

浙江大学实验报告

课程名称：嵌入式系统

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实验名称：实现一个 NTP 服务器

实验类型：嵌入式开发

学号：3120101111

一、实验目的和要求

在 Acadia 或 RPi 或 WRTnode 上实现一个 NTP 服务器，以 Acadia 或 RPi 或 WRTnode 自己的时间提供时间服务。

二、实验内容和原理

1. 掌握 NTP 通讯协议的概念；
2. 掌握在 Acadia 或 RPi 或 WRTnode 上建立 NTP 服务器的方法。

三、主要仪器设备

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；

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；

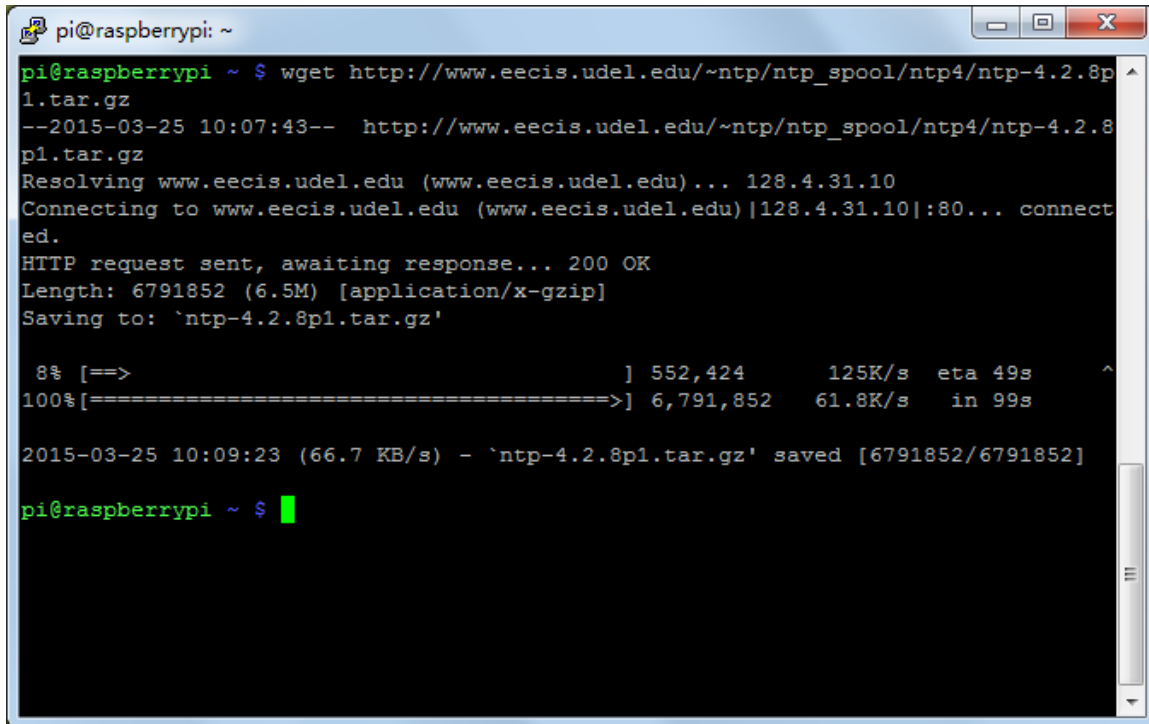
PC 上的串口终端软件，如 minicom、picocom、putty 等；

PC 上的 SSH 软件，如 putty 等。

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四、操作方法和实验步骤

1. 下载 NTP 服务器端并进行配置;



```

pi@raspberrypi: ~
