

浙江大学实验报告

课程名称： 嵌入式系统

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姓名： 张腾

实验名称： NAS

实验类型： 嵌入式开发

学号： 3120101111

一、实验目的和要求

把你的 PCduino 变成一台 NAS 服务器，能接一个 SATA 或 USB 硬盘，实现 Samba、DLNA 和 sftp 访问。

二、实验内容和原理

1. 掌握 pcduino 和 PC 建立文件共享的方式；
2. 掌握 linux 下移动存储设备的挂载。

三、主要仪器设备

硬件

pcduino v2 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；

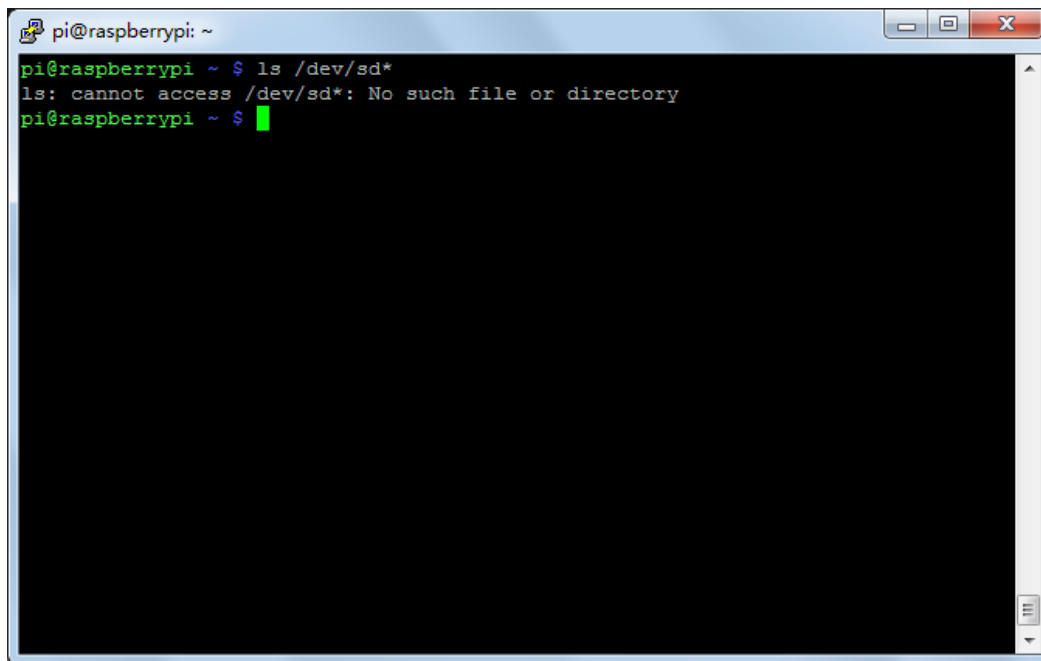
PC 上的串口终端软件，如 minicom、picocom、putty 等；

PC 上的 SSH 软件，如 putty 等。

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四、操作方法和实验步骤

1. 把 USB 移动硬盘连接到 PCduino 上, 并挂载;
在 USB 移动硬盘插入 PCDurino 之前, /dev 目录下并没有设备



```
pi@raspberrypi: ~  
pi@raspberrypi ~ $ ls /dev/sd*  
ls: cannot access /dev/sd*: No such file or directory  
pi@raspberrypi ~ $
```

