Oracle® Linux

Installation Guide for Release 6

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Abstract

This manual provides information about how to install and upgrade Oracle Linux 6 systems.

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Table of Contents

Preface

The *Oracle Linux Installation Guide* provides information about how to install and upgrade Oracle Linux 6 systems.

Audience

This document is intended for administrators who need to install and configure Oracle Linux 6. It is assumed that readers are familiar with web technologies and have a general understanding of administering the Linux operating system.

Document Organization

The document is organized as follows:

- Chapter 1, *Pre-installation Configuration* describes the system requirements for Oracle Linux 6, how to obtain the Oracle Linux 6 software, information that you require to install a system, and how to set up a network installation server .
- Chapter 2, *Installing Oracle Linux Manually* describes how to install Oracle Linux manually from a boot image that is available on CD, DVD, USB memory stick, hard drive, virtual device hosted by a virtual machine hypervisor, or a remote server that is accessible via HTTP or NFS.
- Chapter 3, *Installing Oracle Linux by Using Kickstart* describes how you can use kickstart to automate the installation of Oracle Linux.
- Chapter 4, *Post-installation Configuration* describes configuration changes that you might make to a system after installation.

Related Documents

The documentation for this product is available at:

https://www.oracle.com/technetwork/server-storage/linux/documentation/index.html.

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

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Chapter 1 Pre-installation Configuration

Table of Contents

This chapter describes system and other requirements for installing Oracle Linux 6, including how to obtain the Oracle Linux 6 software and how to plan for an installation. Additional configuration information, for example, how to set up a network installation server, is also provided in this chapter .

1.1 System Requirements

You can install Oracle Linux 6 on systems with a 32 or 64-bit x86 architecture (x86 or x86_64), a minimum of 1 GB of memory, a minimum of 1 GB of disk space, and an unlimited number of CPU cores. The maximum supported memory size is 64 GB for x86 and 4 TB for x86_64.

If your system supports UEFI mode and you plan to boot and install Oracle Linux 6 in this mode, make sure that the target disk uses GPT (GUID Partition Table), as some UEFI firmwares do not allow UEFI/MBR boot.

For the most up-to-date information about system requirements, see https://www.oracle.com/us/technologies/linux/product/specifications/index.html

1.2 Obtaining Oracle Linux 6 Installation Media

The Oracle Linux distribution is free to download, use and distribute.

You can download Oracle Linux installation images from the Oracle Software Delivery Cloud at https://edelivery.oracle.com/linux. After installation, you can obtain Oracle Linux packages from the Unbreakable Linux Network (ULN) and the Oracle Linux yum server. For more information, see Chapter 4, *Post-installation Configuration*.

For example, the following table shows the images that are available for Oracle Linux 6 Update 6 on x64_64.

Name	Part Number	Size
Oracle Linux Release 6 Update 6 source DVD 1	V52216-01	3.1 GB

Name	Part Number	Size
Oracle Linux Release 6 Update 6 source DVD 2	V52217-01	2.1 GB
Oracle Linux Release 6 Update 6 for x86_64 (64 Bit)	V52218-01	3.7 GB
Oracle Linux Release 6 Update 6 Boot ISO image for x86_64 (64 bit)	V52219-01	226 MB
Oracle Linux Release 6 Update 6 UEK Boot ISO image for x86_64 (64 bit)	V52220-01	238 MB

V52218-01 is a full, bootable installation ISO image. You can burn this image to DVD and use it boot and install a system, you can make it available as a virtual DVD-ROM drive to boot and install a guest system under Oracle VM VirtualBox or Oracle VM, or you can copy or mount it and make its contents available over the network via HTTP or NFS. See Section 1.4, “Configuring a Network Installation Server”.

V52219-01 and V52220-01 are boot ISO images for the Red Hat Compatible Kernel and the Unbreakable Enterprise Kernel Release 2 respectively. You can burn these images to CD or DVD and use them to boot a system and start an installation. However, to complete the installation, you must specify how to access the installation packages.

V52216-01 and V52217-01 are images of the source code for the software packages in the release.

1.3 Planning the Installation

The following table is intended to help you prepare and record the information that you need to install a system.

Installation Setting	Value
Text-based or graphical installation.	`[text][graphic]`
Installation language.	`Language:`
Installation keyboard layout.	`Keymap:`

The network interface to use for installation (if any), and its IP address, netmask, and gateway settings if you do not use DHCP.	`Use DHCP?: [yes][no]`
	`Interface:`
	`IP address:`
	`Netmask:`
	`Gateway:`

Type of medium to use for installation: DVD, hard disk, NFS, or URL.
 	
If hard disk, the device name and directory path of the image.
 	
If NFS, the domain name or IP address of the NFS server, the exported path of the directory that contains the installation image, any NFS mount options that are required.
 	
If URL, the URL of the installation image and any required HTTP proxy settings.
	`[DVD][Disk][NFS][URL]`
	
	`Dev name:`
	`Dir path:`
	
	`NFS server:`
	`Export path:`
	`Mount opts:`
	
	`Image URL:`
	`Proxy server:`
	`Proxy user:`
	`Proxy password:`

Storage devices on which you intend to install the operating system, such as a local hard disk.
 	
For iSCSI or FCoE connections, the WWID or the port, target, and LUN to be used.
	`Local storage device(s):`
	
	`Remote storage device(s)`
	`WWID:`
	`or`
	`Port/target/LUN:`

The fully qualified domain name of the system, or if you intend to use DHCP to provide network settings, just the host name.	`System FQDN:`
	`or`
	`Host name:`

Installation Setting	Value

Any other network interface to be configured during installation, and their IP address, netmask, and gateway settings if you do not use DHCP.	`Use DHCP?: [yes][no]`
	`Interface:`
	`IP address:`
	`Netmask:`
	`Gateway:`

The country and city to use when specifying the time zone.	`Country:` `City:`

The layout of the storage devices on which the operating system's file systems will be installed, including any provision for logical volume management or RAID configuration.	`Physical partitions:`
	
	`Use LVM: [yes][no]`
	`LVM physical volume:`
	`LVM volume group:`
	
	`Use RAID: [yes][no]`
	`RAID: [0][1][4][5][6][10]`
	`RAID devices:`

The amount of space required for each file system (`/`, `/boot`, `/home`, `/var/tmp`, and so on), the file system type, and whether the block device underlying each file system should be encrypted.	`/`
	`Space:`
	`Type:`
	`Enc: [yes][no]`
	
	`/boot`
	`Space:`
	`Type:`
	
	`/home`
	`Space:`
	`Type:`
	`Enc: [yes][no]`
	`...`

The software packages that should be installed on the system as determined by the system's intended purpose. For example: Database Server, Web Server, Desktop, or Software Development Workstation.	`Packages:`
Any optional packages to be installed.	`Optional packages:`

The URLs of any additional repositories and proxy settings to be used for package installation.	`Repo URL:`
	`Proxy server:`
	`Proxy user:`
	`Proxy password:`

The following settings apply only if you choose to install the Desktop packages, causing FirstBoot to run:	
Whether the system should be registered with ULN.	`Register with ULN?: [yes][no]`
Whether the system should be registered for Ksplice updates.	`Register for Ksplice?: [yes][no]`
The name and other settings for a non-administrative user account.	`User name:` `Other user-specific information:`
Whether to enable the Kdump kernel crash dump mechanism and the amount of memory to reserve for it.	`Enable Kdump?: [yes][no]` `Memory to reserve:`

1.4 Configuring a Network Installation Server

If you use a Boot ISO or the Preboot eXecution Environment (PXE) to install systems, you can set up a network installation server to host the RPM packages. This server must have sufficient storage space

to host the full Oracle Linux Release 6 installation DVD image (approximately 3.5 GB), and you must configure it to use either HTTP or NFS to serve the image files to the target systems on which you want to install Oracle Linux 6.

The procedures in this section assume that you are configuring an Oracle Linux 6 system as a network installation server. For information about configuring an Oracle Linux 7 system as a network installation server, see the Oracle Linux 7 Installation Guide.

Perform one of the procedures in the following sections to set up an HTTP or NFS server on the system that will act as the network installation server:

- Section 1.4.1, “Setting up a New NFS Server”
- Section 1.4.2, “Configuring an Existing NFS Server”
- Section 1.4.3, “Setting up a New HTTP Server”
- Section 1.4.4, “Configuring an Existing HTTP Server”

You can then set up the network installation server. See Section 1.4.5, “Setting up a Network Installation Server”.

If required, you can configure a network installation server to support installation of a btrfs root file system. See Section 1.4.6, “Modifying a Full DVD Image to Support Btrfs `root` File System Installation”.

If you want to support PXE client installation, configure the Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP) services. See Section 1.4.7, “Configuring DHCP and TFTP Services to Support PXE Clients” or Section 1.4.8, “Configuring Dnsmasq to Support PXE Clients”.

1.4.1 Setting up a New NFS Server

Note

This procedure assumes that you are setting up an Oracle Linux 6 system as an NFS version 4 server. Using NFSv4 greatly simplifies firewall configuration as you need only configure a single rule for TCP port 2049.

To set up an NFS server:

1. Install the `nfs-utils` package.

```
# yum install nfs-utils
```

2. Create the directory where you will copy the full Oracle Linux Release 6 Media Pack DVD image, for example `/var/OSimage/OL6.6`:

```
# mkdir -p /var/OSimage/OL6.6
```

3. Edit the configuration file, `/etc/exports`, as follows.

   a. Add an entry for the directory where you will copy the DVD image.

      The following example allows read-only access to the directory `/var/OSimage/OL6.6` for any NFS client on the 192.168.1 subnet:

```
/var/OSimage/OL6.6 192.168.1.0/24(ro)
```

   b. Save your changes to the file.

4. Start the NFS server, and configure it to start after a reboot.

```
# service rpcbind start
# service nfs start
# service nfslock start
# chkconfig rpcbind on
# chkconfig nfs on
# chkconfig nfslock on
```

5. If you have configured a firewall on your system, configure it to allow incoming NFSv4 requests from NFS clients.

   For example, use the following commands to configure `iptables` to allow NFSv4 connections and save the change to the firewall configuration:

```
# iptables -I INPUT -p tcp -m state --state NEW -m tcp --dport 2049 -j ACCEPT
# service iptables save
```

1.4.2 Configuring an Existing NFS Server

To configure an existing NFS server:

1. Create the directory where you will copy the full Oracle Linux Release 6 Media Pack DVD image, for example `/var/OSimage/OL6.6`:

```
# mkdir -p /var/OSimage/OL6.6
```

2. Use the `exportfs` command to export the directory.

```
# exportfs -i -o options client:export_dir
```

   For example, to allow read-only access to the directory `/var/OSimage/OL6.6` for any NFS client on the 192.168.1 subnet:

```
# exportfs -i -o ro 192.168.1.0/24:/var/OSimage/OL6.6
```

1.4.3 Setting up a New HTTP Server

Note

These instructions assume that you are setting up an Oracle Linux 6 system as an Apache HTTP server.

To set up an HTTP server:

1. Install the Apache HTTP server package.

```
# yum install httpd
```

2. Create the directory where you will copy the full Oracle Linux Release 6 Media Pack DVD image, for example `/var/www/html/OSimage/OL6.6`:

```
# mkdir -p /var/www/html/OSimage/OL6.6
```

Note

If SELinux is enabled in enforcing mode on your system, create the directory under the `/var/www/html` directory hierarchy so that the `httpd_sys_content_t` file type is set automatically on all the files in the repository.

3. Edit the HTTP server configuration file, `/etc/httpd/conf/httpd.conf`, as follows:

   a. Specify the resolvable domain name of the server in the argument to `ServerName`.

   ```
   ServerName server_addr:80
   ```

   If the server does not have a resolvable domain name, enter its IP address instead. For example, the following entry would be appropriate for an HTTP server with the IP address 192.168.1.100.

   ```
   ServerName 192.168.1.100:80
   ```

   b. If the directory to which you will copy the DVD image in not under `/var/www/html`, change the default setting of `DocumentRoot`.

