

Oracle® Linux

Installation Guide for Release 7

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Abstract

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

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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 manually install Oracle Linux 7 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 Oracle Linux 7 Installations*](#) describes some options for troubleshooting Oracle Linux installations.

Related Documents

The documentation for this product is available at:

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

Conventions

The following text conventions are used in this document:

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

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Chapter 1 Pre-installation Configuration

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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

Oracle Linux 7 includes both the Unbreakable Enterprise Kernel (UEK) and Red Hat Compatible Kernel (RHCK). You can install Oracle Linux 7 on x86-64 systems with up to 2048 logical CPUs and 64 TB of memory. The theoretical upper limit is 5120 logical CPUs and 64 TB of memory, but Oracle has not tested this configuration. A minimum of 2 logical CPUs and 1 GB of memory per logical CPU is recommended. Although the minimum disk space required for installation is 1 GB, a minimum of 5 GB is recommended.

If your system supports UEFI mode and you plan to boot and install Oracle Linux 7 in this mode, make sure that the target disk uses GPT (GUID Partition Table), as some UEFI firmwares do not allow UEFI/MBR boot.

For additional details about system requirements and any known installation issues, see the release notes for your Oracle Linux 7 release at https://docs.oracle.com/cd/E52668_01/index.html.

For information about x86-based servers that are certified for Oracle Linux with UEK, see the Hardware Certification List for Oracle Linux and Oracle VM at <https://linux.oracle.com/hardware-certifications>.

For UEK system requirements and known issues, see the documentation for your UEK release at https://docs.oracle.com/cd/E93554_01/index.html.

1.2 Obtaining and Preparing Installation Media

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

You can download the Oracle Linux installation media from the Oracle Software Delivery Cloud at <https://edelivery.oracle.com/linux>. After logging in, the Popular Downloads window containing a list of products is displayed.

To download the Oracle Linux 7 installation media, do the following:

1. Choose one of the following methods to obtain your product:

- If your product is included in the Popular Downloads window, then select that product to add it to the cart.
 - If your product is not included in the Popular Downloads window, then do the following:
 - a. Type "Oracle Linux 7" in the search box, then click Search.
 - b. From the search results list, select the product you want to download to add it to the cart.
2. Click the **Cart** icon.
 3. From the **Platform/Languages** drop-down list, select your system's platform, then continue.
 4. On the next page, accept the terms of licenses, then continue.
 5. On the last page that itemizes the contents of the Oracle Linux package that you selected, click **Download**.

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 that is required 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 or an NFS share. RHCK is used during the installation and both UEK and RHCK kernels are installed. After the installation, the system boots the UEK kernel by default.

**Note**

When installing releases prior to Oracle Linux 7 Update 3, Unbreakable Enterprise Kernel Release 3 is used. From Oracle Linux 7 Update 3 on, the default kernel is Unbreakable Enterprise Kernel Release 4.

- **Oracle Linux 7 UEK Boot ISO image for x86_64 (64 bit)**

This ISO image contains everything that is required 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 or an NFS share. UEK is used during the installation and is the default kernel that is booted after an installation. Use this boot image if you have hardware that is only supported on UEK, or if you are having trouble with the installer when using the RHCK boot image. This ISO image is available in the Media Pack for Oracle Linux 7 Update 2 and later.

- **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 do the following:

- 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 method is typically used when a boot image is used to start an installation. See [Section 1.3, “Configuring a Network Installation Server”](#).

Note that the media pack might contain additional content that may pertain to a particular release update of Oracle Linux. Items such as Driver Update Disks may also be included. These items are described in further detail in the release notes for the particular update release.

After installation, you can obtain Oracle Linux packages from the Unbreakable Linux Network (ULN) and the Oracle Linux yum server. For more information, see [Chapter 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 describe how to 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:

```
# 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.

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

For example:

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

Note that you must write the ISO contents directly to the USB device node, not to a partition on the USB device. This helps to ensure that the device is bootable and the contents are found in the correct location.

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 full Oracle Linux 7 installation ISO image:

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

```
# 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:

```
# 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`:

```
# 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`:

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

3. Unmount the DVD image:

```
# 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 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 full Oracle Linux 7 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 that is configured on the same network. Dynamic Host Configuration Protocol (DHCP) is used to provide clients with the location of the boot files on the FTP 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 following instructions apply to configuring an NFS share on Oracle Linux 7 systems. For instructions on configuring NFS shares on Oracle Linux 6, see 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.

When you 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. For instructions on configuring HTTP directories on Oracle Linux 6 systems, see 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 10.0.0/24 subnet. Any PXE-booted system on the subnet uses the boot loader that the `filename` parameter specifies for its PXE type. The boot loader file `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 than 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`).

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. 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**

Make sure you specify `shim.efi` as the boot loader in your DHCP configuration in `/etc/dhcp/dhcpd.conf`. The shim boot loader is required for Secure Boot, but if it is not used it simply initializes Grub without attempting to validate signatures.

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**

Copy the `shim.efi` and `MokManager.efi` files 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 `tftpd_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 tftpd_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>.

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 `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. For 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=dns
# firewall-cmd --zone=zone --add-service=dns --permanent
```

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 (`vmlinux`).

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. 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

Make sure you specify `shim.efi` as the boot loader in your DHCP configuration in `/etc/dnsmasq.conf`. The shim boot loader is required for Secure Boot, but if it is not used it simply initializes Grub without attempting to validate signatures.

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:

```
# 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:

```
# 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:

```
# cp /tmpdir/boot/efi/EFI/redhat/grubx64.efi /var/lib/tftpboot
# cp /tmpdir/boot/efi/EFI/redhat/shim.efi /var/lib/tftpboot
# cp /tmpdir/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 /var/lib/tftpboot/initrd.img
```



Note

Copy the `shim.efi` and `MokManager.efi` files. The `MokManager.efi` provides utilities for managing the keys used to sign EFI binaries, and `shim.efi` will validate signatures if Secure Boot is enabled. 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

label ol7
kernel vmlinuz
append initrd=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 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`.

Pxlinux 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 initrd=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, `0A0000F`)
- Most significant 24 bits of the IP address (for example, `0A0000`)
- Most significant 20 bits of the IP address (for example, `0A000`)
- Most significant 16 bits of the IP address (for example, `0A00`)

- Most significant 12 bits of the IP address (for example, `0A0`)
- Most significant 8 bits of the IP address (for example, `0A`)
- Most significant 4 bits of the IP address (for example, `0`)
- `default` (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 more information about pxelinux, see <http://www.syslinux.org/wiki/index.php/PXELINUX>.

For information about configuring and using kickstart to perform automated installation, see [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.

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-017 grub.cfg-0A0000FC
# ln master-017 grub.cfg-0A0000FD
# ln master-017 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

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

2.1 Starting the Installation

To install Oracle Linux, you need to boot the system from a boot image. You might need to configure the host system's BIOS or hypervisor settings to use the boot device that you have chosen. When the system locates 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

Uses the graphical installation program to install Oracle Linux, provided that the system has sufficient memory and the video card is supported. Otherwise, the text-based installation option is selected, see [Section 3.3, “Text-Based Installations”](#).

