

## 实现目的

1. 掌握 Acadia 或 RPi 或 WRTnode 和 PC 建立音频交互的方式；

## 实验器材

### 硬件

- Acadia 或 RPi 或 WRTnode 板一块；
- 5V/1A 电源一个；
- microUSB 线一根；
- USB-TTL 串口线一根（FT232RL 芯片或 PL2303 芯片）。

以下为自备（可选）器材：

- PC（Windows/Mac OS/Linux）一台；
- 声卡一个；
- 以太网线一根（可能还需要路由器等）。

### 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，如 minicom、picocom、putty 等；
- PC 上的 SSH 软件，如 putty 等。

## 实验步骤

1. 安装 AirPlay 仿真器；
2. 运行 AirPlay；
3. 在 Acadia 或 RPi 或 WRTnode 上播放音乐。

AirPlay 默认有 HDMI 输出，而我们没有巨屏显示器，故只能更改为默认音频输出

```
pi@raspberrypi: ~
Using username "pi".
pi@10.110.92.80's password:
Linux raspberrypi 3.18.7+ #755 PREEMPT Thu Feb 12 17:14:31 GMT 2015 armv6l

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Mar 26 16:22:23 2015 from 10.110.92.2
zpi@raspberrypi ~ $ sudo zjuvpn -c
Configure L2TP VPN for ZJU.
Username: 18072912242@ZJUA.XY
Password:
[MSG] Disconnecting VPN ... Done!
[MSG] Restarting l2tpd...
Restarting xl2tpd: xl2tpd.
[MSG] Done!
[MSG] Trying to bring up vpn... 3 secs... Done!
[MSG] Detected gateway: 10.110.92.1, PPP device: ppp0 .
[MSG] Setting up route table... Done!
pi@raspberrypi ~ $ amixer cset numid=3 1
```

更新系统软件源信息，安装 shairport 依赖包

```
pi@raspberrypi: ~
libio-socket-ssl-perl libisc84 libisccc80 libisccfg82 liblwp-mediatypes-perl
liblwp-protocol-https-perl liblwres80 libmailtools-perl libmodule-build-perl
libmodule-signature-perl libmro-compat-perl libnet-http-perl
libnet-ssleay-perl libnss-mdns libparams-util-perl libpod-readme-perl
libregexp-common-perl libsocket6-perl libsoftware-license-perl libssl-dev
libssl-doc libsub-exporter-perl libsub-install-perl libtext-template-perl
liburi-perl libwww-perl libwww-robotrules-perl
0 upgraded, 59 newly installed, 0 to remove and 26 not upgraded.
Need to get 8,306 kB of archives.
After this operation, 22.4 MB of additional disk space will be used.
Do you want to continue [Y/n]? y
Get:1 http://mirrordirector.raspbian.org/raspbian/ wheezy/main geoip-database al
1 20130213-1 [1,466 kB]
Get:2 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libavahi-core7 ar
mhf 0.6.31-2 [119 kB]
Get:3 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libgeoip1 armhf 1
.4.8+dfsg-3 [133 kB]
Get:4 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libisc84 armhf 1:9.8.4.d
fsg.P1-6+nmu2+deb7u4 [168 kB]
Get:5 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libdns88 armhf 1:9.8.4.d
fsg.P1-6+nmu2+deb7u4 [708 kB]
Get:6 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libisccc80 armhf 1:9.8.4
.dfsg.P1-6+nmu2+deb7u4 [32.9 kB]
Get:7 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libisccfg82 armhf 1:9.8.
4.dfsg.P1-6+nmu2+deb7u4 [54.3 kB]
Get:8 http://mirrordirector.raspbian.org/raspbian/ wheezy/main libbind9-80 armhf 1:9.8.
4.dfsg.P1-6+nmu2+deb7u4 [41.2 kB]
Get:9 http://mirrordirector.raspbian.org/raspbian/ wheezy/main liblwres80 armhf 1:9.8.4
.dfsg.P1-6+nmu2+deb7u4 [51.1 kB]
Get:10 http://mirrordirector.raspbian.org/raspbian/ wheezy/main bind9-host armhf 1:9.8.
4.dfsg.P1-6+nmu2+deb7u4 [71.3 kB]
34% [Waiting for headers] 176 kB/s 31s
```

