Linux Frequently Asked Questions with Answers

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This is the list of Frequently Asked Questions about Linux, the free Unix for 386/486/586 [see Q1.1 (page 4) 'What is Linux ?' for more details]. It should be read in conjunction with the HOWTO documents, which are available in

- `ftp.funet.fi` (128.214.6.100) : `/pub/OS/Linux/doc/HOWTO`
- `tsx-11.mit.edu` (18.172.1.2) : `/pub/linux/docs/HOWTO`
- `sunsite.unc.edu` (152.2.22.81) : `/pub/Linux/docs/HOWTO`

and mirror sites thereof – see Q2.5 (page 9) 'Where can I get Linux material by FTP ?'. See Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?' for a list of the HOWTOs and more information. The INFO-SHEET and META-FAQ, found in the same place, also list other sources of Linux information.

The Linux Documentation Project documentation is available on `sunsite.unc.edu` in `/pub/Linux/docs/LDP`. These documents (more are in preparation) are invaluable to the newcomer or for use as a reference work.

Please check out these documents and this FAQ, especially Q12.1 (page 35) 'You still haven't answered my question !', before posting your question to the newsgroup `comp.os.linux.help`.

See Q13.2 (page 38) 'Formats in which this FAQ is available' for details of where to get the PostScript, Emacs Info, HTML (WWW) and plain ASCII versions of this document.

A new version of this document appears approximately monthly. If this copy is more than a month old it may be out of date.

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Section 1. Introduction and General Information

Question 1.1. What is Linux ?

Linux is a Unix clone written from scratch by Linus Torvalds with assistance from a loosely-knit team of hackers across the Net. It aims towards POSIX compliance.

It has all the features you would expect in a modern fully-fledged Unix, including true multitasking, virtual memory, shared libraries, demand loading, shared copy-on-write executables, proper memory management and TCP/IP networking.

It runs mainly on 386/486/586-based PCs, using the hardware facilities of the 386 processor family (TSS segments et al) to implement these features. Ports to other architectures are underway [Q1.4 (page 5) 'What ports to other processors are there ?'].

See the Linux INFO-SHEET [Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?'] for more details.

The Linux kernel is distributed under the GNU General Public License - see Q1.6 (page 6) 'Is Linux PD ? Copyrighted ?' for more details.

Question 1.2. What software does it support ?

Linux has GCC, Emacs, X-Windows, all the standard Unix utilities, TCP/IP (including SLIP and PPP) and all the hundreds of programs that people have compiled or ported for it.

There is a DOS emulator [Q3.1 (page 11) 'Can Linux coexist with DOS ? OS/2 ? 386BSD ? Minix ?']. Work is progressing on an iBCS2 (Intel Binary Compatibility Standard) emulator for SVR4 ELF and SVR3.2 COFF binaries and an emulator for Microsoft Windows binaries [Q3.6 (page 12) 'Can I run Microsoft Windows programs under Linux ?'].

For more information see the INFO-SHEET, which is one of the the HOWTOs [Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?']. See also Q5.3 (page 17) 'How do I port XXX to Linux ?'.

Some companies have commercial software available, including Motif. They announce their availability in **`comp.os.linux.announce`** — try searching the archives [Q2.9 (page 11) 'Are the newsgroups archived anywhere ?'].

Question 1.3. Does it run on my computer ? What hardware is supported ?

You need a 386, 486 or 586, with at least 2Mb of RAM and a single floppy, to try it out. To do anything useful more RAM and a hard disk are required.

VESA local bus and PCI are both supported. A driver for the NCR SCSI chip in many PCI machines is included in current alpha test release kernels.

There are problems with machines using MCA (IBM's proprietary bus), mainly to do with the hard disk controller. There is a developers' release for PS/2 ESDI drives on `invaders.dcrl.nd.edu` in `/pub/misc/linux`. Certain kinds of SCSI controllers also work, I understand. Work is in progress to create a suitable version of the Slackware distribution. I'm afraid I don't have any further details; you could try asking Arindam Banerji `<axb@defender.dcrl.nd.edu>`.

Linux is reported to run on 386 family based laptops, with X on most of them.

For details of exactly which PC's, video cards, disk controllers, etc. work see the INFO-SHEET and the Hardware HOWTO [Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?'].

Linux will never run on a 286, because it uses task-switching and memory management facilities only found on 386 family processors.

Question 1.4. What ports to other processors are there ?

A project has been underway for around two years to port Linux to suitable 68000-series based systems such as Amigas and Ataris. This has now reached beta test quality, but still lacks networking support and an X server. There is a `680X0` channel on the Linux Activists mailserver [Q2.8 (page 10) 'What's this mailing list thing at `niksula.hut.fi` ?'].

Work has just been started on a port to the PowerPC. Currently this will be based on the PowerMAC architecture. Again, don't post asking about it unless you have experience to offer, and don't hold your breath.

Jim Paradis `<paradis@sousa.amt.ako.dec.com>` or `<jrp@world.std.com>` is working on a port to the 64-bit DEC AXP (the Alpha). This can currently boot from a floppy disk or disk image loaded into a ramdisk at boot time. Disk drivers are not yet available. Please email him of you have access to an ISA or EISA-based Alpha AXP and wish to contribute to the project, or have access to another class of Alpha and are willing to write drivers.

Ralf Baechle is working on a port to the MIPS, initially for the R4600 on Deskstation Tyne machines. The Linux/MIPS FAQ is available on the WWW and in the MIPS port area on `ftp.waldorf-gmbh.de` in `/pub/linux/mips`. There is also a `MIPS` channel on the Linux Activists mailserver. Interested people may mail their questions and offers of assistance to `<linux@waldorf-gmbh.de>`.

None of these ports will be capable of running Linux/386 binaries.

Question 1.5. How much hard disk space does Linux need ?

10Mb for a very minimal installation, suitable for trying it out and not much else.

You can squeeze a more complete installation including X Windows into 80Mb. Installating the whole of Slackware 1.2 takes around 200Mb, including some space for user files and spool areas.

Question 1.6. Is Linux PD ? Copyrighted ?

The Linux kernel copyright belongs to Linus Torvalds. He has placed it under the GNU General Public Licence, which basically means that you may freely copy, change and distribute it, but that you may not impose any restrictions on further distribution, and that you must make the source code available.

Full details are in the file `COPYING` in the Linux kernel sources (probably in `/usr/src/linux` on your system).

The licences of the utilities and programs which come with the installations vary; much of the code is from the GNU Project at the Free Software Foundation, and is also under the GPL.

Note that discussion about the merits or otherwise of the GPL should be posted to `gnu.misc.discuss` and not to the `comp.os.linux` groups.

Section 2. Network sources and resources

Question 2.1. Where can I get the HOWTOs and other documentation ?

Look in the following places, and on sites that mirror them.

- `ftp.funet.fi` (128.214.6.100) : `/pub/OS/Linux/doc/HOWTO`
- `tsx-11.mit.edu` (18.172.1.2) : `/pub/linux/docs/HOWTO`
- `sunsite.unc.edu` (152.2.22.81) : `/pub/Linux/docs/HOWTO`

For a complete list of Linux FTP sites see Q2.5 (page 9) 'Where can I get Linux material by FTP ?'.

