Beginning Ubuntu LTS Server Administration: From Novice to Professional, Second Edition

ISBN-13 (pbk): 978-1-4302-1082-5

ISBN-13 (electronic): 978-1-4302-1081-8

Printed and bound in the United States of America 9 8 7 6 5 4 3 2 1

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Distributed to the book trade worldwide by Springer-Verlag New York, Inc., 233 Spring Street, 6th Floor, New York, NY 10013. Phone 1-800-SPRINGER, fax 201-348-4505, e-mail `orders-ny@springer-sbm.com`, or visit `http://www.springeronline.com`.

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CHAPTER 1

Installing Ubuntu Server

You probably chose Ubuntu as a server solution because of either your gratifying experience using it on the desktop or the raves you've heard from others about its user-friendly approach. Accordingly, you might expect the general Ubuntu Server installation process to be fairly easy, and indeed it is. Nevertheless, because your ultimate goal is to deploy the server in a production environment, it's a good idea to follow some key aspects of the installation process with rigor, and this chapter is intended to help you do exactly that.

To keep things as simple as possible, you'll read how to complete the installation on a real server, with no virtualization involved. You'll explore the different options presented to you while installing Ubuntu, as well as the best choice to make to ensure that your installation is successful.

Preparing for the Installation

Before starting the installation, you have to do a bit of preparation. First, you must make sure that the required hardware is available. At the most basic, any PC will do, but, if you are interested in putting a real server to work, I recommend using server-grade hardware because that kind of hardware is optimized for the tasks that servers typically perform. On such hardware, you can install Ubuntu directly or virtualized. If you don't have server-grade hardware available, a standard PC is fine. In the end, it all depends on what you plan to do with your Ubuntu Server. An Apache web server at home does have some other requirements—as a corporate database server, for example.

In this chapter you won't learn how to install Ubuntu Server on a computer that already has some Windows installation. The reason for this is simple: on a real server you want only your server operating system and nothing else. Creating a dual-boot machine is cool for a desktop operating system, but you just don't want that for a production server. Because your Ubuntu Server probably has to be available at all times, it won't have any time to run anything but Ubuntu Server. So at this point, make sure that you have the hardware available to start the installation of a dedicated server.

Also make sure that you have the installation CD, which can be downloaded from `www.ubuntu.com`. (Make sure that you select the server version of Ubuntu.) In this book, I'm working with Ubuntu Server 8.04 LTS. The letters *LTS* stand for Long Term Support, which means that this version of Ubuntu Server will have five years of support. That makes it a perfect server operating system to run in an enterprise environment, in which support is of the highest importance.

Are you looking for the latest that Ubuntu Server has to offer? You can download the latest version of Ubuntu Server from `www.ubuntu.com`.

Starting the Ubuntu Server Installation Process

Have everything ready? Time to go! I assume that you already found the CD image at `www.ubuntu.com` and burned it as an image to a CD. Insert the installation CD in your server's optical drive and boot your server. Make sure the server boots from the CD-ROM and follow these steps to complete the installation.

1. In the installation menu that appears once the CD spins up, specify what you want to do. Often, it will be enough to select Install to the hard disk, but in certain cases other options are required as well. This is especially the case if you want to install in a language other than English and you're using a keyboard different from a US keyboard. If this is the case, use the F2 and the F3 keys to specify your language settings. The other options are rarely used, although the F6 key hides an option that some will like: Free software only in this menu ensures that no commercial packages are installed on your server. Make sure that you have everything you need, select Install Ubuntu Server, as shown in Figure 1-1, and then press the Enter key to start the installation.

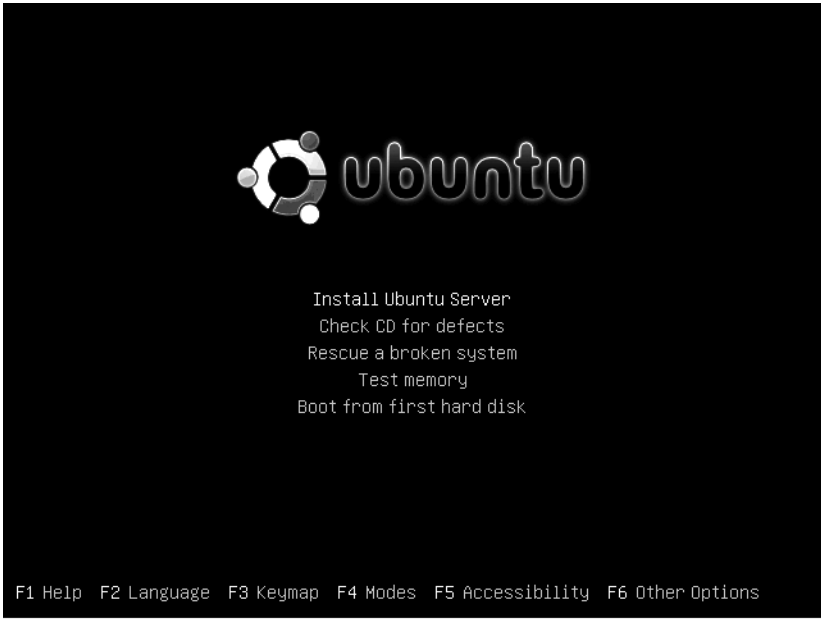
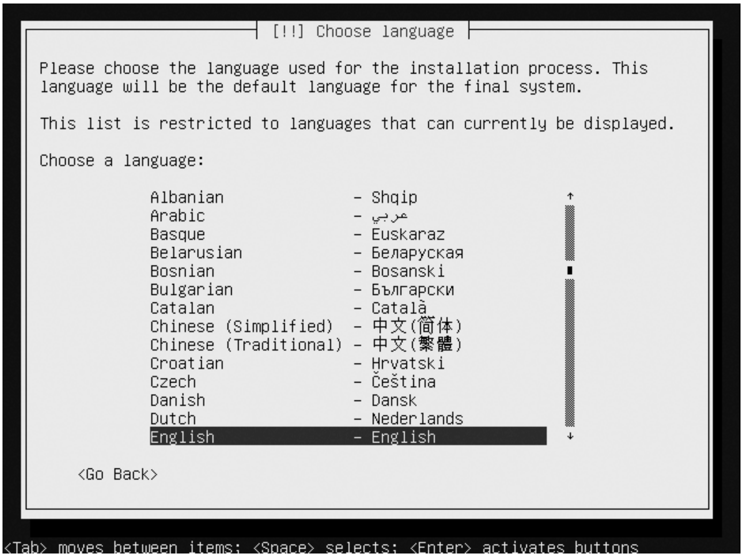

ubuntu
Install Ubuntu Server
Check CD for defects
Rescue a broken system
Test memory
Boot from first hard disk
F1 Help F2 Language F3 Keymap F4 Modes F5 Accessibility F6 Other Options

Figure 1-1. *In many situations, you just have to press the Enter key to start the installation.*

Note If your graphical hardware doesn't support displaying the full graphical menu, you might get an installation screen that looks a little different. In that case, press F1 to see the options that are mentioned before.

2. The next screen shows a menu-driven interface. Ubuntu Server does not have a graphical user interface (GUI) by default because it runs on servers that are hidden in a data center, anyway. Using a GUI would be a waste of precious system resources, so the installation procedure itself is also text-based. In case you did not choose your installation language in the first step of this procedure, you get another chance in the second screen. In this book we'll use English; if you want to install in another language, select it from the menu that you see in Figure 1-2.

