Virtuozzo

Virtuozzo 6

Installation Guide

March 11, 2016

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Introduction

Virtuozzo 6 is a virtualization solution that allows you to run multiple virtual machines and Containers on a single physical server.

This chapter provides general information about Virtuozzo and this guide.

- Virtuozzo basics (p. 5)
- goals and target audience of the guide (p. 6)
- guide organization (p. 6)
- resources to consult to get more information on Virtuozzo (p. 7)
- ways to submit feedback to the documentation team (p. 7)

In This Chapter

About Virtuozzo 6

Virtuozzo 6 is a virtualization solution that allows you to simultaneously run multiple virtual machines and Containers on a single physical server. With Virtuozzo, you can efficiently share your server's hardware resources among virtual machines and Containers.

Virtuozzo is installed directly on the server hardware and does not need any operating system to function. Once it is installed, Virtuozzo allows you to create virtual machines and Containers and manage them using the following tools:

- **Command-line interface (CLI)**. The command-line interface comprises a set of command-line utilities that you can use to manage virtual machines and Containers, both locally and remotely.
- **Virtual Automation**. Virtual Automation is a remote management tool that allows you to manage physical servers and their virtual machines and Containers with the help of a standard Web browser on any platform.

Graphically, a server with the Virtuozzo software installed can be represented as follows:
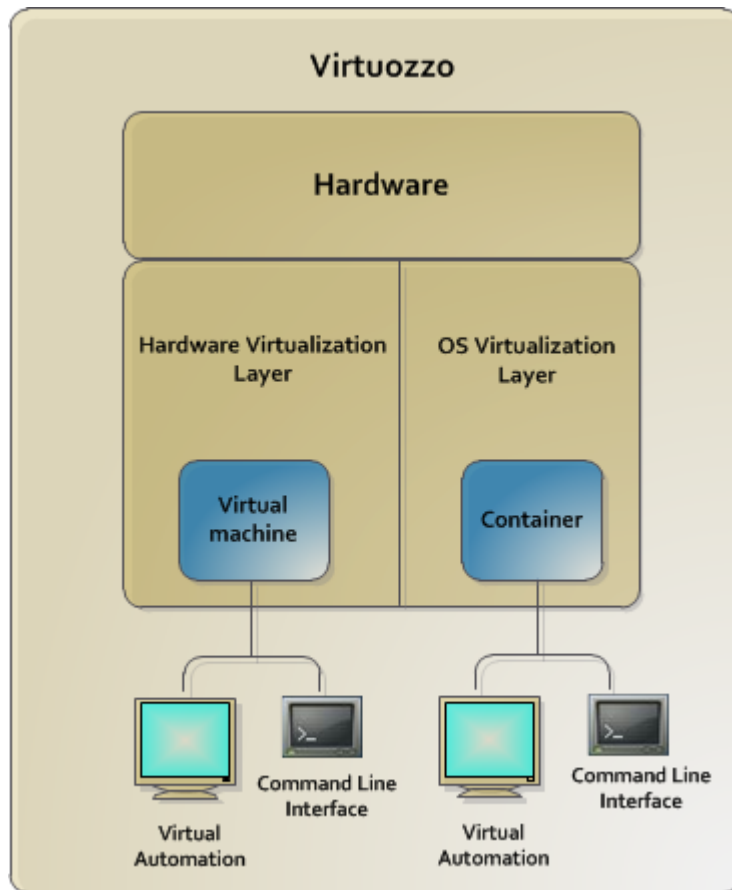
About This Guide

The *Virtuozzo 6 Installation Guide* provides detailed information on installing Virtuozzo on a physical server.

This guide is intended for anyone interested in installing and putting Virtuozzo in operation on their servers.

Organization of This Guide

This guide is organized in the following way:

Chapter 1, Introduction (p. 5), gives an overview of the Virtuozzo product and this guide.

Chapter 2, Preparing for Installation (p. 8), describes the hardware and software requirements a physical server must meet to successfully install Virtuozzo.

Chapter 3, Installing Virtuozzo 6 (p. 12), provides detailed information on installing Virtuozzo on a physical server.

Chapter 4, Exploring Additional Installation Options (p.), explains how to create software RAIDs, boot into rescue mode, and configure Virtuozzo to run in virtual machines.

Chapter 5, Starting to Work in Virtuozzo 6 (p.), instructs you how to set up Virtual Automation, a web-based tool for managing virtual machines and Containers.

Getting Help

In addition to this guide, you can use the following resources to learn how to work in Virtuozzo.

- *Getting Started With Virtuozzo 6*. This guide provides basic information on installing Virtuozzo on a physical server, creating new Containers and virtual machines, and performing main operations on them. Unlike this guide, it does not contain detailed description of all the operations needed to install and set Virtuozzo to work.

- *Installing via PXE*. This guide provides information on installing Virtuozzo 6 over a network using a PXE (Preboot Execution Environment) server.

- *Virtuozzo 6 User's Guide*. This guide provides comprehensive information on Virtuozzo covering the necessary theoretical conceptions as well as all practical aspects of working with the product. The guide does not deal with the process of installing and configuring Virtuozzo systems.

- *Virtuozzo Storage Administrator's Guide*. This guide is intended for system administrators interested in deploying Virtuozzo Storage in their networks.

- *Virtuozzo 6 Templates Management Guide*. This guide is meant to provide complete information on templates, a Virtuozzo technology allowing you to efficiently deploy standard Linux applications in Containers and greatly save the physical server resources (memory, disk space, and so on).

- *Virtuozzo 6 Command Line Reference Guide*. This guide is a complete reference on all Virtuozzo configuration files and command-line utilities.

Feedback

If you spot a typo in this guide, or if you have an opinion about how to make this guide more helpful, you can share your comments and suggestions with us by completing the Documentation Feedback form at http://www.virtuozzo.com/support/usersdoc/.

C H A P T E R 2

Preparing for Installation

This chapter provides the following information:

- hardware requirements for installing Virtuozzo (p. 8)
- software requirements for installing Virtuozzo (p. 10)
- network requirements for Virtuozzo (p. 10)
- ways to obtain Virtuozzo (p. 10)
- the process of making a bootable USB drive with Virtuozzo (p. 10)

In This Chapter

Hardware Compatibility

The system requirements slightly change depending on whether you are deploying Virtuozzo 6

- as a stand-alone installation (p. 8) or
- as part of a Virtuozzo Storage cluster (p. 9)

Requirements for Standalone Installations

The hardware requirements for running Virtuozzo 6 as a standalone installation are as follows:

- x86-64 platform with Intel VT-x or AMD-V hardware virtualization support,
- CPU: 1.5 GHz or faster (a 64-bit processor is required for running x64 versions of guest operating systems),
- RAM: 2 GB or more,
- HDD: 100 GB or more,
- Network: an Ethernet network adapter and a valid IP address.

The actual number of virtual machines and Containers you can run on a physical server and their performance depend on the resources they require. In general, the more resources your physical server has, the more virtual machines and Containers you can run and the higher their performance.

Requirements for Servers in a Virtuozzo Storage Cluster

If you plan to deploy a Virtuozzo Storage cluster, make sure your servers meet the requirements below.

Metadata Servers

- Software: Virtuozzo 6

- RAM: 1 GB per each 100 TB of storage

- Disk space: 10 GB or more

- Network:

  - 1 or more Ethernet adapters (1 Gb or faster)

  - a static IP address for each Ethernet adapter

Chunk Servers

- Software: Virtuozzo 6

- RAM: 1 GB or more

- Disk space: chunk servers can export any amount of available local disk space to a Virtuozzo Storage cluster

- Network: 1 or more Ethernet adapters (1 Gb or faster)

Clients

- Software: Virtuozzo 6

- Network: 1 or more Ethernet adapters (1 Gb or faster)

There are no special requirements to the amount of RAM and disk space that must be available on a client, except for the general recommendations for running the Virtuozzo Storage software.

System Limits

The table below lists the current hardware limits for Virtuozzo 6:

Hardware	Theoretical	Certified
RAM	64 TB	256 GB
CPU cores	128 hyperthreaded cores 256 non-hyperthreaded cores	32 hyperthreaded cores

HDD	16 TB	16 TB

Software Compatibility

Virtuozzo is installed on a bare-metal server and does not need any operating system to function.

Network Requirements

To connect to a physical server with Virtuozzo, you need to establish a wireless or wired network connection between this server and the remote computer. So, you must have a valid IP address for the physical server as well as know the default gateway, network mask, and DNS configuration.

Obtaining Virtuozzo 6 Distribution

You can use one of the following ways to obtain the Virtuozzo 6 distribution:

- Download the ISO image of Virtuozzo 6 from the official website to your computer. In this case, you need to burn the downloaded ISO image to a DVD or to create a bootable USB drive before starting the installation.

- Contact a Virtuozzo sales representative and get a DVD with Virtuozzo 6.

Preparing for Installation from USB Storage Drives

Virtuozzo can be installed from USB storage drives on physical servers with MBR or (U)EFI, given that the server allows booting from USB drives. You will need to make a bootable USB drive using the previously downloaded Virtuozzo distribution image. You will need:

- A 2 GB or more capacious USB drive.

- The Virtuozzo 6 distribution ISO image.

To make a bootable USB storage drive, use the `mkinst_flash` script. The script is located in the root directory of the Virtuozzo installation image and can be executed on any Linux machine or Mac. The installation procedure differs slightly depending on whether the server where you plan to install Virtuozzo has a traditional MBR or (U)EFI.

- To install Virtuozzo on a server with a traditional MBR, run this command:
  ```
  # ./mkinst_flash <distribution_image> <destination_USB_drive> --mbr
  ```

- To install Virtuozzo on a server with (U)EFI, run this command:

```
# ./mkinst_flash <distribution_image> <destination_USB_drive> --efi
```

Note: Running the script without the `--mbr` or `--efi` option will create a "hybrid" bootable drive suitable for both MBR and (U)EFI. However, it may not work on some specific firmware interfaces. In that case, create a bootable drive using an appropriate option as described above.

The following example demonstrates how to create a bootable USB drive mapped to `/dev/sdb` with the supplied `mkinst_flash` script:

```
# ./mkinst_flash parallels-server-6.0.11-3402-x86_64.iso /dev/sdb --efi
```

The `--efi` option, if specified, tells the script to make a bootable drive for a (U)EFI system. During execution, the `mkinst_flash` script repartitions the USB drive and transfers the distribution files to its first partition. So if during installation you are asked for the location of the installation image, specify the first partition of the USB drive. For example, if the USB drive is mapped to `/dev/sdb`, specify `/dev/sdb1`.

Note: To make a "hybrid" bootable USB drive on Windows, you can use the **Win32 Disk Imager** tool (http://sourceforge.net/projects/win32diskimager/).

Installing Virtuozzo 6

This chapter provides detailed information on installing Virtuozzo 6 in different ways:

- in default graphical mode (recommended) (p. 15)
- in graphical mode with basic or framebuffer video driver (p. 38)
- via VNC (Virtual Network Computing) (p. 38)

In This Chapter

Starting Installation

Virtuozzo can be installed from

- DVD discs
- USB drives (see **Preparing for Installation from USB Storage Drives** (p. 10))
- PXE servers (see the *Installation via PXE Server* guide for information on installing Virtuozzo over the network)

> **Note:** Time synchronization via NTP is enabled by default.

