Q: [What are these Nasty Messages about Inodes, Blocks, and the Like?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#nasty-messages-about-inodes)

Q: [Why Do FTP Transfers Seem to Hang?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#ppp-connection-dies-when-sending)

Q: [Why Does Free Dump Core?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#free-dumps-core)

Q: [Why Does Netscape Crash Frequently?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#netscape-crashes)

Q: [Why Won't My FTP or Telnet Server Allow Logins?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#ftp-wont-login)

Q: [How Do I Keep Track of Bookmarks in Netscape?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#track-of-bookmarks-netscape)

Q: [Why Does the Computer Have the Wrong Time?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#computer-has-wrong-time)

Q: [Why Don't Setuid Scripts Work?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#setuid-scripts-dont-work)

Q: [Why Is Free Memory as Reported by **free** Shrinking?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#free-memory-keeps-shrinking)

Q: [Why Does the System Slow to a Crawl When Adding More Memory?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#add-memory-system-slows)

Q: [Why Won't Some Programs (e.g., **xdm**) Allow Logins?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#some-programs-wont-log-in)

Q: [Why Do Some Programs Allow Logins with No Password?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#log-in-with-no-password)

Q: [Why Does the Machine Run Very Slowly with GCC / X / ...?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#machine-runs-very-slowly-when)

Q: [Why Does My System Only Allow Root Logins?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#can-only-log-in-as-root)

Q: [Why Is the Screen Is All Full of Weird Characters Instead of Letters?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#screen-is-all-full-of-weird)

Q: [If I Screwed Up the System and Can't Log In, How Can I Fix It?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#screwed-up-system-and-cant-log-in)

Q: [What if I Forget the root Password?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#forgot-root-password)

Q: [What's This Huge Security Hole in **rm**!?!?!](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#a-security-hole-in-rm)

Q: [Why Don't **lpr** and/or **lpd** Work?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#lpr-andor-lpd-dont-work)

Q: [Why Are the Timestamps on Files on MS-DOS Partitions Set Incorrectly?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#timestamps-on-files-are-incorrectly)

Q: [Why is My Root File System Read-Only?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#root-file-system-read-only)

Q: [What Is /proc/kcore?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#huge-proc-kcore)

Q: [Why Does **fdformat** Require Superuser Privileges?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#fdformat-except-as-root)

Q: [Why Doesn't My PCMCIA Card Work after Upgrading the Kernel?](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#upgraded-kernel-pcmcia-doesnt-work)

**Q:** What are these Nasty Messages about Inodes, Blocks, and the Like?

**A:** You may have a corrupted file system, probably caused by not shutting Linux down properly before turning off the power or resetting. You need to use a recent shutdown program to do this for example, the one included in the util-linux package, available on sunsite and tsx-11.

If you're lucky, the program **fsck** (or **e2fsck** or **xfsck** as appropriate if you don't have the automatic **fsck** front-end) will be able to repair your file system. If you're unlucky, the file system is trashed, and you'll have to re-initialize it with mkfs (or **mke2fs**, **mkxfs**, etc.), and restore from a backup.

NB: don't try to check a file system that's mounted read/writethis includes the root partition, if you don't see

|  |
| --- |
| VFS: mounted root  ... read-only |

at boot time.

**Q:** Why Do FTP Transfers Seem to Hang?

**A:** FTP transfers that die suddenly are due, apparently, to some form of overrunning buffer. It occurs both with Linux and Microsoft servers. On Linux systems, the problem seems to occur most commonly with the distribution's server software.

If you receive ftp: connection refused errors, then the problem is likely due to a lack of authentication. Refer to [*Why Won't My FTP or Telnet Server Allow Logins?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#ftp-wont-login).

One remedy is to be replacing the distribution FTP server with the Linux port of the OpenBSD FTP server. The home page is: [*http://www.eleves.ens.fr:8080/home/madore/programs/*](http://www.eleves.ens.fr:8080/home/madore/programs/).

To install the BSD server, follow the installation instructions, and refer to the manual pages for inetd and inetd.conf. (If you have the newer xinetd, see below.) Be sure to tell inetd to run the BSD daemon alone, not as a subprocess of, for example, tcpd. Comment out the line that begins ftp in the /etc/inetd.conf file and replace it with a line similar to (if you install the new ftpd in /usr/local/sbin/):

|  |
| --- |
| # Original entry, commented out. #ftp stream tcp nowait root /usr/sbin/tcpd  /usr/sbin/in.ftpd  # Replacement entry: ftp stream tcp nowait root /usr/local/sbin/ftpd -l |

The replacement daemon will become effective after rebooting or sending (as root) a SIGHUP to inetd, e.g.:

|  |
| --- |
| # kill -HUP inetd |

To configure xinetd, create an entry in /etc/xinetd.d per the instructions in the xinetd.conf manual page. Make sure, again, that the command-line arguments for ftpd are correct, and that you have installed the /etc/ftpusers and /etc/pam.d/ftp files. Then restart xinetd with the command: /etc/rc.d/init.d/xinetd restart. The command should report "OK," and the restart will be noted in the system message log.

**Q:** Why Does Free Dump Core?

**A:** In Linux 1.3.57 and later, the format of /proc/meminfo was changed in a way that the implementation of free doesn't understand.

Get the latest version, from metalab.unc.edu, in /pub/Linux/system/Status/ps/procps-0.99.tgz.

**Q:** Why Does Netscape Crash Frequently?

**A:** Netscape shouldn't crash, if it and the network are properly configured. Some things to check:

* Make sure that the MOZILLA\_HOME environment variable is correctly set. If you installed Netscape under /usr/local/netscape/, for example, that should be the value of MOZILLA\_HOME. Set it from the command line (e.g, "export MOZILLA\_HOME="/usr/local/netscape"" under **bash** or add it to one your personal or system initialization files. Refer to the manual page for your shell for details.
* If you have a brand-new version of Netscape, try a previous version, in case the run-time libraries are slightly incompatible. For example, if Netscape version 4.75 is installed (type "netscape --version" at the shell prompt), try installing version 4.7. All versions are archived at [*ftp://ftp.netscape.com/*](ftp://ftp.netscape.com/).
* Netscape uses its own Motif and Java Runtime Environment libraries. If a separate version of either is installed on your system, ensure that they aren't interfering with Netscape's libraries; e.g., by un-installing them.
* Make sure that Netscape can connect to its default name servers. The program will appear to freeze and time out after several minutes if it can't. This indicates a problem with the system's Internet connection; likely, the system can't connect to other sites, either.

**Q:** Why Won't My FTP or Telnet Server Allow Logins?

**A:** This applies to server daemons that respond to clients, but don't allow logins. On new systems that have Pluggable Authentication Modules installed, look for a file named, "ftp," or "telnet," in the directory /etc/pam/ or /etc/pam.d/. If the corresponding authentication file doesn't exist, the instructions for configuring FTP and Telnet authentication and other PAM configuration, should be in /usr/doc/pam-&version&. Refer also to the answer for [*FTP server says: "421 service not available, remote server has closed connection."*](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ftp-421-error).

If it's an FTP server on an older system, make sure that the account exists in /etc/passwd, especially anonymous.

This type of problem may also be caused a failure to resolve the host addresses properly, especially if using Reverse Address Resolution Protocol (RARP). The simple answer to this is to list all relevant host names and IP addresses in the /etc/hosts files on each machine. ( Refer to the example /etc/hosts and /etc/resolv.conf files in [*Sendmail Pauses for Up to a Minute at Each Command*](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#sendmail-pause). If the network has an internal DNS, make sure that each host can resolve network addresses using it.

If the host machine doesn't respond to FTP or Telnet clients at all, then the server daemon is not installed correctly, or at all. Refer to the manual pages: inetd and inetd.conf on older systems, or xinetd and xinetd.conf, as well as ftpd, and telnetd.

**Q:** How Do I Keep Track of Bookmarks in Netscape?

**A:** This probably applies to most other browsers, too. In the Preferences/Navigator menu, set your home page to Netscape's bookmarks.html file, which is located in the .netscape (with a leading period) subdirectory. For example, if your login name is smith, set the home page to:

|  |
| --- |
| file://home/smith/.netscape/bookmarks.html |

Setting up your personal home page like this will present you with a nicely formatted (albeit possibly long) page of bookmarks when Netscape starts. And the file is automatically updated whenever you add, delete, or visit a bookmarked site.

**Q:** Why Does the Computer Have the Wrong Time?

**A:** There are two clocks in your computer. The hardware (CMOS) clock runs even when the computer is turned off, and is used when the system starts up and by DOS (if you use DOS). The ordinary system time, shown and set by **date**, is maintained by the kernel while Linux is running.

You can display the CMOS clock time, or set either clock from the other, with /sbin/clock (now called **hwclock** in many distributions). Refer to: man 8 clock or man 8 hwclock.

There are various other programs that can correct either or both clocks for system drift or transfer time across the network. Some of them may already be installed on your system. Try looking for **adjtimex** (corrects for drift), Network Time Protocol clients like **netdate**, **getdate**, and **xntp**, or NTP client-server suite like **chrony**. Refer to [*How Do I Find a Particular Application?*](http://www.tldp.org/FAQ/Linux-FAQ/app-management.html#ported-compiled-written-xxx).

**Q:** Why Don't Setuid Scripts Work?

**A:** They aren't supposed to. This feature has been disabled in the Linux kernel on purpose, because setuid scripts are almost always a security hole. Sudo and SuidPerl can provide more security than setuid scripts or binaries, especially if execute permissions are limited to a certain user ID or group ID.

If you want to know why setuid scripts are a security hole, read the FAQ for [*news:comp.unix.questions*](news:comp.unix.questions).

**Q:** Why Is Free Memory as Reported by **free** Shrinking?

**A:** The "free" figure printed by **free** doesn't include memory used as a disk buffer cacheshown in the buffers column. If you want to know how much memory is really free add the buffers amount to free. Newer versions of **free** print an extra line with this info.

The disk buffer cache tends to grow soon after starting Linux up. As you load more programs and use more files, the contents get cached. It will stabilize after a while.

**Q:** Why Does the System Slow to a Crawl When Adding More Memory?

**A:** This is a common symptom of a failure to cache the additional memory. The exact problem depends on your motherboard.

Sometimes you have to enable caching of certain regions in your BIOS setup. Look in the CMOS setup and see if there is an option to cache the new memory area which is currently switched off. This is apparently most common on a '486.

Sometimes the RAM has to be in certain sockets to be cached.

Sometimes you have to set jumpers to enable caching.

Some motherboards don't cache all of the RAM if you have more RAM per amount of cache than the hardware expects. Usually a full 256K cache will solve this problem.

If in doubt, check the manual. If you still can't fix it because the documentation is inadequate, you might like to post a message to [*news:comp.os.linux.hardware*](news:comp.os.linux.hardware) giving all of the details make, model number, date code, etc., so other Linux users can avoid it.

**Q:** Why Won't Some Programs (e.g., **xdm**) Allow Logins?

**A:** You are probably using non-shadow password programs and are using shadow passwords.

If so, you have to get or compile a shadow password version of the programs in question. The shadow password suite can be found at [*ftp://tsx-11.mit.edu/pub/linux/sources/usr.bin/shadow/*](ftp://tsx-11.mit.edu/pub/linux/sources/usr.bin/shadow/). This is the source code. The binaries are probably in linux/binaries/usr.bin/.

**Q:** Why Do Some Programs Allow Logins with No Password?

**A:** You probably have the same problem as in [*Why Won't Some Programs (e.g., xdm) Allow Logins?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#some-programs-wont-log-in), with an added wrinkle.

If you are using shadow passwords, you should put a letter x or an asterisk in the password field of /etc/passwd for each account, so that if a program doesn't know about the shadow passwords it won't think it's a passwordless account and let anyone in.

**Q:** Why Does the Machine Run Very Slowly with GCC / X / ...?

**A:** You may have too little real memory. If you have less RAM than all the programs you're running at once, Linux will swap to your hard disk instead and thrash horribly. The solution in this case is to not run so many things at once or buy more memory. You can also reclaim some memory by compiling and using a kernel with fewer options configured. See [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel).

You can tell how much memory and swap you're using with the free command, or by typing:

|  |
| --- |
| $ cat /proc/meminfo |

If your kernel is configured with a RAM disk, this is probably wasted space and will cause things to go slowly. Use LILO or rdev to tell the kernel not to allocate a RAM disk (see the LILO documentation or type man rdev).

**Q:** Why Does My System Only Allow Root Logins?

**A:** You probably have some permission problems, or you have a file /etc/nologin.

In the latter case, put rm -f /etc/nologin in your /etc/rc.local or /etc/rc.d/\* scripts.

Otherwise, check the permissions on your shell, and any file names that appear in error messages, and also the directories that contain these files, up to and including the root directory.

**Q:** Why Is the Screen Is All Full of Weird Characters Instead of Letters?

**A:** You probably sent some binary data to your screen by mistake. Type echo 'c' to fix it. Many Linux distributions have a command, **reset**, that does this.

If that doesn't help, try a direct screen escape command: echo '**Ctrl**-**V** **Ctrl**-**O**'.

This resets the default font of a Linux console. Remember to hold down the Control key and type the letter, instead of, for example, **Ctrl**, then **V**. The sequence **Ctrl**-**V** **Esc** **C**.

causes a full screen reset. If there's data left on the shell command line after typing a binary file, press **Ctrl**-**C** a few times to restore the shell command line.

Another possible command is an alias, sane, that can work with generic terminals:

|  |
| --- |
| $ alias sane='echo -e " c";tput is2;  > stty sane line 1 rows $LINES columns $COLUMNS' |

The alias is enclosed with open quotes (backticks), not single quotes. The line break is included here for clarity, and is not required.

Make sure that $LINES and $COLUMNS are defined in the environment with a command similar to this in ~/.cshrc or ~/.bashrc,

|  |
| --- |
| $ LINES=25; export $LINES; $COLUMNS=80; export $COLUMNS |

using the correct numbers of $LINES and $COLUMNS for the terminal.

Finally, the output of **stty -g** can be used to create a shell script that will reset the terminal:

1. Save the output of **stty -g** to a file. In this example, the file is named termset:

|  |
| --- |
| $ stty -g >termset |

1. The output of **stty -g** (the contents of termset) will look something like:

|  |
| --- |
| 500:5:bd:8a3b:3:1c:7f:15:4:0:1:0:11:13:1a:0:12:f:17:16:0:0:73 |

1. Edit termset to become a shell script; adding an interpreter and **stty** command:

|  |
| --- |
| #!/bin/bash stty 500:5:bd:8a3b:3:1c:7f:15:4:0:1:0:11:13:1a:0:12:f:17:16:0:0:73 |

1. Add executable permissions to **termset** and use as a shell script:

|  |
| --- |
| $ chmod +x termset $ ./termset |

[Floyd L. Davidson, Bernhard Gabler]

**Q:** If I Screwed Up the System and Can't Log In, How Can I Fix It?

**A:** You did create an emergency floppy (or floppies), right? Reboot from an emergency floppy or floppy pair. For example, the Slackware boot and root disk pair in the install subdirectory of the Slackware distribution.