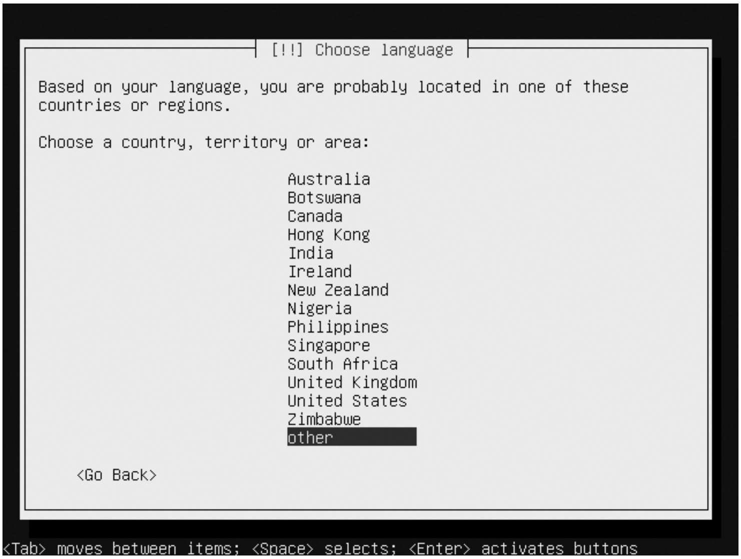


```
[!!] Choose language

Please choose the language used for the installation process. This
language will be the default language for the final system.

This list is restricted to languages that can currently be displayed.

Choose a language:

            Albanian               - Shqip
            Arabic                 - عربي
            Basque                 - Euskaraz
            Belarusian             - Беларуская
            Bosnian                - Bosanski
            Bulgarian              - Български
            Catalan                - Català
            Chinese (Simplified)   - 中文(简体)
            Chinese (Traditional)  - 中文(繁體)
            Croatian               - Hrvatski
            Czech                  - Čeština
            Danish                 - Dansk
            Dutch                  - Nederlands
            English                - English

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-2. *If you did not specify the installation language in the boot screen, you have another chance of selecting the language here.*

3. Based on the language that you selected, you'll see a list of countries (see Figure 1-3). Select your country to make sure that other local settings are applied automatically. If your country is not in the default list, browse to the bottom of the list and select Other, which supplies a larger list.

Tip Ubuntu Server makes some choices for you automatically. If you want to make these choices yourself, use the Go Back button that appears in almost every screen of the installer. This will display a more detailed list of options that are relevant to that particular stage of the installation, and you can choose what you want to do yourself.



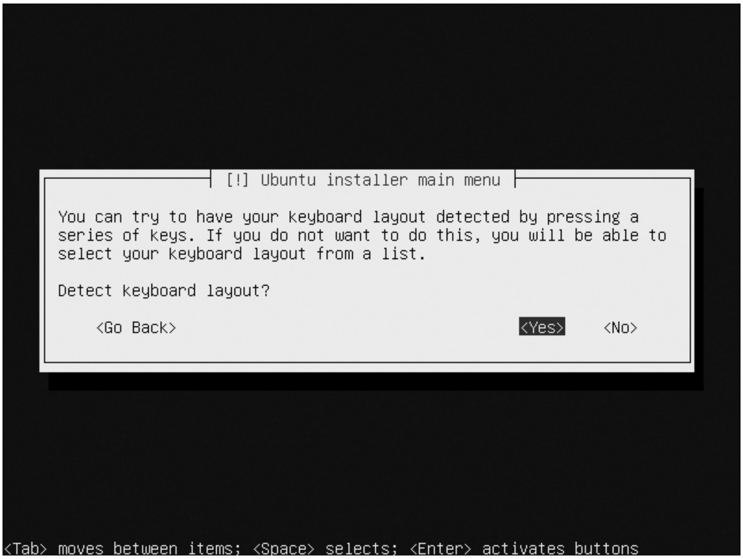
[!!] Choose language

Based on your language, you are probably located in one of these countries or regions.

Choose a country, territory or area:

Figure 1-3. *If your country doesn't appear in the default list of countries, select Other to choose from a larger list of countries.*

4. Next, you can have the installer automatically detect the keyboard that you are using. After selecting this option, the installer will ask you to use some keys on your keyboard; based on the keys you use, the installer will determine the correct keyboard setting. If you don't want to use this feature, click No from the screen that you see in Figure 1-4, and select your keyboard type from the list displayed next.



[!] Ubuntu installer main menu

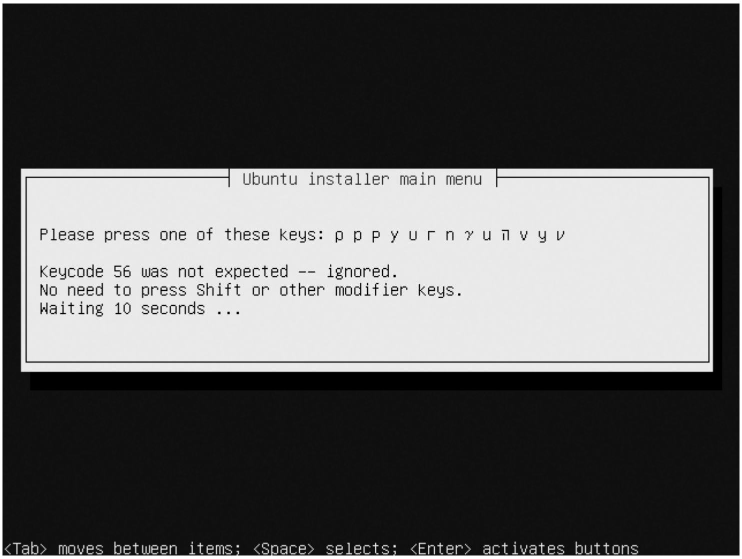
You can try to have your keyboard layout detected by pressing a series of keys. If you do not want to do this, you will be able to select your keyboard layout from a list.

Detect keyboard layout?

<Go Back>
<Yes>
<No>
<Tab> moves between items; <Space> selects; <Enter> activates buttons

Figure 1-4. *The installation program can automatically detect the keyboard layout that you are using.*

5. If you want the program to detect the keyboard automatically, select Yes. Next, the installer will ask you to hit a specified key (see Figure 1-5), by which it can detect the right keyboard layout in a matter of seconds. If you don't want to do the automatic detection, that's fine. You can just select the keyboard from a list of keyboards.

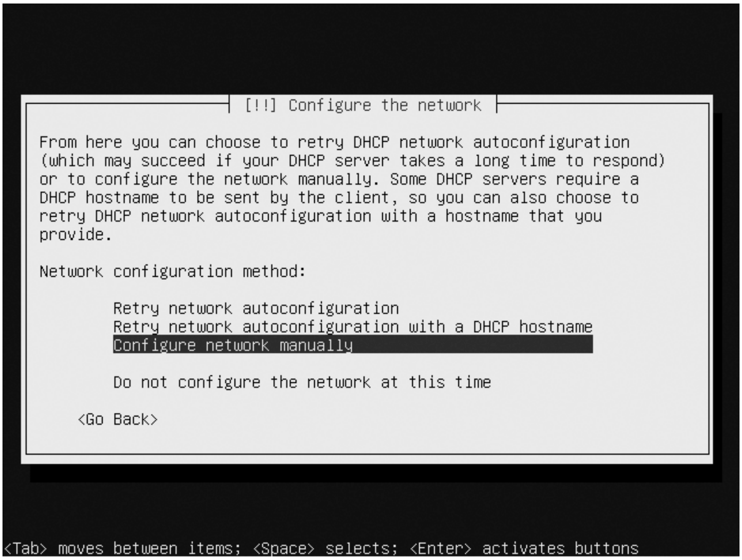


```
Ubuntu installer main menu

Please press one of these keys: ρ p р y υ г n γ u ה v y ν

Keycode 56 was not expected -- ignored.
No need to press Shift or other modifier keys.
Waiting 10 seconds ...

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-5. *Based on the keys that you pressed, the installation program will quickly detect the proper keyboard layout.*

6. After the keyboard is configured, most hardware is detected and configured automatically. Some hardware—such as WiFi network cards or graphical adapters—may require later configuration. Among the most important settings is the network configuration. If a DHCP server is available in the network to automatically assign IP addresses, your server will be provided with an IP address and ask you only for a name for the server; you'll see nothing that is related to the configuration of the network board at all! If you don't have a DHCP server, the network configuration program will start automatically. For a server, it is always a good idea to work with a fixed IP address, because you wouldn't want your services to suddenly switch to a different IP address suddenly. To start the manual network configuration, use the Go Back button now and manually configure the network card. You'll see a list of the available options. In the next step, you manually configure the IP address of your server.

7. After selecting the Go back option, move your cursor to Configure network manually (see Figure 1-6) and press Enter.



```
[!!] Configure the network

From here you can choose to retry DHCP network autoconfiguration
(which may succeed if your DHCP server takes a long time to respond)
or to configure the network manually. Some DHCP servers require a
DHCP hostname to be sent by the client, so you can also choose to
retry DHCP network autoconfiguration with a hostname that you
provide.

Network configuration method:

        Retry network autoconfiguration
        Retry network autoconfiguration with a DHCP hostname
        Configure network manually

        Do not configure the network at this time

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

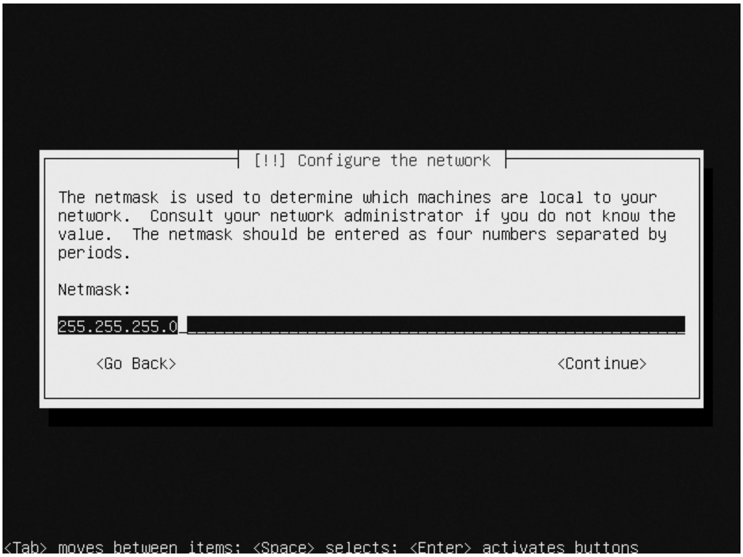
Figure 1-6. *If you don't use the Go Back option, you can't configure your network manually.*

8. Enter the IP address that you want to use for your server, select Continue, and press Enter. Not sure what information you need here? Then either return to step 6 and have DHCP automatically assign an IP address, or ask your service provider or network administrator for the proper address configuration.

9. Every IP address needs a netmask that explains to your server what network it is in. Most IP addresses can use the netmask that is assigned to them by default. If this doesn't work in your situation, enter the proper netmask in the screen shown in Figure 1-7, select Continue, and press Enter.

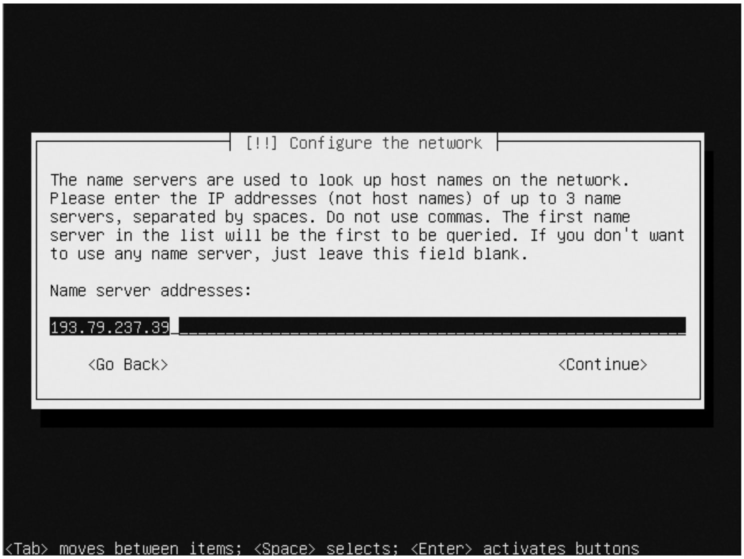
10. Now you're asked to enter the IP address of the default gateway. This is the IP address of the router that is connected to the rest of the Internet. If you don't know what to enter, ask your network administrator what to use here and then proceed to the next step.

11. Enter the IP address of the DNS server that you want to use (see Figure 1-8). This server allows you to reach other computers on the Internet by their names instead of their IP addresses. If you are on a small network, this is probably the address of a server at your Internet service provider. If you are on a larger network, the network administrator may have configured a separate DNS server. Ask what IP address you should use and then proceed to the next step. You would normally enter two IP addresses for DNS name servers to ensure that names will still be resolved if the first DNS server is down. To enter a second IP address for a DNS server, just enter the address with a space as the separator between the two addresses. Use the actual IP addresses here, not names (because using names requires a means for them to be resolved, and setting up that mechanism is just what you're doing here).