Test this media & install Oracle Linux 7

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.

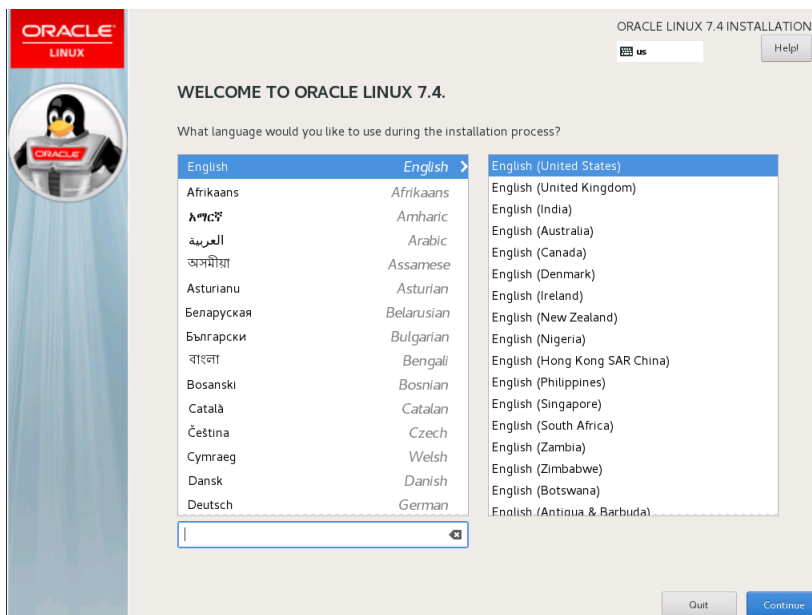
This is the default option.

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.

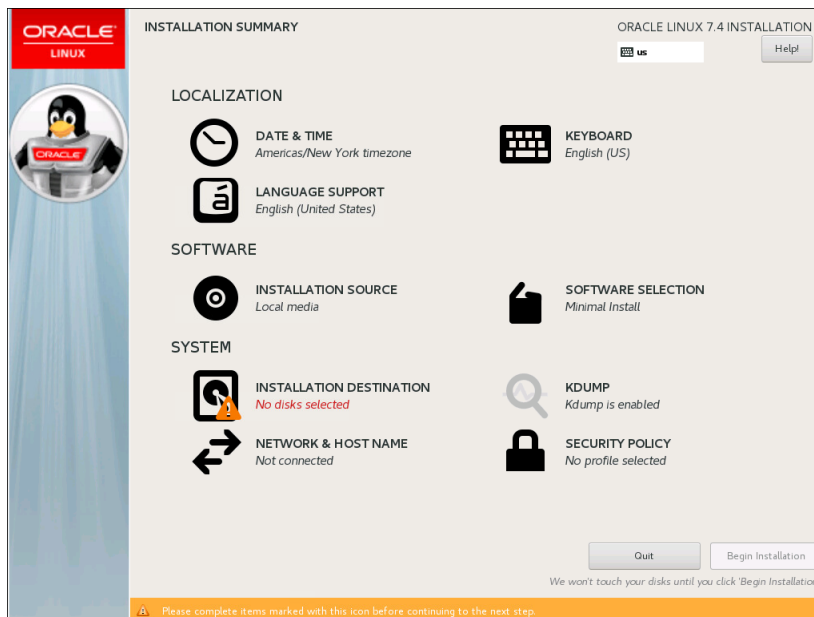
Figure 2.2 Welcome to Oracle Linux 7



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.

Figure 2.3 Installation Summary



The Installation Summary screen presents an overview of the options selected for the installation and a menu for configuring those options. As a minimum, you must visit the options that are marked with a warning icon. If you want to connect the system to a network, you should also visit the Network Configuration option and ensure that network connections are enabled. You can change the installation configuration options as much as you like, the installation does not begin until you click **Begin Installation**. As you visit the configuration options, pay attention to any warning messages displayed at the bottom of the 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 time zone by selecting 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.

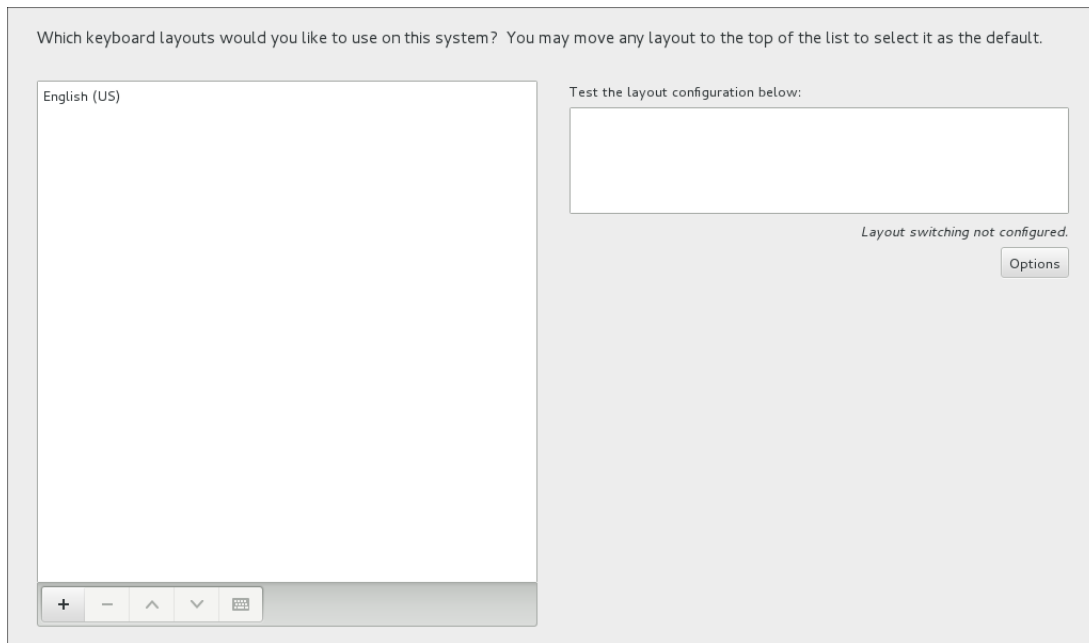
Before you can enable NTP, ensure that the system is connected to a network by selecting the **Network & Hostname** option on the Installation Summary screen (see [Configuring the Host Name and Connecting to a Network](#)). To enable NTP, move the **Network Time** switch to the ON position and click 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.

