LILO, Linux Crash Rescue HOW−TO

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This document discusses methods to recover from Linux system failures. Various reasons for linux system failures can be − LILO is destroyed, or linux fails to boot, or Master Boot Record (MBR) is damaged or linux fails to boot when another operating system like Windows NT is installed which erases LILO or MBR.

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1. Introduction

(The latest version of this document is at http://www.milkywaygalaxy.freeservers.com. You may want to check there for changes).

You cannot avoid accidents and if it happens to linux systems then it may damage the master boot record (MBR) or LILO (Linux boot Loader). There may be cases where linux will not boot due to hard disk failures. The LILO may also fail if you accidentally re−partition the hard disk or you install another additional operating system like Windows 98/NT on the linux computer.

This document gives you some ideas, tips and quick guide to recover fast without wading through hundreds of pages of documentation on LILO or Linux.

1.1 Tiny Floppy Linux

To recover any Windows 95/NT/2000, OS/2, BeOS or Linux box you may need the tiny linux which fits on a single floppy disk. See the list of tiny floppy linux given below −

- The best Tomsrtbt
- Second best floppy linux MuLinux
- Trinux
- DLX
- FloppyFW
- Linux Router Proejct floppy
- Tiny Linux distributions
- TINYLinux

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2. Crash Recovery

2.1 Preparation Tips

It is a good idea to backup the important system files like /etc/fstab, /etc/lilo.conf after you login using Tomsrtbt floppy in next section. This can be very handy during crash situation or something happens to system files.

```
bash# cp /etc/fstab /etc/fstab.orig
bash# cp /etc/lilo.conf /etc/lilo.conf.orig
bash# cp /etc/hosts /etc/hosts.orig
bash# cp /etc/hosts.allow /etc/hosts.allow.orig
bash# cp /etc/hosts.deny /etc/hosts.deny.orig
bash# cp /etc/inetd.conf /etc/inetd.conf.orig
bash# cp /etc/inittab /etc/inittab.orig
bash# cp /etc/networks /etc/networks.orig
```

2.2 Quick Steps to recovery

Follow these steps to recover from LILO or system failures.

1. **SCENE 1:** If your system does not boot −

   Get the tomsrtbt floppy http://www.toms.net/rb or MuLinux floppy (see also Tiny Linux). Boot with tomsrtbt floppy Use fdisk to find the partitions. Try to recognise the root and boot partition. Watch out, you may be having the /boot files on the root partition itself.

   The Linux's root partition has the following directories **bin**, **boot**, **etc**, **usr**.

   And the Linux's boot partition has these directories: **vmlinuz**, **boot.b**, **chain.b**, **map**.

To find out root partition do this :

```
bash# fdisk /dev/hda
Command (m for help): m         (Gives you help on commands)
Command (m for help): p         (Gives you list of partitons)
Command (m for help): q
bash# mkdir /test
bash# mount /dev/hda1 /test
bash# ls /test
You should see root−partition list like this −
bin   fd    lib   mnt  proc  sbin  usr
boot  dev   etc   home  lost+found  opt  root  tmp   var
```

If this is not a root partition, then try the next partition /dev/hda2. Keep trying hda3, hda4, hda5, etc.. untill you find the root partition. If you do not find root partition in **hda** device then repeat the above steps for other hard disk devices like **hdb**, **hdc**, **hdd** etc..

Next, you should find the /boot, /usr and /var partitions. The disk locations of these partitions are needed to create the new lilo configuration.

In my case the root partition is /dev/hda4 which is used in the examples below:

```
bash# mkdir /rootpart
bash# mount /dev/hda4 /rootpart
bash# cat /rootpart/etc/fstab
        Read the output of fstab and mount partitions as per fstab file, see below −
bash# mount /dev/hda5 /rootpart/boot
bash# mount /dev/hda6 /rootpart/usr
bash# mount /dev/hda7 /rootpart/var
bash# mount /dev/hda8 /rootpart/opt
bash# mount /dev/hda9 /rootpart/root
bash# mount /dev/hda10 /rootpart/home
```

In my case, as per fstab file hda5 was **boot**, hda6 was **usr**, hda7 was **var**, hda8 was **opt**, hda9 was **root**, hda10 was **home** and hda11 was windows95 (FAT16 partition).

