

## Ubuntu/ZCU111 の続き

<https://www.wasamon.net/miyo/index.cgi?page=Diary%2F2020%2D12%2D1> の続き

U-boot で自動的に起動するようにする

uEnv.txt じゃなくて boot.scr を使う . 手で入力してたコマンドを boot.script に保存 .

```
fatload mmc 0 0x10000000 Image
fatload mmc 0 0x02a00000 zynqmp-zcu111-revA.dtb
setenv bootargs earlycon clk_ignore_unused consoleblank=0 root=/dev/mmcblk0p2 rootfstype=ext4 rw
rootwait
booti 0x10000000 - 0x02a00000
```

で ,

```
$ ${WORK}/u-boot-xlnx/tools/mkimage -A arm64 -O linux -T script -C none -a 0 -e 0 -n "boot.scr" -d
boot.script boot.scr
```

として boot.scr を作る . これを BOOT.bin とか置いたパーティションにコピー .

## PL の再コンフィギュレーション

これは , ZYNQ でやってたときと同じ .

fpga.dts を用意して

```
/dts-v1/;
/ {
    fragment@0 {
        target-path = "/fpga-full";
        __overlay__ {
            firmware-name = "fpga.bin";
        };
    };
};
```

dtc で dts から dtb を作成

```
dtc -I dts -O dtb -o fpga.dtb fpga.dts
```

fpga-bit2bin.py で bit ファイルから bin ファイルを作って ,

/lib/firmware/fpga.bin に配置して

```
mkdir -p /sys/kernel/config/device-tree/overlays/fpga
cp fpga.dtb /sys/kernel/config/device-tree/overlays/fpga/dtbo
```

## RFdc アプリの実装のためにライブラリの準備

実機で作業してしまう

<https://xilinx-wiki.atlassian.net/wiki/spaces/A/pages/84378586>

/Building+RFDC+application+from+git+sources+for+ZCU111 ベースにしつつ , 実機なのでちょっと違う

libsysfs-dev や cmake やらが必要らしいので apt でインストール

```
sudo apt install libsysfs-dev cmake
```

一式を取得 . ホームディレクトリの下で作業する .

```
cd /
git clone https://github.com/Xilinx/embeddedsw
cd embeddedsw
git checkout xilinx-v2019.1
```

libmetal のビルド

```
cd ThirdParty/sw_services/libmetal/src/libmetal
mkdir build_libm; cd build_libm
cmake .. -DCMAKE_TOOLCHAIN_FILE=../cmake/platforms/zynqmp-linux.cmake
make -k
sudo make install/fast
```

test 関連のソースのビルドでエラーがあるので , ごにょごにとスキップ .

```
cd /embeddedsw/XilinxProcessorIPLib/drivers/rfdc/src/
make -f Makefile.Linux
```

RFdc のサンプルを動かしてみる , が .

```
user@zcu111: /embeddedsw/XilinxProcessorIPLib/drivers/rfdc/examples$ ./rfdc-read-write
RFdc Read and Write Example Test
metal_sys_init
success: sysfs_get_mnt_path
success: fopen /dev/urandom
success: metal_init_page_sizes
try: metal_linux_bus_init
metal_linux_bus_init
metal_linux_probe_bus
try: sysfs_open_bus: platform
success: sysfs_open_bus: platform
try: metal_linux_probe_driver
metal_linux_probe_driver
try: sysfs_open_driver platform uio_pdrv_genirq
result: sysfs_open_driver (nil)
metal_linux_probe_driver
try: sysfs_open_driver platform uio_dmem_genirq
result: sysfs_open_driver (nil)
error: metal_linux_probe_driver
metal_linux_probe_bus
try: sysfs_open_bus: pci
success: sysfs_open_bus: pci
try: metal_linux_probe_driver
metal_linux_probe_driver
try: sysfs_open_driver pci vfio-pci
result: sysfs_open_driver (nil)
metal_linux_probe_driver
try: sysfs_open_driver pci uio_pci_generic
result: sysfs_open_driver (nil)
error: metal_linux_probe_driver
ERROR: Failed to run metal initialization
Read and Write Example Test failed
user@zcu111: /embeddedsw/XilinxProcessorIPLib/drivers/rfdc/examples$
```

って感じで metal\_init で失敗 .