**A:** There are also two, do-it-yourself rescue disk creation packages in [*ftp://metalab.unc.edu/pub/Linux/system/recovery/*](ftp://metalab.unc.edu/pub/Linux/system/recovery/). These are better because they have your own kernel on them, so you don't run the risk of missing devices and file systems.

Get to a shell prompt and mount your hard disk with something like

|  |
| --- |
| $ mount -t ext2 /dev/hda1 /mnt |

Then your file system is available under the directory /mnt and you can fix the problem. Remember to unmount your hard disk before rebooting (**cd** somewhere else first, or it will say it's busy).

**Q:** What if I Forget the root Password?

**A:**

|  |  |
| --- | --- |
| Warning | Incorrectly editing any of the files in the /etc/directory can severely screw up a system. Please keep a spare copy of any files in case you make a mistake. |

If your Linux distribution permits, try booting into single-user mode by typing single at the BOOT lilo: prompt. With more recent distributions, you can boot into single-user mode when prompted by typing linux 1, linux single, or init=/bin/bash.

If the above doesn't work for you, boot from the installation or rescue floppy, and switch to another virtual console with **Alt**-**F1** -- **Alt**-**F8**, and then mount the root file system on /mnt. Then proceed with the steps below to determine if your system has standard or shadow passwords, and how to remove the password.

Using your favorite text editor, edit the root entry of the /etc/passwd file to remove the password, which is located between the first and second colons. '''Do this only if the password field does not contain an x, in which case see below.'''

|  |
| --- |
| root:Yhgew13xs:0:0: ... |

Change that to:

|  |
| --- |
| root::0:0: ... |

If the password field contains an x, then you must remove the password from the /etc/shadow file, which is in a similar format. Refer to the manual pages: man passwd, and man 5 shadow.

[Paul Colquhuon, Robert Kiesling, Tom Plunket]

**Q:** What's This Huge Security Hole in **rm**!?!?!

**A:** No there isn't. You are obviously new to unices and need to read a good book to find out how things work. Clue: the ability to delete files depends on permission to write in that directory.

**Q:** Why Don't **lpr** and/or **lpd** Work?

**A:** First make sure that your /dev/lp\* port is correctly configured. Its IRQ (if any) and port address need to match the settings on the printer card. You should be able to dump a file directly to the printer:

|  |
| --- |
| $ cat the\_file >/dev/lp1 |

If **lpr** gives you a message like myname@host: host not found" it may mean that the TCP/IP loopback interface, lo, isn't working properly. Loopback support is compiled into most distribution kernels. Check that the interface is configured with the ifconfig command. By Internet convention, the network number is 127.0.0.0, and the local host address is 127.0.0.1. If everything is configured correctly, you should be able to telnet to your own machine and get a login prompt.

Make sure that /etc/hosts.lpd contains the machine's host name.

If your machine has a network-aware **lpd**, like the one that comes with LPRng, make sure that /etc/lpd.perms is configured correctly.

Also look at the *Printing HOWTO*. "Where can I get the HOWTO's and other documentation? ".

**Q:** Why Are the Timestamps on Files on MS-DOS Partitions Set Incorrectly?

**A:** There is a bug in the program **clock** (often found in /sbin). It miscounts a time zone offset, confusing seconds with minutes or something like that. Get a recent version.

**Q:** Why is My Root File System Read-Only?

**A:** To understand how you got into this state, see [*EXT2-fs: warning: mounting unchecked file system*](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ext2-fs-warning-mounting).

Remount it. If /etc/fstab is correct, you can simply type:

|  |
| --- |
| mount -n -o remount / |

If /etc/fstab is wrong, you must give the device name and possibly the type, too: e.g.

|  |
| --- |
| mount -n -o remount -t ext2 /dev/hda2 / |

**Q:** What Is /proc/kcore?

**A:** None of the files in /proc are really therethey're all, "pretend," files made up by the kernel, to give you information about the system and don't take up any hard disk space.

/proc/kcore is like an "alias" for the memory in your computer. Its size is the same as the amount of RAM you have, and if you read it as a file, the kernel does memory reads.

**Q:** Why Does **fdformat** Require Superuser Privileges?

**A:** The system call to format a floppy can only be done as root, regardless of the permissions of /dev/fd0\*. If you want any user to be able to format a floppy, try getting the **fdformat2** program. This works around the problems by being setuid to root.

**Q:** Why Doesn't My PCMCIA Card Work after Upgrading the Kernel?

**A:** The PCMCIA Card Services modules, which are located in /lib/modules/*version*/pcmcia, where *version* is the version number of the kernel, use configuration information that is specific to that kernel image only. The PCMCIA modules on your system will not work with a different kernel image. You need to upgrade the PCMCIA card modules when you upgrade the kernel.

When upgrading from older kernels, make sure that you have the most recent version of the run-time libraries, the modutils package, and so on. Refer to the file Documentation/Changes in the kernel source tree for details.

Important: If you use the PCMCIA Card Services, do not enable the Network device support/Pocket and portable adapters option of the kernel configuration menu, as this conflicts with the modules in Card Services.

Knowing the PCMCIA module dependencies of the old kernel is useful. You need to keep track of them. For example, if your PCMCIA card depends on the serial port character device being installed as a module for the old kernel, then you need to ensure that the serial module is available for the new kernel and PCMCIA modules as well.

The procedure described here is somewhat kludgey, but it is much easier than re-calculating module dependencies from scratch, and making sure the upgrade modules get loaded so that both the non-PCMCIA and PCMCIA are happy. Recent kernel releases contain a myriad of module options, too many to keep track of easily. These steps use the existing module dependencies as much as possible, instead of requiring you to calculate new ones.

However, this procedure does not take into account instances where module dependencies are incompatible from one kernel version to another. In these cases, you'll need to load the modules yourself with insmod, or adjust the module dependencies in the /etc/conf.modules file. The Documentation/modules.txt file in the kernel source tree contains a good description of how to use the kernel loadable modules and the module utilities like **insmod**, **modprobe**, and **depmod**. Modules.txt also contains a recommended procedure for determining which features to include in a resident kernel, and which to build as modules.

Essentially, you need to follow these steps when you install a new kernel.

* Before building the new kernel, make a record with the **lsmod** command of the module dependencies that your system currently uses. For example, part of the **lsmod** output might look like this:

|  |
| --- |
| Module Pages Used by  memory\_cs 2 0  ds 2 [memory\_cs] 3  i82365 4 2  pcmcia\_core 8 [memory\_cs ds i82365] 3  sg 1 0  bsd\_comp 1 0  ppp 5 [bsd\_comp] 0  slhc 2 [ppp] 0  serial 8 0  psaux 1 0  lp 2 0 |

This tells you for example that the memory\_cs module needs the ds and pcmcia\_core modules loaded first. What it doesn't say is that, in order to avoid recalculating the module dependencies, you may also need to have the serial, lp, psaux, and other standard modules available to prevent errors when installing the pcmcia routines at boot time with **insmod**. A glance at the /etc/modules file will tell you what modules the system currently loads, and in what order. Save a copy of this file for future reference, until you have successfully installed the new kernel's modules. Also save the **lsmod** output to a file, for example, with the command: **lsmod >lsmod.old-kernel.output**.

* Build the new kernel, and install the boot image, either zImage or bzImage, to a floppy diskette. To do this, change to the arch/i386/boot directory (substitute the correct architecture directory if you don't have an Intel machine), and, with a floppy in the diskette drive, execute the command:

|  |
| --- |
| $ dd if=bzImage of=/dev/fd0 bs=512 |

* if you built the kernel with the **make bzImage** command, and if your floppy drive is /dev/fd0. This results in a bootable kernel image being written to the floppy, and allows you to try out the new kernel without replacing the existing one that LILO boots on the hard drive.
* Boot the new kernel from the floppy to make sure that it works.
* With the system running the new kernel, compile and install a current version of the PCMCIA Card Services package, available from metalab.unc.edu as well as other Linux archives. Before installing the Card Services utilities, change the names of /sbin/cardmgr and /sbin/cardctl to /sbin/cardmgr.old and /sbin/cardctl.old. The old versions of these utilities are not compatible with the replacement utilities that Card Services installs. In case something goes awry with the installation, the old utilities won't be overwritten, and you can revert to the older versions if necessary. When configuring Card Services with the make config command, make sure that the build scripts know where to locate the kernel configuration, either by using information from the running kernel, or telling the build process where the source tree of the new kernel is. The make config step should complete without errors. Installing the modules from the Card Services package places them in the directory /lib/modules/*version*/pcmcia, where *version* is the version number of the new kernel.
* Reboot the system, and note which, if any, of the PCMCIA devices work. Also make sure that the non-PCMCIA hardware devices are working. It's likely that some or all of them won't work. Use **lsmod** to determine which modules the kernel loaded at boot time, and compare it with the module listing that the old kernel loaded, which you saved from the first step of the procedure. (If you didn't save a listing of the **lsmod** output, go back and reboot the old kernel, and make the listing now.)
* When all modules are properly loaded, you can replace the old kernel image on the hard drive. This will most likely be the file pointed to by the /vmlinuz symlink. Remember to update the boot sector by running the **lilo** command after installing the new kernel image on the hard drive.
* Also look at the questions, How do I upgrade/recompile my kernel? and Modprobe can't locate module, "XXX," and similar messages.

Q: [How Do I Compile Programs?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#how-do-i-compile-programs)

Q: [How Do I Port *XXX* to Linux?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#port-xxx-to-linux)

Q: [Can I Use Code or a Compiler Compiled for a 486 on a 386?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#code-or-compiler-for-486-on-386)

Q: [What Does gcc -O6 Do?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#what-does-gcc-o6-do)

Q: [What Do I Do About Errors Trying to Compile the Kernel?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#errors-when-i-try-to-compile)

Q: [How Do I Make a Shared Library?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#make-shared-library)

Q: [Why Are My Programs So Large?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#executables-are-very-large)

Q: [How To Prevent Errors when Linking Programs with Math Functions](http://www.tldp.org/FAQ/Linux-FAQ/development.html#math-lib-errors)

Q: [How To Program *XYZ* Under Linux](http://www.tldp.org/FAQ/Linux-FAQ/development.html#program-xyz-under-linux)

Q: [How To Upgrade/Recompile a Kernel](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel)

Q: [What Is a .gz File? And a .tgz? And .bz2? And... ?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#What-is-a-gz-file-tgz)

Q: [Where Are linux/\*.h and asm/\*.h?](http://www.tldp.org/FAQ/Linux-FAQ/development.html#linux-h-and-asm-h)

Q: [Configuring Emacs' Default Settings](http://www.tldp.org/FAQ/Linux-FAQ/development.html#configure-emacs-with-default)

**Q:** How Do I Compile Programs?

**A:** Most Linux software is written in C and compiled with the GNU C compiler. GCC is a part of every Linux distribution. The latest compiler version, documentation, and patches are on [*ftp://ftp.gnu.org/pub/gnu/*](ftp://ftp.gnu.org/pub/gnu/).

Programs that are written in C++ must be compiled with the GNU G++ compiler, which is also included in Linux distributions and available from the same place as GCC.

To build version 2.0.x kernels, you will need GCC version 2.7.2.x, approximately. Trying to build an early Linux kernel with a different compiler, like GCC 2.8.x, EGCS, or PGCC, may cause problems because of GCC related code dependencies. Kernel versions 2.2, 2.4, and the 2.5 development kernels should compile correctly with more recent compilers.

Information on the EGCS compiler is at [*http://www.gnu.org/software/gcc/gcc.html*](http://www.gnu.org/software/gcc/gcc.html).

Note that at this time, the kernel developers are not answering bug requests for earlier kernels, but instead are concentrating on developing 2.5.x version kernels and maintaining 2.2.x and 2.4.x version kernels.

[J.H.M. Dassen, Axel Boldt]

**Q:** How Do I Port *XXX* to Linux?

**A:** In general, \*nix programs need very little porting. Simply follow the installation instructions. If you don't know and don't know how to find out the answers to some of the questions asked during the installation procedure, you can guess, but this tends to produce buggy programs. In this case, you're probably better off asking someone else to do the port.

If you have a BSD-ish program, you should try using **-I/usr/include/bsd** and **-lbsd** on the appropriate parts of the compilation lines.

**Q:** Can I Use Code or a Compiler Compiled for a 486 on a 386?

**A:** Yes, unless it's the kernel.

The **-m486** option to GCC, which is used to compile binaries for x486 machines, merely changes certain optimizations. This makes for slightly larger binaries that run somewhat faster on a 486. They still work fine on a 386, though, with a small performance hit.

However, from version 1.3.35 the kernel uses 486 or Pentium-specific instructions if configured for a 486 or Pentium, thus making it unusable on a 386.

GCC can be configured for a 386 or 486; the only difference is that configuring it for a 386 makes **-m386** the default and configuring for a 486 makes **-m486** the default. In either case, these can be overridden on a per-compilation basis or by editing /usr/lib/gcc-lib/i\*-linux/ *n.n.n*/specs.

There is an alpha version of GCC that knows how to do optimization well for the 586, but it is quite unreliable, especially at high optimization settings. The Pentium GCC can be found on [*ftp://tsx-11.mit.edu/pub/linux/ALPHA/pentium-gcc/*](ftp://tsx-11.mit.edu/pub/linux/ALPHA/pentium-gcc/).

The ordinary 486 GCC supposedly produces better code for the Pentium using the **-m386**, or at least slightly smaller.

**Q:** What Does gcc -O6 Do?

**A:** Currently, the same as **-O2** (GCC 2.5) or **-O3** (GCC 2.6, 2.7). Any number greater than that does the same thing. The Makefiles of newer kernels use **-O2**, and you should probably do the same.

**Q:** What Do I Do About Errors Trying to Compile the Kernel?

**A:** See the previous question regarding the header files.

Remember that when you apply a patch to the kernel, you must use the -p0 or -p1 option: otherwise, the patch may be misapplied. See the patch manual page for details.

ld: unrecognized option -qmagic means that you should get a newer linker, from [*ftp://tsx-11.mit.edu/pub/linux/packages/GCC/*](ftp://tsx-11.mit.edu/pub/linux/packages/GCC/), in the file binutils-2.8.1.0.1.bin.tar.gz.

**Q:** How Do I Make a Shared Library?

**A:** For ELF,

|  |
| --- |
| $ gcc -fPIC -c \*.c  $ gcc -shared -Wl,-soname,libfoo.so.1 -o libfoo.so.1.0 \*.o |

For a.out, get tools-*n.nn*.tar.gz from tsx-11.mit.edu/pub/linux/packages/GCC/src/. It comes with documentation that will tell you what to do. Note that a.out shared libraries are a very tricky business. Consider upgrading your libraries to ELF shared libraries. See the *ELF HOWTO*, at [*ftp://metalab.unc.edu/pub/Linux/docs/HOWTO/*](ftp://metalab.unc.edu/pub/Linux/docs/HOWTO/).

**Q:** Why Are My Programs So Large?

**A:** With an ELF compiler ([*What's All This about ELF? glibc?*](http://www.tldp.org/FAQ/Linux-FAQ/system-libraries.html#about-elf-glibc)), the most common cause of large executables is the lack of an appropriate .so library link for one of the libraries you're using. There should be a link like libc.so for every library like libc.so.5.2.18.

