

TI DSP, MCU 및 Xilinx Zynq FPGA 프로그래밍 전문가 과정

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FPGA on Petalinux

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1) Petalinux 설치 및 환경설정 1

Petalinux | 교재

Elcid(sile****) 카페메니저 🍵 1:1

<https://www.xilinx.com/support/download.html>

Embedded Development -> Archive -> 2015.4 Petalinux Installer

```
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/petalinux-v2015.4-final/components/linux-kernel/xlnx-4.0/drivers/uiso$ pwd
/home/hyunwoopark/petalinux_zynq/petalinux-v2015.4-final/components/linux-kernel/xlnx-4.0/drivers/uiso
```

```
#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
```



Elcid 작성자 2018.05.30. 10:57 → 답글

신고

https://www.xilinx.com/support/documentation/university/vivado/workshops/vivado-embedded-linux-zynq/materials/2015x/LiveUSB_2015.4.zip

1) Petalinux 설치 및 환경설정 2

```
hyunwoopark@hyunwoopark-P65-P67SG: ~/Downloads
Setting up libtinfo-dev:amd64 (6.0+20160213-1ubuntu1) ...
Setting up libncurses5-dev:amd64 (6.0+20160213-1ubuntu1) ...
Setting up zlib1g-dev:amd64 (1:1.2.8.dfsg-2ubuntu4.1) ...
Setting up libssl-dev:amd64 (1.0.2g-1ubuntu4.12) ...
Setting up libssl-doc (1.0.2g-1ubuntu4.12) ...
Setting up tofrodos (1.7.13+ds-2ubuntu1) ...
Setting up lib32gcc1 (1:6.0.1-0ubuntu1) ...
Setting up lib32stdc++6 (5.4.0-6ubuntu1-16.04.9) ...
Setting up tftpd-hpa (5.2+20150808-1ubuntu1.16.04.1) ...
Processing triggers for libc-bin (2.23-0ubuntu16) ...
Processing triggers for systemd (229-4ubuntu21.1) ...
Processing triggers for ureadahead (0.100.0-19) ...
hyunwoopark@hyunwoopark-P65-P67SG:~/Downloads$ ./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/hyunwoopark/petalinux_zynq/petalinux-v2015.4-final"
INFO: Petalinux SDK has been installed to /home/hyunwoopark/petalinux_zynq/petalinux-v2015.4-final
hyunwoopark@hyunwoopark-P65-P67SG:~/Downloads$
```

```
hyunwoopark@hyunwoopark-P65-P67SG: ~/petalinux_zynq
hyunwoopark@hyunwoopark-P65-P67SG:~$ ls
Desktop      kernel      petalinux_zynq  Videos      xilinx
Documents    lab2        Pictures        vivado.jou   xilinx_vivado
Downloads    mkcscope.sh Public         vivado.log
examples.desktop Music       Templates      vivado_workspace
hyunwoopark@hyunwoopark-P65-P67SG:~$ cd petalinux_zynq/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd petalinux-v2015.4-final/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/petalinux-v2015.4-final$ ls
components  etc  settings.csh  settings.sh  tools
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/petalinux-v2015.4-final$ cd .
.
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$
```


1) Petalinux 설치 및 환경설정 3

```
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd petalinux-v2015.4-final/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/petalinux-v2015.4-final$ ls
components  etc  settings.csh  settings.sh  tools
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/petalinux-v2015.4-final$ cd ..
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd ..
hyunwoopark@hyunwoopark-P65-P67SG:~$ ls
Desktop  examples.desktop  mkcscope.sh  Pictures  Videos  vivado_workspace
Documents  kernel  Music  Public  vivado.jou  xilinx
Downloads  lab2  petalinux_zynq  Templates  vivado.log  xilinx_vivado
hyunwoopark@hyunwoopark-P65-P67SG:~$ cd petalinux_zynq/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ chmod -R 755 petalinux-v2015.4-final/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ chmod -R 755 petalinux-v2015.4-final/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ chmod -R 755 ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
petalinux-v2015.4-final  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ vi ~/.bashrc
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ source ~/.bashrc
PetaLinux environment set to '/home/hyunwoopark/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
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ vi ~/.bashrc
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd ..
hyunwoopark@hyunwoopark-P65-P67SG:~$ ls
Desktop  examples.desktop  lab2  petalinux_zynq  Templates  vivado.log  xilinx_vivado
Documents  fpga_test  mkcscope.sh  Pictures  Videos  vivado_workspace
Downloads  kernel  Music  Public  vivado.jou  xilinx
hyunwoopark@hyunwoopark-P65-P67SG:~$ cd fpga_test/
hyunwoopark@hyunwoopark-P65-P67SG:~/fpga_test$ petalinux-create -t project -n test --template zynq
INFO: Create project: test
INFO: New project successfully created in /home/hyunwoopark/fpga_test/test
hyunwoopark@hyunwoopark-P65-P67SG:~/fpga_test$
```

이제 home 디렉토리의 .bashrc 를 아래와 같이 수정하도록 하자
아래와 같은 명령어를 입력한다.

```
vi ~/.bashrc
```

그리고 맨 아래쪽으로 이동해서 맨 아래 source /home/sdr 부분을 입력해주면 된다.

```
# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc).
if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi
```

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

그리고 source ~/.bashrc 를 한 번 입력해준다.

추가적으로 뒤쪽에서 sudo su - 를 하는 부분이 있다.

해당 내용을 해준 이후에도 pwd 로 이 경로를 파악해 두었다가

source 파악한 경로/.bashrc 를 해서 petalinux 작업을 수행하도록 한다.

1) Petalinux 설치 및 환경설정 4

```
hyunwoopark@hyunwoopark-P65-P67SG:~/fpga_test$ ls
ZYBO_petalinux_v2015_4  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/fpga_test$ cd ZYBO_petalinux_v2015_4/
hyunwoopark@hyunwoopark-P65-P67SG:~/fpga_test/ZYBO_petalinux_v2015_4$ ls
build  components  config.project  hardware  hw-description  images  pre-built  subsystems
hyunwoopark@hyunwoopark-P65-P67SG:~/fpga_test/ZYBO_petalinux_v2015_4$ petalinux-boot --qemu --kernel
INFO: The image provided is a zImage
INFO: Set QEMU tftp to /home/hyunwoopark/fpga_test/ZYBO_petalinux_v2015_4/images/linux
INFO: TCP PORT is free
```

→ Login : root, password : root

Petalinux 설치 전체 코드

```
224 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
225 ./petalinux-v2015.4-final-installer-dec.run ~/petalinux_zynq/
226 cd ~/petalinux_zynq/
+ 구조체 추가 해야함.
```

```
229 cp ~/Downloads/LiveUSB_2015.4/ZYBO_petalinux_v2015_4.bsp ./
235 chmod 755 ZYBO_petalinux_v2015_4.bsp
245 chmod -R 755 petalinux-v2015.4-final/
248 chmod -R 755 ZYBO_petalinux_v2015_4.bsp
250 vi ~/.bashrc
251 source ~/.bashrc
252 vi ~/.bashrc
254 mkdir fpga_test( home 폴더에 만들고 홈으로 이동)
255 cd fpga_test/
256 petalinux-create -t project -n test --template zynq
259 cd test/
263 cp ~/Downloads/LiveUSB_2015.4/ZYBO_petalinux_v2015_4.bsp ./
265 petalinux-create -t project -s ZYBO_petalinux_v2015_4.bsp
267 rm -rf test
```

```
273 cd ZYBO_petalinux_v2015_4/
274 petalinux-build
275 sudo dpkg-reconfigure dash
276 sudo dpkg --add-architecture i386
277 sudo apt-get update
278 sudo apt-get install libbz2-1.0:i386
279 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
283 sudo apt-get install xinetd tftpd-hpa
284 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
```

```
297 sudo apt-get install linaro-image-tools
298 sudo apt-get install qemu-user-static qemu-system
299 sudo apt-get install gcc-arm-linux-gnueabi
```

```
285 petalinux-build
```

```
302 cd ZYBO_petalinux_v2015_4/
303 ls
304 petalinux-boot --qemu --kernel
```

1) Vivado 환경설정 2

Zybo 보드 드라이버 설치

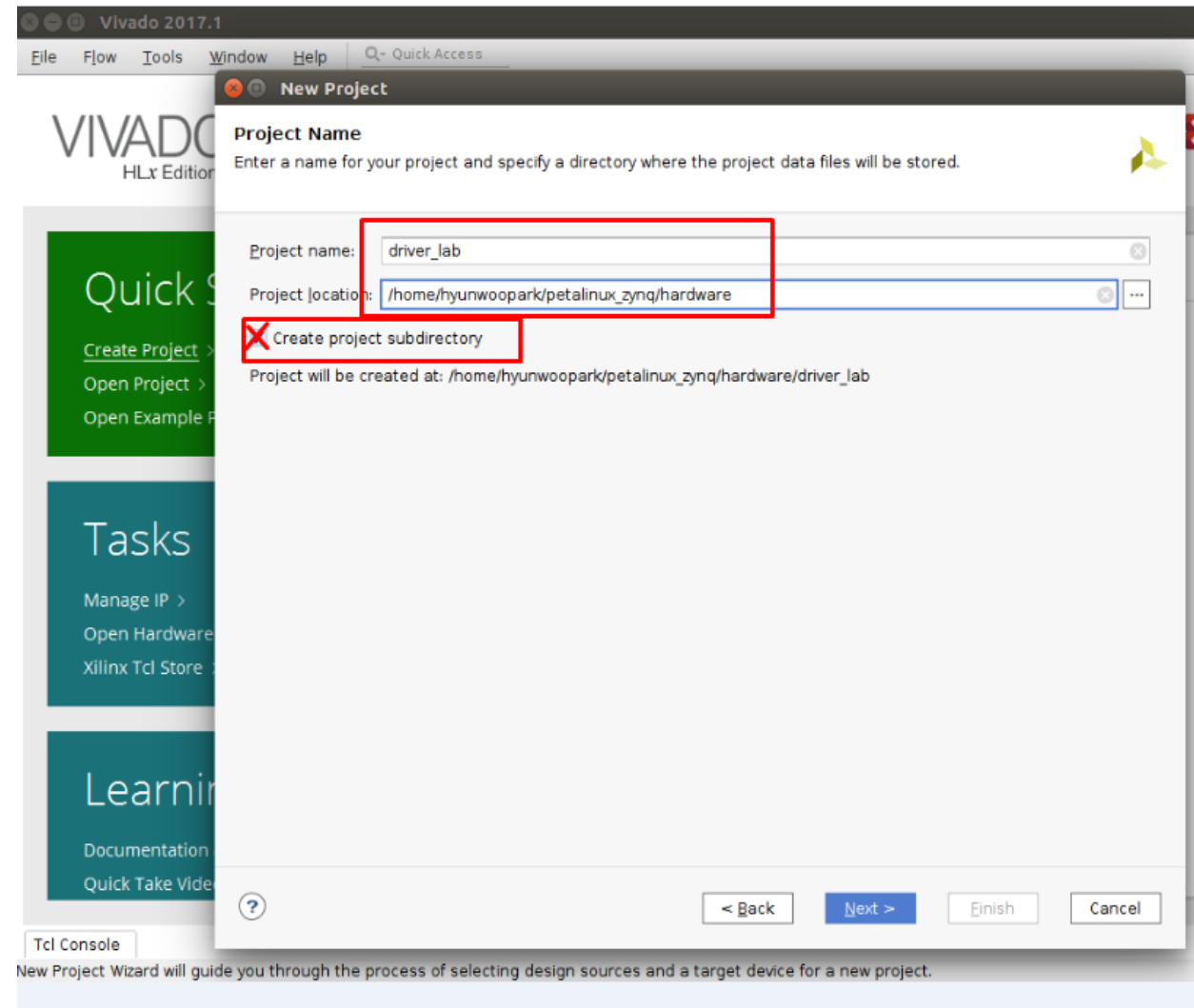
```
hyunwoopark@hyunwoopark-P65-P67SG:~/xilinx/Vivado/2017.1/data/xicom$ cd cable_drivers/lin64/install_script/install_drivers/
hyunwoopark@hyunwoopark-P65-P67SG:~/xilinx/Vivado/2017.1/data/xicom/cable_drivers/lin64/install_script/install_drivers$ sudo ./install_drivers
[sudo] password for hyunwoopark:
INFO: Installing cable drivers.
INFO: Script name = ./install_drivers
INFO: HostName = hyunwoopark-P65-P67SG
INFO: Current working dir = /home/hyunwoopark/xilinx/Vivado/2017.1/data/xicom/cable_drivers/lin64/install_script/install_drivers
INFO: Kernel version = 4.13.0-36-generic.
INFO: Arch = x86_64.
Successfully installed Digilent Cable Drivers
--File /etc/udev/rules.d/52-xilinx-ftdi-usb.rules does not exist.
--File version of /etc/udev/rules.d/52-xilinx-ftdi-usb.rules = 0000.
--Updating rules file.
--File /etc/udev/rules.d/52-xilinx-pcusb.rules does not exist.
--File version of /etc/udev/rules.d/52-xilinx-pcusb.rules = 0000.
--Updating rules file.

INFO: Digilent Return code = 0
INFO: Xilinx Return code = 0
INFO: Xilinx FTDI Return code = 0
INFO: Return code = 0
INFO: Driver installation successful.
CRITICAL WARNING: Cable(s) on the system must be unplugged then plugged back in order for the driver scripts to update the cables.
hyunwoopark@hyunwoopark-P65-P67SG:~/xilinx/Vivado/2017.1/data/xicom/cable_drivers/lin64/install_script/install_drivers$ █
```

