



SWsoft, Inc.

Virtuozzo™ for Windows

User's Guide

Version 3.5



(c) 1999-2005

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Preface

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About This Guide

This guide is meant to provide comprehensive information on Virtuozzo for Windows – high-end server virtualization software for Windows-based computers. The issues discussed in this guide cover the necessary theoretical conceptions as well as practical aspects of working with Virtuozzo. The guide will familiarize you with the way to create and administer Virtual Private Servers (sometimes also called *Virtual Environments*, or *VEs*) on Virtuozzo-based Hardware Nodes and to employ both the graphical and command line interfaces for performing various tasks.

Note: The guide does not familiarize you with the process of installing, configuring, and deploying your Virtuozzo system. Detailed information on all these operations is provided in the *Virtuozzo 3.5 for Windows Installation Guide* shipped with Virtuozzo.

According to the task-oriented approach, most topics of this guide are devoted to a particular task and the ways to perform it. However, Virtuozzo is equipped with as many as three different tools to perform various administrative tasks:

- 1 Virtuozzo Management Console (VZMC) with graphical user interface;
- 2 Virtuozzo Control Center (VZCC) with web interface;
- 3 Virtuozzo command line utilities.

Besides, there is another tool for managing VPSs - Virtuozzo Power Panels. However, this tool is mainly regarded as a means for individual VPS customers to manage their personal VPSs and is therefore not described in this guide.

VZMC is considered the primary tool for administering Virtuozzo and performing main administrative tasks on Hardware Nodes and in the VPS context. Therefore, when describing the ways to perform this or that task, we have provided the corresponding procedures for Virtuozzo Management Console only. Besides, if you are used to working in the command line, you can turn to the **Reference** chapter to learn to manage Hardware Nodes and VPSs by means of Virtuozzo command line utilities. As for VZCC, a web counterpart of VZMC, it is provided with its own guide as well as a comprehensive online help system.

Who Should Read This Guide

The primary audience for this book is anyone responsible for administering one or more systems running Virtuozzo 3.5 for Windows. To fully understand the major Virtuozzo notions and learn to perform the main administrative operations, no more than basic Windows administration habits is required.

Organization of This Guide

Chapter 2, *Virtuozzo Philosophy*, is a must-read chapter that helps you grasp the general principles of Virtuozzo operation. It provides an outline of Virtuozzo architecture and lets you understand the Virtuozzo licensing policy.

Chapter 3, *Operations on Virtual Private Servers*, covers those operations that you may perform on Virtual Private Servers by means of VZMC: creating and deleting Virtual Private Servers, starting and stopping them, migrating between Hardware Nodes, etc.

Chapter 4, *Managing Templates*, shows you the way to handle Virtuozzo application templates properly – create your own templates, upload and install them on the Hardware Node, add templates to Virtual Private Servers, etc.

Chapter 5, *Managing Resources*, zeroes in on configuring the resource control parameters for different VPSs. These parameters include disk quotas, CPU time, and a set of memory-related resources.

Chapter 6, *Managing Hardware Nodes*, centers on all those operations you as Hardware Nodes administrator can perform on your Nodes.

Chapter 7, *Logs and Monitors*, explains the ways to keep track of all system events and the consumption of all kinds of resources by the running Virtual Private Servers and the Hardware Node itself.

Chapter 8, *Managing Services and Processes*, familiarizes you with the operations you can perform on processes and services in Virtuozzo by using the VZMC graphical interface.

Chapter 9, *Customizing VZCC/VZPP*, contains instructions for experienced administrators on the way to customize Virtuozzo Control Center and Virtuozzo Power Panels by changing their layout and appearance and modifying certain VZCC/VZPP settings.

Chapter 10, *Advanced Tasks*, enumerates those tasks that are intended for advanced system administrators who would like to obtain deeper knowledge about Virtuozzo capabilities.

Chapter 11, *Troubleshooting*, suggests ways to resolve common inconveniences should they occur during your work with the Virtuozzo software.

Chapter 12, *Reference*, is a complete reference on the main VPS parameters, action scripts that can be executed on performing certain VPS-related operations, and all Hardware Node command-line utilities. You can read this chapter if you wish to learn how to configure VPS parameters by editing its configuration file, wish to do additional actions by specifying your own scripts, need help for a particular command, or are looking for a command to perform a certain task.

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.

Typographical Conventions

The following kinds of formatting in the text identify special information.

Formatting convention	Type of Information	Example
<code>Preformatted</code>	On-screen computer output in your command-line sessions; source code in XML, C++, or other programming languages.	<code>Saved parameters for VPS 101</code>
Preformatted Bold	What you type, as contrasted with on-screen computer output.	C:\Documents and Settings\Administrator>vzlist
Monospace	The names of commands, files, and directories.	Use <code>vzctl start</code> to start a VPS.
<i>Monospace Italics</i>	Designates a command line placeholder, which is to be replaced with a real name or value.	To destroy a VPS, type <code>vzctl destroy VPSID</code> .
Special Bold	All elements of the graphical user interface (GUI): menu items, menu options, menu buttons, etc. Titles of chapters, sections, and subsections.	Go to the QoS tab. Read the Basic Administration chapter.
<i>Italics</i>	Used to emphasize the importance of a point or to introduce a term.	<i>Host Operating System</i> is an operating system installed on the Hardware Node.
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

Prompts in Command Examples

Command line examples throughout this guide presume that you are using the standard Windows command line that can be launched by entering `cmd` in the standard Windows **Run** dialog window. Inasmuch as you are supposed to work with Virtuozzo with an administrator's privileges, the commands presented in this guide are prepended with the following command line prompt: `C:\Documents and Settings\Administrator>`.

General Conventions

Be aware of the following conventions used in this book.

- Chapters in this guide are divided into sections, which, in turn, are subdivided into subsections. For example, **Documentation Conventions** is a section, and **General Conventions** is a subsection.
- When following steps or using examples, be sure to type double-quotes (") and single-quotes (') exactly as shown.

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!

If you have a suggestion for improving the documentation (or any other relevant comments), try to be as specific as possible when formulating it. If you have found an error, please include the chapter/section/subsection name and some of the surrounding text so we can find it easily.

Please submit a report by e-mail to userdocs@swsoft.com.

CHAPTER 2

Virtuozzo Philosophy

In This Chapter

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Distinctive Features of Virtuozzo	17
Main Principles of Virtuozzo Operation	22
Hardware Node Availability Considerations	30

About Virtuozzo Software

What is Virtuozzo

Virtuozzo is a complete server automation and virtualization solution based on a patent-pending technology developed by SWsoft. Virtuozzo creates multiple isolated Virtual Private Servers (VPSs) on a single physical server to share hardware, licenses, and management effort with maximum efficiency. Each VPS performs and executes exactly like a stand-alone server for its users and applications as it can be rebooted independently and has its own Administrator access, Active Directory domain users, IP addresses, memory, processes, files, applications, system libraries, and configuration files. Light overhead and efficient design of Virtuozzo makes it the right virtualization choice for production servers with live applications and real-life data.

The basic Virtuozzo capabilities are:

- **Dynamic Real-time Partitioning** – Partition a physical server into tens of VPSs, each with full dedicated server functionality.
- **Resource Management** – Assign and control VPS resource parameters and re-allocate resources in real-time.
- **Virtualization** - Move VPSs and its application(s) between physical servers transparently with near-zero or zero downtime.
- **Mass Management** - Manage a multitude of physical servers and Virtual Private Servers in a unified way.

What is VPS

VPS is a virtual private server, which is functionally identical to an isolated standalone server:

- Each VPS has its own processes, Active Directory domain users, files and provides full administrative access.
- Each VPS has its own IP addresses, port numbers, filtering and routing rules.
- Each VPS can have its own configuration for the system and application software, as well as its own versions of Dynamic Link Libraries (DLLs), system libraries, and registry. It is possible to install or customize software packages inside a VPS independently from other VPSs or the host system. Multiple distributions of a package can be run on one and the same Windows box.
- Each VPS has its own unique Administrator user with full control over the given VPS and full access to other user accounts inside this VPS.
- Each VPS can be a member of a Windows domain (e.g. access any of the network shares to which the VPS user has rights). Moreover, any Virtual Private Server can act as a domain controller granting other VPSs and stand-alone servers users access to a set of network resources (applications, printers, etc.).

Virtuozzo Applications

Virtuozzo can be efficiently applied in a wide range of areas: enterprise server consolidation, web and applications hosting, software development and testing, user training, and so on.

If you administer a number of Windows dedicated servers within an enterprise, you can benefit from the Virtuozzo solution in the following ways:

- Reduce the number of required physical servers and corresponding support by grouping a multitude of your enterprise servers onto a single computer without losing a bit of valuable information and without compromising performance.
- Increase server utilization and maximize server potential.
- Provision servers in minutes by using the technology of Virtuozzo templates.
- Migrate Virtual Private Servers in the time of network data transfer, nearly eliminating the planned downtime and enabling fast reaction to unplanned downtime situations.
- Monitor OS and application versions and update/upgrade the current software easily across all of your physical servers running Virtuozzo and their Virtual Private Servers.
- Guarantee Quality-of-Service (QoS) in accordance with a corporate service level agreement (SLA).
- Automate routine tasks such as upgrades and updates.
- Minimize software license and support requirements, etc.

Due to its unique efficiency and completeness, Virtuozzo has also a wide variety of profitable uses for Hosting Service Providers allowing them to:

- Sell new powerful and popular services such as:
 - *Advanced Shared* for shared hosting with customized application sets and QoS;
 - *True VPS* for a cheaper, secure, and easier alternative to dedicated servers;

- *Split Dedicated* allowing your customers to split the servers for their better utilization, etc.
- Provide complete self-administration panels (Virtuozzo Power Panels) including system backup/restore and monitoring tools.
- Have a multitude of customers with their individual full-featured Virtual Private Servers sharing a single physical server.
- Transparently move customers and their environments between servers, without any manual reconfiguration.
- Increase profitability through the better management and leverage of hardware and software investments.
- Automate service provisioning by using the technology of Virtuozzo templates, etc.

Besides, Virtuozzo proves invaluable for IT educational institutions that can now provide every student with a personal Windows server, which can be monitored and managed remotely. Software development companies may use Virtual Private Servers for testing purposes and the like.

Virtuozzo 3.5 for 64-bit Processors

Virtuozzo 3.5 is released in two variants – for common 32-bit processors and for the x86-64 64-bit processors. Depending on the kind of processors to be used, this or that variant of the Virtuozzo distribution set should be chosen.

A list of supported 64-bit processors is presented below:

- AMD Opteron;
- AMD Athlon 64;
- Intel Xeon with EM64T support;
- Intel Pentium with EM64T support.

The Virtuozzo 32-bit version has been fully ported to support x86-64 64-bit processors, therefore, all its functionality is retained in the 64-bit version. So, you can use any Virtuozzo tool and utility in exactly the same way as you would use it on the computers with standard 32-bit processors.

However, while working with the 64-bit version of Virtuozzo, you should keep in mind the following:

- 1 The Virtuozzo 64-bit version should be installed on the computer running Windows Server 2003 x64 Edition (English or Japanese). In all other respects, installing Virtuozzo is the same as is described in Chapter 3 of the *Virtuozzo 3.5 for Windows Installation Guide*.
- 2 The Virtual Private Servers created under Virtuozzo for x86-64 should use the 64-bit OS template.
- 3 The Virtuozzo version for the 64-bit processors allows you to add only 64-bit application templates to your Virtual Private Servers.
- 4 You cannot migrate Virtual Private Servers residing on a Hardware Node running the Virtuozzo 32-bit version to Hardware Nodes running the Virtuozzo 64-bit version and vice versa. Detailed information on how to migrate VPSs from one Node to another is given in the *Migrating VPS* section (on page 66).

- 5 You can use any Hardware Node as a Backup Node irrespective of the Virtuozzo version installed on this Node. So, you can back up a VPS from the Node running the Virtuozzo 32-bit version and store it on the Node running the Virtuozzo 64-bit version and vice versa. More information on VPS backups is provided in the **Backing Up and Restoring VPSs** section (on page 45).

Except for these points, installing and using Virtuozzo 3.5 for 64-bit processors does not differ from working with its 32-bit counterpart.

Note: The 64-bit versions of Virtuozzo allows you to create Virtual Private Servers running German, Spanish, or French versions of Windows Server 2003 x64 Edition with the help of Multilingual User Interface Pack (MUI). Detailed information on MUI is provided in the **Preparing Virtuozzo 64-bit for Creating Localized VPSs** subsection of the **Installing and Configuring Virtuozzo on Hardware Node** chapter in the **Virtuozzo 3.5 for Windows Installation Guide**.

Distinctive Features of Virtuozzo

The concept of Virtuozzo Virtual Private Servers is distinct from the concept of traditional virtual machines in the respect that Virtual Private Servers (VPSs) always run the same OS kernel as the host system (Linux on Linux, Windows on Windows, etc.). This single-kernel implementation technology allows to run Virtual Private Servers with a near-zero overhead. Thus, Virtuozzo VPSs offer an order of magnitude higher efficiency and manageability than traditional virtualization technologies.

OS Virtualization

From the point of view of applications and Virtual Private Server users, each VPS is an independent system. This independence is provided by a virtualization layer over the kernel of the Host OS. Note that only a small part of the CPU resources is spent on virtualization (around 1-2%). The main features of the virtualization layer implemented in Virtuozzo are the following:

- VPS looks like a normal Windows system. Software from vendors can run inside any VPS without Virtuozzo-specific modifications or adjustment;
- VPS has its own unique Administrator user with full control over the given VPS and can have a number of other local users with different rights and permissions assigned to them in respect of this VPS;
- Users can install additional application and system software inside VPSs;
- VPS can be a member of an Active Directory domain (e.g. access any of the network shares to which the VPS user has rights). Moreover, any Virtual Private Server can act as an Active Directory domain controller granting other VPSs and stand-alone servers users access to a set of network resources (applications, printers, etc.);
- Virtual Private Servers are fully isolated from each other in respect of their users, processes, services, file systems, and installed applications;
- Virtual Private Servers share the same executable code, which greatly saves both RAM and disk space;
- Processes belonging to a VPS are scheduled for execution on all available CPUs. Consequently, VPSs are not bound to only one CPU, and any application inside each VPS can use all available CPU power.

Network Virtualization

The Virtuozzo network is designed in such a way as to make Virtual Private Servers communicate with each other and computers on external networks. The picture below demonstrates the structure of such a network:

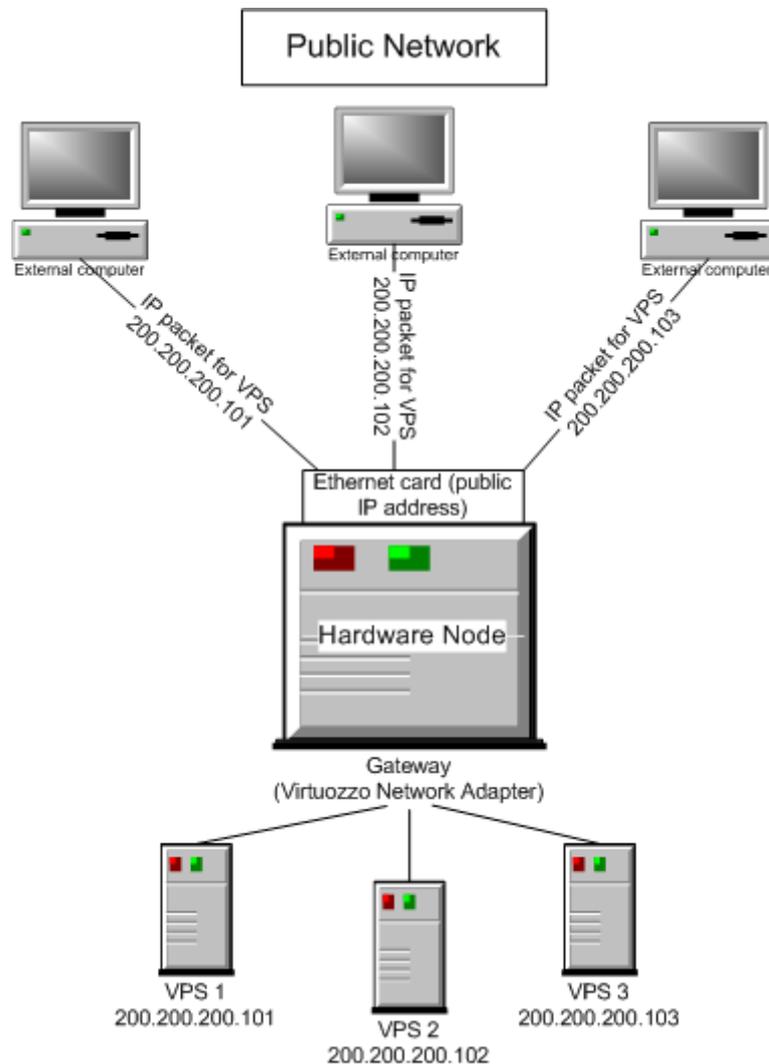


Figure 1: Network Virtualization

In Virtuozzo-based systems, all VPSs on the Node use the Virtuozzo Network Adapter as the default gateway to send and receive data to/from other networks (shown as the Public Network in the picture above). The network adapter is automatically created on the Hardware Node during the Virtuozzo installation and has a private IP address assigned to it. All IP packets from Virtual Private Servers come to this address (gateway) and are redirected thru a public IP address of the Hardware Node to the corresponding computer on the Public Network. In the same way, all IP packets coming from the outer world and destined for VPS IP addresses reach the public IP address of the Hardware Node first and, afterwards, are sent to the addresses of the corresponding Virtual Private Servers. In the latter case, the Node acts as an ARP (Address Resolution Protocol) server translating IP addresses to network addresses of Virtual Private Servers.

The Virtuozzo Network Adapter is also used to exchange the traffic among all the VPSs hosted on the given Hardware Node. All the network traffic of a VPS is isolated from that of the other VPSs, i.e. all Virtual Private Servers are protected from each other in the way that makes traffic snooping impossible.

Like any other stand-alone computer on a network, each VPS on the Hardware Node should have not only a valid IP address (several IP addresses per VPS are allowed), but a subnet mask which is used to unite Virtual Private Servers as well as any other stand-alone computers on the network into one or several subnets. It is not recommended to have all the VPSs on a Node from a single subnet, as in this case you will have to manually change the VPS IP address(es) every time you migrate a VPS to another Node. Instead, use the subnets of your entire datacenter. Thus, all the Hardware Node administrator has to do while setting up their network is make sure that:

- One or more public IP addresses are assigned to the Hardware Node;
- At least one valid IP address is assigned to each Virtual Private Server created on the Node;
- All VPSs belong to subnets not limited to the given Hardware Node;
- IP packets sent to VPS IP addresses successfully reach the Node public IP address(es).

All the other operations (creating the private IP address of the Virtuozzo Network Adapter, delivering IP packets to the corresponding IP addresses, etc.) are performed by Virtuozzo.

Virtuozzo File System (VZFS)

VZFS is a file system that allows to share common files among multiple VPSs without sacrificing security. Any VPS user can modify, update, replace, and delete any application file inside a Virtual Private Server like s/he does it on an isolated stand-alone server. When a user modifies a shared file, VZFS creates a private copy of the file transparently for the user. Thus, the modifications do not affect the other users of the file. Main benefits of VZFS are the following:

- It saves memory required for executables and Dynamic Link Libraries (DLLs). A typical VPS running a simple web site might consume around 30–50 MBytes of RAM just for executable images. Sharing this memory improves scalability and total system performance;
- It saves disk space. A typical Windows server installation occupies several hundred MBytes of disk space. Sharing the files allows you to save more than 90% of disk space.

Templates

A template in Virtuozzo is a set of application files and registry settings installed on the Host operating system in such a way as to be usable by any VPS by mounting over Virtuozzo File System. Virtuozzo provides tools for creating templates, installing and removing them on/from the Hardware Node, adding them to a VPS, etc. Using templates lets you:

- Securely share the RAM among similar applications running in different VPSs to save hundreds of megabytes of memory;
- Securely share the files comprising a template among different VPSs to save gigabytes of disk space;
- Install applications and patches simultaneously in many VPSs.

There are two types of templates in Virtuozzo. These are OS templates and application templates. An OS template is an operating system and the standard set of applications to be found right after the installation. Virtuozzo uses OS templates to create new Virtual Private Servers with a preinstalled operating system. An application template is a set of files and registry settings pertaining to this or that application. Virtuozzo uses application templates to add extra software to the existing Virtual Private Servers. For example, you can create a Virtual Private Server on the basis of the Windows Server 2003 OS template and add the Microsoft SQL server application to it with the help of the MSSQL template.

Resource Management

Virtuozzo Resource Management controls the amount of resources available to Virtual Private Servers. The controlled resources include such parameters as CPU power, disk space, a set of memory-related parameters. Resource management allows Virtuozzo to:

- Effectively share available Hardware Node resources among VPSs;
- Guarantee Quality-of-Service (QoS) in accordance with a service level agreement (SLA);
- Provide performance and resource isolation and protect from denial-of-service attacks;
- Simultaneously assign and control resources for a number of Virtual Private Servers;
- Manage a multitude of Hardware Nodes in a unified way by means of Virtuozzo Management Console (VZMC);
- Collect usage information for system health monitoring, etc.

Resource Management is much more important for Virtuozzo than for a standalone computer since computer resource utilization in a Virtuozzo-based system is considerably higher than that in a typical system.

