


[L14]最小PetaLinux启动

PetaLinux比较挑系统,因此只能按着他游戏规则来,因为里面涉及的Yocto比较挑,推荐使用和Vivado匹配的PetaLinux版本,小版本号比较难以匹配也没办法,比如我只能用Ubuntu 16.04的最后一个LTS,另外2018.3是最后一个依赖hdf的,之后的依赖xsa,所以暂时选2018.3.

Xilinx文档编号:UG1144 - 必须先阅读文档再看这个笔记.



Chapter 2

Setting Up Your Environment

Installation Requirements

The PetaLinux Tools Installation requirements are:

- Minimum workstation requirements:
 - 8 GB RAM (recommended minimum for Xilinx tools)
 - 2 GHz CPU clock or equivalent (minimum of 8 cores)
 - 100 GB free HDD space
- Supported OS:
 - Red Hat Enterprise Workstation/Server 7.2, 7.3, 7.4, 7.5 (64-bit)
 - CentOS 7.2, 7.3, 7.4, 7.5 (64-bit)
 - Ubuntu Linux 16.04.3, 16.04.4 (64-bit)
- You need to have root access to install the required packages mentioned in the following table. The PetaLinux tools need to be installed as a non-root user.
- PetaLinux requires a number of standard development tools and libraries to be installed on your Linux host workstation. Install the libraries and tools listed in the following table on the host Linux. All of the listed Linux Workstation Environments below have the 32-bit libraries needed by the PetaLinux tool. If there are any additional tool chain packages that need 32-bit libs on the host, install the same before issuing `petalinux-build`. [Table 2-1](#) below describes the required packages, and how to install them on different Linux workstation environments.
- PetaLinux tools require your host system `/bin/sh` is `bash`. If you are using Ubuntu distribution and your `/bin/sh` is `dash`, consult your system administrator to change your default host system `/bin/sh` with the `sudo dpkg-reconfigure dash` command.

安装Ubuntu应该人人都没难度,然后直接运行上面的.run文件,推荐在虚拟机中配置,这样在外面一个Proxifier就可以把虚拟机全局代理起来,因为后续很多工具还需要科学上网手段,而且对版本也比较挑,然后缺什么补什么,把工具包装上为止.

```
./petalinux-v2018.3-final-installer.run ~/petalinux
```

```
taterli@taterli-VirtualBox: ~
INFO: Checking installed tools
INFO: Checking installed development libraries
INFO: Checking network and other services
INFO: Checking installer checksum...
INFO: Extracting PetaLinux installer...

LICENSE AGREEMENTS

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

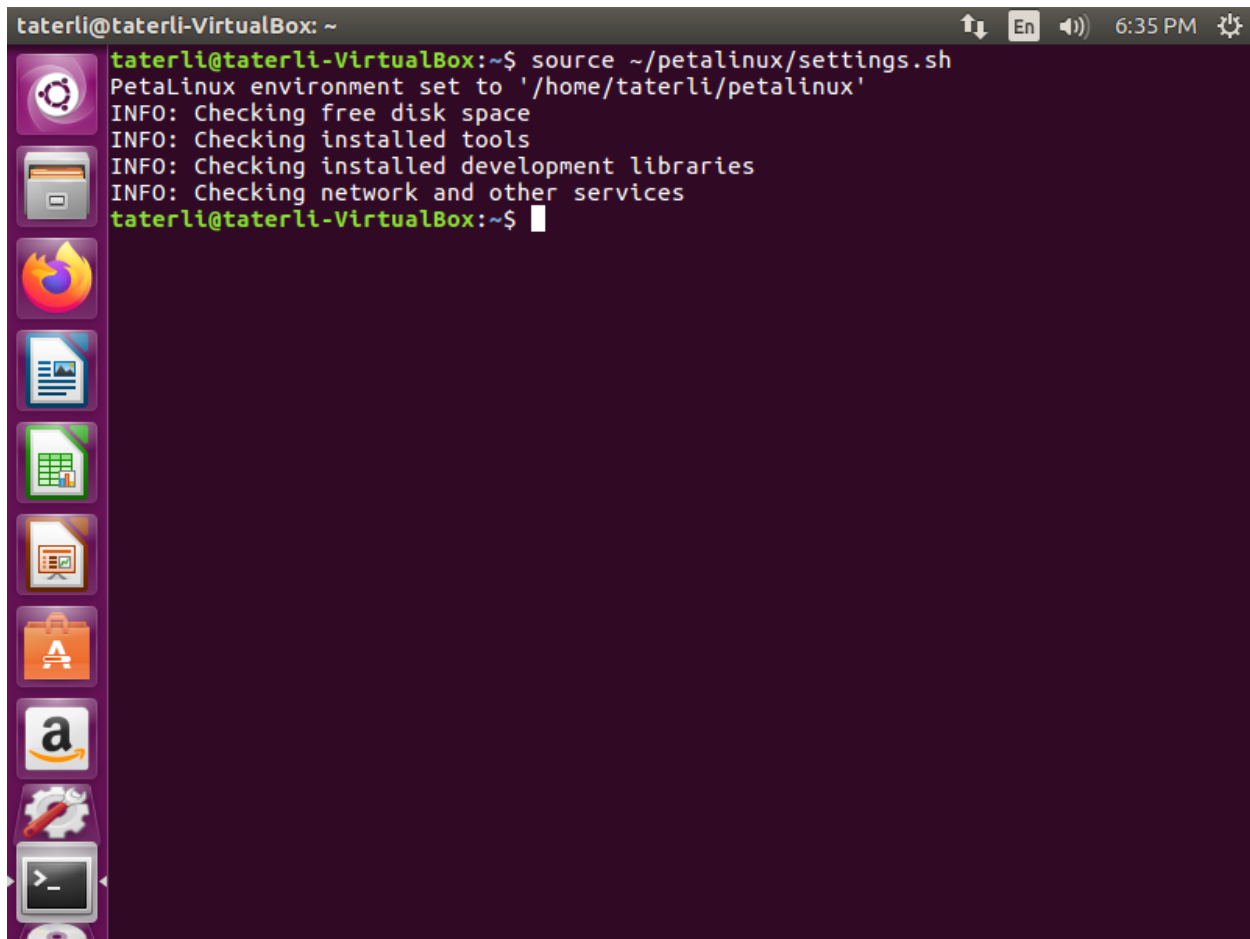
You do not have to accept the licenses, however if you do not then you may
not use PetaLinux SDK.

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: Installing PetaLinux...
INFO: Checking PetaLinux installer integrity...
INFO: Installing PetaLinux SDK to "/home/taterli/petalinux/."
INFO: Installing aarch64 Yocto SDK to "/home/taterli/petalinux/./components/yocto/source/aarch64"...
INFO: Installing arm Yocto SDK to "/home/taterli/petalinux/./components/yocto/source/arm"...
INFO: Installing microblaze_full Yocto SDK to "/home/taterli/petalinux/./components/yocto/source/microblaze_full"...
INFO: Installing microblaze_lite Yocto SDK to "/home/taterli/petalinux/./components/yocto/source/microblaze_lite"...
INFO: PetaLinux SDK has been installed to /home/taterli/petalinux/.
taterli@taterli-VirtualBox:~$
```

