# Debian GNU/Linux Installation Guide

**Debian GNU/Linux Installation Guide**

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This document contains installation instructions for the Debian GNU/Linux 3.1 system (codename “sarge”), for the S/390 (“s390”) architecture. It also contains pointers to more information and information on how to make the most of your new Debian system.

## Warning

This installation guide is based on an earlier manual written for the old Debian installation system (the “boot-floppies”), and has been updated to document the new Debian installer. However, for s390, the manual has not been fully updated and fact checked for the new installer. There may remain parts of the manual that are incomplete or outdated or that still document the boot-floppies installer. A newer version of this manual, possibly better documenting this architecture, may be found on the Internet at the `debian-installer` home page (http://www.debian.org/devel/debian-installer/). You may also be able to find additional translations there.

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# Installing Debian GNU/Linux 3.1 For s390

We are delighted that you have decided to try Debian, and are sure that you will find that Debian's GNU/Linux distribution is unique. Debian GNU/Linux brings together high-quality free software from around the world, integrating it into a coherent whole. We believe that you will find that the result is truly more than the sum of the parts.

We understand that many of you want to install Debian without reading this manual, and the Debian installer is designed to make this possible. If you don't have time to read the whole Installation Guide right now, we recommend that you read the Installation Howto, which will walk you through the basic installation process, and links to the manual for more advanced topics or for when things go wrong. The Installation Howto can be found in Appendix A.

With that said, we hope that you have the time to read most of this manual, and doing so will lead to a more informed and likely more successful installation experience.

# Chapter 1. Welcome to Debian

This chapter provides an overview of the Debian Project and Debian GNU/Linux. If you already know about the Debian Project's history and the Debian GNU/Linux distribution, feel free to skip to the next chapter.

## 1.1. What is Debian?

Debian is an all-volunteer organization dedicated to developing free software and promoting the ideals of the Free Software Foundation. The Debian Project began in 1993, when Ian Murdock issued an open invitation to software developers to contribute to a complete and coherent software distribution based on the relatively new Linux kernel. That relatively small band of dedicated enthusiasts, originally funded by the Free Software Foundation (http://www.fsf.org/) and influenced by the GNU (http://www.gnu.org/gnu/the-gnu-project.html) philosophy, has grown over the years into an organization of around 900 *Debian Developers*.

Debian Developers are involved in a variety of activities, including Web (http://www.debian.org/) and FTP (ftp://ftp.debian.org/) site administration, graphic design, legal analysis of software licenses, writing documentation, and, of course, maintaining software packages.

In the interest of communicating our philosophy and attracting developers who believe in the principles that Debian stands for, the Debian Project has published a number of documents that outline our values and serve as guides to what it means to be a Debian Developer:

- The Debian Social Contract (http://www.debian.org/social_contract) is a statement of Debian's commitments to the Free Software Community. Anyone who agrees to abide to the Social Contract may become a maintainer (http://www.debian.org/doc/maint-guide/). Any maintainer can introduce new software into Debian — provided that the software meets our criteria for being free, and the package follows our quality standards.
- The Debian Free Software Guidelines (http://www.debian.org/social_contract#guidelines) are a clear and concise statement of Debian's criteria for free software. The DFSG is a very influential document in the Free Software Movement, and was the foundation of the The Open Source Definition (http://opensource.org/docs/definition_plain.html).
- The Debian Policy Manual (http://www.debian.org/doc/debian-policy/) is an extensive specification of the Debian Project's standards of quality.

Debian developers are also involved in a number of other projects; some specific to Debian, others involving some or all of the Linux community. Some examples include:

- The Linux Standard Base (http://www.linuxbase.org/) (LSB) is a project aimed at standardizing the basic GNU/Linux system, which will enable third-party software and hardware developers to easily design programs and device drivers for Linux-in-general, rather than for a specific GNU/Linux distribution.
- The Filesystem Hierarchy Standard (http://www.pathname.com/fhs/) (FHS) is an effort to standardize the layout of the Linux file system. The FHS will allow software developers to concentrate their efforts on designing programs, without having to worry about how the package will be installed in different GNU/Linux distributions.

- Debian Jr. (http://www.debian.org/devel/debian-jr/) is an internal project, aimed at making sure Debian has something to offer to our youngest users.

For more general information about Debian, see the Debian FAQ (http://www.debian.org/doc/FAQ/).

## 1.2. What is GNU/Linux?

Linux is an operating system: a series of programs that let you interact with your computer and run other programs.

An operating system consists of various fundamental programs which are needed by your computer so that it can communicate and receive instructions from users; read and write data to hard disks, tapes, and printers; control the use of memory; and run other software. The most important part of an operating system is the kernel. In a GNU/Linux system, Linux is the kernel component. The rest of the system consists of other programs, many of which were written by or for the GNU Project. Because the Linux kernel alone does not form a working operating system, we prefer to use the term "GNU/Linux" to refer to systems that many people casually refer to as "Linux".

Linux is modelled on the Unix operating system. From the start, Linux was designed to be a multi-tasking, multi-user system. These facts are enough to make Linux different from other well-known operating systems. However, Linux is even more different than you might imagine. In contrast to other operating systems, nobody owns Linux. Much of its development is done by unpaid volunteers.

Development of what later became GNU/Linux began in 1984, when the Free Software Foundation (http://www.gnu.org/) began development of a free Unix-like operating system called GNU.

The GNU Project has developed a comprehensive set of free software tools for use with Unix™ and Unix-like operating systems such as Linux. These tools enable users to perform tasks ranging from the mundane (such as copying or removing files from the system) to the arcane (such as writing and compiling programs or doing sophisticated editing in a variety of document formats).

While many groups and individuals have contributed to Linux, the largest single contributor is still the Free Software Foundation, which created not only most of the tools used in Linux, but also the philosophy and the community that made Linux possible.

The Linux kernel (http://www.kernel.org/) first appeared in 1991, when a Finnish computing science student named Linus Torvalds announced an early version of a replacement kernel for Minix to the Usenet newsgroup **`comp.os.minix`**. See Linux International's Linux History Page (http://www.li.org/linuxhistory.php).

Linus Torvalds continues to coordinate the work of several hundred developers with the help of a few trusty deputies. An excellent weekly summary of discussions on the **`linux-kernel`** mailing list is Kernel Traffic (http://www.kerneltraffic.org/kernel-traffic/index.html). More information about the **`linux-kernel`** mailing list can be found on the linux-kernel mailing list FAQ (http://www.tux.org/lkml/).

Linux users have immense freedom of choice in their software. For example, Linux users can choose from a dozen different command line shells and several graphical desktops. This selection is often bewildering to users of other operating systems, who are not used to thinking of the command line or desktop as something that they can change.

Linux is also less likely to crash, better able to run more than one program at the same time, and more secure than many operating systems. With these advantages, Linux is the fastest growing operating system in the server market. More recently, Linux has begun to be popular among home and business users as well.

## 1.3. What is Debian GNU/Linux?

The combination of Debian's philosophy and methodology and the GNU tools, the Linux kernel, and other important free software, form a unique software distribution called Debian GNU/Linux. This distribution is made up of a large number of software *packages*. Each package in the distribution contains executables, scripts, documentation, and configuration information, and has a *maintainer* who is primarily responsible for keeping the package up-to-date, tracking bug reports, and communicating with the upstream author(s) of the packaged software. Our extremely large user base, combined with our bug tracking system ensures that problems are found and fixed quickly.

Debian's attention to detail allows us to produce a high-quality, stable, and scalable distribution. Installations can be easily configured to serve many roles, from stripped-down firewalls to desktop scientific workstations to high-end network servers.

Debian is especially popular among advanced users because of its technical excellence and its deep commitment to the needs and expectations of the Linux community. Debian also introduced many features to Linux that are now commonplace.

For example, Debian was the first Linux distribution to include a package management system for easy installation and removal of software. It was also the first Linux distribution that could be upgraded without requiring reinstallation.

Debian continues to be a leader in Linux development. Its development process is an example of just how well the Open Source development model can work — even for very complex tasks such as building and maintaining a complete operating system.

The feature that most distinguishes Debian from other Linux distributions is its package management system. These tools give the administrator of a Debian system complete control over the packages installed on that system, including the ability to install a single package or automatically update the entire operating system. Individual packages can also be protected from being updated. You can even tell the package management system about software you have compiled yourself and what dependencies it fulfills.

To protect your system against "Trojan horses" and other malevolent software, Debian's servers verify that uploaded packages come from their registered Debian maintainers. Debian packagers also take great care to configure their packages in a secure manner. When security problems in shipped packages do appear, fixes are usually available very quickly. With Debian's simple update options, security fixes can be downloaded and installed automatically across the Internet.

The primary, and best, method of getting support for your Debian GNU/Linux system and communicating with Debian Developers is through the many mailing lists maintained by the Debian Project (there are more than 160 at this writing). The easiest way to subscribe to one or more of these lists is visit Debian's mailing list subscription page (http://www.debian.org/MailingLists/subscribe) and fill out the form you'll find there.

## 1.4. Getting Debian

For information on how to download Debian GNU/Linux from the Internet or from whom official Debian CDs can be purchased, see the distribution web page (http://www.debian.org/distrib/). The list of Debian mirrors (http://www.debian.org/distrib/ftplist) contains a full set of official Debian mirrors, so you can easily find the nearest one.

Debian can be upgraded after installation very easily. The installation procedure will help set up the system so that you can make those upgrades once installation is complete, if need be.

## 1.5. Getting the Newest Version of This Document

This document is constantly being revised. Be sure to check the Debian 3.1 pages (http://www.debian.org/releases/sarge/) for any last-minute information about the 3.1 release of the Debian GNU/Linux system. Updated versions of this installation manual are also available from the official Install Manual pages (http://www.debian.org/releases/sarge/s390/).

## 1.6. Organization of This Document

This document is meant to serve as a manual for first-time Debian users. It tries to make as few assumptions as possible about your level of expertise. However, we do assume that you have a general understanding of how the hardware in your computer works.

Expert users may also find interesting reference information in this document, including minimum installation sizes, details about the hardware supported by the Debian installation system, and so on. We encourage expert users to jump around in the document.

In general, this manual is arranged in a linear fashion, walking you through the installation process from start to finish. Here are the steps in installing Debian GNU/Linux, and the sections of this document which correlate with each step:

1. Determine whether your hardware meets the requirements for using the installation system, in Chapter 2.
2. Backup your system, perform any necessary planning and hardware configuration prior to installing Debian, in Chapter 3. If you are preparing a multi-boot system, you may need to create partition-able space on your hard disk for Debian to use.
3. In Chapter 4, you will obtain the necessary installation files for your method of installation.
4. Chapter 5 describes booting into the installation system. This chapter also discusses troubleshooting procedures in case you have problems with this step.
5. Perform the actual installation according to Chapter 6. This involves choosing your language, configuring peripheral driver modules, configuring your network connection, so that remaining installation files can be obtained directly from a Debian server (if you are not installing from a CD), partitioning your hard drives and installation of minimal working system. (Some background about setting up the partitions for your Debian system is explained in Appendix B.)
6. Boot into your newly installed base system and run through some additional configuration tasks, from Chapter 7.
7. Install additional software in Section 7.2.4.

Once you've got your system installed, you can read Chapter 8. That chapter explains where to look to find more information about Unix and Debian, and how to replace your kernel.

Finally, information about this document and how to contribute to it may be found in Appendix D.

## 1.7. About Copyrights and Software Licenses

We're sure that you've read some of the licenses that come with most commercial software — they usually say that you can only use one copy of the software on a single computer. This system's license

isn't like that at all. We encourage you to put a copy of on every computer in your school or place of business. Lend your installation media to your friends and help them install it on their computers! You can even make thousands of copies and *sell* them — albeit with a few restrictions. Your freedom to install and use the system comes directly from Debian being based on *free software*.

Calling software *free* doesn't mean that the software isn't copyrighted, and it doesn't mean that CDs containing that software must be distributed at no charge. Free software, in part, means that the licenses of individual programs do not require you to pay for the privilege of distributing or using those programs. Free software also means that not only may anyone extend, adapt, and modify the software, but that they may distribute the results of their work as well.

> **Note:** The Debian project, as a pragmatic concession to its users, does make some packages available that do not meet our criteria for being free. These packages are not part of the official distribution, however, and are only available from the **`contrib`** or **`non-free`** areas of Debian mirrors or on third-party CD-ROMs; see the Debian FAQ (http://www.debian.org/doc/FAQ/), under "The Debian FTP archives", for more information about the layout and contents of the archives.

Many of the programs in the system are licensed under the *GNU General Public License*, often simply referred to as "the GPL". The GPL requires you to make the *source code* of the programs available whenever you distribute a binary copy of the program; that provision of the license ensures that any user will be able to modify the software. Because of this provision, the source code[1] for all such programs is available in the Debian system.

There are several other forms of copyright statements and software licenses used on the programs in Debian. You can find the copyrights and licenses for every package installed on your system by looking in the file `/usr/share/doc/`*`package-name`*`/copyright` once you've installed a package on your system.

For more information about licenses and how Debian determines whether software is free enough to be included in the main distribution, see the Debian Free Software Guidelines (http://www.debian.org/social_contract#guidelines).

The most important legal notice is that this software comes with *no warranties*. The programmers who have created this software have done so for the benefit of the community. No guarantee is made as to the suitability of the software for any given purpose. However, since the software is free, you are empowered to modify that software to suit your needs — and to enjoy the benefits of the changes made by others who have extended the software in this way.

1. For information on how to locate, unpack, and build binaries from Debian source packages, see the Debian FAQ (http://www.debian.org/doc/FAQ/), under "Basics of the Debian Package Management System".

# Chapter 2. System Requirements

This section contains information about what hardware you need to get started with Debian. You will also find links to further information about hardware supported by GNU and Linux.

## 2.1. Supported Hardware

Debian does not impose hardware requirements beyond the requirements of the Linux kernel and the GNU tool-sets. Therefore, any architecture or platform to which the Linux kernel, libc, **gcc**, etc. have been ported, and for which a Debian port exists, can run Debian. Please refer to the Ports pages at http://www.debian.org/ports/s390/ for more details on S/390 architecture systems which have been tested with Debian.

Rather than attempting to describe all the different hardware configurations which are supported for S/390, this section contains general information and pointers to where additional information can be found.

### 2.1.1. Supported Architectures

Debian 3.1 supports eleven major architectures and several variations of each architecture known as “flavors”.

| Architecture | Debian Designation | Subarchitecture | Flavor |
|---|---|---|---|
| Intel x86-based | i386 | | vanilla |
| | | | speakup |
| | | | linux26 |
| Motorola 680x0 | m68k | Atari | atari |
| | | Amiga | amiga |
| | | 68k Macintosh | mac |
| | | VME | bvme6000 |
| | | | mvme147 |
| | | | mvme16x |
| DEC Alpha | alpha | | |
| Sun SPARC | sparc | | sun4cdm |
| | | | sun4u |
| ARM and StrongARM | arm | | netwinder |
| | | | riscpc |
| | | | shark |
| | | | lart |
| IBM/Motorola PowerPC | powerpc | CHRP | chrp |

| Architecture | Debian Designation | Subarchitecture | Flavor |
|---|---|---|---|
| | | PowerMac | pmac |
| | | PReP | prep |
| | | APUS | apus |
| HP PA-RISC | hppa | PA-RISC 1.1 | 32 |
| | | PA-RISC 2.0 | 64 |
| Intel ia64-based | ia64 | | |
| MIPS (big endian) | mips | SGI Indy/Indigo 2 | r4k-ip22 |
| | | | r5k-ip22 |
| | | Broadcom BCM91250A (SWARM) | sb1-swarm-bn |
| MIPS (little endian) | mipsel | Cobalt | cobalt |
| | | DECstation | r4k-kn04 |
| | | | r3k-kn02 |
| | | Broadcom BCM91250A (SWARM) | sb1-swarm-bn |
| IBM S/390 | s390 | IPL from VM-reader and DASD | generic |
| | | IPL from tape | tape |

This document covers installation for the *S/390* architecture. If you are looking for information on any of the other Debian-supported architectures take a look at the Debian-Ports (http://www.debian.org/ports/) pages.

## 2.1.2. S/390 and zSeries machine types

Complete information regarding supported S/390 and zSeries machines can be found in IBM's Redbook Linux for IBM eServer zSeries and S/390: Distributions (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg246264.pdf) in chapter 2.1 or at the technical details web page (http://oss.software.ibm.com/developerworks/opensource/linux390/documentation-2.4.shtml) at developerWorks (http://oss.software.ibm.com/developerworks/opensource/linux390/index.shtml). In short, G5, Multiprise 3000, G6 and all zSeries are fully supported; Multiprise 2000, G3 and G4 machines are supported with IEEE floating point emulation and thus degraded performance.

## 2.1.3. Multiple Processors

Multi-processor support — also called "symmetric multi-processing" or SMP — is supported for this architecture. However, the standard Debian 3.1 kernel image does not support SMP. This should not prevent installation, since the standard, non-SMP kernel should boot on SMP systems; the kernel will simply use the first CPU.

In order to take advantage of multiple processors, you'll have to replace the standard Debian kernel. You can find a discussion of how to do this in Section 8.4. At this time (kernel version 2.4.27) the way you enable SMP is to select "Symmetric multi-processing support" in the "Processor type and features" section of the kernel config.