Main Principles of Virtuozzo Operation

Basics of Virtuozzo Technology

In this section we will try to let you form a more or less precise idea of the way the Virtuozzo software operates on your computer. Please see the figure below:

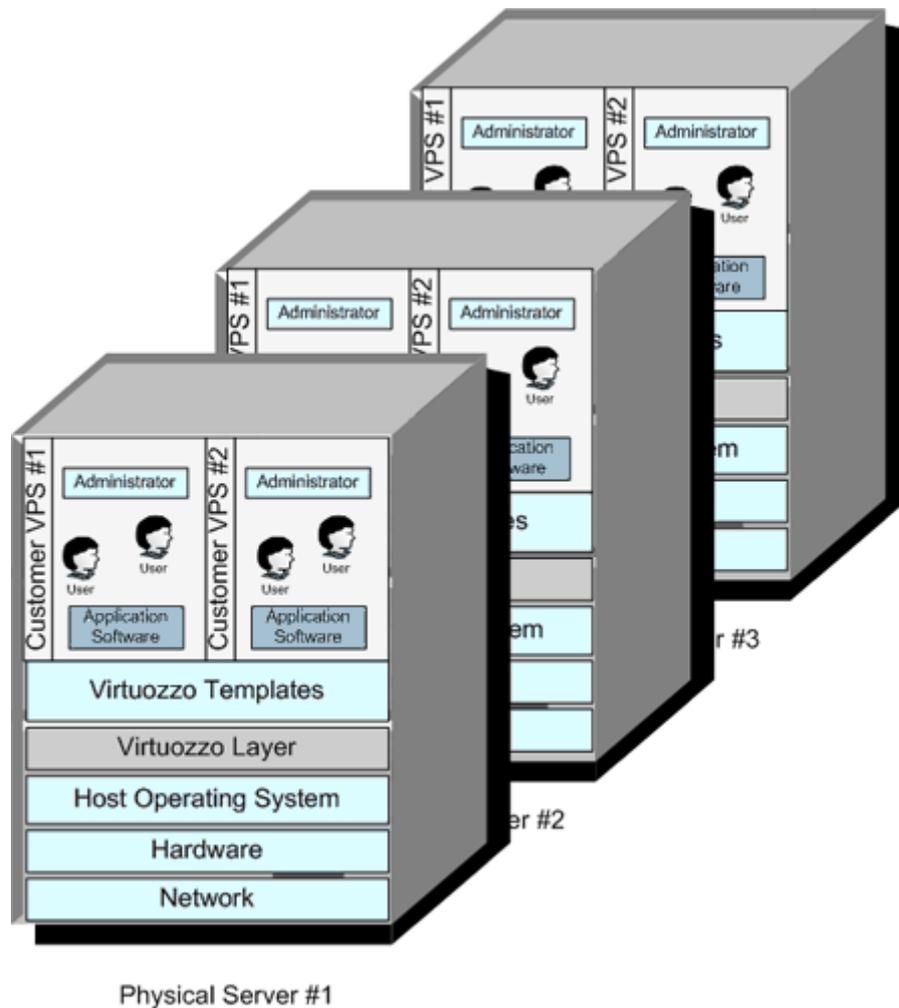


Figure 2: Virtuozzo Technology

This figure presumes that you have a number of physical servers united into a network. In fact, you may have only one dedicated server to effectively use Virtuozzo. If you have more than one Virtuozzo-based physical server, each one of the servers will have a similar architecture. In Virtuozzo terminology, such servers are called *Hardware Nodes* (or *HN*, or just *Nodes*), because they represent hardware units within a network.

Virtuozzo for Windows is installed on a computer running Windows Server 2003 or Windows Server 2003 Service Pack 1 (shown as *Host Operating System* in the figure above). After Virtuozzo is installed, you will be able to run Virtuozzo services supporting virtualization on your computer. This support is presented above as *Virtuozzo Layer*. The Virtuozzo layer ensures that Virtual Private Servers, sharing the same *Hardware Node* and the same OS kernel, are isolated from each other. A Virtual Private Server is a kind of ‘sandbox’ for processes and users.

Before you are able to create a Virtual Private Server, you should install the corresponding OS template in Virtuozzo. This is displayed as *Virtuozzo Templates* in the scheme above. In the current version of Virtuozzo for Windows, Virtual Private Servers can run only the Windows Server 2003 OS and the Windows Server 2003 OS with Service Pack 1 installed (English, German, French, Spanish, or Japanese Standard or Enterprise Edition). In this case we say that a VPS is based on the Windows Server 2003 OS template.

After you have installed at least one OS template, you can create any number of VPSs with the help of various Virtuozzo management tools (VZMC, VZCC, or the command line tools), configure their network and/or other settings, and work with these VPSs as with fully functional Windows servers.

Note: Hereafter, the Windows Server 2003 OS denotation is used to indicate both Windows Server 2003 and Windows Server 2003 Service Pack 1.

Understanding Templates

Templates are part and parcel of the Virtuozzo philosophy because they provide a way of sharing resources among lots of Virtual Private Servers, thus enabling huge savings in terms of disk space and memory. All Virtuozzo templates are divided into OS templates and application templates. *OS templates* are used to create new Virtual Private Servers. In Virtuozzo 3.5, only the Windows Server 2003 OS template can be used for creating new VPSs. *Application templates* are added to VPSs after the latter have been created; more than one application template may be added to one and the same VPS. Examples of application templates are the *msde*, *openssh*, *Plesk* templates, or a template with any other application (possibly more than one application in a single template) not included into the OS template for some reason.

Note: The Windows Server 2003 OS template installed on the Node and used to create new VPSs can be updated like any other application template by installing the corresponding OS updates for this template.

Let us take, for example, the *Plesk* application template, representing the Plesk comprehensive server management software. It is created by SWsoft on the basis of the original Plesk application. When you install this application template in Virtuozzo, Virtuozzo creates the `C:\vz\Templates\Plesk\` directory containing all the application files that can be shared among Virtual Private Servers. When the template is added to a VPS, it contains only special placeholders (*stubs*, in Virtuozzo terminology) of the necessary template files. These stubs occupy very little space on the hard disk, the size of the stub files being 0 bytes. They are situated in the so-called *private area* of the VPS. The corresponding directory is `C:\vz\private\. The private area of a VPS contains not only stubs, but also those files that have been changed by the VPS user and all the private VPS files.`

Note: During the Virtuozzo installation, the `Templates` subdirectory is automatically created in the directory you specify for storing all VPS data. By default, the `C:\vz\` directory is used. However, you may define another path for this directory.

Thanks to the fact that the real application files are written to the hard disk only once, gigabytes of disk space are saved that would be lost if the application were installed separately into each and every VPS. Moreover, the application is also loaded only once into the Node memory, so memory savings are also tangible.

Thus, in order to add a template application to any number of VPSs, you should perform the following steps:

- 1 Install the Virtuozzo template on the Hardware Node. Upon installation, the corresponding `C:\vz\Templates\application_name\` directory is created on the Hardware Node in order to enable sharing common application files among VPSs.
- 2 Add the installed template to any number of Virtual Private Servers of your choice.

All these steps can be performed by using *VZMC*, *VZCC*, or by means of the command line tools.

It goes without saying that in case you want to install an application in only one VPS, there is no need in working with templates: you can work inside the corresponding VPS as well.

VZMC Overview

Virtuozzo Management Console (VZMC) is a remote management tool for Virtuozzo with graphical user interface. It is intended to be installed on the administrator's computer and allows the administrator to control multiple Hardware Nodes, to manage all their Virtual Private Servers, and to monitor the system. The main window of VZMC consists of two parts: the tree pane on the left and the view pane on the right.

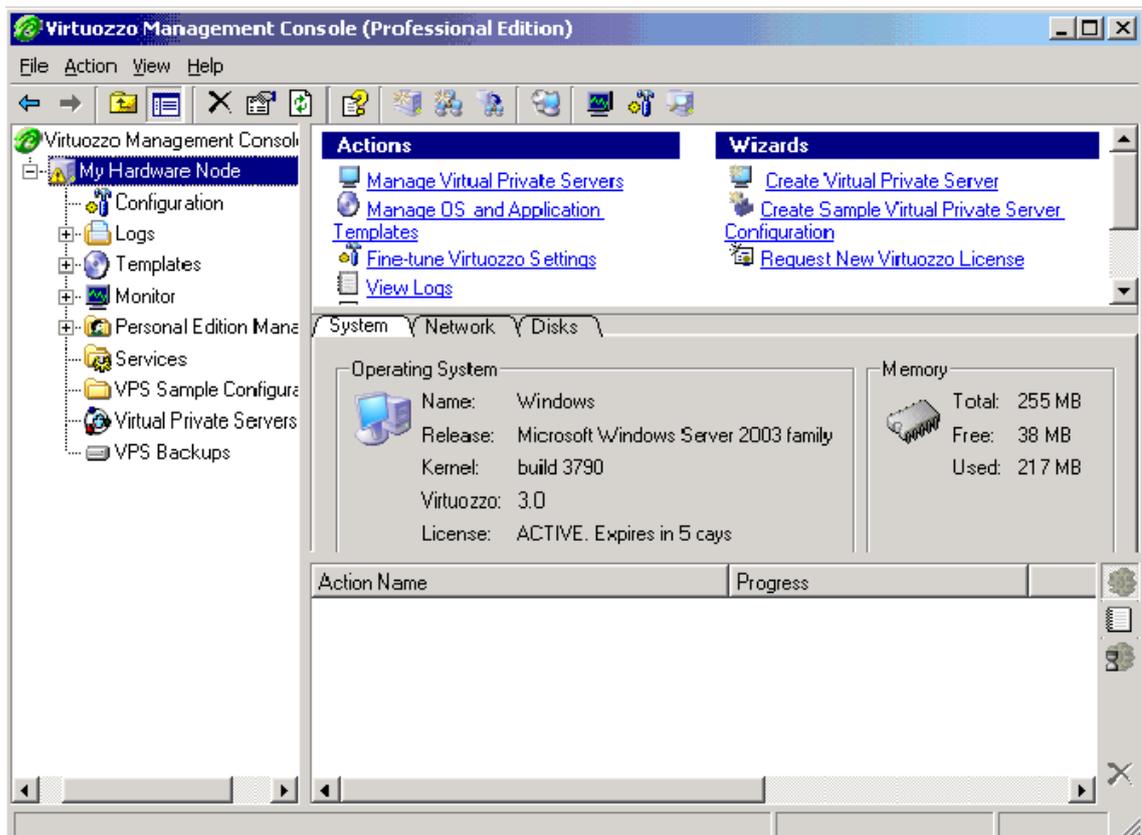


Figure 3: VZMC Main Window

There is a list of Hardware Nodes in the tree pane. The Hardware Node subtree contains a number of items providing convenient access to various aspects of the Hardware Node management, e.g. **Configuration**, **Logs**, etc. The contents of the view pane depend on the item selected in the tree pane.

VZMC uses a typical client/server architecture. The client VZMC program runs on Microsoft Windows 2000/XP/2003 or Linux. The client application with the graphical user interface connects to the Virtuozzo Agent software, which is running in the special Service VPS on the Hardware Node. Virtuozzo Agent communicates with the client via the well-documented open VZAgent XML API and controls the Hardware Node itself and its Virtual Private Servers.

Note: For more information on Virtuozzo Agent and on how to access its services by using XML, please turn to the **VZAgent Developer's Guide** and the **Getting Started With VZAgent SOAP** guide shipped with Virtuozzo.

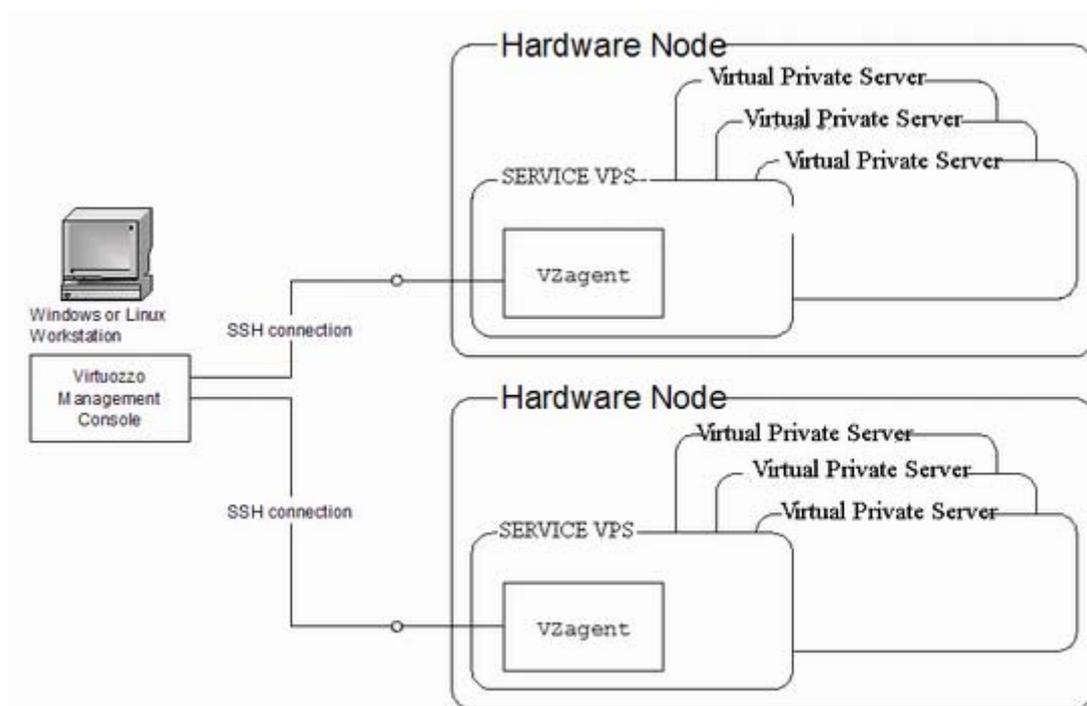


Figure 4: VZMC Network Architecture

The client may control multiple Hardware Nodes simultaneously by connecting to multiple Virtuozzo Agents. As the communications between the client and Virtuozzo Agents are secure, the VZMC workstation may be located virtually anywhere on the net.

More detailed information on the VZMC installation, licensing, and functioning is provided in the *Installing Virtuozzo Management Console* chapter of the *Virtuozzo 3.5 for Windows Installation Guide*.

VZMC Restrictions

Though Virtuozzo Management Console is considered the primary tool for administering Virtuozzo and allows you to perform most administrative tasks on your Hardware Nodes and inside Virtual Private Servers, it does not have graphical counterparts of all the Virtuozzo command line utilities.

Among such utilities are the following:

`vzctl restart` - used to consecutively perform the stopping and starting of the corresponding VPS;

`vzexport` - used to back up the given VPS to some file on the Hardware Node;

`vzimport` - used to restore the backed up VPS to its original state;

`vzcache` - used to scan the specified Virtual Private Servers for common files and cache these files in the Hardware Node template area;

`vzls cache` - used to display a list of cache directories created by the `vzcache` utility;

`vzuncache` - used to copy the regular files from the specified cache directory on the Hardware Node back to the private area of the specified VPS.

On the other hand, all operations that can be performed in VZMC can also be performed by means of Virtuozzo command line utilities. Detailed information on all Virtuozzo utilities is provided in the [Reference](#) chapter.

VZCC Overview

Virtuozzo Control Center (VZCC) is designed for Hardware Node administrators and provides you with the ability to manage a particular Hardware Node and all Virtual Private Servers residing on it with the help of a standard Web browser on any platform. A list of supported browsers is given below:

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

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

In the current version of Virtuozzo, you are able to perform the following main operations on the Hardware Node and in the VPS context by using VZCC:

- View and install Virtuozzo licenses;
- Create new Virtual Private Servers;
- Manage VPS backups;
- Edit the VPS hostname, IP address, and DNS server parameters;
- Manage VPS applications;
- Manage VPS configuration templates;
- Manage both VPS groups and individual VPSs;
- Manage and monitor Hardware Node and VPS resources;
- Start, stop, and restart certain services inside the VPS;
- View the processes currently running on the Node and inside Virtual Private Servers and send signals to them;
- View the Virtuozzo logs;
- Customize the VZCC interface, etc.

Note: Detailed information on Virtuozzo Control Center is given in its comprehensive online help system and the [VZCC Administrator's Guide](#) delivered with VZCC.

VPS Administrators' Tools

Wherever Virtuozzo is applied, there are people that are supposed to be administrators of particular VPSs only, with no access rights to Hardware Nodes as such. This is only but natural as it corresponds directly to the concept of virtualization technology. Such people can be subscribers to a hosting provider, university students, administrators of a particular server within an enterprise, etc. Personal VPSs can be managed with the help of Virtuozzo Power Panels (VZPP). VZPP is a means for administering personal VPSs thru a common browser - Internet Explorer, Mozilla, and others. It allows VPS administrators to:

- Start, stop, or restart the VPS;
- Back up and restore the VPS;
- Change the Administrator password of the VPS;
- Start, stop, or restart certain services inside the VPS;
- View the processes currently running in the VPS and send signals to them;
- View the current resources consumption and resources overusage alerts;
- Connect to the VPS by means of RDP;
- View the system logs;
- Customize the VZPP interface, etc.

Access rights to administer particular VPSs by means of VZPP are determined by the Hardware Node administrator. The **Setting VZCC/VZPP to Work** section provides instructions on how to control access rights to particular Virtual Private Servers thru VZPP.

Note: Apart from VZPP, VPS administrators are able to use the standard Windows Remote Desktop Connection (RDP) or MS Terminal Service Client (MS TSC) to connect to their VPSs and work inside them.

Understanding Licensing

Running Virtuozzo 3.5 for Windows involves dealing with a number of licenses. Here we will try to make an overview of all these licenses - either those issued by SWsoft directly or related to the Windows Server 2003 operating system.

All the licenses can be divided into two groups:

- Licenses that are to be installed on the Hardware Node. This group includes a standard Windows Server 2003 license, a Virtuozzo license, and a VZCC license. While the first two licenses are mandatory and required for installing Virtuozzo and starting to work with it, the latter one is needed only in case you are going to use Virtuozzo Control Center for managing your Node and Virtual Private Servers.
- Licenses that can be installed on a computer other than the Hardware Node. Currently, there is only one license in this group - a VZMC license. You should obtain this license to use Virtuozzo Management Console - a Virtuozzo tool facilitating the management of your Hardware Nodes and Virtual Private Servers.

First of all, Virtuozzo is installed on computers running Windows Server 2003 (English, German, French, Spanish, or Japanese Standard or Enterprise Edition). Before the Virtuozzo 3.5 installation you should install and activate a licensed Windows Server 2003 operating system on your computer. Besides, while running the Virtuozzo initial configuration wizard, you will be prompted to use the same licensed CD with the Windows Server 2003 OS to add the necessary binary files to the Hardware Node to make the Windows Server 2003 OS template fully functional.

Another license is needed to be able to start using Virtuozzo 3.5 itself. To this effect, you should load a special Virtuozzo license to the Hardware Node after installing Virtuozzo 3.5 on the computer with Windows Server 2003. Every Hardware Node shall have its own Virtuozzo license file. License files (or simply “licenses”) are issued by SWsoft and define the number of VPSs the Node may run. One license file can contain one or several Virtuozzo licenses; in the latter case, the license file can be uploaded to several Hardware Nodes. Licenses can be time-limited or permanent. Virtuozzo licenses have a start date and, if they are time-limited, may also have an expiration date specified in them. You shall have to set up your system clock correctly; otherwise, the license validation may fail.

If you plan to use VZMC and/or VZCC to manage your Hardware Node(s) and VPSs (which is normally the case), you should additionally have valid VZMC and/or VZCC license serial numbers to enter them the first time you launch Virtuozzo Management Console or log in to Virtuozzo Control Center. However, a VZCC license is uploaded to the Hardware Node and allows you to manage your Node and VPSs from any computer by means of a standard browser, whereas a VZMC license is installed on a separate workstation (it can be the Node itself) where Virtuozzo Management Console is to be run.

Thus, before installing Virtuozzo 3.5, make sure you have the mandatory licenses to run:

- Windows Server 2003 (English, German, French, Spanish, or Japanese Standard or Enterprise Edition) and
- Virtuozzo 3.5 itself

and two additional licenses if you wish to use:

- Virtuozzo Management Console and

- Virtuozzo Control Center

for managing your Nodes and Virtual Private Servers.

Hardware Node Availability Considerations

Hardware Node availability is more critical than the availability of a typical server. Since it runs multiple Virtual Private Servers providing a number of critical services, Hardware Node outage might be very costly. Hardware Node outage can be as disastrous as the simultaneous outage of a number of servers running critical services.

In order to increase Hardware Node availability and security, we suggest you follow the recommendations below:

- Use RAID storage for critical VPS private areas. Do prefer hardware RAID, but software mirroring RAID might suit too as a last resort.
- Do not run software on the Hardware Node itself. Create special Virtual Private Servers where you can host necessary services such as FTP, IIS, and so on. Virtuozzo does not need any standard Windows Server 2003 services to be run on the Node. Therefore, we recommend that you disable all the services on the Node except for the Virtuozzo services.
- Use firewalls to make the Hardware Node accept connections from a pre-defined set of IP addresses only.
- Do not create users on the Hardware Node itself. You can create as many users as you need in any Virtual Private Server. Remember: compromising the Hardware Node means compromising all Virtual Private Servers as well.
- Do not remove any of the components installed on the Hardware Node. Removing an installed component (for example, Internet Information Server), even if you do not use it, might cause Virtuozzo to malfunction.