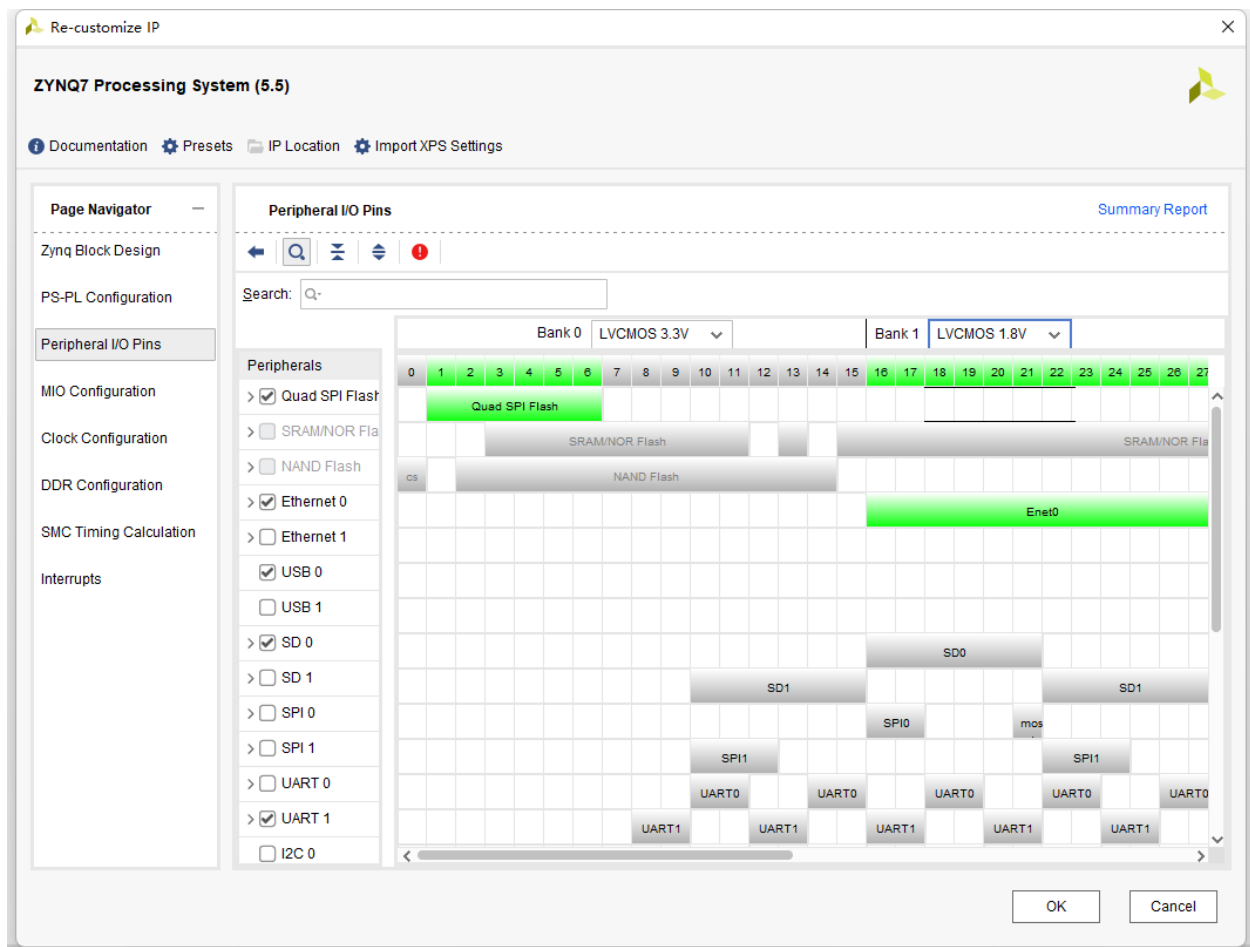
然后检查一下安装结果,有错误就解决错误,通常需要/bin/sh指向/bin/bash才能正常解释.