## 2.2. Installation Media

This section will help you determine which different media types you can use to install Debian. For example, if you have a floppy disk drive on your machine, it can be used to install Debian. There is a whole chapter devoted media, Chapter 4, which lists the advantages and disadvantages of each media type. You may want to refer back to this page once you reach that section.

### 2.2.1. CD-ROM/DVD-ROM

**Note:** Whenever you see "CD-ROM" in this manual, it applies to both CD-ROMs and DVD-ROMs, because both technologies are really the same from the operating system's point of view, except for some very old nonstandard CD-ROM drives which are neither SCSI nor IDE/ATAPI.

CD-ROM based installation is supported for some architectures. On machines which support bootable CD-ROMs, you should be able to do a completely tape-less installation. Even if your system doesn't support booting from a CD-ROM, you can use the CD-ROM in conjunction with the other techniques to install your system, once you've booted up by other means; see Chapter 5.

### 2.2.2. Hard Disk

Booting the installation system directly from a hard disk is another option for many architectures. This will require some other operating system to load the installer onto the hard disk.

### 2.2.3. Network

After the operating system kernel is installed, you can install the rest of your system via any sort of network connection (including PPP after installation of the base system), via FTP or HTTP.

### 2.2.4. Un*x or GNU system

If you are running another Unix-like system, you could use it to install Debian GNU/Linux without using the `debian-installer` described in the rest of the manual. This kind of install may be useful for users with otherwise unsupported hardware or on hosts which can't afford downtime. If you are interested in this technique, skip to the Section C.4.

### 2.2.5. Supported Storage Systems

The Debian boot disks contain a kernel which is built to maximize the number of systems it runs on. Unfortunately, this makes for a larger kernel, which includes many drivers that won't be used for your machine (see Section 8.4 to learn how to build your own kernel). Support for the widest possible range of devices is desirable in general, to ensure that Debian can be installed on the widest array of hardware.

Any storage system supported by the Linux kernel is also supported by the boot system. This means that FBA and ECKD DASDs are supported with the old Linux disk layout (ldl) and the new common S/390 disk layout (cdl).

## 2.3. Peripherals and Other Hardware

Package installations from XPRAM and tape are not supported by this system. All packages that you want to install need to be available on a DASD or over the network using NFS, HTTP or FTP.

## 2.4. Memory and Disk Space Requirements

You must have at least 32MB of memory and 110MB of hard disk space. For a minimal console-based system (all standard packages), 250MB is required. If you want to install a reasonable amount of software, including the X Window System, and some development programs and libraries, you'll need at least 400MB. For a more or less complete desktop system, you'll need a few gigabytes.

## 2.5. Network Connectivity Hardware

Any network interface card (NIC) supported by the Linux kernel are also be supported by the boot disks. All network drivers are compiled as modules so you need to load one first during the initial network setup. The list of supported network devices is:

- Channel to Channel (CTC) and ESCON connection (real or emulated)
- OSA-2 Token Ring/Ethernet and OSA-Express Fast Ethernet (non-QDIO)
- Inter-User Communication Vehicle (IUCV) — available for VM guests only
- OSA-Express in QDIO mode, HiperSockets and Guest-LANs

# Chapter 3. Before Installing Debian GNU/Linux

This chapter deals with the preparation for installing Debian before you even boot the installer. This includes backing up your data, gathering information about your hardware, and locating any necessary information.

## 3.1. Overview of the Installation Process

First, just a note about re-installations. With Debian, a circumstance that will require a complete re-installation of your system is very rare; perhaps mechanical failure of the hard disk would be the most common case.

Many common operating systems may require a complete installation to be performed when critical failures take place or for upgrades to new OS versions. Even if a completely new installation isn't required, often the programs you use must be re-installed to operate properly in the new OS.

Under Debian GNU/Linux, it is much more likely that your OS can be repaired rather than replaced if things go wrong. Upgrades never require a wholesale installation; you can always upgrade in-place. And the programs are almost always compatible with successive OS releases. If a new program version requires newer supporting software, the Debian packaging system ensures that all the necessary software is automatically identified and installed. The point is, much effort has been put into avoiding the need for re-installation, so think of it as your very last option. The installer is *not* designed to re-install over an existing system.

Here's a road map for the steps you will take during the installation process.

1. Back up any existing data or documents on the hard disk where you plan to install.
2. Gather information about your computer and any needed documentation, before starting the installation.
3. Create partition-able space for Debian on your hard disk.
4. Locate and/or download the installer software and any specialized driver files your machine requires (except Debian CD users).
5. Set up boot tapes/floppies/USB sticks, or place boot files (most Debian CD users can boot from one of the CDs).
6. Boot the installation system.
7. Configure one network interface.
8. Open a ssh connection to the new system.
9. Attach one or more DASDs (Direct Access Storage Device).
10. Create and mount the partitions on which Debian will be installed.
11. Watch the automatic download/install/setup of the *base system*.
12. Install a *boot loader* which can start up Debian GNU/Linux and/or your existing system.
13. Load the newly installed system for the first time, and make some initial system settings.
14. Open a ssh connection to the new system.
15. Install additional software (*tasks* and/or *packages*), at your discretion.

If you have problems during the installation, it helps to know which packages are involved in which steps. Introducing the leading software actors in this installation drama:

The installer software, `debian-installer`, is the primary concern of this manual. It detects hardware and loads appropriate drivers, uses `dhcp-client` to set up the network connection, and runs `debootstrap` to install the base system packages. Many more actors play smaller parts in this process, but `debian-installer` has completed its task when you load the new system for the first time.

Upon loading the new base system, `base-config` supervises adding users, setting a time zone (via `tzsetup`), and setting up the package installation system (using `apt-setup`). It then launches `tasksel` which can be used to select large groups of related programs, and in turn can run `aptitude` which allows you to choose individual software packages.

When `debian-installer` finishes, before the first system load, you have only a very basic command line driven system. The graphical interface which displays windows on your monitor will not be installed unless you select it during the final steps, with either `tasksel` or `aptitude`. It's optional because many Debian GNU/Linux systems are servers which don't really have any need for a graphical user interface to do their job.

# 3.2. Back Up Your Existing Data!

Before you start, make sure to back up every file that is now on your system. If this is the first time a non-native operating system has been installed on your computer, it's quite likely you will need to re-partition your disk to make room for Debian GNU/Linux. Anytime you partition your disk, you should count on losing everything on the disk, no matter what program you use to do it. The programs used in installation are quite reliable and most have seen years of use; but they are also quite powerful and a false move can cost you. Even after backing up be careful and think about your answers and actions. Two minutes of thinking can save hours of unnecessary work.

If you are creating a multi-boot system, make sure that you have the distribution media of any other present operating systems on hand. Especially if you repartition your boot drive, you might find that you have to reinstall your operating system's boot loader, or in many cases the whole operating system itself and all files on the affected partitions.

# 3.3. Information You Will Need

## 3.3.1. Documentation

### 3.3.1.1. Installation Manual

The document you are now reading, which is the official version of the Installation Guide for the sarge release of Debian; available in various formats and translations (http://www.debian.org/releases/sarge//installmanual).

### 3.3.1.2. Hardware documentation

Often contains useful information on configuring or using your hardware.

#### 3.3.1.3. S/390 Hardware References

Installation instructions and device drivers (DASD, XPRAM, Console, tape, z90 crypto, chandev, network) for Linux on S/390 using kernel 2.4

- Device Drivers and Installation Commands (http://oss.software.ibm.com/developerworks/opensource/linux390/docu/l

IBM Redbook describing how Linux can be combined with z/VM on zSeries and S/390 hardware.

- Linux for S/390 (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg244987.pdf)

IBM Redbook describing the Linux distributions available for the mainframe. It has no chapter about Debian but the basic installation concepts are the same across all S/390 distributions.

- Linux for IBM eServer zSeries and S/390: Distributions (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg246264.pdf)

### 3.3.2. Finding Sources of Hardware Information

In many cases, the installer will be able to automatically detect your hardware. But to be prepared, we do recommend familiarizing yourself with your hardware before the install.

Hardware information can be gathered from:

- The manuals that come with each piece of hardware.
- The BIOS setup screens of your computer. You can view these screens when you start your computer by pressing a combination of keys. Check your manual for the combination. Often, it is the **Delete** key.
- The cases and boxes for each piece of hardware.
- System commands or tools in another operating system, including file manager displays. This source is especially useful for information about RAM and hard drive memory.
- Your system administrator or Internet Service Provider. These sources can tell you the settings you need to set up your networking and e-mail.

**Table 3-1. Hardware Information Needed for an Install**

| Hardware | Information You Might Need |
|---|---|
| DASD | Device number(s). |
| | Available free space. |
| Network | Type of adapter. |
| | Device numbers. |
| | Relative adapter number for OSA cards. |

### 3.3.3. Hardware Compatibility

Many brand name products work without trouble on Linux. Moreover, hardware for Linux is improving daily. However, Linux still does not run as many different types of hardware as some operating systems.

You can check hardware compatibility by:

- Checking manufacturers' web sites for new drivers.
- Looking at web sites or manuals for information about emulation. Lesser known brands can sometimes use the drivers or settings for better-known ones.
- Checking hardware compatibility lists for Linux on web sites dedicated to your architecture.
- Searching the Internet for other users' experiences.

### 3.3.4. Network Settings

If your computer is connected to a network 24 hours a day (i.e., an Ethernet or equivalent connection — not a PPP connection), you should ask your network's system administrator for this information.

- Your host name (you may be able to decide this on your own).
- Your domain name.
- Your computer's IP address.
- The netmask to use with your network.
- The IP address of the default gateway system you should route to, if your network *has* a gateway.
- The system on your network that you should use as a DNS (Domain Name Service) server.

If you use a wireless network, you should also find out:

- ESSID of your wireless network.
- WEP security key (if applicable).

## 3.4. Meeting Minimum Hardware Requirements

Once you have gathered information about your computer's hardware, check that your hardware will let you do the type of installation that you want to do.

**Table 3-2. Recommended Minimum System Requirements**

| Install Type | RAM | Hard Drive |
|---|---|---|
| No desktop | 24 megabytes | 450 megabytes |
| With Desktop | 64 megabytes | 1 gigabyte |

| Install Type | RAM | Hard Drive |
|---|---|---|
| Server | 128 megabytes | 4 gigabytes |

Here is a sampling of some common Debian system configurations. You can also get an idea of the disk space used by related groups of programs by referring to Section C.3.

Standard Server

This is a small server profile, useful for a stripped down server which does not have a lot of niceties for shell users. It includes an FTP server, a web server, DNS, NIS, and POP. For these 100MB of disk space would suffice, and then you would need to add space for any data you serve up.

Developer

A desktop setup with all the development packages, such as Perl, C, C++, etc. Size is around 475MB. Assuming you are adding X11 and some additional packages for other uses, you should plan around 800MB for this type of machine.

Remember that these sizes don't include all the other materials which are usually to be found, such as user files, mail, and data. It is always best to be generous when considering the space for your own files and data. Notably, the `/var` partition contains a lot of state information specific to Debian in addition to its regular contents like logfiles. The **dpkg** files (with information on all installed packages) can easily consume 20MB. Also, **apt-get** puts downloaded packages here before they are installed. You should usually allocate at least 100MB for `/var`.

## 3.5. Pre-Partitioning for Multi-Boot Systems

Partitioning your disk simply refers to the act of breaking up your disk into sections. Each section is then independent of the others. It's roughly equivalent to putting up walls inside a house; if you add furniture to one room it doesn't affect any other room.

Whenever this section talks about "disks" you should translate this into a DASD or VM minidisk in the S/390 world. Also a machine means an LPAR or VM guest in this case.

If you already have an operating system on your system (VM, z/OS, OS/390, ...) and want to stick Linux on the same disk, you will need to repartition the disk. Debian requires its own hard disk partitions. It cannot be installed on Windows or MacOS partitions. It may be able to share some partitions with other Linux systems, but that's not covered here. At the very least you will need a dedicated partition for the Debian root.

You can find information about your current partition setup by using a partitioning tool for your current operating system, such as the VM diskmap. Partitioning tools always provide a way to show existing partitions without making changes.

In general, changing a partition with a file system already on it will destroy any information there. Thus you should always make backups before doing any repartitioning. Using the analogy of the house, you would probably want to move all the furniture out of the way before moving a wall or you risk destroying it.

If your computer has more than one hard disk, you may want to dedicate one of the hard disks completely to Debian. If so, you don't need to partition that disk before booting the installation system; the installer's included partitioning program can handle the job nicely.

If your machine has only one hard disk, and you would like to completely replace the current operating system with Debian GNU/Linux, you also can wait to partition as part of the installation process (Section 6.3.2.1), after you have booted the installation system. However this only works if you plan to boot the installer system from tapes, CD-ROM or files on a connected machine. Consider: if you boot from files placed on the hard disk, and then partition that same hard disk within the installation system, thus erasing the boot files, you'd better hope the installation is successful the first time around. At the least in this case, you should have some alternate means of reviving your machine like the original system's installation tapes or CDs.

If your machine already has multiple partitions, and enough space can be provided by deleting and replacing one or more of them, then you too can wait and use the Debian installer's partitioning program. You should still read through the material below, because there may be special circumstances like the order of the existing partitions within the partition map, that force you to partition before installing anyway.

If none of the above apply, you'll need to partition your hard disk before starting the installation to create partition-able space for Debian. If some of the partitions will be owned by other operating systems, you should create those partitions using native operating system partitioning programs. We recommend that you do *not* attempt to create partitions for Debian GNU/Linux using another operating system's tools. Instead, you should just create the native operating system's partitions you will want to retain.

If you are going to install more than one operating system on the same machine, you should install all other system(s) before proceeding with Linux installation. Windows and other OS installations may destroy your ability to start Linux, or encourage you to reformat non-native partitions.

You can recover from these actions or avoid them, but installing the native system first saves you trouble.

If you currently have one hard disk with one partition (a common setup for desktop computers), and you want to multi-boot the native operating system and Debian, you will need to:

1. Back up everything on the computer.
2. Boot from the native operating system installer media such as CD-ROM or tapes.
3. Use the native partitioning tools to create native system partition(s). Leave either a place holder partition or free space for Debian GNU/Linux.
4. Install the native operating system on its new partition.
5. Boot back into the native system to verify everything's OK, and to download the Debian installer boot files.
6. Boot the Debian installer to continue installing Debian.

## 3.6. Pre-Installation Hardware and Operating System Setup

This section will walk you through pre-installation hardware setup, if any, that you will need to do prior to installing Debian. Generally, this involves checking and possibly changing firmware settings for your system. The "firmware" is the core software used by the hardware; it is most critically invoked during the bootstrap process (after power-up). Known hardware issues affecting the reliability of Debian GNU/Linux on your system are also highlighted.

### 3.6.1. BIOS Setup

In order to install Debian GNU/Linux on a S/390 or zSeries machine you have first boot a kernel into the system. The boot mechanism of this platform is inherently different to other ones, especially from PC-like systems: there are no floppy devices available at all. You will notice another big difference while you work with this platform: most (if not all) of the time you will work remote, with the help of some client session software like telnet, or a browser. This is due to that special system architecture where the 3215/3270 console is line-based instead of character-based.

Linux on this platform runs either natively on the bare machine, in a so-called LPAR (Logical Partition) or in a virtual machine supplied by the VM system. You can use a boot tape on all of those systems; you may use some other boot media, too, but those may not be generally available. For example, you can use the virtual card reader of a virtual machine, or boot from the HMC (Hardware Management Console) of an LPAR if the HMC and this option is available for you.

Before you actually perform an installation, you have to go over some design and preparation steps. IBM has made documentation available about the whole process, e.g. how to prepare an installation medium and how actually boot from that medium. Duplicating that information here is neither possible nor necessary. However, we will describe here which kind of Debian-specific data is needed and where do you find them. Based on both sources of information you have to prepare your machine and the installation medium and to perform a boot from it. When you see the welcome message in your client session join this document again for the Debian-specific installation steps.

### 3.6.2. Native and LPAR installations

Please refer to chapter 5 of the Linux for S/390 (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg244987.pdf) Redbook and chapter 3.2 of the Linux for IBM eServer zSeries and S/390: Distributions (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg246264.pdf) Redbook on how to set up an LPAR for Linux.

### 3.6.3. Installation as a VM guest

Please refer to chapter 6 of the Linux for S/390 (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg244987.pdf) Redbook and chapter 3.1 of the Linux for IBM eServer zSeries and S/390: Distributions (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg246264.pdf) Redbook on how to set up a VM guest for running Linux.

You need to copy all the files from the `generic` sub-directory to your CMS disk. Be sure to transfer `kernel.debian` and `initrd.debian` in binary mode with a fixed record length of 80 characters.

### 3.6.4. Setting up an installation server

If you don't have a connection to the Internet (either directly or via a web proxy) you need to create a local installation server that can be accessed from your S/390. This server keeps all the packages you want to install and must make them available using NFS, HTTP or FTP.

The installation server needs to copy the exact directory structure from any Debian GNU/Linux mirror but of only the s390 and architecture-independent files are required. You can also copy the contents of all installation CDs into such a directory tree.

## 3.6.5. Hardware Issues to Watch Out For

### 3.6.5.1. More than 64 MB RAM

The Linux Kernel cannot always detect what amount of RAM you have. If this is the case please look at Section 5.2.

