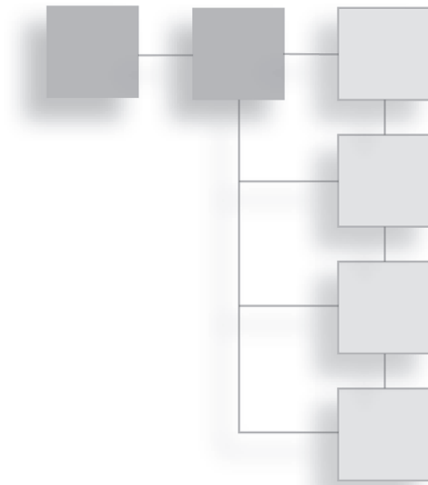CHAPTER 3

Installing Fedora

Now comes the moment of truth. You've done the homework, figured out how you want to install your copy of Fedora, and you're ready to go.

This chapter won't disappoint you. Its sole goal is to walk you through the installation process using the Anaconda graphical installer. Along the way, you will:

■ Discover how to explore Fedora—without installing it.

■ Choose which option will be best for you, installing Fedora alone or alongside another operating system.

■ Journey step by step through the installation process.

■ Create one or more users for your Fedora machine.

Try Before You Buy

This section may leave you scratching your head and wondering why you just went through all of the preparation in Chapter 2. Be patient, there's a method to this madness.

All spins of Fedora are currently available to users as a LiveCD version. "LiveCD" is the label for operating systems that can be booted and run *right from the CD itself*—without installing on your computer's hard drive.

This means that when you insert your Fedora CD into the disc drive and restart your computer, Fedora will automatically begin running on your computer without putting on any new files or touching pre-existing data on your machine. Fedora just starts up and runs.

So why, you ask, should I bother installing Fedora at all? I can just run it from the CD. Well, this is true, and many people do—especially when they are using someone else's PC and don't want to use the pre-existing operating system. Why use Windows on your friend's computer when you can just insert your Fedora LiveCD and have a more familiar environment ready to go?

The first issue is speed: running any operating system from the CD drive means it will be a much slower process. Data has to be pumped in constantly from the drive, and only the fastest drives will give you any kind of decent user experience.

If your system is low on RAM, performance of the LiveCD will take an even bigger hit. When an operating system and its applications run, they use the RAM as a workspace to perform their operations. The more memory that's available, the more efficiently the apps will run. But once there are a lot of applications running, the RAM gets filled up. To keep up with the demand, the operating system uses space on the disk drive known as *swap space* to help fulfill memory needs. This is why you will hear your hard drive churning away when you're running a lot of stuff on your computer. Using swap space is slower, but it gets the job done.

When to Upgrade the RAM

If you hear your hard drive working a lot—even when you are using just one or two applications— it's probably time to consider getting more RAM installed on your machine. It not only speeds your operations up, but it will save a lot of wear and tear on your hard drive.

When you run a LiveCD, however, the swap space option does not apply, since Fedora from the CD won't touch your drive's data. If your system does not have a lot of RAM installed, be prepared for slow LiveCD operation.

Slow operations notwithstanding, the advantages of the LiveCD are that it lets you take your operating system with you, as mentioned before, and—something that benefits you right now—it lets you try Fedora before you "buy" it. Buy, in this case, means installation.

Everything in the LiveCD instance of Fedora matches what you would get if you installed Fedora onto your PC. All you need to do is insert the disc into your CD drive and reboot your PC.

You will see a text menu on a black screen asking you what you want to do. The preselected option is Boot or Install, so you don't have to do anything else. After a bit more of a wait (another disadvantage of using LiveCDs), Fedora will eventually come up on your screen, as shown in Figure 3.1.

If, at this point, you want to explore the Fedora operating system, you are invited to skip ahead to Chapter 4, "Desktop Basics," to begin your exploration.

If you are ready to go ahead and install Fedora, there is one more issue that needs to be addressed: whether you share your PC with Windows.

One or Two Operating Systems?