With an a.out compiler the most common cause of large executables is the **-g** linker (compiler) flag. This produces (as well as debugging information in the output file) a program which is statically linkedone which includes a copy of the C library instead of a dynamically linked copy.

Other things worth investigating are **-O** and **-O2**, which enable optimization (check the GCC documentation), and -s (or the strip command) which strip the symbol information from the resulting binary (making debugging totally impossible).

You may wish to use -N on very small executables (less than 8K with the -N), but you shouldn't do this unless you understand its performance implications, and definitely never with daemons.

**Q:** How To Prevent Errors when Linking Programs with Math Functions

**A:** Older run-time libraries included the math library in the C run-time library. It was not necessary to specify the math library separately when compiling. If the compiler generates a message like this when linking a program that uses math functions:

|  |
| --- |
| /tmp/ccDUQM4J.o: In function "main":  /tmp/ccDUQM4J.o(.text+0x19): undefined reference to "sqrt"  collect2: ld returned 1 exit status |

You need use the -lm option with GCC to link with the math libraries:

|  |
| --- |
| # gcc -o program program.c -lm |

Make sure also to use the statement #include <math.h> in the source file.

[Florian Schmidt]

**Q:** How To Program *XYZ* Under Linux

**A:** Read the manuals, or a good book on Unix and the manual pages (type man man). There is a lot of GNU Info documentation, which is often more useful as a tutorial. Run Emacs and type **F1**-**i**, or type **info info** if you don't have or don't like Emacs. Note that the Emacs libc node may not exactly describe the latest Linux libc, or GNU glibc2. But the GNU project and LDP are always looking for volunteers to upgrade their library documentation.

Anyway, between the existing Texinfo documentation, and the manual pages in sections 2 and 3, should provide enough information to get started.

As with all free software, the best tutorial is the source code itself.

The latest release of the Linux manual pages, a collection of useful GNU Info documentation, and various other information related to programming Linux, can be found on metalab.unc.edu/pub/Linux/docs/man-pages/.

**Q:** How To Upgrade/Recompile a Kernel

**A:** See the *Kernel HOWTO* or the README files which come with the kernel release on [*ftp://ftp.cs.helsinki.fi/pub/Software/Linux/Kernel/*](ftp://ftp.cs.helsinki.fi/pub/Software/Linux/Kernel/) and mirrors. See [*Where Are the Linux FTP Archives?*](http://www.tldp.org/FAQ/Linux-FAQ/linux-distributions.html#get-linux-material-by-ftp). You may already have a version of the kernel source code installed on your system, but if it is part of a standard distribution it is likely to be somewhat out of date (this is not a problem if you only want a custom configured kernel, but it probably is if you need to upgrade.)

With newer kernels you can (and should) make all of the following targets. Don't forget that you can specify multiple targets with one command.

|  |
| --- |
| $ make clean dep install modules modules\_install |

Also remember to update the module dependencies.

|  |
| --- |
| $ depmod -a |

This command can be run automatically at boot time. On Debian/GNU Linux systems, the command is part of the /etc/init.d/modutils script, and can be linked appropriately in the /etc/rc*x*.d/ directories. For more information on **depmod**, see the manual page.

Make sure you are using the most recent version of the modutils utilities, as well as all other supporting packages. Refer to the file Documentation/Changes in the kernel source tree for specifics, and be sure to consult the README file in the modutils package.

Remember that to make the new kernel boot you must run **lilo** after copying the kernel into your root partition. The Makefile in some kernels have a special zlilo target for this; try:

|  |
| --- |
| $ make zlilo |

On current systems, however, you can simply copy the zImage or bzImage file (in arch/i386/boot/ to the /boot/ directory on the root file system, or to a floppy using the **dd** command. Refer also to the question, How do I get LILO to boot the kernel image?

Kernel version numbers with an odd minor version (ie, 1.1.x, 1.3.x) are the testing releases; stable production kernels have even minor versions (1.0.x, 1.2.x). If you want to try the testing kernels you should probably subscribe to the linux-kernel mailing list. See [*What Mailing Lists Are There?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#what-mailing-lists-are-there).

The Web site [*http://www.kernelnotes.org/*](http://www.kernelnotes.org/) has lots of information and links to other sites that provide information about Linux kernel updates.

Also refer to the answers for, [*Why Doesn't My PCMCIA Card Work after Upgrading the Kernel?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#upgraded-kernel-pcmcia-doesnt-work) and [*How Do I Get LILO to Boot the Kernel Image?*](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#lilo-boot-kernel-image).

**A:** Alternatively, on Debian GNU/Linux systems, get a kernel source package from the Debian archive or from a Debian GNU/Linux CD. Then, follow the directions in the README file that is located in the kernel-package subdirectory.

**Q:** What Is a .gz File? And a .tgz? And .bz2? And... ?

**A:** .gz (and .z) files are compressed using GNU **gzip**. You need to use **gunzip** (which is a symlink to the **gzip** command that comes with most Linux installations) to unpack the file.

.taz, .tar.Z, and .tz are *tar* files (made with **tar**) and compressed using **compress**. The standard \*nix **compress** is proprietary software, but free equivalents like ncompress exist.

.tgz (or .tpz) is a tar file compressed with **gzip**.

.bz2 is a file compressed by the more recently introduced (and efficient) **bzip2**.

.lsm is a *Linux Software Map* entry, in the form of a short text file. Details about the LSM project and the LSM itself are available in the subdirectory on [*ftp://metalab.unc.edu/pub/Linux/docs/*](ftp://metalab.unc.edu/pub/Linux/docs/).

.deb is a Debian Binary Package - the binary package format used by the Debian GNU/Linux distribution. It is manipulated using **dpkg** and **dpkg-deb** (available on Debian systems and from: [*http://ftp.debian.org/pool/main/d/dpkg/*](http://ftp.debian.org/pool/main/d/dpkg/). If you use anonymous FTP, connect to: [*ftp://ftp.debian.org/debian/pool/main/d/dpkg/*](ftp://ftp.debian.org/debian/pool/main/d/dpkg/)).

.rpm is a Red Hat RPM package, which is used in the Red Hat and similar distributions.

.sit is a compressed Macintosh archive made with StuffIt, a commercial program. Aladdin Systems Inc., the manufacturer of StuffIt, has a free expander utility that will uncompress these archives. You can download it at [*http://www.aladdinsys.com/expander/*](http://www.aladdinsys.com/expander/).

The **file** command can often tell you what a file is.

If you find that **gzip** complains when you try to uncompress a file, you probably downloaded it in ASCII mode by mistake. You must download most things in binary mode: get, to download the file.

**Q:** Where Are linux/\*.h and asm/\*.h?

**A:** The files /usr/include/linux/ and /usr/include/asm/ are often soft links to the directories where the kernel headers are. They are usually under /usr/src/kernel\*/.

If you don't have the kernel sources, download them. Refer to the answer for [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel).

Then, use **rm** to remove any garbage, and **ln** to create the links:

|  |
| --- |
| $ rm -rf /usr/include/linux /usr/include/asm  $ ln -sf /usr/src/linux/include/linux /usr/include/linux  $ ln -sf /usr/src/linux/include/asm-<architecture> /usr/include/asm |

The assembly language files reside in architecture-specific directories, so you need to link /usr/src/include/asm to /usr/src/linux/include/asm-i386 on PC compatible systems, to /usr/src/linux/include/asm-sparc on Sun Sparc systems, to /usr/src/linux/include/asm-ppc on PPC systems, and so on.

You'll also find that you may need to do "make config" as in a newly-unpacked kernel source tree, to create linux/autoconf.h.

**Q:** Configuring Emacs' Default Settings

**A:** Create a file in your home directory named .emacs with the Emacs Lisp commands that you want to run every time Emacs starts up. You won't see the file in the directory listing. (The leading '.' tells **ls** not to display it, unless you use the -a command line switch with **ls**.)

Any kind of Emacs Lisp statement will work in the .emacs file, including entire defuns. Emacs uses lisp variables and statements extensively, and many of the editing functions are written in Emacs Lisp. For example, to enable word wrapping whenever you edit a file that ends with .txt, add the following statement. This is from the Emacs Texinfo help document ( **F1**-**i**, then **m** Emacs **Return**):

|  |
| --- |
| (add-hook text-mode-hook  '(lambda () (auto-fill-mode1))) |

This adds a statement that calls a *hook* function whenever a text editing mode is entered for that buffer. The value of text-mode-hook, which is a variable, to auto-fill-mode, which is a function.

If you want to turn off the menu bar at the top of each Emacs frame, add this statement:

|  |
| --- |
| (menu-bar-mode -1) |

And if you want to include an Emacs Lisp program that someone has written, like msb.el (an enhanced, pop-up buffer menu), make sure the lisp file is in a directory where Emacs can find it (usually it will be named Site-lisp), and add these statements in the .emacs file:

|  |
| --- |
| (require 'msb)  (msb-mode 1) |

Most tasks have several possible solutions in Emacs Lisp. Any task that can be programmed in Emacs Lisp is valid in the .emacs file. For more information, consult the Texinfo documentation. There is also a FAQ list for Emacs (refer to: What other FAQ's are there for Linux? ).

**14. Solutions to Common Problems**

Q: [How Do I Remove (or Change) the Colors in the ls Display?](http://www.tldp.org/FAQ/Linux-FAQ/common-problems.html#ls-colors)

Q: [Why Won't a Program Work in the Current Directory?](http://www.tldp.org/FAQ/Linux-FAQ/common-problems.html#programs-in-cwd)

Q: [How Do I Find Out If a Notebook Runs Linux?](http://www.tldp.org/FAQ/Linux-FAQ/common-problems.html#my-notebook-runs-linux)

Q: [Can Can I Resume an Interrupted Download?](http://www.tldp.org/FAQ/Linux-FAQ/common-problems.html#resume-ftp)

**Q:** How Do I Remove (or Change) the Colors in the ls Display?

**A:** If **ls** is displaying in color and you haven't told it to, you probably have an alias configured for it. Some distributions ship this way by default.

The shell command, unalias ls, should completely unset the configuration that some distributions provide as standard.

To permanently make this change, check your initialization script, .bashrc.

**A:** To change the colors, rather than removing them, refer to the ls man page (man ls).

**Q:** Why Won't a Program Work in the Current Directory?

**A:** Because the current directory (i.e., .) is not in the search path, for security reasons, as well as to insure that the correct program versions are used. If an intruder is able to write a file to a world-writable directory, like /tmp, presumably he or she would be able to execute it if the directory were in the search path. The solution to this is to include the directory in the command; e.g., ./myprog, instead of myprog. Or add the current directory to your PATH environment variable; e.g., export PATH=".:"$PATH using bash, although this is discouraged for the reasons mentioned above.

**Q:** How Do I Find Out If a Notebook Runs Linux?

**A:** There's no fixed answer to this question, because notebook hardware is constantly updated, and getting the X display, sound, PCMCIA, modem, and so forth, working, can take a good deal of effort.

Most notebooks currently on the market, for example, use "Winmodems," which often do not work with Linux because of their proprietary hardware interfaces. Even notebooks which are certified as "Linux compatible," may not be completely compatible.

Information about installing Winmodems in general is contained in the *Winmodems-and-Linux-HOWTO*. Refer to [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation).

You can find the most current information, or ask other users about their notebook experiences, on the linux-laptop mailing list, which is hosted by the vger.redhat.com server. Refer to [*What Mailing Lists Are There?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#what-mailing-lists-are-there).

A mailing list for Linux on IBM Thinkpads has its home page at [*http://www.topica.com/lists/linux-thinkpad/*](http://www.topica.com/lists/linux-thinkpad/).

Another Thinkpad mailing list is hosted by [*http://www.bm-soft.com/*](http://www.bm-soft.com/). Send email with the word help in the body of the message to [*majordomo@www.bm-soft.com*](mailto:majordomo@www.bm-soft.com).

There is a Web page about Linux on IBM Thinkpads at [*http://peipa.essex.ac.uk/tp-linux/*](http://peipa.essex.ac.uk/tp-linux/).

The Linux Laptop home page is at [*http://www.cs.utexas.edu/users/kharker/linux-laptop/*](http://www.cs.utexas.edu/users/kharker/linux-laptop/).

For information about interfacing peripherals like Zip and CD-ROM drives through parallel ports, refer to the Linux Parallel Port Home Page, at [*http://www.torque.net/linux-pp.html*](http://www.torque.net/linux-pp.html).

If you need the latest version of the PCMCIA Card Services package, it is (or was) located at [*ftp://cb-iris.stanford.edu/pub/pcmcia/*](ftp://cb-iris.stanford.edu/pub/pcmcia/), but that host no longer seems to be available. Recent distributions are on [*ftp://metalab.unc.edu/pub/Linux/kernel/pcmcia/*](ftp://metalab.unc.edu/pub/Linux/kernel/pcmcia/). You will also need to have the kernel source code installed as well. Be sure to read the *PCMCIA-HOWTO*, which is included in the distribution.

**Q:** Can Can I Resume an Interrupted Download?

**A:** You can use the reget command of the standard **ftp** client program after reconnecting to pick up where you left off.

Clients like **ncftp** support resumed FTP downloads, and **wget** supports resumed FTP and HTTP downloads.

**15. Tips And Tricks**

Q: [How Do I Format Man Pages without **man** or **groff**?](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#man-pages-without-man)

Q: [How To Scroll Backwards in Text Mode](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#scrollback-in-text-mode)

Q: [How To Get Email to Work](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#e-mail-to-work)

Q: [Sendmail Pauses for Up to a Minute at Each Command](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#sendmail-pause)

Q: [How To Enable and Select Virtual Consoles](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#switch-virtual-consoles)

Q: [How To Set the Time Zone](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#set-the-time-zone)

Q: [What Is a core File?](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#core-file)

Q: [How To Enable or Disable Core Dumps](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#enable-core-dumps)

Q: [How To Remap a Keyboard to UK, French, Etc.](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#remap-keyboard)

Q: [How To Get NUM LOCK to Default to On](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#num-lock-default-on)

Q: [How To Set (Or Reset) Initial Terminal Colors](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#set-terminal-colors)

Q: [How To Have More Than 128Mb of Swap](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#more-than-128mb-of-swap)

**Q:** How Do I Format Man Pages without **man** or **groff**?

**A:** The **man2html** program translates **groff** text to HTML, which you can view with a Web browser. The **man2html** program, and many like it, are availble on the Web. Look for them with your favorite search engine.

The unformatted manual pages are stored in subdirectories of /usr/man, /usr/local/man, and elsewhere.

If you want to view text, use **nroff** and **less**. Both of these programs have MSDOS versions with an implementation of the *man* macro package available as well. An example would be:

|  |
| --- |
| $ nroff -man /usr/man/man1/ls.1 | less |

If you know where to find a good implementation of the *man* macros without installing *groff*, please let the FAQ maintainer know.

If the manual page filename ends in .gz, then you'll need to uncompress it before formatting it, using **gzip -d** or **gunzip**. A one-line example would be:

|  |
| --- |
| $ gzip -dc /usr/man/man1/ls.1.gz | nroff -man | less |

**Q:** How To Scroll Backwards in Text Mode

**A:** With the default US keymap, you can use **Shift** with the **PgUp** and **PgDn** keys. (The gray ones, not the ones on the numeric keypad.) With other keymaps, look in /usr/lib/keytables. You can remap the **ScrollUp** and **ScrollDown** keys to be whatever you like.