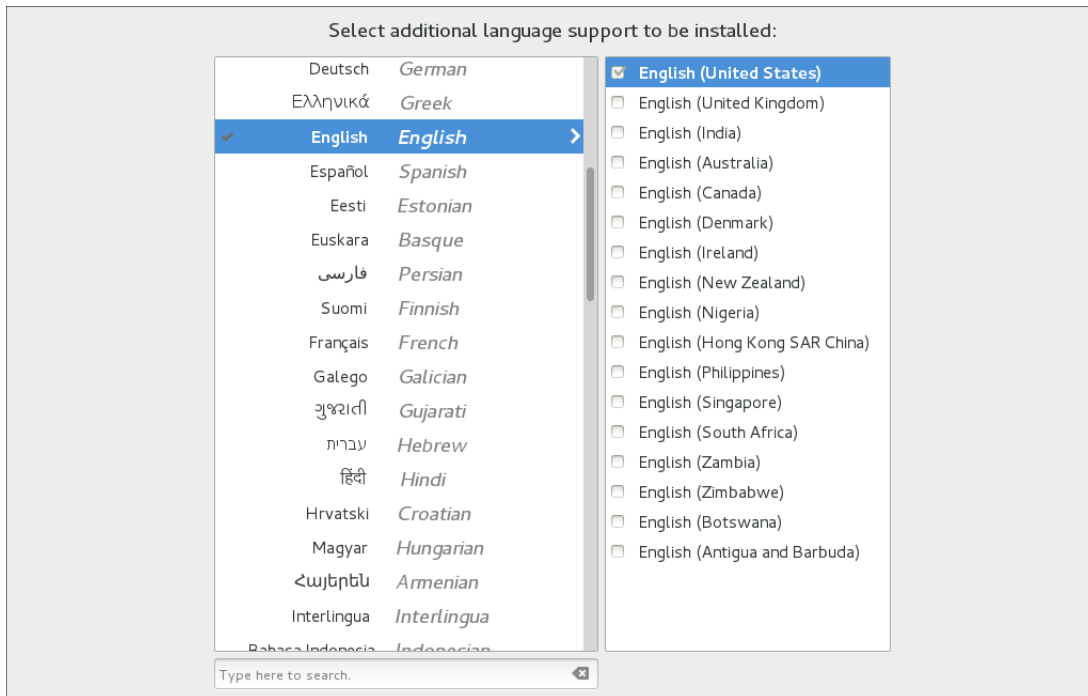
If you add multiple keyboard layouts, the first keyboard shown in the list of keyboards is the default keyboard. Use the arrow buttons to change the order of the list. You should also click **Options** and configure the keyboard shortcut for switching between layouts.

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.

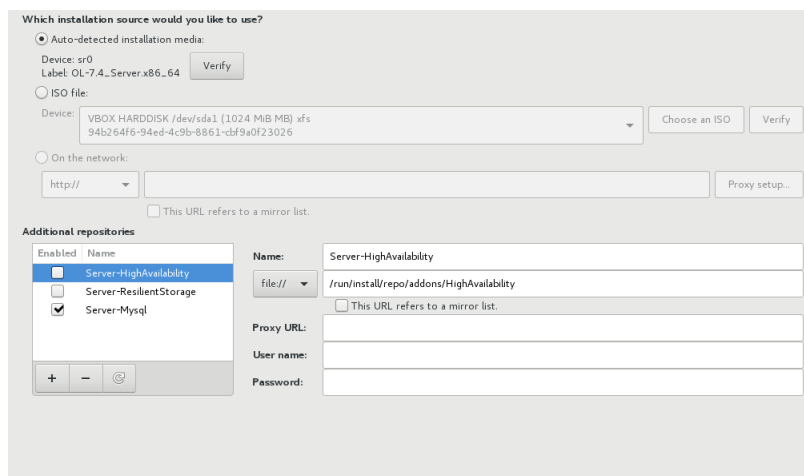
2.3 Selecting the Software to Install

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.

Figure 2.7 Installation Source



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.

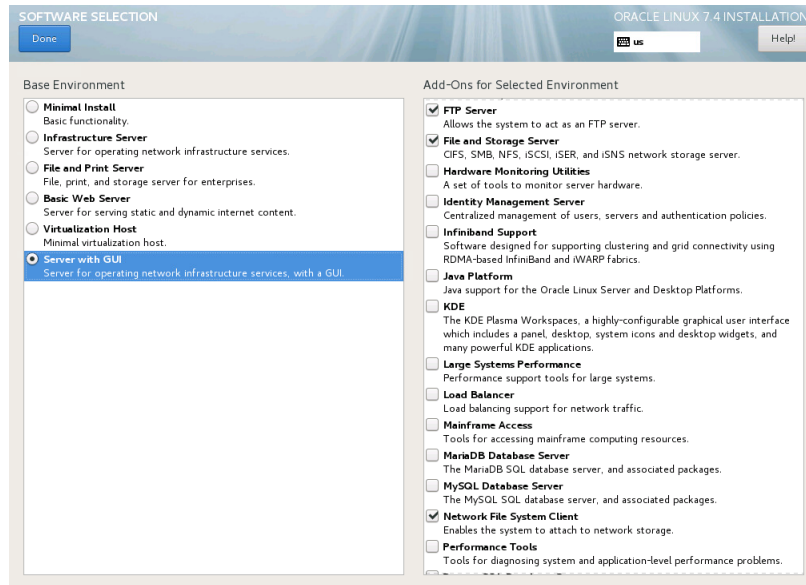
You can also use the **+** button to specify additional repositories containing software you want to install. The **Server-HighAvailability** and **Server-Resilient Storage** repositories listed contains upstream high availability packages and are not supported in Oracle Linux 7.

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



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 that 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.

There is no base environment or add-on for installing the Oracle Database (RDBMS). After you install Oracle Linux 7, you can use the Oracle RDBMS Server Pre-Install RPM to perform preinstallation configuration tasks for Oracle Database. For more information, go to <https://docs.oracle.com/en/database/oracle/oracle-database/18/ladbi/automatically-configuring-oracle-linux-with-oracle-preinstallation-rpm.html#GUID-22846194-58EF-4552-AAC3-6F6D0A1DF794>.

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

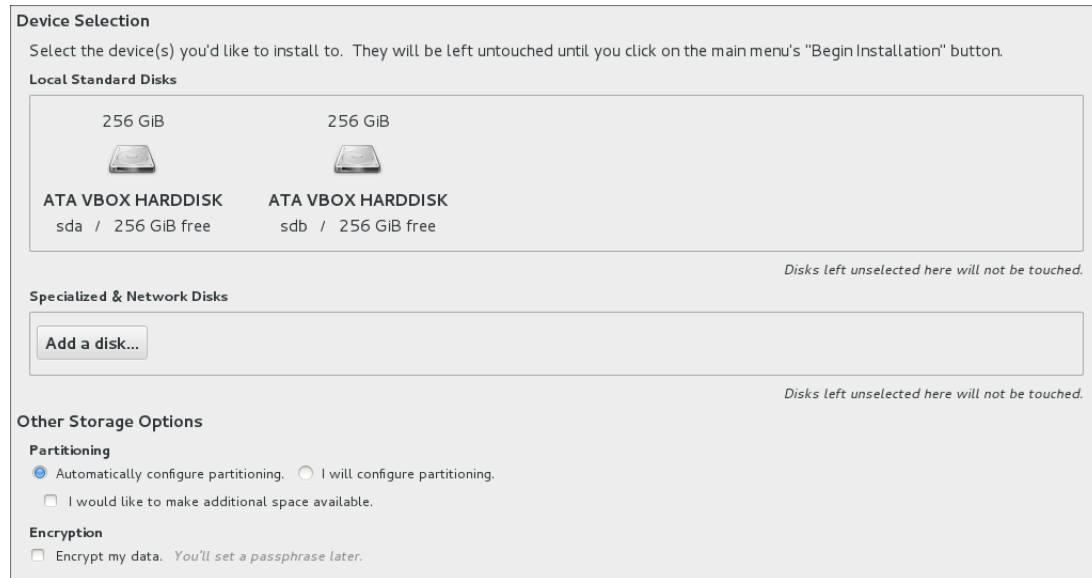
2.4 Configuring System Storage and Networking

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



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.

