How to Enable the LS1028ARDB USB2 as USB Serial Device by Configuring Gadget

How to use the gadget CDC to configure the Layerscape board USB as the serial device to communicate the board by the Serial port. In this file, a setting example has been applied on the LS1028ARDB USB2.

If you are first to generate the Linux Image in the */flexbuild_lsdk2108_github/components/linux/linux/, please generate Linux Image first. Command below will generate Linux Image.

```
$ sudo apt-get install gcc-aarch64-linux-gnu
$ export CROSS_COMPILE=aarch64-linux-gnu-
$ export ARCH=arm64
$ make mrproper;make defconfig;make lsdk.config;make menuconfig;make
```

The Image will be generated in the

*/flexbuild_lsdk2108_github/components/linux/linux/arch/arm64/boot/

Modify the LS1028ARDB DTS from “host” or “otg” to “peripheral” in the */flexbuild_lsdk2108_github/components/linux/linux/arch/arm64/boot/dts/freescale

fsl-ls1028a-rdb.dts

```
&usb1 {
    dr_mode = "peripheral";
};
```

fsl-ls1028a.dtsi

```
usb1: usb@3110000 {
    compatible = "fsl,ls1028a-dwc3", "snps,dwc3";
    reg = <0x0 0x3110000 0x0 0x10000>;
    interrupts = <GIC_SPI 81 IRQ_TYPE_LEVEL_HIGH>;
    dr_mode = "peripheral";
    snps,dis_rxdet_inp3_quirk;
    snps,quirk-frame-length-adjustment = <0x20>;
    snps,incr-burst-type-adjustment = <1>, <4>, <8>, <16>;
    dma-coherent;
};
```

In the */flexbuild_lsdk2108_github/components/linux/linux, run command below:

```
$ export CROSS_COMPILE=aarch64-linux-gnu-
$ export ARCH=arm64
$make
```

Will generate new dtb in the arch/arm64/boot/dts/freescale/ fsl-ls1028a-rdb.dtb

Open the LS1028ARDB, assume the board has install the default LSDK2108 image in the SD card.

https://docs.nxp.com/bundle/GUID-487B2E69-BB19-42CB-AC38-7EF18C0FE3AE/page/GUID-63B176B2-CAC9-468B-9F53-CC1BF3613B6A.html

Reboot the board from SD card by input command in u-boot.

```
=>qixis_reset sd
```

Manually mount the SD partition.

```
root@localhost:/run# mkdir media
root@localhost:/run# cd media
root@localhost:/run/media# mkdir mmcblk0p2
root@localhost:/run/media# mount /dev/mmcblk0p2 mmcblk0p2
```

Get into the mmcblk0p2, you will find all kernel related files.

```
root@localhost:/run/media# cd mmcblk0p2
root@localhost:/run/media/mmcblk0p2# ls
Image                                   fsl-ls1088a-rdb.dtb
Image.gz                                fsl-ls2080a-qds.dtb
```

```
buildinfo                                   fsl-ls2080a-rdb.dtb
config-5.10.35                              fsl-ls2080a-simu.dtb
fsl-ls1012a-2g5rdb.dtb                      fsl-ls2081a-rdb.dtb
fsl-ls1012a-frdm.dtb                        fsl-ls2088a-qds.dtb
fsl-ls1012a-frwy.dtb                        fsl-ls2088a-rdb.dtb
fsl-ls1012a-oxalis.dtb                      fsl-lx2160a-clearfog-cx.dtb
fsl-ls1012a-qds.dtb                         fsl-lx2160a-honeycomb.dtb
fsl-ls1012a-rdb.dtb                         fsl-lx2160a-qds.dtb
fsl-ls1028a-kontron-kbox-a-230-ls.dtb       fsl-lx2160a-rdb.dtb
fsl-ls1028a-kontron-sl28-var2.dtb           fsl-lx2162a-qds.dtb
fsl-ls1028a-kontron-sl28-var3-ads2.dtb      grub
fsl-ls1028a-kontron-sl28-var4.dtb           hdr_ls1012afrwy_bs.out
fsl-ls1028a-kontron-sl28.dtb                hdr_ls1012ardb_bs.out
fsl-ls1028a-qds-13bb.dtb                    hdr_ls1028ardb_bs.out
fsl-ls1028a-qds-65bb.dtb                    hdr_ls1043ardb_bs.out
fsl-ls1028a-qds-7777.dtb                    hdr_ls1046afrwy_bs.out
fsl-ls1028a-qds-85bb.dtb                    hdr_ls1046ardb_bs.out
fsl-ls1028a-qds-899b.dtb                    hdr_ls1088ardb_bs.out
fsl-ls1028a-qds-9999.dtb                    hdr_ls2088ardb_bs.out
```

