Parallels

Parallels Virtuozzo Containers 4.7 for Linux

Getting Started Guide

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Introduction

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

In This Chapter

About Parallels Virtuozzo Containers

Parallels Virtuozzo Containers 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:
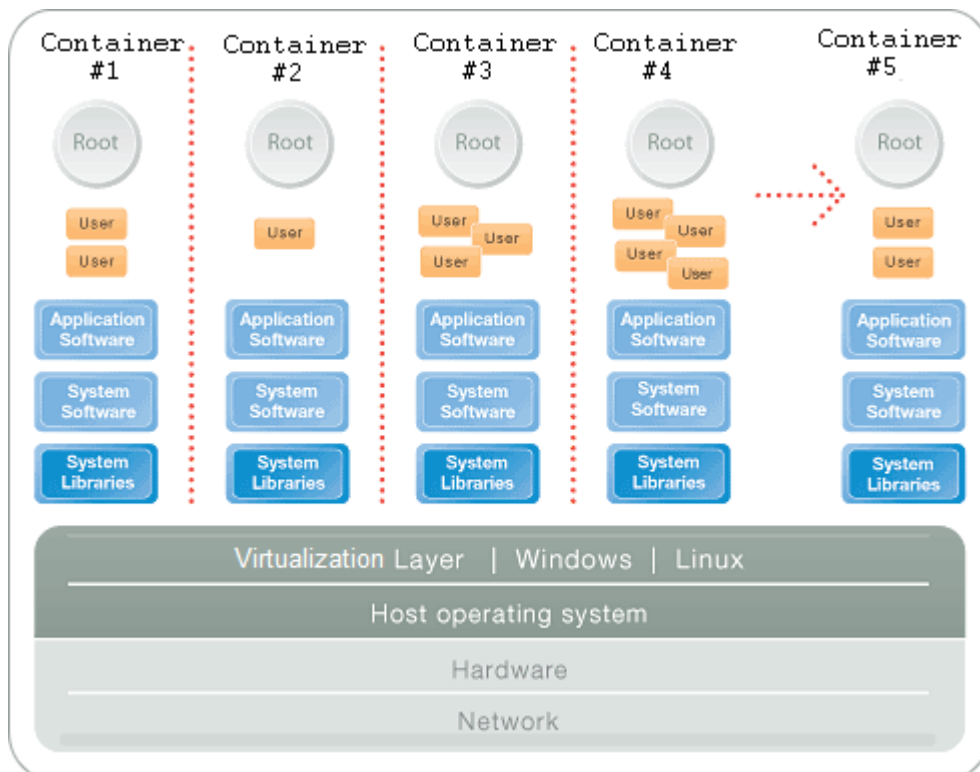
The Parallels Virtuozzo Containers OS virtualization model is streamlined for the best performance, management, and efficiency. At the base resides a standard Host operating system which can be either Windows or Linux. Next is the virtualization layer with a proprietary file system and a kernel service 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

The *Getting Started With Parallels Virtuozzo Containers 4.7 for Linux* guide will help you install and run Parallels Virtuozzo Containers 4.7 on your server. You will also learn the basics of working with Containers—how to create a Container, start and stop it, install additional software in it, and the like.

Organization of This Guide

The guide is organized in the following way:

- **Chapter 1, Preface**, provides an overview of available information sources shipped with Parallels Virtuozzo Containers 4.7, introduces the main Parallels Virtuozzo Containers notions, and lists the requirements for installing the Parallels Virtuozzo Containers 4.7 software.

- **Chapter 2, Installation in a Nutshell**, is a quick reference list sketching out the steps required to install Parallels Virtuozzo Containers 4.7.

- **Chapter 3, Parallels Virtuozzo Containers Installation**, explains how to install Parallels Virtuozzo Containers 4.7 on your server including the installation and configuration of both the Host operating system and Parallels Virtuozzo Containers software itself.

- **Chapter 4, Parallels Virtuozzo Containers Tools**, contains brief instructions on setting up Parallels Management Console and Parallels Virtual Automation—tools for managing Hardware Nodes and Containers.

- **Chapter 5, Container Management**, describes the main operations you can perform on Containers: create new Containers, start and stop them, manage applications inside Containers, and so on.

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 available for Parallels Virtuozzo Containers that can help you use the product more effectively. These resources include:

- *Parallels Virtuozzo Containers 4.7 for Linux Installation Guide*. This guide provides detailed information on installing Parallels Virtuozzo Containers 4.7, including the pre-requisites and the stages you shall pass.

- *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 the product. However, it does not deal with the process of installing and configuring your 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 Command Line Reference Guide*. This guide is a complete reference on all Parallels Virtuozzo Containers configuration files and command line utilities.

- *Deploying Clusters in Parallels-Based Systems*. This guide describes the process of creating Parallels failover and GFS clusters using the Red Hat Cluster Suite (RHCS) software.

- *Parallels Management Console Help*. This help system provides detailed information on Parallels Management Console—a graphical user interface (GuI) tool for managing Hardware Nodes and Containers.

- *Parallels Virtual Automation Online Help*. This help system shows you how to work with Parallels Virtual Automation—a tool providing you with the ability to manage Hardware Nodes and their Containers with the help of a standard Web browser on any platform.

- *Parallels Power Panel Online Help*. This help system deals with Parallels Power Panel—a tool for administering individual Containers through a common Web browser on any platform.

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/).

Parallels Virtuozzo Containers Notions

In order to avoid any misunderstandings while following the instructions in the guide, please become acquainted with the main Parallels Virtuozzo Containers definitions:

- *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.

- *Container* is a virtual private server, which is functionally identical to an isolated standalone computer, 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. Container is a kind of 'sandbox' for processes and users.

- *Hardware Node* (*Node*, *Container 0*) is a server where the Parallels Virtuozzo Containers software is installed for hosting Containers.