The **screen** program, [*http://vector.co.jp/vpack/browse/person/an010455.html*](http://vector.co.jp/vpack/browse/person/an010455.html) provides a searchable scrollback buffer and the ability to take "snapshots" of text-mode screens.

Recent kernels that have the VGA Console driver can use dramatically more memory for scrollback, provided that the video card can *actually handle* 64 kb of video memory. Add the line:

|  |
| --- |
| #define VGA\_CAN\_DO\_64B |

to the start of the file drivers/video/vgacon.c. This feature may become a standard setting in future kernels. If the video frame buffer is also enabled in the kernel, this setting may not affect buffering.

In older kernels, the amount of scrollback is fixed, because it is implemented using the video memory to store the scrollback text. You may be able to get more scrollback in each virtual console by reducing the total number of VC's. See linux/tty.h.

[Chris Karakas]

**Q:** How To Get Email to Work

**A:** For sending mail via SMTP (Simple Mail Transfer Protocol) and receiving mail from an ISP's POP (Post Office Protocol) server, you can use a desktop client like Netscape Communicator or KDE kmail. You will need to enter the names of the SMTP and POP servers in the preferences of the respective application, as well as your E-mail address (e.g., username@example.com), and your dial-up password. The same applies to Usenet News. Enter the name of the NNTP (Network News Transfer Protocol) server in your News client's preferences section. You may also have to provide the IP addresses of the ISP's primary and secondary name servers.

If you have a traditional MTA (Mail Transport Agent) like Sendmail, Smail, qmail, or Exim, you'll need to follow the instructions in each package. Basically, configuration entails determining which host machine, either on your local LAN or via dial-up Internet, is the "Smart Host", if you're using SMTP. If you're using the older UUCP protocol, then you'll need to consult the directions for configuring UUCP, and also make sure that your ISP's system is configured to relay mail to you.

Information about Internet hosting, and News and E-mail in general, is available on the Usenet News group *news.announce.newusers*, and those FAQ's are also archived at [*ftp://rtfm.mit.edu/pub/usenet/*](ftp://rtfm.mit.edu/pub/usenet/).

**Q:** Sendmail Pauses for Up to a Minute at Each Command

**A:** Make sure that Sendmail can resolve your hostname to a valid (i.e., parsable) domain address. If you are not connected to the Internet, or have a dial-up connection with dynamic IP addressing, add the fully qualified domain name to the /etc/hosts file, *in addition* to the base host name; e.g., if the host name is bilbo and the domain is bag-end.com:

|  |
| --- |
| 192.168.0.1 bilbo.bag-end.com bilbo |

And make sure that either the /etc/host.conf or /etc/resolv.conf file contains the line:

|  |
| --- |
| order hosts,bind |

|  |  |
| --- | --- |
| Caution | Do not change the localhostentry in /etc/hosts, because many programs depend on it for internal message-passing. |

Sendmail takes many factors into account when resolving domain addresses. These factors, collectively, are known as, "rulesets", in sendmail jargon. The program does *not* require that a domain address be canonical, or even appear to be canonical. In the example above, bilbo. (note the period) would work just as well as bilbo.bag-end.com. This and other modifications apply mainly to recent versions.

Prior to version 8.7, sendmail required that the FQDN appear first in the /etc/hosts entry. This is due to changes in the envelope address masquerade options. Consult the sendmail documents.

If you have a domain name server for *only* a local subnet, make sure that "." refers to a SOA record on the server machine, and that reverse lookups (check by using nslookup) work for all machines on the subnet.

Finally, FEATURE configuration macro options like nodns, always\_add\_domain, and nocanonify, control how sendmail interprets host names.

The document, *Sendmail: Installation and Operation Guide*, included in the doc/ subdirectory of Sendmail source code distributions, discusses briefly how Sendmail resolves Internet addresses. Sendmail source code archives are listed at: [*http://www.sendmail.org/*](http://www.sendmail.org/)

[Chris Karakas]

**Q:** How To Enable and Select Virtual Consoles

**A:** In text mode, press the left **Alt**-**F1** to **Alt**-**F12** to select the consoles tty1 to tty12; Right **Alt**-**F1** gives tty13 and so on. To switch out of X you must press **Ctrl**-**Alt**-**F1**, etc; **Alt**-**F5** or whatever will switch back.

However, If you have a non-PC compatible system, please see the note below.

If you want to use a VC for ordinary login, it must be listed in */etc/inittab*, which controls which terminals and virtual consoles have login prompts. The X Window System needs at least one free VC in order to start.

|  |  |
| --- | --- |
| Note | The key sequence is actually **Ctrl**Meta**F***N*. On PC compatible systems, the right and left **Alt**keys are really synonymous with the keysymbols Meta\_Land Meta\_R. If the binding is different, you can determine what keys produce Meta\_Land Meta\_Rwith xkeycapsor a similar application. |

[David Charlap]

**Q:** How To Set the Time Zone

**A:** Change directory to /usr/lib/zoneinfo/. Get the time zone package if you don't have this directory. The source is available in [*ftp://metalab.unc.edu/pub/Linux/system/admin/time/*](ftp://metalab.unc.edu/pub/Linux/system/admin/time/).

Then make a symbolic link named localtime pointing to one of the files in this directory (or a subdirectory), and one called posixrules pointing to localtime. For example:

|  |
| --- |
| $ ln -sf US/Mountain localtime  $ ln -sf localtime posixrules |

This change will take effect immediatelytry **date**.

If the system uses Red Hat-style configuration files, the respective time zone info files are /usr/share/zoneinfo and /etc/localtime.

The manual pages for **tzset** or **tzselect** describe setting the time zone. Some programs recognize the TZ environment variable, but this is not POSIX-correct.

You should also make sure that your Linux kernel clock is set to the correct GMT time. Type **date -u** and check that the correct UTC time is displayed. See [*Why Does the Computer Have the Wrong Time?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#computer-has-wrong-time).

**Q:** What Is a core File?

**A:** A core file is created when a program terminates unexpectedly, due to a bug, or a violation of the operating system's or hardware's protection mechanisms. The operating system kills the program and creates a core file that programmers can use to figure out what went wrong. It contains a detailed description of the state that the program was in when it died.

If would like to determine what program a core file came from, use the file command, like this:

|  |
| --- |
| $ file core |

That will tell you the name of the program that produced the core dump. You may want to write the maintainer(s) of the program, telling them that their program *dumped core.*

[Eric Hanchrow]

**Q:** How To Enable or Disable Core Dumps

**A:** By using the **ulimit** command in **bash**, the **limit** command in **tcsh**, or the **rlimit** command in **ksh**. See the appropriate manual page for details.

This setting affects all programs run from the shell (directly or indirectly), not the whole system.

If you wish to enable or disable core dumping for all processes by default, you can change the default setting in linux/sched.h. Refer to definition of INIT\_TASK, and look also in linux/resource.h.

PAM support optimizes the system's environment, including the amount of memory a user is allowed. In some distributions this parameter is configurable in the /etc/security/limits.conf file. For more information, refer to the *Linux Administrator's Security Guide*. See [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation).

**Q:** How To Remap a Keyboard to UK, French, Etc.

**A:** For recent kernels, get /pub/Linux/system/Keyboards/kbd-0.90.tar.gz from [*ftp://metalab.unc.edu/*](ftp://metalab.unc.edu/). Make sure you get the appropriate version; you have to use the right keyboard mapping package for your kernel version.

For older kernels you have to edit the top-level kernel Makefile, in /usr/src/linux/.

You may find more helpful information in *The Linux Keyboard and Console HOWTO*, by Andries Brouwer, at [*ftp://metalab.unc.edu/pub/Linux/docs/HOWTO/*](ftp://metalab.unc.edu/pub/Linux/docs/HOWTO/).

**Q:** How To Get NUM LOCK to Default to On

**A:** Use the **setleds** program, for example (in /etc/rc.local or one of the /etc/rc.d/\* files):

|  |
| --- |
| for t in 1 2 3 4 5 6 7 8  do  setleds +num < /dev/tty$t > /dev/null  done |

**setleds** is part of the kbd package ("How do I remap my keyboard to UK, French, etc.? ").

Alternatively, patch your kernel. You need to arrange for KBD\_DEFLEDS to be defined to (1 << VC\_NUMLOCK) when compiling drivers/char/keyboard.c.

**Q:** How To Set (Or Reset) Initial Terminal Colors

**A:** The following shell script should work for VGA consoles:

|  |
| --- |
| for n in 1 2 4 5 6 7 8;  do  setterm -fore yellow -bold on -back blue -store > /dev/tty$n  done |

Substitute your favorite colors, and use /dev/ttyS$n for serial terminals.

To make sure they are reset when people log out (if they've been changed):

Replace the references to getty (or mingetty or uugetty or whatever) in /etc/inittab with references to /sbin/mygetty.

|  |
| --- |
| #!/bin/sh setterm -fore yellow -bold on -back blue -store > $1  exec /sbin/mingetty $@ |

[Jim Dennis]

**Q:** How To Have More Than 128Mb of Swap

**A:** Use several swap partitions or swap files. Linux kernels before version 2.2 supported up to 16 swap areas, each of up to 128Mb. Recent versions do not have this limitation.

Very old kernels only supported swap partition sizes up to 16Mb.

Linux on machines with 8KB paging, like Alpha and Sparc64, support a swap partition up to 512MB. The 128MB limitation comes from PAGE\_SIZE\*BITSPERBYTE on machines with 4KB paging, but is 512KB on machines with 8KB paging. The limit is due to the use of a single page allocation map.

The file mm/swapfile.c has all of the gory details.

**16. The X Window System**

Q: [Does Linux Support X?](http://www.tldp.org/FAQ/Linux-FAQ/x-windows.html#linux-support-x)

Q: [How To Get the X Window System to Work](http://www.tldp.org/FAQ/Linux-FAQ/x-windows.html#get-x-window-system-work)

Q: [Where To Find a Ready-Made XF86Config file](http://www.tldp.org/FAQ/Linux-FAQ/x-windows.html#ready-made-xf86config)

Q: [What Desktop Environments Run on Linux?](http://www.tldp.org/FAQ/Linux-FAQ/x-windows.html#what-desktop-environments)

Q: [**xterm** Logins Show Up Strangely in **who**, **finger**](http://www.tldp.org/FAQ/Linux-FAQ/x-windows.html#xterm-logins-show-strangely)

Q: [How to Start a X Client on Another Display](http://www.tldp.org/FAQ/Linux-FAQ/x-windows.html#detach-xterm)

**Q:** Does Linux Support X?

**A:** Yes. Linux uses XFree86 (the current version is 4.0, which is based on X11R6). You need to have a video card which is supported by XFree86. See the *XFree86 HOWTO* for more details.

Most Linux distributions nowadays come with an X installation. However, you can install or upgrade your own, from [*ftp://metalab.unc.edu/pub/Linux/X11/*](ftp://metalab.unc.edu/pub/Linux/X11/) and its mirror sites, or from [*http://www.xfree86.org/*](http://www.xfree86.org/).

**Q:** How To Get the X Window System to Work

**A:** The answers to this question can, and do, fill entire books. If the installation program wasn't able to configure the X server correctly, Linux will most likely try to start the X display, fail, and drop back into text-only terminal mode.

First and foremost, make certain that you have provided, as closely as possible, the correct information to the installation program of your video hardware: the video card and monitor. Some installation programs can correctly guess a "least common denominator" screen configuration, like a 640-by-480 VESA-standard display, but there are many possible video hardware configurations that may not be able to display this standard.

The X Window System configuration file is called (usually) /etc/XF86Config, /etc/X11/XF86Config, or /usr/X11R6/lib/X11/XF86Config.

If you need to manually configure the X server, there are several possible methods:

* Try to use the **XF86Setup** program, which can help identify the correct X server and monitor timings for the video hardware.
* Make sure that the X server has the correct options. If you log in as the superuser, you should be able to use X --probeonly to get a listing of the video card chipset, memory, and any special graphics features. Also, refer to the manual page for the X server. (E.g.; man X), and try running the X server and redirecting the standard error output to a file so you can determine, after you can view text on the screen again, what error messages the server is generating; e.g., X 2>x.error.
* With that information, you should be able to safely refer to one of the references provided by the Linux Documentation Project. ("Where can I get the HOWTO's and other documentation? ") There are several HOWTO's on the subject, including a HOWTO to calculate video timings manually if necessary. Also, the *Installation and Getting Started* guide has a chapter with a step-by-step guide to writing a XF86Config file.

Also, make sure that the problem really is an incorrect XF86Config file, not something else like the window manager failing to start. If the X server is working correctly, you should be able to move the mouse cursor on the screen, and pressing **Ctrl**-**Alt**-**Backspace** will shut down the X server and return to the shell prompt in one of the virtual terminals.

**Q:** Where To Find a Ready-Made XF86Config file

**A:** If you can't seem to get X working using the guidelines above, refer to the *XFree86 HOWTO*, recent versions of *Installation and Getting Started*, and the instructions for the **XF86Setup** program.

The contents of the XF86Config file depend on the your exact combination of video card and monitor. It can either be configured by hand, or using the **XF86Setup** utility. Read the instructions that came with XFree86, in /usr/X11R6/lib/X11/etc. The file you probably need to look at most is README.Config.

You should not use the sample XF86Config.eg file which is included with newer versions of XFree86 verbatim, because the wrong video clock settings can damage your monitor.

Please don't post to [*news:comp.os.linux.x*](news:comp.os.linux.x) asking for an XF86Config, and please don't answer such requests.

If you have a laptop, look at the Linux Laptop Web page at [*How Do I Find Out If a Notebook Runs Linux?*](http://www.tldp.org/FAQ/Linux-FAQ/common-problems.html#my-notebook-runs-linux). Many of the installation notes also have the XF86Config file for the display. If you have a desktop machine, there are a few sample XF86Config files at [*ftp://metalab.unc.edu/*](ftp://metalab.unc.edu/). Refer also to the *XFree86 FAQ* [*http://www.xfree.org/FAQ/*](http://www.xfree.org/FAQ/) and the monitor timings list [*http://www.xfree.org/#resources/*](http://www.xfree.org/#resources/), and in the /usr/X11R6/lib/X11/ directory of your X distribution.

**Q:** What Desktop Environments Run on Linux?

**A:** Linux with XFree86 supports the KDE, GNOME, and commercial CDE desktop environments, and extended window managers like WindowMaker. Each uses a different set of libraries and provides varying degrees of MS Windows-like look and feel.

Information on KDE is available from [*http://www.kde.org/*](http://www.kde.org/). The KDE environment uses the Qt graphics libraries, available from Trolltech at [*http://www.trollTech.com*](http://www.trollTech.com). The desktop uses its own window manager, kwm, and provides a MS Windows-like look and feel.

