CDServer−HOWTO

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Added description and link to cdtower shell script.		
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Updated for 2.4 kernels. Added more References and links. Convert to DocBook XML 4.1.2 Change License from LDP boilerplate to GFDL.		
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First version released in text and html.		

The CD Server HOWTO describes the steps and commands you can use to setup your own CD Server using Linux and some built−in Unix commands along with other freely available software packages. The CD Server can then share the CD's via the network to Windows and/or other client machines.

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1. Introduction

With disk space becoming less expensive (100GB Western Digital 7200rpm available for US $195 in January 2002), it is viable to use an Open Source software−based CD Server solution, instead of paying $800−$4,000 for a software, thin−server, or CD Jukebox solution.

I've setup my CD Server on a Pentium 200 with 64MB RAM, using one of these large drives.

Any comments, suggestions, additions, or corrections can be sent to my email address at Talcon Information Systems: `<randy@talcon.com>`.

1.1. Intended Audience

This HOWTO is specifically directed toward System Administrators and uses Linux for the examples. It should work with other flavors of Unix provided that they have a loop device or a method of mounting a CD image file within the directory tree as a block device using the iso9660 file system.

1.2. Things You'll Need

The commands and utilities needed to setup your own CD Server are already included in most (if not all) Linux distributions.

- A Linux Distribution (This HOWTO uses Linux−Mandrake for the examples)
- **dd** − Converts and copies a file (a standard Unix command)
- **mount** − Mounts and Unmounts filesystems (a standard Unix command)
- Samba − A Windows SMB/CIFS fileserver for Unix
- NFS (optional for Unix) − Network File System (included in Linux distributions)
- Netatalk (optional for Macs) − A package that lets a Unix machine supply Appletalk print and file services on a LAN.

Note

> Previous to the 2.4 kernels, the Linux−Mandrake distribution I was using only had support for 8 loop devices compiled into the kernel (see Section 3 to increase this number). At that time, you were only be able to share 8 CD's on a network with that default value, and to share more than 8, the loop block driver source code (loop.c) needed to be modified and a new kernel compiled.
>
> *With the 2.4 kernels, that is no longer required.* You can now set the number of loop devices dynamically via the max_loop module parameter, or by passing max_loop=[1−255] to the kernel on boot.

1.3. Suggested Reading and References

SMB HOWTO by: David Wood, dwood (at) plugged.net.au. Part of the Linux Documentation Project. This document describes how to use the Server Message Block (SMB) protocol, also called the Session Message

Block, NetBIOS or LanManager protocol, with Linux using Samba.

Using Samba by: Robert Eckstein, David Collier−Brown, Peter Kelly 1st Edition November 1999, O'Reilly and Associates, Inc. ISBN 1−56592−449−5,

The Linux CD−ROM HOWTO by: Jeff Tranter, tranter (at) pobox.com. Part of the Linux Documentation Project. How to install, configure, and use CD−ROM drives under Linux. It lists the supported hardware and answers a number of frequently asked questions. This HOWTO also gives some information on using multi−platter CD−ROM drives with Linux.

CD−Writing HOWTO by: Winfried Trümper, winni (at) xpilot.org. Part of the Linux Documentation Project. This document explains how to write CD−ROMs under Linux. This HOWTO also includes information on making 1:1 image copies of CD−ROMs.

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You are strongly recommended to make a backup of your system before major installation and should make backups at regular intervals.

1.6. News

As always, check the revision history at the top of this document.

DocBook XML source for this document is available. Any additions/changes should be made to the DocBook XML source, not derivative formats.

This documents home page is at the CDServer−HOWTO site page in case you need the latest version, or there is a problem with the page format you are viewing.

