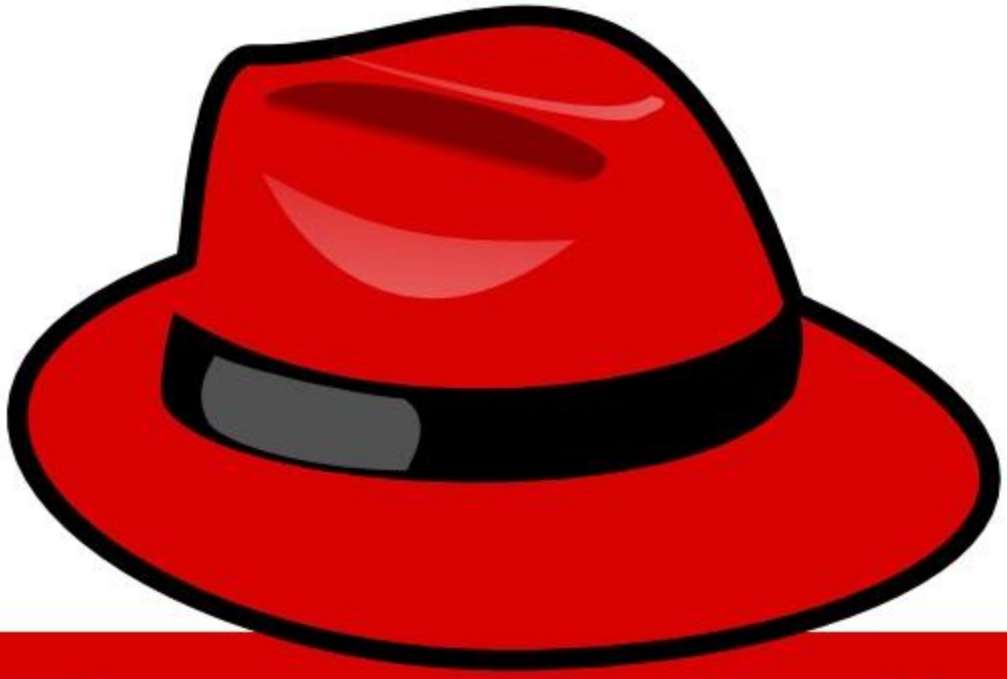
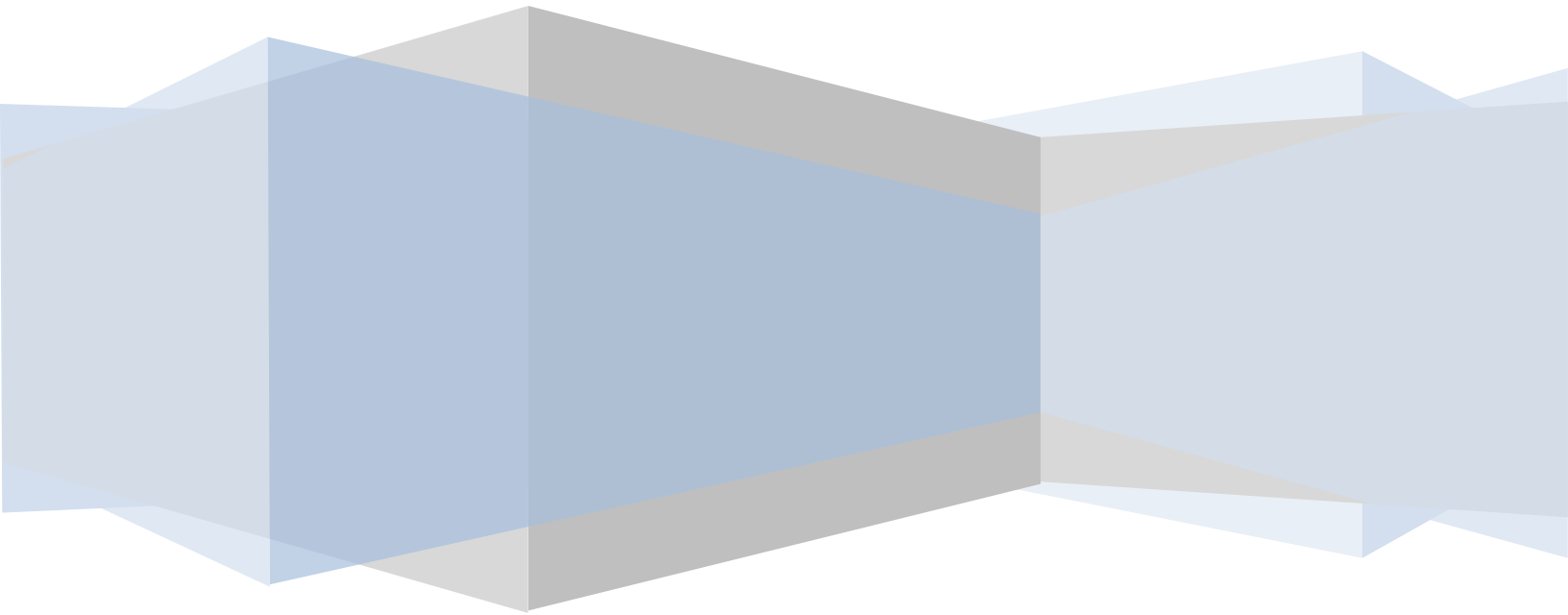
Red Hat Enterprise Linux 6



Essentials

Red Hat Enterprise Linux 6 Essentials



Red Hat Enterprise Linux 6 Essentials – First Edition

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Chapter 1. About RHEL 6 Essentials

Arguably one of the most highly regarded and widely used enterprise Linux distributions available today is Red Hat Enterprise Linux (RHEL). It is considered to be amongst the most stable and reliable operating systems and is backed by the considerable resources and technical skills of Red Hat, Inc.