To start the installation, do the following:

1   Configure the server to boot from the chosen media (either a DVD disc or a USB drive).

2   Boot the server from the chosen media and wait for the **Welcome** screen:
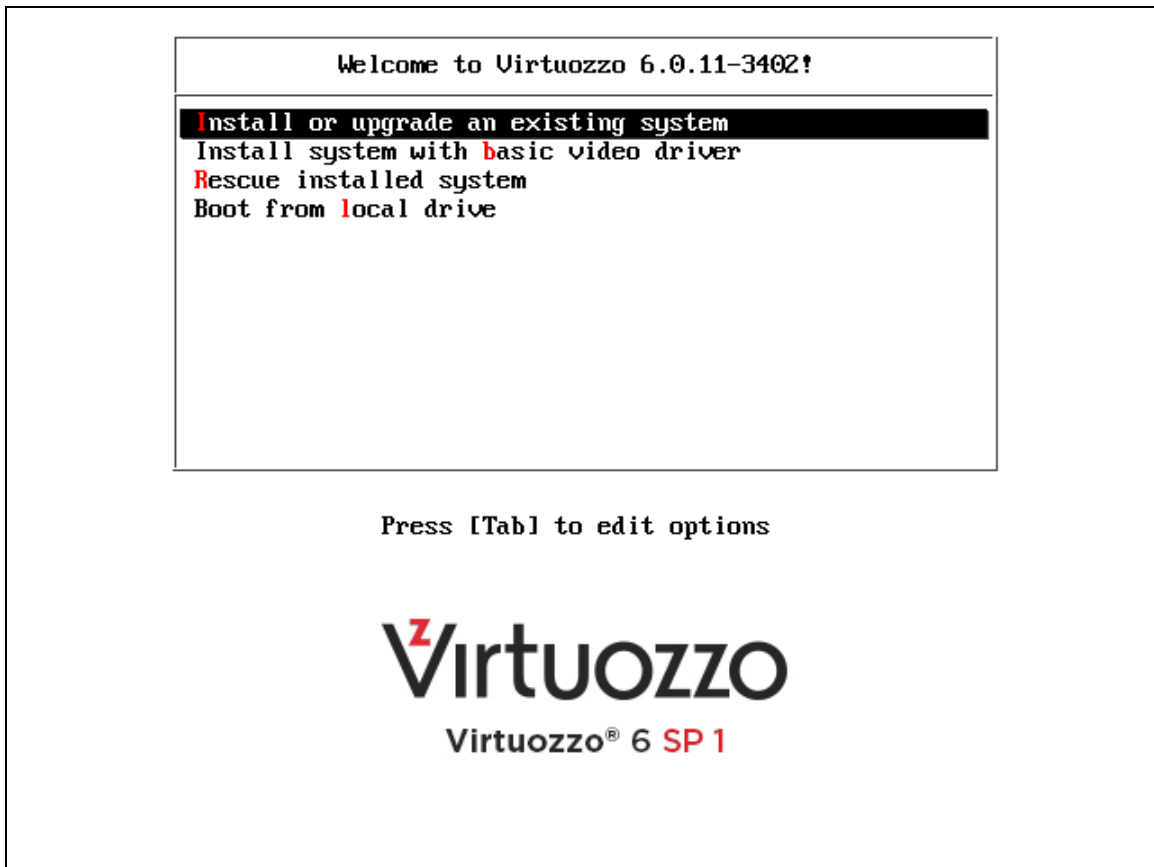
Choosing Installation Type

You can install Virtuozzo 6 in one of the following modes:

- *graphical* (default, recommended): install Virtuozzo using the graphical installer.

- *graphical with basic video driver*: install Virtuozzo using the graphical installer in a special mode. Choose this mode if the installer cannot load the correct driver for your video card.

- *graphical with framebuffer video driver* (available for EFI-based installations only): install Virtuozzo using the graphical installer in a special mode. Choose this mode in case of issues with the basic video driver mode.

Your further installation steps will differ depending on the chosen mode.

Enabling Forced Detection of SSDs

Certain solid-state drives (SSDs) may not be autodetectable by the installer. This may result in issues when you create or join Virtuozzo Storage clusters. To avoid this problem, you can force the installer to identify the required drives as SSDs by doing the following:

1 On the installer welcome screen, choose the desired installation option.

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2 Press `Tab` to edit the chosen installation option.

3 In the console prompt that appears, add the following parameter at the end of the installation command:

`ssd_hack=sd<N>[,...]`

where `<N>` is the letter of the required SSD (see an example below).
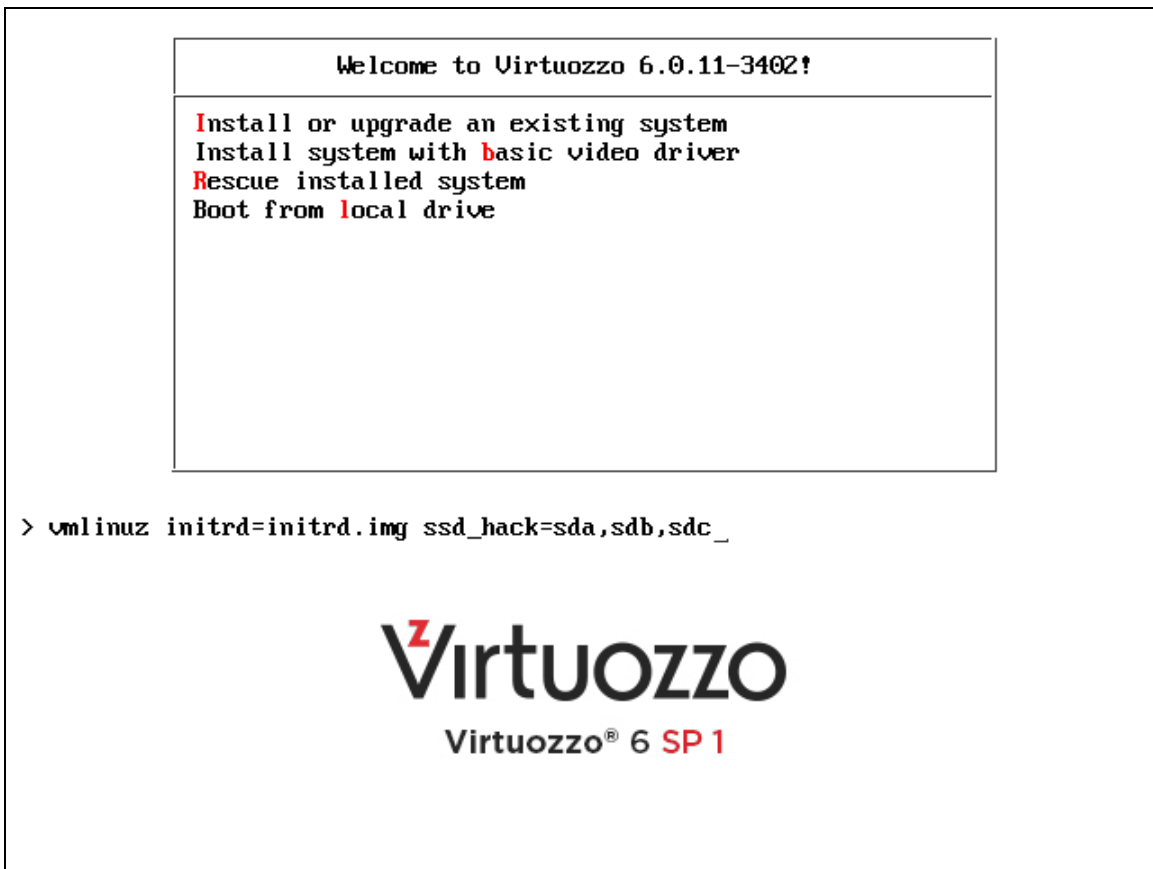
4 Press `Enter` to start installation.

The installer will identify the specified drives as SSDs.

Disabling RAID

To install Virtuozzo on disks which were previously used in RAID setups, you may need to do the following:

1 Disable RAID in BIOS to be able to boot from a single HDD.

2 On the installer welcome screen, choose the desired installation option.

3 Press `Tab` to edit the chosen installation option.

4   In the console prompt that appears, add the `nodmraid` parameter at the end of the installation command:

5   Press `Enter` to start installation.

> **Warning:** Any RAID configurations you have will be ignored during the installation. Make sure you will not lose any data because of this.

Installing in Graphical Mode

To install in the graphical mode, choose the **Install or upgrade an existing system** option in the **Welcome** window and press Enter. In this mode, you use the graphical installer and specify only basic parameters to install Virtuozzo.

Reading and Accepting the License Agreement

Read and accept the end-user license agreement. To accept the license agreement, click **Next**, and in the displayed window, click **Agree**.
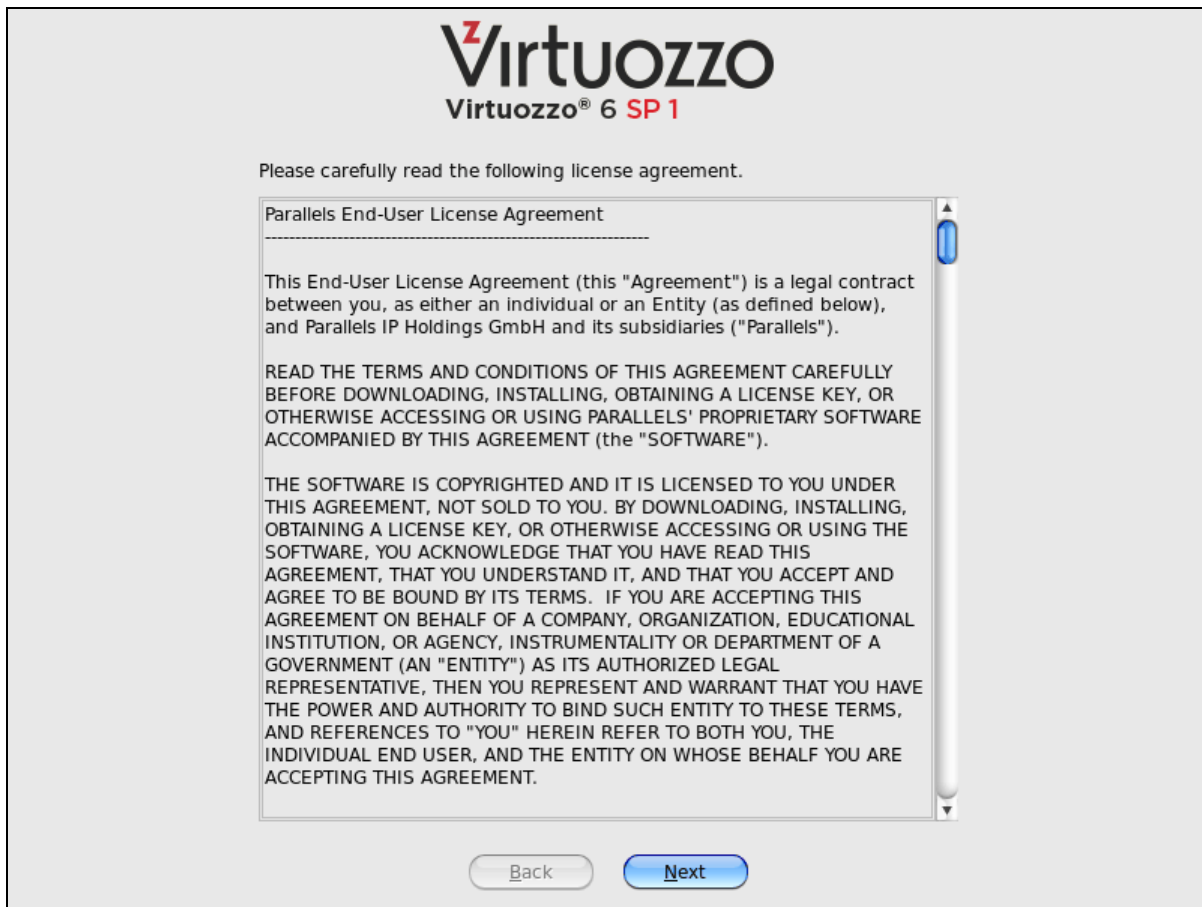
Selecting the Keyboard Type

Select the keyboard layout to use for the installation and as the system default once the installation is complete.

