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Parallels Virtuozzo Containers 4.7 for Linux

Installation Guide

Contents

Introduction

This chapter provides basic information about Parallels Virtuozzo Containers 4.7 and this guide.

In This Chapter

About Parallels Virtuozzo Containers 4.7

Parallels Virtuozzo Containers 4.7 is a patented OS virtualization solution. It creates isolated partitions or Containers on a single physical server and OS instance to utilize hardware, software, data center and management effort with maximum efficiency. The basic Parallels Virtuozzo Containers capabilities are:

- **Intelligent Partitioning**—Division of a server into as many as hundreds of Containers with full server functionality.

- **Complete Isolation**—Containers are secure and have full functional, fault and performance isolation.

- **Dynamic Resource Allocation**—CPU, memory, network, disk and I/O can be changed without rebooting.

- **Mass Management**—Suite of tools and templates for automated, multi-Container and multi-server administration.

The diagram below represents a typical model of the Parallels Virtuozzo Containers system structure:
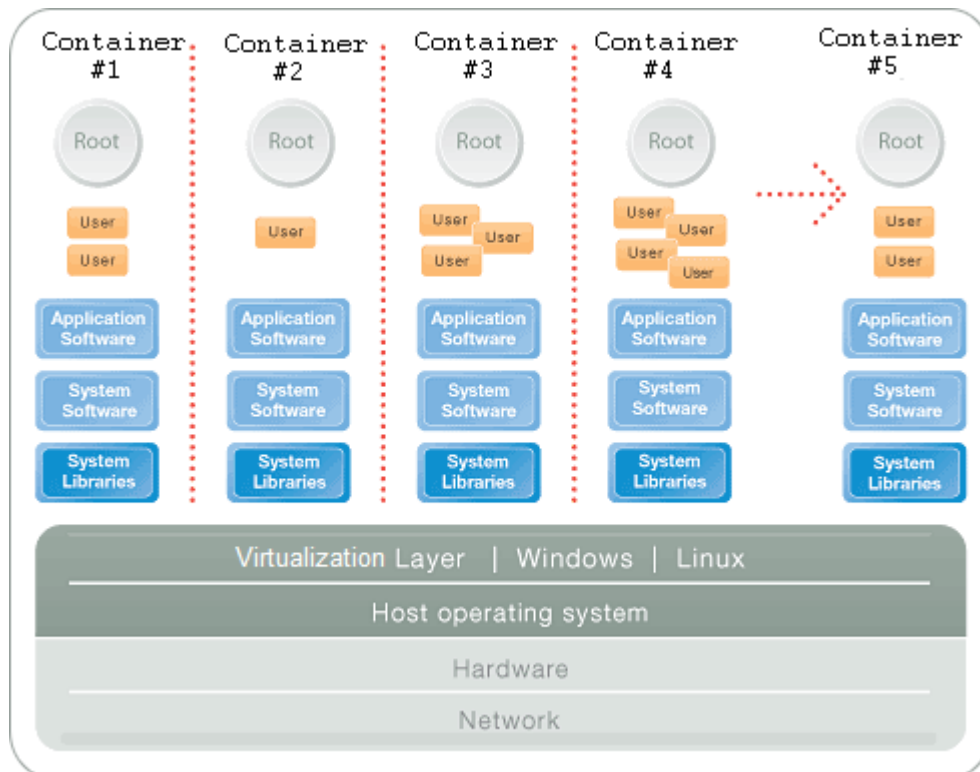
The Parallels Virtuozzo Containers OS virtualization model is streamlined for the best performance, management, and efficiency. At the base resides a standard Host operating system which can be either Windows or Linux. Next is the virtualization layer with a proprietary file system and a kernel service abstraction layer that ensure the isolation and security of resources between different Containers. The virtualization layer makes each Container appear as a standalone server. Finally, the Container itself houses the application or workload.

The Parallels Virtuozzo Containers OS virtualization solution has the highest efficiency and manageability making it the best solution for organizations concerned with containing the IT infrastructure and maximizing the resource utilization. The Parallels Virtuozzo Containers complete set of management tools and unique architecture makes it the perfect solution for easily maintaining, monitoring, and managing virtualized server resources for consolidation and business continuity configurations.

About This Guide

This guide provides exhaustive information on the process of installing, configuring, and deploying Parallels Virtuozzo Containers 4.7 on your system including the pre-requisites and the stages you shall pass.

The primary audience for this book is anyone interested in installing and putting Parallels Virtuozzo Containers 4.7 in operation on their servers. To fully understand the guide, you should have strong Linux system administration habits. Still, no more than superficial knowledge of Linux Server OS is required in order to learn to perform the basic installation operations.

Organization of This Guide

Chapter 2, Preliminary Operations, explains the fundamentals of planning your Parallels system, describes hardware and software requirements your system must meet, and sketches out the steps required to successfully install Parallels Virtuozzo Containers 4.7.

Chapter 3, Installing Parallels Virtuozzo Containers 4.7, focuses on setting up Parallels Virtuozzo Containers 4.7 on the Hardware Node including the installation and configuration of both the Host operating system and the Parallels Virtuozzo Containers software itself.

Chapter 4, Setting Parallels Tools to Work, provides information on how to set up Parallels Management Console and Parallels Virtual Automation—tools for managing Hardware Nodes and Containers residing on them.

Documentation Conventions

Before you start using this guide, it is important to understand the documentation conventions used in it.

The table below presents the existing formatting conventions.

Formatting convention	Type of Information	Example
Special Bold	Items you must select, such as menu options, command buttons, or items in a list.	Go to the **Resources** tab.
	Titles of chapters, sections, and subsections.	Read the **Basic Administration** chapter.
Italics	Used to emphasize the importance of a point, to introduce a term or to designate a command-line placeholder, which is to be replaced with a real name or value.	These are the so-called *EZ templates*. To destroy a Container, type `vzctl destroy ctid`.
`Monospace`	The names of commands, files, and directories.	Use `vzctl start` to start a Container.
`Preformatted`	On-screen computer output in your command-line sessions; source code in XML, C++, or other programming languages.	`Saved parameters for Container 101`
`Monospace Bold`	What you type, as contrasted with on-screen computer output.	**`# rpm –V virtuozzo-release`**
Key+Key	Key combinations for which the user must press and hold down one key and then press another.	Ctrl+P, Alt+F4

Besides the formatting conventions, you should also know about the document organization convention applied to Parallels documents: chapters in all guides are divided into sections, which, in their turn, are subdivided into subsections. For example, **About This Guide** is a section, and **Documentation Conventions** is a subsection.

Getting Help

In addition to this guide, there are a number of other resources shipped with Parallels Virtuozzo Containers 4.7 which can help you use the product more effectively.

- *Getting Started With Parallels Virtuozzo Containers 4.7 for Linux*. This guide provides basic information on how to install Parallels Virtuozzo Containers 4.7 on your server, create new Containers, and perform main operations on them. Unlike this guide, it does not contain detailed description of all the operations needed to install and set Parallels Virtuozzo Containers to work (e.g. planning the structure of your network or performing the Parallels Virtuozzo Containers unattended installation).

- *Parallels Virtuozzo Containers 4.7 for Linux User's Guide*. This guide provides comprehensive information on Parallels Virtuozzo Containers 4.7 covering the necessary theoretical conceptions as well as all practical aspects of working with Parallels Virtuozzo Containers. However, it does not deal with the process of installing and configuring your Parallels system.

- *Parallels Virtuozzo Containers 4.7 for Linux Templates Management Guide*. This guide is meant to provide complete information on Parallels templates—an exclusive Parallels Virtuozzo Containers technology allowing you to efficiently deploy standard Linux applications inside your Containers and to greatly save the Hardware Node resources (physical memory, disk space, and so on).

- *Parallels Virtuozzo Containers 4.7 for Linux Reference Guide*. This guide is a complete reference on all Parallels configuration files and Hardware Node command-line utilities.

- *Deploying Clusters in Parallels-Based Systems*. This document provides information on creating failover and data sharing clusters in Parallels Virtuozzo Containers-based systems.

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 on our website (http://www.parallels.com/en/support/usersdoc/).

Preliminary Operations

This chapter familiarizes you with the basics of planning a Parallels Virtuozzo Containers system, describes hardware and software requirements your system must meet, and sketches out the stages you need to pass to successfully install Parallels Virtuozzo Containers 4.7 on your server.

In This Chapter

Planning Your System

Before installing the product, you need to carefully plan the structure of your network and the roles the individual computers will perform in it. The principal roles of computers in a Parallels-based network are the following:

1 *Hardware Node*. A Hardware Node is a server with the Parallels Virtuozzo Containers software installed that houses a certain number of Containers.

2 *Parallels Management Console workstation*. A Parallels Management Console workstation is a computer running a Windows or Linux operating system and having the Parallels Management Console application installed. It can be located virtually everywhere on the Internet and serves for the remote administration of Hardware Nodes and Containers.

3 *Parallels Virtual Automation client*. A Parallels Virtual Automation client is a computer providing you with the ability to manage Hardware Nodes and Containers with the help of a standard Web browser on any platform. The only requirement this computer must meet is to be able to connect to the Hardware Node and run a Web browser supported by Parallels Virtuozzo Containers 4.7.

4 *Backup Node*. A Backup Node is a server used to store Containers backups on its hard disks.

