Abstract

This manual provides information about how to install and upgrade Oracle Linux 7 systems.

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# Table of Contents

Preface .............................................................................................................. v
1 Pre-installation Configuration ...................................................................... 1
  1.1 System Requirements ........................................................................... 1
  1.2 Obtaining and Preparing Installation Media .......................................... 1
    1.2.1 Preparing CD or DVD Installation Media .................................... 2
    1.2.2 Preparing USB Installation Media ............................................. 2
    1.2.3 Extracting the Contents of the Full Installation ISO Image ............ 3
  1.3 Configuring a Network Installation Server .......................................... 3
    1.3.1 Configuring an Existing NFS Server ......................................... 4
    1.3.2 Configuring an Existing Apache HTTP Server .......................... 5
    1.3.3 Configuring DHCP and TFTP Services to Support PXE Clients . 6
    1.3.4 Configuring Dnsmasq to Support PXE Clients ......................... 9
    1.3.5 Boot Loader Configuration for BIOS-Based PXE Clients .......... 13
    1.3.6 Boot Loader Configuration for UEFI-Based PXE Clients .......... 15
  1.4 Planning an Installation ....................................................................... 16
2 Installing Oracle Linux Manually ................................................................. 19
  2.1 Starting the Installation ...................................................................... 19
  2.2 Setting the System Time and Supporting Other Languages ............... 21
  2.3 Selecting the Software to Install ....................................................... 24
  2.4 Configuring the System Storage and Network .................................... 26
  2.5 Completing the Installation ................................................................ 30
3 Options for Installation .............................................................................. 35
  3.1 Installation Boot Options ..................................................................... 35
  3.2 Automated Installation Using Kickstart ............................................ 38
    3.2.1 Creating a Kickstart File ......................................................... 38
    3.2.2 Using a Kickstart File to Install a System ............................... 41
  3.3 Text-Based Installations ..................................................................... 41
  3.4 Installing a System With a Btrfs Root File System ............................. 42
  3.5 Using a Driver Update Disk ................................................................ 44
4 Upgrading an Oracle Linux System ............................................................... 47
  4.1 Conditions for Performing an Inplace Upgrade ................................... 47
  4.2 Performing an Inplace Upgrade .......................................................... 47
5 Post-installation Configuration .................................................................. 51
  5.1 Registering with the Unbreakable Linux Network ............................... 51
  5.2 Obtaining Errata and Updates from the Oracle Linux Yum Server .... 51
  5.3 Obtaining Packages from the Oracle Linux Installation Media .......... 52
  5.4 Applying Updates ............................................................................. 52
  5.5 Managing a System ........................................................................... 52
6 Troubleshooting ......................................................................................... 55
  6.1 Troubleshooting Menu Options ............................................................ 55
  6.2 Debug and Log Information ................................................................ 55
Preface

The *Oracle Linux Installation Guide* provides information about how to install and upgrade Oracle Linux 7 systems.

Audience

This document is intended for administrators who need to install and configure Oracle Linux 7. 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 7, how to obtain the Oracle Linux 7 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 7 manually from a boot image that is available on a CD, DVD, USB memory stick, or hard drive. The packages used for the installation can be available locally or hosted on a network installation server.

- **Chapter 3, Options for Installation** describes some of the options you have for installing Oracle Linux 7 including the boot options that can be used to control the installation and how you can use Kickstart to automate the installation of Oracle Linux.

- **Chapter 4, Upgrading an Oracle Linux System** describes how you can upgrade from a previous Oracle Linux release.

- **Chapter 5, Post-installation Configuration** describes configuration changes that you might make to a system after installation.

- **Chapter 6, Troubleshooting** describes some options for troubleshooting Oracle Linux installations.

Related Documents

The documentation for this product is available at:


Conventions

The following text conventions are used in this document:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>boldface</strong></td>
<td>Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.</td>
</tr>
<tr>
<td><strong>italic</strong></td>
<td>Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.</td>
</tr>
<tr>
<td><strong>monospace</strong></td>
<td>Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.</td>
</tr>
</tbody>
</table>
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Chapter 1 Pre-installation Configuration

Table of Contents

1.1 System Requirements ................................................................. 1
1.2 Obtaining and Preparing Installation Media .................................. 1
  1.2.1 Preparing CD or DVD Installation Media ...................................... 2
  1.2.2 Preparing USB Installation Media .............................................. 2
  1.2.3 Extracting the Contents of the Full Installation ISO Image .............. 3
1.3 Configuring a Network Installation Server .................................... 3
  1.3.1 Configuring an Existing NFS Server .......................................... 4
  1.3.2 Configuring an Existing Apache HTTP Server ............................. 5
  1.3.3 Configuring DHCP and TFTP Services to Support PXE Clients .......... 6
  1.3.4 Configuring Dnsmasq to Support PXE Clients ............................. 9
  1.3.5 Boot Loader Configuration for BIOS-Based PXE Clients ............... 13
  1.3.6 Boot Loader Configuration for UEFI-Based PXE Clients ............... 15
1.4 Planning an Installation ............................................................ 16

This chapter describes the system requirements for Oracle Linux 7, how to obtain the software, how to set up a network installation server, and some general guidelines to help prepare for an installation.

1.1 System Requirements

The system requirements can be found in the release notes for your Oracle Linux 7 release. You should also check the release notes for any known issues with installation.

Oracle Linux 7 includes the Unbreakable Enterprise Kernel (UEK) and Red Hat Compatible Kernel (RHCK). You should also check the release notes for the included UEK release for known issues.

Release note documents can be found in the Oracle Linux 7 documentation library at http://docs.oracle.com/cd/E52668_01/index.html.

For details of x86-based servers certified with Oracle Linux with UEK, see the Hardware Certification List for Oracle Linux and Oracle VM at http://linux.oracle.com/hardware-certifications.

1.2 Obtaining and Preparing Installation Media

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

You can download Oracle Linux installation media from the Oracle Software Delivery Cloud at http://edelivery.oracle.com/linux. Once you have logged in, select the Linux/OVM/VMs check box, select Oracle Linux as the Product and x86 64 bit as the Platform, and then click Continue to search. Select the Media Pack for your Oracle Linux 7 release.

The Media Pack contains the following ISO images:

- **Oracle Linux 7 for x86_64 (64 bit)**
  This ISO image contains everything needed to boot a system and install Oracle Linux.

- **Oracle Linux 7 Boot ISO image for x86_64 (64 bit)**
  This ISO image contains everything needed to boot a system and start an installation. However, to complete the installation, you must specify the location of the packages, for example on a local disk.
Preparing CD or DVD Installation Media

or an NFS share. The Red Hat Compatible Kernel (RHCK) is used during the installation. Both the Unbreakable Enterprise Kernel (UEK) and the RHCK are installed. After installation, the system boots the UEK kernel by default.

**Note**
When installing releases prior to Oracle Linux 7 update 3, UEK Release 3 is used, but from Oracle Linux update 3 onward, the default kernel is UEK Release 4.

- **Oracle Linux 7 Source DVD 1 and 2**

  These ISO images contain the source code for the software packages in the release.

  You can use the full installation ISO image or the boot ISO image to:

  - Create a CD or DVD, see Section 1.2.1, “Preparing CD or DVD Installation Media”
  - Create a bootable USB drive, see Section 1.2.2, “Preparing USB Installation Media”

  The ISO images can be used in a virtual DVD-ROM drive to boot and install an Oracle VM or Oracle VM VirtualBox virtual machine (guest).

  You can use the full installation ISO image to prepare a network location, such as an NFS share or HTTP server directory, for use during an installation. This is typically used when a boot image is used to start an installation. See Section 1.3, “Configuring a Network Installation Server”.

  After installation, you can obtain Oracle Linux packages from the Unbreakable Linux Network (ULN) and the Oracle Yum Server. For more information, see Chapter 5, *Post-installation Configuration*.

### 1.2.1 Preparing CD or DVD Installation Media

Only a recordable DVD has enough storage capacity for the full installation ISO image.

A recordable CD has enough storage capacity for the boot ISO image, but not for the full installation ISO image.

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

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

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

### 1.2.2 Preparing USB Installation Media

If a system's firmware supports booting from a USB drive, you can create a boot image on a USB drive and use this to install Oracle Linux. Depending on the capacity of the USB drive, you can use the full installation ISO image or the boot ISO image to create the bootable USB drive.

To create a bootable USB drive, you can use the `dd` command, or a separate utility that can write an ISO image to a USB drive. The following steps use the `dd` command.

**Caution**
This procedure destroys any existing data on the drive.
To avoid overwriting an existing hard disk partition, ensure that you specify the correct device name for the USB drive. The following procedure assumes that the USB drive is the `/dev/sdb1` device, which might not be the case on your system.

1. Insert a USB drive into an Oracle Linux system.

   If the operating system mounts any file systems on the device, unmount these file systems, for example:

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

2. Use the `dd` command to write the contents of the ISO image file to the USB device.

   ```bash
   # dd if=iso_file_name of=usb_device bs=bytes
   ```

   For example:

   ```bash
   # dd if=./full_image.iso of=/dev/sdb bs=512k
   ```

   You can now remove the USB drive and use it to boot a system.