```
[!!] Configure the network

The netmask is used to determine which machines are local to your
network.  Consult your network administrator if you do not know the
value.  The netmask should be entered as four numbers separated by
periods.

Netmask:

255.255.255.0

    <Go Back>                                              <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

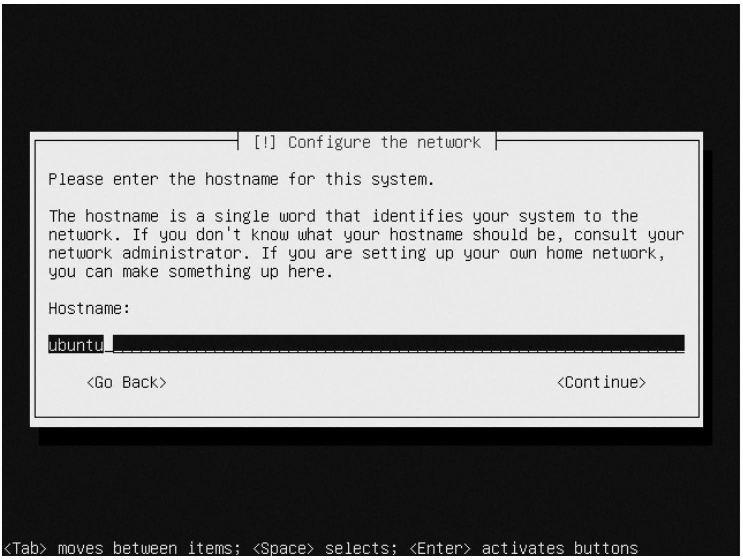
Figure 1-7. *On most networks, the default netmask can be used.*



```
[!!] Configure the network

The name servers are used to look up host names on the network.
Please enter the IP addresses (not host names) of up to 3 name
servers, separated by spaces. Do not use commas. The first name
server in the list will be the first to be queried. If you don't want
to use any name server, just leave this field blank.

Name server addresses:

193.79.237.39

    <Go Back>                                              <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-8. *The IP address of the DNS server is necessary to contact other computers on the Internet by their names instead of their IP addresses.*

12. Now you are asked for the name you want to use for your computer. By default, the installer assigns a host name automatically (depending on the hardware configuration you're using, it will usually be Ubuntu). There's nothing wrong with using this assigned name, but you may want to use a name that provides a little more information or individuality. Also, the name typically has to conform to the naming scheme of your network.



```
[!] Configure the network

Please enter the hostname for this system.

The hostname is a single word that identifies your system to the
network. If you don't know what your hostname should be, consult your
network administrator. If you are setting up your own home network,
you can make something up here.

Hostname:

ubuntu

    <Go Back>                                           <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-9. *The default host name is set to Ubuntu. You may want to change that to something that provides more information.*

13. As the last part of the network configuration, you have to enter a domain name now. If there's a DHCP server on your network, you'll see that a domain name was entered automatically. (You're free to change that automatically assigned name to any other name if it doesn't fit what you want to do with your server.)

14. Now you have to select your server's time zone. It is based on the country that you selected earlier, so if you don't see the time zone you want to use, go back and change the country that you selected or change the time zone after your server has been installed completely.

Configuring the Server's Hard Drive

You've now completed the first part of the installation, but basically nothing has changed on your computer yet. So, if you want to stop the installation of Ubuntu Server and install Windows NT anyway, you can. If you want to continue, it's time to do some thinking. The installer is going to ask you how you want to lay out your server's hard drive. You have a couple of choices here, and you'd better make them now because they'll be very difficult to change later. So wait before you press Enter and read this section first.

The first choice you have to make is between using just one partition or volume to install your server, or using several of them. Using more than one storage unit can make your server more flexible and more secure. If, for example, you put all data on one large storage unit (like one root partition), a user or a process can fill that partition completely by accident, thus making your server completely unusable. It's useful to use more than one storage unit for the following reasons, as well:

- Working with more than one partition or logical volume makes it possible to mount them with different properties while mounting. For example, a partition where things normally wouldn't change can be mounted as read-only, thus increasing the security of your server.
- Using more than one partition makes it easier to work with external storage like a storage area network (SAN). For example, you could put all the system data on the server's local hard drive, and all the user data could reside on the SAN.
- Working with more than one partition is necessary in some situations. For example, to make sure that your server will always be able to start up, you could create a separate partition to boot from.

Next, you have to decide between using logical volumes or partitions. *Partitions* are fixed-size slices of disk space. It is very hard (although not impossible) to change them later. *Logical volumes* from the Logical Volume Manager (LVM) system are much more flexible. It's very easy to resize them, and they offer some other cool advanced features as well (about which you'll read in Chapter 4 of this book). In the next subsections you'll learn more about partitions and volumes.

Working with Traditional Partitions

Partitions have been used to divide server hard disks in several usable slices since the very first days of the personal computer. To create partitions, you use the partition table in the master boot record of your server's hard disk. Because this partition table is only 64 bytes, you can create only four partitions here. Originally, these were so-called primary partitions. In some cases, four is not enough, and that's what the extended partition was invented for. A *primary partition* can contain a file system directly. This is not the case for extended partitions. An *extended partition* functions like an empty box that allows you to create logical partitions inside of it. So the only purpose of extended partitions is to allow you to create logical partitions. No logical partitions without extended partitions. The number of logical partitions that can be created depends on the hardware and software that you are using, but it is never more than 16. So, using the traditional partitioning scheme, a maximum of 20 partitions can be created. This number may seem enough, but in some situations it isn't.

The next characteristic of a traditional partition is that it is not very flexible. If, after some time, you learn that one of the partitions is almost full, it is very difficult in a traditional partitioning scheme to increase the size of one partition while decreasing the size of another partition. It can be done, but the work is really best left to the experts, because you could lose all data on all partitions involved.

Caution You think you're an expert? Okay. Here's how it works: first shrink the size of the file system in the partition (check Chapter 4 for more information). After that, delete the partition you want to reduce in size and create it again, using the same start cylinder and the new size you want to use for the partition. But remember when you do this, you're only one small step away from destroying all files on your partition, so be careful and don't blame me if it goes wrong. Better wait until you read Chapter 4 before you try to perform a potentially dangerous action like this.

Advantages of Logical Volumes

The LVM system can be used to avoid the disadvantages of traditional partitions. If you use an LVM layout, you format the logical volumes instead of the partitions. The logical volume has more or less the same functionality as the partition, but LVMs have some important benefits:

- You can create as many as 256 LVM logical volumes.
- Logical volumes are very easy to resize.
- A logical volume does not have a one-to-one relationship with the storage device that it's created on. Thus, it's possible to create a logical volume that uses three hard disks at the same time. (Although this process is certainly not recommended because if you lost one hard disk, you would lose your complete volume, but it's cool that you can do it, and there are ways of coping with hard disk failure.)
- Logical volumes support working with snapshots. A *snapshot* allows you to freeze the state of a volume at a given point in time, which makes backing up data on a logical volume very convenient. This is done in a very clever way, so that the snapshot uses only a fraction of the disk space of the original volume.

Note Really want to understand how LVM is working? The LVM-HOWTO at `http://tldp.org/HOWTO/LVM-HOWTO` has some good in-depth information. Chapter 4 has some more information as well.

Apart from all the good news, LVMs have one drawback: it is very hard to boot from a logical volume. Therefore, even if you're using LVMs, you'll always need at least one traditional partition to boot your server.

Creating an Efficient Hard Disk Layout on the Server

When installing a Linux server, it's common not to put all files on one huge partition or logical volume for the reasons just discussed. Because Linux servers normally contain many different files, it is a good idea to create some partitions or volumes to store these files. Each of these partitions or volumes is assigned to (mounted on) a specific directory. Of course, you can put everything on one partition only, but you may run into troubles later, such as if a user completely fills this partition. Before starting the actual installation of your server, you should decide on the most appropriate way to use your hard drive.

Tip You don't want to go for the complicated setup straight away—just a simple Ubuntu Server? Use the first Guided partitioning option from the menu in Figure 1-10 (in the section "Using the Guided Partitioning Procedure") and press Enter. In that case, you can also skip the next couple of pages of this chapter. Want to have not just a Ubuntu Server but also a well-performing Ubuntu Server? Read on, please.

It is a good idea to give the directories their own partition or logical volume on your server.