   In this example, the DVD image will be copied to `/var/www/html/OSimage/OL6.6` so the setting of `DocumentRoot` can remain unchanged.

   ```
   DocumentRoot "/var/www/html"
   ```

   c. Verify that the `<Directory>` setting points to the same setting as `DocumentRoot`.

   ```
   #
   # This should be changed to whatever you set DocumentRoot to.
   #
   <Directory "/var/www/html">
   ```

   d. If you want to be able to browse the directory hierarchy, verify that the `Options` directive specifies the `Indexes` option, for example:

   ```
   Options Indexes FollowSymLinks
   ```

   

   Note

   The `Indexes` option is not required for installation.

   e. Save your changes to the file.

4. Start the Apache HTTP server, and configure it to start after a reboot.

   ```
   # service httpd start
   # chkconfig httpd on
   ```

5. If you have enabled a firewall on your system, configure it to allow incoming HTTP connection requests on TCP port 80.

   For example, the following command configures `iptables` to allow incoming HTTP connection requests and saves the change to the firewall configuration:

   ```
   # iptables -I INPUT -p tcp -m state --state NEW -m tcp --dport 80 -j ACCEPT
   # service iptables save
   ```

1.4.4 Configuring an Existing HTTP Server

Note

This procedure assumes that the system is already configured as an Apache HTTP server. For other types of HTTP server, you will need to modify the steps for the server's configuration.

To configure an existing Apache HTTP server:

1. Under the `DocumentRoot` hierarchy that is defined in the HTTP server configuration file (`/etc/httpd/conf/httpd.conf`), create the directory where you will copy the full Oracle Linux Release 6 Media Pack DVD image, for example `/var/www/html/OSimage/OL6.6`:

```
# mkdir -p /var/www/html/OSimage/OL6.6
```

2. Edit the HTTP server configuration file, `/etc/httpd/conf/httpd.conf`, and add a `<Directory>` section, for example:

```
<Directory "/var/www/html/OSimage/OL6.6">
    Options Indexes FollowSymLinks
    AllowOverride None
    Order allow,deny
    Allow from all
</Directory>
```

   Place this section after the closing `</Directory>` statement for the `<Directory DocumentRoot>` section.

Note

The `Indexes` option is not required for installation. Specify this option if you want to be able to browse the directory hierarchy.

3. Reload the Apache HTTP server.

```
# service httpd reload
```

1.4.5 Setting up a Network Installation Server

Note

This procedure assumes that you have set up the system as an NFS or HTTP server.

To set up a network installation server:

1. Download the full Oracle Linux Media Pack DVD image (for example, `V52218-01.iso` for x86_64 (64 bit) Oracle Linux Release 6 Update 6 from the Oracle Software Delivery Cloud at https://edelivery.oracle.com/linux.

2. Mount the DVD image on a suitable mount point (for example, `/mnt`):

```
# mount -t iso9660 -o loop V52218-01.iso /mnt
```

3. Use the following command to extract the contents of the DVD image into a directory whose contents are shareable using NFS or HTTP.

   For example, to copy the DVD image mounted on `/mnt` to `/var/OSimage/OL6.6`:

```
# cp -a -T /mnt /var/OSimage/OL6.6
```

   or to `/var/www/html/OSimage/OL6.6`:

```
# cp -a -T /mnt /var/www/html/OSimage/OL6.6
```

4. Unmount the DVD image:

```
# umount /mnt
```

5. If SELinux is enabled in enforcing mode on your system and you have configured the system as an HTTP server but you did not copy the DVD image to a directory under /var/www/html:

   a. Use the semanage command to define the default file type of the directory hierarchy as httpd_sys_content_t:

   ```
   # /usr/sbin/semanage fcontext -a -t httpd_sys_content_t "/var/OSimage(/.*)?"
   ```

   b. Use the restorecon command to apply the file type to the entire directory hierarchy.

   ```
   # /sbin/restorecon -R -v /var/OSimage
   ```

Note

The semanage and restorecon commands are provided by the policycoreutils-python and policycoreutils packages.

To customize a network installation server that allows the installation of a system with a btrfs root file system, modify the images directory to support the Unbreakable Enterprise Kernel (UEK) instead of the Red Hat Compatible Kernel as the installation kernel. See Section 1.4.6, "Modifying a Full DVD Image to Support Btrfs root File System Installation".

1.4.6 Modifying a Full DVD Image to Support Btrfs root File System Installation

Note

This procedure assumes that you have set up the system as a network installation server that uses HTTP or NFS to server files.

To set up a network installation server that allows the installation of a system with a btrfs root file system:

1. Download the full Oracle Linux Media Pack DVD image (for example, V52218-01.iso for x86_64 (64 bit) Oracle Linux Release 6 Update 6) from the Oracle Software Delivery Cloud at https://edelivery.oracle.com/linux and copy its contents to a suitable directory such as /var/www/html/OSimage/OL6.6_UEK/images or /var/OSimage/OL6.6_UEK/images, whose contents are shareable using NFS or HTTP. See Section 1.4.5, "Setting up a Network Installation Server".

2. Modify the images directory of the image to support the Unbreakable Enterprise Kernel (UEK) as the installation kernel:

   a. Download the UEK Boot ISO image for the desired architecture (for example, V52220-01.iso for x86_64 (64 bit)).

   b. Mount the UEK Boot ISO image:

   ```
   # mount -t iso9660 -o loop V52220-01.iso /mnt
   ```

   c. Replace the contents of the images directory that you copied from the full DVD image with the contents of the images directory from the UEK Boot ISO image.

   For example, to replace /var/OSimage/OL6.6_UEK/images:

   ```
   # rm -rf /var/OSimage/OL6.6_UEK/images
   # cp -r /mnt/images /var/OSimage/OL6.6_UEK
   ```

   To replace /var/www/html/OSimage/OL6.6_UEK/images:

```
# rm -rf /var/www/html/OSimage/OL6.6_UEK/images
# cp -r /mnt/images /var/www/html/OSimage/OL6.6_UEK
```

3. Copy the UEK Boot ISO image to a suitable medium from which you can boot the target system on which you want to install Oracle Linux 6 Update 6.

4. Unmount the UEK Boot ISO image:

```
# umount mount_dir
```

You can now use the modified image to install a system with a btrfs root file system. See Section 2.4.1, “Installing a Btrfs `root` File System”.

1.4.7 Configuring DHCP and TFTP Services to Support PXE Clients

The server or servers that host the DHCP and TFTP services do not need to host the installation packages. The DHCP server defines the boot loader file and the TFTP server from which a client can download the boot-loader, installation kernel, and initial ram-disk files. The boot-loader files that the TFTP server hosts can optionally define the server from which a client can obtain the installation packages.

To configure the Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP) services for PXE client installation requests:

1. Configure the DHCP service on a server:

   a. Install the `dhcp` package.

```
# yum install dhcp
```

   b. Edit `/etc/dhcp/dhcpd.conf` and configure an entry for the PXE clients, for example:

```
allow booting;
allow bootp;

set vendorclass = option vendor-class-identifier;
option pxe-system-type code 93 = unsigned integer 16;
set pxetype = option pxe-system-type;

option domain-name "mydom.com";

subnet 10.0.0.0 netmask 255.255.255.0 {
  option domain-name-servers 10.0.0.1;
  option broadcast-address 10.0.0.255;
  option routers 10.0.0.1;
  default-lease-time 14400;
  max-lease-time 28800;
  if substring(vendorclass, 0, 9)="PXEClient" {
    if pxetype=00:06 or pxetype=00:07 {
        filename "efi/BOOTX64.efi";
    } else {
        filename "pxelinux/pxelinux.0";
    }
  }
  pool {
    range 10.0.0.101 10.0.0.200;
  }
  next-server 10.0.0.6;
}

host svr1 {
hardware ethernet 08:00:27:c6:a1:16;
```

```
fixed-address 10.0.0.253;
option host-name "svr1";
}

host svr2 {
hardware ethernet 08:00:27:24:0a:56;
fixed-address 10.0.0.254;
option host-name "svr2";
}
```

This example configures a pool of generally available IP addresses in the range 10.0.0.101 through 10.0.0.200 on the 10.0.0/24 subnet. Any PXE-booted system on the subnet uses the boot loader that the `filename` parameter specifies for its PXE type. The boot-loader file `BOOTX64.efi` for UEFI-based clients is located in the `efi` subdirectory of the TFTP server directory. The boot-loader file `pxelinux.0` for BIOS-based clients is located in the `pxelinux` subdirectory.

The `next-server` statement specifies the IP address of the TFTP server from which a client can download the boot-loader file.

Note

You should include a `next-server` statement even if you use the same server to host both DHCP and TFTP services. Otherwise, some boot loaders do not know how to obtain their configuration files, which causes them to reboot the client, to hang, or to display a prompt such as `boot:` or `grub>`.

The static IP addresses 10.0.0.253 and 10.0.0.254 are reserved for `svr1` and `svr2`, which are identified by their MAC addresses.

c. If the server has more than one network interface, edit `/etc/sysconfig/dhcpd` and configure the interface on which the server should respond to DHCP requests, for example:

```
DHCPDARGS="eth1"
```

d. Start the DHCP service, and configure it to start after a reboot.

```
# service dhcpd start
# chkconfig dhcpd on
```

If you make any changes to `/etc/dhcp/dhcpd.conf`, restart the `dhcpd` service. You do not need to restart the service if you change the content of boot loader configuration files.

e. Configure the firewall to accept DHCP requests, for example:

```
# iptables -I INPUT -i eth1 -p udp --dport 67:68 --sport 67:68 -j ACCEPT
# service iptables save
```

In this example, the server expects to receive requests on interface `eth1`.

2. Configure the TFTP service on a server:

a. Install the `syslinux` and `tftp-server` packages:

```
# yum install syslinux tftp-server
```

The `syslinux` package provides the `pxelinux.0` boot loader, which BIOS-based PXE clients can use to load the Linux installation kernel (`vmlinuz`).

UEFI-based PXE clients can use the `BOOTX64.efi` boot loader, which is available as `EFI/BOOT/BOOTX64.efi` from the Oracle Linux 6 Update 6 Media Pack DVD image.

b. Edit `/etc/xinetd.d/tftp` and modify the `disable` and `server_args` attributes to enable `xinetd` to start the TFTP service (`in.tftpd`) and define the TFTP server directory, for example:

```
service tftp
{
    socket_type = dgram
    protocol    = udp
    wait        = yes
    user        = root
    server      = /usr/sbin/in.tftpd
    server_args = -s /var/lib/tftpboot
    disable     = no
    per_source  = 11
    cps         = 100 2
    flags       = IPv4
}
```

This example defines the TFTP server directory to be `/var/lib/tftpboot`, which is the default.

When `xinetd` receives a TFTP request, it starts `in.tftpd` and directs the request to it.

For more information about the configuration attributes, see the `xinetd.conf(5)` manual page.

c. Create `efi` and `pxelinux/pxelinux.cfg` subdirectories of the TFTP server directory, for example:

```
# mkdir -p /var/lib/tftpboot/efi
# mkdir -p /var/lib/tftpboot/pxelinux/pxelinux.cfg
```

These directories are used to contain the boot loader configuration files for UEFI and BIOS-based PXE clients respectively.

d. Copy the BIOS boot-loader file to the `pxelinux` directory, the UEFI boot-loader and splash image files to the `efi` subdirectory, and the installation kernel and ram-disk image files to both subdirectories, for example:

```
# cp /usr/share/syslinux/pxelinux.0 /var/lib/tftpboot/pxelinux/pxelinux.0
# wget http://10.0.0.11/OSimage/OL6.6/EFI/BOOT/BOOTX64.efi \
  -O /var/lib/tftpboot/efi/BOOTX64.efi
# wget http://10.0.0.11/OSimage/OL6.6/EFI/BOOT/splash.xpm.gz \
  -O /var/lib/tftpboot/efi/splash.xpm.gz
# wget http://10.0.0.11/OSimage/OL6.6/isolinux/vmlinuz \
  -O /var/lib/tftpboot/efi/vmlinuz-OL6u6
# wget http://10.0.0.11/OSimage/OL6.6/isolinux/initrd.img \
  -O /var/lib/tftpboot/efi/initrd-OL6u6.img
# ln /var/lib/tftpboot/efi/vmlinuz-OL6u6 /var/lib/tftpboot/pxelinux/vmlinuz-OL6u6
# ln /var/lib/tftpboot/efi/initrd-OL6u6.img /var/lib/tftpboot/pxelinux/initrd-OL6u6.img
```

This example uses HTTP to obtain the `BOOTX64.efi`, `splash.xpm.gz`, `vmlinuz`, and `initrd.img` files from an installation server.

