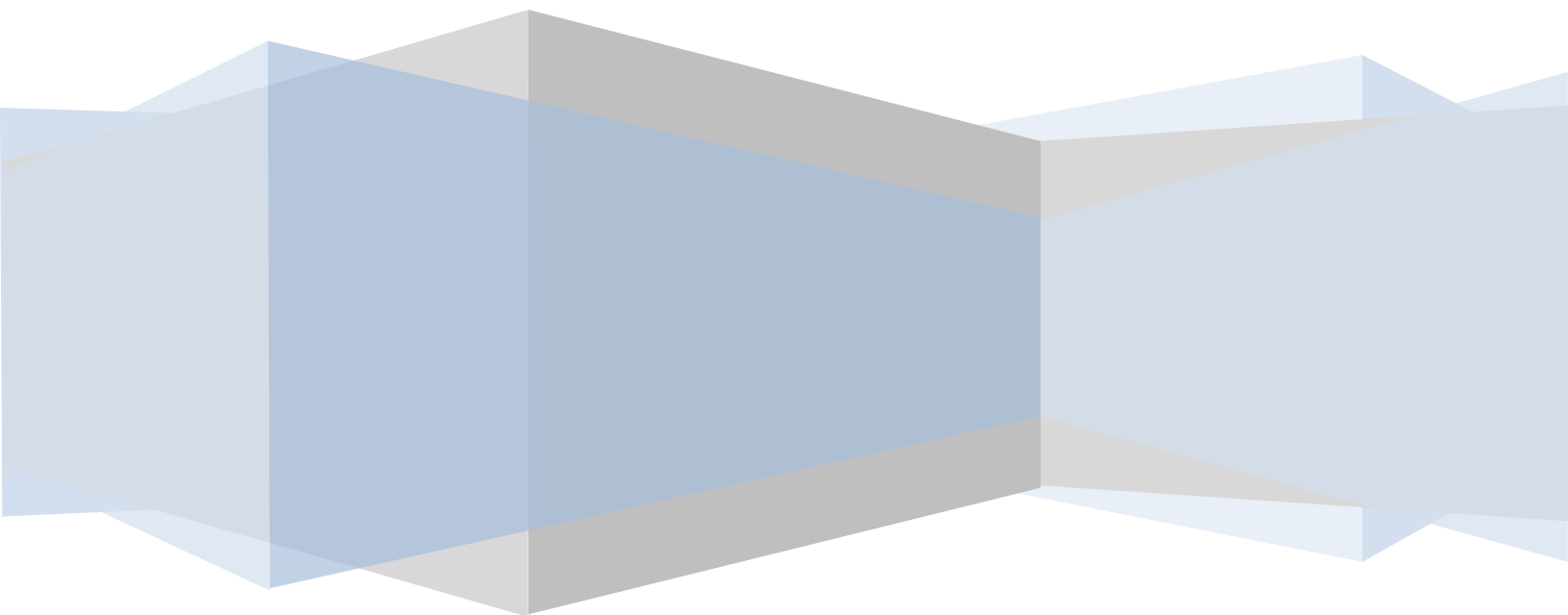


# CentOS 6



## Essentials

# CentOS 6 Essentials



CentOS 6 Essentials – First Edition

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## Chapter 1. About CentOS 6 Essentials

The CentOS Linux distribution is a remarkable case study of the unique power of open source software. In CentOS 6 we have an enterprise level operating system that is developed and maintained at great expense that we can download and deploy without having to pay any money. To fully understand the origins of CentOS, however, it is necessary to begin by talking about another Linux distribution.

Arguably one of the most highly regarded and widely used enterprise Linux distributions available today is Red Hat Enterprise Linux 6 (RHEL 6). 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. Red Hat Enterprise Linux is also an open source product, meaning that anyone can access the source code to the operating system and modify it as they see fit. Whilst the source code to CentOS is freely available, CentOS is not free of charge. In order to get a binary copy of this operating system you have to purchase it as part of a service agreement that includes technical support.

CentOS 6 is 100% compatible with Red Hat Enterprise Linux 6. In fact, CentOS 6 is essentially Red Hat Enterprise Linux 6 with the Red Hat branding and logos removed. CentOS is available for free so you get the power and stability of Red Hat Enterprise Linux without having to purchase it.

Of course, CentOS lacks the dedicated and guaranteed technical support that you get by buying a Red Hat subscription so if you plan to deploy Linux in a mission critical environment where any level of downtime is unacceptable then the Red Hat service is unquestionably worth the money. That said, CentOS is backed by a skilled and active community and I have yet to encounter a problem with CentOS that could not be resolved with the help of the extremely responsive and helpful experts who participate on the CentOS forums.