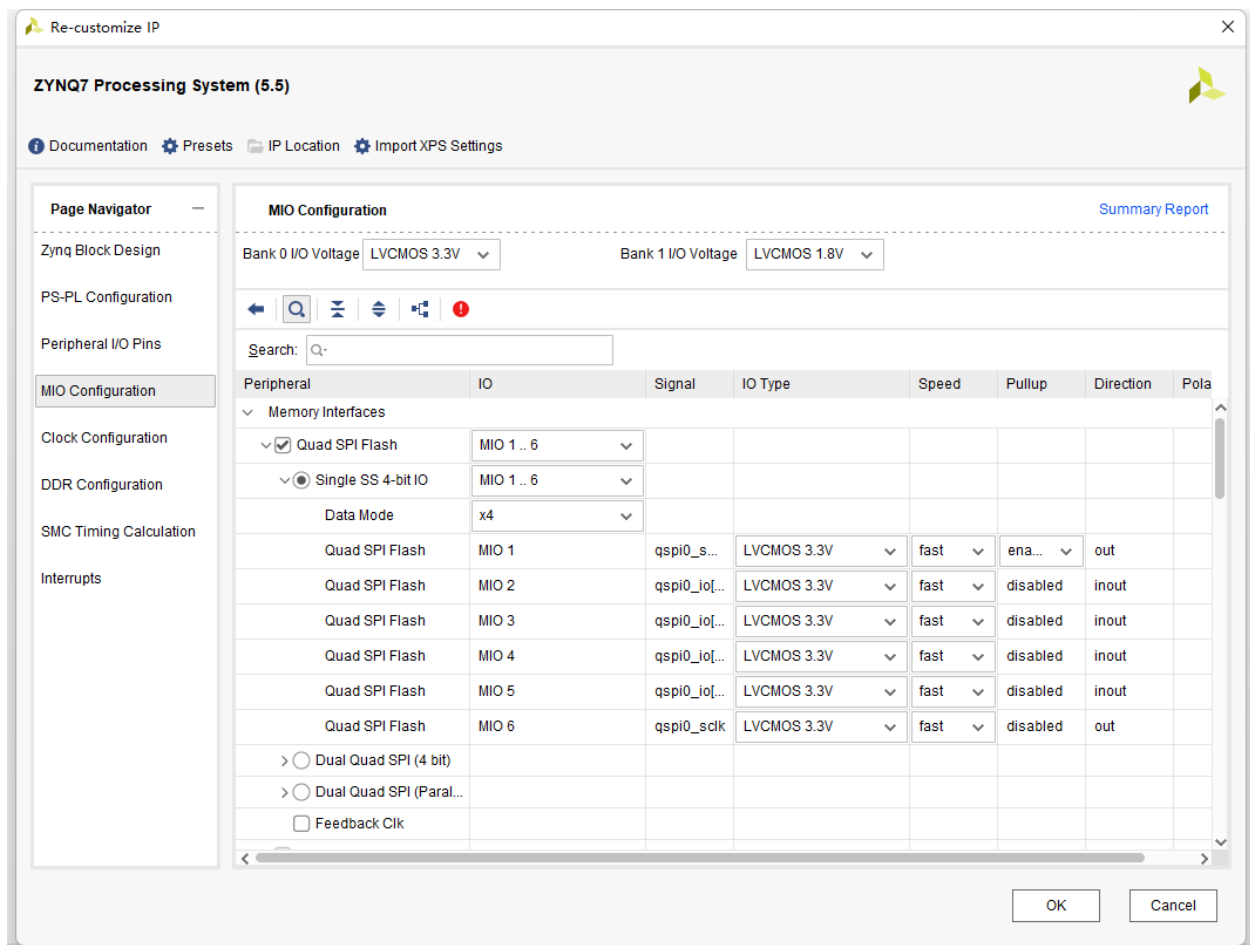
```
source ~/petalinux/settings.sh
```

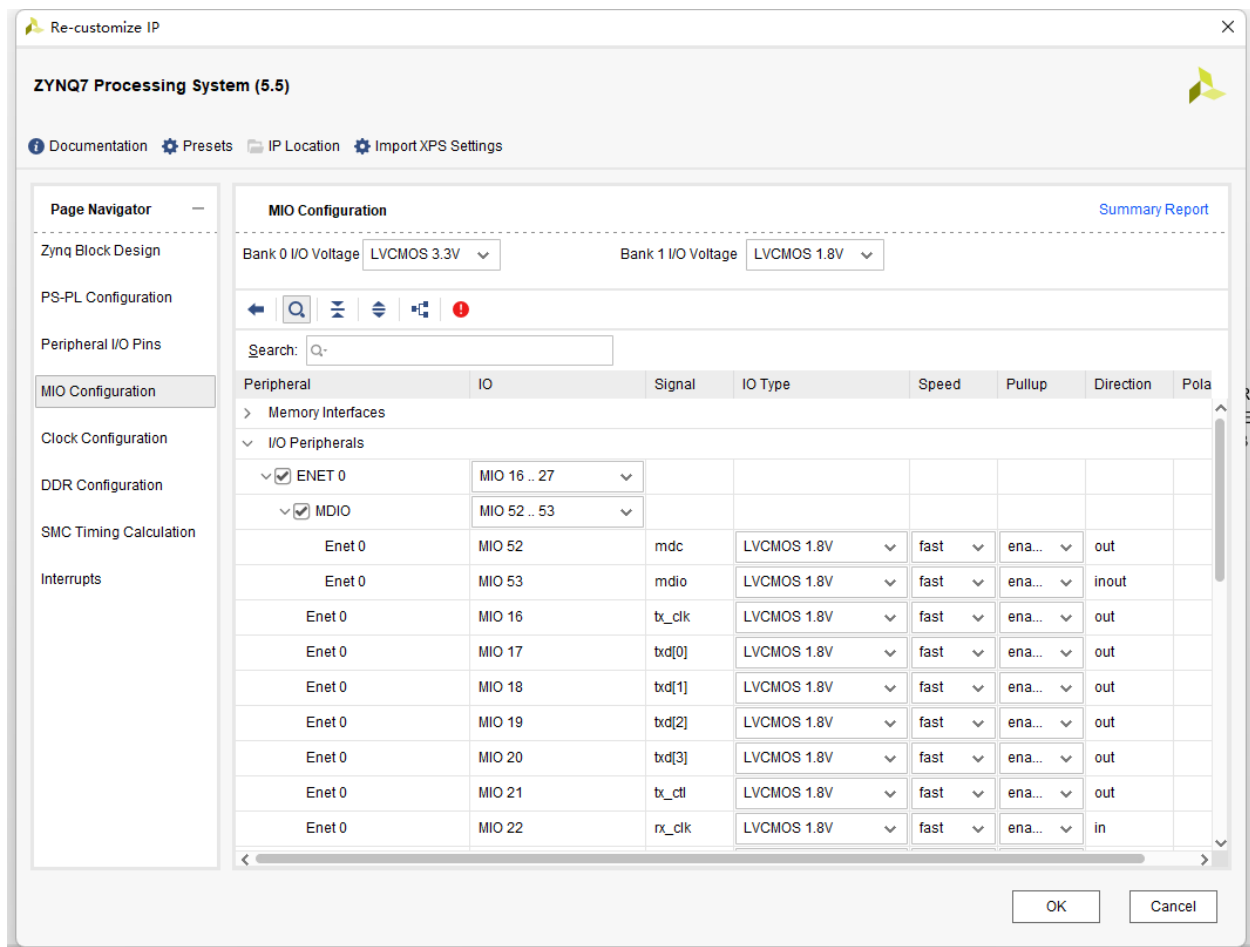


```
taterli@taterli-VirtualBox: ~  
taterli@taterli-VirtualBox:~$ source ~/petalinux/settings.sh  
PetaLinux environment set to '/home/taterli/petalinux'  
INFO: Checking free disk space  
INFO: Checking installed tools  
INFO: Checking installed development libraries  
INFO: Checking network and other services  
taterli@taterli-VirtualBox:~$
```

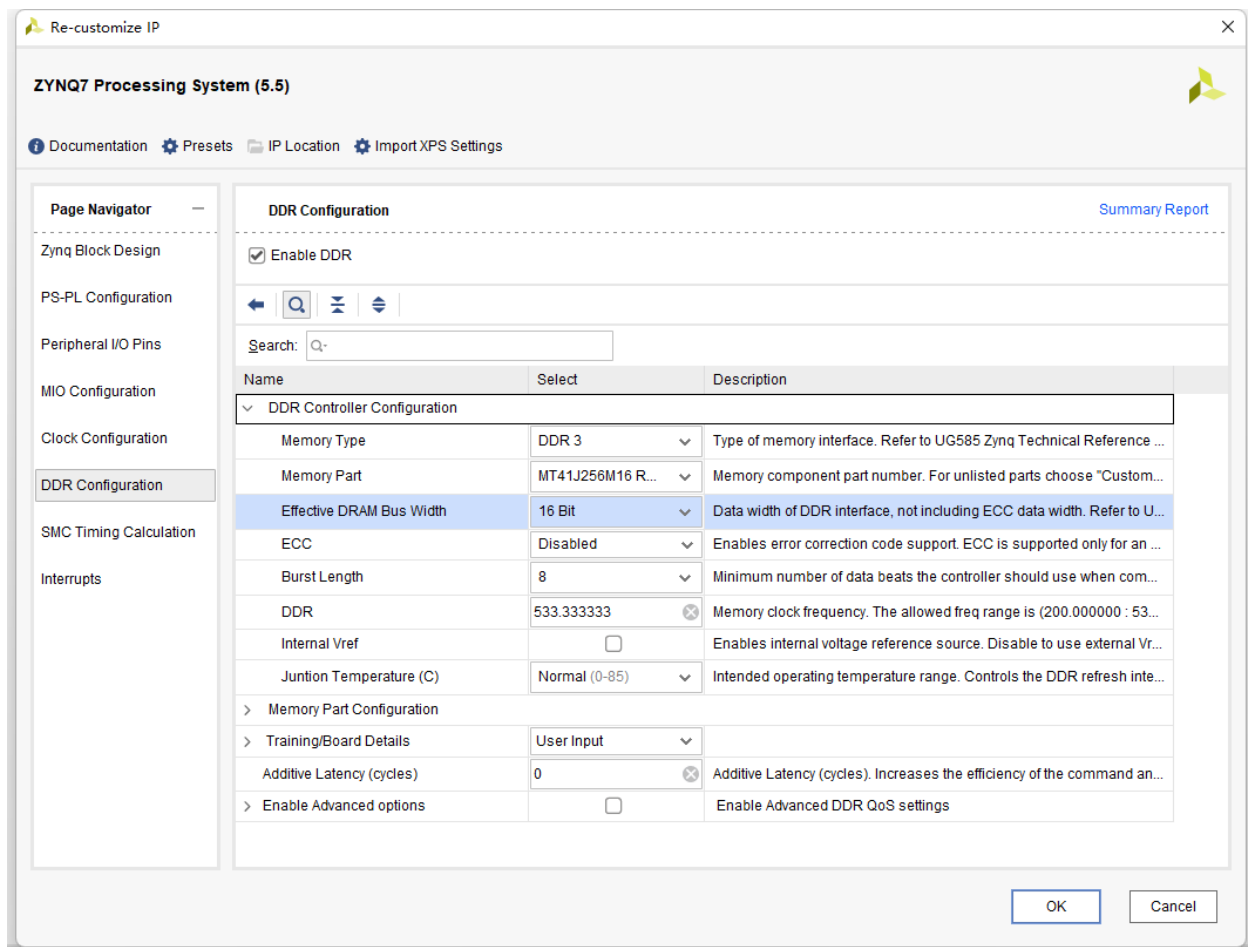
为了能编译PetaLinux需要一个hdf文件,hdf文件由Vivado导出,于是新建一个bd,配置IO.
QSPI位于MIO1-6,以太网位MIO16-27,SD0位于MIO40-45,USB位于MIO28-39,串口
MIO48-49,BANK 0是3.3V,BANK1是1.8V,QSPI,以太网,以太网MDIO,USB都设置成fast.