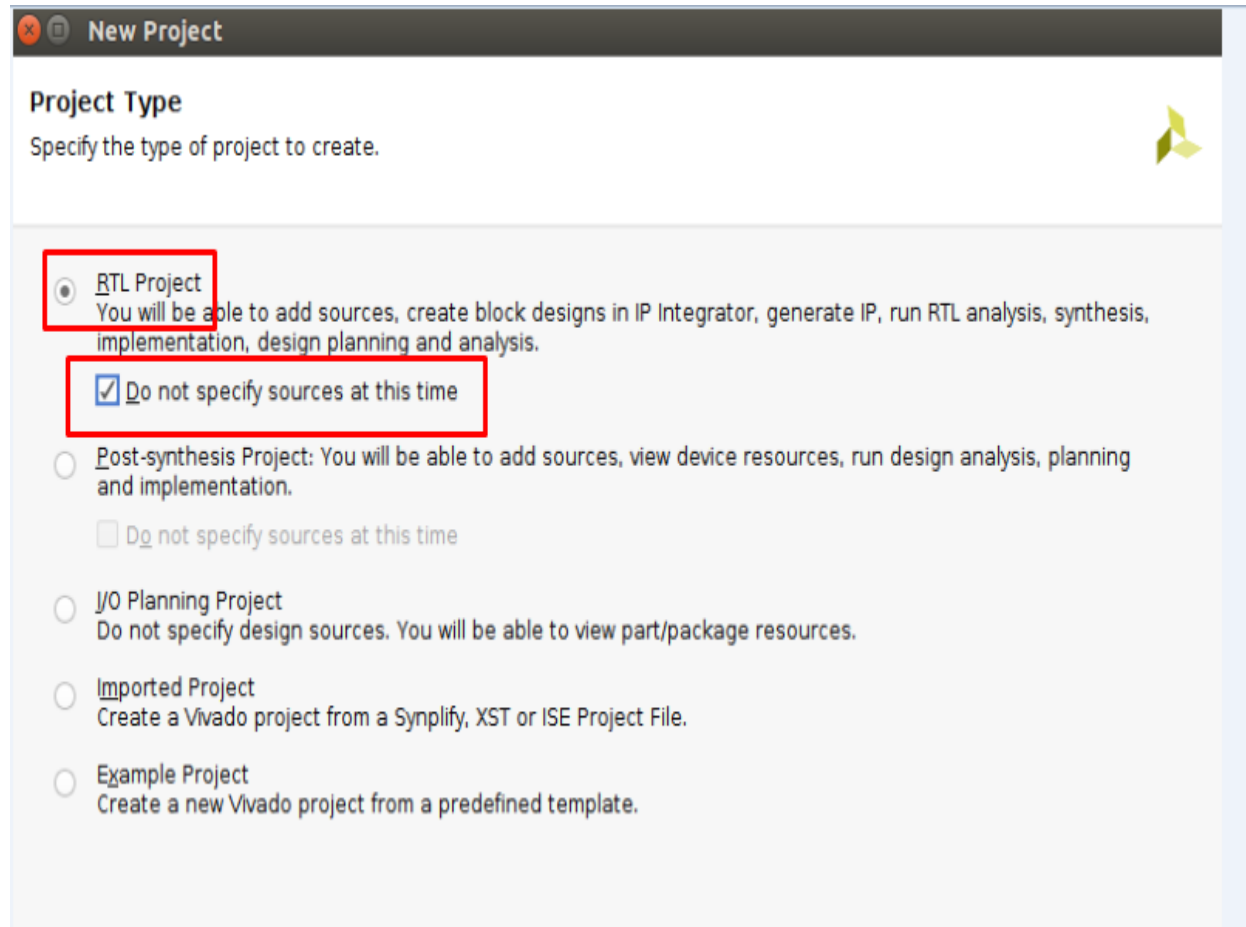
드라이버 설치가 제대로 안될 수 있기 때문에 드라이버 설치 권장.