RHEL 6 Essentials is designed to provide detailed information on the use and administration of the Red Hat Enterprise Linux 6 distribution. For beginners, the book covers the basics of configuring the desktop environment, resolving screen resolution issues and configuring email and web servers. Installation topics such as network installation and dual booting with Microsoft Windows are covered together with all important security topics such as configuring a firewall and user and group administration.

For the experienced user, topics such as remote access, logical volume management (LVM), disk partitioning, swap management, KVM virtualization, Secure Shell (SSH) and file sharing using both Samba and NFS are covered in detail to provide a thorough overview of this enterprise class operating system.

Chapter 2. A Brief History of Red Hat Linux

Red Hat Enterprise Linux is the product of a U.S. company called Red Hat, Inc., based in Raleigh, North Carolina near the campus of NC State University. The company was founded in the mid 1990s when Marc Ewing and Bob Young merged two companies.

In 1993 Bob Young created a company called ACC Corporation that he says he ran from his wife's "sewing closet". The name ACC was intended to represent a catalog business but was also an abbreviation of a small business his wife ran called "Antiques and Collectables of Connecticut". Amongst the items sold through the ACC catalog business were Linux CDs and related open source software.

Around the same time Marc Ewing had created his own Linux distribution which he named Red Hat Linux (after his propensity to wear a red hat).

In 1995, ACC acquired Red Hat and adopted the name Red Hat, Inc. Red Hat went public in 1999 making both owners fabulously wealthy.

Early releases of Red Hat Linux were shipped to customers on floppy disks and CDs (this, of course, predated the widespread availability of broadband internet connections). When users encountered problems with the software they could contact Red Hat only by email. In fact, Bob Young often jokes that this was effective in limiting support requests since by the time a customer realized they needed help, their computer was usually inoperative and therefore unavailable to be used to send an email message seeking assistance from Red Hat's support team.

In later years Red Hat provided better levels of support tied to paid subscriptions (and you can now get phone support 24 hours a day).

Red Hat Enterprise Linux 6 is the latest commercial offering from Red Hat and is targeted at corporate, mission critical installations. It is an open source product in that you can download the source code free of charge and build the software yourself if you wish to do so (a task not to be undertaken lightly) but if you wish to download a pre-built binary version of the software you have to buy a maintenance subscription which also provides you with support and updates.

Red Hat also sponsors the Fedora Project. The goal of this project is to provide access to a free Linux operating system (in both source and binary distributions) in the form of Fedora Linux. Fedora also acts as a proving ground for new features that eventually are adopted into the Red Hat Enterprise Linux operating system family.

For users that cannot afford a Red Hat Enterprise Linux subscription, another option is provided in the form of the CentOS operating system. CentOS is a community driven project that takes the source code to Red Hat Enterprise Linux, removes the Red Hat branding and subscription requirements, compiles it and provides the distribution for download.

Bob Young left the company in 1999 and has since gone on to start Lulu, a company that provides self-publishing services to book authors.

Chapter 3. Installing RHEL 6 on a Clean Disk Drive

The first step on the path to learning about Red Hat Enterprise Linux 6 involves installing the operating system. RHEL can be installed either in a *clean disk* environment (where an entire disk is cleared of any existing partitions and dedicated entirely to RHEL) or in a *dual boot* environment where RHEL co-exists with another operating system on the disk (typically a member of the Microsoft Windows family of operating systems).

In this chapter we will be covering the clean disk approach to installation. Dual boot installation will be covered in Installing RHEL 6 with Windows in Dual Boot Environment.

3.1 Obtaining the Red Hat Enterprise Linux Installation Media

Although RHEL is an open source operating system, and as such, the source code is freely downloadable, the binary installation images are only available as part of a paid Red Hat Enterprise Linux subscription. In addition to access to the installation images for RHEL, this subscription also provides technical support for the operating system. If you already have a paid subscription, log into your Red Hat account to download the operating system. If you would like to try out RHEL before purchasing, Red Hat provides a 30-day trial. To register for a trial, visit the Red Hat website at http://www.redhat.com/rhel/details/eval/ and complete the registration process. For qualifying software developers and partners, RHEL 6 subscriptions for testing purposes are available through the Red Hat partner program.

The installation distribution can be downloaded as a single DVD image. This DVD image is named using the following convention:

```
rhel-<variant>-<version>-<architecture>-dvd.iso
```

For example, the RHEL 6.0 server DVD image for 64-bit systems is named as follows:

```
rhel-server-6.0-x86_64-dvd.iso
```

Having downloaded the DVD image, either burn it to disk, configure your virtualization environment to treat it as a DVD drive or use the steps outlined in Performing an RHEL 6 Network Installation to access the installation image over a network.

3.2 Installing Red Hat Enterprise Linux 6

Insert the RHEL 6 DVD into the appropriate drive and power on the system. If the system tries to boot from the hard disk drive you will need to enter the BIOS set up for your computer and

change the boot order so that it boots from the DVD drive first. Once the system has booted you will be presented with the following screen:

To install using the graphical installer, simply select the first installation option and press the <Enter> key. If you encounter problems with the display when the graphical installer begins, reboot and try again with the *basic video driver* option. Note also that if the host system has insufficient memory or a graphics card is not detected, the installer will run in text mode. To force the installation to take place in text mode, press the *Esc* key when the above menu screen is displayed and enter *linux text* at the resulting boot prompt followed by *Enter*.

Options are also available to boot from the current operating system on the local drive (if one is installed), test the system memory, or rescue an installed RHEL 6 system. The last option alone is reason enough to keep the installation DVD in a safe place in case you need to perform a rescue at some future date.

The RHEL installer will then provide the option to test the installation media for errors. Use the arrow keys to navigate between the options and make a selection with the <Enter> key. After a short delay the first screen of the graphical installer will appear. Navigate through the next few pages to configure your preferred language, keyboard type and storage devices (unless you plan to use a Storage Area Network device, the Basic option is recommended). If the installer detects that the target disk needs to be initialized a dialog will appear seeking confirmation.

3.3 Timezone and the Root Password

Subsequent screens will request information about Timezone and the root password of the system.