CentOS 6 Essentials is designed to provide detailed information on the use and administration of the CentOS 6.x Linux distribution. For beginners, the book covers the basics of configuring the desktop environment, resolving screen resolution issues and configuring the email client to send and receive email messages via web based services such as GMail. Installation topics such as dual booting with Microsoft Windows and configuring wireless networking are covered together with all important security topics such as configuring a firewall.

For the experienced user, topics such as configuring email and web servers, KVM virtualization, Secure Shell (SSH), remote desktop access and file sharing are covered in detail to provide a thorough overview of this enterprise class operating system.

## Chapter 2. Installing CentOS 6 on a Clean Disk Drive

The first step on the path to learning about CentOS 6 involves installing the operating system. CentOS 6 can be installed either in a *clean disk* environment (where an entire disk is cleared of any existing partitions and dedicated entirely to CentOS 6) or in a *dual boot* environment where CentOS 6 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 CentOS 6 with Windows in Dual Boot Environment](#).

### 2.1 Trying CentOS 6 without Installing

In addition to installing CentOS 6, there is one other option that will allow you to try out CentOS 6 without physically installing it to a disk drive. This is achieved by using the CentOS Live CD. This is essentially a copy of CentOS that can be booted run from the DVD/CDROM drive of your system without making any changes to the hard disk drive. The Live CD image can be downloaded from the mirror sites listed on the CentOS web site at:

<http://mirror.centos.org/centos/6/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 to view the available downloads 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 explore.

A couple of points should be noted about the Live CD. Firstly, in addition to providing a live, bootable environment in which to try out CentOS 6, the Live CD also provides the ability to install the operating system onto a hard disk drive. Once the live system is running, simply look for the *Install to Hard Drive* icon on the desktop. Installation from a Live CD involves a preconfigured operating system image being written directly to the disk drive with no control over which packages get installed. Whilst packages may be added and removed post-installation, if detailed control over package selection during installation is required it is necessary to perform the installation using the CentOS 6 installation DVD images.

Secondly, because the Live CD system runs on a virtual disk drive in memory, as soon as you shut down or reboot the system any files you have created will be lost.

Finally, the performance of running an operating system from a CDROM is going to be orders of magnitude slower than running from a disk drive, so don't be put off by the sluggishness of the system while you are trying it out. This is entirely indicative of the slow speed of CDROM drives, not a reflection of the performance of the operating system.

The Live CD is a good way to quickly get a copy of CentOS 6 up and running without wiping or repartitioning disk drives, but to really appreciate the power of the CentOS 6, you need to install it to a disk drive.

After you decide to install CentOS 6 onto a hard disk drive it is worth keeping the Live CD in a safe place. It is an ideal tool for performing system rescue and maintenance tasks in the event of problems with the installed system.

### 2.2 Obtaining the CentOS 6 Installation Media

An alternative to running the Live CD is to install directly onto a hard disk drive using the CentOS 6 installation media. In addition to installing from within the Live CD, it is also possible to download and install directly from the CentOS 6 installation media. Once again, go to the following URL and select either the 32-bit or 64-bit link to view available download mirrors:

<http://mirror.centos.org/centos/6/isos/>

The installation distribution is downloaded in the form of two ISO format DVD images. The DVD images are named using the following convention:

`CentOS-<version>-<architecture>-bin-DVD<number>.iso`

Alternatively, the image may be downloaded using BitTorrent by selecting the corresponding *.torrent* file.

Having downloaded the DVD images, either burn them to disk or configure your virtualization environment to treat them as virtual DVD drives.

### 2.3 Installing CentOS 6

Insert the first CentOS 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 setup menu 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 CentOS 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 CentOS 6 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.

When prompted, enter a suitable host name for the CentOS 6 installation. This is the name by which the system will be identified on the network to which it is attached. Additional network

configuration options may be modified by clicking on the *Configure Network* button, selecting a network interface and clicking on the *Edit...* button.