Graphically, a typical Parallels system can be represented as follows:
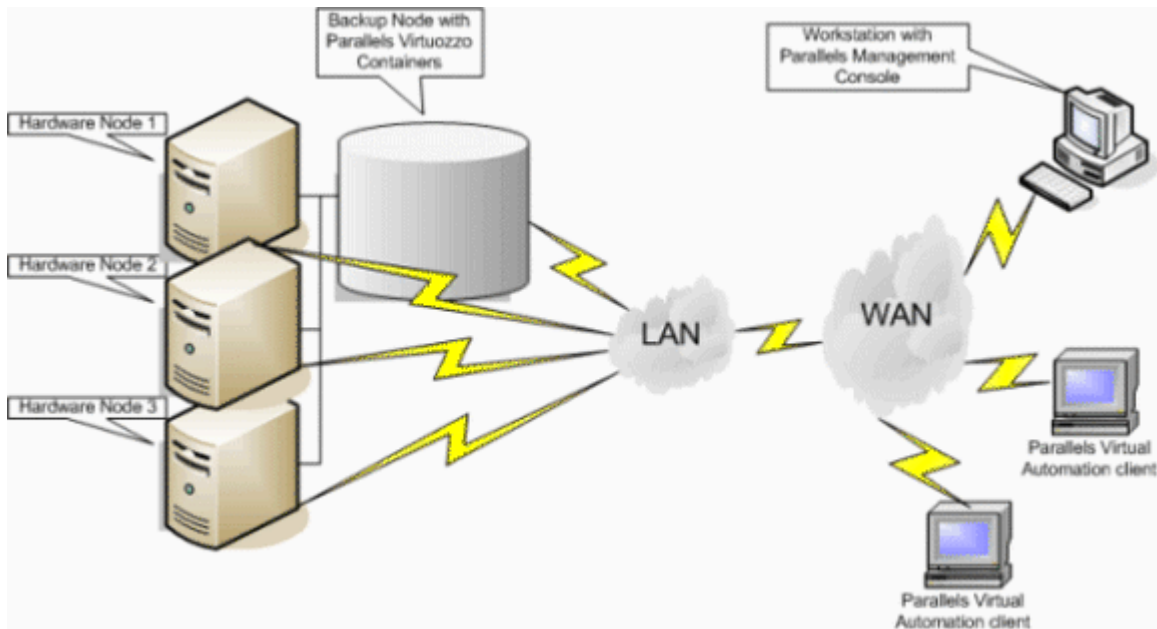
This picture shows the configuration with a network consisting of three Hardware Nodes and a server performing the functions of the Backup Node. As a rule, you are supposed to have several physical servers with Parallels Virtuozzo Containers, but you can have only one dedicated server to effectively use Parallels Virtuozzo Containers 4.7. All the Hardware Nodes have separate Parallels Virtuozzo Containers licenses installed and host a number of Containers. All Containers residing on the Hardware Nodes can be migrated from one Node to another with near-zero downtime; so, you can easily move all Containers from a Node in case of its upgrading or for any other purpose.

The Backup Node is a server intended for storing the backups of your Containers. Generally, any Hardware Node can be assigned an additional role of the Backup Node. However, we recommend that you set up a dedicated server to serve as the Backup Node (which is shown in the picture above). The Backup Node should have high-capacity hard drives to be able to store Containers backups on them.

Apart from the aforementioned servers, you can use the following computers to remotely manage and monitor Hardware Nodes and Containers:

- a workstation with Parallels Management Console

- a workstation where Parallels Virtual Automation is launched in a standard Web browser

The picture above shows only one of the possible configurations you can choose while planning your network. You can hold to this scheme or work out your own one and build your own network. You may, as a matter of fact, assign all the roles to one and the same Hardware Node, though you are not recommended to. The only condition that must be met when planning a Parallels-based network is to make sure that all Nodes are accessible from the other participating workstations.

Installation Requirements

Once you decide on the structure of your Parallels system, you need to make sure that all Hardware Nodes that will run Parallels Virtuozzo Containers 4.7 meet the requirements described below.

Hardware Requirements

The hardware requirements for Parallels Virtuozzo Containers 4.7 include the following:

- Platform:

  Any x86 or x64 platform that is supported by the Host Linux operating system.

- Memory:

  1 GB or more.

- Disk space:

  At least 15 GB of free disk space.

- Network interfaces:

  One or more network cards. You can find the complete list of network cards supported in Parallels Virtuozzo Containers 4.7 at http://www.parallels.com/en/products/virtuozzo/hcl/network.

The exact server configuration depends on how many Containers you are going to run on the server and what load these Containers are going to produce. To choose the right configuration, follow the recommendations below:

- *CPUs*. The more Containers you plan to run simultaneously, the more CPUs you need.

- *Memory*. The required amount depends on the total number of Containers you plan to simultaneously run on the server.

- *Disk space*. The required amount depends on the size of the software you plan to install in Containers.

Software Requirements

Parallels Virtuozzo Containers 4.7 can be installed on servers running one of the following Linux distributions (both x86 and x64):

- Red Hat Enterprise Linux 6
- Red Hat Enterprise Linux 5
- CentOS 6
- CentOS 5

Network Requirements

You can avoid delays and problems with getting Parallels Virtuozzo Containers 4.7 up and running if you take care in advance of the following:

- Local Area Network (LAN) for the server.

- Active Internet connection for the server.

- Valid IP address and other network parameters (default gateway, network mask, DNS configuration) for the server.

- At least one valid IP address for each Container you plan to create. The total number of IP addresses must be no less than the planned number of Containers. The addresses can be allocated in different IP networks.

- If a firewall is deployed, check that IP addresses allocated to Containers are open for access from the outside.

- Ensure that the IP address of the server is not altered while Parallels Virtuozzo Containers is running. If you are using a DHCP server, also ensure that one and the same IP address is always leased to a particular MAC address.

Installation Process Overview

The basic installation and preliminary operations for any Parallels-based system include the following steps:

1   Installing and configuring the root Linux operating system on the server.

2   Installing the Parallels Virtuozzo Containers 4.7 software on the server:

   a   Installing the Parallels Virtuozzo Containers packages.

   b   Installing the OS and application templates.

   Step 2b can be performed at Step 2a at your desire. You can also skip this step and install the necessary templates later. For detailed information on installing templates, see **Installing OS Templates** (p. 40).

3   Setting Parallels Virtual Automation to work.

   Parallels Virtual Automation is a tool providing you with the ability to manage Hardware Nodes and Containers with the help of a standard Web browser on any platform. Parallels Virtual Automation currently supports the following browsers: Internet Explorer 6 and above, Firefox 2 and higher, and Safari 3.x and higher.

4   Installing Parallels Management Console and registering the Hardware Node.

   Parallels Management Console is a graphical user interface (GUI) tool for managing Hardware Nodes and Containers. This tool can run under the following operating systems: Windows XP, Windows 7, Windows Server 2003, Windows Server 2008, and Windows Server 2008 R2.

The following chapters describe all these steps in detail.

Installation Checklist

We provide this checklist for your convenience. It contains the steps required to install Parallels Virtuozzo Containers 4.7 successfully. Mark check boxes as you finish the corresponding steps.

Installing and Configuring the Host operating system (Host OS)

❑　　　　　　　Start the Host OS installation.

❑　　　　　　　Partition disk.

❑　　　　　　　Reboot your system and log in as `root`.

Installing Parallels Virtuozzo Containers 4.7

❑　　　　　　　Install the Parallels Virtuozzo Containers software.

❑　　　　　　　Reboot the Hardware Node.

❑　　　　　　　Install OS and application templates.

❑　　　　　　　Verify the Parallels Virtuozzo Containers installation.

❑　　　　　　　Configure daemons.

Installing Parallels Management Console and Registering the Hardware Node

❑　　　　　　　Install Parallels Management Console.

❑　　　　　　　Register the Hardware Node.

Configuring Parallels Virtual Automation

❑　　　　　　　Log in to Parallels Virtual Automation.

Installing Parallels Virtuozzo Containers 4.7

The given chapter provides information on how to install Parallels Virtuozzo Containers 4.7 on a physical server. Along with the information on installing the Parallels Virtuozzo Containers software itself, it explains the way to install the Host operating system (Host OS) on the server and to configure it for Parallels Virtuozzo Containers 4.7.

In This Chapter

Installing and Configuring a Host Operating System

This section provides information on the specifics you should take into account when installing and configuring a Host operating system (Host OS) on your physical server.

Note: We use Red Hat Enterprise Linux 6 as an example Host OS throughout this section.