Edit /etc/fstab (not /rootpart/etc/fstab) and put (sample code given here) –

```
        /dev/hda4  /rootpart           ext2 defaults 1 1
        /dev/hda5  /rootpart/boot      ext2 defaults 1 1
        /dev/hda6  /rootpart/usr       ext2 defaults 1 1
        /dev/hda7  /rootpart/var       ext2 defaults 1 1
        /dev/hda8  /rootpart/opt       ext2 defaults 1 1
        /dev/hda9  /rootpart/root      ext2 defaults 1 1
        /dev/hda10 /rootpart/home      ext2 defaults 1 1
        /dev/hda11 /rootpart/win95part vfat defaults 1 1

On my computer hda4 contains the linux root partition, hda5 had boot partition and
hda11 has windows 95 vfat system.

bash# mkdir /rootpart/win95part
```

```
bash# mount /rootpart/win95part
        And repair the problem partitions using fsck or e2fsck commands.
bash# man fsck
bash# man e2fsck
```

2. **SCENE 2:** If LILO is not working..

   Follow scene 1 above, if that fails then follow these steps. After executing steps in scene 1 above, you should have already mounted /rootpart and have created /etc/fstab file.

   Note: It is very important to note how chroot command works below. The **/sbin/lilo** file which chroot uses is actually located in **/rootpart/sbin/lilo** and NOT in /sbin!! Hence, do not get confused.

```
bash# mount −a
bash# chroot /rootpart /sbin/lilo −q
bash# man chroot
bash# chroot /rootpart /sbin/lilo
```

   Note: New users of chroot will be confused. If chroot command complains that it cannot find /boot/map file then it actually means it that it cannot find /rootpart/boot/map. Because you gave /rootpart as the first argument to chroot and all references are with respect to /rootpart.

   Alternatively, you can directly use /sbin/lilo instead of chroot. The −r option of lilo actually does chroot. It is very **strongly recommended** that you use chroot, instead of lilo −r, as it is more convenient and can catch errors more easily.

```
bash# man lilo
bash# /sbin/lilo −r /rootpart
```

3. **SCENE 3:** If LILO is not working..

   If scene 1 and 2 failes, then if you made the boot disk with 'mkbootdisk' (during install or by using 'man mkbootdisk'), boot with it and repair your partitions. The mkbootdisk is in mkbootdisk*.rpm package, you must install this. Or get boot disks for Linux/NT/Windows/DOS/Mac are at http://www.bootdisk.com Other option is − get a hold of installation Linux−CDROM. Just about every Linux distribution provides a image of a rescue disk on their CD. Under Linux use "dd if=/cdrom/disks/rescue of=/dev/fd0" to create a rescue floppy disk. Under DOS use rawrite.exe (included on Linux CD) and then do "rawrite image−name a:".
4. **SCENE 4:** If 1, 2 and 3 above fails and you do not have boot disk

   If you have another computer running linux, then login as root and do −

   Note: If you compile your own kernel as a bzImage (for instance, bzImage−2.4.4), then you should create a hard link to vmlinuz−2.4.4 as follows (note the the z in name vmlinuz and it is not vmlinux). If you do not do this then mkbootdisk command may fail.

```
bash# cd /boot
bash# ls -l vmlinuz*
bash# ln /boot/bzImage-2.4.4  /boot/vmlinuz-2.4.4
```

Now that you have bzImage and vmlinuz, give these commands −

```
bash$ man mkbootdisk
bash# cp /etc/lilo.conf /etc/lilo-original.conf
```

Edit the /etc/lilo.conf and put the root partition name as you obtained in 'scene 1' above and insert a blank floppy and give −

```
bash$ mkbootdisk --device /dev/fd0 2.2.12-20
```