Now comes the time when you have a really important decision to make. Like all important decisions, you should weigh your options carefully. You must decide whether you are going to run Fedora alone on your PC, or whether you want to retain Windows and be able to switch back and forth between it and Fedora. This section will examine the pros and cons of each side of the decision and give you tips on what to do if you decide to dual boot your system.
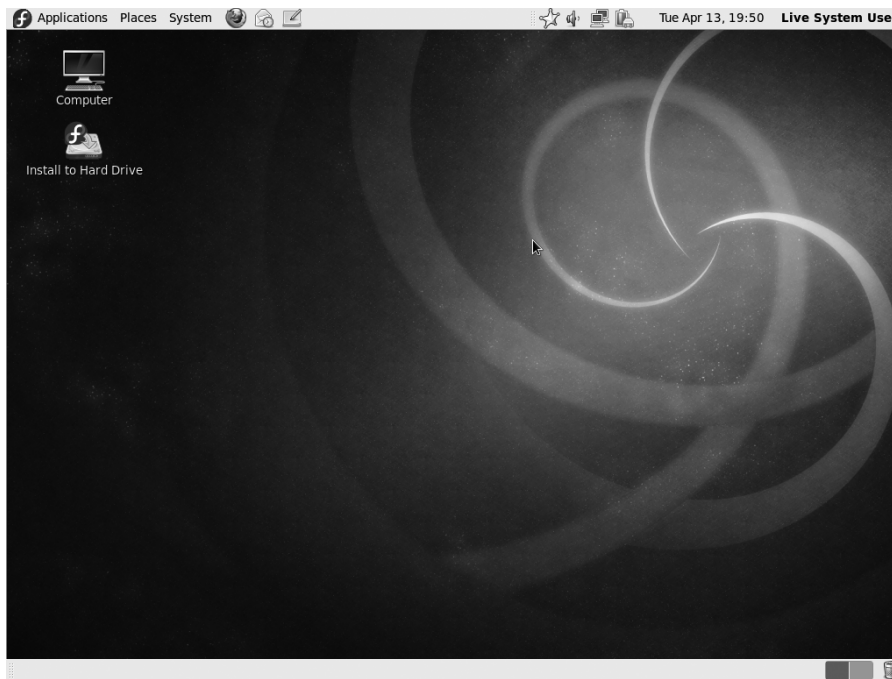

Figure 3.1
The Fedora LiveCD desktop.

Making Room for Multiple Operating Systems

There are several pros and cons for using multiple operating systems on one computer. The cons include the headaches of installing two or more operating systems on a machine, resulting in more limited hard drive space available for each of the operating systems.

But the benefits of using multiple operating systems are significant. For instance, you will have the ability to run all of the programs available for each of the operating systems you'll have on your PC. You will also be able to use all of the hardware your PC has. Finally, you'll save money by not needing to buy another PC.

It is recommended that dual booting is the way you should go—especially if you have Windows applications that you just can't part with and that have no counterparts in Fedora. This option gives you the benefits of using Fedora without a lot of investment in time or money.

If you decide to include Fedora on your PC in addition to Windows, you will need to make room for it on your hard drive. But making room on your hard drive for Fedora is a far different operation than making room for the latest computer game. You will need to create a brand-new *partition* from which Fedora will operate.

Here is a crash course in disk partitions and why you can't write data to a disk without them.

Why Partition?

Imagine the bee, buzzing around your garden. If you were to follow this bee back to its home, you would find a seemingly chaotic mass of buzzing insects, each looking as if it aimlessly wanders about with nothing better to do than hang out and buzz.

But as we all know, bees all have a specific purpose, working together for the collective benefit of the hive. One group of bees has the job of taking care of all of the cute little baby bees after the queen lays her eggs. Now, think back to your science classes: Where are the baby bees raised?

If you said the honeycomb, you're right. If you're wondering what this has to do with partitions, hang on.

The honeycomb is an ingenious device composed of hexagonal cells made of beeswax, where honey and bee larvae are stored for safekeeping. Ponder this: How would the bees get by if they did not have honeycombs? The answer is they wouldn't.

Keeping the honeycombs in mind, you can apply this analogy to how data is stored on a disk drive. Data, you see, cannot be stored on a drive without some sort of structure already in place for the data to be organized.

When data is placed on a drive, it is written into this structure, called a *file system* in the Linux community. A file system is the format in which data is stored—a honeycomb of cells if you will, where each little piece of data gets placed.

Computers being computers, it's a little more complicated than that. Data for a single file, for example, does not get stored in data blocks that sit right next to each other. The data may be stored in data blocks 456, 457, and 458 and then block 6,134, then block 7,111, and so on. (This is an oversimplification, but you get the idea.) It's the job of the file system to track where each file resides so that when you send a command to work with a file, the file system knows all of the separate blocks where the file is stored.

Because of all of this file tracking and retrieving, computer engineers came up with the idea of keeping the file systems small, even on large hard drives. So the idea of partitions came into play. Basically, the partition is a virtual barrier that tells the file system: "You used to be able to write to blocks 1–25,000 all over the disk, but now you're only allowed to write to blocks 1–17,500. A second file system will write to blocks 17,501–25,000, so hands off!"

Thus, you have partitions. And each partition can use a different file system. As an analogy, honeycombs created by honeybees are different than those created by wasps—similar structure but different outcomes.

If your PC contains a typical installation of Windows, your Windows file system is contained within one big partition that covers your entire hard drive. This leaves no room for another partition and a new file system. Remember, even if you have gigabytes of empty space on your drive, this space, like files and directories, may be scattered throughout the drive and still belong to the Windows partition.

The easiest method to add a partition to your existing hard drive file system is to use the partitioning tool within Anaconda. This will shove your existing partition into a single, smaller collection of data blocks, leaving truly empty and unstructured (unformatted) space elsewhere in the drive where you can install a partition in which Fedora can reside.