### 1.2.3 Extracting the Contents of the Full Installation ISO Image

To extract the contents of the Oracle Linux 7 full installation ISO image:

1. Mount the full installation ISO image on a suitable mount point, for example `/mnt`:

   ```bash
   # mount -t iso9660 -o loop full_image.iso /mnt
   ```

2. Extract the contents of the full installation ISO image.

   Ensure that the command you use extracts the `.treeinfo` file at the root of the ISO image, for example:

   ```bash
   # cp -a -T mount_dir output_dir
   ```

   For example, to extract the ISO image mounted on `/mnt` to an NFS share at `/var/OSimage/OL7`:

   ```bash
   # cp -a -T /mnt /var/OSimage/OL7
   ```

   For example, to extract the ISO image mounted on `/mnt` to a web server directory at `/var/www/html/OSimage/OL7`:

   ```bash
   # cp -a -T /mnt /var/www/html/OSimage/OL7
   ```

3. Unmount the DVD image:

   ```bash
   # umount mount_dir
   ```

### 1.3 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 7 installation DVD image (approximately 4.5 GB), and you must configure it to use either NFS or HTTP to serve the image files to the target systems on which you want to install Oracle Linux 7.
To configure a network installation server:

1. Set up an NFS or HTTP server.
   
   Instructions can be found in the Administrator's Guide for your Oracle Linux release:
   - Oracle Linux 7 Administrator's Guide
   - Oracle Linux 6 Administrator's Guide

2. Download the Oracle Linux 7 full installation ISO image.
   
   See Section 1.2, “Obtaining and Preparing Installation Media”.

3. Configure the NFS or HTTP server to act as a network installation server.
   
   - Section 1.3.1, “Configuring an Existing NFS Server”
   - Section 1.3.2, “Configuring an Existing Apache HTTP Server”

4. (Optional) Configure support for installation on PXE clients.
   
   In deployments where multiple systems are installed, it is common to perform a network-based installation by configuring systems to load a PXE boot image from a Trivial File Transfer Protocol (TFTP) server configured on the same network. Dynamic Host Configuration Protocol (DHCP) is used to provide clients with the location of the boot files on a TFTP server.

   If you want to support PXE client installation, configure the Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP) services. See Section 1.3.3, “Configuring DHCP and TFTP Services to Support PXE Clients” or Section 1.3.4, “Configuring Dnsmasq to Support PXE Clients”.

### 1.3.1 Configuring an Existing NFS Server

The instructions in this section are for configuring an NFS share on Oracle Linux 7 systems. Instructions for configuring NFS shares on Oracle Linux 6 systems can be found in the Oracle Linux 6 Administrator's Guide.

To configure an existing NFS server:

1. Create the directory you want to export as the NFS share, for example /var/OSimage/OL7:

   ```
   # mkdir -p /var/OSimage/OL7
   ```

2. Copy the Oracle Linux 7 installation files to the NFS share.

   You can simply copy the full installation ISO image to the NFS share. The installation program is able to detect that the installation source is the full installation ISO image and install from that file.

   If you prefer, you can extract the contents of the full installation ISO image to the NFS share, see Section 1.2.3, “Extracting the Contents of the Full Installation ISO Image”.

3. 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/OL7 for any NFS client on the 192.168.1 subnet:

   ```
   # exportfs -i -o ro 192.168.1.0/24:/var/OSimage/OL7
   ```
Alternatively, edit the `/etc/exports` configuration file and add an entry for the directory, for example:

```
/var/OSimage/OL7  192.168.1.0/24(ro)
```

Then use the `exportfs -ra` command to reload the NFS shares defined in the `/etc/exports` file.

### 1.3.2 Configuring an Existing Apache HTTP Server

The instructions in this section are for configuring an HTTP directory on Oracle Linux 7 systems. Instructions for configuring HTTP directories on Oracle Linux 6 systems can be found in the Oracle Linux 6 Administrator's Guide.

To configure an existing Apache HTTP server:

1. Create the directory that will be used to store the contents of the full installation ISO image.

   Create the directory under the `DocumentRoot` hierarchy that is defined in the HTTP server configuration file (`/etc/httpd/conf/httpd.conf`), for example `/var/www/html/OSimage/OL7`.

   ```
   # mkdir -p /var/www/html/OSimage/OL7
   ```

2. Extract the contents of the full installation ISO image to the HTTP directory.

   See Section 1.2.3, “Extracting the Contents of the Full Installation ISO Image”.

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

   For example:

   ```
   <Directory "/var/www/html/OSimage/OL7">
   Options Indexes FollowSymLinks
   AllowOverride None
   Order allow,deny
   Allow from all
   Require all granted
   </Directory>
   ```

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

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

4. If SELinux is enabled in enforcing mode and you extracted the ISO image to a directory that is not under `/var/www/html`, use the `semanage` and `restorecon` commands to restore the SELinux security context on the extracted files.

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

   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
   ```
See the httpd_selinux(8) manual page for more information.

### 1.3.3 Configuring DHCP and TFTP Services to Support PXE Clients

The DHCP and TFTP services required to install Oracle Linux 7 on PXE clients do not have to run on the same host. If you configure separate DHCP and TFTP servers, the DHCP server must define the TFTP server from which a client can download the boot loader, installation kernel, and initial ram-disk files.

The DHCP and TFTP servers do not have to host the installation packages, you can use a separate network installation source. The TFTP server can define a network installation source from which a client can obtain the installation packages.

**To configure the DHCP service for PXE client installation requests:**

1. Install the dhcp package.
   
   ```
   # yum install dhcp
   ```

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

   ```
   set vendorclass = option vendor-class-identifier;
   option pxe-system-type code 93 = unsigned integer 16;
   set pxetype = option pxe-system-type;
   option domain-name "example.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/grubx64.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 10.0.0/16 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 grubx64.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.

If the server has more that one network interface, the DHCP service uses the `/etc/dhcp/dhcpd.conf` file to determine which interfaces to listen on.

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

```
# systemctl start dhcpd
# systemctl enable dhcpd
```

If you make any changes to `/etc/dhcp/dhcpd.conf`, restart the `dhcpd` service.

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

```
# firewall-cmd --zone=zone --add-port=67-68/udp
# firewall-cmd --zone=zone --add-port=67-68/udp --permanent
```

To configure the TFTP service for PXE client installation requests:

1. Install the `tftp-server` package.

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

2. 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.

3. Obtain the boot loader files.

PXE clients require a boot loader to load the Linux installation kernel (`vmlinuz`).
Configuring DHCP and TFTP Services to Support PXE Clients

For BIOS-based PXE clients, you can use the `pxelinux.0` boot loader available in the `syslinux` package. To install this package:

```
# yum install syslinux
```

For UEFI-based PXE clients, you can use the `grubx64.efi` boot loader available in the `grub2-efi` package. If you need to support Secure Boot on clients, you also need the first-stage boot loader `shim.efi`, available in the `shim` package, so that the boot loader and kernel can be verified. Either download these packages to a temporary location, or copy them from the full installation ISO image. Then extract the contents of the packages:

```
# cd /tmpdir
# rpm2cpio grub2-efi-version.rpm | cpio -idmv
# rpm2cpio shim-version.rpm | cpio -idmv
```

**Note**

If you need to support Secure Boot, make sure you specify `shim.efi` as the boot loader in your DHCP configuration in `/etc/dhcp/dhcpd.conf`.

4. Create the directories used to contain the boot loaders and their configuration files as subdirectories of the TFTP server directory.

For BIOS-based clients, create the `pxelinux/pxelinux.cfg` directories, for example:

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

For UEFI-based clients, create the `efi` directory, for example:

```
# mkdir -p /var/lib/tftpboot/efi
```

5. Copy the boot loader files, the installation kernel (`vmlinuz`), and the ram-disk image file (`initrd.img`) to the TFTP server subdirectories.

For BIOS-based clients, copy the BIOS boot loader file, the installation kernel, and the ram-disk image file to the `pxelinux` directory:

```
# cp /usr/share/syslinux/pxelinux.0 /var/lib/tftpboot/pxelinux
# wget http://10.0.0.11/OSimage/OL7/isolinux/vmlinuz -O /var/lib/tftpboot/pxelinux/vmlinuz
# wget http://10.0.0.11/OSimage/OL7/isolinux/initrd.img -O /var/lib/tftpboot/pxelinux/initrd.img
```

For UEFI-based clients, copy the BIOS boot loader file, the installation kernel, and the ram-disk image file to the `efi` directory:

```
# cp /tmpdir/boot/efi/EFI/redhat/grubx64.efi /var/lib/tftpboot/efi
# cp /tmpdir/boot/efi/EFI/redhat/shim.efi /var/lib/tftpboot/efi
# cp /tmpdir/boot/efi/EFI/redhat/MokManager.efi /var/lib/tftpboot/efi
# wget http://10.0.0.11/OSimage/OL7/isolinux/vmlinuz -O /var/lib/tftpboot/efi/vmlinuz
# wget http://10.0.0.11/OSimage/OL7/isolinux/initrd.img /var/lib/tftpboot/efi/initrd.img
```

**Note**

You only need to copy the `shim.efi` and `MokManager.efi` files if you need to support Secure Boot on clients. The `MokManager.efi` provides utilities for managing the keys used to sign EFI binaries.