The mkbootdisk is in mkbootdisk*.rpm package, you must install this. Make sure you move the /etc/lilo−original.conf back to /etc/lilo.conf!! And then take this floppy and goto scene 3

5. **SCENE 5:** This is the worst scenerio and hopefully you will never come to this stage. Scenes from 1 to 4 will take care of majority of cases. But just in case, all the above scenes 1, 2, 3 and 4 fail then −

   Step 1: Boot tomsrtbt (see Tiny Linux) and mount the partitions and backup the root partition to another partition having disk space with comamnds −

```
        Edit /etc/fstab and put (sample code given here, you may have to
        change as per your disk layout) -
                /dev/hda4  /rootpart    ext2 defaults 1 1
                /dev/hda11 /b1          vfat defaults 1 1
bash$ mkdir /rootpart; mount /rootpart
bash$ mkdir /b1; mount /b1
bash$ cd /
bash$ df
        And see that there is enough disk space in /b1 to tar up the root partition
bash$ tar cvf /b1/root-hda4.tar   /rootpart
```

   Step 2: Insert Linux cdrom, reboot and install the redhat linux on /dev/hda4 (but DO NOT install any extra packages, you just need to install only the root, boot systems and LILO manager that is, a very bare minimum). This will also install the LILO on hard disk. Boot linux now and login as root and do −

```
bash$ man mkbootdisk
bash# cp /etc/lilo.conf /etc/lilo-original.conf
```

   Note: You MUST remember to copy back lilo−original.conf to lilo.conf!! Edit the /etc/lilo.conf and put the root partition name as you obtained in 'scene 1' above and insert a blank floppy and give −

```
bash$ mkbootdisk --device /dev/fd0 2.2.12-20
bash# cp /etc/lilo-original.conf /etc/lilo.conf
```

Test this boot floppy to see that this works and then restore back the all the files which you backedup using tar on /b1/root−hda4.tar as in step 1 above.

2.3 Precautionary measures

You should take the following pre−cautionary measures to tackle the problems in future.

- You MUST make emergency boot disk from time to time and whenever you make changes to the partition. Insert a blank floppy and do this −

```
bash$ man mkbootdisk
The mkbootdisk is in mkbootdisk*.rpm package, you must install this.
bash$ mkbootdisk --help
bash$ mkbootdisk --device /dev/fd0 2.2.12-20
```

- You MUST backup the partition tables setup to a floppy and to a hard disk. You should also print this out and paste it on the computer box.

```
bash$ su - root
bash# man fdisk
bash# fdisk -l /dev/sda > partition_table_backup.txt
```

  Very helpful if you need to repartition the hard disk. From the printout, you would know where your partition starts. During recovery, after repatitioning and formating you can restore data from the backup.

- You must keep the tomsrtbt boot floppy handy. Visit http://www.toms.net/rb (see also Tiny Linux)
- You must keep the Yard rescue and boot floppy disk handy. Visit http://www.linuxlots.com/~fawcett/yard
- Backup /root and /boot directories. Boot the Tomsrtbt floppy (see also Tiny Linux) and then

```
bash# vi /etc/fstab
And put these lines -
                /dev/hda1 /a1 vfat defaults 1 1
                /dev/hdb1 /b1 vfat defaults 1 1
In my case hda1 had the linux root partition '/'
bash# cd /
bash# tar cvf /b1/linux-root-partition-hda1.tar  a1
bash# tar cvf /b1/linux-boot-partition-hda1.tar  a1/boot
```

2.4 Removing LILO

You can replace the boot sector with the DOS boot loader by issuing the DOS command at MS DOS prompt:

```
        FDISK  /MBR
```

where MBR stands for "Master Boot Record".

See also LILO documentation on linux at /usr/doc/lilo* for other methods of uninstalling the LILO. And see also 'man lilo'.