Back Up Your Data

> As stated in Chapter 2, before you use any tool to manipulate or create partitions, back up or save your data to an alternate physical drive. And definitely back up everything if you plan to completely replace Windows with Fedora. Please.

Partitions Fedora Will Need

When Fedora is installed, it uses an seven-step application known as *Anaconda* to accomplish the task. When Anaconda detects another operating system on your computer, it will ask you whether you will want to replace the contents of your entire hard drive or perform a partition operation.

This is the choice point that will determine if you have a single Fedora operating system on your computer or multiple ones (Fedora and Windows). The mechanics of how to go through this procedure will be outlined in the "Partition Settings" section later in this chapter. For now, there are recommendations that should be passed on to new Fedora users.

In Fedora systems, the file system is oriented toward a key root directory that is based on the drive letter of the hard drive. For most primary drives, that drive letter is "C," so the root directory in Windows is denoted as C:\. Other drives have root directories (D:\, E:\, etc.), too. The root directories are always tied to the physical drive or partition, and all the subdirectories (or subfolders as they're called in Windows) are directly descended from the root directory on the same physical drive. C:\Documents and Settings\Brian\My Documents will always be located on the primary (C:\) drive or partition.

The file systems in Fedora are a bit more flexible. For instance, the common path for a user's home directory is /home/<username>. The "home" is a subdirectory of the root folder, which is denoted in Linux-based systems as "/". So, in the author's case, the home directory might be /home/bproffitt. Here's the default directory structure for a Fedora machine.

```
/
/bin
/boot
/dev
/etc
/home
/lib
```

```
/lost+found
/media
/mnt
/opt
/proc
/root
/sbin
/selinux
/srv
/sys
/tmp
/usr
/var
```

Odd names aside, it looks similar to a set of Window folders, doesn't it? A bunch of directories in a nice tree pattern, all located on the same partition. Except, while this listing reflects the typical Fedora file system, it does not mean all of these directories are located on the same partition.

That is due to a unique UNIX file system property known as *mount points.* If you want, you can decide to put any directory on any drive or partition, and Fedora's file management will seamlessly copy, retrieve, save, or delete files wherever they are physically located.

Using the author's system as an example, the root (/) directory's mount point is located on /dev/hda2, which denotes the second partition ("2") of the primary ("a") hard drive ("dev/hd"). But the mount point for the /home directory (and all of its subdirectories) is located on /dev/hda3, a completely separate partition. The advantages to this are that the personal data that belongs to the author will always be stored on a separate partition, which means that if ever it were necessary to migrate to another Linux distribution or perform a clean installation of a future version of Fedora, that personal data would always be preserved and the files accessible though the /home directory in Fedora's file system.

You can mount different directories of the Fedora file system on any partition or drive, even different drives, if your PC is so equipped.

When you use Anaconda's partitioning tool to set up your drive, it is obvious that you will need to devote some space to your existing Windows operating system and some to Fedora. How much? The easy answer is simply to divide your

drive in half, with each OS getting a fair share of the pie. Many other factors may play into making that choice different.

If, for example, you have a small drive upon which Windows is taking up a lot of space, then you will need to be conservative with your Fedora installation.

Space Available

> You will need at least 4GB of disk space to handle an average Fedora installation. Figure at least two more GB of storage space, unless you have some sort of networked storage devices available.

While you are considering the amount of space you will need to set aside for Fedora, also make sure that you have enough to allocate for swap space on your drive. It is often hard to determine how much swap space to create, because different users need differing amounts based on the type of work they do. If you work with a lot of really big files (graphics, desktop publishing), you should set your swap space memory to be pretty high, such as double your system's RAM capacity. For most users, the rule of thumb is that the swap should equal 1.5 times your RAM.

Running Anaconda

For older versions of Fedora—and, indeed, for older versions of any Linux distribution—starting an installation was a matter of inserting the CD into the drive and rebooting your system. The installation application would be presented as a choice on the initial menu, and once selected, off the installation would go.

Today, with the LiveCD option for Fedora, starting the installation is even less strenuous. As you may have noticed in Figure 3.1, there is a nice little Install to Hard Drive icon on the desktop when you run the Fedora LiveCD. Now that the preliminaries are out of the way, double-click the Install to Hard Drive icon and follow this guide through the installation process.

Anaconda is a seven-step installation routine that begins with an introduction screen (called a *splash screen*). Click next to reach the Keyboard Setup screen, detailed in the next section.

Let's walk you through what happens, so you will know what to expect.

Keyboard Settings

You might think a keyboard is a keyboard, but around the world, and even within nations, there are many variations in the way people input their words

into a PC. Step 1 of Anaconda, displayed in Figure 3.2, shows many of the different keyboards supported by Fedora.