The above examples use HTTP to obtain the installation kernel and ram-disk images files from a separate network installation server. You could use a local copy of the files if the TFTP server also hosts the installation packages.
To be able to install different operating system versions on PXE clients, you can rename the kernel and ram-disk image files, for example to `vmlinuz-ol7` and `initrd-ol7.img`. Alternatively, you could copy the kernel and ram-disk image files to subdirectories such as `efi/ol7` and `pxelinux/ol7`.

6. Create the boot loader configuration files.

As a minimum, you should create the default boot loader configuration files:

```
pxelinux/pxelinux.cfg/default
```

Default boot loader configuration file for BIOS-based PXE clients.

```
efi/grub.cfg
```

Default boot loader configuration file for UEFI-based PXE clients.

You can create additional client-specific boot loader configuration files in either `pxelinux/pxelinux.cfg` or `efi`, depending on whether the client is BIOS or UEFI-based. For more information, see:

- Section 1.3.5, “Boot Loader Configuration for BIOS-Based PXE Clients”
- Section 1.3.6, “Boot Loader Configuration for UEFI-Based PXE Clients”

7. If SELinux is enabled in enforcing mode on your system and you configured 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
```

See the `tftpd_selinux(8)` manual page for more information.

---

**Note**

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

8. Enable the TFTP network socket, and configure it to start after a reboot.

```
# systemctl start tftp.socket
# systemctl enable tftp.socket
```

You do not need to restart the TFTP service if you change the content of boot loader configuration files.

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

```
# firewall-cmd --zone=zone --add-service=tftp
# firewall-cmd --zone=zone --add-service=tftp --permanent
```

---

**1.3.4 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](http://www.thekelleys.org.uk/dnsmasq/doc.html).
The dnsmasq server does not have to host the installation packages, you can use a separate network installation source.

**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=em1
   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
   dhcp-match=set:efi-x86_64,option:client-arch,7
   dhcp-boot=tag:efi-x86_64,grubx64.efi
   enable-tftp
   tftp-root=/var/lib/tftpboot
   ```

   The lines in the sample configuration file do the following:

   ```
   interface=em1
   ```

   Listen for incoming client requests on interface `em1` 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, in this case for BIOS-based PXE clients.

   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
   ```

   ```
   dhcp-boot=tag:efi-x86_64,grubx64.efi
   ```

   Specify the location of the boot loader file required by PXE clients identified with the tag `efi-x86_64`, in this case UEFI-based PXE clients. The `efi-x86_64` tag is defined by the
Configuring Dnsmasq to Support PXE Clients

dhcp-match=set:efi-x86_64 line, which applies the tag to UEFI-based x86_64 clients (architecture code 7).

This example specifies the grubx64.efi boot loader. If you need to support Secure Boot on UEFI clients, specify shim.efi as the boot loader.

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=tag:efi-x86_64,grubx64.efi,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.

For information on how to configure a separate TFTP server, see Section 1.3.3, “Configuring DHCP and TFTP Services to Support PXE Clients”.

3. 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 nm-tui 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

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

# systemctl start dnsmasq
# systemctl enable dnsmasq

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.

5. Configure the firewall.

   - Configure the firewall to accept DHCP requests, for example:

   # firewall-cmd --zone=zone --add-port=67-68/udp
   # firewall-cmd --zone=zone --add-port=67-68/udp --permanent

   - If you enable the TFTP service in dnsmasq, configure the firewall to accept TFTP requests, for example:

   # firewall-cmd --zone=zone --add-service=tftp
   # firewall-cmd --zone=zone --add-service=tftp --permanent

   - If you want dnsmasq to act as a caching-only name server, configure the firewall to accept DNS requests:

   # firewall-cmd --zone=zone --add-service=dn
To configure the dnsmasq TFTP service for PXE client installation requests:

1. Obtain the boot loader files.

PXE clients require a boot loader to load the Linux installation kernel (`vmlinuz`).

For BIOS-based PXE clients, you can use the `pxelinux.0` boot loader available in the `syslinux` package. To install this package:

```bash
# yum install syslinux
```

For UEFI-based PXE clients, you can use the `grubx64.efi` boot loader available in the `grub2-efi` package. If you need to support Secure Boot on clients, you also need the first-stage boot loader `shim.efi`, available in the `shim` package, so that the boot loader and kernel can be verified. Either download these packages to a temporary location, or copy them from the full installation ISO image. Then extract the contents of the packages:

```bash
# cd /tempdir
# rpm2cpio grub2-efi-version.rpm | cpio -idmv
# rpm2cpio shim-version.rpm | cpio -idmv
```

**Note**

If you need to support Secure Boot, make sure you specify `shim.efi` as the boot loader in your DHCP configuration in `/etc/dnsmasq.conf`.

2. Create the directories used to contain the boot loaders and their configuration files as subdirectories of the TFTP server directory.

   For BIOS-based clients, create the `pxelinux/pxelinux.cfg` directories, for example:

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

   For UEFI-based clients, the dnsmasq TFTP server expects the boot loaders and configuration files to be in the root directory, for example `/var/lib/tftpboot`. You should ensure that this directory exists.

3. Copy the boot loader files, the installation kernel (`vmlinuz`), and the ram-disk image file (`initrd.img`) to the TFTP server subdirectories.

   For BIOS-based clients, copy the BIOS boot loader file, the installation kernel, and the ram-disk image file to the `pxelinux` directory:

   ```bash
   # cp /usr/share/syslinux/pxelinux.0 /var/lib/tftpboot/pxelinux
   # wget http://10.0.0.11/OSimage/OL7/isolinux/vmlinuz -O /var/lib/tftpboot/pxelinux/vmlinuz
   # wget http://10.0.0.11/OSimage/OL7/isolinux/initrd.img -O /var/lib/tftpboot/pxelinux/initrd.img
   ```

   For UEFI-based clients, copy the UEFI boot loader files, the installation kernel, and the ram-disk image file to the root directory of the TFTP server:

   ```bash
   # cp /tempdir/boot/efi/EFI/redhat/grubx64.efi /var/lib/tftpboot
   # cp /tempdir/boot/efi/EFI/redhat/shim.efi /var/lib/tftpboot
   # cp /tempdir/boot/efi/EFI/redhat/MokManager.efi /var/lib/tftpboot
   # wget http://10.0.0.11/OSimage/OL7/isolinux/vmlinuz -O /var/lib/tftpboot/vmlinuz
   # wget http://10.0.0.11/OSimage/OL7/isolinux/initrd.img -O /var/lib/tftpboot/initrd.img
   ```
Note

You only need to copy the shim.efi and MokManager.efi files if you need to support Secure Boot on clients. The MokManager.efi provides utilities for managing the keys used to sign EFI binaries. Depending on your Grub 2 configuration, you could copy the installation kernel, and the ram-disk image file to a subdirectory.

The above examples use HTTP to obtain the installation kernel and ram-disk images files from a separate network installation server. You could use a local copy of the files if the dnsmasq server also hosts the installation packages.

To be able to install different operating system versions on PXE clients, you can rename the kernel and ram-disk image files, for example to vmlinuz-ol7 and initrd-ol7.img. Alternatively, you could copy the kernel and ram-disk image files to subdirectories such as efi/ol7 and pxelinux/ol7.

4. Create the boot loader configuration files.

As a minimum, you should create the default boot loader configuration files:

pxelinux/pxelinux.cfg/default

Default boot loader configuration file for BIOS-based PXE clients.

grub.cfg

Default boot loader configuration file for UEFI-based PXE clients.

You can create additional client-specific boot loader configuration files in either pxelinux/pxelinux.cfg or to the root directory of the TFTP server, depending on whether the client is BIOS or UEFI-based. For more information, see:

• Section 1.3.5, “Boot Loader Configuration for BIOS-Based PXE Clients”

• Section 1.3.6, “Boot Loader Configuration for UEFI-Based PXE Clients”

5. If SELinux is enabled in enforcing mode on your system and you configured 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.

1.3.5 Boot Loader Configuration for BIOS-Based PXE Clients

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 ol7
timeout 0
```
Boo
t Loader Configuration for BIOS-Based PXE Clients

label ol7
kernel vmlinuz
append inst.repo=http://10.0.0.11/OSimage/OL7 inst.ks.sendmac inst.ks=http://10.0.0.11/ksfiles/ol7_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, ol7.

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 a Kickstart file.

The kernel and ram-disk image file paths are assumed to be relative to the subdirectory that contains the boot loader, for example pxelinux. If you place the vmlinuz and initrd.img files in a subdirectory such as pxelinux/OL7, ensure you have the correct relative paths.

If you want to display the boot loader configuration as a menu on the screen, you can use the menu.c32 module. To do this:

1. Copy the menu.c32 module to the boot loader directory:

   ```
   # cp /usr/share/syslinux/menu.c32 /var/lib/tftpboot/pxelinux
   ```

2. Edit the boot loader configuration to use the module, for example:

   ```
   default menu.c32
   timeout 0

   menu title Install Oracle Linux
   label Install Oracle Linux 7
   kernel vmlinuz
   append instrd-initrd.img inst.repo=http://10.0.0.11/OSimage/OL7 inst.ks.sendmac inst.ks=http://10.0.0.11/ksfiles/ol7_cfg.ks
   ```

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).

Note

The file name must use lowercase characters for the MAC address.