## 2.4 Timezone and the Root Password

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

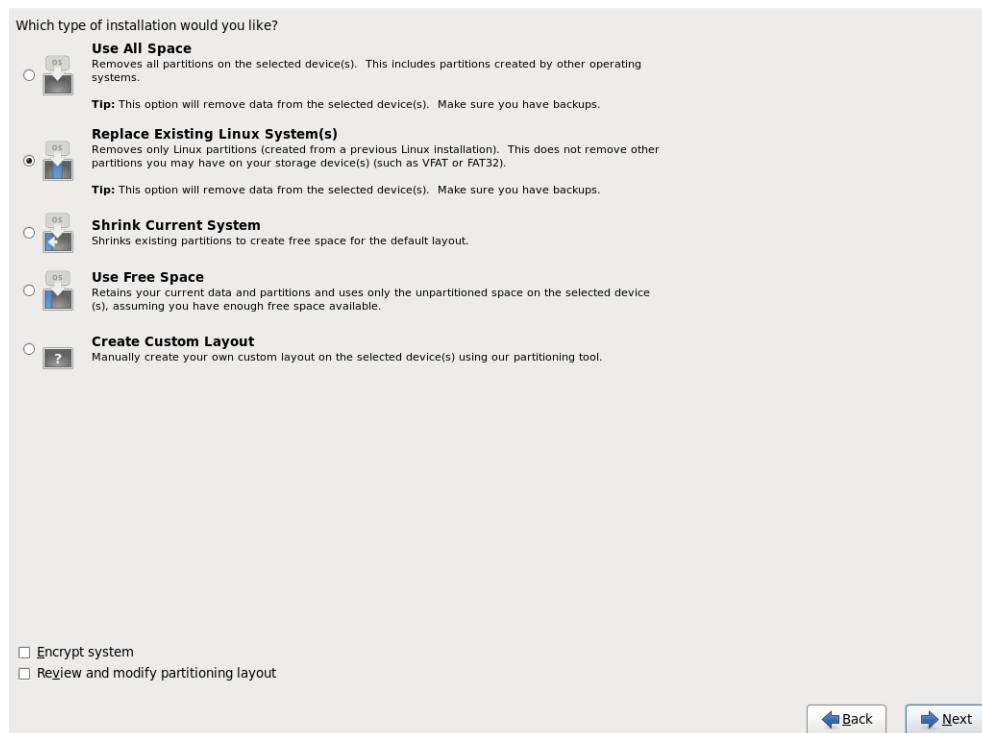
On the Timezone screen, make a selection corresponding to your geographical location. The option is also provided to use UTC which automatically adjusts the time to account for daylight savings time. If the computer on which CentOS 6 is being installed also runs another operating system which already 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.

## 2.5 Partitioning a Disk for CentOS 6

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 CentOS 6:

- **Use All Space** - The entire disk drive will be assigned to the CentOS 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 CentOS. 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 CentOS 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 CentOS 6 installation. Note that the installer is unable to automatically shrink Windows based FAT or NTFS partitions. More details on such an installation scenario are provided in a later chapter entitled [Installing CentOS 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 CentOS 6 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 CentOS 6, select the *Use All Space* option. In order to implement a dual boot configuration, refer to [Installing CentOS 6 with Windows in Dual Boot Environment](#).