ちなみに TRD で実行してみると

```

root@xilinx-zcu111          -2020      _2          :/media/sd-mmcblk0          p2
/home/user/embeddedsw/XilinxProcessorIPLib/drivers/rfdc/examples# ./rfdc-read-write
RFdc Read and Write Example Test
metal: info:      Registered shmem provider linux_shm.
metal: info:      Registered shmem provider ion.reserved.
metal: info:      Registered shmem provider ion.ion_system_contig_heap.
metal: info:      Registered shmem provider ion.ion_system_heap.
metal:   info:      metal_linux_dev_open:  checking  driver  vfio-platform,b0040000
.usp_rf_data_converter,uio_pdrv_genirq
metal:   info:      metal_linux_dev_open:  checking  driver  uio_pdrv_genirq,b0040000
.usp_rf_data_converter,uio_pdrv_genirq
metal:   info:      metal_linux_dev_open:  driver  uio_pdrv_genirq  bound  to  b0040000
.usp_rf_data_converter
metal:   warning:   reading  attribute  /sys/devices/platform/amba/b0040000
.usp_rf_data_converter/uio/uio5/maps/map1/offset yields result -22
metal:   info:      metal_linux_dev_open:  checking  driver  vfio-platform,b0040000
.usp_rf_data_converter,(null)
metal:   warning:   reading  attribute  /sys/devices/platform/amba/b0040000
.usp_rf_data_converter/uio/uio5/maps/map1/offset yields result -22
Segmentation fault
root@xilinx-zcu111          -2020      _2          :/media/sd-mmcblk0          p2
/home/user/embeddedsw/XilinxProcessorIPLib/drivers/rfdc/examples#

```

とか

ために TRD で sys 以下を find してみると

```

root@xilinx-zcu111-2020_2:/sys# find . -name ¥*uio¥* -print
./class/uio
./class/uio/uio1
./class/uio/uio4
./class/uio/uio2
./class/uio/uio0
./class/uio/uio3
./devices/platform/amba/fd0b0000.perf-monitor/uio
./devices/platform/amba/fd0b0000.perf-monitor/uio/uio1
./devices/platform/amba/fd490000.perf-monitor/uio
./devices/platform/amba/fd490000.perf-monitor/uio/uio2
./devices/platform/amba/ffa00000.perf-monitor/uio
./devices/platform/amba/ffa00000.perf-monitor/uio/uio0
./devices/platform/amba/b0010000.axi_perf_mon/uio
./devices/platform/amba/b0010000.axi_perf_mon/uio/uio4
./devices/platform/amba/ffa10000.perf-monitor/uio
./devices/platform/amba/ffa10000.perf-monitor/uio/uio3
./bus/platform/drivers/uio_pdrv_genirq
./bus/platform/drivers/uio_dmem_genirq
./module/uio_xilinx_ai_engine
root@xilinx-zcu111-2020_2:/sys# find . -name ¥*pci¥* -print
./kernel/debug/clk/pcie_ref_mux
./kernel/debug/clk/pcie_ref_div1
./kernel/debug/clk/pcie_ref
./class/pci_bus
./bus/platform/drivers/xilinx-pcie
./bus/platform/drivers/xilinx-xdma-pcie
./bus/platform/drivers/nwl-pcie
./bus/pci
./bus/pci/drivers/ps_pcie_dma
./firmware/devicetree/base/amba/pcie@fd0e0000
./firmware/devicetree/base/__symbols__/pcie
./firmware/devicetree/base/__symbols__/pcie_intc
./module/edac_core/parameters/edac_pci_panic_on_pe
./module/edac_core/parameters/check_pci_errors