- A client's IP address expressed in hexadecimal without any leading 0x (for example, 0A0000FD represents the IP address 10.0.0.253).

To reduce the number of configuration files, you can group clients by IP address range, for example 0A0000E represents the IP address range 10.0.0.224 through 10.0.0.239.

Place the configuration files in pxelinux/pxelinux.cfg.

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, 0A000F)
- Most significant 24 bits of the IP address (for example, 0A000)
- Most significant 20 bits of the IP address (for example, 0A00)
- Most significant 16 bits of the IP address (for example, 0A0)
- Most significant 12 bits of the IP address (for example, 0A)
- Most significant 8 bits of the IP address (for example, 0A)
- Most significant 4 bits of the IP address (for example, 0)
- **default** (the default configuration file)

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

```
# ln master-ol7 0A0000FC
# ln master-ol7 0A0000FD
# ln master-ol7 0A0000FE
```


For information about configuring and using Kickstart to perform automated installation, see Section 3.2, “Automated Installation Using Kickstart”.

### 1.3.6 Boot Loader Configuration for UEFI-Based PXE Clients

The `grub.cfg` file is the default boot loader configuration file for UEFI-based PXE clients and uses GRUB 2 configuration settings:

```
set default 0
set timeout=10

menuentry 'ol7' {
    echo "Loading efi/vmlinuz"
    linuxefi efi/vmlinuz inst.repo=http://10.0.0.11/OSimage/OL7 inst.ks.sendmac \
    inst.ks=http://10.0.0.11/ksfiles/ol7_cfg.ks
    echo "Loading efi/initrd.img"
    initrdefi efi/initrd.img
    echo "Booting installation kernel"
}
```

The `linuxefi` directive defines the name of the kernel executable and defines any parameters that should be appended when loading the kernel, such as the location of the installation packages, and how to access these packages. This example uses HTTP to install the packages from the specified URL. The `initrdefi` directive defines the name of the ram-disk image.

The kernel and ram-disk image file paths are assumed to be relative to the subdirectory that contains the boot loader, for example `efi`. If you place the `vmlinuz` and `initrd.img` files in a subdirectory such as `efi/OL7`, ensure you have the correct relative paths.

By default, GRUB 2 does not provide any indication that is transferring the kernel and ram-disk images files. The `echo` statements in the example above provide a simple indication of progress.
Planning an Installation

To support different types of client, you can create a configuration file named *grub2.cfg-client-ID* where *client-ID* is one of the following:

- 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*).

  **Note**

  The file name must use lowercase characters for the MAC address.

- A client's IP address expressed in hexadecimal without any leading 0x (for example, *0A0000FD* represents the IP address 10.0.0.253).

  To reduce the number of configuration files, you can group clients by IP address range, for example *0A0000E* represents the IP address range 10.0.0.224 through 10.0.0.239.

Place the configuration files in the same directory as the boot loader files, for example *efi*.

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

- *01-MAC_address* (for example, *grub.cfg-01-80-00-27-c6-a1-16*)
- Full 32 bits of the IP address (for example, *grub.cfg-0A0000FD*)
- Most significant 28 bits of the IP address (for example, *grub.cfg-0A0000F*)
- Most significant 24 bits of the IP address (for example, *grub.cfg-0A0000*)
- Most significant 20 bits of the IP address (for example, *grub.cfg-0A000*)
- Most significant 16 bits of the IP address (for example, *grub.cfg-0A00*)
- Most significant 12 bits of the IP address (for example, *grub.cfg-0A0*)
- Most significant 8 bits of the IP address (for example, *grub.cfg-0A*)
- Most significant 4 bits of the IP address (for example, *grub.cfg-0*)
- *grub.cfg* (the default configuration file)

If several configuration files have identical content, you can use the *ln* command to link the files to a master copy, for example:

```
# ln master-ol7 grub.cfg-0A0000FC
# ln master-ol7 grub.cfg-0A0000FD
# ln master-ol7 grub.cfg-0A0000FE
```

For more information about GRUB 2, enter the *info grub* command to access the GRUB 2 manual.

For information about configuring and using Kickstart to perform automated installation, see Section 3.2, “Automated Installation Using Kickstart”.

### 1.4 Planning an Installation

Planning for an installation helps to ensure that the resulting system is ready for its intended use. Use the information in *Chapter 2, Installing Oracle Linux Manually* to familiarize yourself with the installation process.
The following are the main considerations when planning to install a system:

**Storage**

The storage devices on which you intend to install the operating system, such as a local hard disk. If the storage devices are already partitioned, identify the partitions that can be used for the installation. The installation program indicates how much disk space is required, and warns you if there is insufficient space.

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.

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.

For iSCSI or FCoE connections, the WWID or the port, target, and LUN to be used.

**Network**

The network interface to use for installation (if any), and its IP address, netmask, and gateway settings if you do not use DHCP.

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

Any other network interface to be configured during installation, and their IP address, netmask, and gateway settings if you do not use DHCP.

Any specialized network interfaces to be configured during installation, such as VLANs and bonds.

**Software**

The software packages that should be installed on the system as determined by the system's intended purpose, such as a web server.

The URLs of any additional repositories and the proxy settings to be used to install packages.
Chapter 2 Installing Oracle Linux Manually

Table of Contents

2.1 Starting the Installation .......................................................... 19
2.2 Setting the System Time and Supporting Other Languages .......... 21
2.3 Selecting the Software to Install .................................................. 24
2.4 Configuring the System Storage and Network .............................. 26
2.5 Completing the Installation ......................................................... 30

This chapter describes how to perform a basic Oracle Linux installation using a CD, DVD, or a USB drive.

2.1 Starting the Installation

To install Oracle Linux, you need to 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 boot image file, the boot menu appears, as shown in Figure 2.1.

Figure 2.1 Boot Menu

The boot menu contains the following options:

Install Oracle Linux 7.x
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, see Section 3.3, “Text-Based Installations”.

Test this media & install Oracle Linux 7.x
Tests the installation media and then 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.
Starting the Installation

This is the default option.

**Troubleshooting**

Provides access to a separate menu which contains options for resolving issues with installing or booting an Oracle Linux 7 system, see Section 6.1, "Troubleshooting Menu Options".

Use the up and down arrow keys to navigate the boot menu. To install Oracle Linux 7, select one of the options to install Oracle Linux and press Enter. The Welcome to Oracle Linux 7 screen is displayed. **Figure 2.2** shows the options on this screen.

**Figure 2.2 Welcome to Oracle Linux 7**

In the left-hand box, use the mouse to select the language to use for the installation, or type the name of the language in the search box. In the right-hand box, select a locale. The language you select becomes the default language for the system. If you need to, you can change the default language after you have installed the software.

Click **Continue**, the Installation Summary screen is displayed. **Figure 2.3** shows the options on this screen.
2.2 Setting the System Time and Supporting Other Languages

This section describes how to use the options in the Localization section of the Installation Summary screen.

Setting the System Time

To set the correct time for the system, click the Date & Time option on the Installation Summary screen to display the Date & Time screen. Figure 2.4 shows the options on this screen.
Figure 2.4 Date & Time

Pick a region and city from the drop-down lists, or by clicking a location on the map. 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) to set the time on the system.

Before you can enable NTP, ensure that the system is connected to a network by selecting the **Network & Hostname** option on the Installation Summary screen (see Configuring the Host Name and Connecting to a Network). To enable NTP, move the **Network Time** switch to the ON position and click the **Settings** button to display a dialog where you can configure the NTP servers that the system should use.

To set the date and time manually, ensure the **Network Time** switch is in the OFF position, and then adjust the date and time at the bottom of the screen if needed.

Click **Done** to save your configuration and return to the Installation Summary screen.

Adding Keyboard Layouts

To add support for any additional keyboards that will be used with the system, click the **Keyboard** option on the Installation Summary screen to display the Keyboard Layout screen. Figure 2.5 shows the options on this screen.
Figure 2.5 Keyboard Layout

Click the + button to display a dialog where you can select the additional keyboard layouts you want to install on the system. To check a keyboard layout:

- Select the keyboard in the list and click the Keyboard button at the bottom of the screen to display a picture of the layout.
- Click the keyboard icon at the top of the screen to change the current keyboard, then click in the box on the right, and type some text.

If you add multiple keyboard layouts, the first keyboard shown in the list of keyboards is the default keyboard. Use the arrow buttons to change the order of the list. You should also click Options and configure the keyboard shortcut for switching between layouts.

Click Done to save your configuration and return to the Installation Summary screen.

Adding Language Support

To add support for any additional locales that will be used with the system, click the Language Support option on the Installation Summary screen to display the Language Support screen. Figure 2.6 shows the options on this screen.
Figure 2.6 Language Support

Select a language in the left-hand box, or type in the search box, and then select one or more locales in the right-hand box.

Click **Done** to save your configuration and return to the Installation Summary screen.

### 2.3 Selecting the Software to Install

This section describes how to use the options in the Software section of the Installation Summary screen.

#### Selecting the Full Installation Image

When you install Oracle Linux, you need to specify a location that contains the full installation image. To specify a location, click the **Installation Source** option on the Installation Summary screen to display the Installation Source screen. Figure 2.7 shows the options on this screen.
Select the location of the full installation image, as follows:

**Auto-detected installation media**

This option is only available if the installation program detected a local device that contains the full installation image. If you did not check the installation media when you started the installation, click **Verify** to check the media.