fsl-ls1028a-qds.dtb	hdr_lx2160ardb_bs.out
fsl-ls1028a-rdb-dpdk.dtb	hdr_lx2162aqds_bs.out
fsl-ls1028a-rdb.dtb	lost+found
fsl-ls1028a-rdb.dts	ls1012afrwy_boot.scr
fsl-ls1043a-qds-sdk.dtb	ls1012ardb_boot.scr
fsl-ls1043a-qds.dtb	ls1028ardb_boot.scr
fsl-ls1043a-rdb-sdk.dtb	ls1043ardb_boot.scr
fsl-ls1043a-rdb-usdpaa.dtb	ls1046afrwy_boot.scr
fsl-ls1043a-rdb.dtb	ls1046ardb_boot.scr
fsl-ls1046a-frwy-sdk.dtb	ls1088ardb_boot.scr
fsl-ls1046a-frwy-usdpaa.dtb	ls2088ardb_boot.scr
fsl-ls1046a-frwy.dtb	lsdk2108_yocto_tiny_LS_arm64.itb
fsl-ls1046a-qds-sdk.dtb	lx2160ardb_boot.scr
fsl-ls1046a-qds.dtb	lx2162aqds_boot.scr
fsl-ls1046a-rdb-sdk.dtb	modules
fsl-ls1046a-rdb-usdpaa-shared.dtb	secboot_hdrs
fsl-ls1046a-rdb-usdpaa.dtb	srk_hash.txt
fsl-ls1046a-rdb.dtb	tools
fsl-ls1088a-qds.dtb	vmlinuz-5.10.35

Replace the fsl-ls1028a-rdb.dts and fsl-ls1028a-rdb.dtb by the new generated dts and dtb.

In the default LSDK2108 Image, USB serial gadget has been generate default.

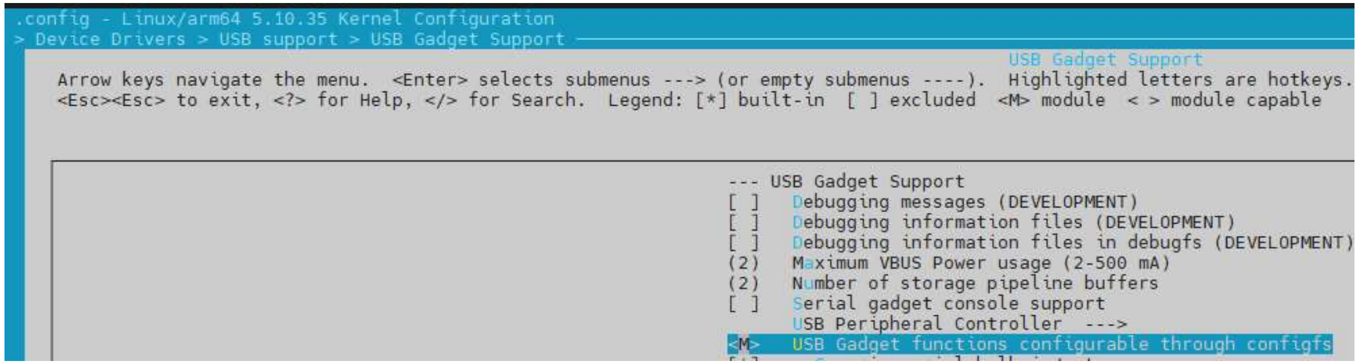
Please confirm all Kos below have been generated.