1.7. Credits

My thanks go the readers of this HOWTO and those willing to share their experiences and knowledge with me. I have the pleasure of acknowledging:

Mark F. Komarinski	markk (at) linuxdoc.org	LDP Author Guide
Jorge Godoy	godoy (at) metalab.unc.edu	LDP Author Guide
David C. Merrill	dcmerrill (at) mindspring.com	LDP Author Guide
Stein Gjoen	sgjoen (at) nyx.net	HOWTO−Template
Gregory Leblanc	gleblanc (at) cu−portland.edu	HOWTO−Template
Greg Ferguson	gferg (at) sgi.com	HOWTO−Template
Amar Chaouche	achaouche (at) linbox.com	mount unhide option
Giblhauser Carl Michael	mike (at) bawb.bmlf.gv.at	runoutblock i/o errors
Monte Milanuk	milanuk (at) yahoo.com	nfs help
Paul A. Sand	pas (at) unh.edu	loop module option max_loop
Tony Melia	Tony.Melia (at) downsmicro.com.au	max_loop kernel boot parameter
Richard Black	Richard.Black (at) compaq.com	more info and mknod script
Bradley Wendelboe	krakken (at) icehouse.2y.net	cdtower shell script
James Mumm	dart (at) windeath.2y.net	cdtower shell script

1.8. Translations

- Korean (html and sgml) at http://www.ibiblio.org/pub/Linux/docs/HOWTO/translations/korean/

If you have the capacity it would be nice to make the CDServer−HOWTO available in a number of formats and languages.

If you've translated this document, please send to me:

- Your name, email address, the language and URL to the translated document (preferred).
- Or an email attachment of the work.

Please send either to my email address at Talcon Information Systems: `<randy@talcon.com>`.

2. Procedure

Summary of Steps

- Create a large partition to hold the CD Image Files.
- Copy the CD to an image file using the **dd** command.
- Mount the CD image file within the directory tree.
- Share the directory on the network using Samba, NFS, etc.

Also, make sure you've read Section 1 and Section 1.2.

2.1. Creating the ISO Images

Choose (or create) a file system with the largest available disk space on it. Keep in mind that CD−ROM's can hold around 640MB of data, so if you want to share 8 full CD's on your network, you'll need 5.1GB of space available.

Login as root or "su" to root.

```
bash# df −h

Filesystem            Size  Used Avail Use% Mounted on
/dev/hda5             1.4G   82M  1.3G   6% /
/dev/hda1              15M  827k   14M   6% /boot
/dev/hda7             2.4G 1008M  1.3G  43% /usr
/dev/hda8            23.6G 11.7G 11.7G  50% /home
```

Here the `/home` filesystem has the most available space, so it is the most suitable filesystem to use for dumping the CD images to.

```
bash# cd /home
bash# mkdir image
bash# cd image
```

Now, copy the CD to an ISO image. You must know the device name of your CD−ROM drive (usually `/dev/cdrom`, it could be `/dev/scd0` for SCSI CD−ROM's) I'll use the Mandrake distribution CD−ROM as an Example:

```
bash# dd if=/dev/cdrom of=mndrk81.iso
```

Note

> The "if=" is the input file, the "of=" is the output file. You should see a message stating the number of records in and number of records out.
>
> If you see i/o errors, they will most likely be due to the lead−in and lead−out runoutblocks on the CD. If the number of records in and number of records out do not match you may have a problem, otherwise the image will most likely be alright, but you can never know if the errors happened while reading the ISO part of the CD or not (due to dust or scratches on the CD).

Other utilities to read CD's exist, like **readcd** or **sdd**.

More information about making 1:1 copies of CD's exists in the [CD−Writing−HOWTO], see Section 1.3.

My thanks to Giblhauser Carl Michael for the runoutblock information.

2.2. Mounting the ISO Images

The next step is to mount the ISO image file. Let's create a directory under `/mnt` to place the mounted file.

```
bash# cd /mnt
bash# mkdir iso
bash# cd iso
bash# mkdir mndrk81
```

Now mount the ISO image file to this newly created directory

```
bash# mount −o loop,unhide −t iso9660 −r /home/image/mndrk81.iso /mnt/iso/mndrk81
```

Note

The "−o loop" means use the option that mounts a file as a block device. The unhide option shows hidden files. The "−t iso9660" means that the file is in the iso9660 CD−ROM format. The "−r" means to mount read−only.

