

Virtuozzo

Virtuozzo 6

Getting Started Guide

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Parallels IP Holdings GmbH

Vordergasse 59

8200 Schaffhausen

Switzerland

Tel: + 41 52 632 0411

Fax: + 41 52 672 2010

www.virtuozzo.com

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CHAPTER 1

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

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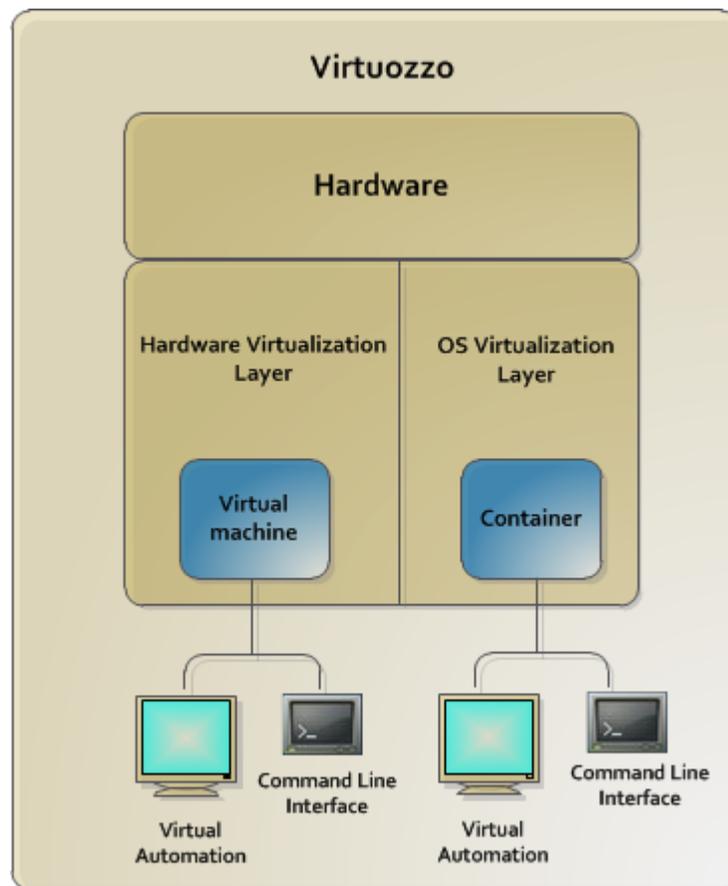
About Virtuozzo 6

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.
- **Virtuozzo Automator.** Virtuozzo Automator 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 *Getting Started With Virtuozzo 6* guide provides information on installing and deploying Virtuozzo on your server, including the pre-requisites and the stages you shall pass.

The guide is intended for anyone interested in deploying Virtuozzo 6 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, Installing Virtuozzo 6 (p. 9), describes the hardware and software requirements your server must meet to successfully install Virtuozzo. It also provides detailed information on how to install Virtuozzo.

Chapter 3, Starting to Work in Virtuozzo 6 (p. 36), provides instructions on setting up Virtuozzo Automator, a web-based tool for managing virtual machines and Containers.

Chapter 4, Performing Basic Operations in Virtuozzo 6 (p. 41), familiarizes you with the way to perform the main operations on your virtual machines and Containers: create new virtual machines and Containers, start and stop them, adjust their configuration, and so on.

Getting Help

In addition to this guide, there are a number of other resources available for Virtuozzo which can help you use the product more effectively. These resources include:

- *Virtuozzo 6 Installation Guide*. This guide provides detailed information on installing Virtuozzo on your server, including the pre-requisites and the stages you shall pass.
- *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. However, it does not deal with the process of installing and configuring your system.
- *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 inside your Containers and to greatly save host resources (physical memory, disk space, etc.).
- *Virtuozzo 6 Command Line Reference Guide*. This guide is a complete reference on all Virtuozzo configuration files and command line utilities.

Key Terms

To avoid any misunderstandings while following the instructions in the guide, please become acquainted with the main Virtuozzo definitions:

Container. A virtual private server, which 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. Containers share one physical server and one operating system (OS) kernel. However, they are isolated from each other. Container is a kind of 'sandbox' for processes and users.

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

Hardware virtualization. A technology allowing you to efficiently use your physical server's hardware resources by sharing them between multiple virtual machines created on the server.

Virtuozzo license (or **product key**). A special license that you must install on the physical server to be able to start using Virtuozzo. Every physical server must have its own license installed.

OS virtualization. A technology allowing you to create multiple isolated Containers on a single physical server to share hardware, licenses, and management effort with maximum efficiency.

Host. A server where Virtuozzo is installed for running virtual machines and 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, virtual machines run their own operating systems rather than share one operating system kernel.

CHAPTER 2

Installing Virtuozzo 6

The current chapter provides comprehensive information on the process of installing Virtuozzo 6 on your server, including the pre-requisites and the stages you shall pass.

Note: This guide describes how to install Virtuozzo 6 in the default graphical mode. For information on other installation modes, consult the *Virtuozzo 6 Installation Guide*.

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Hardware Compatibility

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

- as a stand-alone installation (p. 9) or
- as part of a Virtuozzo Storage cluster (p. 10)

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.