If you don't have access to FTP try using the FTP-by-mail servers at `ftpmail@decwrl.dec.com`, `ftpmail@doc.ic.ac.uk` or `ftp-mailer@informatik.tu-muenchen.de`.

A complete list of HOWTO's is available in the file `HOWTO.INDEX` in the `docs/HOWTO` directory at the FTP sites, but here is a (possibly incomplete) list:

Linux INFO-SHEET	
Linux META-FAQ	BUPS HOWTO (regarding the Back UPS).
Busmouse HOWTO	CDROM HOWTO
Distribution HOWTO	DOSEMU HOWTO
Ethernet HOWTO	Ftape HOWTO
Hardware HOWTO	Installation HOWTO
Japanese Extensions HOWTO	Keystroke HOWTO
Mail HOWTO	MGR HOWTO
NET-2 HOWTO	News HOWTO
Printing HOWTO	SCSI HOWTO
Sound HOWTO	Term HOWTO
Tips HOWTO	UUCP HOWTO
XFree86 HOWTO	

More of these documents are always in preparation. You should check in nearby directories on the FTP sites if you can't find the answer in one of the HOWTOs. There are also a few mini-HOWTOs on `sunsite.unc.edu` in the `/pub/Linux/docs/HOWTO/mini` directory.

The `HOWTO.INDEX` also contains information on how to write a new HOWTO.

The HOWTOs are coordinated by Matt Welsh, `<mdw@sunsite.unc.edu>`.

The 'books' produced by the Linux Documentation Project are available in `/pub/Linux/docs/LDP` on `sunsite.unc.edu`. Please read them if you are new to Unix and Linux. Here is a list of those released so far:

- The Linux Documentation Project manifesto
- Installation and Getting Started Guide
- The Kernel Hacker's Guide
- Network Administration Guide
- Linux System Administrator's Guide

Question 2.2. Where should I look on the World Wide Web for Linux stuff ?

Matt Welsh maintains the Linux Documentation Project Home Page, at `http://sunsite.unc.edu/mdw/linux.html`.

This page refers to all the FAQs and HOWTOs, both those which are available in HTML (WWW) format, like this FAQ, and those which aren't.

Question 2.3. What newsgroups are there for Linux ?

There are five international Usenet newsgroups devoted to Linux.

`comp.os.linux.announce` is the moderated announcements group; you should read this if you intend to use Linux. Submissions for that group should be emailed to `linux-announce@tc.cornell.edu`.

`comp.os.linux.help`, `comp.os.linux.development`, `comp.os.linux.admin` and `comp.os.linux.misc` are also worth reading – you may find that many common problems are too recent to find in this FAQ but are answered in the newsgroups.

Remember that since Linux is a Unix clone, most all of the material in `comp.unix.*` and `comp.windows.x.*` groups will be relevant. Apart from hardware considerations, and some obscure or very technical low-level issues, you'll find that these groups are the right place to start.

Please read Q12.1 (page 35) 'You still haven't answered my question !' before posting, and make sure you post to the right newsgroup. Crossposting is rarely a good idea.

See also Q2.7 (page 10) 'I don't have Usenet access. Where do I get information ?'.

Other regional and local newsgroups also exist - you may find the traffic more manageable there. The French Linux newsgroup is `fr.comp.os.linux`; The German one is `de.comp.os.linux`. In Australia, try `aus.computers.linux`.

There may well be Linux groups local to your institution or area - check there first.

Question 2.4. How do I install Linux ?

There are several pre-packaged releases of Linux available, including the MCC-Interim release, the TAMU release and the Slackware release. Each contains the software you need to run Linux, ready to install and use. The exact details of which software is included and how to install them vary from release to release.

You should read the Installation HOWTO for more details on how to go about installing Slackware. If you prefer a small, clean distribution to one with everything but the kitchen sink you might like to try the MCC-Interim release.

All of those releases are available via anonymous FTP from the Linux archive sites [Q2.5 (page 9) 'Where can I get Linux material by FTP ?']. There are also a large number of other releases which are distributed less globally, which suit special local and national requirements (for example, better internationalisation support).

Question 2.5. Where can I get Linux material by FTP ?

There are three main archive sites for Linux:

- `ftp.funet.fi` (Finland, 128.214.6.100) : `/pub/OS/Linux`
- `sunsite.unc.edu` (US, 152.2.22.81) : `/pub/Linux`
- `tsx-11.mit.edu` (US, 18.172.1.2) : `/pub/linux`

The MCC-Interim release is available from `ftp.mcc.ac.uk` (US, 130.88.200.7) in `/pub/linux`; the TAMU release is available from `net.tamu.edu` (US, 128.194.177.1) in `/pub/linux`.

The contents of these sites is mirrored (copied, usually approximately daily) by a number of other sites. Please use one close to you – that will be faster for you and easier on the network.

- `src.doc.ic.ac.uk` : `/packages/Linux` (UK)
- `sunacm.swan.ac.uk` : `/pub/Linux` (UK)
- `ftp.ibp.fr` : `/pub/linux` (France)
- `wuarchive.wustl.edu` : `/systems/linux` (US)
- `mrcnext.cso.uiuc.edu` : `/pub/linux` (US)
- `ftp.informatik.tu-muenchen.de` : `/pub/comp/os/linux` (Germany)
- `ftp.ibr.cs.tu-bs.de` : `/pub/os/linux` (Germany)
- `ftp.dfv.rwth-aachen.de` : `/pub/linux` (Germany)
- `ftp.informatik.rwth-aachen.de` : `/pub/Linux` (Germany)
- `bond.edu.au` : `/pub/OS/Linux` (Australia)
- `monu1.cc.monash.edu.au` : `/pub/linux` (Australia)
- `ftp.sun.ac.za` : `/pub/linux` (South Africa)

Not all of these mirror all of the other ‘source’ sites, and some have material not available on the ‘source’ sites.

Question 2.6. I don’t have FTP access. Where do I get Linux ?

The easiest thing is probably to find a friend with FTP access. If there is a Linux users group near you they may be able to help.

If you have a reasonably good email connection you could try the FTP-by-mail servers at `ftpmail@decwrl.dec.com`, `ftpmail@doc.ic.ac.uk` or `ftp-mailer@informatik.tu-muenchen.de`.

Linux is also available via traditional mail on diskette, CD-ROM and tape. The Installation HOWTO, and the file `/pub/Linux/docs/distributions` on `sunsite.unc.edu`, contain information on these distributions.

You could also try Zane Healy `<healyzh@holonet.net>`’s list of Linux BBS’s, which is posted regularly (1st and 15th of each month) to `comp.os.linux.announce` and occasionally to the Fidonet and RIME UNIX echoes.

Question 2.7. I don't have Usenet access. Where do I get information ?

Digests of postings to the `comp.os.linux.*` groups are available by subscribing to the bidirectional gateway at `linux-*-request@news-digests.mit.edu`, where `*` is one of `announce`, `development`, `help`, `misc` or `admin`.

You are strongly advised to subscribe to at least `linux-announce-request@news-digests.mit.edu`, as this carries important information and documentation about Linux.

Please remember to use the `-request` addresses for your subscription and unsubscription messages; mail to the other address is posted to the newsgroup !

Question 2.8. What's this mailing list thing at `niksula.hut.fi` ?

It's a multi-channel mailing list, mainly used by the developers of Linux to talk about technical issues and future developments. Most of the channels are not intended for new users to ask their questions on.