CHAPTER 3

Operations on Virtual Private Servers

Virtual Private Server (or *VPS*) is functionally identical to an isolated standalone server, having its own IP addresses, processes, files, Active Directory domain users, its own configuration files, its own applications, Dynamic Link Libraries (DLLs), system libraries, registry, and so on. Virtual Private Servers share the same *Hardware Node* and the same OS kernel. However, they are isolated from each other. A Virtual Private Server is a kind of ‘sandbox’ for processes and users.

Virtual Private Servers behave just like isolated stand-alone servers:

- Each VPS has its own processes, users, files and provides full administrative access;
- Each VPS has its own IP addresses, port numbers, filtering and routing rules;
- Each VPS can have its own configuration for the system and application software, as well as its own versions of system libraries. It is possible to install or customize software packages inside a VPS independently from other VPSs or the host system. Multiple distributions of an application can be run on one and the same Windows computer.

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Creating New VPS

This section guides you through the process of creating and configuring a Virtual Private Server. We assume that you have successfully installed Virtuozzo and the Windows Server 2003 OS template and created the Service VPS. If you have not, please turn to the **Virtuozzo 3.5 for Windows Installation Guide** first.

Before You Begin

Before you start creating a Virtual Private Server, you should:

- Check that the Hardware Node is visible on your network. You should be able to connect to/from other hosts. Otherwise, your VPSs will not be accessible from other computers.
- Check that you have at least one IP address per a VPS and the addresses belong to the same network as the Hardware Node or routing to the Virtual Private Servers has been set up via the Hardware Node.

Note: You can use private addresses for the Hardware Node itself.

Choosing VPS ID

Every Virtual Private Server has a numeric ID, also known as VPS ID, associated with it. The ID is a 32-bit integer number beginning with zero and unique for a given Hardware Node. When choosing an ID for your VPS, please follow the simple guidelines below:

- ID 0 is used for the Hardware Node itself. You cannot and should not try to create a VPS with ID 0.
- This version of Virtuozzo uses ID 1 for the Service VPS.
- Virtuozzo reserves the IDs ranging from 0 to 100. Though Virtuozzo 3.5 uses only IDs 0 and 1 from them, the next version might use additional Virtual Private Servers IDs for internal needs. *To facilitate upgrading, please do not create VPSs with IDs below 101.*

The only strict requirement for a VPS ID is to be unique for a particular Hardware Node. However, if you are going to have several computers running Virtuozzo, we recommend assigning different VPS ID ranges to them. For example, on Hardware Node 1 you create VPSs within the range of IDs from 101 to 1000; on Hardware Node 2 you use the range from 1001 to 2000, and so on. This approach makes it easier to remember on which Hardware Node a VPS has been created, and eliminates the possibility of VPS ID conflicts when a Virtual Private Server migrates from one Hardware Node to another.

Another approach to assigning VPS IDs is to follow some pattern of VPS IP addresses. Thus, for example, if you have a subnet with the 10.0.x.x address range, you may want to assign the 17015 ID to the VPS with the 10.0.17.15 IP address, the 39108 ID to the VPS with the 10.0.39.108 IP address, and so on. This makes it much easier to run a number of Virtuozzo utilities eliminating the necessity to check up the VPS IP address by its ID and similar tasks. You can also think of your own patterns for assigning VPS IDs depending on the configuration of your network and your specific needs.

Before you decide on a new VPS ID, you may want to make sure that no VPS with this ID has yet been created on the Hardware Node. It is enough to click on the name of your Hardware Node in the left pane, and then on the **Virtual Private Servers** item. The VZMC right pane will display a list of existing VPSs on the Node:

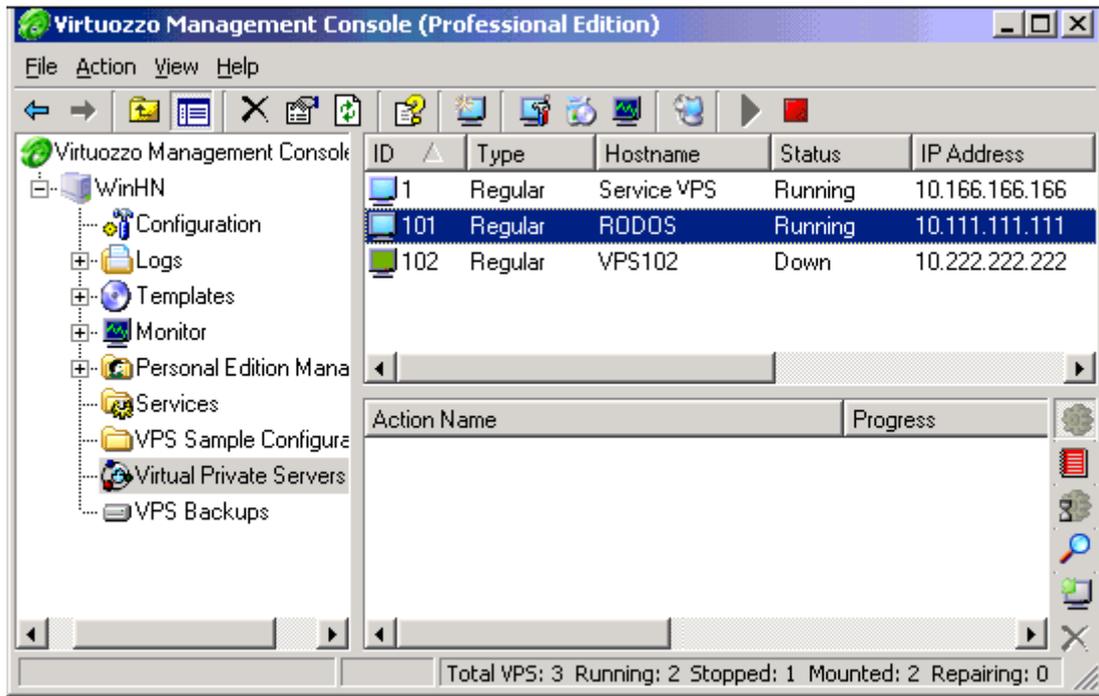


Figure 5: VZMC - Viewing Existing VPSs

You can see that currently the Service VPS with ID 1 and regular VPSs 101 and 102 exist on the Hardware Node.

Creating VPS

VZMC uses one wizard to create and initially configure a Virtual Private Server. You can launch the **Create New Virtual Private Servers** wizard by selecting the **Virtual Private Servers** item under the corresponding **Hardware Node** name in the VZMC left pane and choosing the **Create Virtual Private Server** option on the **Action** menu:

Create New Virtual Private Servers

Specify Basic Virtual Private Server Parameters

The wizard needs to know basic parameters for Virtual Private Server creation, such as sample configuration to use, number of VPSs to create, their IDs, etc

Please choose one of sample configuration as a basis to create your Virtual Private Servers:

Name	OS Template	Description
basic	w2k3	Standard VPS
MSDE	w2k3	Configuration file for running Microsoft ...
Oracle	w2k3	Configuration file for running Oracle se...
Plesk	w2k3	Configuration file for running Plesk 7.0
SharePoint	w2k3	Configuration file for running SharePoi...

Number of Virtual Private Servers to create: 1

Virtual Private Server ID

Assign Virtual Private Server ID automatically from the pool at the Master node.

Virtual Private Server ID start from: 101

Hostname

Assign hostname automatically

Hostname:

Administrative account password

Password:

Confirm password:

Help < Back Next > Finish Cancel

Figure 6: VZMC - Choosing Sample Configuration File

The main VPS parameters, including the templates and resource management parameters, can be retrieved on the basis of the VPS configuration sample indicated in the very first option (detailed information on VPS configuration samples is provided in the **Managing VPS Resources Configurations** section (on page 103)) and the cluster settings, if the given **Hardware Node** belongs to a cluster of **Nodes**. To know more about clusters, turn to the **Managing Node Clusters** section of the **Managing Hardware Nodes** chapter. In particular, the **Assign Virtual Private Server ID automatically...** checkbox, if selected, tells VZMC to retrieve a VPS ID(s) from the cluster database.

The **Hostname** group of options on the first page of the wizard shown above might help you make use of your DNS server. If your DNS server has records for the IP addresses that will be assigned to the newly-created VPSs, select the **Assign hostname automatically** radio button. The hostnames will be assigned on the basis of DNS records found. Selecting the **Hostname** radio button allows you to manually set a hostname for the Virtual Private Server. In case of creating several VPSs at once, you should use the `$VPSID` placeholder which is automatically replaced with the ID of the VPS being created. For example, if you are creating Virtual Private Servers in the range from 101 to 110 and enter `MyVPS$VPSID` into the **Hostname** field, your VPSs will have the following hostnames: `MyVPS101`, `MyVPS102`, ..., `MyVPS110`.

You should set the **Administrator** password for the VPS being created on the first page of the wizard by typing the desired password in the **Password** and **Confirm password** fields. You will need this password in future to connect to the VPS by means of Virtuozzo Power Panels (VZPP) or by using the standard Microsoft Terminal Services Client/Windows Remote Desktop Connection applications. If you are creating several Virtual Private Servers, all VPSs will be given the same **Administrator** password. However, you can change the password for each Virtual Private Server at a later time (see page 69).

Pressing the Next button displays the window where you should specify VPS network settings:

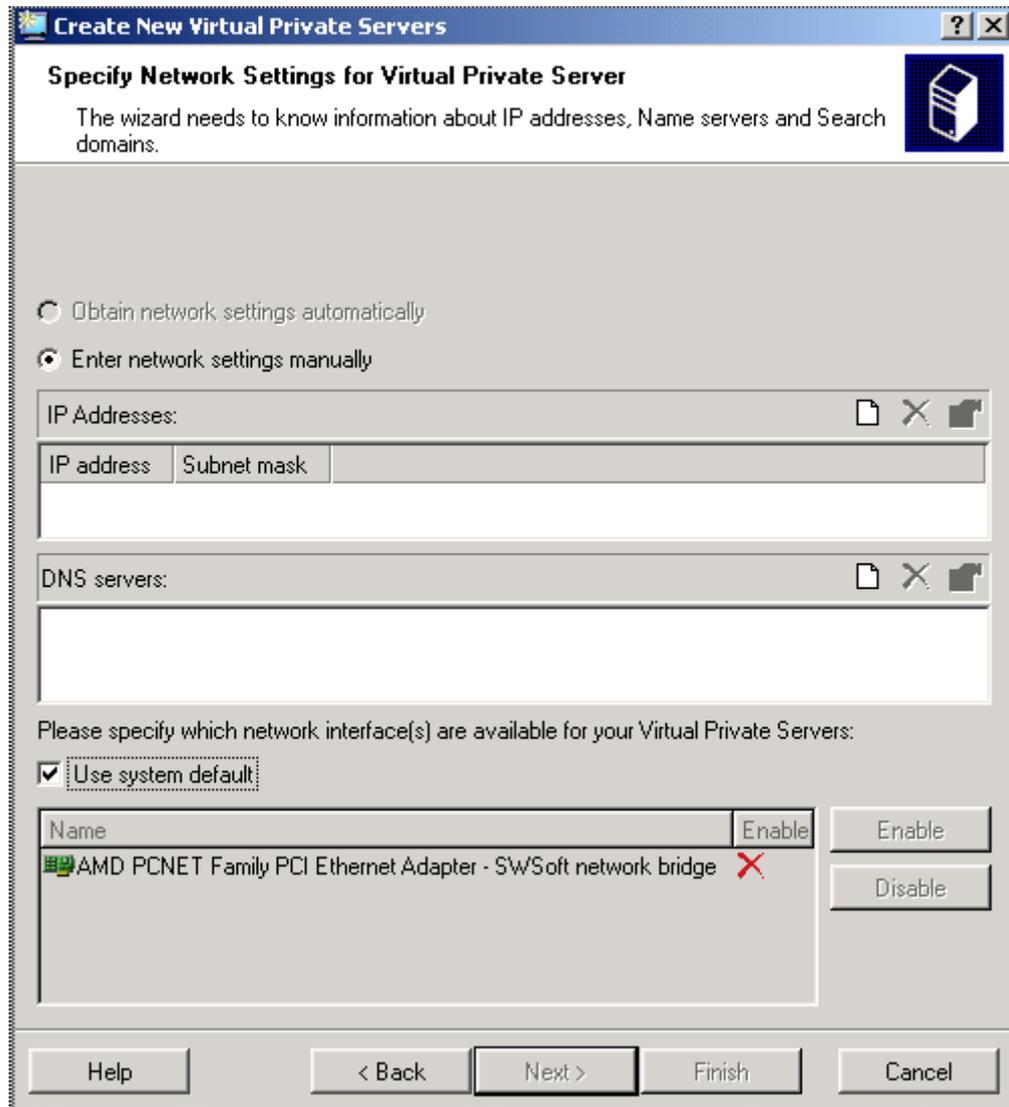


Figure 7: VZMC - Specifying Network Settings

On this screen, you should use the provided **Add**, **Delete**, and **Edit** icons for the corresponding operations on VPS IP addresses, their subnet masks, and DNS servers:

- Each VPS is bound to have at least one IP address assigned to it, so you cannot leave the **IP Addresses** field blank. In the **Subnet mask** field, you should additionally specify a subnet mask to define to what subnetwork the VPS being created will belong. We strongly recommend that you specify the same subnet for all Virtual Private Servers on all your Nodes. In this case you will not have to manually change the VPS IP address(es) every time you migrate a VPS to another Node.

Note: Make sure that the IP address you wish to assign to the Virtual Private Server differs from that assigned to your Hardware Node.

- You may indicate one or more DNS servers that this VPS is supposed to use in the **DNS servers** field or leave it blank.

In case there are several network interface cards installed on the Hardware Node, Virtuozzo allows you to specify the preferred network adapter for the Virtual Private Server by clearing the **Use system default** checkbox, selecting the corresponding network adapter, and clicking on the **Enable** button. This network adapter will be used to connect the VPS to the network, i.e. to handle the whole network traffic for this VPS. By default, all network adapters on the Node are used to control the network flows of the Virtual Private Server. Detailed information on how to manage network interface cards on the Node is provided in the **Changing Network Adapter for VPS** section (on page 191).

The **Obtain network settings automatically** radio button becomes available only in case your Hardware Node belongs to a cluster of Nodes. This option allows you to automatically select and assign an IP address to your VPS from the range of IP addresses specified in the cluster. Detailed information on clusters is provided in the **Managing Node Clusters** section.

You can click on the **Finish** button on this step of the wizard and create the VPS with the configuration parameters specified in the configuration sample you chose on the first step of the wizard. If you do not rely on any configuration sample, press the **Next** button instead of **Finish**. In this case you will have to go through a number of steps of the wizard and set all the parameters of the new VPS separately. However, you can click **Finish** on every of the following steps of the wizard to start creating the VPS. All the pages of the wizard are self-explanatory, so there is no need in dwelling upon them here in detail. You have the possibility to choose the application templates to be added to the VPSs, to set the path to the VPS private area, to configure Quality of Service parameters, to specify whether the VPS is to be started on the Hardware Node boot, to enable the Quality of Service packet scheduler and network browsing for the VPS, and to allow the offline management for the VPS for it to be directly managed by its Administrator from any browser at the VPS IP address. Besides, you can save all the defined parameters as a configuration sample file to be used in future for creating new Virtual Private Servers on its basis. The information on Quality of Service parameters and VPS samples is provided in the **Managing Resources** chapter (on page 93). Please consult it to gather more understanding of these topics.

Creating a new Virtual Private Server may take some time. You can see the progress in the **Actions** pane.

After you have created, for example, a VPS with ID 101, you can see it in the right pane of the VZMC window:

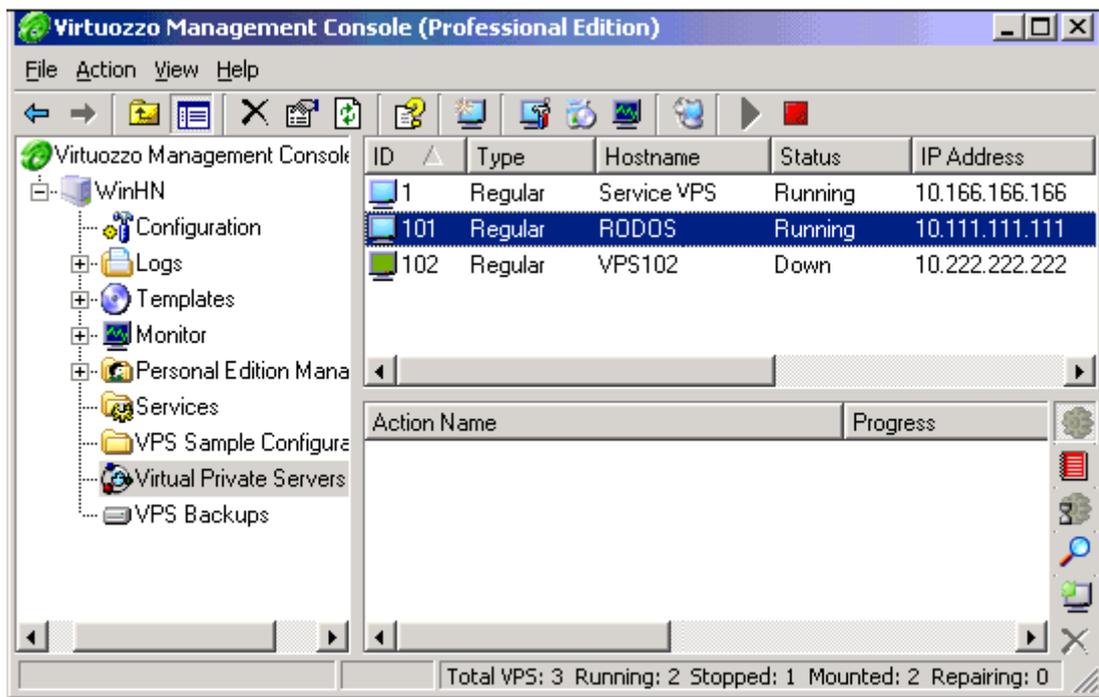


Figure 8: VZMC - Viewing Created VPS

You can also use the `vzctl create` command to create a new VPS. Detailed information on this command is provided in the Reference chapter.

Starting, Stopping, and Querying Status of VPS

When a Virtual Private Server is created, it may be started up and shut down like an ordinary computer. In VZMC, you can see the status of all the Virtual Private Servers of the given Hardware Node simply by selecting the **Virtual Private Servers** item under the corresponding Node.

There are two kinds of Virtual Private Servers in the **Virtual Private Servers** table. You may change the properties of and control those that are marked with grey monitor icons. The Virtual Private Servers marked with pink monitor icons provide critical services for Virtuozzo (for example, the Service VPS). You cannot change the properties of or stop such Virtual Private Servers.

To start or stop one or more Virtual Private Servers, right-click it (them) in the **Virtual Private Servers** table in the right pane and choose **Start/Stop** on the context menu:

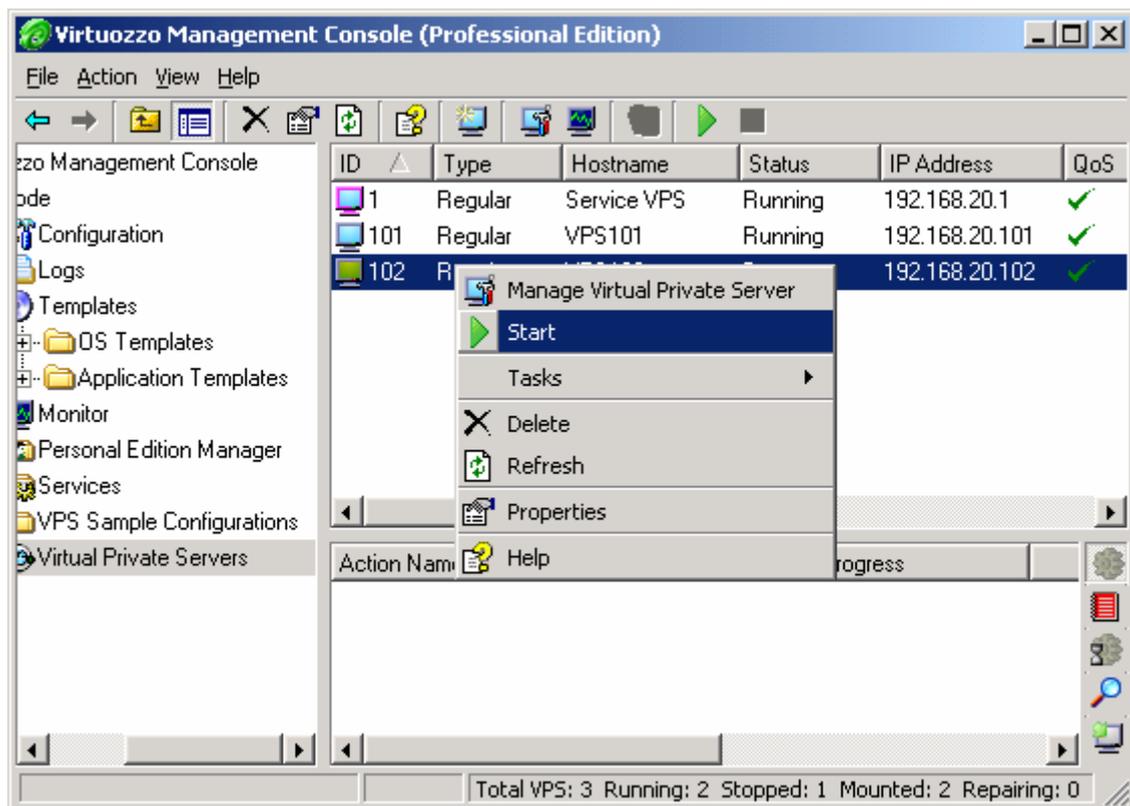


Figure 9: VZMC - Starting VPS

You can use CTRL+Click to select or deselect an entry, SHIFT+Click to select a range of Virtual Private Servers, CTRL+A to select all Virtual Private Servers. Then press the **Start** or **Stop** button on the toolbar or select **Start** or **Stop** on the **Action** menu.