安装 Perl NET-SDP 包

```
pi@raspberrypi: ~
Cloning into 'perl-net-sdp'...
^[[A^[[Aerror: The requested URL returned error: 403 while accessing https://github.com/njh/perl-net-sdp.git/info/refs
fatal: HTTP request failed
root@raspberrypi:/home/pi/shairport# git clone https://github.com/njh/perl-net-sdp.git
perl-net-sdp
Cloning into 'perl-net-sdp'...
^C

root@raspberrypi:/home/pi/shairport#
root@raspberrypi:/home/pi/shairport# ./shairport.pl -a iPhone
Can't locate Net/SDP.pm in @INC (@INC contains: /etc/perl /usr/local/lib/perl/5.14.2 /usr/local/share/perl/5.14.2 /usr/lib/perl5 /usr/share/perl5 /usr/lib/perl/5.14 /usr/share/perl/5.14 /usr/local/lib/site_perl .) at ./shairport.pl line 48.
BEGIN failed--compilation aborted at ./shairport.pl line 48.
root@raspberrypi:/home/pi/shairport# git clone https://github.com/njh/perl-net-sdp.git
perl-net-sdp
Cloning into 'perl-net-sdp'...
remote: Counting objects: 193, done.
remote: Total 193 (delta 0), reused 0 (delta 0), pack-reused 193
Receiving objects: 100% (193/193), 40.48 KiB | 47 KiB/s, done.
Resolving deltas: 100% (83/83), done.
root@raspberrypi:/home/pi/shairport# cd perl-net-sdp
root@raspberrypi:/home/pi/shairport/perl-net-sdp# perl Build.PL
WARNING: the following files are missing in your kit:
    Makefile.PL
    META.yml
Please inform the author.

Created MYMETA.yml and MYMETA.json
Creating new 'Build' script for 'Net-SDP' version '0.07'
root@raspberrypi:/home/pi/shairport/perl-net-sdp#
```