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

- *Parallels Virtuozzo Containers license* is a special license that you need to install on the Hardware Node to start using Parallels Virtuozzo Containers and Parallels tools (*Parallels Management Console*, *Parallels Virtual Automation*, and *Parallels Power Panel*). Every Hardware Node must have its own Parallels Virtuozzo Containers license installed.

- *Parallels Virtuozzo Containers template* is a set of program files that make up a complete OS or application and that are installed on the Host operating system in such a way as to be usable by any Container on the Hardware Node and to allow Containers to efficiently share OS and application resources.

- *Parallels Management Console* is a Parallels Virtuozzo Containers management and monitoring tool with graphical user interface. Parallels Management Console is cross–platform and runs on both Microsoft Windows and Linux workstations.

- *Parallels Virtual Automation* (former *Parallels Infrastructure Manager*) is a tool designed for managing Hardware Nodes and Containers with the help of a standard Web browser on any platform.

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 in a Nutshell

To install Parallels Virtuozzo Containers 4.7, follow these steps. To know more of a particular step, see the next chapter.

Installing and configuring the Host Linux operating system on the server

1 Start the Linux installation.

2 Partition your hard disk by creating the `/` (10-12 Gb), `swap` (2 times RAM if RAM <=2 GB; otherwise, RAM + 2 GB), and `/vz` (all the remaining space on the disk) partitions.

3 Select the `Basic Server` software set to install on your system.

4 Reboot the server and log in as root.

5 Disable the firewall.

Installing the Parallels Virtuozzo Containers 4.7 software on the server

1 Run the Parallels Virtuozzo Containers installation program:

- If you have the Parallels Virtuozzo Containers software on a CD or DVD, you can do it by running the `install` utility, for example:

```
# ./install
```

- If you have downloaded the Parallels Virtuozzo Containers software to your server via the `vzinstall-linux.bin` utility, execute one of the following commands:

    To install the x86 version of Parallels Virtuozzo Containers:

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

    To install the x64 version of Parallels Virtuozzo Containers on x64-86 processors:

```
# ./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.

2 The **License Agreement** window:

Click **Next** to accept the Parallels end user license agreement, and in the displayed window, click **Accept** to confirm your decision.

3 The **Install Templates** window:

Select all available templates, and click **Install**. This window is skipped if your Parallels Virtuozzo Containers distribution does not include any templates.

4 The **Parallels Virtuozzo Containers Product Key Installation** window:

Enter the Parallels Virtuozzo Containers license, and click **Next**.

5   The **Parallels Virtuozzo Containers Online Update** window:

Click **Next**.

6   The **Congratulations** window:

Select the **Install PVA Agent** and **Install PVA Management Node** check boxes, and click **Reboot**.

> **Note:** PVA Agent and PVA Management Node are the components of the Parallels Virtual Automation application that allows you to connect to the server and manage your Containers using your favorite browser.

7   The **Parallels Virtual Automation Parameters** window:

Enter the requested parameters, and click **OK**.

Parallels Virtuozzo Containers Installation

The current chapter provides information on the process of installing, configuring, and deploying your Parallels Virtuozzo Containers system including the pre-requisites and the stages you shall pass.

In This Chapter

Obtaining Licenses

Before installing Parallels Virtuozzo Containers, you need to obtain a special license that allows you to use the Parallels Virtuozzo Containers 4.7 software on your server. You can use one of the following ways to obtain the license:

- Fill out a special registration form on the Parallels web site and get a free evaluation license.

- Contact a Parallels sales representative.

You will be asked to enter the obtained license the Parallels Virtuozzo Containers installation.

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:
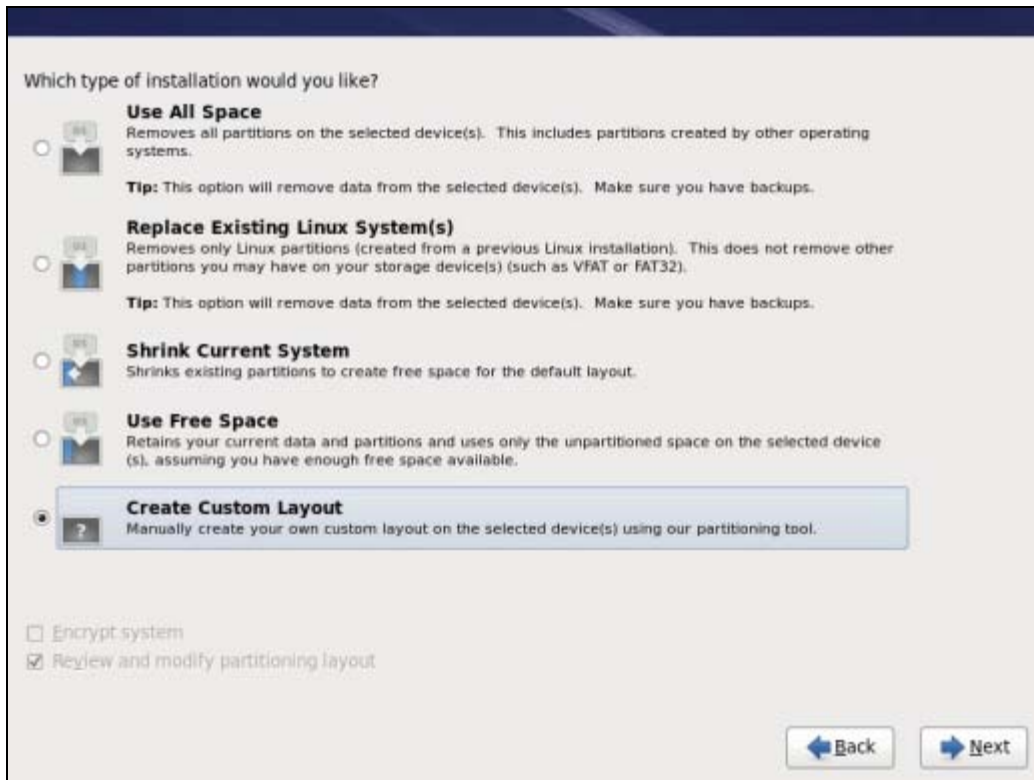
In this window, select the **Create custom layout** radio button as shown in the picture above, and click **Next**. Create the following partitions on the server:

Partition	Description	Typical size
/	The root partition containing all Host OS and Parallels Virtuozzo Containers program files.	10-12 Gb
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

> **Note:** ext3 and ext4 are the only filesystems officially supported by Parallels Virtuozzo Containers 4.7.

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.

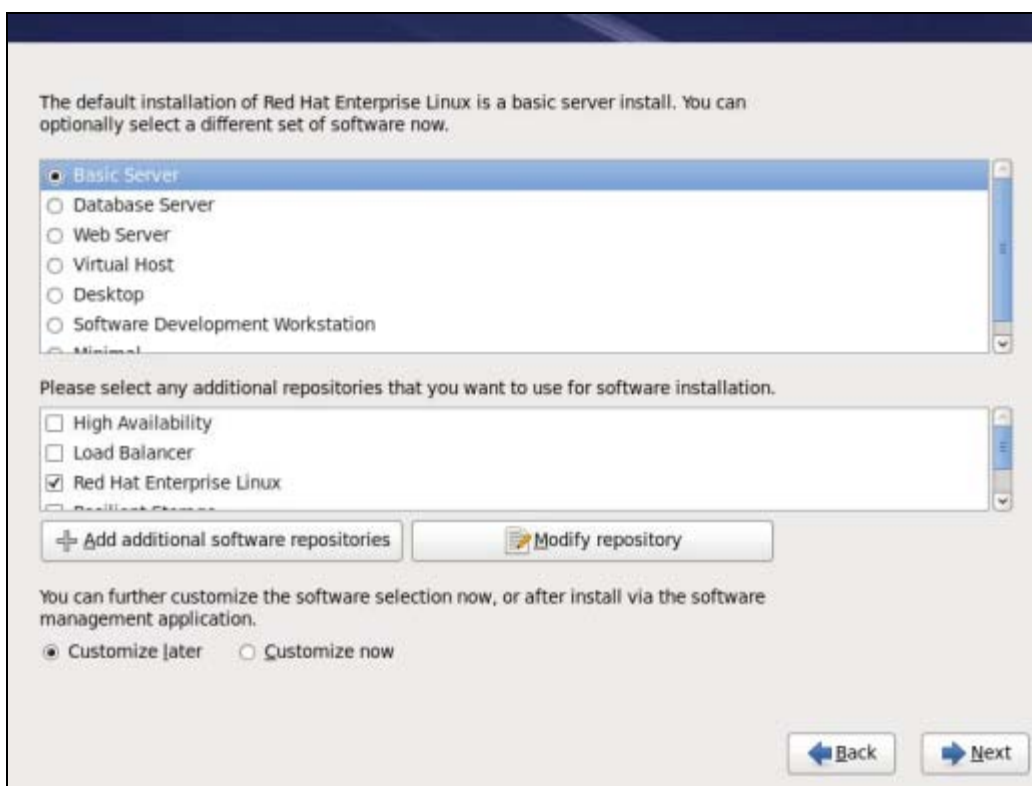* When choosing the packages to install on the server, select the **Basic Server** option—that is, a basic installation of Red Hat Enterprise 6. For its functioning, Parallels Virtuozzo Containers 4.7 does not need any additional packages to be installed on the server.

The default installation of Red Hat Enterprise Linux is a basic server install. You can optionally select a different set of software now.

- ● Basic Server
- ○ Database Server
- ○ Web Server
- ○ Virtual Host
- ○ Desktop
- ○ Software Development Workstation
- ○ Minimal

Please select any additional repositories that you want to use for software installation.

- ☐ High Availability
- ☐ Load Balancer
- ☑ Red Hat Enterprise Linux
- ☐ Resilient Storage

[＋ Add additional software repositories] [📝 Modify repository]

You can further customize the software selection now, or after install via the software management application.

- ● Customize later   ○ Customize now

[← Back] [→ Next]

> **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 want only 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.