When a VPS is being started or stopped, all the typical operations are performed that happen during the startup and shutdown of the Windows operating system on a standalone computer. Therefore, starting or stopping a considerable number of Virtual Private Servers may take a rather long run. The progress is displayed in the **Actions** pane.

In the command line, you can perform all the aforementioned operations by using the `vzctl` utility. Detailed information on this utility is provided in the **Reference** chapter.

Note: Before stopping a VPS, make sure that there are no users connected to the VPS by means of Microsoft Terminal Services Client or Remote Desktop Protocol. To this effect, open Virtual Private Server Manager of the corresponding VPS, select **Monitor** --> **QoS**, and check that the **Number of TS sessions** parameter value is equal to 0.

Accessing VPS

There are a number of ways for you to access a VPS as you would normally access a standalone computer:

- Launching the standard Microsoft Terminal Services Client (MS TSC) application.
- Launching the standard Windows Remote Desktop Connection application.
- Accessing the files inside the VPS by the Windows file sharing protocol.
- Using the Citrix MetaFrame XP application (<http://www.citrix.com>).

In all these cases, the access is ensured by using the IP address or hostname of the VPS and the administrator's or other users' credentials entered when creating and maintaining the given VPS.

Note: Please do not install and run Microsoft Terminal Server and Citrix MetaFrame XP inside Virtual Private Servers. You are able to open terminal sessions with VPSs and use Citrix ICA clients to access VPSs thanks to the MS Terminal Server and Citrix MetaFrame XP applications installed on the Host OS, respectively. Terminal Server and Citrix MetaFrame XP installed inside a VPS are completely irrelevant and may interfere with normal VPS operation.

Terminal Services Client

Microsoft Terminal Services Client (MS TSC) is a standard Windows application to be used when connecting to any Virtuozzo-based VPS:

- 1 Launch MS TSC in the host operating system or on another computer on the network by selecting **Programs** --> **Terminal Services Client** --> **Terminal Services Client** on the Windows Start menu;
- 2 Enter the hostname or the IP address of the VPS in the **Server** field;
- 3 Press **Connect**.
- 4 A new window is launched with an invitation to provide the user name and password for logging in to the Virtual Private Server. Type `Administrator` as the user name and the Administrator's password into the corresponding fields and press **OK**.

After the logon, it is possible to change passwords, to create new users, and do all related tasks in the standard way inside the VPS.

Remote Desktop Connection

Remote Desktop Connection is a standard Windows application to be used when connecting to any Virtuozzo-based VPS by means of the Remote Desktop Protocol (RDP). The easiest way to connect to a VPS is right-clicking it in the list of VPSs and selecting **Connect via Remote Desktop** on the context menu. Naturally, the VPS must be running for this option to become available.

You may connect to the VPS from the Remote Desktop Connection (RDC) application itself:

- 1 Launch RDC in the host operating system by selecting **Programs --> Accessories --> Communications --> Remote Desktop Connection** on the Windows Start menu;
- 2 Enter the hostname or the IP address of the VPS in the **Computer** field;
- 3 Press **Connect**.
- 4 A new window is launched with an invitation to provide the user name and password for logging in to the Virtual Private Server. Type **Administrator** as the user name and the Administrator's password into the corresponding fields and press **OK**.

After the logon, it is possible to change passwords, to create new users and do all related tasks in the standard way inside the VPS.

In case of connecting to a VPS as a non-Administrator user, you should make sure that:

- 1 The user whose credentials you wish to use to log in to the VPS is created inside this VPS;
- 2 The **Remote Desktop Users** group allowing the VPS users to remotely log in to Virtual Private Servers via RDP exists inside the VPS;
- 3 The user belongs to the **Remote Desktop Users** group.

Note: The default Windows Server 2003 installation permits you to have only 2 (two) RDP/MS TSC sessions per Hardware Node opened at the same time. It means that if there are two RDP/MS TSC sessions opened simultaneously for any VPSs, you will not be able to establish an RDP/MS TSC connection to the Hardware Node itself. If you wish to be able to open more RDP/MS TSC sessions at once, you should install additional TSAL (Terminal Service Access License) licenses on the Hardware Node.

Windows File Sharing

To access VPS share folders via standard Windows clients, you should type their IP address or hostname preceded by two back slashes in the Windows command line or in the address line of Windows Explorer on the host operating system or on another computer on the network. You may optionally specify the name of the VPS itself to see what shares are available. For example:

```
\\vps103\c$  
\\192.168.20.103
```

If an authentication window is displayed, enter the appropriate user name and password for the given VPS. There must be an administrative account built in the VPS that you should know or you might have already created a number of other users inside the VPS.

Citrix MetaFrame XP

Citrix MetaFrame XP is a remote access/application publishing product built on the Citrix Systems' thin client protocol and used to connect to any Virtuozzo-based VPS. To start using Citrix to access your VPSs on the given Hardware Node, you should:

- 1 Install and enable the Terminal Services component on the Node;
- 2 Install and configure the Citrix MetaFrame XP application on the Node.

After you have successfully completed the aforementioned operations on your Hardware Node, you can use a Citrix ICA Client on the Host OS or on any other computer on the network to connect to any of your Virtual Private Servers on this Node by means of the Citrix MetaFrame XP application.

For example, if you have the Program Neighbourhood Client installed on your computer, you can select **Programs --> ICA Client --> Citrix Program Neighbourhood** on the Windows Start menu to launch the Citrix ICA Client software. In the opened window, you should then double-click the **Add ICA Connection** icon to invoke the wizard that will help you create a new ICA connection to be used to access your Virtual Private Server.

Note: Detailed information on how to install, license, configure, and operate your Citrix MetaFrame XP application is provided in the documentation available on the Citrix web site at <http://www.citrix.com/support>.

Listing VPSs

Very often you may want to get an overview of the Virtual Private Servers existing on the given Hardware Node and to get additional information about them - their IP addresses, hostnames, status, etc. In VZMC, you may display a list of all VPSs by clicking the **Virtual Private Servers** item:

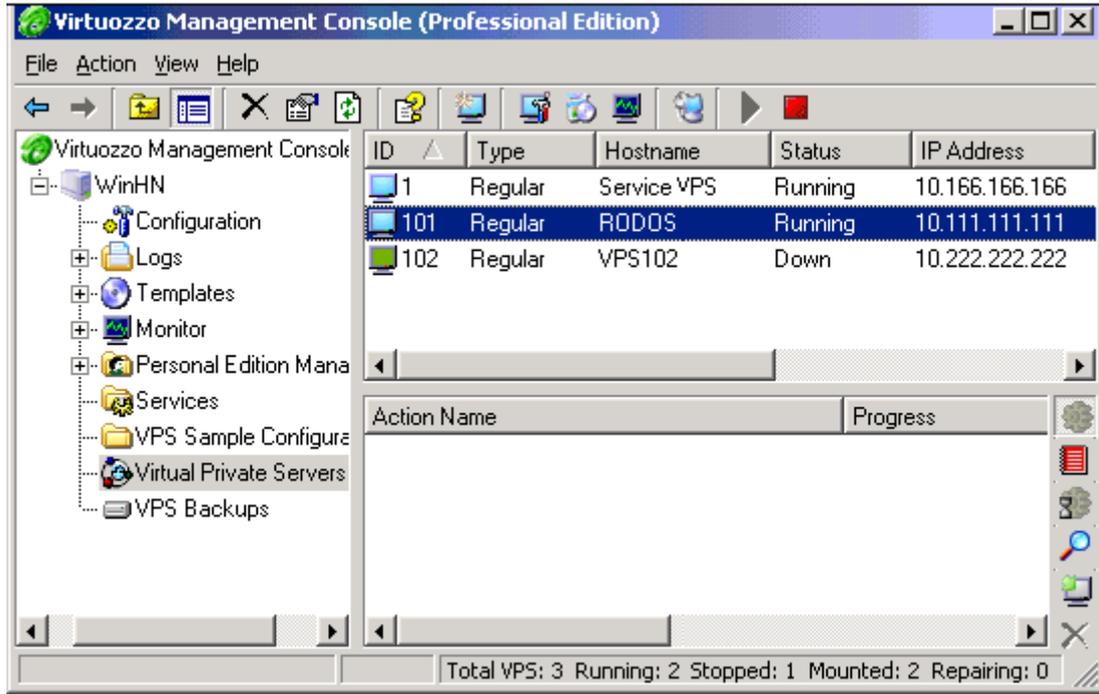


Figure 10: VZMC - Listing VPSs

You can see that currently the Service VPS with ID 1 and regular VPSs 101 and 102 exist on the Hardware Node.

To facilitate working with Virtual Private Servers, you can sort them by different parameters: their ID, type, hostname, status, IP address, etc. Just click the column with the appropriate name to put VPSs in the desired order.

You may also get a list of all VPSs present on the Hardware Node by using the `vzlist` command line utility. A full list of the `vzlist` command line switches, output, and sorting options is available in the `vzlist` subsection of the **Reference** chapter.

Backing Up and Restoring VPSs

A regular backing up of the existing Virtual Private Servers is essential for any Hardware Node reliability. It is highly recommended to set up a dedicated Node for running the backing-up utilities and storing the VPS backups (further on, the Backup Node). In a more general case, any Hardware Node can be assigned an additional role of the Backup Node.

Any Virtual Private Server is defined by its private area and configuration file. Virtuozzo allows you to back up all these components. Each backup file may be of one of the following 2 types:

- a full backup containing the whole VPS private area and its configuration file;
- an incremental backup containing only the files changed since the full backup or the previous incremental backup.

An incremental backup may prove very useful because it records only the changes since the last VPS backup and therefore is much less in size and takes much less time than the full backup. However, after several consecutive incremental backups it is recommended to create a full backup de nouveau and start the incremental backups chain from scratch.

If an incremental backup is performed, and the corresponding full backup cannot be found, a full backup is automatically performed.

Note: You can use any Hardware Node as a Backup Node irrespective of a Virtuozzo version installed on this Node. So, you can back up a VPS from the Node running the Virtuozzo 32-bit version and store it on the Node running the Virtuozzo 64-bit version and vice versa.

Backups Overview

VZMC deals with three kinds of Nodes - the *Source Nodes* (the Nodes where VPSs are hosted during their backing up); the *Backup Nodes* (the Nodes where VPS backups are stored); and the *Destination Nodes* (the Nodes where VPS backups are restored).

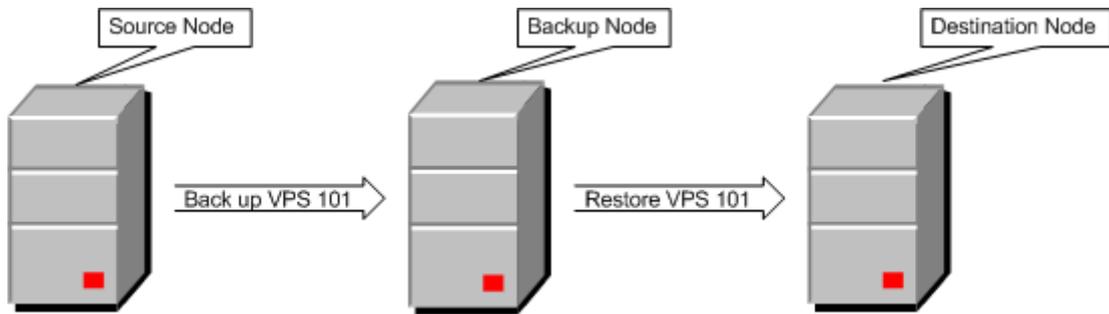


Figure 11: Backup Overview

These Nodes are singled out by their functionality only. In reality, one and the same Hardware Node may perform two or even three functions. Usually, the Source and Destination Node are represented by one and the same HN, because you will likely want the VPSs you back up to be restored to their original Node. However, setting up a dedicated Backup Node is recommended.

You should make sure that all the three Nodes are registered in VZMC before starting to work with them.

VZMC lets you perform the following backup-related functions:

- Assign the default Backup Node for the given Source Node;
- Set the default backup folder for storing VPS backups on the Backup Node;
- Back up a single VPS from the Source Node to the Backup Node;
- Back up a number of VPSs or the whole Hardware Node (i.e. all the VPSs on the given Node) to the Backup Node;
- Restore a single VPS from the Backup Node to the Destination Node;
- Restore separate files from the VPS backup on the Backup Node to the Destination Node;
- Restore a number of VPSs or the whole Hardware Node from the Backup Node;
- Directly manage the Backup Nodes;
- Search the backup of a given VPS from the Source Node across all the Backup Nodes.

Assigning Default Backup Node

When you are backing up Virtual Private Servers from a Source Node, you shall always specify on what Node the resulting backups should be placed, i.e. the Backup Node. The **Default Backup Node** window allows you to assign the default Backup Node for the given Source Node, i.e. for the Node for which the window has been invoked. To display this window, right-click the respective Source Node and choose **Backup --> Set Default Backup Node** on the context menu.

The window presents a list of Nodes registered in VZMC together with their IP addresses. If the default Backup Node already exists for the given Source Node, it is selected in the table. You should select the Node you wish to be the default Backup Node for the given Source Node and press **OK**. The assignment of the default Backup Node brings about the following effects:

- When backing up Virtual Private Servers from the corresponding Source Node, you will be automatically suggested to place the backups onto the default Backup Node. This facilitates keeping track of those places where various backups are stored.
- When a VPS administrator backs up their Virtual Private Server by means of Virtuozzo Power Panels (VZPP) or Virtuozzo Control Center (VZCC), the corresponding backup is automatically placed on the default Backup Node.

There are no restrictions as to what Hardware Node may be the default Backup Node; it may even be the Source Node itself. In the latter case, the VPS backups will be placed on the same Node where the corresponding Virtual Private Servers are hosted. The only thing you have to ensure is that the default Backup Node has sufficient disk space for housing multiple backups.

Setting Default Backup Location

VZMC allows you to change the backup folder on the Backup Node defined during the Virtuozzo installation and used to store all VPS backups. The VPS backups to be stored in this folder can be created in one of the following ways:

- By means of VZMC and VZCC/VZPP if there is no default Backup Node or the given Hardware Node is to serve as one. In the latter case, this directory will be used to store the VPS backups from all Hardware Nodes registered in VZMC.
- By using the `vzexport` Virtuozzo backup utility (see the Reference chapter for the description of this utility), or
- By using the `vzbackup` Virtuozzo utility (see the Reference chapter for detailed information on this utility).

To set another backup folder to be used as the default one for storing VPS backups, you should right-click the corresponding Hardware Node in the left pane of the VZMC main window and select **Backup --> Set Default Backup Location** on the context menu. The following window is displayed:

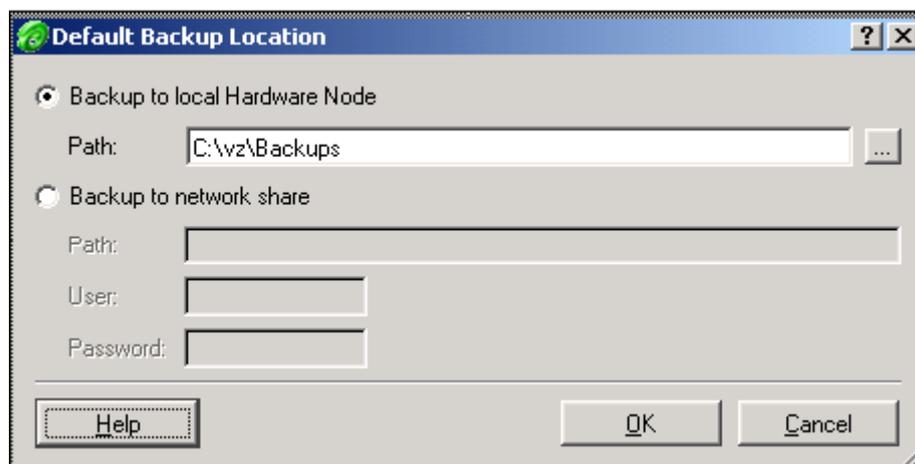


Figure 12: VZMC - Setting Default Backup Location

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

- Select the **Backup to local Hardware Node** radio button to specify a backup folder on one of the Backup Node local disk drives. To set a new backup folder, you should type its full path on the Node in the **Path** field or click on the ... button and select the desired folder in the displayed window.
- Select the **Backup to network share** radio button to specify a backup folder on a network share, i.e. on a Backup Node network drive. To this effect, you should enter the full path to the folder on the network drive in the **Path** field. If the network drive where your backup folder is to be located is password-protected, you should specify the user name and password to access this share in the **User** and **Password** fields, respectively.

After you have specified a new folder for storing VPS backups, click **OK** for the changes to take effect.

Note: While defining the backup folder, make sure that the disk drive where this folder is to be located has sufficient disk space for housing multiple VPS backups.

Backing Up Single VPS

To back up a Virtual Private Server from the Source Node to the Backup Node, do the following:

- 1** Expand the *Source Node* item in the left pane of the VZMC main window and click the **Virtual Private Servers** item to open the Virtual Private Server manager window.
- 2** Select the Virtual Private Server you wish to back up. You may use the CTRL and SHIFT keys for selecting a number of VPSs.
- 3** Click the right mouse button and select **Backup --> Back Up Virtual Private Server** on the context menu.

The Back Up Virtual Private Server wizard opens:

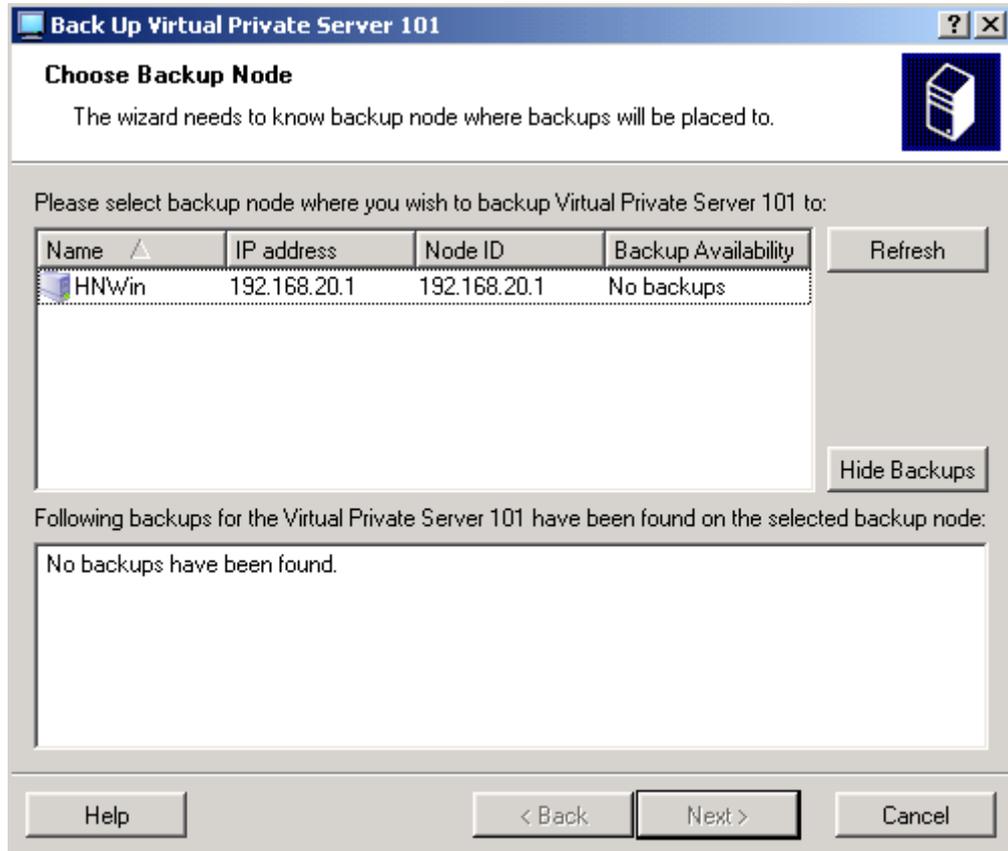


Figure 13: VZMC - Backing Up VPSs Wizard

In this wizard you should:

- Select the Backup Node. This Node is the place where the VPS backups will be stored. The only requirement for this Node is that it should be registered in VZMC; it may even be the Source Node itself. Often, it will be a dedicated Backup Node.
- In the next window, specify the backup type. It may be full or incremental. Detailed information on backup types is provided in the **Backing Up and Restoring Virtual Private Servers** section (on page 45). If you are backing up a single VPS, and no backup of this VPS has been found on the Backup Node, this step is omitted, and a full backup is automatically created.
- On the **Review Virtual Private Server Backup Settings** page:
 - Stop the VPS(s) for the time necessary for their backing up or leave them running. Selecting the **Stop Virtual Private Server before backup** option forces the VPS(s) to be stopped. In this case, if a client tries to access the VPSs during their downtime, a temporary "busy" page is shown. If this checkbox is cleared, the VPSs are backed up while they are running, which is better, on the one hand, but does not guarantee the VPSs consistency, on the other.
 - Do not stop the VPSs backup even if any errors appear (the **Don't stop on errors** checkbox is selected) or break the backup process should any malfunction occur (the checkbox is cleared).