pi@raspberrypi ~ $ wget http://www.eecis.udel.edu/~ntp/ntp_spool/ntp4/ntp-4.2.8p1.tar.gz
--2015-03-25 10:07:43--  http://www.eecis.udel.edu/~ntp/ntp_spool/ntp4/ntp-4.2.8p1.tar.gz
Resolving www.eecis.udel.edu (www.eecis.udel.edu)... 128.4.31.10
Connecting to www.eecis.udel.edu (www.eecis.udel.edu)|128.4.31.10|:80... connect
ed.
HTTP request sent, awaiting response... 200 OK
Length: 6791852 (6.5M) [application/x-gzip]
Saving to: `ntp-4.2.8p1.tar.gz'

 8% [==>] 552,424      125K/s  eta 49s
100%[=====>] 6,791,852  61.8K/s  in 99s

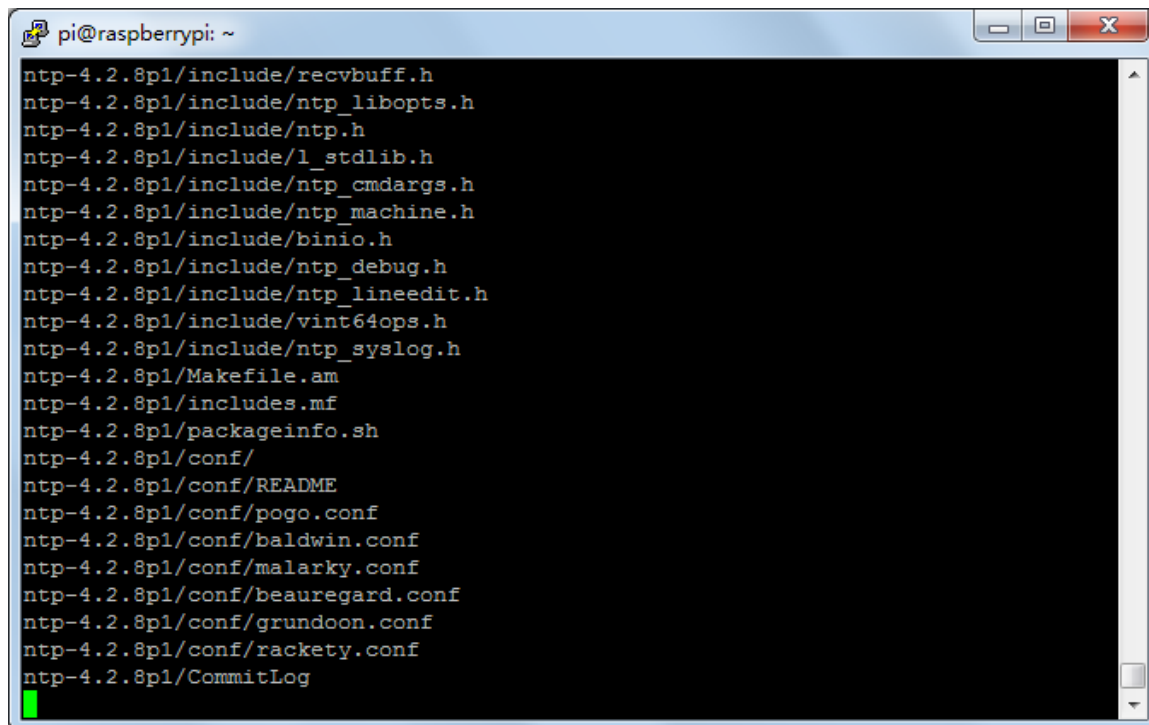
2015-03-25 10:09:23 (66.7 KB/s) - `ntp-4.2.8p1.tar.gz' saved [6791852/6791852]

pi@raspberrypi ~ $

