

任务 37: WRTnode 的交叉编译环境

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实验名称: 交叉编译 实验类型: 嵌入式开发 学好: 3120101849

一、实验目的

在树莓派或 Acadia 上实现一个 C 语言的交叉编译环境,能编译产生 WRTnode 用的 MIPS 程序。

二、主要仪器设备

硬件:

- 实验主板一块
- 5V/1A 电源一个
- USB-TTL 串口线一根
- PC (Windows) 一台
- 以太网线一根

软件:

- PC 上的 USB-TTL 串口线配套的驱动程序;
- PC 上的串口终端软件 putty;
- PC 上的 SSH 软件 SecureCRT。

三、实验过程及结果

1. 安装必要的工具,包括 bison、flex、texinfo、ncurses 等

```
root@Acadia:~/temp/buildroot# sudo apt-get install bison
Reading package lists... Done
Building dependency tree
Reading state information... Done
bison is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

```
root@Acadia:~/temp/buildroot# sudo apt-get install flex
Reading package lists... Done
Building dependency tree
Reading state information... Done
flex is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

```

root@Acadia:~/temp/buildroot# sudo apt-get install texinfo
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  texlive-base texlive-latex-base texlive-generic-recommended
  texinfo-doc-nonfree
The following NEW packages will be installed:
  texinfo
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 432 kB of archives.
After this operation, 1118 kB of additional disk space will be used.
WARNING: The following packages cannot be authenticated!
  texinfo
Authentication warning overridden.
Get:1 http://ports.ubuntu.com/ubuntu-ports/ precise/main texinfo armhf 4.13a.dfsg.1-8ubuntu2 [432 kB]
Fetched 432 kB in 6s (68.2 kB/s)
Selecting previously unselected package texinfo.
(Reading database ... 87779 files and directories currently installed.)
Unpacking texinfo (from .../texinfo_4.13a.dfsg.1-8ubuntu2_armhf.deb) ...
Processing triggers for man-db ...
Setting up texinfo (4.13a.dfsg.1-8ubuntu2) ...

```

```

root@Acadia:~/temp/buildroot# sudo apt-get install libncurses5-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
libncurses5-dev is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.

```

2. 下载 buildroot 包，并用 sftp 传输到实验板

```

sftp> put buildroot-snapshot.tar.bz2
uploading buildroot-snapshot.tar.bz2 to /root/temp/buildroot-snapshot.tar.bz2
100% 2948KB 2948KB/s 00:00:00
e:/sftp/buildroot-snapshot.tar.bz2: 3019668 bytes transferred in 0 seconds (2948
KB/s)
sftp>

```

3. 使用 tar 命令解压包

```

root@Acadia:~/temp# ls
buildroot  buildroot-snapshot.tar.bz2
root@Acadia:~/temp# tar -jxvf buildroot-snapshot.tar.bz2