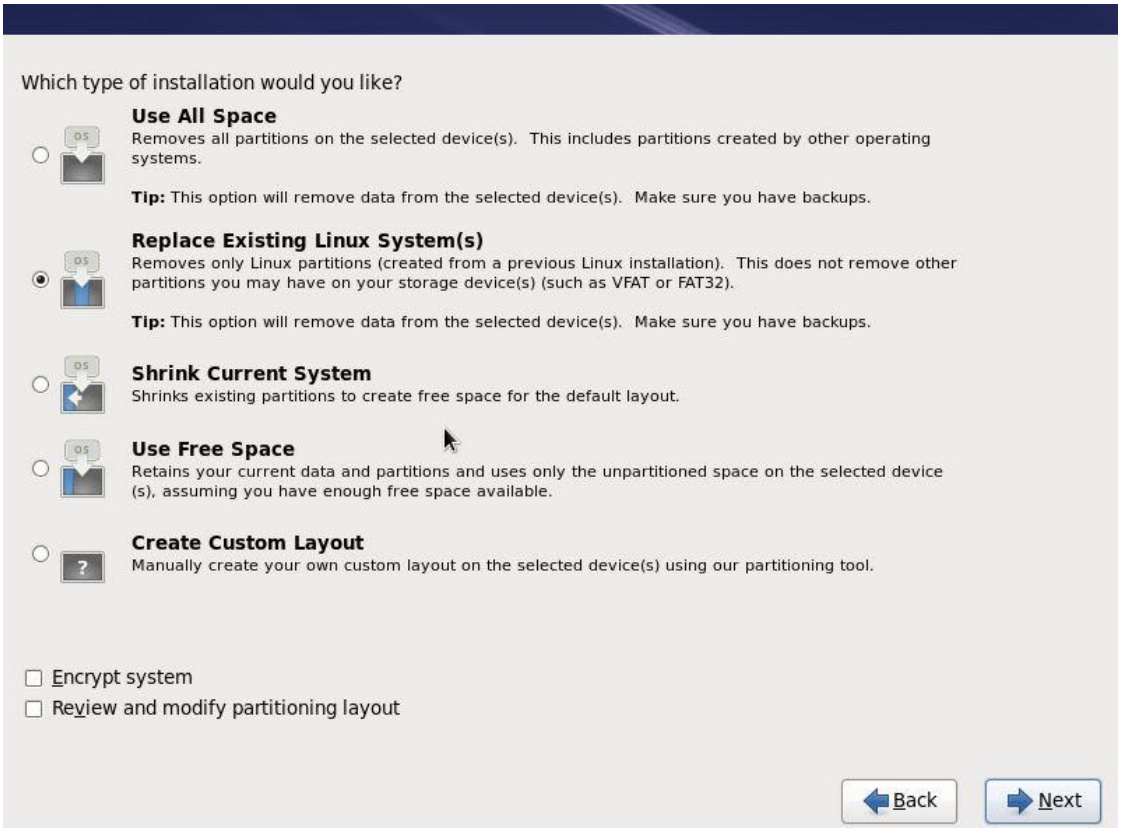
On the Timezone screen, make a selection corresponding to your geographical location. The option is also provided to use UTC which automatically adjusts the time to account for daylight savings time. If the computer on which RHEL is being installed also runs another operating system which already uses UTC (such as Windows), leave this option unselected.

On the next screen, enter a password for the root account on the system. The root, or super-user account, is a special user that has administrative privileges on the system. Whilst you will generally use your own account to log into the system, you will need to gain root privileges in order to configure the system and to perform other administrative tasks.

The installer will subsequently move on to the disk partitioning screen.

3.4 Partitioning a Disk for RHEL

When you reach the disk partitioning phase of the installation, the installer will present a screen similar to the one illustrated in the following figure:



A number of options are provided for allocating space for the installation of RHEL 6:

- **Use All Space** - The entire disk drive will be assigned to the RHEL 6 operating system installation. Any pre-existing partitions, together with any existing operating systems and associated data files contained therein will be deleted to make room for RHEL. This option should only be used if you are absolutely sure you no longer need anything that is currently stored on that disk, or have already backed up all user files.

- **Replace existing Linux System(s)** - If the drive was previously configured to support a Windows/Linux dual boot environment or was devoted entirely to another Linux installation, this option may be selected to instruct the installer to delete the pre-existing Linux partition and replace it with RHEL 6. Once again, it is important to backup any user data that may still be needed.

- **Shrink Current system** - Allows an existing partition to be reduced in size to make room on the drive for the RHEL 6 installation. More details on this option are provided in a later chapter entitled Installing RHEL 6 with Windows in Dual Boot Environment.

- **Use Free Space** - If the current partitions on the drive do not take up the entire disk space available, any unallocated space may be assigned to the RHEL installation using this option.

- **Create Custom Layout** - When selected, this option displays the disk partitioning tool allowing each partition on the disk to be manually configured. Unless you have experience with low level disk partitioning this option is not recommended.

On this screen, make a selection based on your requirements. If, for example, the entire disk is to be used for RHEL 6, select the *Use All Space* option. In order to implement a dual boot configuration, refer to Installing RHEL 6 with Windows in Dual Boot Environment.

For the purposes of this chapter we are assuming the entire disk is available to accommodate the RHEL 6 installation so select the *Use All Space* option.