**ISO file**

This option is only available if the installation program detected a local hard drive that can be mounted. Select the device in the **Drive** list, and then click **Choose an ISO** to select an ISO image. Click **Verify** to check the media.

**On the network**

Select the network protocol required to access a network installation server from the list and then enter either:

- For HTTP or HTTPS, the URL of the installation image.
  
  If needed, click **Proxy setup** and configure the details for your organization's proxy server that acts as an intermediary for Internet access.

- For NFS and FTP, the domain name or IP address of the server and the path to the directory that contains the installation image.

  For NFS, the path can be the path to an ISO image. Enter any **NFS mount options** that are required.

  To use a network location, ensure that the system is connected to a network (see Configuring the Host Name and Connecting to a Network) otherwise the installation program reports an error.

You can also use the + button to specify additional repositories containing software you want to install. The **Server-HighAvailability** and **Server-Resilient Storage** repositories listed contains upstream high availability packages and are not supported in Oracle Linux 7.
Click **Done** to save your configuration and return to the Installation Summary screen.

**Selecting the Software to Install**

To select the software you want to install on the system, click the **Software Selection** option on the Installation Summary screen to display the Software Selection screen. Figure 2.8 shows the options on this screen.

**Figure 2.8 Software Selection**

<table>
<thead>
<tr>
<th>Base Environment</th>
<th>Add-Ons for Selected Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Minimal Install</td>
<td>□ Debugging Tools</td>
</tr>
<tr>
<td>□ Infrastructure Server</td>
<td>Tools for debugging misbehaving applications and diagnosing performance problems.</td>
</tr>
<tr>
<td>□ File and Print Server</td>
<td>□ Compatibility Libraries</td>
</tr>
<tr>
<td>□ Basic Web Server</td>
<td>Compatibility libraries for applications built on previous versions of Oracle Linux.</td>
</tr>
<tr>
<td>□ Virtualization Host</td>
<td>□ Development Tools</td>
</tr>
<tr>
<td>□ Server with GUI</td>
<td>A basic development environment.</td>
</tr>
<tr>
<td></td>
<td>□ Security Tools</td>
</tr>
<tr>
<td></td>
<td>Security tools for integrity and trust verification.</td>
</tr>
<tr>
<td></td>
<td>□ Smart Card Support</td>
</tr>
<tr>
<td></td>
<td>Support for using smart card authentication.</td>
</tr>
</tbody>
</table>

The screen is in two parts, the Base Environment on the left and the Add-Ons for Selected Environment on the right. In the Base Environment part, you select an environment that best matches what the system will be used for. In the Add-Ons part, you select the software you want to add to the selected Base Environment.

The Minimal Install base environment is the default environment. It contains only the minimum set of packages required to run Oracle Linux and does not include many administration tools that you might normally use, such as `wget` or `unzip`. This environment is the most secure environment to install and requires the least system resources to run. After the software is installed, you can install any other packages you require.

The Server with GUI base environment is the only environment that displays a graphical desktop when the system boots. All other base environments boot into a command-line environment.

By default, the Server with GUI base environment installs the Gnome 3 desktop. If you want an alternative desktop, select KDE as an add-on.

Click **Done** to save your configuration and return to the Installation Summary screen.

**2.4 Configuring the System Storage and Network**

This section describes how to use the options in the System section of the Installation Summary screen.
Choosing Where to Install the Software and Configuring Storage

To choose where to install the software and to configure the storage, click the **Installation Destination** option on the Installation Summary screen to display the Installation Destination screen. Figure 2.9 shows the options on this screen.

**Figure 2.9 Installation Destination**

![Installation Destination](image)

On this screen, you select the local disks and other storage you want to use for the installation, and configure the partitioning and file system types you want to use. The installation program does not make any changes to any of the disks and storage until you click **Begin Installation** on the Installation Summary screen.

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

- In the Local Standard Disks section, select the local disks you want to use for the installation by clicking on them. A tick icon is displayed next to the disks you have selected.
- In the Specialist & Network Disks section, you can select hardware RAID, iSCSI or Fibre Channel over Ethernet (FCoE) storage devices. Click **Add Disk** to display the options for adding and configuring these device types.

Next, select how you want to partition the selected disks automatically or manually. By default, the **Automatically configure partitioning** option is selected. Automatic disk partitioning creates the following layout on the selected disks:

- A 500 MB standard partition for an XFS file system mounted at `/boot`.
- A 200 MB EFI system partition mounted at `/boot/efi` (UEFI-based systems only).
- A partition in the remaining disk space configured as a Logical Volume Manager (LVM) physical volume for an LVM volume group that contains:
  - A logical volume for an XFS file system for the root file system (`/`).
  - A logical volume for an XFS file system for the `/home` file system (if the selected disks are larger than 50 GB in total).
Choosing Where to Install the Software and Configuring Storage

- A logical volume for a swap partition.

With automatic partitioning, you might not have sufficient space to install the software if the disk is already partitioned. The information at the bottom of the screen tells you how much disk space is needed for the software you have selected. To free some disk space, select I would like to make additional space available and click Done. The Reclaim Disk Space window is displayed, as shown in Figure 2.10. You are also prompted to free disk space if you click Done and there is insufficient space.

**Figure 2.10 Reclaim Disk Space**

Select the partitions you want to use, then click Delete, Shrink, or Delete all to free disk space, and then click Reclaim Space.

If you want full control over how the disks are partitioned or the file system types used, you must partition the disks manually by selecting I will configure partitioning. The options for partitioning are displayed when you click Done. You can partition disks using standard partitions, btrfs, LVM logical volumes, or LVM thin provisioning. For an example of how to partition disks manually, see Section 3.4, “Installing a System With a Btrfs Root File System”

If you select Encrypt my data on the Installation Destination screen, you are prompted to enter a passphrase for the encryption when you click Done. This option encrypts all the disk partitions, except the partition that contains /boot, using Linux Unified Key Setup (LUKS). If a partition is encrypted, you cannot access data on the partition without entering the passphrase. If you lose this passphrase, you cannot recover the data on the disk. If you only want to encrypt particular partitions, you must partition the disks manually.

Oracle Linux uses Grand Unified Bootloader version 2 (GRUB 2) as the boot loader. The boot loader runs when the system starts and loads the kernel, without the need for boot media. By default, GRUB 2 is installed in either the master boot record (MBR) or the GUID partition table of the device that contains the root (/) file system. Click Full disk summary and bootloader to change the location of GRUB 2 or to prevent its installation. For UEFI-based systems, the GPT is always used. For BIOS-based systems
Configuring Kdump

(including UEFI-based systems in legacy BIOS mode), by default the MBR is used if the disk size is less than 2 TB, otherwise the GPT is used.

Click **Done** to save your configuration and return to the Installation Summary screen.

**Configuring Kdump**

To configure Kdump, click the **Kdump** option on the Installation Summary screen, the Kdump window is displayed. **Figure 2.11** shows the options on this screen.

**Figure 2.11 Kdump**

![Kdump configuration window]

In the event of a system crash, Kdump captures information that assists in determining the cause. By default, Kdump is enabled and the amount of memory reserved for Kdump is calculated automatically. Select **Manual** if you want to set the amount of reserved memory yourself.

Click **Done** to save your configuration and return to the Installation Summary screen.

**Configuring the Host Name and Connecting to a Network**

The installation program does not force you to configure the system's network interfaces and, for some types of installation, network connections are disabled by default. To connect the system to a network either during installation or when the system boots, click **Network & Hostname** option on the Installation Summary screen to display the Network & Hostname screen. **Figure 2.12** shows the options on this screen.

**Figure 2.12 Network**

![Network configuration screen]
To enable a network interface, select the interface in the list of interfaces and then move the switch to the ON position. By default, the IP settings for a network interface are configured automatically using DHCP for IPv4, and the Automatic method for IPv6. To edit the connection, click **Configure** to display the connection settings window as shown in Figure 2.13.

**Figure 2.13 Network Connection Settings**

To enable the connection whenever the network is available, select **Automatically connect to this network when it is available** on the General tab. Use the settings on the other tabs to configure the connection. For example, to set a static IPv4 address, click **IPv4 Settings** and select **Manual** for the Method, and then enter values for the IP address, network mask, gateway, and DNS parameters. When you have finished configuring the connection, click **Save**.

On the Network & Hostname screen, enter the host name of the system as either as a single name or as a fully-qualified domain name (FQDN), for example, `host01.example.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.

You can also add special network devices such as an interface bond or team, or a VLAN (virtual local area network) device. Click the + button to access the settings for configuring these devices.

Click **Done** to save your configuration and return to the Installation Summary screen.

### 2.5 Completing the Installation

Once you have selected all your installation configuration options, click **Begin Installation** on the Installation Summary screen to start the installation. The Configuration screen is displayed. Figure 2.14 shows the options on this screen.
Setting the Root Password

Figure 2.14 User Settings

The screen contains a menu with two options for configuring users and a status bar that shows the progress of the installation. You can use the menu options while the installation is in progress. You must set the root password to finish the installation. Creating a user is optional, you can do it now or when the installation is complete. It is best to create a user, as you should not log in to the system as the root user.