# Chapter 4. Obtaining System Installation Media

## 4.1. Official Debian GNU/Linux CD-ROM Sets

By far the easiest way to install Debian GNU/Linux is from an Official Debian CD-ROM Set. You can buy a set from a vendor (see the CD vendors page (http://www.debian.org/CD/vendors/)). You may also download the CD-ROM images from a Debian mirror and make your own set, if you have a fast network connection and a CD burner (see the Debian CD page (http://www.debian.org/CD/) for detailed instructions). If you have a Debian CD set and CDs are bootable on your machine, you can skip right to Chapter 5; much effort has been expended to ensure the files most people need are there on the CD. Although a full set of binary packages requires several CDs, it is unlikely you will need packages on the third CD and above. You may also consider using the DVD version, which saves a lot of space on your shelf and you avoid the CD shuffling marathon.

If your machine doesn't support CD booting, but you do have a CD set, you can use an alternative strategy such as tape, emulated tape, or manually loading the kernel from the CD to initially boot the system installer. The files you need for booting by another means are also on the CD; the Debian network archive and CD folder organization are identical. So when archive file paths are given below for particular files you need for booting, look for those files in the same directories and subdirectories on your CD.

Once the installer is booted, it will be able to obtain all the other files it needs from the CD.

If you don't have a CD set, then you will need to download the installer system files and place them on the installation tape so they can be used to boot the installer.

## 4.2. Downloading Files from Debian Mirrors

To find the nearest (and thus probably the fastest) mirror, see the list of Debian mirrors (http://www.debian.org/distrib/ftplist).

When downloading files from a Debian mirror, be sure to download the files in *binary* mode, not text or automatic mode.

### 4.2.1. Where to Find Installation Images

The installation images are located on each Debian mirror in the directory debian/dists/sarge/main/installer-s390/current/images/ (http://http.us.debian.org/debian/dists/sarge/main/installer-s390/current//images) — the MANIFEST (http://http.us.debian.org/debian/dists/sarge/main/installer-s390/current//images/MANIFEST) lists each image and its purpose.

## 4.3. Creating an IPL tape

If you can't boot (IPL) from the CD-ROM and you are not using VM you need to create an IPL tape

first. This is described in section 3.4.3 in the Linux for IBM eServer zSeries and S/390: Distributions (http://www.redbooks.ibm.com/pubs/pdfs/redbooks/sg246264.pdf) Redbook. The files you need to write to the tape are (in this order): `kernel.debian`, `parmfile.debian` and `initrd.debian`. The files can be downloaded from the `tape` sub-directory, see Section 4.2.1,

# 4.4. Automatic Installation

For installing on multiple computers it's possible to do fully automatic installations. Debian packages intended for this include `fai` (which uses an install server), `replicator`, `systemimager`, `autoinstall`, and the Debian Installer itself.

## 4.4.1. Automatic Installation Using the Debian Installer

The Debian Installer supports automating installs via preconfiguration files. A preconfiguration file can be loaded from the network or from removable media, and used to fill in answers to questions asked during the installation process.

Although most dialogs used by `debian-installer` can be preseeded using this method, there are some notable exceptions. You can (re)partition an entire disk or use available free space on a disk; it is not possible to use existing partitions. You currently cannot use preseeding to set up RAID and LVM. Also, with the exception of network driver modules, it is not possible to preconfigure kernel module parameters.

The preconfiguration file is in the format used by the debconf-set-selections command. A well documented and working example that you can edit is in Section C.1.

Alternatively, one way to get a complete file listing all the values that can be preseeded is to do a manual install, and then use `debconf-get-selections`, from the `debconf-utils` package, to dump both the debconf database and the cdebconf database in /var/log/debian-installer/cdebconf to a single file:

```
$ debconf-get-selections --installer > file
$ debconf-get-selections >> file
```

However, a file generated in this manner will have some items that should not be preseeded, and the file in Section C.1 is a better starting place for most users.

Once you have a preconfiguration file, you can edit it if necessary, and place it on a web server, or copy it onto the installer's boot media. Wherever you place the file, you need to pass a parameter to the installer at boot time to tell it to use the file.

To make the installer use a preconfiguration file downloaded from the network, add preseed/url=http://url/to/preseed.cfg to the kernel boot parameters. Of course the preconfiguration will not take effect until the installer manages to set up the network to download the file, so this is most useful if the installer can set up the network via DHCP without asking any questions. You may want to set the installation priority to critical to avoid any questions while the network is being configured. See Section 5.2.1.

To place a preconfiguration file on a CD, you would need to remaster the ISO image to include your preconfiguration file. See the manual page for mkisofs for details. Alternatively, put the preseed file on a floppy, and use preseed/file=/floppy/preseed.cfg

# Chapter 5. Booting the Installation System

## 5.1. Booting the Installer on S/390

### 5.1.1. s390 Limitations

In order to run the installation system a working network setup and ssh session is needed on S/390.

The booting process starts with a network setup that prompts you for several network parameters. If the setup is successful, you will login to the system by starting a ssh session which will launch the standard installation system.

### 5.1.2. s390 Boot Parameters

On S/390 you can append boot parameters in the parm file. This file can either be in ASCII or EBCDIC format. Please read Device Drivers and Installation Commands (http://oss.software.ibm.com/developerworks/opensource/linux390/docu/l390dd08.pdf) for more information about S/390-specific boot parameters.

## 5.2. Boot Parameters

Boot parameters are Linux kernel parameters which are generally used to make sure that peripherals are dealt with properly. For the most part, the kernel can auto-detect information about your peripherals. However, in some cases you'll have to help the kernel a bit.

If this is the first time you're booting the system, try the default boot parameters (i.e., don't try setting parameters) and see if it works correctly. It probably will. If not, you can reboot later and look for any special parameters that inform the system about your hardware.

Information on many boot parameters can be found in the Linux BootPrompt HOWTO (http://www.tldp.org/HOWTO/BootPrompt-HOWTO.html), including tips for obscure hardware. This section contains only a sketch of the most salient parameters. Some common gotchas are included below in Section 5.3.

When the kernel boots, a message

```
Memory:availk/totalk available
```

should be emitted early in the process. *total* should match the total amount of RAM, in kilobytes. If this doesn't match the actual amount of RAM you have installed, you need to use the **mem=*ram*** parameter, where *ram* is set to the amount of memory, suffixed with "k" for kilobytes, or "m" for megabytes. For example, both **mem=65536k** and **mem=64m** mean 64MB of RAM.

### 5.2.1. Debian Installer Parameters

The installation system recognizes a few additional boot parameters[1] which may be useful.

debconf/priority

This parameter sets the lowest priority of messages to be displayed.

The default installation uses **debconf/priority=high**. This means that both high and critical priority messages are shown, but medium and low priority messages are skipped. If problems are encountered, the installer adjusts the priority as needed.

If you add **debconf/priority=medium** as boot parameter, you will be shown the installation menu and gain more control over the installation. When **debconf/priority=low** is used, all messages are shown (this is equivalent to the *expert* boot method). With **debconf/priority=critical**, the installation system will display only critical messages and try to do the right thing without fuss.

DEBIAN_FRONTEND

This boot parameter controls the type of user interface used for the installer. The current possible parameter settings are:

- **DEBIAN_FRONTEND=noninteractive**
- **DEBIAN_FRONTEND=text**
- **DEBIAN_FRONTEND=newt**
- **DEBIAN_FRONTEND=slang**
- **DEBIAN_FRONTEND=ncurses**
- **DEBIAN_FRONTEND=bogl**
- **DEBIAN_FRONTEND=gtk**
- **DEBIAN_FRONTEND=corba**

The default front end is **DEBIAN_FRONTEND=newt**. **DEBIAN_FRONTEND=text** may be preferable for serial console installs. Generally only the **newt** frontend is available on default install media, so this is not very useful right now.

BOOT_DEBUG

Setting this boot parameter to 2 will cause the installer's boot process to be verbosely logged. Setting it to 3 makes debug shells available at strategic points in the boot process. (Exit the shells to continue the boot process.)

**BOOT_DEBUG=0**

This is the default.

**BOOT_DEBUG=1**

More verbose than usual.

**BOOT_DEBUG=2**

Lots of debugging information.

1. Note that the kernel accepts a maximum of 8 command line options and 8 environment options (including any options added by default for the installer). If these numbers are exceeded, 2.4 kernels will drop any excess options and 2.6 kernels will panic.

**BOOT_DEBUG=3**

Shells are run at various points in the boot process to allow detailed debugging. Exit the shell to continue the boot.

INSTALL_MEDIA_DEV

The value of the parameter is the path to the device to load the Debian installer from. For example, **INSTALL_MEDIA_DEV=/dev/floppy/0**

The boot floppy, which normally scans all floppies and USB storage devices it can to find the root floppy, can be overridden by this parameter to only look at the one device.

debian-installer/framebuffer

Some architectures use the kernel framebuffer to offer installation in a number of languages. If framebuffer causes a problem on your system you can disable the feature by the parameter **debian-installer/framebuffer=false**. Problem symptoms are error messages about bterm or bogl, a blank screen, or a freeze within a few minutes after starting the install.

debian-installer/probe/usb

Set to **false** to prevent probing for USB on boot, if that causes problems.

netcfg/disable_dhcp

By default, the `debian-installer` automatically probes for network configuration via DHCP. If the probe succeeds, you won't have a chance to review and change the obtained settings. You can get to the manual network setup only in case the DHCP probe fails.

If you have a DHCP server on your local network, but want to avoid it because e.g. it gives wrong answers, you can use the parameter **netcfg/disable_dhcp=true** to prevent configuring the network with DHCP and to enter the information manually.

hw-detect/start_pcmcia

Set to **false** to prevent starting PCMCIA services, if that causes problems. Some laptops are well known for this misbehavior.

preseed/url

Specify the url to a preconfiguration file to download and use in automating the install. See Section 4.4.

preseed/file

Specify the path to a preconfiguration file to load to automating the install. See Section 4.4.

ramdisk_size

If you are using a 2.2.x kernel, you may need to set **ramdisk_size=13000** .

## 5.3. Troubleshooting the Installation Process

### 5.3.1. Boot Configuration

If you have problems and the kernel hangs during the boot process, doesn't recognize peripherals you actually have, or drives are not recognized properly, the first thing to check is the boot parameters, as discussed in Section 5.2.

If you are booting with your own kernel instead of the one supplied with the installer, be sure that **CONFIG_DEVFS** is set in your kernel. The installer requires **CONFIG_DEVFS**.

Often, problems can be solved by removing add-ons and peripherals, and then trying booting again.

If you have a large amount of memory installed in your machine, more than 512M, and the installer hangs when booting the kernel, you may need to include a boot argument to limit the amount of memory the kernel sees, such as **mem=512m**.

### 5.3.2. Interpreting the Kernel Startup Messages

During the boot sequence, you may see many messages in the form `can't find` *`something`* , or *`something`* `not present`, `can't initialize` *`something`* , or even `this driver release depends on` *`something`* . Most of these messages are harmless. You see them because the kernel for the installation system is built to run on computers with many different peripheral devices. Obviously, no one computer will have every possible peripheral device, so the operating system may emit a few complaints while it looks for peripherals you don't own. You may also see the system pause for a while. This happens when it is waiting for a device to respond, and that device is not present on your system. If you find the time it takes to boot the system unacceptably long, you can create a custom kernel later (see Section 8.4).

### 5.3.3. Bug Reporter

If you get through the initial boot phase but cannot complete the install, the bug reporter menu choice may be helpful. It copies system error logs and configuration information to a user-supplied floppy. This information may provide clues as to what went wrong and how to fix it. If you are submitting a bug report you may want to attach this information to the bug report.

Other pertinent installation messages may be found in `/var/log/` during the installation, and `/var/log/debian-installer/` after the computer has been booted into the installed system.

### 5.3.4. Submitting Installation Reports

If you still have problems, please submit an installation report. We also encourage installation reports to be sent even if the installation is successful, so that we can get as much information as possible on the largest number of hardware configurations.

Please use this template when filling out installation reports, and file the report as a bug report against the `installation-reports` pseudo package, by sending it to <`submit@bugs.debian.org`>.

```
Package: installation-reports

Boot method: <How did you boot the installer? CD? floppy? network?>
Image version: <Fill in date and from where you got the image>
Date: <Date and time of the install>

Machine: <Description of machine (eg, IBM Thinkpad R32)>
```

```
Processor:
Memory:
Partitions: <df -Tl will do; the raw partition table is preferred>

Output of lspci and lspci -n:

Base System Installation Checklist:
[O] = OK, [E] = Error (please elaborate below), [ ] = didn't try it

Initial boot worked:    [ ]
Configure network HW:   [ ]
Config network:         [ ]
Detect CD:              [ ]
Load installer modules: [ ]
Detect hard drives:     [ ]
Partition hard drives:  [ ]
Create file systems:    [ ]
Mount partitions:       [ ]
Install base system:    [ ]
Install boot loader:    [ ]
Reboot:                 [ ]

Comments/Problems:

<Description of the install, in prose, and any thoughts, comments
      and ideas you had during the initial install.>
```

In the bug report, describe what the problem is, including the last visible kernel messages in the event of a kernel hang. Describe the steps that you did which brought the system into the problem state.

# Chapter 6. Using the Debian Installer

## 6.1. How the Installer Works

The Debian Installer consists of a number of special-purpose components to perform each installation task. Each component performs its task, asking the user questions as necessary to do its job. The questions themselves are given priorities, and the priority of questions to be asked is set when the installer is started.

When a default installation is performed, only essential (high priority) questions will be asked. This results in a highly automated installation process with little user interaction. Components are automatically run in sequence; which components are run depends mainly on the installation method you use and on your hardware. The installer will use default values for questions that are not asked.

If there is a problem, the user will see an error screen, and the installer menu may be shown in order to select some alternative action. If there are no problems, the user will never see the installer menu, but will simply answer questions for each component in turn. Serious error notifications are set to priority "critical" so the user will always be notified.

Some of the defaults that the installer uses can be influenced by passing boot arguments when `debian-installer` is started. If, for example, you wish to force static network configuration (DHCP is used by default if available), you could add the boot parameter **`netcfg/disable_dhcp=true`**. See Section 5.2.1 for available options.

Power users may be more comfortable with a menu-driven interface, where each step is controlled by the user rather than the installer performing each step automatically in sequence. To use the installer in a manual, menu-driven way, add the boot argument **`debconf/priority=medium`**.

If your hardware requires you to pass options to kernel modules as they are installed, you will need to start the installer in "expert" mode. This can be done by either using the **expert** command to start the installer or by adding the boot argument **`debconf/priority=low`**. Expert mode gives you full control over `debian-installer`.

The normal installer display is character-based (as opposed to the now more familiar graphical interface). The mouse is not operational in this environment. Here are the keys you can use to navigate within the various dialogs. The **Tab** or **right** arrow keys move "forward", and the **Shift-Tab** or **left** arrow keys move "backward" between displayed buttons and selections. The **up** and **down** arrow select different items within a scrollable list, and also scroll the list itself. In addition, in long lists, you can type a letter to cause the list to scroll directly to the section with items starting with the letter you typed and use **Pg-Up** and **Pg-Down** to scroll the list in sections. The **space bar** selects an item such as a checkbox. Use **Enter** to activate choices.

S/390 does not support virtual consoles. You may open a second and third ssh session to view the logs described below.

Error messages are redirected to the third console. You can access this console by pressing **Left Alt-F3** (hold the left **Alt** key while pressing the **F3** function key); get back to the main installer process with **Left Alt-F1**.

These messages can also be found in `/var/log/messages`. After installation, this log is copied to `/var/log/debian-installer/messages` on your new system. Other installation messages may be found in `/var/log/` during the installation, and `/var/log/debian-installer/` after the computer has been booted into the installed system.

## 6.2. Components Introduction

Here is a list of installer components with a brief description of each component's purpose. Details you might need to know about using a particular component are in Section 6.3.

main-menu

Shows the list of components to the user during installer operation, and starts a component when it is selected. Main-menu's questions are set to priority medium, so if your priority is set to high or critical (high is the default), you will not see the menu. On the other hand, if there is an error which requires your intervention, the question priority may be downgraded temporarily to allow you to resolve the problem, and in that case the menu may appear.