Partitioning Hard Drives

When installing the Host OS on your server, follow the instructions from the Red Hat Enterprise Linux 5 installation guide until the following window appears:
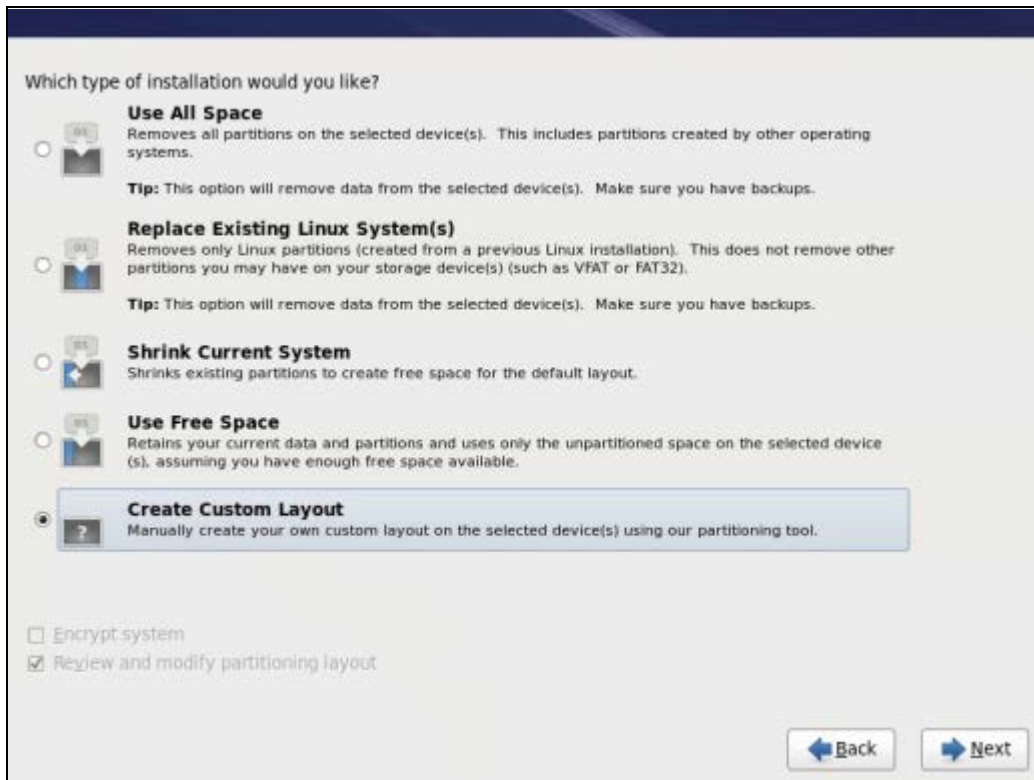
In this window, select the **Create custom layout** radio button as shown in the picture above, and click **Next**. Create the following partitions on the server:

Partition	Description	Size
/	The root partition containing all Host OS and Parallels Virtuozzo Containers program files.	10 GB or more
swap	The paging partition for the Host OS.	2 times RAM if RAM <=2 GB otherwise, RAM + 2 GB
/vz	The partition to host all Container data and Parallels Virtuozzo Containers templates. You are recommended to allocate as much disk space as possible to this partition and to format it as ext3 or ext4.	all the remaining space on the hard disk

Once you create the recommended partitions, your partitioning window should look like the following:
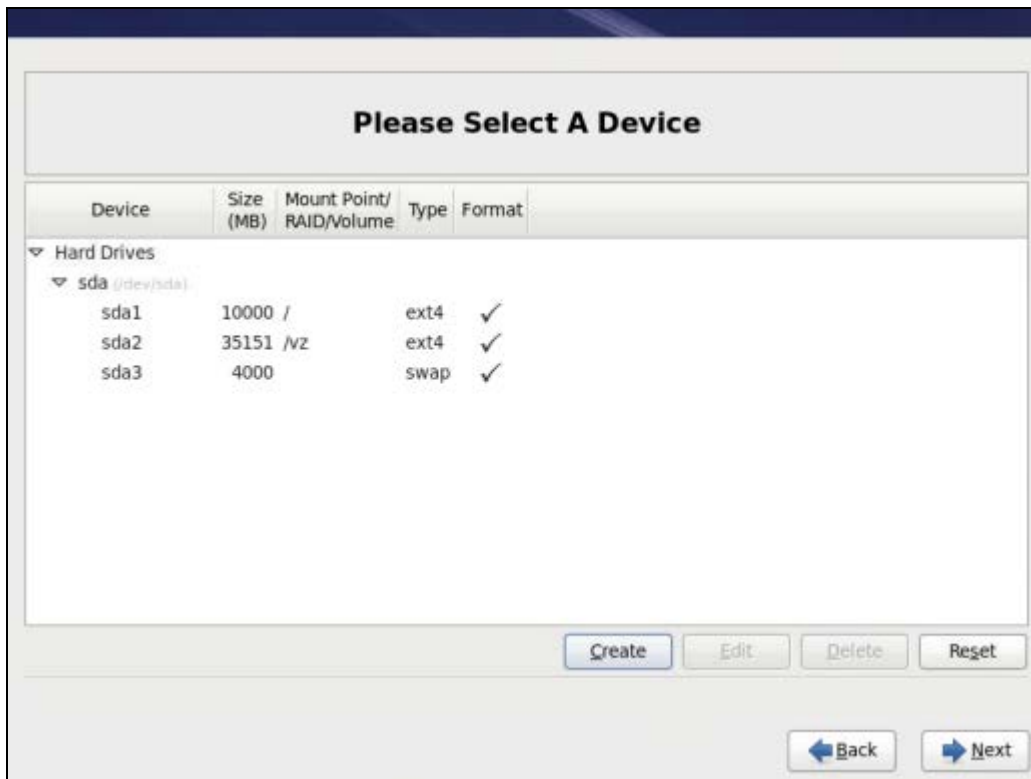
Click **Next** to continue with the installation.

Finishing Host OS Installation

Once you partition your hard drives, proceed with the installation by following the instructions in the Red Hat Enterprise Linux 6 installation guide and the recommendations below:

- When deciding on the network settings, ensure the correctness of the server IP address, hostname, DNS, and default gateway information. If you are using DHCP, make sure that it is properly configured. If necessary, consult your network administrator.

- When choosing the packages to install on the server, select the **Basic Server** option—that is, a basic installation of Red Hat Enterprise 6. For its functioning, Parallels Virtuozzo Containers 4.7 does not need any additional packages to be installed on the server.
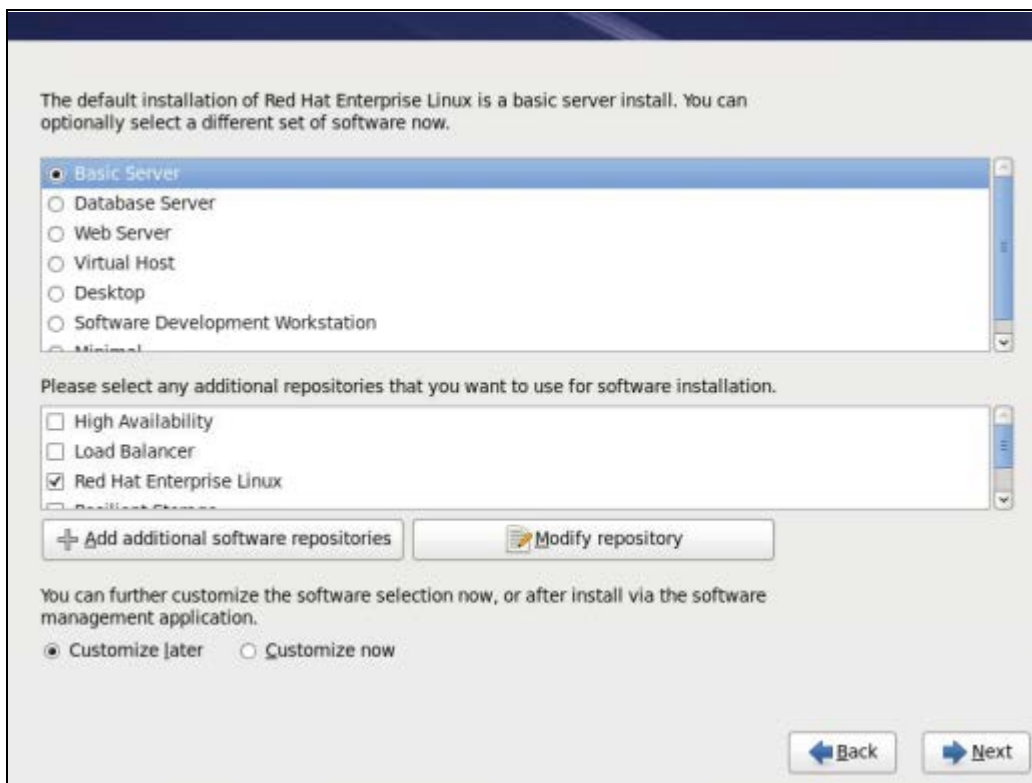
> **Note:** If you are installing a Linux distribution for x64 platforms (e.g., the x64 version of CentOS 5), you need to additionally ascertain that the 32-bit runtime environment providing support for 32-bit applications is also installed on the server. Otherwise, the Parallels Virtuozzo Containers installation may fail.

Once you install the Host OS, use these guidelines to configure your Red Hat Linux Enterprise installation:

- Disable the Rat Hat standard firewall. The Parallels Virtuozzo Containers software uses a number of specific services for its operation. To prevent unsafe network packets from accessing your system, consider using an external firewall.

- Disable SELinux. The current version of Parallels Virtuozzo Containers does not support SELinux functionality; so, enabling this option will not have any effect.

Obtaining Parallels Virtuozzo Containers

You can obtain the Parallels Virtuozzo Containers 4.7 distribution set in one of the following ways:

- Get a CD or DVD containing Parallels Virtuozzo Containers 4.7 from Parallels.

- Use the `vzinstall-linux-i386.bin` or `vzinstall-linux-x86_64.bin` utility (for the x86 or x86-64 version of Parallels Virtuozzo Containers 4.7, respectively). This way of getting the Parallels Virtuozzo Containers software is described below in detail.

