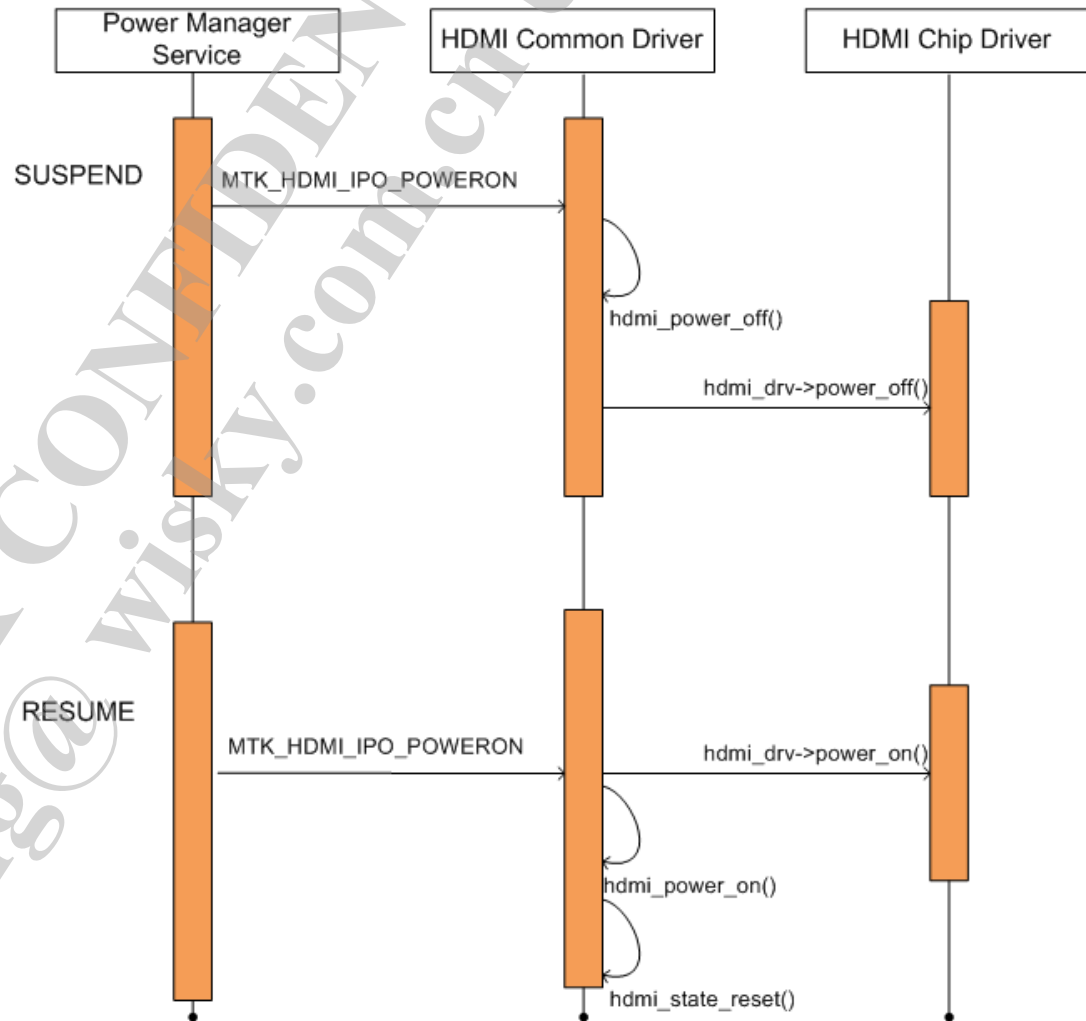


Work Flow

Suspend/Resume

✓ HDMI and tvout will not follow the android's default early suspend flow, because in android's earlysuspend, it will shutdown backlight first, and then shutdown lcd. If HDMI/TVOUT suspend when lcd is powered off, there will have redundant data shown on the TV. So power manager service create an additional jni to control HDMI/TVOUT suspend/resume flow;