You can get to the main menu by selecting the "Back" button repeatedly to back all the way out of the currently running component.

languagechooser

Shows a list of languages and language variants. The installer will display messages in the chosen language, unless the translation for that language is not complete. When a translation is not complete, English messages are shown.

countrychooser

Shows a list of countries. The user may choose the country he lives in.

kbd-chooser

Shows a list of keyboards, from which the user chooses the model which matches his own.

hw-detect

Automatically detects most of the system's hardware, including network cards, disk drives, and PCMCIA.

cdrom-detect

Looks for and mounts a Debian installation CD.

netcfg

Configures the computer's network connections so it can communicate over the internet.

iso-scan

Looks for ISO file systems, which may be on a CD-ROM or on the hard drive.

choose-mirror

Presents a list of Debian archive mirrors. The user may choose the source of his installation packages.

cdrom-checker

Checks integrity of a CD-ROM. This way the user may assure him/herself that the installation CD-ROM was not corrupted.

lowmem

Lowmem tries to detect systems with low memory and then does various tricks to remove unnecessary parts of `debian-installer` from the memory (at the cost of some features).

anna

Anna's Not Nearly APT. Installs packages which have been retrieved from the chosen mirror or CD.

partman

Allows the user to partition disks attached to the system, create file systems on the selected partitions, and attach them to the mountpoints. Included are also interesting features like a fully automatic mode or LVM support. This is the preferred partitioning tool in Debian.

autopartkit

Automatically partitions an entire disk according to preset user preferences.

partitioner

Allows the user to partition disks attached to the system. A partitioning program appropriate to your computer's architecture is chosen.

partconf

Displays a list of partitions, and creates file systems on the selected partitions according to user instructions.

lvmcfg

Helps the user with the configuration of the *LVM* (Logical Volume Manager).

mdcfg

Allows the user to setup Software *RAID* (Redundant Array of Inexpensive Disks). This Software RAID is usually superior to the cheap IDE (pseudo hardware) RAID controllers found on newer motherboards.

base-installer

Installs the most basic set of packages which would allow the computer to operate under Linux when rebooted.

os-prober

Detects currently installed operating systems on the computer and passes this information to the bootloader-installer, which may offer you an ability to add discovered operating systems to the bootloader's start menu. This way the user could easily choose at the boot time which operating system to start.

bootloader-installer

Installs a boot loader program on the hard disk, which is necessary for the computer to start up using Linux without using a floppy or CD-ROM. Many boot loaders allow the user to choose an alternate operating system each time the computer boots.

base-config

Provides dialogs for setting up the base system packages according to user preferences. This is normally done after rebooting the computer; it is the "first run" of the new Debian system.

shell

Allows the user to execute a shell from the menu, or in the second console.

bugreporter

Provides a way for the user to record information on a floppy disk when trouble is encountered, in order to accurately report installer software problems to Debian developers later.

# 6.3. Using Individual Components

In this section we will describe each installer component in detail. The components have been grouped into stages that should be recognizable for users. They are presented in the order they appear during the install. Note that not all modules will be used for every installation; which modules are actually used depends on the installation method you use and on your hardware.

## 6.3.1. Setting up Debian Installer and Hardware Configuration

Let's assume the Debian Installer has booted and you are facing its first screen. At this time, the capabilities of `debian-installer` are still quite limited. It doesn't know much about your hardware, preferred language, or even the task it should perform. Don't worry. Because `debian-installer` is quite clever, it can automatically probe your hardware, locate the rest of its components and upgrade itself to a capable installation system. However, you still need to help `debian-installer` with some information it can't determine automatically (like selecting your preferred language, keyboard layout or desired network mirror).

You will notice that `debian-installer` performs *hardware detection* several times during this stage. The first time is targeted specifically at the hardware needed to load installer components (e.g. your CD-ROM or network card). As not all drivers may be available during this first run, hardware detection needs to be repeated later in the process.

### 6.3.1.1. Check available memory

One of the first things `debian-installer` does, is to check available memory. If the available memory is limited, this component will make some changes in the installation process which hopefully will allow you to install Debian GNU/Linux on your system.

During a low memory install, not all components will be available. One of the limitations is that you won't be able to choose a language for the installation.

### 6.3.1.2. Language selection

As the first step of the installation, select the language in which you want the installation process to proceed. The language names are listed in both English (left side) and in the language itself (right side); the names on the right side are also shown in the proper script for the language. The list is sorted on the English names.

The language you choose will be used for the rest of the installation process, provided a translation of the different dialogs is available. If no valid translation is available for the selected language, the installer will default to English. The selected language will also be used to help select a suitable keyboard layout.

#### 6.3.1.3. Country selection

If you selected a language in Section 6.3.1.2 which has more than one country associated with it (true for Chinese, English, French, and many other languages), you can specify the country here. If you choose Other at the bottom of the list, you will be presented with a list of all countries, grouped by continent.

This selection will be used later in the installation process to pick the default timezone and a Debian mirror appropriate for your geographic location. If the defaults proposed by the installer are not suitable, you can make a different choice. The selected country, together with the selected language, may also affect locale settings for your new Debian system.

#### 6.3.1.4. Choosing a Keyboard

Keyboards are often tailored to the characters used in a language. Select a layout that conforms to the keyboard you are using, or select something close if the keyboard layout you want isn't represented. Once the system installation is complete, you'll be able to select a keyboard layout from a wider range of choices (run **kbdconfig** as root after you have completed the installation).

Move the highlight to the keyboard selection you desire and press **Enter**. Use the arrow keys to move the highlight — they are in the same place in all national language keyboard layouts, so they are independent of the keyboard configuration. An 'extended' keyboard is one with **F1** through **F10** keys along the top row.

#### 6.3.1.5. Looking for the Debian Installer ISO Image

When installing via the *hd-media* method, there will be a moment where you need to find and mount the Debian Installer iso image in order to get the rest of the installation files. The component **iso-scan** does exactly this.

At first, **iso-scan** automatically mounts all block devices (e.g. partitions) which have some known filesystem on them and sequentially searches for filenames ending with `.iso` (or `.ISO` for that matter). Beware that the first attempt scans only files in the root directory and in the first level of subdirectories (i.e. it finds `/`*`whatever`*`.iso`, `/data/`*`whatever`*`.iso`, but not `/data/tmp/`*`whatever`*`.iso`). After an iso image has been found, **iso-scan** checks its content to determine if the image is a valid Debian iso image or not. In the former case we are done, in the latter **iso-scan** seeks for another image.

In case the previous attempt to find an installer iso image fails, **iso-scan** will ask you whether you would like to perform a more thorough search. This pass doesn't just look into the topmost directories, but really traverses whole filesystem.

If **iso-scan** does not discover your installer iso image, reboot back to your original operating system and check if the image is named correctly (ending in `.iso`), if it is placed on a filesystem recognizable by `debian-installer`, and if it is not corrupted (verify the checksum). Experienced Unix users could do this without rebooting on the second console.

#### 6.3.1.6. Configuring Network

As you enter this step, if the system detects that you have more than one network device, you'll be asked to choose which device will be your *primary* network interface, i.e. the one which you want to use for installation. The other interfaces won't be configured at this time. You may configure additional interfaces after installation is complete; see the interfaces(5) man page.

By default, `debian-installer` tries to configure your computer's network automatically via DHCP. If the DHCP probe succeeds, you are done. If the probe fails, it may be caused by many factors ranging from unplugged network cable, to a misconfigured DHCP setup. Or maybe you don't have a DHCP server in your local network at all. For further explanation check the error messages on the third console. In any case, you will be asked if you want to retry, or if you want to perform manual setup. DHCP servers are sometimes really slow in their responses, so if you are sure everything is in place, try again.

The manual network setup in turn asks you a number of questions about your network, notably `IP address`, `Netmask`, `Gateway`, `Name server addresses`, and a `Hostname`. Moreover, if you have a wireless network interface, you will be asked to provide your `Wireless ESSID` and a `WEP key`. Fill in the answers from Section 3.3.

> **Note:** Some technical details you might, or might not, find handy: the program assumes the network IP address is the bitwise-AND of your system's IP address and your netmask. It will guess the broadcast address is the bitwise OR of your system's IP address with the bitwise negation of the netmask. It will also guess your gateway. If you can't find any of these answers, use the system's guesses — you can change them once the system has been installed, if necessary, by editing `/etc/network/interfaces`. Alternatively, you can install `etherconf`, which will step you through your network setup.

## 6.3.2. Partitioning and Mount Point Selection

At this time, after hardware detection has been executed a final time, `debian-installer` should be at its full strength, customized for the user's needs and ready to do some real work. As the title of this section indicates, the main task of the next few components lies in partitioning your disks, creating filesystems, assigning mountpoints and optionally configuring closely related issues like LVM or RAID devices.

### 6.3.2.1. Partitioning Your Disks

Now it is time to partition your disks. If you are uncomfortable with partitioning, or just want to know more details, see Appendix B.

First you will be given the opportunity to automatically partition either an entire drive, or free space on a drive. This is also called "guided" partitioning. If you do not want to autopartition, choose Manually edit partition table from the menu.

If you choose guided partitioning, you will be able to choose from the schemes listed in the table below. All schemes have their pros and cons, some of which are discussed in Appendix B. If you are unsure, choose the first one. Bear in mind, that guided partitioning needs certain minimal amount of free space to operate with. If you don't give it at least about 1GB of space (depends on chosen scheme), guided partitioning will fail.

| Partitioning scheme | Minimum space | Created partitions |
|---|---|---|
| All files in one partition | 600MB | `/`, swap |
| Desktop machine | 500MB | `/`, `/home`, swap |
| Multi-user workstation | 1GB | `/`, `/home`, `/usr`, `/var`, `/tmp`, swap |

After selecting a scheme, the next screen will show your new partition table, including information on whether and how partitions will be formatted and where they will be mounted.

The list of partitions might look like this:

```
IDE1 master (hda) - 6.4 GB WDC AC36400L
      #1 primary   16.4 MB     ext2       /boot
      #2 primary  551.0 MB     swap       swap
      #3 primary    5.8 GB     ntfs
         pri/log    8.2 MB     FREE SPACE

IDE1 slave (hdb) - 80.0 GB ST380021A
      #1 primary   15.9 MB     ext3
      #2 primary  996.0 MB     fat16
      #3 primary    3.9 GB     xfs        /home
      #5 logical    6.0 GB     ext3       /
      #6 logical    1.0 GB     ext3       /var
      #7 logical  498.8 MB     ext3
      #8 logical  551.5 MB     swap       swap
      #9 logical   65.8 GB     ext2
```

This example shows two IDE harddrives divided into several partitions; the first disk has some free space. Each partition line consists of the partition number, its type, size, optional flags, file system, and mountpoint (if any).

This concludes the guided partitioning. If you are satisfied with the generated partition table, you can choose Finish partitioning and write changes to disk from the menu to implement the new partition table (as described at the end of this section). If you are not happy, you can choose to Undo changes to partitions, to run guided partitioning again or modify the proposed changes as described below for manual partitioning.

A similar screen to the one shown just above will be displayed if you choose manual partitioning except that your existing partition table will be shown and without the mount points. How to manually setup your partition table and the usage of partitions by your new Debian system will be covered in the remainder of this section.

If you select a pristine disk which doesn't have neither partitions nor free space on it, you will be offered to create a new partition table (this is needed so you can create new partitions). After this a new line entitled "FREE SPACE" should appear under the selected disk.

If you select some free space, you will be offered to create new partition. You will have to answer a quick series of questions about its size, type (primary or logical), and location (beginning or end of the free space). After this, you will be presented with detailed overview of your new partition. There are options like mountpoint, mount options, bootable flag, or way of usage. If you don't like the preselected defaults, feel free to change them to your liking. E.g. by selecting the option Use as:, you can choose different filesystem for this partition including the possibility to use the partition for swap, software RAID, LVM, or not use it at all. Other nice feature is the possibility to copy data from existing partition onto this one. When you are satisfied with your new partition, select Done setting up the partition and you will be thrown back to the **partman**'s main screen.

If you decide you want to change something about your partition, simply select the partition, which will bring you to the partition configuration menu. Because this is the same screen like when creating a new partition, you can change the same set of options. One thing which might not be very obvious at a first glance is that you can resize the partition by selecting the item displaying the size of the partition. Filesystems known to work are at least fat16, fat32, ext2, ext3 and swap. This menu also allows you to delete a partition.

Be sure to create at least two partitions: one for the *root* filesystem (which must be mounted as `/`) and one for *swap*. If you forget to mount the root filesystem, **partman** won't let you continue until you correct this issue.

Capabilities of **partman** can be extended with installer modules, but are dependent on your system's architecture. So if you can't see all promised goodies, check if you have loaded all required modules (e.g. `partman-ext3`, `partman-xfs`, or `partman-lvm`).

After you are satisfied with partitioning, select Finish partitioning and write changes to disk from the partitioning menu. You will be presented with a summary of changes made to the disks and asked to confirm that the filesystems should be created as requested.

### 6.3.2.2. Configuring Logical Volume Manager (LVM)

If you are working with computers at the level of system administrator or "advanced" user, you have surely seen the situation where some disk partition (usually the most important one) was short on space, while some other partition was grossly underused and you had to manage this situation with moving stuff around, symlinking, etc.

To avoid the described situation you can use Logical Volume Manager (LVM). Simply said, with LVM you can combine your partitions (*physical volumes* in LVM lingo) to form a virtual disc (so called *volume group*), which can then be divided into virtual partitions (*logical volumes*). The point is that logical volumes (and of course underlying volume groups) can span across several physical discs.

Now when you realize you need more space for your old 160GB `/home` partition, you can simply add a new 300GB disc to the computer, join it with your existing volume group and then resize the logical volume which holds your `/home` filesystem and voila — your users have some room again on their renewed 460GB partition. This example is of course a bit oversimplified. If you haven't read it yet, you should consult the LVM HOWTO (http://www.tldp.org/HOWTO/LVM-HOWTO.html).

LVM setup in `debian-installer` is quite simple. At first, you have to mark your partitions to be used as physical volumes for LVM. (This is done in **partman** in the Partition settings menu where you should select Use as:⟶physical volume for LVM.) Then start the **lvmcfg** module (either directly from **partman** or from the `debian-installer`'s main menu) and combine physical volumes to volume group(s) under the Modify volume groups (VG) menu. After that, you should create logical volumes on the top of volume groups from the menu Modify logical volumes (LV).

After returning from **lvmcfg** back to **partman**, you will see any created logical volumes in the same way as ordinary partitions (and you should treat them like that).

### 6.3.2.3. Configuring Multidisk Device (Software RAID)

If you have more than one harddrive[1] in your computer, you can use **mdcfg** to setup your drives for increased performance and/or better reliability of your data. The result is called *Multidisk Device* (or after its most famous variant *software RAID*).

MD is basically a bunch of partitions located on different disks and combined together to form a *logical* device. This device can then be used like an ordinary partition (i.e. in **partman** you can format it, assign a mountpoint, etc.).

The benefit you gain depends on a type of a MD device you are creating. Currently supported are:

1. To be honest, you can construct MD device even from partitions residing on single physical drive, but that won't bring you anything useful.

RAID0

Is mainly aimed at performance. RAID0 splits all incoming data into *stripes* and distributes them equally over each disk in the array. This can increase the speed of read/write operations, but when one of the disks fails, you will loose *everything* (part of the information is still on the healthy disk(s), the other part *was* on the failed disk).

The typical use for RAID0 is a partition for video editing.

RAID1

Is suitable for setups where reliability is the first concern. It consists of several (usually two) equally sized partitions where every partition contains exactly the same data. This essentially means three things. First, if one of your disks fails, you still have the data mirrored on the remaining disks. Second, you can use only a fraction of the available capacity (more precisely, it is the size of the smallest partition in the RAID). Third, file reads are load balanced among the disks, which can improve performance on a server, such as a file server, that tends to be loaded with more disk reads than writes.

Optionally you can have a spare disk in the array which will take the place of the failed disk in the case of failure.

RAID5

Is a good compromise between speed, reliability and data redundancy. RAID5 splits all incomming data into stripes and distributes them equally on all but one disks (similar to RAID0). Unlike RAID0, RAID5 also computes *parity* information, which gets written on the remaining disk. The parity disk is not static (that would be called RAID4), but is changing periodically, so the parity information is distributed equally on all disks. When one of the disks fails, the missing part of information can be computed from remaining data and its parity. RAID5 must consist of at least three active partitions. Optionally you can have a spare disk in the array which will take the place of the failed disk in the case of failure.

As you can see, RAID5 has similar degree of reliability like RAID1 while achieving less redundancy. On the other hand it might be a bit slower on write operation than RAID0 due to computation of parity information.

To sum it up:

| **Type** | **Minimum Devices** | **Spare Device** | **Survives disk failure?** | **Available Space** |
|---|---|---|---|---|
| RAID0 | 2 | no | no | Size of the smallest partition multiplied by number of devices in RAID |
| RAID1 | 2 | optional | yes | Size of the smallest partition in RAID |
| RAID5 | 3 | optional | yes | Size of the smallest partition multiplied by (number of devices in RAID minus one) |

If you want to know the whole truth about Software RAID, have a look at Software RAID HOWTO (http://www.tldp.org/HOWTO/Software-RAID-HOWTO.html).

To create a MD device, you need to have the desired partitions it should consist of marked for use in a RAID. (This is done in **partman** in the Partition settings menu where you should select Use as:⟶physical volume for RAID.)

**Warning**

Support for MD is a relatively new addition to the installer. You may experience problems for some RAID levels and in combination with some bootloaders if you try to use MD for the root (/) filesystem. For experienced users, it may be possible to work around some of these problems by executing some configuration or installation steps manually from a shell.

Next, you should choose Configure software RAID from the main **partman** menu. On the first screen of **mdcfg** simply select Create MD device. You will be presented with a list of supported types of MD devices, from which you should choose one (e.g. RAID1). What follows depends on the type of MD you selected.

- RAID0 is simple — you will be issued with the list of available RAID partitions and your only task is to select the partitions which will form the MD.
- RAID1 is a bit more tricky. First, you will be asked to enter the number of active devices and the number of spare devices which will form the MD. Next, you need to select from the list of available RAID partitions those that will be active and then those that will be spare. The count of selected partitions must be equal to the number provided few seconds ago. Don't worry. If you make a mistake and select different number of partitions, the `debian-installer` won't let you continue until you correct the issue.
- RAID5 has similar setup procedure as RAID1 with the exception that you need to use at least *three* active partitions.