Thanks to Amar Chaouche for pointing out the unhide option for the mount command.

Now you can:

```
bash# cd mndrk81
bash# ls −al
```

You should see a listing (**ls**) of the files and directories that are on the actual CD (only now they're inside the ISO image file, and that's what you're currently looking at!)

2.3. Mounting the Image upon System Restart

Now that we've manually mounted the image, and made sure it works, an entry needs to made in the `/etc/fstab` file so that the image is remounted on the next system startup. It's important to make the entry AFTER the entry for the parent filesystem, e.g. `/home` (I use **vim**, but **emacs**, **joe**, **pico** or **jed** will work just as well):

```
bash# vim /etc/fstab
```

After the line that looks like the following (or whichever filesystem you've placed your images):

```
/dev/hda8 /home ext2 defaults 1 2
```

Insert the following line with your text editor:

```
/home/image/mndrk81.iso /mnt/iso/mndrk81 iso9660 ro,loop,auto,unhide 0 0
```

2.4. Sharing it on a Windows Network using Samba

You'll need to have Samba installed and working to perform the next steps (that's outside the scope of this instruction, see Section 1.3). If it's not yet installed, consult your Linux distribution's instructions for installing the Samba package. Or you can visit the Samba website at http://us1.samba.org/samba/samba.html for installation instructions, binaries, and/or the source code.

To share your mounted CD's on a windows network, simply create a stanza in the `/etc/smb.conf` file similar to the following:

```
[cdimages]
  comment = All Shared CD Images
  path = /mnt/iso
  public = yes
  writable = no
```

This will share all the subdirectories under the `/mnt/iso` directory on the network. To mount the share to a local drive (in this case the I: drive), bring up an MS−DOS Prompt on the Windows machine and type the following:

```
C:\> net use I: \\yourlinuxmachine\cdimages
```

Each CD image will now appear as a subdirectory on the I: drive of your Windows machine.

To mount ONLY the Mandrake CD image to a drive letter (we'll use M:, the root drive of which, will correspond exactly to the CD as if it was just inserted in the CD−ROM drive), create the following stanza in the `/etc/smb.conf` file.

```
[mndrk81]
  comment = Mandrake Linux 8.1
  path = /mnt/iso/mndrk81
  public = yes
  writable = no
```

Then, at your MS−DOS Prompt, mount it with the following command:

```
C:\> net use m: \\yourlinuxmachine\mndrk81
```

Warning

> *The Samba smb.conf file stanzas presented here are simplified, and not secure. Many more options exist for a Samba share which limit who can mount the shares, control how user authentication is performed, and whether the share is even browseable through Network Neighborhood on the Windows machines.*

2.5. Sharing the Images on a Unix network using NFS

Make sure that NFS is running and configured correctly on your Linux machine, then add the following to the `/etc/exports` file using your own preferred options:

```
# sample /etc/exports file
       /mnt/iso            (ro,insecure,nohide,all_squash)
```

Note

> The nohide option will allow you to mount a parent directory, without explicitly mounting all exported subdirectories beneath it.

Now try running:

```
bash# exportfs −r
```

This should re−export everything in your `/etc/exports` file.

Now, when typing "**showmount −e *`yourlinuxmachine`***" you should see that the `/mnt/iso` directory is included in the exports list.

3. Adding Support for More Loop Devices

Newer Linux kernels (2.4) allow you to add more loop devices easily by editing `/etc/modules.conf` or through the use of a boot parameter.

Older kernels (2.2 ?) only had support for 8 loop devices compiled into the kernel. In short, you were only able to share 8 CD's on a network with this default value. In order to support more than that default, you needed to modify the kernel source and recompile a new kernel.

Use the following methods to determine which version of the kernel you are running.

```
bash# uname −a
```

or

```
bash# cat /proc/version
```

3.1. Adding the Loop Module Option

Current kernels allow you to set the number of loop devices supported without recompiling the kernel. One of these methods is to add an options line to `/etc/modules.conf`. This method will only work if your loop support has been configured as a loadable kernel module (which is how most major Linux distributions come preconfigured now).

