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Parallels

# Getting Started With Parallels Virtuozzo Containers for Linux

Version 4.0



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## CHAPTER 1

# Introduction

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# About Parallels Virtuozzo Containers

Parallels Virtuozzo Containers is a patented OS virtualization solution. Virtuozzo Containers 4.0 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 Virtuozzo 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 Virtuozzo-based system structure:

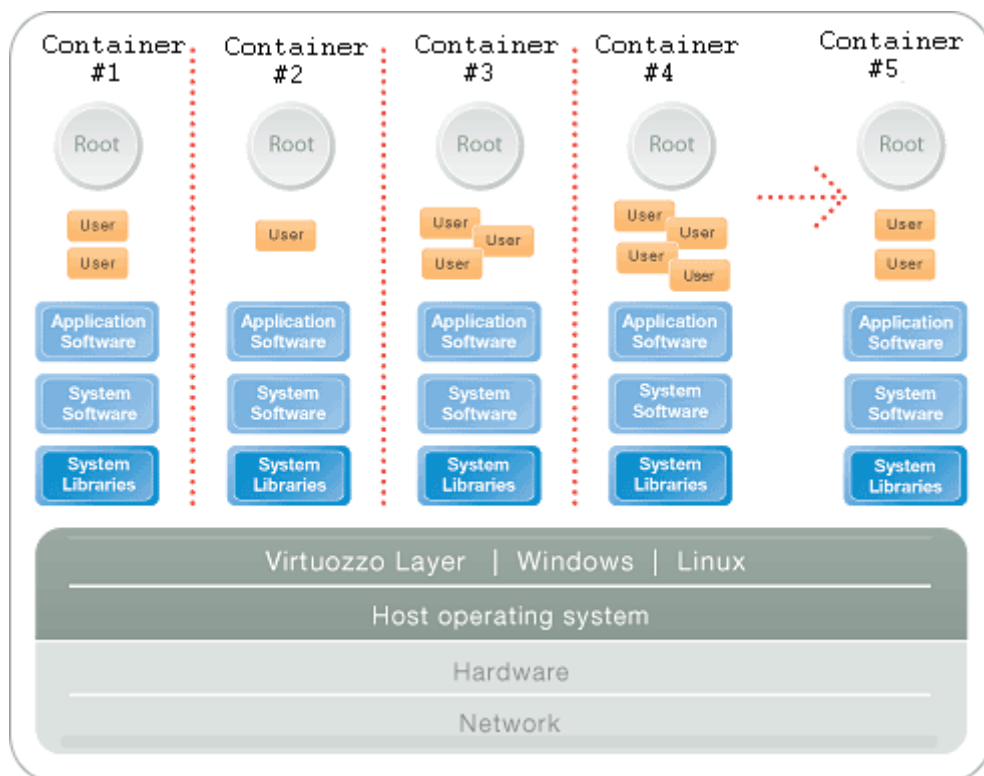


Figure 1: Virtuozzo Containers OS Virtualization

The Parallels Virtuozzo 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 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 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.

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## About This Guide

The **Getting Started With Virtuozzo Containers 4.0 for Linux** guide will help you install and run Parallels Virtuozzo Containers 4.0 on your server. You will also learn the basics of working with Containers (Containers) - how to create a Container, start/stop it, install additional software in it, and the like.

## Organization of This Guide

The guide is organized in the following way:

- **Chapter 1, Introduction**, provides an overview of available information sources shipped with Virtuozzo Containers 4.0, introduces the main Virtuozzo notions, and enumerates the requirements to be fulfilled to successfully install the Virtuozzo Containers software on your server.
- **Chapter 2, Installation in a Nutshell**, is a quick reference list sketching out the steps required to successfully install Virtuozzo Containers 4.0.
- **Chapter 3, Virtuozzo Containers Installation**, furnishes you with detailed information on how to install Virtuozzo Containers 4.0 on your server including the installation and configuration of both the Host operating system and Virtuozzo Containers software itself.
- **Chapter 4, Container Management**, familiarizes you with the way to perform the main operations on your Containers: create new Containers, start/stop them, manage applications inside your Containers, etc.
- **Chapter 5, Using Virtuozzo Tools**, contains brief instructions on how to install Parallels Management Console and to log in to Parallels Infrastructure Manager - tools to efficiently manage your 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. For information on specialized terms used in the documentation, see the Glossary at the end of this document.