It is perfectly possible to have several types of MD at once. For example if you have three 200 GB hard drives dedicated to MD, each containing two 100 GB partitions, you can combine first partitions on all three disk into the RAID0 (fast 300 GB video editing partition) and use the other three partitions (2 active and 1 spare) for RAID1 (quite reliable 100 GB partition for `/home`).

After you setup MD devices to your liking, you can Finish **mdcfg** to return back to the **partman** to create filesystems on your new MD devices and assign them the usual attributes like mountpoints.

## 6.3.3. Installing the Base System

Although this stage is the least problematic, it consumes most time of the install because it downloads, verifies and unpacks the whole base system. If you have a slow computer or network connection, this could take some time.

### 6.3.3.1. Base System Installation

During the Base installation, package unpacking and setup messages are redirected to **`tty3`**. You can access this terminal by pressing **Left Alt-F3**; get back to the main installer process with **Left Alt-F1**.

The unpack/setup messages generated by the base installation are saved in `/var/log/messages` when the installation is performed over a serial console.

As part of the installation, a Linux kernel will be installed. At the default priority, the installer will choose one for you that best matches your hardware. In lower priority modes, you will be able to choose from a list of available kernels.

## 6.3.4. Making Your System Bootable

Note that multiple operating systems booting on a single machine is still something of a black art. This document does not even attempt to document the various boot managers, which vary by architecture and even by subarchitecture. You should see your boot manager's documentation for more information.

### 6.3.4.1. Detecting other operating systems

Before a boot loader is installed, the installer will attempt to probe for other operating systems which are installed on the machine. If it finds a supported operating system, you will be informed of this during the boot loader installation step, and the computer will be configured to boot this other operating system in addition to Debian.

Note that multiple operating systems booting on a single machine is still something of a black art. The automatic support for detecting and setting up boot loaders to boot other operating systems varies by architecture and even by subarchitecture. If it does not work you should consult your boot manager's documentation for more information.

> **Note:** The installer may fail to detect other operating systems if the partitions on which they reside are mounted when the detection takes place. This may occur if you select a mountpoint (e.g. /win) for a partition containing another operating system in **partman**, or if you have mounted partitions manually from a console.

### 6.3.4.2. zipl-installer

The boot loader on S/390 is "zipl". **ZIPL** is similar in configuration and usage to **LILO**, with a few exceptions. Please take a look at "LINUX for S/390 Device Drivers and Installation Commands" from IBM's developerWorks web site if you want to know more about **ZIPL**.

### 6.3.4.3. Continue Without Boot Loader

This option can be used to complete the installation even when no boot loader is to be installed, either because the arch/subarch doesn't provide one, or because none is desired (e.g. you will use existing boot loader).

If you plan to manually configure your bootloader, you should check the name of the installed kernel in `/target/boot`. You should also check that directory for the presence of an *initrd*; if one is present, you will probably have to instruct your bootloader to use it. Other information you will need are the disk and partition you selected for your `/` filesystem and, if you chose to install `/boot` on a separate partition, also your `/boot` filesystem.

## 6.3.5. Finishing the First Stage

These are the last bits to do before rebooting to your new Debian. It mostly consists of tidying up after the `debian-installer`.

### 6.3.5.1. Finish the Installation and Reboot

This is the last step in the initial Debian installation process. You will be prompted to remove the boot media (CD, floppy, etc) that you used to boot the installer. The installer will do any last minute tasks, and then reboot into your new Debian system.

Select the Finish the installation menu item which will halt the system because rebooting is not supported on S/390 in this case. You then need to IPL GNU/Linux from the DASD which you selected for the root filesystem during the first steps of the installation.

## 6.3.6. Miscellaneous

The components listed in this section are usually not involved in the installation process, but are waiting in the background to help the user in case something goes wrong.

### 6.3.6.1. Saving the installation logs

If the installation is successful, the logfiles created during the installation process will be automatically saved to `/var/log/debian-installer/` on your new Debian system.

Choosing Save debug logs from the main menu allows you to save the log files to a floppy disk. This can be useful if you encounter fatal problems during the installation and wish to study the logs on another system or attach them to an installation report.

### 6.3.6.2. Using the Shell and Viewing the Logs

There is an Execute a Shell item on the menu. If the menu is not available when you need to use the shell, press **Left Alt-F2** (on a Mac keyboard, **Option-F2**) to switch to the second *virtual console*. That's the **Alt** key on the left-hand side of the **space bar**, and the **F2** function key, at the same time. This is a separate window running a Bourne shell clone called **ash**.

At this point you are booted from the RAM disk, and there is a limited set of Unix utilities available for your use. You can see what programs are available with the command **ls /bin /sbin /usr/bin /usr/sbin** and by typing **help**. The text editor is **nano**. The shell has some nice features like autocompletion and history.

Use the menus to perform any task that they are able to do — the shell and commands are only there in case something goes wrong. In particular, you should always use the menus, not the shell, to activate your swap partition, because the menu software can't detect that you've done this from the shell. Press **Left Alt-F1** to get back to menus, or type **exit** if you used a menu item to open the shell.

### 6.3.6.3. Installation Over the Network

For installations on S/390, this is the default method after setting up the network.

You will be asked for a new password to be used for connecting to the installation system and for its confirmation. That's all. Now you should see a screen which instructs you to login remotely as the

user *installer* with the password you just provided. Another important detail to notice on this screen is the fingerprint of this system. You need to transfer the fingerprint securely to the "person who will continue the installation remotely".

Should you decide to continue with the installation locally, you can always press **Enter**, which will bring you back to the main menu, where you can select another component.

Now let's switch to the other side of the wire. As a prerequisite, you need to configure your terminal for UTF-8 encoding, because that is what the installation system uses. If you do not, remote installation will be still possible, but you may encounter strange display artefacts like destroyed dialog borders or unreadable non-ascii characters. Establishing a connection with the installation system is as simple as typing:

```
$ ssh -l installer install_host
```

Where *install_host* is either the name or IP address of the computer being installed. Before the actual login the fingerprint of the remote system will be displayed and you will have to confirm that it is correct.

> **Note:** If you install several computers in turn and they happen to have the same IP address or hostname, **ssh** will refuse to connect to such host. The reason is that it will have different fingerprint, which is usually a sign of a spoofing attack. If you are sure this is not the case, you will need to delete the relevant line from `~/.ssh/known_hosts` and try again.

After the login you will be presented with an initial screen where you have two possibilities called Start menu and Start shell. The former brings you to the main installer menu, where you can continue with the installation as usual. The latter starts a shell from which you can examine and possibly fix the remote system. You should only start one SSH session for the installation menu, but may start multiple sessions for shells.

## Warning

After you have started the installation remotely over SSH, you should not go back to the installation session running on the local console. Doing so may corrupt the database that holds the configuration of the new system. This in turn may result in a failed installation or problems with the installed system.

Also, if you are running the SSH session from an X terminal, you should not resize the window as that will result in the connection being terminated.

### 6.3.6.4. Running base-config From Within `debian-installer`

It is possible to configure the base system within the first stage installer (before rebooting from the hard drive), by running **base-config** in a *chroot* environment. This is mainly useful for testing the installer and should normally be avoided.

# Chapter 7. Booting Into Your New Debian System

## 7.1. The Moment of Truth

Your system's first boot on its own power is what electrical engineers call the "smoke test".

If you are booting directly into Debian, and the system doesn't start up, either use your original installation boot media, or insert the custom boot floppy if you have one, and reset your system. This way, you will probably need to add some boot arguments like **`root=`*`root`***, where *`root`* is your root partition, such as `/dev/sda1`.

## 7.2. Debian Post-Boot (Base) Configuration

After booting, you will be prompted to complete the configuration of your basic system, and then to select what additional packages you wish to install. The application which guides you through this process is called `base-config`. Its concept is very similar to the `debian-installer` from the first stage. Indeed, `base-config` consists of a number of specialized components, where each component handles one configuration task, contains "hidden menu in the background" and also uses the same navigation system.

If you wish to re-run the `base-config` at any point after installation is complete, as root run **`base-config`**.

### 7.2.1. Configuring Your Time Zone

After a welcome screen, you will be prompted to configure your time zone. First select whether the hardware clock of your system is set to local time or Greenwich Mean Time (GMT or UTC). The time displayed in the dialog may help you decide on the correct option.

Depending on the location selected at the beginning of the installation process, you will next be shown either a single timezone or a list of timezones relevant for that location. If a single timezone is shown, choose Yes to confirm or choose No to select from the full list of timezones. If a list is shown, select your timezone from the list, or select Other for the full list.

### 7.2.2. Setting Up Users And Passwords

#### 7.2.2.1. Set the Root Password

The *root* account is also called the *super-user*; it is a login that bypasses all security protection on your system. The root account should only be used to perform system administration, and only used for as short a time as possible.

Any password you create should contain at least 6 characters, and should contain both upper- and lower-case characters, as well as punctuation characters. Take extra care when setting your root password, since it is such a powerful account. Avoid dictionary words or use of any personal information which could be guessed.

If anyone ever tells you they need your root password, be extremely wary. You should normally never give your root password out, unless you are administering a machine with more than one system administrator.

#### 7.2.2.2. Create an Ordinary User

The system will ask you whether you wish to create an ordinary user account at this point. This account should be your main personal log-in. You should *not* use the root account for daily use or as your personal login.

Why not? Well, one reason to avoid using root's privileges is that it is very easy to do irreparable damage as root. Another reason is that you might be tricked into running a *Trojan-horse* program — that is a program that takes advantage of your super-user powers to compromise the security of your system behind your back. Any good book on Unix system administration will cover this topic in more detail — consider reading one if it is new to you.

You will first be prompted for the user's full name. Then you'll be asked for a name for the user account; generally your first name or something similar will suffice and indeed will be the default. Finally, you will be prompted for a password for this account.

If at any point after installation you would like to create another account, use the **adduser** command.

### 7.2.3. Configuring APT

The main means that people use to install packages on their system is via a program called **apt-get**, from the `apt` package.[1] Other front-ends for package management, like **aptitude**, **synaptic** and the older **dselect** also use and depend on **apt-get**. These front-ends are recommended for new users, since they integrate some additional features (package searching and status checks) in a nice user interface.

APT must be configured so that it knows where to retrieve packages from. The helper application which assists in this task is called **apt-setup**.

The next step in your configuration process is to tell APT where other Debian packages can be found. Note that you can re-run this tool at any point after installation by running **apt-setup**, or by manually editing `/etc/apt/sources.list`.

If an official CD-ROM is in the drive at this point, then that CD-ROM should automatically be configured as an apt source without prompting. You will notice this because you will see the CD-ROM being scanned.

For users without an official CD-ROM, you will be offered an array of choices for how Debian packages are accessed: FTP, HTTP, CD-ROM, or a local file system.

You should know that it's perfectly acceptable to have a number of different APT sources, even for the same Debian archive. **apt-get** will automatically pick the package with the highest version number given all the available versions. Or, for instance, if you have both an HTTP and a CD-ROM APT source, **apt-get** should automatically use the local CD-ROM when possible, and only resort to HTTP if a newer version is available there. However, it is not a good idea to add unnecessary APT sources, since this will tend to slow down the process of checking the network archives for new versions.

1. Note that the actual program that installs packages is called **dpkg**. However, this package is more of a low-level tool. **apt-get** is a higher-level tool as it will invoke **dpkg** as appropriate and also because it knows to install other packages which are required for the package you're trying to install, as well as how to retrieve the package from your CD, the network, or wherever.

#### 7.2.3.1. Configuring Network Package Sources

If you plan on installing the rest of your system via the network, the most common option is to select the **`http`** source. The **`ftp`** source is also acceptable, but tends to be somewhat slower making connections.

The next step during the configuration of network package sources is to tell **apt-setup** which country you live in. This configures which of the official Debian Internet mirrors you will connect to. Depending on which country you select, you will be presented with a list of possible servers. It's generally fine to pick the one at the top of the list, but any of them should work. Note however that the mirror list provided by the installation was generated when this version of Debian was released and some mirrors may no longer be available.

After you have selected a mirror, you will be asked if a proxy server should be used. A proxy server is a server that will forward all your HTTP and/or FTP requests to the Internet and is most often used to regulate and optimize access to the Internet on corporate networks. In some networks only the proxy server is allowed access to the Internet, in which case you will have to enter the name of the proxy server. You may also have to include an user name and password. Most home users will not need to specify a proxy server, although some ISPs may provide proxy servers for their users.

After you select a mirror, your new network package source will be tested. If all goes well, you will be prompted whether you want to add another package source. If you have any problems using the package source you selected, try using a different mirror (either from your country list or from the global list), or try using a different network package source.

### 7.2.4. Package Installation

Next you will be offered a number of pre-rolled software configurations offered by Debian. You could always choose, package by package, what you want to install on your new machine. This is the purpose of the **aptitude** program, described below. But this can be a long task with around 14700 packages available in Debian!

So, you have the ability to choose *tasks* first, and then add on more individual packages later. These tasks loosely represent a number of different jobs or things you want to do with your computer, such as "desktop environment", "web server", or "print server"[2]. Section C.3 lists the space requirements for the available tasks.

Once you've selected your tasks, select Ok. At this point, **aptitude** will install the packages you've selected.

> **Note:** Even if you did not select any tasks at all, any standard, important, or required priority packages that are not yet present on your system will be installed. This functionality is the same as running **`tasksel -ris`** at the command line, and currently involves a download of about 37M of archives. You will be shown the number of packages to be installed, and how many kilobytes of packages, if any, need to be downloaded.

If you do want to choose what to install on a package by package basis, select the "manual package selection" option in **tasksel**. If you select one or more tasks alongside this option, **aptitude** will be

2. You should know that to present this list, **base-config** is merely invoking the **tasksel** program. For manual package selection, the **aptitude** program is being run. Any of these can be run at any time after installation to install (or remove) more packages. If you are looking for a specific single package, after installation is complete, simply run **`aptitude install`** ***`package`***, where *`package`* is the name of the package you are looking for.

called with the **--visual-preview** option. This means you will be able to review[3] the packages that are to be installed. If you do not select any tasks, the normal **aptitude** screen will be displayed. After making your selections you should press "**g**" to start the download and installation of packages.

> **Note:** If you choose "manual package selection" *without* selecting any tasks, no packages will be installed by default. This means you can use this option if you want to install a minimal system, but also that the responsibility for selecting any packages not installed as part of the base system (before the reboot) that might be required for your system lies with you.

Of the 14700 packages available in Debian, only a small minority are covered by tasks offered in the Task Installer. To see information on more packages, either use **`apt-cache search`** ***`search-string`*** for some given search string (see the apt-cache(8) man page), or run **aptitude** as described below.

### 7.2.4.1. Advanced Package Selection with aptitude

**Aptitude** is a modern program for managing packages. **aptitude** allows you to select individual packages, set of packages matching given criteria (for advanced users), or whole tasks.

The most basic keybindings are:

| Key | Action |
|---|---|
| **Up**, **Down** | Move selection up or down. |
| **Enter** | Open/collapse/activate item. |
| **+** | Mark package for installation. |
| **-** | Mark package for removal. |
| **d** | Show package dependencies. |
| **g** | Actually download/install/remove packages. |
| **q** | Quit current view. |
| **F10** | Activate menu. |

For more commands see the online help under the **?** key.

## 7.2.5. Prompts During Software Installation

Each package you selected with **tasksel** or **aptitude** is downloaded, unpacked and then installed in turn by the **apt-get** and **dpkg** programs. If a particular program needs more information from the user, it will prompt you during this process. You might also want to keep an eye on the output during the process, to watch for any installation errors (although you will be asked to acknowledge errors which prevented a package's installation).

3. You can also change the default selections. If you would like to select any additional package, use View⟶New Package View.

### 7.2.6. Configuring Your Mail Transport Agent

Today, email is a very important part of many people's life, so it's no surprise Debian lets you configure your mail system right as a part of the installation process. The standard mail transport agent in Debian is **exim4**, which is relatively small, flexible, and easy to learn.

You may ask if this is needed even if your computer is not connected to any network. The short answer is: Yes. The longer explanation: Some system utilities (like **cron**, **quota**, **aide**, . . . ) may send you important notices via email.

So on the first screen you will be presented with several common mail scenarios. Choose the one that most closely resembles your needs:

internet site

Your system is connected to a network and your mail is sent and received directly using SMTP. On the following screens you will be asked a few basic questions, like your machine's mail name, or a list of domains for which you accept or relay mail.

mail sent by smarthost

In this scenario is your outgoing mail forwarded to another machine, called a "smarthost", which does the actual job for you. Smarthost also usually stores incoming mail addressed to your computer, so you don't need to be permanently online. That also means you have to download your mail from the smarthost via programs like fetchmail. This option is suitable for dial-up users.

local delivery only

Your system is not on a network and mail is sent or received only between local users. Even if you don't plan to send any messages, this option is highly recommended, because some system utilities may send you various alerts from time to time (e.g. beloved "Disk quota exceeded"). This option is also convenient for new users, because it doesn't ask any further questions.

no configuration at this time

Choose this if you are absolutely convinced you know what you are doing. This will leave you with an unconfigured mail system — until you configure it, you won't be able to send or receive any mail and you may miss some important messages from your system utilities.