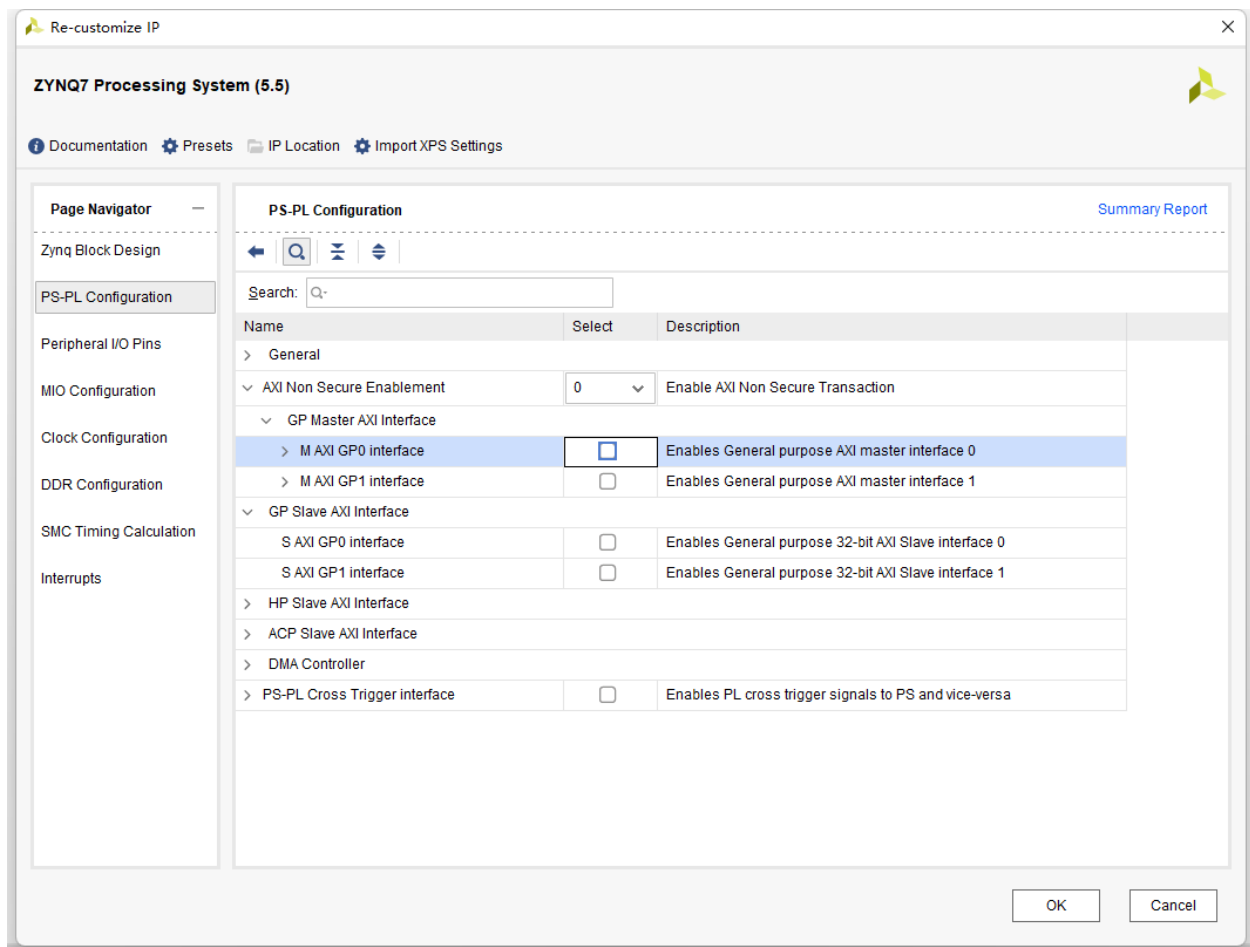




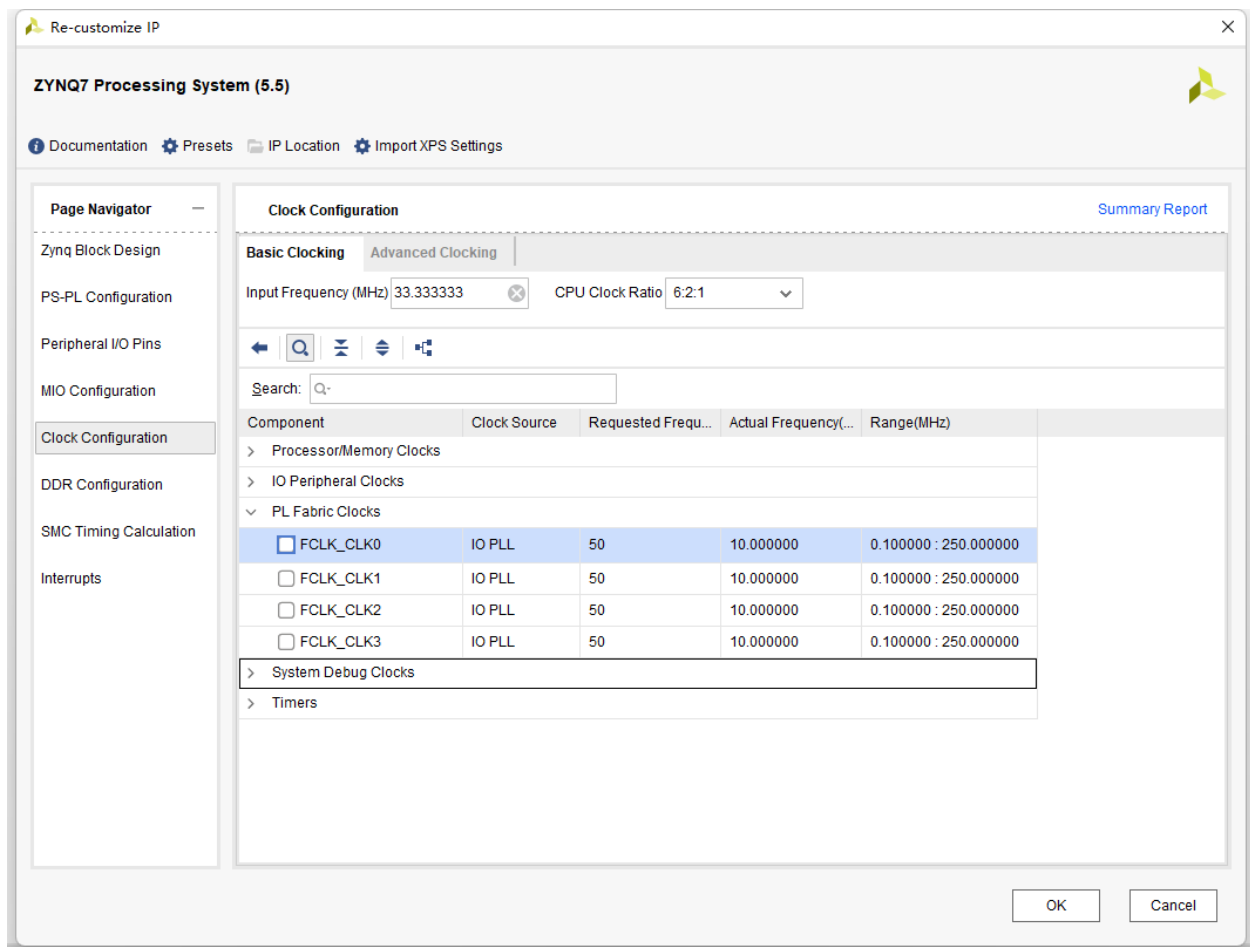
内存配置,已经是轻车熟路了.