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

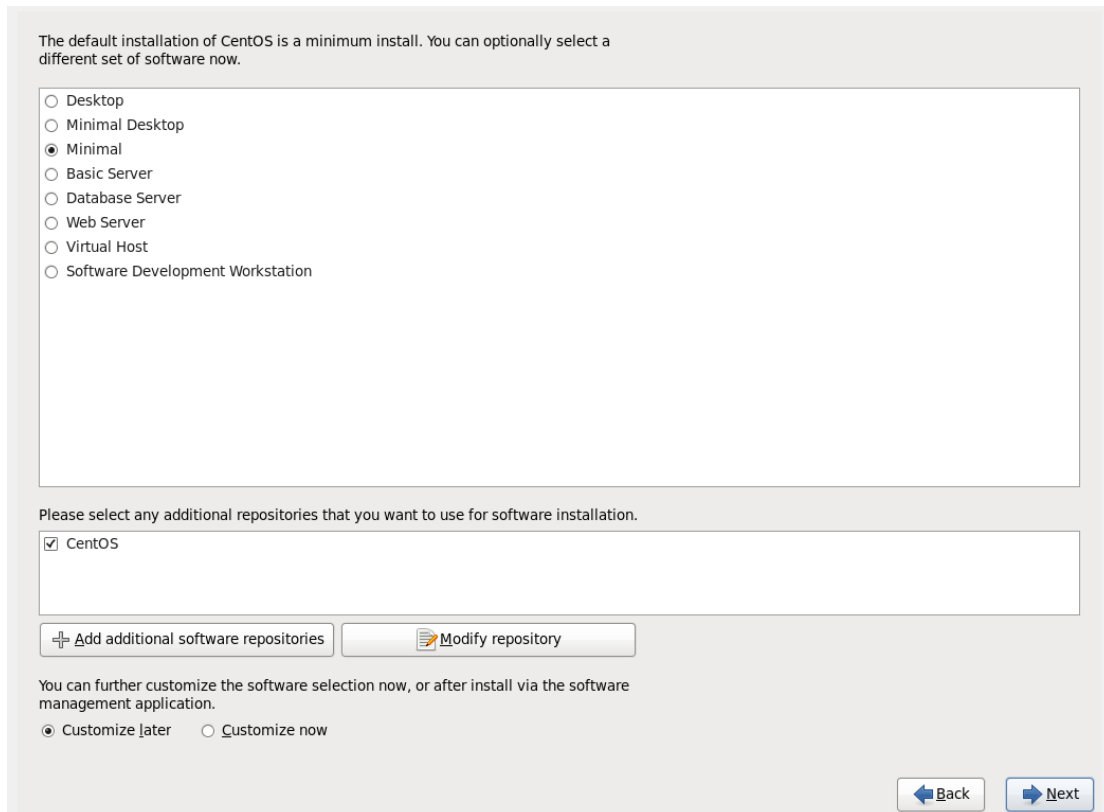
Beneath the partition menu is the option to encrypt the system. The choice of whether to use encryption will depend on the purpose for which the system is being used, its physical location and type of data it is going to store. Keep in mind that as with any form of encryption there are performance overheads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

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

## 2.6 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:



The default installation of CentOS is a minimum install. You can optionally select a different set of software now.

- ☐ Desktop
- ☐ Minimal Desktop
- ☒ Minimal
- ☐ Basic Server
- ☐ Database Server
- ☐ Web Server
- ☐ Virtual Host
- ☐ Software Development Workstation

Please select any additional repositories that you want to use for software installation.

- ☒ CentOS

You can further customize the software selection now, or after install via the software management application.

☒ Customize later ☐ Customize now

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. In the interests of

security and efficiency it is generally recommended that the minimum number of packages be installed initially and then other packages added on as needed basis once the operating system is up and running.

## 2.7 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 together 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.

## 2.8 Final Configuration Steps

After the system has started for the first time, the CentOS 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).

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 CentOS 6 system to be synchronized with an external Network Time Protocol server, select the *Synchronize date and time over network* option before proceeding. Finally, choose whether or not to enable Kdump support.

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

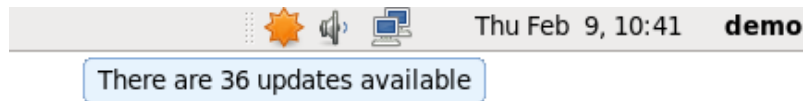
## 2.9 Installing Updates

As with most operating systems today, the each particular release of CentOS 6 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.

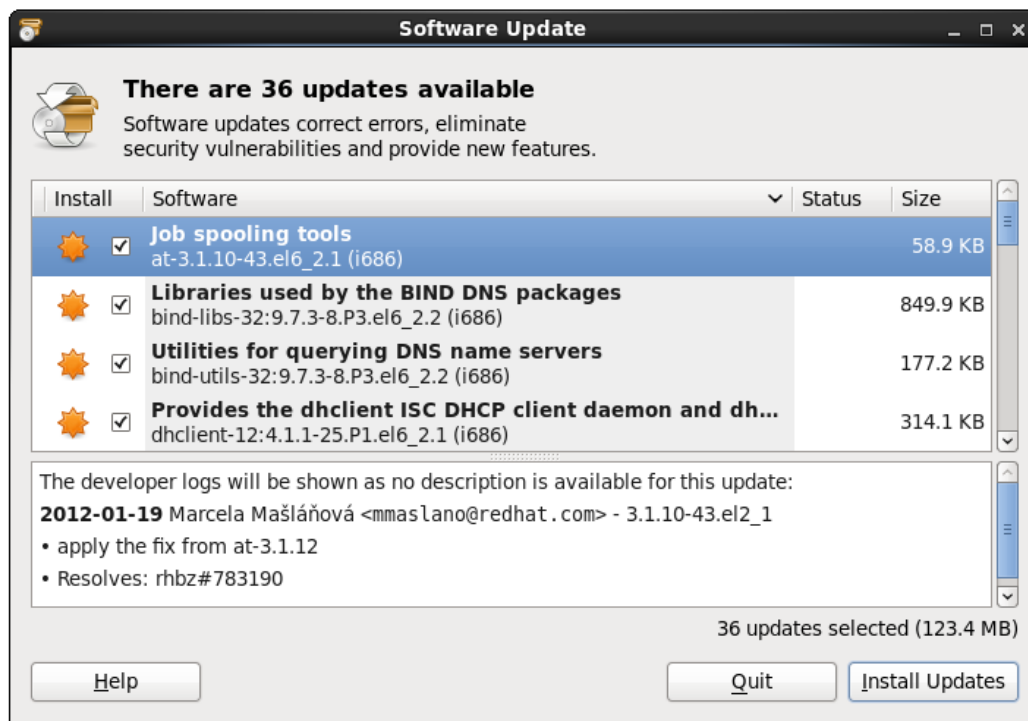
Best practices dictate that the first step after installing CentOS 6 is to make sure any available updates are applied to the system. This can be achieved either through the desktop environment or via the command-line prompt in a Terminal window.