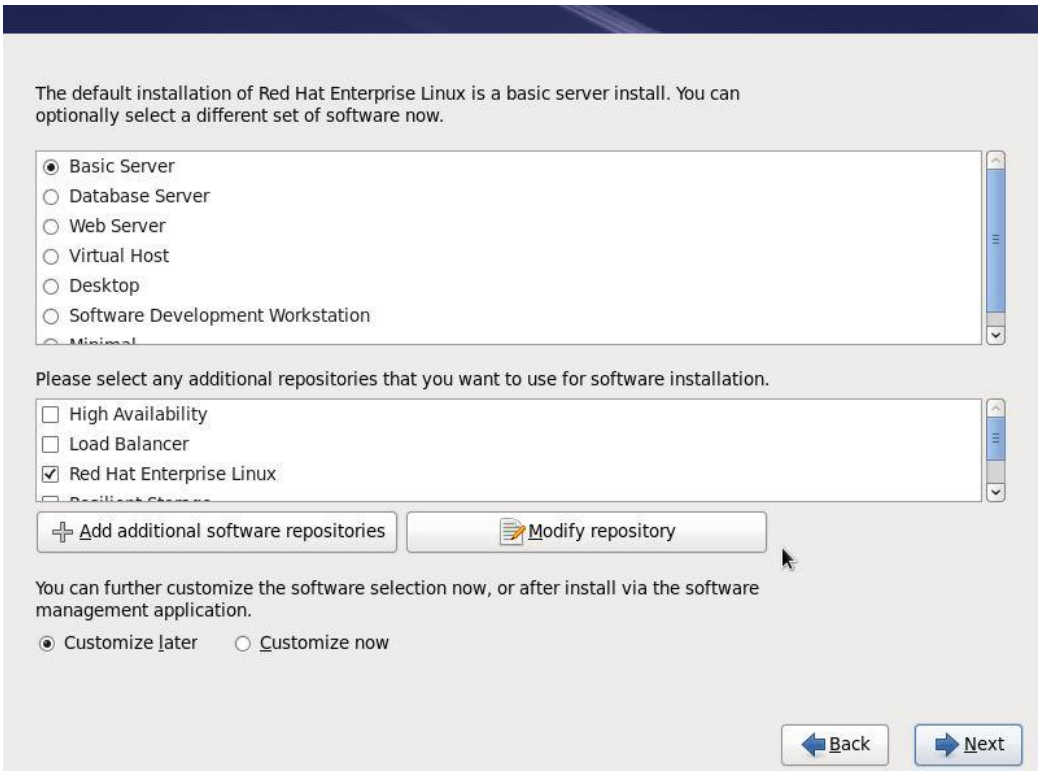
Beneath the partition menu is the option to encrypt the system. The choice of whether to use encryption will depend on the purpose for which the system is being used, its physical location and type of data it is going to store. Keep in mind that as with any form of encryption there are performance overheads associated with selecting this option.

Having made the partitioning selection click *Next* to begin the partitioning process.

3.5 Package Selection

Linux is a modular operating system in that it provides a basic operating system kernel and infrastructure upon which a range of different packages may be installed depending on your specific requirements for the system. If, for example, you plan on using the system as a web server you would need to install the Apache web server package.

At this point in the installation the installer needs us to decide which packages should be installed along with the base operating system and displays the screen shown in the following figure:



This screen allows you to make general choices about the type of functions you need the system to perform. Ideally, you should select the option that most closely resembles the intended purpose of the system.

To view or modify the specific package selections, make sure that the *Customize Now* option is selected before proceeding. You will then be provided a complete overview of which packages are selected for installation and which are not together with the ability to make changes to these selections. Don't worry too much about getting this exactly right at this stage. Packages can be added and removed at any time after the installation is complete by selecting the desktop *System -> Administration -> Add/Remove Software* menu option.

3.6 The Physical Installation

Having made the appropriate package selections, clicking *Next* will initiate the installation process. During the installation process, the installer will provide a running commentary of the selected packages as they are installed and a progress bar. If you are using the DVD the installation will complete without further interaction. Once the installation process is complete

a screen will appear containing a button to reboot the system. Remove the installation media and click the button.

3.7 Final Configuration Steps

After the system has started for the first time, the RHEL 6 Setup Agent will appear with a welcome message. Click on the *Forward* button to display licensing terms and conditions and select the option to accept the terms of the agreement (assuming of course that you do agree to them).

On the *Setup Software Updates* screen, register the system with the Red Hat Network (RHN). This enables additional packages to be installed from the RHN repositories and also allows the system to receive software updates. In order to register the system, enter your RHN user login and password when prompted. If you would prefer to register the system at a later time, do so simply by running the *rhn_register* command from a terminal window or selecting the *System -> Administration -> RHN Registration* menu option.

Choose whether or not to enable Kdump support and then work through the remaining screens to create a user account for yourself and verify the date and time. If you would like the date and time of your RHEL system to be synchronized with an external Network Time Protocol server, select the *Synchronize date and time over network* option before proceeding.

Having worked through all the set up pages, click *Finish* to exit the setup agent and log in using your newly created account credentials.