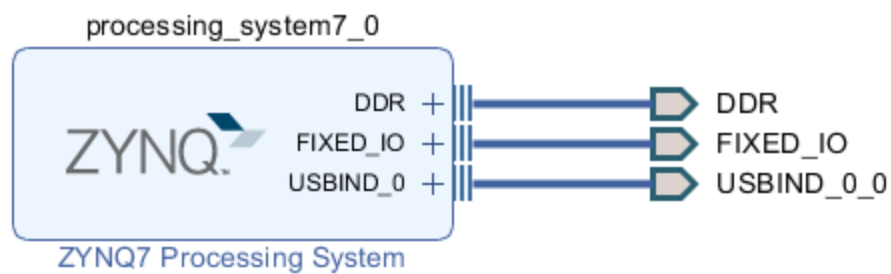
暂时不和PL通信,取消PL通信接口.



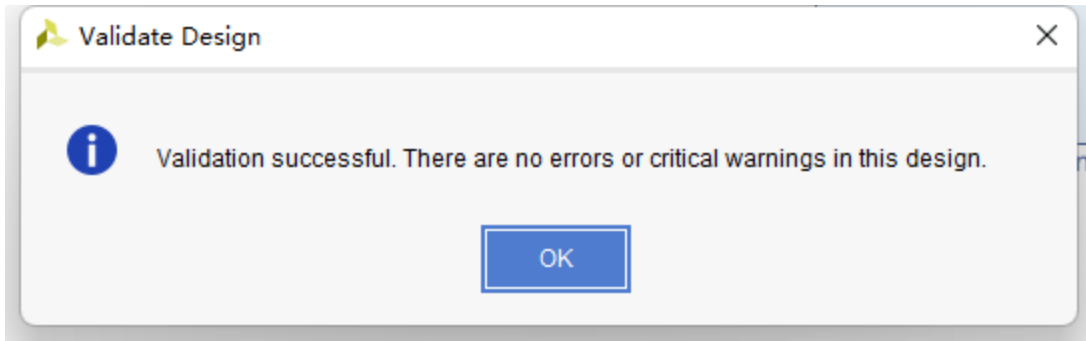
暂时也不对外输出时钟和复位.(复位没有截图,在另外页面.)



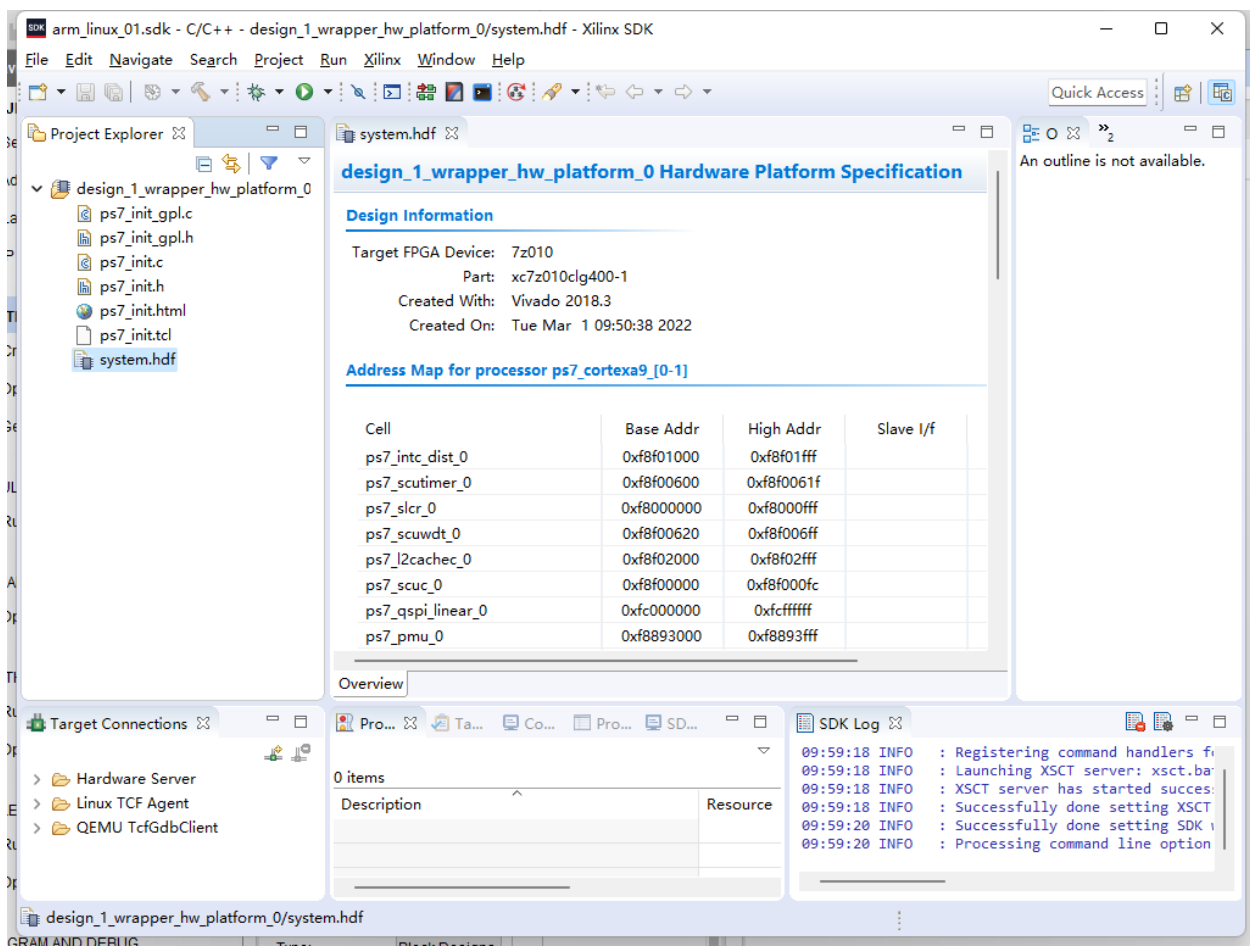
然后设法让他全部导出.



最后养成好习惯检查一下图纸.