Figure 1

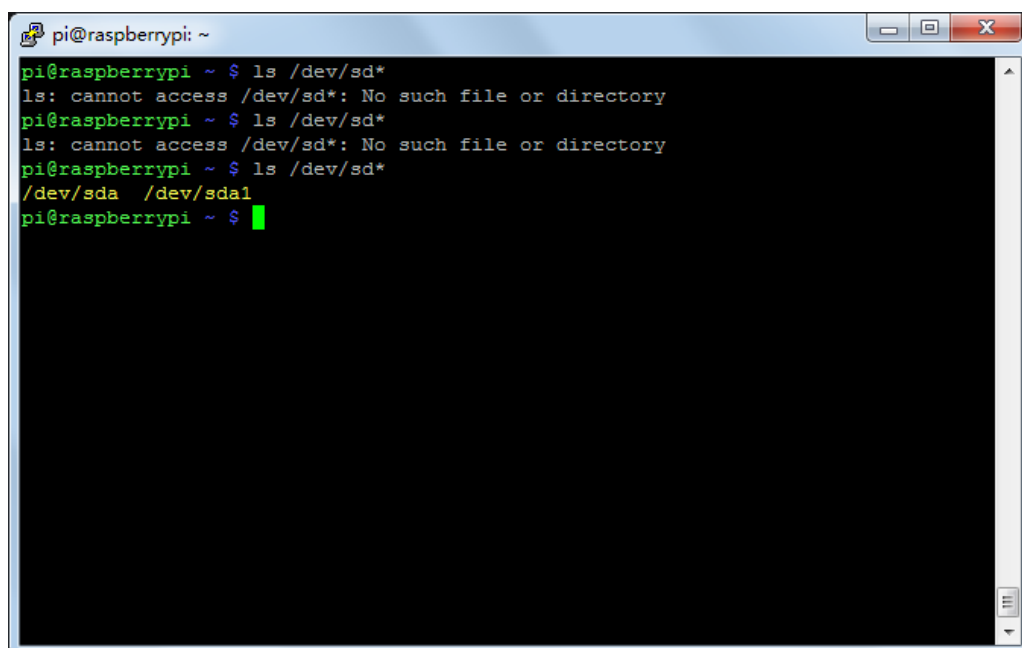
将 USB 插入串口



Figure 2

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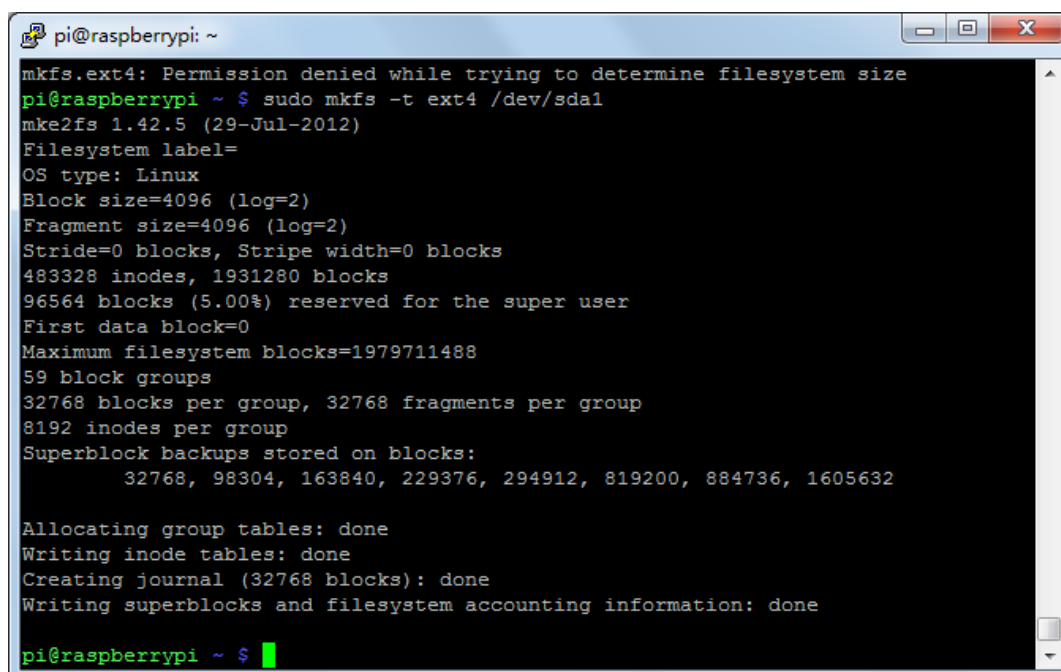
在终端可以看到 U 盘已被识别

A terminal window titled 'pi@raspberrypi: ~' with a black background and green text. It shows the execution of 'ls /dev/sd*' three times. The first two attempts result in the error 'ls: cannot access /dev/sd*: No such file or directory'. The third attempt shows the output '/dev/sda /dev/sda1', indicating the U disk has been successfully identified.

```
pi@raspberrypi ~ $ ls /dev/sd*
ls: cannot access /dev/sd*: No such file or directory
pi@raspberrypi ~ $ ls /dev/sd*
ls: cannot access /dev/sd*: No such file or directory
pi@raspberrypi ~ $ ls /dev/sd*
/dev/sda /dev/sda1
pi@raspberrypi ~ $
```

Figure 3

将 U 盘格式化为 ext4 文件格式。

A terminal window titled 'pi@raspberrypi: ~' with a black background and green text. It shows the execution of 'mkfs.ext4' and 'sudo mkfs -t ext4 /dev/sda1'. The output displays various filesystem statistics such as block size, fragment size, inodes, and reserved blocks. It concludes with 'Allocating group tables: done', 'Writing inode tables: done', 'Creating journal (32768 blocks): done', and 'Writing superblocks and filesystem accounting information: done'.

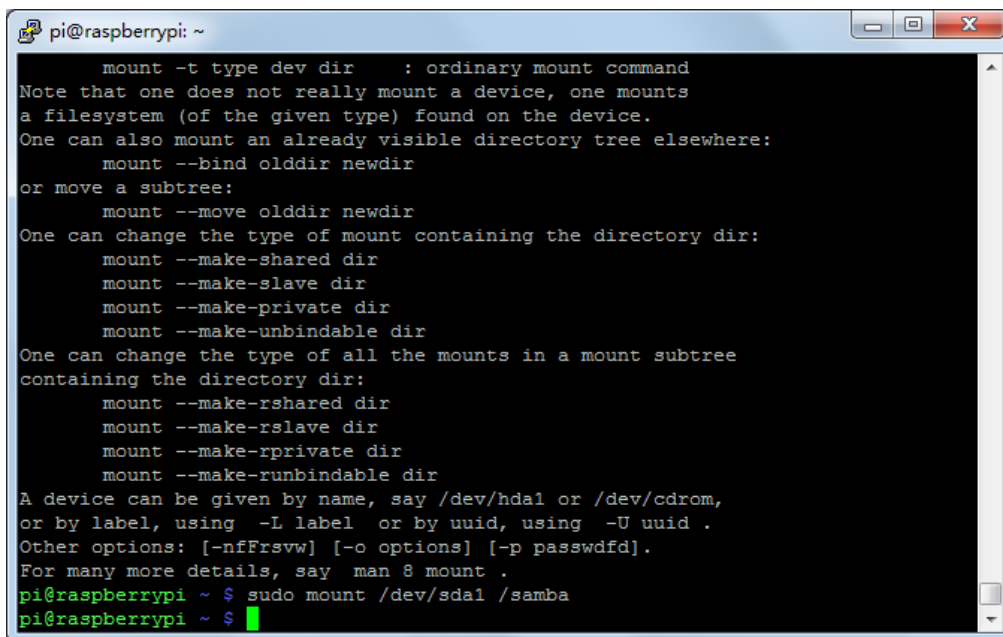
```
mkfs.ext4: Permission denied while trying to determine filesystem size
pi@raspberrypi ~ $ sudo mkfs -t ext4 /dev/sda1
mke2fs 1.42.5 (29-Jul-2012)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
483328 inodes, 1931280 blocks
96564 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=1979711488
59 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
pi@raspberrypi ~ $
```