The table below presents the existing formatting conventions.

Formatting convention	Type of Information	Example
Triangular Bullet(▶)	Step-by-step procedures. You can follow the instructions below to complete a specific task.	<i>To create a Container:</i>
Special Bold	Items you must select, such as menu options, command buttons, or items in a list.	Go to the <b>Resources</b> tab.
	Titles of chapters, sections, and subsections.	Read the <b>Basic Administration</b> chapter.
<i>Italics</i>	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 <i>EZ templates</i> . To destroy a Container, type <code>vzctl destroy <i>ctid</i></code> .
Monospace	The names of commands, files, and directories.	Use <code>vzctl start</code> to start a Container.
Preformatted	On-screen computer output in your command-line sessions; source code in XML, C++, or other programming languages.	<pre>Saved parameters for Container 101</pre>
Monospace Bold	What you type, as contrasted with on-screen computer output.	<pre># rpm -V virtuozzo-release</pre>
CAPITALS	Names of keys on the keyboard.	SHIFT, CTRL, ALT
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 turn, are subdivided into subsections. For example, **About This Guide** is a section, and **Documentation Conventions** is a subsection.

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## Getting Help

In addition to this guide, there are a number of other resources shipped with Virtuozzo Containers 4.0 which can help you use the product more effectively. These resources include:

- **Manuals:**
  - **Parallels Virtuozzo Containers Evaluation Guide.** This guide is destined to introduce you to the main features of Virtuozzo Containers 4.0 and to its underlying technology, to help you set up an environment for evaluating the Virtuozzo major features, and to suggest the relevant procedures for this evaluation.
  - **Parallels Virtuozzo Containers for Linux Installation Guide.** This guide provides exhaustive information on the process of installing, configuring, and deploying your Virtuozzo system. As distinct from the given guide, it contains a more detailed description of all the operations needed to install and set Virtuozzo Containers 4.0 to work including planning the structure of your Virtuozzo network, performing the Virtuozzo Containers unattended installation, etc. Besides, it does not include the description of any Container-related operations.
  - **Parallels Virtuozzo Containers for Linux User's Guide.** This guide provides comprehensive information on Virtuozzo Containers 4.0 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 Virtuozzo system.
  - **Parallels Virtuozzo Containers for Linux Templates Management Guide.** This guide is meant to provide complete information on Virtuozzo templates - an exclusive Parallels Virtuozzo technology allowing you to efficiently deploy standard Linux applications inside your Containers and to greatly save the Hardware Node resources (physical memory, disk space, etc.).
  - **Parallels Virtuozzo Containers for Linux Reference Guide.** This guide is a complete reference on all Virtuozzo configuration files and Hardware Node command-line utilities.
- **Help systems:**
  - **Parallels Management Console Help.** This help system provides detailed information on Parallels Management Console - a graphical user interface tool for managing Virtuozzo Hardware Nodes and their Containers.
  - **Parallels Infrastructure Manager Online Help.** This help system shows you how to work with Parallels Infrastructure Manager - a tool providing you with the ability to manage Virtuozzo 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 means for administering individual Containers thru a common Web browser on any platform.

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## Feedback

If you spot a typo in this guide, or if you have thought of a way to make this guide better, we would love to hear from you!

The Parallels documentation forum is the ideal place for your comments and suggestions. It is regularly monitored by the members of the Parallels technical documentation department, so it is likely that you will receive a reply to your post before long.

Note that new users will be asked to fill in a short registration form before being able to post. Registering will allow you to participate not only in the documentation forum discussions, but in all the other Parallels forums as well.

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## Virtuozzo Notions

In order to avoid any misunderstandings while following the instructions in the guide, please become acquainted with the main Virtuozzo 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 Virtuozzo Containers software is installed for hosting Containers.
- *Host Operating System (or Host OS)* is an operating system installed on the Hardware Node.
- *Virtuozzo license* is a special license that you should install on the Hardware Node to be able to start using Parallels Virtuozzo Containers and Virtuozzo Tools (*Parallels Management Console, Parallels Infrastructure Manager, and Parallels Power Panel*). Every Hardware Node shall have its own Virtuozzo license.
- *Virtuozzo 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 Virtuozzo management and monitoring tool with graphical user interface. Parallels Management Console is cross-platform and runs on both Microsoft Windows and Linux workstations.
- *Parallels Infrastructure Manager* 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.