The `ANNOUNCE` channel is a digest of postings to `comp.os.linux.announce`, for the benefit of those without Usenet access. However since `niksula.hut.fi` is slow and overloaded I'd recommend subscribing to the MIT digestifier instead [Q2.7 (page 10) 'I don't have Usenet access. Where do I get information ?'].

There is also a `NEWBIE` channel where 'no question is too stupid'; unfortunately it seems that few of the experienced users read that channel, probably because of all the 'stupid' questions !

If you want to subscribe to one or more of the channels at the multi-channel list, send an empty mail message to `linux-activists-request@niksula.hut.fi` and you'll receive the instructions for operating the list subscription software.

If you want to unsubscribe send a mail message like this

```
From: you@domain.org
To: linux-activists-request@niksula.hut.fi
Subject: irrelevant

X-Mn-Admin: leave CHANNEL
```

to leave a channel called `CHANNEL`. Do *not* put an `X-Mn-Key` line in your message - that will cause it to be posted to the list.

Note that you *must* remember to unsubscribe *before* you change your email address, as due to a design flaw in the list server it is virtually impossible to get yourself unsubscribed after such a change.

Question 2.9. Are the newsgroups archived anywhere ?

Yes. `ftp.funet.fi` and `tsx-11.mit.edu` contain archives of both `comp.os.linux.announce` and the old group `comp.os.linux`, in their Linux areas. The `comp.os.linux.announce` archives are mirrored from `/usenet` on `src.doc.ic.ac.uk` (which also contains another archive of `comp.os.linux`).

Section 3. Compatibility with other operating systems

Question 3.1. Can Linux coexist with DOS ? OS/2 ? 386BSD ? Minix ?

Yes. Linux uses the standard PC partitioning scheme, so it can share your disk with other operating systems.

Linux can read and write the files on your DOS and OS/2 FAT partitions and floppies using either the DOS filesystem type built into the kernel or mtools. There is a DOS emulator (look on `tsx-11.mit.edu` in `/pub/linux/ALPHA/dosemu`) which can run DOS itself and some (but not all) DOS applications.

Linux can also access Minix and System V UFS filesystems, and can read (but not yet write) OS/2 HPFS and Amiga filesystems.

Question 3.2. How do I access files on my DOS partition or floppy ?

Use the DOS filesystem, i.e. 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 filesystem as they appear under Linux. If you mount your DOS filesystem 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 Q2.5 (page 9) 'Where can I 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.

Question 3.3. Can I use my Stacked/DBLSPC/etc. DOS drive ?

Not easily. You can access them from within the DOS emulator [Q3.1 (page 11) ‘Can Linux coexist with DOS ? OS/2 ? 386BSD ? Minix ?’], but not as a normal filesystem under Linux or using mtools.

Question 3.4. Can I access OS/2 HPFS partitions from Linux ?

Yes, but it’s only read-only at the moment. To use it you must compile a kernel with support for it enabled [Q7.6 (page 24) ‘How do I upgrade/recompile my kernel ?’]. Then you can mount it using the `mount` command, for example:

```
mkdir /hpfs
mount -t hpfs /dev/hda5 /hpfs
```

Question 3.5. Can I access BSD FFS, SysV UFS, Mac, Amiga, etc filesystems ?

I’m told that there is an alpha test read-only Amiga filesystem on `sunsite.unc.edu`, probably in `/pub/Linux/kernel/misc-patches/ffs-patch`. Work may well be progressing on upgrading this to read-write for the 680x0 Linux project.

The 1.1.x alpha test kernel series contains support for the UFS filesystem used by System V and Coherent.

There is no support for the rest of those yet; I have not heard of any recent work on providing some.

Question 3.6. Can I run Microsoft Windows programs under Linux ?

Not yet. There is a project, known as WINE, to build an MS Windows emulator for Linux, but it is not ready for users yet. Don’t ask about it unless you think you can contribute; look out for the status reports in `comp.emulators.ms-windows.wine`.

In the meantime if you need to run MS Windows programs your best bet is probably to reboot when you want to switch environments. LILO (the Linux bootloader) has the facility for a boot menu — see its documentation for more details.

Question 3.7. How can I boot Linux from OS/2’s Boot Manager ?

1. Create a partition using OS/2’s `FDISK` (Not Linux’s `fdisk`).

2. Format the partition under OS/2, either with FAT or HPFS. This is so that OS/2 knows about the partition being formatted.

3. Add the partition to the Boot Manager.

4. Boot Linux, and create a filesystem on the partition using `mkfs -t ext2` or `mke2fs`. At this point you may, if you like, use Linux's `fdisk` to change the partition type code of the new partition to type 83 (Linux Native) – this may help some automated installation scripts find the right partition to use.

5. Install Linux on the partition.

6. 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 config file. To do this you should put

```
boot = /dev/hda2
```

(where `/dev/hda2` is the *partition* you want to boot off) in your `/etc/lilo/config` or `/etc/lilo.config` file.

7. 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.

Question 3.8. How can I share a swap partition between Linux and MS Windows ?

See the Mini-HOWTO on the subject by H. Peter Anvin, `<hpa@eecs.nwu.edu>`. It is available on `sunsite.unc.edu` in `/pub/Linux/docs`.

Section 4. Linux's handling of filesystems, disks and drives

Question 4.1. How can I undelete files ?

In general, this is very hard to do on Unices because of their multitasking nature. Undelete functionality for the ext2fs is being worked on, but don't hold your breath.

There are a number of packages available that work by providing new commands for deletion and sometimes copying that move deleted files into a 'wastebasket' directory instead; they can then be recovered until cleaned out automatically by background processing.

Alternatively you can search the raw disk device which holds the filesystem in question. This is hard work, and you will need to be root to do this.

Question 4.2. Is there a defragmenter for ext2fs etc. ?

Yes. There is a Linux filesystem defragmenter for minix, old-style, ext2, and xia filesystems available on `sunsite.unc.edu` in `system/Filesystems/defrag-0.6.tar.gz`.

Users of the ext2 filesystem can probably do without defrag since ext2 contains extra code to keep fragmentation reduced even in very full filesystems.

Question 4.3. How do I format and create a filesystem on a floppy ?

For a 3.5 inch high density floppy:

```
fdformat /dev/fd0H1440
mkfs -t ext2 -m 0 /dev/fd0H1440 1440
```

For a 5.25 inch floppy use `fd0h1200` and `1200` as appropriate. For the 'B' drive use `fd1` instead of `fd0`. Full details of which floppy devices do what can be found in the Linux Device List [Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?']. If you don't have the `fsutils` package you'll have to run `mke2fs` instead of `mkfs -t ext2`. The `-m 0` option tells `mkfs.ext2` not to reserve any space on the disk for the superuser — usually the last 10% is reserved for root.

The first command low-level formats the floppy; the second creates an empty filesystem on it. After doing this you can mount the floppy like a hard disk partition and simply `cp` and `mv` files, etc.

Question 4.4. I get nasty messages about inodes, blocks, and the suchlike

You probably have a corrupted filesystem, 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 fsutils package) will be able to repair your filesystem; if you're unlucky the filesystem is trashed and you'll have to reinitialise it with `mkfs` (or `mke2fs`, `mkxfs` etc.) it and restore from a backup.