The CentOS 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:



To identify and apply updates using the graphical software update tool, either click on the toolbar icon or select the *System -> Administration -> Software Update* desktop menu option. The resulting dialog will download a list of available updates and provide the option for those updates to be applied to the system:



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 CentOS system is connected.

The latest updates may also be applied from within a 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 CentOS 6 is ready for use.

## Chapter 3. Performing a CentOS 6 Network Installation

In addition to installing directly from the physical CentOS 6 installation media (in the form of a DVD) it is also possible to perform a network based CentOS installation whereby the installation image is installed on a remote server and downloaded in packages to the destination computer system during installation. CentOS 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.

### 3.1 CentOS 6 Network Installation Requirements

Before a network installation of CentOS 6 can be performed a number of items are required. Firstly, the CentOS 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/CentOS6-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 CentOS6_image.iso /path/to/mount/point
```

In this case, `/path/to/mount/point` is replaced by the full path to the location where the CentOS 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/CentOS6`. Note that the specified mount point directory must already exist before executing this command.

### 3.2 Obtaining a Network Boot Image

Once the remote server is configured with a copy of the CentOS 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* image from a CentOS mirror server at:

<http://mirror.centos.org/centos/6/isos/>



The file name containing this image is usually adopts the following format:

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

For example, the 32-bit installation image for CentOS 6.2 is named *CentOS-6.2-i386-netinstall.iso*.

This image is approximately 170 Mb in size and may be burned to a CDROM, DVD or USB flash drive.

### 3.3 Writing the Boot Image to a USB Flash Drive

Once the network installation ISO image has been downloaded from the CentOS web site, it may optionally 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
```

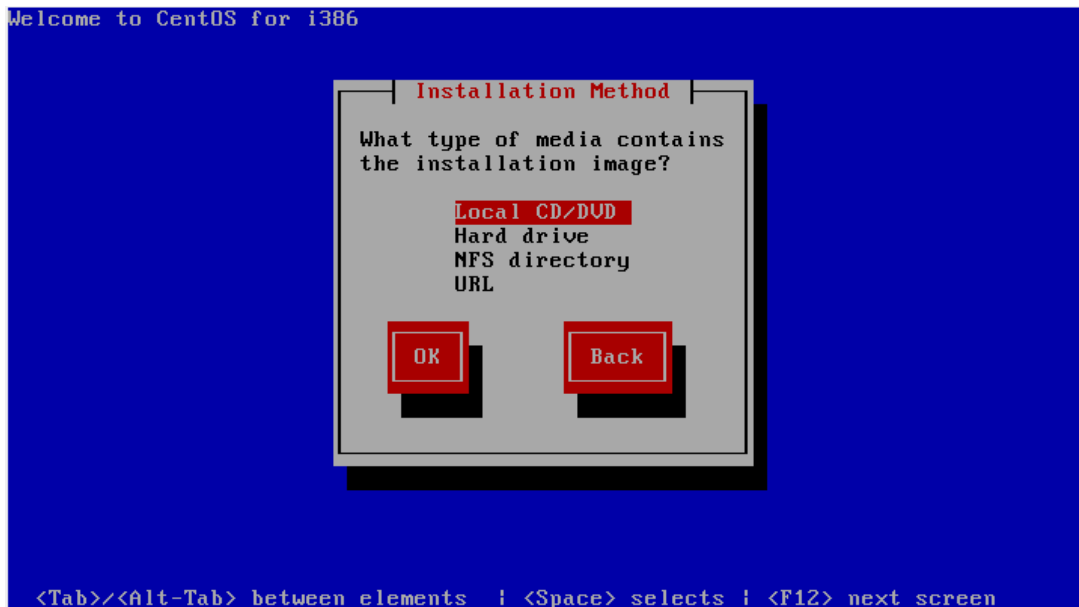
Once the image has been written to the drive, take it to the target system, modify the BIOS boot settings to ensure that the system will boot from a USB device prior to any other storage devices and reboot the system.