```

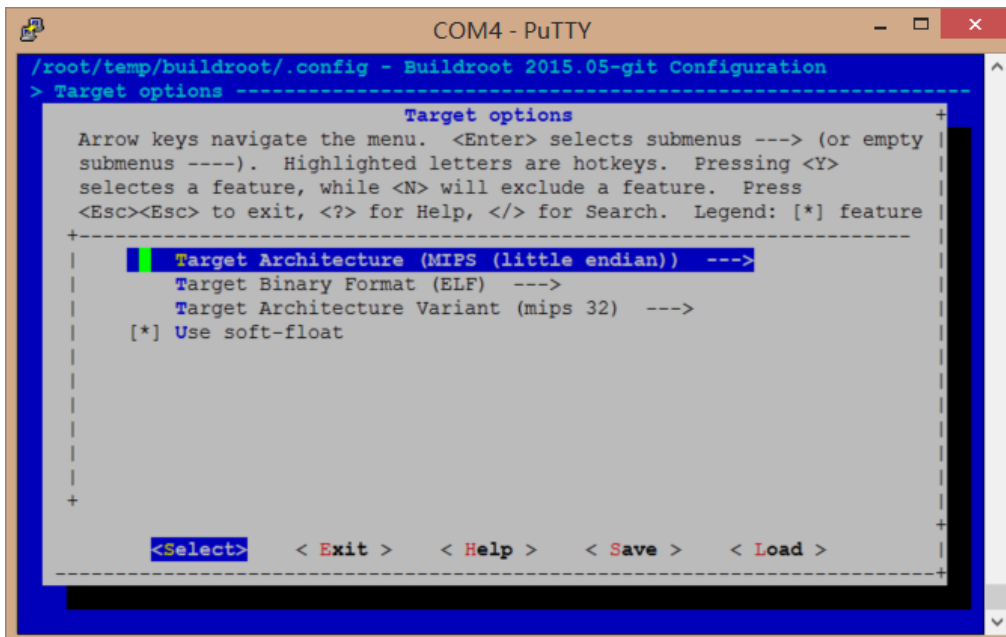
4. 进入 buildroot 目录，并执行 make clean

```

root@Acadia:~/temp# cd buildroot
root@Acadia:~/temp/buildroot# ls
CHANGES  Config.in.legacy  README  boot  fs  support
COPYING   Makefile          arch    config  linux  system
Config.in Makefile.legacy  board   docs    package  toolchain
root@Acadia:~/temp/buildroot# make clean
rm -rf /root/temp/buildroot/output/target /root/temp/buildroot/output/images /ro
ot/temp/buildroot/output/host \
        /root/temp/buildroot/output/build /root/temp/buildroot/output/st
aging \
        /root/temp/buildroot/output/legal-info /root/temp/buildroot/outp
ut/graphs
root@Acadia:~/temp/buildroot#

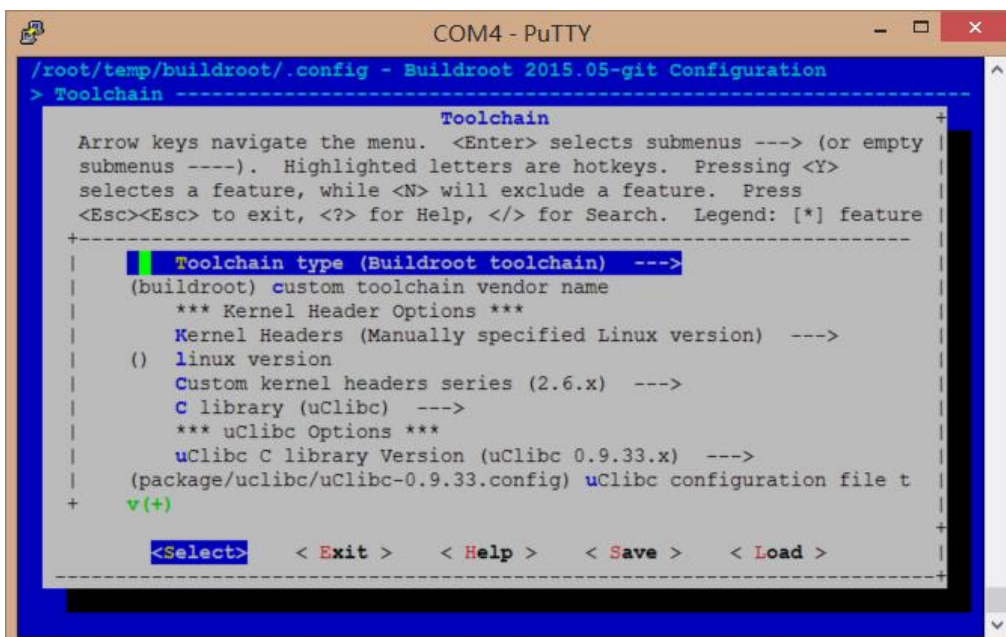
```