Backing Up Group of VPSs

To back up several or all VPSs from a single Source Node, right-click the **Virtual Private Servers** item under the corresponding *Source Node* and select **Tasks --> Back up Virtual Private Servers** on the pop-up menu. The **Back Up Virtual Private Servers** wizard is displayed. In this wizard you should:

- Select the Virtual Private Servers from the Source Node you wish to back up. By default, all the VPSs are selected, but you may exclude certain VPSs from the backup.
- On the next page of the wizard, select the Backup Node. This Node is the place where the VPS backups will be stored. The only requirement for this Node is that it should be registered in VZMC; otherwise it will not be displayed on this page. It may even be the Source Node itself. Often, it will be a dedicated Backup Node.
- On the Review page:
 - Stop the VPS(s) for the time necessary for their backing up or leave them running. Selecting the **Stop Virtual Private Server before backup** option forces the VPS(s) to be stopped. In this case, if a client tries to access the VPSs during their downtime, a temporary "busy" page is shown. If this checkbox is cleared, the VPSs are backed up while they are running, which is better, on the one hand, but does not guarantee the VPSs consistency, on the other.
 - Do not stop the VPSs backup even if any errors appear (the **Don't stop on errors** checkbox is selected) or break the backup process should any malfunction occur (the checkbox is cleared).
 - Force a full backup for all the VPSs (the **Force full backup** checkbox on the Review page is selected), or allow an incremental backup for those VPSs whose full backups are already present on the Backup Node (the checkbox is cleared).

Another way of backing up a number of VPSs from the given Source Node is the following:

- 1 Expand the *Source Node* item in the left pane of the VZMC main window and click the **Virtual Private Servers** item to open the Virtual Private Servers manager window.
- 2 Select the Virtual Private Servers you wish to back up. Use the CTRL and SHIFT keys for selecting a number of VPSs.
- 3 Click the right mouse button and select **Back up Virtual Private Servers** on the context menu.

The aforementioned **Back Up Virtual Private Servers** wizard is opened directly at the second page, because the first page (**Choose Virtual Private Servers to Back Up**) becomes unnecessary.

Restoring Single VPS

To restore a Virtual Private Server from its backup, do the following:

- 1 Expand the *Source Node* item in the left pane of the VZMC main window and click the **Virtual Private Servers** item to open the Virtual Private Servers manager window.
- 2 Select the Virtual Private Server the backup of which you wish to restore from the Backup Node.
- 3 Click the right mouse button and select **Backup --> Restore Virtual Private Server** on the context menu.

The Restore Virtual Private Server wizard opens:

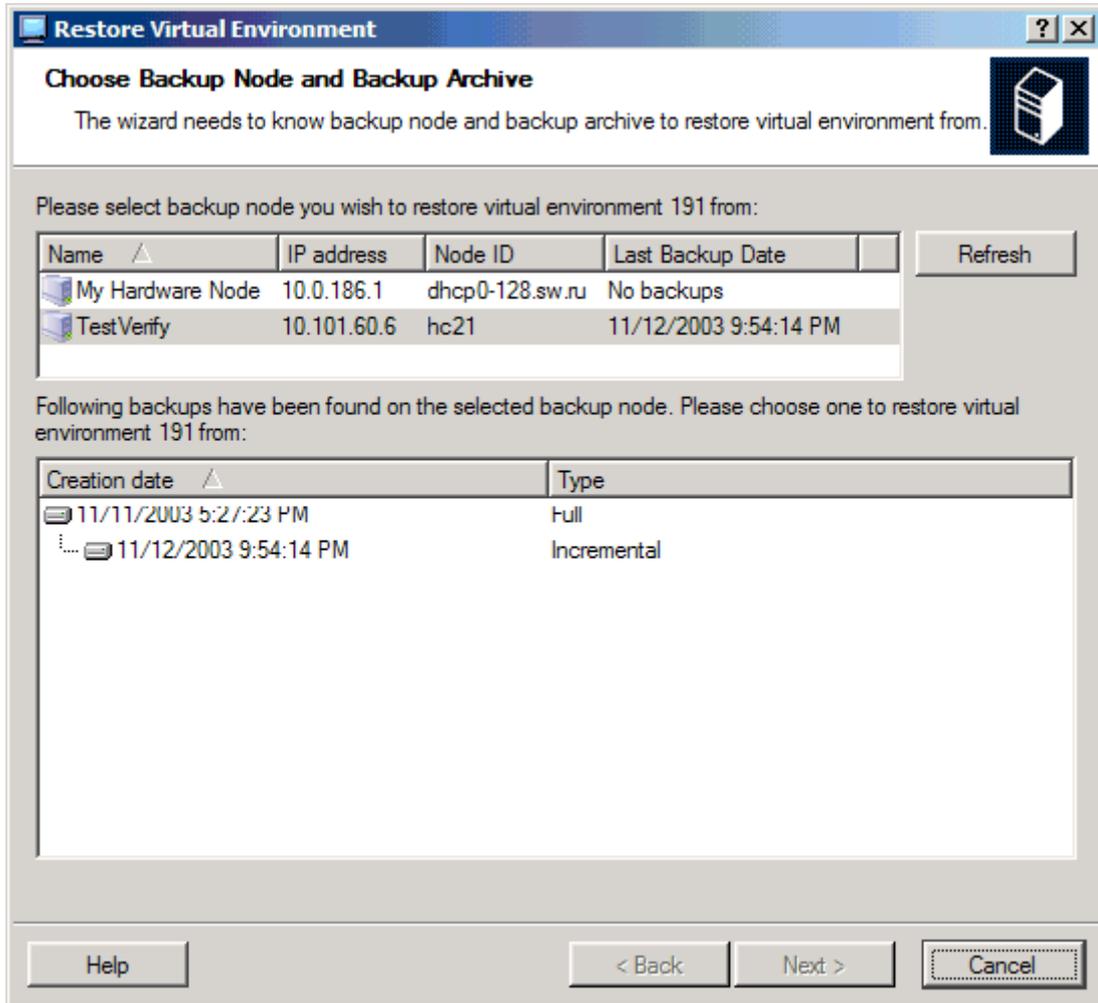


Figure 14: VZMC - Restoring VPSs Wizard

In this wizard you should:

- Select the Backup Node. This Node is the place where the VPS backup is stored. The **Last Backup Date** column in the list of Backup Nodes shows the date and time of the last backup (if any) of the selected VPS on the corresponding Node.
- Select the backup from which the VPS is to be restored. Any VPS may have any number of its backups made at different dates and of different types. As a rule, you choose the most recent backup, unless you have reasons to restore an intermediary one.

Note: During this operation, the Destination Node is supposed to be the same as the Source Node. For instructions on how to restore a VPS to a Destination Node other than the Source Node, see [Managing Backup Node](#).

Restoring VPS Files

Virtuozzo allows you to browse the directory structure of any VPS backup as if this backup had already been restored and restore only the needed files and folders. To this effect, you should do the following:

- 1 Expand the *Source Node* item in the left pane of the VZMC main window and click the **Virtual Private Servers** item to open the Virtual Private Servers manager window.
- 2 Right-click the Virtual Private Server the files/folders of which you wish to restore and select **Backup --> Selectively Restore Virtual Private Server's Files** on the context menu to open the **Restore Virtual Private Server Files** wizard.

On the first step of the wizard, you should:

- Select the Backup Node. This Node is the place where the VPS backup is stored. The **Last Backup Date** column in the list of Backup Nodes shows the date and time of the last backup (if any) of the selected VPS on the corresponding Node.
- Select the VPS backup from which the VPS files/folders are to be restored.

The second step of the wizard allows you to review and explore the contents of all the backed up drives that were present inside your Virtual Private Server at the moment of the backup creation:

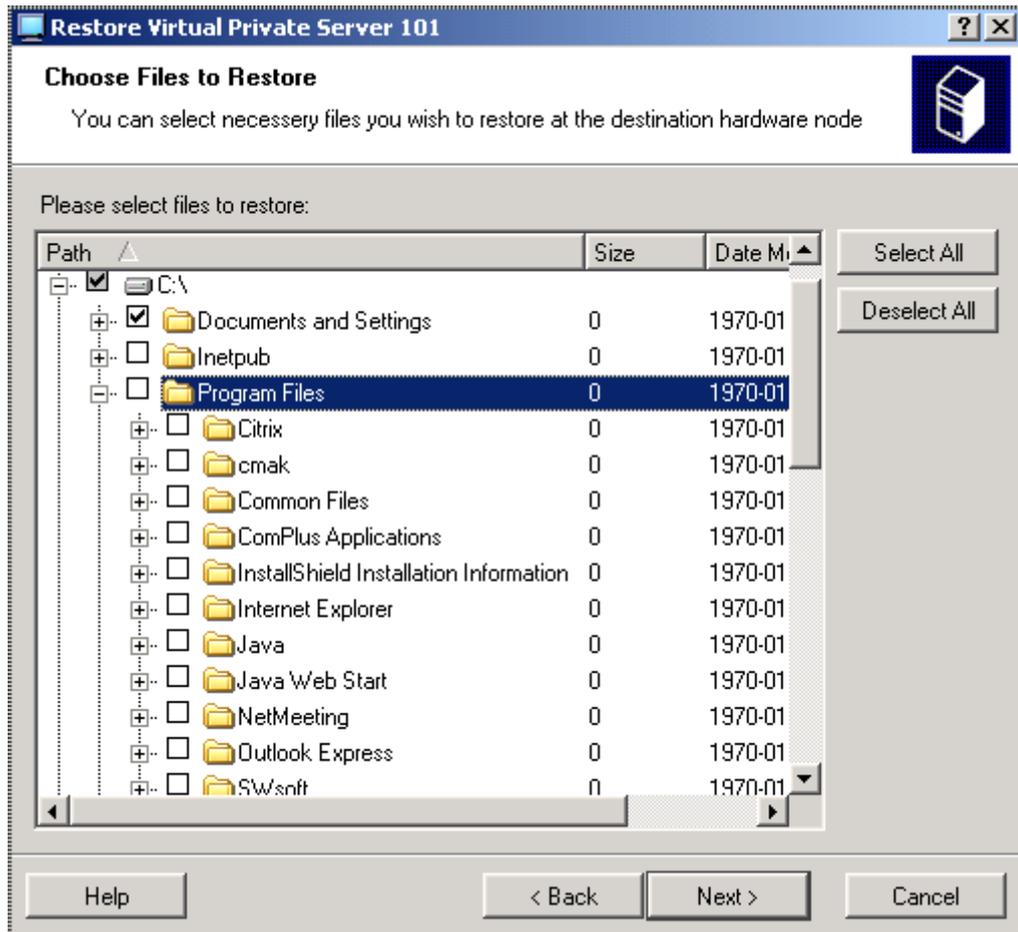


Figure 15: VZMC - Choosing Files For Restoring

All drives shown in the **Choose Files to Restore** window have a tree view of the files and folders that you have backed up. So, you can use this tree view in the same way as you use Windows Explorer to open and find folders and files on your computer. To enqueue this or that file/folder for being restored, you should select its checkbox. While selecting files and folders, please keep in mind the following:

- You can select the checkbox in front of the corresponding drive to restore all the files and folders from the drive.
- You can use the **Select All/Deselect All** buttons in the right corner of the **Choose Files to Restore** screen to select/deselect all the VPS files and folders at once, respectively.

The last screen enables you to review the parameters you have entered on the previous steps of the wizard. If you are satisfied with the parameters set, click **Finish** to start restoring the selected VPS files/folders to the Destination Node. Otherwise, click **Back** and change the corresponding parameters.

Restoring Group of VPSs

To restore several Virtual Private Servers of a single Source Node from their backups on the Backup Node, right-click the **Virtual Private Servers** item under the corresponding *Source Node*, and select **Tasks --> Restore Virtual Private Servers** on the context menu. The **Restore Virtual Private Servers** wizard is displayed. In this wizard you should:

- Select the **Backup Node**. This Node is the place where the backups of the Source Node VPSs are stored. The **Backup Availability** column in the list of Backup Nodes shows whether backups have been found on the corresponding Node.
- Select the Virtual Private Servers you wish to restore from the Backup Node. By default, all the backups of the VPSs originally belonging to the Source Node are selected, but you may exclude certain VPSs from this list, as well as include in it any other backups found on this Backup Node (i.e. the backups of those VPSs not belonging to the Source Node). To include these other backups, you should first make them visible by selecting the **Show all available backups** checkbox.

Note: During this operation, all the VPSs will be restored to the Source Node, i.e. to the Node for which you have invoked the wizard, irrespective of whether the backed up Virtual Private Servers originally belonged to this Source Node or to any other Node.

Managing Backup Node

Any Hardware Node may perform the functions of the Backup Node, i.e. store the backups of any VPSs of any Hardware Nodes. To see a list of VPS backups stored on a Hardware Node, expand its name in the left pane of the VZMC main window and select the VPS Backups item:

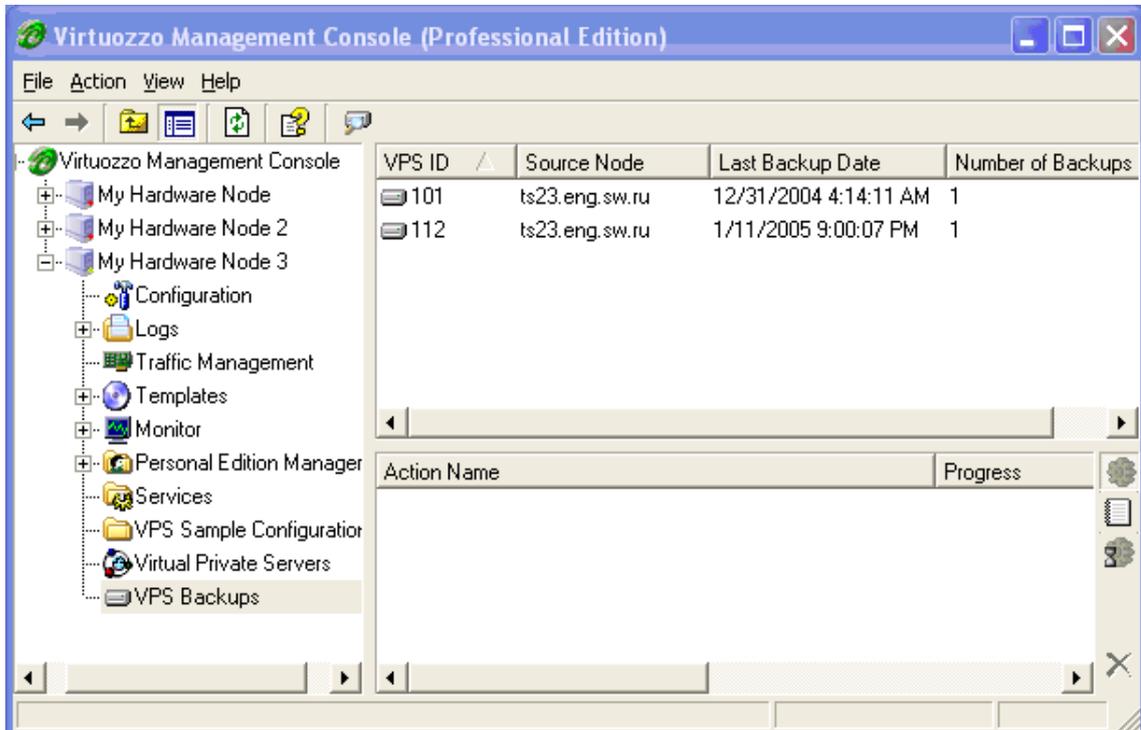


Figure 16: VZMC - Listing Backups

The table in the right pane presents the following information about the VPS backups stored on the current Backup Node:

Column Name	Description
VPS ID	The ID of the backed up Virtual Private Server.
Source Node	The Node where the VPS was hosted during its backing up.
Last Backup Date	The date and time when the last backing up of the VPS took place.
Number of Backups	The number of VPS backups on the Node.

The backup manager window allows you to perform the following operations:

- Restore a single VPS from its backup. You should right-click the needed VPS backup and select **Restore Virtual Private Server** on the context menu to start the **Restore Virtual Private Server** wizard. In this wizard, you should:
 - Select the Destination Node, i.e. the place whither the VPS will be restored. By default, the VPS Source Node is selected. Only the Nodes registered in VZMC are shown.
 - Select the backup from which the VPS is to be restored. Any VPS may have any number of its backups made at different dates and of different types. As a rule, you choose the most recent backup, unless you have reasons to restore an intermediary one.

- Restore one or several files and/or folders from a particular VPS backup. You should right-click the VPS backup whose files/folders you wish to restore and select **Selectively Restore Virtual Private Server's Files** on the context menu to start the **Restore Virtual Private Server Files** wizard. In this wizard you should:
 - Select the Destination Node, i.e. the place whither the VPS files/folders will be restored. By default, the VPS Source Node is selected. Only the Nodes registered in VZMC are shown.
 - Select the VPS backup from which the VPS files/folders are to be restored.
 - Choose the files/folders to be restored by selecting their checkboxes.

Right-clicking on a VPS backup in this table and selecting **Properties** on the context menu brings about the **Virtual Private Server Backups** dialog where you can view extensive information about the current VPS backup, including all its full and incremental backups, as well as delete any of these backups, show their contents (i.e. the VPS drives, files, and folders), or restore the VPS or any of its files/folders in the manner depicted above.

Searching for VPS Backups

If you do not remember the place where you are storing the backup of a particular VPS (identified by its ID or its IP address or its hostname or by the date of its creation), you can search for the backup across all the Hardware Nodes (performing the function of Backup Nodes in this case) registered in VZMC.

To search for a backup, do the following:

- 1 Right-click the Virtual Private Servers item under the corresponding *Source Node*, and select Backup --> Search for Backups on the pop-up menu to open the Find Virtual Private Server Backups dialog:

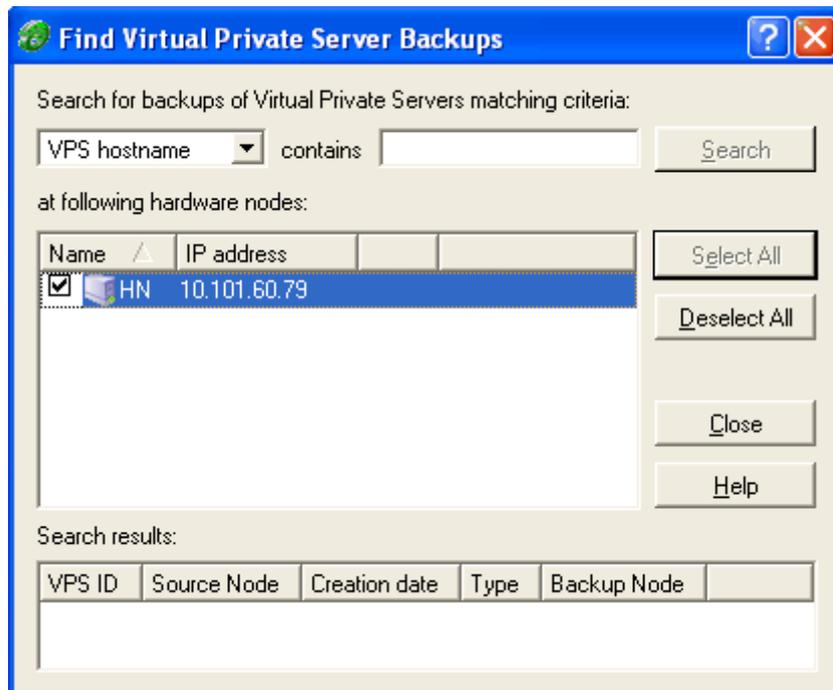


Figure 17: VZMC - Searching for Backups

- 2 On the upper left drop-down menu, choose the VPS parameter by which you wish to search for the corresponding VPS backup.
- 3 Enter the value of the parameter in the text field on the right. All the VPSs with the corresponding parameter including the specified value as its part will be found. E.g., if you enter "100" as the value for VPS ID, the backups of VPSs 100, 1000, 1001, 1002, 2100, 3100, and so on, will be searched for.
- 4 Check those Nodes where you want to search for the backups.
- 5 Press the Search button.

The Search results table presents the following information about the found backups:

Column Name	Description
VPS ID	The ID of the VPS whose backup has been found.
Source Node	The Node where the VPS was hosted during its backing up.

Creation date	The date and time when the backup was created.
Type	The backup type. An incremental backup represents only those changes that the VPS has undergone since its last full or incremental backup. Therefore, an incremental backup is usually much less in size than a full backup.
Backup Node	The Backup Node - the Node where the backup has been found.

Double-clicking on a VPS backup in this table brings about the **Virtual Private Server Backups** dialog where you can view extensive information about the current VPS backup, including all its full and incremental backups, as well as delete any of these backups or restore them in the manner depicted above.