2.5 Common mistakes

After making changes to /etc/lilo.conf you **MUST run lilo** to make changes to go in effect. It is a very common mistake committed by newusers. Type −

```
bash# lilo −v −v −v
```

---

3. Related URLs

Visit following locators which are related to LILO, Rescue Linux, crash recovery −

- Mini Lilo HOWTO at http://www.linuxdoc.org/HOWTO/mini/LILO.html
- Bootdisk−HOWTO at http://www.metalab.unc.edu/LDP/HOWTO/Bootdisk−HOWTO/index.html

- Pre−made boot disks at http://www.linuxdoc.org/HOWTO/Bootdisk−HOWTO
- Boot disks for Linux/NT/Windows/DOS/Mac at http://www.bootdisk.com
- Tomsrtbt boot floppy disk http://www.toms.net/rb and (see also Tiny Linux)
- Yard rescue and boot floppy disk http://www.linuxlots.com/~fawcett/yard

- BootPrompt−HOWTO at http://www.linuxdoc.org/HOWTO/BootPrompt−HOWTO.html
- Multiboot with LILO mini HOWTO at http://www.linuxdoc.org/HOWTO/mini/Multiboot−with−LILO.html
- Linux+WinNT mini HOWTO at http://www.linuxdoc.org/HOWTO/mini/Linux+WinNT.html

- Linux goodies main site http://www.milkywaygalaxy.freeservers.com Mirror sites are at − http://aldev0.webjump.com, angelfire, geocities, virtualave, 50megs, theglobe, NBCi, Terrashare, Fortunecity, Freewebsites, Tripod, Spree, Escalix, Httpcity, Freeservers.
- Vim color text editor for C++, C http://metalab.unc.edu/LDP/HOWTO/Vim−HOWTO.html

4. Other Formats of this Document

This document is published in 14 different formats namely − DVI, Postscript, Latex, Adobe Acrobat PDF, LyX, GNU−info, HTML, RTF(Rich Text Format), Plain−text, Unix man pages, single HTML file, SGML (Linuxdoc format), SGML (Docbook format), MS WinHelp format.

This howto document is located at −

- http://www.linuxdoc.org and click on HOWTOs and search for howto document name using CTRL+f or ALT+f within the web−browser.

You can also find this document at the following mirrors sites −

- http://www.caldera.com/LDP/HOWTO
- http://www.linux.ucla.edu/LDP
- http://www.cc.gatech.edu/linux/LDP
- http://www.redhat.com/mirrors/LDP
- Other mirror sites near you (network−address−wise) can be found at http://www.linuxdoc.org/mirrors.html select a site and go to directory /LDP/HOWTO/xxxxx−HOWTO.html

- You can get this HOWTO document as a single file tar ball in HTML, DVI, Postscript or SGML formats from − ftp://www.linuxdoc.org/pub/Linux/docs/HOWTO/other−formats/ and http://www.linuxdoc.org/docs.html#howto

- Plain text format is in: ftp://www.linuxdoc.org/pub/Linux/docs/HOWTO and http://www.linuxdoc.org/docs.html#howto

- Single HTML file format is in: http://www.linuxdoc.org/docs.html#howto

  Single HTML file can be created with command (see man sgml2html) − sgml2html −split 0 xxxxhowto.sgml

- Translations to other languages like French, German, Spanish, Chinese, Japanese are in ftp://www.linuxdoc.org/pub/Linux/docs/HOWTO and http://www.linuxdoc.org/docs.html#howto Any help from you to translate to other languages is welcome.