5. 执行 make menuconfig, 选择编译选项



COM4 - PuTTY

```
/root/temp/buildroot/.config - Buildroot 2015.05-git Configuration
> Target options -----
                                Target options
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y>
selectes a feature, while <N> will exclude a feature. Press
<Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] feature
+-----+
| [*] Target Architecture (MIPS (little endian)) ---> |
| Target Binary Format (ELF) --->                     |
| Target Architecture Variant (mips 32) --->          |
| [*] Use soft-float                                   |
|-----+-----+
| <Select> < Exit > < Help > < Save > < Load > |
+-----+-----+
```



COM4 - PuTTY

```
/root/temp/buildroot/.config - Buildroot 2015.05-git Configuration
> Toolchain -----
                                Toolchain
Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
submenus ----). Highlighted letters are hotkeys. Pressing <Y>
selectes a feature, while <N> will exclude a feature. Press
<Esc><Esc> to exit, <?> for Help, </> for Search. Legend: [*] feature
+-----+
| [*] Toolchain type (Buildroot toolchain) --->      |
| (buildroot) custom toolchain vendor name           |
| *** Kernel Header Options ***                     |
| Kernel Headers (Manually specified Linux version) ---> |
| () linux version                                   |
| Custom kernel headers series (2.6.x) --->          |
| C library (uClibc) --->                             |
| *** uClibc Options ***                             |
| uClibc C library Version (uClibc 0.9.33.x) --->     |
| (package/uclibc/uClibc-0.9.33.config) uClibc configuration file t |
| v(+)                                                 |
|-----+-----+
| <Select> < Exit > < Help > < Save > < Load > |
+-----+-----+
```

6. 使用 make 进行编译

```
root@Acadia:~/temp/buildroot# make
mkdir -p /root/temp/buildroot/output/target
rsync -a --ignore-times --exclude .svn --exclude .git --exclude .hg --exclude .b
zr --exclude CVS \
```

7. 编译结束，编写程序

```
COM4 - PuTTY
#include<stdio.h>
int main(void){
    printf("Hello World!\n");
    return 0;
}
```

8. 编译成 mips 程序，可以看到文件信息表示程序是 MIPS 的

```
root@Acadia:~/test# ls
a  a.c
root@Acadia:~/test# mips-linux-gcc a.c -o a
root@Acadia:~/test# ls
a  a.c
root@Acadia:~/test#

root@Acadia:~/test# ls
a  a.c
root@Acadia:~/test# file a
a: ELF 32-bit LSB executable, MIPS, MIPS32 rel2 version 1 (SYSV), dynamically li
nked (uses shared libs), with unknown capability 0xf41 = 0x756e6700, with unknow
n capability 0x70100 = 0x3040000, not stripped
root@Acadia:~/test#
```

9. 放置到 WRTnode 板子上测试，查看运行结果

```
COM3 - PuTTY
bin      etc      lib      overlay  rom      sbin     test     usr      www
root@OpenWrt:/# cd /etc/samba
root@OpenWrt:/etc/samba# ls
lowercase.dat      smb.conf           smbpasswd           valid.dat
secrets.tdb        smb.conf.template upcase.dat
root@OpenWrt:/etc/samba# vi smb.conf
root@OpenWrt:/etc/samba# cd ..
root@OpenWrt:/etc# cd
root@OpenWrt:~# /etc/init.d/samba enable
root@OpenWrt:~# /etc/init.d/samba start
root@OpenWrt:~# cd /etc/samba
root@OpenWrt:/etc/samba# vi smb.conf
root@OpenWrt:/etc/samba# cd
root@OpenWrt:~# cd /tmp
root@OpenWrt:/tmp# ls
RT2860.dat          extroot            resolv.conf
TZ                  hosts              resolv.conf.auto
a                    lock               run
dhcp.leases         log                state
dnsmasq.d           nmbd               sysinfo
etc                  overlay            wifi_encryption_ra0.dat
root@OpenWrt:/tmp# ./a
Hello World!
root@OpenWrt:/tmp#
```

总结：

该实验其实为实验二的拓展，因为我的原板子为 acadia，所以这次重新搭建了 MIPS 的交叉编译环境，感觉收获很多。