Searching for VPS

Usually there are a great number of Virtual Private Servers on your Hardware Node(s). To quickly find the necessary VPS, go to the **Virtual Private Servers** item, right-click it, and choose **Task -> Search for Virtual Private Server**. The **Find Virtual Private Servers** window opens:

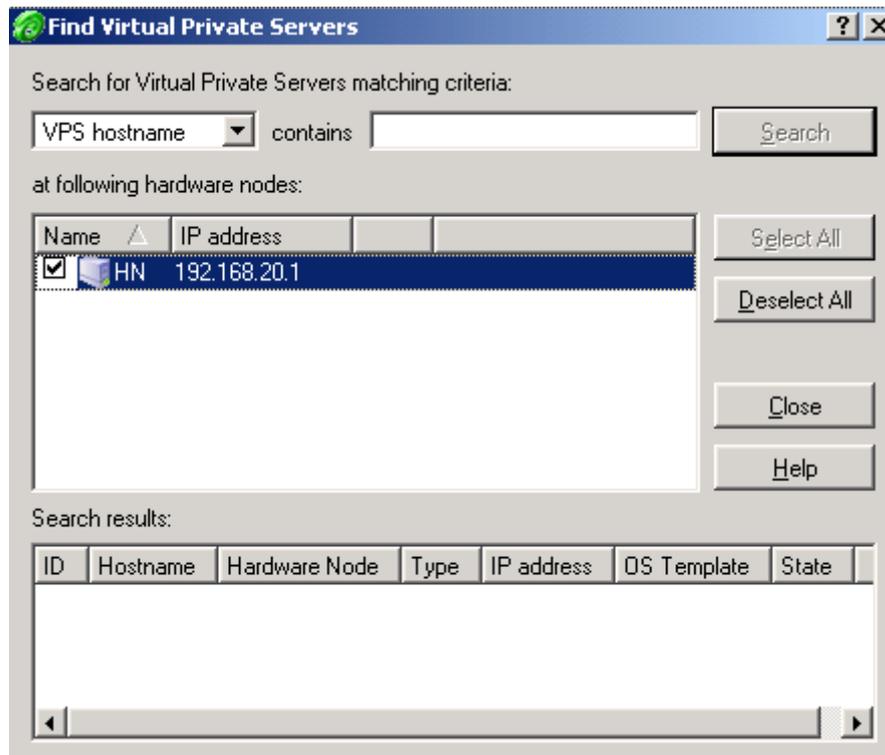


Figure 18: VZMC - Finding VPS

This dialog window provides you with a list of VPSs across one or several Hardware Nodes united by a common parameter value. This can be the VPS ID, name, type, status, or IP address assigned to the VPS.

You should indicate the parameter by which you wish to search for VPSs on the upper left drop-down menu, and then the value of the parameter. If you choose to search for VPSs by their state (status) or ID you will be presented with a list of predefined values of these parameters. It is connected with the fact that there is a fixed number of VPS statuses, and VPS IDs can be only of the integer type. By searching for VPSs by their name or IP address, you can enter any string in the corresponding field. In this case the search results will display all the VPSs whose name/IP address contain the specified string, even if only as a part.

You should also select the Hardware Node(s) where you wish to search for VPSs with the specified characteristics. VPSs from different Nodes matching the search criterion will be displayed in one and the same search result table. After you have selected the Hardware Node(s), click the **Search** button. The table will be populated at the bottom of the window.

The VPSs in the **Search Results** table corresponding to the specified search criterion may also be sorted by a number of parameters, among which are their ID, name, the Hardware Node they belong to, their IP address, etc. To sort the VPSs by a parameter, click the corresponding column name. Another click will reverse the sorting order.

From the **Search Results** table, you may also open the VPS manager window by double-clicking the corresponding Virtual Private Server.

Changing VPS ID

You can change the ID of a VPS with the help of the Move Virtual Private Server wizard. To invoke the wizard, select the **Virtual Private Servers** item under the corresponding **Hardware Node**, right-click the Virtual Private Server you wish to change the ID of, and select **Tasks -> Move Virtual Private Server** on the context menu:

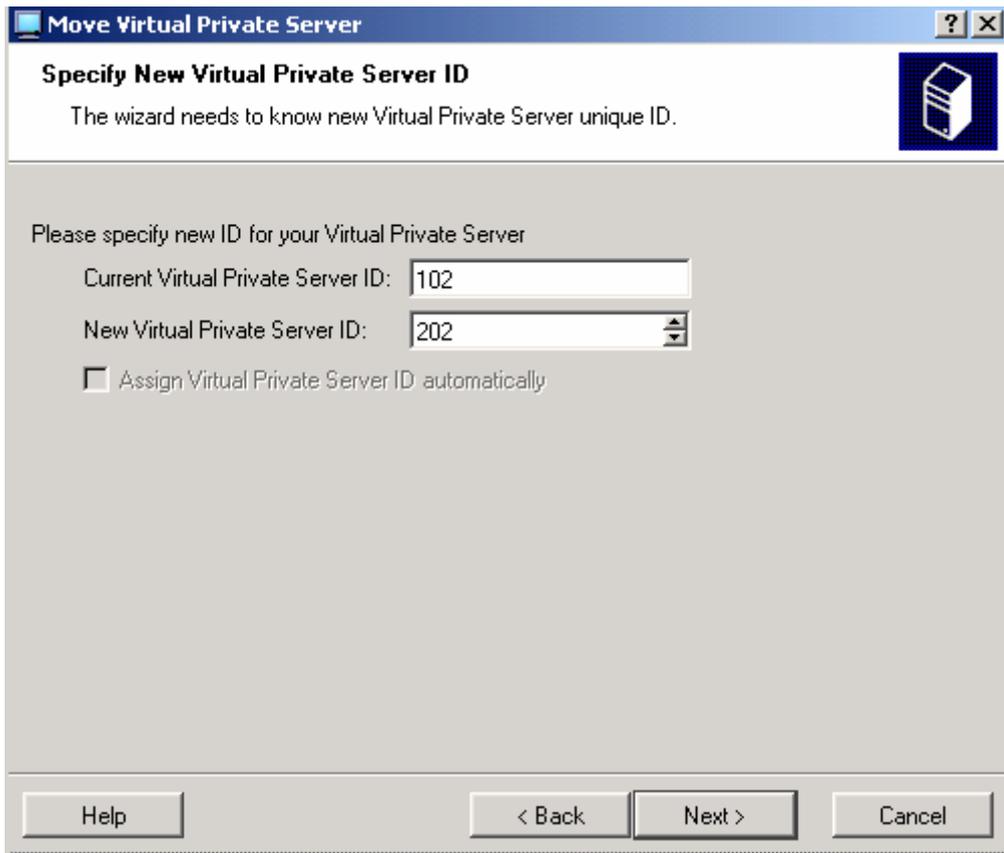


Figure 19: VZMC - Specifying IP Address

In this window, you should specify a new ID for the corresponding VPS. Note that the old ID for this Virtual Private Server will be lost and all VPS private data will be transferred to the `C:\vz\private\ directory, where <new_VPS_ID> denotes the new ID assigned to the VPS.`

On the next screen, you should specify the path to the VPS private area. You can leave the path offered in the **Old path** field by default (`C:\vz\Private\) or select the Override default path to ... checkbox and type the desired path in the Path to VPS private area field.`

Pressing **Next** will display the **Review Virtual Private Server Movement Settings** window. The window enables you to review the settings made by you on the previous step. Click the **Finish** button to begin the moving process. This process may take some time, so be sure to wait for it to complete.

In the command line, you can use the `vzmlocal` utility to change the ID of a Virtual Private Server. Detailed information on the `vzmlocal` utility can be found in the [Reference](#) chapter.

Note: In the current version of Virtuozzo, you can change IDs of stopped Virtual Private Servers only.

Copying VPS Within Hardware Node

You can create a complete copy of a particular VPS (in respect of all the VPS data and QoS parameters), or a VPS *clone*. This saves your time because you do not have to think of setting up the VPS configuration parameters and the like. Moreover, you can create a number of VPS clones at a sitting.

In order to create a VPS clone, click **Virtual Private Servers** under the name of the corresponding Hardware Node, and as soon as a list of VPSs appears, right-click the Virtual Private Server you are going to clone. Select **Tasks** on the context menu and proceed with the **Clone Virtual Private Server** option. The **Clone Virtual Private Server** wizard will guide you thru the process of cloning the VPS.

First, you will need to specify the number of VPS clones to create and the starting VPS ID. The **Assign Virtual Private Server ID automatically** checkbox lets Virtual Private Servers IDs be automatically taken from the ID pool on the Master Node and becomes available only in case the Hardware Node where the VPS resides belongs to a cluster (detailed information on clusters and ID pools is provided in the **Managing Node Cluster** section (on page 122)):

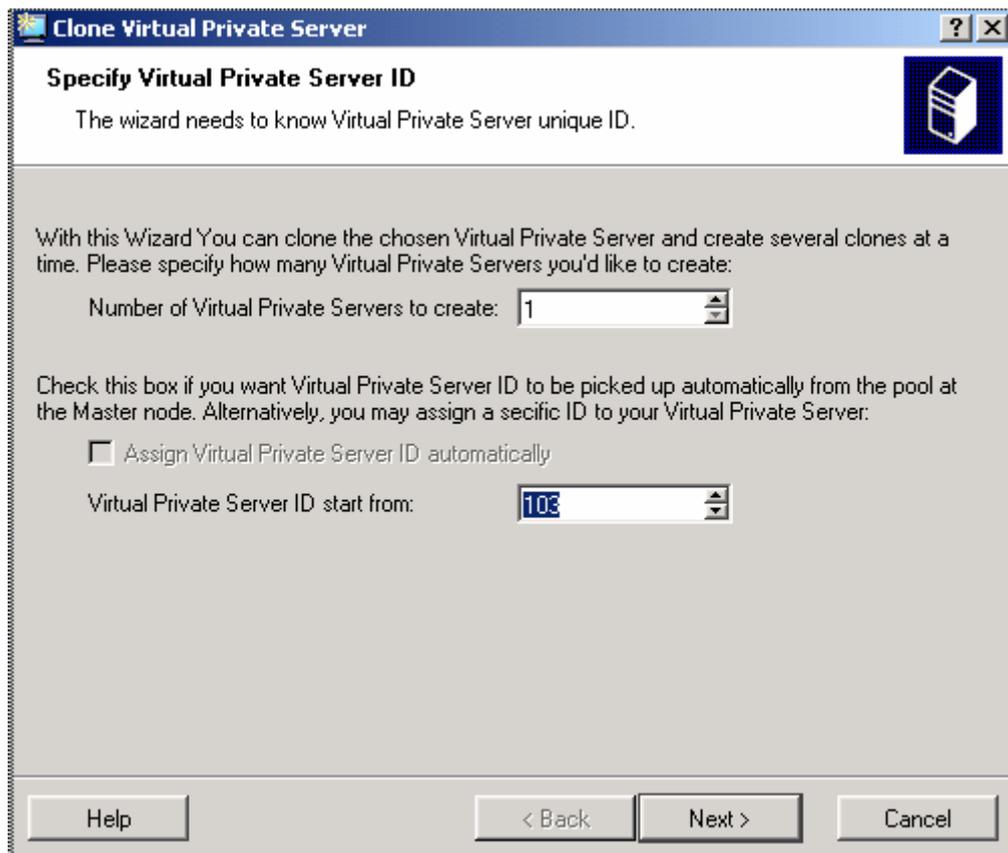


Figure 20: VZMC - Cloning VPS

The number of clones depends on the capacity of the Hardware Node. This taken into account, it is safe to create up to 100 VPS clones at one time. The default is 1.

Similarly to creating new VPSs, the **Clone Virtual Private Server** wizard allows the simultaneous creation of several VPS clones with IDs in a continuous series only. The default starting VPS ID, which is automatically offered, is the first unoccupied ID starting from 101. For example, if you already have VPSs with IDs from 101 thru 105 and 107, the ID of 106 will be offered by default. And if you are creating only one VPS clone, you may safely accept this number. Or you can specify any other number, and the system will check up if the ID is unoccupied. However, if you are going to create a number of VPS clones, it is recommended to decide on an unoccupied ID series in advance.

After you press the **Next** button, the **Assign IP addresses to Virtual Private Servers** window is displayed where you should assign IP address(es) for the cloned VPS(s). Set the radio button to one of the following options:

- **Assigning IP addresses starting from.** You should specify an unoccupied IP address to assign to the cloned VPS and a subnet mask to define to what subnetwork the new VPS will belong. If you are cloning a number of Virtual Private Servers, the rest of the VPSs will get the nearest unoccupied IP addresses immediately following the specified one. All the cloned VPSs will have the same subnet mask and, therefore, belong to the same subnetwork. While defining a subnet mask for your VPS(s), we strongly recommend that you specify the same subnet mask as is set for the VPS you are making a clone of. Detailed information on VPS IP addresses and subnet masks is provided in the **Network Virtualization** subsection (on page 19).
- **Set IP addresses manually.** You should select the VPS clones one by one by clicking on them and press the corresponding **Add IP address** buttons. Type the IP address and subnet mask in the fields provided. You can define a separate subnet mask for every IP address to make the cloned VPSs belong to one or several subnetworks. We strongly recommend that you specify the same subnet mask as is set for the VPS you are making a clone of for all Virtual Private Servers to be cloned. Detailed information on VPS IP addresses and subnet masks is provided in the **Network Virtualization** subsection (on page 19).

The last window lets you review the parameters you have entered on the previous steps. Click **Finish** to start the copying process.

In the command line, the `vzmlocal` utility is used to copy a VPS within the given Hardware Node. Detailed information on the `vzmlocal` command line switches and options is provided in the **Reference** chapter.

Note: You can clone both running and stopped Virtual Private Servers.

Migrating VPS

Migrating VPSs is possible if Virtuozzo for Windows is installed on two or more Hardware Nodes, so you are able to move a Virtual Private Server to another Node. Migration may be necessary if a Hardware Node is undergoing a planned maintenance or in certain other cases. In the latter case, there will be a short downtime in the VPS operation.

You can move both stopped and running Virtual Private Servers. Migrating a stopped VPS includes copying all VPS private files and registry from one Node to another and does not differ from copying a number of files from one computer to another over the network. In its turn, the migration procedure of a running VPS is a bit more complicated and may be described as follows:

- 1** After initiating the migration process, a snapshot of all VPS private files and registry is made, i.e. all VPS private files and registry are remembered in the state they were at the beginning of the migration.
- 2** The files and registry are copied to the Destination Node. During this time, the VPS on the Source Node continues running.
- 3** The VPS on the Source Node is stopped.
- 4** The VPS private files and registry copied to the Destination Node are compared with those on the Source Node and, if any files and registry keys were changed during the 2nd migration step, they are copied to the Destination Node again and rewrite the outdated versions.
- 5** The VPS on the Destination Node is started.

There is a short downtime needed to stop the VPS on the Source Node, copy the VPS files and registry changes to the Destination Node, and start the VPS on the Destination Node. However, this time is very short and does not usually exceed one minute.

To migrate one or more Virtual Private Servers to another Hardware Node with Virtuozzo for Windows using VZMC, select these Virtual Private Servers from the list in the right pane after selecting the **Virtual Private Servers** item in the left pane. Then right-click the selection and point to **Tasks -> Migrate to Another Hardware Node** on the context menu. Note that the target Hardware Node must be already registered in VZMC; otherwise, the migration option will not be available. A migration dialog appears, for example:

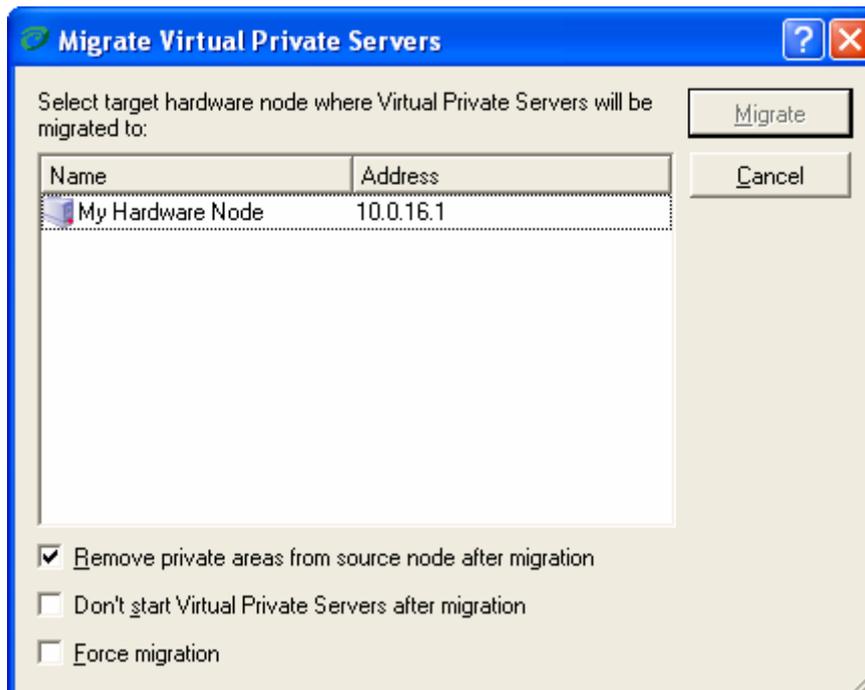


Figure 21: VZMC - Migrating VPSs

Review the three checkboxes at the bottom of the window and check up the needed ones. The **Force migration** checkbox, when selected, forces the VPS migration even if the templates necessary for the VPS correct operation are not installed on the Destination Node. However, it will be impossible to start such a VPS after the migration in case of the absence of the needed templates. Select the target Hardware Node where you want to migrate the selected Virtual Private Server(s) and press the **Migrate** button.

You can also use the `vzmigrate` utility to migrate a VPS by means of the command line. Detailed information on the `vzmigrate` utility can be found in the **Reference** chapter.

Note: You cannot migrate Virtual Private Servers residing on a Hardware Node running the Virtuozzo 32-bit version to Hardware Nodes running the Virtuozzo 64-bit version and vice versa.

Deleting VPS

VZMC allows you to delete Virtual Private Servers that are not needed anymore. The VPSs that can be deleted are marked with grey monitor icons (user VPSs). To delete one or more user Virtual Private Servers, select it (them) in the **Virtual Private Servers** table in the right pane of the VZMC main window. You can use CTRL+Click to select or deselect an entry, SHIFT+Click to select a range of Virtual Private Servers, CTRL+A to select all Virtual Private Servers. Then right-click the selected VPS(s) and choose **Delete**. You can also press the **Delete** button on the toolbar or select **Delete** on the **Action** menu:

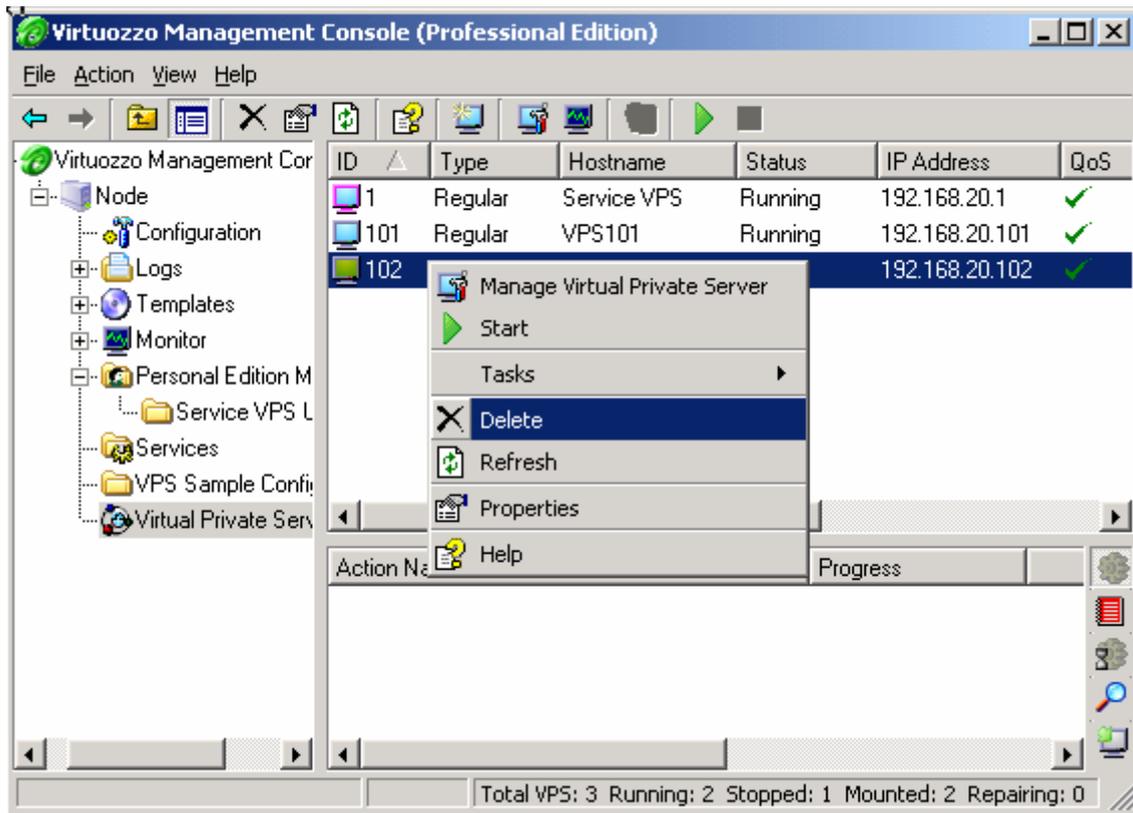


Figure 22: VZMC - Deleting VPS

Deleting a considerable number of Virtual Private Servers may take a rather long run. The progress is displayed in the **Actions** pane.

In the command line, you can delete a Virtual Private Server with the `vzctl destroy` command. Detailed information on this command is provided in the **Reference** chapter.

Note: Destroying a VPS means that the private area of the VPS is deleted from the `C:\vz\private` directory on the Host OS and all the VPS private files are irrevocably erased from the Node without being moved to the Recycle Bin.