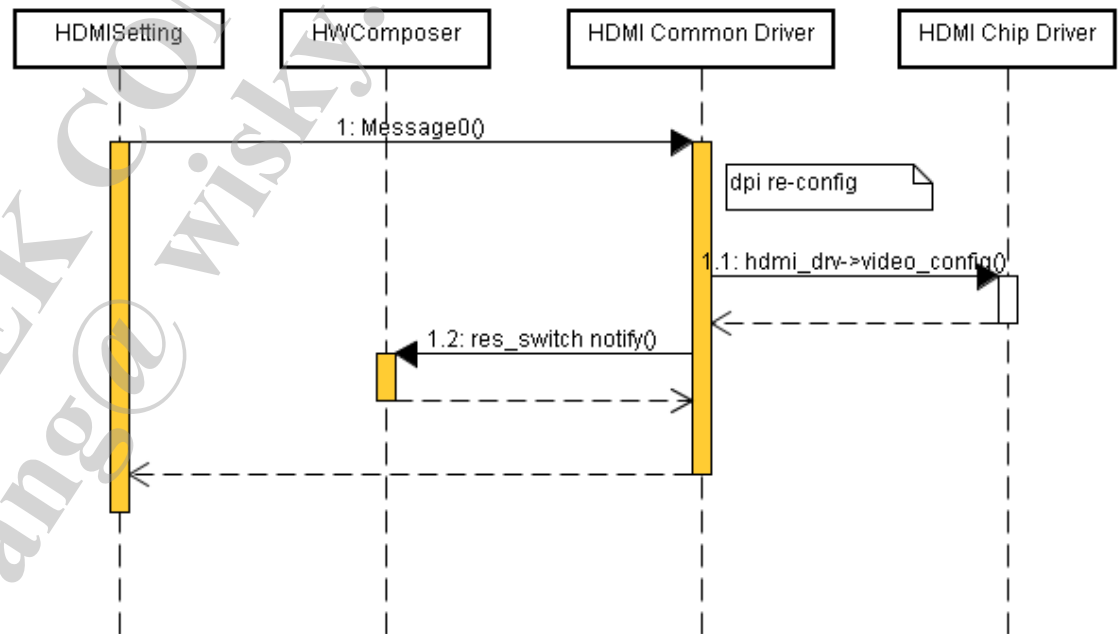
✓ `hdmi_state_reset()` is to ensure the application's state is correct with the hdmi chip.



Work Flow

Video Configuration

✓ This is only available for LCD Mirror Mode, because for DPI Bypass mode, the output resolution is selected by hdmi chip itself.