The selected keyboard is the default keyboard setting based on the language selection you made when you first ran the Fedora LiveCD. If you are unsure of what kind of keyboard you are using, leave the default option selected. Otherwise, select the appropriate keyboard and then click Next to advance to Step 2.

Device Type Settings

Most Fedora users will likely be installing the Fedora operating system on a PC or PC-like device, such as a laptop or a netbook. However, advanced users and system administrators can also install Fedora on other types of machines that use storage area networks, which are a set of servers and disks designed to hold data for large organizations.

Presumably, if you have this type of project in mind, you are not going to need this book. So, we'll assume a more basic choice and leave the Basic Storage Devices option selected (shown in Figure 3.3). Click Next to continue to Step 3.
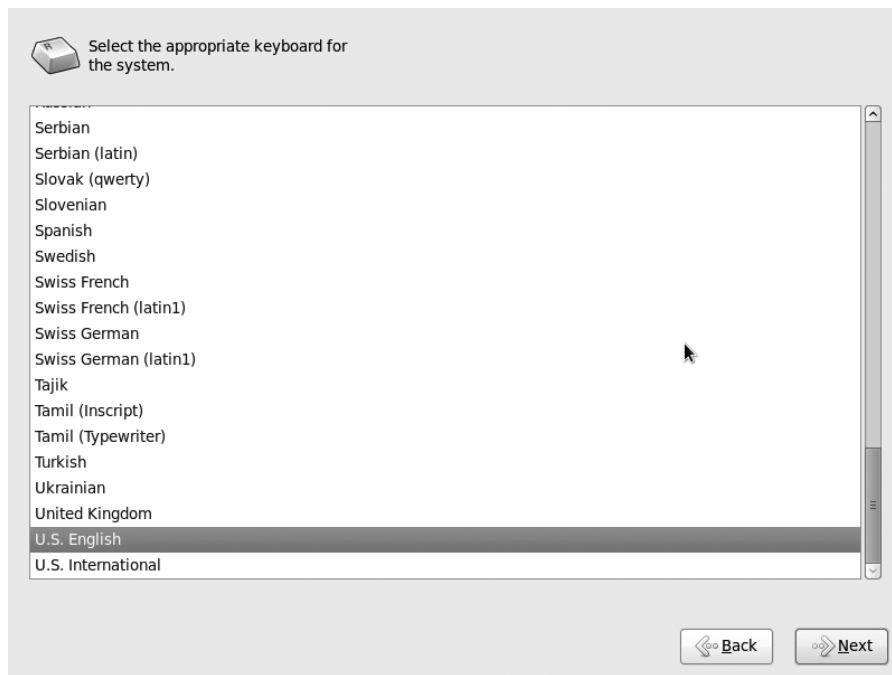

Figure 3.2
It's not just a QWERTY world out there.

Figure 3.3
What kind of storage does your PC have?

Drive and Computer Settings

Most computers these days come with one hard drive, usually a big one. Still, there are many systems out there that come with more than one hard drive, or their users add one later.

With that in mind, Fedora lets you choose the hard drive on which you would like to install Fedora. In the example shown in Figure 3.4, there is only one drive available, so it should be clicked to select it, and then Next should be clicked to move to Step 4.

However, if you have more than one hard drive in your system, you can select the one you prefer for your Fedora installation.

In the next screen, you have the opportunity to name your computer (see Figure 3.5). Pick something simple like "Fedora" or "officepc." This name is what will identify your computer on a network, if it's connected to one.
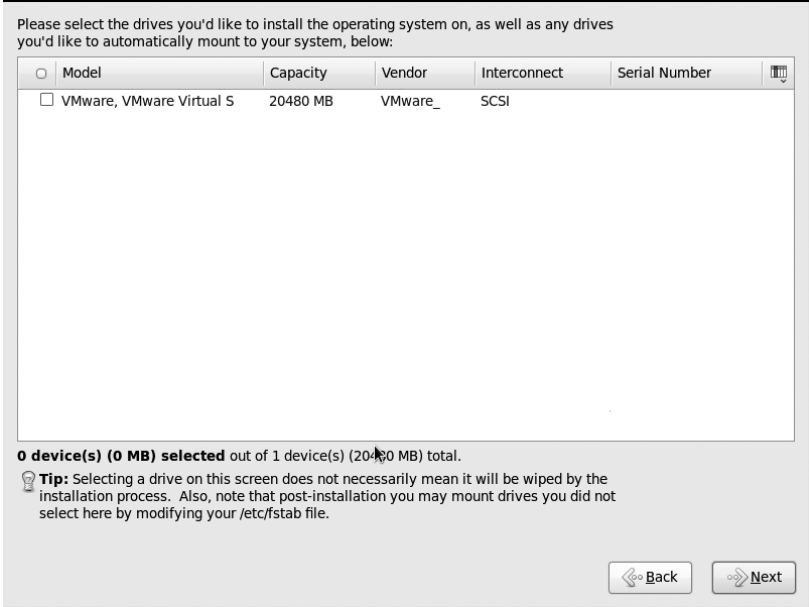
Click Next to move to Step 5.