NB don't try to check a filesystem that's mounted read-write - this includes the root partition if you don't see

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

at boot time.

Question 4.5. My swap area isn't working.

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` or `/etc/rc.local` (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 manpage for details; it works much like `mkfs`.

Check the Installation HOWTO for detailed instructions of how to set up a swap area.

Question 4.6. How do I remove LILO so my system boots DOS again ?

Using DOS (MS-DOS 5.0 or later, or OS/2), type `FDISK /MBR`. This will restore a standard MS-DOS Master Boot Record. If you have DR-DOS 6.0, go into `FDISK` in the normal way and then select the 'Re-write Master Boot Record' option.

If you don't have DOS 5 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 `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
```

which will erase your partition table and boot sector completely: you can then reformat the disk using your favourite software; however 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.

Question 4.7. Why can't I use `fdformat` except as root ?

The system call to format a floppy may 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.

Question 4.8. Is there something like Stacker or Doublespace for Linux ?

Currently none of the Linux filesystems can do compression in the filesystem.

There is a transparently uncompressing C library, which is a drop-in replacement for the standard C library. It allows programs to read compressed (ie, GNU zipped) files as if they were not compressed. You install it, and then you can compress files using `gzip` and have programs still find them. Look on `sunsite.unc.edu` in `/pub/Linux/libs`. The author is Alain Knaff `<Alain.Knaff@imag.fr>`.

There is a compressing block device driver that can provide filesystem-independant on the fly disk compression in the kernel. It is called ‘DouBle’. There is a source only distribution on `sunsite.unc.edu` in `/pub/Linux/utils/compress`; the auther is Jean-Marc Verbavatz `<jmv@receptor.mgh.harvard.edu>`. Note that since this compresses inodes (administrative information) and directories as well as file contents any corruption is quite likely to be serious.

There is also a package available called `tcx` (Transparently Compressed Executables) which allows you to keep infrequently used executables compressed and only uncompress them temporarily while you use them. You’ll find it on the Linux FTP sites [Q2.5 (page 9) ‘Where can I get Linux material by FTP ?’]; it was also announced in `comp.os.linux.announce`. Note - this is not the same as `gzexe`, which is an inferior implementation of the same concept.

Question 4.9. My ext2fs partitions are checked each time I reboot.

See Q9.11 (page 30) ‘`EXT2-fs: warning: mounting unchecked filesystem`’.

Question 4.10. I have a huge `/proc/kcore` ! Can I delete it ?

None of the files in `/proc` are really there - they’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 ask to read it as a file the kernel does memory reads.

Question 4.11. My AHA1542C doesn’t work with Linux.

The option to allow disks with more than 1024 cylinders is only required as a workaround for a DOS misfeature and should be turned *off* under Linux. For older Linux kernels you need to turn off most of the "advanced BIOS" options - all but the one about scanning the bus for bootable devices.

Section 5. Porting, compiling and obtaining programs

Question 5.1. What is `ld.so` and where do I get it ?

`ld.so` is the new dynamic library loader. Each binary using shared libraries used to have about 3K of start-up code to find and load the shared libraries. Now that code has been put in a special shared library, `/lib/ld.so`, where all binaries can look for it, so that it wastes less disk space, and can be upgraded more easily.

It can be obtained from `tsx-11.mit.edu` in `/pub/linux/packages/GCC` and mirror sites thereof. The latest version at the time of writing is `ld.so.1.4.4.tar.gz`.

Question 5.2. Has anyone ported / compiled / written XXX for Linux ?

First, look in the Linux Software Map (LSM) — it's in the `docs` directory on `sunsite.unc.edu`, and on the other FTP sties.

Check the FTP sites (see Q2.5 (page 9) 'Where can I get Linux material by FTP ?') first — search the `find-ls` or `INDEX` files for appropriate strings. Check the Linux Projects Map (LPM), on `ftp.ix.de` in `/pub/Linux/docs/Projects-Map.gz`.

If you don't find anything, you could either download the sources to the program yourself and compile them – see Q5.3 (page 17) 'How do I port XXX to Linux ?' – or, if it's a large package which may require some porting, post a message to the newsgroup.

If you compile a largeish program please upload it to one or more of the FTP sites and post a message to `comp.os.linux.announce` (submit your posting to `<linux-announce@tc.cornell.edu>`).

If you're looking for an application-type program the chances are someone has already written a free verson. Try reading the FAQ in `comp.sources.wanted` for instructions on how to find sources.

You should also check the Projects-FAQ, available in `/pub/Linux/docs/faqs/Projects-FAQ` on `sunsite.unc.edu`.

Question 5.3. How do I port XXX to Linux ?

In general Unix 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 or by 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.

Question 5.4. Can I use code or a compiler compiled for a 486 on my 386 ?

Yes.

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

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 overriden on a per-compilation basis or by editing `/usr/lib/gcc-lib/i*-linux/n.n.n/specs`.

GCC does not currently know how to do optimisation well for the 586, because Intel won't release the necessary information except under nondisclosure. Don't buy a Pentium or wait for people to reverse-engineer the required optimisations.

Question 5.5. What does `gcc -O6` do ?

Currently the same as `-O2`; any number greater than 2 currently works just like 2. The Makefiles of newer kernels use `-O2`, and so should you.

GCC 2.6 adds optimisation level `-O3`. However, GCC 2.6.0 and several of the following versions are known to have some problems with Linux, though these will hopefully be solved soon. In any case you should not use `-O3` on a program until you're sure it doesn't create any problems.

Question 5.6. Where are `<linux/*.h>` and `<asm/*.h>` ?

These are in the directories `/usr/include/linux` and `/usr/include/asm`.

However they should be symbolic links to your kernel sources in `/usr/src/linux` and not real directories.

If you don't have the kernel sources download them — see Q7.6 (page 24) 'How do I upgrade/recompile my 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 /usr/include/asm
```

Question 5.7. I get errors when I try to compile the kernel.

Make sure that `/usr/include/linux` and `/usr/include/asm` aren't actual directories but instead symbolic links to `/usr/src/linux/include/linux` and `/usr/src/linux/include/asm` respectively.

If necessary, delete them using `rm` and then use `ln -s` to make the links as in Q5.6 (page 18) 'Where are `<linux/*.h>` and `<asm/*.h>` ?'.

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 manpage for `patch` for details.

If you're using a kernel more recent than 1.1.44 you should find that there are new directories `/usr/src/linux/include/asm-i386`. The directory `asm` there should be removed, as should the directory `asm`. The `symlinks Makefile` target will make these be symbolic links to `asm-i36` and `arch/i386/boot` respectively. The easiest way to make sure all this gets done is not to try to patch 1.1.44 to make 1.1.45, but to download `linux-1.1.45.tar.gz` instead.

`ld: unrecognised option '-qmagic'` means you should get a newer linker, from `tsx-11.mit.edu` in `/pub/linux/packages/GCC`.

Question 5.8. How do I make a shared library ?

Get `tools-n.nn.tar.gz` from `tsx-11.mit.edu`, in `/pub/linux/packages/GCC/src`. It comes with documentation that will tell you what to do.

Question 5.9. How do I make my executables smaller ?

The most common cause of large executables is the `-g` compiler flag. This produces (as well as debugging information in the output file) a program which is statically linked, i.e. one which includes a copy of the C library instead of using a dynamically linked copy.