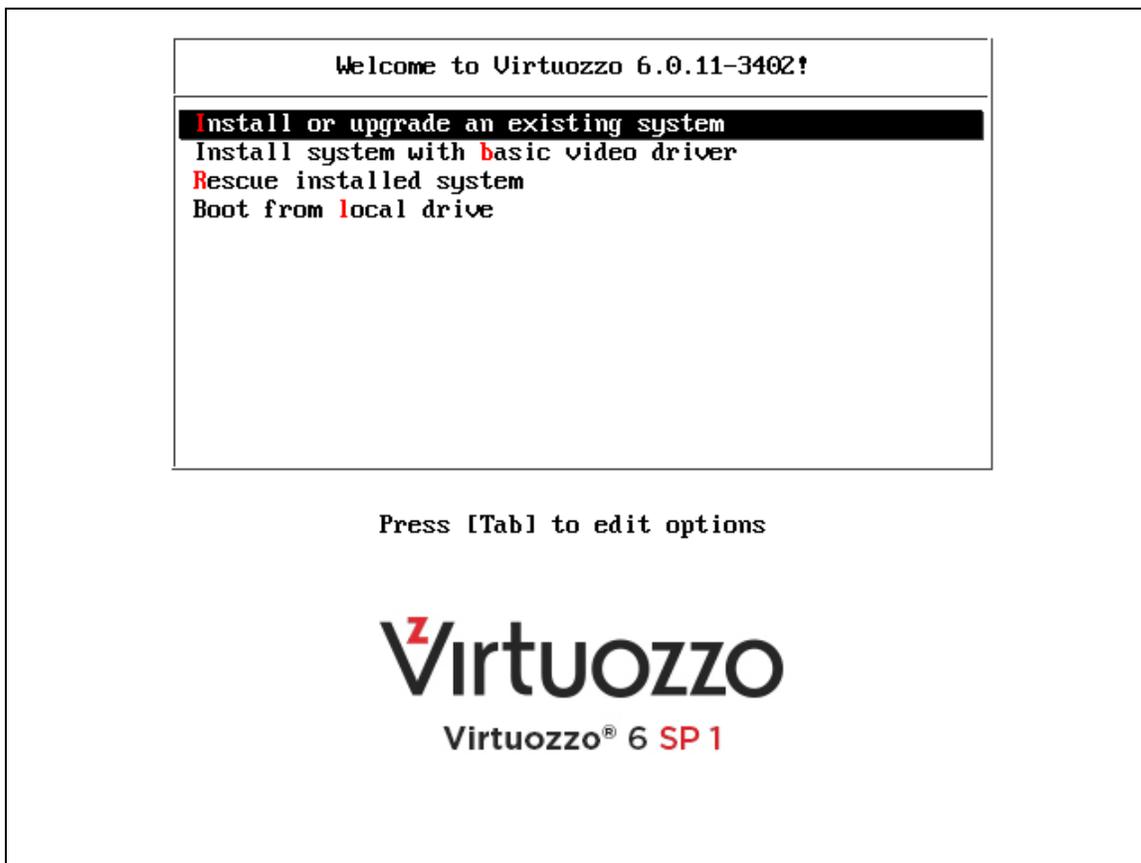
Starting Installation

Virtuozzo can be installed from

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

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

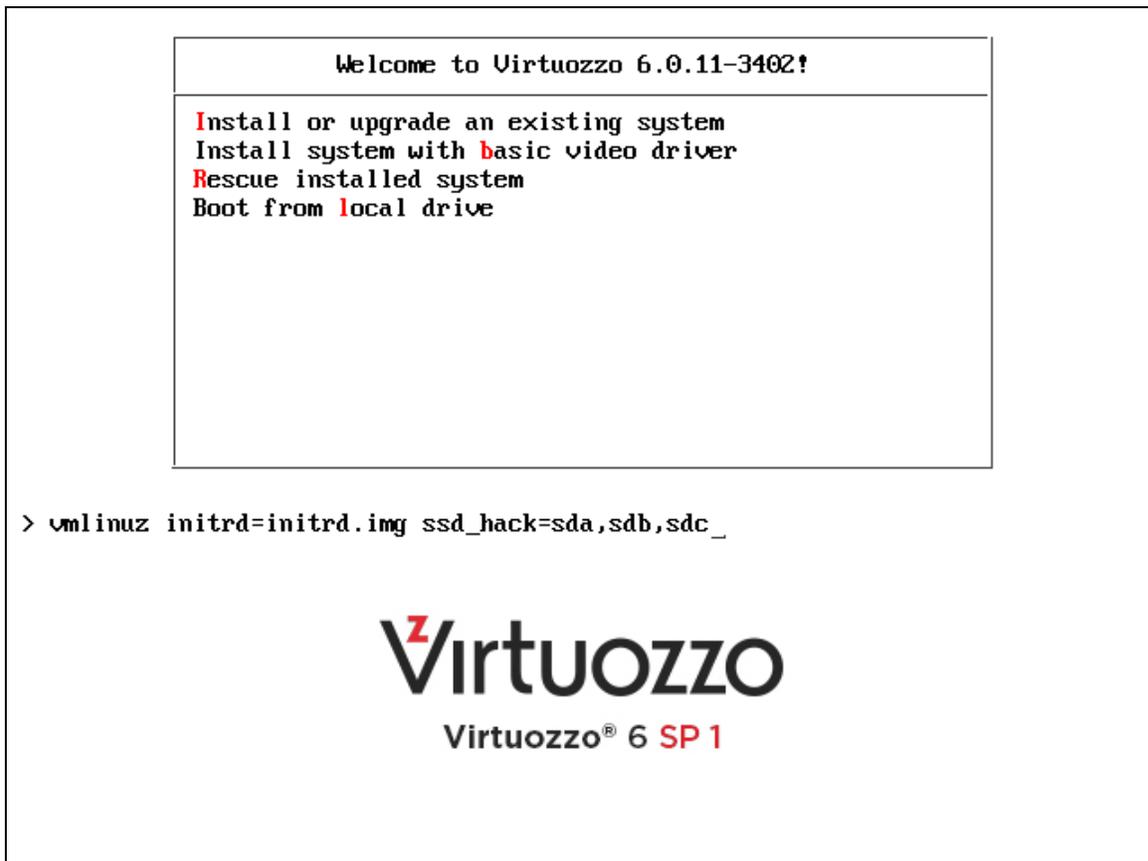
Certain solid-state drives (SSDs) may not be autodetectable by the installer. This may result in issues when you create or join Virtuozzo Storage clusters. To avoid this problem, you can force the installer to identify the required drives as SSDs by doing the following:

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

- 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:

```

Welcome to Virtuozzo 6.0.11-3402!

Install or upgrade an existing system
Install system with basic video driver
Rescue installed system
Boot from local drive

> vmlinuz initrd=initrd.img nodmraid_

Virtuozzo
Virtuozzo® 6 SP 1
```

- 5 Press `Enter` to start installation.