Figure 3.4
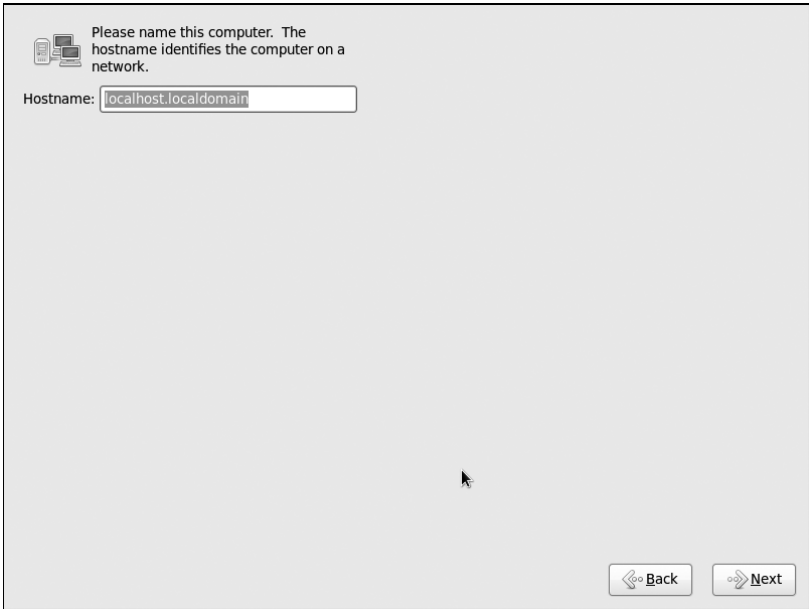Choose the destination hard drive.

Figure 3.5
Name your computer.

Time Zone Settings

Step 5 of Anaconda displays a map of the world, with which you can determine your proper time zone settings (see Figure 3.6).

If you want to use the map, you can use the magnifying slider on the left of the map to zoom in to a specific region. Click the city closest to your location that's still in your same time zone. The city will appear in the Selected City drop-down list below the map. If you clicked on the wrong city, just try again.

Confirm that you have the correct city selected and the time zone is also correct. Click Next to proceed to Step 6.

Root Settings

On the screen shown in Figure 3.7, you will need to set your system's root password. "Root" is the name given to any Linux system's administrator account. The root user is given enormous privileges to configure a Linux system any way

Figure 3.6
Finding yourself with Fedora.

Figure 3.7
Set the root password.

he or she can. As such, this is not a password you will use casually. Make it a good one, and don't forget it.

After entering the same password twice, click Next to move to Step 7. If Fedora detects that you have entered a weak password, such as one based on a dictionary word, it will warn you and give you the opportunity to enter a stronger password.

Partition Settings

Now comes the most important part of the Anaconda process: selecting your partition options.

By default Anaconda will select the option to Replace Existing Linux System(s). But you will need to set the option to Shrink Current System (see Figure 3.8). Before you leave that option selected and click Next, let's review what that means.

Shrink Current System means that Anaconda will attempt to reduce the size of the existing Windows system using any unused space in that file system, to make room for Fedora on a now-empty part of the disk.
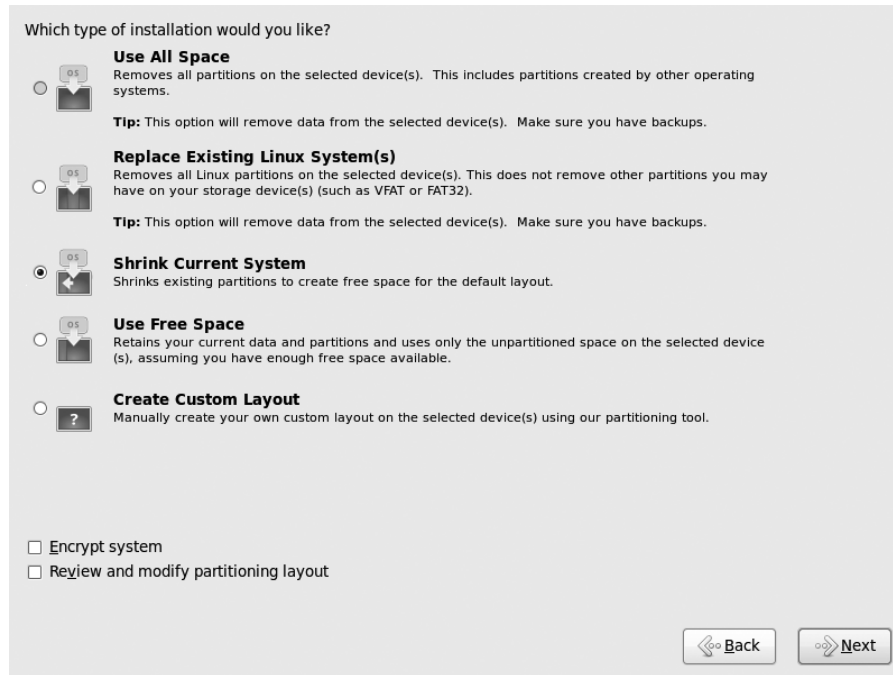
Figure 3.8
Caution: partitioning ahead.