### 3.4 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:

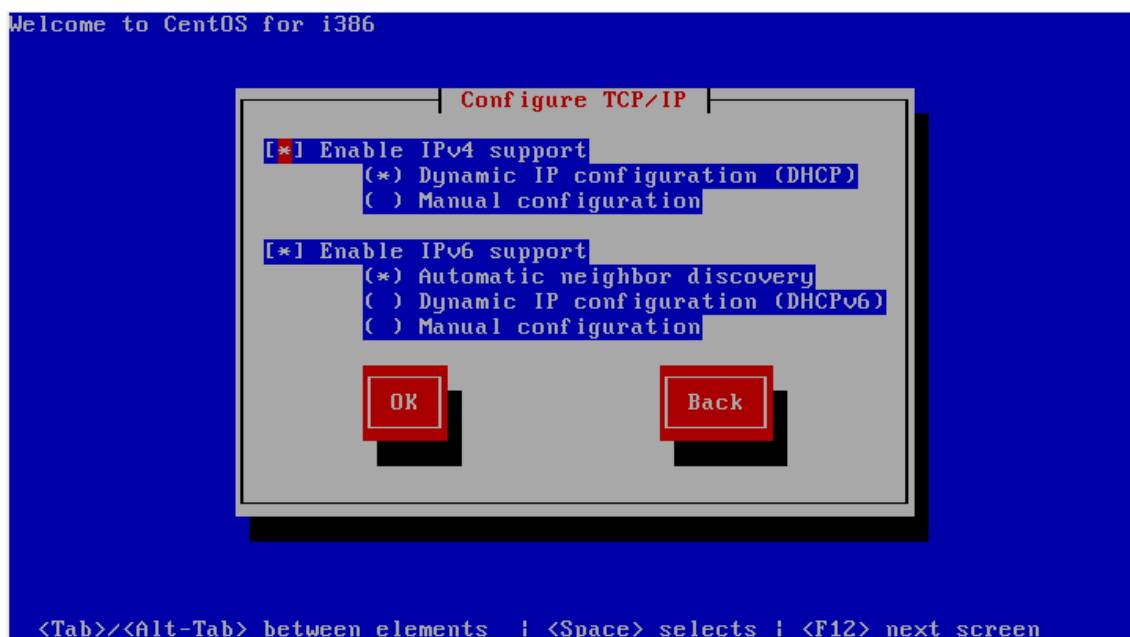
```
linux askmethod
```

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:

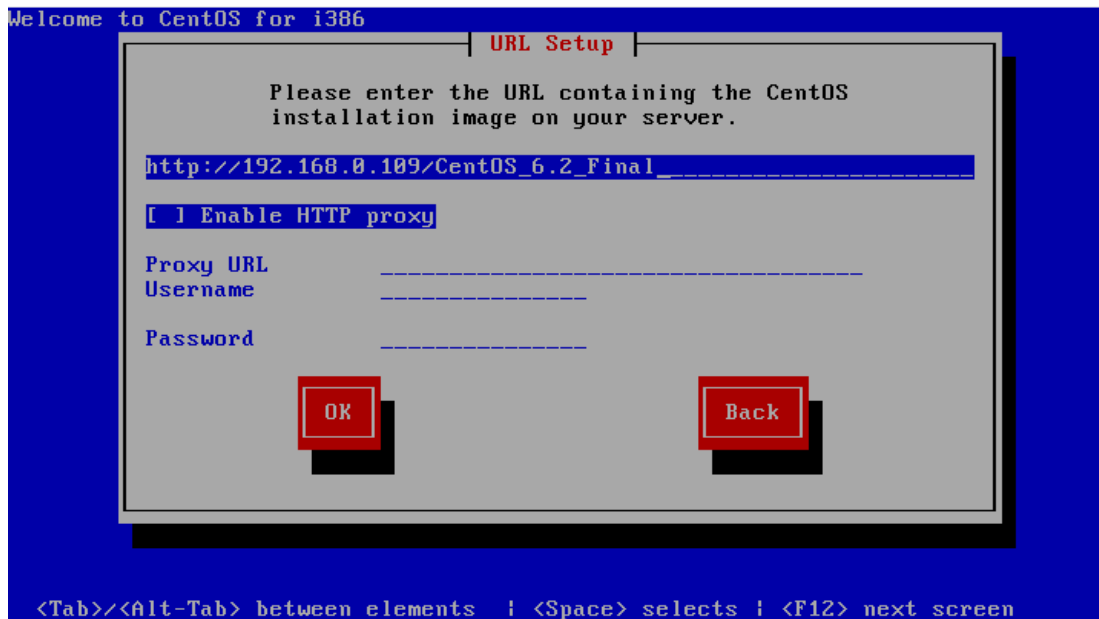


Depending on the method by which the installation images are being served by the remote system select either *NFS Directory* or, in the case of an FTP or HTTP based server, *URL*. For the purposes of this tutorial we will be assuming the use of HTTP.

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:



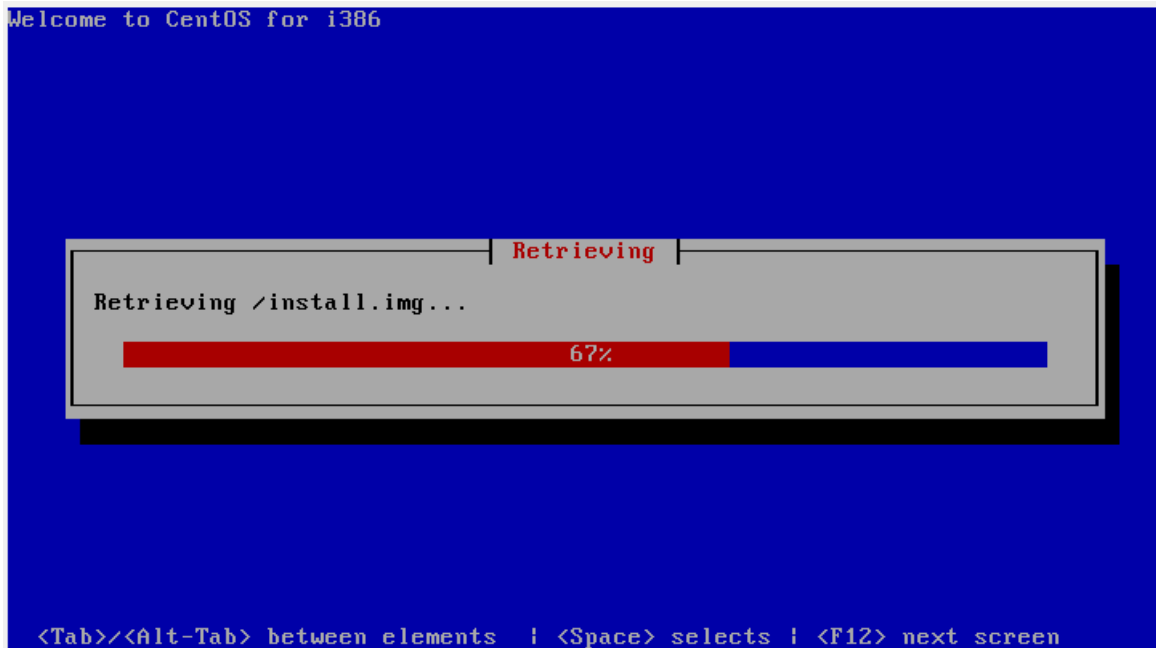
The next item of information that the installer needs is the URL of server containing the installation images and the path to the directory where the first installation image media was mounted. Enter this information either as a hostname or IP address before clicking OK to proceed:



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.

### 3.5 Starting the CentOS 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 */install.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 media unless the remote server and client are connected via a high speed network connection such as that provided by a fiber channel.