> **Note:** For installations from a USB drive, the screen where you can select the desired keyboard layout is shown before the **License Agreement** screen.

Defining Network Settings

Choose a hostname for your server. You can specify a hostname as a fully qualified domain name (*hostname.domainname*) or as a short name (*hostname*).

On this screen, you may also need to configure your network settings for at least one network card. To do this:

1 Click the **Configure Network** button.

2 Select one of the network cards installed on the server.

3 Click **Edit**.

4 Do one of the following:

- Accept the network settings offered by the installer. View the default settings in the editing network card window, and if you are satisfied with them, click **Apply**; then click **Close**.

- Configure the network card settings. Click the necessary tabs in the editing network card window, and configure the settings to meet your demands. When you are done, click **Apply**; then click **Close**.

Click **Next** to continue with the installation.

Choosing the Installation Device

Select the storage device to install Virtuozzo on.

You can choose between two options:

- **Basic Storage Devices**: Perform a standalone installation of Virtuozzo 6 on a hard drive that is connected directly to your local system (local hard drive).

- **Virtuozzo Storage**: Include the server in a Virtuozzo Storage cluster. If you choose this option, you will need to specify a number of additional settings described in **Configuring for Use with Virtuozzo Storage** (p. 21).

> **Notes**:
>
> 1. Virtuozzo Storage is a solution that transforms local hard drives into a highly protected enterprise-level storage (like SAN or NAS) with data replication, high-availability, and self-healing features. Using Virtuozzo Storage, you can safely store and run virtual machines and Containers, migrate them with zero downtime, provide high availability for your Virtuozzo installations, and much more. For more information on Virtuozzo Storage, see the *Virtuozzo Storage Administrator's Guide*.
>
> 2. In a Virtuozzo Storage cluster, all servers must have unique hostnames. So if you did not set a hostname for the server, click **Back** and specify one on the screen of defining network settings.

Configuring for Use with Virtuozzo Storage

If you choose to install on Virtuozzo Storage, you can do one of the following:

- **Join an existing Virtuozzo Storage**. Choose this option to join the server to an existing Virtuozzo Storage cluster. You can use this option if you already have set up at least one cluster in your network and want to make the server part of this cluster.

- **Create a new Virtuozzo Storage**. Choose this option to create a Virtuozzo Storage cluster from scratch. You can use this option if you do not have any clusters in your network or want to set up a separate cluster for this installation.

Depending on which option you choose, your further steps will slightly differ.

> **Note:** For detailed information on working with Virtuozzo Storage clusters, consult the *Virtuozzo Storage Administrator's Guide*.

Joining an Existing Virtuozzo Storage Cluster

If you select the **Join an existing Virtuozzo Storage** option and click **Next**, you will see this window:

Specify the parameters to join your new server to the cluster:

1 **Cluster name**: Specify the name of the Virtuozzo Storage you want to join your server to.

In most cases, the installer automatically detects all Virtuozzo Storage clusters in your network and displays their names as a list box to the right of the **Cluster name** field. If the installer cannot find any cluster, it shows a warning, and you need to manually type the cluster name in the provided field.

2 **Security settings**. Click the button and specify the password to authenticate your new server in the cluster. Type the password you specified when creating the cluster and press Enter.

3 **Metadata Server Role**. Specify whether the installer should configure your server to act as a metadata (MDS) server in the cluster. MDS servers are an essential part of any Virtuozzo Storage cluster. They store metadata about chunk servers and control how files keeping the contents of virtual machines and Containers are split into chunks and where these chunks are located.

When you create a new Virtuozzo Storage cluster, the **Metadata Server Role** option is selected by default. To set up an MDS server, you need to specify an IP address to use for connecting to this server. You can type it manually in the **IP address** field or click the arrow at the end of the field and choose one from the list of IP addresses that were detected by the installer (it shows all IP addresses it could find for the server).

> **Note:** MDS servers must have static IP addresses assigned. If you are using DHCP, map an IP address to the MAC address of the MDS server.

4 **Chunk Server Role**. Specify whether the installer should configure your server to act as a chunk server in the cluster. Chunk servers store the contents of virtual machines and Containers in the form of fixed-size chunks and provide access to these chunks. All data chunks are replicated and the replicas are kept on different chunk servers to achieve high availability. If one of the chunk servers goes down, the other chunk servers will continue providing the data chunks that were stored on the failed server.

> **Warning:** Virtuozzo Storage has redundancy built in, so you should avoid running Virtuozzo Storage on redundant types of RAID like 1, 5, or 6 over local storage. In this case, a single write operation may affect a significant number of HDDs resulting in very poor performance. For example, for 3 Virtuozzo Storage replicas and RAID5 on servers with 5 HDDs each, a single write operation may result in 15 I/O operations. For recommendations on optimal local storage configurations, consult the *Virtuozzo Storage Administrator's Guide*.

By default, the installer does the following:

- If your server has several disk drives, the installer will automatically configure each disk drive to act as a separate chunk server.

- If one or more SSD drives are available on the server, they will be set up to store chunk server write journals (each chunk server will get its own journal). By using SSD drives for write journaling, you can boost the performance of write operations in the cluster by up to 2 and more times. For more information on using SSD drives, consult the *Virtuozzo Storage Administrator's Guide*.

> **Note:** If one or more SSDs are not detected automatically, find out their drive letters (e.g., invoke the console by pressing `Ctrl+Alt+F2` and analyze `dmesg` output), reboot to the installer Welcome screen, and see **Enabling Forced Detection of SSDs** (p. 13) for instructions.

To check the chunk server settings that will be applied to your disk drives, click the **Chunk Server settings** button.

5 **Client Server Role**: Specify whether the installer should configure your server to act as a client in the cluster. Clients are computers with Virtuozzo 6 from where you run virtual machines and Containers stored in your Virtuozzo Storage cluster.

By default, the installer

- Enables High Availability support for the client and for all virtual machines and Containers you will create on it. With High Availability turned on, if the client fails, all virtual machines and Containers hosted on it will be automatically moved to a healthy server. For detailed information on High Availability, consult the *Virtuozzo 6 User's Guide*.

- If one or more SSD drives are available on the server, configures them to store a local cache of frequently accessed data. By having a local cache on an SSD drive, you can increase the overall cluster performance by up to 10 and more times. For more information on using SSD drives, consult the *Virtuozzo Storage Administrator's Guide*.

> **Note:** If one or more SSDs are not detected automatically, find out their drive letters (e.g., invoke the console by pressing `Ctrl+Alt+F2` and analyze `dmesg` output), reboot to the installer Welcome screen, and see **Enabling Forced Detection of SSDs** (p. 13) for instructions.

Using the **Client settings** button, you can check whether the support for using SSD drives to store a local cache is enabled.

When you are done, click **Next**.

Creating a New Virtuozzo Storage Cluster

If you choose to create a new Virtuozzo Storage cluster, you see this window:

Specify the parameters for your new Virtuozzo Storage cluster. All parameters are described below.

Main cluster parameters

First, you need to assign a name for the cluster and set a password to access it.

- **Cluster name**. Specify a name for the cluster that will uniquely identify it among other clusters in your network. A cluster name must consist of the characters a-z, A-Z, 0-9, minus (-), underscore (_), and must not exceed 63 characters.

- **Security settings**. Click this button and specify a password to use for password-based authentication in your cluster.

Password-based authentication enhances security, requiring each server to be authenticated before it can be included in the cluster. The password you specify is encrypted and saved to the `/etc/pstorage/clusters/CLUSTER_NAME/auth_digest.key` file on the server.

> **Note:** You need to authenticate a server only once. After that, you can configure it as an MDS server, chunk server, or a client. So if you later decide to configure the server where you are setting the first MDS server as a chunk server, no additional authentication will be required.

Cluster Roles

Each server in the cluster can play one or all of the following roles:

- **Metadata Server Role**. Specify whether the installer should configure your server to act as a metadata (MDS) server in the cluster. MDS servers are an essential part of any Virtuozzo Storage cluster. They store metadata about chunk servers and control how files keeping the contents of virtual machines and Containers are split into chunks and where these chunks are located.

  When you create a new Virtuozzo Storage cluster, the **Metadata Server Role** option is selected by default. To set up an MDS server, you need to specify an IP address to use for connecting to this server. You can type it manually in the **IP address** field or click the arrow at

the end of the field and choose one from the list of IP addresses that were detected by the installer (it shows all IP addresses it could find for the server).

> **Note:** MDS servers must have static IP addresses assigned. If you are using DHCP, map an IP address to the MAC address of the MDS server.

- **Chunk Server Role**. Specify whether the installer should configure your server to act as a chunk server in the cluster. Chunk servers store the contents of virtual machines and Containers in the form of fixed-size chunks and provide access to these chunks. All data chunks are replicated and the replicas are kept on different chunk servers to achieve high availability. If one of the chunk servers goes down, the other chunk servers will continue providing the data chunks that were stored on the failed server.

> **Warning:** Virtuozzo Storage has redundancy built in, so you should avoid running Virtuozzo Storage on redundant types of RAID like 1, 5, or 6 over local storage. In this case, a single write operation may affect a significant number of HDDs resulting in very poor performance. For example, for 3 Virtuozzo Storage replicas and RAID5 on servers with 5 HDDs each, a single write operation may result in 15 I/O operations. For recommendations on optimal local storage configurations, consult the *Virtuozzo Storage Administrator's Guide*.

By default, the installer does the following:

- If your server has several disk drives, the installer will automatically configure each disk drive except system to act as a separate chunk server.

> **Note:** Creating chunk servers on system disks is not recommended as additional load from system/swap may reduce CS performance which may lead to overall cluster performance degradation. If you still want to create a CS on a system disk, click **Chunk Server settings** and check the **Create CS on system disk** box.