Note: The process of downloading and installing Parallels Virtuozzo Containers 4.7 with the `vzinstall-linux-i386.bin` and `vzinstall-linux-x86_64.bin` utilities is the same. Therefore, we use a generic term `vzinstall-linux.bin` to indicate both utilities throughout this chapter.

Parallels Virtuozzo Containers 4.7 comes with a new utility—`vzinstall-linux.bin`—allowing you to quickly download the Parallels Virtuozzo Containers software from the Internet. All you have to do is to download the `vzinstall-linux.bin` file from the Parallels web site to your server, make the file executable using the `chmod a+x vzinstall-linux.bin` command, and run it on the server. When executed, the utility launches the **Virtuozzo Containers Autoinstall** wizard that asks you about the Parallels Virtuozzo Containers components you want to download and, after gathering the necessary information, starts the download process. You can also make the wizard automatically launch the **Parallels Virtuozzo Containers Installation** wizard once the selected components are downloaded to the server.

In the first step of the wizard, you are asked to choose the `vzinstall-linux.bin` operating mode.

You can choose between the two modes:

- *Download only*. If you want to download the Parallels Virtuozzo Containers software to the server, but do not plan to install it there (for example, you intend to install Parallels Virtuozzo Containers 4.7 on another server), select the **Download only** radio button, and click **Next**.

- *Download and install*. If you want to download and install Parallels Virtuozzo Containers 4.7 on the server where you are running the `vzinstall-linux.bin` utility, select the **Download and install** radio button, and click **Next**.

Depending on the installation type chosen, your further installation steps will slightly differ. These steps are described in the following subsections in detail.

Configuring Parallels Virtuozzo Containers Repository Parameters

Before proceeding with the **Virtuozzo Containers Autoinstall** wizard, you may wish to check and configure the parameters that the **Virtuozzo Containers Autoinstall** wizard will use during its execution. To view the current settings, click the **Configure settings** button on the **Welcome to Virtuozzo Containers Autoinstall** screen. The **Configure Settings** window appears.

```
┤ Configure settings ├
The repository details below are taken from the
/root/virtuozzo/conf file.
Leave them as is or provide another path and credentials for
retrieving the Virtuozzo Containers installation set.

Repository URL:       http://vzautoinstall.parallels.com......
Proxy host[:port]:    .................................
Proxy login:          .................................
Proxy password:       .................................
Download directory:   /root/virtuozzo/download.............
Temporary directory:  /root/virtuozzo/tmp...................


      [< Ok >]                        [ Cancel ]
```

In this window, you can view and, if necessary, configure the following parameters:

- **Repository URL**. The URL of the server storing the repository with Parallels Virtuozzo Containers installation files.

- **Proxy host[:port]**. The hostname or IP address of the proxy server to use for connecting to the repository (if you use the proxy server).

- **Proxy login**. The user name used by the proxy server for your authentication.

- **Proxy password**. The password of the user specified in the **Proxy login** field and used for your authentication by the proxy server.

- **Download directory**. The directory on your server where the Parallels Virtuozzo Containers distribution will be downloaded. By default, the `/root/virtuozzo/download` directory is used.

- **Temporary directory**. The temporary directory where the Parallels Virtuozzo Containers distribution will be stored during the downloading process. By default, the `/root/virtuozzo/tmp` directory is used.

Running vzinstall-linux.bin in 'Download only' Mode

If you only want to download Parallels Virtuozzo Containers 4.7 without installing it on the local server, select the **Download only** radio button, and click **Next** in the **Welcome to Virtuozzo Containers Autoinstall** window. The **Select Virtuozzo Containers Version** windows appears.
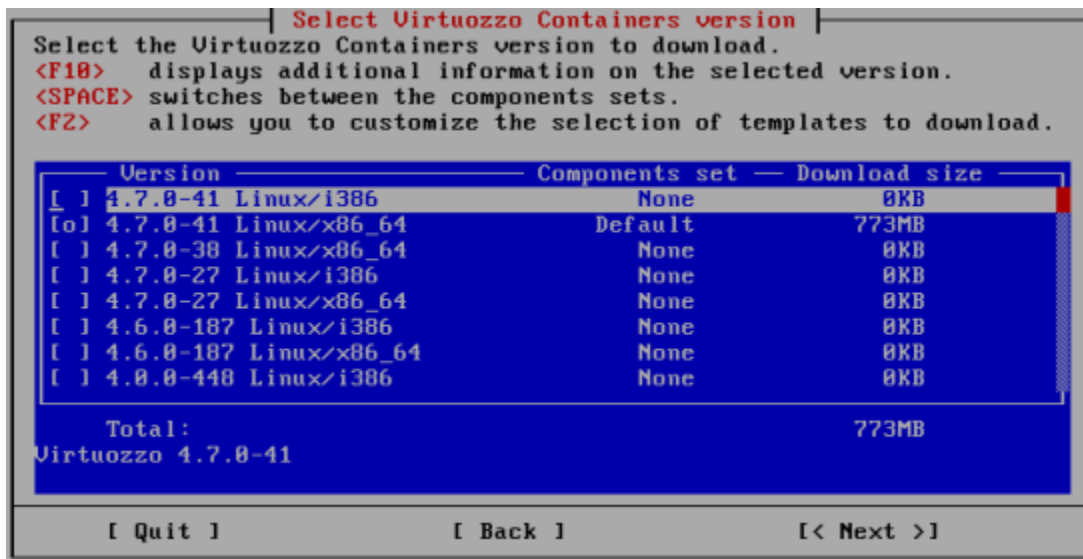
In this window, choose the version of Parallels Virtuozzo Containers you want to download. By default, you are offered to download the Parallels Virtuozzo Containers distribution set corresponding to the server architecture where you are running `vzinstall-linux.bin` and one OS template—CentOS 5 (you will need this OS template to create Containers on its basis). However, you can choose any of the Parallels Virtuozzo Containers distribution sets listed in the **Select Virtuozzo Containers Version** window and configure the set of OS templates by doing the following:

- To download the full set of Parallels Virtuozzo Containers 4.7 containing the product program files and all available OS templates, select the name of the corresponding Parallels Virtuozzo Containers distribution, and click the space bar once (the `o` sign will change to `x` and the **Components set** column will have the 'Full' inscription displayed).

- To customize the set of OS templates to be downloaded, select the name of the corresponding Parallels Virtuozzo Containers distribution, and press F2. You will be presented with the **Select Templates** window where you can choose the necessary OS templates for downloading.

- To schedule a Parallels Virtuozzo Containers distribution for downloading, select the name of the corresponding distribution, and click the space bar either once (to download the default set of Parallels Virtuozzo Containers) or twice (to download the full set of Parallels Virtuozzo Containers).

- To prevent the selected Parallels Virtuozzo Containers distribution from being downloaded, click the space bar two times (the `o` sign will disappear and the **Components set** column will have the 'None' inscription displayed).

> **Note:** The **Select Virtuozzo Containers Version** screen lists all available Parallels Virtuozzo Containers distribution sets for servers running both the supported Linux and Windows Server operating systems. You can choose any of the listed sets and download them to your server for further installation.

Once you choose the necessary Parallels Virtuozzo Containers distribution set, click **Next**.

```
┤ Summary ├
The selected Virtuozzo version(s) will be downloaded to the following
directory:
   /root/virtuozzo/download/Linux/x86_64

Download summary:
   The total download size                     773MB
   The available free space                    7.6GB

Selected components:
   Virtuozzo 4.7.0-41/x86_64        (Default set)      773MB




        [ Quit ]              [ Back ]           [ Download ]
```

The **Summary** window allows you to review the parameters you entered in the previous steps of the wizard. Click **Download** to start downloading the selected Parallels Virtuozzo Containers distribution sets to the download folder; otherwise, click **Back** and configure the necessary parameters.

Downloading the Parallels Virtuozzo Containers software and the selected templates may take some time. Once the download is complete, you will see the corresponding window where you can click **OK** to exit the wizard.

At any time, you can start the Parallels Virtuozzo Containers installation by doing the following:

1   Follow the http://www.parallels.com/virtuozzo/linux_eval/ link, and get a free Parallels Virtuozzo Containers evaluation license.

2   Go to the download directory (`/root/virtuozzo/download` by default), and copy the contents of this directory to the system where you are planning to install Parallels Virtuozzo Containers, if needed, and execute one of the following commands:

- To install the x32 version of Parallels Virtuozzo Containers 4.7:

```
# ./virtuozzo-4.7.0-<build_version>-i386.sfx
```

- To install the x64 version of Parallels Virtuozzo Containers 4.7:

```
# ./virtuozzo-4.7.0-<build_version>-x86_64.sfx
```

You may need to make the `sfx` installation file executable (e.g., `chmod +x virtuozzo-4.7.0-<build_version>-x86_64.sfx`) before starting the installation.

This will launch the **Parallels Virtuozzo Containers 4.7 Installation** wizard. Detailed information on this wizard is given in **Running the Installation Program**.

Running vzinstall-linux.bin in 'Download and Install' Mode

If you want to download Parallels Virtuozzo Containers 4.7 and then install it on the local server, select the **Download and install** radio button, and click **Next** in the **Welcome to Virtuozzo Containers Autoinstall** window. The **Virtuozzo Containers Autoinstall** wizard starts gathering the information on your system architecture and, on the basis of the collected data, determines the version of the Parallels Virtuozzo Containers distribution set that is suitable for installing on your server. The process of gathering the information is shown in the **Checking System Requirements** window. Once the wizard gathers all the necessary data, click **Next**.