安裝 shairport

```
pi@raspberrypi: ~
Setting up libhtml-parser-perl (3.69-2) ...
Setting up liblwp-mediatypes-perl (6.02-1) ...
Setting up libhttp-message-perl (6.03-1) ...
Setting up libhtml-form-perl (6.03-1) ...
Setting up libhtml-tree-perl (5.02-1) ...
Setting up libhtml-format-perl (2.10-1) ...
Setting up libhttp-cookies-perl (6.00-2) ...
Setting up libhttp-daemon-perl (6.01-1) ...
Setting up libhttp-negotiate-perl (6.00-2) ...
Setting up libsocket6-perl (0.23-1) ...
Setting up libio-socket-inet6-perl (2.69-2) ...
Setting up libnet-ssleay-perl (1.48-1) ...
Setting up libio-socket-ssl-perl (1.76-2) ...
Setting up libnet-http-perl (6.03-2) ...
Setting up libwww-robotrules-perl (6.01-1) ...
Setting up libmailtools-perl (2.09-1) ...
Setting up libmodule-build-perl (0.400100-2) ...
Setting up libmodule-signature-perl (0.68-1+deb7u1) ...
Setting up libnss-mdns (0.10-3.2) ...
First installation detected...
Checking NSS setup...
Setting up libregexp-common-perl (2011121001-1) ...
Setting up libpod-readme-perl (0.11-1) ...
Setting up libtext-template-perl (1.45-2) ...
Setting up libsoftware-license-perl (0.103004-2) ...
Setting up libssl-dev (1.0.1e-2+rvt+deb7u16) ...
Setting up libssl-doc (1.0.1e-2+rvt+deb7u16) ...
Setting up libwww-perl (6.04-1) ...
Setting up liblwp-protocol-https-perl (6.03-1) ...
root@raspberrypi:/home/pi# git clone https://github.com/hendrikw82/shairport.git
Cloning into 'shairport'...
```

```
pi@raspberrypi: ~  
Setting up libmailtools-perl (2.09-1) ...  
Setting up libmodule-build-perl (0.400100-2) ...  
Setting up libmodule-signature-perl (0.68-1+deb7u1) ...  
Setting up libnss-mdns (0.10-3.2) ...  
First installation detected...  
Checking NSS setup...  
Setting up libregexp-common-perl (2011121001-1) ...  
Setting up libpod-readme-perl (0.11-1) ...  
Setting up libtext-template-perl (1.45-2) ...  
Setting up libsoftware-license-perl (0.103004-2) ...  
Setting up libssl-dev (1.0.1e-2+rvt+deb7u16) ...  
Setting up libssl-doc (1.0.1e-2+rvt+deb7u16) ...  
Setting up libwww-perl (6.04-1) ...  
Setting up liblwp-protocol-https-perl (6.03-1) ...  
root@raspberrypi:/home/pi# git clone https://github.com/hendrikw82/shairport.git  
Cloning into 'shairport'...  
  
error: RPC failed; result=52, HTTP code = 0  
fatal: The remote end hung up unexpectedly  
root@raspberrypi:/home/pi#  
root@raspberrypi:/home/pi# git clone https://github.com/hendrikw82/shairport.git  
Cloning into 'shairport'...  
remote: Counting objects: 697, done.  
remote: Total 697 (delta 0), reused 0 (delta 0), pack-reused 697  
Receiving objects: 100% (697/697), 204.42 KiB | 100 KiB/s, done.  
Resolving deltas: 100% (390/390), done.  
root@raspberrypi:/home/pi# cd shairport  
root@raspberrypi:/home/pi/shairport# make  
cc -O2 -Wall -c alac.c -o alac.o  
cc -O2 -Wall -DHAIRTUNES_STANDALONE hairtunes.c alac.o -o hairtunes -lm -lpthread -ls  
sl -lcrypto -lao
```

开启 AirPort 服务

```
pi@raspberrypi: ~  
t/10parse.t ..... ok  
t/20repeat.t .... ok  
t/30asstring.t .. ok  
All tests successful.  
Files=5, Tests=69, 7 wallclock secs ( 0.80 usr 0.06 sys + 3.09 cusr 0.17 csys = 4.  
12 CPU)  
Result: PASS  
root@raspberrypi:/home/pi/shairport/perl-net-sdp# ./Build install  
Building Net-SDP  
Installing /usr/local/man/man1/sdp2rat.1p  
Installing /usr/local/share/perl/5.14.2/Net/SDP.pm  
Installing /usr/local/share/perl/5.14.2/Net/SDP/Media.pm  
Installing /usr/local/share/perl/5.14.2/Net/SDP/Time.pm  
Installing /usr/local/man/man3/Net::SDP::Media.3pm  
Installing /usr/local/man/man3/Net::SDP.3pm  
Installing /usr/local/man/man3/Net::SDP::Time.3pm  
Installing /usr/local/bin/sdp2rat  
root@raspberrypi:/home/pi/shairport/perl-net-sdp# ./shairport.pl -a ding  
bash: ./shairport.pl: No such file or directory  
root@raspberrypi:/home/pi/shairport/perl-net-sdp# cd shairport  
bash: cd: shairport: No such file or directory  
root@raspberrypi:/home/pi/shairport/perl-net-sdp# ./shairport.pl -a ding  
bash: ./shairport.pl: No such file or directory  
root@raspberrypi:/home/pi/shairport/perl-net-sdp# cd shairport  
bash: cd: shairport: No such file or directory  
root@raspberrypi:/home/pi/shairport/perl-net-sdp# cd /home/pi  
root@raspberrypi:/home/pi# ls  
Desktop python_games shairport this_is_pi.txt  
root@raspberrypi:/home/pi# cd shairport  
root@raspberrypi:/home/pi/shairport# ./shairport.pl -a ding  
Established under name 'C2EAA4C670CD@ding'
```