To be able to install different operating system versions on PXE clients, `vmlinuz` and `initrd.img` are renamed as `vmlinuz-OL6u6` and `initrd-OL6u6.img`. Alternatively, you could copy the kernel and ram-disk image files to subdirectories such as `efi/OL6u6` and `pxelinux/OL6u6`.

e. Create the default boot loader configuration file, for example `efi/efidefault` or `pxelinux/pxelinux.cfg/default`.

For more information, see Section 1.4.9, “About Boot-Loader Configuration Files”.

f. If SELinux is enabled in enforcing mode on your system and you configure a TFTP server directory other than `/var/lib/tftpboot`, use the `semanage` command to define the default file type of the TFTP server directory hierarchy as `tftpdir_t` and then use the `restorecon` command to apply the file type to the entire directory hierarchy, for example:

```
# /usr/sbin/semanage fcontext -a -t tftpdir_t "/var/tftpboot(/.*)?"
# /sbin/restorecon -R -v /var/tftpboot
```

Note

The `semanage` and `restorecon` commands are provided by the `policycoreutils-python` and `policycoreutils` packages.

g. Start the `xinetd` service, and configure it to start after a reboot.

```
# service xinetd start
# chkconfig xinetd on
```

If you make any changes to `/etc/xinetd.d/tftp`, restart the `xinetd` service. You do not need to restart the service if you change the content of boot loader configuration files.

h. Configure the firewall to accept TFTP requests, for example:

```
# iptables -I INPUT -i eth1 -p udp --dport 69 -j ACCEPT
# service iptables save
```

In this example, the server expects to receive requests on interface `eth1`.

For information about configuring and using kickstart to perform automated installation, see Chapter 3, *Installing Oracle Linux by Using Kickstart*.

1.4.8 Configuring Dnsmasq to Support PXE Clients

Dnsmasq is designed to act as a DNS forwarder, DHCP server, and TFTP server for small networks. You can use dnsmasq as an alternative to configuring separate DHCP and TFTP services. For more information about dnsmasq, see the `dnsmasq(8)` manual page, `/usr/share/doc/dnsmasq-version`, and http://www.thekelleys.org.uk/dnsmasq/doc.html.

To configure dnsmasq for PXE client installation requests:

1. Install the `dnsmasq` package.

```
# yum install dnsmasq
```

2. Edit `/etc/dnsmasq.conf` and configure entries for PXE clients and other systems on the network, for example:

```
interface=eth1
dhcp-range=10.0.0.101,10.0.0.200,6h
dhcp-host=80:00:27:c6:a1:16,10.0.0.253,svr1,infinite
dhcp-boot=pxelinux/pxelinux.0
enable-tftp
tftp-root=/var/lib/tftpboot
```

The lines in the sample configuration file do the following:

`interface=eth1` Listen for incoming client requests on interface `eth1` only.

`dhcp-range=10.0.0.101,10.0.0.200,6h`

Reserve a pool of generally available IP addresses in the range 10.0.0.101 through 10.0.0.200 on the 10.0.0/24 subnet with a six-hour lease.

Note

A `dhcp-range` setting is required to enable the DHCP service provided by dnsmasq. If you want to configure static addresses but not an address pool, specify a static network address and the keywords `static` and `infinite`, for example:

```
dhcp-range=10.0.0.253,static,infinite
```

`dhcp-host=80:00:27:c6:a1:16,10.0.0.253,svr1,infinite`

Reserve the IP address 10.0.0.253 with infinite lease time for `svr1`, which is identified by the MAC address 08:00:27:c6:a1:16.

`dhcp-boot=pxelinux/pxelinux.0`

Specify the location of the boot-loader file required by PXE clients. This example supports BIOS-based PXE clients. An entry that supports UEFI-based clients might take the following form:

```
dhcp-boot=efi/BOOTX64.efi
```

If you want to use a separate TFTP server instead of dnsmasq, specify its IP address after the boot-loader path, for example:

```
dhcp-boot=pxelinux/pxelinux.0,10.0.0.11
```

`enable-tftp`

Enable the TFTP service provided by dnsmasq.

`tftp-root=/var/lib/tftpboot`

Specify the root directory for files served by TFTP. To prevent clients from accessing any file on the host, dnsmasq rejects requests that specify `..` as a path element.

3. If you configure dnsmasq to provide the TFTP service:

   a. Create the TFTP server directories, for example:

   ```
   # mkdir -p /var/lib/tftpboot/pxelinux/pxelinux.cfg
   ```

   b. Copy the installation kernel and ram-disk image files to the TFTP server directory hierarchy, for example:

   ```
   # wget http://10.0.0.11/OSimage/OL6.6/isolinux/vmlinuz \
     -O /var/lib/tftpboot/pxelinux/vmlinuz
   # wget http://10.0.0.11/OSimage/OL6.6/isolinux/initrd.img \
     -O /var/lib/tftpboot/pxelinux/initrd.img
   ```

   This example uses HTTP to obtain the files from an installation server.

   c. If you want to support BIOS-based PXE clients, install the `syslinux` package and copy the `pxelinux.0` boot loader to the TFTP server directory hierarchy.

   ```
   # yum install syslinux
   # cp /usr/share/syslinux/pxelinux.0 /var/lib/tftpboot/pxelinux/pxelinux.0
   ```

If you want to support UEFI-based PXE clients, copy the `BOOTX64.efi` boot loader and splash image files to the TFTP server directory hierarchy, for example:

```
# wget http://10.0.0.11/OSimage/OL6.6/EFI/BOOT/BOOTX64.efi \
  -O /var/lib/tftpboot/efi/BOOTX64.efi
# wget http://10.0.0.11/OSimage/OL6.6/EFI/BOOT/splash.xpm.gz \
  -O /var/lib/tftpboot/efi/splash.xpm.gz
```

d. Create the default boot loader configuration file, for example `efi/efidefault` or `pxelinux/pxelinux.cfg/default`.

For more information, see Section 1.4.9, “About Boot-Loader Configuration Files”.

e. If SELinux is enabled in enforcing mode on your system, use the `semanage` command to define the default file type of the TFTP server directory hierarchy as `tftpdir_t` and then use the `restorecon` command to apply the file type to the entire directory hierarchy, for example:

```
# /usr/sbin/semanage fcontext -a -t tftpdir_t "/var/lib/tftpboot(/.*)?"
# /sbin/restorecon -R -v /var/lib/tftpboot
```

Note

The `semanage` and `restorecon` commands are provided by the `policycoreutils-python` and `policycoreutils` packages.

4. If you want dnsmasq to act as a caching-only name server, configure a name server entry for 127.0.0.1 that precedes other name server entries.

Dnsmasq ignores the 127.0.0.1 entry and forwards DNS queries to the other listed name servers. If the `NetworkManager` service is enabled, you can configure name service entries by using the graphical applet, the `nm-connection-editor` utility, or the `system-config-network` utility. Otherwise, you can configure name server entries directly in `/etc/resolv.conf`, for example:

```
nameserver 127.0.0.1
nameserver 10.0.0.8
nameserver 10.0.0.4
```

5. Start the `dnsmasq` service, and configure it to start after a reboot.

```
# service dnsmasq start
# chkconfig dnsmasq on
```

If you make any changes to `/etc/dnsmasq.conf`, restart the `dnsmasq` service. You do not need to restart the service if you change the content of boot loader configuration files.

6. Configure the firewall:

a. Allow access by DHCP requests, for example:

```
# iptables -I INPUT -i eth1 -p udp --dport 67:68 --sport 67:68 -j ACCEPT
```

In this example, the server expects to receive requests on interface `eth1`.

b. If you enable the TFTP service in dnsmasq, allow access by TFTP requests:

```
# iptables -I INPUT -i eth1 -p udp --dport 69 -j ACCEPT
```

c. If you want dnsmasq to act as a caching-only name server, allow access by DNS requests:

```
# iptables -I INPUT -i eth1 -p tcp -m state --state NEW -m tcp --dport 53 -j ACCEPT
```

```
# iptables -I INPUT -i eth1 -p udp -m udp --dport 53 -j ACCEPT
```

d. Save the configuration:

```
# service iptables save
```

For information about configuring and using kickstart to perform automated installation, see Chapter 3, *Installing Oracle Linux by Using Kickstart*.

1.4.9 About Boot-Loader Configuration Files

The `default` file is the default boot-loader configuration file for BIOS-based PXE clients and uses pxelinux configuration settings, for example:

```
prompt 0
default ol6u6
timeout 0

label ol6u6
kernel vmlinuz-OL6u6
append initrd=initrd-OL6u6.img ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
```

To allow the `boot:` prompt to be displayed, change the value of `prompt` to 1. To display the prompt, press `Shift` or `Alt` at the console.

The `default` directive identifies the default boot entry by its `label` value, `ol6u6`.

Pxelinux boots the client using the default boot entry after `timeout`/10 seconds.

The `kernel` directive defines the name of the kernel executable and the `append` directive defines any parameters that should be appended when loading the kernel, such as the name of the ram-disk image and the location of the kickstart file.

You can use a configuration file such as the following to support a choice of installations:

```
prompt 0
default ol6u6
timeout 50

label ol6u6
kernel vmlinuz-OL6u6
append initrd=initrd-OL6u6.img ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks

label ol7u1
kernel vmlinuz-OL7u1
append initrd=initrd-OL7u1.img ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol7u1_cfg.ks
```

The `efidefault` file is the default boot loader configuration file for UEFI-based PXE clients and uses GRUB configuration settings, for example:

```
default=0
hiddenmenu
splashimage=(nd)/splash.xpm.gz
timeout=0

title Oracle Linux 6 Update 6 Installation
    root (nd)
    kernel /vmlinuz-OL6u6 ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
    initrd /initrd-OL6u6.img
```

The `timeout=0` and `hiddenmenu` directives cause the default kernel to boot immediately without allowing you to press a key to display a menu or modify the configuration of a boot entry. The default kernel is defined as the first entry (`0`), which is the only entry listed in this file.

`splashimage` specifies the splash screen that hides boot messages unless you press `Esc`. In the example, the splash-screen file is shown as being available on `(nd)`, which is the network device. The `root` directive defines that the kernel and initial ram-disk image files are also available on `(nd)`.

The `kernel` directive defines the name of the kernel executable and any parameters that should be appended when loading the kernel, such as the location of the installation packages, and how to access these packages. The `initrd` directive specifies the initial ram-disk image file.

You can use a configuration file such as the following to support a choice of installations:

```
default=0
splashimage=(nd)/splash.xpm.gz
timeout=10

title Oracle Linux 6 Update 6 Installation
    root (nd)
    kernel /vmlinuz-OL6u6 ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
    initrd /initrd-OL6u6.img

title Oracle Linux 7 Update 1 Installation
    root (nd)
    kernel /vmlinuz-OL7u1 ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol7u1_cfg.ks
    initrd /initrd-OL7u1.img
```

The kernel and ram-disk image file paths are assumed to be relative to the subdirectory such as `efi` or `pxelinux` that contains the boot loader. If you placed the `vmlinuz` and `initrd.img` files in a subdirectory such as `efi/OL6u6` or `pxelinux/OL6u6`, the appropriate `kernel` and `append` lines for pxelinux would be:

```
kernel OL6u6/vmlinuz
append initrd=OL6u6/initrd.img ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
```

For GRUB, the appropriate `kernel` and `initrd` lines would be:

```
kernel /OL6u6/vmlinuz ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
initrd /OL6u6/initrd.img
```

To support different types of client, you can create a configuration file named for:

- A client's UUID (for example, `a8943708-c6f6-51b9-611e-74e6ac80b93d`)
- A client's MAC address prefixed by `01-`, which represents the ARP hardware type for Ethernet, and using dashes to separate each byte value instead of colons (for example, `01-80-00-27-c6-a1-16`)
- A client's IP address expressed in hexadecimal without any leading 0x (for example, `0A0000FD` represents the IP address 10.0.0.253)

The configuration files should be placed in either `efi` or `pxelinux/pxelinux.cfg`, depending on whether the client is UEFI or BIOS-based.