- If one or more SSD drives are available on the server, they will be set up to store chunk server write journals (each chunk server will get its own journal). By using SSD drives for write journaling, you can boost the performance of write operations in the cluster by up to 2 and more times. For more information on using SSD drives, consult the *Virtuozzo Storage Administrator's Guide*.

> **Note:** If one or more SSDs are not detected automatically, find out their drive letters (e.g., invoke the console by pressing `Ctrl+Alt+F2` and analyze `dmesg` output), reboot to the installer Welcome screen, and see **Enabling Forced Detection of SSDs** (p. 13) for instructions.

To check the chunk server settings that will be applied to your disk drives, click the **Chunk Server settings** button.

- **Client Server Role**: Specify whether the installer should configure your server to act as a client in the cluster. Clients are computers with Virtuozzo 6 from where you run virtual machines and Containers stored in your Virtuozzo Storage cluster.

By default, the installer

- Enables High Availability support for the client and for all virtual machines and Containers you will create on it. With High Availability turned on, if the client fails, all virtual machines and Containers hosted on it will be automatically moved to a healthy server. For detailed information on High Availability, consult the *Virtuozzo 6 User's Guide*.

- If one or more SSD drives are available on the server, configures them to store a local cache of frequently accessed data. By having a local cache on an SSD drive, you can increase the overall cluster performance by up to 10 and more times. For more information on using SSD drives, consult the *Virtuozzo Storage Administrator's Guide*.

> **Note:** If one or more SSDs are not detected automatically, find out their drive letters (e.g., invoke the console by pressing `Ctrl+Alt+F2` and analyze `dmesg` output), reboot to the installer Welcome screen, and see **Enabling Forced Detection of SSDs** (p. 13) for instructions.

Using the **Client settings** button, you can check whether the support for using SSD drives to store a local cache is enabled.

When you are done, click **Next**.

Entering the License Key

Enter the required license keys:

- *Virtuozzo license key*. Each physical server running Virtuozzo requires a separate license key to be installed.

- *Virtuozzo Storage license key*. A separate license key is required for each Virtuozzo Storage cluster.

If you choose to go with the basic installation, you will only need a Virtuozzo license key.

Type the license key(s) in the field(s) provided, and click **Next**. You can skip this step and install the key(s) later. However, if you do not specify the key for Virtuozzo, you will not be able to install Virtual Automation and its components along with Virtuozzo. For more information about Virtual Automation, see **Installing Virtual Automation** (p.).

Defining Time Zone Settings

Specify your time zone settings.

To set your time zone, either select the city nearest to your physical location on the drop-down menu or click a spot on the interactive map to zoom in to it. You can also select the **System clock uses UTC** check box to set your system to UTC (Universal Time Coordinated), which makes it automatically switch between normal and daylight saving time.

Setting a Password

Specify a password for the root account.

You will need to log in to the physical server as `root` to manage virtual machines and Containers.

Partitioning the Hard Drive

The **Partitioning** window allows you to choose the way of partitioning your server.

Do one of the following:

- Select the **Use All Space** radio button to create the default layout on the server. If you do not feel comfortable with partitioning servers, you are recommended to select this option and let the installer automatically partition your system. For details, see **Creating the Default Layout** (p. 31).

- Select the **Create Custom Layout** radio button to manually partition your disk drive. Detailed information on how you can do it is given in **Creating Custom Layout** (p. 32).

Creating the Default Layout

The default partitioning scheme differs depending on whether you use Virtuozzo with a local storage or Virtuozzo Storage.

Using with a Local Storage

If you are using Virtuozzo with a local storage, the installer creates the following partitions on your system:

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Partition	Description
/boot	Boot partition containing boot files for Virtuozzo.
/	Root partition containing Virtuozzo files.
/vz	Partition where all virtual machines and Containers will be located.
swap	Paging partition for Virtuozzo.

Using with a Virtuozzo Storage

If you are using Virtuozzo with a Virtuozzo Storage, the installer creates the following:

Partition	Description
/boot	Boot partition containing boot files for Virtuozzo.
/	Root partition containing Virtuozzo files.
/vz	Partition for storing OS and application template files.
swap	Paging partition for Virtuozzo.
/pstorage	The directory for Virtuozzo Storage data. In it, the installer may create the following subdirectories, depending on the options you choose: • $CLUSTER\_NAME$-cs[N]: Mount point(s) for the chunk server(s). Created if the Node will host chunk servers. • $CLUSTER\_NAME$-mds: Stores metadata about Virtuozzo Storage data. Created if the Node will host an MDS server. • $CLUSTER\_NAME$: Mount point for the Virtuozzo Storage cluster. Created if the Node will serve as a client.

Creating a Custom Layout

If you choose to create a custom layout, you will be able to partition your system manually. You can use the provided buttons (**Create**, **Edit**, and so on) to create and configure your partitions. The partitions you need to create differ depending on whether you use Virtuozzo with a local storage or with a Virtuozzo Storage.

Using with a Local Storage

If you are using Virtuozzo with a local storage, create the following partitions on your system:

Partition	Description
/boot	Boot partition containing boot files for Virtuozzo. Allocate 500 MB.
/	Root partition containing Virtuozzo system files. Allocate at least 12 GB.
swap	Paging partition for Virtuozzo. For details on how much disk space to allocate to swap, see **Creating the Paging Partition** below.
/vz	Partition where all Containers and virtual machines will be stored. Allocate all the remaining disk space to this partition (at least 88 GB).

Using with a Virtuozzo Storage

If you are using Virtuozzo with a Virtuozzo Storage, create the following partitions:

Partition	Description
/boot	Boot partition for Virtuozzo boot files. Allocate 500 MB.
/	Root partition for Virtuozzo files. Allocate 20-30 GB.

/vz	Partition for OS and application template files. Allocate 30-40 GB.
swap	Paging partition for Virtuozzo. For details on how much disk space to allocate to swap, see **Creating the Paging Partition** below.
/pstorage/CLUSTER_NAME-cs[*N*]	Chunk server partition. Allocate at least 100GB. Create only one CS partition per physical disk. When adding CS partitions, choose a mount point for each in the corresponding column.

Creating the Paging Partition

Use the following guidelines when deciding on how much disk space to allocate to swap:

RAM	swap
up to 4 GB	2 GB
4-16 GB	4 GB
16-64 GB	8 GB
64-256 GB	16 GB
256-512 GB	32 GB

Choosing the Device

Choose the storage device to install Virtuozzo and the boot loader on. This screen is displayed only if your system contains more than one storage device.

To choose a device, select it in the **Data Storage Devices** table, and then click the right arrow button to move the device to the **Install Target Devices** table. If you move more than one device to the **Install Target Devices** table, you will also need to choose the device to install the boot loader to. To do this, click the radio button next to the desired device.

Note that the devices you leave in the **Data Storage Devices** table will be attached to the file system as data storages but will not be partitioned or formatted.

Installing Virtual Automation

Choose the Virtual Automation components to install on your server. This screen is displayed only if you entered the license in one of the previous steps and your license provides support for Virtual Automation.

Do one of the following:

- Clear the **Install Virtual Automation Agent for Virtuozzo** and **Install Virtual Automation Management Node** check boxes, and click **Next** if you do not want to use Virtual Automation for managing your server and virtual machines and Containers.

- Leave the **Install Virtual Automation Agent for Virtuozzo** and **Install Virtual Automation Management Node** check boxes selected to set up the Virtual Automation application and its components on the server. Using Virtual Automation, you can connect to the server and manage virtual machines and Containers with your favorite browser.

  If you leave the check boxes selected, you will need to specify a valid and unused IP address accessible from the Internet and a hostname (optional) for Virtual Automation Management Node. This Virtual Automation component will be downloaded to and installed in a Container, so make sure this Container with the IP you have chosen will have Internet access. Once the Virtual Automation Management Node installation is complete, you can log in to Virtual Automation by visiting the chosen IP address or hostname and using the username `root` and the password you specified in the previous step.

  When the check boxes are selected, the installer performs the following operations after you restart the server:

1. Downloads the installation packages for Virtual Automation from the official website. Notice that the download process may take some time, depending on the speed of your Internet connection.

2. Sets up Virtual Automation and its components. The installation is automatically initiated once the installation packages are downloaded and runs without your interaction.

When you are done, click **Next** to start installing Virtuozzo.

> **Notes**:
>
> 1. Your server and the Container must be connected to the Internet to download the Virtual Automation installation packages from the official repository.
>
> 2. You can use Virtual Automation to manage hosts only if your license allows you to do so. If the license does not support using Virtual Automation, the Virtual Automation components screen is not displayed. In this case, you must first upgrade your license and then install the Virtual Automation application manually. For more information, see **Installing Virtual Automation Manually** (p. 58).
>
> 3. For more information on setting up and logging in to Virtual Automation, see **Using Virtual Automation** (p. 56).

Installing Virtuozzo Updates

To save time, you can also download and install product updates from the official repository during Virtuozzo installation. To do this, click **Yes** in the alert window that is shown after the installation has started but before any packages are installed:
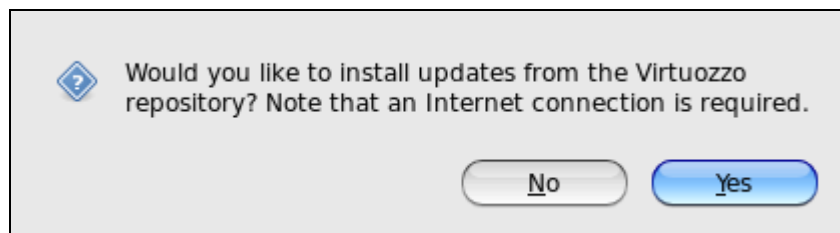
After you have made your choice, the installation will continue.

Finishing the Installation

Once the installation is complete, the **Congratulations** window appears. Click **Reboot** to restart the server and boot into Virtuozzo.

The **Eject the installation DVD** option, when selected, automatically removes the Virtuozzo installation disc from your DVD-ROM drive before booting the system.

> **Note:** If you are installing Virtuozzo from a USB drive, remove the drive manually before restarting the server.

Congratulations, your Virtuozzo installation is complete.

Please reboot to use the installed system. Note that updates may be available to ensure the proper functioning of your system and installation of these updates is recommended after the reboot.

☑ Eject the installation DVD

Back   Reboot

Installing with Basic or Framebuffer Video Driver

If the installer cannot load the correct driver for your video card, you can try to install Virtuozzo in the *graphical mode with basic or framebuffer video driver*. The latter is available for EFI-based installations only. To install in one of these modes:

* Choose the **Install system with basic video driver** option on the **Welcome** screen, and press Enter.

* Choose the **Install system with framebuffer video driver** option on the **Welcome** screen, and press Enter.

Installing Virtuozzo in these modes does not differ from installing it in the default graphical mode. Consult **Installing in Graphical Mode** (p. 15) for information on specific installation steps.

Installing via VNC

To install Virtuozzo in the VNC (Virtual Network Computing) mode:

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1   In the **Welcome** screen, press Esc.