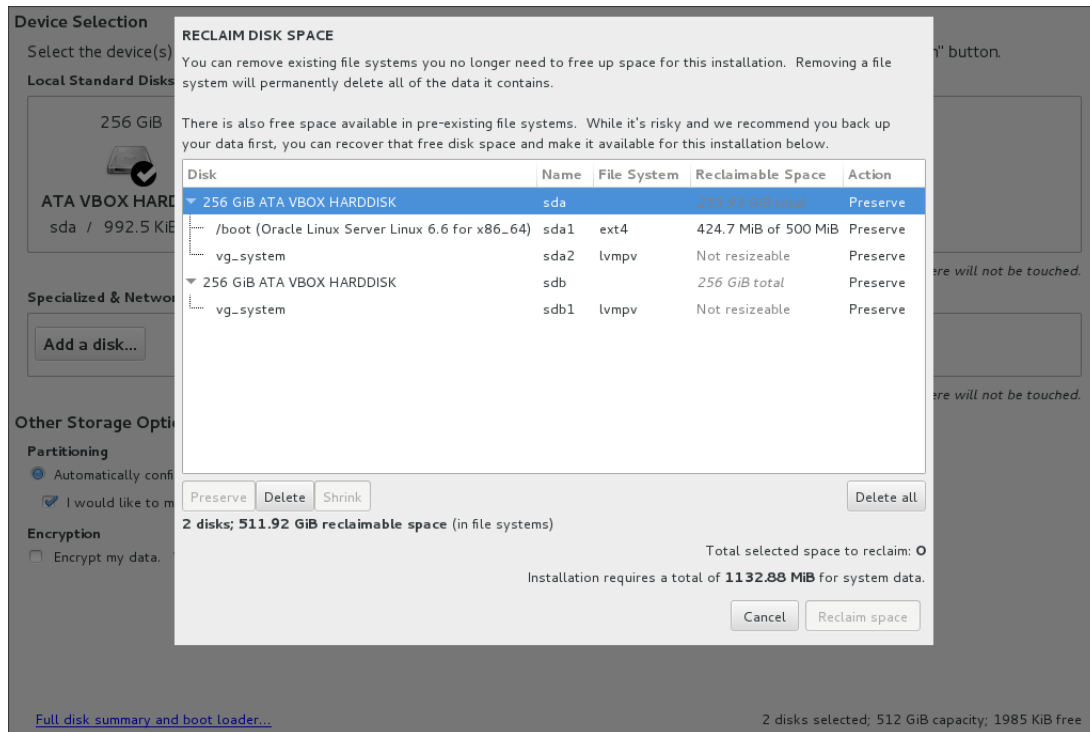
Next, select how you want to partition the selected disks automatically or manually. By default, the **Automatically configure partitioning** option is selected. Automatic disk partitioning creates the following layout on the selected disks:

- A standard partition for an XFS file system mounted at `/boot`. This partition is sized to 500 MiB by default, or 1 GiB on systems running Oracle Linux 7 Update 3 or later.
- A 200 MiB 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 GiB in total).

- 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. There are some important issues when encrypting data:

- For LVM, selecting **Encrypt my data** encrypts the LVM physical volume and all the logical volumes that it contains. If you do not select **Encrypt my data**, you can encrypt the logical volume by selecting the **Encrypt** check box on the Manual Partitioning screen or encrypt the physical volume by selecting the **Encrypt** check box on the Configure Volume screen.

- For `btrfs`, encryption can only be applied to the block device that contains the file system, including its subvolumes. For example, enabling encryption for the `/home` subvolume of a `btrfs` root file system implicitly enables encryption for the root file system itself. You can only select the **Encrypt** check box on the Configure Volume screen. Because `btrfs` does not support encryption at the file-system level, you cannot select the **Encrypt** check box on the Manual Partitioning screen for a `btrfs` file system.
- Do not select the **Encrypt** check box or a **BTRFS, LVM, or LVM Thin Provisioning** device type for the `/boot` file system. The `/boot` file system must be configured on a standard partition and should be of the type, `ext4` or XFS.

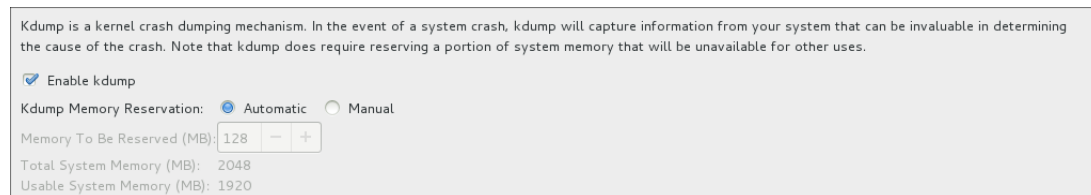
Oracle Linux uses the Grand Unified Bootloader version 2 (GRUB 2) boot loader as the default boot loader. The boot loader runs when the system starts and loads the kernel, without the need for boot media. By default, GRUB 2 is installed in either the master boot record (MBR) or the GUID partition table 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 (including UEFI-based systems in legacy BIOS mode), by default the MBR is used if the disk size is less than 2 TiB, 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



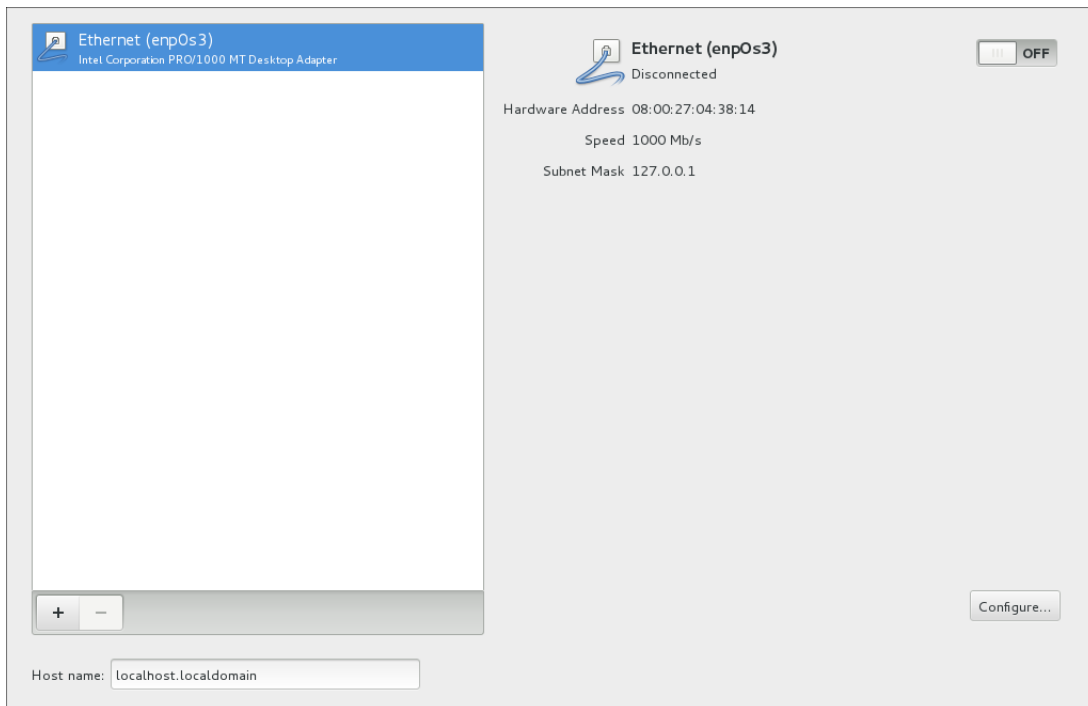
In the event of a system crash, Kdump captures information that assists in determining the cause. By default, Kdump is enabled and the amount of memory reserved for Kdump is calculated automatically. Select **Manual** if you want to set the amount of reserved memory yourself.