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# Installation Requirements

Before starting to install Virtuozzo Containers 4.0 on your server, please make sure that the following requirements are fulfilled in respect of your system:

- The Virtuozzo Containers software can be installed on the Hardware Node running one of the following Linux distributions with the 2.6 kernel:
  - Red Hat Enterprise Linux 4;
  - Red Hat Enterprise Linux 5;
  - CentOS 4;
  - CentOS 5;
  - Fedora 7 (except for the 64-bit version of Virtuozzo Containers for IA-64-bit processors);
  - Fedora 8 (except for the 64-bit version of Virtuozzo Containers for IA-64-bit processors);
  - Suse Linux Enterprise Server 10 with or without Service Pack 1;
  - Suse Linux Enterprise Desktop 10 with or without Service Pack 1 (except for the 64-bit version of Virtuozzo Container for IA-64-bit processors).
- The network requirements:
  - Local Area Network (LAN) for the Hardware Node;
  - Internet connection for the Hardware Node;
  - Valid IP address for the Hardware Node as well as other IP parameters (default gateway, network mask, DNS configuration);
  - One or several spare IP addresses for your Containers. You can assign either public or private IP addresses to your Containers; however, in the latter case you will have to configure routing to these Containers via the IP address of the Hardware Node to make them accessible from external networks.

## CHAPTER 2

# Installation in a Nutshell

To install Virtuozzo Containers 4.0, follow these steps. To know more of a particular step, please see the next chapter.

- 1 Install and configure the Host Linux operating system on your server:
  - Start the Linux installation.
  - Partition your hard disk by creating the / (10-12 Gb), /swap (2 times RAM installed on your server), and /vz (all the remaining space on the disk) partitions.
  - Disable the firewall.
  - Define the minimum system software set to be installed on your system.
  - Reboot your system and log in as root.

- 2 Install the Virtuozzo Containers 4.0 software on your server:

- Run the Virtuozzo Containers installation program:
  - a If you have the Virtuozzo Containers software on a CD or DVD, you can do it by executing the following commands:

```
# mount /media/cdrom  
# /media/cdrom/install
```

- b If you have downloaded the Virtuozzo Containers software to some directory on your server, you can proceed as follows:

```
# /Vz_Soft_Dir/install
```

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

To install the 32-bit version of Virtuozzo Containers:

```
# ./virtuozzo-4.0.0-<build_version>.swsoft-i386.sfx
```

To install the 64-bit version of Virtuozzo Containers on x64-86 processors:

```
# ./virtuozzo-4.0.0-<build_version>.swsoft-x86_64.sfx
```

To install the 64-bit version of Virtuozzo Containers on IA-64 processors:

```
# ./virtuozzo-4.0.0-<build_version>.swsoft-ia64.sfx
```

- The Virtuozzo Product Key Installation window:  
Enter the Virtuozzo license number and click Next.
- The Install Templates window:  
Select all available templates and click Install.
- The Virtuozzo Containers Online Update window:  
Click Next.
- The Installation Completed window:  
Click the Reboot button.

## CHAPTER 3

# Virtuozzo Containers Installation

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

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## Obtaining Virtuozzo License

Before installing Parallels Virtuozzo Containers on your server, you should obtain a special license needed to start using the Virtuozzo Containers 4.0 software on your Hardware Node. You can use one of the following ways to obtain a Virtuozzo license:

- fill up a special registration form on the Parallels web site (available at [http://www.swsoft.com/en/products/virtuozzo/linux\\_eval](http://www.swsoft.com/en/products/virtuozzo/linux_eval)) and get a free evaluation license;
- contact a Parallels sales representative.

You will have to enter the obtained Virtuozzo license number during the Virtuozzo Containers installation on your server.

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## Installing and Configuring Host Operating System on Hardware Node

Please follow these recommendations when installing the Host OS on your Hardware Node:

- Proceed in accordance with your Linux Installation Guide till the **Disk Partitioning Setup** window is displayed. In this window select the **Manual partition** check box and, on the next screen, create the following partitions on the Hardware Node:

Partition	Description	Typical size
/	The root partition containing all Host operating system and Virtuozzo Containers software files.	10-12 Gb
swap	The paging partition for the Linux operating system.	2 times RAM

`/vz` The partition to host Virtuozzo Templates and all the remaining space Container data. You are recommended to allocate as much on the hard disk disk space as possible to this partition.