```

Figure 1

解压:



```

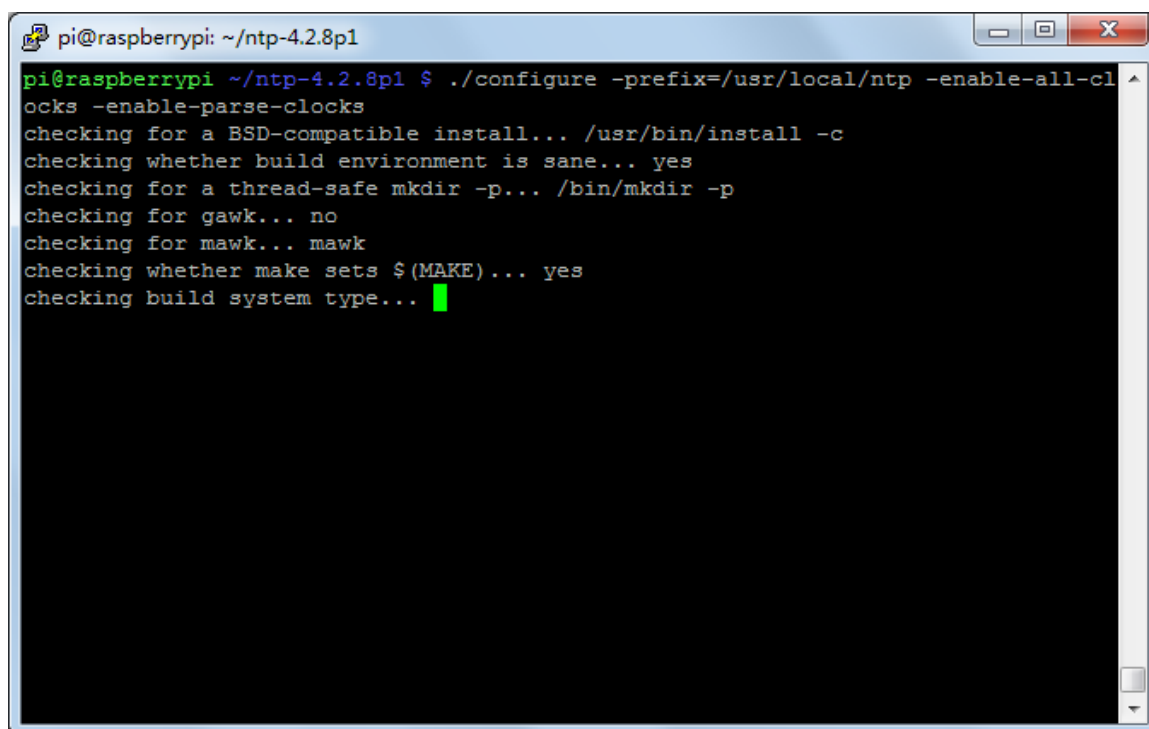
pi@raspberrypi: ~
ntp-4.2.8p1/include/recvbuff.h
ntp-4.2.8p1/include/ntp_libopts.h
ntp-4.2.8p1/include/ntp.h
ntp-4.2.8p1/include/l_stdlib.h
ntp-4.2.8p1/include/ntp_cmdargs.h
ntp-4.2.8p1/include/ntp_machine.h
ntp-4.2.8p1/include/binio.h
ntp-4.2.8p1/include/ntp_debug.h
ntp-4.2.8p1/include/ntp_lineedit.h
ntp-4.2.8p1/include/vint64ops.h
ntp-4.2.8p1/include/ntp_syslog.h
ntp-4.2.8p1/Makefile.am
ntp-4.2.8p1/includes.mf
ntp-4.2.8p1/packageinfo.sh
ntp-4.2.8p1/conf/
ntp-4.2.8p1/conf/README
ntp-4.2.8p1/conf/pogo.conf
ntp-4.2.8p1/conf/baldwin.conf
ntp-4.2.8p1/conf/malarky.conf
ntp-4.2.8p1/conf/beauregard.conf
ntp-4.2.8p1/conf/grundoon.conf
ntp-4.2.8p1/conf/rackety.conf
ntp-4.2.8p1/CommitLog