- `/boot`: Because the information in the `/boot` directory is needed to start a server, it's a rather important directory. For that reason and especially to protect it from everything else that is used on your server, `/boot` often has its own partition. This directory cannot be on a logical volume because booting from logical volumes is currently not supported out of the box. Because this directory is the first thing that is needed when booting a server, it's a very good idea to put it at the beginning of your server's hard drive. Doing so will prevent time-out issues while booting the server. It will also make troubleshooting a lot easier. And if these reasons are not enough, it is a good idea to have a separated `/boot` partition if working on a server with an older BIOS because it should be at the beginning of your hard disk. Typically, it is more than enough to allocate the `/boot` directory to a 100 MB partition.
- `/`: The root directory of the file system always has its own file system, which is also referred to as the root file system. The *root file system* is rather simple: it contains everything that hasn't been split off to another partition. If no data files are stored here, 8 GB is typically large enough.
- `/var`: The `/var` directory is used by lots of processes that need to create files on your server dynamically (such as printer spool files or the cache that is created by your proxy cache server). However, because the `/var` directory is so very dynamic, it has an increased chance of problems. So it's always a good idea to put it on its own partition. In a normal environment, 4 GB is a reasonable amount of disk space to assign to this partition, but in some specific environments, you'll need lots more.

Caution A badly configured log system can eat up available disk space very fast. So don't just create a `/var` volume and never look at it again; make sure that you tune your logging services as well. (More on that in Chapter 3.)

- `/home`: The `/home` directory belongs to the user and is where he or she will normally store files if the server is a file server. Because it also is very dynamic, and users are accessing it all the time, make sure that it also has its own partition. The amount of disk space you reserve for this partition depends on how much space you want to grant to your users.

- `/srv`: The `/srv` directory is used by servers such as the Apache web server and the FTP server to store data. Because files in this directory can be accessed by users that make a connection from the Internet, it should have some extra security. A simple way to do this is to place it in its own partition or volume. The amount of disk space on this partition depends on how you are going to use your server. If it is a public FTP server, assign it the maximum space; if your servers serve web or FTP files only occasionally, you can keep the disk space in this directory quite moderate.

File Systems

Because it's a Linux server, Ubuntu offers a choice from many file systems. When creating disk partitions or volumes, you have to tell the partitioning utility what type of file system you want to use on that volume. The following file systems are available for Ubuntu Server:

- *Ext3*: This is the default file system on almost all Linux distributions. Although it is a very stable file system with many debug tools available, there is a major drawback: Ext3 isn't the best file system to handle many files on one volume. It also isn't the fastest if you have to write many small files to your volume.
- *Ext2*: Ext2 and Ext3 are largely the same, except that Ext3 uses a journal to make it easier to recover a corrupted file system. This isn't the case for Ext2. Despite the absence of a journal, Ext2 is still a good choice for small volumes where the services of a journal aren't necessarily needed (because, for example, the files are not supposed to be opened for writing anyway). For instance, if you create a 100 MB `/boot` partition, the Ext2 file system is an excellent choice for it.
- *ReiserFS*: ReiserFS is a very advanced file system with great features. These features include journaling, advanced indexing, and many others. ReiserFS is particularly strong if many small files have to be written. However, it has two drawbacks: its main developer is currently facing myriad legal issues, and the file system is not particularly known for its stability and active community support. Use it if you want to write intensively or if you want to store many files in one directory, but make sure that you make a good backup at the same time. Want something that offers the same functionality but is more stable? Better use XFS.
- *XFS*: XFS was developed by SGI as a special-purpose open source file system. It is especially meant to be used when the server will see lots of usage or when the files are very large. So use it if you want to stream lots of media files or if you have an FTP server with multiple terabytes of data. In its most recent versions, XFS offers a good alternative for ReiserFS.
- *Ext4*: As you can probably guess from its name, Ext4 is the next generation of the Ext file systems. At the time of this writing, the first code was just available and it was far from being a usable file system. It is not in Ubuntu Server 8.04, but you will probably see it soon in future releases of Ubuntu Server.
- *FAT*: FAT vfat and NTFS file systems allow you to create a multiboot environment for a computer on which both Windows and Linux are installed. The purpose of these file systems is to access files stored in Windows partitions. Because there's no Windows on your Ubuntu Server, you don't need it there.

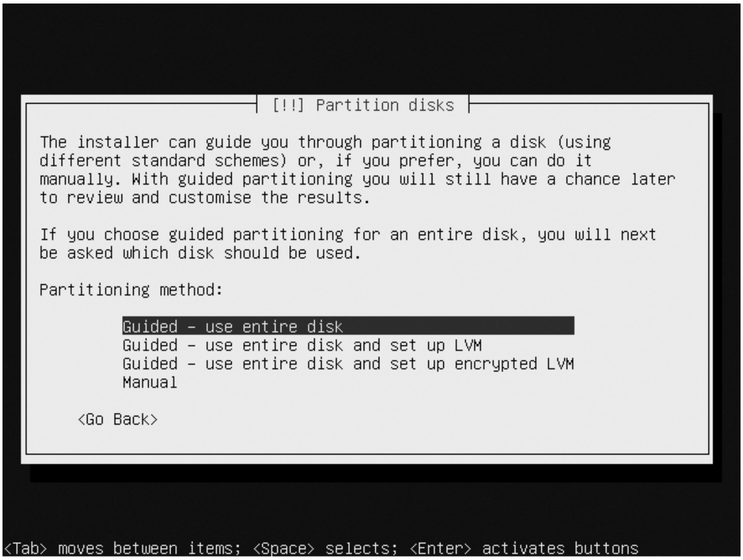
Continuing the Installation of Ubuntu Server

Now that you know some more about the choices that are offered when installing Ubuntu Server, let's continue. You now have to specify how you want to partition your server's hard disk. Because the partitioning of a hard disk is one of the most important parts of the server installation process, we will cover all choices. The choices are divided into three main categories:

- *Guided - use entire disk*: This is the easiest option. It offers a guided installation of your hard disk, based on traditional partitions. If you want to keep the partitions that already are on your server's hard drive, use Guided – resize instead. This option will shrink any installed operation system and use the space that is freed for installing Ubuntu Server. There is also an option that allows you to use the largest continuous free space, but this option is usable only if you have some free, unpartitioned disk space on your server's hard drive. Because the last of these two options is useful only for multiboot configurations, it is not covered in this chapter.
- *Guided - use entire disk and set up LVM*: This configuration option is a bit more complex. It offers you a wizard that allows you to create an LVM-based disk configuration. If you want to put up a well-secured environment, you can even choose to set up encrypted LVM instead. This is a good idea if you want to be sure that unauthorized people will never be able to access the data on your volume. Be aware, though, that an encrypted LVM volume will never be accessible if the related user credentials get lost. Also, there is a performance price for using encrypted volumes, so make sure that you really want them before applying them.
- *Manual*: Use this procedure if you're sure you know what you are doing and you don't need the help of any wizard.

Using the Guided Partitioning Procedure

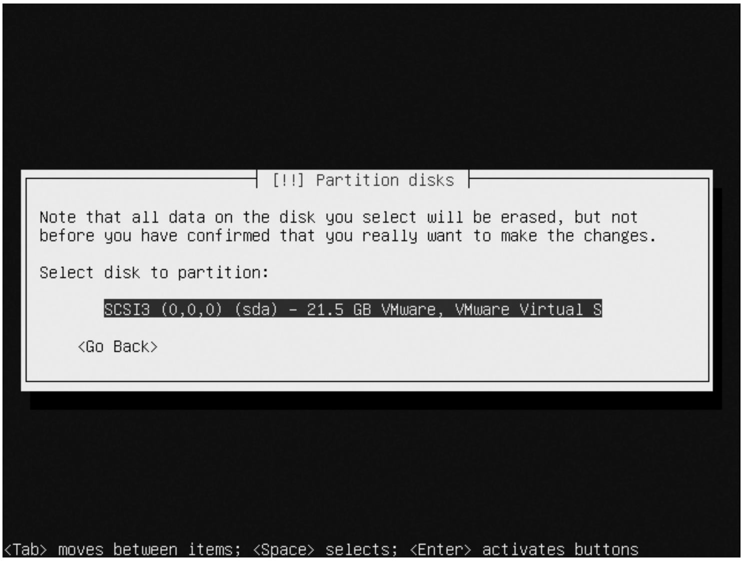
Let's first talk about the guided procedure to set up a server hard disk. Your starting point is the screen shown in Figure 1-10. (At least, something that looks like it because the exact offering depends on what you already have on your server's hard drive.)



```
[!!] Partition disks

The installer can guide you through partitioning a disk (using
different standard schemes) or, if you prefer, you can do it
manually. With guided partitioning you will still have a chance later
to review and customise the results.

If you choose guided partitioning for an entire disk, you will next
be asked which disk should be used.

Partitioning method:

         Guided - use entire disk
         Guided - use entire disk and set up LVM
         Guided - use entire disk and set up encrypted LVM
         Manual

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-10. *You have several choices for configuring your server's hard disk.*

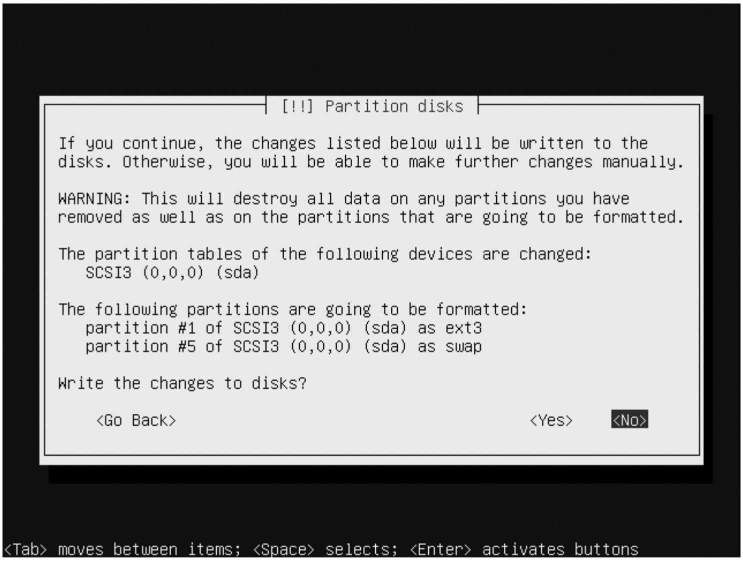
1. From the screen shown in Figure 1-10, select Guided - use entire disk.
2. The installation shows an overview of all the available hard disks (see Figure 1-11). Choose the disk that you want to use and press the Enter key.



