TI DSP, MCU 및 Xilinx Zynq FPGA
프로그래밍 전문가 과정

강사 – Innova Lee(이상훈)

gcccompil3r@gmail.com

학생 – 문한나

mhn97@naver.com

환경설정

petalinux 다운로드

liveUSB_2015_4.zip 다운로드

```
mkdir fpga
cd fpga
```
홈 아래에 폴더 생성 후 진입

```
chmod 755 petalinux-v2015.4-final-installer-dec.run
```


권한설정

```
unzip LiveUSB_2015.4.zip
```

```
sudo apt-get update

sudo apt-get install tofrodos iproute tftpd-hpa gawk gcc git-core
make net-tools libncurses5-dev zlib1g-dev libssl-dev flex bison
lib32z1 lib32ncurses5 lib32stdc++6 libselinux1
```
필요한 라이브러리 install

```
sudo ./petalinux-v2015.4-final-installer-dec.run ~/petalinux_zynq/
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga$ sudo ./petalinux-v2015.4-final-installer-dec.run ~/petalinux_zynq/
INFO: Checking installer checksum...
INFO: Extracting PetaLinux installer...
INFO: Installing PetaLinux...
INFO: Checking PetaLinux installer integrity...
INFO: Extracting Installation files...

LICENSE AGREEMENTS

PetaLinux SDK contains software from a number of sources.  Please review
the following licenses and indicate your acceptance of each to continue.

You do not have to accept the licenses, however if you do not then you may
not use PetaLinux SDK.

Use PgUp/PgDn to navigate the license viewer, and press 'q' to close

Press Enter to display the license agreements
Do you accept Xilinx End User License Agreement? [y/N] > y
Do you accept Webtalk Terms and Conditions? [y/N] > y
Do you accept Third Party End User License Agreement? [y/N] > y
INFO: Checking installation environment requirements...
INFO: Checking free disk space
INFO: Checking installed tools
INFO: Checking installed development libraries
INFO: Checking network and other services
INFO: Installing PetaLinux SDK to "/home/mhn/petalinux_zynq//petalinux-v2015.4-final"
INFO: PetaLinux SDK has been installed to /home/mhn/petalinux_zynq//petalinux-v2015.4-final
```

```
cd ~/petalinux_zynq/

cp ~/fpga/LiveUSB_2015.4/ZYBO_petalinux_v2015_4.bsp ./

sudo chmod 755 ZYBO_petalinux_v2015_4.bsp

chmod -R 755 petalinux-v2015.4-final/

chmod -R 755 ZYBO_petalinux_v2015_4.bsp
```

```
mhn@mhn-Z20NH-AS51B5U:~/petalinux_zynq$ ls
petalinux-v2015.4-final  ZYBO_petalinux_v2015_4.bsp
```

```
vi ~/.bashrc
```

```
108 # enable programmable completion features (you don't need to enable
109 # this, if it's already enabled in /etc/bash.bashrc and /etc/profile
110 # sources /etc/bash.bashrc).
111 if ! shopt -oq posix; then
112   if [ -f /usr/share/bash-completion/bash_completion ]; then
113     . /usr/share/bash-completion/bash_completion
114   elif [ -f /etc/bash_completion ]; then
115     . /etc/bash_completion
116   fi
117 fi
118
119 source /home/mhn/petalinux_zynq/petalinux-v2015.4-final/settings.sh
```

```
source /home/mhn/petalinux_zynq/petalinux-v2015.4-final/settings.sh
```

```
source ~/.bashrc
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ source ~/.bashrc
PetaLinux environment set to '/home/mhn/petalinux_zynq/petalinux-v2015.4-final'
INFO: Checking free disk space
INFO: Checking installed tools
INFO: Checking installed development libraries
INFO: Checking network and other services
```

```
petalinux-create -t project -n test --template zynq
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ petalinux-create -t project -n test --template zynq
INFO: Create project: test
INFO: New project successfully created in /home/mhn/fpga_test/test
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ ls
test
```

```
cp ../fpga/LiveUSB_2015.4/ZYBO_petalinux_v2015_4.bsp ./
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ cp ../fpga/LiveUSB_2015.4/ZYBO_petalinux_v2015_4.bsp ./
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ LS
The program 'LS' is currently not installed. You can install it by typing:
sudo apt install sl
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ ls
test  ZYBO_petalinux_v2015_4.bsp
```

```
petalinux-create -t project -s ZYBO_petalinux_v2015_4.bsp
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ petalinux-create -t project -s ZYBO_petalinux_v2015_4.bsp
INFO: Create project:
INFO: Projects:
INFO:   * ZYBO_petalinux_v2015_4
INFO: has been successfully installed to /home/mhn/fpga_test/
INFO: New project successfully created in /home/mhn/fpga_test/
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ ls
test  ZYBO_petalinux_v2015_4  ZYBO_petalinux_v2015_4.bsp
```

```
rm -rf test
```

```
petalinux-build
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga_test$ petalinux-build
ERROR: You are not inside a PetaLinux project. Please specify a PetaLinux project!
Builds the project or the specified components.

Usage:
  petalinux-build [options]

Required:

Options:
  -h, --help                      show function usage
  -p, --project <PROJECT>         path to PetaLinux SDK project.
                                  Default is working project.
  -c, --component <COMPONENT>     Specify the component
                                  all: to build the whole project
                                  If you specify other component,it will