Figure 4

挂载 U 盘

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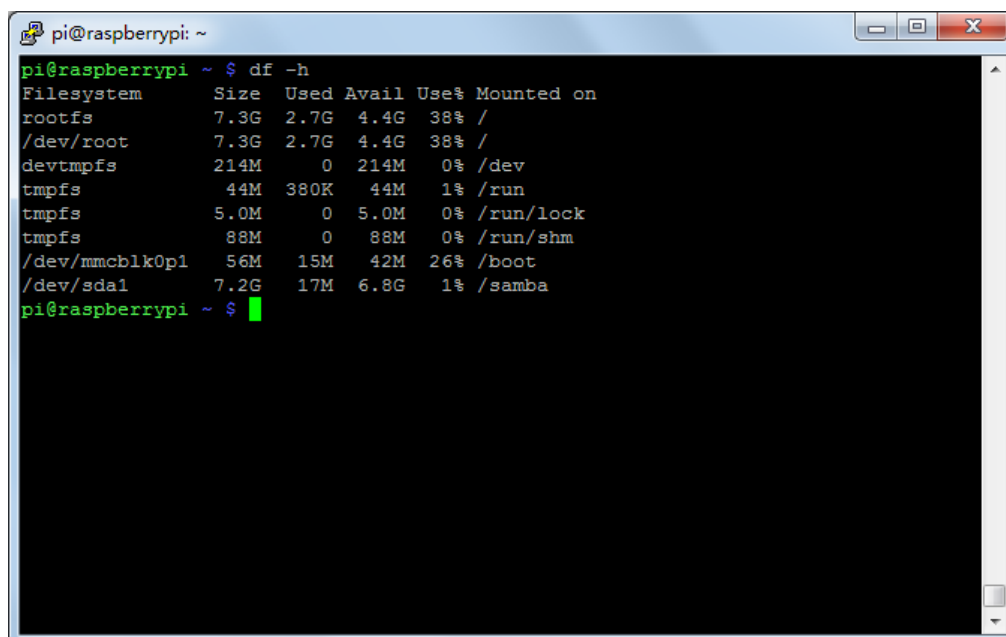
```

pi@raspberrypi: ~
mount -t type dev dir : ordinary mount command
Note that one does not really mount a device, one mounts
a filesystem (of the given type) found on the device.
One can also mount an already visible directory tree elsewhere:
    mount --bind olddir newdir
or move a subtree:
    mount --move olddir newdir
One can change the type of mount containing the directory dir:
    mount --make-shared dir
    mount --make-slave dir
    mount --make-private dir
    mount --make-unbindable dir
One can change the type of all the mounts in a mount subtree
containing the directory dir:
    mount --make-rshared dir
    mount --make-rslave dir
    mount --make-rprivate dir
    mount --make-runbindable dir
A device can be given by name, say /dev/hda1 or /dev/cdrom,
or by label, using -L label or by uuid, using -U uuid .
Other options: [-nfFrsvw] [-o options] [-p passwdfd].
For many more details, say man 8 mount .
pi@raspberrypi ~ $ sudo mount /dev/sda1 /samba
pi@raspberrypi ~ $

```

Figure 5

使用 df -h 命令查看磁盘使用情况:



```

pi@raspberrypi: ~
pi@raspberrypi ~ $ df -h
Filesystem      Size  Used Avail Use% Mounted on
rootfs          7.3G  2.7G  4.4G   38% /
/dev/root       7.3G  2.7G  4.4G   38% /
devtmpfs        214M    0  214M    0% /dev
tmpfs           44M   380K   44M    1% /run
tmpfs           5.0M    0   5.0M    0% /run/lock
tmpfs           88M    0   88M    0% /run/shm
/dev/mmcblk0p1  56M   15M   42M   26% /boot
/dev/sda1       7.2G   17M  6.8G    1% /samba
pi@raspberrypi ~ $