```
┤ Select Virtuozzo Containers version ├
Select the Virtuozzo Containers version to download.
<F10>   displays additional information on the selected version.
<SPACE> switches between the components sets.
<F2>    allows you to customize the selection of templates to download.

─── Version ──────────────── Components set ── Download size ──
[ ] 4.7.0-41 Linux/i386            None              0KB
[o] 4.7.0-41 Linux/x86_64          Default           773MB
[ ] 4.7.0-38 Linux/x86_64          None              0KB
[ ] 4.7.0-27 Linux/i386            None              0KB
[ ] 4.7.0-27 Linux/x86_64          None              0KB
[ ] 4.6.0-187 Linux/i386           None              0KB
[ ] 4.6.0-187 Linux/x86_64         None              0KB
[ ] 4.0.0-448 Linux/i386           None              0KB

    Total:                                          773MB
Virtuozzo 4.7.0-41

    [ Quit ]             [ Back ]              [< Next >]
```
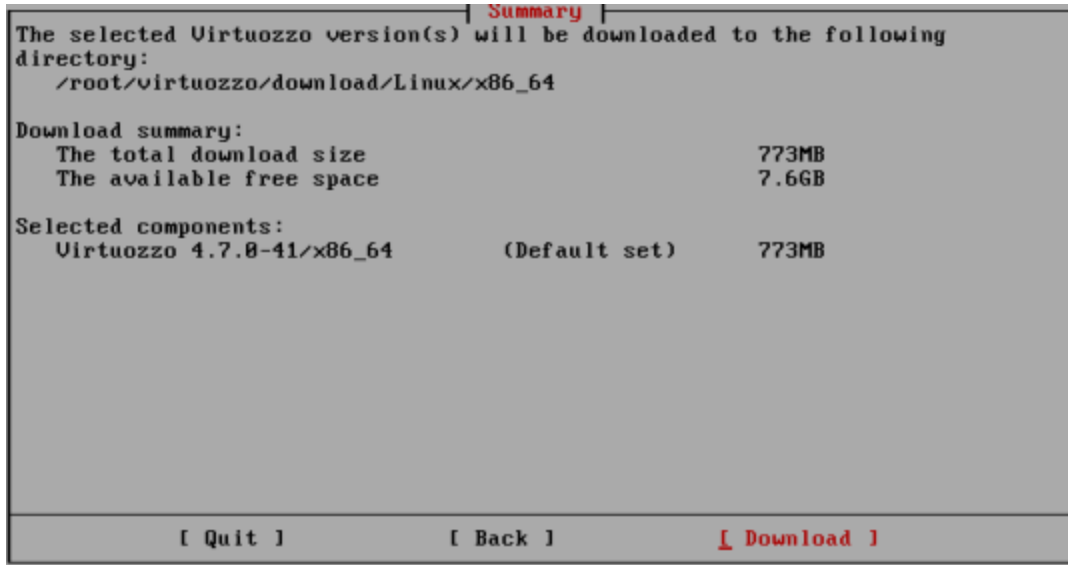
In this window, choose the version of Parallels Virtuozzo Containers you want to download. By default, you are offered to download the Parallels Virtuozzo Containers distribution set corresponding to the server architecture where you are running `vzinstall-linux.bin` and one OS template—CentOS 5 (you 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`
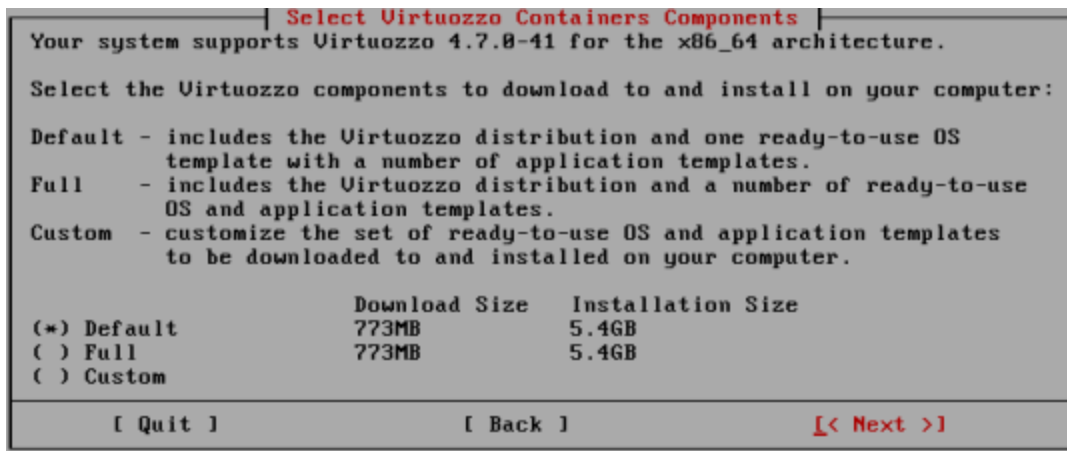
You may need to make the `sfx` installation file executable (e.g., `chmod +x virtuozzo-4.7.0-<build_version>-x86_64.sfx`) before starting the installation.

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