The boot loader looks for a configuration file in the following order until it finds a matching file name:

- *`UUID`* (for example, `a8943708-c6f6-51b9-611e-74e6ac80b93d`)
- `01-`*`MAC_address`* (for example, `01-80-00-27-c6-a1-16`)
- Full 32 bits of the IP address (for example, `0A0000FD`)
- Most significant 28 bits of the IP address (for example, `0A0000F`)
- Most significant 24 bits of the IP address (for example, `0A0000`)
- Most significant 20 bits of the IP address (for example, `0A000`)

- Most significant 16 bits of the IP address (for example, `0A00`)
- Most significant 12 bits of the IP address (for example, `0A0`)
- Most significant 8 bits of the IP address (for example, `0A`)
- Most significant 4 bits of the IP address (for example, `0`)
- `default` (BIOS) or `efidefault` (EFI)

To reduce the number of configuration files that are required, you can group clients of the same type by IP address. For example, a configuration file named `0A0000E` represents the IP address range 10.0.0.224 through 10.0.0.239.

If several configuration files have contents that should remain identical, you can use the `ln` command to link the files to a master copy, for example:

```
# ln master-ol6u6 0A0000FC
# ln master-ol6u6 0A0000FD
# ln master-ol7u1 0A0000FE
```

For more information about GRUB, enter the `info grub` command to access the GRUB manual.

For more information about pxelinux, see http://www.syslinux.org/wiki/index.php/PXELINUX.

For information about configuring and using kickstart to perform automated installation, see Chapter 3, *Installing Oracle Linux by Using Kickstart*.

1.4.10 Configuring DHCP to Support iPXE Clients

iPXE extends the capabilities of PXE in many ways, including:

- iPXE clients can boot using HTTP, iSCSI, AoE, and FCoE
- The boot process can be controlled using scripts
- DNS lookup is available
- Booting across wide area networks or the Internet is possible

The `gpxelinux.0` boot loader provides some iPXE features, such as DNS lookup and HTTP file transfer, and is available in the `syslinux` package. It does not support iPXE commands or scripts.

You can use `gpxelinux.0` with BIOS-based PXE clients and with UEFI-based PXE clients in legacy mode but not in UEFI mode.

To configure the DHCP service to support iPXE clients:

1. Edit `/etc/dhcp/dhcpd.conf`:
   a. Add the following lines to define the iPXE options for DHCP:

```
option space ipxe;
option ipxe-encap-opts code 175 = encapsulate ipxe;
option ipxe.priority code 1 = signed integer 8;
option ipxe.keep-san code 8 = unsigned integer 8;
option ipxe.skip-san-boot code 9 = unsigned integer 8;
option ipxe.syslogs code 85 = string;
option ipxe.cert code 91 = string;
option ipxe.privkey code 92 = string;
option ipxe.crosscert code 93 = string;
option ipxe.no-pxedhcp code 176 = unsigned integer 8;
option ipxe.bus-id code 177 = string;
```

```
option ipxe.bios-drive code 189 = unsigned integer 8;
option ipxe.username code 190 = string;
option ipxe.password code 191 = string;
option ipxe.reverse-username code 192 = string;
option ipxe.reverse-password code 193 = string;
option ipxe.version code 235 = string;
option iscsi-initiator-iqn code 203 = string;
option ipxe.pxeext code 16 = unsigned integer 8;
option ipxe.iscsi code 17 = unsigned integer 8;
option ipxe.aoe code 18 = unsigned integer 8;
option ipxe.http code 19 = unsigned integer 8;
option ipxe.https code 20 = unsigned integer 8;
option ipxe.tftp code 21 = unsigned integer 8;
option ipxe.ftp code 22 = unsigned integer 8;
option ipxe.dns code 23 = unsigned integer 8;
option ipxe.bzimage code 24 = unsigned integer 8;
option ipxe.multiboot code 25 = unsigned integer 8;
option ipxe.slam code 26 = unsigned integer 8;
option ipxe.srp code 27 = unsigned integer 8;
option ipxe.nbi code 32 = unsigned integer 8;
option ipxe.pxe code 33 = unsigned integer 8;
option ipxe.elf code 34 = unsigned integer 8;
option ipxe.comboot code 35 = unsigned integer 8;
option ipxe.efi code 36 = unsigned integer 8;
option ipxe.fcoe code 37 = unsigned integer 8;
option ipxe.vlan code 38 = unsigned integer 8;
option ipxe.menu code 39 = unsigned integer 8;
option ipxe.sdi code 40 = unsigned integer 8;
option ipxe.nfs code 41 = unsigned integer 8;
```

b. If you do not use a proxy DHCP server, specify the following line to speed up negotiation with the DHCP server:

```
option ipxe.no-pxedhcp 1;
```

c. Add the following line to define the `user-class` option:

```
option user-class code 77 = string;
```

d. Configure the DHCP server to provide the IP addresses of name servers that iPXE clients can use to resolve domain names to IP addresses, for example:

```
option domain-name-servers 10.0.0.1, 10.0.0.4, 10.0.0.8;
```

e. Configure DHCP to specify the `gpxelinux.0` boot loader for non-iPXE clients and the URI of a boot script for iPXE clients, for example:

```
if exists user-class and option user-class = "iPXE" {
      filename "http://web.mydom.com/pxeboot.php";
  } else {
      filename "gpxelinux.0";
  }
```

In this example, pure iPXE clients run the HTTP-served boot script `pxeboot.php`.

The following is an example of a boot script for an iPXE client:

```
#!ipxe

dhcp
kernel http://web.mydom.com/OSimage/OL6.6/isolinux/vmlinuz
initrd http://web.mydom.com/OSimage/OL6.6/isolinux/initrd.img
boot vmlinuz initrd=initrd.img ksdevice=eth0 kssendmac \
 ks=http://web.mydom.com/ksfiles/ol6u6_cfg.ks
```

`dhcp` configures the client's network interfaces.

`kernel` downloads the installation kernel.

`initrd` downloads the initial ram-disk image file.

`boot` boots the downloaded installation kernel. Boot line parameters, such as the name of the initial ram-disk file and the location of the kickstart file, are specified as additional arguments. Do not use the `\` line-continuation character. This character is used in the example to denote that the line has been broken for printing. The `boot` command and all of its arguments must be on the same line.

For more information, see http://ipxe.org/scripting and http://ipxe.org/cmd.

Non-iPXE clients boot using `gpelinux.0`. A configuration file for `gpxelinux.0` is named in the same way as for `pxelinux.0` as described in Section 1.4.9, “About Boot-Loader Configuration Files”. Unlike `pxelinux.0`, you can use HTTP to access the installation kernel and initial ram-disk image files.

The following is an example of a configuration file for `gpxelinux.0`:

```
prompt 0
default ol6u6
timeout 0

label ol6u6
kernel http://websvr.mydom.com/OSimage/OL6.6/isolinux/vmlinuz
append initrd=http://websvr.mydom.com/OSimage/OL6.6/isolinux/initrd.img \
 ksdevice=eth0 kssendmac ks=http://web.mydom.com/ksfiles/ol6u6_cfg.ks
```

Do not use the `\` line-continuation character. This character is used in the example to denote that the line has been broken for printing. The `append` keyword and all of its arguments must be on the same line.

2. Restart the DHCP service:

```
# service dhcpd restart
```

If you make any changes to `/etc/dhcp/dhcpd.conf`, restart the `dhcpd` service. You do not need to restart the service if you change the content of the boot loader configuration files.

1.5 Writing a Boot ISO Image to CD or DVD

A recordable DVD has enough storage capacity for a full, bootable installation ISO image (about 3.5 GB).

A recordable CD has enough storage capacity for a boot ISO image (about 200 MB), but not for a full, bootable installation ISO image.

To write an ISO image file to a CD or DVD that you can use to boot a physical system, use a command such as `cdrecord`, for example:

```
# cdrecord -v -eject speed=16 dev=ATA:0,2,0 V41364-01.iso
```

You can use the `cdrecord -scanbus` command to display the SCSI subsystem and device that corresponds to the CD or DVD writer.

For instructions on how to create an boot ISO image on a USB memory stick, see Section 1.7, “Creating a Bootable USB Memory Stick”.

1.6 Customizing an Installation Boot Image

You can write the kickstart file to a modified installation boot image, which you can use to install a guest machine under Oracle VM or Oracle VM Virtualbox. Alternatively, you can burn the image to a bootable CD or DVD.

For information about using kickstart for automated installation, see Chapter 3, *Installing Oracle Linux by Using Kickstart*.

To customize an installation boot image:

1. On another Oracle Linux 6 system, mount the installation CD, DVD, or boot ISO image on a suitable mount point, for example `/media/Oracle\ Linux\ Server`.

2. Copy the `isolinux` directory to a temporary directory such as `/tmp`:

```
# cp -r /media/Oracle\ Linux\ Server/isolinux /tmp
```

3. Copy the kickstart file to `/tmp/isoimage`, for example:

```
# cp /root/ks.cfg /tmp/isoimage
```

4. Change the mode on the files in `/tmp/isoimage` to be writable by `root`:

```
# chmod u+w /tmp/isoimage/*
```

5. Edit `/tmp/isoimage/isolinux.cfg` and change the setting for `append` in the `label linux` menu entry to use the kickstart file, for example:

```
label linux
  menu label ^Install or upgrade an existing system
  menu default
  kernel vmlinuz
  append initrd=initrd.img ks=cdrom:/ks.cfg
```

   If required, specify the method that should be used for the installation together with any other parameters. For example, use DHCP to configure the network interface and install the system from an HTTP server on which the installation image is available:

```
  append initrd=initrd.img ks=cdrom:/ks.cfg ip=dhcp repo=http://192.168.1.100/OL6.6
```

6. Create the ISO image file:

```
# mkisofs -o /tmp/boot.iso -b isolinux.bin -c boot.cat -no-emul-boot \
  -boot-load-size 4 -boot-info-table -R -J -v -T /tmp/isolinux
```

7. In Oracle VM VirtualBox or Oracle VM, you can make the `boot.iso` file available to a guest machine via a virtual CD-ROM device, and boot the machine from this device.

   To write the image to a CD or DVD that you can use to boot a physical system, use a command such as `cdrecord`, for example:

```
# cdrecord -v -eject speed=16 dev=ATA:0,2,0 boot.iso
```

   You can use the `cdrecord -scanbus` command to display the SCSI subsystem and device that corresponds to the CD or DVD writer.

1.7 Creating a Bootable USB Memory Stick

If a UEFI system's firmware supports booting from a USB drive, you can create a boot image on a USB memory stick and use this device to boot the system and start the installation. This boot image does not contain any installation packages. During installation, you are prompted to specify the location of the media that contains the full installation image. See Section 2.1.1, “Starting the Installation”.

Caution

This procedure destroys any existing data on the memory stick.

To avoid overwriting an existing hard disk partition, ensure that you specify the correct device for the USB memory stick. The procedure assumes that the memory stick corresponds to the device `/dev/sdb`, which might not be the case on your system.

To create a boot image on a USB memory stick:

1. Insert a USB memory stick into an Oracle Linux 6 system. If the operating system mounts any file systems on the device, unmount these file systems, for example:

```
# df /media/MEMORYSTICK
Filesystem           1K-blocks      Used Available Use% Mounted on
/dev/sdb1                35346     35346         0 100% /media/MEMORYSTICK
# umount /dev/sdb1
```

2. Mount the installation CD, DVD, or boot ISO image on a suitable mount point, for example `/media/Oracle\ Linux\ Server`.