```

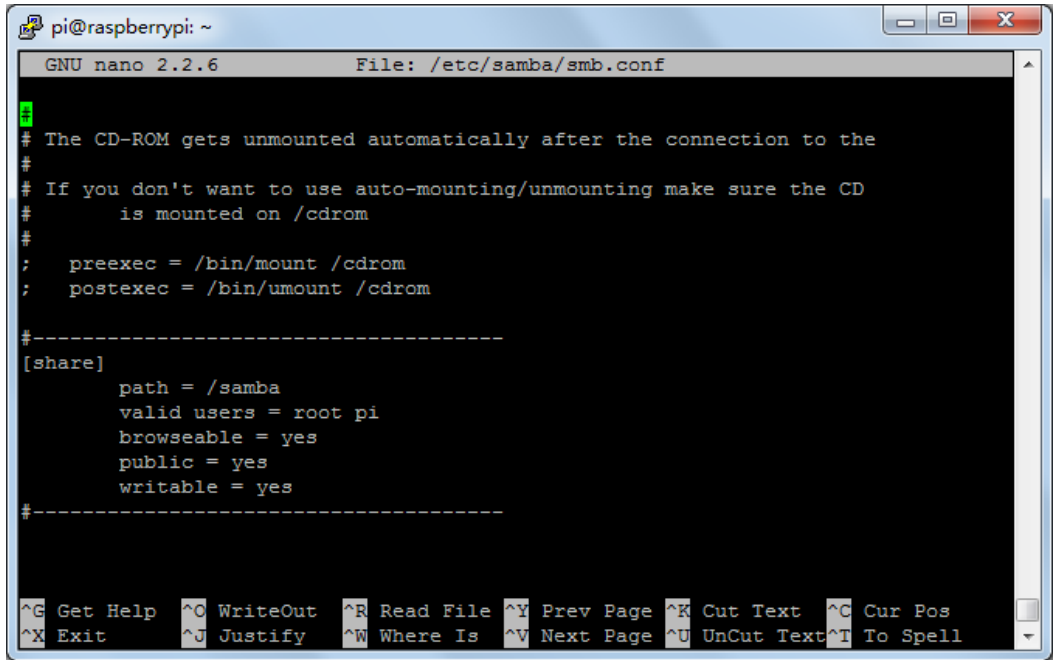
Figure 6

安装配置 Samba、DLNA 和 sftp, 在 PC 上分别用这三种访问移动硬盘。

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Samba:

下载 samba, 并配置其配置文件:



```
pi@raspberrypi: ~
GNU nano 2.2.6 File: /etc/samba/smb.conf

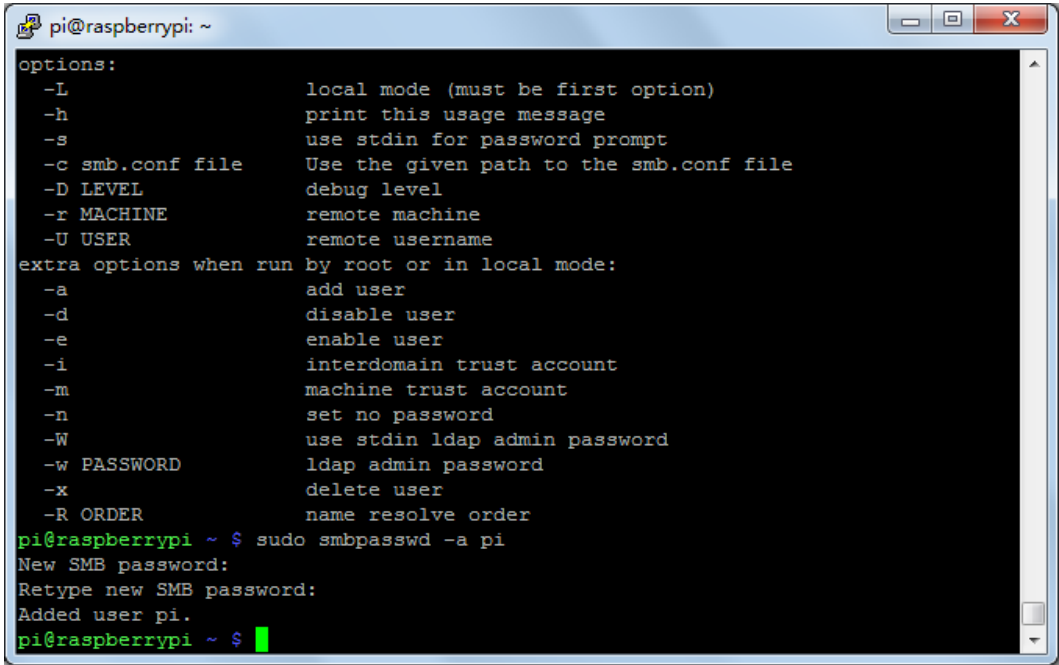
# The CD-ROM gets unmounted automatically after the connection to the
#
# If you don't want to use auto-mounting/unmounting make sure the CD
# is mounted on /cdrom
#
; preexec = /bin/mount /cdrom
; postexec = /bin/umount /cdrom

#-----
[share]
    path = /samba
    valid users = root pi
    browseable = yes
    public = yes
    writable = yes
#-----

^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
```

Figure 7

重新启动 samba 服务后添加用户:



```
pi@raspberrypi: ~
options:
  -L                local mode (must be first option)
  -h                print this usage message
  -s                use stdin for password prompt
  -c smb.conf file  Use the given path to the smb.conf file
  -D LEVEL          debug level
  -r MACHINE        remote machine
  -U USER           remote username
extra options when run by root or in local mode:
  -a                add user
  -d                disable user
  -e                enable user
  -i                interdomain trust account
  -m                machine trust account
  -n                set no password
  -W                use stdin ldap admin password
  -w PASSWORD       ldap admin password
  -x                delete user
  -R ORDER          name resolve order
pi@raspberrypi ~ $ sudo smbpasswd -a pi
New SMB password:
Retype new SMB password:
Added user pi.
pi@raspberrypi ~ $
```

Figure 8

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在 PC 上添加网络文件夹映射:

