1. Overview

Compared to standard Linux/Android release, you may need to do some software changes and configurations for passing USB-IF certification Test. The document is to show an example to do these software changes and configurations based on following platform:

- SW environment: imx_4.1.15_1.2.0_ga
- HW environment: imx7d-sdb

2. Linux kernel configuration

2.1 and 2.2 are required for all USB Certifications, 2.3 is required for USB OTG Certification, 2.4 is required for USB HOST Certification, 2.5 is required for USB Peripheral Certification.

2. 1 Enable Target Peripheral List

```
Device Drivers  --->
        [*] USB support  --->
                [*]    Rely on OTG and EH Targeted Peripherals List
```

2. 2 Build-in USB Mass Storage Gadget

```
Device Drivers  --->
        [*] USB support  --->
                <*>   USB Gadget Support  --->
                        <*>   USB Gadget Drivers (Mass Storage Gadget)  --->
                                        Mass Storage Gadget
```

2. 3 Enable OTG (optional) for OTG certification test

```
        Device Drivers  --->
                [*] USB support  --->
                        -*-    OTG support
                                <*>    USB 2.0 OTG FSM implementation
```

2. 4 Build in EHSET module (optional)

If you want to make your filesystem unchanged, build in EHSET, it is built as module default.

```
Device Drivers  --->
        [*] USB support  --->
                <*>   USB EHSET Test Fixture driver
```

2. 5 Change bMaxPower for gadget

```
Device Drivers  --->
        [*] USB support  --->
                <*>   USB Gadget Support  --->
                        (10)  Maximum VBUS Power usage (2-500 mA)
```

3. Device tree changes

According to USB-IF certification requirements, the user may need following operations :

- Disable charger detection
- Support TPL for embedded host or OTG host

These operation can be implemented by changing device tree. Because charger detection is disabled by default, the user only need to change tpl_support feature in related dts file as follows:.

```
diff --git a/arch/arm/boot/dts/imx7d-sdb.dts
b/arch/arm/boot/dts/imx7d-sdb.dts

index 09089bb..c8e0fbd 100644

--- a/arch/arm/boot/dts/imx7d-sdb.dts

+++ b/arch/arm/boot/dts/imx7d-sdb.dts

@@ -1130,12 +1130,14 @@

        srp-disable;

        hnp-disable;

        adp-disable;

+       tpl_support;

        status = "okay";

 };
 &usbotg2 {

        vbus-supply = <&reg_usb_otg2_vbus>;

        dr_mode = "host";

+       tpl_support;

        status = "okay";

 };
```

4. Linux kernel codes changes

Currently, the TPL includes HUB class, HID class, Mass Storage Class, and test devices for USB-IF certification test. If the user wants to support other USB devices, please edit drivers/usb/core/otg_whitelist.h, and modify the struct whitelist_table.

5. Boot command changes

Because g_mass_storage driver is built-in and Linux will automatically load g_mass_storage during booting, the user should change uboot bootargs to configure g_mass_storage . Below is an example to configure bootagrs at u-boot command line:

```
setenv usb_certi_args 'setenv bootargs
console=${console},${baudrate} root=${mmcroot}
g_mass_storage.removable=1 g_mass_storage.idVendor=0x15a2
g_mass_storage.idProduct=0x7b
g_mass_storage.iSerialNumber=12345678ABCD g_mass_storage.luns=1'

setenv usb_certi_boot 'echo Booting from mmc ...; run
usb_certi_args;if test ${boot_fdt} = yes || test ${boot_fdt} =
try; then if run loadfdt;then bootz ${loadaddr} - ${fdt_addr};
else if test ${boot_fdt} = try; then bootz; else echo WARN:
Cannot load the DT; fi; fi; else bootz; fi;'

setenv bootcmd 'mmc dev ${mmcdev};if mmc rescan; then if run
loadbootscript; then run bootscript; else if run loadimage; then
run usb_certi_boot; else run netboot; fi; fi; else run netboot;
fi'

save

boot /* boot the board */
```

When the kernel boots up, kernel command line like below:

```
console=ttymxc0,115200 root=/dev/mmcblk3p2 rootwait rw
g_mass_storage.removable=1 g_mass_storage.idVendor=0x15a2
g_mass_storage.idProduct=0x7b
g_mass_storage.iSerialNumber=12345678ABCD g_mass_storage.luns=1
```

For peripheral only or OTG peripheral certification test, the user needs to assign the back file for g_mass_storage.

```
echo "/dev/mmcblk2p1" >
/sys/bus/platform/devices/30b10000.usb/ci_hdrc.0/gadget/lun0/file
```

NOTE: Do not assign boot partition as back file, or the boot images will be destroyed for USB mass storage test.

If there is no suitable block device exists, the commands listed below can be used to create one:

```
dd if=/dev/zero of=/home/root/storage.img bs=1M count=128
```

```
mkfs.vfat /home/root/storage.img
```

```
echo "/home/root/storage.img" >
/sys/bus/platform/devices/30b10000.usb/ci_hdrc.0/gadget/lun0/file
```

The user can also add above operation to initialization script:

```
vi /etc/init.d/usb_certi_init.sh
```

```
echo "/home/root/storage.img" >
/sys/bus/platform/devices/30b10000.usb/ci_hdrc.0/gadget/lun0/file
```

```
chmod +x /etc/init.d/usb_certi_init.sh
```

```
cd /etc/rc5.d/
```

```
ln -s ../init.d/usb_certi_init.sh S99z_usb_certi
```

In order to speed boot up, the user can disable dhcp client daemon.

```
mv /sbin/udhcpc /sbin/udhcpc_bak
```

6. USB wakeup settings

For embedded host or OTG host, USB-IF certification requires to do some wakeup tests. Below configurations may be needed for certification test.

6. 1 Enable USB wakeup

USB wakeup (as system wakeup source) is not enabled by default, so after plugging in the usb device, the user needs to enable usb wakeup using below script.

```
for i in $(find /sys -name wakeup | grep usb);do echo enabled  >
$i;echo "echo enabled > $i";done;
```

6. 2 Let the system enter suspend (standby) mode

For standard Linux bsp, the user can use below commands:

```
echo mem > /sys/power/state
```

6. 3 Operations for creating wakeup event

Remote wakeup, disconnect and connect event will trigger wakeup event to let the system leave suspend (standby) mode.

6. 4 Disable runtime power management

```
for i in $(find /sys -name control | grep usb);do echo on >
$i;echo "echo on > $i";done;
```

6. 5 Set another wakeup source for suspend mode

Below is the example to wakeup from console.

```
echo enabled > /sys/class/tty/ttymxc0/power/wakeup
```