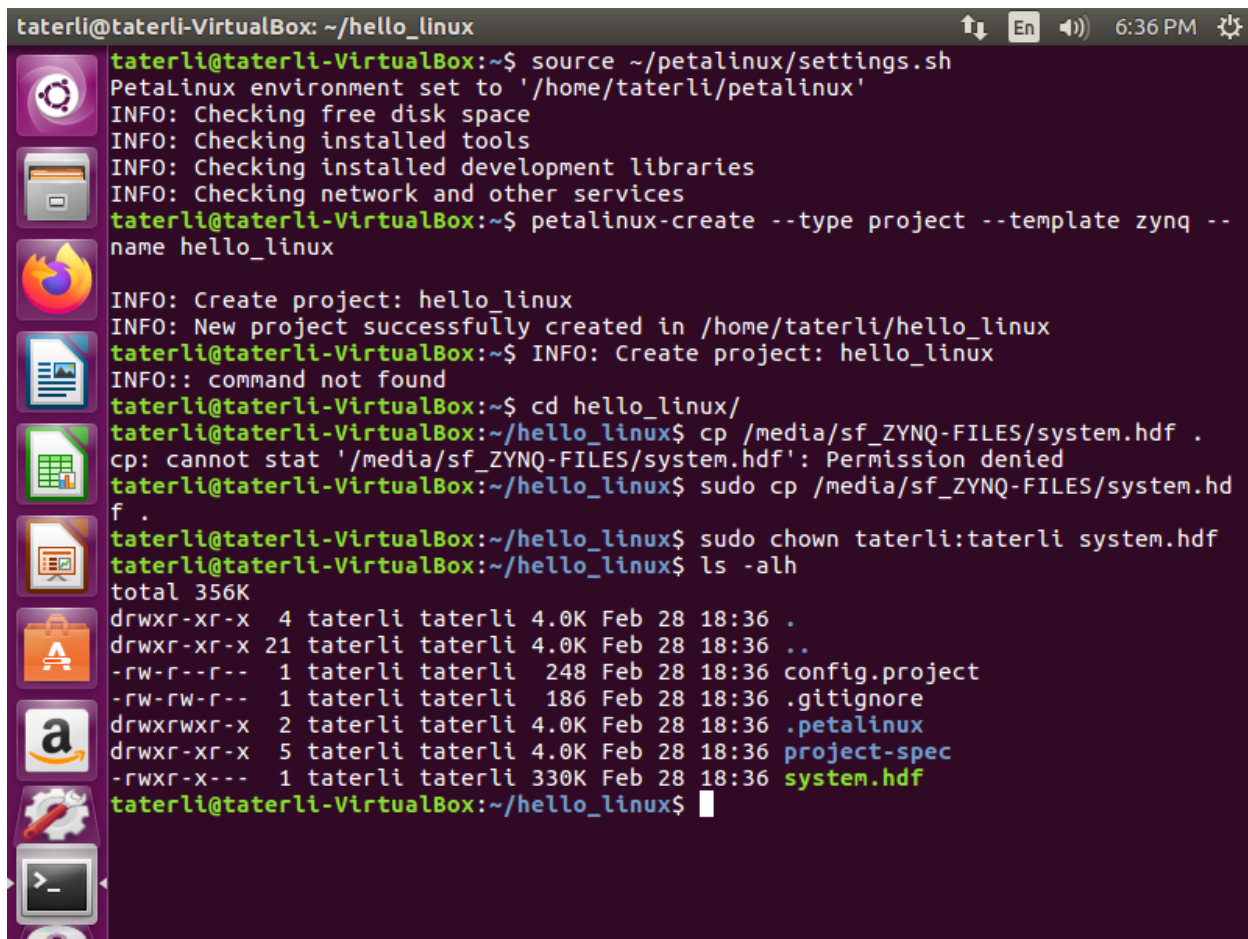
保存后一步一步生成直到导出HDF.



创建工程并复制HDF.(大致流程,并非一成不变!)

```
~$ petalinux-create --type project --template zynq --name hello_linux
INFO: Create project: hello_linux
INFO: New project successfully created in /home/tater/hello_linux
~$ cd hello_linux/
```

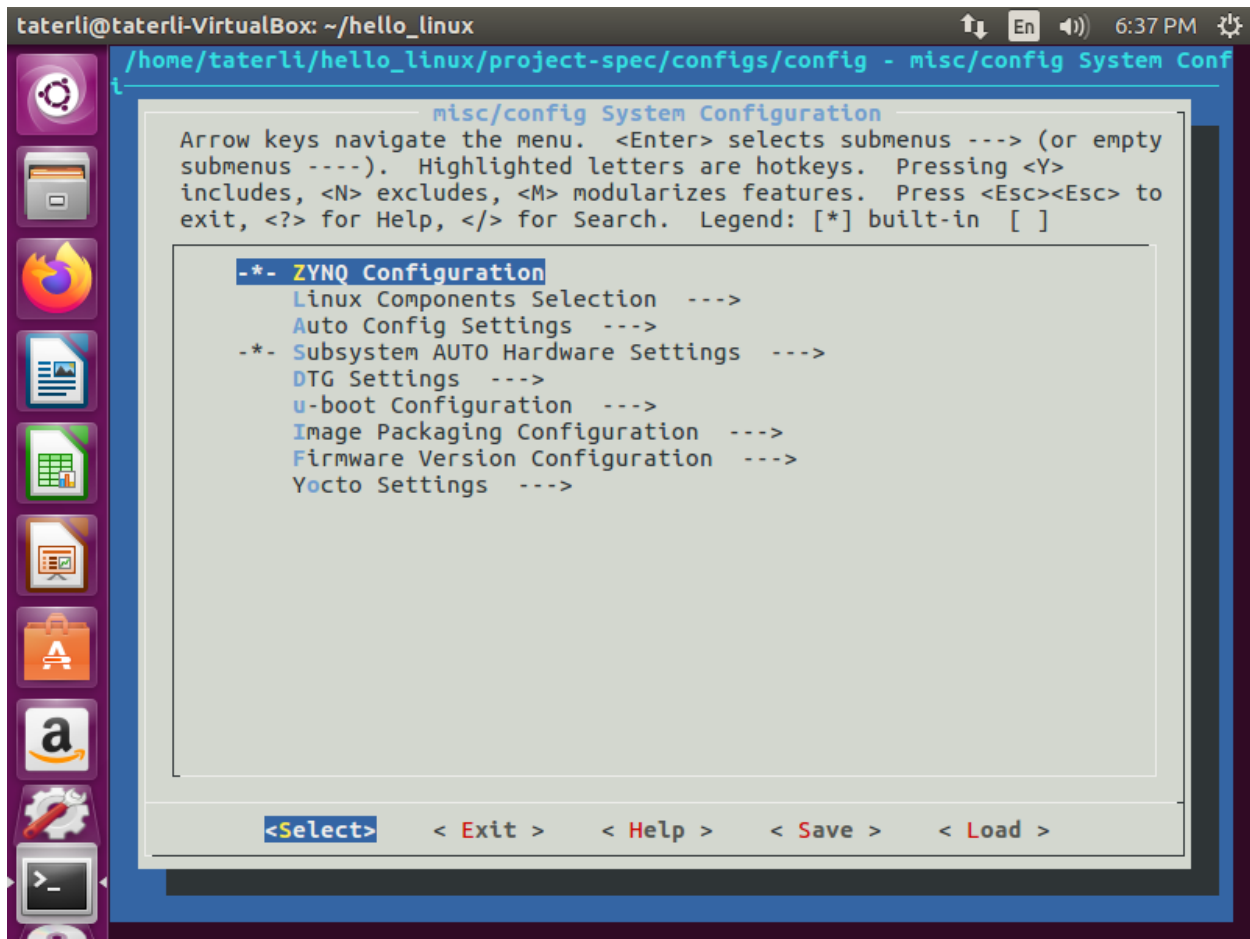
```
~/hello_linux$ cp [system.hdf 路径] .
~/hello_linux$ ls -alh
total 356K
drwxr-xr-x  4 tater tater 4.0K Feb 28 18:01 .
drwxr-xr-x 20 tater tater 4.0K Feb 28 18:01 ..
-rw-r--r--  1 tater tater  248 Feb 28 18:01 config.project
-rw-rw-r--  1 tater tater  170 Feb 28 18:01 .gitignore
drwxrwxr-x  2 tater tater 4.0K Feb 28 18:01 .petalinux
drwxr-xr-x  5 tater tater 4.0K Feb 28 18:01 project-spec
-rw-rw-r--  1 tater tater 330K Feb 28 18:01 system.hdf
~/hello_linux$
```



```
taterli@taterli-VirtualBox: ~/hello_linux
taterli@taterli-VirtualBox:~$ source ~/petalinux/settings.sh
Petalinux environment set to '/home/taterli/petalinux'
INFO: Checking free disk space
INFO: Checking installed tools
INFO: Checking installed development libraries
INFO: Checking network and other services
taterli@taterli-VirtualBox:~$ petalinux-create --type project --template zynq --name hello_linux
INFO: Create project: hello_linux
INFO: New project successfully created in /home/taterli/hello_linux
taterli@taterli-VirtualBox:~$ INFO: Create project: hello_linux
INFO:: command not found
taterli@taterli-VirtualBox:~$ cd hello_linux/
taterli@taterli-VirtualBox:~/hello_linux$ cp /media/sf_ZYNQ-FILES/system.hdf .
cp: cannot stat '/media/sf_ZYNQ-FILES/system.hdf': Permission denied
taterli@taterli-VirtualBox:~/hello_linux$ sudo cp /media/sf_ZYNQ-FILES/system.hdf .
taterli@taterli-VirtualBox:~/hello_linux$ sudo chown taterli:taterli system.hdf
taterli@taterli-VirtualBox:~/hello_linux$ ls -alh
total 356K
drwxr-xr-x  4 taterli taterli 4.0K Feb 28 18:36 .
drwxr-xr-x 21 taterli taterli 4.0K Feb 28 18:36 ..
-rw-r--r--  1 taterli taterli  248 Feb 28 18:36 config.project
-rw-rw-r--  1 taterli taterli  186 Feb 28 18:36 .gitignore
drwxrwxr-x  2 taterli taterli 4.0K Feb 28 18:36 .petalinux
drwxr-xr-x  5 taterli taterli 4.0K Feb 28 18:36 project-spec
-rwxr-x---  1 taterli taterli 330K Feb 28 18:36 system.hdf
taterli@taterli-VirtualBox:~/hello_linux$
```