In the next step of the wizard, you can customize the set of OS templates to be downloaded to and installed on the server.

```
                  ┤ Select Virtuozzo Containers Components ├
 Your system supports Virtuozzo 4.7.0-41 for the x86_64 architecture.

 Select the Virtuozzo components to download to and install on your computer:

 Default - includes the Virtuozzo distribution and one ready-to-use OS
           template with a number of application templates.
 Full    - includes the Virtuozzo distribution and a number of ready-to-use
           OS and application templates.
 Custom  - customize the set of ready-to-use OS and application templates
           to be downloaded to and installed on your computer.


                          Download Size    Installation Size
 (*) Default              773MB            5.4GB
 ( ) Full                 773MB            5.4GB
 ( ) Custom

     [ Quit ]                     [ Back ]                  [< Next >]
```

In this window, you can choose one of the following options:

- *Default*. Select this radio button to download and install the Parallels Virtuozzo Containers program files and one OS template—CentOS 5 (you will need this OS template to create Containers on its basis).

- *Full*. Select this radio button to download all available OS templates to the server and install them there.

- *Custom*. Select this radio button to customize the set of OS templates to download to and install on the server. In this case, once you click the **Next** button, you will see the **Select Templates** window where you can choose the necessary OS templates for downloading.

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

```
                          ┤ Summary ├
Virtuozzo is ready to be downloaded and installed.
The total download size is 773MB. Installer has detected there is enough
free space to complete the installation.

Components for download:
  Virtuozzo 4.7.0-41/x86_64              518MB
Precreated template sets:
  Centos 5 x86_64                        255MB

Download directory:  /root/virtuozzo/download
Temporary directory: /root/virtuozzo/tmp

Disk space requirements:
Mount point                        Required        Available
/vz                                  1.9GB            32.7GB
/                                    2.6GB             7.6GB




          [ Quit ]              [ Back ]           [ Download ]
```

The **Summary** window allows you to review the parameters you entered in the previous steps of the wizard. Click **Download** to start downloading Parallels Virtuozzo Containers and the selected templates to the server; otherwise, click **Back** and configure the necessary parameters.

Once the download is complete, you will see the **Installation** screen where you can click the **Install** button to start installing Parallels Virtuozzo Containers 4.7 on your system. Detailed information on the Parallels Virtuozzo Containers installation process is given in the next section.

Running the Installation Program

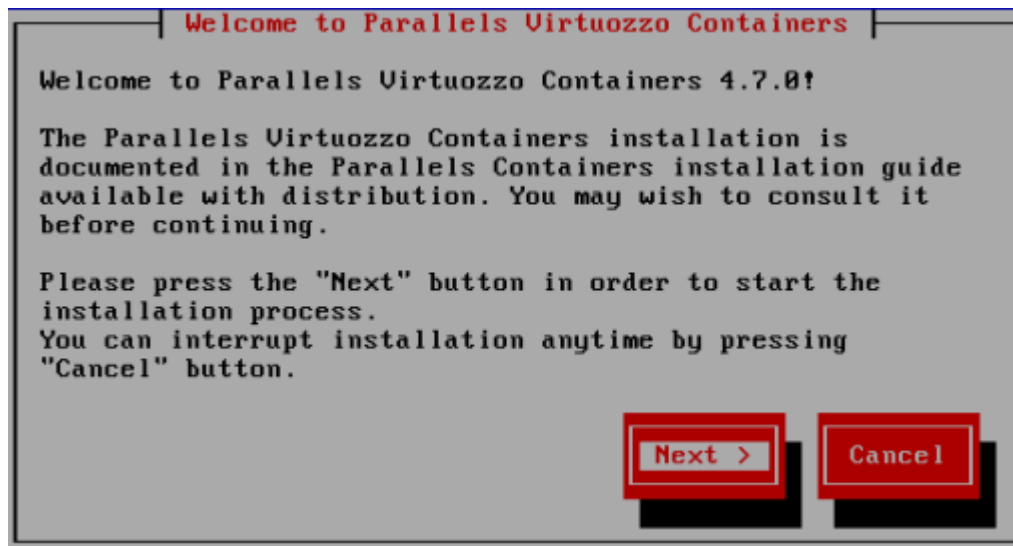To install Parallels Virtuozzo Containers 4.7, do the following:

1 Make sure that the Parallels Virtuozzo Containers 4.7 installation files are located on a persistent storage (for example, on a local file system). This is needed to ensure the accessibility of the installation files after the system reboot that is performed in the last installation step.

2 Log in to the server as root, and do one of the following:

- If your Parallels Virtuozzo Containers installation files include the `install` utility (for example, if you have obtained Parallels Virtuozzo Containers on a DVD), run this utility. For example, you can change to the directory where install is located and execute this command:

```
# ./install
```

- If you have downloaded the Parallels Virtuozzo Containers distribution using the `vzinstall-linux.bin` utility, execute the `./virtuozzo-4.7.0-<build_version>-<arch>.sfx` command to launch the **Parallels Virtuozzo Containers Installation** wizard.

The **Welcome** window appears.

> **Note:** If you are running the `vzinstall-linux.bin` utility in the 'Download and install' mode, the **Welcome to Parallels Virtuozzo Containers** screen is automatically displayed once the Parallels Virtuozzo Containers distribution set is downloaded to your server.

Clicking **Next** displays the Parallels end user license agreement that you must accept to install Parallels Virtuozzo Containers 4.7. Use either the PgDn key or the down arrow on your keyboard to read all the text of the agreement; then press **Accept**.

> **Note:** If you did not create a separate `/vz` partition during the Host OS installation (see **Partitioning Hard Drives** (p. 18) for more details), you will see a message informing you of this fact. For performance and reliability reasons, we recommend that you allocate a separate partition for holding all Container data and Parallels templates. To cancel the Parallels Virtuozzo Containers installation and repartition your disks, click **Cancel**; otherwise, click **OK**.

Once you accept the license agreement, the installation program starts installing Parallels Virtuozzo Containers 4.7.

Next, the installation program looks for Parallels Virtuozzo Containers templates in your distribution. If it finds any, it shows you the list of available templates and asks you which templates you want to install on the server. In the **Parallels Virtuozzo Containers Templates Installation** window, you can do one of the following:

- Choose the templates you want to install on the server, and click **Install**. By default, no templates are selected for installation. To schedule a template for installation, expand the plus (**<+>**) sign next to the corresponding template (for example, by pressing the space bar or Enter), and use the space bar to select the template.

- Click the **Skip** button to proceed with the Parallels Virtuozzo Containers installation without installing any templates. You will be able to install the necessary templates later using Parallels Virtual Automation, Parallels Management Console, or Parallels command line utilities.

> **Notes:**
>
> 1. The **Install Templates** window is skipped if you are installing Parallels Virtuozzo Containers 4.7 using the `vzinstall-linux.bin` utility. In this case, `vzinstall-linux.bin` will install the OS and application templates you specified in the **Select Parallels Virtuozzo Containers Components** window of the **Virtuozzo Containers Autoinstaller** wizard (p. 27).
>
> 2. For detailed information on templates, see the *Parallels Virtuozzo Containers 4.7 Templates Management Guide*.

Next, you are prompted to enter the Parallels Virtuozzo Containers license.

⊣ **Parallels Virtuozzo Containers Product Key installation** ⊢

Please enter your Parallels Virtuozzo Containers product key
in the field below.

If you skip this step, you will be asked to enter a valid
product key before you can start using Parallels Containers.

If you do not have a valid product key yet, request an
evaluation key on the
http://www.parallels.com/download/pvc46/ web page or contact
a Parallels sales representative.

        Next >   Configure   Skip

Every server must have its own license installed. Licenses are issued by Parallels and needed to start using Parallels Virtuozzo Containers. Although you can complete some tasks on the server without having a Parallels Virtuozzo Containers license, you are not allowed to perform the majority of operations until you install a valid license (for example, all Container-related operations). In the **Parallels Virtuozzo Containers Product Key Installation** window, do one of the following:

- Install a valid Parallels license by entering the license key number in the field provided and clicking **Next**. If you plan to activate Parallels Virtuozzo Containers with an activation code, make sure that your server is connected to the Internet. An active Internet connection is required to complete the Parallels Virtuozzo Containers activation process. If your server uses a proxy server to connect to the Internet, use the **Configure** button to specify the necessary information about your proxy server.

  If you do not have a valid Parallels Virtuozzo Containers license, you can follow the http://www.parallels.com/en/products/virtuozzo/linux_eval link and obtain a free Parallels Virtuozzo Containers evaluation license. This license does not impose any restrictions on the Parallels Virtuozzo Containers functionality. You can evaluate all Parallels Virtuozzo Containers features to the full extent but for a limited period of time.

- Click the **Skip** button to skip the step of installing a license on the server. You will be able to install the license later using Parallels Management Console, Parallels Virtual Automation, or the `vzlicload` utility. For more information on installing licenses, see the *Parallels Virtuozzo Containers 4.7 User's Guide*.

  Note: If you do not install the license, you will not be able to install the Parallels Virtual Automation application in the last step of the wizard. Parallels Virtual Automation is used to manage the server with Parallels Virtuozzo Containers and Containers with your favorite web browser.