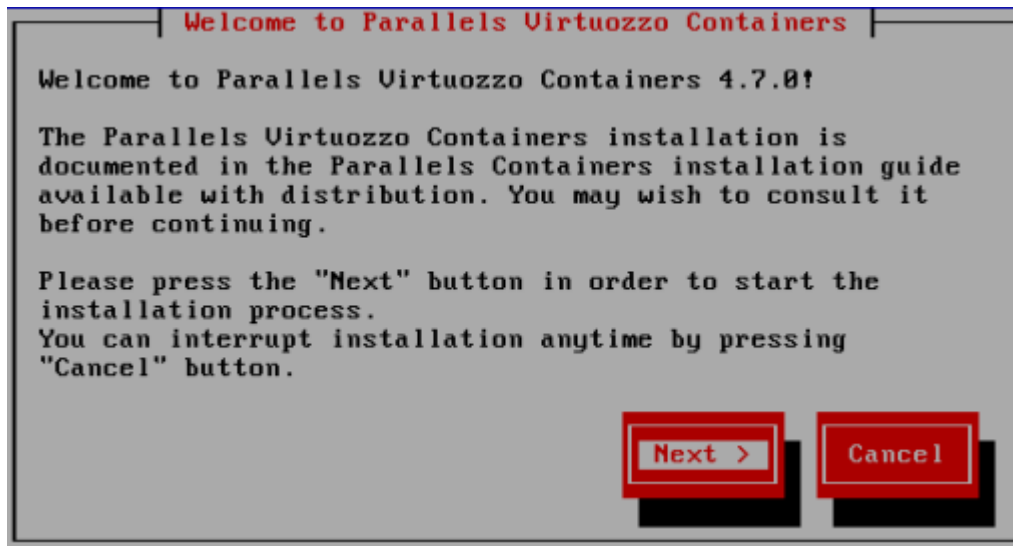To install Parallels Virtuozzo Containers 4.7, do the following:

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. 16) 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. 24).
>
> 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.
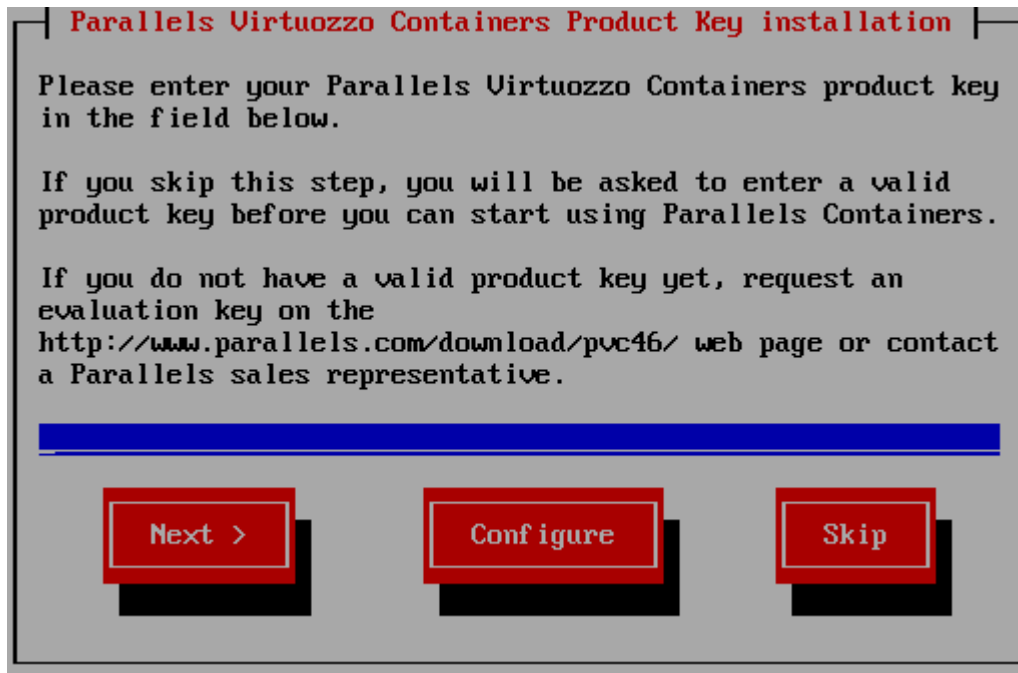
Every server must have its own license installed. Licenses are issued by Parallels and needed to start using Parallels Virtuozzo Containers. Although you can complete some tasks on the server without having a Parallels Virtuozzo Containers license, you are not allowed to perform the majority of operations 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.
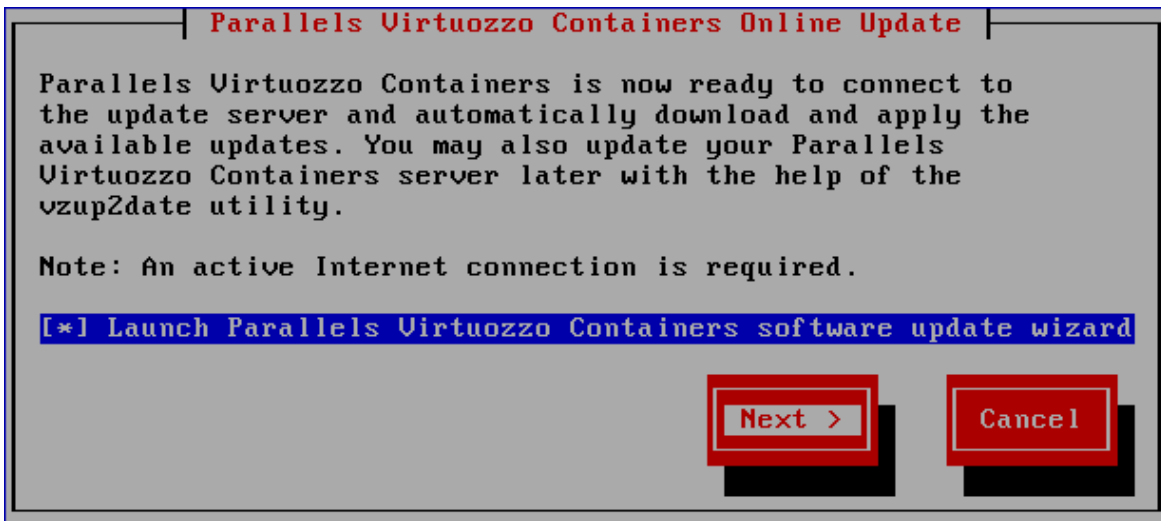

You are highly recommended to check for available updates right during the Parallels Virtuozzo Containers installation. In this case, you will have the latest Parallels Virtuozzo Containers core, utilities, and templates installed once the Parallels Virtuozzo Containers 4.7 installation is complete.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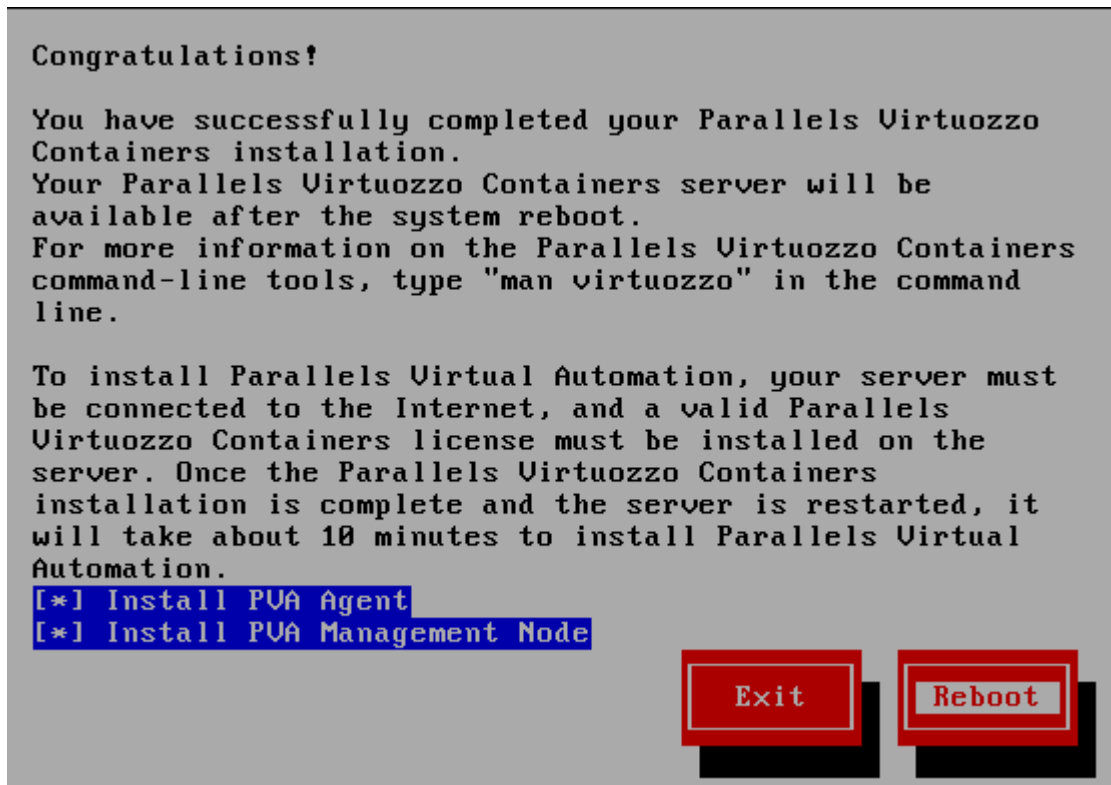
In this window, do the following:

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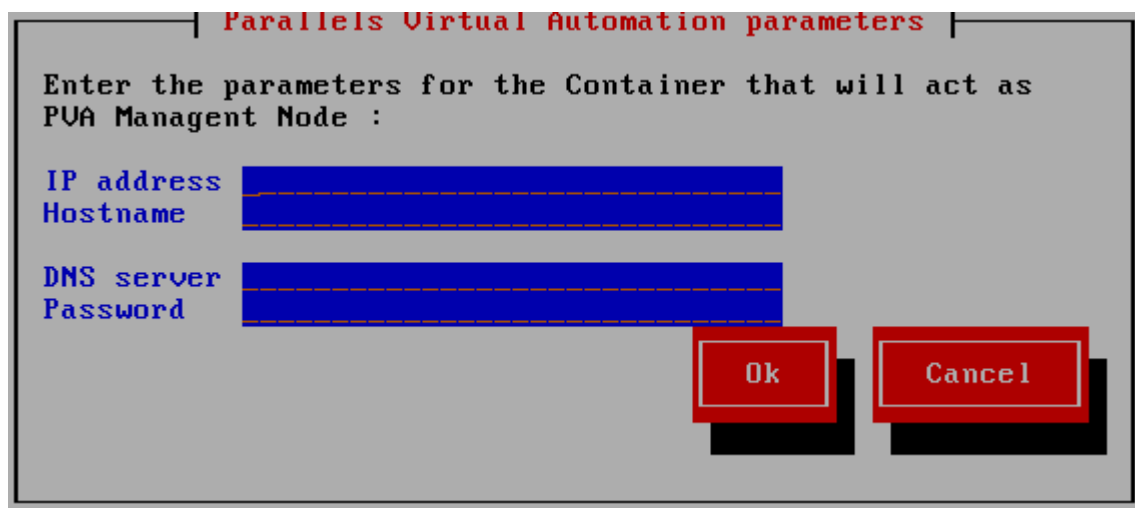
When deciding on whether to set up Parallels Virtual Automation, keep in mind the following:

- 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. 35) 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.

Parameter	Description
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**.