We highly recommend that you use the ext3 file system for the `/vz` partition. We also recommend using the ext3 filesystem for other partitions on your server, if you are going to have any. Otherwise, these partitions may become invisible/inaccessible when the Virtuozzo kernel is loaded.

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**Note:** Along with ext3, the Virtuozzo 4.0 kernel also includes support for other conventional filesystems: reiserfs, jfs, xfs, etc. However, ext3 is the only filesystem that has been thoroughly tested with Virtuozzo Containers 4.0 and is officially supported by Parallels.

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- While on the **Network Configuration** screen, you should ensure the correctness of the Hardware Node IP address, host name, DNS, and default gateway information. If you are using DHCP, make sure that it is properly configured. If necessary, consult your network administrator.
- On the **Package Group Selection** screen, clear the **Clear the Software Development, Virtualization, and Web server** check boxes and select the **Customize now** radio button.
- In the **Package Group Details** window, clear the check boxes of all package groups offered for installing on your server, except for the **Base** package group available on clicking the **Base System** item in the left part of the displayed window. For its functioning, Parallels Virtuozzo Containers does not need any additional packages to be installed on the Hardware Node.

After finishing the installation, please reboot the server.

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## Obtaining Virtuozzo Containers Distribution Set

You can use one of the following ways to obtain the Virtuozzo Containers 4.0 distribution set:

- Get a CD or DVD containing Virtuozzo Containers 4.0 from Parallels.
- Use the `vzinstall-linux.bin` utility (or the `vzinstall-linux-ia64.bin` utility if you wish to install the IA64-bit version of Virtuozzo Containers) to download the Virtuozzo Containers 4.0 distribution to your server and install it there, if necessary. In this case you should download the `vzinstall-linux.bin` file from the Parallels web site to the server and run it there. When executed, the utility launches the **Virtuozzo Containers Autoinstall** wizard which will ask you about the Virtuozzo components you wish to download and, after gathering the necessary information, start the downloading process. You can also make the `vzinstall-linux.bin` utility initiate the **Virtuozzo Containers Installation Wizard** (explained in the next section in detail) right after the Virtuozzo components downloading and help you install Virtuozzo Containers 4.0 on the server.

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# Installing Virtuozzo Containers Software

To install the Virtuozzo Containers software on your server, you should perform the following operations:

- 1 Make sure that the Virtuozzo Containers 4.0 distribution files are located on a persistent storage (e.g. on a local file system). This is needed to ensure their accessibility after the system reboot, which is performed on the last step of the Virtuozzo Containers installation.
- 2 Log in as root and run the `install` utility located in the root directory of your Virtuozzo Containers 4.0 CD, DVD, or distribution directory. For example, your session may look like below if you are installing Virtuozzo Containers from the CD:

```
# mount /media/cdrom  
# /media/cdrom/install
```

---

**Notes:** 1. If you are running the `vzinstall-linux.bin` utility in the 'Download and install' mode, the Virtuozzo Containers installation is launched automatically after the Virtuozzo Containers distribution set has been successfully downloaded to your server.

2. If you have downloaded the Virtuozzo Containers distribution using `vzinstall-linux.bin`, you should execute the `./virtuozzo-4.0.0-<build_version>.swsoft-<arch>.sfx` command to launch the Parallels Virtuozzo Containers Installation Wizard.

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- 3 On the Welcome screen, click **Next** to proceed with the installation.
  - 4 The next screen will display the Parallels end user license agreement that you must accept to be able to install Virtuozzo Containers 4.0 on the server.
  - 5 After accepting the license agreement, the installation program starts installing packages from the Virtuozzo Containers CD, DVD, or your local distribution directory. In case you did not follow completely the operating system installation instructions as was described earlier, the installation program can report unresolved dependencies in system package database. Review these dependencies and, if they are not critical to your system operation, you can continue with the installation.