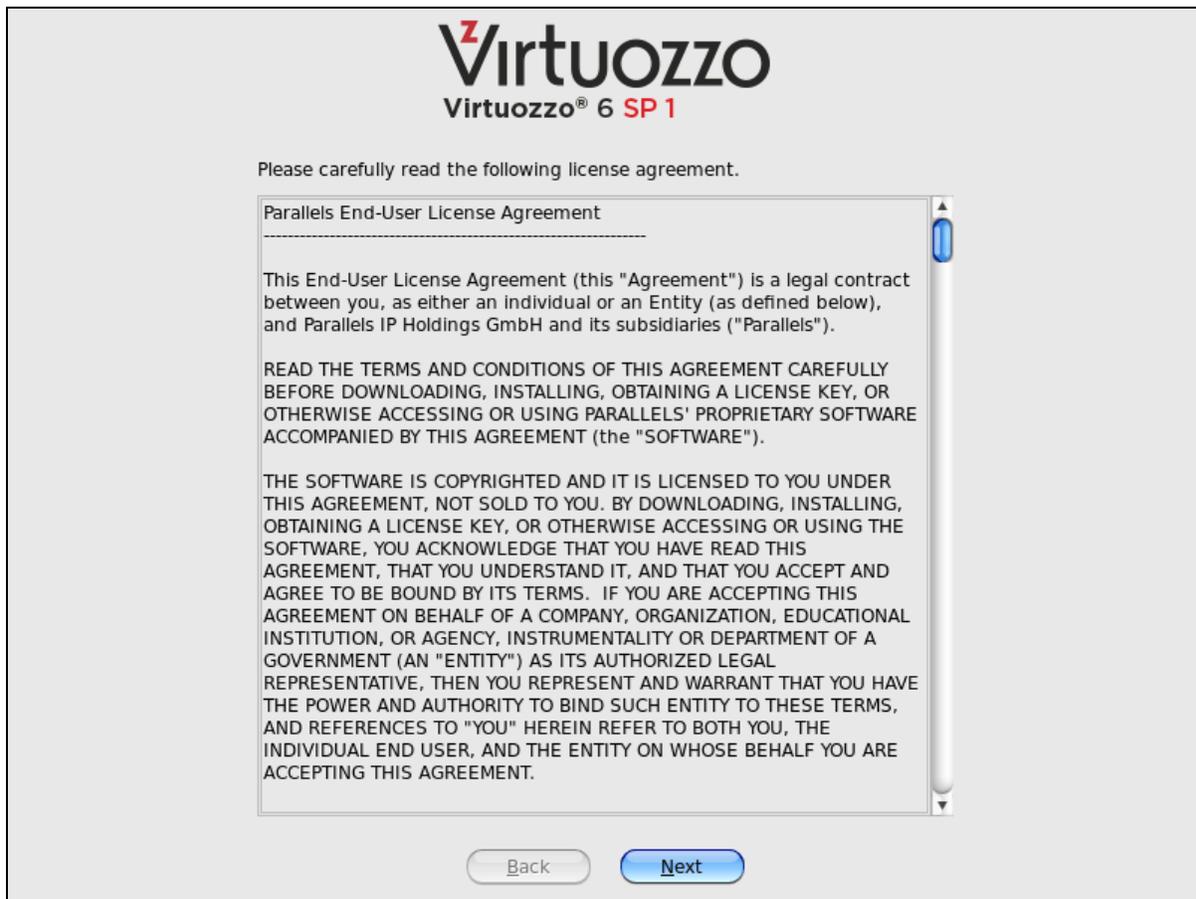
Warning: Any RAID configurations you have will be ignored during the installation. Make sure you will not lose any data because of this.

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.

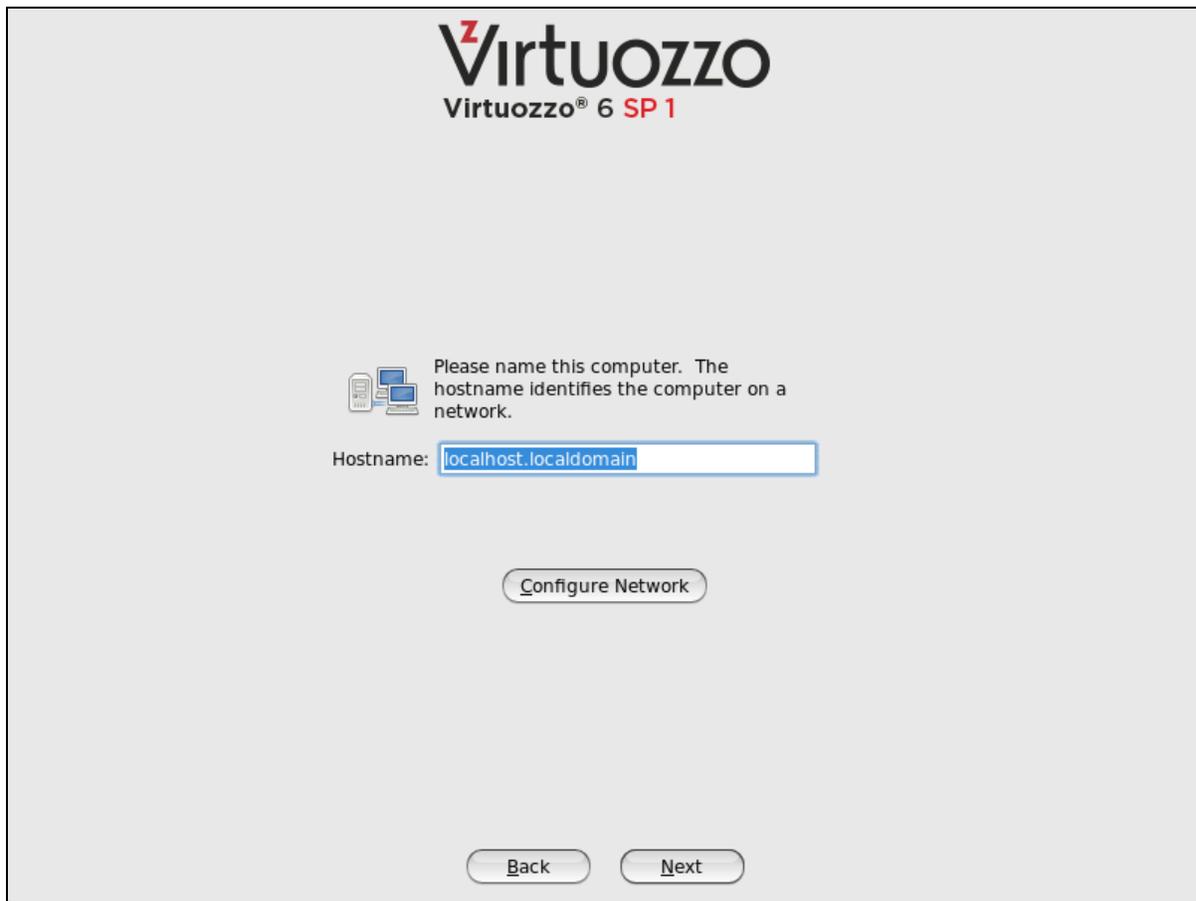
Reading and Accepting the License Agreement

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



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**.