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

Configuring the Host Name and Connecting to a Network

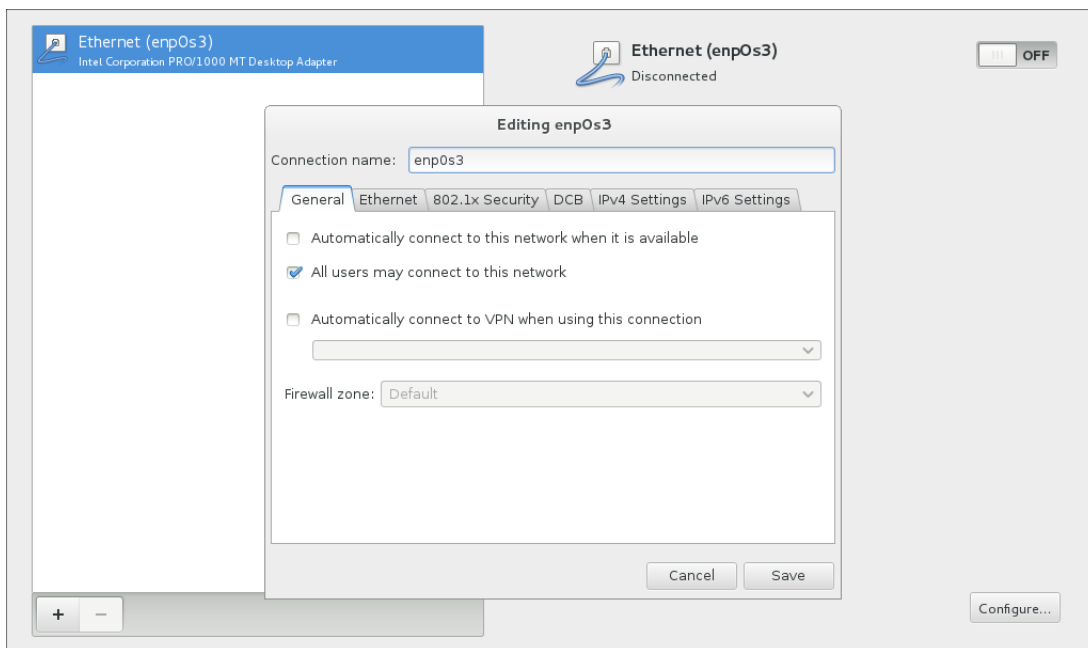
The installation program does not force you to configure the system's network interfaces and, for some types of installation, network connections are disabled by default. To connect the system to a network either during installation or when the system boots, click **Network & Hostname** option on the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

Figure 2.12 Network



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 Setting the Security Policy

You can optionally set security policy at installation time by configuring settings in the Security Policy screen.



Note

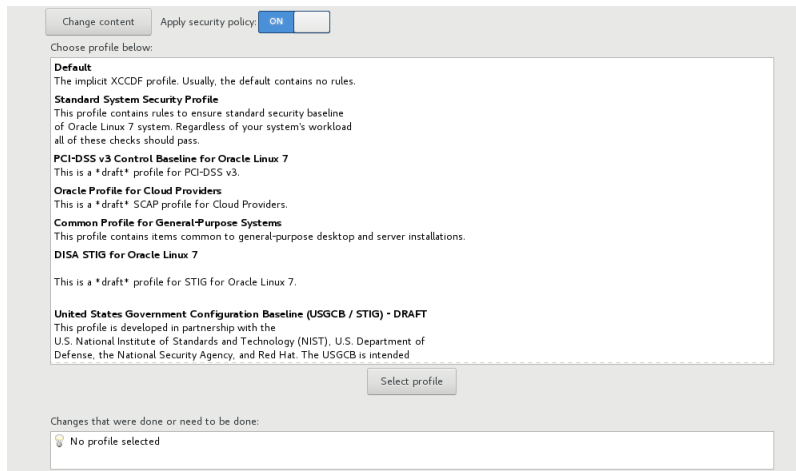
Because security policy is not required on all systems, only use the Security Policy screen if you need to enforce a specific security policy, per what is mandated by your organization or government regulations.

By default, no security policies are enforced and no checks are performed during or after an installation, unless you specifically configure settings in this screen at installation time.

As shown in [Figure 2.14](#), there are several pre-defined policies (profiles) that are available in the Security Policy screen. These security policies follow the recommendations and guidelines that are defined by the Security Content Automation Protocol (SCAP) standard. See https://docs.oracle.com/cd/E52668_01/E54670/html/ol7-scap-sec.html for more details about SCAP.

You can also add custom security policies that you download from an HTTP, HTTPS, or FTP server. You use the **Change content** option in the Security Policy screen to configure custom policies.

Figure 2.14 Security Policy



To set security policy in the Security Policy screen, begin by toggling the **Apply security policy** switch to **On**. This switch is located at the top of the screen.



Note

If the **Apply security policy** switch is set to **Off**, you cannot configure any of the settings in this screen. The switch can be set to **Off** if you are not setting security policy during the installation.

Select a profile from the list of profiles that is displayed in the top window of the screen. Click the **Select profile** button. A message confirming the selection is displayed in the *Changes that were done or need to be done*: field that is located in the bottom window of the screen. A checkmark is displayed next to the selected profile on the right of the window.

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

You use the same screen to configure custom security settings. You can download the custom profile from an HTTP, HTTPS, or FTP server. Note that you must have an active network connection so that you can download the custom profile prior to using this option. You also might need to perform certain pre-installation tasks.

To use a custom profile, click the **Change content** button that is located in the top left corner of the screen. Clicking this button opens another window, where you type the URL to the download location of the custom profile.



Note

You must use the complete address, including the protocol, for the location of the custom profile, for example, <http://>.

Click **Fetch** to download the custom security profile. Alternately, click **Use SCAP Security Guide** to return to the default policy selection window.

Check that the *Changes that were done or need to be done*: field shows the changes to be made. Then, click **Done** to save the changes.