If none of these scenarios suits your needs, or if you need a finer setup, you will need to edit configuration files under the `/etc/exim4` directory after the installation is complete. More information about **exim4** may be found under `/usr/share/doc/exim4`.

## 7.3. Log In

After you've installed packages, you'll be presented with the login prompt. Log in using the personal login and password you selected. Your system is now ready to use.

If you are a new user, you may want to explore the documentation which is already installed on your system as you start to use it. There are currently several documentation systems, work is proceeding on integrating the different types of documentation. Here are a few starting points.

Documentation accompanying programs you have installed is in `/usr/share/doc/`, under a subdirectory named after the program. For example, the APT User's Guide for using **apt** to install other programs on your system, is located in `/usr/share/doc/apt/guide.html/index.html`.

In addition, there are some special folders within the `/usr/share/doc/` hierarchy. Linux HOWTOs are installed in *.gz* format, in `/usr/share/doc/HOWTO/en-txt/`. After installing **dhelp** you will find a browse-able index of documentation in `/usr/share/doc/HTML/index.html`.

One easy way to view these documents is to **`cd /usr/share/doc/`**, and type **`lynx`** followed by a space and a dot (the dot stands for the current directory).

You can also type **`info`** ***`command`*** or **`man`** ***`command`*** to see documentation on most commands available at the command prompt. Typing **`help`** will display help on shell commands. And typing a command followed by **`--help`** will usually display a short summary of the command's usage. If a command's results scroll past the top of the screen, type **`| more`** after the command to cause the results to pause before scrolling past the top of the screen. To see a list of all commands available which begin with a certain letter, type the letter and then two tabs.

For a more complete introduction to Debian and GNU/Linux, see `/usr/share/doc/debian-guide/html/noframes/index.html`.

# Chapter 8. Next Steps and Where to Go From Here

## 8.1. If You Are New to Unix

If you are new to Unix, you probably should go out and buy some books and do some reading. A lot of valuable information can also be found in the Debian Reference (http://www.debian.org/doc/user-manuals#quick-reference). This list of Unix FAQs (http://www.faqs.org/faqs/unix-faq/) contains a number of UseNet documents which provide a nice historical reference.

Linux is an implementation of Unix. The Linux Documentation Project (LDP) (http://www.tldp.org/) collects a number of HOWTOs and online books relating to Linux. Most of these documents can be installed locally; just install the `doc-linux-html` package (HTML versions) or the `doc-linux-text` package (ASCII versions), then look in `/usr/share/doc/HOWTO`. International versions of the LDP HOWTOs are also available as Debian packages.

## 8.2. Orienting Yourself to Debian

Debian is a little different from other distributions. Even if you're familiar with Linux in other distributions, there are things you should know about Debian to help you to keep your system in a good, clean state. This chapter contains material to help you get oriented; it is not intended to be a tutorial for how to use Debian, but just a very brief glimpse of the system for the very rushed.

### 8.2.1. Debian Packaging System

The most important concept to grasp is the Debian packaging system. In essence, large parts of your system should be considered under the control of the packaging system. These include:

- `/usr` (excluding `/usr/local`)
- `/var` (you could make `/var/local` and be safe in there)
- `/bin`
- `/sbin`
- `/lib`

For instance, if you replace `/usr/bin/perl`, that will work, but then if you upgrade your `perl` package, the file you put there will be replaced. Experts can get around this by putting packages on "hold" in **aptitude**.

One of the best installation methods is apt. You can use the command line version **apt-get** or full-screen text version aptitude. Note apt will also let you merge main, contrib, and non-free so you can have export-restricted packages as well as standard versions.

### 8.2.2. Application Version Management

Alternative versions of applications are managed by update-alternatives. If you are maintaining multiple versions of your applications, read the update-alternatives man page.

### 8.2.3. Cron Job Management

Any jobs under the purview of the system administrator should be in `/etc`, since they are configuration files. If you have a root cron job for daily, weekly, or monthly runs, put them in `/etc/cron.{daily,weekly,monthly}`. These are invoked from `/etc/crontab`, and will run in alphabetic order, which serializes them.

On the other hand, if you have a cron job that (a) needs to run as a special user, or (b) needs to run at a special time or frequency, you can use either `/etc/crontab`, or, better yet, `/etc/cron.d/whatever`. These particular files also have an extra field that allows you to stipulate the user under which the cron job runs.

In either case, you just edit the files and cron will notice them automatically. There is no need to run a special command. For more information see cron(8), crontab(5), and `/usr/share/doc/cron/README.Debian`.

## 8.3. Further Reading and Information

If you need information about a particular program, you should first try **`man`** ***`program`***, or **`info`** ***`program`***.

There is lots of useful documentation in `/usr/share/doc` as well. In particular, `/usr/share/doc/HOWTO` and `/usr/share/doc/FAQ` contain lots of interesting information. To submit bugs, look at `/usr/share/doc/debian/bug*`. To read about Debian-specific issues for particular programs, look at `/usr/share/doc/(package name)/README.Debian`.

The Debian web site (http://www.debian.org/) contains a large quantity of documentation about Debian. In particular, see the Debian GNU/Linux FAQ (http://www.debian.org/doc/FAQ/) and the Debian Reference (http://www.debian.org/doc/user-manuals#quick-reference). An index of more Debian documentation is available from the Debian Documentation Project (http://www.debian.org/doc/ddp). The Debian community is self-supporting; to subscribe to one or more of the Debian mailing lists, see the Mail List Subscription (http://www.debian.org/MailingLists/subscribe) page. Last, but not least, the Debian Mailing List Archives (http://lists.debian.org/) contain a wealth of information on Debian.

A general source of information on GNU/Linux is the Linux Documentation Project (http://www.tldp.org/). There you will find the HOWTOs and pointers to other very valuable information on parts of a GNU/Linux system.

## 8.4. Compiling a New Kernel

Why would someone want to compile a new kernel? It is often not necessary since the default kernel shipped with Debian handles most configurations. Also, Debian often offers several alternative

kernels. So you may want to check first if there is an alternative kernel image package that better corresponds to your hardware. However, it can be useful to compile a new kernel in order to:

- handle special hardware needs, or hardware conflicts with the pre-supplied kernels
- use options of the kernel which are not supported in the pre-supplied kernels (such as high memory support)
- optimize the kernel by removing useless drivers to speed up boot time
- create a monolithic instead of a modularized kernel
- run an updated or development kernel
- learn more about linux kernels

## 8.4.1. Kernel Image Management

Don't be afraid to try compiling the kernel. It's fun and profitable.

To compile a kernel the Debian way, you need some packages: `fakeroot`, `kernel-package`, `kernel-source-2.4.27` (the most recent version at the time of this writing) and a few others which are probably already installed (see `/usr/share/doc/kernel-package/README.gz` for the complete list).

This method will make a .deb of your kernel source, and, if you have non-standard modules, make a synchronized dependent .deb of those too. It's a better way to manage kernel images; `/boot` will hold the kernel, the System.map, and a log of the active config file for the build.

Note that you don't *have* to compile your kernel the "Debian way"; but we find that using the packaging system to manage your kernel is actually safer and easier. In fact, you can get your kernel sources right from Linus instead of `kernel-source-2.4.27`, yet still use the `kernel-package` compilation method.

Note that you'll find complete documentation on using `kernel-package` under `/usr/share/doc/kernel-package`. This section just contains a brief tutorial.

Hereafter, we'll assume you have free rein over your machine and will extract your kernel source to somewhere in your home directory[1]. We'll also assume that your kernel version is 2.4.27. Make sure you are in the directory to where you want to unpack the kernel sources, extract them using **`tar xjf /usr/src/kernel-source-2.4.27.tar.bz2`** and change to the directory `kernel-source-2.4.27` that will have been created.

Now, you can configure your kernel. Run **`make xconfig`** if X11 is installed, configured and being run; run **`make menuconfig`** otherwise (you'll need `libncurses5-dev` installed). Take the time to read the online help and choose carefully. When in doubt, it is typically better to include the device driver (the software which manages hardware peripherals, such as Ethernet cards, SCSI controllers, and so on) you are unsure about. Be careful: other options, not related to a specific hardware, should be left at the default value if you do not understand them. Do not forget to select "Kernel module loader" in "Loadable module support" (it is not selected by default). If not included, your Debian installation will experience problems.

Clean the source tree and reset the `kernel-package` parameters. To do that, do **`make-kpkg clean`**.

1. There are other locations where you can extract kernel sources and build your custom kernel, but this is easiest as it does not require special permissions.

Now, compile the kernel: **`fakeroot make-kpkg --revision=custom.1.0 kernel_image`**. The version number of "1.0" can be changed at will; this is just a version number that you will use to track your kernel builds. Likewise, you can put any word you like in place of "custom" (e.g., a host name). Kernel compilation may take quite a while, depending on the power of your machine.

Once the compilation is complete, you can install your custom kernel like any package. As root, do **`dpkg -i ../kernel-image-2.4.27-`*`subarchitecture`*`_custom.1.0_s390.deb`**. The *`subarchitecture`* part is an optional sub-architecture, depending on what kernel options you set. **`dpkg -i kernel-image...`** will install the kernel, along with some other nice supporting files. For instance, the `System.map` will be properly installed (helpful for debugging kernel problems), and `/boot/config-2.4.27` will be installed, containing your current configuration set. Your new `kernel-image-2.4.27` package is also clever enough to automatically use your platform's boot-loader to run an update on the booting, allowing you to boot without re-running the boot loader. If you have created a modules package, e.g., if you have PCMCIA, you'll need to install that package as well.

It is time to reboot the system: read carefully any warning that the above step may have produced, then **`shutdown -r now`**.

For more information on `kernel-package`, read the fine documentation in `/usr/share/doc/kernel-package`.

# Appendix A. Installation Howto

This document describes how to install Debian GNU/Linux sarge for the S/390 ("s390") with the new `debian-installer`. It is a quick walkthrough of the installation process which should contain all the information you will need for most installs. When more information can be useful, we will link to more detailed explanations in the Debian GNU/Linux Installation Guide.

## A.1. Preliminaries

If you encounter bugs during your install, please refer to Section 5.3.4 for instructions on how to report them. If you have questions which cannot be answered by this document, please direct them to the debian-boot mailing list (debian-boot@lists.debian.org) or ask on IRC (#debian-boot on the freenode network).

## A.2. Booting the installer

The debian-cd team provides builds of CD images using `debian-installer` on the Debian CD page (http://www.debian.org/CD/). For more information on where to get CDs, see Section 4.1.

Some installation methods require other images than CD images. Section 4.2.1 explains how to find images on Debian mirrors.

The subsections below will give the details about which images you should get for each possible means of installation.

### A.2.1. CDROM

There are two different netinst CD images which can be used to install sarge with the `debian-installer`. These images are intended to boot from CD and install additional packages over a network, hence the name 'netinst'. The difference between the two images is that on the full netinst image the base packages are included, whereas you have to download these from the web if you are using the business card image. If you'd rather, you can get a full size CD image which will not need the network to install. You only need the first CD of the set.

Download whichever type you prefer and burn it to a CD.

### A.2.2. Booting from network

It's also possible to boot `debian-installer` completely from the net. The various methods to netboot depend on your architecture and netboot setup. The files in `netboot/` can be used to netboot `debian-installer`.

### A.2.3. Booting from hard disk

It's possible to boot the installer using no removable media, but just an existing hard disk, which can have a different OS on it. Download `hd-media/initrd.gz`, `hd-media/vmlinuz`, and a Debian

CD image to the top-level directory of the hard disk. Make sure that the CD image has a filename ending in `.iso`. Now it's just a matter of booting linux with the initrd.

## A.3. Installation

Once the installer starts, you will be greeted with an initial screen. Press **Enter** to boot, or read the instructions for other boot methods and parameters (see Section 5.2).

After a while you will be asked to select your language. Use the arrow keys to pick a language and press **Enter** to continue. Next you'll be asked to select your country, with the choices including countries where your language is spoken. If it's not on the short list, a list of all the countries in the world is available.

You may be asked to confirm your keyboard layout. Choose the default unless you know better.

Now sit back while debian-installer detects some of your hardware, and loads the rest of itself from CD, floppy, USB, etc.

Next the installer will try to detect your network hardware and set up networking by DHCP. If you are not on a network or do not have DHCP, you will be given the opportunity to configure the network manually.

Now it is time to partition your disks. First you will be given the opportunity to automatically partition either an entire drive, or free space on a drive. This is recommended for new users or anyone in a hurry, but if you do not want to autopartition, choose manual from the menu.

On the next screen you will see your partition table, how the partitions will be formatted, and where they will be mounted. Select a partition to modify or delete it. If you did automatic partitioning, you should just be able to choose Finished partitioning from the menu to use what it set up. Remember to assign at least one partition for swap space and to mount a partition on `/`. Appendix B has more information about partitioning.

Now `debian-installer` formats your partitions and starts to install the base system, which can take a while. That is followed by installing a kernel.

The last step is to install a boot loader. If the installer detects other operating systems on your computer, it will add them to the boot menu and let you know.

`debian-installer` will now tell you that the installation has finished. Remove the cdrom or other boot media and hit **Enter** to reboot your machine. It should boot up into the next stage of the install process, which is explained in Chapter 7.

If you need more information on the install process, see Chapter 6.

## A.4. Send us an installation report

If you successfully managed an installation with `debian-installer`, please take time to provide us with a report. There is a template named `install-report.template` in the `/root` directory of a freshly installed system. Please fill it out and file it as a bug against the package `installation-reports`, as explained in Section 5.3.4.

If you did not reach base-config or ran into other trouble, you probably found a bug in debian-installer. To improve the installer it is necessary that we know about them, so please take the time to report them. You can use an installation report to report problems; if the install completely fails, see Section 5.3.3.

## A.5. And finally..

We hope that your Debian installation is pleasant and that you find Debian useful. You might want to read Chapter 8.

# Appendix B. Partitioning for Debian

## B.1. Deciding on Debian Partitions and Sizes

At a bare minimum, GNU/Linux needs one partition for itself. You can have a single partition containing the entire operating system, applications, and your personal files. Most people feel that a separate swap partition is also a necessity, although it's not strictly true. "Swap" is scratch space for an operating system, which allows the system to use disk storage as "virtual memory". By putting swap on a separate partition, Linux can make much more efficient use of it. It is possible to force Linux to use a regular file as swap, but it is not recommended.

Most people choose to give GNU/Linux more than the minimum number of partitions, however. There are two reasons you might want to break up the file system into a number of smaller partitions. The first is for safety. If something happens to corrupt the file system, generally only one partition is affected. Thus, you only have to replace (from the backups you've been carefully keeping) a portion of your system. At a bare minimum, you should consider creating what is commonly called a "root partition". This contains the most essential components of the system. If any other partitions get corrupted, you can still boot into GNU/Linux to fix the system. This can save you the trouble of having to reinstall the system from scratch.

The second reason is generally more important in a business setting, but it really depends on your use of the machine. For example, a mail server getting spammed with e-mail can easily fill a partition. If you made `/var/mail` a separate partition on the mail server, most of the system will remain working even if you get spammed.

The only real drawback to using more partitions is that it is often difficult to know in advance what your needs will be. If you make a partition too small then you will either have to reinstall the system or you will be constantly moving things around to make room in the undersized partition. On the other hand, if you make the partition too big, you will be wasting space that could be used elsewhere. Disk space is cheap nowadays, but why throw your money away?

## B.2. The Directory Tree

Debian GNU/Linux adheres to the Filesystem Hierarchy Standard (http://www.pathname.com/fhs/) for directory and file naming. This standard allows users and software programs to predict the location of files and directories. The root level directory is represented simply by the slash `/`. At the root level, all Debian systems include these directories:

| Directory | Content |
|---|---|
| `bin` | Essential command binaries |
| `boot` | Static files of the boot loader |
| `dev` | Device files |
| `etc` | Host-specific system configuration |
| `home` | User home directories |
| `lib` | Essential shared libraries and kernel modules |
| `media` | Contains mount points for replaceable media |

| Directory | Content |
|---|---|
| mnt | Mount point for mounting a file system temporarily |
| proc | Virtual directory for system information (2.4 and 2.6 kernels) |
| root | Home directory for the root user |
| sbin | Essential system binaries |
| sys | Virtual directory for system information (2.6 kernels) |
| tmp | Temporary files |
| usr | Secondary hierarchy |
| var | Variable data |
| opt | Add-on application software packages |

The following is a list of important considerations regarding directories and partitions. Note that disk usage varies widely given system configuration and specific usage patterns. The recommendations here are general guidelines and provide a starting point for partitioning.