The screenshot shows a network configuration window titled 'System eth0'. It has a 'Connection name' field with 'System eth0' entered. Below it is a checked checkbox for 'Connect automatically'. There are four tabs: 'Wired' (selected), '802.1x Security', 'IPv4 Settings', and 'IPv6 Settings'. The 'Device MAC address' field contains '00:1C:42:5C:CB:A7'. The 'Cloned MAC address' field is empty. The 'MTU' field is set to 'automatic' with a dropdown arrow and the unit 'bytes'. At the bottom left, there is a checked checkbox for 'Available to all users'. At the bottom right, there are 'Cancel' and 'Apply..' buttons.

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. 19).

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.

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.



The screenshot shows the Virtuozzo 6 SP1 installation wizard. At the top, the logo 'Virtuozzo' is displayed in a large, bold, black font, with a red 'Z' above the 'V'. Below the logo, 'Virtuozzo® 6 SP 1' is written in a smaller, black font. The main content area has a light gray background. It contains two sections for entering license keys. The first section is titled 'Type your product key for Virtuozzo:' in bold black text, followed by a white rectangular input field. The second section is titled 'Type your product key for Virtuozzo Storage:' in bold black text, followed by another white rectangular input field. Below these fields, the text 'You can skip this step and activate the products later.' is displayed in a smaller, gray font. At the bottom of the screen, there are two buttons: a 'Back' button with a light gray background and a 'Next' button with a blue background and white text.

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 Virtuozzo Automator and its components along with Virtuozzo. For more information about Virtuozzo Automator, see **Installing Virtuozzo Automator** (p. 32).

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*.



Creating a New Virtuozzo Storage Cluster

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

Virtuozzo
Virtuozzo® 6 SP 1

Specify Virtuozzo Storage Parameters

Cluster name [Security settings](#)

Enter a name for your Virtuozzo Storage. This name will uniquely identify the Storage in your network.

Select functional roles for this server:

Metadata Server Role

IP address

A Metadata Server stores metadata about Chunk Servers. The specified IP address will be used to access the Metadata Server and cannot be changed later.

Chunk Server Role

A Chunk Server stores the contents of virtual machines and Containers on its local drives. [Chunk Server settings](#)

Client Server Role

A Client Server allows you to access the Virtuozzo Storage from this server and run virtual machines and Containers hosted on the Storage. [Client settings](#)

[Back](#) [Next](#)

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.



Virtuozzo Storage Security Settings

Virtuozzo Storage uses password-based authentication to authenticate servers in the cluster. Enter the password for server authentication:

Cluster Password:

Confirm:

Show Password

Cancel OK

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. 12) 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. 12) 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**.

Joining an Existing Virtuozzo Storage Cluster

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

The screenshot shows the Virtuozzo 6 SP1 installer window titled "Specify the Virtuozzo Storage to Join". It features a "Cluster name" field with a dropdown menu and a "Security settings" button. Below this is a text prompt: "Enter the name of the Virtuozzo Storage to join this server to." The "Select functional roles for this server:" section includes three checked options: "Metadata Server Role" with an "IP address" field containing "10.31.238.204" and a descriptive note; "Chunk Server Role" with a "Chunk Server settings" button; and "Client Server Role" with a "Client settings" button. At the bottom are "Back" and "Next" buttons.

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.

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- 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. 12) 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**.

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. 29).
- 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. 30).

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:

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	<p>The directory for Virtuozzo Storage data. In it, the installer may create the following subdirectories, depending on the options you choose:</p> <ul style="list-style-type: none"> • <code>CLUSTER_NAME-cs[N]</code>: Mount point(s) for the chunk server(s). Created if the Node will host chunk servers. • <code>CLUSTER_NAME-mds</code>: Stores metadata about Virtuozzo Storage data. Created if the Node will host an MDS server. • <code>CLUSTER_NAME</code>: 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.

<code>/vz</code>	Partition for OS and application template files. Allocate 30-40 GB.
<code>swap</code>	Paging partition for Virtuozzo. For details on how much disk space to allocate to swap, see Creating the Paging Partition below.
<code>/pstorage/CLUSTER_NAME-cs[N]</code>	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

Installing Virtuozzo Automator

Choose the Virtuozzo Automator 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 Virtuozzo Automator.

Virtuozzo
Virtuozzo® 6 SP 1

Do you want to install Virtual Automation after the restart?

Virtual Automation is a web-based tool that enables you to manage both containers and virtual machines.
If you are new to Virtual Automation, please install both the agent and the management node. If you already have a management node, you can install Virtual Automation Agent only.

Install Virtual Automation Agent for Virtuozzo
 Install Virtual Automation Management Node

IP Address:

Hostname:

To access Virtual Automation, type `http://` followed by the management node IP address or hostname in your web browser, and log in with the user name and password you created during the installation of Virtuozzo.

Do one of the following:

- Clear the **Install Virtuozzo Automator Agent for Virtuozzo** and **Install Virtuozzo Automator Management Node** check boxes, and click **Next** if you do not want to use Virtuozzo Automator for managing your server and virtual machines and Containers.
- Leave the **Install Virtuozzo Automator Agent for Virtuozzo** and **Install Virtuozzo Automator Management Node** check boxes selected to set up the Virtuozzo Automator application and its components on the server. Using Virtuozzo Automator, 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 Virtuozzo Automator Management Node. This Virtuozzo Automator 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 Virtuozzo Automator Management Node installation is complete, you can log in to Virtuozzo Automator 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 Virtuozzo Automator from the official website. Notice that the download process may take some time, depending on the speed of your Internet connection.
2. Sets up Virtuozzo Automator and its components. The installation is automatically initiated once the installation packages are downloaded and runs without your interaction.

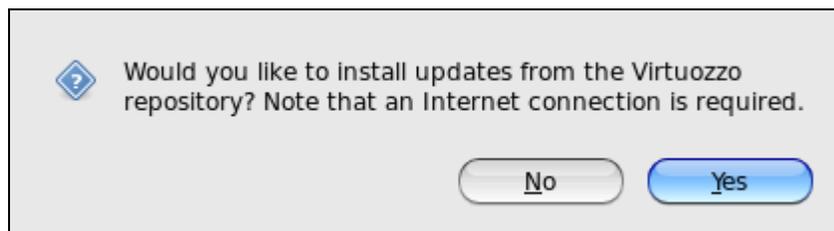
When you are done, click **Next** to start installing Virtuozzo.