2   At the boot prompt that appears, type `linux vnc`, and press Enter.

3   Wait until the installer launches the VNC server and displays the information on how to connect to the server via a VNC client.

4   On the computer you plan to use for installing Virtuozzo, run your favorite VNC client.

5   Connect to the server using the information provided by the installer in Step 3.

6   Follow the on-screen instructions to install Virtuozzo in the graphical mode. For details, see **Installing in Graphical Mode** (p. 15).

Note: You can also specify the standard `vnc` command in a kickstart file to view the graphical installation of Virtuozzo remotely via VNC. For details on this command, see the description of kickstart options in the *Red Hat Linux Enterprise Installation Guide*.

Configuring Ports

This section lists the ports that need to be opened for your server to operate properly. The set of ports differs depending on your system configuration:

- If the server does not participate in a Virtuozzo Storage cluster and does not use Virtual Automation, see **Servers Without Virtual Automation** (p. 39) for information on ports used by Virtuozzo.

- If the server is part of a Virtuozzo Storage cluster, see **Servers in Virtuozzo Storage Clusters** (p. 40) for information on ports used by the cluster.

- If the Virtual Automation application is installed on the server, see **Servers With Virtual Automation** (p. 41) for information on ports used by this application.

- If you plan to set up a Virtual Automation Management Node, see **Virtual Automation Management Node** (p. 41) for information on ports required by this component.

Servers without Virtual Automation

The table below lists the ports for servers that do not participate in Virtuozzo Storage clusters and do not use the Virtual Automation application. "I" in the **Description** column signals that the port should be opened for incoming traffic and "O" — for outgoing traffic.

Port	Description
22	(IO) Used for secure logins via SSH.
80	(IO) Used for HTTP connections, e.g., to download Virtuozzo updates and EZ templates from remote repositories.
21	(O) Used to connect to the Debian repository to cache Debian EZ templates.
443	(O) Used to send problem reports to the support team.
5224	(O) Used to connect to the Key Administrator server to update Virtuozzo lease licenses.

64000	(IO) Used for remote connections to the Virtuozzo dispatcher via Odin Automation for Cloud Infrastructure.
1621, 1622	(O) Used to migrate Containers to virtual machines on servers that run Virtuozzo hypervisor-based solutions.
67	Used to support Host-Only adapters in virtual machines. Virtuozzo does not use port 67 for any external connections.
`rpc ports`	Used by various RPC services (e.g., to support NFS shares). Port numbers may differ from system to system. To learn what RPC services are registered on your server and what ports they are using, run this command: `# rpcinfo -p localhost`
647, 847	Reserved by the Linux `portreserve` program for the DHCP server, if you use one.

You may also need to additionally open ports used to connect to remote `yum` repositories. Though most of the repositories can be accessed via HTTP, some may require access via HTTPS or FTP. To check what repositories are currently configured for your system and what protocols are used to connect to them, run the following commands and examine their output:

```
# yum repolist -v | egrep -e 'baseurl|mirrors'
# curl http://repo.cloudlinux.com/psbm/mirrorlists/psbm6-os.mirrorlist
```

Servers in Virtuozzo Storage Clusters

A Virtuozzo Storage cluster requires the following ports to be open, in addition to the ports listed in **Servers Without Virtual Automation** (p.):

Port	Description
MDS Servers	
2510	(IO) Used for communication between MDS servers.
2511	(IO) Used for communication with chunks servers and clients.
Chunk Servers	
2511	(O) Used for communication with MDS servers.
`random_port`	(I) Used for communication with clients. The chunk server management service automatically binds to any available port. You can also manually assign the service to a specific port.
Clients	
2511	(O) Used for communication with MDS servers.
`random_port`	(O) Used for communication with chunk servers. The client management service automatically binds to any available port. You can also manually assign the service to a specific port.

Servers with Virtual Automation

Servers running Virtual Automation must have the following ports open, in addition to the ports listed in **Servers Without Virtual Automation** (p. 39):

Port	Description
4643, 8443	(I) Used to connect to virtual machines and Containers via the Power Panel and Plesk Panel applications, respectively.
22, 64000	(IO) Used by Virtual Automation for backing up and migrating virtual machines and Containers.
25	(I) Used to send email notifications to users via the SMTP protocol.
4646	(I) Used for communication with the server via the Virtuozzo Agent SOAP interface.
8443, 8880	(I) Used for integration between Plesk Control Panel and Power Panel.
4433, 4435	(I) Used for non-encrypted connections to the Virtuozzo Agent.
4434	(I) Used for encrypted SSL connections to the Virtuozzo Agent.
4534	(I) Used for encrypted SSL XML connections to the Virtuozzo Agent.
4649	(I) Used for managing virtual machines and Containers with the offline management feature enabled via the VNC protocol.

Virtual Automation Management Node

If you plan to deploy a Virtual Automation Management Node, make sure the following ports are opened on this node:

Port	Description
22	(IO) Used for secure logins via SSH.
4533	(I) Used for non-encrypted TCP connections to the Virtual Automation Management Node.
4534	(I) Used for encrypted SSL connections to the Virtual Automation Management Node.
4648	(I) Used to connect to the Virtual Automation Control Panel.
80, **443**	(I) Used for redirects to the Virtual Automation Control Panel.

C H A P T E R 4

Exploring Additional Installation Options

This chapter describes how to

- create software RAIDs for systems with Virtuozzo (p. 42)
- boot into rescue mode (p. 48)
- run Virtuozzo in virtual machines (p. 53)

In This Chapter

Creating Software RAIDs

A software RAID consists of two or more physical hard disks combined to act as a single logical unit. Software RAIDs are created using special software and are meant for improving the disk performance and providing fault tolerance against disk errors.

You can create software RAIDs when installing Virtuozzo on your server. To do this, select the **Create custom layout** radio button in the **Partitioning** window, and click **Next**. The main partitioning window appears:

The process is similar to creating software RAIDs in most modern Linux distributions (e.g., Red Hat Enterprise Linux or CentOS) and includes the following stages:

1 Making software RAID partitions (p.).

**2** Creating RAID arrays (or devices) from the newly made software RAID partitions (p.).

This section describes how to create a software RAID for the /vz partition when running the Virtuozzo installer in the graphical mode. However, you can easily adapt the procedures shown here to create software RAIDs for other partitions (e.g., root) in both the graphical and text modes.

Making Software RAID Partitions

In the first step, you need to create two or more identical software RAID partitions for the /vz partition. These partitions will then be used as the basis for a RAID array.

To create a software RAID partition:

1 Click the **Create** button on the **Please Select a Device** screen. The **Create Partition** dialog box appears.
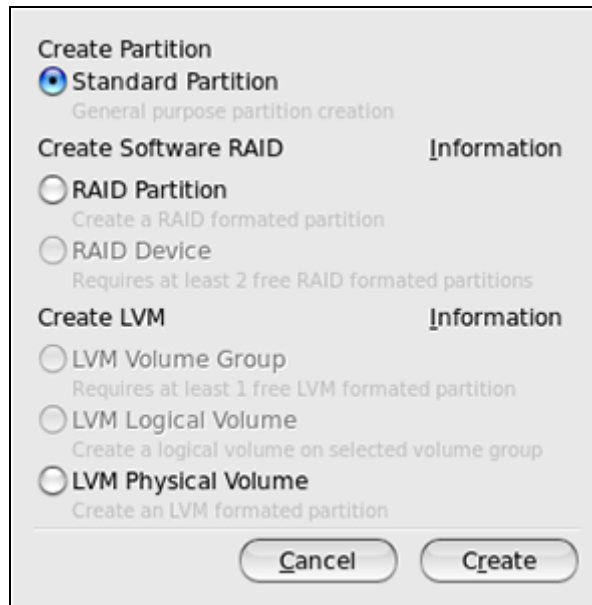
2   Select the **RAID Partition** radio button, and click **Create**.

3   Set the following options:

a   In the **Allowable Drives** section, select the check box of the drive you want to use for the RAID. Make sure the check boxes of all the other drives are cleared. This is necessary because a software RAID partition can be situated on one disk drive only.

b   In the **Size** field, specify the size for the /vz partition. The /vz partition is intended to store all virtual machines and Containers data and should occupy as much disk space as possible.

c   Select **Force to be a primary partition** if you want to make the /vz partition a primary partition.

4   Click **OK**. After a while, the newly created software RAID partition should appear in the main partitioning window.

Repeat the steps above to create other software RAID partitions for the /vz partition. Their number can differ depending on the RAID configuration you want to implement. For example, if you are going to deploy the RAID 1 configuration with two mirrored hard drives, you need to create one more software RAID partition. Once you create it, your window should look like the following:

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Creating RAID Devices

Now that you have created the necessary RAID partitions for the /vz partition, you can make a RAID array on their basis. To do this:

1 On the **Please Select a Device** screen, click the **Create** button.

2 On the **Create Storage** screen, select the **RAID Device** radio button, and click **Next**.

3 In the **Make RAID Device** dialog, set the following parameters for the RAID device:

  a Specify a mount point in the **Mount Point** field. In our case, the mount point should be /vz.

  b Set the RAID file system type in the **File System Type** field to ext4.

  c Select a name for the RAID array in the **RAID Device** field.

  d Choose the RAID level in the **RAID Level** field. You can choose any of the RAID levels available on the drop-down menu.

  e The **RAID Members** section lists all your software RAID partitions. Select the check boxes next to the RAID partitions you created for the /vz partition.

  f Specify the number of spare partitions in the **Number of spares** field. Spare partitions can be configured in RAID 1 and RAID 5 implementations only.