- The root partition `/` must always physically contain `/etc`, `/bin`, `/sbin`, `/lib` and `/dev`, otherwise you won't be able to boot. Typically 150–250 MB is needed for the root partition.
- `/usr`: contains all user programs (`/usr/bin`), libraries (`/usr/lib`), documentation (`/usr/share/doc`), etc. This is the part of the file system that generally takes up most space. You should provide at least 500 MB of disk space. This amount should be increased depending on the number and type of packages you plan to install. A generous workstation or server installation should allow 4-6 GB.
- `/var`: variable data like news articles, e-mails, web sites, databases, the packaging system cache, etc. will be placed under this directory. The size of this directory depends greatly on the usage of your system, but for most people will be dictated by the package management tool's overhead. If you are going to do a full installation of just about everything Debian has to offer, all in one session, setting aside 2 or 3 gigabyte of space for `/var` should be sufficient. If you are going to install in pieces (that is to say, install services and utilities, followed by text stuff, then X, ...), you can get away with 300–500 MB. If hard drive space is at a premium and you don't plan on doing major system updates, you can get by with as little as 30 or 40 MB.
- `/tmp`: temporary data created by programs will most likely go in this directory. 40–100 MB should usually be enough. Some applications — including archive manipulators, CD/DVD authoring tools, and multimedia software — may use `/tmp` to temporarily store image files. If you plan to use such applications, you should adjust the space available in `/tmp` accordingly.
- `/home`: every user will put his personal data into a subdirectory of this directory. Its size depends on how many users will be using the system and what files are to be stored in their directories. Depending on your planned usage you should reserve about 100 MB for each user, but adapt this value to your needs. Reserve a lot more space if you plan to save a lot of multimedia files (MP3, movies) in your home directory.

## B.3. Recommended Partitioning Scheme

For new users, personal Debian boxes, home systems, and other single-user setups, a single `/` partition (plus swap) is probably the easiest, simplest way to go. However, if your partition is larger than around 6GB, choose ext3 as your partition type. Ext2 partitions need periodic file system integrity checking, and this can cause delays during booting when the partition is large.

For multi-user systems or systems with lots of disk space, it's best to put `/usr`, `/var`, `/tmp`, and `/home` each on their own partitions separate from the `/` partition.

You might need a separate `/usr/local` partition if you plan to install many programs that are not part of the Debian distribution. If your machine will be a mail server, you might need to make `/var/mail` a separate partition. Often, putting `/tmp` on its own partition, for instance 20 to 50MB, is a good idea. If you are setting up a server with lots of user accounts, it's generally good to have a separate, large `/home` partition. In general, the partitioning situation varies from computer to computer depending on its uses.

For very complex systems, you should see the Multi Disk HOWTO (http://www.tldp.org/HOWTO/Multi-Disk-HOWTO.html). This contains in-depth information, mostly of interest to ISPs and people setting up servers.

With respect to the issue of swap partition size, there are many views. One rule of thumb which works well is to use as much swap as you have system memory. It also shouldn't be smaller than 16MB, in most cases. Of course, there are exceptions to these rules. If you are trying to solve 10000 simultaneous equations on a machine with 256MB of memory, you may need a gigabyte (or more) of swap.

On 32-bit architectures (i386, m68k, 32-bit SPARC, and PowerPC), the maximum size of a swap partition is 2GB. That should be enough for nearly any installation. However, if your swap requirements are this high, you should probably try to spread the swap across different disks (also called "spindles") and, if possible, different SCSI or IDE channels. The kernel will balance swap usage between multiple swap partitions, giving better performance.

As an example, an older home machine might have 32MB of RAM and a 1.7GB IDE drive on `/dev/hda`. There might be a 500MB partition for another operating system on `/dev/hda1`, a 32MB swap partition on `/dev/hda3` and about 1.2GB on `/dev/hda2` as the Linux partition.

For an idea of the space taken by tasks you might be interested in adding after your system installation is complete, check Section C.3.

## B.4. Device Names in Linux

Linux disks and partition names may be different from other operating systems. You need to know the names that Linux uses when you create and mount partitions. Here's the basic naming scheme:

- The first DASD device is named `/dev/dasda`.
- The second DASD device is named `/dev/dasdb`, and so on.

The partitions on each disk are represented by appending a decimal number to the disk name: `dasda1` and `dasda2` represent the first and second partitions of the first DASD device in your system.

## B.5. Debian Partitioning Programs

Several varieties of partitioning programs have been adapted by Debian developers to work on various types of hard disks and computer architectures. Following is a list of the program(s) applicable for your architecture.

**partman**

Recommended partitioning tool in Debian. This Swiss army knife can also resize partitions, create filesystems and assign them to the mountpoints.

**fdasd**

S/390 version of **fdisk**; Please read the fdasd manual page or chapter 13 in Device Drivers and Installation Commands (http://oss.software.ibm.com/developerworks/opensource/linux390/docu/l390dd08.pdf) for details.

One of these programs will be run by default when you select Partition a Hard Disk. If the one which is run by default isn't the one you want, quit the partitioner, go to the shell (**tty2**) by pressing **Alt** and **F2** keys together, and manually type in the name of the program you want to use (and arguments, if any). Then skip the Partition a Hard Disk step in **debian-installer** and continue to the next step.

If you will be working with more than 20 partitions on your ide disk, you will need to create devices for partitions 21 and beyond. The next step of initializing the partition will fail unless a proper device is present. As an example, here are commands you can use in **tty2** or under Execute A Shell to add a device so the 21st partition can be initialized:

```
# cd /dev
# mknod hda21 b 3 21
# chgrp disk hda21
# chmod 660 hda21
```

Booting into the new system will fail unless proper devices are present on the target system. After installing the kernel and modules, execute:

```
# cd /target/dev
# mknod hda21 b 3 21
# chgrp disk hda21
# chmod 660 hda21
```

# Appendix C. Random Bits

## C.1. Preconfiguration File Example

This is a complete working example of a preconfiguration file for an automated install. Its use is explained in Section 4.4. You may want to uncomment some of the lines before using the file.

> **Note:** In order to be able to properly present this example in the manual, we've had to split some lines. This is indicated by the use of the line-continuation-character "\" and extra indentation in the next line. In a real preconfiguration file, these split lines have to be joined into *one single line*. If you do not, preconfiguration will fail with unpredictable results.
>
> A "clean" example file is available from http://www.debian.org/releases/sarge/example-preseed.txt.

```
#### Startup.

# To use a preseed file, you'll first need to boot the installer,
# and tell it what preseed file to use. This is done by passing the
# kernel a boot parameter, either manually at boot or by editing the
# syslinux.cfg (or similar) file and adding the parameter to the end
# of the append line(s) for the kernel.
#
# If you're netbooting, use this:
#   preseed/url=http://host/path/to/preseed
# If you're remastering a CD, you could use this:
#   preseed/file=/cdrom/preseed
# If you're installing from USB media, use this, and put the preseed file
# in the toplevel directory of the USB stick.
#   preseed/file=/hd-media/preseed
# Be sure to copy this file to the location you specify.
#
# Some parts of the installation process cannot be automated using
# some forms of preseeding, because the questions are asked before
# the preseed file is loaded. For example, if the preseed file is
# downloaded over the network, the network setup must be done first.
# One reason to use initrd preseeding is that it allows preseeding
# of even these early steps of the installation process.
#
# If a preseed file cannot be used to preseed some steps, the install can
# still be fully automated, since you can pass preseed values to the kernel
# on the command line. Just pass path/to/var=value for any of the preseed
# variables listed below.
#
# While you're at it, you may want to throw a debconf/priority=critical in
# there, to avoid most questions even if the preseeding below misses some.
# And you might set the timeout to 1 in syslinux.cfg to avoid needing to hit
# enter to boot the installer.
#
# Note that the kernel accepts a maximum of 8 command line options and
# 8 environment options (including any options added by default for the
# installer). If these numbers are exceeded, 2.4 kernels will drop any
```

```
# excess options and 2.6 kernels will panic. With kernel 2.6.9 or newer,
# you can use 32 command line options and 32 environment options.
#
# Some of the default options, like 'vga=normal' may be safely removed
# for most installations, which may allow you to add more options for
# preseeding.

# It is not possible to use preseeding to set language, country, and
# keyboard. Instead you should use kernel parameters. Example:
# languagechooser/language-name=English
# countrychooser/shortlist=US
# console-keymaps-at/keymap=us

#### Network configuration.

# Of course, this won't work if you're loading your preseed file from the
# network! But it's great if you're booting from CD or USB stick. You can
# also pass network config parameters in on the kernel params if you are
# loading preseed files from the network.

# netcfg will choose an interface that has link if possible. This makes it
# skip displaying a list if there is more than one interface.
d-i netcfg/choose_interface select auto

# If you have a slow dhcp server and the installer times out waiting for
# it, this might be useful.
#d-i netcfg/dhcp_timeout string 60

# If you prefer to configure the network manually, here's how:
#d-i netcfg/disable_dhcp boolean true
#d-i netcfg/get_nameservers string 192.168.1.1
#d-i netcfg/get_ipaddress string 192.168.1.42
#d-i netcfg/get_netmask string 255.255.255.0
#d-i netcfg/get_gateway string 192.168.1.1
#d-i netcfg/confirm_static boolean true

# Note that any hostname and domain names assigned from dhcp take
# precedence over values set here. However, setting the values still
# prevents the questions from being shown even if values come from dhcp.
d-i netcfg/get_hostname string unassigned-hostname
d-i netcfg/get_domain string unassigned-domain

# Disable that annoying WEP key dialog.
d-i netcfg/wireless_wep string
# The wacky dhcp hostname that some ISPs use as a password of sorts.
#d-i netcfg/dhcp_hostname string radish

#### Mirror settings.

d-i mirror/country string enter information manually
d-i mirror/http/hostname string http.us.debian.org
d-i mirror/http/directory string /debian
d-i mirror/suite string testing
d-i mirror/http/proxy string

#### Partitioning.
```

```
# If the system has free space you can choose to only partition that space.
#d-i partman-auto/init_automatically_partition \
#    select Use the largest continuous free space

# Alternatively, you can specify a disk to partition. The device name can
# be given in either devfs or traditional non-devfs format.
# For example, to use the first disk devfs knows of:
d-i partman-auto/disk string /dev/discs/disc0/disc

# You can choose from any of the predefined partitioning recipes:
d-i partman-auto/choose_recipe select \
     All files in one partition (recommended for new users)
#d-i partman-auto/choose_recipe select Desktop machine
#d-i partman-auto/choose_recipe select Multi-user workstation

# Or provide a recipe of your own...
# The recipe format is documented in the file devel/partman-auto-recipe.txt.
# If you have a way to get a recipe file into the d-i environment, you can
# just point at it.
#d-i partman-auto/expert_recipe_file string /hd-media/recipe

# If not, you can put an entire recipe in one line. This example creates
# a small /boot partition, suitable swap, and uses the rest of the space
# for the root partition:
#d-i partman-auto/expert_recipe string boot-root :: \
#    20 50 100 ext3 $primary{ } $bootable{ } method{ format } format{ } \
#    use_filesystem{ } filesystem{ ext3 } mountpoint{ /boot } . \
#    500 10000 1000000000 ext3 method{ format } format{ } \
#    use_filesystem{ } filesystem{ ext3 } mountpoint{ / } . \
#    64 512 300% linux-swap method{ swap } format{ } .
# For reference, here is that same recipe in a more readable form:
#    boot-root ::
#       40 50 100 ext3
#          $primary{ } $bootable{ }
#          method{ format } format{ }
#          use_filesystem{ } filesystem{ ext3 }
#          mountpoint{ /boot }
#       .
#       500 10000 1000000000 ext3
#          method{ format } format{ }
#          use_filesystem{ } filesystem{ ext3 }
#          mountpoint{ / }
#       .
#       64 512 300% linux-swap
#          method{ swap } format{ }
#       .

# This makes partman automatically partition without confirmation.
d-i partman/confirm_write_new_label boolean true
d-i partman/choose_partition select \
    Finish partitioning and write changes to disk
d-i partman/confirm boolean true

#### Boot loader installation.

# Grub is the default boot loader (for x86). If you want lilo installed
# instead, uncomment this:
```

```
#d-i grub-installer/skip boolean true

# This is fairly safe to set, it makes grub install automatically to the MBR
# if no other operating system is detected on the machine.
d-i grub-installer/only_debian boolean true

# This one makes grub-installer install to the MBR if if finds some other OS
# too, which is less safe as it might not be able to boot that other OS.
d-i grub-installer/with_other_os boolean true

# Alternatively, if you want to install to a location other than the mbr,
# uncomment and edit these lines:
#d-i grub-installer/bootdev  string (hd0,0)
#d-i grub-installer/only_debian boolean false
#d-i grub-installer/with_other_os boolean false

#### Finishing up the first stage install.

# Avoid that last message about the install being complete.
d-i prebaseconfig/reboot_in_progress note

#### Shell commands.

# d-i preseeding is inherently not secure. Nothing in the installer checks
# for attempts at buffer overflows or other exploits of the values of a
# preseed file like this one. Only use preseed files from trusted
# locations! To drive that home, and because it’s generally useful, here’s
# a way to run any shell command you’d like inside the installer,
# automatically.

# This first command is run as early as possible, just after
# preseeding is read.
#d-i preseed/early_command string anna-install some-udeb

# This command is run just before the install finishes, but when there is
# still a usable /target directory.
#d-i preseed/late_command string echo foo > /target/etc/bar

# This command is run just as base-config is starting up.
#base-config base-config/early_command string echo hi mom

# This command is run after base-config is done, just before the login:
# prompt. This is a good way to install a set of packages you want, or to
# tweak the configuration of the system.
#base-config base-config/late_command string \
#    apt-get install zsh; chsh -s /bin/zsh

###### Preseeding the 2nd stage of the installation.

#### Preseeding base-config.

# Avoid the introductory message.
base-config base-config/intro note

# Avoid the final message.
base-config base-config/login note
```

```
# If you installed a display manager, but don’t want to start it immediately
# after base-config finishes.
#base-config base-config/start-display-manager boolean false

# Some versions of the installer can report back on what you’ve installed.
# The default is not to report back, but sending reports helps the project
# determine what software is most popular and include it on CDs.
#popularity-contest popularity-contest/participate boolean false

#### Clock and time zone setup.

# Controls whether or not the hardware clock is set to UTC.
#base-config tzconfig/gmt boolean true
# If you told the installer that you’re in the United States, then you
# can set the time zone using this variable.
# (Choices are: Eastern, Central, Mountain, Pacific, Alaska, Hawaii,
# Aleutian, Arizona East-Indiana, Indiana-Starke, Michigan, Samoa, other)
#base-config tzconfig/choose_country_zone/US select Eastern
# If you told it you’re in Canada.
# (Choices are: Newfoundland, Atlantic, Eastern, Central,
# East-Saskatchewan, Saskatchewan, Mountain, Pacific, Yukon, other)
#base-config tzconfig/choose_country_zone/CA select Eastern
# If you told it you’re in Brazil. (Choices are: East, West, Acre,
# DeNoronha, other)
#base-config tzconfig/choose_country_zone/BR select East
# Many countries have only one time zone. If you told the installer you’re
# in one of those countries, you can choose its standard time zone via this
# question.
#base-config tzconfig/choose_country_zone_single boolean true
# This question is asked as a fallback for countries other than those
# listed above, which have more than one time zone. You can preseed one of
# the time zones, or "other".
#base-config tzconfig/choose_country_zone_multiple select

#### Account setup.

# To preseed the root password, you have to put it in the clear in this
# file. That is not a very good idea, use caution!
#passwd passwd/root-password password r00tme
#passwd passwd/root-password-again password r00tme

# If you want to skip creation of a normal user account.
#passwd passwd/make-user boolean false

# Alternatively, you can preseed the user’s name and login.
#passwd passwd/user-fullname string Debian User
#passwd passwd/username string debian
# And their password, but use caution!
#passwd passwd/user-password password insecure
#passwd passwd/user-password-again password insecure

#### Apt setup.

# This question controls what source the second stage installation uses
# for packages. Choices are cdrom, http, ftp, filesystem, edit sources list
# by hand
base-config apt-setup/uri_type select http
```

```
# If you choose ftp or http, you'll be asked for a country and a mirror.
base-config apt-setup/country select enter information manually
base-config apt-setup/hostname string http.us.debian.org
base-config apt-setup/directory string /debian
# Stop after choosing one mirror.
base-config apt-setup/another boolean false

# You can choose to install non-free and contrib software.
#base-config apt-setup/non-free boolean true
#base-config apt-setup/contrib boolean true

# Do enable security updates.
base-config apt-setup/security-updates boolean true

#### Package selection.

# You can choose to install any combination of tasks that are available.
# Available tasks as of this writing include: Desktop environment,
# Web server, Print server, DNS server, File server, Mail server,
# SQL database, Laptop, Standard system, manual package selection. The
# last of those will run aptitude. You can also choose to install no
# tasks, and force the installation of a set of packages in some other
# way. We recommend always including the Standard system task.
tasksel tasksel/first multiselect Desktop environment, Standard system
#tasksel tasksel/first multiselect Web server, Standard system

#### Mailer configuration.

# During a normal install, exim asks only a few questions. Here's how to
# avoid even those. More complicated preseeding is possible.
exim4-config exim4/dc_eximconfig_configtype \
    select no configuration at this time
exim4-config exim4/no_config boolean true
exim4-config exim4/no_config boolean true

# It's a good idea to set this to whatever user account you choose to
# create. Leaving the value blank results in postmaster mail going to
# /var/mail/mail.
exim4-config exim4/dc_postmaster string

#### X Configuration.

# Preseeding Debian's X config is possible, but you probably need to know
# some details about the video hardware of the machine, since Debian's X
# configurator does not do fully automatic configuration of everything.

# X can detect the right driver for some cards, but if you're preseeding,
# you override whatever it chooses. Still, vesa will work most places.
#xserver-xfree86 xserver-xfree86/config/device/driver select vesa

# A caveat with mouse autodetection is that if it fails, X will retry it
# over and over. So if it's preseeded to be done, there is a possibility of
# an infinite loop if the mouse is not autodetected.
#xserver-xfree86 xserver-xfree86/autodetect_mouse boolean true

# Monitor autodetection is recommended.
```

```
xserver-xfree86 xserver-xfree86/autodetect_monitor boolean true
# Uncomment if you have an LCD display.
#xserver-xfree86 xserver-xfree86/config/monitor/lcd boolean true
# X has three configuration paths for the monitor. Here's how to preseed
# the "medium" path, which is always available. The "simple" path may not
# be available, and the "advanced" path asks too many questions.
xserver-xfree86 xserver-xfree86/config/monitor/selection-method \
    select medium
xserver-xfree86 xserver-xfree86/config/monitor/mode-list \
    select 1024x768 @ 60 Hz

#### Everything else.

# Depending on what software you choose to install, or if things go wrong
# during the installation process, it's possible that other questions may
# be asked. You can preseed those too, of course. To get a list of every
# possible question that could be asked during an install, do an
# installation, and then run these commands:
#   debconf-get-selections --installer > file
#   debconf-get-selections >> file

# If you like, you can include other preseed files into this one.
# Any settings in those files will override pre-existing settings from this
# file. More that one file can be listed, separated by spaces; all will be
# loaded. The included files can have preseed/include directives of their
# own as well. Note that if the filenames are relative, they are taken from
# the same directory as the preseed file that includes them.
#d-i preseed/include string x.cfg

# More flexibly, this runs a shell command and if it outputs the names of
# preseed files, includes those files. For example, to switch configs based
# on a particular usb storage device (in this case, a built-in card reader):
#d-i preseed/include_command string \
#    if $(grep -q "GUID: 0aec3050aec305000001a003" /proc/scsi/usb-storage-*/*); \
#    then echo kraken.cfg; else echo otherusb.cfg; fi

# To check the format of your preseed file before performing an install,
# you can use debconf-set-selections:
#   debconf-set-selections -c preseed.cfg
```