Notes:

1. Your server and the Container must be connected to the Internet to download the Virtuozzo Automator installation packages from the official repository.
2. You can use Virtuozzo Automator to manage hosts only if your license allows you to do so. If the license does not support using Virtuozzo Automator, the Virtuozzo Automator components screen is not displayed. In this case, you must first upgrade your license and then install the Virtuozzo Automator application manually. For more information, see **Installing Virtuozzo Automator Manually** (p. 39).
3. For more information on setting up and logging in to Virtuozzo Automator, see **Using Virtuozzo Automator** (p. 37).

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.

Virtuozzo

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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

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. 36)
- Virtuozzo Automator (p. 37)

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

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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.

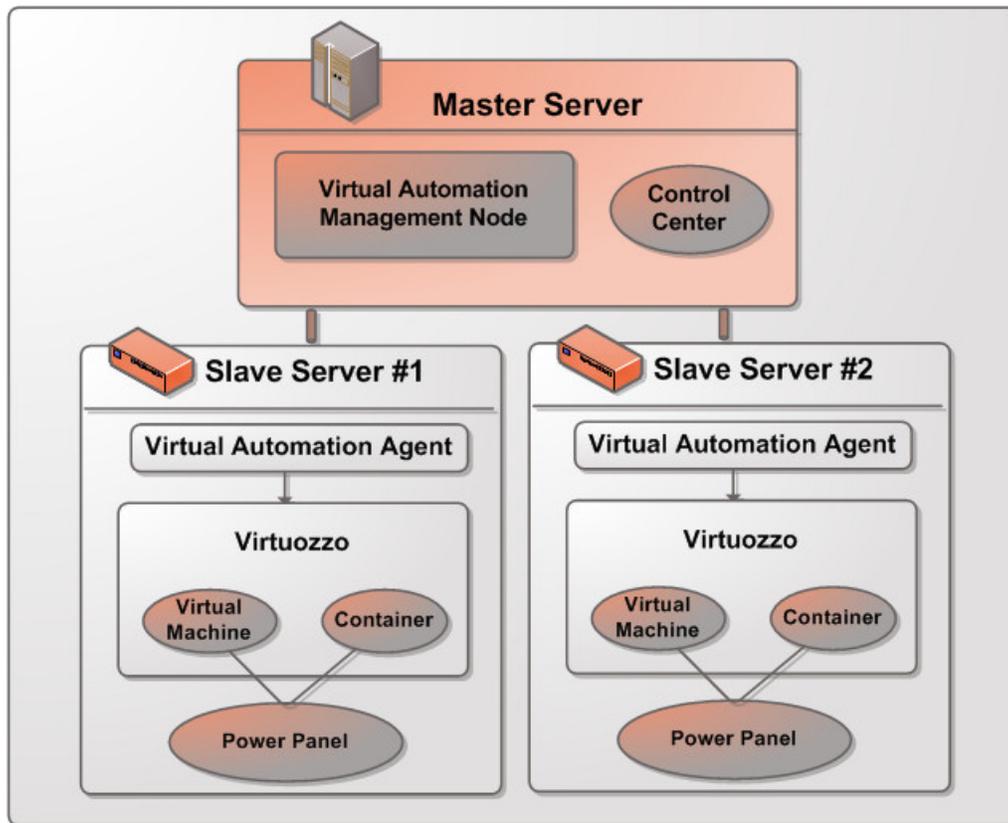
Using Virtuozzo Automator

Virtuozzo Automator 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 Virtuozzo Automator, you can use it to connect to your Parallel servers with a standard web browser on any platform.

Virtuozzo Automator includes the following components:

- *Virtuozzo Automator Management Node*. A server (either physical or virtual) that ensures the communication between the server with Virtuozzo (known as *Slave Server*) and the Virtuozzo Automator application. The Master Server keeps a database with the information about all registered Slave Servers.
- *Control Center*. A front-end to the Virtuozzo Automator application. You see Control Center in the browser window when you log it to the Virtuozzo Automator Management Node using Virtuozzo Automator.
- *Virtuozzo Automator 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 Virtuozzo Automator 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 Virtuozzo Automator can be represented as follows:



Setting Up Virtuozzo Automator

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

- 1 Installs the Virtuozzo Automator 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 Virtuozzo Automator 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 Virtuozzo Automator 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 Virtuozzo Automator parameters in the installer.

Installing Virtuozzo Automator Manually

During the Virtuozzo installation, the Virtuozzo Automator 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 Virtuozzo Automator.
- You had no Internet connection when installing Virtuozzo.

Later on, if you make up your mind to use Virtuozzo Automator 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 Virtuozzo Automator.
- 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 Virtuozzo Automator Agent components or `PVA_AGENT=0` if you do not want to.
 - `PVA_MN=1` if you want to install the Virtuozzo Automator 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 Virtuozzo Automator 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 Virtuozzo Automator 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 Virtuozzo Automator 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 Virtuozzo Automator, do the following:

- 1 On any computer, open your favorite web browser.
- 2 Make sure that the computer can access the Virtuozzo Automator 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 Virtuozzo Automator for managing servers with Virtuozzo, consult the *Virtuozzo Automator Administrator's Guide* available at the official website.

CHAPTER 4

Performing Basic Operations in Virtuozzo 6

This chapter outlines the basic day-to-day operations that you are likely to perform with virtual machines and Containers in Virtuozzo.

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Creating Virtual Machines and Containers

This section explains how to create new virtual machines and Containers. The options you should pass to this command differ depending on whether you want to create a virtual machine or Container.

Creating Containers

To create a Container, use the `prlctl create` command as follows:

```
# prlctl create 101 --vmtype ct
```

Virtuozzo will create a new Container with the name of 101 using the default parameters from the global configuration file `/etc/vz/vz.conf`. All Container contents will be stored in this Container's private area. To find out where the private area is located, use the `prlctl list` command as follows:

```
# prlctl list 101 -i | grep "Home"
Home: /vz/private/101
```

Notes:

1. For more information on options you can pass to `prlctl create` when creating Containers, see the *Virtuozzo 6 Command Line Reference Guide*.

2. For information on creating Containers with preinstalled applications, see **Using OS Template Caches with Preinstalled Applications** in the *Virtuozzo 6 User's Guide*.

Creating Virtual Machines

The process of creating a new virtual machine includes the following steps:

- 1 Creating a virtual machine configuration.
- 2 Installing an operating system in the virtual machine.
- 3 Installing Virtuozzo guest tools in the virtual machine, a set of special utilities that facilitate your work with virtual machines.