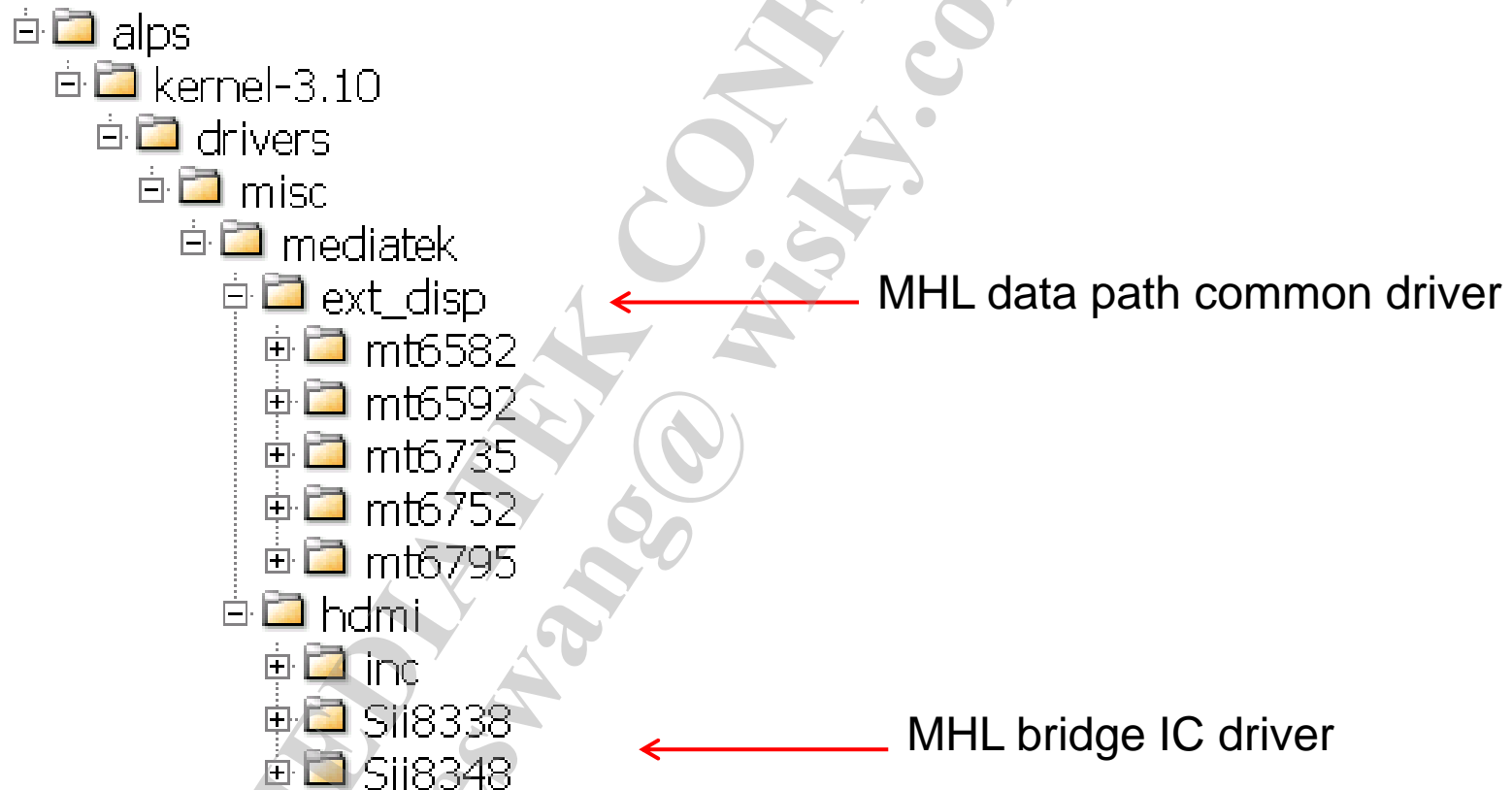
Project Configuration

	Configuration file	Switch on	Switch off
user space	device/mediatek/ (\$project)/ProjectConfig.mk;	MTK_HDMI_SUPPORT = yes	MTK_HDMI_SUPPORT = no
kernel space	kernel- xxx/arch/armxx/configs/(\$project)_debug_ defconfig; kernel- xxx/arch/armxx/configs/(\$project)_defconfi g;	CONFIG_MTK_HDMI_SUPPORT=y CUSTOM_CUSTOM_KERNEL_HD MI="Sii8348"	# CONFIG_MTK_HDMI_SUPPORT is not set