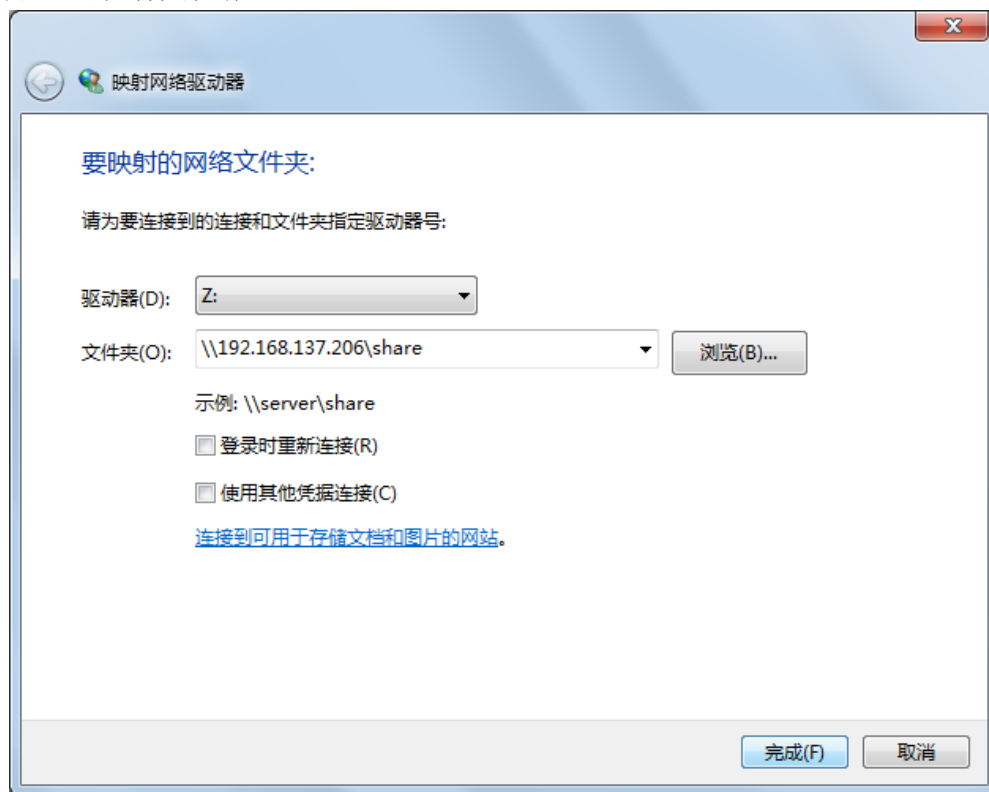


Figure 9

在 PcDunino 上创建一个文件, 可以在 PC 上进行修改, 实现文件的共享

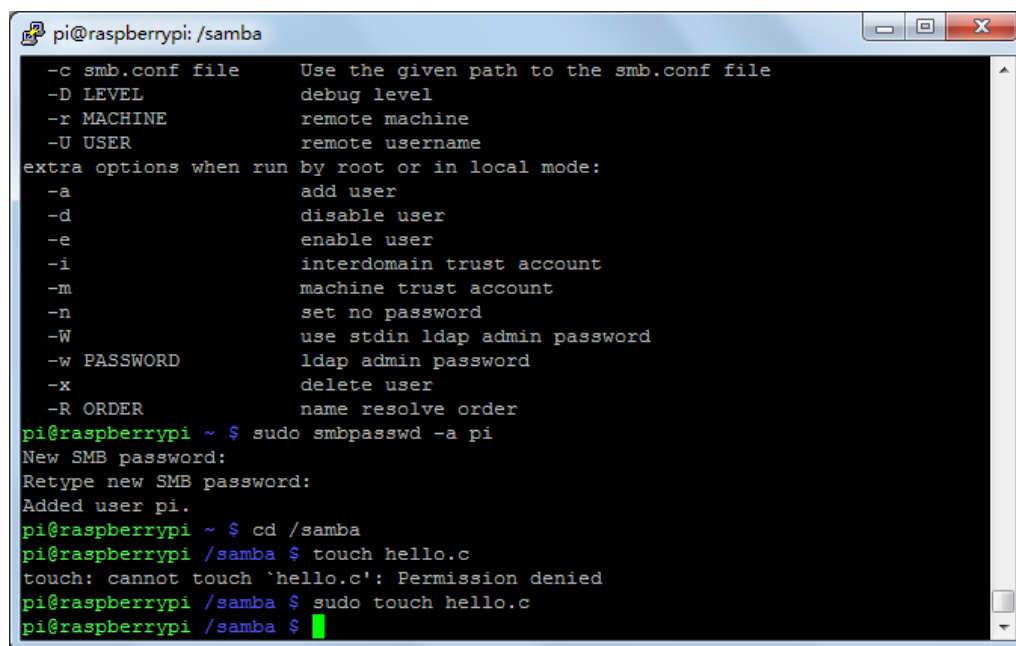


Figure 10

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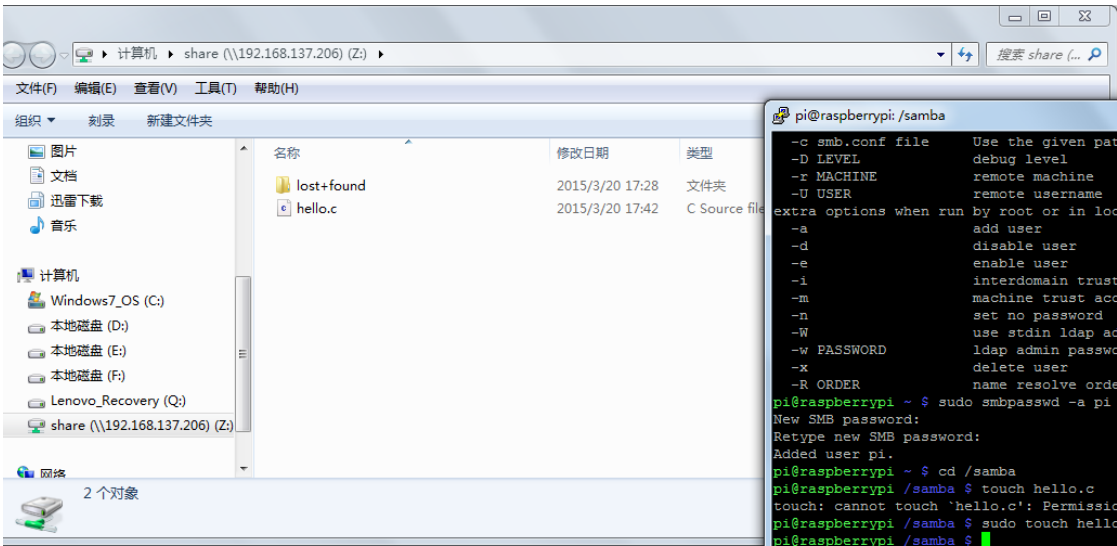