2) Vivado hardware 설계 1

1

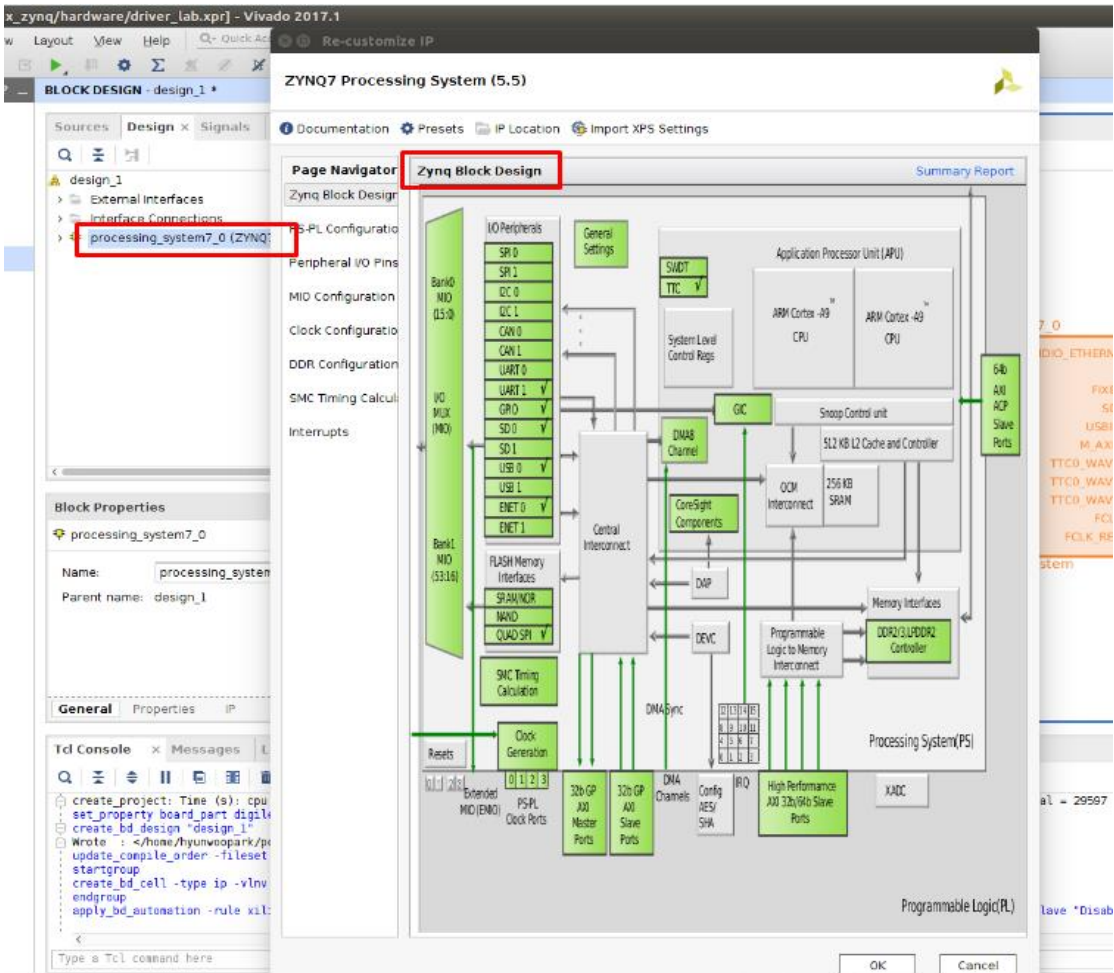


2

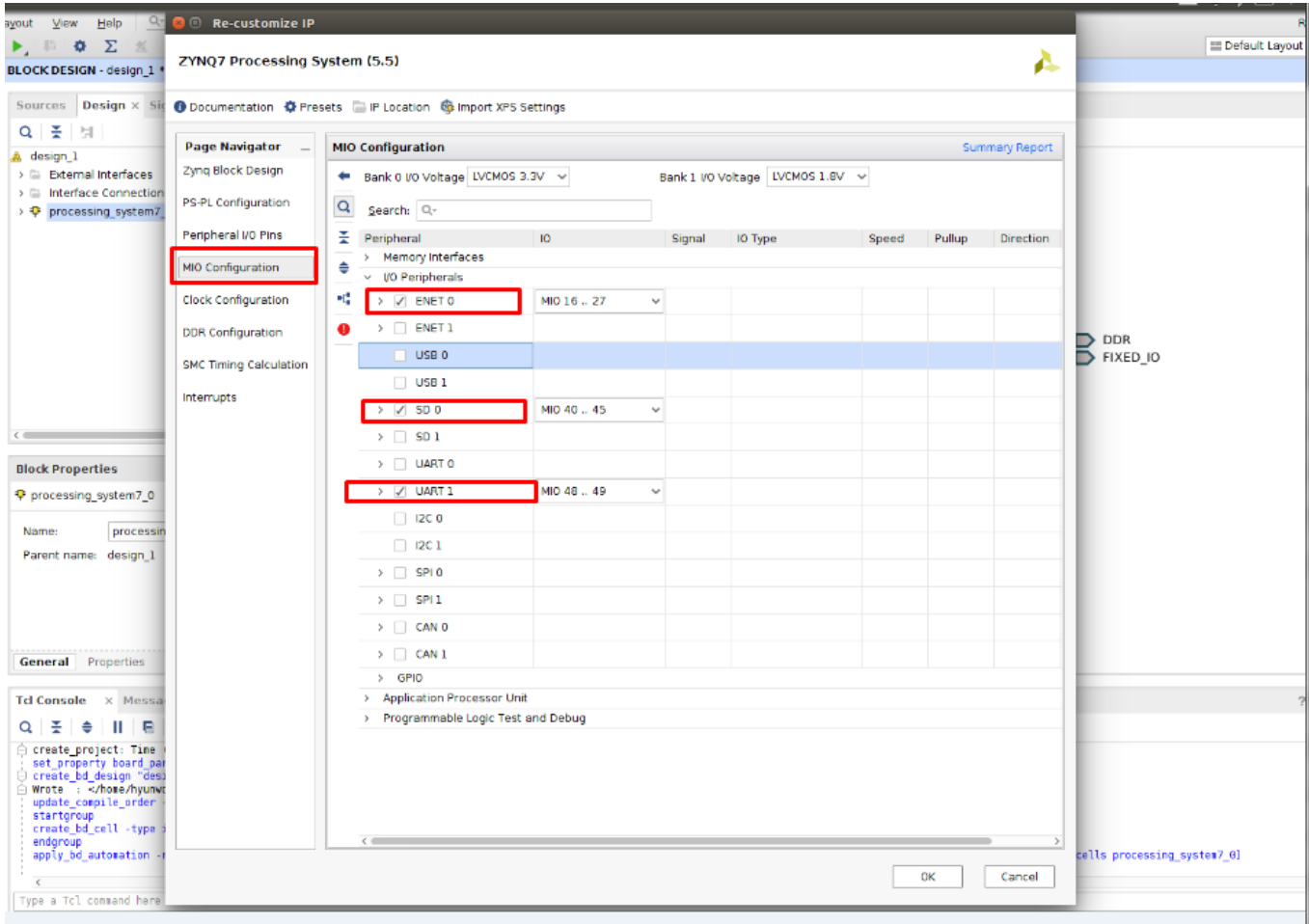


2) Vivado hardware 설계 2

3

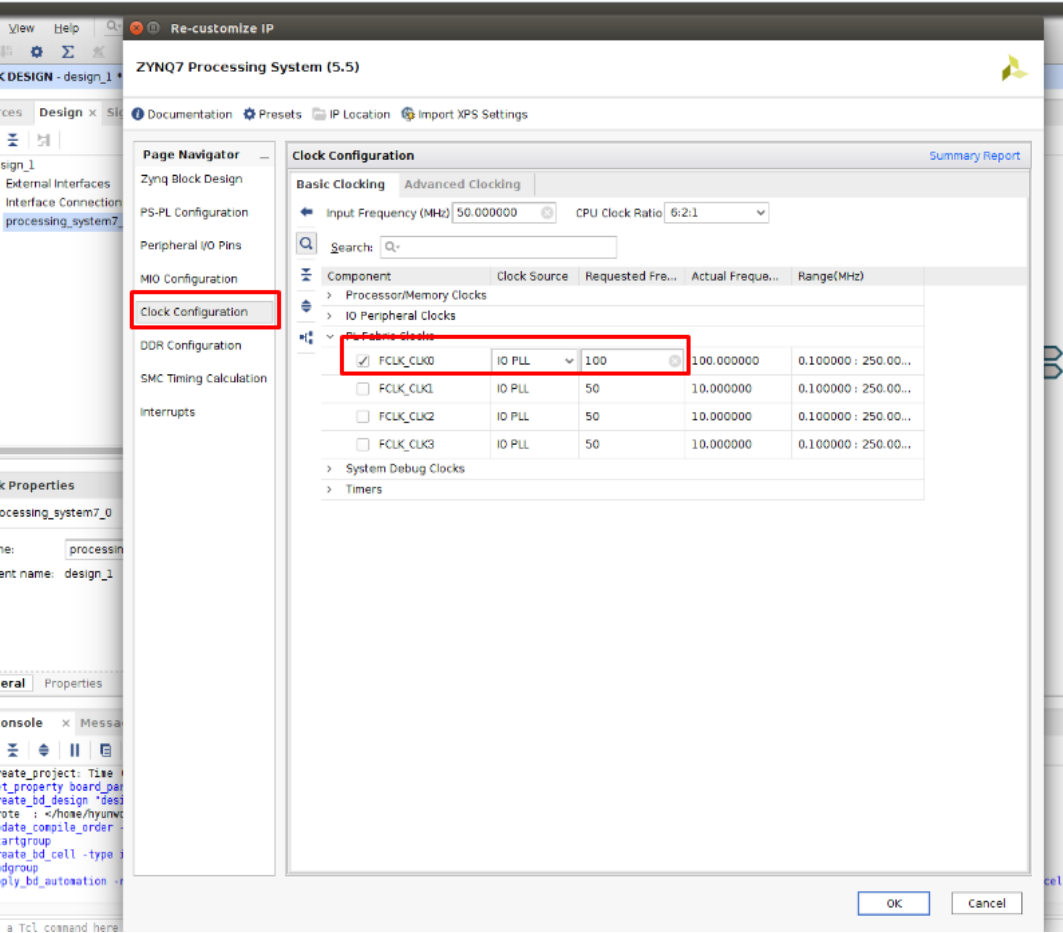


4

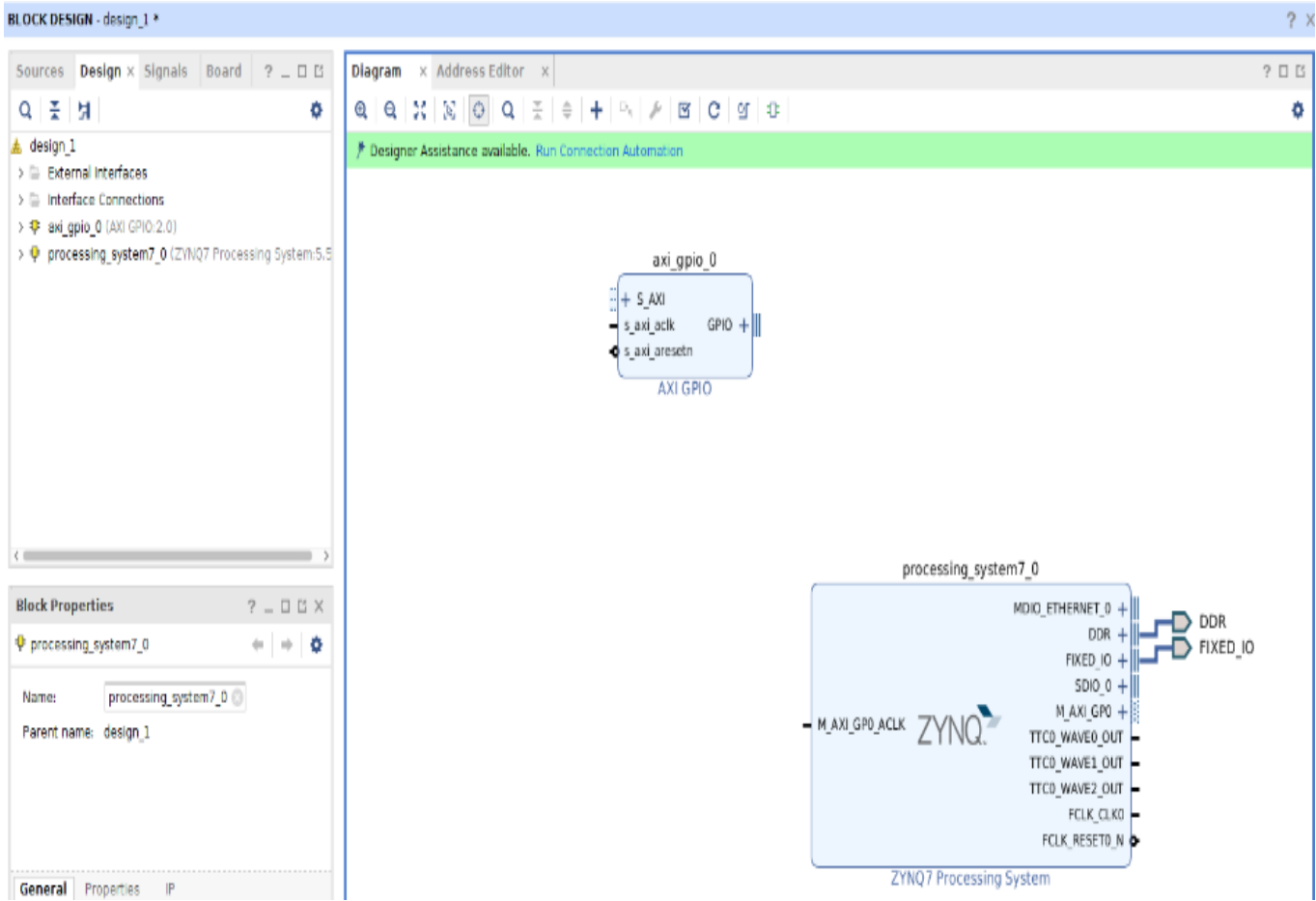


2) Vivado hardware 설계 3

5

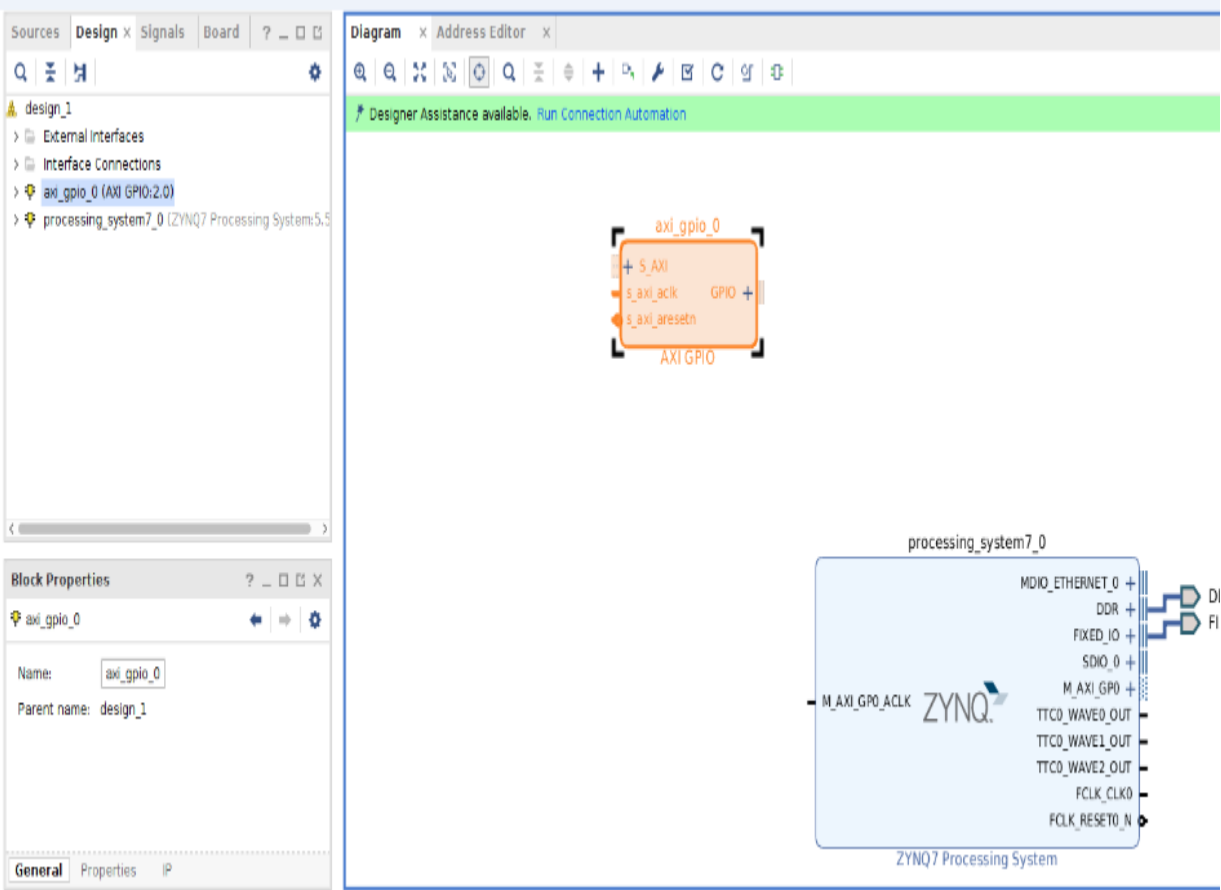


6

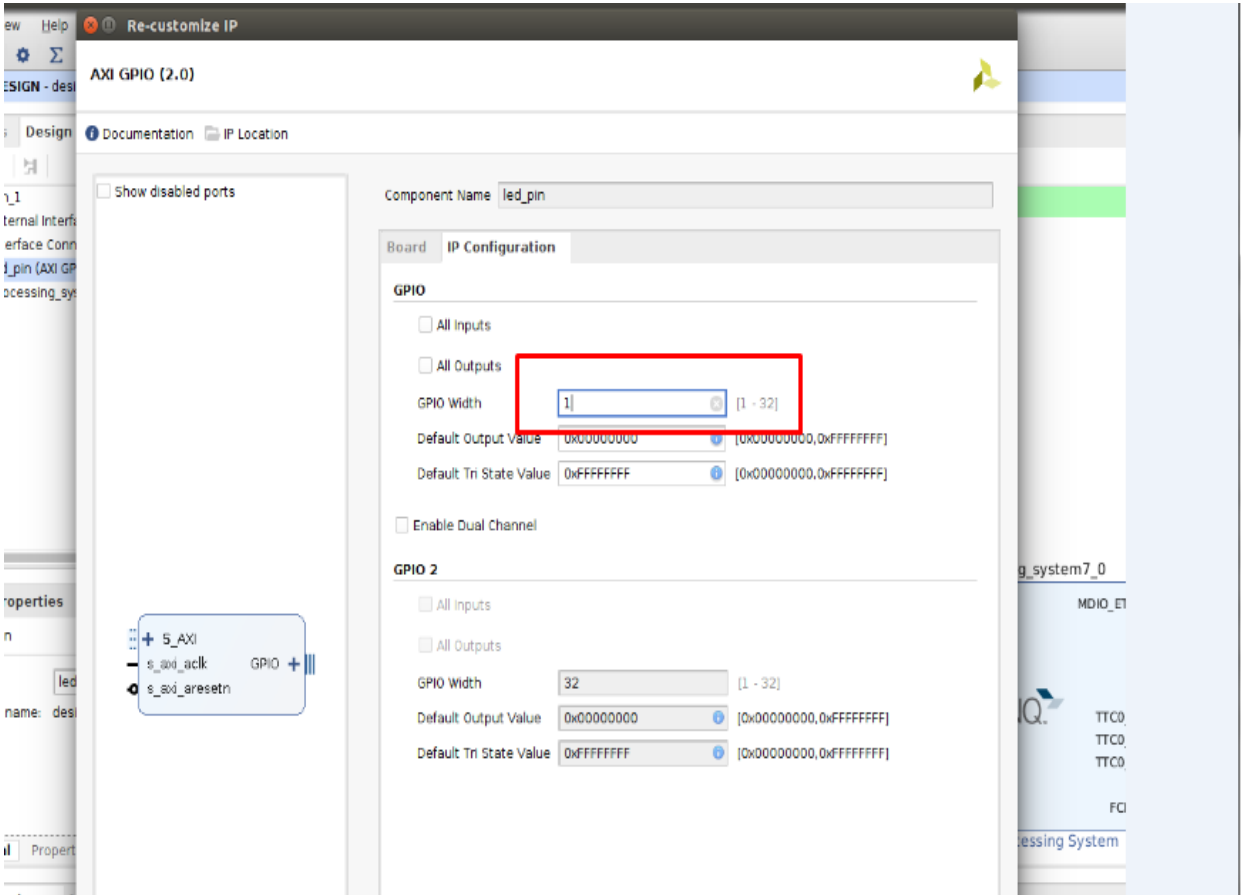


2) Vivado hardware 설계 4

7

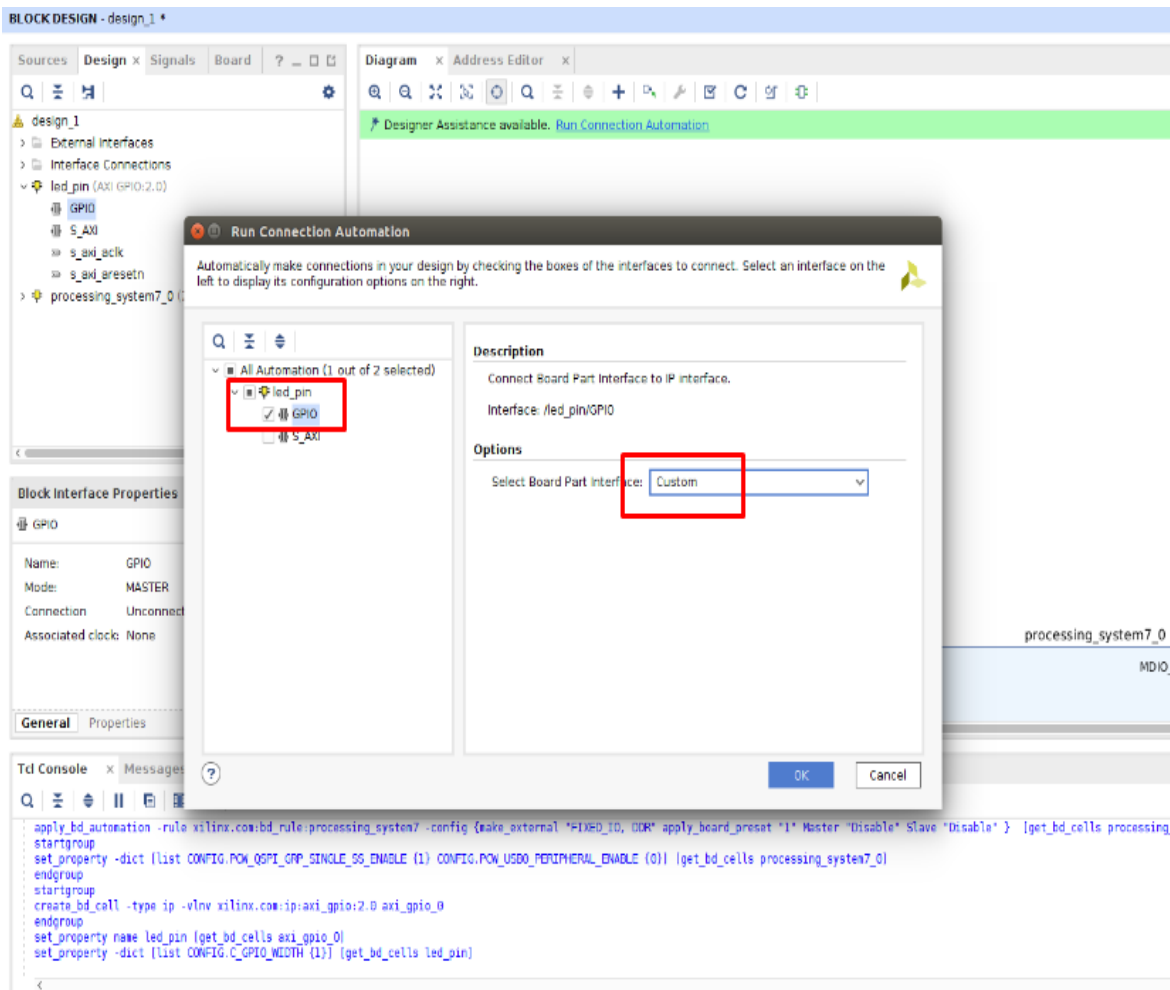