```
[!!] Partition disks

Note that all data on the disk you select will be erased, but not
before you have confirmed that you really want to make the changes.

Select disk to partition:

       SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-11. *Choose the hard disk that you want to partition.*

3. Now the installation program shows you what it intends to do with your server's hard disk (see Figure 1-12). The program isn't very verbose about this, as it just shows that it wants to create a swap partition and an Ext3 partition. But you probably don't care because this option is meant to offer a simple partitioning for your server. So select Yes and then press Enter to continue.

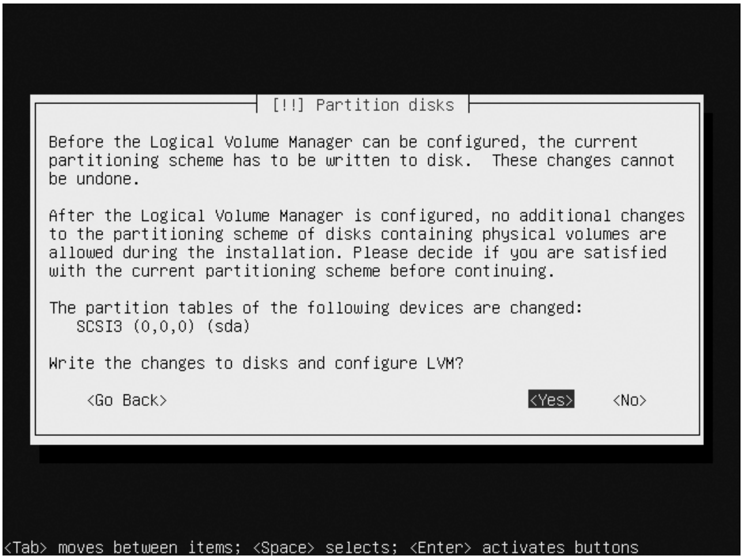


```
[!!] Partition disks

If you continue, the changes listed below will be written to the
disks. Otherwise, you will be able to make further changes manually.

WARNING: This will destroy all data on any partitions you have
removed as well as on the partitions that are going to be formatted.

The partition tables of the following devices are changed:
   SCSI3 (0,0,0) (sda)

The following partitions are going to be formatted:
   partition #1 of SCSI3 (0,0,0) (sda) as ext3
   partition #5 of SCSI3 (0,0,0) (sda) as swap

Write the changes to disks?

     <Go Back>                                       <Yes>    <No>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-12. *The default partitioning scheme is rather basic.*

Using the Guided LVM-Based Setup

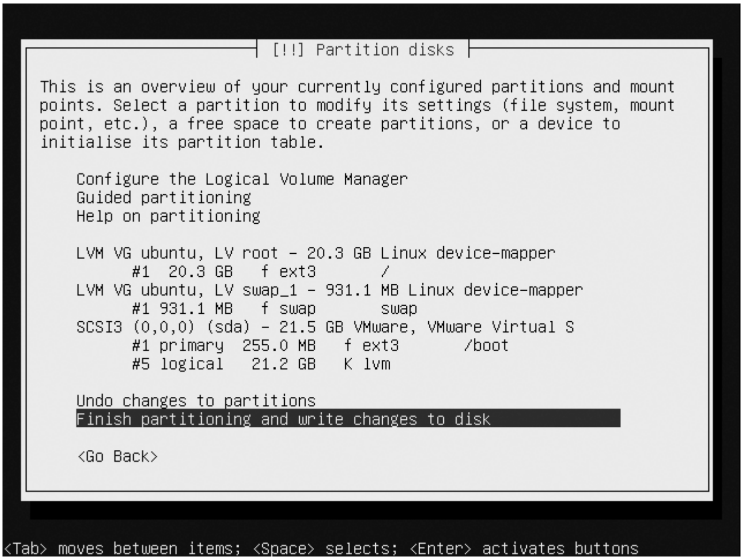
The procedure for an LVM-based disk layout is a lot like the simple guided disk setup. Choosing the guided LVM-based setup also brings you to a screen from which you can select the disk or disks that you want to use. Press Enter to select your disk. The partitioning program next tells you that it wants to write a basic partitioning scheme to disk before it can continue (see Figure 1-13). This is needed because an LVM environment is created on top of a traditional partition. Be aware that this is the point of no return; after you've written this basic partitioning scheme to hard disk, you can't undo your installation.



```
[!!] Partition disks

Before the Logical Volume Manager can be configured, the current
partitioning scheme has to be written to disk.  These changes cannot
be undone.

After the Logical Volume Manager is configured, no additional changes
to the partitioning scheme of disks containing physical volumes are
allowed during the installation. Please decide if you are satisfied
with the current partitioning scheme before continuing.

The partition tables of the following devices are changed:
   SCSI3 (0,0,0) (sda)

Write the changes to disks and configure LVM?

    <Go Back>                                     <Yes>    <No>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-13. *Before the logical volumes can be created, some traditional partition setup has to be written to disk.*

Once the default partitioning has been set up, the installation program makes a proposition for two logical partitions that are set up on top of that (see Figure 1-14). By default, this is a root partition, formatted as Ext3 and a swap partition. Select Finish partitioning and write changes to disk and press Enter to continue with the installation.



```
[!!] Partition disks

This is an overview of your currently configured partitions and mount
points. Select a partition to modify its settings (file system, mount
point, etc.), a free space to create partitions, or a device to
initialise its partition table.

    Configure the Logical Volume Manager
    Guided partitioning
    Help on partitioning

    LVM VG ubuntu, LV root - 20.3 GB Linux device-mapper
          #1  20.3 GB   f ext3       /
    LVM VG ubuntu, LV swap_1 - 931.1 MB Linux device-mapper
          #1 931.1 MB   f swap       swap
    SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S
          #1 primary  255.0 MB   f ext3       /boot
          #5 logical   21.2 GB   K lvm

    Undo changes to partitions
    Finish partitioning and write changes to disk

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-14. *By default, two logical volumes are created on top of the partitions.*

Manually Setting Up Your Hard Drive

If you want to set up your server's hard drive manually, that's perfectly fine, but you need to do some thinking before you start. First, you need to decide if you want to use LVM or traditional partitions only. Once you have made this decision, you need to choose between the different file systems that are available for Linux. I recommend making a small overview like the one in Table 1-1. While making such an overview, don't forget to assign some swap space as well. In Linux, swapping happens to a partition or volume, so you must consider it while setting up your server. In general, there is no need to make your swap space larger than 1 GB, with the exception of servers with special applications such as Oracle. If that is the case for your environment, consult your application documentation to find out what amount of swap space is reasonable for your situation.

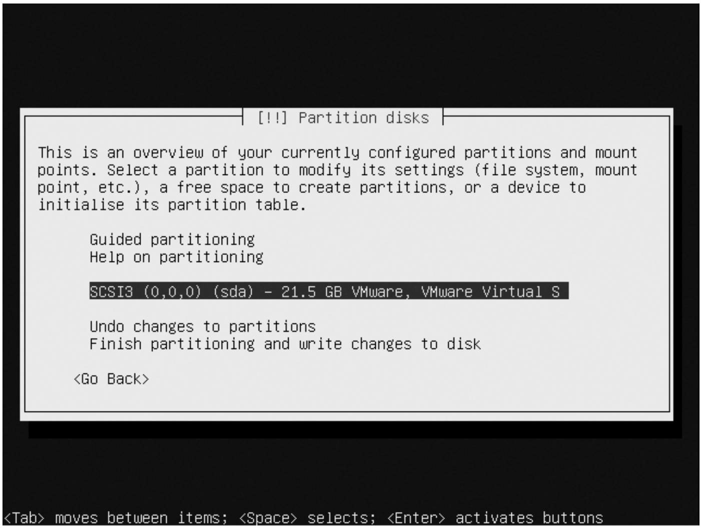
Table 1-1. *Hard Disk Configuration Overview*

Directory	Type	File System	Size
`/boot`	Primary partition	Ext2	100 MB
`/var`	LVM	XFS	4 GB
`/home`	LVM	XFS	200 GB
`/`	LVM	Ext3	50 GB
`swap`	LVM	Swap	1 GB

Once you have made up your mind about the hard disk usage, follow these steps to apply your decision.

1. From the Partition disks interface, select Manual.

2. You now see a screen like the one in Figure 1-15. In this screen, select the hard disk that you want to configure first.

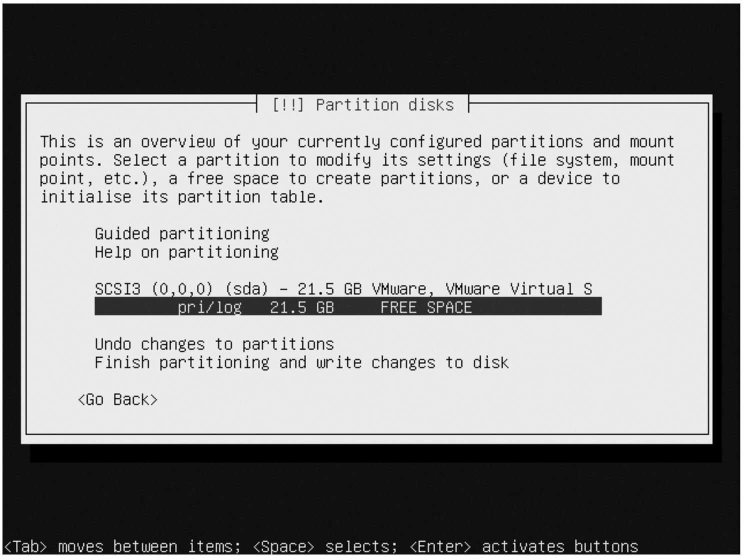


```
[!!] Partition disks

This is an overview of your currently configured partitions and mount
points. Select a partition to modify its settings (file system, mount
point, etc.), a free space to create partitions, or a device to
initialise its partition table.