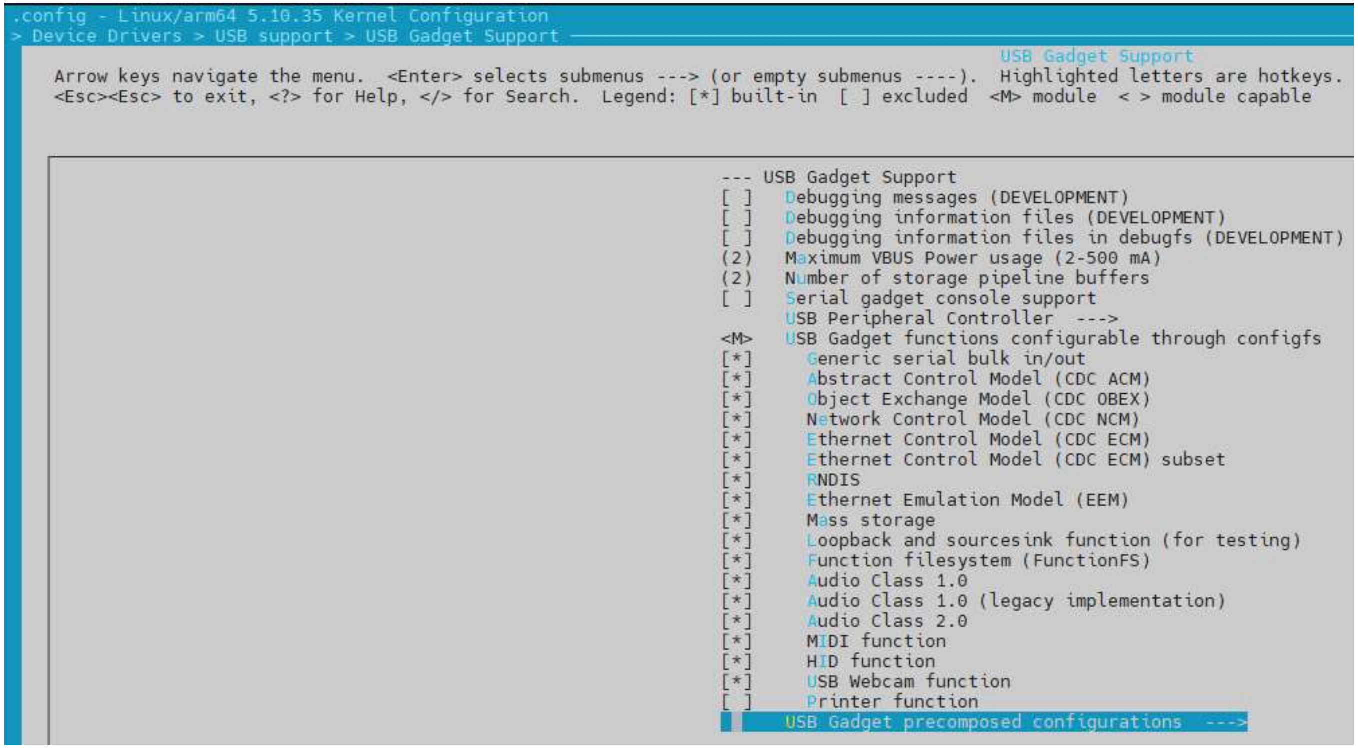
```
/run/media/mmcblk0p2/modules/5.10.35/kernel/drivers/usb/gadget/ libcomposite.ko
/run/media/mmcblk0p2/modules/5.10.35/kernel/drivers/usb/gadget/function/u_serial.ko
/run/media/mmcblk0p2/modules/5.10.35/kernel/drivers/usb/gadget/function/usb_f_obex.ko
/run/media/mmcblk0p2/modules/5.10.35/kernel/drivers/usb/gadget/function/usb_f_serial.ko
/run/media/mmcblk0p2/modules/5.10.35/kernel/drivers/usb/gadget/function/usb_f_acm.ko
/run/media/mmcblk0p2/modules/5.10.35/kernel/drivers/usb/gadget/legacy/g_serial.ko
```

Any file could not be find, please generate kernel again.

```
$ export CROSS_COMPILE=aarch64-linux-gnu-
$ export ARCH=arm64
$ make mrproper;make defconfig;make lsdk.config;make menuconfig;make
```

And set


.config - Linux/arm64 5.10.35 Kernel Configuration
> Device Drivers > USB support > USB Gadget Support
USB Gadget Support
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys.
<Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] built-in [ ] excluded <M> module < > module capable
--- USB Gadget Support
[ ] Debugging messages (DEVELOPMENT)
[ ] Debugging information files (DEVELOPMENT)
[ ] Debugging information files in debugfs (DEVELOPMENT)
(2) Maximum VBUS Power usage (2-500 mA)
(2) Number of storage pipeline buffers
[ ] Serial gadget console support
USB Peripheral Controller --->
<M> USB Gadget functions configurable through configfs