If you want users to authenticate using a mechanism such as LDAP or Kerberos, you need to configure this when the installation is complete.

Setting the Root Password

Click Root Password to display the Root Password screen. Figure 2.15 shows the options on this screen.

Figure 2.15 Root Password

Enter the root password in the Root Password and Confirm fields. The screen provides a visual indication about the strength of the password. Click Done to return to the Configuration screen. If you set a weak password, you have to click Done twice.

Creating a User

Click User Creation to display the Create User screen. Figure 2.16 shows the options on this screen.

Figure 2.16 Create User

Enter the details of the local user account you want to create. Again there is a visual indication about the strength of the password.
Select **Make this user administrator** if you want the user to be able to administer the system. Selecting this option adds the user to the **wheel** user group, which enables them to run administrative tools using the **sudo** command.

If you want more control over how the user is configured, for example to specify the user's home directory or user ID, click **Advanced**.

Once you have configured the user, click **Done** to return to the Configuration screen. If you set a weak password, you have to click **Done** twice.

**Rebooting and Initial Setup**

Once you have completed the user configuration, click **Finish Configuration**. When the packages are installed, click **Reboot**.

If you installed a base environment other than the Server with GUI environment, the system reboots as a non-graphical system and displays a login prompt. Once you log in, you can review the license agreement at /usr/share/oraclelinux-release/EULA.

If you installed the Server with GUI environment, the system reboots and the Initial Setup screen is displayed. **Figure 2.17** shows the options on this screen.

**Figure 2.17 Initial Setup**

![Initial Setup Screen](image)

You must select the License Information option and accept the license agreement. The User Creation option is only displayed if you did not create a user during installation. If you create a user here, the options for creating a user are the same as during the installation.

Click **Finish Configuration**, the Set Up Software Updates window is displayed, as shown in **Figure 2.18**.
If the system has an active network connection, you use the following screens to register your system with the Unbreakable Linux Network (ULN), and to subscribe the system to software and Ksplice updates. Click Finish. The graphical login screen is displayed.
Chapter 3 Options for Installation

Table of Contents

3.1 Installation Boot Options .................................................................................. 35
3.2 Automated Installation Using Kickstart ............................................................... 38
  3.2.1 Creating a Kickstart File .............................................................................. 38
  3.2.2 Using a Kickstart File to Install a System .................................................. 41
3.3 Text-Based Installations ..................................................................................... 41
3.4 Installing a System With a Btrfs Root File System ............................................. 42
3.5 Using a Driver Update Disk ............................................................................... 44

This chapter describes some of the options you have for installing Oracle Linux 7.

3.1 Installation Boot Options

You can specify options for an installation by editing the boot command line, for example to specify the
network settings. You access the boot command line by selecting an installation option in the boot menu
and then press either the E key (UEFI systems) or the Tab key (BIOS systems). A prompt is displayed
which enables you to edit the boot options already defined and to add your own options.

Note

On BIOS systems, you can press the Esc key instead of the E key, a boot: prompt
is displayed, which does not contain any predefined boot options. You must enter
linux to load the predefined boot options before appending your own options.

When you edit the boot command line, separate each boot option with a space. Some options have
parameters, which must be specified with the option=parameter syntax.

To discard your changes and return to the boot menu, press Esc. To start the installation using the
customized boot options, press either Ctrl+X (UEFI systems) or Return (BIOS systems).

In the following example, boot options are used to specify that the installation should use the full installation
ISO image stored on an NFS share, that the installation should be automated using a Kickstart file stored
on an NFS share, and that the network interfaces should be configured using DHCP:

sta.repo=nfs:nfs.example.com:/ISOs/OL7/full_image.iso \
inst.ks=nfs:nfs.example.com:/Kickstart/OL7/server-ks.cfg ip=dhcp

For a list of the available boot options, see:

• Installation program boot options: https://rhinstaller.github.io/anaconda/boot-options.html.
• Dracut kernel command line options: see the dracut.cmdline(7) manual page.

Note

If you are upgrading from a previous release, check the above documentation for
removed and deprecated boot options. Starting with the Oracle Linux 7 release, an
inst. prefix has been added to the installation program boot options, but the prefix
is currently not enforced.

The following are some of the most commonly-used boot options.
Boot Options for Specifying the Installation Type

inst.graphical
   Specifies a graphical-based installation.

inst.text
   Specifies a text-based installation, see Section 3.3, “Text-Based Installations”.

Boot Options for Specifying the Installation Source

inst.repo=cdrom[:device]
   Specifies a CD or DVD drive as the location that contains everything needed to install the software.
   The installation program searches all the system’s CD or DVD drives, unless a device is specified.
   If access to a network is required and no network boot options are specified, the installation program enables DHCP on all available network devices.

inst.repo=ftp://user:password@FTP_server/path
   Specifies an FTP server as the location that contains everything needed to install the software.
   If access to a network is required and no network boot options are specified, the installation program enables DHCP on all available network devices.

inst.repo=hd:device:path
   Specifies a local disk as the location that contains everything needed to install the software.
   You can specify the device by its device name (sdb2), label (LABEL=label), or UUID (UUID=uuid).

inst.repo=[http:|https://]HTTP_server/path
   Specifies a web server as the location that contains everything needed to install the software.

inst.repo=nfs:[options:]NFS_server:path
   Specifies an NFS share as the location that contains everything needed to install the software.
   Use options to specify a comma-separated list of NFS mount options.
   The NFS share can be the path to an ISO image or a directory.

Boot Options for Configuring the Network

ip=[interface:]dhcp|dhcp6|auto6|ibft
   Specifies a network automatic configuration method. If interface is not specified, all interfaces are configured. Use ibft to use the MAC address of the interface specified by the iSCSI Boot Firmware Table (iBFT) in the system BIOS or firmware.

ip=ip::gateway:netmask:hostname:interface:none
   Specifies a static IP configuration for interface. Enclose IPv6 addresses in square brackets, for example [2509:f0d0:1001::0004].

nameserver=IP
   Specifies the IP address of a DNS server to use during installation. Multiple nameserver options can be used.
Installation Boot Options

bootdev=interface

Specifies the primary network interface. Required if you use more than one ip option.

inst.dhcpclass

Specifies a vendor class identifier to DHCP.

Boot Options for Kickstart Installations

inst.ks=cdrom[:device]/path

Specifies a Kickstart file on a CD or DVD drive.

inst.ks=ftp://user:password@FTP_server/path

Specifies a Kickstart file on an FTP server.

inst.ks=hd:device:path

Specifies a Kickstart file on a local disk.

You can specify the device by its device name (sdb2), label (LABEL=label) or UUID (UUID=uuid).

inst.ks=[:http:]https://HTTP_server/path

Specifies a Kickstart file on a web server.

inst.ks=nfs[:options:]NFS_server:path

Specifies a Kickstart file on an NFS share.

Use options to specify a comma-separated list of NFS mount options.

Boot Options for Remote Installations

inst.vnc

Enables remote graphical-based installation by starting a VNC server.

A VNC client can connect by using a command such as vncviewer server:port, where server is the IP address of the system being installed.

After installation, the system starts in text mode even if a graphical desktop environment is selected as the base environment.

inst.vncconnect=client[:port]

Specifies the VNC client and optional port that is listening for connections from a VNC server (vncviewer -listen). The default port is 5900.

inst.vncpassword=password

Specifies the password for client connections using VNC.

Miscellaneous Boot Options

inst.keymap=layout

Specifies the keyboard layout for installation.

inst.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.

3.2 Automated Installation Using Kickstart

This section describes how you can use Kickstart to automate the installation of Oracle Linux.

3.2.1 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.

The following sections describe the structure of a Kickstart file and demonstrate some of the available configuration options. Documentation for Kickstart is included in the pykickstart package and can be found at /usr/share/doc/pykickstart-version/kickstart-docs.txt.

If you are upgrading from a previous Oracle Linux release, use the ksverdiff command (included in the pykickstart package) to check for removed and deprecated Kickstart options. Starting with Oracle Linux 7, network interface device names have changed and are now based on information derived either from the system BIOS or from a device's firmware, system path, or MAC address.

Once you have prepared a Kickstart configuration file, use the ksvalidator utility (included in the pykickstart package) to check that the syntax of the file is correct.

3.2.1.1 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:

```bash
#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

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

# Root password
rootpw --iscrypted SHA512_password_hash

# Use graphical install
graphical
firstboot --disable

# System keyboard
keyboard --vckeymap=us --xlayouts='us'

# System language
lang en_US.UTF-8

# SELinux configuration
selinux --enforcing
```
Creating a Kickstart File

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

# System timezone
timezone America/Los_Angeles

# Network information
network --bootproto=dhcp --device=em1 --onboot=yes --hostname=hostname

# 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=sd
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.

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

```bash
network --bootproto=dhcp --device=em1 --onboot=yes
```

### 3.2.1.2 Packages Section

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

```bash
%packages
@base
@core
@desktop-debugging
@dial-up
@fonts
@gnome-desktop
@guest-agents
@guest-desktop-agents
@input-methods
@internet-browser
@multimedia
@print-client
@print-server
@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
```
Creating a Kickstart File

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. The asterisk (*) wildcard character can be used to specify multiple packages. If you specify a `–` character as a prefix to a package, the package is not installed.