3. Use the `dd` command to write the contents of the `images/efidisk.img` image file to the USB device:

```
# dd if=/media/Oracle\ Linux\ Server/images/efidisk.img of=/dev/sdb
```

You can now remove the memory stick and use it to boot a target system.

Chapter 2 Installing Oracle Linux Manually

Table of Contents

This chapter describes how to install Oracle Linux manually from a boot image that is available on CD, DVD, USB memory stick, hard drive, virtual device hosted by a virtual machine hypervisor, or a remote server that is accessible via HTTP or NFS.

2.1 Installation Overview

The following sections describe the major steps in installing an Oracle Linux system:

- Section 2.1.1, “Starting the Installation”
- Section 2.1.2, “Continuing the Installation”
- Section 2.1.3, “Configuring Disk Partitions”
- Section 2.1.4, “Selecting Software Packages”
- Section 2.1.5, “Performing FirstBoot Configuration Tasks”

If you want to configure the system with a btrfs root file system, see Section 2.4, “Installing a System with a Btrfs `root` File System”.

2.1.1 Starting the Installation

To install Oracle Linux manually:

1. Boot the system from the boot image. You might need to configure the host system's BIOS or hypervisor settings to use the boot device that you have chosen. If the system can locate the image file, the boot menu appears and displays the following options:

   Install or upgrade an existing system
   Uses the graphical installation program to install Oracle Linux provided that the system has sufficient memory and the video card is supported. Otherwise, text-based installation is selected.

   This is the default option.

   Install system with basic video driver
   Select this option if the default option results in a corrupted display screen as a result of the correct video driver not being available.

Rescue installed system — If you are unable to boot an installed system, this option allows you to edit partitions or configuration files to fix a variety of boot problems. Select this option if you want to configure a btrfs root file system.

Boot from local drive — Boots an already installed system from the hard disk.

Memory test — Runs the `memtest86` utility that verifies the integrity of the system's RAM.

If you press `Esc` the system displays the `boot:` prompt, which allows you to specify boot options such as the language, display resolution, interface type, installation method, and network settings. For example, the following line would specify text-based rather than graphical installation:

```
boot: linux text
```

For more information, see Section 2.2, “Installation Boot Options”.

If you select to install the system and the installer locates the installation media, the Media Test window appears.

2. Click **OK** to test the installation media or **Skip** to skip the testing.

   The Logo window appears next.

3. Click **Next** to display the Language Selection screen. (In text mode, press `F12` instead.)

4. Select the language to use for the installation. The selected language becomes the default language for the system.

   

   Note

   After the installation is complete, you can use the graphical `system-config-language` command to change the default language, or you can edit the settings in `/etc/sysconfig/i18n` and reboot the system.

   Click **Next** to display the Keyboard Selection screen.

5. Select the keyboard to use for the installation.

   

   Note

   After the installation is complete, you can use the graphical `system-config-keyboard` command to change the keyboard type, or you can edit the settings in `/etc/sysconfig/keyboard` and reboot the system.

   If you booted the system using a full installation image, click **Next** to display the Storage Devices Selection window. See Section 2.1.2, “Continuing the Installation”.

   If you booted the system from a boot ISO image, click Next to display the Installation Method window.

6. Select the type of media that contains the full installation image and click **OK**:

   Local CD/DVD — Insert the CD or DVD containing the full installation image, or, in the case of a virtual machine installation, make the installation image ISO available to the guest, and click **OK**.

Hard drive

In the Select Partition window, select the device and directory that contains the installation image, and click **OK**.

NFS directory

In the Configure TCP/IP window, enable one of both of IPv4 and IPv6, select how you want to configure the network settings, and click **OK**.

In the NFS Setup window, enter the domain name or IP address of the NFS server, the exported path of the directory that contains the installation image, any NFS mount options that are required, and click **OK**.

See Section 1.4.1, “Setting up a New NFS Server”, Section 1.4.2, “Configuring an Existing NFS Server” and Section 1.4.5, “Setting up a Network Installation Server” for more information.

URL

In the Configure TCP/IP window, enable one of both of IPv4 and IPv6, select how you want to configure the network settings, and click **OK**.

In the URL Setup window, enter the URL of the extracted installation image, configure any required HTTP proxy settings, and click **OK**.

See Section 1.4.3, “Setting up a New HTTP Server”, Section 1.4.4, “Configuring an Existing HTTP Server” and Section 1.4.5, “Setting up a Network Installation Server” for more information.

For installation from a CD, DVD or hard drive, the Media Test window appears. Click **OK** to test the installation media or **Skip** to skip the testing.

The Storage Devices Selection window appears next.

2.1.2 Continuing the Installation

Having located the full installation media, the installation continues.

1. In the Storage Devices Selection window, select one of the following options:

   Basic Storage Devices

   The installer automatically detects any locally attached storage devices, and displays the Storage Device Warning window that asks you to choose whether to discard or keep existing data on those devices.

   Specialized Storage Devices

   The installer displays the Storage Devices Selection window with tabs for each of the supported device types. You can select the devices on which to install the operating system in addition to any drives that the system should mount automatically. To configure iSCSI or FCoE connections, click **Add Advanced Target**. You can filter storage devices by WWID or by a combination of port, target, and LUN.

   Click **Next** to display the Set Hostname window.

2. Enter the host name of the system as either as a single name or as a fully-qualified domain name (FQDN), for example, `host01.mydom.com`. If you use the Dynamic Host Configuration Protocol (DHCP) to provide network settings, enter a single name and allow DHCP to assign the domain name.

   

   Note

   The following procedure in this step assumes that your system is connected to a wired IPv4 network.

   If you require the system to have network access during installation, click **Configure Network** to display the Network Connections window:

   a. Select the tab corresponding to the network interface type, for example, Wired.

   b. Select the network interface that you want to configure, for example `eth0`, and click **Edit**.

      The Editing System window appears with the following tabs:

Wired	Allows you to specify the MAC address and MTU for the network adapter.
802.1x Security	Allows you to configure 802.1X port-based network access control (PNAC) if required. You can select TLS (transport layer security), FAST (Flexible Authentication via Secure Tunneling), Tunneled TLS, or Protected EAP (Protected Extensible Authentication Protocol or PEAP) as the authentication method. To configure one of the methods, provide the identify, certification, and private key information.
IPv4 Settings	Allows you to configure IP settings for IPv4.
IPv6 Settings	Allows you to configure IP settings for IPv6.

   c. In the Editing System window, select the IPv4 Settings tab.

   d. Ensure that the **Connect automatically** check box is selected so that the system enables the connection at boot time.

   e. Select either **Automatic (DHCP)** or **Manual** as the method for obtaining settings.

      If you select **Automatic (DHCP)**, enter the DCHP client ID, if required, and click **Apply**.

      If you select **Manual**, enter values for the IP address, network mask, gateway, and DNS parameters, and click **Apply**.

   Click **Next** to display the Time Zone Selection window.

3. Select a time zone by clicking the map or selecting from the drop-down list. Choose a country and city that are in the same time zone as your system. You need to specify a time zone even if you intend to use the Network Time Protocol (NTP).

   

   Note

   Only deselect the **System clock uses UTC** check box if the system is an Oracle Linux and Microsoft Windows dual-boot environment.

After the installation is complete, you can use the graphical `system-config-date` command to change the time-zone setting, or you can copy a timezone file from the `/usr/share/zoneinfo` directory hierarchy over the existing `/etc/localtime` file. To enable or disable **System clock uses UTC**, set the third line of `/etc/adjtime` to `UTC` or `LOCAL` respectively.

Click **Next** to display the Set Root Password window.

4. Enter the root password in the **Root Password** and **Confirm** text fields, and click **Next** to display the Disk Partitioning window.

Note

The installer's password checking algorithm displays a warning if the password is weak. You can choose to override the warning.

2.1.3 Configuring Disk Partitions

The Disk Partitioning window displays the following options:

Use All Space

Removes all existing partitions and data. If you select this option, the installer creates the following default layout on the installation disk:

- A 500 MB partition for an ext4 file system that contains `/boot`.
- A partition in the remaining disk space configured an LVM physical volume for an LVM volume group that contains:
  - A logical volume for an ext4 file system that contains the root file system (`/`).
  - A logical volume for an ext4 file system that contains the `/home` file system (provided that the disk is larger than 50 GB).
  - A logical volume for a swap partition.

Replace Existing Linux System(s)

Removes any Linux partitions created by a previous Linux installation, and preserve any other partitions that contain data.

Shrink Current System

Resizes the existing partitions and create a default partition layout for Oracle Linux in the recovered space.

Use Free Space

Preserves any existing partitions and install Oracle Linux in the unused space.

The Disk Partitioning window also displays the following buttons:

Encrypt system

Allows you to choose to encrypt disk partitions other than the partition that contains `/boot`. You are prompted to enter a passphrase for the encryption.

Review and modify partitioning layout

Allows you to configure disk partitioning manually.

To configure the disk partitions for a system:

1. In the Disk Partitioning window, select the disk partitioning option that you require and click **Next**.

If the installer detects that the system has more than one storage device, the Storage Devices window appears.

To choose the devices on which you want to install Oracle Linux:

a. Select the devices from the Data Storage Devices list and click the right arrow to move them to the Install Target Devices list.

b. From the devices in the Install Target Devices list, select the boot device by clicking the radio button next to the device.

Click **Next** to save your changes and continue.

If you selected **Review and modify partitioning layout**, the Partition Layout window appears. You can select one or more of the displayed storage objects (hard drives, partitions, software RAID partitions or devices, or LVM volume groups or logical volumes), and click **Create**, **Edit**, or **Delete** buttons to modify the layout.

2. To add a storage object:

   a. Select the storage object or objects for which you want to add a storage object and click **Create**.

      The Create Storage dialog appears, and, depending on the context of the selected storage object or objects, you can choose to add one of the following storage objects:

Standard Partition	Specifies a standard disk partition.
RAID Partition	Specifies a standard disk partition that will form part of a software RAID device.
RAID Device	Specifies a RAID device configured over two or more RAID partitions.
LVM Volume Group	Specifies a volume group configured from one or more physical volumes.
LVM Logical Volume	Specifies a logical volume group configured within a volume group.
LVM Physical Volume	Specifies a physical volume within a disk partition.

   b. Select the type of storage object that you require and click **Create**.

      The Add Partition dialog appears. For standard partitions, RAID devices, and LVM logical volumes, you can configure the following settings:

Mount Point	Specifies the mount point for the file system. You can enter the mount point or select it from the drop-down list (for example: `/`, `/boot`, or `/home`). For a swap partition, do not enter a value.
File System Type	Specifies the file system type: ext2, ext3, ext4, LVM, RAID, swap, or vfat. From Oracle Linux 6 Update 3, the UEK R2 Boot ISO allows you to configure a btrfs file system. See Section 2.4, “Installing a System with a Btrfs `root` File System”.
Allowable Drives	Allows you to specify the devices to use for the file system.

Size (MB)	Specifies the size in megabytes of the partition.
Additional Size Options	Allows you to choose to keep the partition at a fixed size, to permit the partition to grow up to a designated size, or to use all remaining space on the device for the partition.
Force to be a primary partition	Specifies if the partition must be one of the first four partitions on the hard drive rather than a logical partition within an extended partition. This option applies only to hard disks with a traditional master boot record (MBR). It does not apply to disks with a GUID Partition Table (GPT), software RAID partitions, or LVM partitions.
Encrypt	Specifies if the underlying block device is Linux Unified Key Setup (LUKS) encrypted. If encrypted, you cannot access data on the partition without entering a passphrase.

Note

The file system that contains `/boot` cannot be encrypted.

The **Edit**, or **Delete** buttons allow you to modify or delete the settings for storage objects.

If necessary, click **Reset** to undo your changes.

Click **Next** to save your changes.