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 4 or 5). 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*.

Parallels Virtuozzo Containers Tools

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

- *Parallels Virtual Automation* (formerly Parallels Infrastructure Manager). 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.
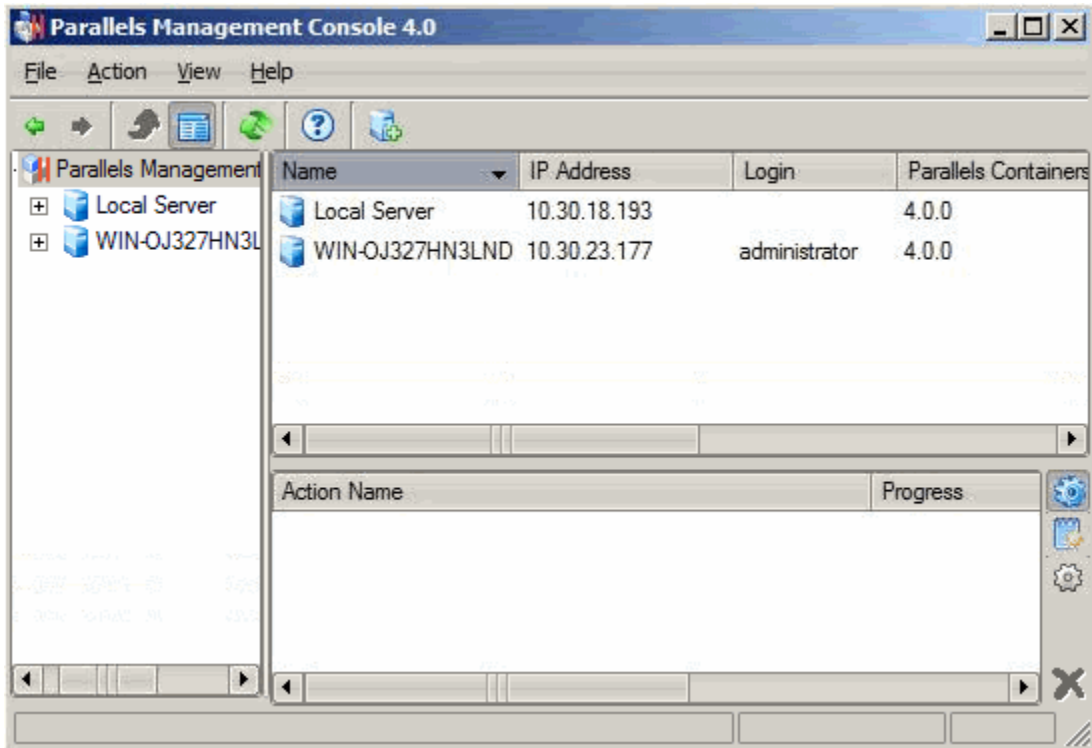
Container Management

This chapter outlines the major day-to-day operations that you are likely to perform with Containers in your Parallels Virtuozzo Containers system.

In This Chapter

Creating a New Container

A new Container can be created by means of the `vzctl create` command. This command requires that you specify the following parameters:

- A Container ID—a numeric ID associated with a Container. The Container ID should be an integer greater than 100 and unique for a given Hardware Node.

- The name of the OS template to base the Container on. We assume that you have successfully installed at least one OS template on the Hardware Node. If there are no OS templates installed on the Node, see **Installing OS Templates** (p. 33) first.

- The name of the sample configuration file that will be used for setting the Container resource control parameters. Sample configuration files are located in the `/etc/vz/conf` directory on the Node and have names with the following mask: `ct-<configname>.conf-sample`. The most commonly used sample is the `ct-basic.conf-sample` file. This sample file has resource control parameters suitable for most Containers.

Thus, for example, you can create a new Container by executing the following command:

```
# vzctl create 101 --ostemplate centos-5-x86 --config basic
Creating Container private area (centos-x86)
...
Container private area was created
```

In this case, Parallels Virtuozzo Containers 4.7 will create a Container with ID 101, the CentOS 5 installed inside, and the configuration parameters taken from the `ct-basic.conf-sample` sample configuration file.

In principle, now you are ready to start the newly created Container. However, typically you need to set its network IP address, hostname, DNS server address and `root` password before starting the Container for the first time. Please see the next section for information on how to perform these tasks.

List of Supported Linux Distributions for Containers

The current version of Parallels Virtuozzo Containers allows you to create Containers running the following Linux distributions:

- Red Hat Enterprise Linux 5.6 and 6.x
- CentOS 5.6 and 6.x
- Debian 5.0 and 6.0
- Fedora 14
- OpenSUSE 11 with Service Packs 4
- SUSE Linux Enterprise Server 10 and 11
- Ubuntu 10.04, 10.10, and 11.04

Configuring Containers

Configuring a Container consists of the following main tasks:

- setting Container network parameters
- setting Container user passwords

For these tasks, the `vzctl set` command is used.

Setting Network Parameters

To make a Container accessible from the network, you need to assign a valid IP address and hostname to the Container and configure a DNS server. The session below illustrates how to configure these network settings for Container 101:

```
# vzctl set 101 --hostname test101.parallels.com --save
Hostname for Container set: test101.parallels.com
Saved parameters for Container 101
# vzctl set 101 --ipadd 10.0.186.1 --save
Adding IP address(es): 10.0.186.1
Saved parameters for Container 101
# vzctl set 101 --nameserver 192.168.1.165 --save
File resolv.conf was modified
Saved parameters for Container 101
```

The commands above assign Container 101 the IP address of `10.0.186.1`, the hostname of `test101.parallels.com`, and set the DNS server address to `192.168.1.165`. The `--save` flag saves all the parameters to the Container configuration file.

You can issue the above commands when the Container is both stopped and running. In the latter case, if you do not want the applied values to persist, you can omit the `--save` option, and the applied values will be valid only until the Container shutdown.

Setting the root Password for a Container

Setting the `root` user password is necessary for connecting to a Container via SSH or Parallels Power Panel. By default, the `root` account is locked in a newly created Container, and you cannot log in. In order to log in to the Container, it is necessary to create a user account inside the Container and set a password for this account or unlock the `root` account. The easiest way of doing it is to run:

```
# vzctl start 101
[This command starts Container 101, if it is not started yet]
# vzctl set 101 --userpasswd root:test
```

In this example, the root password for Container 101 is set to `test`, and you can log in to the Container via SSH as root and administer it in the same way you administer a standalone Linux server: install additional software, add users, set up services, and so on. The password will be set inside the Container in the `/etc/shadow` file in an encrypted form and will not be stored in the Container configuration file.

Starting, Stopping, Restarting, and Querying Status of a Container

When a Container is created, it can be started up and shut down like an ordinary computer. To start a Container, use the following command:

```
# vzctl start 101
Starting Container ...
Setup slm memory limit
Setup slm subgroup (default)
Setting devperms 20002 dev 0x7d00
Adding port redirection to Container(1): 4643 8443
Adding IP address(es) to pool:
Adding IP address(es): 10.14.14.101
Hostname for Container set: localhost.localdomain
Container start in progress...
```

To simultaneously start all Containers on the Hardware Node that are currently not running, execute the following script:

```
# for ctid in `vzlist -SHo ctid`; do vzctl start $ctid; done
Starting Container 101...
...
Starting Container 102...
...
```

To check the status of a Container, use the `vzctl status` command:

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

In our case, `vzctl` reports that Container 101 exists, is mounted and running. Alternatively, you can make use of the `vzlist` utility:

```
# vzlist 101
CTID       NPROC STATUS  IP_ADDR        HOSTNAME
 101          20 running 10.0.186.101     test.parallels.com
```

The following command is used to stop a Container:

```
# vzctl stop 101
Stopping Container ...
Container was stopped
Container is unmounted
# vzctl status 101
VEID 101 exists unmounted down
```

To restart a Container, you may as well use the `vzctl restart` command:

```
# vzctl restart 101
Stopping Container ...
Container was stopped
Container is unmounted
Starting Container ...
...
Container start in progress...
```

Listing Containers

Very often you may want to get an overview of the Containers existing on the given Hardware Node and to get additional information about them—their IP addresses, hostnames, current resource consumption, etc. In the most general case, you may get a list of all Containers by issuing the following command:

```
# vzlist -a
      CTID        NPROC STATUS  IP_ADDR          HOSTNAME
         1           35 running 10.101.60.79     localhost
       101            8 running 10.101.66.1      ct101.parallels.com
       102            7 running 10.101.66.159    ct102.parallels.com
       103            - stopped 10.101.66.103    ct103.parallels.com
```

The -a switch tells the vzlist utility to output both running and stopped Containers. By default, only running Containers are shown. The default columns inform you of the Container IDs, the number of running processes inside Containers, their status, IP addresses, and hostnames. This output can be customized as desired by using vzlist command line switches. For example:

```
# vzlist -o ctid,diskinodes.s -s diskinodes.s
     CTID   DQINODES.S
        1      400000
      101      200000
      102      200000
```

This shows only running Containers with the information about their IDs and soft limit on disk inodes, with the list sorted by this soft limit. For the full list of the vzlist command line options, see the *Parallels Virtuozzo Containers 4.7 Reference Guide*.

Deleting Containers

You can delete a Container that is not needed anymore using the vzctl delete command. Please note that you cannot delete a running Container. The example below illustrates deleting Container 101:

```
# vzctl delete 101
Deleting Container private area: /vz/private/101
Container is currently mounted (unmount first)
# vzctl stop 101
Stopping Container ...
Container was stopped
Container is unmounted
# vzctl delete 101
Deleting Container private area: /vz/private/101
Container private area was deleted
# vzctl status 101
VEID 101 deleted unmounted down
```

Running Commands in Containers

Usually, a Container administrator logs in to the Container via network and executes any commands in the Container as on any other Linux box. However, you may need to execute commands inside Containers bypassing the normal login sequence. This can happen if:

- You do not know the Container login information, but you need to run some diagnosis commands inside the Container to verify that it is operational.

- Network access is absent for a Container. For example, the Container administrator might have accidentally applied incorrect firewalling rules or stopped the SSH daemon.

Parallels Virtuozzo Containers allows you to execute commands in a Container in these cases. To do this, you can use the `vzctl exec <CT_ID>` command. For example, the session below illustrates the situation when the SSH daemon is not started in Container 101:

```
# vzctl exec 101 /etc/init.d/sshd status
sshd is stopped
# vzctl exec 101 /etc/init.d/sshd start
Starting sshd:[  OK  ]
# vzctl exec 101 /etc/init.d/sshd status
sshd (pid 26187) is running...
```

Now Container users can log in to Container 101 via SSH.

Managing Applications

You can use one of the following ways to deploy new applications to Containers:

- Copying the application files to each Container on the Node (for example, via SSH) and then installing the application in a standard way from inside the corresponding Container.

- Installing an application inside the Container by using the technology of Parallels Virtuozzo Containers templates. A template in Parallels Virtuozzo Containers is a set of application files installed on the Host operating system in such a way as to be usable by any Container on the Node. Using templates lets you securely share

  - the RAM among similar applications running in different Containers to save hundreds of megabytes of memory

  - the files comprising a template among different Containers to save gigabytes of disk space

All application templates are issued in the form of RPM packages and should be installed on the Hardware Node before you can start deploying them to your Containers. A great number of already created application templates are shipped by Parallels with Parallels Virtuozzo Containers (for example, the templates for most important applications such as MySQL, PHP, and Perl). In addition, you can create your own application templates and pack them as RPMs; detailed information on how you can do it is given in the *Parallels Virtuozzo Containers 4.7 Templates Management Guide*.

The following subsections provide information on the main operations you can perform with application templates.

Installing and Listing Application Templates on the Hardware Node

Application templates can be installed on the Hardware Node using the `vzpkg install template` command. For example, to install the `mysql` template intended to be run under Fedora 14, you can issue the following command:

```
# vzpkg install template \
  mysql-fedora-core-14-x86-tmpl-4.7.0-3.rpm
Preparing...                    ############################# [100%]
  1:mysql-fedora-core-14-x86    ############################# [100%]
```

The `mysql` template is installed into the `/vz/template/fedora/14/x86/config/app/mysql` directory on the Hardware Node.

You can use the `vzpkg list` command to list the templates installed on the Hardware Node. They may be already used or not used by certain Containers:

```
# vzpkg list
fedora-core-14-x86                    2011-04-21 02:22:45
fedora-core-14-x86   mysql
```

As you see, the `fedora-core-14-x86` and `mysql` templates are available on the Node. Specifying a Container ID as the parameter, `vzpkg list` prints the templates applied to the specified Container:

```
# vzpkg list 101
fedora-core-14-x86                    2011-04-21 02:22:45
```

Adding Applications to Containers

Once the application template is installed on the Hardware Node, you can add it to any running Container on this Node using the `vzpkg install` command. The example below shows how to add the `mysql` application template meant to run under Fedora 14 to Container 101:

```
# vzctl status 101
CTID 101 exists mounted running
# vzpkg list
fedora-core-14-x86
fedora-core-14-x86    mysql
...
# vzpkg install 101 mysql
...
Installed:
 mysql               i386      0:4.1.12-3.FC14.1
 mysql-bench         i386      0:4.1.12-3.FC14.1
 mysql-devel         i386      0:4.1.12-3.FC14.1
...
```

During the command execution, the `vzpkg` utility locates and downloads the packages included in the `mysql` template from the Fedora 14 repository on the Internet. Keep in mind that the packages are downloaded from the repository and installed on the Hardware Node only once—when adding an application template to any Container on this Node for the first time.

Upon the command completion, you can start using the application from inside the corresponding Container in the same way as you would use it on a standalone server.

Removing Applications From Containers

The applications installed inside a Container by using the technology of Parallels templates and not needed any more can be removed from the Container with the `vzpkg remove` command. A session below shows you an example of how to remove the `mysql` template from Container 101:

```
# vzpkg list 101
fedora-core-14-x86                    2011-05-21 02:21:56
fedora-core-14-x86    mysql           2011-05-21 05:36:42
# vzpkg remove 101 mysql --with
vzpkg remove 101 mysql
Removed:
 mysql
 mysql-server
 mysql-devel
 mysql-bench
 perl-DBD-MySQL
# vzpkg list 101
fedora-core-14-x86                    2011-05-21 02:21:56
```

You can see that the `mysql` template has been successfully removed from Container 101. The `--with` option tells the `vzpkg remove` command to also delete from the Container all packages having interdependencies with `mysql`.

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