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**Note:** If you did not create a separate `/vz` partition during the Host OS installation (see the [Installing and Configuring Host Operating System on Hardware Node](#) section (on page 11) for more detail), you will be presented with a special message informing you of this fact before the Virtuozzo Containers packages are installed on your server. For performance and reliability reasons, we recommend that you allocate a separate partition for holding all Container data and Virtuozzo templates. To abort the Virtuozzo Containers installation and repartition your storage, click the **Cancel** button; otherwise, click **OK**.

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- 6 Next, the installation program will offer to install all the templates found on the Virtuozzo Containers 4.0 CD, DVD, or in your distribution directory.

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**Note:** The **Install Templates** screen is skipped if you are installing Virtuozzo Containers 4.0 using the `vzinstall-linux.bin` utility. In this case `vzinstall-linux.bin` will install the OS and application templates specified by you on the **Select Virtuozzo Components** screen of the Parallels Virtuozzo Containers Autoinstall wizard.

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Please keep in mind that before you can start using the installed EZ templates on your Hardware Node (e.g. as the basis for the Container creation), you may need to set up a package repository for them. So, you have to build a special repository for all commercial versions of the Linux distributions (e.g. Red Hat Linux Enterprise 4 and 5). Detailed information on how to manage package repositories is provided in the **Setting Up Repository for EZ Template** section of **Parallels Virtuozzo Templates Management Guide**.

- 7 On the next screen, you will be prompted to enter the Virtuozzo product key (license). Every Hardware Node should have its own Virtuozzo license installed. Licenses are issued by Parallels and needed to start using Parallels Virtuozzo Containers on your server. Although you can complete some tasks on the Hardware Node without having a Virtuozzo license, you are not allowed to perform the majority of operations until you upload a valid Virtuozzo license to the Node (e.g. all Container-related operations including the Container creation). In the **Virtuozzo Product Key Installation** window, you can do one of the following:
  - Install a valid Virtuozzo license by entering the license key number in the field provided and clicking **Next**. When activating your Virtuozzo Containers installation using a Virtuozzo activation code:
    - a Make sure that your server is connected to the Internet. This is necessary for the Virtuozzo activation process to complete.
    - b If your Hardware Node uses a proxy server to connect to the Internet, use the **Configure** button to specify the necessary information about the proxy server.
  - If you do not have a valid Virtuozzo license, you can follow the [http://www.swsoft.com/en/products/virtuozzo/linux\\_eval](http://www.swsoft.com/en/products/virtuozzo/linux_eval) link and obtain a free Virtuozzo evaluation license. This license does not impose any restrictions on the Virtuozzo Containers functionality; so, you can access and evaluate all Virtuozzo features to the full extent (however, for a limited period of time only). You can also click the **Skip** button to skip the step of installing a Virtuozzo license onto your Hardware Node. You will be able to install the license later on by means of Parallels Management Console, Parallels Infrastructure Manager, or the `vzlicload` utility. Please turn to the **Managing Virtuozzo Licenses** section of **Parallels Virtuozzo Containers User's Guide** to learn how you can do it.
- 8 On the last step, you will be offered to check for available Virtuozzo Containers updates. We recommend that you check for available updates right during the Virtuozzo Containers installation, which will allow you to keep the Virtuozzo Containers software at the most recent version (i.e. to have the latest Virtuozzo Containers core, utilities, and templates installed). To this effect, leave the **Launch Virtuozzo Containers software update wizard** check box selected. In this case the **Virtuozzo Up-To-Date** wizard will be automatically launched after clicking either the **Exit** or **Reboot** button; follow the instructions of the wizard to check for available updates, if any, and install them on your Node. If you do not wish to update your Virtuozzo Containers installation for some reason or other, clear the check box; you will be able to update the Virtuozzo software later by means of the `vzup2date` utility or Parallels Management Console. Detailed information on how you can do it is provided in **Parallels Virtuozzo Containers Reference Guide** and the **Keeping Your Virtuozzo System Up-to-Date** chapter of **Parallels Virtuozzo Containers User's Guide**.

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

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- 9 Finally, the installation program will greet you with a success window. In the **Congratulations!** window, you can do the following:
  - Click **Exit** to do a manual check of the Hardware Node before booting to the Virtuozzo kernel. Otherwise, click **Reboot** to reboot the Hardware Node.