For example, suppose you have a 200GB drive with Windows installed, and you have about 100GB of free space on the drive. Anaconda will compress the 200GB Windows file system down to 120GB, leaving 80GB of completely unused space, where it will install Fedora.

If this is the case, clicking on this option will generate the Volume to Shrink dialog box, where you can set the size for the existing Windows partition. It is recommended that you give Fedora at least 60GB of space, but you can easily manage with 20GB, especially if you have external storage available for your data.

Use All Space means that when you are finished with Anaconda, the installation process will completely format your hard drive, which means that everything that was on it (Windows and your personal data) will be gone. Forever.

If you read Chapter 2, "Before You Install Fedora," and backed up all of your system's files, then this will be only a minor headache as you restore what was overwritten by the Fedora installation process. If you did not back up your

Windows partition, and you did not want to format your entire drive, this will be akin to a major disaster.

So, and it cannot be stressed enough, be sure that you want to totally replace Windows and your personal data with Fedora before you select the Use All Space option.

Save Your Personal Files

Many new users think that somehow their personal files will be preserved and that Windows will automatically be transformed to Fedora. This is not the case. Make sure that you have your personal files safely backed up.

Choose the option you want and click Next. The Writing Storage Configuration to Disk dialog box will open (see Figure 3.9).

At this point, you are now committing yourself to installing Fedora. Clicking Write Changes to Disk will start the installation process and permanently make changes to your disk drive. It cannot be emphasized enough that all of your data should be backed up at this point.

Figure 3.9
Committing to your installation.

If it is, and you are ready, click Write Changes to Disk, and the installation will begin. When Anaconda is finished (and it may take a while), the completion screen will appear (see Figure 3.10).

Click Close to exit the Anaconda installer. In the main Fedora LiveCD desktop, click the System | Shut Down menu command. Click the Restart option in the next dialog box and click OK to restart your system. You should remove the CD after the system shuts down so it doesn't reboot back to the Fedora Live system.

First Run Configuration

The very first time Fedora runs, it gives you one more set of configuration screens from the Setup Agent to finish things up.

The first Setup Agent screen you will see will be the Welcome screen, as shown in Figure 3.11. Click Forward to continue.

The second Setup Agent screen is the License screen, which briefly lets you know that the Fedora distribution is distributed as free software. This is good to know

Congratulations, your Fedora installation is complete.

Please reboot to use the installed system. Note that updates may be available to ensure the proper functioning of your system and installation of these updates is recommended after the reboot.

Back   Close
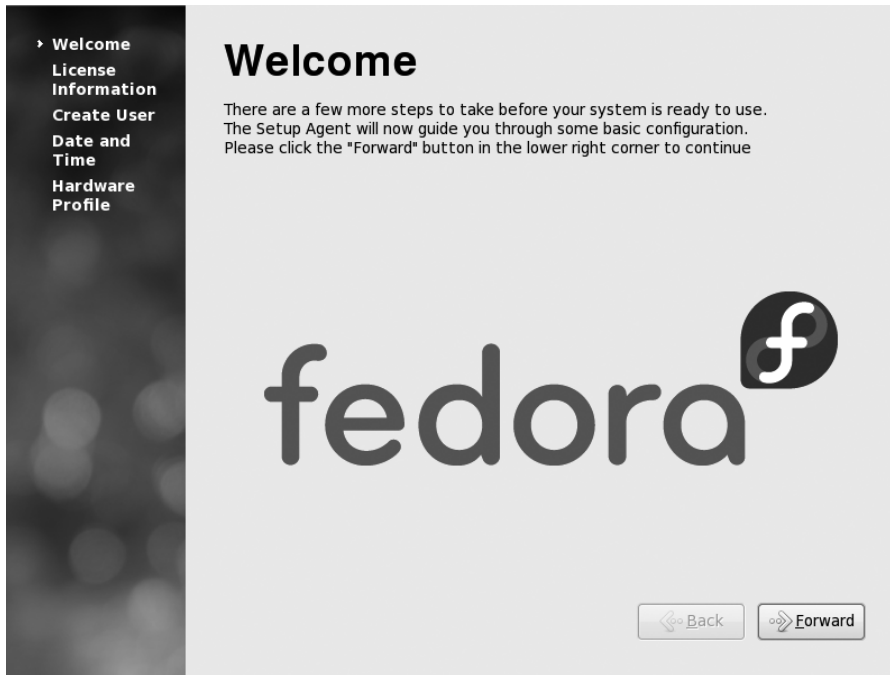
Figure 3.10
Installation is complete.