3. If you are warned that pre-existing devices are going to be formatted, potentially destroying any existing data, click **Format** to continue.

4. If you are warned that data on deleted or reformatted partitions will be lost, click **Write changes to disk** to continue.

   The Boot Loader Selection window appears. The boot loader runs when the system starts and loads the kernel, without the need for boot media. Oracle Linux uses the GRand Unified Bootloader (GRUB), which is installed by default in the MBR of the disk that contains `/boot`.

5. If required, click **Change Device** to select a different location for the boot loader. Only deselect the **Install boot loader on ...** check box if you intend to boot the system from a boot loader on a removable device.

6. If you require the boot loader to be password protected, select the **Use a boot loader password** check box, and click **Change password** to set the password.

   A boot loader password is recommended to enhance system security for systems that are located outside a secure data center. Without a boot loader password enabled, users can use kernel boot options to give them `root` access to the system without providing the `root` password. However, with a boot loader password enabled, the system cannot reboot automatically without human intervention.

   Oracle Linux attempts to detect existing operating systems on the hard disk and configures GRUB to boot them. If necessary, click **Add** to configure operating systems in GRUB manually. Each operating system becomes a bootable entry in the GRUB configuration file.

   Click **Next** to save your changes and display the Software Package Selection.

2.1.4 Selecting Software Packages

The Software Package Selection window allows you to select the software packages that you want to install on the system.

To select the software packages for installation on a system:

1. In the Software Package Selection window, select from one of the following sets of software:

Basic Server	Installs a default software set for a basic server configuration.
Database Server	Installs the MySQL and PostgreSQL databases.

Note

This selection not install the Oracle Database (RDBMS) nor it does not prepare the system for installing the Oracle Database. You can use the Oracle RDBMS Server Pre-Install RPM to perform preinstallation configuration tasks for Oracle Database.

Web Server	Installs the Apache web server.
Enterprise Identity Server Base	Installs OpenLDAP and the System Security Services Daemon (SSSD).
Virtual Host	Installs KVM and Virtual Machine Manager tools.
Desktop	Installs OpenOffice, the graphical user environment and tools, and multimedia applications.
Software Development Workstation	Installs compiler and other software development tools.
Minimal	Installs only a minimal set of packages that are required to run Oracle Linux. This set does not include many administration tools that you might normally use, such as `wget` or `unzip`.

Note

Only the Desktop software set installs a graphical user environment by default.

You can choose to install the packages from the **Oracle Linux Server** and the **UEK2 kernel repo** software repositories on locally accessible media, or you can click **Add additional software repositories** to specify alternative or additional repositories such as the channels that are available on the Oracle Linux yum server for your system's architecture (i386 or x86_64).

For example, the Oracle Linux 6 latest channels on the Oracle Linux yum server for the x86_64 architecture are available at:

- `https://yum.oracle.com/repo/OracleLinux/OL6/latest/x86_64/`
- `https://yum.oracle.com/repo/OracleLinux/OL6/UEK/latest/x86_64/`

Note

The name that you assign to a repository is arbitrary. You do not have to use the repository's real name.

If necessary, configure the details for your organization's proxy server that acts as an intermediary for Internet access.

Any repositories that you define are added to the list with the names that you assigned to them and enabled for use.

The **High Availability**, **Load Balancer**, **Resilient Storage**, and **Scalable Filesystem Support**repositories are not supported in Oracle Linux 6. The standard Red Hat Enterprise Linux 6 distribution does not contain these packages, which Red Hat offer as separate, chargeable add-ons. Oracle provides alternative or equivalent solutions. For example, Oracle Linux support subscriptions cover Oracle Clusterware, OCFS2, and XFS support. (The **Scalable Filesystem Support** add-on from Red Hat provides the XFS file system packages, which Oracle distributes through the Oracle Linux yum server and ULN.

For more information, see the footnotes at https://linux.oracle.com/supported.html.

To customize software packages that are installed, select **Customize Now** and then click **Next** to display the Software Customization window.

2. In the left-hand column, select a package category to display the associated package groups in the right-hand column. Select or deselect individual package groups that you want to be or not to be installed.

   Some package groups provide optional packages that provide additional functionality, but which are not required. To view any optional packages, click **Optional packages**.

   For example, to install the OCFS2 support package:

   a. Select **Servers** in the left-hand column.

   b. Select **System administration tools** in the right-hand column.

   c. Click **Optional Packages**.

   d. In the System administration tools window, select the `ocfs2-tools` package from the list.

   When you have finished choosing the packages that you want to install, click **Next**.

   The installer displays a status bar that shows the progress of the package installation along with the name of each package that is being installed.

3. After the packages have been installed, click **Reboot** to reboot the system.

   If you chose to install a Basic Server, the system reboots to run level 3 without any graphics, and displays a login prompt. You can log in as `root` to configure the system.

   If you chose to install the Desktop packages including the X Window System, the system reboots to run level 5 and displays the FirstBoot window.

2.1.5 Performing FirstBoot Configuration Tasks

Note

If you are performing a kickstart installation, FirstBoot does not run unless the kickstart configuration installs the Desktop packages, including the X Window System, enables graphical installation, and configures a non-administrative user. See Chapter 3, *Installing Oracle Linux by Using Kickstart*.

FirstBoot runs only after an initial installation and guides you through the various remaining configuration tasks.

1. Click **Forward** to display the License Information window.
2. Select **Yes, I agree to the license agreement**, and click **Forward** to display the Set Up Software Updates window.
3. If your system has an active network connection, you can register your system with ULN and subscribe the system to software and Ksplice updates.

   Click **Forward** to display the Create User window.
4. Create a non-administrative user account. If you have an existing IPA, LDAP, Kerberos, NIS, or Winbind user database, click **Use Network Login** to configure the system to obtain user account information from the network server. Click **Advanced** if you want to specify the user's home directory or user ID.

   Click **Forward** to display the Date and Time window.
5. Set the current date and time. You can choose to synchronize the system's date and time from an NTP server.

   Click **Forward** to display the Kdump window.
6. If required, enable the Kdump kernel crash dump mechanism and configure the amount of memory to reserve for it. If your system crashes, Kdump captures information that assists in determining the cause of the crash.

   Click **Finish** to complete FirstBoot configuration and display the graphical login screen.

2.2 Installation Boot Options

Note

To use kickstart to perform an installation, you must specify the `ks` boot option.

The following are the most commonly used boot options when installing a system:

`askmethod`	Prompts to choose an installation source.
`asknetwork`	Prompts to configure the network settings.
`autostep`	Configures the kickstart installation to be completely non-interactive.
`pdb`	Starts the Python debugger.
`dhcpclass=`*`class`*	Specifies a vendor class identifier to DHCP.

`dns=dns1[,dns2[,dns3]]`	Specifies the IPv4 addresses of DNS servers to use for network installation.
`gateway=IP_address`	Specifies the IPv4 address of the network gateway.
`graphical`	Specifies graphical-based installation.
`ip=dhcp`	Specifies that the system should obtain its IPv4 settings from DHCP for network installation.
`ip=IP_address`	Specifies the IPv4 address of the system for network installation.
`ipv6=auto`	Specifies that the system should use automatic configuration with DHCPv6 to obtain its IPv6 network settings.
`ipv6=dhcp`	Specifies that the system should obtain its IPv6 settings from DHCPv6 for network installation.
`keymap=layout`	Specifies the keyboard layout for installation.
`ks=cdrom:path`	Specifies the path of a kickstart file on a CD or DVD.
`ks=hd:device:path`	Specifies the path of a kickstart file on a device that contains an `ext2` or `vfat` file system.
`ks=nfs:[options:]NFS_server:path`	Specifies the path of a kickstart file on a file system that is exported by an NFS server. If required, you can specify a comma-separated list of mount options.
`ks=URL`	Specifies the URL (which can use either `http` or `https`) of a kickstart file on a web server.
`ksdevice=bootif`	Specifies that network installation should use the interface that the system used to boot from a PXE server. For systems with multiple interfaces, this option prevents the installation prompting you to choose a network interface if you also specify `ipappend 2` in the pxelinux boot loader configuration file.
`ksdevice=ibft`	Specifies that network installation should use the MAC address of the interface specified by the iSCSI Boot Firmware Table (iBFT) in the system BIOS or firmware.
`ksdevice=interface`	Specifies the name of the interface (for example, `eth0`) to use for network installation. For systems with multiple interfaces, this option prevents the installation prompting you to choose a network interface. This option also controls which interface is used rather than selecting the first active network interface found on the system.
`ksdevice=link`	Specifies that network installation should use the first active network interface found on the system. For systems with multiple interfaces, this option prevents the installation prompting you to choose a network interface.
`ksdevice=MAC_address`	Specifies the MAC address of the interface to use for network installation.
`lang=language`	Specifies the language for installation.

`loglevel=level` — Specifies the logging level for installation: `critical`, `debug`, `error`, `info`, or `warning`. The default level is `info`.

`mediacheck` — Prompt to choose whether to verify the integrity of ISO-based installation media.

`netmask=mask` — Specifies the IPv4 network mask for network installation.

`nofallback` — Aborts the installation of the graphical installation is not possible.

`noipv6` — Disables IPv6 for network installation.

`repo=cdrom[:device]` — Specifies to install packages from a CD or DVD device. Only one `repo` option may be specified on the boot line.

Note

The `repo` boot option replaces the deprecated `method` option.

`repo=ftp://[user:password@]FTP_server/path` — Specifies to install packages from a path on an FTP server.

`repo=hd:device:path` — Specifies to install packages from a path on a hard disk device.

`repo=hd:LABEL=label:path` — Specifies to install packages from a path on a hard disk device identified by its label.

`repo=hd:UUID=uuid:path` — Specifies to install packages from a path on a hard disk device identified by its UUID.

`repo=nfs:[options:]NFS_server:path` — Specifies to install packages from a path on a file system that is exported by an NFS server.

`repo=nfsiso:[options:]NFS_server:path` — Specifies to install packages from an ISO image on a file system that is exported by an NFS server.

`repo=URL` — Specifies to install packages from a URL (which can use either `http` or `https`) on a web server.

`text` — Specifies text-based installation. The kickstart file must specify disk partitioning, boot loader configuration, and package selection.

`vnc` — Enables remote installation by starting a VNC server.

`vncconnect=client[:port]` — Specifies the VNC client and optional port. Alternatively, the VNC client can connect by using a command such as `vncviewer server:port`, where `server` is the IP address of the system being installed.

`vncpassword=password` — Specifies the password for client connections using VNC.

2.3 Installation Logs

The following log files are created during installation:

`/root/install.log` — Contains a list of the software packages that were installed.

/root/install.log.syslog	Contains the syslog messages that the installation generated.
/var/log	Contains Anaconda logs relating to the installation.

Every installation also creates a kickstart file, /root/anaconda-ks.cfg that you can modify to perform automated installations. For more information, see Chapter 3, *Installing Oracle Linux by Using Kickstart*.

2.4 Installing a System with a Btrfs root File System

For compatibility reasons, the default installation image of Oracle Linux boots the Red Hat compatible kernel to perform the installation. Oracle provides an alternative installation image (UEK Boot ISO) that supports the installation of Oracle Linux 6 Update 3 or later using the Unbreakable Enterprise Kernel (UEK) as the installation kernel. This installation method allows you to create a btrfs root file system.

As the UEK Boot ISO contains only the bootable installation image, you must set up a network installation server for the RPM packages. This server must have sufficient storage space to host the full Oracle Linux Release 6 Update 3 or later Media Pack DVD image (approximately 3.5 GB), and you must configure it to use either HTTP or NFS to serve the image files to the target systems on which you want to install Oracle Linux 6 Update 3 or later.