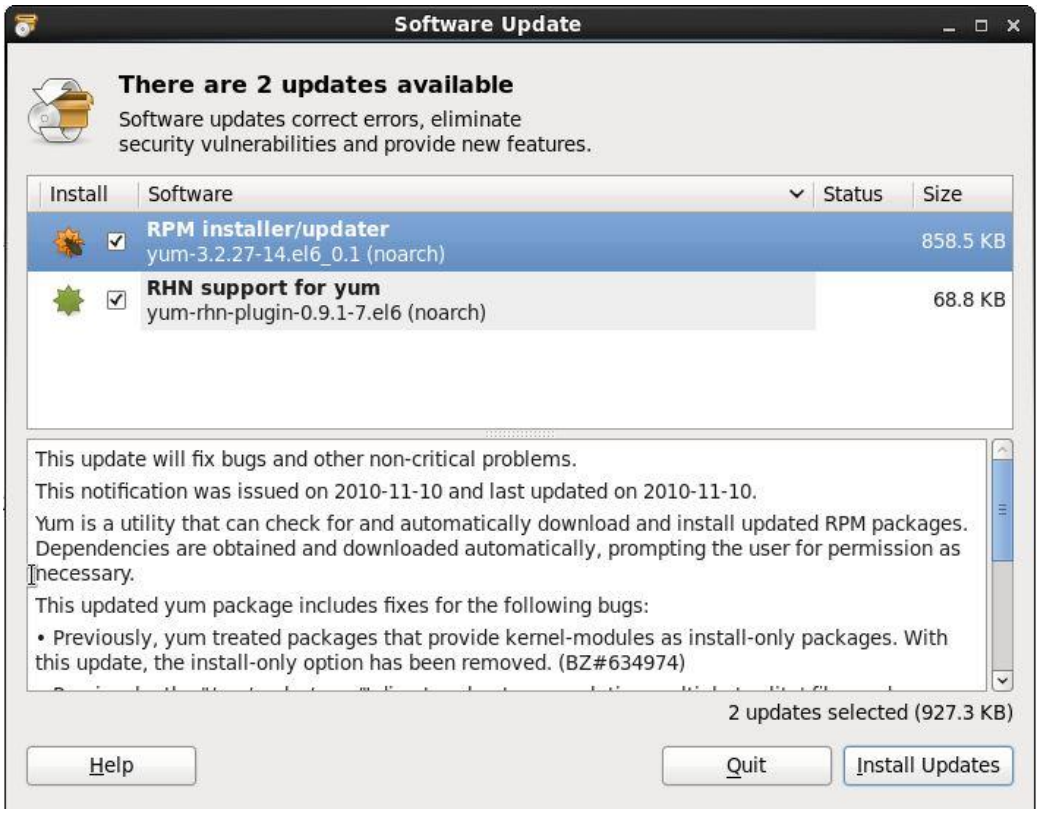
3.8 Installing Updates

As with most operating systems today, the each particular release of RHEL distribution continues to evolve after it has been released to the public. This generally takes the form of bug fixes and security updates and, occasionally, new features that may be downloaded over the internet and installed on your system.

Best practices dictate that the first step after installing RHEL is to make sure any available updates are applied to the system. This can be achieved either through the desktop environment or via the command-line prompt in a Terminal window.

The RHEL 6 desktop environment places an indicator in the top desktop panel to notify the user that updates are available to be applied to the system. This indicator takes the form of orange star with a bug crawling on it. Moving the mouse pointer over this icon will display a message indicating the number of updates that are currently available for the system as illustrated in the following figure:

Clicking on update notification icon invokes the software update window containing a list of available updates together with references to more detailed information on each one:



Clicking the *Install Updates* button will begin the update process which consists of resolving package dependencies, downloading and installation of the updates. The duration of the update process will depend on the number and size of updates available combined with the speed of the internet connection to which the Fedora system is connected.

The latest updates may also be applied from within terminal window (*Applications -> System Tools -> Terminal*) using the *yum* command:

```
su -
yum update
```

Upon execution, the yum tool will provide a list of packages that are available for update and prompt to perform the update.

Once the update is complete the installation is essentially finished and RHEL 6 is ready for use.

Chapter 4. Performing an RHEL 6 Network Installation

In addition to installing directly from the physical Red Hat Enterprise Linux 6 installation media (in the form of a DVD) it is also possible to perform a network based RHEL installation whereby the installation image is installed on a remote server and downloaded in packages to the destination computer system during installation. RHEL 6 currently supports network installation via HTTP, FTP and NFS. For the purposes of this tutorial we will focus on the use of HTTP (in other words the installation image is available via a web server on a remote host) though the concepts are largely the same for the other network installation options.

4.1 RHEL 6 Network Installation Requirements

Before a network installation of RHEL 6 can be performed a number of items are required. Firstly, the RHEL 6 installation image must be loaded onto the remote server and mounted. If the installation media is in the form of DVD then the image can be read from that media into a disk based ISO image file using the *dd* command as follows:

```
dd if=/dev/media of=/path/to/iso/file/rhel6-image.iso
```

Note that in the above example, */dev/media* would be replaced by the path to the DVD device and */path/to/iso/file/* represents the path to a suitable location on the file system to create the image file. Also keep in mind that the installation media may comprise multiple disk images, each of which may need to be imported into the server.

Having created the ISO image file from the installation media, it now needs to be mounted in a location that is accessible to the web server, ftp server or NFS mount point so that it is accessible to the target system. This is achieved using the mount *loopback* interface:

```
mount -o loop rhel6_image.iso /path/to/mount/point
```

In this case, */path/to/mount/point* is replaced by the full path to the location where the RHEL 6 installation image is to be mounted such that it can be accessed via the chosen network installation method. For example, in the case of an HTTP based installation, the chosen mount point might be */var/www/html/rhel6*. Note that the specified mount point directory must already exist before executing this command.

4.2 Obtaining a Network Boot Image

Once the remote server is configured with a copy of the RHEL 6 installation image, the next step is to plan how the installation process will be initiated on the target system. Clearly we will still need to be able to boot from something locally to start the installation. The best option is to

download the *Network Install and Recovery Disc* image from Red Hat Network software downloads page. This image is approximately 220 Mb in size and may be burned to a CDROM, DVD or USB flash drive.

4.3 Writing the Boot Image to a USB Flash Drive

Once the network installation ISO image has been downloaded from the Red Hat Network web site, it may be burned onto a USB flash drive and then used to boot the system on which the network installation is to be performed. This task is best performed on another Linux system using the *dd* command to directly write the ISO image to the flash drive.