Figure 3.11
Starting the initial configuration.

but requires little input from you (see Figure 3.12). Click Forward to move ahead.

On the third Setup Agent screen, you need to enter your personal information, including name, preferred user ID, and password (see Figure 3.13).

Most of this is straightforward information and easy to fill in. A couple of caveats for you to follow: First, never make your user ID any variation of the word "root." As mentioned earlier, logging on as the root user will give you a lot of privileges on your Fedora machine. While that may sound good, it is most assuredly not. Root, or superuser, accounts have the capability to damage many files at once, whereas regular users are not granted such access.

Superuser access is needed for some operations in Fedora, and we'll explore those later.

The second thing, and you surely will hear this a lot, is please make your password hard to guess. Use letters and numbers in combinations that don't make up words or proper names. Such passwords are easier to crack. One favorite scheme
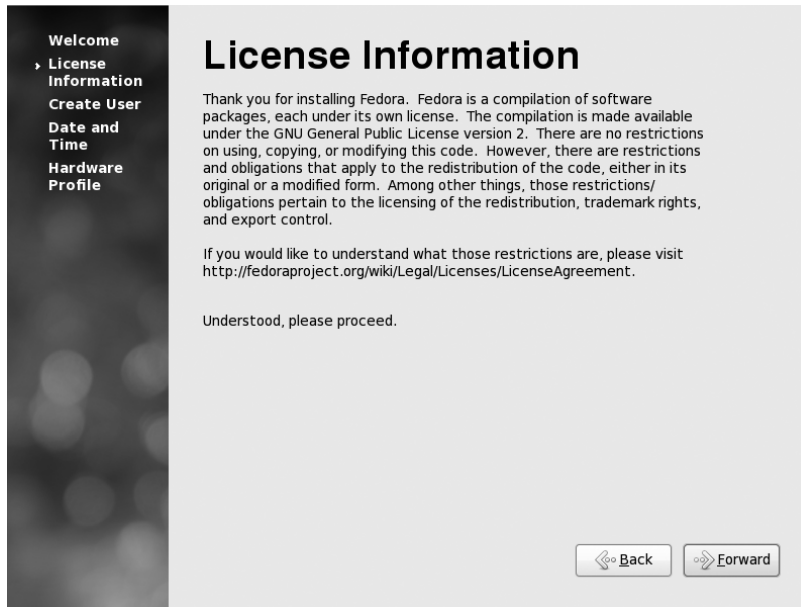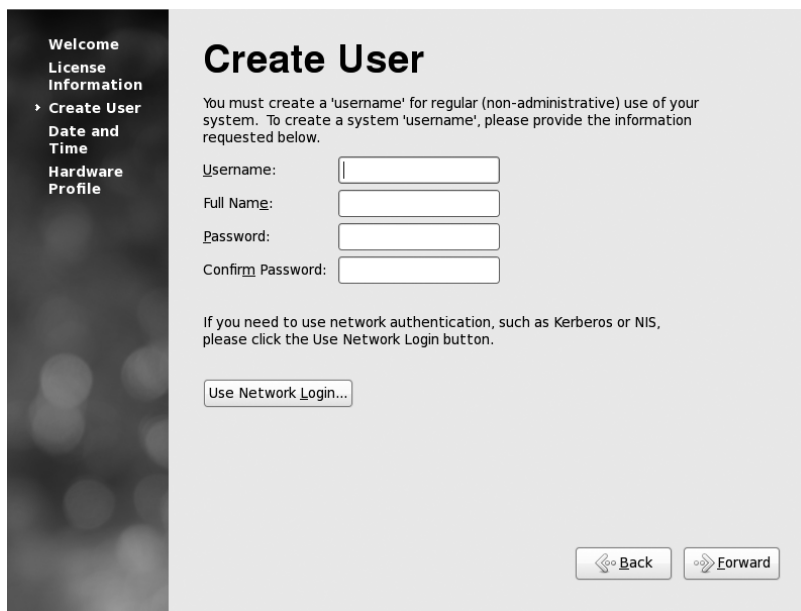
Figure 3.12
The basic Fedora license statement.

Figure 3.13
The Create User screen.

is to use the first letter of the words in a refrain from your favorite song. You should get a suitably hardened password.

Once you fill in the information, click Forward to continue.

In the Date and Time screen, shown in Figure 3.14, you can confirm the date and time information Fedora has picked up from your system and the time zone settings you made in Anaconda.

Synchronize Those Watches

If you want really accurate time, click the Synchronize Date and Time over the Network option. This will link your computer to hyper-accurate servers on the Internet that get their time settings from atomic clocks. You should never be late again.

After your time settings are confirmed, clicking Continue will bring you to the last screen of the Setup Agent: the Hardware Profile screen (see Figure 3.15).