```

Figure 2

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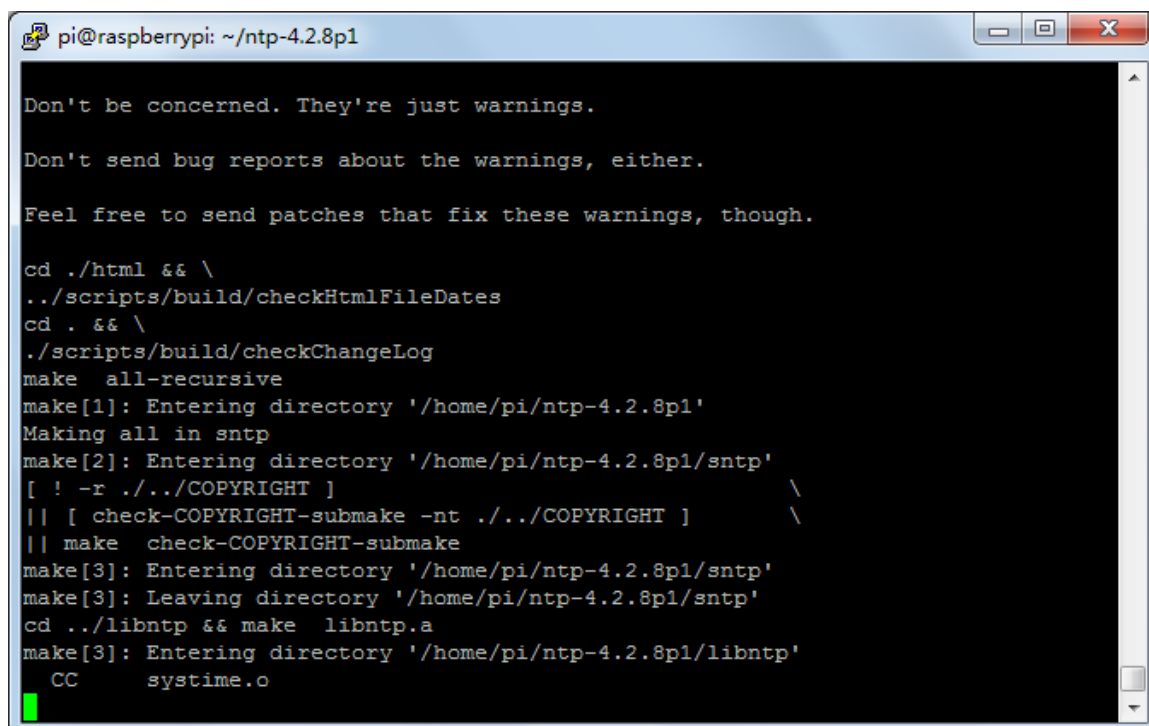
配置文件和安装目录:



```
pi@raspberrypi: ~/ntp-4.2.8p1
pi@raspberrypi ~/ntp-4.2.8p1 $ ./configure -prefix=/usr/local/ntp -enable-all-cl
ocks -enable-parse-clocks
checking for a BSD-compatible install... /usr/bin/install -c
checking whether build environment is sane... yes
checking for a thread-safe mkdir -p... /bin/mkdir -p
checking for gawk... no
checking for mawk... mawk
checking whether make sets $(MAKE)... yes
checking build system type... █
```

Figure 3

Make



```
pi@raspberrypi: ~/ntp-4.2.8p1

Don't be concerned. They're just warnings.

Don't send bug reports about the warnings, either.

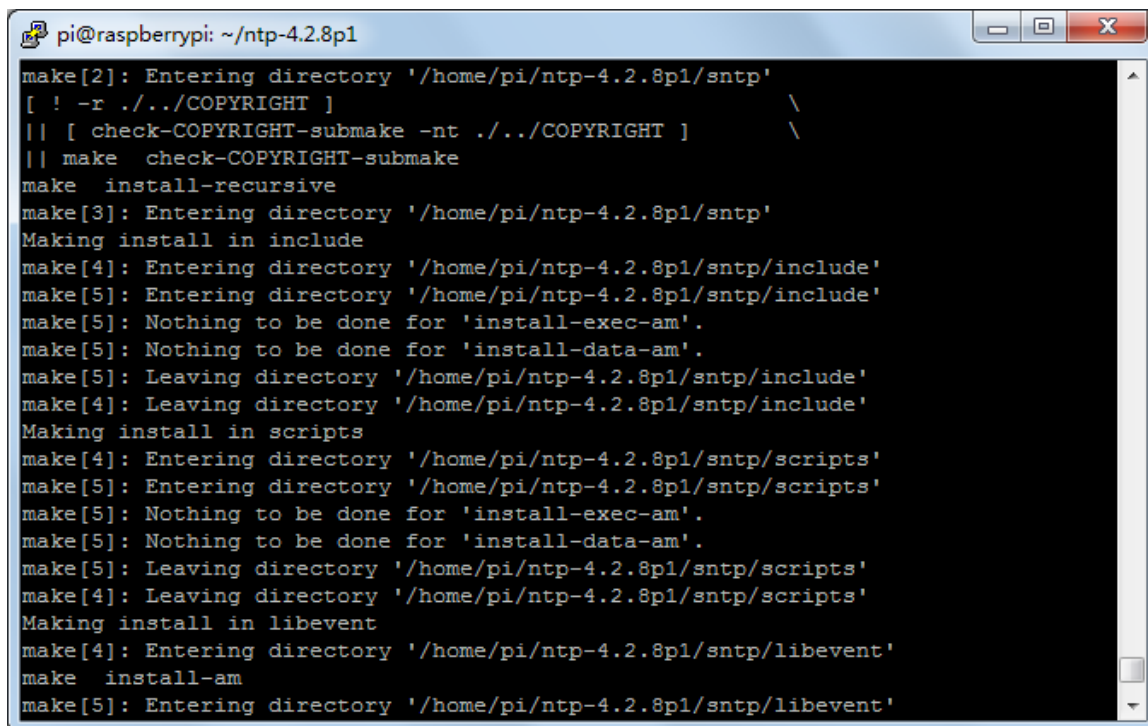
Feel free to send patches that fix these warnings, though.

cd ./html && \
../scripts/build/checkHtmlFileDates
cd . && \
../scripts/build/checkChangeLog
make all-recursive
make[1]: Entering directory '/home/pi/ntp-4.2.8p1'
Making all in sntp
make[2]: Entering directory '/home/pi/ntp-4.2.8p1/sntp'
[ ! -r ../../COPYRIGHT ] \
|| [ check-COPYRIGHT-submake -nt ../../COPYRIGHT ] \
|| make check-COPYRIGHT-submake
make[3]: Entering directory '/home/pi/ntp-4.2.8p1/sntp'
make[3]: Leaving directory '/home/pi/ntp-4.2.8p1/sntp'
cd ../libntp && make libntp.a
make[3]: Entering directory '/home/pi/ntp-4.2.8p1/libntp'
CC      systime.o
█
```