The GNOME home page is [*http://www.gnome.org*](http://www.gnome.org). The environment uses the free GTK libraries, available from [*http://www.gtk.org*](http://www.gtk.org), and window managers like Enlightenment, [*http://www.enlightenment.org*](http://www.enlightenment.org) and SawFish, [*http://www.sawfish.org/*](http://www.sawfish.org/). There's also a Web page for Red Carpet, a GNOME installation and upgrade utility that functions much like Debian's **apt-get** utility with a friendly GUI front end. It's at [*http://www.ximian.com/products/redcarpet*](http://www.ximian.com/products/redcarpet).

The commercial CDE environment uses the Motif libraries and a variation of the Motif **mwm** window manager, **dtwm**, and provides a suite of desktop and session-management utilities. Several vendors have made the source code of Motif available and provided binary packages for Linux distributions. As a starting point, download and installation information is available at [*http://www.opengroup.org/openmotif/*](http://www.opengroup.org/openmotif/).

A free version of Motif, called LessTiF, is available from [*http://www.lesstif.org/*](http://www.lesstif.org/).

WindowMaker, [*http://www.windowmaker.org/*](http://www.windowmaker.org/) is a window manager that has many desktop environment-like features. It provides support for GNUstep, [*http://www.gnustep.org/*](http://www.gnustep.org/), a clone of the commercial NeXTStep environment.

**Q: xterm** Logins Show Up Strangely in **who**, **finger**

**A:** The **xterm** that comes with XFree86 2.1 and earlier doesn't correctly understand the format that Linux uses for the /var/adm/utmp file, where the system records who is logged in. It therefore doesn't set all the information correctly.

The xterms in XFree86 3.1 and later versions fix this problem.

**Q:** How to Start a X Client on Another Display

**A:** To start a X client on another system that has a running X server, use the following commands:

* Use xhost on the server system to allow the client system use the display. If the server's IP address is 192.168.20.1, enter the command:

|  |
| --- |
| $ xhost + 192.168.20.1 |

* On the client system, open a telnet connection to the server system.
* In the telnet session, start a xterm in the background with the -display and -e options. For example, if the IP address of the machine running the server is 192.168.20.1 and the client program name is named **clientapp**, use the following command:

|  |
| --- |
| $ xterm -display 192.168.20.1 -e clientapp & |

**17. Frequently Encountered Error Messages**

Q: [**Modprobe** Can't Locate Module, *XXX*, and Similar Messages](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#modprobe-cant-locate-module)

Q: [Unknown Terminal Type linux and Similar](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#unknown-terminal-type)

Q: [INET: Warning: old style ioctl... called!](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#inet-warning-old-style)

Q: [ld: unrecognized option '-m486'](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ld-unrecognized)

Q: [GCC Says, Internal compiler error.](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#gcc-says)

Q: [Make Says, Error 139.](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#make-says)

Q: [Shell-Init: Permission Denied when I Log In](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#shell-init-permission)

Q: [No Utmp Entry. You Must Exec ... when Logging In](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#no-utmp-entry)

Q: [Warning--bdflush Not Running](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#warning--bdflush)

Q: [Warning: obsolete routing request made](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#warning-obsolete-routing)

Q: [EXT2-fs: warning: mounting unchecked file system](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ext2-fs-warning-mounting)

Q: [EXT2-fs warning: maximal count reached](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ext2-fs-maximal)

Q: [EXT2-fs warning: checktime reached](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ext2-fs-warning)

Q: [**df** Says, Cannot read table of mounted file systems.](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#df-says-cannot)

Q: [**fdisk** Says, "Partition X has different physical/logical..."](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#fdisk-says-partition)

Q: [fdisk: Partition 1 does not start on cylinder boundary](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#fdisk-partition-does-not)

Q: [**fdisk** Says Partition *n* Has an Odd Number of Sectors](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#fdisk-odd-number-sectors)

Q: [Mtools Utilities Say They Cannot Initialize Drive *X*](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#mtools-cannot-initialize)

Q: [At the Start of Booting: Memory tight](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#memory-tight)

Q: [The System Log Says, end\_request: I/O error, ....](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#my-syslog-says-end-request)

Q: [You don't exist. Go away.](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#you-don-t-exist)

Q: [Operation not permitted.](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#chattr)

Q: [*programname:* error in loading shared libraries: lib *xxx.*.so. *x*: cannot open shared object file: No such file or directory.](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#and-ltemphasis-role-eq-bold-and-gtprogramname:-and-lt-slash-emphasis-and-gt-and-ltliteral-and-gterror-in-loading-shared-libraries:-lib-and-lt-slash-literal-and-gt-and-ltemphasis-role-eq-bold-and-gtxxx-dot-and-lt-slash-emphasis-and-gt-and-ltliteral-and-gt-dot-so-dot-and-lt-slash-literal-and-gt-and-ltemphasis-role-eq-bold-and-gtx-and-lt-slash-emphasis-and-gt-and-ltliteral-and-gt:-cannot-open-shared-object-file:-no-such-file-or-directory-dot-and-lt-slash-literal-and-gt)

Q: [init: Id "x" respawning too fast: disabled for 5 minutes .](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#and-ltliteral-and-gt-init:-id-and-quotx-and-quot-respawning-too-fast:-disabled-for-five-minutes-and-lt-slash-literal-and-gt-dot)

Q: [FTP server says: "421 service not available, remote server has closed connection."](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ftp-421-error)

**Q: Modprobe** Can't Locate Module, *XXX*, and Similar Messages

**A:** These types of messages mostly occur at boot time or shutdown. If modprobe, insmod, or rmmod complain about not being able to find a module, add the following to the /etc/modules.conf or /etc/modutils/aliases file, whichever is present on your system.

|  |
| --- |
| $ alias <module-name> off |

And use the name of the module that appears in the error message.

[J.H.M. Dassen]

**Q:** Unknown Terminal Type linux and Similar

**A:** In early kernels the default console terminal type has changed from console to linux. You must edit /etc/termcap to change the line reading:

|  |
| --- |
| console|con80x25: |

to

|  |
| --- |
| linux|console|con80x25: |

(there may be an additional dumb in there - if so it should be removed.)

To get the editor to work you may need type:

|  |
| --- |
| $ TERM=console |

(for **bash** and **ksh**), or

|  |
| --- |
| $ setenv TERM console |

for **csh** or **tcsh**.

Some programs use /usr/lib/terminfo instead of /etc/termcap. For these programs you should upgrade your terminfo package, which is part of ncurses.

The same is true for X terminal displays. If your distribution sets the TERM to something strange like xterm-24-color, you can simply reset it to a generic value from the command line:

|  |
| --- |
| $ TERM="xterm"; export TERM |

**Q:** INET: Warning: old style ioctl... called!

**A:** You are trying to use the old network configuration utilities. The new ones can be found on [*ftp://ftp.linux.org.uk/pub/linux/Networking/PROGRAMS/NetTools/*](ftp://ftp.linux.org.uk/pub/linux/Networking/PROGRAMS/NetTools/) (source only, I'm afraid).

Note that they cannot be used just like the old-style programs. See the *NET-2 HOWTO* for instructions on how to set up the old-style networking programs correctly. Even better, see the *NET-3 HOWTO* and upgrade your networking software.

**Q:** ld: unrecognized option '-m486'

**A:** You have an old version of **ld**. Install a newer binutils package that contains an updated **ld**. Look on tsx-11.mit.edu in /pub/linux/packages/GCC/ for binutils-2.6.0.2.bin.tar.gz.

**Q:** GCC Says, Internal compiler error.

**A:** If the fault is repeatable (i.e., it always happens at the same place in the same file - even after rebooting and trying again, using a stable kernel) you have discovered a bug in GCC. See the GCC Info documentation (type **F1**-**i** in Emacs, and select GCC from the menu) for details on how to report the error. Make sure you have the latest version, though.

Note that this is probably not a Linux-specific problem. Unless you are compiling a program many other Linux users also compile, you should not post your bug report to any of the comp.os.linux groups.

If the problem is not repeatable, you may be experiencing memory corruption. Refer to the answer for [*Make Says, Error 139.*](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#make-says).

**Q:** Make Says, Error 139.

**A:** Your compiler (GCC) dumped core. You probably have a corrupted, buggy, or old version of GCC - get the latest release or EGCS. Alternatively, you may be running out of swap space. Refer to [*Why Does the Machine Run Very Slowly with GCC / X / ...?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#machine-runs-very-slowly-when).

If this doesn't fix the problem, you are probably having problems with memory or disk corruption. Check that the clock rate, wait states, and refresh timing for your SIMMS and cache are correct (hardware manuals are sometimes wrong, too). If so, you may have some marginal SIMMS, or a faulty motherboard or hard disk or controller.

Linux is a very good memory tester - much better than MS-DOS based memory test programs.

Reportedly, some clone x87 math coprocessors can cause problems. Try compiling a kernel with math emulation (see [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel)). The no387 kernel command line flag on the LILO prompt to force the kernel to use math emulation, or it may be able to work and still use the '387, with the math emulation compiled in but mainly unused.

More information about this problem is available on the Web at [*http://www.bitwizard.nl/sig11/*](http://www.bitwizard.nl/sig11/).

**Q:** Shell-Init: Permission Denied when I Log In

**A:** Your root directory and all the directories up to your home directory must be readable and executable by everybody. See the manual page for **chmod** or a book on Unix for how to fix the problem.

**Q:** No Utmp Entry. You Must Exec ... when Logging In

**A:** Your /var/run/utmp is screwed up. You should have

|  |
| --- |
| /var/run/utmp |

in your /etc/rc.local or /etc/rc.d/\*. See [*If I Screwed Up the System and Can't Log In, How Can I Fix It?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#screwed-up-system-and-cant-log-in). Note that the utmp may also be found in /var/adm/ or /etc/ on some older systems.

**Q:** Warning--bdflush Not Running

**A:** Modern kernels use a better strategy for writing cached disk blocks. In addition to the kernel changes, this involves replacing the old **update** program which used to write everything every 30 seconds with a more subtle daemon (actually a pair), known as **bdflush**. Get bdflush-*n.n*.tar.gz from the same place as the kernel source code (see [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel)) and compile and install it. **bdflush** should be started before the usual boot-time file system checks. It will work fine with older kernels as well, so there's no need to keep the old **update** around.

**Q:** Warning: obsolete routing request made

**A:** This is nothing to worry about. The message means that your version **route** is a little out of date, compared to the kernel. You can make the message go away by getting a new version of **route** from the same place as the kernel source code. See [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel).

**Q:** EXT2-fs: warning: mounting unchecked file system

**A:** You need to run **e2fsck** (or fsck -t ext2 if you have the **fsck** front end program) with the **-a** option to get it to clear the dirty flag, and then cleanly unmount the partition during each shutdown.

The easiest way to do this is to get the latest **fsck**, **umount**, and **shutdown** commands, available in Rik Faith's util-linux package (see [*Where Are the Linux FTP Archives?*](http://www.tldp.org/FAQ/Linux-FAQ/linux-distributions.html#get-linux-material-by-ftp)). You have to make sure that your /etc/rc\*/ scripts use them correctly.

NB: Don't try to check a file system that's mounted read/write. This includes the root partition if you don't see

|  |
| --- |
| VFS: mounted root ... read-only |

at boot time. You must arrange to mount the root file system read/only to start with, check it if necessary, and then remount it read/write. Almost all distributions do this. If your's doesn't, read the documentation that comes with util-linux to find out how to do this.

Note that you need to specify the **-n** option to **mount** so it won't try to update /etc/mtab, since the root file system is still read-only, and this will otherwise cause it to fail.

**Q:** EXT2-fs warning: maximal count reached

**A:** This message is issued by the kernel when it mounts a file system that's marked as clean, but whose "number of mounts since check" counter has reached the predefined value. The solution is to get the latest version of the ext2fs utilities (e2fsprogs-0.5b.tar.gz at the time of writing) from the usual sites. See [*Where Are the Linux FTP Archives?*](http://www.tldp.org/FAQ/Linux-FAQ/linux-distributions.html#get-linux-material-by-ftp).

The maximal number of mounts value can be examined and changed using the **tune2fs** program from this package.

**Q:** EXT2-fs warning: checktime reached

**A:** Kernels from 1.0 onwards support checking a file system based on the elapsed time since the last check as well as by the number of mounts. Get the latest version of the ext2fs utilities. See [*EXT2-fs warning: maximal count reached*](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ext2-fs-maximal).

**Q: df** Says, Cannot read table of mounted file systems.

**A:** There is probably something wrong with your /etc/mtab or /etc/fstab files. If you have a reasonably new version of mount, /etc/mtab should be emptied or deleted at boot time (in /etc/rc.local or /etc/rc.d/\*), using something like

|  |
| --- |
| $ rm -f /etc/mtab\* |

Some old Linux distributions have an entry for the root partition in /etc/mtab made in /etc/rc\* by using **rdev**. That is incorrectthe newer versions of **mount** do this automatically.

Some old distributions also have a line in /etc/fstab that looks like:

|  |
| --- |
| /dev/sdb1 /root ext2 defaults |

The entry for /root should read simply /.

**Q: fdisk** Says, "Partition X has different physical/logical..."

**A:** If the partition number (X, above) is 1, this is the same problem as in fdisk: Partition 1 does not start on cylinder boundary.

If the partition begins or ends on a cylinder numbered greater than 1024, this is because the standard DOS disk geometry information format in the partition table can't cope with cylinder numbers with more than 10 bits. You should see [*How Can I Get Linux to Work With My Disk?*](http://www.tldp.org/FAQ/Linux-FAQ/disk-drives.html#linux-to-work-with-my-disk).

**Q:** fdisk: Partition 1 does not start on cylinder boundary

**A:** The version of **fdisk** that comes with many Linux systems creates partitions that fail its own validity checking. Unfortunately, if you've already installed your system, there's not much you can do about this, apart from copying the data off the partition, deleting and remaking it, and copying the data back.

You can avoid the problem by getting the latest version of **fdisk**, from Rik Faith's util-linux package (available on all the usual FTP sites). Alternatively, if you are creating a new partition 1 that starts in the first cylinder, you can do the following to get a partition that **fdisk** likes.

* Create partition 1 in the normal way. A p listing will produce the mismatch complaint.
* Type **u** to set sector mode and do **p** again. Copy down the number from the End column.
* Delete partition 1.
* While still in sector mode, re-create partition 1. Set the first sector to match the number of sectors per track. This is the sector number in the first line of the **p** output. Set the last sector to the value you wrote down in the step above.
* Type **u** to reset cylinder mode and continue with other partitions.

Ignore the message about unallocated sectors. They refer to the sectors on the first track apart from the Master Boot Record, and they are not used if you start the first partition in track 2.

**Q: fdisk** Says Partition *n* Has an Odd Number of Sectors

**A:** The PC disk partitioning scheme works in 512-byte sectors, but Linux uses 1K blocks. If you have a partition with an odd number of sectors, the last sector is wasted. Ignore the message.

**Q:** Mtools Utilities Say They Cannot Initialize Drive *X*

**A:** This means that mtools is having trouble accessing the drive. This can be due to several things.

Often this is due to the permissions on floppy drive devices (/dev/fd0\* and /dev/fd1\*) being incorrect. The user running mtools must have the appropriate access. See the manual page for **chmod** for details.

Most versions of mtools distributed with Linux systems (not the standard GNU version) use the contents of a file /etc/mtools to determine which devices and densities to use, in place of having this information compiled into the binary. Mistakes in this file often cause problems. There is often no documentation about this.