.config - Linux/arm64 5.10.35 Kernel Configuration
> Device Drivers > USB support > USB Gadget Support
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Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys.
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--- USB Gadget Support
[ ] Debugging messages (DEVELOPMENT)
[ ] Debugging information files (DEVELOPMENT)
[ ] Debugging information files in debugfs (DEVELOPMENT)
(2) Maximum VBUS Power usage (2-500 mA)
(2) Number of storage pipeline buffers
[ ] Serial gadget console support
USB Peripheral Controller --->
<M> USB Gadget functions configurable through configfs
[*] Generic serial bulk in/out
[*] Abstract Control Model (CDC ACM)
[*] Object Exchange Model (CDC OBEX)
[*] Network Control Model (CDC NCM)
[*] Ethernet Control Model (CDC ECM)
[*] Ethernet Control Model (CDC ECM) subset
[*] RNDIS
[*] Ethernet Emulation Model (EEM)
[*] Mass storage
[*] Loopback and sourcesink function (for testing)
[*] Function filesystem (FunctionFS)
[*] Audio Class 1.0
[*] Audio Class 1.0 (legacy implementation)
[*] Audio Class 2.0
[*] MIDI function
[*] HID function
[*] USB Webcam function
[ ] Printer function
USB Gadget precomposed configurations --->

```
.config - Linux/arm64 5.10.35 Kernel Configuration
> Device Drivers > USB support > USB Gadget Support > USB Gadget precomposed configurations
                                          USB Gadget precomposed configurations
  Arrow keys navigate the menu.  <Enter> selects submenus ---> (or empty submenus ----).  Highlighted letters are hotkeys.
  <Esc><Esc> to exit, <?> for Help, </> for Search.  Legend: [*] built-in  [ ] excluded  <M> module  < > module capable

                                  <M> Gadget Zero (DEVELOPMENT)
                                  [ ]   HNP Test Device
                                  <M> Audio Gadget
                                  [ ]   UAC 1.0
                                  <M> Ethernet Gadget (with CDC Ethernet support)
                                  [*]   RNDIS support
                                  [ ]   Ethernet Emulation Model (EEM) support
                                  < > Network Control Model (NCM) support
                                  < > Gadget Filesystem
                                  < > Function Filesystem
                                  <M> Mass Storage Gadget
                                  <M> Serial Gadget (with CDC ACM and CDC OBEX support)
```

And then generate the new Image, please replace the Image in the /run/media/mmcblk0p2 by the new Image.

Reboot the LS1028ARDB, confirm the dtb has been replaced correctly. Run command below:

```
$ dtc -I fs -O dts -o dts /proc/device-tree
$ cat dts | less
```

Confirm the information below.

```
usb@3110000 {
        iommus = <0x11 0x02>;
        dma-coherent;
        snps,incr-burst-type-adjustment = <0x01 0x04 0x08 0x10>;
        snps,quirk-frame-length-adjustment = <0x20>;
        interrupts = <0x00 0x51 0x04>;
        snps,dis_rxdet_inp3_quirk;
        compatible = "fsl,ls1028a-dwc3\0snps,dwc3";
        reg = <0x00 0x3110000 0x00 0x10000>;
        phandle = <0x41>;
        dr_mode = "peripheral";
};
```

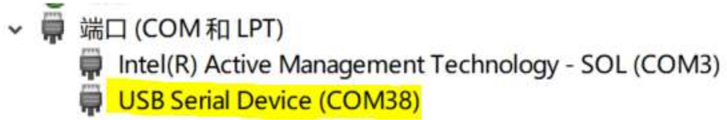
Now install the 6 *.Kos.

```
root@localhost:/boot/modules/5.10.35/kernel/drivers/usb/gadget#insmod libcomposite.ko
root@localhost:/boot/modules/5.10.35/kernel/drivers/usb/gadget/function# insmod u_serial.ko
root@localhost:/boot/modules/5.10.35/kernel/drivers/usb/gadget/function# insmod usb_f_obex.ko
root@localhost:/boot/modules/5.10.35/kernel/drivers/usb/gadget/function# insmod usb_f_serial.ko
root@localhost:/boot/modules/5.10.35/kernel/drivers/usb/gadget/function# insmod usb_f_acm.ko
root@localhost:/boot/modules/5.10.35/kernel/drivers/usb/gadget/ legacy # insmod g_serial.ko
```

Please run cat /sys/class/tty/ttyGS0/dev to get the device major number

```
root@localhost:/# cat /sys/class/tty/ttyGS0/dev
506:0
```

Now connect the Win 10 and LS1028ARDB USB2 with type-c cable. Check the Win 10 Device manager.



Then test the ttyGS0 on the LS1028ARDB and COM38 on the PC.