The `%packages` keyword can take options, the following are the most useful:

- `--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.
- `--multilib` Sets the multilib policy in `yum` configuration to all so that 32-bit packages can be installed on the system.

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
```

### 3.2.1.3 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 the 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.

### 3.2.1.4 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
%include http://instsvr.mydom.com/scripts/post-config
%end
```

### 3.2.2 Using a Kickstart File to Install a System

A Kickstart installation requires access to the full installation media which can be on a local CD-ROM drive, USB drive or hard drive, or on a network installation server that is accessible using HTTP or NFS.

To use a Kickstart file to install a system:

1. Boot the system using local boot media.
2. Selecting an installation option in the boot menu and then press either the E key (UEFI systems) or the Tab key (BIOS systems) to access the boot prompt.
3. Use the `inst.ks` boot option to specify the location of the Kickstart file.

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

   ```
   ip=em1:dhcp inst.ks=nfs:192.168.1.100:/ksfiles/ks.cfg
   ```

   where `ip=em1:dhcp` specifies that DHCP should be used to configure the `em1` network interface.

   If access to a network is required and no network configuration is specified either on the boot prompt or in the Kickstart configuration, the installation program enables DHCP on all available network devices.

   If a system has multiple network interfaces, use the `bootdev` option to specify the interface to be used for installation, otherwise you will prompted to choose an interface.

   For PXE clients, it is usual to specify the Kickstart parameters in the boot loader configuration. For more information, see:

   - Section 1.3.5, “Boot Loader Configuration for BIOS-Based PXE Clients”
   - Section 1.3.6, “Boot Loader Configuration for UEFI-Based PXE Clients”

   For more information about boot options, see Section 3.1, “Installation Boot Options”.

### 3.3 Text-Based Installations

The installation program can also run in text mode. Text mode is used automatically, for example, if the system has insufficient memory or the video card is not supported. Alternatively, you can explicitly request text mode using a boot option or a Kickstart option. When a text-based installation is used, a menu of options is displayed similar to the graphical installation.
By default Oracle Linux 7 uses XFS as the default file system. Follow these steps to install a system with a btrfs root file system:

1. Begin the installation by booting the system from the installation media.
2. On the Installation Summary screen, select Installation Destination. The Installation Destination screen is displayed.
3. Select the local disks and add any Specialized & Network disks you want to use for the installation.
4. (Optional) Select Encrypt my data. The encryption is applied to the block devices that contain the btrfs subvolumes and file systems.
5. Select I will configure partitioning and click Done. The Manual Partitioning screen is displayed.
6. (Optional) Free disk space by removing existing partitions.
   On the left-hand side, select a mount point and click the - button to remove it. Changes to partitioning are not applied until you click Begin Installation on the Installation Summary screen.
7. Create the mount points.
   From the partitioning scheme list, select BTRFS.
   To create the default mount points automatically, click Click here to create them automatically. By default, automatic partitioning creates the following layout:
   - A 500 MB partition for an XFS file system that contains /boot.
   - A 200 MB EFI system partition mounted at /boot/efi (UEFI-based systems only).
   - A btrfs subvolume that contains the root file system (/).
   - A btrfs subvolume that contains the /home file system.
• A swap partition.

To create mount points manually, click the + button. As a minimum, create mount points for /, /boot, /home, and swap. The swap and /boot partitions cannot be configured as btrfs file systems.

Figure 3.2 shows the results after automatic btrfs partitioning.

**Figure 3.2 Mount Points After Automatic Partitioning**

8. Configure the btrfs root file system.

Select the / mount point and click **Modify**. The Configure Volume window is displayed, as shown in Figure 3.3.
Using a Driver Update Disk

Figure 3.3 Configure Volume

Specify a name for the volume, select the disks to use, the RAID level, and the size policy.

If you select the Encrypt check box, this enables encryption for the block device that contains the root file system because btrfs does not support encryption at the file-system level. The same applies, if you enable encryption on a different btrfs subvolume such as /home.

9. Click Save. The Configure Volume screen is closed. Click Update Settings to refresh the screen with your configuration changes.

10. Click Done. If you enabled encryption, you are prompted to enter an encryption passphrase.

11. Proceed with the rest of the installation.

3.5 Using a Driver Update Disk

A Driver Update Disk 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 Driver Update Disk may be released at a later date, to facilitate installation on newer hardware.

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

During installation, the installer can load the updated device driver kernel modules from the Driver Update Disk 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 Driver Update Disk 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 Driver Update Disk 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 Driver Update Disk ISO file. Replace `/dev/sdX` with the device node that belongs to the storage media that you intend to use for the Driver Update Disk. Typically you might use a USB disk for this purpose.

Using the Driver Update Disk during installation

To use the Driver Update Disk during installation, boot from the standard Oracle Linux installation media as normal, but also attach the media with the Driver Update Disk image before the installer starts. The installer should automatically recognize the Driver Update Disk and use it directly. You may 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 Driver Update Disk USB media once the boot process started. For example, attach the disk while the system is at the GRUB boot prompt.

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

To access the boot parameters in the Boot Menu when you are running the installation manually, press either the E key (UEFI systems) or the Tab key (BIOS systems). A prompt is displayed which enables you to edit the boot options already defined and to add your own options. See Section 3.1, “Installation Boot Options” for more information.

If you intend to use a Driver Update Disk 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:

```
driverdisk /dev/sdb1
```

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

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

The installer supports using HTTP, FTP or NFS as sources for network hosted Driver Update Disk images.
Chapter 4 Upgrading an Oracle Linux System

Table of Contents

4.1 Conditions for Performing an Inplace Upgrade ................................................................. 47
4.2 Performing an Inplace Upgrade ......................................................................................... 47

Typically, you upgrade an Oracle Linux system by performing a fresh installation. However, starting with Oracle Linux 7, there is limited support for inplace upgrades. This chapter describes the conditions and method for performing an inplace upgrade.

4.1 Conditions for Performing an Inplace Upgrade

Inplace upgrades are supported only for systems that run Oracle Linux 6 Update 5 or later. The following conditions must also be met:

- The system must meet the minimum installation requirements for Oracle Linux 7, see Section 1.1, “System Requirements”.
- The Oracle Linux 6 system has been completely updated from the ol6_x86_64_latest channel or ol6_latest repository.
- Oracle Unbreakable Enterprise Kernel Release 3 (UEK R3) or Oracle Unbreakable Enterprise Kernel Release 4 (UEK R4) must be installed on the system and it must be the default boot kernel. Upgrading from UEK R2 is not supported.
- The Oracle Linux 6 system must have been installed using the Minimal set of software.
- No Oracle product stack is present on the system.

If the RedHat Compatible Kernel (RHCK) is installed, it is upgraded as part of the process, but it must not be set as the default boot kernel.

If the system to be upgraded contains valuable data, make a backup or snapshot of the system so that you can recover its previous state should the upgrade fail.

Before you upgrade, check the release notes for any known issues with upgrades. See the Oracle Linux 7 documentation library at http://docs.oracle.com/cd/E52668_01/index.html.

To perform an inplace upgrade you must install some additional packages and their dependencies. The system should have access to the Unbreakable Linux Network (ULN), Oracle Yum Server, or a local yum server.

4.2 Performing an Inplace Upgrade

1. Use the yum update command to update the system to the latest Oracle Linux 6 release.

   The system must be subscribed to the ol6_x86_64_latest channel or ol6_latest repository in order to be updated.

2. Install the required packages.

   Obtain the latest versions of the following packages from ULN (in the ol6_x86_64_addons channel), or from Oracle Yum Server (in the ol6_addons repository):
Performing an Inplace Upgrade

- preupgrade-assistant
- preupgrade-assistant-el6toel7
- preupgrade-assistant-el6toel7-data
- preupgrade-assistant-ui
- preupgrade-assistant-tools
- redhat-upgrade-tool

You should also ensure that the openscap package, version 1.0.8-1.0.1 or greater, is installed on the system. Depending on your yum configuration, this might be installed automatically when you install the above packages.

3. If the system is registered with ULN, delete the system from ULN and disable yum plugins.

   You can only delete a system if it is registered to your user name on ULN.
   a. Log in to http://linux.oracle.com with your ULN user name and password.
   b. On the Systems tab, click the link for the system in the list of registered machines.
   c. On the System Details page, click Delete.
   d. When prompted to confirm the deletion, click OK.
   e. On the system, edit the yum configuration file /etc/yum.conf file and disable yum plugins by setting plugins=0.

4. Run the preupg command to perform an upgrade assessment:

   # preupg

5. Examine the upgrade assessment results file /root/preupgrade/result.html.

   If the assessment reports any fail, needs_action, or needs_inspection issues, read the remediation instructions for these issues and perform any required actions before proceeding with the upgrade.

   You might also need to perform some actions after performing the upgrade.

   You can run the preupg command as often as you like to check the system’s readiness for upgrading.
   A backup of each assessment is stored in the /root/preupgrade-results directory. You might want to back up this directory before performing the upgrade.

   The /root/preupgrade directory (and its contents) must be present for the upgrade to proceed.