It can be set to "Sii8338" or "Sii8348"
according to your project

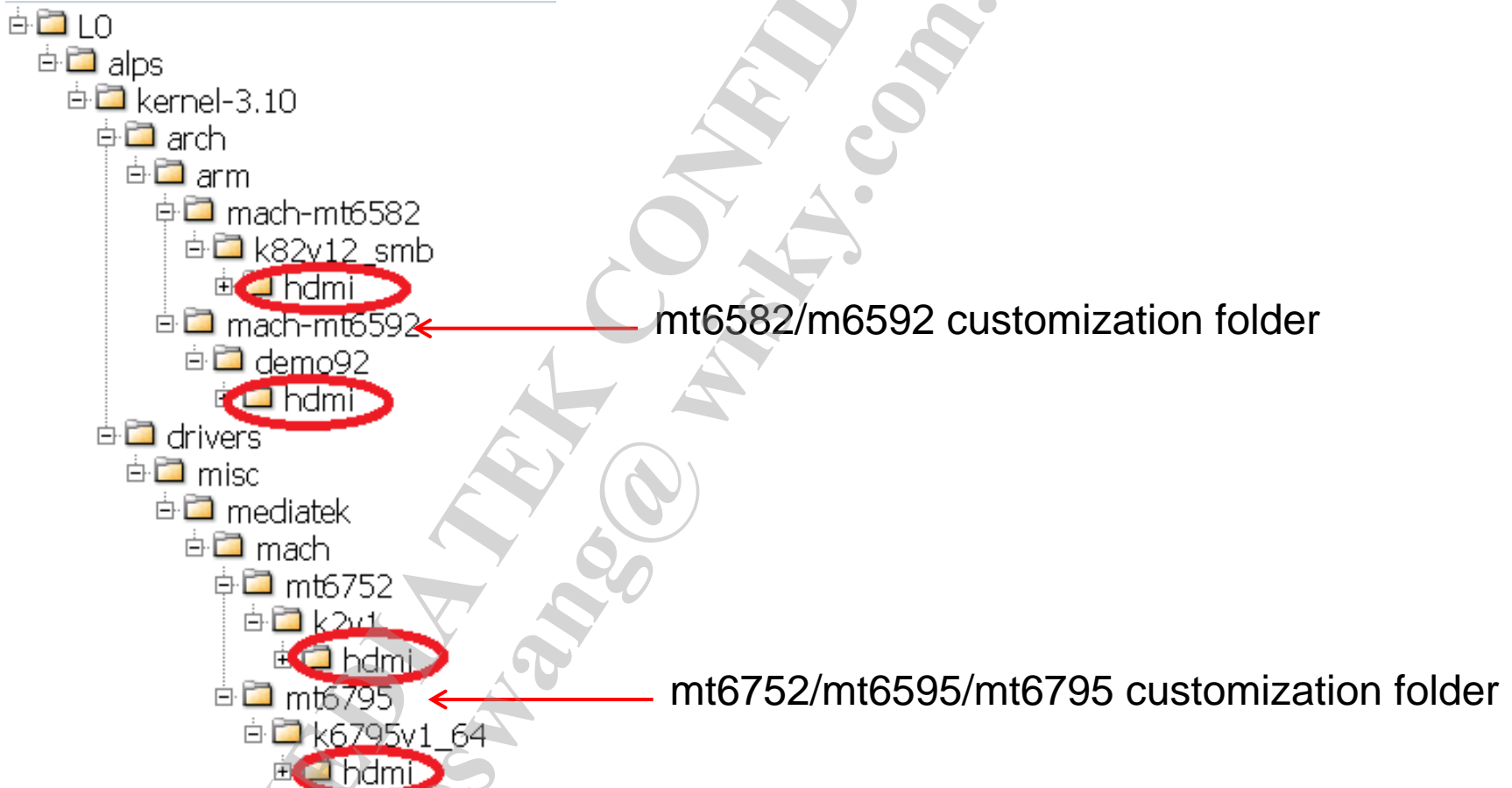
Folder Layout

- The architecture of HDMI driver is very familiar to Display driver, which include 2 parts: common driver and chip driver.



Folder Layout

- The architecture of HDMI driver is very familiar to Display driver, which include 2 parts: common driver and chip driver.



GPIO Customization (1/2)

I2S GPIO customize

For audio i2s GPIO

- The following name should be defined in dws: GPIO_MHL_I2S_OUT_WS_PIN
GPIO_MHL_I2S_OUT_CK_PIN GPIO_MHL_I2S_OUT_DAT_PIN

Need enable/disable i2s mode in customize file:

- The following dct configure should be defined according to your platform and project.