When you are done, click **OK**. The created RAID array appears in the **Devices** column under **RAID Devices**.
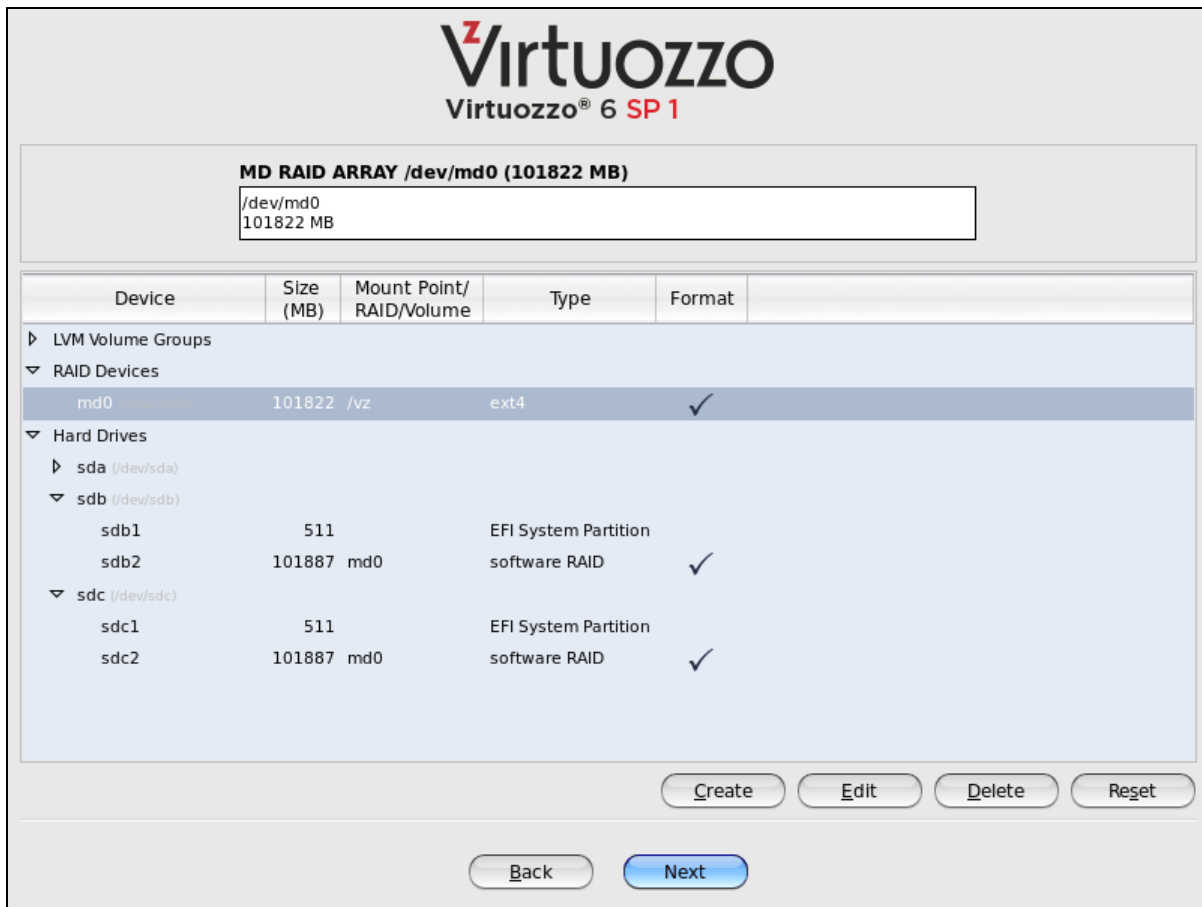
Note: For more information on RAIDs, see https://raid.wiki.kernel.org/index.php/Linux_Raid.

Booting into Rescue Mode

If you experience a problem with your system, you can boot into the rescue mode to troubleshoot your problem. Once you are in the rescue mode, your Virtuozzo installation is mounted under `/mnt/sysimage`. You can go to this directory and make the necessary changes to your system.

To enter the rescue mode, do the following:

1 Boot your system from a Virtuozzo DVD or USB drive.

2 In the **Welcome** screen, choose the **Rescue installed system** option, and press Enter.
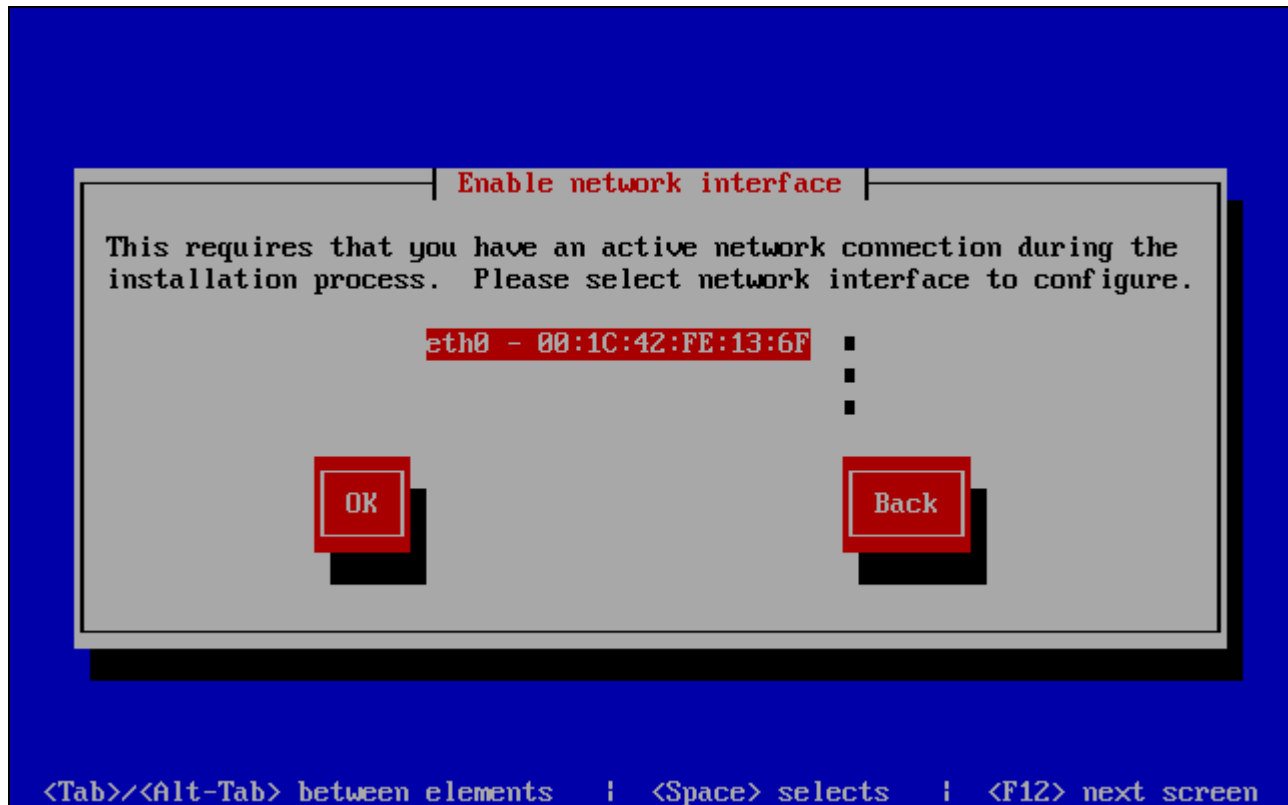
3 Choose the language to use in the rescue mode.
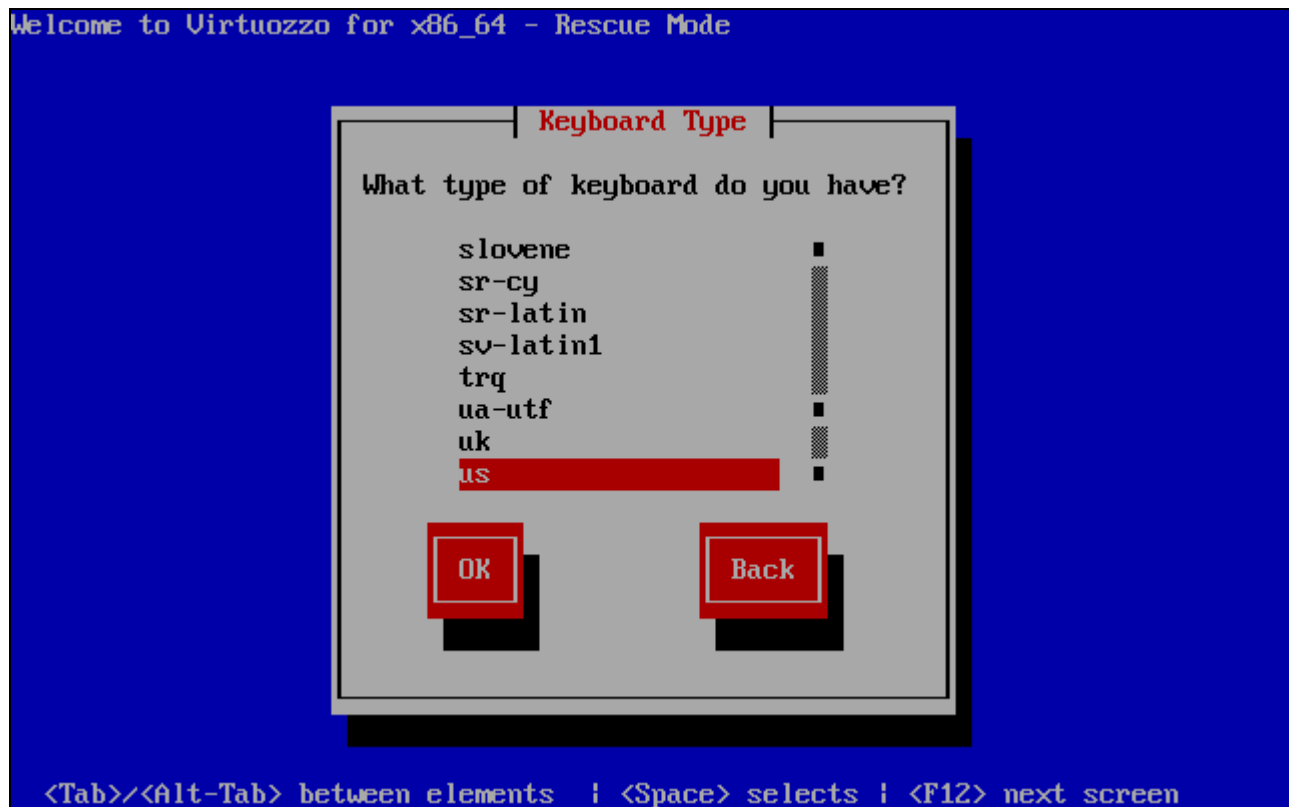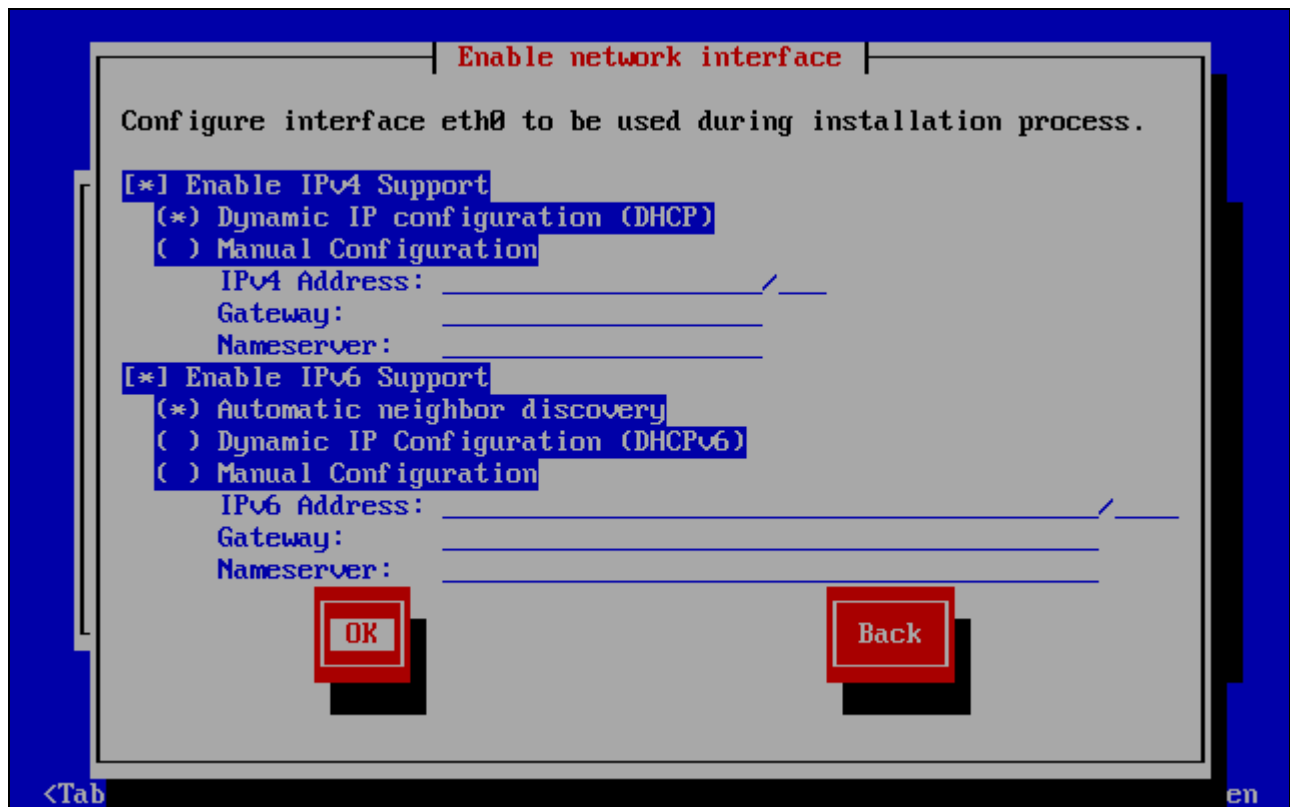
4 Choose the keyboard type.