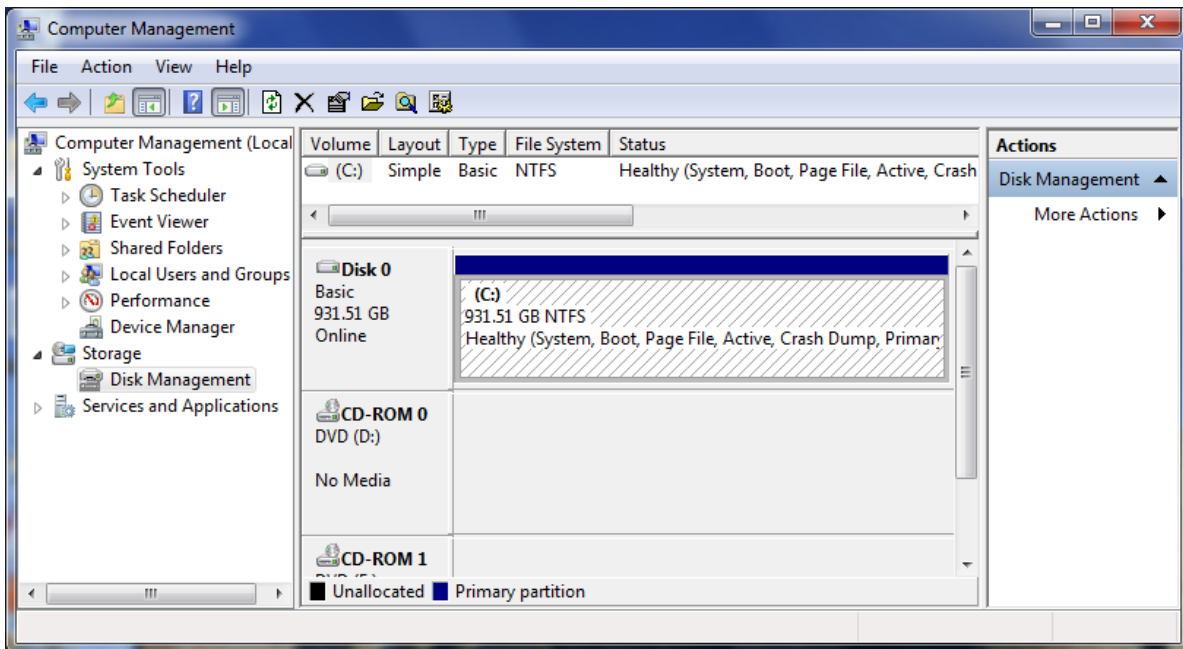
## Chapter 4. Installing CentOS 6 with Windows in a Dual Boot Environment

CentOS 6, in common with 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 CentOS 6 installation or Windows. Obviously you can only run one operating system at a time in such a configuration, but it is worth noting that the files on the Windows partition of your disk drive will be available to you from CentOS 6 regardless of whether your Windows partition was formatted using Microsoft's NTFS, FAT16 or FAT32 file system formats.

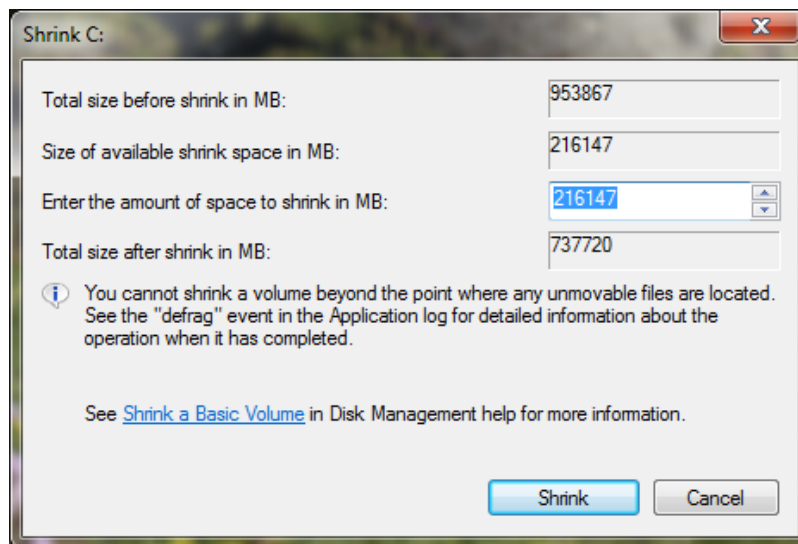
This installation method involves shrinking the size of the existing Windows partition to accommodate the installation of CentOS 6. How you go about doing this will depend on the version of Windows currently installed on the disk.

### 4.1 Partition Resizing

In order to accommodate CentOS 6 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, Windows Server 2008 or later, the recommended course of action is to use the Windows Disk Management interface to reduce the size of the partition prior to attempting to install CentOS 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 may be reduced 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 CentOS 6 installation media (as outlined in [Installing CentOS 6 on a Clean Disk Drive](#)) and proceed with the installation. When prompted to decide on where CentOS 6 is to be installed be sure to select the *Use Free Space* option.