然后开始配置.

```
petalinux-config --get-hw-description=.
```



我们做最小启动可以完全不配置这里,不过我们依然可以大致浏览下有什么东西,退出配置界面就会自动开始配置,期间CPU占用比较高.

```
taterli@taterli-VirtualBox: ~/hello_linux
taterli@taterli-VirtualBox:~/hello_linux$ sudo cp /media/sf_ZYNQ-FILES/system.hdf
f .
taterli@taterli-VirtualBox:~/hello_linux$ sudo chown taterli:taterli system.hdf
taterli@taterli-VirtualBox:~/hello_linux$ ls -alh
total 356K
drwxr-xr-x  4 taterli taterli 4.0K Feb 28 18:36 .
drwxr-xr-x 21 taterli taterli 4.0K Feb 28 18:36 ..
-rw-r--r--  1 taterli taterli  248 Feb 28 18:36 config.project
-rw-rw-r--  1 taterli taterli  186 Feb 28 18:36 .gitignore
drwxrwxr-x  2 taterli taterli 4.0K Feb 28 18:36 .petalinux
drwxr-xr-x  5 taterli taterli 4.0K Feb 28 18:36 project-spec
-rwxr-x---  1 taterli taterli 330K Feb 28 18:36 system.hdf
taterli@taterli-VirtualBox:~/hello_linux$ petalinux-config --get-hw-description=
.
INFO: Getting hardware description...
[INFO] generating Kconfig for project
[INFO] menuconfig project
configuration written to /home/taterli/hello_linux/project-spec/configs/config
*** End of the configuration.
*** Execute 'make' to start the build or try 'make help'.

[INFO] sourcing bitbake
[INFO] generating plnxtool conf
[INFO] generating meta-plnx-generated layer
[INFO] generating machine configuration
[INFO] generating bbappends for project . This may take time !
[INFO] generating u-boot configuration files
[INFO] generating kernel configuration files
[INFO] generating kconfig for Rootfs
[INFO] oldconfig rootfs
[INFO] generating petalinux-user-image.bb
taterli@taterli-VirtualBox:~/hello_linux$
```

然后开始编译.

```
petalinux-build
```
























耐心等待编译完成,有错误就解决错误.

```
taterli@taterli-VirtualBox: ~/hello_linux
taterli@taterli-VirtualBox:~/hello_linux$ petalinux-build
[INFO] building project
[INFO] sourcing bitbake
INFO: bitbake petalinux-user-image
Loading cache: 100% |#####| Time: 0:00:00
Loaded 3444 entries from dependency cache.
Parsing recipes: 100% |#####| Time: 0:00:06
Parsing of 2569 .bb files complete (2536 cached, 33 parsed). 3445 targets, 149 s
kipped, 0 masked, 0 errors.
NOTE: Resolving any missing task queue dependencies
Initialising tasks: 100% |#####| Time: 0:00:09
Checking sstate mirror object availability: 100% |#####| Time: 0:00:06
NOTE: Executing SetScene Tasks
NOTE: Executing RunQueue Tasks
WARNING: petalinux-user-image-1.0-r0 do_rootfs: [log_check] petalinux-user-image
: found 1 warning message in the logfile:
[log_check] warning: %post(sysvinit-inittab-2.88dsf-r10.plnx_zynq7) scriptlet fa
iled, exit status 1
NOTE: Tasks Summary: Attempted 3065 tasks of which 3061 didn't need to be rerun
and all succeeded.
Summary: There was 1 WARNING message shown.
INFO: Copying Images from deploy to images
NOTE: Successfully copied built images to tftp dir: /tftpboot
[INFO] successfully built project
taterli@taterli-VirtualBox:~/hello_linux$
taterli@taterli-VirtualBox:~/hello_linux$
taterli@taterli-VirtualBox:~/hello_linux$
taterli@taterli-VirtualBox:~/hello_linux$
taterli@taterli-VirtualBox:~/hello_linux$
taterli@taterli-VirtualBox:~/hello_linux$
taterli@taterli-VirtualBox:~/hello_linux$
```

需要拷贝的编译结果有以下几个.

1. zynq_fsbl.elf - 完成对PL的配置
2. u-boot.elf - 负责引导ARM完成Linux启动
3. image.ub - 真实Linux镜像

```
sudo cp /tftpboot /media/sf_ZYNQ-FILES -r
```

名称	修改日期	类型	大小
 image.ub	2022/3/1 10:56	UB 文件	9,759 KB
 rootfs.bin	2022/3/1 10:56	BIN 文件	9,759 KB
 rootfs.cpio	2022/3/1 10:56	CPIO 文件	13,225 KB
 rootfs.cpio.bz2	2022/3/1 10:56	BZ2 压缩文件	5,444 KB
 rootfs.cpio.gz	2022/3/1 10:56	GZ 压缩文件	5,895 KB
 rootfs.cpio.gz.u-boot	2022/3/1 10:56	U-BOOT 文件	5,895 KB
 rootfs.ext3	2022/3/1 10:56	EXT3 文件	65,536 KB
 rootfs.ext3.bz2	2022/3/1 10:56	BZ2 压缩文件	5,490 KB
 rootfs.ext4	2022/3/1 10:56	EXT4 文件	65,536 KB
 rootfs.ext4.gz	2022/3/1 10:56	GZ 压缩文件	5,956 KB
 rootfs.its	2022/3/1 10:56	ITS 文件	3 KB
 rootfs.jffs2	2022/3/1 10:56	JFFS2 文件	7,424 KB
 rootfs.manifest	2022/3/1 10:56	MANIFEST 文件	6 KB
 rootfs.tar.bz2	2022/3/1 10:56	BZ2 压缩文件	5,438 KB
 rootfs.tar.gz	2022/3/1 10:56	GZ 压缩文件	5,912 KB
 rootfs.testdata.json	2022/3/1 10:56	JSON 源文件	283 KB
 system.dtb	2022/3/1 10:56	DTB 文件	14 KB
 System.map.linux	2022/3/1 10:56	LINUX 文件	1,922 KB
 u-boot.bin	2022/3/1 10:56	BIN 文件	512 KB
 u-boot.elf	2022/3/1 10:56	ELF 文件	4,336 KB
 vmlinux	2022/3/1 10:56	文件	24,622 KB
 zImage	2022/3/1 10:56	文件	9,761 KB
 zynq_fsbl.elf	2022/3/1 10:56	ELF 文件	434 KB

回到Windows的SDK,选Xilinx → Create Boot Image菜单,制作BOOT.BIN.

Create Boot Image

Create Boot Image

Creates Zynq Boot Image in .bin format from given FSBL elf and partition files in specified output folder.

Architecture: Zynq

☒ Create new BIF file
☐ Import from existing BIF file

Basic

Security

Output BIF file path:

F:\ZYNQ-FILES\output.bif

Browse...

UDF data:

Browse...