The example below shows you how to make a new virtual machine configuration using the `prlctl create` command:

```
# prlctl create MyVM --distribution win-2008 --vmtype vm
```

This creates a virtual machine with the name of `MyVM`, adjusts its configuration for installing the Windows Server 2008 operating system in it, and places all virtual machine-related files in the `/var/parallels` directory.

Once the virtual machine configuration is ready, you can install Windows Server 2008 and guest tools in it. To do this, you can

- Use the Virtuozzo Automator application. For details on using this application, consult the *Virtuozzo Automator Administrator's Guide*.
- Enable VNC support in the virtual machine configuration and install the operating system and guest tools using your favorite VNC client. For information, on configuring VNC support in virtual machines, see **Enabling VNC Access to Virtual Machines and Containers** in the *Virtuozzo 6 User's Guide*.

Note: For more information on options you can pass to `prlctl create` when creating virtual machines, see the *Virtuozzo 6 Command Line Reference Guide*.

Supported Guest Operating Systems

Listed below are the operating systems that have been tested in virtual machines and Containers and are officially supported in Virtuozzo 6.

Virtual Machines

Windows

- Windows Server 2016
- Windows Server 2012 R2
- Windows Server 2008 R2 with Service Pack 1
- Windows Server 2003 R2 with Service Pack 2 (x86, x64)

Linux

- Red Hat Enterprise Linux 7.x (x64)
- Red Hat Enterprise Linux 6.x (x86, x64)
- Red Hat Enterprise Linux 5.x (x86, x64)
- Fedora 23 (x64)
- Fedora 22 (x64)
- Fedora 21 (x64)
- Fedora 20 (x86, x64)
- CentOS 7.x (x64)
- CentOS 6.x (x86, x64)
- CentOS 5.x (x86, x64)
- SUSE Linux Enterprise Server 11 with Service Pack 2 or Service Pack 3 (x86, x64)
- openSUSE 13.2 (x64)
- openSUSE 13.1 (x86, x64)
- Debian 8.x (x86, x64)
- Debian 7.x (x86, x64)
- Debian 6.x (x86, x64)
- Ubuntu 16.04 (x86, x64)
- Ubuntu 15.10 (x86, x64)
- Ubuntu 14.10 (x86, x64)
- Ubuntu 14.04 (x86, x64)
- Ubuntu 10.04.4 (x86, x64)

FreeBSD

- FreeBSD 10 (x86, x64)
- FreeBSD 9 (x86, x64)

Containers

- Red Hat Enterprise Linux 7.x (x64)
- Red Hat Enterprise Linux 6.x (x86, x64)
- Red Hat Enterprise Linux 5.x (x86, x64)
- Fedora 23 (x64)
- Fedora 22 (x64)
- Fedora 21 (x64)

- Fedora 20 (x86, x64)
- CentOS 7.x (x64)
- CentOS 6.x (x86, x64)
- CentOS 5.x (x86, x64)
- SUSE Linux Enterprise Server 11 with Service Pack 2 or Service Pack 3 (x86, x64)
- SUSE Linux Enterprise Server 12 with Service Pack 1 (x64)
- openSUSE 13.2 (x64)
- openSUSE 13.1 (x86, x64)
- Debian 8.x (x86, x64)
- Debian 7.x (x86, x64)
- Debian 6.x (x86, x64)
- Ubuntu 16.10 (x86, x64)
- Ubuntu 16.04 (x86, x64)
- Ubuntu 15.10 (x86, x64)
- Ubuntu 15.04 (x86, x64)
- Ubuntu 14.10 (x86, x64)
- Ubuntu 14.04 (x86, x64)
- Ubuntu 10.04.4 (x86, x64)

Performing Initial Configuration

Before starting your newly created virtual machine or Container, you first need to configure it. This section describes the main configuration steps.

Configuring Network Settings

To make virtual machines and Containers accessible from the network, you need to assign valid IP addresses to them and configure DNS servers. The session below illustrates setting these parameters for the `MyVM` virtual machine and Container 101:

- Assigning IPv4 and IPv6 addresses:

```
# prlctl set MyVM --device-set net0 --ipadd 10.0.186.100/24
# prlctl set MyVM --device-set net0 --ipadd 1fe80::20c:29ff:fe01:fb07
# prlctl set 101 --ipadd 10.0.186.101/24
# prlctl set 101 --ipadd fe80::20c:29ff:fe01:fb08
```

`net0` in the commands above denotes the network card in the virtual machine to assign the IP address to. You can view all network cards of a virtual machine using the `prlctl list VM_name -i` command.

- Setting DNS server addresses:

```
# prlctl set MyVM --nameserver 192.168.1.165
# prlctl set 101 --nameserver 192.168.1.165
```

Notes:

1. You can configure the network settings only for virtual machines that have guest tools installed.
2. To assign network masks to Containers operating in the `venet0` network mode, you must set the `USE_VENET_MASK` parameter in the `/etc/vz/vz.conf` configuration file to `yes`.

Setting Passwords for Virtual Machine and Containers

In Virtuozzo, you can use the `--userpasswd` option of the `prlctl set` command to create new accounts in your virtual machines and Containers directly from the host. The created account can then be used to log in to the virtual machine or Container. The easiest way of doing it is to run this command:

```
# prlctl set MyVM --userpasswd user1:2wsx123qwe
```

This command creates the `user1` account in the `MyVM` virtual machine and sets the `2wsx123qwe` password for it. Now you can log in to the `MyVM` virtual machine as `user1` and administer it in the same way you would administer a standalone server: install additional software, add users, set up services, and so on.

The `prlctl set` command can also be used to change passwords for existing accounts in your virtual machines and Containers. For example, to change the password for `user1` in the `MyVM` virtual machine to `0pi65jh9`, run this command:

```
# prlctl set MyVM --userpasswd user1:0pi65jh9
```

When setting passwords for virtual machines and Containers, keep in mind the following:

- You can use manage user accounts only inside virtual machines that have guest tools installed.
- You should use passwords that meet the minimum length and complexity requirements of the respective operating system. For example, for Windows Server 2008, a password must be more than six characters in length and contain characters from three of the following categories: uppercase characters, lowercase characters, digits, and non-alphabetic characters.
- You should not create accounts with empty passwords for virtual machines and Containers running Linux operating systems.

Starting, Stopping, Restarting, and Querying Status of Virtual machines and Containers

After a virtual machine or Container has been created, it can be managed like a usual computer.