- Get informed of your further steps to start working with Virtuozzo Containers 4.0 after the Hardware Node reboot:
  - a Log in to the Hardware Node thru Parallels Infrastructure Manager using the specified URL (`http://Hardware_Node_IP_Address:4643`) and the system administrative credentials (i.e. the `root` username and the password you specified for this user when installing the Host OS on your server).
  - b Log in to the Hardware Node thru SSH (Secure Shell) and run the `man virtuo` command to get primary information on the main Virtuozzo commands.

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## Installing OS Templates

Operating system templates are used to create new Containers with a pre-installed operating system. Therefore, you are bound to install at least one OS template from your Virtuozzo Containers CD, DVD, or Virtuozzo Containers distribution directory before creating Containers. You can use the following command to install an OS template on your Hardware Node:

```
# vzpkg install template redhat-el5-x86-ez-3.0.0-4.swsoft.noarch.rpm
Preparing... ##### [100%]
 1:redhat-el5-x86 ##### [100%]
```

You can check that the `redhat-el5-x86` EZ template has been successfully installed on the Node by issuing the following command:

```
# vzpkg list
redhat-el5-x86          2007-09-12 12:57:57
```

However, before you can start using the installed OS template for the Container creation, you should cache it with the `vzpkg create cache` command:

```
# vzpkg create cache redhat-el5-x86
...
Complete!
Packing cache file redhat-el5-x86.tar.gz ...
Cache file redhat-el5-x86.tar.gz [14M] created.
```

---

**Notes:** 1. To be able to cache your OS EZ templates, you may need to set up a package repository for them. So, you have to build a special repository for all commercial versions of the Linux distributions (e.g. Red Hat Linux Enterprise 4). Detailed information on how to manage package repositories is provided in the [Setting Up Repository for EZ Template](#) section of [Parallels Virtuozzo Templates Management Guide](#).

2. Detailed information on how to manage standard OS templates and OS EZ templates is provided in [Parallels Virtuozzo Templates Management Guide](#) shipped with Virtuozzo Containers 4.0.

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## CHAPTER 4

# Container Management

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

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## Creating New Container

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

- 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 your 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 your Node, please turn to the [Installing OS Templates](#) section first (on page 15).
- The name of the sample configuration file that will be used for setting all the Container resource control parameters. The sample configuration files are residing 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 fedora-core-8-x86 --config basic
Creating Container private area (fedora-core-8-x86)
...
Container private area was created
```

In this case Virtuozzo Containers 4.0 will create a Container with ID 101, the Fedora 8 OS installed inside, and the configuration parameters taken from the `ct-basic.conf-sample` sample configuration file.

In principle, now you are ready to start your 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.

---

## Configuring Container

Configuring a Container consists of the following main tasks:

- setting Container network parameters and
- setting Container user passwords.

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

## Setting Network Parameters

In order to be accessible from the network, a Container shall be assigned a correct IP address and hostname; DNS servers shall also be configured. In addition, the SSH or Telnet daemon shall be running inside the Container. The session below illustrates setting the Container 101 network parameters:

```
# vzctl set 101 --hostname test101.swsoft.com --save
Hostname for Container set: test101.swsoft.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
```

These commands will assign Container 101 the IP address of 10.0.186.1, the hostname of test101.swsoft.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 running. In this 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.

To check whether SSH is running inside the Container, use `vzctl exec`, which allows you to execute any commands in the Container context:

```
# vzctl start 101
[This command starts Container 101, if it is not started yet]
# vzctl exec 101 service sshd status
sshd (pid 13138 8267) is running...
```

For more information on running commands inside a Container from the Hardware Node, see the Running Commands in Container subsection (on page 21).

## Setting root Password for 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, we set the root password for Container 101 to “test”, and you can log in to the Container via SSH as `root` and administer it in the same way as 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 Container

When a Container is created, it may 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
CTID 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.swsoft.com
```