For the easiest way to access your MS-DOS files (especially those on a hard disk partition) see How do I access files on my DOS partition or floppy? Noteyou should never use mtools to access files on an msdosfs mounted partition or disk!

**Q:** At the Start of Booting: Memory tight

**A:** This means that you have an extra-large kernel, which means that Linux has to do some special memory-management magic to be able to boot itself from the BIOS. It isn't related to the amount of physical memory in your machine. Ignore the message, or compile a kernel containing only the drivers and features you need. See [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel).

**Q:** The System Log Says, end\_request: I/O error, ....

**A:** This error message, and messages like it, almost always indicate a hardware error with a hard drive.

This commonly indicates a hard drive defect. The only way to avoid further data loss is to completely shut own the system. You must also make sure that whatever data is on the drive is backed up, and restore it to a non-defective hard drive.

This error message may also indicate a bad connection to the drive, especially with home brew systems. If you install an IDE drive, *always* use new ribbon cables. It's probably is a good idea with SCSI drives, too.

In one instance, this error also seemed to coincide with a bad ground between the system board and the chassis. Be sure that all electrical connections are clean and tight before placing the blame on the hard drive itself.

[Peter Moulder, Theodore Ts'o]

**Q:** You don't exist. Go away.

**A:** This is not a viral infection. It comes from programs like **write**, **talk**, and **wall**, if your invoking UID doesn't correspond to a valid user (probably due to /etc/passwd being corrupted), or if the session (pseudoterminal, specifically) you're using isn't properly registered in the utmp file (probably because you invoked it in a funny way).

**Q:** Operation not permitted.

**A:** One or more of the file's or directory's attribute bits are set incorrectly. If the I bit is set, for example, you won't be able to change file permissions with **chmod**.

The solution is to use **lsattr** to display file and directory attributes, and **chattr** to set and unset them. The programs' documentation is contained in their manual pages.

[Paul Campbell]

**Q:** *programname:* error in loading shared libraries: lib *xxx.*.so. *x*: cannot open shared object file: No such file or directory.

**A:** A message like this, when the program that you're trying to run uses shared libraries, usually means one of two things: the program was either compiled on a machine that had a different set of libraries or library paths than yours; or you've upgraded your libraries but not the program.

Executable programs that are linked with dynamic libraries, expect the full pathname of each of the library files it requires. So do the shared libraries, if they rely on other libraries. This is so the shared object dependencies remain as unambiguous as possible, and also as a security measure.

Short of recompiling the executable file for the libraries on the systemprobably the most desirable alternative in the long run - you can try to determine which libraries the executable file needs with the command: ldd *programname*. The output will be a list of the shared libraries on the system that the program needs to run, as well as the missing libraries. You can then add the library packages, or if the libraries already exist in a different directory, you can create a symbolic link so the program can find it. For example, if the program requires /usr/lib/libncurses.so.2, and your machine has /lib/libncurses.so.2, you can create a link where the program expects to find the library; e.g.:

|  |
| --- |
| # cd /usr/lib &amp;&amp; ln -s /lib/libncurses.so.2 . |

You should note, however, that creating library links like these should be considered a security risk, and the additional links you create will not be compatible with future upgrades. It's simply a quick fix for backward compatibility.

Also, it may take some guesswork to determine in exactly which of the system library directories the program expects to find a shared library file, because ldd will not list the paths of libraries it can't find. A program most likely will tell the run-time linker, /lib/ld.so, to look for shared libraries in /lib, /usr/lib, /usr/local/lib, or /usr/X11R6/lib, if it's an X client. But that doesn't mean that libraries can't be installed elsewhere. It helps to have some idea of the original library configuration before proceeding.

Also be sure to run ldconfig after creating the symbolic link, so that ld.so has an updated view of the system's libraries. You should also make certain that all of the library directories are listed in /etc/ld.so.conf, and perhaps in the LD\_LIBRARY\_PATH environment variable.

**Q:** init: Id "x" respawning too fast: disabled for 5 minutes .

**A:** In most distributions this means that the system is booting by default into runlevel 5, which is supposed to respawn (re-start again after it's been exited) a graphical login via xdm, kdm, gdm, or whatever, and the system can't locate the program.

However, Id can also indicate the absence or misconfiguration of another program, like mingetty, if init tries to respawn itself more than 10 times in 2 minutes.

Id "x" is the number in the leftmost column of the /etc/inittab file:

|  |
| --- |
| # Run gettys in standard runlevels  1:2345:respawn:/sbin/mingetty tty1  2:2345:respawn:/sbin/mingetty tty2  3:2345:respawn:/sbin/mingetty tty3  4:2345:respawn:/sbin/mingetty tty4  5:2345:respawn:/sbin/mingetty tty5  6:2345:respawn:/sbin/mingetty tty6 |

Commenting the offending line out and then fixing the errant program and testing on the command line will allow you to see any error messages that go to standard error output (console) if the errors are not going to the system log file. Uncomment the line and restart init with kill -SIGHUP 1 or telinit q to cause init to reinitialize and reread the /etc/inittab file.

Some systems, however, rewrite /etc/inittab when booting. In that case, refer to the init man page, and/or the settings in /etc/sysconfig/init.

Refer to the init and /etc/inittab man pages for detailed information.

[Carl King]

**Q:** FTP server says: "421 service not available, remote server has closed connection."

**A:** If an FTP server won't allow logins, it is probably configured correctly, but the problem is probably with authorizing users at login. FTP servers in current distributions often authorize users with the Pluggable Authentication Modules library, in which case there should be an authorization file /etc/pam.d/ftp. A generic authorization file looks like this. (The line break on the first "auth" line is for readability. The entry is actually a single, long line).

|  |
| --- |
| #%PAM-1.0  auth required /lib/security/pam\_listfile.so item=user  sense=deny file=/etc/ftpusers onerr=succeed  auth required /lib/security/pam\_pwdb.so shadow nullok  auth required /lib/security/pam\_shells.so  account required /lib/security/pam\_pwdb.so  session required /lib/security/pam\_pwdb.so |

Also, make sure the /etc/ftpusers file, or whatever users file is named in the first "auth" line, is configured correctly.

Btw, the sample ftp file above is actually the ftpd/ftp.pam.sample file from the ftpd-BSD-0.3.1.tar.gz package. Many thanks to David A. Madore for this much needed port.

**8. Booting the OS**

Q: [Can Linux Boot from MS-DOS?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#boot-linux-from-ms-dos)

Q: [How Can Linux Boot from OS/2's Boot Manager?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#boot-linux-from-os2s-boot)

Q: [How Do I Set the Boot-Time Configuration?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#boot-time-parameters)

Q: [How Do I Get LILO to Boot the Kernel Image?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#lilo-boot-kernel-image)

Q: [Can I Remove LILO So the System Boots DOS Again?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#remove-lilo-so-my-system-boots)

Q: [Why Does the System Check the Ext2fs Partitions Each Reboot?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#partitions-checked-each-reboot)

Q: [How Do I Make Sure the System Boots after Re-Installing the Operating System?](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#make-sure-it-boots)

Q: [How To Make a Rescue Floppy](http://www.tldp.org/FAQ/Linux-FAQ/booting.html#make-rescue-floppy)

**Q:** Can Linux Boot from MS-DOS?

**A:** If LILO doesn't work, and if the machine has MS-DOS or Microsoft Windows, you may be left with a computer that won't boot. This can also happen on an upgrade to your Linux distribution. Re-installing LILO is the last thing that the installation does.

It is vitally important when installing or upgrading Linux on a dual boot machine, to have a MS-DOS or Windows rescue disk nearby so you can FDISK -MBR. Then you can go about using LOADLIN.EXE instead of LILO.

This config.sys file is one possible way to invoke LOADLIN.EXE and boot MS-DOS or Linux.

|  |
| --- |
| [menu] menuitem=DOS, Dos Boot menuitem=LINUX, Linux Boot  [LINUX] shell=c: edhatloadlin.exe c: edhatautobootvmlinuz vga=5 root=/dev  [DOS] STACKS = 0,0 rem all the other DOS drivers get loaded here. |

This creates a menu where you can directly jump to LOADLIN.EXE before all of the MS-DOS drivers get loaded.

The paths and options are peculiar to one machine and should be intuitively obvious to the most casual observer. See the LOADLIN.EXE docs for options. They are the same as LILO, and options are just passed to the kernel, anyhow.

[Jim Harvey]

**Q:** How Can Linux Boot from OS/2's Boot Manager?

**A:** #Create a partition using OS/2's FDISK.EXE (Not Linux's **fdisk**).

1. Format the partition under OS/2, either with FAT or HPFS. This is so that OS/2 knows about the partition being formatted. (This step is not necessary with OS/2 Warp 3.0.)
2. Add the partition to the Boot Manager.
3. Boot Linux, and create a file system on the partition using **mkfs -t ext2** or **mke2fs**. At this point you may, if you like, use Linux's **fdisk** to change the code of the new partition to type 83 (Linux Native)this may help some automated installation scripts find the right partition to use.
4. Install Linux on the partition.
5. Install LILO on the Linux partition NOT on the master boot record of the hard drive. This installs LILO as a second-stage boot loader on the Linux partition itself, to start up the kernel specified in the LILO configuration file. To do this, you should put

|  |
| --- |
| boot = /dev/hda2 |

1. (where /dev/hda2 is the partition you want to boot from) in your /etc/lilo/config or /etc/lilo.config file.
2. Make sure that it is the Boot Manager partition that is marked active, so that you can use Boot Manager to choose what to boot.

There is a set of HOWTO's on the subject of multi-boot systems at the LDP Home Page, [*http://tldp.org*](http://tldp.org).

**Q:** How Do I Set the Boot-Time Configuration?

**A:** You can configure Linux at the lilo: prompt either by typing the kernel arguments at the BOOT lilo: prompt, or by adding an append= directive to the /etc/lilo.conf file; for example, at the LILO prompt (example only):

|  |
| --- |
| BOOT lilo: parport=0x3bc,7  parport=0x3bc,none serial=0x3f8,4 serial=0x2f8,3 |

Example statement for /etc/lilo.conf:

|  |
| --- |
| append="parport=0x3bc,none serial=0x3f8,4 serial=0x2f8,3" |

If you modify the /etc/lilo.conf file, be sure to run the **lilo** command to install the new configuration.

Configuration notes for specific hardware devices are in the documentation of the kernel source distribution, /usr/src/linux/Documentation in most distributions.

Refer to the **lilo** and /etc/lilo.conf manual pages, as well as the LDP *BootPrompt-HowTo*, see [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation), and the documentation in /usr/doc/lilo.

**Q:** How Do I Get LILO to Boot the Kernel Image?

**A:** From kernel versions 1.1.80 on, the compressed kernel image, which is what LILO needs to find, is in arch/i386/boot/zImage, or arch/i386/boot/bzImage when it is built, and is normally stored in the /boot/ directory. The /etc/lilo.conf file should refer to the vmlinuz symbolic link, not the actual kernel image.

This was changed to make it easier to build kernel versions for several different processors from one source tree.

**Q:** Can I Remove LILO So the System Boots DOS Again?

**A:** The **lilo** program (not the complete LILO package), uses the command line option **-u** to uninstall the LILO boot loader. You have to supply the device name of the device you installed LILO on, for example:

|  |
| --- |
| lilo -u /dev/hda |

This rewrites the original, pre-LILO master boot record back to the first hard drive, from the boot record saved in /boot/boot.0300. If you installed LILO to a partition as a secondary boot loader, for example, /dev/hda1, **lilo** re-installs the original boot sector from the save file /boot/boot.0301. Refer to the **lilo** manual page for details. Thanks to Villy Kruse for reminding me to update this answer.

If you have an earlier version of LILO, you will have to use the DOS (MS-DOS 5.0 or later, or OS/2) FDISK /MBR (which is not documented). This will overwrite the lilo boot loader with a standard MS-DOS Master Boot Record. If you have DR-DOS 6.0, go into FDISK.EXE in the normal way and then select the Re-write Master Boot Record option.

If you create a boot floppy during the Windows installation process, make sure that it contains the programs FDISK.EXE, FORMAT.COM, and SYS.COM, and use that to re-install MS-DOS on the hard disk.

If you don't have MS-DOS or DR-DOS, you need to have the boot sector that LILO saved when you first installed it. You did keep that file, didn't you? It's probably called boot.0301 or some such. Type:

|  |
| --- |
| dd if=boot.0301 of=/dev/hda bs=445 count=1 |

(or /dev/sda if you're using a SCSI disk). This may also wipe out your partition table, so beware! If you're desperate, you could use

|  |
| --- |
| dd if=/dev/zero of=/dev/hda bs=512 count=1 |

This will erase your partition table and boot sector completely: you can then reformat the disk using your favorite software. But this will render the contents of your disk inaccessible you'll lose it all unless you're an expert.

Note that the DOS MBR boots whichever (single!) partition is flagged as "active." You may need to use **fdisk** to set and clear the active flags on partitions appropriately.

**Q:** Why Does the System Check the Ext2fs Partitions Each Reboot?

**A:** Refer to [*EXT2-fs: warning: mounting unchecked file system*](http://www.tldp.org/FAQ/Linux-FAQ/error-messages.html#ext2-fs-warning-mounting).

**Q:** How Do I Make Sure the System Boots after Re-Installing the Operating System?

**A:** This should work whether you're re-installing Linux or some other, commercial, operating system:

* Insert a blank, formatted floppy in drive A:
* Save a copy of the boot hard drive's Master Boot Record to the floppy, by executing the command:

|  |
| --- |
| #dd if=/dev/hda of=/dev/fd0 count=1 |

* dd is a standard program on Linux systems. A MS-Windows compatible version is available from [*ftp://ftp.gnu.org/*](ftp://ftp.gnu.org/), as well as many MS software archives.
* Test that the floppy boots the system by rebooting with the floppy in the A: drive.
* Then you should be able to install the other operating system (on a different hard drive and/or partition, if you don't want to uninstall Linux).
* After installation, boot Linux again from the floppy, and re-install the MBR with the command: /sbin/lilo.

[Jacques Guy]

**Q:** How To Make a Rescue Floppy

**A:** Make a file system on it with bin, etc, lib and dev directorieseverything you need. Install a kernel on it and arrange to have LILO boot it from the floppy (see the LILO documentation, in lilo.u.\*.ps).

If you build the kernel (or tell LILO to tell the kernel) to have a RAM disk the same size as the floppy the RAM disk will be loaded at boot time and mounted as root in place of the floppy.

**3. The Linux Kernel**

Q: [What Platforms Does Linux Support?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#platform-support)

Q: [What Hardware Is Supported?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#does-linux-run-on-my-computer)

Q: [Ports to Other Processors](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#what-ports-to-other-processors-are-there)

Q: [How Does Linux Kernel Versioning Work?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#linux-versioning)

Q: [Where Is the Latest Kernel Version on the Internet?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#where-can-i-get-the-latest-kernel-version)

Q: [Does Linux Support Threads or Lightweight Processes?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#threads-or-lightweight-processes)

Q: [What Version of Linux and What Machine Name Is This?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#version-of-linux-and-what-machine)

Q: [What is a BogoMip?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#bogomip)

Q: [Does Linux Support USB Devices?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#does-linux-support-the-usb-bus)

Q: [Can Linux Use More than 3 Serial Ports by Sharing Interrupts?](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#serial-ports-by-sharing)

**Q:** What Platforms Does Linux Support?

**A:** Linux runs on almost every general-purpose computer made in the last 10 years. It runs on systems as small as PDAs (for example, the Sharp Zaurus) and on systems as large as IBM mainframes.