Starting Virtual Machines and Containers

You can start virtual machines and Containers with the `prlctl start` command. For example:

- To start the Container 101:

```
# prlctl start 101
```

- To start the virtual machine `MyVM`:

```
# prlctl start MyVM
```

Stopping Virtual Machines and Containers

You can stop virtual machines and Containers with the `prlctl stop` command. For example:

- To stop the Container 101:

```
# prlctl stop 101
```

- To stop the virtual machine `MyVM`:

```
# prlctl stop MyVM
```

Restarting Virtual Machines and Containers

You can restart virtual machines and Containers with the `prlctl restart` command. For example:

- To restart the Container 101:

```
# prlctl restart 101
```

- To restart the virtual machine `MyVM`:

```
# prlctl restart MyVM
```

Note: Restarting virtual machines requires a guest OS and guest tools to be installed.

Checking Status of Virtual Machines and Containers

You can check the status of a Container or virtual machine with the `prlctl status` command. For example:

- To check the status of the Container 101:

```
# prlctl status 101
VEID 101 exists mounted running
```

- To check the status of the virtual machine `MyVM`:

```
# prlctl status MyVM
Vm MyVM exists stopped
```

Listing Virtual Machines and Containers

To get an overview of the virtual machines and Containers existing on the physical server and to get additional information about them - their IP addresses, hostnames, current resource consumption,

and so on - use the `prlctl list` command. In the most general case, you may get a list of all virtual machines and Containers by issuing the following command:

```
# prlctl list -a
                ID      NPROC  STATUS  IP_ADDR  HOSTNAME
                101      12    started 10.10.1.101 CT101
{b8cb6d99-1af1-453d-a302-2fddd8f86769} -    stopped 10.10.100.1 VM_1
```

The `-a` option tells the `prlctl list` command to output both running and stopped Containers and virtual machines. By default, only running Containers and virtual machines are shown. The default columns inform you of the Container and virtual machine IDs, the number of running processes inside Containers and virtual machines, their status, IP addresses, and hostnames. This output may be customized as desired by using `prlctl list` command line options. For example:

```
# prlctl list -a -o name,ctid
NAME                ID
-                   101
My_Vm {b8cb6d99-1af1-453d-a302-2fddd8f86769}
```

This command displays only the names and IDs of the virtual machines and Containers existing on the physical server. The full list of the `prlctl list` command options for Containers and virtual machines is available in the *Virtuozzo 6 Command Line Reference Guide*.

Deleting Virtual Machines and Containers

You can delete a virtual machine or Container that is not needed anymore using the `prlctl delete` command. Note that you cannot delete a running or mounted virtual machine or Container. The example below illustrates deleting the running Container 101:

```
# prlctl delete 101
Deleting Container private area: /vz/private/101
Container is currently running (stop first)
# prlctl stop 101
Stopping Container...
Container was stopped
Container is unmounted
# prlctl delete 101
Deleting Container private area: /vz/private/101
Container private area was deleted
```

Running Commands in Virtual Machines and Containers

Virtuozzo allows you to execute arbitrary commands inside virtual machines and Containers by running them on the physical server, i.e. without the need to log in to the respective virtual machine or Container. For example, this can be useful in these cases:

- If you do not know the virtual machine or Container login information, but need to run some diagnosis commands to verify that it is operational.

- If network access is absent for a virtual machine or Container.

In both these cases, you can use the `prlctl exec` command to run a command inside the respective virtual machine or Container. The session below illustrates the situation when you run the stopped SSH daemon inside a Linux virtual machine with the name of `My_Linux`:

```
# prlctl exec My_Linux /etc/init.d/sshd status
sshd is stopped
# prlctl exec My_Linux /etc/init.d/sshd start
Starting sshd:[OK]
# prlctl exec My_Linux /etc/init.d/sshd status
sshd (pid 26187) is running...
```

Notes:

1. You can use the `prlctl exec` command only inside virtual machines that have guest tools installed.
2. The `prlctl exec` command is executed inside a virtual machine or Container from the `/` directory rather than from the `/root` one.

Monitoring Resources

In Virtuozzo, you can use the `pstat` utility to monitor system resources in real time. When executed, the utility displays the status and load of the system: its disk, network, CPU, memory, and other parameters. It also provides the list of running virtual machines and Containers together with their resources consumption statistics. For example, you can run the following command on the server to view your current system resources:

```
# pstat -d 5
 5:39pm, up 4 days,  5:33,  2 users, load average: 1.08, 1.11, 1.05
CTNum 2, procs 268: R  1, S 265, D  1, Z  0, T  1, X  0
CPU [ OK ]: CTs  0%, CT0  0%, user  0%, sys  1%, idle 99%, lat(ms)  1/0
Mem [ OK ]: total 7831MB, free 4147MB/0MB (low/high), lat(ms) 1/0
  ZONE0 (DMA): size 9MB, act 0MB, inact 0MB, free 10MB (0/0/0)
  ZONE1 (DMA32): size 3238MB, act 42MB, inact 39MB, free 3118MB (4/5/6)
  ZONE2 (Normal): size 4661MB, act 2730MB, inact 606MB, free 1019MB (6/8/9)
Mem lat (ms): A0 0, K0 1, U0 0, K1 1, U1 0
Slab pages: 181MB/181MB (ino 39MB, de 13MB, bh 21MB, pb 40MB)
Swap [ OK ]: tot 2000MB, free 2000MB, in 0.000MB/s, out 0.000MB/s
Net [ OK ]: tot: in  0.027MB/s  233pkt/s, out  0.040MB/s  37pkt/s
              lo: in  0.000MB/s   0pkt/s, out  0.000MB/s   0pkt/s
              eth0: in  0.014MB/s  116pkt/s, out  0.020MB/s  19pkt/s
              sit0: in  0.000MB/s   0pkt/s, out  0.000MB/s   0pkt/s
              br0: in  0.000MB/s   0pkt/s, out  0.000MB/s   0pkt/s
              br1: in  0.013MB/s  116pkt/s, out  0.020MB/s  19pkt/s
Disks [ OK ]: in 0.000MB/s, out 0.000MB/s
ST  %VM  %KM  CPU  FCNT  MLAT  NAME
OK 0.0/27 0.0/- 0.00/33  0  0 1
OK 0.2/685 0.0/- 0.00/33  0  0 101
OK 0.4/685 0.0/- 0.00/33  0  0 102
OK 27/6.7 0.1/- 0.00/33  0  0 Windows7
```

The command output is updated with the time interval equal to the value specified after the `-d` (delay) option measured in seconds. In the session above, the statistics displayed is renewed every five seconds. If the `-d` option is not specified, the default interval equals 1 second.