Changing Administrator Password

While creating a new Virtual Private Server, you should have specified the Administrator password to log in to the VPS as the Administrator user thru VZPP, RDP, or MS TSC. This Administrator user differs from the Administrator user of the Hardware Node and has full control over the given VPS only.

To change the specified Administrator password for a VPS, select the **Virtual Private Servers** item under the Hardware Node name, right-click the corresponding VPS in the table, and select **Properties** on the context menu. After the **VPS Properties** dialog is displayed, click the **Advanced** tab:



Figure 23: VZMC - Setting Administrator Password

Click the **Set Password** button. After this, type the Administrator password in the provided fields.

Alternatively, you can open a separate console for the VPS (VPS Manager) and set the password for the Administrator user as is described in the **Managing Users and Groups** section (on page 71).

Operations Inside VPS

VZMC allows you to manage VPS users and groups and perform different operations on the files/folders located inside your VPS by means of Virtual Private Server Manager. VPS Manager can be accessed by selecting the **Virtual Private Servers** item under the Hardware Node name and double-clicking on the corresponding VPS in the right part of VZMC.

Note: You can also perform all operations described in this section by establishing an RDP/TSC connection to the VPS and working inside this VPS as on a stand-alone Windows 2003 server.

Managing Users and Groups

Virtuozzo Management Console does not allow you to manage users or groups of the Host OS not to compromise the security of the Hardware Node. However, you can manage users and groups inside regular Virtual Private Servers with the help of Virtual Private Server Manager. All users and groups are adjustable. You can also add new users and groups.

To manage groups or users inside a Virtual Private Server, open the main tree for this Virtual Private Server and select either the **Groups** or **Users** items in the **Users and Groups** folder, respectively.

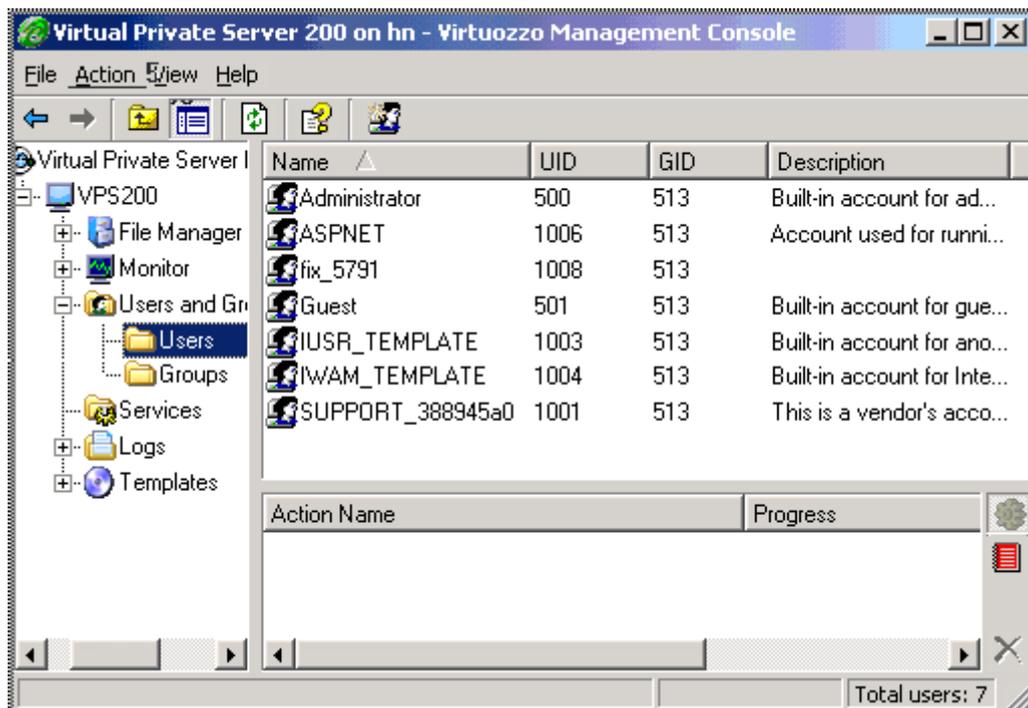


Figure 24: VZMC - Managing Users and Groups

To open the group properties dialog, double-click on the group name in the table of groups or select **Properties** on the context menu. To add a new user to the group, click the **Add** button. To remove a user from the group, select the user name and press the **Remove** button.

To add a new group, click the **New Group** button on the toolbar (note that this button appears only if you are currently working with VPS groups). Then enter the group name and press **OK**.

To delete a group, select its name in the table of groups and press the **Delete** button on the toolbar or select the **Delete** item on the context menu.

To add a new user, open the list of users and click the **New user** button at the top toolbar. Enter the user login (user name). This is the only mandatory parameter. You may also set the user description and password and add the user to one or more groups (see the **Member Of** tab). Then press **OK**.

To edit an existing user, double-click on the user name in the table of users or use the **Properties** item on the context menu. The user properties dialog is analogous to the **New User** dialog.

To change the password for a user, right-click the user in the table of users, select **Set Password** on the context menu, then enter the password in the fields provided.

To delete a user, select its name in the table of users and click the **Delete** button at the top toolbar or select the **Delete** option on the context menu.

Note: In the current version of Virtuozzo, you cannot create Active Directory domain user accounts inside your VPS by means of VZMC. However, you can log in to the VPS which acts as a domain controller via RDP and create a domain user like you would do it on any other stand-alone Windows 2003 server.

Managing Files

You cannot manage files/folders directly on the Hardware Node by means of VZMC, but you can do it inside each and every Virtual Private Server by means of the Virtual Private Server Manager window. To open the VPS manager window, select the **Virtual Private Server** item in the left pane of the VZMC main window and double-click the corresponding VPS. After you expand the **File Manager** item in the VPS main tree, you will see a list of disk drives available inside your VPS:

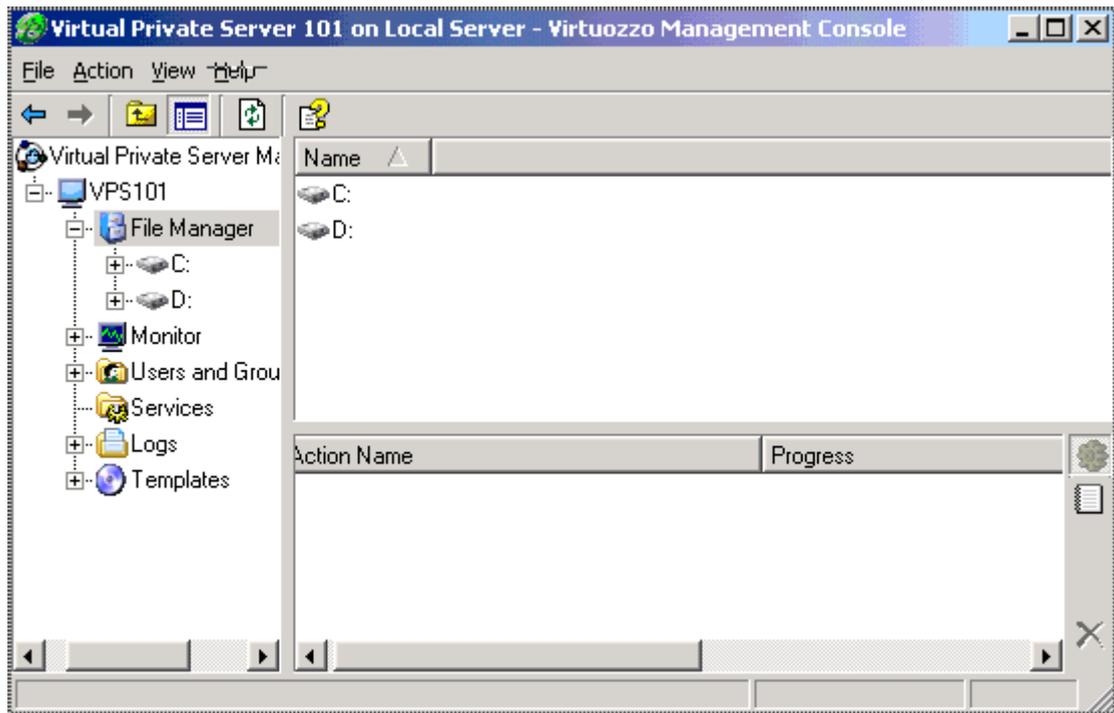


Figure 25: VZMC - File Manager

The principles of working with the VPS file manager are standard. You can move thru the hierarchy of VPS drives and folders by double-clicking their names or selecting the necessary drives and folders in the left pane. Use the menu items, toolbar buttons, table view, and context menus to perform the following tasks:

- View the contents of simple text files;
- View the principal information about a file/folder available inside the given VPS;
- Upload any number of files or whole folders from your local computer (the computer where VZMC is installed) to any folder of the given VPS;
- Download any number of files from the given VPS to your local computer;
- Create new folders within the drives of the VPS;
- Copy files to another drive/folder of the given VPS;
- Move files to another drive/folder of the given VPS;
- Delete VPS files/folders;
- Rename VPS files/folders.

VZMC provides a user-intuitive interface for performing all these tasks.

While managing files and folders inside your Virtual Private Server, you may accidentally delete one or several system files necessary for the error-free functioning of the VPS or even get your VPS in a non-operational state. In this case Virtuozzo allows you to restore the VPS provided you have a backup of this VPS. Detailed information on how to back up and restore your Virtual Private Servers is provided in the **Backing Up and Restoring VPSs** section (on page 45).

Note: In the current version of Virtuozzo, you cannot compress files and folders as well as encrypt them inside your Virtual Private Servers.

Uploading Files to Virtual Private Server

The VPS Manager window allows you to upload any number of files or whole folders from the local computer (the computer where VZMC is installed) to any folder on any VPS disk drive. In the Virtual Private Server main tree, right-click the **File Manager** item and select **Tasks -> Upload Local File**. The **Upload Files Wizard** opens:

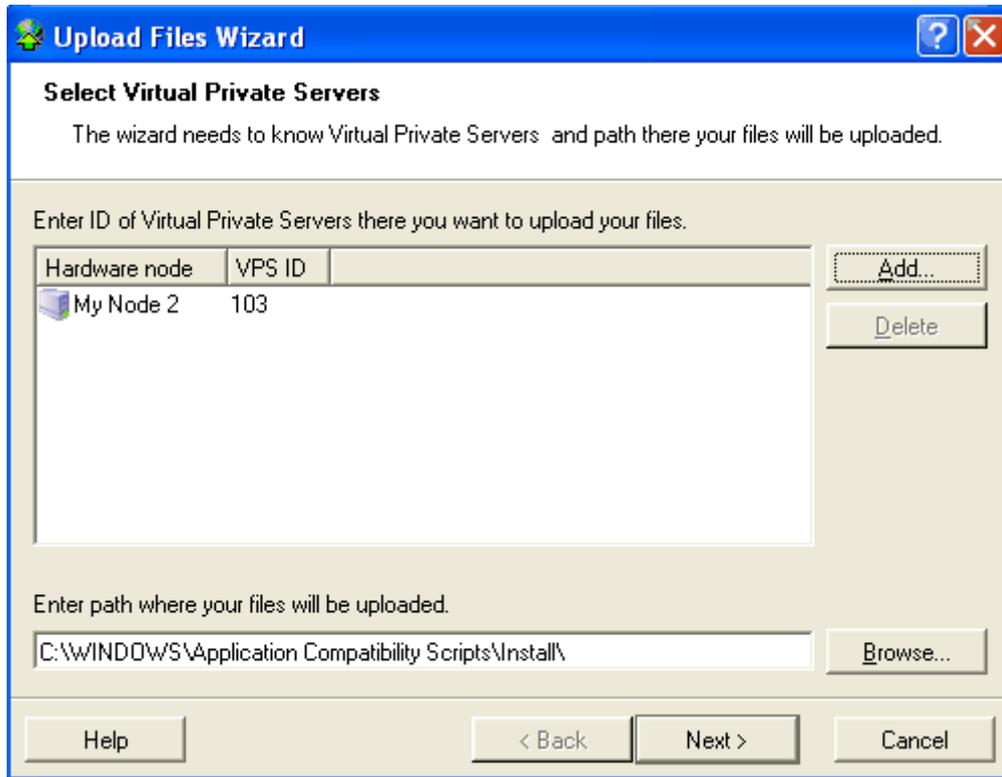


Figure 26: VZMC - Uploading Files to VPS

It is a three-step wizard. On the first step of the wizard, you should define Virtual Private Servers and the path where the files will be uploaded. Press the **Add** button to open the **Select Virtual Private Servers Identifiers** window where you should consecutively select a Hardware Node and/or a Virtual Private Server from this Node and add it to the VPS upload list. Repeat this sequence for every VPS where you wish to upload files and then click **OK**. After that, you should enter the path where your files are to be uploaded or browse for this path inside the remote VPS. Press **Next** when you are finished.

In the second window of the **Upload Files** wizard, you should specify the local files or folders you wish to upload to the Virtual Private Server(s) that you specified on the previous step. Press the **Add** button and select a file or a group of files from a single directory for uploading. You can also upload the whole folder by pressing the **Add Directory** button. If you need to upload files from various local folders, press the **Add** button the required number of times. After you have added all the files and folders to be uploaded, click **Next**.

The next window lets you review all the information provided on the previous steps of the wizard. Make sure that the settings are correct. To change the settings, click the **Back** button and make the necessary corrections. After you click **Next**, the uploading process begins. The operation progress is graphically displayed in the window of the **Upload Files** wizard. You can see how each of the selected files is being consecutively uploaded to the selected Virtual Private Server(s). Please wait for the operation to finish.

After the uploading process is finished, you will get informed of the results of the operation. The table in the displayed window lets you view the results regarding every file uploaded to the selected Virtual Private Server(s). Press **Finish** to exit the wizard.

Copying and Moving Files

Virtual Private Server Manager enables you to copy and move files/folders within the corresponding Virtual Private Server.

To copy/move any file/folder, you should perform the following operations:

- 1 Click on the **File Manager** item in the VPS main tree.
- 2 Select the file you wish to copy/move (you can use **CTRL+Click** to select or deselect the file, **SHIFT+Click** to select a range of files, **CTRL+A** to select all files).
- 3 Right-click it and choose either the **Copy to Folder** or **Move to Folder** item depending on the operation you wish to perform.

After that, the **Copy File/Move File** window opens. This window lets you define the following options for the copy or move file operations presented in the table below:

Option	Description
You are about to copy/move the following files	This field is read-only. It just enumerates those files/folders that you have selected before opening the given window. These files/folders will be copied or moved to the destination folder you specify.
Destination path	You should either type the path to the folder where you want the specified files/folders to be copied or moved, or press the ... button and select the destination folder in the dialog window that appears.
Overwrite existing files	Check this box to overwrite the files/folders in the destination folder if they happen to have the same name as the files/folders being copied/moved. If you leave this box unchecked, the program will fail to copy/move the files/folders with an already existing name.

After you have set the parameters, press **OK** to copy or move the file(s). Pressing the **Cancel** button will just close the window regardless of its contents.

Downloading Files to Local Computer

VZMC allows you to download any file or folder located on any Virtual Private Server disk drive to the computer where VZMC is installed. To this effect, do the following:

- 1 Expand the **File Manager** item in the VPS main tree.

- 2** Select the file/folder you wish to download to your local computer (you can use CTRL+Click to select or deselect the file/folder, SHIFT+Click to select a range of files/folders, CTRL+A to select all files/folders);
- 3** Right-click it and choose **Tasks --> Copy To Local Computer** on the context menu.
- 4** In the displayed window, specify the folder where you wish to download the selected file/folder.
- 5** Click OK.

CHAPTER 4

Managing Templates

A template is a set of original application files, repackaged for mounting over Virtuozzo File System. Virtuozzo templates allow you to share resources among lots of VPSs, thus enabling huge savings in terms of disk space and memory.

Note: Detailed information on Virtuozzo templates is provided in the *Understanding Templates* subsection (on page 24).

You may perform the following operations with templates:

- Create your own application templates;
- Upload new templates to the Hardware Node;
- List the templates currently installed on the Hardware Node;
- Install templates on and remove them from the Hardware Node;
- Add templates to any number of VPSs;
- Remove templates from the Hardware Node.

All these operations are described below in this chapter.

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Creating Application Template

You may wish to use special software inside your Virtual Private Server(s) to perform a specific task or function, such as word-processing, creating spreadsheets, generating graphics, sending and receiving electronic mail, etc. However, installing an application inside every VPS where you wish to use it may be a time-consuming operation and require many megabytes of disk space inside each VPS. At the same time, adding an application to your VPSs by using the technology of Virtuozzo templates helps you avoid these problems:

- Thanks to the fact that the real application files are written to the HN hard disk only once, gigabytes of disk space are saved that would be lost if the application were installed separately into each and every VPS.
- The application is loaded only once into the Node memory, so memory savings are also tangible.

Virtuozzo 3.5 provides you with a special wizard for creating Virtuozzo application templates. The **Virtuozzo Template Creation Wizard** will guide you through the process, gather all the necessary information, and make an application template for you. In order to invoke the wizard, select **Programs --> SWsoft --> Virtuozzo --> Virtuozzo Template Creation Wizard** on the Windows Start menu.

After you have launched the wizard, you will be presented with the **Welcome to Virtuozzo Template Creation Wizard** window where you should select a variant of the template creation:

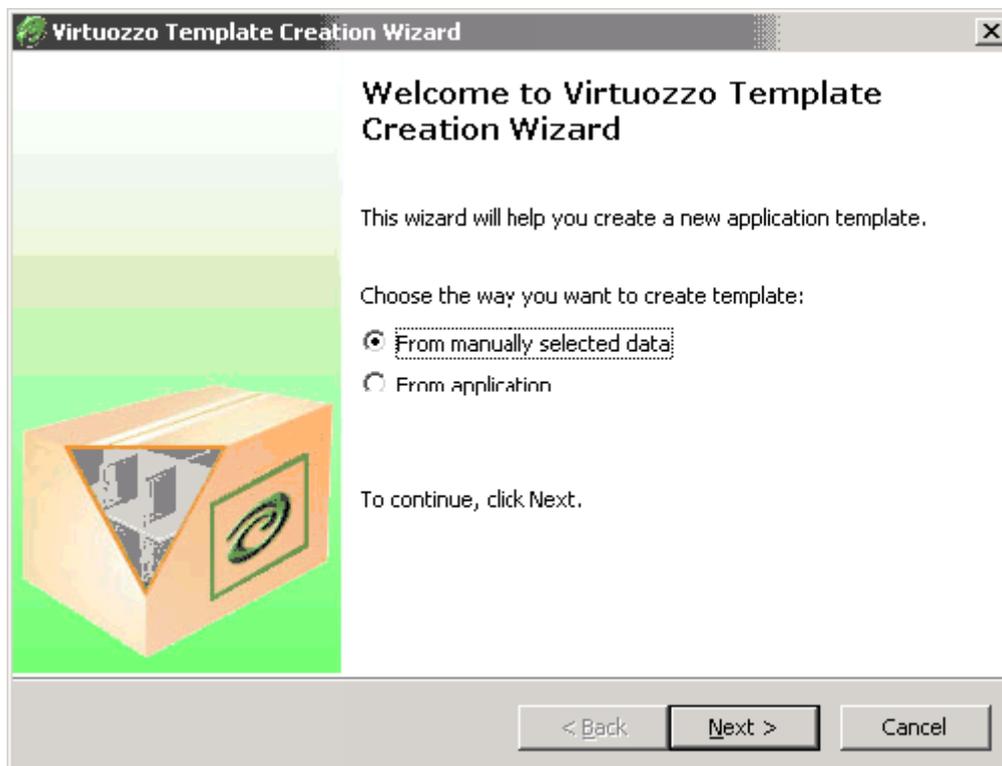


Figure 27: VZMC - Choosing Creation Variant

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

- Select the **From manually selected data** checkbox to manually specify the files and registry settings out of which you wish to create your application template. In this case you will be able to choose and edit any available files and registry keys for making the template.
- Select the **From application** checkbox to create your application template on the basis of the corresponding application installed in a special temporary VPS. As distinct from the first variant, only the files and registry settings that will result from the application installation inside the temporary VPS will be included in the template.

Both ways of the template creation are described below in this section in detail.