During the installation, the security policy that you applied is installed according to the restrictions and recommendations that are defined in the specified profile. In addition, the `openscap-scanner` package is added to the packages that are installed. This package provides a tool for compliance and vulnerability scanning.

When the installation has completed, the system is automatically scanned to verify compliance, and the results are saved to the `/root/openscap_data` directory on the system.

2.6 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 2.15](#) shows the options on this screen.

Figure 2.15 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 2.16](#) shows the options on this screen.

Figure 2.16 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 2.17](#) shows the options on this screen.

Figure 2.17 Create User

Full name

User name

Tip: Keep your user name shorter than 32 characters and do not use spaces.

Make this user administrator

Require a password to use this account

Password

Empty

Confirm password

Advanced...

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.

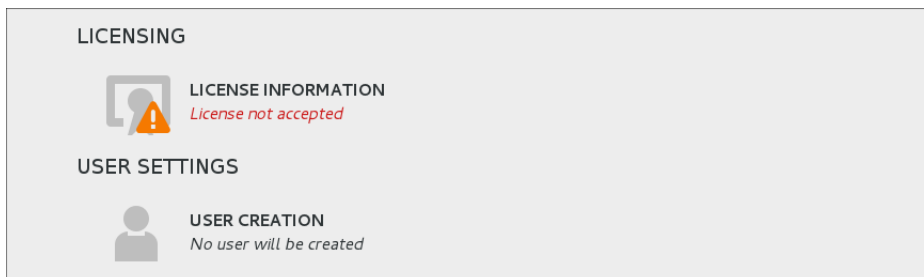
Rebooting and Initial Setup

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 2.18 shows the options on this screen.

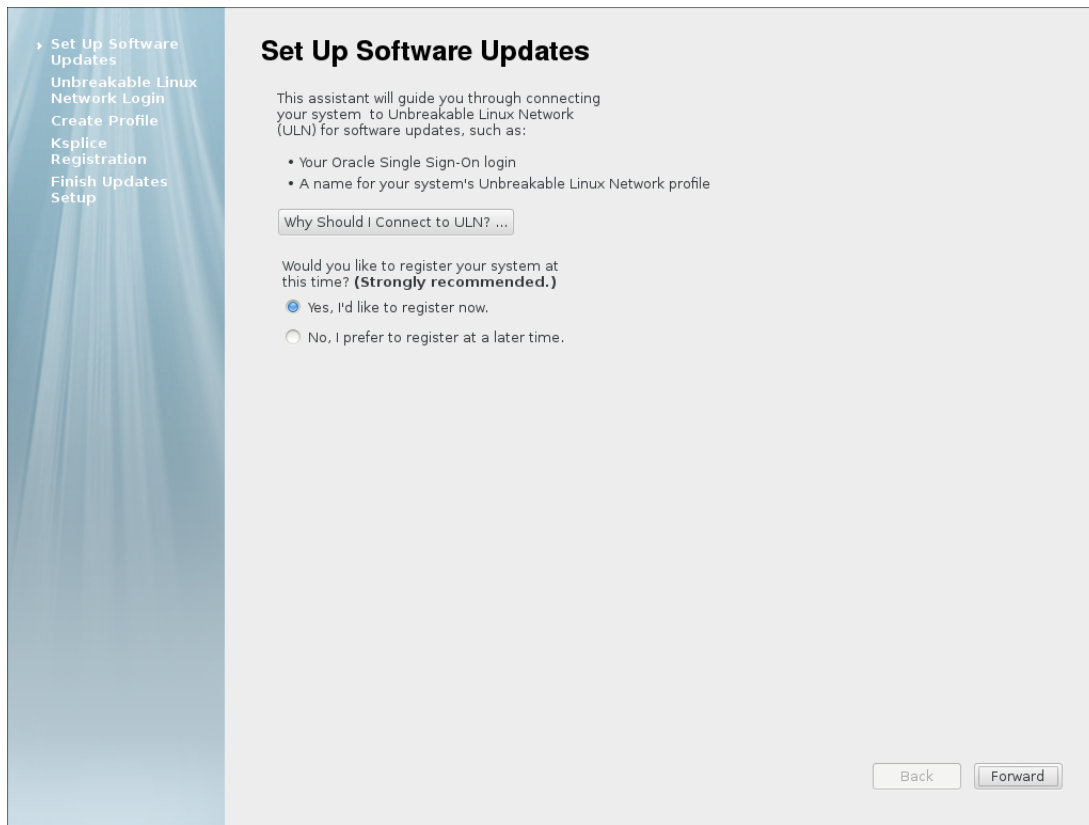
Figure 2.18 Initial Setup



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 2.19.

Figure 2.19 ULN Registration



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

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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 pressing either the E key (UEFI-based systems) or the Tab key (BIOS-based systems). A prompt is displayed, which enables you to edit the boot options that are already defined and add your own options.



Note

On BIOS-based systems, you can press the Esc key instead of the E key to display the `boot:` prompt, which does not contain any predefined boot options. You must enter `linux` to load the predefined boot options before appending with 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-based systems) or Return (BIOS-based 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:

```
inst.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 the following:

- 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.

`inst.stage2=[installation_source]`

Specifies the location to fetch the installer runtime image; packages are ignored. If this option is not specified, `inst.repo` is used instead. The path specified for *installation_source* can match any of the protocol and path options used for `inst.repo`.

The directory path specified for the *installation_source* should contain a valid `.treeinfo` file that specifies the location of the runtime image. If a `.treeinfo` file is not present at the source, the installer uses `LiveOS/squashfs.img` as the default location at the specified source.

Note that when specifying a remote runtime image using the `inst.stage2` option while performing a network boot using the Unbreakable Enterprise Kernel boot and installation ISO, you must use the same ISO for the installation repository. Do not attempt to use the standard **Oracle Linux 7 ISO image for x86_64 (64 bit)** as the installation repository when using the runtime image from the **Oracle Linux 7 UEK Boot ISO image for x86_64 (64 bit)**.

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.

`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 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.rst`.

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 that is derived from the system BIOS, from a device's firmware, system path, or MAC address.

When you have prepared a kickstart configuration file, use the `ksvalidator` utility, which is 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:

```
#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 --usesshadow --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

# 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=sda

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

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

```

Comments in the kickstart file begin with a # character.

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

```
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:

```

%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
odtjob
wodim
sgpio
genisoimage
device-mapper-persistent-data
abrt-gui
samba-winbind
certmonger
openldap-clients
pam_krb5
krb5-workstation
ldapjdk
slapi-nis
libXmu
perl-DBD-SQLite
perl-Mozilla-LDAP
%end
```

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

Individual packages to be installed are named without the @ prefix. 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:

- | | |
|------------------------------|---|
| <code>--ignoremissing</code> | 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. |
| <code>--multilib</code> | Sets the <code>multilib</code> policy in <code>yum</code> configuration to <code>all</code> 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
wget -q -O- http://192.168.1.100/scripts/resolv.conf > /etc/resolv.conf
%include http://instsvr.mydom.com/scripts/post-config
.
.
.
%end
```

3.2.2 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-based systems) or the Tab key (BIOS-based 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 be 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.

Figure 3.1 Text-Based Installation