Figure 11

DLNA

下载并配置 minidlna

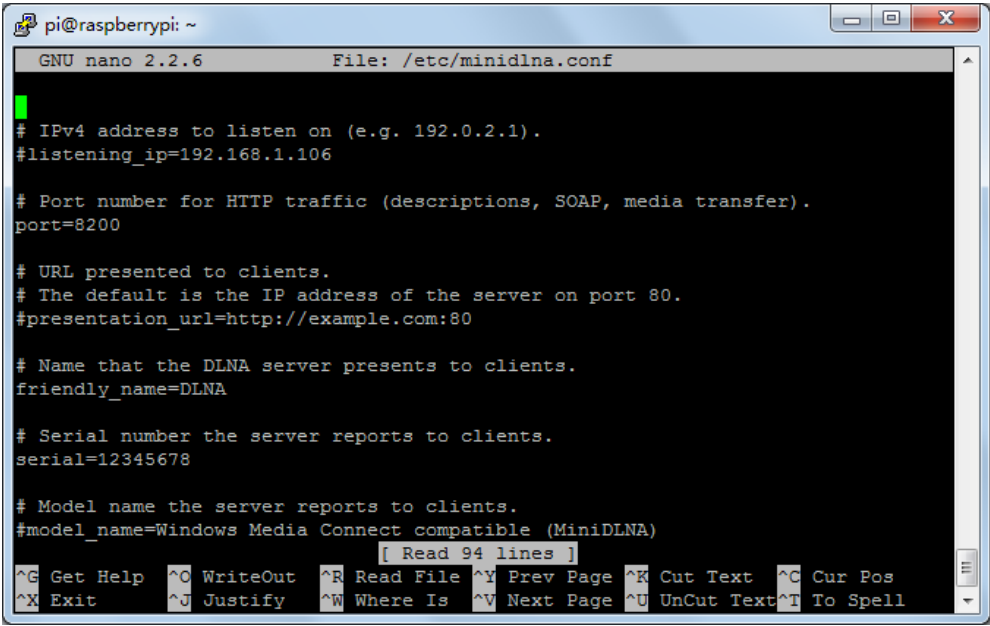
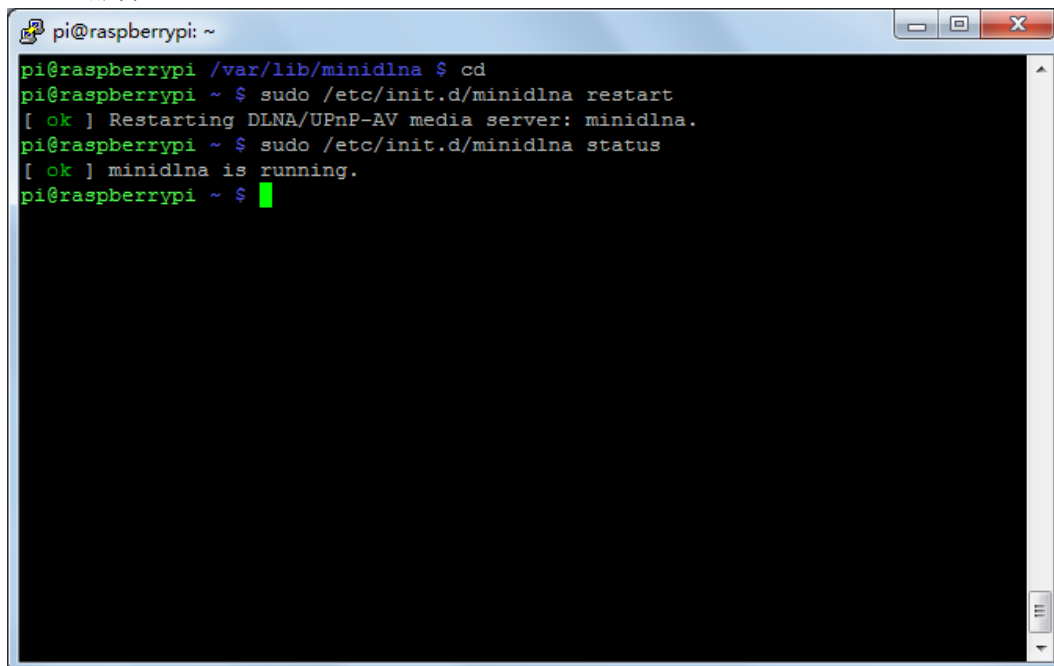


Figure 12

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重启 minidlna 服务:



```
pi@raspberrypi: ~  
pi@raspberrypi /var/lib/minidlna $ cd  
pi@raspberrypi ~ $ sudo /etc/init.d/minidlna restart  
[ ok ] Restarting DLNA/UPnP-AV media server: minidlna.  
pi@raspberrypi ~ $ sudo /etc/init.d/minidlna status  
[ ok ] minidlna is running.  
pi@raspberrypi ~ $
```