                                  build that component
                                  E.g. -c rootfs
                                  E.g. -c rootfs/myapp
                                  If you use -c with --help option, it will
                                  show you subcomponents.
                                  E.g. -c rootfs --help shows subcomponents
                                  of rootfs.
  -x, --execute <GNU_MAKE_TARGET> Specify a GNU make command of the component
  --makeenv <MAKE ENV>            Pass GNU make environment variables
  -v, --verbose                   Show compile messages verbose mode
```

```
cd ZYBO_petalinux_v2015_4/

petalinux-build
```

```
mhn@mhn-Z20NH-AS51B5U:~/fpga_test/ZYBO_petalinux_v2015_4$ petalinux-build
INFO: Checking component...
INFO: Generating make files and build linux
INFO: Generating make files for the subcomponents of linux
INFO: Building linux
[INFO ] pre-build linux/rootfs/fwupgrade
[INFO ] pre-build linux/rootfs/gpio-demo
[INFO ] pre-build linux/rootfs/peekpoke
[INFO ] build system.dtb
[INFO ] build linux/kernel
[INFO ] generate linux/u-boot configuration files
[INFO ] update linux/u-boot source
[INFO ] build linux/u-boot
[INFO ] build zynq_fsbl
[INFO ] Setting up stage config
[INFO ] Setting up rootfs config
[INFO ] Updating for cortexa9-vfp-neon
[INFO ] Updating package manager
[INFO ] Expanding stagefs
[INFO ] build linux/rootfs/fwupgrade
[INFO ] build linux/rootfs/gpio-demo
[INFO ] build linux/rootfs/peekpoke
[INFO ] build kernel in-tree modules
[INFO ] modules linux/kernel
[INFO ] post-build linux/rootfs/fwupgrade
[INFO ] post-build linux/rootfs/gpio-demo
[INFO ] post-build linux/rootfs/peekpoke
[INFO ] pre-install linux/rootfs/fwupgrade
[INFO ] pre-install linux/rootfs/gpio-demo
[INFO ] pre-install linux/rootfs/peekpoke
[INFO ] install system.dtb
[INFO ] install linux/kernel
[INFO ] generate linux/u-boot configuration files
[INFO ] update linux/u-boot source
[INFO ] build linux/u-boot
[INFO ] install linux/u-boot
[INFO ] Expanding rootfs
[INFO ] install sys_init
[INFO ] install linux/rootfs/fwupgrade
[INFO ] install linux/rootfs/gpio-demo
[INFO ] install linux/rootfs/peekpoke
[INFO ] install kernel in-tree modules
[INFO ] modules_install linux/kernel
[INFO ] post-install linux/rootfs/fwupgrade
[INFO ] post-install linux/rootfs/gpio-demo
[INFO ] post-install linux/rootfs/peekpoke
[INFO ] package rootfs.cpio to /home/mhn/fpga_test/ZYBO_petalinux_v2015_4/images/linux
[INFO ] Update and install vmlinux image
[INFO ] vmlinux linux/kernel
[INFO ] install linux/kernel
[INFO ] package zImage
[INFO ] zImage linux/kernel
[INFO ] install linux/kernel
[INFO ] Package HDF bitstream
[INFO ] Failed to copy images to TFTPBOOT /tftpboot
```

```
sudo dpkg-reconfigure dash

sudo dpkg --add-architecture i386

sudo apt-get update

sudo apt-get install libbz-1.0:i386
```

```
sudo apt-get install tofrodos iproute tftpd-hpa gawk gcc git-core
make net-tools libncurses5-dev zlib1g-dev libssl-dev flex bison
lib32z1 lib32ncurses5 lib32stdc++6 libselinux1

sudo apt-get install xinetd tftpd-hpa

sudo apt-get install tofrodos iproute tftpd-hpa gawk gcc git-core
make net-tools libncurses5-dev zlib1g-dev libssl-dev flex bison
lib32z1 lib32ncurses5 libselinux1

sudo apt-get install linaro-image-tools

sudo apt-get install qemu-user-static qemu-system

sudo apt-get install gcc-arm-linux-gnueabi

petalinux-build

petalinux-boot --qemu –kernel
```

```
ALSA device list:
  No soundcards found.
Freeing unused kernel memory: 3956K (c0659000 - c0a36000)
INIT: version 2.88 booting
Creating /dev/flash/* device nodes
random: dd urandom read with 0 bits of entropy available
Starting internet superserver: inetd.
update-rc.d: /etc/init.d/run-postinsts exists during rc.d purge (continuing)
 Removing any system startup links for run-postinsts ...
   /etc/rcS.d/S99run-postinsts
INIT: Entering runlevel: 5
Configuring network interfaces... done.
starting Busybox HTTP Daemon: httpd... done.
NET: Registered protocol family 10
IPv6: ADDRCONF(NETDEV_UP): eth0: link is not ready

Built with PetaLinux v2015.4 (Yocto 1.8) ZYBO_petalinux_v2015_4 /dev/ttyPS0
ZYBO_petalinux_v2015_4 login: root
Password: macb e000b000.ethernet eth0: link up (1000/Full)
IPv6: ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready

root
Login incorrect
ZYBO_petalinux_v2015_4 login: root
Password:
login[828]: root login on 'ttyPS0'
root@ZYBO_petalinux_v2015_4:~# QEMU: Terminated
```

```
login : root
password : root
```

경로 : ~/petalinux_zynq/petalinux-v2015.4-final/components/linux-kernel/xlnx-4.0/drivers/uio
파일이름 : uio_pdrv_genirq.c

```c
#ifdef CONFIG_OF
static struct of_device_id uio_of_genirq_match[] = {
        { .compatible = "generic-uio", },
        { /* This is filled with module_parm */ },
        { /* Sentinel */ },
};
MODULE_DEVICE_TABLE(of, uio_of_genirq_match);
module_param_string(of_id, uio_of_genirq_match[0].compatible, 128, 0);
MODULE_PARM_DESC(of_id, "Openfirmware id of the device to be handled by uio");
#endif
```

내용추가 : { .compatible = "generic-uio", },