Edit `/etc/modules.conf` and add the following line.

```
options loop max_loop=64
```

After making the above change, simply reboot. Or you can try to use **rmmod** and **insmod** to make the change on the fly − but this will not work if you currently have any loop devices mounted (you'll get an error saying loop: Device or resource busy).

Note

> If you do not have an `/etc/modules.conf` file, your module configuration file may be called `/etc/conf.modules` (this name is now deprecated).

Continue with Section 3.4.

Thanks to Paul A. Sand for pointing out the /etc/modules.conf option.

3.2. Appending to the Boot Prompt

If your loop support has been compiled directly into the kernel (in other words, it is not loaded as a module), you can append the number of loop devices you would like to support at the linux boot prompt.

```
boot:  linux max_loop=64
```

Or, if you are using LILO, you can edit your linux boot stanza in `/etc/lilo.conf` and add/modify the *append=* line. Here is an example stanza showing *append=* (*note: only add or modify the append line, don't change your whole stanza to look like this one or your system may not boot*). For more information about LILO, consult the LILO mini−HOWTO at http://www.linuxdoc.org/HOWTO/mini/LILO.html.

```
image=/boot/vmlinuz
        label=linux
        root=/dev/hdb5
        initrd=/boot/initrd.img

        append="max_loop=64"

        vga=788
        read-only
```

After changing `/etc/lilo.conf`, you need to run the **lilo** command for your changes to take effect.

```
bash# lilo

Added linux *
Added linux-nonfb
Added failsafe
Added windows
Added floppy
```

Next restart your system. After your system restarts, you can check your boot command line by typing the following:

```
bash# cat /proc/cmdline
```

Note

> I am not sure if the loop module (compiled as a module) reads `/proc/cmdline` when the module is loaded, and therefore may not need an options line `/etc/modules.conf`. It's possible that it can (and if it doesn't, it should). To summarize: I have not tested this.

Continue with Section 3.4.

Thanks to Tony Melia for the boot prompt info.

3.3. Tweaking the Kernel

If you have an older kernel (v. 2.2) or if you are completely comfortable recompiling the kernel, you can increase the number of loop devices supported by editing the `/usr/src/linux/drivers/block/loop.c` file.

Note

> If you find that the kernel sources are not installed on your machine, you'll need to consult your Linux Distribution's documentation on how to install them (the Kernel Sources come with all distributions − it's part of the GNU GPL licensing).

Change the number in the following line to however many loop devices you'll need.

```
#define MAX_LOOP 16
```

Compile the new kernel or module as the case may be. If you need some help getting started with this, read `/usr/src/linux/README` or consult The Linux Kernel HOWTO.

Continue with Section 3.4.

3.4. Creating the Loop Devices in /dev

You should check how many `/dev` entries you have for loop devices.

```
bash# ls −l /dev/loop*
```

The **mknod** command creates the devices in the `/dev` directory. The loop devices have a major number of "7", and the minor numbers begin at "0". If your *MAX_LOOP* was defined as "8" in `/usr/src/linux/drivers/block/loop.c`, you should have `/dev/loop0` through `/dev/loop7`. To create the `/dev/loop8` device, use the following command (subsitute the appropriate number you need for both the "8's" in the example below).

```
bash# mknod −m660 /dev/loop8 b 7 8
```

Check Owner/Group & Permissions on the new file (using **ls −l**). You can change the owner and group with the following command:

```
bash# chown root.disk /dev/loop8
```

You can change the permissions using the following command:

```
bash# chmod 666 /dev/loop8
```

4. More Information

Be sure to check the suggested reading in Section 1.3.

4.1. Frequently Asked Questions

I finally had to create this section − Frequently Asked Questions. Although, I sometimes think it should be called Frequently Answered Questions (at least I try to answer them all).

Q: Can I copy CD contents to a directory and share it with SAMBA?
Q: Do any scripts or programs exist that automate this process?
Q: Do any web interfaces exist that automate this process?
Q: Can copy−protected CD's (e.g. laserlok) be shared in this way?