Figure 4

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Make install



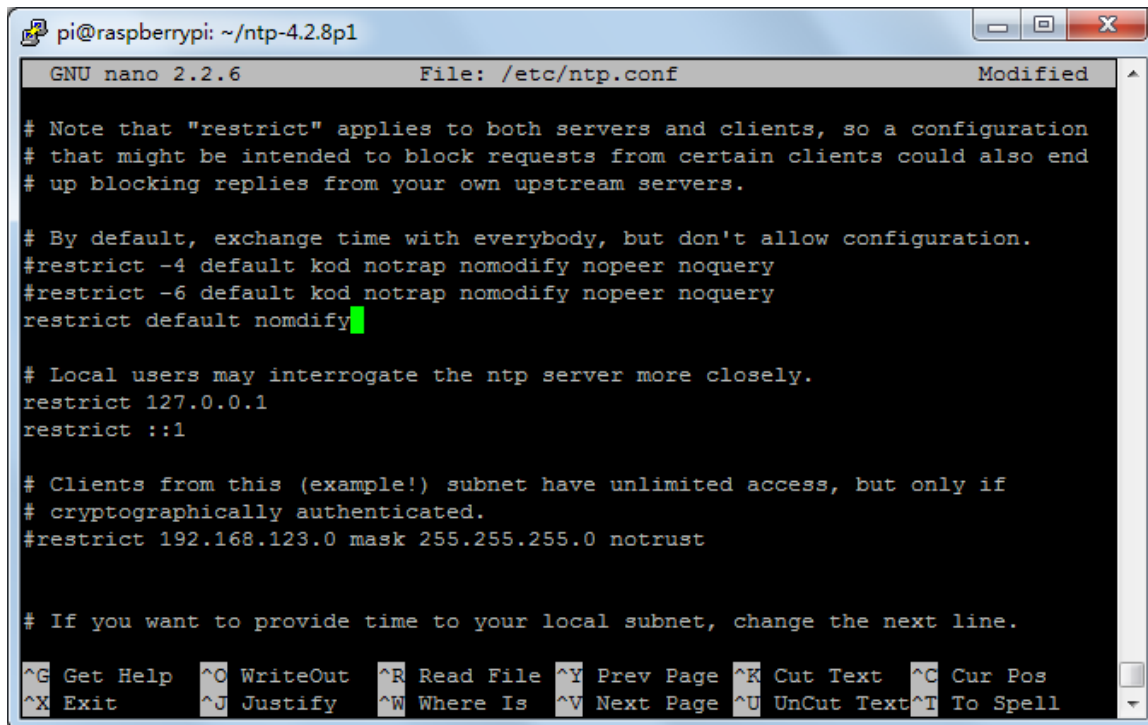
```

pi@raspberrypi: ~/ntp-4.2.8p1
make[2]: Entering directory '/home/pi/ntp-4.2.8p1/sntp'
[ ! -r ../../COPYRIGHT ]
|| [ check-COPYRIGHT-submake -nt ../../COPYRIGHT ]
|| make check-COPYRIGHT-submake
make install-recursive
make[3]: Entering directory '/home/pi/ntp-4.2.8p1/sntp'
Making install in include
make[4]: Entering directory '/home/pi/ntp-4.2.8p1/sntp/include'
make[5]: Entering directory '/home/pi/ntp-4.2.8p1/sntp/include'
make[5]: Nothing to be done for 'install-exec-am'.
make[5]: Nothing to be done for 'install-data-am'.
make[5]: Leaving directory '/home/pi/ntp-4.2.8p1/sntp/include'
make[4]: Leaving directory '/home/pi/ntp-4.2.8p1/sntp/include'
Making install in scripts
make[4]: Entering directory '/home/pi/ntp-4.2.8p1/sntp/scripts'
make[5]: Entering directory '/home/pi/ntp-4.2.8p1/sntp/scripts'
make[5]: Nothing to be done for 'install-exec-am'.
make[5]: Nothing to be done for 'install-data-am'.
make[5]: Leaving directory '/home/pi/ntp-4.2.8p1/sntp/scripts'
make[4]: Leaving directory '/home/pi/ntp-4.2.8p1/sntp/scripts'
Making install in libevent
make[4]: Entering directory '/home/pi/ntp-4.2.8p1/sntp/libevent'
make install-am
make[5]: Entering directory '/home/pi/ntp-4.2.8p1/sntp/libevent'