Other things that are worth investigating are `-O` and `-O2` which enable optimisation (check the GCC documentation) and -s which strips 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.

Using QMAGIC binaries also can reduce the size of binaries, especially small ones. Don't worry about this unless you know what QMAGIC is; Linux is moving to QMAGIC as a default.

Section 6. Solutions to common miscellaneous problems

Question 6.1. Setuid scripts don't seem to work.

That's right. This feature has been deliberately disabled in the Linux kernel because setuid scripts are almost always a security hole. If you want to know why read the FAQ for `comp.unix.questions`.

Question 6.2. Free memory as reported by `free` keeps shrinking.

The 'free' figure printed by `free` doesn't include memory used as a disk buffer cache - shown in the 'buffers' column. If you want to know how much memory is really free add the 'buffers' amount to 'free'.

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

Question 6.3. When I add more memory it slows to a crawl.

This is quite 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 RAMs have to be in certain sockets to be cached.

Sometimes you have to set jumpers to enable the caching.

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

If in doubt, check your motherboard manual. If you still can't fix it because the documentation is inadequate you might like to post a message giving *all* the details - make, model number, date code, etc. so that other Linux users can avoid it.

Question 6.4. Some programs (e.g. `xdm`) won't let me log in.

You are probably using non-shadow-password programs but are using shadow passwords.

If so, you have to get or compile a shadow password version of the program(s) in question. The shadow password suite can be found in (amongst other places):

`tsx-11.mit.edu:/pub/linux/sources/usr.bin/shadow-*`

This is the source code; you will probably find the binaries in `.../linux/binaries/usr.bin`.

Question 6.5. Some programs let me log in with no password.

You probably have the same problem as in Q6.4 (page 21) 'Some programs (e.g. `xdm`) won't let me log in.', with an added wrinkle:

If you are using shadow passords you should put 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.

Question 6.6. My machine runs very slowly when I run GCC / X / ...

You may not have any swap enabled. You need to enable swapping to allow Linux to page out bits of data programs aren't using at the moment to disk to make more room for other programs and data. If you don't Linux has to keep data in memory and throw away in-memory copies of programs (which are paged straight from the filesystem) and so less and less program is in memory and everything runs very slowly.

See the Installation HOWTO and the Installation and Getting Started Guide [Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?'] for details of how to set up a swap partition or swapfile; see also Q4.5 (page 15) 'My swap area isn't working.'.

Alternatively you may have too little real memory. If you have less RAM than all the programs you're running at once use Linux will use your hard disk instead and thrash horribly. The solution in this case is to not run so many things at once or to buy more memory. You can also reclaim some memory by compiling and using a kernel with less options configured. See Q7.6 (page 24) 'How do I upgrade/recompile my kernel ?'.

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

```
cat /proc/meminfo
```

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

Question 6.7. I can only log in as root.

You probably have some permission problems, or you have a file `/etc/nologin`.

If the latter put `rm -f /etc/nologin` in your `/etc/rc` or `/etc/rc.local`.

Otherwise check the permissions on your shell, and any filenames which appear in error messages, and also the directories containing these files all the way back up the tree to the root directory.

Question 6.8. My screen is all full of weird characters instead of letters.

You probably sent some binary data to your screen by mistake. Type `echo ^V^[c` (that's `e c h o` space control-`V` escape `c` return) to fix it. Many Linux distributions have a command `reset` that does this.

Question 6.9. I have screwed up my system and can't log in to fix it.

Reboot from an emergency floppy or floppy pair, for example the Slackware boot- and root-disk pair (in the `install` subdirectory of the Slackware mirrors) or the MCC installation boot floppy. There are also two diy rescue disk creation packages on `sunsite.unc.edu` in `/pub/Linux/system/Recovery`. These are better as they'll have your own kernel on them, so that you don't run the risk of missing devices, filesystems, etc.

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

```
mount -t ext2 /dev/hda1 /mnt
```

Then your filesystem is available under the directory `/mnt` and you can fix the problem. Remember to unmount your hard disk before rebooting (`cd` back down to `/` first or it will say it's busy).

Question 6.10. Emacs just dumps core.

You probably have the X version of Emacs that comes with SLS. It doesn't work without the X libraries. The solution is to install X Windows or get a newer Emacs binary without any X Windows support.

Question 6.11. I've discovered a huge security hole in `rm`!

No you haven't. You are obviously new to Unix and need to read a good book on it to find out how things work. Clue: ability to delete files under Unix depends on permission to write the directory they are in.

Question 6.12. lpr and/or lpd aren't working.

Check the Printing HOWTO [Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?'].

Section 7. How do I do this or find out that ... ?

Question 7.1. How can I get scrollback in text mode ?

With the default US keymap you can use Shift with the PageUp and PageDown keys (NB these must be the grey ones, not the ones on the numeric keypad !). With other keymaps check the maps in `/usr/lib/keytables`; you can remap the scroll up and down keys to be whatever you like — for example, in order to remap them to keys that exist on an 84-key AT keyboard.

You can't increase the amount of scrollback, because of the way it is implemented using the video memory to store the scrollback text, though you may be able to get more scrollback in each virtual console by reducing the total number of VC's — see `<linux/tty.h>`.

Question 7.2. How do I switch virtual consoles ? How do I enable them ?

In text mode, press (Left) Alt-F1 to Alt-F12 to select the consoles `tty1` to `tty12`. To switch out of X windows you must press Ctrl-Alt-F1 etc; Alt-F5 or whatever will switch back.

Your kernel probably doesn't have all 12 compiled in; the default is 8. This is controlled by `NR_CONSOLES` in `linux/include/linux/tty.h`.

If you want to use a VC for ordinary login you need to list it in `/etc/inittab`, which controls which terminals and virtual consoles have login prompts. NB: X needs at least one free VC in order to start.

Question 7.3. How do I set the timezone ?

Change directory to `/usr/lib/zoneinfo`; get the timezone package if you don't have this directory. The source can be found on `sunsite.unc.edu` in `/pub/Linux/system/Admin/timesrc-1.2.tar.gz`.

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 immediately - try `date`.

Don't try to use the `TZ` variable - leave it unset.

Question 7.4. What version of Linux and what machine name am I using ?

Type:

```
uname -a
```

Question 7.5. How can I enable or disable `core` dumps ?

Since 0.99pl14 Linux has had corefiles turned off by default for all processes.

You can turn them on or off by using the `ulimit` command in `bash`, or the `limit` command in `tcsh`. See the manpage for the shell for more details.

That command affects all programs run from that shell (directly or indirectly), not the whole system.

If you wish to enable or disable coredumping for all processes by default you can change the default setting in `<linux/sched.h>` - see the definition of `INIT_TASK`.

Question 7.6. How do I upgrade/recompile my kernel ?

See the `README` which comes with the kernel release on `ftp.funet.fi`, in `/pub/OS/Linux/PEOPLE/Linus` and mirrors thereof. Try to get it from a closer site if possible; `ftp.funet.fi` is a very busy site and therefore slow – see Q2.5 (page 9) 'Where can I get Linux material by FTP ?'. You may already have a version of the kernel source code installed on your system, but if you got it as 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.)

Remember that to make the new kernel boot you must run LILO after copying the kernel into your root partition – the `Makefile` in recent kernels has a special `zlilo` target for this; try `make zlilo`.