Perform one of the procedures in the following sections to set up an HTTP or NFS server on the system that will act as the network installation server:

- Section 1.4.1, “Setting up a New NFS Server”
- Section 1.4.2, “Configuring an Existing NFS Server”
- Section 1.4.3, “Setting up a New HTTP Server”
- Section 1.4.4, “Configuring an Existing HTTP Server”

You can then set up the network installation server, modify a full Oracle Linux Media Pack DVD image to support the Unbreakable Enterprise Kernel (UEK) as an installation kernel, and use this image to install a system with a btrfs root file system:

- Section 1.4.5, “Setting up a Network Installation Server”
- Section 1.4.6, “Modifying a Full DVD Image to Support Btrfs root File System Installation”
- Section 2.4.1, “Installing a Btrfs root File System”

2.4.1 Installing a Btrfs root File System

To install a target system from a network installation server:

1. Boot the target system using the UEK Boot ISO image.
2. Select **Install or upgrade an existing system**.
3. On the **Installation Method** screen, select either **NFS directory** or **URL** depending on whether you configured your installation server to use NFS or HTTP respectively.
4. After configuring the network settings, enter the settings for the NFS or HTTP installation server.

   For installation using NFS, enter the path of the full DVD image, for example /var/OSimage/OL6.6_UEK.

For installation using HTTP, enter the URL of the full DVD image, for example `http://192.168.1.100/OSimage/OL6.6_UEK`.

5. Follow the installation instructions in Section 2.1, “Installation Overview”. The default disk layout creates a btrfs root file system.

Note

You cannot configure a bootable partition, such as `/boot`, as a btrfs file system.

2.5 Using a Driver Update Disk

A Driver Update Disk (DUD) provides a mechanism for delivering updated device drivers during system installation. On some systems, hardware may not be fully supported for an Oracle Linux release. In these cases, a DUD may be released at a later date, to facilitate installation on newer hardware.

DUDs may be released by Oracle and made available on the Oracle Software Delivery Cloud or through Oracle Support, as modules become available for previously unsupported hardware. The DUD is usually released in the form of an ISO.

During installation, the installer can load the updated device driver kernel modules from the DUD so that it can access the devices and install the required RPM packages, containing the alternate device drivers, on the target system. This allows the installation of Oracle Linux to proceed smoothly on systems with hardware that may not have been initially supported at the time of the Oracle Linux release.

To prepare to use a Driver Update Disk image

Warning

Writing the DUD ISO to the wrong device may result in data loss. Check that you reference the correct device node when you copy the image. Use the `lsblk` utility to help you to identify the different disks block devices on your system.

Use the `dd` command line utility to transfer the DUD image to an alternate storage device:

```
# dd if=/path/to/DUD.iso of=/dev/sdX
```

Replace *`/path/to/DUD.iso`* with the path to access the DUD ISO file. Replace *`/dev/sdX`* with the device node that belongs to the storage media that you intend to use for the DUD. Typically, you might use a USB disk for this purpose.

Using the Driver Update Disk during installation

To use the DUD during installation, boot from the standard Oracle Linux installation media as you normally would, but additionally, attach the media with the DUD image before the installer starts. The installer should automatically recognize the DUD and use it. You might be prompted to select which drivers you want to install.

Note

Some versions of BIOS may fail to identify the installation media when multiple USB storage devices are connected. Therefore, it is recommended that you insert the DUD USB media as soon as the boot process starts. For example, attach the disk when the system is at the GRUB boot prompt.

> The kernel that is used by the installer might not include support for USB 3.0. When using the DUD on USB media, ensure that you use a USB 2.0 compatible port to connect the USB media to the system.

It is also possible to manually specify the location of the DUD before the installer boots, which makes it possible to host the ISO at an alternate location, such as a web server or an NFS server, and helps to facilitate kickstart installations, where the DUD might be required. To manually specify the location of the DUD, edit the boot parameters to include `inst.dd=`*`location`*, where *`location`* is the URL or path to the device where the DUD can be accessed.

To access the boot parameters in the boot menu when you are running a manual installation, press either the E key (UEFI-based systems) or the Tab key (BIOS-based systems) to display a prompt that enables you to edit previously defined boot options and add your own boot options. See Section 2.1.1, “Starting the Installation” and Section 2.2, “Installation Boot Options” for more information.

If you intend to use the DUD during a kickstart installation, use the `driverdisk` installation option in your kickstart file to specify the location of the disk. For example, to install from an attached block device, use the following location:

```
driverdisk /dev/sdb1
```

Or, to install from a network location, use the `--source` switch:

```
driverdisk --source=http://www.example.com/dd.iso
```

The installer supports the use of HTTP, FTP, and NFS as sources for network-hosted DUD images.

Chapter 3 Installing Oracle Linux by Using Kickstart

Table of Contents

This chapter describes how you can use the kickstart method to automate an Oracle Linux installation.

3.1 Creating a Kickstart File

A kickstart configuration file contains all the information that kickstart requires to perform an automated installation. Every Oracle Linux installation creates a kickstart file, `/root/anaconda-ks.cfg`. You can use this file to repeat an installation, or you can customize the settings in this file for different system configurations. The file is also useful for troubleshooting a boot-time problem with an installed system. You can use the Kickstart Configurator (`system-config-kickstart`) to create or modify a kickstart file.

3.1.1 Installation Options Section

The first part of a kickstart file defines the installation options and their associated values, and it defines how to configure the system storage, for example:

```
#platform=x86, AMD64, or Intel EM64T
#version=DEVEL
# Firewall configuration
firewall --enabled --service=ssh

# Install OS instead of upgrade
install

# Use CDROM installation media
cdrom
repo --name="Oracle Linux Server" --baseurl=cdrom:sr0 --cost=100

# System authorization information
auth  --useshadow  --passalgo=sha512

# Root password
rootpw --iscrypted SHA512_password_hash

# Use graphical install
graphical
firstboot --disable

# System keyboard
keyboard us

# System language
lang en_US

# SELinux configuration
selinux --enforcing

# Installation logging level
logging --level=info
```

```
# System timezone
timezone  America/Los_Angeles

# Network information
network --bootproto=dhcp --device=eth0 --onboot=on

# System bootloader configuration
bootloader --append="rhgb crashkernel=auto quiet" --location=mbr --driveorder="sda"

# Non-administrative user
user --name=user --homedir=/home/user --password=SHA512_password_hash --iscrypted

# Partition information

clearpart --all --drives=sda

part /boot --fstype=ext4 --size=500
part pv.008002 --grow --size=1

volgroup vg_hostname --pesize=4096 pv.008002
logvol / --fstype=ext4 --name=lv_root --vgname=vg_hostname --grow --size=1024 --maxsize=51200
logvol swap --name=lv_swap --vgname=vg_hostname --grow --size=2016 --maxsize=4032
```

Comments in the kickstart file begin with a `#` character.

Note

The Unbreakable Enterprise Kernel supports the use of the setting `crashkernel=auto` for UEK release 3 quarterly update 1 and later.

PXE cannot bring up the network interface unless you include a line such as the following:

```
network --bootproto=dhcp --device=eth0 --onboot=on
```

You can include multiple `repo` lines in the file, For example, if you use an HTTP-based network installation server, you might want to include both the `Server` and `UEK2` repositories.

```
url --url http://192.168.1.100/OL6.4
repo --name="OL6.4 Server repo" --baseurl=http://192.168.1.100/OL6.4/Server
repo --name="OL6.4 UEK R2 repo" --baseurl=http://192.168.1.100/OL6.4/UEK2
```

You can also include `repo` lines that point to the latest channels on the Oracle Linux yum server so that the system is automatically up to date after the installation. For example:

```
repo --name="OL6.4 latest" \
 --baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/latest/x86_64/
repo --name="OL6.4 UEK R2 latest" \
 --baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEK/latest/x86_64/
```

Note

Do not use the `\` line-continuation character in a Kickstart file. This character is used in the example to break long lines for printing.

3.1.2 Packages Section

The `%packages` section defines the packages to be installed on the system, for example:

```
%packages
@base
@client-mgmt-tools
@core
@debugging
@basic-desktop
@desktop-debugging
```

```
@desktop-platform
@directory-client
@general-desktop
@graphical-admin-tools
@identity-management-server
@input-methods
@internet-browser
@java-platform
@legacy-x
@network-file-system-client
@network-tools
@perl-runtime
@print-client
@remote-desktop-clients
@security-tools
@server-platform
@server-policy
@system-admin-tools
@x11
mtools
pax
python-dmidecode
oddjob
wodim
sgpio
genisoimage
device-mapper-persistent-data
abrt-gui
samba-winbind
certmonger
openldap-clients
pam_krb5
krb5-workstation
ldapjdk
slapi-nis
libXmu
perl-DBD-SQLite
perl-Mozilla-LDAP
%end
```

Package group names start with a `@` character. You can use the `yum grouplist` command on an existing Oracle Linux server to display both the installed package groups and the package groups that are available to install.

Individual packages to be installed are named without the `@` prefix. If you specify a `-` character as a prefix, the package is not installed.

The `%packages` keyword takes the following options:

`--ignoredeps`	Installs the packages without attempting to fix any unresolved dependencies.
`--ignoremissing`	Installs the available packages without prompting about missing packages. By default, kickstart interrupts the installation and asks you whether you want to continue the installation.
`--resolvedeps`	Install the packages and prompt if there are any unresolved dependencies.

You can also use a package list that is available as a local file in kickstart's ramdisk file system or that is accessible on an HTTP server, for example:

```
%packages --ignoremissing
%include /tmp/package-list
```

```
%end
```

3.1.3 Pre-installation Configuration Section

The `%pre` section defines any actions that kickstart must perform before installation. This section is optional.

For example, the following `%pre` section runs the script `config-partitions` that is stored on an HTTP server and downloads a list of packages for use with a `%include /tmp/package-list` statement in the `%packages` section.

```
%pre
%include http://192.168.1.100/scripts/config-partitions
wget -q -O- http://192.168.1.100/scripts/package-list > /tmp/package-list
%end
```

In this example, the `wget` command saves the package list in kickstart's file system, which exists as a ramdisk in memory.

An included script or file must be accessible at the specified path or URL.

As name service is not available before installation, you must use IP addresses instead of domain names in the `%pre` section or in any script that it includes.

3.1.4 Post-installation Configuration Section

The `%post` section defines any actions that kickstart must perform after installation. This section is optional.

By default, kickstart runs post-installation tasks in a `chroot` environment that is based on the root file system of the newly installed system. If you need to access any files that are outside the `chroot` environment, specify the `--nochroot` option to `%post`. You can then access files in the kickstart file system with the newly installed system's root file system being mounted at `/mnt/sysimage`.

For example, the following `%post` section runs the script `/tmp/post-config` in kickstart's file system:

```
%post --nochroot
%include /tmp/post-config
%end
```

If you configure the installed system's network interface to obtain its settings using DHCP, you must either use IP addresses instead of domain names or set up a temporary `resolv.conf` file, for example:

```
%post
wget -q -O- http://192.168.1.100/scripts/resolv.conf > /etc/resolv.conf
%include http://instsvr.mydom.com/scripts/post-config
.
.
.
%end
```

3.2 Using a Kickstart File to Install a System

A kickstart installation requires access to the Oracle Linux installation media on a local CD-ROM drive or hard drive, or over the network using HTTP or NFS.

To use a kickstart file to install a system:

1. Boot the system from a bootable medium or from a network installation server that supports PXE client installation. If you need to modify the boot command, press `Esc` to access the command line. Note, however, that the boot configuration might not allow you to modify the boot command.

For PXE clients, it is usual to specify the kickstart parameters in the boot loader configuration. For example, the following example configures a kickstart installation for a PXE client that boots using pxelinux:

```
prompt 0
default ol6u6
timeout 0

label ol6u6
kernel vmlinuz-OL6u6
append initrd=initrd-OL6u6.img ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
```

The `ksdevice=eth0` parameter specifies the interface to be used for network installation. If a system has multiple network interfaces, this prevents the installation from prompting you to choose an interface. Alternatively, you could specify `ksdevice=bootif` and add an `ipappend 2` entry after the `append` entry:

```
prompt 0
default ol6u6
timeout 0

label ol6u6
kernel vmlinuz-OL6u6
append initrd=initrd-OL6u6.img ksdevice=bootif kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
ipappend 2
```

This configuration also prevents you from being prompted to choose a network interface but it does not control which interface is selected.