```
Installation
1) [x] Language settings          2) [!] Time settings
   (English (United States))      (Timezone is not set.)
3) [!] Installation source       4) [!] Software selection
   (Processing...)                (Processing...)
5) [!] Installation Destination  6) [x] Kdump
   (No disks selected)           (Kdump is enabled)
7) [ ] Network configuration     8) [!] Root password
   (Not connected)              (Password is not set.)
9) [!] User creation
   (No user will be created)
Please make your choice from above [ 'q' to quit | 'b' to begin installation |
'r' to refresh]: _
```

The text-based installation menu does not include all of the configuration options available in graphical installations. In particular, you can only use automatic disk partitioning and select a base environment. If you want more control over the installation, you can perform a remote graphical installation using VNC (see [Section 3.1, “Installation Boot Options”](#)) or use a kickstart file (see [Section 3.2, “Automated Installation Using Kickstart”](#)). After installation, the system starts in text mode even if a graphical desktop is selected as the base environment.

3.4 Installing a System With a Btrfs `root` File System

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**.

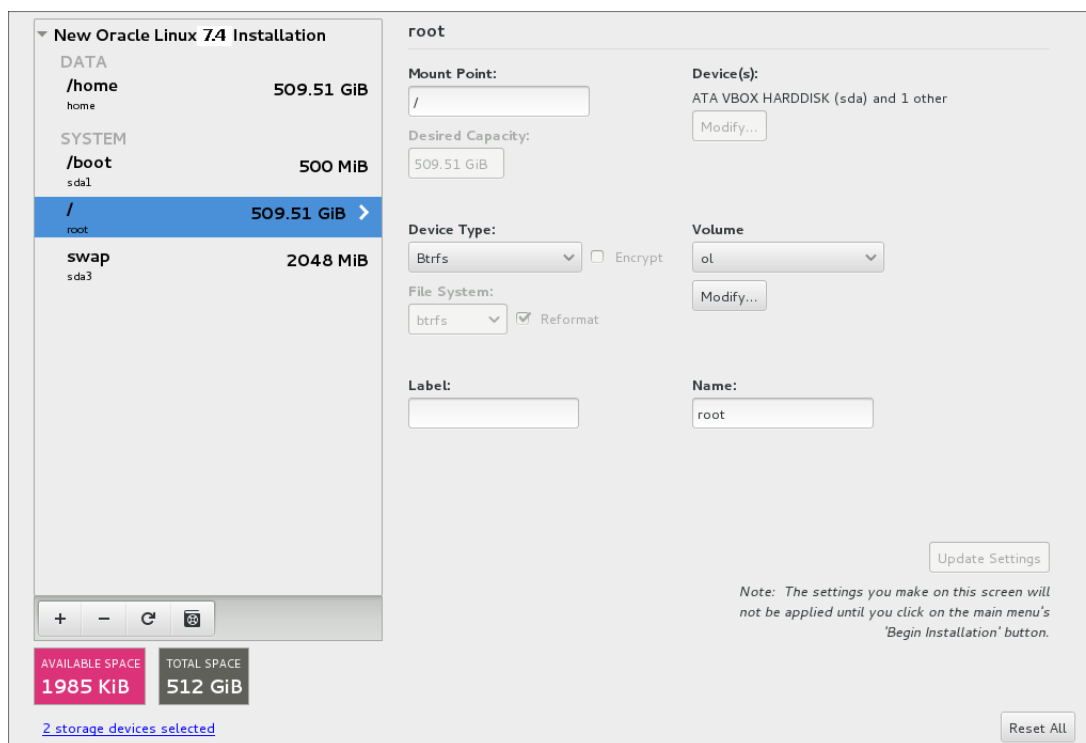
To create the default mount points automatically, click **Click here to create them automatically**. By default, automatic partitioning creates the following layout:

- A 500 MiB, or 1 GiB if you are running Oracle Linux 7 Update 3 or later, partition for an XFS file system that contains `/boot`.
- A 200 MiB 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.

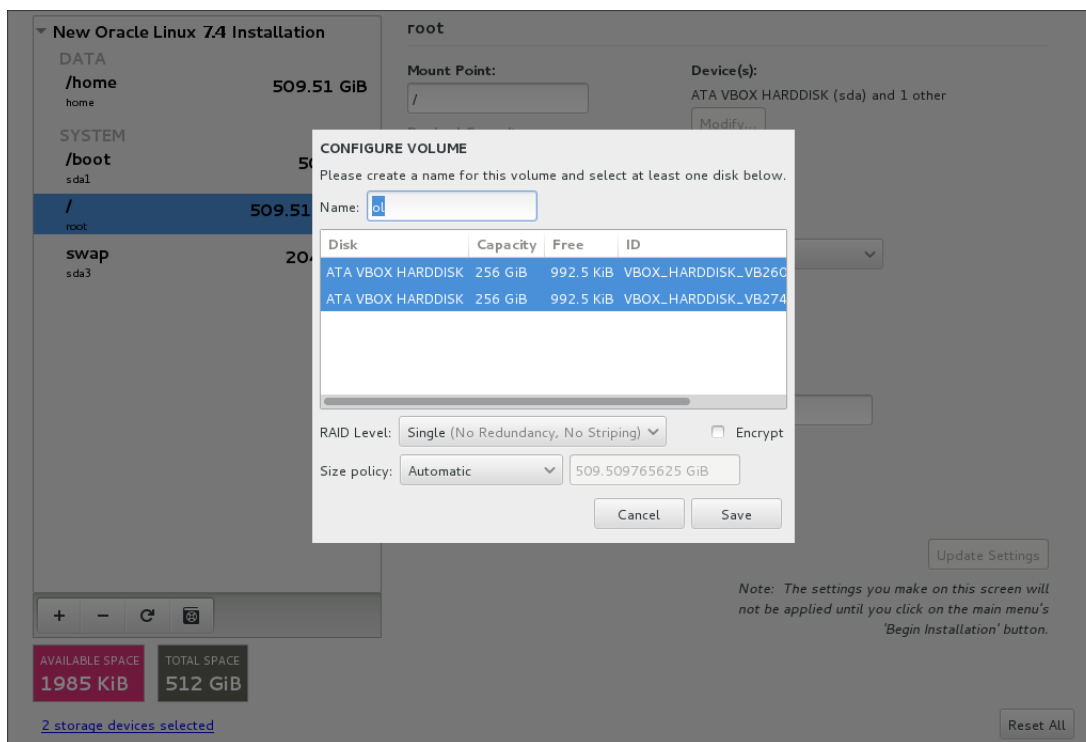
Figure 3.2 Mount Points After Automatic Partitioning



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.

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

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

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

Preparing to use a Driver Update Disk image



Warning

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

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

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

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

Using the Driver Update Disk during installation

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



Note

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

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

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

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

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

```
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 the use of HTTP, FTP and NFS as sources for network hosted DUD images.