	EintMode	Def.Mode	M0	M1	M2	M3	M4	M5	M6	M7	InPull	En	InPull SelHigh	Def.Dir	In	Out	OutHigh	VarName1
GPIO129	<input type="checkbox"/>	1:I2S3_W	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	GPIO_MHL_I2S_OUT_WS_PIN
GPIO130	<input type="checkbox"/>	1:I2S3_BCK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	GPIO_MHL_I2S_OUT_CK_PIN
GPIO132	<input type="checkbox"/>	1:I2S3_DO_1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	GPIO_MHL_I2S_OUT_DAT_PIN

GPIO Customization (1/2)

I2S GPIO customize

- mt6582/mt6592: kernel-xxx/arch/arm/marh-(&platform)/(&project)/hdmi/hdmi_cust.c
- others: kernel-xxx/drivers/misc/mediatek/marh-(&platform)/(&project)/hdmi/hdmi_cust.c
- The function should be implemented according to your platform and project.

```
int cust_hdmi_i2s_gpio_on(int on)
{
    if(on > 0)
    {
#ifdef GPIO_MHL_I2S_OUT_WS_PIN
        mt_set_gpio_mode(GPIO_MHL_I2S_OUT_WS_PIN, GPIO_MHL_I2S_OUT_WS_PIN_M_I2S3_WS);
        mt_set_gpio_mode(GPIO_MHL_I2S_OUT_CK_PIN, GPIO_MHL_I2S_OUT_CK_PIN_M_I2S3_BCK);
        mt_set_gpio_mode(GPIO_MHL_I2S_OUT_DAT_PIN, GPIO_MHL_I2S_OUT_DAT_PIN_M_I2S3_DO);
    #else
        printk("%s,%d Error. GPIO_MHL_I2S_OUT_WS_PIN is not defined\n", __func__, __LINE__);
    #endif
    }
    else
    {
#ifdef GPIO_MHL_I2S_OUT_WS_PIN
        mt_set_gpio_pull_enable(GPIO_MHL_I2S_OUT_WS_PIN, GPIO_PULL_DISABLE);
        mt_set_gpio_pull_enable(GPIO_MHL_I2S_OUT_CK_PIN, GPIO_PULL_DISABLE);
        mt_set_gpio_pull_enable(GPIO_MHL_I2S_OUT_DAT_PIN, GPIO_PULL_DISABLE);
    #endif
    }
    return 0;
} ? end cust_hdmi_i2s_gpio_on ?
```

GPIO Customization (1/2)

■ DPI GPIO customize

- For DPI GPIO
 - GPIO_EXT_DISP_DPI0_PIN name should be defined in dws.
- Need enable/disable dpi mode in customize file:
 - The following dct configure should be defined according to your platform and project

EintMode	Def.Mode	M0	M1	M2	M3	M4	M5	M6	M7	InPull	En	InPull	SelfHigh	Def.Dir	In	Out	OutHigh	VarName1
GPIO138	1:DPI_CLK	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	GPIO_EXT_DISP_DPI0
GPIO139	1:DPI_DE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO140	1:DPI_D0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO141	1:DPI_D1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO142	1:DPI_D2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO143	1:DPI_D3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO144	1:DPI_D4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO145	1:DPI_D5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO146	1:DPI_D6	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO147	1:DPI_D7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO148	1:DPI_D8	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO149	1:DPI_D9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO150	1:DPI_D10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO151	1:DPI_D11	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO152	1:DPI_HSYN	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
GPIO153	1:DPI_VSYN	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

GPIO Customization (1/2)