Russel Nelson posts summaries of what changes in recent kernel patches to `comp.os.linux.development`, and these are archived on `ftp.emlist.com` in `/pub/kchanges`.

Question 7.7. Can I have more than 3 serial ports by sharing interrupts ?

Not without some trickery. This is a limitation of the ISA bus architecture.

See the Serial HOWTO for information about how to work around this problem.

Question 7.8. How do I make a bootable floppy ?

Make a filesystem on it with `bin`, `etc` and `lib` directories – everything 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 ramdisk the same size as the floppy the ramdisk will be loaded at boot-time and mounted as root in place of the floppy.

Question 7.9. How do I remap my keyboard to UK, French, etc. ?

For recent kernels, get `kbd*.tar.gz` from the same place as you got the kernel source. Make sure you get the appropriate version; you have to use the right keyboard-mapping package to go with your kernel version. The latest at the time of writing is `kbd-0.85.tar.gz`, which works with kernel versions from 1.0.

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

You may find more helpful information in the Keystroke FAQ, on `ftp.funet.fi` in `/pub/OS/Linux/doc/kbd.FAQ`.

Question 7.10. How do I get NUM LOCK to default to on ?

Use the `setleds` program, for example (in `/etc/rc.local`):

```
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-0.8x package (see Q7.9 (page 25) '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`.

Section 8. Miscellaneous information and questions answered

Question 8.1. What is a `.gz` file ? And a `.tgz` ? And ... ?

`.gz` (and `.z`) files have been compressed using GNU **gzip**. You have to get a copy of **gunzip** (included in the **gzip** distribution and with most Linux installations) to unpack the file.

`.taz` and `.tz` are tarfiles (made with Unix **tar**) compressed using standard Unix **compress**.

`.tgz` (or `.tpz`) is a tarfile compressed with **gzip**.

`.lsm` is a Linux Software Map entry, in the form of a short text file. Details about the LSM and the LSM itself are available in the **docs** subdirectory on **sunsite.unc.edu**.

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

If you find that **gzip** complains when you try to uncompress a gzipped file you probably downloaded it in ASCII mode by mistake. You must download most things in binary mode - remember to type **binary** as a command in FTP before using **get** to get the file.

Question 8.2. What does `VFS` stand for ?

Virtual File System. It's the abstraction layer between the user and real filesystems like ext2, minix and msdos. Amongst other things, its job is to flush the read buffer when it detects a disk change on the floppy disk drive:

```
VFS: Disk change detected on device 2/0
```

Question 8.3. What is a BogoMip ?

'BogoMips' is a contraction of 'Bogus MIPS'. MIPS stands for (depending who you listen to) 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.

As a very rough guide the BogoMips will be approximately:

```
386SX           clock * 0.14
386DX           clock * 0.18
486Cyrix/IBM    clock * 0.33
486SX/DX/DX2    clock * 0.50
586             clock * 0.39
```

If the number you're seeing is wildly lower than this you may have the Turbo button or CPU speed set incorrectly, or have some kind of caching problem [as described in Q6.3 (page 20) 'When I add more memory it slows to a crawl.'.]

For values people have seen with other, rarer, chips, see the BogoMips Mini-HOWTO, on `sunsite.unc.edu` in `/pub/Linux/docs/howto/mini/BogoMips`.

Question 8.4. What is the Linux Journal and where can I get it ?

Linux Journal is a monthly magazine (printed on paper) that is available on newsstands and via subscription worldwide. Email `<linux@ssc.com>` for details.

Question 8.5. How many people use Linux ?

Linux is freely available, and no one is required to register their copies with any central authority, so it is difficult to know. Several businesses are now surviving solely on selling and supporting Linux, and very few Linux users use those businesses, relatively speaking. The Linux newsgroups are some of the most heavily read on the Net, so the number is likely in the hundreds of thousands, but firm numbers are hard to come by.

However, one brave soul, Harald T. Alvestrand `<Harald.T.Alvestrand@uninett.no>`, has decided to try, and asks that if you use Linux, you send a message to `<linux-counter@uninett.no>` with one of the following subjects: 'I use Linux at home', 'I use Linux at work', or 'I use Linux at home and at work'. He will also accept 'third-party' registrations - ask him for details.

He posts his counts to comp.os.linux.misc each month; alternatively look on `aun.uninett.no` in `/pub/misc/linux-counter`.

Question 8.6. How should I pronounce Linux ?

This is a matter of religious debate, of course !

If you want to hear the Linus himself say how he pronounces it download `english.au` or `swedish.au` from `ftp.funet.fi` (in `/pub/OS/Linux/PEOPLE/Linus/SillySounds`). If you have a soundcard or the PC-speaker audio driver you can hear them by typing

```
cat english.au >/dev/audio
```

The difference isn't in the pronunciation of Linux but in the language Linus uses to say hello.

For the benefit of those of you who don't have the equipment or inclination: Linus pronounces Linux approximately as Leenus, where the ee is as in feet but rather shorter and the u is like a much shorter version of the French eu sound in peur (pronouncing it as the u in put is probably passable).

When speaking English I pronounce it Lie-nucks (u as in bucket) — this is an anglicised pronunciation based on the analogy with Linus' name, which in English is usually pronounced

Lie-nus (u as in put). It is of course quite acceptable and common to modify the pronunciation of a proper noun when it changes languages.

I think I can safely say that the pronunciation Linnucks (short i as in pit, short u as in bucket) is wrong in English, as it is not the original Swedish pronunciation, not a sensible direct anglicisation of it, and not based on the anglicised version of Linus' name.

Section 9. Frequently encountered error messages

Question 9.1. During linking I get `Undefined symbol _mcount`

This is usually due to a bad interaction between a brokenness in SLS and the C library release notes. Your **`libc.a`** has been replaced by the profiling library. You should remove **`libc.a`**, **`libg.a`** and **`libc_p.a`** and once again install the new libraries (following the release notes, of course).

Question 9.2. `lp1 on fire`

This is a joke/traditional error message indicating that some sort of error is being reported by your printer, but it isn't offline or out of paper. It may be that you have some kind of I/O or IRQ conflict - check your cards' settings. Hopefully it isn't really on fire ...

Question 9.3. `INET: Warning: old style ioctl(IP_SET_DEV) called!`

You are trying to use the old network configuration utilities; the new ones can be found on `tsx-11.mit.edu` in `/pub/linux/packages/net/net-2/binaries`.

Note that they cannot be used just like the old-style programs; see the NET-2 HOWTO for instructions on how to set up networking correctly.

Question 9.4. `ld: unrecognized option '-m486'`

You have an old version of `ld`. Install a newer binutils package – this will contain an updated `ld`. Look on `tsx-11.mit.edu` in `/pub/linux/packages/GCC` for `binutils.tar.z`.

Question 9.5. GCC says `Internal compiler error`

If the fault is repeatable (ie, 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 Control-`h i` in Emacs, and select GCC from the menu) for details on how to report this – make sure you have the latest version though.

Note that this is probably not a Linux-specific problem; unless you were 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 are very probably experiencing memory corruption — see Q9.6 (page 29) '`make` says `Error 139`'.

Question 9.6. `make` says `Error 139`

Your compiler driver (`gcc`) dumped core. You probably have a corrupted, buggy or old version of GCC — get the latest release. Alternatively you may be running out of swap space — see Q6.6 (page 21) 'My machine runs very slowly when I run GCC / X / ...' for more info.

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 are correct. If so you may have some dodgy SIMMs or a faulty motherboard or hard disk or controller.

Linux, like any Unix, is a very good memory tester — much better than DOS-based memory test programs.

Reportedly some clone x87 maths coprocessors can cause problems; try compiling a kernel with maths emulation [Q7.6 (page 24) 'How do I upgrade/recompile my kernel ?']; you may need to use the `no387` kernel command line flag on the LILO prompt to force the kernel to use it, or it may be able to work and still use the 387, with the maths emulation compiled in but mainly unused.

Question 9.7. `shell-init: permission denied` when I log in.

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

Question 9.8. `No utmp entry. You must exec ...` when I log in.

Your `/etc/utmp` is screwed up. You should have