        Guided partitioning
        Help on partitioning

        SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S

        Undo changes to partitions
        Finish partitioning and write changes to disk

     <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-15. *Select the hard disk on which you want to create partitions and volumes.*

3. Because you have just selected an entire hard disk to configure, the installation program warns you, stating that continuing will remove all existing partitions on the hard drive. If you are sure you want to do this, select Yes and press the Enter key. If there's more than one hard disk on which you want to create partitions, select this additional hard disk and repeat these steps.

4. You now see an overview of all available unconfigured disk space on the selected hard drive (see Figure 1-16). Select this free space and press Enter.



```
                    ┤ [!!] Partition disks ├

 This is an overview of your currently configured partitions and mount
 points. Select a partition to modify its settings (file system, mount
 point, etc.), a free space to create partitions, or a device to
 initialise its partition table.

       Guided partitioning
       Help on partitioning

       SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S
                pri/log   21.5 GB      FREE SPACE

       Undo changes to partitions
       Finish partitioning and write changes to disk

     <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

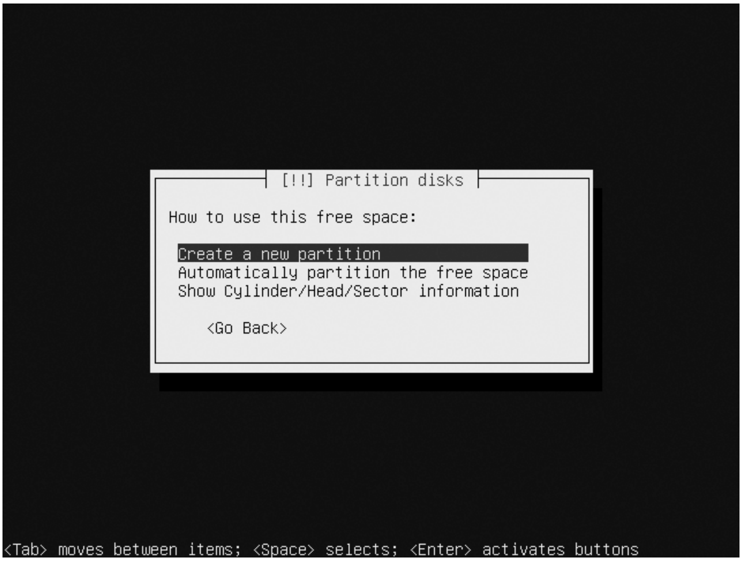
Figure 1-16. *Select the available disk space and press Enter.*

5. Now the installer asks how to use the available disk space. To create the setup detailed in Table 1-1, you first have to set up two partitions. One of them will be used by the `/boot` partition, and the other will contain all available disk space on the hard drive. This second partition is used to create a partition of the type 0x8e (LVM), which will be used to set up logical volumes later. To set up the `/boot` partition first, select Create a new partition (see Figure 1-17) and press Enter.

■ **Note** Partition types are written as hexadecimal numbers. You know that they are hexadecimal numbers because you can often see them as *0x8e* (the *0x* indicates that it is a hexadecimal number). In most cases, however, there is no problem in omitting this *0x*, so *0x8e* and *8e* can both be used to refer to the partition ID.

6. Next, enter the size that you want to assign to the partition. You can enter a percentage of disk space that you want to use or just type **max** if you want to use the maximum available size. Next, select Continue and press the Enter key.

7. Now you have to enter the type of partition you need, and the installation program offers a choice between a primary and a logical partition. If you choose a logical partition, the program will automatically create the necessary extended partition. Because you need only two partitions in this scenario, you can choose the primary partition type for both of the partitions.



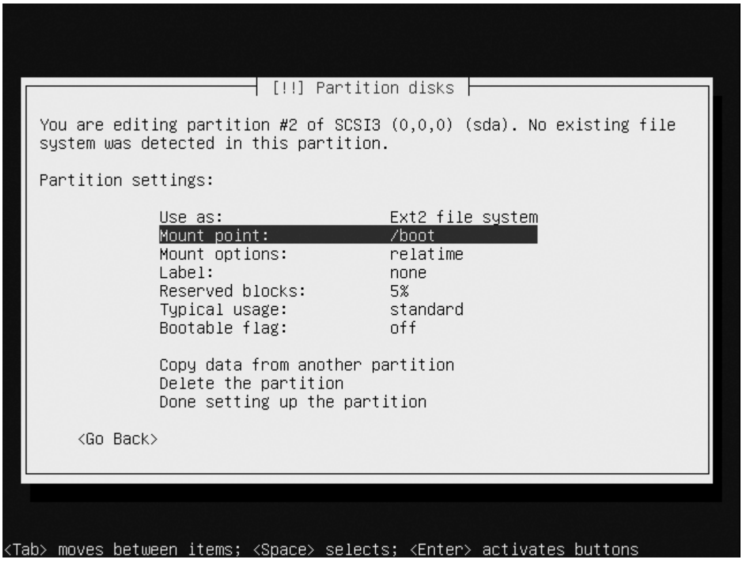
```
[!!] Partition disks

How to use this free space:

 Create a new partition
 Automatically partition the free space
 Show Cylinder/Head/Sector information

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-17. *You first have to create two traditional partitions, even if you want to create an LVM-based setup.*

8. Now specify where the new partition should start. Choose Beginning to create the partition at the beginning of the available disk space, or choose End to create it at the end of the available disk space. It makes sense to create the first partition at the beginning, so select Beginning and then press the Enter key.

9. Next, you see a screen that contains all the default properties for the new partition (see Figure 1-18). Assuming that this really is the partition that you want to use for `/boot`, make sure you enter the following values, select Done setting up the partition, and press the Enter key to continue.

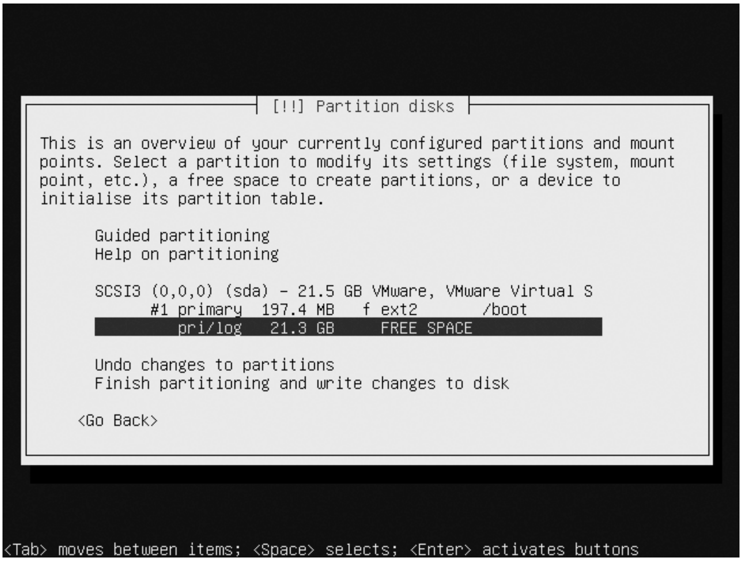
   - *Use as*: Ext2 file system. You are going to create a very small file system with files that will rarely change, so it doesn't make sense to use a journaling file system here.
   - *Mount point*: `/boot`
   - *Mount options*: Use the options that are selected by default
   - *Label*: none
   - *Reserved blocks*: 5%
   - *Typical usage*: standard
   - *Bootable flag*: off



```
[!!] Partition disks

You are editing partition #2 of SCSI3 (0,0,0) (sda). No existing file
system was detected in this partition.

Partition settings:

          Use as:                  Ext2 file system
          Mount point:             /boot
          Mount options:           relatime
          Label:                   none
          Reserved blocks:         5%
          Typical usage:           standard
          Bootable flag:           off

          Copy data from another partition
          Delete the partition
          Done setting up the partition

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-18. *Make sure your boot partition uses these settings.*

10. In the screen shown in Figure 1-19, select the available free space to create the LVM partition.



```
[!!] Partition disks

This is an overview of your currently configured partitions and mount
points. Select a partition to modify its settings (file system, mount
point, etc.), a free space to create partitions, or a device to
initialise its partition table.

      Guided partitioning
      Help on partitioning

      SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S
            #1 primary  197.4 MB   f ext2        /boot
               pri/log   21.3 GB      FREE SPACE

      Undo changes to partitions
      Finish partitioning and write changes to disk

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-19. *Select the available free space again to create the LVM partition.*

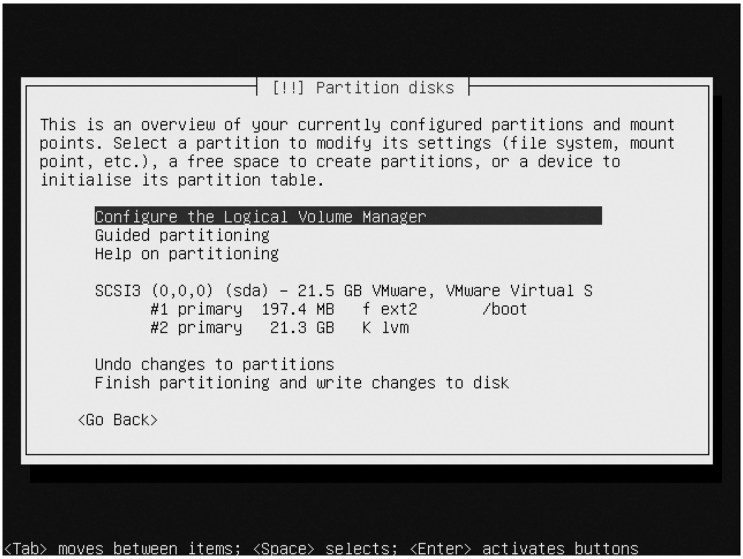
11. Select Create a new partition and accept the default in which all available disk space is assigned to the new partition. Then specify that the new partition should be a primary partition. Next, in the screen with the partition settings, make sure you set the following options as shown:

    - *Use as*: physical volume for LVM
    - *Bootable flag*: off

Tip Did something not work out the way it should have? Take a look at the syslog screen. You'll be able to see exactly what the installation program is trying to do and whether it succeeds. You can access the syslog screen by using Alt+F4. To return to the main installation screen, use Alt+F1.