Next, you are offered to check for available Parallels Virtuozzo Containers updates.
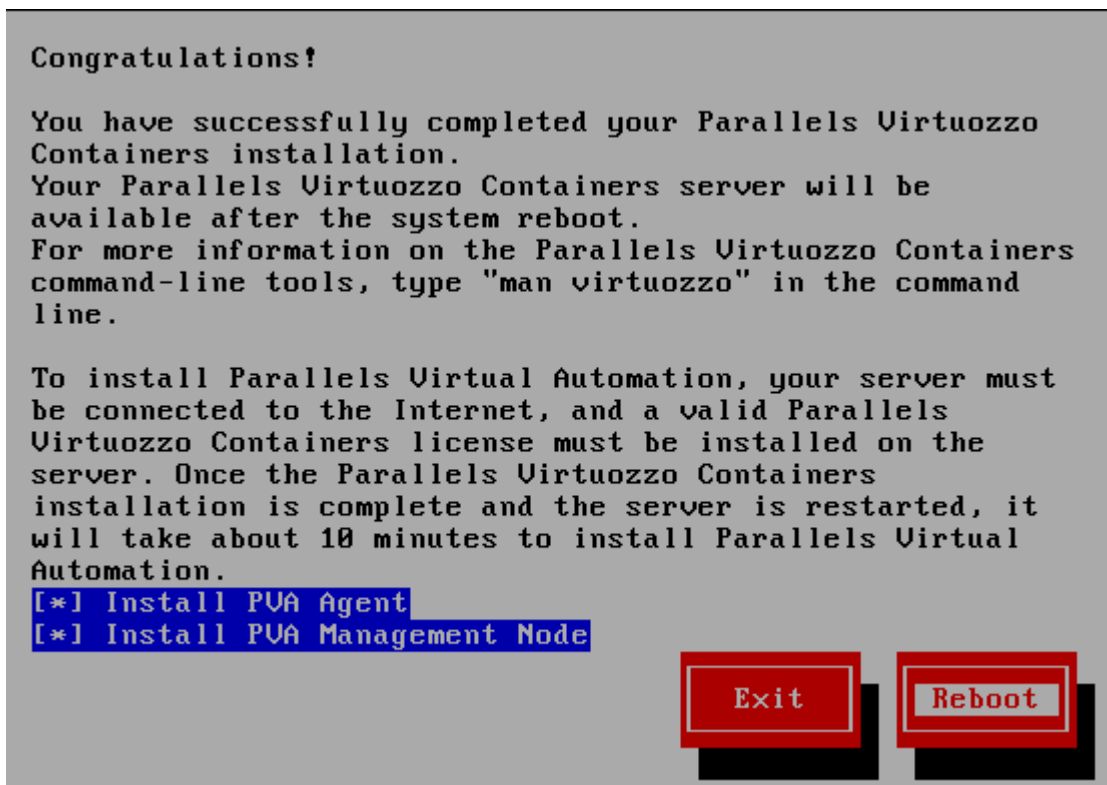
You are highly recommended to check for available updates right during the Parallels Virtuozzo Containers installation. In this case, you will have the latest Parallels Virtuozzo Containers core, utilities, and templates installed once the Parallels Virtuozzo Containers 4.7 installation is complete. To do this:

1 Leave the **Launch Parallels Virtuozzo Containers software update wizard** check box selected, and click **Next**.

2 Follow the instructions of the wizard to check for available updates and install them on the server.

If, however, you do not want to update your Parallels Virtuozzo Containers installation at the moment, clear the check box, and click **Next**. You will be able to update the Parallels Virtuozzo Containers software later using the `vzup2date` utility, Parallels Virtual Automation, or Parallels Management Console. Detailed information on how to update Parallels Virtuozzo Containers using these tools is given in the *Parallels Virtuozzo Containers 4.7 Reference Guide*, *Parallels Virtuozzo Containers 4.7 User's Guide*, and *Parallels Virtual Automation Administrator's Guide*.

> **Note:** The **Parallels Virtuozzo Containers Online Update** window is skipped if you are running the `vzinstall-linux.bin` utility in the 'Download and install' mode.

Finally, the installation program displays the **Congratulations** window.

```
Congratulations!

You have successfully completed your Parallels Virtuozzo
Containers installation.
Your Parallels Virtuozzo Containers server will be
available after the system reboot.
For more information on the Parallels Virtuozzo Containers
command-line tools, type "man virtuozzo" in the command
line.

To install Parallels Virtual Automation, your server must
be connected to the Internet, and a valid Parallels
Virtuozzo Containers license must be installed on the
server. Once the Parallels Virtuozzo Containers
installation is complete and the server is restarted, it
will take about 10 minutes to install Parallels Virtual
Automation.
[*] Install PVA Agent
[*] Install PVA Management Node
                                    Exit      Reboot
```

In this window, do the following:

- Select the **Install PVA Agent** and **Install PVA Management Node** check boxes to set up the Parallels Virtual Automation application and its components on the server once you restart it. With Parallels Virtual Automation, you can connect to the server and manage Containers using your favorite browser. If you select both check boxes, the installer does the following after restarting the server:

  1. Downloads the installation packages for Parallels Virtual Automation from the Parallels web site to the server. The download process may take some time, depending on the speed of your Internet connection.

  2. Install the PVA Agent component on the server. PVA Agent ensures the interaction between your server, the Management Node (see below), and Parallels Virtual Automation. Without this component installed, you will not be able to connect to your server using Parallels Virtual Automation.

  3. Creates a special Container on the server and installs the PVA Management Node component inside it. PVA Management Node (also called *Master Server*) ensures the communication between the server running Parallels Virtuozzo Containers (known as *Slave Server*) and the Parallels Virtual Automation application. The Master Server keeps a database with the information about all registered Slave Servers. If you have already set up a Master Server, you can skip this step (clear **Install PVA Management Node** check box).

When you are ready, remove the installation media, if any, from the server's CD/DVD-ROM drive, and click **Reboot** to restart the server. You can also click **Exit** to quit the installer without restarting the server. In this case, the installation of Parallels Virtual Automation will start automatically the next time you restart the server.

> **Note:** If you choose to install the PVA Management Node component, you will need to complete one more step before the installer will be closed and server will be restarted. See the description of this step in below.

- Clear the the **Install PVA Agent** and **Install PVA Management Node** check boxes, remove the installation media, if any, from the server's CD/DVD-ROM drive, and click **Reboot** to restart the server and complete the installation without installing the Parallels Virtual Automation application and its components. You can also click **Exit** to quit the installer without restarting the server.

When deciding on whether to set up Parallels Virtual Automation, keep in mind the following:

- You must have an active Internet connection to download the Parallels Virtual Automation installation packages.

- If you did not enter a valid Parallels Virtuozzo Containers license in the **Parallels Virtuozzo Containers Product Key Installation** window, the Parallels Virtual Automation components are not available for installation.

For more information on using Parallels Virtual Automation for managing your servers and Containers, see the **Logging In to Parallels Virtual Automation** section (p. 42) and the *Parallels Virtual Automation Administrator's Guide* at http://www.parallels.com/products/pva46/resources/.

Configuring PVA Management Node Parameters

If you choose to install the PVA Management Node component, you will see the following window once you click the **Reboot** or **Exit** button in the **Congratulations** window.

In this window, set the following parameters for the Container that will act as the PVA Management Node:

Parameter	Description
IP address	Valid IP address to be assigned to the Container. You will then use this IP address to connect to the server through Parallels Virtual Automation.
	Note: The Container must have access to the Internet. Otherwise, the PVA Management Node installation will fail.
Hostname	Valid hostname to be assigned to the Container. You will then use this hostname to connect to the server through Parallels Virtual Automation.
DNS server	DNS server to be used by the Container.
Password	Password to be assigned to the Container. You will then use the root login and this password to log in to the server through Parallels Virtual Automation.

Once you set all the necessary parameters, click **OK**.

Unattended Parallels Virtuozzo Containers Installation

While running in unattended mode, the installation program uses the parameters passed to the `install` utility to automatically install and configure the Parallels Virtuozzo Containers 4.7 software on your server.

The following command-line parameters control the installation in unattended mode:

Parameter	Description
`-a, --auto`	Install Parallels Virtuozzo Containers 4.7 in unattended mode.
`-n, --nodeps`	Ignore dependencies. You can use this option if the installation fails because of broken RPM dependencies.
`-o, --all-templates`	Install all OS and application templates the installation program finds in your Parallels Virtuozzo Containers distribution, not only the default set. The default set includes the CentOS 5 OS template and a number of application templates for CentOS 5.

`-t,--templates-file <file>`	Read the list of templates from the specified file. The file must contain a list of file names from the directory where the templates are located. The file names in the list must be separated by a new-line character as follows:
	
	`centos-5-x86-ez-4.7.0-2.i386.rpm`
	
	`redhat-el5-x86-ez-4.7.0-4.noarch.rpm`

`-r,--rpmdir <directory>`	Path to the directory storing Parallels Virtuozzo Containers RPM files. By default, the `/virtuozzo/RPMS` directory is used.
`--skip-reboot`	Do not reboot the server during installation.
`-p, --proxy <URL>`	Set the parameters of the HTTP proxy server, if you use any to connect to the Internet. An active Internet connection is required, for example, to set up the Parallels Virtual Automation application (see below for details). Use the following form to specify the proxy server parameters: `http://[user:password@]host`.
`--optional packages <list_of_packages>`	Install additional Parallels Virtuozzo Containers packages that are not installed by default during installation. To specify several packages, separate them by commas. You can find all additional packages in the `/virtuozzo/RPMS/optional` directory of your Parallels Virtuozzo Containers distribution.
`--pva-agent`	Install the PVA Agent component on the server. PVA Agent ensures the interaction between your server, the PVA Management Node, and Parallels Virtual Automation. Without this component installed, you will not be able to connect to your server using the web-based Parallels Virtual Automation application. This operation is performed once you restart the server after the Parallels Virtuozzo Containers installation.