The following command is used to stop a Container:

```
# vzctl stop 101
Stopping Container ...
Container was stopped
Container is unmounted
# vzctl status 101
CTID 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.swsoft.com
   102         7 running 10.101.66.159 ct102.swsoft.com
   103          - stopped 10.101.66.103 ct103.swsoft.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 may 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. The full list of the `vzlist` command line switches and output and sorting options is available in the `vzlist` subsection of the [Virtuozzo Command Line Interface](#) chapter in [Parallels Virtuozzo Containers Reference Guide](#).

---

## Deleting Container

You can delete a Container that is not needed anymore with 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
CTID 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 might need to execute commands inside Containers bypassing the normal login sequence. This can happen if:

- You do not know the Container login information, and you need to run some diagnosis commands inside the Container in order 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. Use the `vzctl exec <CT_ID>` command for running a command inside the Container with the given ID. The session below illustrates the situation when the SSH daemon is not started:

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

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

---

## Managing Applications

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

- Copying the application files to each Container on the Node (e.g. 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 Virtuozzo 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;
  - Securely share 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 Virtuozzo Containers 4.0 (e.g. 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 [Virtuozzo Templates Management Guide](#).

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

## Installing and Listing Application Templates on Hardware Node

Application templates can be installed on the Hardware Node by using the `vzpkg install template` command. For example, to install the `mysql` template intended to be run under Fedora 8, you can issue the following command:

```
# vzpkg install template \  
mysql-fedora-core-8-x86-tmpl-4.0.0-2.swsoft.rpm  
Preparing... ##### [100%]  
 1:mysql-fedora-core-8-x86 ##### [100%]
```

The `mysql` template will be installed in the `/vz/template/fedora/8/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-8-x86          2007-07-21 02:22:45  
fedora-core-8-x86 mysql
```

As you see, the `fedora-core-8-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-8-x86          2007-07-21 02:22:45
```

## Adding Application to Container

After the application template has been installed on the Hardware Node, you can add it to any existing Container on this Node by means of the `vzpkg install` command. To successfully add an application template to a Container, this Container should be running; otherwise, it is impossible to run the installation process in the Container context.

In the example below, the `mysql` application template meant to run under Fedora Core 6 and already installed on the Hardware Node is added to Container 101:

```
# vzctl status 101
CTID 101 exists mounted running
# vzpkg list
fedora-core-6-x86
fedora-core-6-x86  mysql
...
# vzpkg install 101 mysql
...
Installed:
mysql             i386          0:4.1.12-3.FC8.1
mysql-bench       i386          0:4.1.12-3.FC8.1
mysql-devel       i386          0:4.1.12-3.FC8.1
...
```

During the command execution, the `vzpkg` utility will locate and download the packages included in the `mysql` template from the corresponding repository on the Internet. Please 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 Application From Container

The applications installed inside a Container by using the technology of Virtuozzo 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-8-x86                2007-05-21 02:21:56
fedora-core-8-x86  mysql         2007-05-21 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-8-x86                2007-05-21 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`.

## CHAPTER 5

# Using Virtuozzo Tools

Along with the command line utilities, you can make use of the following tools intended for managing your servers running Parallels Virtuozzo Containers:

- Parallels Management Console - a remote management tool for Parallels Virtuozzo Containers with graphical user interface. Management Console is designed for Hardware Node administrators having access to all the Containers on a particular Node. It allows the administrator to control multiple Hardware Nodes, to manage all sorts of Containers, and to monitor the system.
- Parallels Infrastructure Manager designed for Hardware Node administrators and providing you with the ability to manage a particular Hardware Node and all Containers residing on it with the help of a standard Web browser on any platform.

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

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---

## Installing Parallels Management Console

The Parallels Management Console shall be installed on a special workstation for the remote administration of the existing Hardware Nodes. The Management Console installation files are located in the `client` subdirectory on your Virtuozzo Containers 4.0 CD, DVD, or in your local distribution directory. There are two subdirectories there containing the Management Console builds for Microsoft Windows 2000/XP/2003 and Linux (Fedora 7 and 8; Red Hat Enterprise Linux 4 and 5; CentOS 4 and 5; SUSE Linux Enterprise Desktop 10; Ubuntu 6):

- `win32`: the Management Console build for Windows workstations. To install Parallels Management Console for Windows, select **Programs --> Parallels --> Virtuozzo Tools --> Parallels Management Console Setup File** on the Windows **Start** menu, double-click the `pmc_setup.exe` file in the displayed window, and follow the instructions of the Management Console setup wizard.
- `linux`: the Parallels Management Console build for Linux workstations. It can be installed on Fedora 7 and 8, RHEL 4 and 5, CentOS 4 and 5, SUSE Linux Enterprise Desktop 10, and Ubuntu 6.

To install Parallels Management Console for Linux:

- Use the `rpm -i` command for all Linux distributions except for Ubuntu 6. For example, to install Parallels Management Console on the 32-bit version of Fedora 8, you can issue the following command:

```
# rpm -ihv pmc-<build_version>.swsoft.i386.rpm
```

- Use the following commands to install Management Console on Ubuntu 6:

```
# sudo aptitude update
[you will be asked to provide the password of the root user]
# sudo aptitude install alien
# cd /client/linux
# sudo alien -i pmc-<build_version>.swsoft.<arch>.rpm
```

After the installation is complete, you can start Parallels Management Console by running the `pmc` command on Linux or by selecting **Programs --> Parallels --> Virtuozzo Tools --> Parallels Management Console** on the **Start** menu in Windows.

Before you can start managing a Hardware Node in Parallels Management Console, you should register it there. To start the Node registration process, select the **Register Hardware Node** item on the **Action** menu. You will be presented with the **Register New Hardware Node** window where you should enter the following information in the fields provided:

- **Friendly name.** A friendly name for the Hardware Node which will be displayed in the Management Console left pane and help you easily find your Node among other Hardware Nodes registered in Parallels Management Console. You may 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 (e.g. `MyNode.sw.com`).
- **Address.** The IP address of the Hardware Node.
- **User name.** The user name to log in to the Hardware Node. Use the `root` credentials to log in to the Node. [ParallelsVirtuozzo Containers User's Guide](#)
- **Password.** The password of the user specified in the **User name** field. If you are logging in as `root`, please use the password you entered while installing the Host OS on your server.

The **Save my password** check box, if selected, saves the provided password permanently on the computer where Management Console is installed; so, you will not have to enter the password each time when trying to access the Hardware Node.

After providing the necessary information, click the **Connect** button to establish a secure connection to the Hardware Node.

---

## Setting Parallels Infrastructure Manager to Work

Along with Parallels Management Console, you can make use of Parallels Infrastructure Manager intended for managing your servers running Parallels Virtuozzo Containers. This tool is designed for Hardware Node administrators and provides you with the ability to manage multiple Hardware Nodes and all Containers residing on them with the help of a standard Web browser on any platform.

To log in to Parallels Infrastructure Manager, launch the Web browser that is compatible with Infrastructure Manager. A list of Web browsers currently supported by Virtuozzo Containers 4.0 is given below:

- Internet Explorer 6.0 and above;
- Mozilla 1.7 and above;
- Firefox 1.0 and above;
- Opera 8.0 and above.

Chances are that you will also be able to use other browsers, but Virtuozzo Containers 4.0 has not been extensively tested with them.

After you have opened a browser window, log in to Infrastructure Manager by typing the IP address (or hostname) of your Hardware Node and the 4643 TCP port. Assuming that the Node has the IP address of 197.158.201.100, you can enter

```
https://197.158.201.100:4643
```

in the address line of your browser to log in to Infrastructure Manager. To connect to the Hardware Node, enter the Host OS credentials (i.e. the `root` username and the corresponding password) in the fields provided on the Infrastructure Manager login screen and click the **Login** button.

---

**Note:** If the Virtuozzo Hardware Node you wish to manage is part of a Virtuozzo Group, you should log in to the Master Node of this Group. Logging in at the IP address/hostname of a Slave Node is not allowed.

---

Parallels Infrastructure Manager and Parallels Power Panel use the Secure Sockets Layer (SSL) protocol to establish an encrypted connection to the Hardware Node and Containers, thus ensuring that this connection cannot be intercepted and used by unauthorized parties. For a client browser to successfully set up an SSL connection to a Node or a Container, this Node or Container should have the appropriate server certificate installed. The procedure of installing a server certificate on a Hardware Node or inside a Container does not differ from that on a standalone server and is described in the Apache web server documentation (e.g. available at <http://httpd.apache.org/docs/2.0/ssl/>) in detail. When working with certificates, please keep in mind the following:

- You can also work in Parallels Infrastructure Manager and Parallels Power Panel without installing certificates on your Hardware Node and inside its Containers. However, in this case the corresponding warning message will be displayed each time you or your clients will try to connect to the Node and its Containers using their favorite web browsers.

- To set up a certificate for your Node, you should log in to the Service Container (also known as Container 1) and install and configure the certificate inside this Service Container.

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