```

で、自分でセットアップした方は、

```

root@zcu111:/sys# find . -name ¥*uio¥* -print
./class/uio
./class/uio/uio1
./class/uio/uio2
./class/uio/uio0
./class/uio/uio3
./devices/platform/amba/fd0b0000.perf-monitor/uio
./devices/platform/amba/fd0b0000.perf-monitor/uio/uio1
./devices/platform/amba/fd490000.perf-monitor/uio

```

```

./devices/platform/amba/fd490000.perf-monitor/uis/uis2
./devices/platform/amba/ffa00000.perf-monitor/uis
./devices/platform/amba/ffa00000.perf-monitor/uis/uis3
./devices/platform/amba/ffa10000.perf-monitor/uis
./devices/platform/amba/ffa10000.perf-monitor/uis/uis3
root@zcu111:/sys# find . -name ¥*pci¥* -print
./kernel/debug/clk/pci_ref_mux
./kernel/debug/clk/pci_ref_div1
./kernel/debug/clk/pci_ref
./class/pci_bus
./bus/platform/drivers/nwl-pcie
./bus/pci
./firmware/devicetree/base/amba/pci@fd0e0000
./module/edac_core/parameters/edac_pci_panic_on_pe
./module/edac_core/parameters/check_pci_errors
root@zcu111:/sys#

```

たしかに， uio\_pdrv\_genirq や uio\_dmem\_genirq がいない。  
Linux の .config をみると，

```

CONFIG_UIO_PDRV_GENIRQ=m
CONFIG_DMEMP_GENIRQ=m

```

だったので，

```

CONFIG_UIO_PDRV_GENIRQ=y
CONFIG_DMEMP_GENIRQ=y

```

にしてビルド。

```

/sys/bus/platform/drivers/uio_pdrv_genirq
/sys/bus/platform/drivers/uio_dmem_genirq

```

がはえた．というわけで再実行．

```

user@zcu111: /embeddedsw/XilinxProcessorIPLib/drivers/rfdc/examples$ ./rfdc-read-write
RfDc Read and Write Example Test
metal_sys_init
success: sysfs_get_mnt_path
success: fopen /dev/urandom
success: metal_init_page_sizes
try: metal_linux_bus_init
metal_linux_bus_init
metal_linux_probe_bus
try: sysfs_open_bus: platform
success: sysfs_open_bus: platform
try: metal_linux_probe_driver
metal_linux_probe_driver
try: sysfs_open_driver platform uio_pdrv_genirq
result: sysfs_open_driver 0x55bb715e20
metal_linux_probe_driver
try: sysfs_open_driver platform uio_dmem_genirq
result: sysfs_open_driver 0x55bb715fc0
success: metal_linux_probe_driver
try: metal_linux_register_bus
metal_linux_probe_bus
try: sysfs_open_bus: pci
success: sysfs_open_bus: pci
try: metal_linux_probe_driver
metal_linux_probe_driver
try: sysfs_open_driver pci vfio-pci
[sudo] password for user:
result: sysfs_open_driver (nil)
metal_linux_probe_driver
try: sysfs_open_driver pci uio_pci_generic
result: sysfs_open_driver (nil)
error: metal_linux_probe_driver
success: metal_linux_bus_init
success: open /proc/self/pagemap

```

```
success: metal_linux_irq_init
metal: info:      Registered shmem provider linux_shm.
metal: error:    metal_ion_shm_provider_init: failed to open ion dev file.
success: metal_linux_init_shmem
metal: warning:  metal_linux_irq_handling: Failed to set scheduler: Unknown error -1.
metal: error:
Invalid device id ORead and Write Example Test failed
user@zcu111: /embeddedsw/XilinxProcessorIPLib/drivers/rfdc/examples$
```

とりあえず, metal\_init は通ったよう .

```
Invalid device id ORead and Write Example Test failed
```

は, DAC や ADC のエントリがないから仕方がない気がする ( 次の仕事だと思う ).  
ちょっと libmetal を分かってからじゃないと次すすめないな .