`--pva-node`	Create a special Container on the server and install the PVA Management Node component inside this Container. PVA Management Node serves as an intermediary between your server and Parallels Virtual Automation ensuring their communication. You can register more than one server running the Parallels Virtuozzo Containers software with PVA Management Node. Thus, if you have set up PVA Management Node before, you do not have to do it again.

This operation is performed once you restart the server after the Parallels Virtuozzo Containers installation. |
| `--pva-hostname` | The hostname to assign to the Container that will host the PVA Management Node component. Once the installation is complete, you can use this hostname to log in to Parallels Virtual Automation and start managing your server and Containers.

This option is mandatory if you specify the `--pva-node` option. |
| `--pva-ip` | The IP address to assign to the Container that will host the PVA Management Node component. It must be unique within your network. Once the installation is complete, you can use this IP address to log in to Parallels Virtual Automation and start managing your server and Containers.

This option is mandatory if you specify the `--pva-node` option. |
| `--pva-password` | The password to be used to log in to the Container that will host the Management Node. You will need to enter this password when logging it to Parallels Virtual Automation.

This option is mandatory if you specify the `--pva-node` option. |
| `--pva-dns` | The IP address of the DNS server to be used by the Container that will host the Management Node.

This option is mandatory if you specify the `--pva-node` option. |
| `--clustermode` | Use this option when installing Parallels Virtuozzo Containers 4.7 on servers that you plan to include in the cluster. If you specify `--clustermode`:

• No templates are installed on the server even if the `-o` or `-t` option is indicated.

• The `/vz` service is not started when you boot the server. |
| `-v, --version` | Print the version of the `install` utility. |
| `-h, --help` | Display the utility usage and exit. |

For example, you can run the following command to install Parallels Virtuozzo Containers in unattended mode:

```
# ./install -a -o
```

For more detailed information on installing the Parallels Virtuozzo Containers software in unattended mode, refer to the *unattended* file included in the Parallels Virtuozzo Containers distribution.

Verifying Parallels Virtuozzo Containers Installation

Parallels Virtuozzo Containers includes a special package named `virtuozzo-release` that can help you check up that all Parallels Virtuozzo Containers packages have been successfully installed. Run the following command:

```
# rpm -V virtuozzo-release
```

The command exits silently if all required Parallels Virtuozzo Containers packages are available. If some packages are missing, the output will look like below:

```
# rpm -V virtuozzo-release
Unsatisfied dependencies for virtuozzo-release-4.7.0-138:
vzctl = 4.7.0-55
```

This output shows that the required version of the `vzctl` package is not installed on the system.

Configuring Daemons

Now that you have finished installing Parallels Virtuozzo Containers, there are a lot of daemons running by default. Many of those are not needed for Parallels Virtuozzo Containers to operate correctly. Moreover, some may introduce security risks in the future. It is strongly recommended that you disable unnecessary daemons.

Below is a list of daemons Parallels Virtuozzo Containers needs to work correctly:

- If you have PVA Agent installed on your server you will need `crond`, `iptables`, `network`, `sshd`, `syslog`, `vz`, `vzlmond`, `vznetcfg`, `httpd`;

- If you do not use PVA Agent you will need `crond`, `iptables`, `network`, `sshd`, `syslog`, `vz`, `vzlmond`, `vznetcfg`.

Installing OS Templates

Operating system templates are used to create new Containers with a pre-installed operating system. You need to install at least one OS template included in your Parallels Virtuozzo Containers distribution before you start creating Containers. You can use the `vzpkg install template` command to install an OS template on the Hardware Node. For example, the following command installs the CentOS 5 template that you can use to create Containers with the CentOS 5 operating system:

```
# vzpkg install template centos-5-x86-ez-4.7.0-3.noarch.rpm
Preparing...                 ############################### [100%]
   1:redhat-el5-x86          ############################### [100%]
```

You can check that the CentOS 5 template has been successfully installed on the Node by issuing the following command:

```
# vzpkg list
centos-5-x86          2011-04-12 12:57:57
```

Before you can start using the installed OS template for creating Containers, you need to cache it with the `vzpkg create cache` command:

```
# vzpkg create cache centos-5-x86
...
Complete!
Packing cache file centos-5-x86.tar.gz ...
Cache file centos-5-x86.tar.gz [14M] created.
```

> **Notes:**
>
> 1. To be able to cache some OS EZ templates, you may need to set up a package repository for them. For example, you need to build a special repository for all commercial versions of Linux (for instance, for Red Hat Linux Enterprise 5 and 6). Detailed information on creating and managing package repositories is given in the *Parallels Virtuozzo Containers 4.7 Templates Management Guide*.
>
> 2. Detailed information on how to manage standard OS templates and OS EZ templates is provided in the *Parallels Virtuozzo Containers 4.7 Templates Management Guide*.

Setting Parallels Virtuozzo Containers Tools to Work

In Parallels Virtuozzo Containers, you can use the following tools for managing servers running Parallels Virtuozzo Containers:

*   *Parallels Virtual Automation*. The comprehensive management solution that streamlines operations and reduces complexity of managing Hardware Nodes and Containers. Through self-service and automation, it allows administrators to lower costs and efficiently manage their infrastructure from anywhere using their favorite web browsers.

*   *Parallels Management Console*. The remote management tool for Parallels Virtuozzo Containers with graphical user interface that allows administrators to manage Hardware Nodes and Containers.

The following sections provide information on how to prepare these Parallels tools for working in Parallels-based systems.

In This Chapter

Setting Up Parallels Virtual Automation

Parallels Virtual Automation is a tool providing you with the ability to manage Hardware Nodes and Containers with the help of a standard Web browser on any platform.

Logging In to Parallels Virtual Automation

To log in to Parallels Virtual Automation, launch a Web browser compatible with Parallels Virtual Automation. The list of currently supported Web browsers is given below:

- Internet Explorer 6.0 and above

- Firefox 2.x and above

- Safari 3.x and above

Chances are that you will also be able to use other browsers, but Parallels Virtuozzo Containers has not been extensively tested with them.

To start managing your Hardware Node with Parallels Virtual Automation:

1 On the Master Server or any other computer, open your favorite Web browser and log in to Parallels Virtual Automation by typing the Master Server IP address or hostname and TCP port 4648 in the address bar. The resulting line may look like the following: `https://10.50.120.70:4648`.

When logging in from the Master Server, replace the IP address with `localhost`.

2 When the browser displays the login window, type the user name and password for the Master Server, and click the **Login** button.

> **Note**: For more information on using Parallels Virtual Automation to manage Hardware Nodes and Containers, see the *Parallels Virtual Automation Administrator's Guide* at http://www.parallels.com/products/pva46/resources/.

Registering Hardware Nodes

To register a physical server in Parallels Virtual Automation, do the following:

1 Enter the server's IP address into the **Server Address** field in the **Connection to Physical Server** section.

2 Specify the Administrator credentials for the server in the **Administrative Login to Hardware Node** section.

3 Click the **Register** button to register the server.

You can register several physical servers with the same Master Server.

Setting Up Parallels Management Console

Parallels Management Console is a graphical user interface client that allows you to remotely manage Hardware Nodes and Containers.

Installing the Graphical Client

Parallels Management Console can be installed on computers running the following operating systems:

- Windows XP

- Windows 7

- Windows Server 2003

- Windows Server 2008
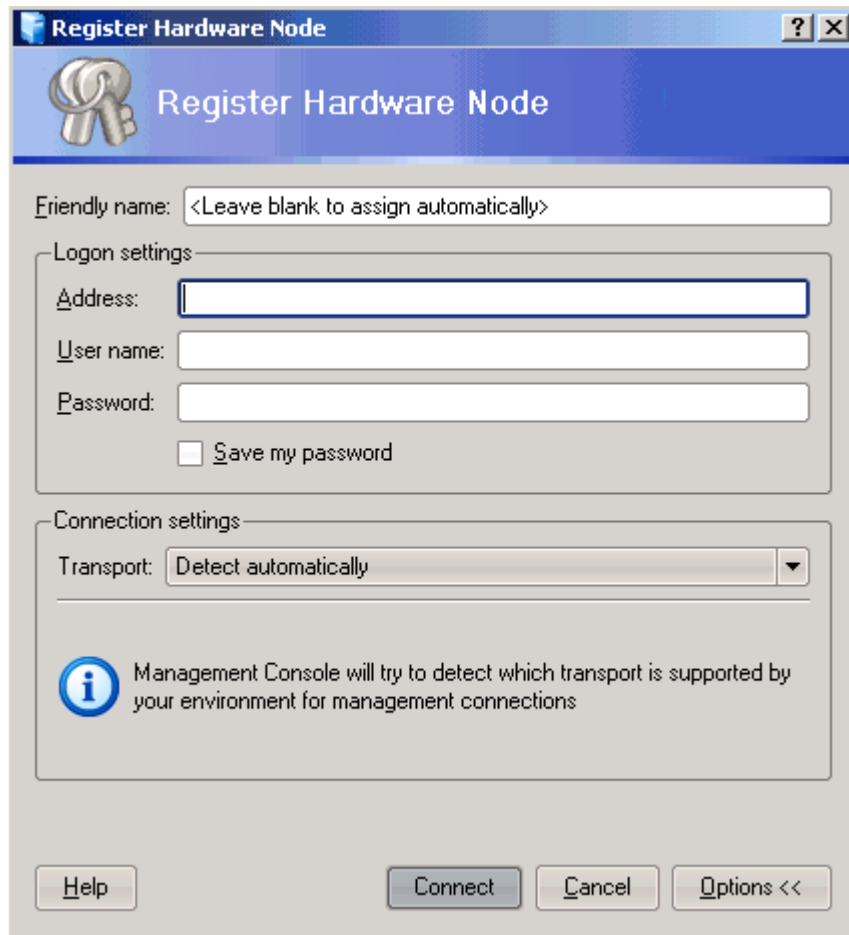
- Windows Server 2008 R2