8

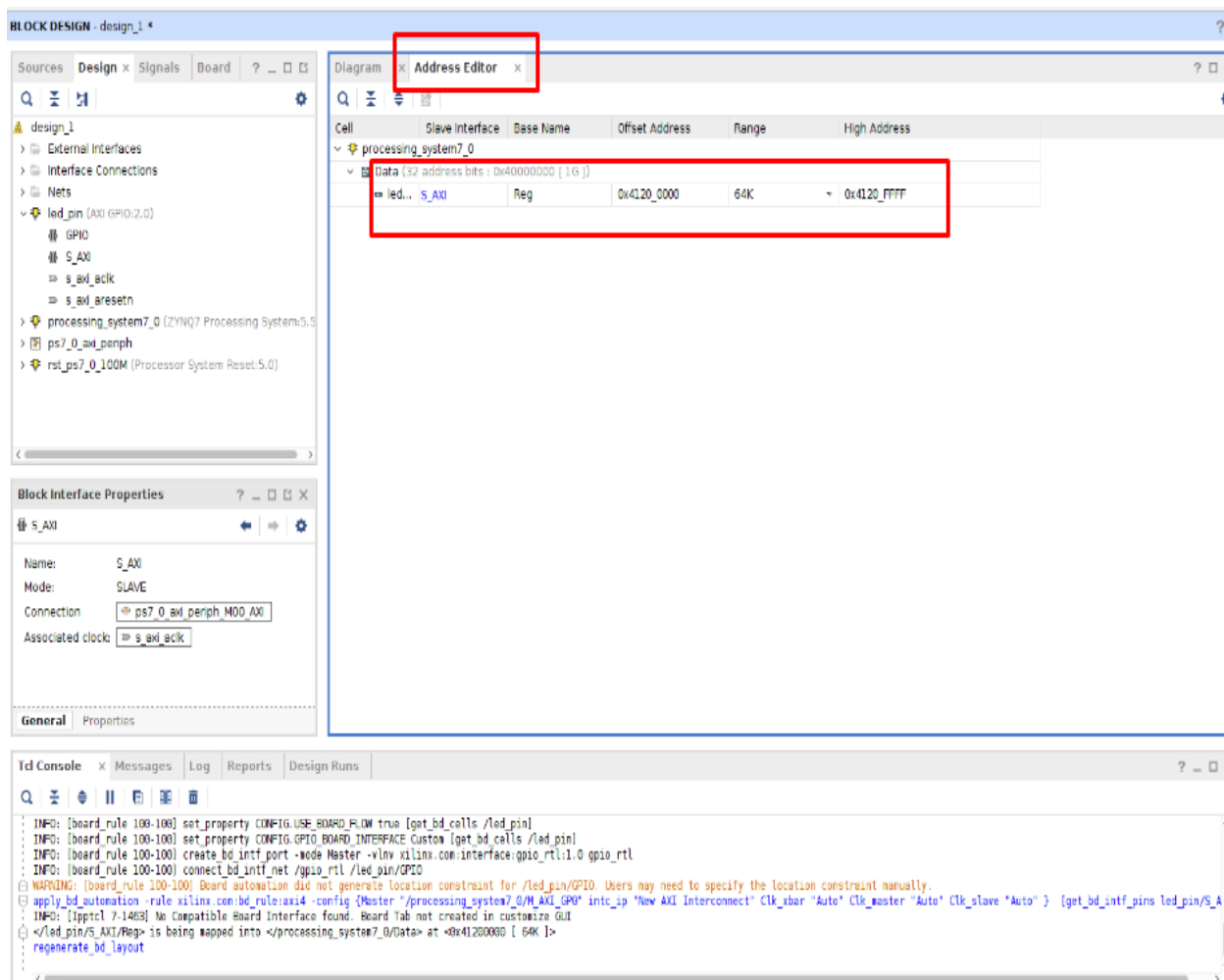


2) Vivado hardware 설계 5

9

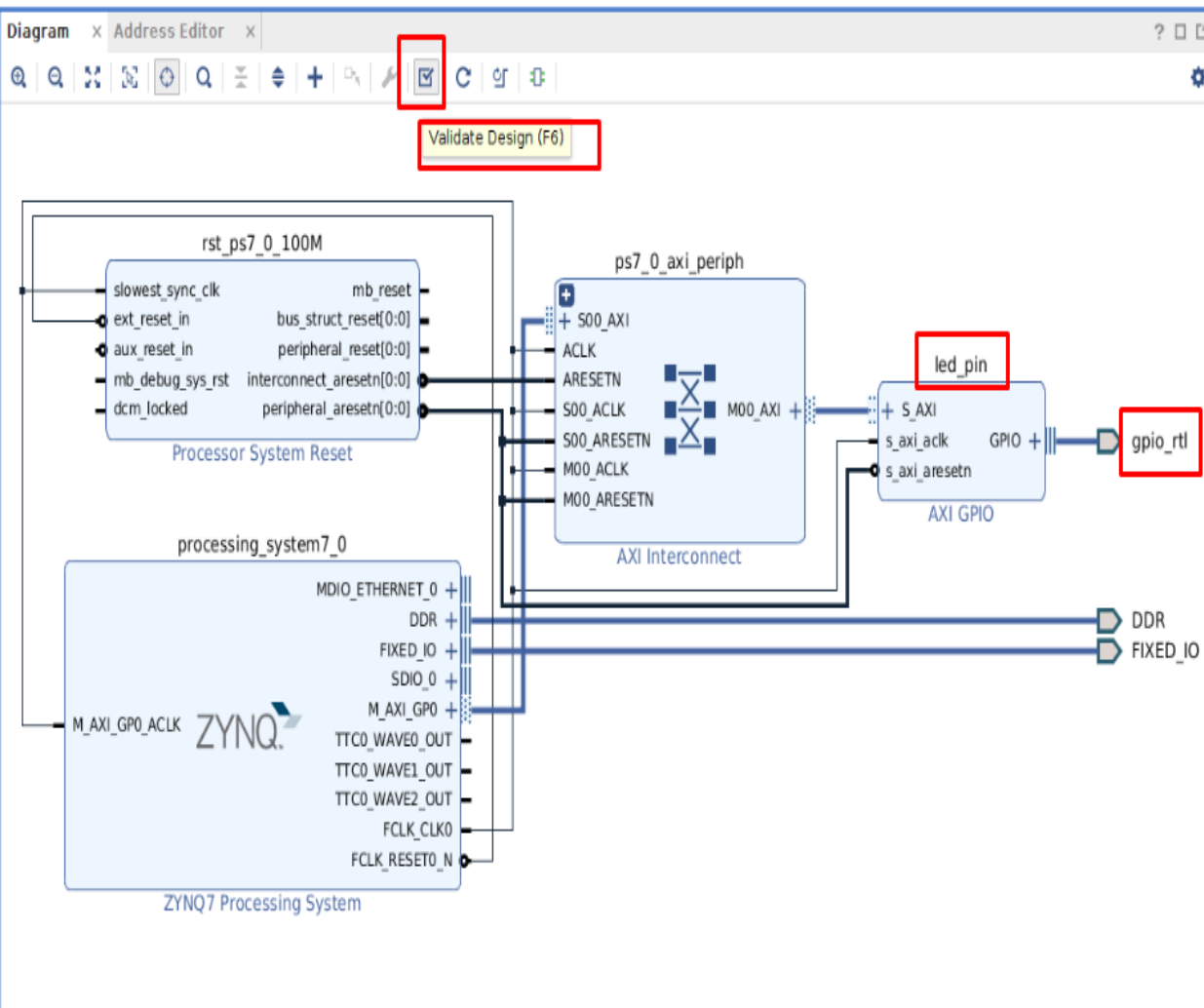


10

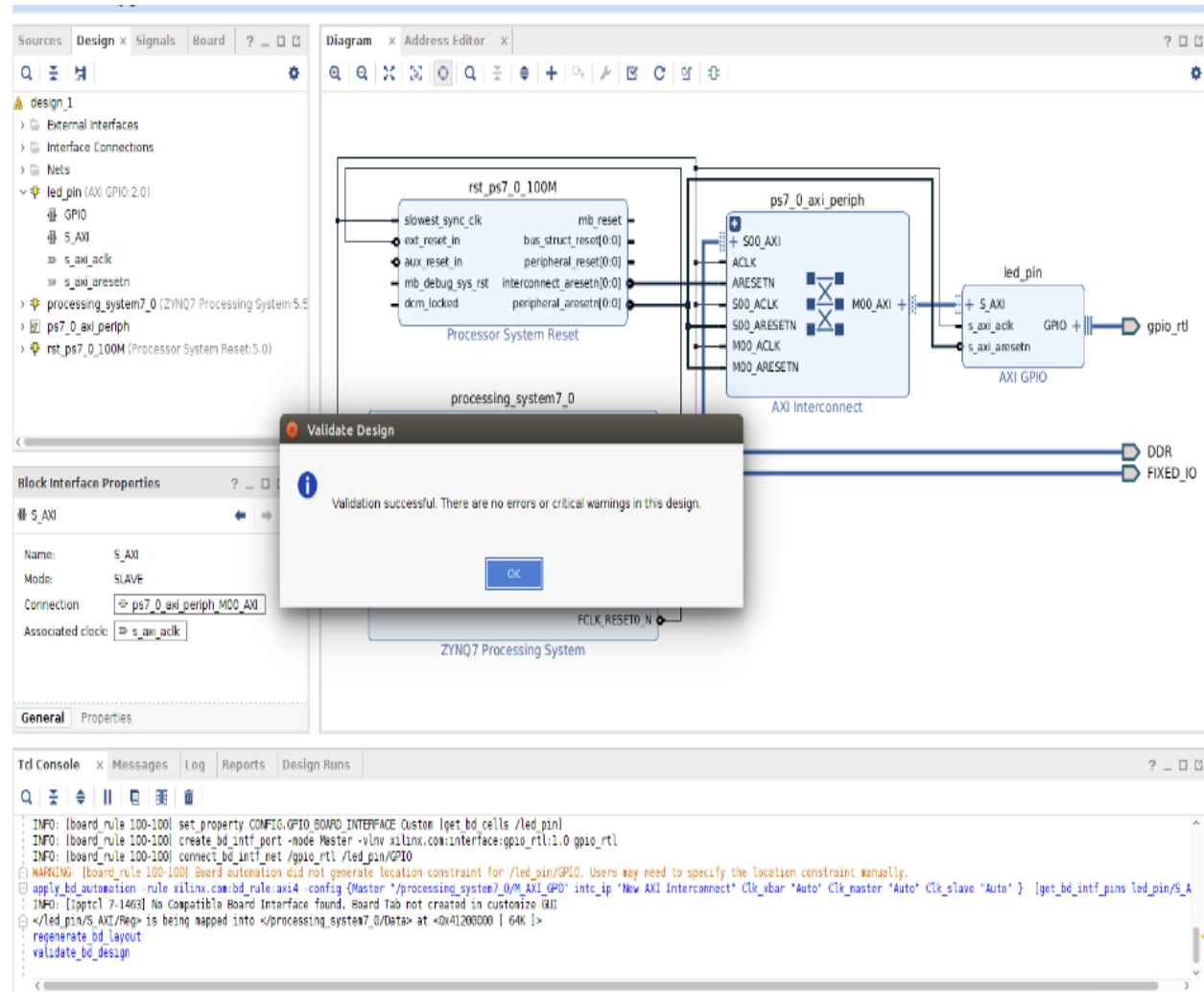


2) Vivado hardware 설계 6

11

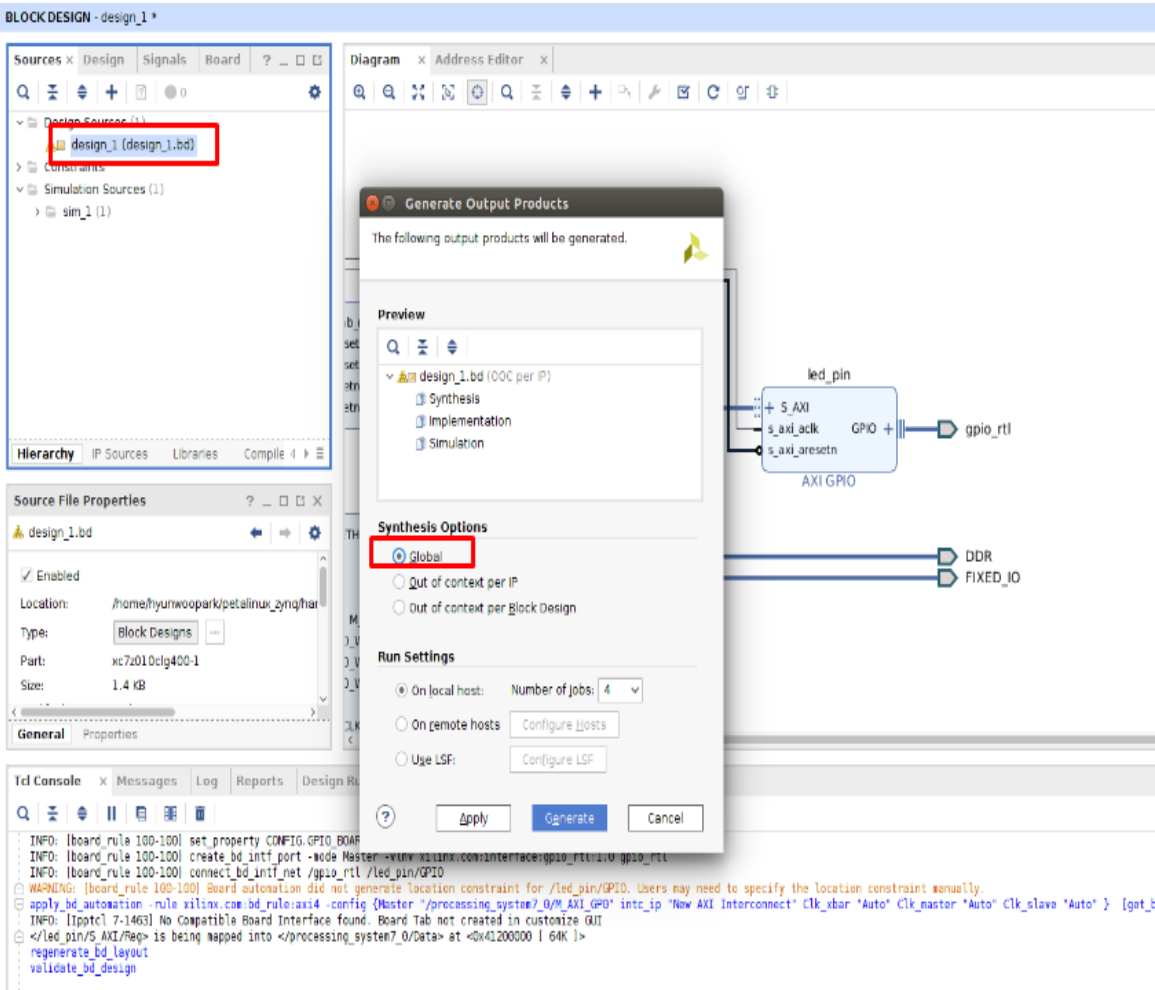


12

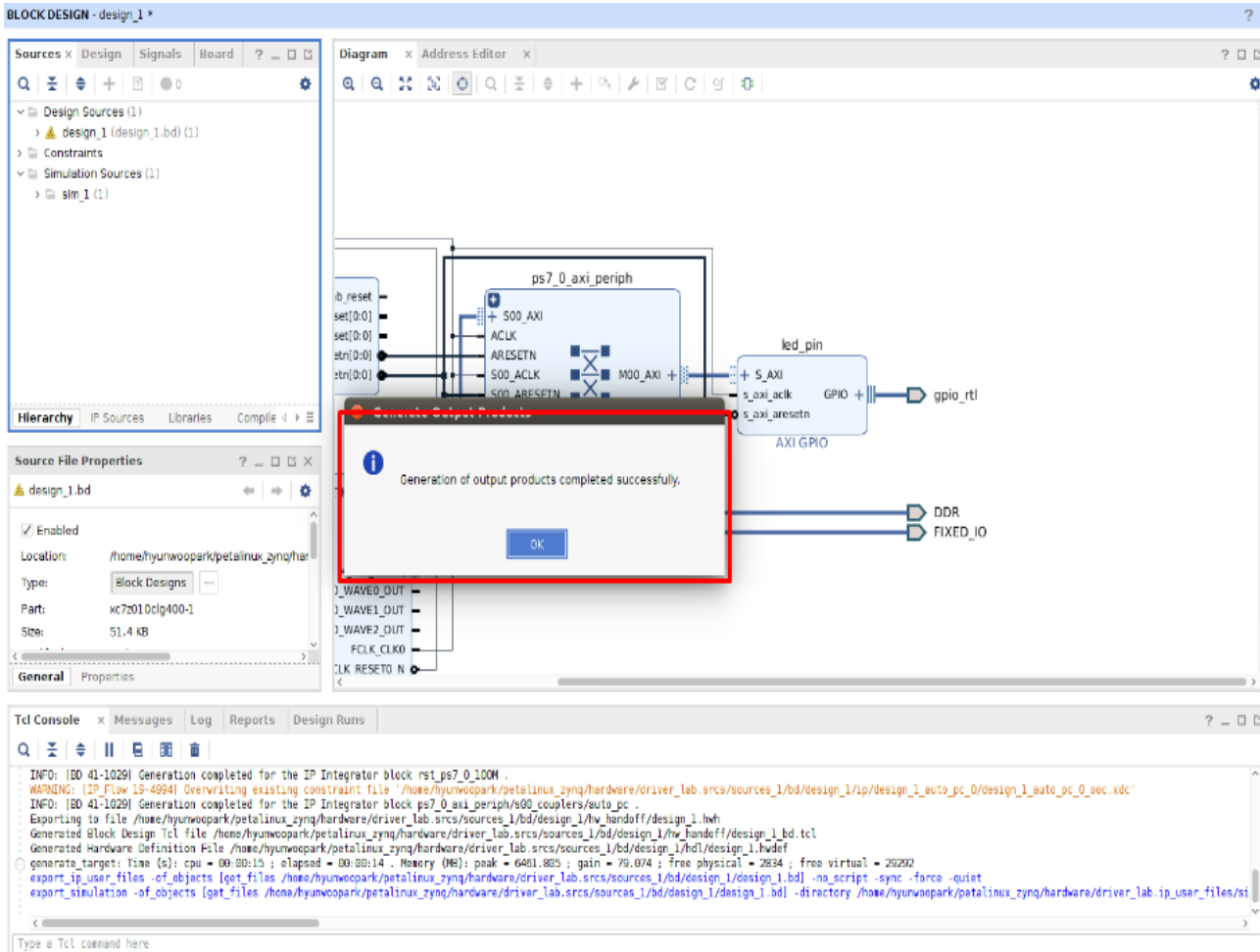


2) Vivado hardware 설계 7

13



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2) Vivado hardware 설계 8

15

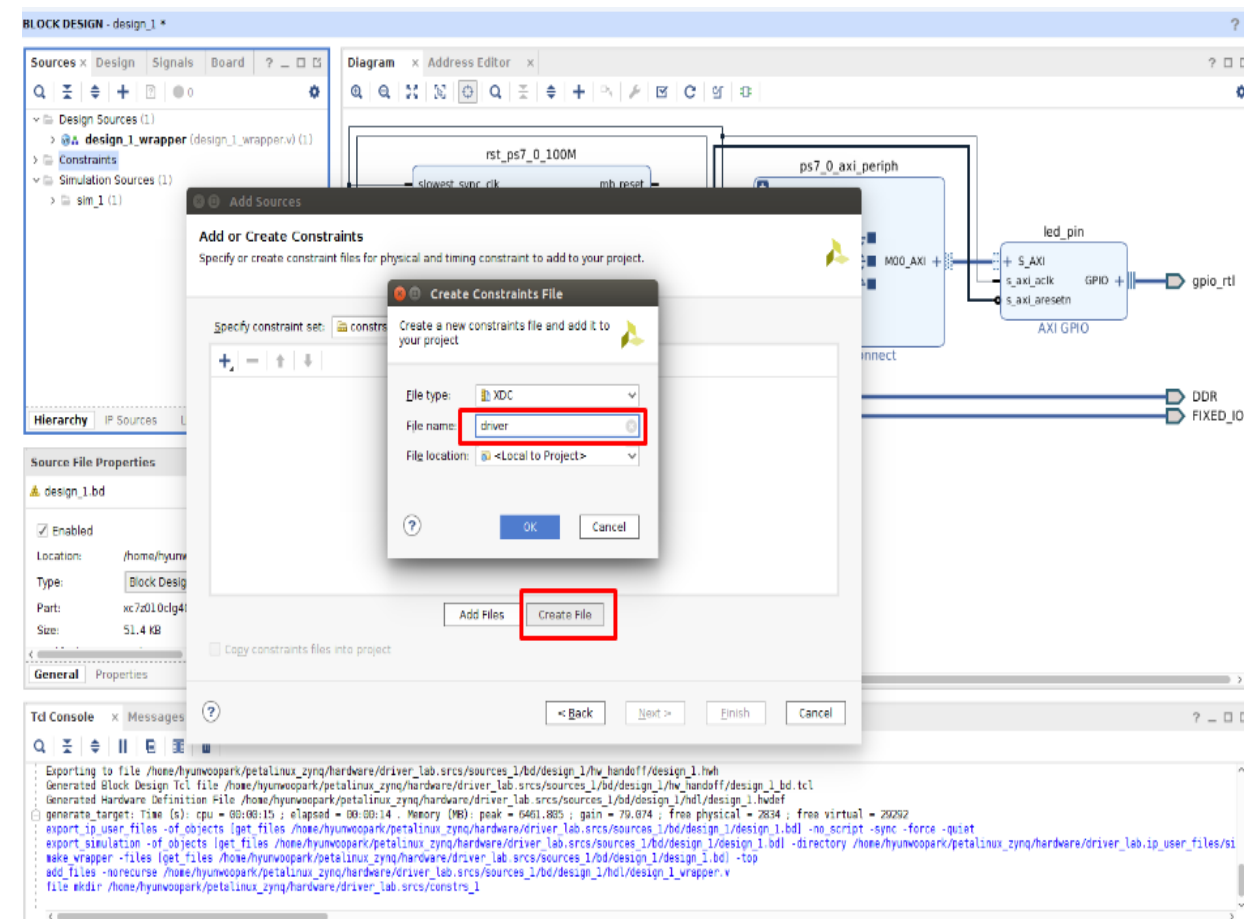
The screenshot shows the Vivado Block Design interface for a project named 'design_1'. The design includes a 'rst_ps7_0_100M' block, a 'ps7_0_axi_periph' block, and an 'led_pin' block. A 'Create HDL Wrapper' dialog box is open, prompting the user to either add or copy the HDL wrapper file to the project. The dialog has two options: 'Copy generated wrapper to allow user edits' (selected) and 'Let Vivado manage wrapper and auto-update'. The background design shows connections between the reset block, the AXI peripheral, and the LED pin, with various signals like 'slowest_sync_clk', 'mb_reset', 'ext_reset_in', 'aux_reset_in', 'mb_debug_sys_rst', 'dcm_locked', 'bus_struct_reset[0:0]', 'peripheral_reset[0:0]', 'interconnect_aresetn[0:0]', and 'peripheral_aresetn[0:0]'. The 'led_pin' block is connected to 'GPIO' and 'gpi_rtl'.