6. Run the redhat-upgrade-tool-cli command to perform the upgrade.

   For example, to upgrade using an Oracle Linux 7 installation repository at a URL:

   # redhat-upgrade-tool-cli --network=7.0 --instrepo=OL7_repo_URL \
   --debuglog=/tmp/upgrade.log --cleanup-post

   The --cleanup-post option ensures that there are no Oracle Linux 6 packages remaining on the system after the upgrade. If you do not use this option, you should check the system after the upgrade.
Performing an Inplace Upgrade

and manually remove any Oracle Linux 6 packages, for example by using `yum remove `rpm -qa | grep el6``.

For more information, use the `--help` option to `redhat-upgrade-tool-cli`.

7. Reboot the system to start the upgrade.

   After the reboot, the upgrade tool installs the required packages, reconfigures the system, and then reboots. Depending on the number of packages, this may take some time.

   After the upgrade completes, perform any post-upgrade actions identified by the upgrade assessment.

8. If the system was previously registered with ULN, check that yum plugins are enabled and reregister the system with ULN.

   a. On the system, edit the yum configuration file `/etc/yum.conf` file and enable yum plugins by setting `plugins=1`.

   b. Run the `uln_register` command.

      ```
      # uln_register
      ```

      Alternatively, if you use the GNOME graphical user desktop, select `Applications, System Tools`, and then `ULN Registration`.

   c. When prompted, enter your ULN user name, password, and customer support identifier (CSI).
Chapter 5 Post-installation Configuration

Table of Contents

5.1 Registering with the Unbreakable Linux Network ................................................................. 51
5.2 Obtaining Errata and Updates from the Oracle Linux Yum Server ....................................... 51
5.3 Obtaining Packages from the Oracle Linux Installation Media ................................................ 52
5.4 Applying Updates ..................................................................................................................... 52
5.5 Managing a System .................................................................................................................. 52

This chapter describes configuration changes that you might make to a system after installation.

5.1 Registering with the Unbreakable Linux Network

When you install Oracle Linux 7 on a system, you have the option of registering the system with the Unbreakable Linux Network (ULN). To register with ULN after installation, either use the \texttt{uln_register} command, or select Applications, System Tools, and then ULN Registration from the desktop menu.

To obtain Oracle Linux updates from ULN, you must have an Oracle Linux support subscription. For more information about ULN, see \url{http://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 4.

ULN also provides channels for Oracle-specific software packages such as Oracle's \texttt{ASMLib} userspace package and the Oracle Instant Client. To enable access to these packages, log in to ULN and subscribe your system to the Oracle Software for Oracle Linux 7 channel.

If you have an Oracle Linux Premier Support account, you can opt to use Oracle Ksplice, which enables 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 \texttt{yum} to install the \texttt{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.

5.2 Obtaining Errata and Updates from the Oracle Linux Yum Server

Oracle also provides all errata and updates for Oracle Linux via 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 \url{http://yum.oracle.com}.

By default, all new installations of Oracle Linux 7 are automatically configured to use the Oracle Linux Yum Server. If you subsequently register the system with ULN, any configuration to use the Oracle Linux Yum Server is automatically disabled.

The following entries in the \texttt{/etc/yum.repos.d/public-yum-ol7.repo} file enable you to download the latest available packages for Oracle Linux 7 and the Unbreakable Enterprise Kernel Release 4:

```ini
[ol7_latest]
name=Oracle Linux $releasever Latest ($basearch)
baseurl=http://yum.oracle.com/repo/OracleLinux/OL7/latest/$basearch/
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
```
5.3 Obtaining Packages from the Oracle Linux Installation Media

After installation, you can configure `yum` to use the full installation ISO image as a repository for installing packages, as follows:

1. Mount the full installation ISO image on a suitable mount point, for example `/mnt`:

   ```bash
   # mount -t iso9660 -o loop full_image.iso /mnt
   ```

2. Create the file `/etc/yum.repos.d/Media.repo` that contains entries similar to the following:

   ```ini
   [ol7_base_media]
   name=Oracle Linux 7 Base Media
   baseurl=file:///mnt
   gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY-oracle
   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.

3. Use the `yum repolist` command to check the repository configuration.

5.4 Applying Updates

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

   ```bash
   # yum update
   ```

This command upgrades your system to the latest available update of Oracle Linux 7.

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

   ```bash
   # yum update package
   ```

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

   ```bash
   # yum update zsh
   ```

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

5.5 Managing a System

The following are some common tasks for managing a system after installation:

**System Locale and Keyboard Layout**

Use the `localectl` command to change the default system locale and keyboard layout, or you can edit the settings in `/etc/locale.conf`, and then reboot the system. For more information, see the `localectl(1)` and `locale.conf(5)` manual pages.
Managing a System

System Date and Time

Use the `timedatectl` command to change the system date and time. For more information, see the `timedatectl(1)` manual page.

System Services

Use the `systemctl` command to enable, start and stop system services. For more information, see the `systemctl(1)` manual page.

System Firewall

To implement a simple, general-purpose firewall, you can use the Firewall Configuration GUI (`firewall-config`) or the `firewall-cmd` command 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.

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

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

**Note**

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

For detailed information on how to configure firewalls, see the *Oracle Linux 7 Administration Guide* in the Oracle Linux 7 documentation library at [http://docs.oracle.com/cd/E52668_01/index.html](http://docs.oracle.com/cd/E52668_01/index.html).

System State

Use the `systemctl` command to change the run state of the system. For more information, see the `systemctl(1)` manual page.
To change the default system state and switch to the multi-user graphical environment (runlevel 5 in previous Oracle Linux releases):

```
# systemctl set-default graphical.target
# systemctl isolate graphical.target
```

To change the default system state and switch to the multi-user command-line environment (runlevel 3 in previous Oracle Linux releases):

```
# systemctl set-default multi-user.target
# systemctl isolate multi-user.target
```

To reboot the system:

```
# systemctl reboot
```

To shut down and power-off the system:

```
# systemctl poweroff
```
Chapter 6 Troubleshooting

Table of Contents

6.1 Troubleshooting Menu Options .............................................................. 55
6.2 Debug and Log Information ................................................................. 55

This chapter describes some options for troubleshooting Oracle Linux 7 installations. You should also check the release notes for your Oracle Linux release for known installation issues and also the release notes for Unbreakable Enterprise Kernel Release for known hardware issues. Both release note documents can be found in the Oracle Linux 7 documentation library at http://docs.oracle.com/cd/E52668_01/index.html.

6.1 Troubleshooting Menu Options

The boot menu on the Oracle Linux 7 installation media contains a Troubleshooting option, which contains the following options:

Install Oracle Linux 7.x in basic graphics mode

Use this option if the screen goes blank or appears distorted when you try to install Oracle Linux in graphical mode.

Rescue a Oracle Linux system

Use this option to boot an installed system in a mode that enables you to edit partitions or configuration files to fix a variety of boot problems.

Run a memory test

Use this option to run the memtest86 utility, which verifies the integrity of the system’s RAM.

Boot from local drive

Use this option to boot an installed system from the hard disk.

6.2 Debug and Log Information

During an installation, you can press Ctrl+Alt+F1 to display the virtual console for the installation program. This console contains the messages and debugging information output by the installation program. Additional virtual consoles are available, which display log information from different sources (described below). Press Ctrl+b, and then press either n (for next) or b (for back) to move between the virtual consoles. To return to the graphical installation program, press Ctrl+Alt+F6.

During an installation several log files are generated to capture the messages from the following sources:

Anaconda program

The /tmp/anaconda.log file contains Anaconda logs relating to the installation.

During the installation you can access the messages stored in this log by pressing Ctrl+Alt+F1 to display the virtual console, then press Ctrl+b, and then press 3.

If the installation succeeds, the log file is copied to /var/log/anaconda/anaconda.log.
Hardware detection and configuration

The /tmp/syslog file contains messages relating to the system hardware.

If the installation succeeds, the log file is copied to /var/log/anaconda/syslog.

Kickstart

The /tmp/ks-name.log file contains logs from Kickstart installations.

If the installation succeeds, the log file is copied to /var/log/anaconda/ks-script-name.log.

Network detection and configuration

The /tmp/ifcfg.log file contains logs relating to network configuration.

If the installation succeeds, the log file is copied to /var/log/anaconda/anaconda.ifcfg.log.

Other programs

The /tmp/program.log file contains logs from all other programs used during the installation.

During the installation you can view the messages stored in this log by pressing Ctrl+Alt+F1 to display the virtual console, then press Ctrl+b, and then press 5.

If the installation succeeds, the log file is copied to /var/log/anaconda/anaconda.program.log.

Package installation

The /tmp/packaging.log file contains package installation messages output by the yum and rpm commands.

If the installation succeeds, the log file is copied to /var/log/anaconda/anaconda.packaging.log.

Storage detection and configuration

The /tmp/storage.log file contains logs from the storage modules.

During the installation you can view the messages stored in this log by pressing Ctrl+Alt+F1 to display the virtual console, then press Ctrl+b, and then press 4.

If the installation succeeds, the log file is copied to /var/log/anaconda/anaconda.storage.log.

If the installation fails, the messages from these log files are combined into a single log file at /tmp/anaconda-tb-name.

To access a shell prompt as the root user during the installation, press Ctrl+Alt+F1 to display the virtual console, then press Ctrl+b, and then press 2. You can use this shell prompt to access the log files and copy them to a local storage device such as a USB device, or to copy them to a network location using the scp command.