Begin by inserting the USB flash drive into an appropriate port on the Linux system and wait for the system to detect the device and mount it. Identify the device name assigned to the drive using the *mount* command in a terminal window and then unmount the media. Assuming, for the sake of an example, that the *mount* command indicated the USB drive was assigned to device file */dev/sdb*, the following command would be used to write the ISO image to the drive:

```
dd if=/path/to/iso/image of=/dev/sdb
```

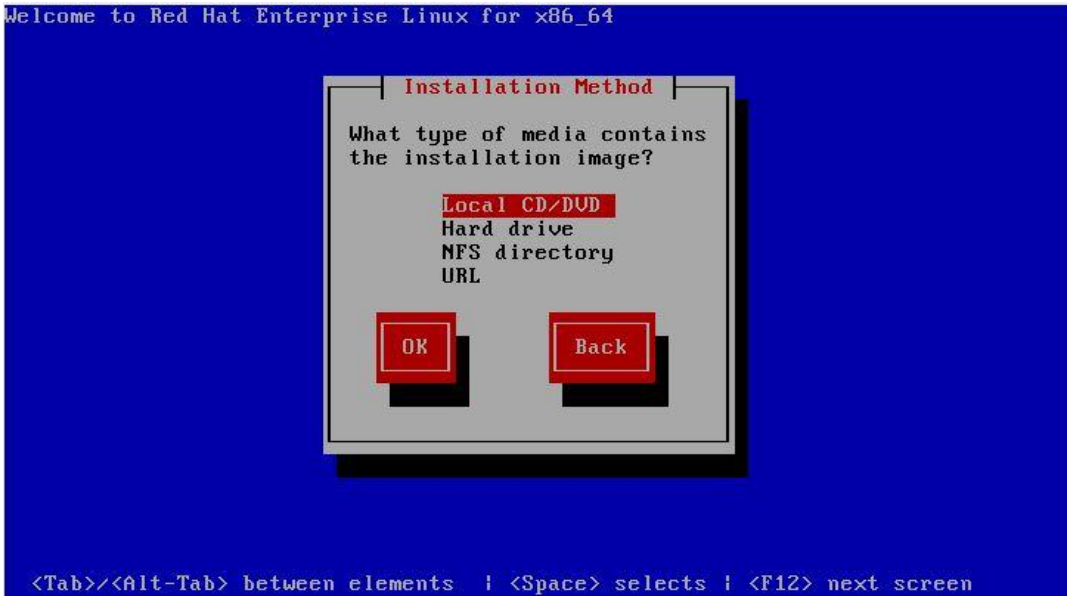
Once the image has been written to the drive, take it to the target system, modify the BIOS boot settings to ensure that the system will boot from a USB device prior to any other storage devices and reboot the system.

4.4 Configuring the Network Installation

When the network installer image has booted press the *Esc* key on the boot menu screen, enter the following command at the *boot:* prompt and press the enter key:

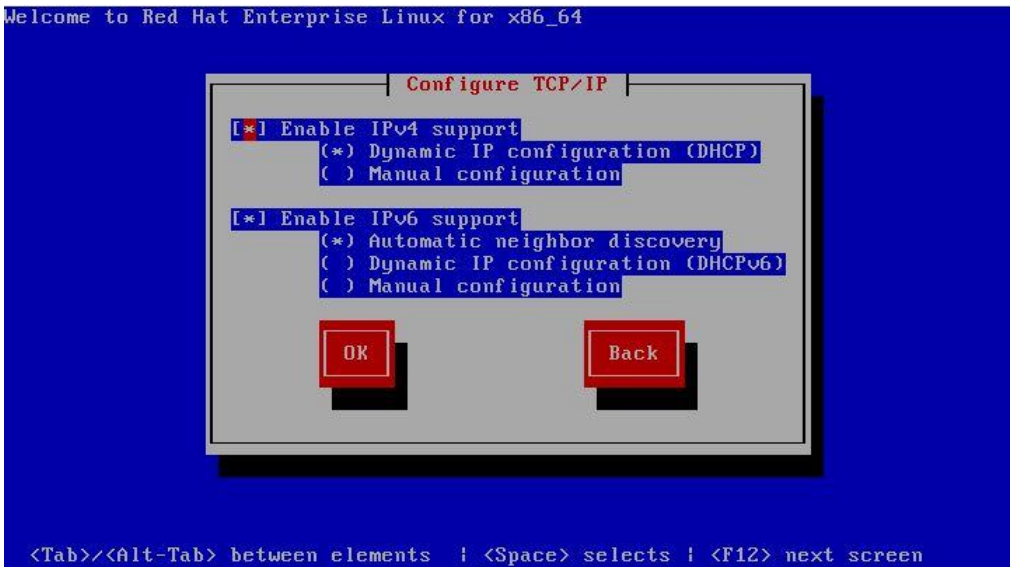
```
linux askmethod
```

A sequence of screens will subsequently appear providing the opportunity to select a language and keyboard type. Once these settings have been defined, a screen will appear requesting the location of the installation media:



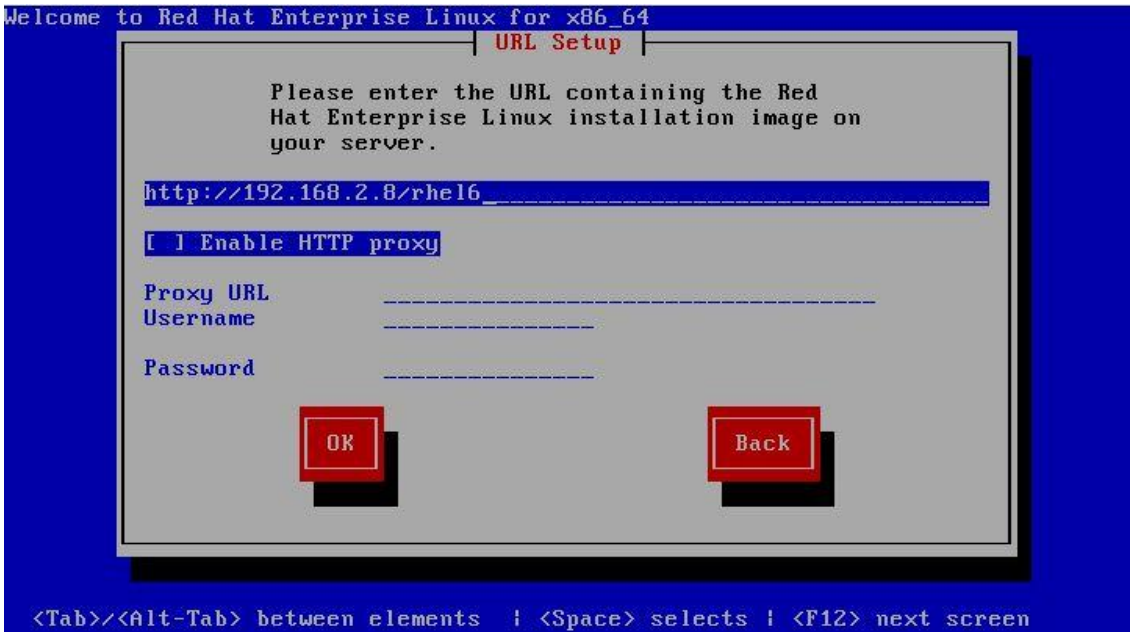
Depending on the method by which the installation images are being served by the remote system select either *NFS Directory* or, in the case of an FTP or HTTP based server, *URL.* For the purposes of this tutorial we will be assuming the use of HTTP.