5 Choose the Virtuozzo distribution media.

6 In the **Setup Networking** window, decide whether or not to start the network devices installed on the server.
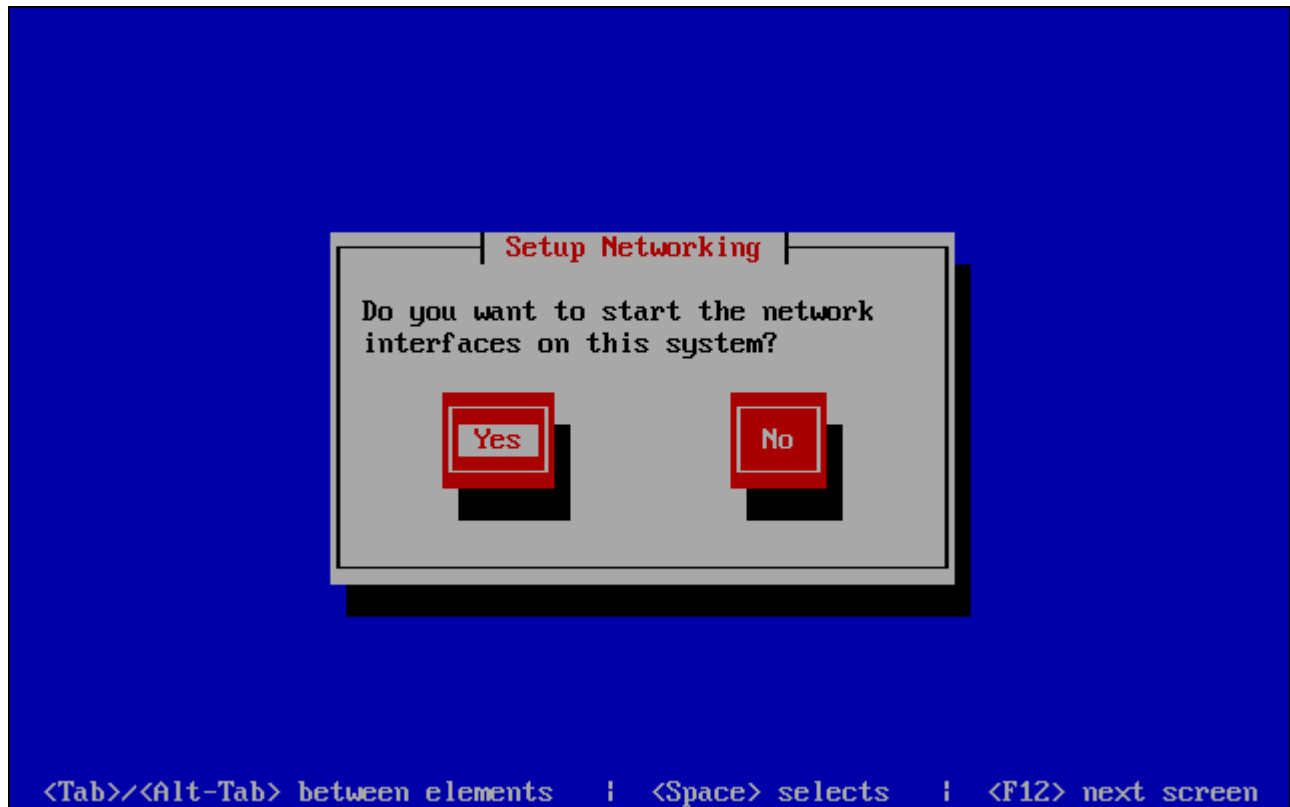
7 If you choose to start your network devices, you are prompted to configure their settings:

a Choose the network card to configure.

```
                    ┤ Enable network interface ├
 This requires that you have an active network connection during the
 installation process.  Please select network interface to configure.

                    eth0 - 00:1C:42:FE:13:6F  ▪
                                              ▪
                                              ▪

         ┌──────┐                              ┌──────┐
         │  OK  │                              │ Back │
         └──────┘                              └──────┘



 <Tab>/<Alt-Tab> between elements   ┆   <Space> selects   ┆   <F12> next screen
```

b   Configure the network settings.

8 The **Rescue** window informs you of what will be done in the rescue mode. Read the information carefully before proceeding. You can choose one of the following options:

-   **Continue**. Choose this option to mount your file system in read and write mode under `/mnt/sysimage`.

-   **Read-Only**. Choose this option to mount your file system in read-only mode under `/mnt/sysimage`.

-   **Skip**. Choose this option if your file system cannot be mounted; for example, when it is corrupted.

-   **Advanced**. Choose this option to activate SAN devices.
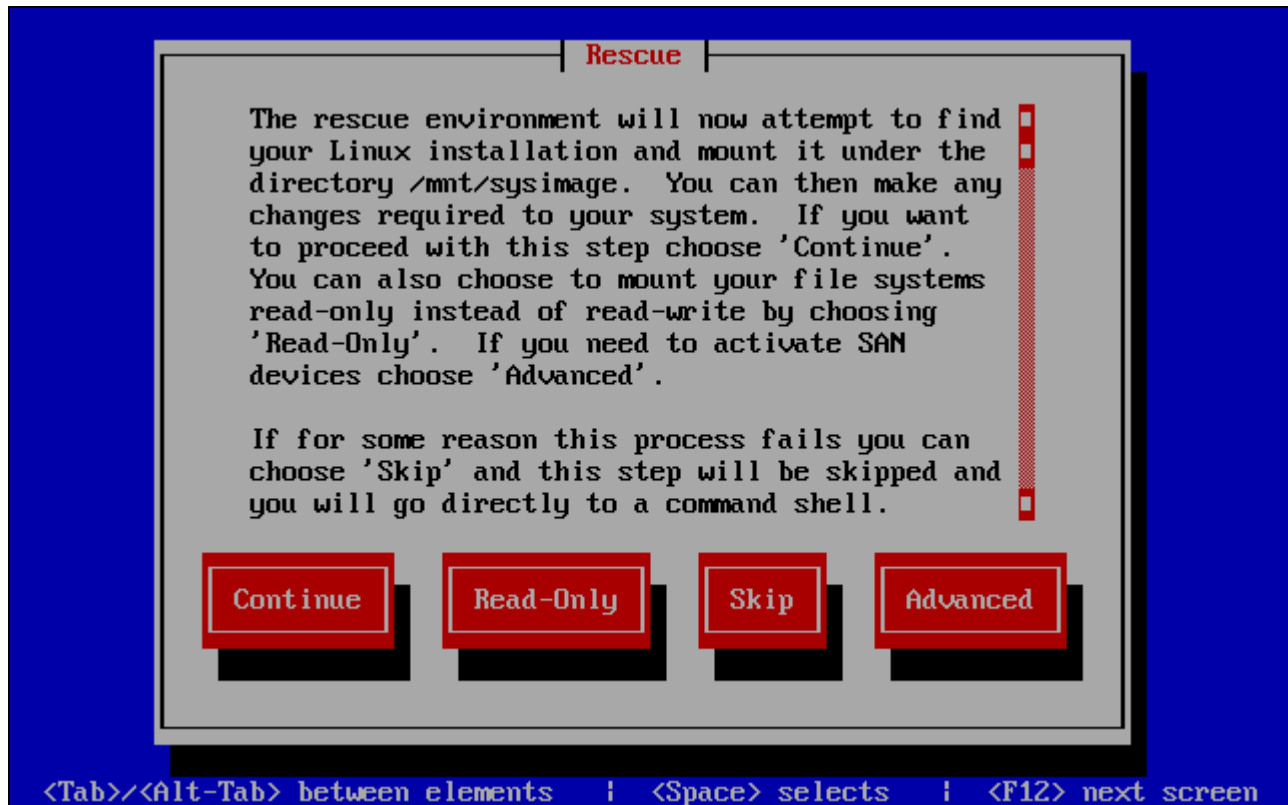
9   Once your file system is in the rescue mode, you are presented with the **Rescue** window informing you of this fact and providing further instructions on working in this mode. Read the instructions carefully, and press Enter.

10 In a prompt that appears, run this command to change to the root partition of your file system:

```
# chroot /mnt/sysimage
```

Now you can run commands and try to fix the problem you are experiencing.

> **Note:** If you choose the **Skip** option, you can try to manually mount your file system using the `mount` utility.

11 After you fix the problem, run the `exit` command to exit the `chroot` environment, and restart the system.

Running Virtuozzo in Virtual Machines

Starting with version 5, you can install Virtuozzo in virtual machines. Doing so may prove useful if you want to evaluate the product but do not have a spare physical server.

To run virtual machines with Virtuozzo 6, a physical server must have one of the following architectures:

- Intel with VT-x and EPT,

- AMD with AMD-V and RVI.

Recommended Virtual Machine Configuration

A virtual machine is best optimized for use with Virtuozzo 6 if it has the following configuration:

- CPU: 2 or more virtual CPUs

- RAM: 2 GB or more

- HDD: 40 GB or more on a plain hard disk

Installing Virtuozzo in a virtual machine does not differ from installing it on a standalone server.

Restrictions and Peculiarities

When using Virtuozzo in a virtualized environment, keep in mind the following restrictions and specifics:

- Running Virtuozzo in a virtual machine is intended for evaluation purposes only. You are not recommended to use such installations in production.

- If you change the configuration of a virtual machine where Virtuozzo is installed, you may need to reactivate the product.

- When you start a virtual machine with Virtuozzo, VMware Fusion may warn you that it requires full access to the network traffic. Ignore this message, and proceed with booting the virtual machine.