There are Linux distributions specifically for mobile and handheld platforms. Information on the Linux distribution for the Compaq iPAQ is at [*http://www.handhelds.org*](http://www.handhelds.org).

**A:** Linux was written originally for Intel processor based PC's, using the hardware facilities of the 80386 processor and its successors to implement its features. The 80386 family includes the 80486 and all of the Pentium chips. However, there are now many ports to other hardware platforms. See [*Ports to Other Processors*](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#what-ports-to-other-processors-are-there).

Refer also to the Linux *INFO-SHEET* for more details as well as the answers to [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation), [*What Hardware Is Supported?*](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#does-linux-run-on-my-computer), and [*Ports to Other Processors*](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#what-ports-to-other-processors-are-there), below.

**Q:** What Hardware Is Supported?

**A:** A minimal Linux installation requires a machine for which a port exists, at least 2Mb of RAM, and a single floppy drive, but to do anything even remotely useful, more RAM and disk space are needed. Refer to: [*Ports to Other Processors*](http://www.tldp.org/FAQ/Linux-FAQ/kernel.html#what-ports-to-other-processors-are-there), [*What are the Disk Space Requirements for Minimal, Server, and Workstation Use?*](http://www.tldp.org/FAQ/Linux-FAQ/linux-distributions.html#how-much-hard-disk-space-does-linux-need), and [*What are the Minimum and Maximum Memory Requirements?*](http://www.tldp.org/FAQ/Linux-FAQ/linux-distributions.html#how-much-memory-does-linux-need).

Intel CPU, PC-compatible machines require at least an 80386 processor to run the standard Linux kernel.

Linux, including the X Window System GUI, runs on most current laptops. Refer to the answer for: [*How Do I Find Out If a Notebook Runs Linux?*](http://www.tldp.org/FAQ/Linux-FAQ/common-problems.html#my-notebook-runs-linux). There are numerous sources of information about specific PC's, video cards, disk controllers, and other hardware. Refer to the *INFO-SHEET*, *Laptop-HOWTO*, and the *Unix-Hardware-Buyer-HOWTO*. See [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation).

**Q:** Ports to Other Processors

**A:** Ports are currently available for:

* [*Compaq Alpha AXP*](http://www.linuxalpha.org)
* [*Sun SPARC and UltraSPARC*](http://www.ultralinux.org)
* [*Motorola 68000*](http://www.linux-m68k.org)
* [*PowerPC*](http://penguinppc.org)
* [*PowerPC64*](http://linuxppc64.org)
* [*ARM*](http://www.arm.linux.org)
* [*Hitachi SuperH*](http://linuxsh.sourceforge.net)
* [*IBM zSeries and S/390*](http://www.ibm.com/s390/linux)
* [*MIPS*](http://www.linux-mips.org)
* [*HP PA-RISC*](http://www.parisc-linux.org)
* [*Intel IA-64*](http://www.linuxia64.org)
* [*DEC VAX*](http://linux-vax.sourceforge.net)
* [*AMD x86-64*](http://www.x86-64.org)
* [*CRIS*](http://developer.axis.com/software/linux)

**A:** There are always efforts underway to port Linux onto new processors. Linux Online maintains a [*http://www.linux.org/projects/ports.html:list of ports currently in development*](http://www.linux.org/projects/ports.html:list%20of%20ports%20currently%20in%20development).

In addition, the following information is available about specific ports:

On Intel platforms, VESA Local Bus and PCI bus are supported.

MCA (IBM's proprietary bus) and ESDI hard drives are mostly supported. There is further information on the MCA bus and what cards Linux supports on the Micro Channel Linux Web page, [*http://www.dgmicro.com/mca*](http://www.dgmicro.com/mca). Refer also to the answer for: [*Where Is the Linux Stuff on the World Wide Web?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#world-wide-web-for-linux-stuff).

There is a port of Linux to the 8086, known as the Embeddable Linux Kernel Subset (ELKS). This is a 16-bit subset of the Linux kernel which will mainly be used for embedded systems, at: [*http://www.linux.org.uk/Linux8086.html*](http://www.linux.org.uk/Linux8086.html). Standard Linux does not run 8086 or 80286 processors, because it requires task-switching and memory management facilities found on 80386 and later processors.

Linux supports multiprocessing with Intel MP architecture. See the file Documentation/smp.tex in the Linux kernel source code distribution.

An API specification and developers kit for the Crusoe Smart Microprocessor developed by Transmeta Corporation are at [*http://www.transmeta.com*](http://www.transmeta.com).

A project has been underway for a while to port Linux to suitable 68000-series based systems like Amigas and Ataris. The Linux/m68K FAQ is located at [*http://www.clark.net/pub/lawrencc/linux/faq/faq.html*](http://www.clark.net/pub/lawrencc/linux/faq/faq.html). The URL of the Linux/m68k home page is [*http://www.linux-m68k.org/faq/faq.html*](http://www.linux-m68k.org/faq/faq.html).

There is also a linux-680x0 mailing list. See [*What Mailing Lists Are There?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#what-mailing-lists-are-there).

There is (or was) a FTP site for the Linux-m68k project on [*ftp://ftp.phil.uni-sb.de/pub/atari/linux-68k*](ftp://ftp.phil.uni-sb.de/pub/atari/linux-68k), but this address may no longer be current.

Debian GNU/Linux has ports to Alpha, Sparc, Motorola 68k, PowerPC, ARM, IBM S/390, MIPS, HP PA-RISC, and IA-64. A Port to amd64 is being developed. There are mailing lists for all of them. See [*http://www.debian.org/MailingLists/*](http://www.debian.org/MailingLists/) for general information, then follow the "subscription" link, and find the mailing list you are interested in.

One of the Linux-PPC project pages is [*http://www.linuxppc.org*](http://www.linuxppc.org), and the archive site is [*ftp://ftp.linuxppc.org/linuxppc*](ftp://ftp.linuxppc.org/linuxppc).

There are two sites for the Linux iMac port: [*http://w3.one.net/~johnb/imaclinux*](http://w3.one.net/~johnb/imaclinux), and [*http://www.imaclinux.net:8080/content/index.html*](http://www.imaclinux.net:8080/content/index.html).

A port to the 64-bit DEC Alpha/AXP is at [*http://www.azstarnet.com/~axplinux/*](http://www.azstarnet.com/~axplinux/). There is a mailing list at vger.redhat.com: see [*What Mailing Lists Are There?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#what-mailing-lists-are-there).

Ralf Baechle is working on a port to the MIPS, initially for the R4600 on Deskstation Tyne machines. The *Linux-MIPS* FTP sites are [*ftp://ftp.fnet.fr/linux-mips*](ftp://ftp.fnet.fr/linux-mips) and [*ftp://ftp.linux.sgi.com/pub/mips-linux*](ftp://ftp.linux.sgi.com/pub/mips-linux). Interested people may mail their questions and offers of assistance to [*linux@waldorf-gmbh.de*](mailto:linux@waldorf-gmbh.de).

There is (or was) also a MIPS channel on the Linux Activists mail server and a linux-mips mailing list. See [*What Mailing Lists Are There?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#what-mailing-lists-are-there).

There are currently two ports of Linux to the ARM family of processors. One of these is for the ARM3, fitted to the Acorn A5000, and it includes I/O drivers for the 82710/11 as appropriate. The other is to the ARM610 of the Acorn RISC PC. The RISC PC port is currently in its early to middle stages, owing to the need to rewrite much of the memory handling. The A5000 port is in restricted beta testing. A release is likely soon.

For more, up-to-date information, read the newsgroup [*news:comp.sys.acorn.misc*](news:comp.sys.acorn.misc). There is a FAQ at [*http://www.arm.uk.linux.org*](http://www.arm.uk.linux.org).

The Linux SPARC project is a hotbed of activity. There is a FAQ and plenty of other information available from the UltraLinux page, [*http://www.ultralinux.org*](http://www.ultralinux.org).

The Home Page of the UltraSPARC port ("UltraPenguin") is located at [*http://sunsite.mff.cuni.cz/linux/ultrapenguin-1.0/*](http://sunsite.mff.cuni.cz/linux/ultrapenguin-1.0/), although the URL may not be current.

There is also a port to SGI/Indy machines ("Hardhat"). The URL is [*http://www.linux.sgi.com*](http://www.linux.sgi.com).

**Q:** How Does Linux Kernel Versioning Work?

**A:** At any given time, there are several "stable" versions of Linux, and one "development" version. Unlike most proprietary software, older stable versions continue to be supported for as long as there is interest, which is why multiple versions exist.

Linux version numbers follow a longstanding tradition. Each version has three numbers, i.e., X.Y.Z. The "X" is only incremented when a really significant change happens, one that makes software written for one version no longer operate correctly on the other. This happens very rarely -- in Linux's history it has happened exactly once.

The "Y" tells you which development "series" you are in. A stable kernel will always have an even number in this position, while a development kernel will always have an odd number.

The "Z" specifies which exact version of the kernel you have, and it is incremented on every release.

The current stable series is 2.4.x, and the current development series is 2.5.x. However, many people continue to run 2.2.x and even 2.0.x kernels, and they als o continue to receive bugfixes. The development series is the code that the Linu x developers are actively working on, which is always available for public viewing, testing, and even use, although production use is not recommended! This is part of the "open source development" method.

Eventually, the 2.5.x development series will be "sprinkled with holy penguin pee" and become the 2.6.0 kernel and a new stable series will then be established, and a 2.7.x development series begun. Or, if any really major changes happen, it might become 3.0.0 instead, and a 3.1.x series begun.

**Q:** Where Is the Latest Kernel Version on the Internet?

**A:** The easiest way to update your kernel is to get the update directly from the distribution which you are running.

**A:** If you need or want to configure and compile your own kernel, the web page at [*http://www.kernel.org/*](http://www.kernel.org/) lists the current versions of the development and production kernels.

If you want to download the source code, FTP to ftp.xx.kernel.org, where xx is the two-letter Internet domain abbreviation of your country; e.g., us for United States, ca for Canada, or de for Germany. Kernel versions 2.2.x are archived in the directory pub/linux/kernel/v2.2, as are patches for the prerelease versions. The kernel source code is archived as a .tar.gz file, and as a .tar.bz2 file.

Follow the instructions in any of the standard references to compile the kernel, as you would with any other custom kernel. The Documentation subdirectory contains information by the authors of various subsystems and drivers, and much of that information is not documented elsewhere.

If you want to participate in kernel development, make sure that you sign on to the linux-kernel mailing list to find out what people are working on. Refer to the answer: [*What Mailing Lists Are There?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#what-mailing-lists-are-there).

There is a story about the features of the 2.4 series kernels at [*http://features.linuxtoday.com/stories/8191.html*](http://features.linuxtoday.com/stories/8191.html).

**Q:** Does Linux Support Threads or Lightweight Processes?

**A:** As well as the Unix multiprocessing model involving heavyweight processes, which is of course part of the standard Linux kernel, there are several implementations of lightweight processes or threads. Recent kernels implement a thread model, kthreads. In addition, there are the following packages available for Linux.

* GNU glibc2 for Linux has optional support for threads. The archive is available from the same place as glibc2, [*ftp://ftp.gnu.org/pub/gnu/*](ftp://ftp.gnu.org/pub/gnu/)
* In [*ftp://sipb.mit.edu/pub/pthread/*](ftp://sipb.mit.edu/pub/pthread/) or [*ftp://ftp.ibp.fr:/pub/unix/threads/pthreads*](ftp://ftp.ibp.fr:/pub/unix/threads/pthreads). Documentation isn't in the package, but is available on the World Wide Web at [*http://www.mit.edu:8001/people/proven/home\_page.html*](http://www.mit.edu:8001/people/proven/home_page.html). Newer Linux libc's contain the pthreads source. The GNU Ada compiler on [*ftp://metalab.unc.edu/pub/Linux/devel/lang/ada/*](ftp://metalab.unc.edu/pub/Linux/devel/lang/ada/) contains binaries made from that source code.
* In [*ftp://ftp.cs.washington.edu/pub/qt-001.tar.Z*](ftp://ftp.cs.washington.edu/pub/qt-001.tar.Z) is QuickThreads. More information can be found in the technical report, available on the same site is /tr/1993/05/UW-CSE-93-05-06.PS.Z.
* In [*ftp://ftp.cs.fsu.edu/pub/PART/*](ftp://ftp.cs.fsu.edu/pub/PART/), an Ada implementation. This is useful mainly because it has a lot of Postscript papers that you'll find useful in learning more about threads. This is not directly usable under Linux.

Please contact the authors of the packages in question for details.

**Q:** What Version of Linux and What Machine Name Is This?

**A:** Type:

|  |
| --- |
| $ uname -a |

**Q:** What is a BogoMip?

**A:** "BogoMips" is a combination of *Bogus* and *Mips*. MIPS stands for (depending on who you ask) *Millions of Instructions per Second*, or *Meaningless Indication of Processor Speed*.

The number printed at boot time is the result of a kernel timing calibration, used for very short delay loops by some device drivers.

According to the *BogoMips mini-HOWTO*, the rating for your machine will be:

|  |
| --- |
| Common BogoMips Ratings  Processor BogoMips Comparison  --------- -------- ----------  Intel 8088 clock \* 0.004 0.02  Intel/AMD 386SX clock \* 0.14 0.8  Intel/AMD 386DX clock \* 0.18 1 (definition)  Motorola 68030 clock \* 0.25 1.4  Cyrix/IBM 486 clock \* 0.34 1.8  Intel Pentium clock \* 0.40 2.2  Intel 486 clock \* 0.50 2.8  AMD 5x86 clock \* 0.50 2.8  Mips R4000/R4400 clock \* 0.50 2.8  Nexgen Nx586 clock \* 0.75 4.2  PowerPC 601 clock \* 0.84 4.7  Alpha 21064/21064A clock \* 0.99 5.5  Alpha 21066/21066A clock \* 0.99 5.5  Alpha 21164/21164A clock \* 0.99 5.5  Intel Pentium Pro clock \* 0.99 5.5  Cyrix 5x86/6x86 clock \* 1.00 5.6  Intel Pentium II/III clock \* 1.00 5.6  Intel Celeron clock \* 1.00 5.6  Mips R4600 clock \* 1.00 5.6  Alpha 21264 clock \* 1.99 11.1  AMD K5/K6/K6-2/K6-III clock \* 2.00 11.1  UltraSparc II clock \* 2.00 11.1  Pentium MMX clock \* 2.00 11.1  PowerPC 604/604e/750 clock \* 2.00 11.1  Motorola 68060 clock \* 2.01 11.2  Motorola 68040 Not enough data (yet).  AMD Athlon Not enough data (yet).  IBM S390 Not enough data (yet). |

If the number is wildly lower, you may have the Turbo button or CPU speed set incorrectly, or have some kind of caching problem (as described in [*Why Does the System Slow to a Crawl When Adding More Memory?*](http://www.tldp.org/FAQ/Linux-FAQ/troubleshooting.html#add-memory-system-slows)).