16

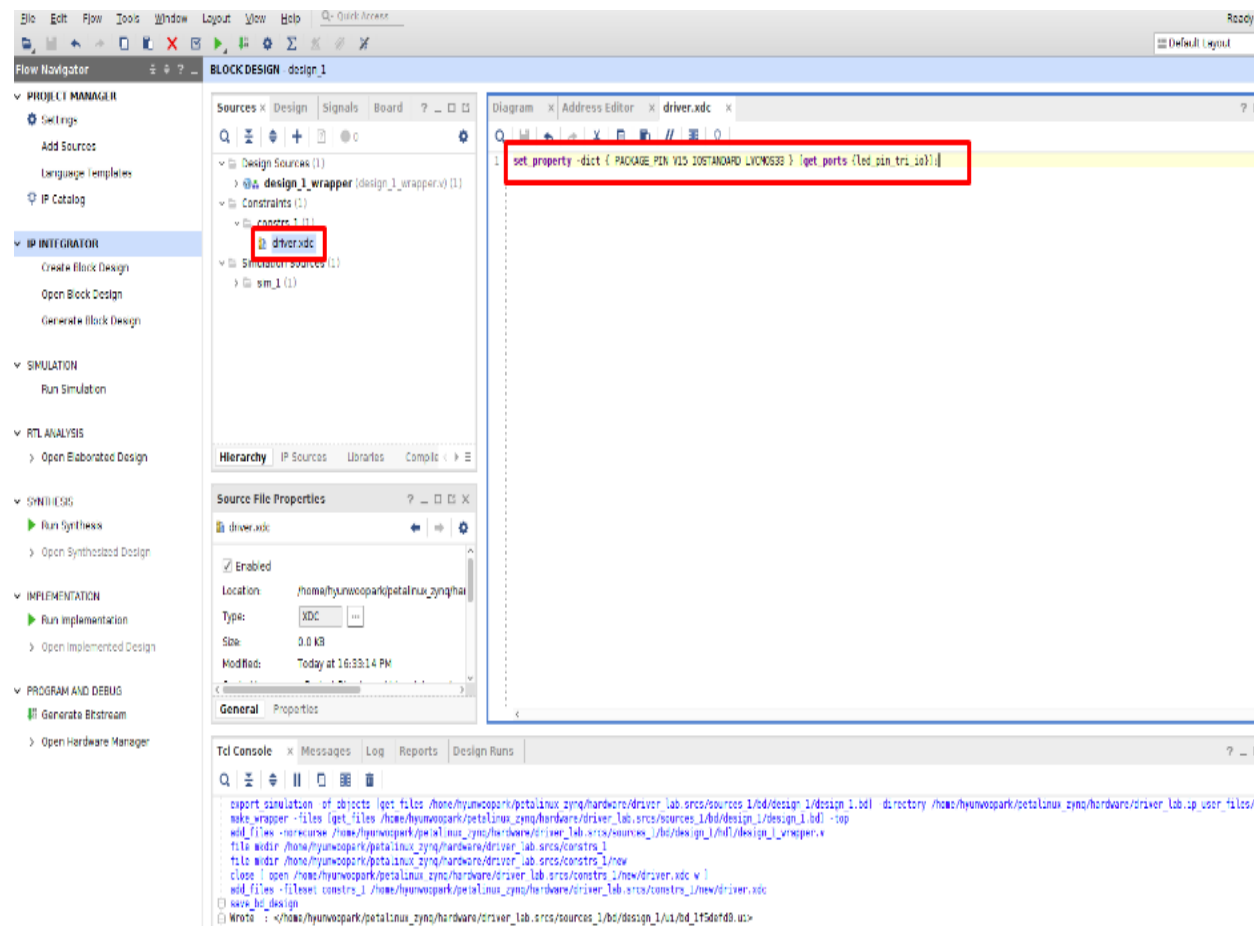
The screenshot shows the Vivado Block Design interface for a project named 'design_1'. The design includes a 'rst_ps7_0_100M' block, a 'ps7_0_axi_periph' block, and an 'led_pin' block. An 'Add Sources' dialog box is open, guiding the user through the process of adding and creating sources for the project. The dialog has three options: 'Add or create constraints' (selected), 'Add or create constraint files for physical and timing constraint to add to your project', and 'Add or create generated sources'. The background design shows connections between the reset block, the AXI peripheral, and the LED pin, with various signals like 'slowest_sync_clk', 'mb_reset', 'ext_reset_in', 'aux_reset_in', 'mb_debug_sys_rst', 'dcm_locked', 'bus_struct_reset[0:0]', 'peripheral_reset[0:0]', 'interconnect_aresetn[0:0]', and 'peripheral_aresetn[0:0]'. The 'led_pin' block is connected to 'GPIO' and 'gpi_rtl'.

2) Vivado hardware 설계 9

17



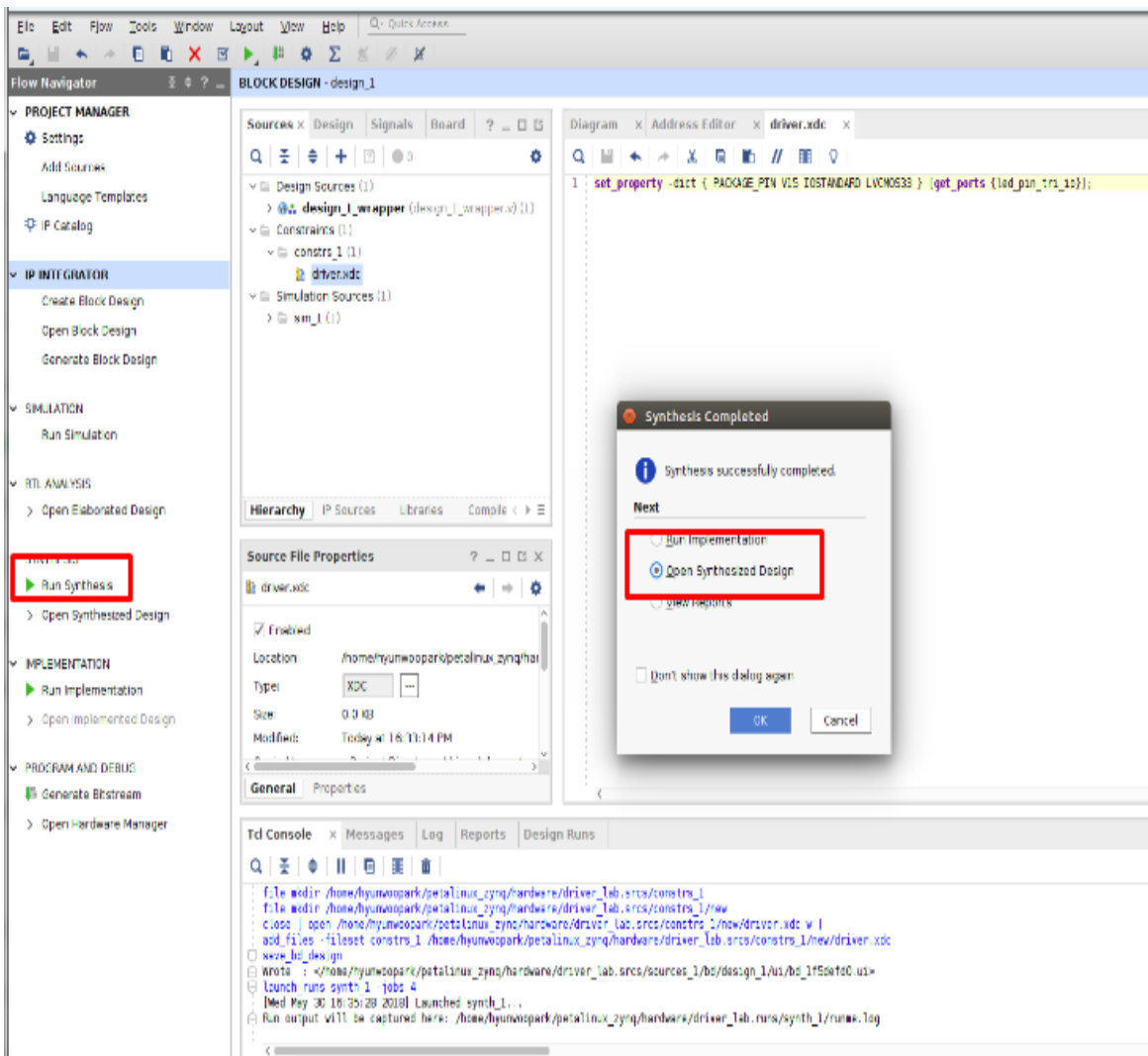
18



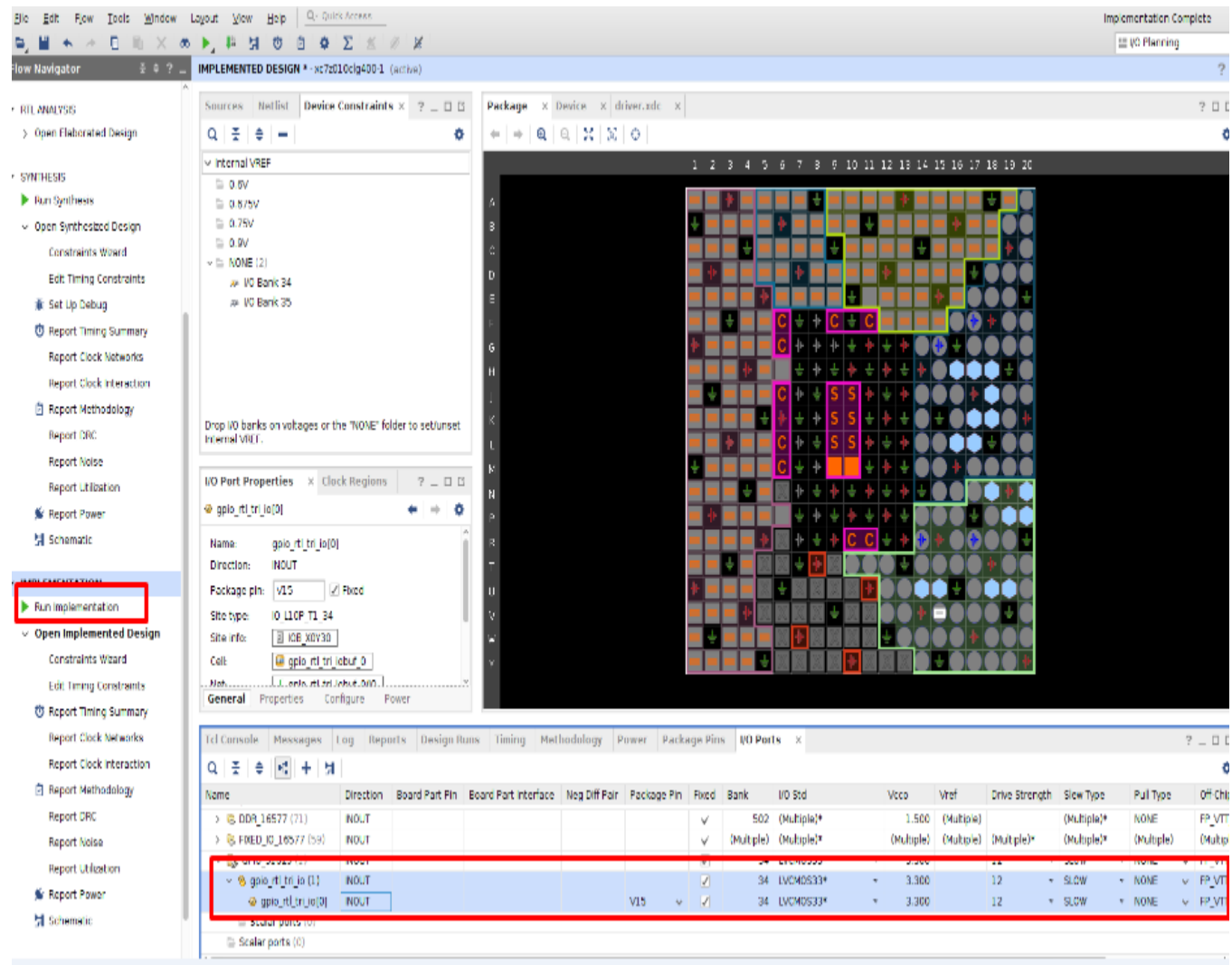
```
set_property -dict { PACKAGE_PIN V15 IOSTANDARD LVCMOS33 } [get_ports {gpio_rtl_tri_io}];
```