Figure 13

我们可以看到在 PC 端已经检测到了 DLNA 设备

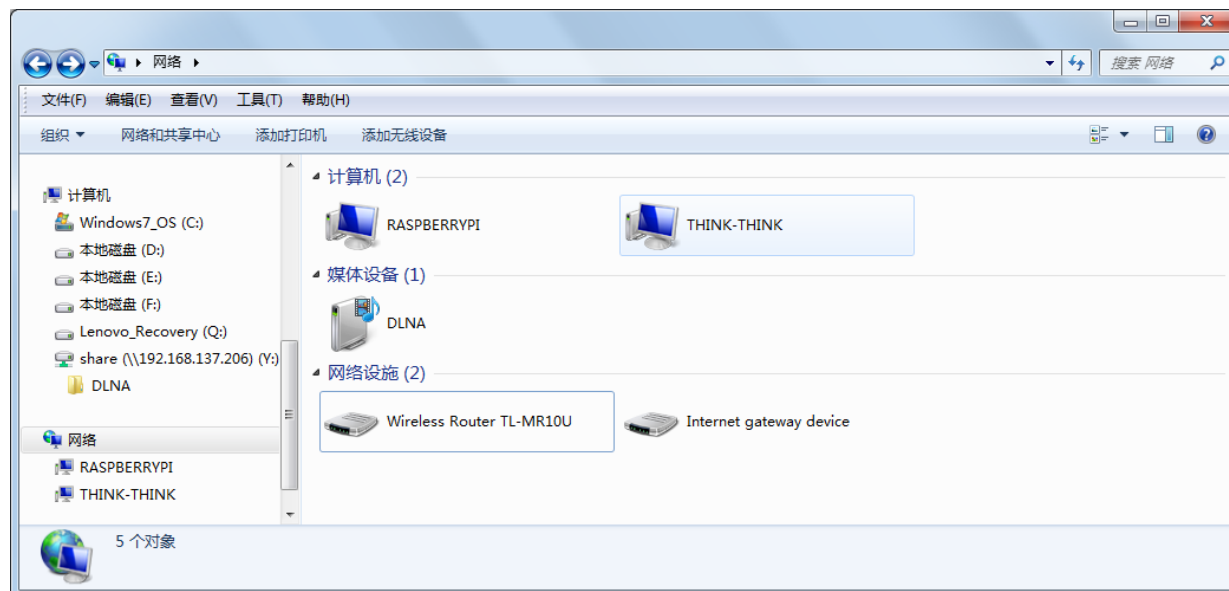
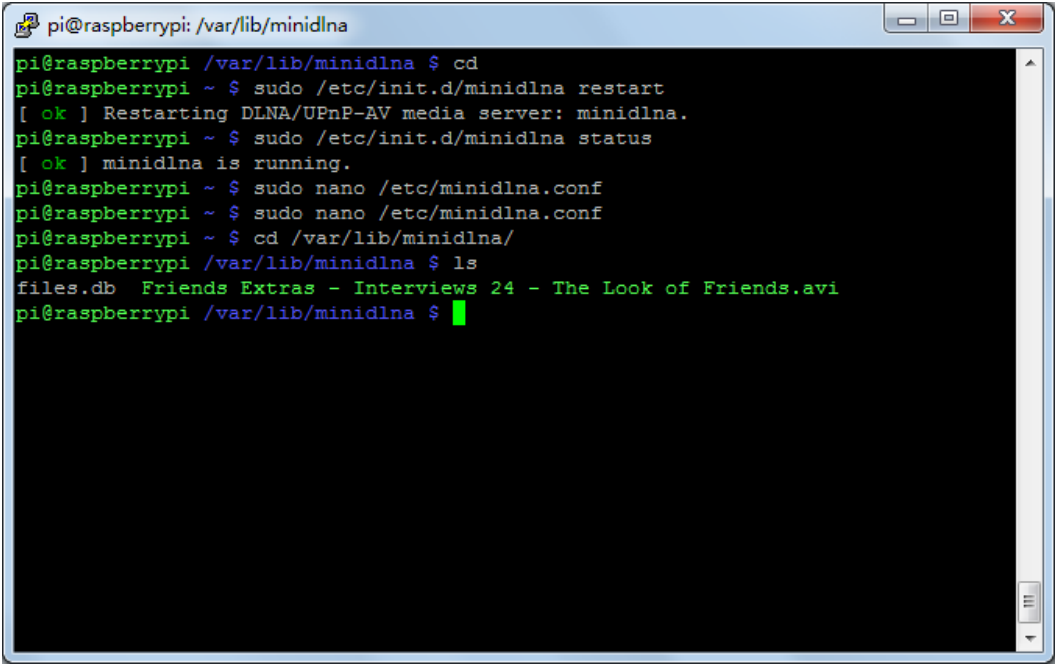


Figure 14

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将视频文件拷贝到 pcDunino 的/var/lib/minidlna 目录下



```
pi@raspberrypi: /var/lib/minidlna
pi@raspberrypi /var/lib/minidlna $ cd
pi@raspberrypi ~ $ sudo /etc/init.d/minidlna restart
[ ok ] Restarting DLNA/UPnP-AV media server: minidlna.
pi@raspberrypi ~ $ sudo /etc/init.d/minidlna status
[ ok ] minidlna is running.
pi@raspberrypi ~ $ sudo nano /etc/minidlna.conf
pi@raspberrypi ~ $ sudo nano /etc/minidlna.conf
pi@raspberrypi ~ $ cd /var/lib/minidlna/
pi@raspberrypi /var/lib/minidlna $ ls
files.db  Friends Extras - Interviews 24 - The Look of Friends.avi
pi@raspberrypi /var/lib/minidlna $
```

Figure 15

可以在 PC 端使用 media player 进行播放:

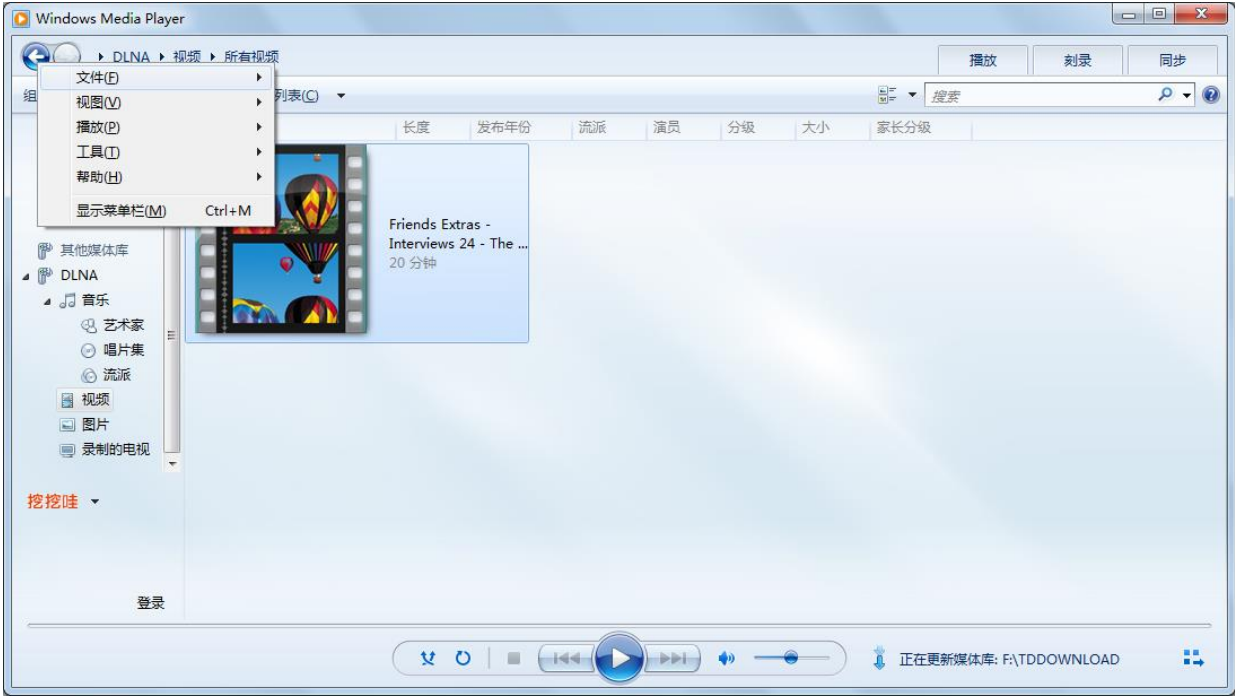


Figure 16

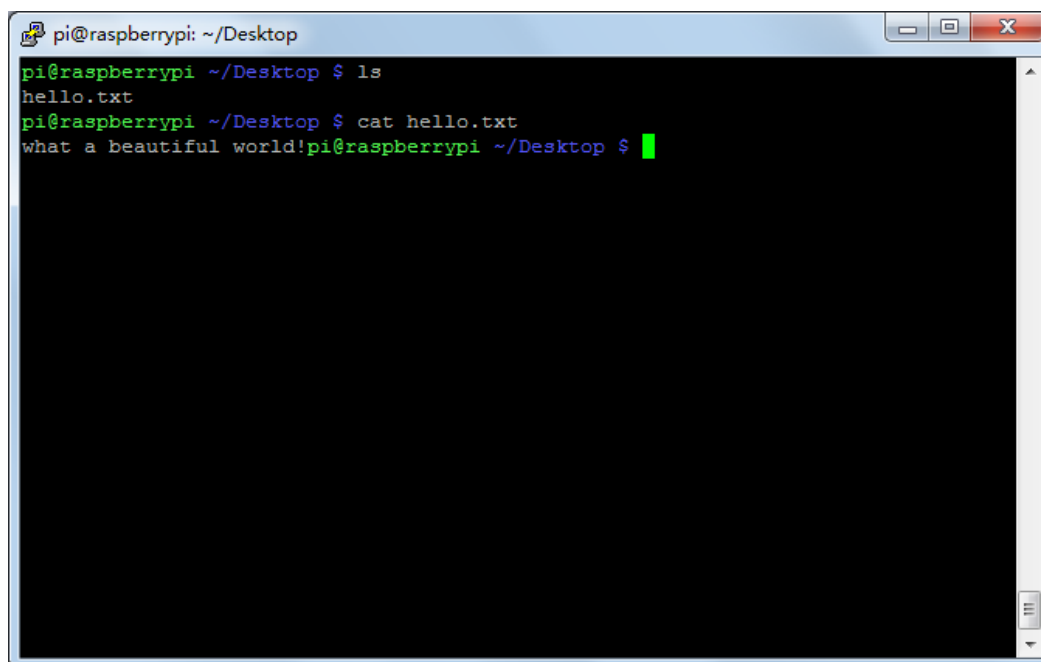
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Figure 17

至此，DLNA 已部署完毕

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A terminal window titled 'pi@raspberrypi: ~/Desktop' with standard window controls. The terminal shows the following commands and output:

```
pi@raspberrypi ~/Desktop $ ls
hello.txt
pi@raspberrypi ~/Desktop $ cat hello.txt
what a beautiful world!pi@raspberrypi ~/Desktop $
```

Figure 20

至此 sftp 配置完成。

五、实验数据记录和处理

暂无实验数据。

六、实验结果与分析

结果正确，完成实验要求。

七、讨论、心得

通过本次试验，我们使用三种方式（Samba、DLNA、SFTP）方式将树莓派变成了一个网络存储设备（NAS），实现了 PCDunino 和 PC 之间的资源共享，能够在 PC 上播放、观赏 PCDunino 上的媒体资源，总之，本次试验，使我更深入了解磁盘的挂载，以及建立文件共享的方式。