As you can see, the utility provides real-time information on all main resources subsystems pertaining both to the physical server and to its virtual machines and Containers: the disk, network, CPU, and memory subsystems. You may want to shrink the output of the utility by specifying the `-b` (brief) option instead of the `-v` (verbose) one, or to do without any options to use the “normal” mode of displaying.

The following information is displayed by default per each virtual machine or Container:

Column	Description
ST	virtual machine or Container status. If there are no failed counters and the latency values are normal, the status is “OK”. Otherwise, it is displayed in red as “!”. You can sort virtual machines and Containers by their status to see the problem virtual machines and Containers first.
%VM	Virtual memory usage, in per cent to the total memory. The first number is how much virtual memory is being used, and the second one is the virtual memory barrier.
%KM	Kernel memory usage, in per cent to the normal zone size. The first number is how much kernel memory is being used, and the second one is the kernel memory barrier.
CPU	CPU usage in per cent to all available CPUs. The first number is how much of the CPU power is being used by the virtual machine or Container, and the second one is its guaranteed share judging by the <code>cpuunits</code> parameter. Note that the actual CPU usage may be higher than the guaranteed one.
FCNT	The number of failed counters for all the resource parameters. In the standard mode of displaying, this number represents the increase of failed counters since the previous screen update, whereas in the average mode of displaying, it represents an absolute failed counters sum for the given virtual machine or Container.
MLAT	Maximal scheduling latency for the virtual machine or Container, in ms. This parameter shows the maximal scheduling latency inside the given virtual machine or Container, i.e. for how long (at the utmost) a process inside the virtual machine or Container awaits for the CPU.
NAME	Virtual machine or Container name.

The **%VM**, **%KM**, and **CPU** columns provide two values per column separated by a slash for each virtual machine and Container. The first value indicates the real usage of the corresponding parameter by the virtual machine or Container, and the second one – the maximal value allowed for the virtual machine or Container.

For detailed information on options that you can use with the `psstat` utility, consult the *Virtuozzo 6 Command Line Reference Guide*.

Migrating Virtual Machines and Containers

Virtuozzo provides a special utility - `pmigrate` - allowing you to perform different types of migration.

Migrating a physical server to a virtual machine/Container

The `pmigrate` utility allows you to migrate physical servers to virtual machines and Containers on the physical server running Virtuozzo. For example, to move a physical server to the `MyVM` virtual machine, you can execute the following command:

```
# pmigrate h 192.168.1.130 v localhost/MyVM
```

where

- `h` denotes that you are migrating a physical server.
- `192.168.1.130` is the IP address of the physical server to be migrated.
- `v` indicates that the physical server is to be moved to a virtual machine.
- `localhost/MyVM` denotes that the physical server must be migrated to the `MyVM` virtual machine on the local server.

If you want to migrate the same physical server to a Container, just specify `c` instead of `v` and the ID of the resulting Container (e.g. 101) instead of `MyVM`.

Migrating virtual machines and Containers between physical servers

The `pmigrate` utility supports migrating virtual machines and Containers between physical servers running Virtuozzo. For example, to migrate a virtual machine with the name of `MyVM` from the server having the IP address of `192.168.1.130` to the local server, run this command:

```
# pmigrate v 192.168.1.130/MyVM v localhost/MyVM
```

Specifying `c` instead of `v` and the Container ID instead of `MyVM` allows you to migrate Containers between physical servers with Virtuozzo:

```
# pmigrate c 192.168.1.130/101 c localhost/101
```

Migrating Containers to virtual machines

You can also migrate Containers to virtual machines. The Containers to be migrated can reside on both local and remote physical servers. For example, you can migrate Container 101 residing on the physical server with the IP address of `192.168.1.130` to the `MyVM` virtual machine on the local server as follows:

```
# pmigrate c 192.168.1.130/101 v MyVM
```

In its turn, you can migrate Container 101 from the local server to the `MyVM` virtual machine on the physical server with the IP address of `192.168.1.130` by executing this command:

```
# pmigrate c 101 v 192.168.1.130/MyVM
```

Note: If you are migrating from/to a remote physical server, you will be asked for the `root` credentials to log in to this server.

Managing Virtual Machine and Container Backups

A regular backing up of the existing virtual machines and Containers is essential for any physical server reliability. In Virtuozzo, you can use the `prlctl backup` and `prlctl restore` commands to back up and restore your virtual machines and Containers.

Note: You can also use the `pbackup` and `prestore` utilities to back up and restore your virtual machines and Containers.

Creating a backup

The `prlctl backup` command allows you to create virtual machine and Container backups on both local and remote physical servers. You can back up to any server running the Virtuozzo software and having sufficient space for storing virtual machine and Container backups. For example, to make a full backup of the `MyVM` virtual machine residing on the local server and save it on the destination physical server with the IP address of `10.10.100.1`, run the following command:

```
# prlctl backup MyVM -s root:1qaz2wsx@10.10.100.1
```

`root:1qaz2wsx` before the destination server IP address denotes the root credentials used to log in to this server. If you do not specify these credentials, you will be asked to do so during the command execution.

Restoring a backup

To restore a backup of a virtual machine and Container, you can use the `prlctl restore` command. This command supports restoring backups to a local host only. For example, to restore a backup of the `MyVM` virtual machine stored on the remote server with the IP address of `10.10.100.1`, you can run this command on the local server:

```
# prlctl restore MyVM -s root:1qaz2wsx@10.10.100.1
```

If you have two or more backups of the `MyVM` virtual machine, you can use the `prlctl backup-list` command to find out the ID assigned to a specific backup:

```
# prlctl backup-list -s 10.10.100.1
```

ID	Backup_ID	Node	Date	Type
{e3c8be4a-...}	{7a5e7605-...}	server.com	2012-08-21 10:10:32	f
{e3c8be4a-...}	{24a3011c-...}	server.com	2012-08-21 11:12:35	f

You can now indicate the found ID after the `-t` option to tell `prlctl backup` to restore a particular backup. For example, to restore the backup that was created first, execute this command:

```
# prlctl restore -t {7a5e7605-a467-4e04-9f5f-6f0078b5f9f5} -s root:1qaz2wsx@10.10.100.1
```

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