- To run in a virtualized Virtuozzo environment, a virtual machine must have guest tools installed.

- Virtual machines may run only 32-bit operating systems and have only one CPU.

C H A P T E R   5

Starting to Work in Virtuozzo 6

After you restart the host, you will see a screen providing instructions on how to start working in Virtuozzo 6.

You can manage Virtuozzo using these tools:

- Command-line utilities (p.)

- Virtual Automation (p.)

Detailed information on both tools is given in the following sections.

In This Chapter

Using CLI

Virtuozzo provides a set of utilities that allow you to manage virtual machines and Containers both locally and remotely.

Connecting to Virtuozzo Locally

To manage your virtual machines and Containers locally, i.e. from the same server where Virtuozzo is installed, log in to the server by typing the `root` username and the password you provided when installing Virtuozzo at the bottom of the welcome screen.

After you have successfully logged in to the server, you will see a command prompt and can start creating and managing your virtual machines and Containers using command line utilities.

Connecting to Virtuozzo Remotely

To connect to Virtuozzo remotely, use the IP address or hostname indicated on the server's screen. For example, you can use a Secure Shell client to connect to your host. When logging in to the server, use the `root` user name and the password you provided when installing Virtuozzo.
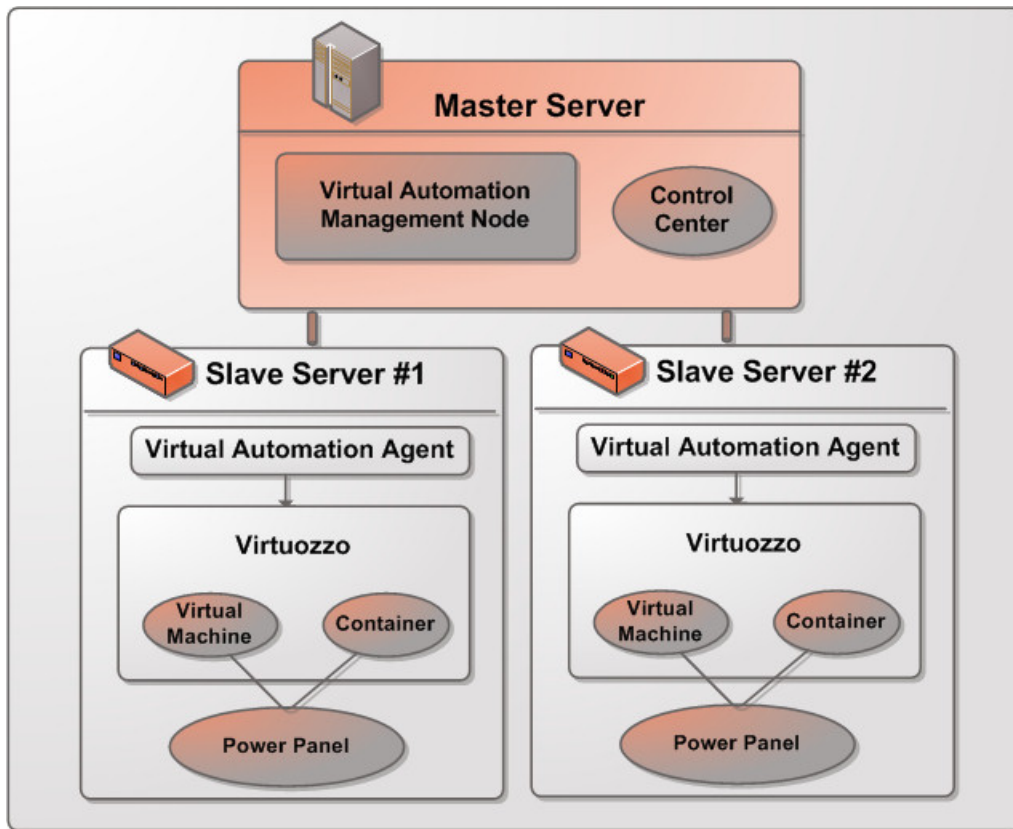
Using Virtual Automation

Virtual Automation is a flexible and easy-to-use administration tool for managing servers with Virtuozzo and virtual machines and Containers residing on these servers. Once you set up Virtual Automation, you can use it to connect to your servers with a standard web browser on any platform.

Virtual Automation includes the following components:

- *Virtual Automation Management Node*. A server (either physical or virtual) that ensures the communication between the server with Virtuozzo (known as *Slave Server*) and the Virtual Automation application. The Master Server keeps a database with the information about all registered Slave Servers.

- *Control Center*. A front-end to the Virtual Automation application. You see Control Center in the browser window when you log it to the Virtual Automation Management Node using Virtual Automation.

- *Virtual Automation Agent*. A special agent installed on a Slave Server and ensuring the interaction between the Slave Server and the Master Server. Without this component, you cannot register a Slave Server the Virtual Automation Management Node.

- *Slave Server*. A server running the Virtuozzo software and hosting a number of virtual machines and Containers. You use Control Center to connect to the Slave Server to manage your virtual machines and Containers.

- *Power Panel*. A tool installed on the Slave Server and used for managing particular virtual machines and Containers by their end users.

Graphically, a typical system with Virtual Automation can be represented as follows:

Setting Up Virtual Automation

Virtual Automation is automatically set up on your server during the Virtuozzo installation if you select the **Install Virtual Automation Agent for Virtuozzo** and **Install Virtual Automation Management Node** options in the Virtuozzo installer. During the setup procedure, the installer performs the following operations:

1 Installs the Virtual Automation Agent component, including Power Panel, on the server. After that, the server starts acting as the Slave Server.

2 Creates a special Container on the server and installs the Virtual Automation Management Node and Control Center components inside the Container. Once the Container is created and the components are installed, the Container starts acting as the Master Server.

The Virtual Automation Management Node and Control Center components cannot be installed directly on a server with Virtuozzo. Instead, a special Container is automatically created during the Virtuozzo installation where these components are installed. Once the setup is complete, you can access the Container by the IP address you entered in the step of specifying Virtual Automation parameters in the installer.

Installing Virtual Automation Manually

During the Virtuozzo installation, the Virtual Automation application is not installed on the server in the following cases:

- You did not enter a product key.
- Your product key does not allow you to use Virtual Automation.
- You had no Internet connection when installing Virtuozzo.

Later on, if you make up your mind to use Virtual Automation for managing hosts and their virtual machines and Containers, you can install this application manually by doing the following:

1 Obtain the appropriate product key. This step is required only if your current key does not support using Virtual Automation.

2 Install the product key on the server using the `vzlicload` utility. For information on installing product keys using this tool, see the *Virtuozzo 6 User's Guide*.

3 Once the license is installed, create the `pva_opt.cfg` file, open it for editing, and specify the following options:

- `PVA_AGENT=1` if you want to install the Virtual Automation Agent components or `PVA_AGENT=0` if you do not want to.
- `PVA_MN=1` if you want to install the Virtual Automation Management Node and Control Center components or `PVA_MN=0` if you do not want to.
- `PASSWD="XXXXXX"` where `XXXXXX` is the root password on the host (set during the Virtuozzo installation). This option is mandatory if you choose to install Virtual Automation Management Node and Control Center components.
- `PVA_IP="X.X.X.X"` where `X.X.X.X` is the IP address to be assigned to the Management Node. You will then use this IP address to log in to the Management Node. This option is mandatory if you choose to install Virtual Automation Management Node and Control Center components.

> **Note:** The Management Node must have an active Internet connection to download the installation files from the official remote repository.

- `PVA_HOSTNAME="hostname"` where `hostname` is the hostname to be assigned to the Management Node. This option is mandatory if you choose to install Virtual Automation Management Node and Control Center components

4 Make sure the host is connected to the Internet.

5 In a terminal, change to the directory where the `pva_opt.cfg` file is located, and run this command:

```
# /usr/libexec/pva-setup.sh --install pva_opt.cfg
```

Connecting to a Server

To connect to a server using Virtual Automation, do the following:

1   On any computer, open your favorite web browser.

2   Make sure that the computer can access the Virtual Automation Management Node over the network.

3   Type the IP address or hostname of the Container acting as the Master Server in the browser window.

4   Log in to the Container with root credentials (that is, the root user name and the password you entered during the Virtuozzo installation).

Note: For more information on using Virtual Automation for managing servers with Virtuozzo, consult the *Virtual Automation Administrator's Guide* available at the official website.

C H A P T E R 6

Glossary

This glossary defines terms and spells out abbreviations used in Virtuozzo documentation. References to terms defined elsewhere in the glossary appear in italics.

Application template. A template used to install a set of applications in *Containers*. See also *Template*.

Container (or regular Container). A virtual private server, which is functionally identical to an isolated standalone server, with its own IP addresses, processes, files, users database, configuration files, applications, system libraries, and so on. Containers share one host and one OS kernel. However, they are isolated from each other. A Container is a kind of 'sandbox' for processes and users.

Guest operating system (Guest OS). An operating system installed inside a virtual machine and Container. It can be any of the supported Windows or Linux operating systems.

Hardware virtualization. A technology allowing you to virtualize physical servers at the hardware level. Hardware virtualization provides the necessary environment for creating and managing Virtuozzo virtual machines.

Operating system virtualization (OS virtualization). A technology allowing you to virtualize physical servers at the operating system (kernel) level. OS virtualization provides the necessary environment for creating and managing Virtuozzo Containers.

OS template (Operating System template). A template used to create new *Containers* with a pre-installed operating system. See also *Template*.

Package set. See *Template*.

Host (physical server or server). A server where the Virtuozzo software is installed for hosting Virtuozzo virtual machines and Containers. Sometimes, it is marked as Container 0.

Virtuozzo license key. A license key that you should install on the physical server to use Virtuozzo. Every physical server must have its own key installed.

Virtuozzo Storage license key. A license key for Virtuozzo Storage to use its functionality.

Memory and IOPS deduplication. A feature introduced in Virtuozzo 6.0. By caching identical files in multiple Containers it helps save memory and IOPS on the Hardware Node.

Parallels Virtuozzo Containers for Linux. An operating system virtualization solution allowing you to create multiple isolated Containers on a single physical server to share hardware, licenses, and management effort with maximum efficiency.

Private area. A part of the file system storing *Container* files that are not shared with other *Containers*.

Template (package set). A set of original application files (packages) repackaged for mounting. There are two types of templates. OS Templates are used to create new *Containers* with a pre-installed operating system. Application templates are used to install an application or a set of applications in *Containers*.

UBC. An abbreviation of *User Beancounter*.

User Beancounter. The subsystem of the Virtuozzo software for managing *Container* memory and some system-related resources.

Virtual Environment (VE). An obsolete designation of a *Container*.

Virtuozzo File System (VZFS). A virtual file system for legacy Containers.

Virtual machine (VM). A computer emulated by Virtuozzo. Like a Container, a virtual machine is functionally identical to an isolated standalone computer, with its own IP addresses, processes, files, users database, configuration files, applications, system libraries, and so on. However, unlike Containers, virtual machines run their own operating systems rather than sharing one operating system kernel.

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