```

Figure 5

允许任何 IP 的客户机进行同步



```

pi@raspberrypi: ~/ntp-4.2.8p1
GNU nano 2.2.6 File: /etc/ntp.conf Modified

# Note that "restrict" applies to both servers and clients, so a configuration
# that might be intended to block requests from certain clients could also end
# up blocking replies from your own upstream servers.

# By default, exchange time with everybody, but don't allow configuration.
#restrict -4 default kod notrap nomodify nopeer noquery
#restrict -6 default kod notrap nomodify nopeer noquery
restrict default nomodify

# Local users may interrogate the ntp server more closely.
restrict 127.0.0.1
restrict ::1

# Clients from this (example!) subnet have unlimited access, but only if
# cryptographically authenticated.
#restrict 192.168.123.0 mask 255.255.255.0 notrust

# If you want to provide time to your local subnet, change the next line.

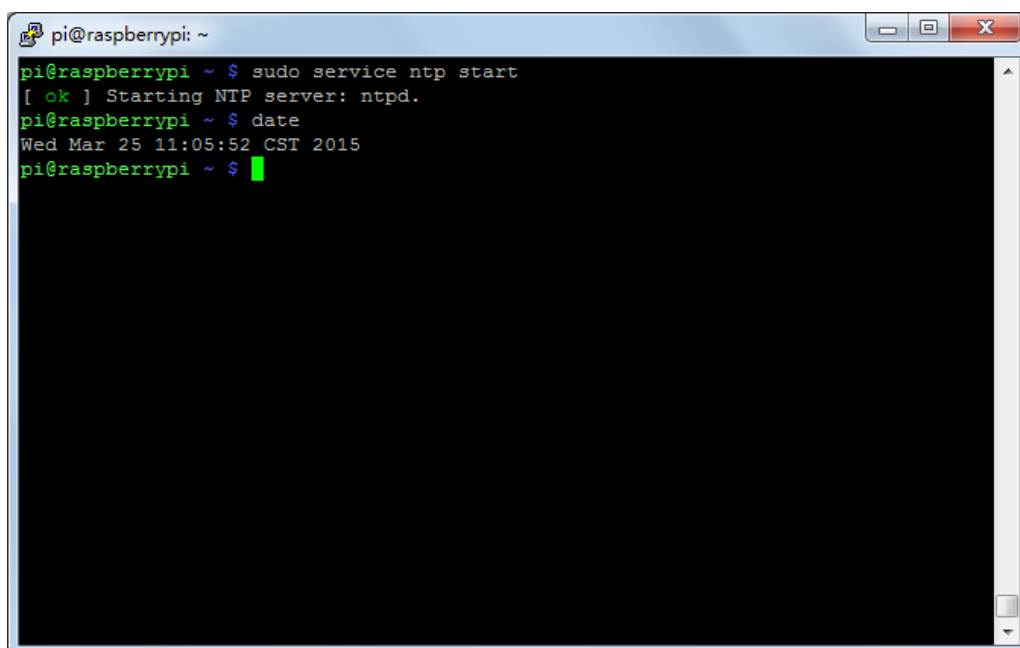
^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell

```

2. 同步服务器的时间。

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开启 ntp 服务



```
pi@raspberrypi: ~  
pi@raspberrypi ~ $ sudo service ntp start  
[ ok ] Starting NTP server: ntpd.  
pi@raspberrypi ~ $ date  
Wed Mar 25 11:05:52 CST 2015  
pi@raspberrypi ~ $
```

Figure 6

在 PC 上通过 IP 进行实践同步

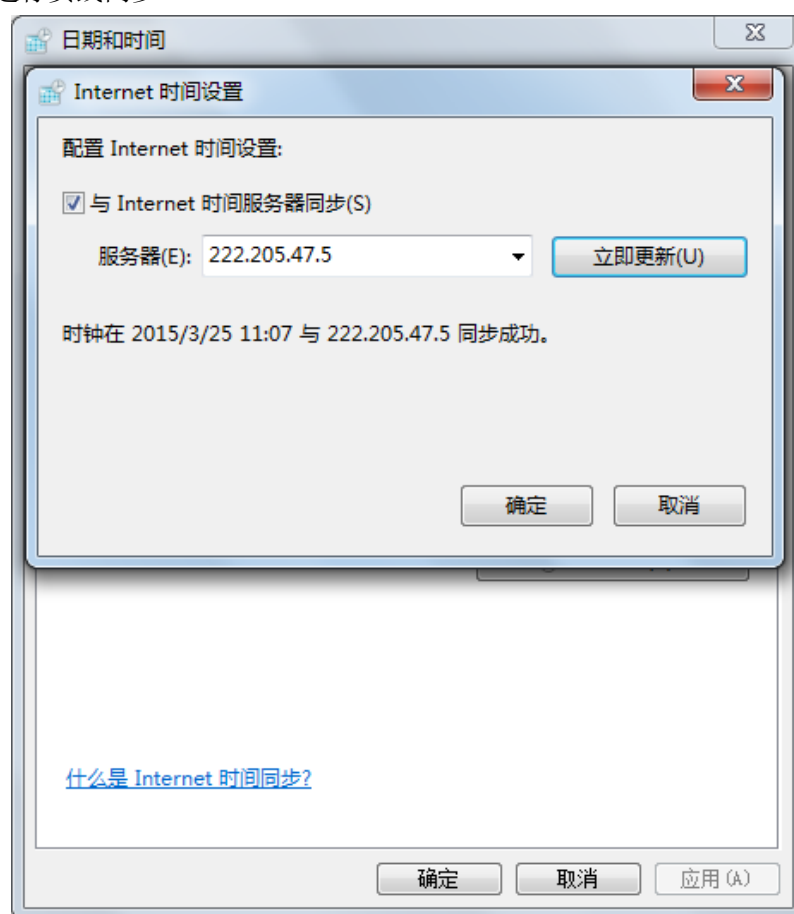


Figure 7

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五、实验数据记录和处理

暂无实验数据

六、实验结果与分析

完成全部实验要求

七、讨论、心得

在本次试验中，我们将树莓派变成了一个 ntp 服务器，通过更改设置文件，任何 IP 的 PC 客户机都可以通过树莓派的 IP 与树莓派的时间进行同步。