☐ Split

Output format: BIN

Output path:

F:\ZYNQ-FILES\BOOT.bin

Browse...

Boot image partitions

File path	Encrypted	Authenticat...
(bootloader) F:\ZYNQ-FILES\tftpboot\zynq_fsbl.elf	none	none
F:\ZYNQ-FILES\tftpboot\u-boot.elf	none	none

Add

Delete

Edit

Up

Down

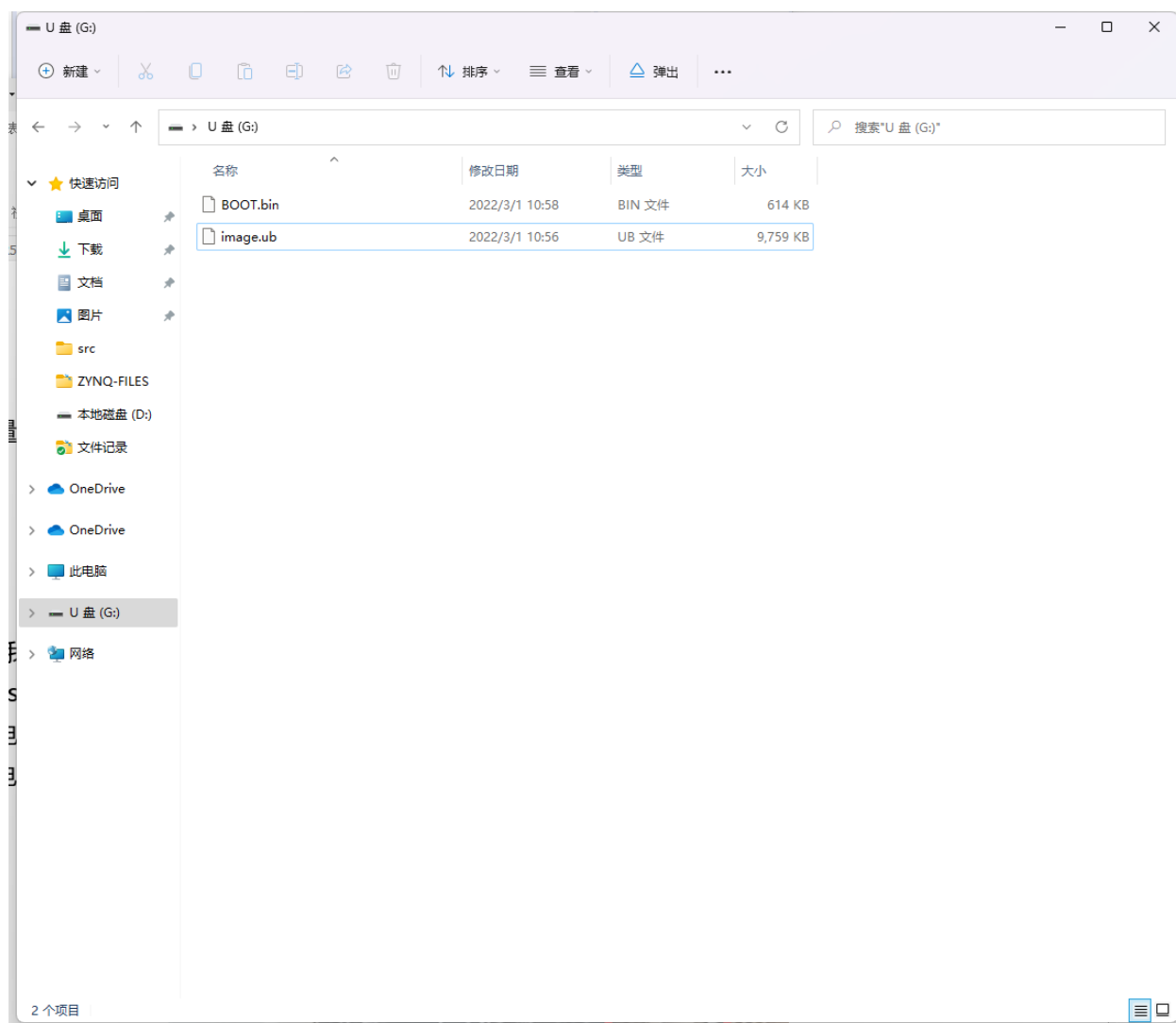
?

Preview BIF Changes

Create Image

Cancel

创建后就有BOOT.BIN,然后把BOOT.bin和image.ub复制到FAT32的TF卡中,并塞到TF启动卡槽,调整BOOT,比如ZYNQ ECO板子就是把BOOT两个引脚都拨到SPI Flash那一侧.



顺利启动,用户名密码都是root.

```
COM4 - PuTTY
udhcpd (v1.24.1) started
Sending discover...
Sending discover...
Sending discover...
No lease, forking to background
done.
Starting Dropbear SSH server: Generating key, this may take a while...
Public key portion is:
ssh-rsa AAAAB3NzaClyc2EAAAADAQABAAQCLynxd5P7Ic0J+6ytERf2B5gQTA6vcMIm5q4h2smBB
P0kxv17YaiFMTIztXVAWpe+dX9ZNBKbixHwtPhhb4cIa3eZ2CQC5S/3XLAq2MAhtlt6Cz0Ph7NIs0QArj
8WvB8QL2ta/aHdI/dYqRjBBqUc5XsDlCFhJA2wCn5YN295v4/cA8+PPEdhwiLTLxOMTP6tKML66BjSy2
MauMmqOiqCcjcfrdzneK5Dwlt1LyD0vYdrhrifhHXoeSDLud87vJPkqONQEV8Yj15a1WYmKgVb8bgIgm
wMAAjxNKKmupPG8akFT026ik+Mh+KwNAprTRbMb9ONDM626da86qCFpshnaJ root@hello_linux
Fingerprint: md5 bb:3d:48:5c:b0:b2:69:df:a5:ee:ab:c8:60:18:a8:e7
dropbear.
hwclock: can't open '/dev/misc/rtc': No such file or directory
Starting syslogd/klogd: done
Starting tcf-agent: OK

PetaLinux 2018.3 hello_linux /dev/ttyPS0

hello_linux login: root
Password:
root@hello_linux:~#
```

网络OK.

```
COM4 - PuTTY

hello_linux login: root
Password:
root@hello_linux:~# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0a:35:00:1e:53 brd ff:ff:ff:ff:ff:ff
    inet 192.168.31.193/24 brd 192.168.31.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 240e:3b3:50df:2a70:20a:35ff:fe00:1e53/64 scope global mngtmpaddr dynamic
        valid_lft 235052sec preferred_lft 148652sec
    inet6 fe80::20a:35ff:fe00:1e53/64 scope link
        valid_lft forever preferred_lft forever
3: sit0@NONE: <NOARP> mtu 1480 qdisc noop state DOWN group default qlen 1000
    link/sit 0.0.0.0 brd 0.0.0.0
root@hello_linux:~#
```

```
COM4 - PuTTY
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 00:0a:35:00:1e:53 brd ff:ff:ff:ff:ff:ff
    inet 192.168.31.193/24 brd 192.168.31.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 240e:3b3:50df:2a70:20a:35ff:fe00:1e53/64 scope global mngtmpaddr dynamic
        valid_lft 235052sec preferred_lft 148652sec
    inet6 fe80::20a:35ff:fe00:1e53/64 scope link
        valid_lft forever preferred_lft forever
3: sit0@NONE: <NOARP> mtu 1480 qdisc noop state DOWN group default qlen 1000
    link/sit 0.0.0.0 brd 0.0.0.0
root@hello_linux:~# ping 2600::
PING 2600:: (2600::): 56 data bytes
64 bytes from 2600::: seq=0 ttl=50 time=360.687 ms
64 bytes from 2600::: seq=1 ttl=50 time=353.685 ms
```