Once the installation method has been selected, click *OK* to proceed to the TCP/IP configuration screen. If the computer has multiple network adaptors, select the one to be used during the installation. On the next screen, configure the required IPv4 and IPv6 settings for the network to which the computer is attached:



The next item of information that the installer needs is the URL of server containing the installation images and the path to the directory where the first installation image media was

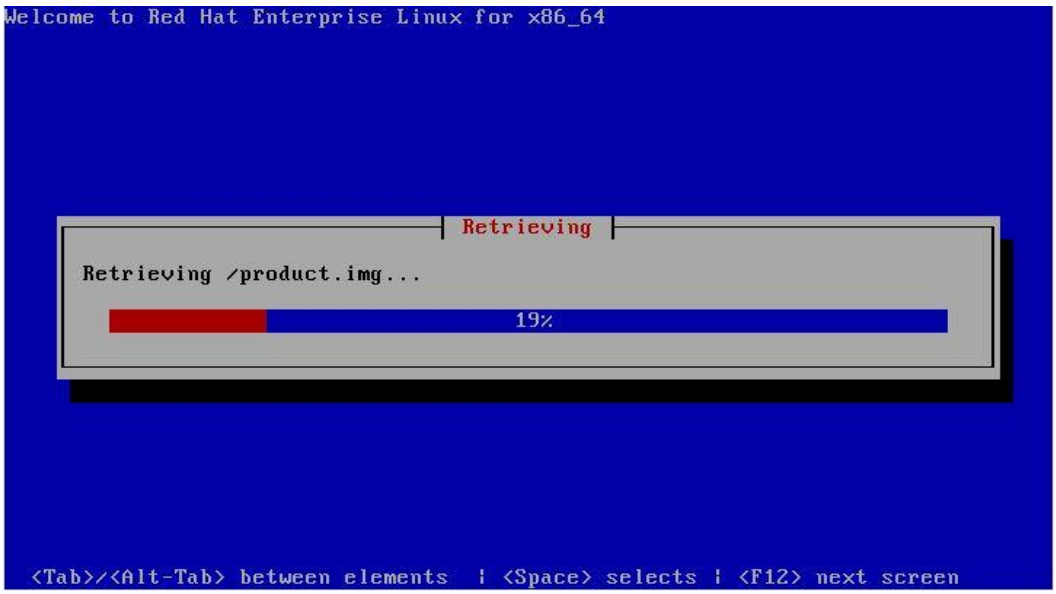
mounted. Enter this information either as a hostname or IP address before clicking OK to proceed:



In the above figure, the installation media is identified via an HTTP URL to the location on the remote web server where the installation image is located. Proxy and user and password information may also be specified if required for access to the server.

4.5 Starting the Red Hat Enterprise Linux 6 Network Installation

Once the network configuration settings are complete, select the *OK* button to begin the installation process. The network installation process will now connect to the remote server and download the first installation image file (this is typically */product.img*):



The duration of this download will vary subject to the speed of the connection between the local system and the remote server hosting the installation image. Once the image has downloaded the installation will proceed as outlined in the previous chapter, with the inevitable exception that it may proceed more slowly than a comparable installation from a local DVD drive unless the remote server and client are connected via a high speed network connection such as that provided by a fiber channel.

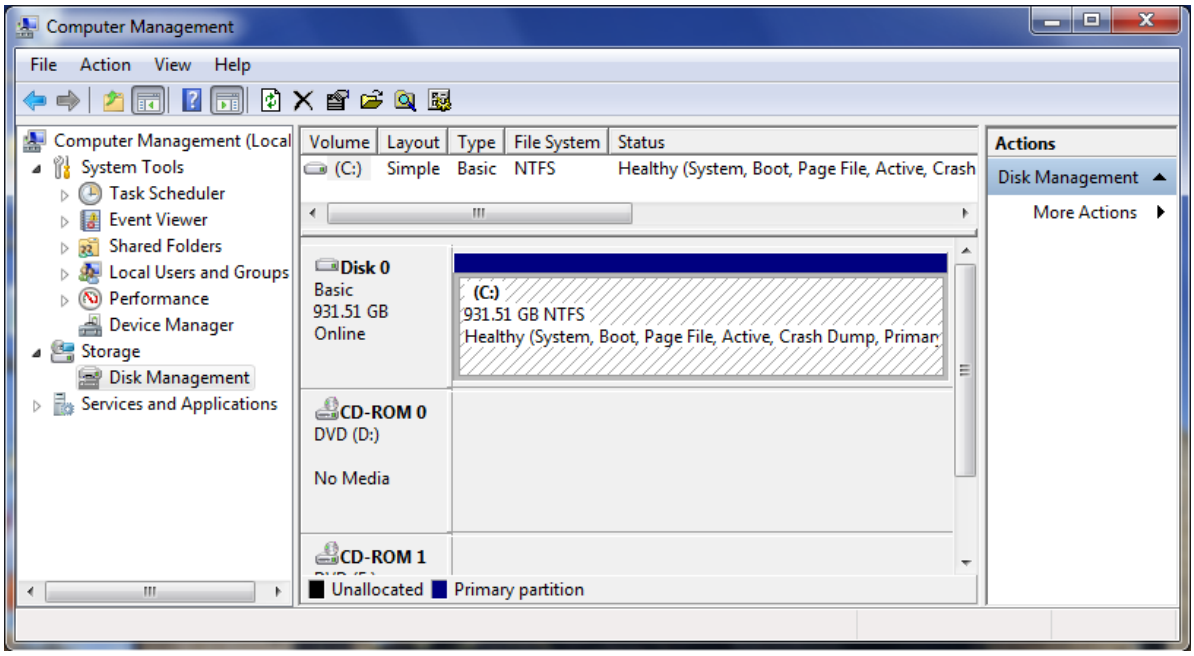
Chapter 5. Installing RHEL 6 with Windows in Dual Boot Environment