Chapter 4 Upgrading an Oracle Linux System

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

4.1 Conditions for Performing an In-Place Upgrade

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

- The system to be upgraded 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 the `ol6_latest` repository.
- Either the Unbreakable Enterprise Kernel Release 3 (UEK R3) or the Unbreakable Enterprise Kernel Release 4 (UEK R4) release must be installed on the system and it *must* be the default boot kernel. Upgrading from Unbreakable Enterprise Kernel Release 2 is not supported.
- The Oracle Linux 6 system must have been installed with the Minimal set of software.
- No Oracle product stack is present on the system.

If the 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 it to its previous state if the upgrade fails.

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

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

4.2 Performing an In-Place Upgrade

1. If the system is registered with ULN, make sure that it is subscribed to the `ol6_x86_64_latest` and `ol6_x86_64_addons` channels.

If the system is using the Oracle Linux yum server or a local mirror, make sure that the `ol6_latest` and `ol6_addons` repositories are enabled.

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

3. Install the latest versions of the following required packages:

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

For example:

```
# yum install redhat-upgrade-tool preupgrade-assistant \
preupgrade-assistant-el6toel7 preupgrade-assistant-el6toel7-data-0 \
preupgrade-assistant-tools preupgrade-assistant-ui openscap
```

4. 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 <https://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`.

5. Run the `preupg` command to perform an upgrade assessment:

```
# preupg
```

6. 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.

7. Run the `redhat-upgrade-tool-cli` command to perform the upgrade.

For example, to upgrade using an Oracle Linux 7 installation ISO, you might use the following command:

```
# redhat-upgrade-tool-cli --iso=OL7_ISO \  
--debuglog=/tmp/upgrade.log --cleanup-post
```

Substitute `OL7_ISO` with the path to the installation ISO. Alternately, use the `--device` option to point to a burned media copy of the installation ISO. For example:

```
# redhat-upgrade-tool-cli --device=/dev/cdrom \  
--debuglog=/tmp/upgrade.log --cleanup-post
```

Substitute `/dev/cdrom` with the device where the installation media is accessible.

If you wish to use a network-based resource to perform the upgrade, you can use the `--network` option in conjunction with the `--instrepo` to specify the URL where the ISO contents are located. For example:

```
# redhat-upgrade-tool-cli --network=7.5 --instrepo=OL7_repo_url \  
--debuglog=/tmp/upgrade.log --cleanup-post
```

Substitute `OL7_repo_url` with the URL where the installation media is accessible. Note that an installation repository must contain a `.treeinfo` file that provides metadata for the installation. Currently, you cannot use the standard yum repositories exposed on the Oracle Linux yum server directly. If you wish to install from a network resource, you can copy the contents of an installation ISO to a locally hosted web server.

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

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

If you require use of a proxy server to access a network resource where your installation repository is located, set the appropriate command line variables before running the command. For example:

```
# export http_proxy="http://USER:PASSWORD@PROXY_SERVER:PORT"
```

8. 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.

9. If the system was previously registered with ULN, check that yum plugins are enabled and re-register the system with ULN.

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

```
# uln_register
```

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

- When prompted, enter your ULN user name, password, and customer support identifier (CSI).

Chapter 5 Post-Installation Configuration

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This chapter describes system configuration changes that you might make after an 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, you can use the `uln_register` command. Or, from the desktop menu, you can select **System Tools** under the **Applications** menu, then select the **ULN Registration** option.

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

During the ULN registration, your server is automatically registered with the latest channels for the base repository and the Unbreakable Enterprise Kernel Release 5.

ULN also provides channels for Oracle-specific software packages such as Oracle's `ASMLib` user space package and the Oracle Instant Client. To enable access to these packages, log in to ULN and subscribe your system to the Oracle Software 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 them 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 on them. After the registration is complete, you can use the `yum` command to install the Ksplice Uptrack package. The Ksplice Uptrack client downloads the access key from ULN and automatically configures itself so that your system can immediately begin to use Ksplice Uptrack. For more information about Ksplice, see the *Oracle Linux Ksplice User's Guide* at https://docs.oracle.com/cd/E52668_01/index.html.

5.2 Obtaining Errata and Updates from the Oracle Linux Yum Server

Oracle also provides all errata and updates for Oracle Linux through the Oracle Linux yum server, which includes updates to the base distribution, but does not include Oracle-specific software. You do not require an Oracle Linux support subscription to use this service. For more information on how to obtain updates from the Oracle Linux yum server, see <https://yum.oracle.com>.

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

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

Oracle revised how repository configuration files for the Oracle Linux yum server are distributed and updated in January 2019. Older implementations may use a consolidated configuration file available in

`/etc/yum.repos.d/public-yum-ol7.repo`. If your system is still configured in this way, consider updating and running the `/usr/bin/ol_yum_configure.sh` script to complete the transition to use the modular yum configuration files managed through yum itself.

Core repositories such as `ol7_latest` are enabled by default at installation. These repositories allow you to install base software required to run Oracle Linux 7. They also allow you to install the packages that provide the Oracle Linux yum server repository configurations that enable repositories where other software may be available. You can get a listing of the available repository configuration packages by running:

```
# yum list *release-el7*
```

See the [Oracle Linux 7 Administrator's Guide](#) for more information.

5.3 Obtaining Packages from the Oracle Linux Installation Media

After installation, following these steps to configure yum to use the full installation ISO image as a repository for installing packages:

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

```
# 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:

```
[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

When you have set up the ULN channels, Oracle Linux yum server repositories, or installation media repositories that yum should use, you can update all of the installed packages as follows:

```
# yum update
```

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

Use the following command to install or update a specific package:

```
# yum update package
```

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

```
# yum update zsh
```

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

5.5 Managing an Oracle Linux 7 System

The following are some common tasks for managing an Oracle Linux 7 system after an 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 the `/etc/locale.conf` file, and then reboot the system. For more information, see the `localectl(1)` and `locale.conf(5)` man pages.

System Date and Time

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

System Services

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

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



Note

The ports that are 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* at https://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)` man page.

To change the default system state and switch to the multi-user graphical environment (run level 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 (run level 3 in previous Oracle Linux releases):

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

To reboot an Oracle Linux 7 system:

```
# systemctl reboot
```

To shut down and power off the system:

```
# systemctl poweroff
```

Chapter 6 Troubleshooting Oracle Linux 7 Installations

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This chapter describes some options for troubleshooting Oracle Linux 7 installations. Also check the release notes in the Oracle Linux 7 Documentation Library at https://docs.oracle.com/cd/E52668_01/index.html for any known installation issues that pertain to the release you are running.

For known hardware issues, see the release notes for your UEK release in the Unbreakable Enterprise Kernel Documentation Library at https://docs.oracle.com/cd/E93554_01/index.html.

6.1 Troubleshooting Menu Options

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

Install Oracle Linux 7 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 the Ctrl+Alt+F1 keys to display the virtual console for the installation program. This console contains messages and debugging information output for the installation program. Additional virtual consoles are available to display log information from different sources, as described in the following section. Press Ctrl+b, and then press either n (for next) or b (for back) to switch between the virtual consoles. To return to the graphical installation program, press Ctrl+Alt+F6.

During an installation, several log files are generated, which capture 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, followed by pressing the number 2. You can use the shell prompt to access the log files and to copy them to a local storage device such as a USB device. Or, you can copy the log files to a network location by using the `scp` command.