## C.2. Linux Devices

In Linux you have various special files in `/dev`. These files are called device files. In the Unix world accessing hardware is different. There you have a special file which actually runs a driver which in turn accesses the hardware. The device file is an interface to the actual system component. Files under `/dev` also behave differently than ordinary files. Below are the most important device files listed.

| | |
|---|---|
| `fd0` | First Floppy Drive |
| `fd1` | Second Floppy Drive |

| | |
|---|---|
| hda | IDE Hard disk / CD-ROM on the first IDE port (Master) |
| hdb | IDE Hard disk / CD-ROM on the first IDE port (Slave) |
| hdc | IDE Hard disk / CD-ROM on the second IDE port (Master) |
| hdd | IDE Hard disk / CD-ROM on the second IDE port (Slave) |
| hda1 | First partition of the first IDE hard disk |
| hdd15 | Fifteenth partition of the fourth IDE hard disk |

| | |
|---|---|
| sda | SCSI Hard disk with lowest SCSI ID (e.g. 0) |
| sdb | SCSI Hard disk with next higher SCSI ID (e.g. 1) |
| sdc | SCSI Hard disk with next higher SCSI ID (e.g. 2) |
| sda1 | First partition of the first SCSI hard disk |
| sdd10 | Tenth partition of the fourth SCSI hard disk |

| | |
|---|---|
| sr0 | SCSI CD-ROM with the lowest SCSI ID |
| sr1 | SCSI CD-ROM with the next higher SCSI ID |

| | |
|---|---|
| ttyS0 | Serial port 0, COM1 under MS-DOS |
| ttyS1 | Serial port 1, COM2 under MS-DOS |
| psaux | PS/2 mouse device |
| gpmdata | Pseudo device, repeater data from GPM (mouse) daemon |

| | |
|---|---|
| cdrom | Symbolic link to the CD-ROM drive |
| mouse | Symbolic link to the mouse device file |

| | |
|---|---|
| null | Everything pointed to this device will disappear |
| zero | One can endlessly read zeros out of this device |

## C.2.1. Setting Up Your Mouse

The mouse can be used in both the Linux console (with gpm) and the X window environment. The two uses can be made compatible if the gpm repeater is used to allow the signal to flow to the X server as shown:

```
mouse => /dev/psaux  => gpm => /dev/gpmdata -> /dev/mouse => X
```

```
/dev/ttyS0              (repeater)        (symlink)
/dev/ttyS1
```

Set the repeater protocol to be raw (in `/etc/gpm.conf`) while setting X to the original mouse protocol in `/etc/X11/XF86Config` or `/etc/X11/XF86Config-4`.

This approach to use gpm even in X has advantages when the mouse is unplugged inadvertently. Simply restarting gpm with

```
# /etc/init.d/gpm restart
```

will re-connect the mouse in software without restarting X.

If gpm is disabled or not installed with some reason, make sure to set X to read directly from the mouse device such as /dev/psaux. For details, refer to the 3-Button Mouse mini-Howto at `/usr/share/doc/HOWTO/en-txt/mini/3-Button-Mouse.gz`, **`man gpm`**, `/usr/share/doc/gpm/FAQ.gz`, and README.mouse (http://www.xfree86.org/current/mouse.html).

## C.3. Disk Space Needed for Tasks

The base installation for i386 using the default 2.4 kernel, including all standard packages, requires 573MB of disk space.

The following table lists sizes reported by aptitude for the tasks listed in tasksel. Note that some tasks have overlapping constituents, so the total installed size for two tasks together may be less than the total obtained by adding up the numbers.

Note that you will need to add the sizes listed in the table to the size of the base installation when determining the size of partitions. Most of the size listed as “Installed size” will end up in `/usr`; the size listed as “Download size” is (temporarily) required in `/var`.

| Task | Installed size (MB) | Download size (MB) | Space needed to install (MB) |
|---|---|---|---|
| Desktop | 1392 | 460 | 1852 |
| Web server | 36 | 12 | 48 |
| Print server | 168 | 58 | 226 |
| DNS server | 2 | 1 | 3 |
| File server | 47 | 24 | 71 |
| Mail server | 10 | 3 | 13 |
| SQL database | 66 | 21 | 87 |

**Note:** The *Desktop* task will install both the Gnome and KDE desktop environments.

If you install in a language other than English, **tasksel** may automatically install a *localization task*, if one is available for your language. Space requirements differ per language; you should allow up to 200MB in total for download and installation.

# C.4. Installing Debian GNU/Linux from a Unix/Linux System

This section explains how to install Debian GNU/Linux from an existing Unix or Linux system, without using the menu-driven installer as explained in the rest of the manual. This "cross-install" HOWTO has been requested by users switching to Debian GNU/Linux from Red Hat, Mandrake, and SUSE. In this section some familiarity with entering *nix commands and navigating the file system is assumed. In this section, `$` symbolizes a command to be entered in the user's current system, while `#` refers to a command entered in the Debian chroot.

Once you've got the new Debian system configured to your preference, you can migrate your existing user data (if any) to it, and keep on rolling. This is therefore a "zero downtime" Debian GNU/Linux install. It's also a clever way for dealing with hardware that otherwise doesn't play friendly with various boot or installation media.

## C.4.1. Getting Started

With your current *nix partitioning tools, repartition the hard drive as needed, creating at least one filesystem plus swap. You need at least 150MB of space available for a console only install, or at least 300MB if you plan to install X.

To create file systems on your partitions. For example, to create an ext3 file system on partition `/dev/hda6` (that's our example root partition):

```
# mke2fs -j /dev/hda6
```

To create an ext2 file system instead, omit **`-j`**.

Initialize and activate swap (substitute the partition number for your intended Debian swap partition):

```
# mkswap /dev/hda5
# sync; sync; sync
# swapon /dev/hda5
```

Mount one partition as `/mnt/debinst` (the installation point, to be the root (`/`) filesystem on your new system). The mount point name is strictly arbitrary, it is referenced later below.

```
# mkdir /mnt/debinst
# mount /dev/hda6 /mnt/debinst
```

> **Note:** If you want to have parts of the filesystem (e.g. /usr) mounted on separate partitions, you will need to create and mount these directories manually before proceding with the next stage.

## C.4.2. Install debootstrap

The tool that the Debian installer uses, which is recognized as the official way to install a Debian base system, is **debootstrap**. It uses **wget** and **ar**, but otherwise depends only on `/bin/sh`. Install **wget** and **ar** if they aren't already on your current system, then download and install **debootstrap**.

If you have an rpm-based system, you can use alien to convert the .deb into .rpm, or download an rpm-ized version at http://people.debian.org/~blade/install/debootstrap

Or, you can use the following procedure to install it manually. Make a work folder for extracting the .deb into:

```
# mkdir work
# cd work
```

The **debootstrap** binary is located in the Debian archive (be sure to select the proper file for your architecture). Download the **debootstrap** .deb from the pool (http://ftp.debian.org/debian/pool/main/d/debootstrap/), copy the package to the work folder, and extract the binary files from it. You will need to have root privileges to install the binaries.

```
# ar -x debootstrap_0.X.X_arch.deb
# cd /
# zcat /full-path-to-work/work/data.tar.gz | tar xv
```

Note that running **debootstrap** may require you to have a minimal version of `glibc` installed (currently GLIBC_2.3). **debootstrap** itself is a shell script, but it calls various utilities that require `glibc`.

## C.4.3. Run debootstrap

**debootstrap** can download the needed files directly from the archive when you run it. You can substitute any Debian archive mirror for **`http.us.debian.org/debian`** in the command example below, preferably a mirror close to you network-wise. Mirrors are listed at http://www.debian.org/misc/README.mirrors.

If you have a sarge Debian GNU/Linux CD mounted at `/cdrom`, you could substitute a file URL instead of the http URL: **`file:/cdrom/debian/`**

Substitute one of the following for *`ARCH`* in the **debootstrap** command: **`alpha`**, **`arm`**, **`hppa`**, **`i386`**, **`ia64`**, **`m68k`**, **`mips`**, **`mipsel`**, **`powerpc`**, **`s390`**, or **`sparc`**.

```
# /usr/sbin/debootstrap --arch ARCH sarge \
     /mnt/debinst http://http.us.debian.org/debian
```

## C.4.4. Configure The Base System

Now you've got a real Debian system, though rather lean, on disk. **Chroot** into it:

```
# LANG= chroot /mnt/debinst /bin/bash
```

### C.4.4.1. Mount Partitions

You need to create `/etc/fstab`.

```
# editor /etc/fstab
```

Here is a sample you can modify to suit:

```
# /etc/fstab: static file system information.
#
# file system    mount point   type    options                  dump pass
/dev/XXX         /             ext3    defaults                 0    1
/dev/XXX         /boot         ext3    ro,nosuid,nodev          0    2

/dev/XXX         none          swap    sw                       0    0
proc             /proc         proc    defaults                 0    0

/dev/fd0         /mnt/floppy   auto    noauto,rw,sync,user,exec 0    0
/dev/cdrom       /mnt/cdrom    iso9660 noauto,ro,user,exec      0    0

/dev/XXX         /tmp          ext3    rw,nosuid,nodev          0    2
/dev/XXX         /var          ext3    rw,nosuid,nodev          0    2
/dev/XXX         /usr          ext3    rw,nodev                 0    2
/dev/XXX         /home         ext3    rw,nosuid,nodev          0    2
```

Use **`mount -a`** to mount all the file systems you have specified in your `/etc/fstab`, or to mount file systems individually use:

```
# mount /path   # e.g.: mount /usr
```

You can mount the proc file system multiple times and to arbitrary locations, though `/proc` is customary. If you didn't use **`mount -a`**, be sure to mount proc before continuing:

```
# mount -t proc proc /proc
```

The command **`ls /proc`** should now show a non-empty directory. Should this fail, you may be able to mount proc from outside the chroot:

```
# mount -t proc proc /mnt/debinst/proc
```

### C.4.4.2. Configure Keyboard

To configure your keyboard:

```
# dpkg-reconfigure console-data
```

Note that the keyboard cannot be set while in the chroot, but will be configured for the next reboot.

### C.4.4.3. Configure Networking

To configure networking, edit `/etc/network/interfaces`, `/etc/resolv.conf`, and `/etc/hostname`.

```
# editor /etc/network/interfaces
```

Here are some simple examples from `/usr/share/doc/ifupdown/examples`:

```
#######################################################################
# /etc/network/interfaces -- configuration file for ifup(8), ifdown(8)
# See the interfaces(5) manpage for information on what options are
# available.
#######################################################################

# We always want the loopback interface.
#
auto lo
iface lo inet loopback

# To use dhcp:
#
# auto eth0
# iface eth0 inet dhcp

# An example static IP setup: (broadcast and gateway are optional)
#
# auto eth0
# iface eth0 inet static
#     address 192.168.0.42
#     network 192.168.0.0
#     netmask 255.255.255.0
#     broadcast 192.168.0.255
#     gateway 192.168.0.1
```

Enter your nameserver(s) and search directives in `/etc/resolv.conf`:

```
# editor /etc/resolv.conf
```

A simple `/etc/resolv.conf`:

```
search hqdom.local\000
nameserver 10.1.1.36
nameserver 192.168.9.100
```

Enter your system's host name (2 to 63 characters):

```
# echo DebianHostName > /etc/hostname
```

If you have multiple network cards, you should arrange the names of driver modules in the `/etc/modules` file into the desired order. Then during boot, each card will be associated with the interface name (eth0, eth1, etc.) that you expect.

### C.4.4.4. Configure Timezone, Users, and APT

Set your timezone, add a normal user, and choose your **apt** sources by running

```
# /usr/sbin/base-config new
```

### C.4.4.5. Configure Locales

To configure your locale settings to use a language other than English, install the locales support package and configure it:

```
# apt-get install locales
# dpkg-reconfigure locales
```

NOTE: Apt must be configured before, ie. during the base-config phase. Before using locales with character sets other than ASCII or latin1, please consult the appropriate localization HOWTO.

## C.4.5. Install a Kernel

If you intend to boot this system, you probably want a Linux kernel and a boot loader. Identify available pre-packaged kernels with

```
# apt-cache search kernel-image
```

Then install your choice using its package name.

```
# apt-get install kernel-image-2.X.X-arch-etc
```

## C.4.6. Set up the Boot Loader

To make your Debian GNU/Linux system bootable, set up your boot loader to load the installed kernel with your new root partition. Note that debootstrap does not install a boot loader, though you can use apt-get inside your Debian chroot to do so.

# Appendix D. Administrivia

## D.1. About This Document

This manual was created for Sarge's debian-installer, based on the Woody installation manual for boot-floppies, which was based on earlier Debian installation manuals, and on the Progeny distribution manual which was released under GPL in 2003.

This document is written in DocBook XML. Output formats are generated by various programs using information from the `docbook-xml` and `docbook-xsl` packages.

In order to increase the maintainability of this document, we use a number of XML features, such as entities and profiling attributes. These play a role akin to variables and conditionals in programming languages. The XML source to this document contains information for each different architecture — profiling attributes are used to isolate certain bits of text as architecture-specific.

## D.2. Contributing to This Document

If you have problems or suggestions regarding this document, you should probably submit them as a bug report against the package `debian-installer-manual`. See the `reportbug` package or read the online documentation of the Debian Bug Tracking System (http://bugs.debian.org/). It would be nice if you could check the open bugs against debian-installer-manual (http://bugs.debian.org/debian-installer-manual) to see whether your problem has already been reported. If so, you can supply additional corroboration or helpful information to <*xxxx*`@bugs.debian.org`>, where *xxxx* is the number for the already-reported bug.

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Please do *not* contact the authors of this document directly. There is also a discussion list for `debian-installer`, which includes discussions of this manual. The mailing list is <`debian-boot@lists.debian.org`>. Instructions for subscribing to this list can be found at the Debian Mailing List Subscription (http://www.debian.org/MailingLists/subscribe) page; or you can browse the Debian Mailing List Archives (http://lists.debian.org/) online.

## D.3. Major Contributions

This document was originally written by Bruce Perens, Sven Rudolph, Igor Grobman, James Treacy, and Adam Di Carlo. Sebastian Ley wrote the Installation Howto. Many, many Debian users and developers contributed to this document. Particular note must be made of Michael Schmitz (m68k support), Frank Neumann (original author of the Amiga install manual (http://www.informatik.uni-oldenburg.de/~amigo/debian_inst.html)), Arto Astala, Eric Delaunay/Ben Collins (SPARC information), Tapio Lehtonen, and Stéphane Bortzmeyer for numerous edits and text. We have to thank Pascal

Le Bail for useful information about booting from USB memory sticks. Miroslav Kuře has documented a lot of the new functionality in Sarge's debian-installer.

Extremely helpful text and information was found in Jim Mintha's HOWTO for network booting (no URL available), the Debian FAQ (http://www.debian.org/doc/FAQ/), the Linux/m68k FAQ (http://www.linux-m68k.org/faq/faq.html), the Linux for SPARC Processors FAQ (http://www.ultralinux.org/faq.html), the Linux/Alpha FAQ (http://linux.iol.unh.edu/linux/alpha/faq/), amongst others. The maintainers of these freely available and rich sources of information must be recognized.

The section on chrooted installations in this manual (Section C.4) was derived in part from documents copyright Karsten M. Self.

## D.4. Trademark Acknowledgement

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# Appendix E. GNU General Public License

Version 2, June 1991

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one line to give the program's name and a brief idea of what it does.

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