12. Now select Done setting up the partition, and press Enter.

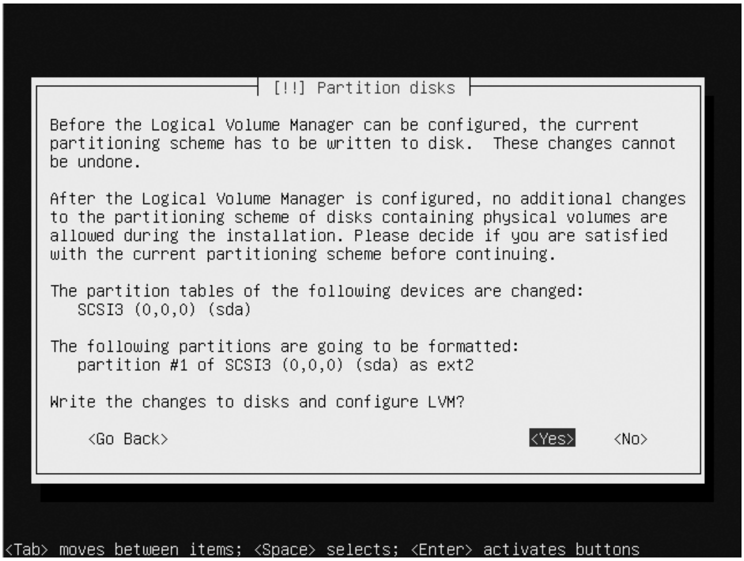
13. Once back in the main screen (see Figure 1-20), select Configure the Logical Volume Manager and press Enter.



```
[!!] Partition disks

This is an overview of your currently configured partitions and mount
points. Select a partition to modify its settings (file system, mount
point, etc.), a free space to create partitions, or a device to
initialise its partition table.

      Configure the Logical Volume Manager
      Guided partitioning
      Help on partitioning

      SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S
            #1 primary  197.4 MB   f ext2       /boot
            #2 primary   21.3 GB   K lvm

      Undo changes to partitions
      Finish partitioning and write changes to disk

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-20. *After setting up the partitions, you must create the LVM environment.*

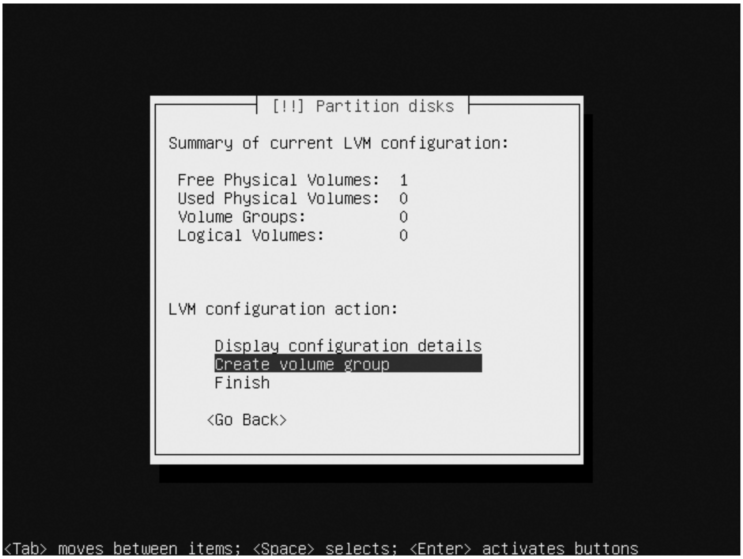
14. You'll now get a message (see Figure 1-21) that the current partitioning scheme has to be written to disk before setting up LVM. Select Yes and press Enter.



```
[!!] Partition disks

Before the Logical Volume Manager can be configured, the current
partitioning scheme has to be written to disk.  These changes cannot
be undone.

After the Logical Volume Manager is configured, no additional changes
to the partitioning scheme of disks containing physical volumes are
allowed during the installation. Please decide if you are satisfied
with the current partitioning scheme before continuing.

The partition tables of the following devices are changed:
   SCSI3 (0,0,0) (sda)

The following partitions are going to be formatted:
   partition #1 of SCSI3 (0,0,0) (sda) as ext2

Write the changes to disks and configure LVM?

    <Go Back>                                         <Yes>    <No>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-21. *You must write the changes in the partitioning to hard disk before you can create logical volumes.*

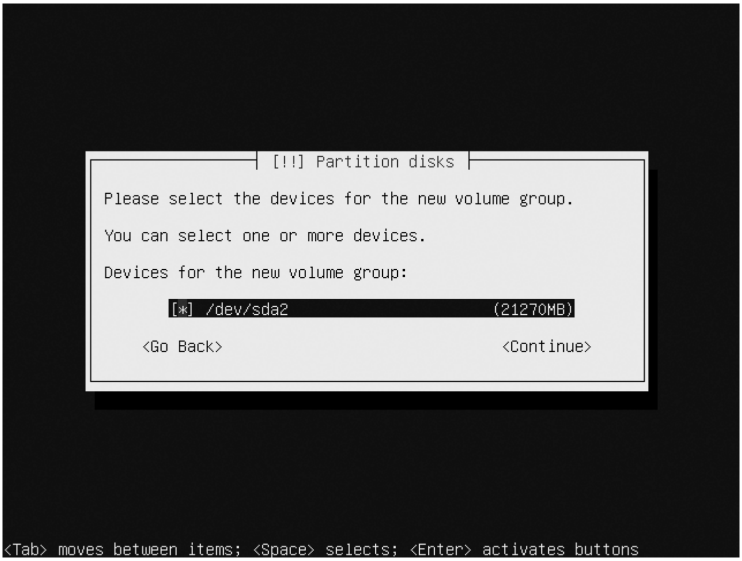
15. As the first step in the setup of an LVM environment, you must now assign all usable disk space to a volume group. From the screen shown in Figure 1-22, select Create volume group.



```
[!!] Partition disks

Summary of current LVM configuration:

 Free Physical Volumes:  1
 Used Physical Volumes:  0
 Volume Groups:          0
 Logical Volumes:        0


LVM configuration action:

     Display configuration details
     Create volume group
     Finish

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-22. *An LVM setup is based on one or more volume groups.*

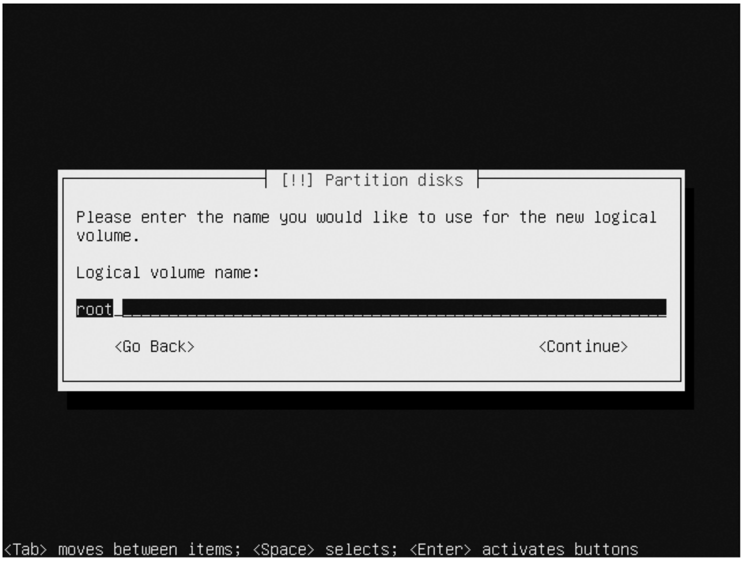
16. Next, enter a name for the volume group. In this example setup, I'll use "system". After specifying the name, select Continue and press Enter. You next see a list of all devices that are available for the LVM environment, which in this case is just one device that probably has the name `/dev/sda2` (see Figure 1-23). Select the device and select Continue once more to return to the main screen of the LVM setup program.



```
[!!] Partition disks

Please select the devices for the new volume group.

You can select one or more devices.

Devices for the new volume group:

        [*] /dev/sda2                    (21270MB)

    <Go Back>                              <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-23. *In most situations, you'll select the device `/dev/sda2` to be used by the Logical Volume Manager.*

17. From the LVM main screen, select Create logical volume. Next, select the volume group that you have just created and enter a name for the first logical volume that you want to use (see Figure 1-24). I recommend using the name of the file system you are going to mount on the logical volume, so *root* is a decent name for the root file system, *var* is good if you are going to mount the `/var` directory on it, and so on. I'll show you how to create the root logical volume in this and the following step. Make sure to repeat these steps for all other volumes that you want to create.