Red Hat Enterprise Linux 6, just like most Linux distributions, will happily co-exist on a hard disk drive with just about any version of Windows up to and including Windows 7 and Windows Server 2008 R2. This is a concept known as *dual-booting*. Essentially, when you power up the system, you will be presented with a menu providing the option to boot either your RHEL 6 installation or Windows. Obviously you can only run one operating system at a time, but it is worth noting that the files on the Windows partition of your disk drive will be available to you from RHEL 6 regardless of whether your Windows partition was formatted using NTFS, FAT16 or FAT32.

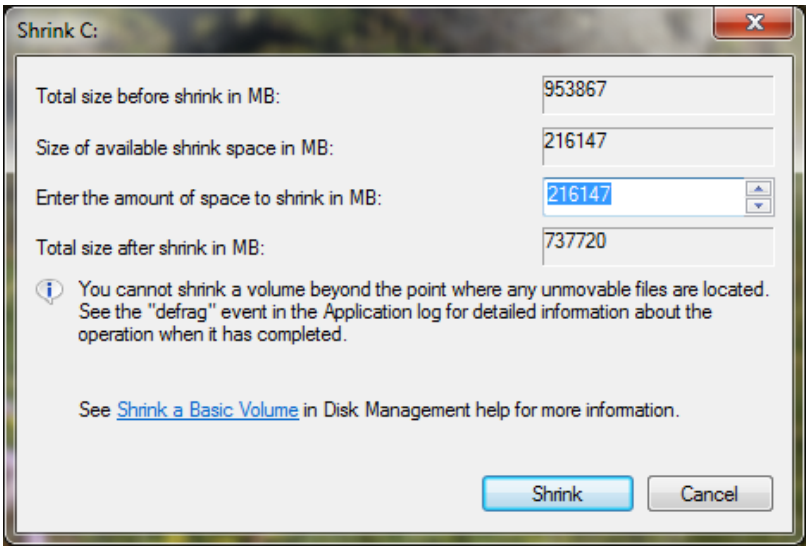
This installation method involves shrinking the size of the existing Windows partition to accommodate the installation of RHEL. How you go about doing this will depend on the version of Windows currently installed on the disk.

5.1 Partition Resizing

In order to accommodate RHEL on a disk drive that already contains a Windows installation the first step involves shrinking the Windows partition to make some room. If you are running Windows Vista, Windows 7 or Windows Server 2008, the recommended course of action is to use the Windows Disk Management interface to reduce the size of the partition before attempting to install RHEL 6. You can generally access this by right clicking on the *Computer* icon and selecting *Manage* from the popup menu. Within the *Computer Management* interface, select *Disk Management* to display a graphical representation of the disk drives in your system:



Right click on the partition you wish to reduce and select *Shrink Volume.* The tool will calculate the maximum amount by which the volume can be shrunk without data loss (a process that can take several minutes depending on the overall size of the partition). Once this analysis is complete, a dialog similar to the one in the following figure will appear:



Enter into the *Total size after shrink in MB* field the new target size for the partition and click on *Shrink* to proceed. Once the resizing operation is complete, reboot using the RHEL 6 installation media (as outlined in Installing RHEL 6 on a Clean Disk Drive) and proceed with the installation. When prompted to decide on where RHEL 6 is to be installed be sure to select the *Use Free Space* option.

5.2 Shrinking the Windows Partition from within Linux

Whilst it is possible to shrink existing Windows partitions using the Windows Disk Management tool on recent versions of Windows, this is not possible from within Windows XP. If you need to shrink a Windows XP partition in order to install RHEL 6, one option is to use one of the commercially available partitioning tools such as PartitionMagic. If you would prefer not to buy a partitioning tool, the repartitioning may also be performed from within a Linux Live CD distribution using the *fdisk* and *ntfsresize* utilities. A Linux Live CD is a CDROM from which a Linux distribution can be booted and run without the necessity to install the operating system on a disk drive. Whilst Red Hat Enterprise Linux 6 is not available as a Live CD, many other Linux distributions are. Perhaps the best option under these circumstances is to use the CentOS Live CD. CentOS is built from the Red Hat Enterprise Linux source code (with the Red Hat branding removed) so establishes a high level of compatibility.

Before attempting this resizing technique it is vital that you back up all essential data from your Windows system. In this section we will be performing some low level disk partitioning activities using command line tools. Whilst following these steps is an invaluable method for learning about the structure of disk partitions, it is important that you understand that errors in performing the following the steps may result in loss of data. With that warning out of the way we can proceed.

The CentOS Live CD image can be downloaded from the mirror sites listed on the CentOS web site at:

http://mirror.centos.org/centos/5/isos/

Once you have loaded this page into your browser, select either the i386 or x86_64 link depending on whether the target system is a 32-bit or 64-bit platform. Within the next screen select a mirror from the list and look for a link to download the Live CD image. This will typically be named as follows:

```
CentOS-<version>-<architecture>-LiveCD.iso
```

Once you have downloaded the image, burn it to a CD, then make sure your BIOS is configured to boot from the CDROM/DVD drive before the hard disk and then boot from the CD. The system will boot CentOS and you will have a fully functional CentOS environment to use during the repartitioning process.