To install Parallels Management Console:

1 Copy the `pmc_setup.exe` installation file to the computer where you want to run Parallels Management Console.

2 Execute the installation file, and follow the on-screen instructions.

Once the installation is complete, you can start Parallels Management Console by choosing **Programs** > **Parallels** > **Parallels Virtuozzo Containers Tools** > **Parallels Management Console** from the **Start** menu.

Registering Hardware Nodes

To register a Hardware Node in Parallels Management Console, choose **Register Hardware Node** from the **Action** menu. The **Register New Hardware Node** window appears.

In this window, enter the following information in the fields provided:

- **Friendly name**. A friendly name for the Hardware Node. This name will be displayed in the Parallels Management Console left pane and help you easily find the Node among other Hardware Nodes registered in Parallels Management Console. You can specify any name you consider suitable for the Node. You can also leave this field blank; in this case, the hostname assigned to the Hardware Node will be used as its name.

- **Address**. The IP address or hostname of the Hardware Node.

- **User name**. The user name to log in to the Hardware Node. Use the `root` user name to log in to the server.

- **Password**. The password of the user specified in the **User name** field. When you are logging in as `root`, use the password you entered while installing the Host OS on your server.

  The **Save my password** check box, if selected, permanently saves the specified password on the server where Parallels Management Console is installed so that you do not need to enter it each time you are connecting to the Hardware Node anew.

- Under the **Connection settings** group, choose the type of the transport protocol to use for connecting to the Hardware Node:

  - `Detect automatically`. Selecting this option lets the wizard automatically choose the most appropriate protocol for you. This option is selected by default.

  - `TCP/IP with SSL encryption`. Selecting this option allows you to use the TCP/IP protocol to connect to the Hardware Node while additionally securing your connection using the secure socket layer (SSL) protocol. Choose this protocol if your Hardware Node is running Parallels Virtuozzo Containers 4.0 or higher.

    You can also change the port number. The default port where the TCP/IP service is listening is 4434; you can modify it if necessary.

  - `Secure Socket Shell tunnel`. Selecting this option enables you to connect to the Hardware Node by means of the SSH (Secure Shell Protocol) protocol. Choose if your Hardware Node is running a Parallels Virtuozzo Containers version earlier than 4.0.

    You can also choose a version of SSH and change the port number. The default port where the SSH service is listening is 22; you can modify it if necessary. You have an option to use SSH version 1 instead of default SSH version 2; however, we recommend using SSH version 2 because it provides a better security level.

> **Note:** If the **Connection settings** group is hidden, you can display it by clicking the **Options** button at the bottom of the **Register New Hardware Node** screen.

After providing the necessary information and clicking the **Connect** button, the program will try to connect to the Hardware Node and register it in Parallels Management Console.

Once the registration is complete, the Hardware Node name appears in both parts of the Management Console main window—the tree pane on the left and the view pane on the right.
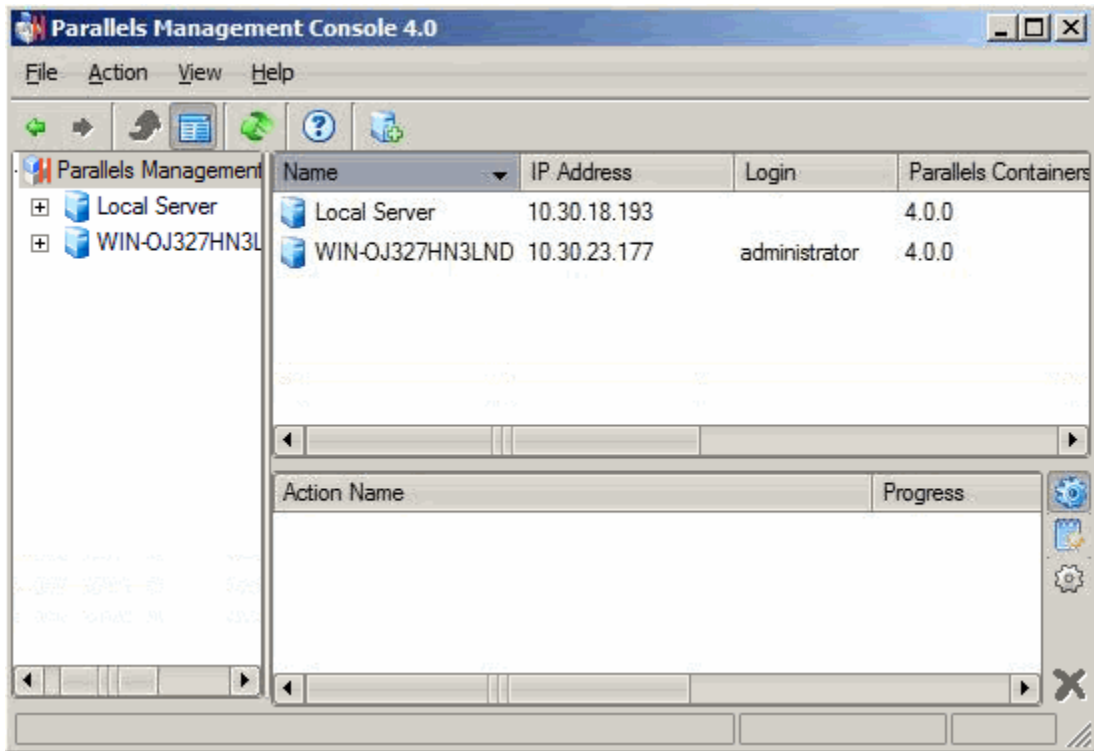
Glossary

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

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

Container 0 is used to designate a *Hardware Node* where the *Parallels Virtuozzo Containers* software is installed.

EZ template is a template file that points to a repository with the packages that comprise the template. Unlike *standard templates*, EZ templates cannot be updated because the repository stays the same. However, the packages in the repository can be updated.

Hardware Node (or *Node*) is a server where the Parallels Virtuozzo Containers software is installed for hosting *Containers*. Sometimes, it is marked as *Container 0*.

Host Operating System (or *Host OS*) is an operating system installed on the *Hardware Node*.

OS template (or *Operating System template*) is used to create new *Containers* with a preinstalled operating system. See also *Template*.

Package set is a synonym for *Template*.

Parallels Virtual Automation is a tool designed for managing Hardware Nodes and all *Containers* residing on them with the help of a standard Web browser on any platform.

Parallels Management Console (or *Management Console*) is a Parallels Virtuozzo Containers management and monitoring tool with graphical user interface. It is used to control individual *Hardware Nodes* and their *Containers*. *Management Console* is cross-platform and runs on both Microsoft Windows and Linux workstations.

Parallels Power Panel is a means for administering personal Containers with the help of a standard Web browser (Internet Explorer, Mozilla, etc.) on any platform.

Parallels Virtuozzo Containers is a complete server automation and 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 is a part of the file system where *Container* files that are not shared with other *Containers* are stored.

Standard template (obsolete) is a template file that has inside itself all the re-usable files of all the packages comprising the template. If newer versions of any of these packages appear, a standard template can be correspondingly updated. Compare *EZ template*.

Template (or *package set*) is a set of original application files (packages) repackaged for mounting over Virtuozzo File System. There are two types of templates. OS Templates are used to create new *Containers* with a preinstalled operating system. Application templates are used to install an application or a set of applications in *Containers*. See also *Standard template* and *EZ template*.

UBC is an abbreviation of *User Beancounter*.

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

venet0 is a virtual networking device, a gateway from a *Container* to the external network.

Virtual Environment (or *VE*) is an obsolete designation of a *Container*.

Virtuozzo Control Center (or *VZCC*) is an obsolete designation of *Parallels Virtual Automation*.

Virtuozzo File System (*VZFS*) is a virtual file system for mounting to Container private areas. VZFS symlinks are seen as real files inside *Containers*.

Parallels Virtuozzo Containers license is a special license that you should load to the *Hardware Node* to be able to start using the *Parallels Virtuozzo Containers* software. Every *Hardware Node* shall have its own license.

Virtual Private Server (or *VPS*) is an obsolete designation of a *Container*.

Parallels Agent (or *Parallels Agent Protocol*) is an XML-based protocol used to monitor and manage a *Hardware Node*. The *Parallels Agent* software implements this protocol and is a backend for the *Parallels Management Console*.

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