2) Vivado hardware 설계 10

19

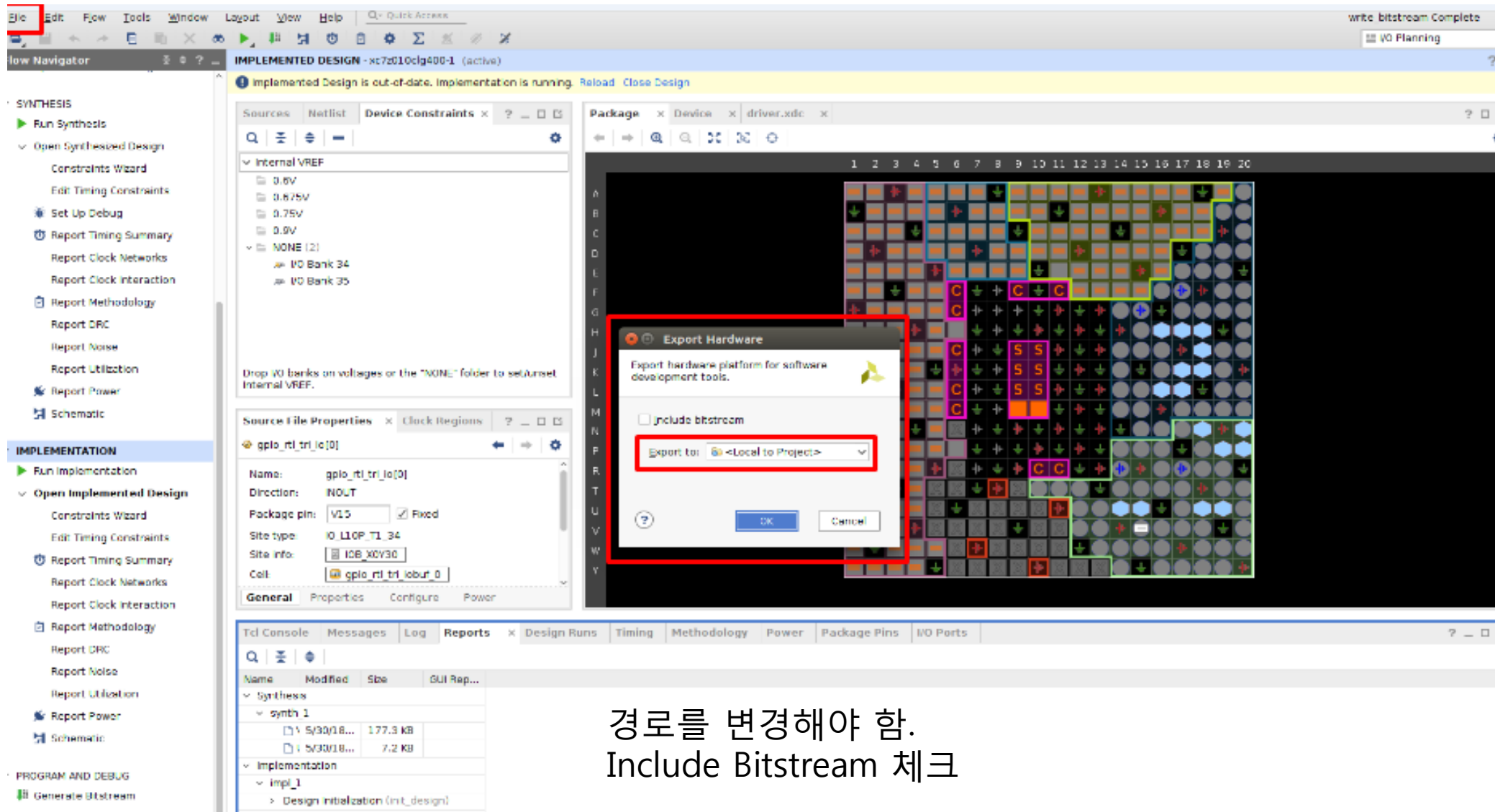


20



2) Vivado hardware 설계 11

21



경로를 변경해야 함.
Include Bitstream 체크

2) Vivado hardware 설계 12

22

```
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ petalinux-create -t project -n software --template zynq
INFO: Create project: software
INFO: New project successfully created in /home/hyunwoopark/petalinux_zynq/software
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd hardware/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/hardware$ ls
driver_lab.cache  driver_lab.ioplanning  driver_lab.runs  driver_lab.sim  driver_lab.xpr
driver_lab.hw     driver_lab.ip_user_files  driver_lab.sdk  driver_lab.srscs
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/hardware$ cd driver_lab.sdk/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/hardware/driver_lab.sdk$ petalinux-config --get-hw-description -p ~/petalinux_zynq/software/
```

```
hyunwoopark@hyunwoopark-P65-P67SG: ~/petalinux_zynq/hardware/driver_lab.sdk
/home/hyunwoopark/petalinux_zynq/software/subsystems/linux/config - linux System Configuration

linux System Configuration
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty submenus ----). Highlighted letters are hotkeys.
Pressing <Y> includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to exit, <?> for Help, </> for Search.
Legend: [*] built-in [ ] excluded <M> module < > module capable

linux Components Selection --->
  Auto Config Settings --->
  *- Subsystem AUTO Hardware Settings ---->
  Kernel Bootargs --->
  u-boot Configuration --->
  Image Packaging Configuration --->
  Firmware Version Configuration --->

<Select> <Exit> <Help> <Save> <Load>
```

2) Vivado hardware 설계 13

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```
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ 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/hyunwoopark/petalinux_zynq/
INFO: New project successfully created in /home/hyunwoopark/petalinux_zynq/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$
```

```
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd ZYBO_petalinux_v2015_4/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/ZYBO_petalinux_v2015_4$ petalinux-create -t apps --name gpio-dev-mem-test
INFO: Create apps: gpio-dev-mem-test
INFO: New apps successfully created in /home/hyunwoopark/petalinux_zynq/ZYBO_petalinux_v2015_4/components/apps/gpio-dev-mem-test
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/ZYBO_petalinux_v2015_4$
```

```
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/ZYBO_petalinux_v2015_4$ ls
components  config.project  hardware  hw-description  pre-built  subsystems
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/ZYBO_petalinux_v2015_4$ cd ..
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ ls
hardware  petalinux-v2015.4-final  software  ZYBO_petalinux_v2015_4  ZYBO_petalinux_v2015_4.bsp
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq$ cd software/
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/software$ ls
build  components  config.project  hw-description  subsystems
hyunwoopark@hyunwoopark-P65-P67SG:~/petalinux_zynq/software$ petalinux-build
```

2) Vivado hardware 설계 14

- 38) 이제 HW 설계와 SW 연동을 수행해보도록 한다.
그 이전에 각종 설계를 수행할 것인데
관리를 위해 디렉토리를 한 단계 더 분할하도록 한다.
mkdir hw_sw_co_design
- (39) cd hw_sw_co_design
- (40) FPGA 로 설계한 HW 를 보관할 디렉토리를 만든다.
mkdir hardware
- (41) Xilinx Vivado 툴을 실행한다.
- (42) 수업에서 진행하였듯이 아래와 같은 각종 HW 를 설계한다.
(GPIO, ADC, I2C, SPI, PWM, 기타 전용 HW 등등)
프로젝트 저장장 방금 만든 hardware 디렉토리에 저장하도록 한다.
hardware 의 위치는 아래와 같다.
fpga_dev_driver/hw_sw_co_design/hardware
- (43) petalinux-create -t project -n kernel --template zynq
- (44) cd kernel
- (45) petalinux-config --get-hw-description=~/fpga_dev_driver/hw_sw_co_design/hardware/~~~.sdk
여기서 sdk 는 Vivado 에서 HW 설계한 내용에 해당한다.
- (46) cd components/bootloader/zynq_fsbl
- (47) ls
FPGA 베이스의 Cortex-A9 부트 코드를 볼 수 있다
- (48) cd ../../..
- (49) petalinux-config -c u-boot
- (50) petalinux-build
- (51) petalinux-create -t apps -n device_driver --enable
- (52) cd components/apps/device_driver
- (53) vi device_driver.c

HW 를 제어하기 위한 SW 코드인 Device Driver 코드를 작성한다.

(54) cd ~/fpga_dev_driver/hw_sw_co_design/kernel/images/linux

(55) ls
여기에 부트 로더와 리눅스 이미지가 있는 것을 볼 수 있을 것이다.

(56) petalinux-build

(57) petalinux-package --boot --fsbl zynq_fsbl.elf --fpga ./비트스트림 --u-boot --force
Vivado 에서 설계한 HW 와 관련한 비트스트림 정보가 여기에 있다.

예로 비트스트림 파일명이 test_wrapper.bit 라면
./비트스트림은 ./test_wrapper.bit 로 변경되어야 한다.

✔ **Re: petalinux bootgen missing**

export PATH=\$PATH:/home/hyunwoopark/xilinx/SDK/2017.1/bin/

Ps. 이거 때문에 진짜... 새벽까지 잠도 못자고 진짜 고생했다.
하;;;

3) SD 카드 설정 및 보드에 올리기

- (58) 수업중 제공한 문서를 기반으로 SD 카드에 부트 로더와 리눅스 이미지를 옮긴다.
- (59) FPGA 보드의 점퍼를 SD 카드 부팅으로 변경한다.
- (60) 컴퓨터와 FPGA 보드를 USB 로 연결한다.
- (61) 전원을 인가한다.
- (62) dmesg 를 통해 USB Device Driver 가 잘 잡히는지 확인한다.
- (63) `sudo apt-get install putty`
- (64) 푸티의 폰트 등 각종 설정을 수행한다.
- (65) `sudo chmod 666 /dev/ttyUSB1`
- (66) Baud Rate 를 115200 으로 지정하고 연결한다.
- (67) 리눅스 부팅되는 모습을 볼 수 있다.[출처] [64 회차 교육 로그](#) | 작성자 [silenc3502](#)