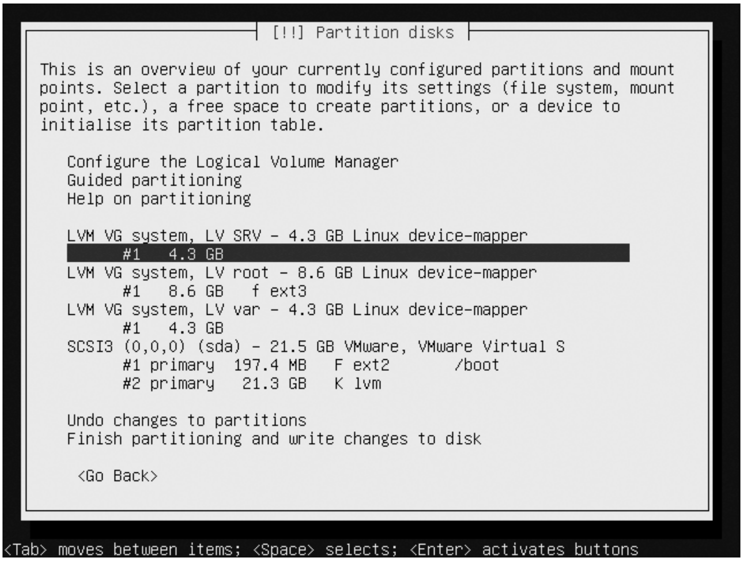
```
[!!] Partition disks

Please enter the name you would like to use for the new logical
volume.

Logical volume name:

root

<Go Back>                                          <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-24. *Every logical volume needs a unique name.*

18. Now enter the size that you want to assign to the logical volume. Even if logical volumes are quite flexible, you should try to specify a realistic size here. Next, specify the file system sizes that you want to use on your logical volumes and finalize the LVM setup procedure by clicking Finish.

Tip If you run into problems while writing the new partitioning scheme to disk, this is probably due to a conflict with some already existing setup. In this case, it may be a good idea to wipe your server's master boot record (MBR). From the installation program, use Alt+F2 to display a console window. Press Enter to activate the console and enter the following command: `dd if=/dev/zero of=/dev/sda bs=512 count=1`. This will wipe your server's MBR so that you can start all over again. You'll have to restart the installation as well.

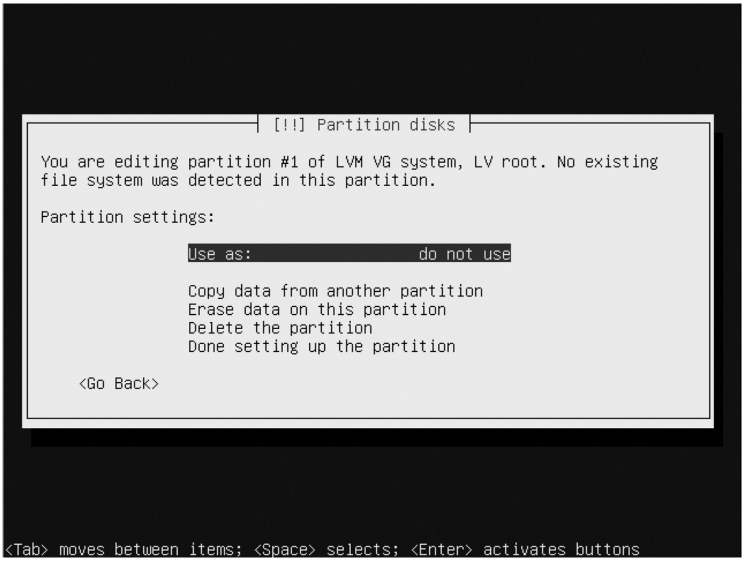
19. Back in the main partitioning screen, you now see a list of all the logical volumes that you have created; they're just on top of the list (see Figure 1-25). You now have to put a file system on every one of them. To do that, select the logical volume from the list and press Enter.



```
                    [!!] Partition disks

This is an overview of your currently configured partitions and mount
points. Select a partition to modify its settings (file system, mount
point, etc.), a free space to create partitions, or a device to
initialise its partition table.

   Configure the Logical Volume Manager
   Guided partitioning
   Help on partitioning

   LVM VG system, LV SRV - 4.3 GB Linux device-mapper
         #1   4.3 GB
   LVM VG system, LV root - 8.6 GB Linux device-mapper
         #1   8.6 GB   f ext3
   LVM VG system, LV var - 4.3 GB Linux device-mapper
         #1   4.3 GB
   SCSI3 (0,0,0) (sda) - 21.5 GB VMware, VMware Virtual S
         #1 primary  197.4 MB   F ext2       /boot
         #2 primary   21.3 GB   K lvm

   Undo changes to partitions
   Finish partitioning and write changes to disk

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-25. *Select the logical volume you want to format and press Enter to put a file system on it.*

20. You now see the Partition Settings screen, in which the option Use as shows do not use. Select this option and press Enter. Now from the list of available file systems, select the file system that you want to use on this volume; for example, Ext3 if this is the root volume (see Figure 1-26).



```
                    [!!] Partition disks

You are editing partition #1 of LVM VG system, LV root. No existing
file system was detected in this partition.

Partition settings:

                Use as:                  do not use

                Copy data from another partition
                Erase data on this partition
                Delete the partition
                Done setting up the partition

    <Go Back>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-26. *Select Use as to specify the file system that you want to use on your logical volume.*

21. Select the Mount Point option and select the directory to which you want to assign this volume (/ for the root volume). Select any specific options you want to use on this file system as well and then select Done setting up the partition.

22. Repeat this procedure to put a file system on all the remaining logical volumes. When finished, from the Partition disks main screen (refer to Figure 1-25), select Finish partitioning and write changes to disk. Select Yes when asked if you want to write the changes to disk. This brings you to the next stage of the installation, in which all relevant software packages are copied to your server.

Completing the Installation

Now that you have created the partitioning scheme for your server's hard drive, it's time to finalize the installation of your server. In this part of the installation, you enter some generic properties (like some user information), and you specify what software packages to install.

1. Next, the installer asks you to create a user account. This is the user account that you will normally be working with, instead of using the root user account by default. Enter the name of the user account and then enter (twice) the password for this user. The installation of the base system now begins. In this phase, some basic packages that are needed at all times are copied to your server. Hang on because this can take a couple of minutes.

2. After the core system is installed, the installer asks if you want to use an HTTP proxy. If this is the case, enter its details now, or leave the information bar empty and select Continue to go on.

3. Next, you can choose additional software to install. The default choices allow you to select between some of the most important server tasks (see Figure 1-27):

   - *DNS server*: A DNS server allows your server to participate in the DNS hierarchy and translate computer names into IP addresses.

   - *LAMP* server: Selecting the LAMP (*L*inux, *A*pache, *M*ySQL, and *P*HP server) option will set up a versatile web server for you.

   - *Mail server*: Want to set up your server as an MTA? Select this option to make it a mail server that allows you to send and receive e-mail messages for all users in your company.

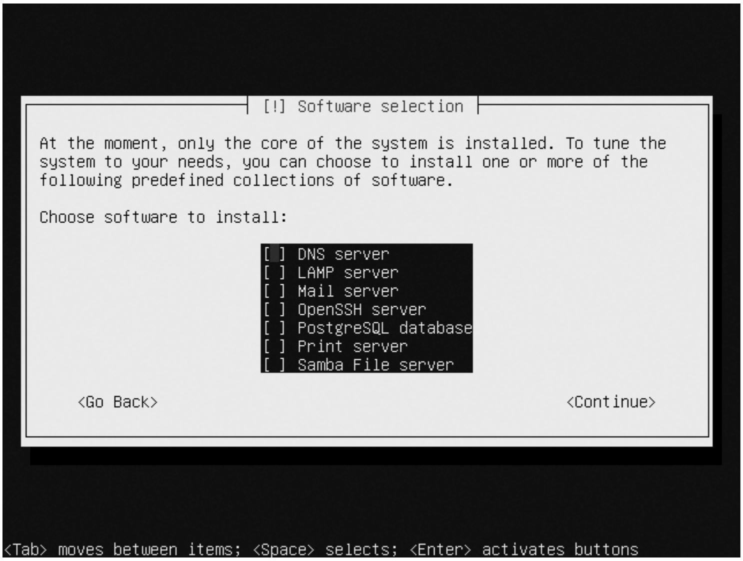
   - *OpenSSH server*: This is the option you'll want to use in almost all situations. It allows you to access your server remotely, which is very useful for doing maintenance work on it.

   - *PostgreSQL*: Use this option if you want to install your server as an application server, hosting a PostgreSQL database.

   - *Print server*: This option installs the Common UNIX Print System (CUPS). Select it if you want your server to control access to shared printers.

- *Samba File server*: Need a server to offer shared files to the Windows users in your network? Check this option. The Samba file server offers the best-performing CIFS-based file server in the world, and it even is a good solution if you want to offer shared files to Linux and Apple users!

That's it for installation choices! If you need additional software to be started on your server, you need to install that software later. See Chapter 3 for more details on that.



```
[!] Software selection

At the moment, only the core of the system is installed. To tune the
system to your needs, you can choose to install one or more of the
following predefined collections of software.

Choose software to install:

                    [ ] DNS server
                    [ ] LAMP server
                    [ ] Mail server
                    [ ] OpenSSH server
                    [ ] PostgreSQL database
                    [ ] Print server
                    [ ] Samba File server

    <Go Back>                                         <Continue>

<Tab> moves between items; <Space> selects; <Enter> activates buttons
```

Figure 1-27. *The installation program lets you choose between different server profiles.*

4. Once all software packages have been copied to your server, the system is ready for use. You just have to press the Enter key once more to restart the server, and it will be usable.

Once the server has been restarted, you will see the text-based login prompt of your server. You are supposed to enter your user name and password here. A *text-based* prompt? Yes, this is a server, and a server is generally locked behind doors in an air-conditioned room. Therefore, there is no need to set up a graphical user environment in most cases. But because many people consider a GUI quite useful anyway, you'll learn how to set it up in Chapter 3. For now, though, you'll learn in Chapter 2 how to manage Ubuntu Server from the command line.

Summary

You learned in this chapter how to set up Ubuntu Server. Because the file system layout is a very important part of a server configuration, special attention was paid to configuring your server's file system with LVM or traditional partitions. At the end of this chapter, you ended up with a text-based console that's not so user friendly. In Chapter 2, you will learn to work with the most important commands needed for Linux server administration.