■ DPI GPIO customize

- mt6582/mt6592: kernel-xxx/arch/arm/marh-(&platform)/(&project)/hdmi/hdmi_cust.c
- others: kernel-xxx/drivers/misc/mediatek/marh-(&platform)/(&project)/hdmi/hdmi_cust.c
- The following function should be implemented according to your platform and project

```
int cust_hdmi_dpi_gpio_on(int on)
{
    unsigned int dpi_pin_start = 0;
    if(on > 0)
    {
        #ifdef GPIO_EXT_DISP_DPI0_PIN
            for(dpi_pin_start = GPIO_EXT_DISP_DPI0_PIN; dpi_pin_start < GPIO_EXT_DISP_DPI0_PIN + 16; dpi_pin_start++)
            {
                mt_set_gpio_mode(dpi_pin_start, GPIO_MODE_01);
            }
            printk("%s, %d GPIO_EXT_DISP_DPI0_PIN is defined+ %x\n", __func__, __LINE__, GPIO_EXT_DISP_DPI0_PIN);
        #else
            printk("%s,%d Error: GPIO_EXT_DISP_DPI0_PIN is not defined\n", __func__, __LINE__);
        #endif
    }
    else
    {
        #ifdef GPIO_EXT_DISP_DPI0_PIN
            for(dpi_pin_start = GPIO_EXT_DISP_DPI0_PIN; dpi_pin_start < GPIO_EXT_DISP_DPI0_PIN + 16; dpi_pin_start++)
            {
                mt_set_gpio_mode(dpi_pin_start, GPIO_MODE_00);
                mt_set_gpio_dir(dpi_pin_start, GPIO_DIR_IN);
                mt_set_gpio_pull_enable(dpi_pin_start, GPIO_PULL_ENABLE);
                mt_set_gpio_pull_select(dpi_pin_start, GPIO_PULL_DOWN);
            }
            printk("%s, %d GPIO_EXT_DISP_DPI0_PIN is defined- %x\n", __func__, __LINE__, GPIO_EXT_DISP_DPI0_PIN);
        #endif
    }
    return 0;
}
} ? end cust_hdmi_dpi_gpio_on ?
```

GPIO Customization (2/2)

■ GPIO_MHL_RST_B_PIN

- This pin should be defined and is used to reset MHL bridge IC when power on
- The following dct configure should be defined according to your platform and project

	EintMode	Def.Mode	M0	M1	M2	M3	M4	M5	M6	M7	InPull En	InPull SelHigh	Def.Dir	In	Out	OutHigh	VarName1
GPIO	<input type="checkbox"/>	0:GPIO133	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OUT	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	GPIO_MHL_RST_B_PIN

■ CUST_EINT_MHL_NUM

- This pin should be defined and is used to receive interrupt from MHL bridge IC.
- The following dct configure should be defined according to your platform and project

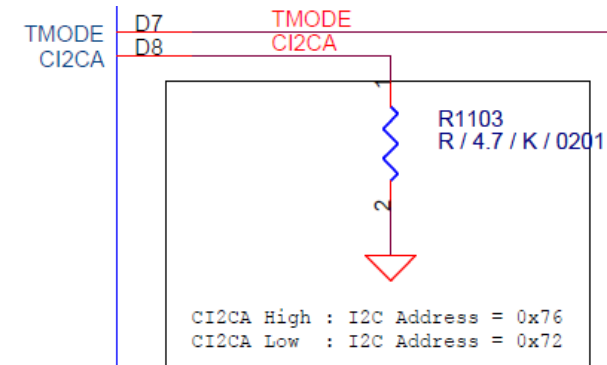
GPIO Setting	I2C Setting		CLOCK BUFFER Setting							EINT Setting		ADC Setting		KEYPAD Setting		PMIC Setting		TDSEL/RDSEL		MD1_EINT Setting	
	EintMode	Def.Mode	M0	M1	M2	M3	M4	M5	M6	M7	InPull En	InPull SelHigh		Def.Dir		In	Out	OutHigh		VarName1	
GPIO	<input checked="" type="checkbox"/>	0.GPIO134									<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	IN							GPIO_MHL_EINT_PIN	

GPIO Setting | **EINT Setting** | ADC Setting | KEYPAD Setting | PMIC Setting | POWER Setting | MD1_EINT Setting

	EINT Var	Debounce Time (ms)	Polarity	Sensitive_Level	Debounce En
EINT	1:MHL	10	Low	Level	Disable

I2C Customization

- For Sii8338 MHL bridge IC, the I2C address can't be customized according to CI2CA pin status and selected I2C channel



- MHL I2C can be customized in
 - mt6582/mt6592: kernel-xxx/arch/arm/marh-(&platform)/(&project)/hdmi/hdmi_cust.h
 - others: kernel-xxx/drivers/misc/mediatek/marh/(&platform)/(&project)/hdmi/hdmi_cust.h

```
#define SII_I2C_ADDR (0x72)
#define HDMI_I2C_CHANNEL 3
```

MEDIATEK

Thank You !