```
> /etc/utmp
```

in your `/etc/rc` or `/etc/rc.local`. See Q6.9 (page 22) 'I have screwed up my system and can't log in to fix it.' for how to be able to do this.

Question 9.9. `Warning - bdflush not running`

The development kernel series now uses 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 [Q7.6 (page 24) 'How do I upgrade/recompile my kernel ?'] and compile and install it; it should be started before the usual boot-time filesystem checks. It will work fine with older kernels as well, so there's no need to keep the old `update` around.

Question 9.10. `Warning: obsolete routing request made.`

This is nothing to worry about; it just means that the version of `route` you have 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 [Q7.6 (page 24) 'How do I upgrade/recompile my kernel ?'].

Question 9.11. `EXT2-fs: warning: mounting unchecked filesystem`

You need to run `e2fsck` (or `fsck -t ext2` if you have the fsutils package) 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 [Q2.5 (page 9) 'Where can I 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 filesystem 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 for to initially mount the root filesystem readonly, check it if necessary, and then remount it read-write. 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` to get it not to try to update `/etc/mtab`, since the root filesystem is still read-only and this will otherwise cause it to fail !

Question 9.12. `EXT2-fs warning: maximal count reached`

This message is issued by the kernel when it mounts a filesystem that's marked as clean, but whose 'number of mounts since check' counter has reached the predifined value. The solution is to get the latest version of the ext2fs utilities (`e2fsprogs-0.5a.tar.gz` at the time of writing) from the usual sites [Q2.5 (page 9) 'Where can I get Linux material by FTP ?'].

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

Question 9.13. `EXT2-fs warning: checktime reached`

Kernels from 1.0 onwards support checking a filesystem 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 Q9.12 (page 31) '`EXT2-fs warning: maximal count reached`'].

Question 9.14. `df` says `Cannot read table of mounted filesystems`

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` or `/etc/rc.local`), using something like

```
rm -f /etc/mtab*
```

Some versions of SLS have an entry for the root partition in `/etc/mtab` made in `/etc/rc` by using `rdev`. This is incorrect – the newer versions of `mount` do this automatically.

Other versions of SLS have a line in `/etc/fstab` that looks like:

```
/dev/sdb1   /root   ext2   defaults
```

This is wrong. `/root` should read simply `/`.

Question 9.15. `fdisk` says `Partition X has different physical/logical ...`

If the partition number (`X`, above) is 1 this is the same problem as Q9.16 (page 32) '`fdisk: Partition 1 does not start on cylinder boundary`'.

If the partition begins or ends on a cylinder numbered beyond 1024, this is because standard DOS disk geometry information format in the partition table can't cope with cylinder numbers with more than 10 bits.

This will cause DOS to be unable to access the partition correctly, and will make booting a Linux kernel from that partition using LILO problematic at best.

You can still use the partition for Linux or other operating systems that use linear addressing (ie, number the disk blocks sequentially without looking at heads, tracks and sectors).

I'd recommend creating at least one Linux partition entirely under the 1024-cylinder limit and booting off that; the other partitions will then be OK.

Question 9.16. `fdisk: Partition 1 does not start on cylinder boundary`

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 good 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.

1. Create partition 1 in the normal way. A `p` listing will produce the mismatch complaint.

2. Type `u` to set sector mode and do `p` again. Copy down the number from the "End" column.

3. Delete partition 1.

4. While still in sector mode recreate 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 noted in 2. above.

5. 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, which are not used if you start the first partition in track 2.

Question 9.17. `fdisk` says `cannot use nnn sectors of this partition`

Originally Linux only supported the Minix filesystem, which cannot use more than 64Mb per parition. This limitation is not present in the more advanced filesystems now available, such as ext2fs (the 2nd version of the Extended Filesystem) and xiafs (Qi Xia's filesystem).

If you intend to use ext2fs or xiafs you can ignore the message.

Question 9.18. `fdisk` says `partition n has an odd number of sectors`

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.

Question 9.19. mtools says `cannot initialise drive XYZ`

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 manpage 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 discover 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 — distribution packagers please note that this is *evil*.

For the easiest way to access your DOS files (especially those on a hard disk partition) see Q3.2 (page 11) 'How do I access files on my DOS partition or floppy ?'. Note - you should never use mtools to access files on an msdosfs mounted partition or disk !

Section 10. The X Window System

Question 10.1. Does Linux support X Windows ?

Yes. Linux uses XFree86 (the current version is 3.1, which is based on X11R6). You need to have a video card which is supported by XFree86. See the Linux XFree86 HOWTO for more details.

Some of the Linux releases – MCC, for example – don't come with X Windows already included; however you can easily download and install it from `/pub/Linux/X11/Xfree86-`* on `sunsite.unc.edu` and its mirror sites. Read the XFree86 HOWTO for installation instructions.

Other releases – Slackware, Debian, TAMU and SLS, for example – come with X Windows already included

Question 10.2. Where can I get an `Xconfig` for my video card and monitor ?

See the Linux XFree86 HOWTO.

You'll need to put together your own `Xconfig` file, because it depends on the exact combination of video card and monitor you have. It's not that hard to do – read the instructions that came with XFree86, in `/usr/X386/lib/X11/etc`. The file you probably most need to look at is `README.Config`.

Please don't post to `comp.os.linux.help` asking for an `Xconfig`.

Question 10.3. `xterm` logins show up strangely in `who`, `finger`

The `xterm` that comes with XFree86 2.0 and earlier doesn't correctly understand the format that Linux uses for the `/etc/utmp` file, where the system records who is logged in. It therefore doesn't set all the information correctly.

I do not know whether XFree86 2.1 fixes this problem.

Question 10.4. I can't get X Windows to work right.

Read the XFree86 HOWTO - note the question and answer section.

Try reading `comp.windows.x.i386unix` – specifically read the the FAQ for that group.

Please don't post X Windows or XFree86 related questions to `comp.os.linux.help` unless they are Linux-specific.

Section 11. Questions applicable to very out-of-date software

The questions in this section are only relevant to users of software that is at least 3 months old.

Please let me know if you find the answer to a problem you had here, as unused questions in this section will eventually disappear [Q13.1 (page 37) 'Feedback is invited'].

Question 11.1. How can I have more than 16Mb of swap ?

Use a recent kernel – from at least 0.99.14 Linux can use swap partitions of up to 128Mb.

If you use an older kernel which only supports swap area sizes up to 16Mb you have to set up more than one swap partition or swapfile.

Question 11.2. GCC sometimes uses huge amounts of virtual memory and thrashes

Older versions of GCC had a bug which made them use lots of memory if you tried to compile a program which had a large static data table in it.

You can either upgrade your version of GCC to at least version 2.5, or add more swap if necessary and just grin and bear it; it'll work in the end.

Question 11.3. My keyboard goes all funny after I switch VC's.

This is a bug in kernel versions before 0.99pl14-alpha-n. Sometimes Linux loses track of what modifier keys (Shift, Alt, Control etc.) are pressed or not, and believes that one or more are pressed when they are not. The solution is to press and release each of the modifier keys (without pressing any other keys) — this will ensure that Linux knows what state the keyboard is actually in.

This problem often occurs when switching out of X windows; it can sometimes be avoided by releasing Ctrl and Alt very quickly after pressing the F-key of the VC you are switching to.

Section 12. How to get further assistance

Question 12.1. You still haven't answered my question !

Please read all of this answer before posting. I know it's a bit long, but you may be about to make a fool of yourself in front of 50000 people and waste hundreds of hours of their time. Don't you think it's worth it to spend some of your time reading and following these instructions ?

If you think an answer is incomplete or inaccurate, please mail Ian Jackson at `<ijackson@nyx.cs.du.edu>`.

Read the appropriate Linux Documentation Project books - see Q2.1 (page 6) 'Where can I get the HOWTOs and other documentation ?'.

If you're a Unix newbie read the FAQ for `comp.unix.questions`, and those for any of the other `comp.unix.*` groups that may be relevant.

Linux is a Unix clone, so almost everything you read there will apply to Linux. Those FAQs can, like all FAQs, be found on `rtfm.mit.edu` in `/pub/usenet/news.answers` (the `mail-server@rtfm.mit.edu` can send you these files, for those who don't have FTP access). There are mirrors of `rtfm`'s FAQ artchives on various sites - check the Introduction to `*.answers` posting, posted, or look in `news-answers/introduction` in the directory above.

Check the relevant HOWTO for the subject in question, if there is one, or an appropriate old-style sub-FAQ document. Check the FTP sites.

Try experimenting — that's the best way to get to know Unix and Linux.

Read the documentation. Check the manpages (type `man man` if you don't know about manpages. Try `man -k <subject>` — it often lists useful and relevant manpages.

Check the Info documentation (type `C-h i`, i.e. Control H followed by I in Emacs) — NB this isn’t just for Emacs; for example the GCC documentation lives here as well.

There will also often be a `README` file with a package giving installation and/or usage instructions.

Make sure that you don’t have a corrupted or out-of-date copy of the program in question. If possible, download it again and reinstall it — perhaps you made a mistake the first time.

Read `comp.os.linux.announce` — this often contains very important information for all Linux users.

X-Windows questions belong in `comp.windows.x.i386unix`, not in `comp.os.linux.help`. But read the group first (including the FAQ), before you post !

Only if you have done all of these things and are still stuck should you post to `comp.os.linux.help`. Make sure you read the next question, Q12.2 (page 36) ‘What to put in a posting to `comp.os.linux.help`’, first.

Question 12.2. What to put in a posting to `comp.os.linux.help`

Please read carefully the following advice about how to write your posting. Taking heed of it will greatly increase the chances that an expert and/or fellow user reading your posting will have enough information and motivation to reply.

Make sure you give full details of the problem, including:

- What program, exactly, you are having problems with. Include the version number if known and say where you got it. Many standard commands tell you their version number if you give them a `-version` option.
- Which Linux release you’re using (MCC, Slackware, Debian or whatever) and what version of that release.
- The *exact* and *complete* text of any error messages printed.
- Exactly what behaviour you were expecting, and exactly what behaviour you observed. A transcript of an example session is a good way of showing this.
- The contents of any configuration files used by the program in question and any related programs.
- What version of the kernel and of the shared libraries you are using. The kernel version can be found by typing `uname -a`, and the shared library version by typing `ls -l /lib/libc.so.4`.
- Details of what hardware you’re running on, if it seems appropriate.

You are in little danger of making your posting too long unless you include large chunks of source code or uuencoded files, so err on the side of giving too much information.

Use a clear, detailed Subject line. Don’t put things like ‘doesn’t work’, ‘Linux’, ‘help’ or ‘question’ in it — we already knew that ! Save the space for the name of the program, a fragment of the error message, summary of the unusual behaviour, etc.

If you are reporting an ‘unable to handle kernel paging request’ message, follow the instructions in the Linux kernel sources `README` for turning the numbers into something more meaningful. If you don’t do this noone who reads your post will be able to do it for you, as the mapping from numbers to function names varies from one kernel to another.

Put a summary paragraph at the top of your posting.

At the bottom of your posting, ask for responses by email and say you’ll post a summary. Back this up by using `Followup-To: poster`. Then, do actually post a summary in a few days or a week or so. Don’t just concatenate the replies you got — summarise. Putting the word `SUMMARY` in your summary’s Subject line is also a good idea. Consider submitting the summary to comp.os.linux.announce.

Make sure your posting doesn’t have an inappropriate `References` header line. This marks your article as part of the thread of the article referred to, which will often cause it to be junked by the readers with the rest of a boring thread.

You might like to say in your posting that you’ve read this FAQ and the appropriate HOWTOs - this may make people less likely to skip your posting.

Remember that you should not post email sent to you personally without the sender’s permission.

Section 13. Administrative information and acknowledgements

Question 13.1. Feedback is invited

Please send me your comments on this FAQ.

I accept submissions for the FAQ in any format; All contributions comments and corrections are gratefully received.

Please send them to `<ijackson@nyx.cs.du.edu>`.

By the way, if you wish to refer to a question(s) in the FAQ it’s most useful for me if you do so by the question heading, rather than the number, as the question numbers are generated automatically and I don’t see them in the source file I edit.

Question 13.2. Formats in which this FAQ is available

This document is available as an ASCII text file, an Emacs Info document, an HTML World Wide Web page, PostScript and as a USENET news posting.

The ASCII, Emacs Info, HTML and posted versions and a Lout typesetter file (from which the PostScript is produced) are generated automatically by a Perl script which takes as input a file in the Bizarre Format with No Name.

The output files `linux-faq.ascii`, `.info` and `.ps` and a tarfile `linux-faq.source.tar.gz`, containing the BFNN source and Perl script converter, are available in the `docs` directories of the major Linux FTP sites.

The HTML version of this FAQ is available as
`http://www.cl.cam.ac.uk/users/iwj10/linux-faq/index.html`.

The USENET version is posted regularly to `comp.os.linux.announce`, `comp.os.linux.help`, `comp.answers` and `news.answers`.

Question 13.3. Authorship and acknowledgements

This FAQ was compiled by Ian Jackson `<ijackson@nyx.cs.du.edu>`, with assistance and comments from others too numerous to mention. It was loosely based on the original Linux FAQ by Marc-Michel Corsini.

Special thanks are due to Matt Welsh, who coordinates the HOWTOs and has written substantial portions of many of them, and to Marc-Michel Corsini. Thanks also to the contributors to the previous Linux FAQ, and to those sent me comments about this FAQ, and who answered questions on the newsgroup.

Last but not least, thanks to Linus Torvalds and the other contributors to Linux for giving us something to write about !

Question 13.4. Disclaimer and Copyright

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