This screen contains all of the data Anaconda and the Setup Agent gathered about your system using a tool called Smolt and presents the option to send this
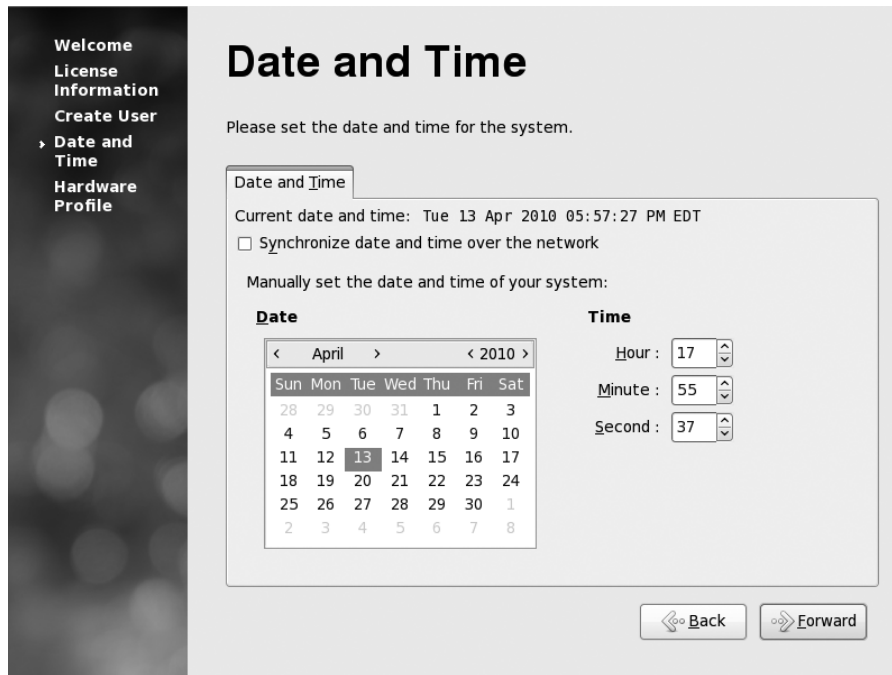

Figure 3.14
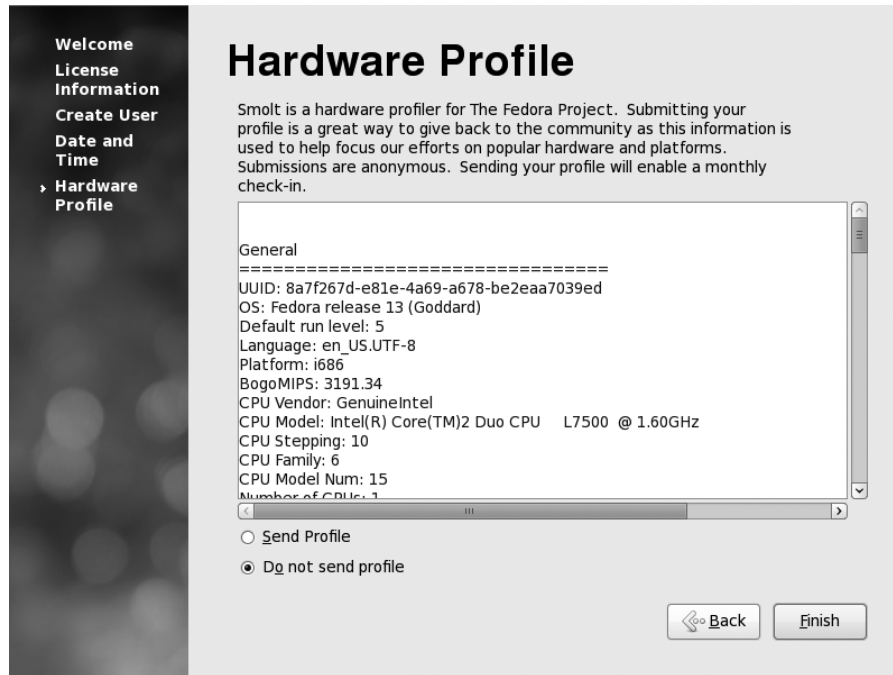The Date and Time screen.

Figure 3.15
Giving back to the Fedora community.

information to Fedora. Why? Because as each system is surveyed, the Fedora developers will have a better idea of where to focus their efforts in future versions. This information is strictly anonymous, and none of your personal data will be sent.

Choose the option you want and then click Finish. The Setup Agent will close, and you will then see the main login screen.

Enter your user and password information, and enter Fedora.

Conclusion

In this chapter, you reviewed the installation steps for getting Fedora on your PC. Special attention was paid to the partitioning settings, because this is the one part of the installation where there is a potential for important data loss.

Now that Fedora is installed, it's time to take the grand tour of this excellent operating system in Chapter 4, "Desktop Basics."