The next example configures a kickstart installation for a PXE client that boots using GRUB:

```
default=0
hiddenmenu
splashimage=(nd)/splash.xpm.gz
timeout=0

title Oracle Linux 6 Update 6 Installation
    root (nd)
    kernel /vmlinuz-OL6u6 ksdevice=eth0 kssendmac ks=http://10.0.0.11/ksfiles/ol6u6_cfg.ks
    initrd /initrd-OL6u6.img
```

Note

The `ipappend 2` option does not work as documented for UEFI boot environments on Oracle Linux 6. In some situations, such as when using UEFI in conjunction with the Anaconda installer, the PXE environment does not pass the information required to identify the boot interface if you use the `ksdevice=bootif` option. This can cause the installation to stop to prompt the user to select an interface. The workaround is to manually set the `BOOTIF` environment variable to contain the MAC address of the device, prefixed with '01-'. For example:

```
prompt 0
timeout 0

title ol6u8-x86_64-UEFI
  root (nd)
  kernel vmlinuz-OL6u8 initrd=initrd-OL6u8.img ksdevice=bootif BOOTIF=01-08-00-27-60-9
 ks=http://10.0.0.11/ksfiles/ol6u8_cfg.ks
```

> *08-00-27-60-95-d5* in the above example is equivalent to the MAC address for the boot interface.

2. If you have not customized the boot configuration to use kickstart, you can use the `ks` option to specify the location of the kickstart file.

   The following boot command specifies that the kickstart file is on the boot CD:

   ```
   boot: linux ks=cdrom:/ks.cfg
   ```

   If the kickstart file is located on an NFS server, you might use a boot command such as the following:

   ```
   boot: linux ksdevice=eth0 ip=dhcp ks=nfs:10.0.0.11:/ksfiles/ks.cfg
   ```

   where `ksdevice=eth0` specifies the network interface and `ip=dhcp` specifies that DHCP should be used to configure this interface.

   For more information, see Section 2.2, “Installation Boot Options”.

3. If the kickstart configuration does not specify the installation method, insert the installation DVD or make the installation image available to the system when prompted.

Chapter 4 Post-installation Configuration

Table of Contents

This chapter describes system configuration changes that you might after an nstallation.

4.1 Registering with the Unbreakable Linux Network

When you install Oracle Linux 6 on a system, you have the option of registering the system with ULN. To register with ULN after installation, use the `uln_register` command.

To obtain Oracle Linux updates from ULN, you must have an Oracle Linux support subscription. For more information about ULN, see https://linux.oracle.com.

During ULN registration, your server is automatically registered with the latest channels for the base repository and the Unbreakable Enterprise Kernel Release 3 (UEK R3) if your system has the x86_64 architecture and is running Oracle Linux 6 Update 5 or later. Other systems running Oracle Linux 6 are registered with the latest channels for the base repository and the Unbreakable Enterprise Kernel Release 2 (UEK R2). If you have upgraded your system from a previous update of Oracle Linux 6 and you want to install UEK R3, you must manually subscribe the server to the `ol6_x86_64_UEKR3_latest` channel and unsubscribe it from the `ol6_i386_UEK_latest` or `ol6_x86_64_UEK_latest` channel.

Note

UEK R3 is not available for the 32-bit x86 architecture.

ULN also provides channels for Oracle-specific software packages such as Oracle's `ASMlib` user-space package and the Oracle Instant Client. To enable access to these packages, log in to ULN and subscribe your system to the Oracle Software channel.

If you have an Oracle Linux Premier Support account, you can opt to use Oracle Ksplice, which allows you to keep your systems secure and highly available by automatically updating your systems with the latest kernel security errata and other critical updates. If you choose to use Ksplice, you can subscribe your systems to the Ksplice for Oracle Linux channel and install the Ksplice Uptrack software on them. After registration is complete, you can use `yum` to install the `uptrack` package. The Uptrack client downloads the access key from ULN and automatically configures itself so that your system can immediately begin to use Ksplice Uptrack.

4.2 Obtaining Errata and Updates from the Oracle Linux Yum Server

Oracle also provides all errata and updates for Oracle Linux through the Oracle Linux yum server, which includes updates to the base distribution, but does not include Oracle-specific software. You do not require

an Oracle Linux support subscription to use this service. For more information on how to obtain updates from the Oracle Linux yum server, see https://yum.oracle.com.

By default, all new installations of Oracle Linux 6 are automatically configured to use the Oracle Linux yum server. If you subsequently register the system with ULN, any configuration for using the Oracle Linux yum server is automatically disabled.

The configuration files that control access to repositories hosted on the the Oracle Linux yum server are located in `/etc/yum.repos.d/`.

Oracle revised how repository configuration files for the Oracle Linux yum server are distributed and updated in January 2019. Older implementations may use a consolidated configuration file available in `/etc/yum.repos.d/public-yum-ol6.repo`. If your system is still configured in this way, consider updating and running the `/usr/bin/ol_yum_configure.sh` script to complete the transition to use the modular yum configuration files managed through yum itself.

Core repositories such as `ol6_latest` are enabled by default at installation. These repositories allow you to install base software required to run Oracle Linux 6. They also allow you to install the packages that provide the Oracle Linux yum server repository configurations that enable repositories where other software may be available. You can get a listing of the available repository configuration packages by running:

```
# yum list *release-el6*
```

See the *Oracle Linux 6 Administrator's Guide* for more information.

4.3 Obtaining Packages from the Oracle Linux Installation Media

The installation media for Oracle Linux 6 contain two distinct repository sources for the Red Hat Compatible Kernel and the Unbreakable Enterprise Kernel. After installation, you can configure `yum` to use both repositories from an ISO image of the installation media by creating the file `/etc/yum.repos.d/Media.repo` that contains entries similar to the following:

```
[ol6_base_media]
name=Oracle Linux 6 Update 5 Base Media
baseurl=file:///media/ISOimage/Server
gpgkey=file:///media/ISOimage/RPM-GPG-KEY
gpgcheck=1
enabled=1

[ol6_uek_media]
name=Oracle Linux 6 Update 5 UEK R3 Media
baseurl=file:///media/ISOimage/UEK3
gpgkey=file:///media/ISOimage/RPM-GPG-KEY
gpgcheck=1
enabled=1
```

Adjust the value of the `baseurl` and `gpgkey` parameters to match the mount point of the ISO image on your system. If you do not require one of the repositories, set the value of the corresponding `enabled` parameter to 0.

4.4 Applying Updates

Once you have set up the ULN channels, the Oracle Linux yum server repositories, or installation media repositories that `yum` should use, you can update all installed packages by running the following command:

```
# yum update
```

This command upgrades your system to the latest available update of Oracle Linux 6.

You can use the following command to install or update a specific package:

```
# yum update package
```

For example, to install or update the Z-shell package (`zsh`), you would enter:

```
# yum update zsh
```

For more information, see the `yum(8)` manual page.

4.5 Installing the Unbreakable Enterprise Kernel

If the installed system is configured to use the Red Hat Compatible Kernel and the Unbreakable Enterprise Kernel (UEK) is not installed, you can use `yum` to install the `kernel-uek` package:

```
# yum install kernel-uek
```

Installing `kernel-uek` also installs the `kernel-uek-firmware` package on which it depends, and configures the UEK as the default kernel in `/etc/grub.conf`. Reboot the system to use this kernel.

4.6 Upgrading the Unbreakable Enterprise Kernel

Oracle Linux 6 Update 5 and later updates ship with the latest Unbreakable Enterprise Kernel Release 2 (UEK R2) for x86 and Unbreakable Enterprise Kernel Release 3 (UEK R3) for x86_64. If you upgrade your system from the installation media, there are four upgrade scenarios:

- If the UEK Release 2 or Release 3 is not currently installed on the system, only the latest Red Hat Compatible Kernel is installed. The UEK R2 or UEK R3 kernel is not installed.
- If UEK R2 is currently installed on an x86 system, the latest version of the UEK R2 kernel is installed.
- If UEK R2 is currently installed on an x86_64 system, the latest version of the UEK R2 kernel is installed unless you enable the UEK R3 repository.
- If UEK R3 is currently installed on an x86_64 system, the latest version of the UEK R3 kernel is installed.

`yum` uses whatever repositories you have configured on your system to upgrade it. You can find the latest UEK R2 packages in the `ol6_i386_UEK_latest` and `ol6_x86_64_UEK_latest` repositories and the latest UEK R3 packages in the `ol6_UEKR3_latest` repository.

If you want to install the latest UEK R2 kernel on an x86 or x86_64 system, subscribe your system to the `ol6_i386_UEK_latest` or `ol6_x86_64_UEK_latest` channel on ULN, or configure the repository in the appropriate `/etc/yum.repos.d/` file as shown here:

```
[ol6_UEK_latest]
name=Latest Unbreakable Enterprise Kernel for Oracle Linux $releasever ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEK/latest/$basearch/
gpgkey=https://yum.oracle.com/RPM-GPG-KEY-oracle-ol6
gpgcheck=1
enabled=1
```

If you want to update an x86_64 system to use the latest UEK R3 kernel, subscribe your system to the `ol6_x86_64_UEKR3_latest` channel on ULN, or configure the repositories in the appropriate `/etc/yum.repos.d/` file as shown here:

```
[ol6_UEKR3_latest]
name=Latest Unbreakable Enterprise Kernel Release 3 for Oracle Linux $releasever ($basearch)
baseurl=https://yum.oracle.com/repo/OracleLinux/OL6/UEKR3/latest/$basearch/
```

```
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
gpgcheck=1
enabled=1
```

4.7 Configuring the System Firewall

To implement a simple, general-purpose firewall, you can use the Firewall Configuration GUI (`system-config-firewall`) or the text-based version of this tool (`system-config-firewall-tui`) to create basic packet filtering rules. To create a more complex firewall configuration, use the `iptables` and `ip6tables` utilities to configure the rules for IPv4 and IPv6.

For example, the following commands add a permanent IPv4 rule to allow incoming access to TCP port number *N* on a system from the local subnet:

```
# iptables -I INPUT -s subnet_addr/prefix_length -p tcp \
  -m state --state NEW -m tcp --dport N -j ACCEPT
# service iptables save
```

The commands to add a rule for a UDP port are similar:

```
# iptables -I INPUT -s subnet_addr/prefix_length -p udp \
  -m udp --dport N -j ACCEPT
# service iptables save
```

The following table lists some ports that you might need to open in the firewall to allow access to various services.

Service	TCP Ports	UDP Ports
DNS (name service)	53	53
HTTP (web service)	80	
HTTPS (secure web service)	443	
IPP client (network printing)		631
IPP server (network printing)	631	631
Kerberos (authentication)	88, 464, 749	88, 464, 749
LDAP (directory service)	389	
LDAPS (LDAP over SSL)	636	
SMTP (email transport)	25	
SSH (secure shell)	22	
NFSv2 and NFSv3	111, 662*, 892*, 2049, 32803*	111, 662*, 892*, 2049, 32769*
NFSv4	2049	-
NIS (administrative databases)	111, 834	111, 834
OCFS2 (cluster file system)	7777	7777
Samba	139, 445	137, 138

* These ports used by NFSv2 and NFSv3 are determined by settings in `/etc/sysconfig/nfs` for `LOCKD_TCPPORT`, `LOCKD_UDPPORT`, `MOUNTD_PORT`, and `STATD_PORT`.

4.8 Changing the SELinux Mode

You can set the default and current SELinux mode in the Status view of the SELinux Administration GUI (`system-config-selinux`).

Alternatively, to display the current mode, use the `getenforce` command:

```
# getenforce
Enforcing
```

To set the current mode to `Enforcing`, enter:

```
# setenforce Enforcing
```

To set the current mode to `Permissive`, enter:

```
# setenforce Permissive
```

The current value that you set for a mode using `setenforce` does not persist across reboots. To configure the default SELinux mode, edit the configuration file for SELinux, `/etc/selinux/config`, and set the value of the `SELINUX` directive to `disabled`, `enabled`, or `permissive`.