For values people have seen with other, rarer, chips, or to calculate your own BogoMips rating, please refer to the *BogoMips Mini-HOWTO*, on [*ftp://metalab.unc.edu/*](ftp://metalab.unc.edu/). See [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation).

[Wim van Dorst]

**Q:** Does Linux Support USB Devices?

**A:** Linux supports a few dozen USB devices at present, and work is underway to develop additional device drivers. There is a Web page devoted to the subject, at [*http://www.linux-usb.org*](http://www.linux-usb.org). There is also LDP documentation, at: [*Where Is the Linux Stuff on the World Wide Web?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#world-wide-web-for-linux-stuff).

Support for USB version 2.0 was recently added to development kernels, but is not yet available in the 2.4 series.

**Q:** Can Linux Use More than 3 Serial Ports by Sharing Interrupts?

**A:** Yes, but you won't be able to use simultaneously two ordinary ports which share an interrupt (without some trickery). This is a limitation of the ISA Bus architecture.

See the *Serial HOWTO* for information about possible solutions and workarounds for this problem.

**5. Partitions And Filesystems**

Q: [Does Linux Support Virtualized File Systems Like RAID?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#virtualized-file-systems-like-raid)

Q: [Can Linux Use the Same Hard Drive as MS-DOS? OS/2? 386BSD? Win95?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#can-linux-share-my-disk-with-dos)

Q: [How Do I Access Files on a MS-DOS Partition or Floppy?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#how-do-i-access-files-on-my-dos-partition)

Q: [Does Linux Support Compressed Ext2 File Systems?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#support-compressed-ext2-file-systems)

Q: [Can Linux Use Stacked/DBLSPC/Etc. DOS Drives?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#can-i-use-my-stacked)

Q: [Can Linux Access OS/2 HPFS Partitions?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#can-i-access-os2-hpfs)

Q: [Can Linux Access Amiga File Systems?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#can-linux-access-amiga-file-systems)

Q: [Can Linux Access BSD, SysV, Etc. UFS?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#can-linux-access-bsd-sysv)

Q: [Can Linux Access MacIntosh File Systems?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#can-linux-access-macintosh-file-systems)

Q: [How Do I Create a File System on a Floppy?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#create-file-system-on-a-floppy)

Q: [Does Linux Support File System Encryption?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#support-file-system-encryption)

Q: [How Do I Resize a Partition Non-Destructively?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#resize-a-partition-non-destructively)

Q: [Where Is the Journalling File System on the Net?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#find-the-journalling-file-system)

Q: [Why Isn't My Virtual Memory Swap Area Working?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#swap-area-isnt-working)

Q: [How Do I Add Temporary Swap Space?](http://www.tldp.org/FAQ/Linux-FAQ/partitions.html#add-temporary-swap-space)

**Q:** Does Linux Support Virtualized File Systems Like RAID?

**A:** The most recent Linux kernels support software RAID, and they will work with RAID disk controllers.

An automounter for NFS partitions is part of most Linux distributions.

In addition, several virtual file system projects exist. One of them, the *Linux Logical Volume Manager*, is located at [*http://linux.msede.com/lvm/*](http://linux.msede.com/lvm/).

**Q:** Can Linux Use the Same Hard Drive as MS-DOS? OS/2? 386BSD? Win95?

**A:** Yes. Linux supports many, many filesystems, including the standard MS-DOS partitioning scheme, so it can share your disk with other operating systems.

Linux supports all known versions of the Microsoft FAT and VFAT file systems, including those used by Windows 95, Windows 98, Windows NT, Windows 2000 and Windows ME through loadable kernel modules. In a correctly configured system, they should load automatically when the partitions are mounted.

Note, however, that many other operating systems may not be exactly compatible. DOS's FDISK.EXE and FORMAT.EXE, for example, can overwrite data in a Linux partition, because they sometimes incorrectly use partition data from the partition's boot sector rather than the partition table.

In order to prevent programs from doing this, it is a good idea to zero out under Linux the start of a partition you created, before you use MS-DOS or whatever to format it. Type:

|  |
| --- |
| $ dd  if=/dev/zero of=/dev/hdXY bs=512 count=1 |

where *hdXY* is the relevant partition; e.g., /dev/hda1 for the first partition of the first (IDE) disk.

Linux can read and write the files on your DOS and OS/2 FAT partitions and floppies using either the DOS file system type built into the kernel or **mtools**.

There is reportedly a GPL'd OS/2 device driver that will read and write Linux ext2 partitions.

For information about FAT32 partition support, see [*http://bmrc.berkeley.edu/people/chaffee/fat32.html*](http://bmrc.berkeley.edu/people/chaffee/fat32.html).

See [*What Software does Linux Support?*](http://www.tldp.org/FAQ/Linux-FAQ/app-management.html#what-software-does-linux-support) for details and status of the emulators for DOS, MS Windows, and System V programs.

See also, "Can Linux access Amiga file systems?", "Can Linux access Macintosh file systems?", "Can Linux access BSD, SysV, etc., UFS?", and "Can Linux access SMB file systems?"

There are said to be NTFS drivers under development, which should support compression as a standard feature.

**Q:** How Do I Access Files on a MS-DOS Partition or Floppy?

**A:** Use the DOS file system, type, for example:

|  |
| --- |
| $ mkdir /dos $  mount -t msdos -o conv=text,umask=022,uid=100,gid=100 /dev/hda3 /dos |

If it's a floppy, don't forget to **umount** it before ejecting it!

You can use the conv=text/binary/auto, umask=nnn, uid=nnn, and gid=nnn options to control the automatic line-ending conversion, permissions and ownerships of the files in the DOS file system as they appear under Linux. If you mount your DOS file system by putting it in your /etc/fstab, you can record the options (comma-separated) there, instead of defaults.

Alternatively, you can use mtools, available in both binary and source form on the FTP sites. See [*Where Are the Linux FTP Archives?*](http://www.tldp.org/FAQ/Linux-FAQ/linux-distributions.html#get-linux-material-by-ftp).

A kernel patch (known as the fd-patches) is available which allows floppies with nonstandard numbers of tracks and/or sectors to be used; this patch is included in the 1.1 alpha testing kernel series.

**Q:** Does Linux Support Compressed Ext2 File Systems?

**A:** The ext2compr project provides a kernel patch Information about them is located at [*http://e2ompr.memalpha.cx/e2compr/*](http://e2ompr.memalpha.cx/e2compr/).

There is also a Web site for the e2compr patches. The code is still experimental and consists of patches for the 2.0 and 2.1 kernels. For more information about the project, including the latest patches, and the address of the mailing list, look up the URL at [*http://debs.fuller.edu/e2compr/*](http://debs.fuller.edu/e2compr/).

[Roderich Schupp, Peter Moulder

**A:** *zlibc* is a program that allows existing applications to read compressed (GNU gzip'ed) files as if they were not compressed. Look at [*ftp://metalab.unc.edu/pub/Linux/libs/*](ftp://metalab.unc.edu/pub/Linux/libs/). The author is Alain Knaff.

**A:** There is also a compressing block device driver, "DouBle," by Jean-Marc Verbavatz, which can provide on-the-fly disk compression in the kernel. The source-only distribution is located at [*ftp://metalab.unc.edu/pub/Linux/patches/diskdrives/*](ftp://metalab.unc.edu/pub/Linux/patches/diskdrives/). This driver compresses inodes and directory information as well as files, so any corruption of the file system is likely to be serious.

**A:** There is also a package called tcx (Transparently Compressed Executables), which allows you to keep infrequently used executables compressed and only uncompress them temporarily when in use. It is located at [*ftp://metalab.unc.edu/pub/Linux/utils/compress/*](ftp://metalab.unc.edu/pub/Linux/utils/compress/).

**Q:** Can Linux Use Stacked/DBLSPC/Etc. DOS Drives?

**A:** Until recently, not very easily. You can access DOS 6.X volumes from the DOS emulator ("What software does Linux support? "), but it's harder than accessing a normal DOS volume via the DOS kernel option, a module, or mtools.

There is a recently added package, dmsdos, that reads and writes compressed file systems like DoubleSpace/DriveSpace in MS-DOS 6.x and Win95, as well as Stacker versions 3 and 4. It is a loadable kernel module. Look at [*ftp://metalab.unc.edu/pub/Linux/system/filesystems/dosfs/*](ftp://metalab.unc.edu/pub/Linux/system/filesystems/dosfs/).

**Q:** Can Linux Access OS/2 HPFS Partitions?

**A:** Yes, but Linux access to HPFS partitions is read-only. HPFS file system access is available as an option when compiling the kernel or as a module. See the Documentation/filesystems/hpfs.txt file in the kernel source distribution. See [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel). Then you can mount HPFS partition, using, for example:

|  |
| --- |
| $ mkdir /hpfs $ mount -t hpfs  /dev/hda5 /hpfs |

**Q:** Can Linux Access Amiga File Systems?

**A:** The Linux kernel has support for the Amiga Fast File System (AFFS) version 1.3 and later, both as a compile-time option and as a module. The file Documentation/filesystems/affs.txt in the Linux kernel source distribution has more information.

See [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel).

Linux supports AFFS hard-drive partitions only. Floppy access is not supported due to incompatibilities between Amiga floppy controllers and PC and workstation controllers. The AFFS driver can also mount disk partitions used by the Un\*x Amiga Emulator, by Bernd Schmidt.

**Q:** Can Linux Access BSD, SysV, Etc. UFS?

**A:** Recent kernels can mount (read only) the UFS file system used by System V; Coherent; Xenix; BSD; and derivatives like SunOS, FreeBSD, NetBSD, and NeXTStep. UFS support is available as a kernel compile-time option and a module.

See [*How To Upgrade/Recompile a Kernel*](http://www.tldp.org/FAQ/Linux-FAQ/development.html#upgrade-recompile-kernel).

**Q:** Can Linux Access MacIntosh File Systems?

**A:** There is a set of user-level programs that read and write the older Macintosh Hierarchical File System (HFS). It is available at metalab.unc.edu/pub/Linux/utils/disk-management/.

Access to the newer, HFS+ file systems is still under development.

**Q:** How Do I Create a File System on a Floppy?

**A:** If you are running recent Gnome or KDE desktops, you have a GUI tool that makes formatting floppies easy.

**A:** To format a 3.5-inch, high density floppy at the command prompt:

|  |
| --- |
| $ fdformat /dev/fd0H1440  $ mkfs -t ext2 -m 0 /dev/fd0H1440 1440 |

For a 5.25 inch floppy, use /dev/fd0h1200 and 1200 as appropriate. For the B: drive use /dev/fd1 instead of /dev/fd0.

The **-m 0** option tells mkfs.ext2 not to reserve any space on the disk for the superuserusually the last 10% is reserved for root.

The first command performs a low-level format. The second creates an empty file system. You can mount the floppy like a hard disk partition and simply **cp** and **mv** files, etc.

Device naming conventions generally are the same as for other unices. They can be found in Matt Welsh's *Installation and Getting Started* guide. Refer to [*Where Is the Documentation?*](http://www.tldp.org/FAQ/Linux-FAQ/online-resources.html#howtos-and-other-documentation). A more detailed and technical description is *Linux Allocated Devices* by H. Peter Anvin, [*hpa@zytor.com*](mailto:hpa@zytor.com), which is included in LaTeX and ASCII form in the kernel source distribution (probably in /usr/src/kernel/Documentation/), as devices.tex and devices.txt.

**Q:** Does Linux Support File System Encryption?

**A:** Yes. One file system, ppdd, is archived at [*http://pweb.de.uu.net/flexsys.mtk/*](http://pweb.de.uu.net/flexsys.mtk/).

**Q:** How Do I Resize a Partition Non-Destructively?

**A:** Use the **FIPS.EXE** program, included with most Linux distributions,under MS-DOS.

**A:** GNU **parted**, a partition editor, is stable enough for non-guru, mere-mortal use with relative confidence. Source code for the latest version is at: [*ftp://ftp.gnu.org/pub/gnu/parted/*](ftp://ftp.gnu.org/pub/gnu/parted/). There's also a boot disk image for resizing root partitions and for running **parted** on non-Linux machines. The disk image may be easier for beginners. Building from source could require some extra configuration.

Parted also has tutorial-style, plain-text documentation for Linux and FAT (MS-DOS) file systems.

**A:** Also, some commercial distributions come with their own partitioning software, like Partition Magic.

**Q:** Where Is the Journalling File System on the Net?

**A:** Linux actually supports several journalling file systems. ext3 is now included in current 2.4.x kernels.

**A:** The journalling file system named Reiserfs has just been released from testing. It is said to make Linux even faster than Linux with the Ext2 file system installed, particularly when dealing with many small files.

Complete information is available at [*http://devlinux.org/namesys/*](http://devlinux.org/namesys/).

**A:** JFS is still under development.

**Q:** Why Isn't My Virtual Memory Swap Area Working?

**A:** When you boot (or enable swapping manually) you should see

|  |
| --- |
| Adding Swap: NNNNk swap-space |

If you don't see any messages at all you are probably missing

|  |
| --- |
| swapon -av |

(the command to enable swapping) in your /etc/rc.local or /etc/rc.d/\* (the system startup scripts), or have forgotten to make the right entry in /etc/fstab:

|  |
| --- |
| /dev/hda2 none swap  sw |

for example.

If you see:

|  |
| --- |
| Unable to find swap-space signature |

you have forgotten to run **mkswap**. See the manual page for details; it works much like **mkfs**.

Running the command **free**, in addition to showing free memory, should display:

|  |
| --- |
| total used free Swap: 10188 2960 7228 |

If typing cat /proc/swaps reveals only file or partition names, but no swap space information, then the swap file or partition needs re-initialization.

Use **fdisk** (as root) to determine which partition on a hard drive has been designated as the swap partition. The partition still needs to be initialized with **mkswap** before enabling it with **swapon**.

[Andy Jefferson, Steve Withers]

**Q:** How Do I Add Temporary Swap Space?

**A:** In addition to a swap partition, Linux can also use a swap file. Some programs, like g++, can use huge amounts of virtual memory, requiring the temporary creation of extra space. To install an extra 64 MB of swap space, for example, use the following shell commands:

|  |
| --- |
| # dd if=/dev/zero of=/swap bs=1024 count=65535  # mkswap /swap  # swapon /swap |

The **count=** argument to **dd** determines how big the swap file will be. In this example the swap file's name is /swap, but the name and location are, generally, arbitrary, depending only on the file system's available space and your having write permissions in the directory.

When you don't need the swap space any more, remove it with the following statements:

|  |
| --- |
| # swapoff /swap  # rm /swap |

Take a look also at the *Installation HOWTO* and *Installation & Getting Started* for detailed instructions.

If that still doesn't provide enough swap space, refer to [*How To Have More Than 128Mb of Swap*](http://www.tldp.org/FAQ/Linux-FAQ/tips.html#more-than-128mb-of-swap).

http://www.tldp.org/FAQ/Linux-FAQ/index.html