The document is written using a tool called "SGML−Tools" which can be got from − http://www.sgmltools.org Compiling the source you will get the following commands like

- sgml2html xxxxhowto.sgml (to generate html file)
- sgml2html −split 0 xxxxhowto.sgml (to generate a single page html file)
- sgml2rtf xxxxhowto.sgml (to generate RTF file)
- sgml2latex xxxxhowto.sgml (to generate latex file)

4.1 Acrobat PDF format

PDF file can be generated from postscript file using either acrobat **distill** or **Ghostscript**. And postscript file is generated from DVI which in turn is generated from LaTex file. You can download distill software from http://www.adobe.com. Given below is a sample session:

```
bash$ man sgml2latex
bash$ sgml2latex filename.sgml
bash$ man dvips
bash$ dvips −o filename.ps filename.dvi
bash$ distill filename.ps
bash$ man ghostscript
bash$ man ps2pdf
bash$ ps2pdf input.ps output.pdf
bash$ acroread output.pdf &
```

Or you can use Ghostscript command **ps2pdf**. ps2pdf is a work−alike for nearly all the functionality of Adobe's Acrobat Distiller product: it converts PostScript files to Portable Document Format (PDF) files. **ps2pdf** is implemented as a very small command script (batch file) that invokes Ghostscript, selecting a special "output device" called **pdfwrite**. In order to use ps2pdf, the pdfwrite device must be included in the makefile when Ghostscript was compiled; see the documentation on building Ghostscript for details.

4.2 Convert Linuxdoc to Docbook format

This document is written in linuxdoc SGML format. The Docbook SGML format supercedes the linuxdoc format and has lot more features than linuxdoc. The linuxdoc is very simple and is easy to use. To convert linuxdoc SGML file to Docbook SGML use the program **ld2db.sh** and some perl scripts. The ld2db output is not 100% clean and you need to use the **clean_ld2db.pl** perl script. You may need to manually correct few lines in the document.

- Download ld2db program from http://www.dcs.gla.ac.uk/~rrt/docbook.html or from Milkyway Galaxy site
- Download the cleanup_ld2db.pl perl script from from Milkyway Galaxy site

The ld2db.sh is not 100% clean, you will get lots of errors when you run

```
        bash$ ld2db.sh file-linuxdoc.sgml db.sgml
        bash$ cleanup.pl db.sgml > db_clean.sgml
        bash$ gvim db_clean.sgml
        bash$ docbook2html db.sgml
```

And you may have to manually edit some of the minor errors after running the perl script. For e.g. you may need to put closing tag < /Para> for each < Listitem>

4.3 Convert to MS WinHelp format

You can convert the SGML howto document to Microsoft Windows Help file, first convert the sgml to html using:

```
        bash$ sgml2html xxxxhowto.sgml     (to generate html file)
        bash$ sgml2html −split 0   xxxxhowto.sgml (to generate a single page html file)
```

Then use the tool HtmlToHlp. You can also use sgml2rtf and then use the RTF files for generating winhelp files.

4.4 Reading various formats

In order to view the document in dvi format, use the xdvi program. The xdvi program is located in tetex−xdvi*.rpm package in Redhat Linux which can be located through ControlPanel | Applications | Publishing | TeX menu buttons. To read dvi document give the command −

```
xdvi -geometry 80x90 howto.dvi
man xdvi
```

And resize the window with mouse. To navigate use Arrow keys, Page Up, Page Down keys, also you can use 'f', 'd', 'u', 'c', 'l', 'r', 'p', 'n' letter keys to move up, down, center, next page, previous page etc. To turn off expert menu press 'x'.

You can read postscript file using the program 'gv' (ghostview) or 'ghostscript'. The ghostscript program is in ghostscript*.rpm package and gv program is in gv*.rpm package in Redhat Linux which can be located through ControlPanel | Applications | Graphics menu buttons. The gv program is much more user friendly than ghostscript. Also ghostscript and gv are available on other platforms like OS/2, Windows 95 and NT, you view this document even on those platforms.

- Get ghostscript for Windows 95, OS/2, and for all OSes from http://www.cs.wisc.edu/~ghost

To read postscript document give the command −

```
gv howto.ps
ghostscript howto.ps
```

You can read HTML format document using Netscape Navigator, Microsoft Internet explorer, Redhat Baron Web browser or any of the 10 other web browsers.

You can read the latex, LyX output using LyX a X−Windows front end to latex.

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5. Copyright