Q: Can I copy CD contents to a directory and share it with SAMBA?

A: In a word − Yes.

There is nothing to keep you from doing that. However I'm not sure which arguments you would have to use with tar and which options to include in the SAMBA stanzas. Also, there could be problems with file name mangling (case sensitivity, spaces in file names), file attributes (read−only), etc. If anyone is doing this successfully, please send me examples of the commands you used for copying the contents of the CD, and your SAMBA stanzas for the shares.

Here's some commands you can use to copy the contents:

```
bash# cd /home
bash# mkdir image
bash# cd image
bash# mkdir mndrk81
bash# mount /mnt/cdrom
bash# cd /mnt/cdrom
bash# tar cvf − . | (cd /home/image/mndrk81; tar xvf −)
```

Thanks to Giblhauser Carl Michael for this info

Q: Do any scripts or programs exist that automate this process?

A: Yes:

- Bradley Wendelboe and James Mumm wrote a shell script called CDTower − see Section 4.2.2 to download it.

  I have no independent test results of this script − use at your own risk.

Q: Do any web interfaces exist that automate this process?

A: Not yet. However there is much interest in this.

- Tony Melia [Tony.Melia (at) downsmicro.com.au] has announced that he is 60% complete with a web interface, i.e. sucking CD's in, creating extra `/dev/loop` entries and seeing what space the CD's are taking up.
- I am planning on writing a module for Webmin to automate this process. That project is currently hosted on SourceForge at http://sourceforge.net/projects/opencdserver

Q: Can copy−protected CD's (e.g. laserlok) be shared in this way?

A: To the best of my knowledge, No.

> Others have reported problems to me trying to share ISO images made from copy−protected CD's. It seems that even when using the "unhide" option with **mount** that files will remain hidden.

4.2. Other Instructions Available on the Web

This section is devoted to instructional materials that others have written or have sent to me.

4.2.1. Saving a CD−ROM to a File and Mounting it

Richard Black (Compaq) has some good pages about Saving CD−ROM's to files and mounting them in Red Hat Linux.

- Saving a CD−ROM to a File and Mounting it
- Linux Loop Devices − This page also includes the script below for creating many loop device nodes at once in `/dev`.

```
Device nodes are required to access the loop devices. You already have loop0 - loop7.
You can run the following loop to create the rest of the nodes (loop8 - loop255).
You can type all of the following lines of code on one single line if you leave off
the trailing "\" characters.

C=8; echo; echo "Creating loop device nodes."; \
   while [ $C -lt 256 ]; do mknod /dev/loop$C b 7 $C; \
   echo -n .; C=`expr $C + 1`; done; echo;


Note: the quoting around the expr section are called backtick's and they are located
with the tilde character ("~") in the upper left hand corner of the keyboard. The
character is not a single quote.
```

Thanks to Richard Black for permission to add this info and for linking back to this document.

4.2.2. CDTower v.06

A script to automate the creation of ISO images and share them via Samba

by Bradley Wendelboe [krakken (at) icehouse.2y.net] and James Mumm [dart (at) windeath.2y.net]

This software is covered under the GPL See http://www.gnu.org/copyleft/gpl.html for details.

To view/download this script:

> http://www.talcon.com/projects/CDServer−HOWTO/scripts/cdtower_v0.06.sh.txt

Caution

> *I have no independent test results of this script − use at your own risk.*

Thanks to Bradley Wendelboe for forwarding this script to me.

4.3. Under Future Consideration

These are things I'm currently looking into, trying to figure out, or planning to get done.

- Make more scripts available that others have sent to me, either within this howto, or by hosting them and linking to them from this document.
- Sharing CD's to Apple and Netware clients (Appletalk and IPX).
- Compressed ISO Images.
- Changing CD Shares on the fly (hopefully transparent to users).
- Adding a module to Webmin to automate the CDServer process.
- Distribution specific instructions.
- I have a volunteer for a German translation, hopefully it will be done soon.

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Version 1.1, March 2000

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