Creating Template From Manually Added Data

After you have selected the **From manually selected data** checkbox and clicked **Next** in the **Welcome to Virtuozzo Template Creation Wizard** window, you will be presented with the **Specify VPS Settings** window:

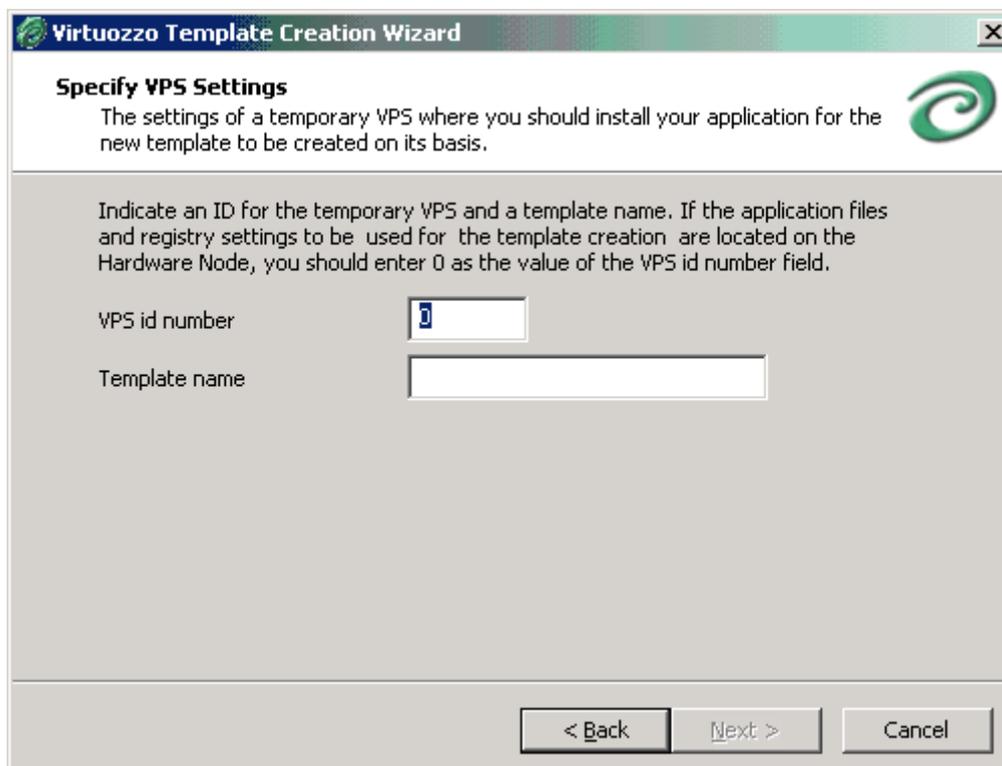


Figure 28: VZMC - Specifying VPS ID and Name

In this window, you should provide information in the following fields:

- **VPS id number:** specify the ID of the Virtual Private Server where the application files and registry entries are stored, which will be used for the template creation. If they are stored on the Hardware Node itself, you should specify 0 as the value of this field.

Note: Make sure the Virtual Private Server where the application files and registry entries are located is running; otherwise, you will be warned with a message informing you that the corresponding VPS is currently stopped.

- **Template name:** choose a name for the application template. You can type any alphanumeric identifier that you consider reasonable for the template and that will be used to refer to this application template. When you are ready, press the **Next** button.

In the **Configure Application template inside VPS** window, you should specify what application files and registry entries are to be added to the application template:

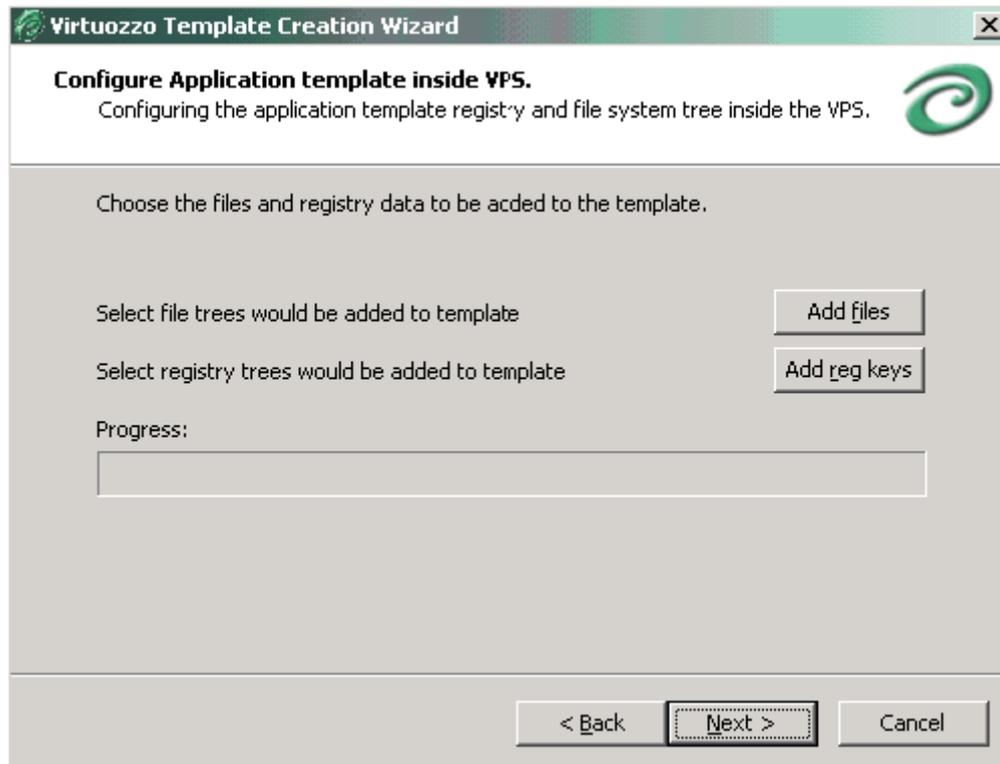


Figure 29: VZMC - Adding Files and Registry Entries

In this window, you can do the following:

- Press the **Add files** button to open the **Template configuration** window where you can choose the application files out of which the application template will be created. You may select any number of files with any extensions (.exe, .vbs, .txt, etc.). After you have chosen the needed files, click on the **Save** button in the **Template configuration** window to confirm your selection.
- Press the **Add reg_keys** button to open the **Template configuration** window where you can select those registry entries that will be added to the application template. After you have chosen the needed entries, click on the **Save** button in the **Template configuration** window to confirm your selection.

After you have selected the necessary files and registry entries and pressed the **Next** button, the **Create Template** window is shown:

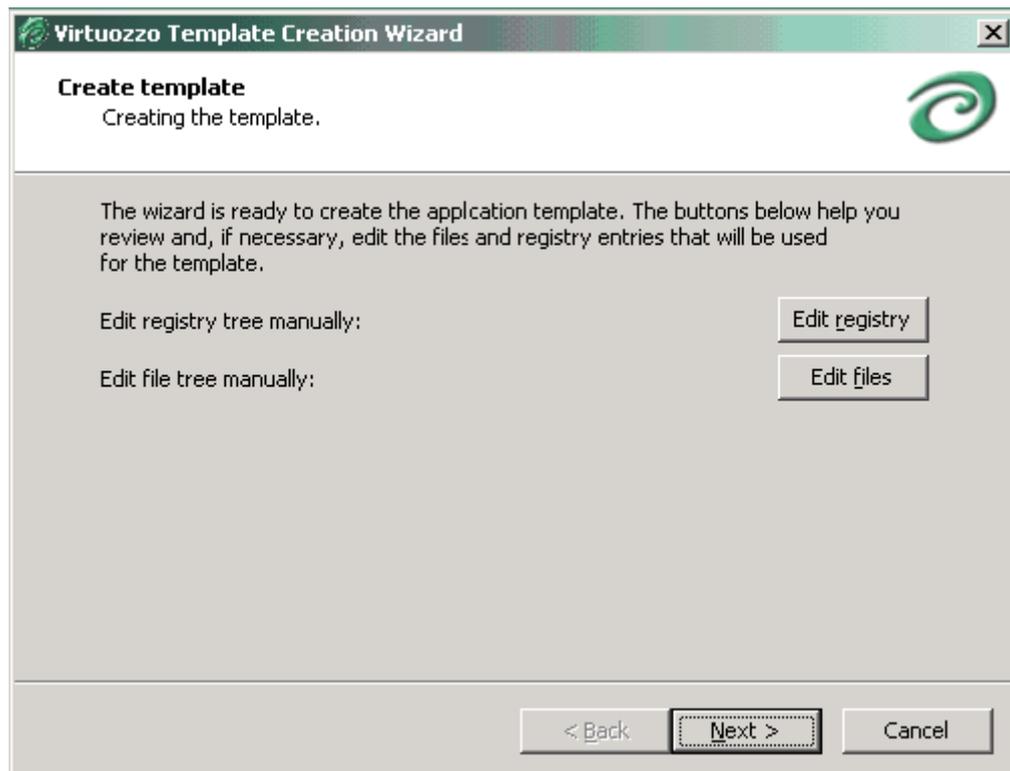


Figure 30: Creating Application Template - Creating Template

In this window, you can use the **Edit registry** and **Edit files** buttons to view and edit the registry entries and files that you have selected on the previous step of the wizard and that will be used for making the application template. After you have pressed the **Next** button, the application creation process is started.

After a while, the **Application Template Creation Completed** window is displayed notifying you that your application template has been successfully made. Click **Finish** to exit the wizard. The template is placed to the `C:\vz\Templates__cache` directory on the Hardware Node. However, before starting to use the newly created template, you should install it on the Node by means of the `vzpkgdeploy` utility. Please consult the `vzpkgdeploy` subsection of the Reference chapter (on page 243) to learn how to deploy and install your application templates on the Node.

Creating Template From Application Data

If you have selected the From application checkbox and clicked Next in the Welcome to Virtuozzo Template Creation Wizard window, the following window is displayed:

Figure 31: Creating Application Template - Defining VPS Settings

In the **Specify VPS Settings** window, you are asked to set the parameters for a Virtual Private Server to be used for creating your application template. The fields you should fill in are explained below:

- In the **VPS ID** field, specify the ID of the Virtual Private Server where the application template is to be created. The VPS with the ID specified is automatically created by the wizard for the period necessary for making the application template and deleted after the template has been successfully created and copied to the Hardware Node. Make sure that the VPS with the ID specified in the **VPS ID** field does not exist on your Node. Otherwise, you will be warned with a message asking you to choose another VPS ID.
- In the **VPS IP address** field, enter the IP address (it should be unique within your network) to be assigned to the Virtual Private Server where the application template is to be created. You should specify a valid IP address to be able to connect to your VPS via RDP at a later time.
- Indicate a DNS server that this Virtual Private Server is supposed to use in the **DNS servers** field or select the **Use DNS server of Hardware Node** checkbox under the **DNS server** field to set the same DNS server as is used for the Hardware Node.

- In the **VPS Disk space limit** field, type the amount of disk space the Virtual Private Server will be guaranteed to receive, in megabytes. Make sure that the size of the files you wish to use for creating the application template does not exceed the size of the specified disk space. Otherwise, a warning will be displayed notifying you that the allocated disk space is not enough for copying the application files.

Pressing the **Next** button displays the window where you should specify the path to the application files and the name of the template:

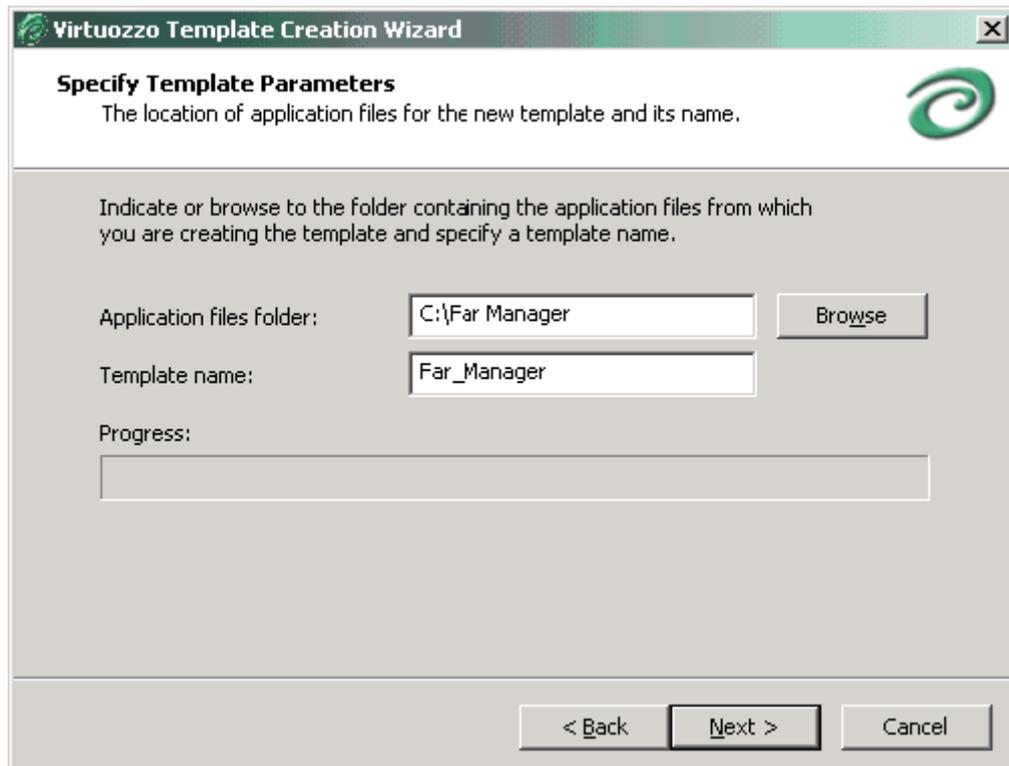


Figure 32: Creating Application Template - Specifying Path and Application Name

- In the **Application files folder** field, you should enter the path to the directory where the application files are stored that will be used for creating the application template. You can also use the **Browse** button to the right of the **Application files folder** field to point to the desired directory. The directory may contain any number of files with any extensions (.exe, .vbs, .txt, etc.). The files specified in this field will be copied to and manually installed inside the created temporary VPS at a later time.
- In the **Template name** field, you should choose a name for the application template. You can type any alphanumeric identifier that you consider reasonable for the template and that will be used to refer to this application template.

When you are ready with specifying the template name and choosing the necessary files, press the **Next** button to create the Virtual Private Server whose ID you have specified in the **Specify VPS Settings** window and where the application template is to be created.

After the VPS has been created and started, the **Connect to VPS** window is displayed. In this window, you are supposed to click **Next** to establish an RDP connection to the Virtual Private Server. This is needed to copy the source application files from the Hardware Node to the VPS where the application template will be created; later on, these source application files will be manually installed inside this VPS and the application template will be created on the basis of the installed files. After an RDP connection window is opened, minimize it and proceed with the wizard.

Note: Please do not close the RDP connection window manually.

On the **Prepare to Install** screen displayed after clicking **Next** in the previous window, just press the **Next** button to open the **Create Template** window. Now you should switch to the minimized RDP connection window and manually install your source application files that have been copied inside the Virtual Private Server. The source application files are located in the root directory of your hard drive (e.g. C:\Far_Manager). You can also customize the installed application to meet your demands; the files and registry settings of this installed and customized application will be used to create the template. Then switch back to the **Create Template** window and press **Next**.

Note: After you click **Next** in the **Create Template** window, you will be notified that your RDP connection to the temporary VPS was closed. Just click **OK** in the displayed message window.

The last screen of the wizard helps you make the final preparations for creating the application template:

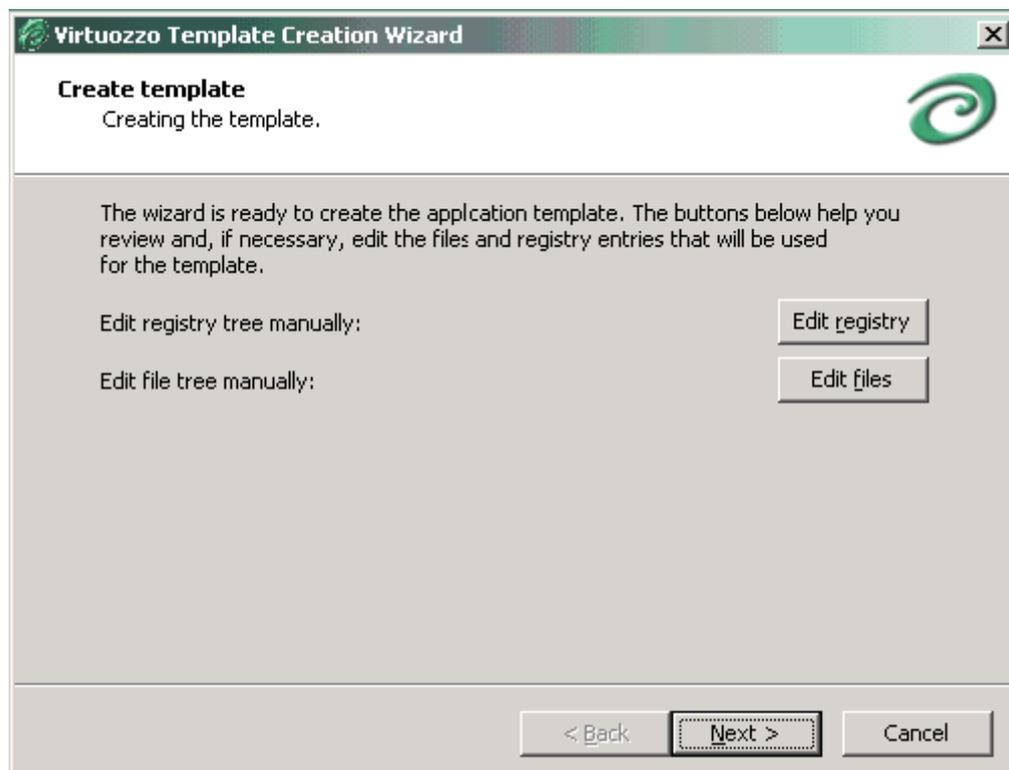


Figure 33: Creating Application Template - Creating Template

In this window, you can use the **Edit registry** and **Edit files** buttons to view and edit the registry entries and files of the installed application that the wizard will use for making the application template. After you have pressed the **Next** button, the application creation process is started.

After a while, the **Application Template Creation Completed** window is displayed notifying you that your application template has been successfully made. Click **Finish** to exit the wizard. The template is placed to the `C:\vz\Templates__cache` directory on the Hardware Node. However, before starting to use the newly created template, you should install it on the Node by means of the `vzpkgdeploy` utility. Please consult the `vzpkgdeploy` subsection of the **Reference** chapter (on page 243) to learn how to deploy and install your application templates on the Node.

Uploading and Installing New Virtuozzo Templates on Hardware Node

In case you have one or more new Virtuozzo templates that you would like to upload and install on your Hardware Node(s), you should first have these files accessible from the computer where VZMC is installed (e.g. insert the CD-ROM with the template(s) into the computer CD-ROM drive or copy the templates to the computer hard disk) and then launch the **Upload and Install New Virtuozzo Templates** wizard.

Note: In Virtuozzo 3.5, you can upload and install only application templates.

To invoke the wizard, right-click on the **Templates** item under any Hardware Node registered in VZMC and select the **Upload and Install New Virtuozzo Template** option. The **Choose Virtuozzo Templates to Distribute** window opens:

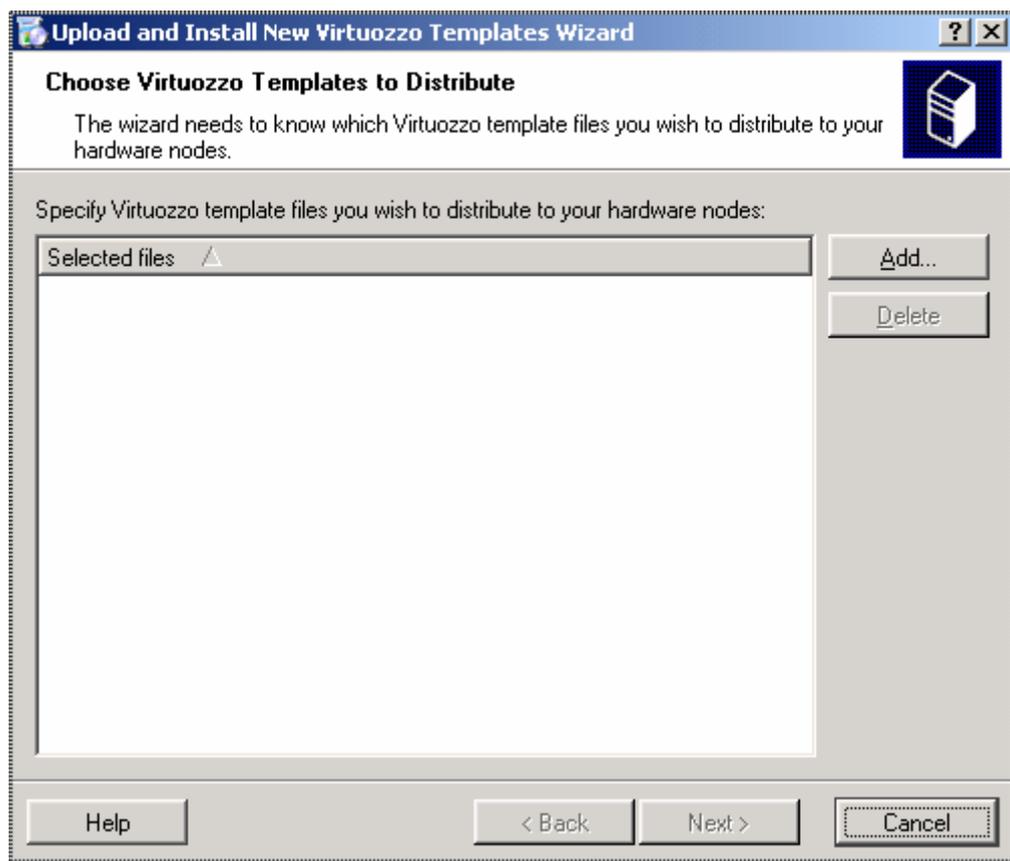


Figure 34: VZMC - Choosing Templates for Uploading

In this window, you will be asked to choose Virtuozzo template files you wish to deploy to your Hardware Node(s). To this effect, press the **Add** button and provide the path to the Virtuozzo templates you would like to install to a Hardware Node; then press **Next**.

The next screen will prompt you to define target Hardware Nodes where you wish to install new Virtuozzo templates. VZMC may upload and install the specified template(s) to any registered Hardware Node. By default, the current Hardware Node is selected. Select all the Nodes where you want the template(s) to be installed and press **Next**. In case of a large number of Nodes, it is reasonable to make use of the **Select All** or **Deselect All** buttons.

The last page of the wizard allows you to review Virtuozzo templates deploying settings:

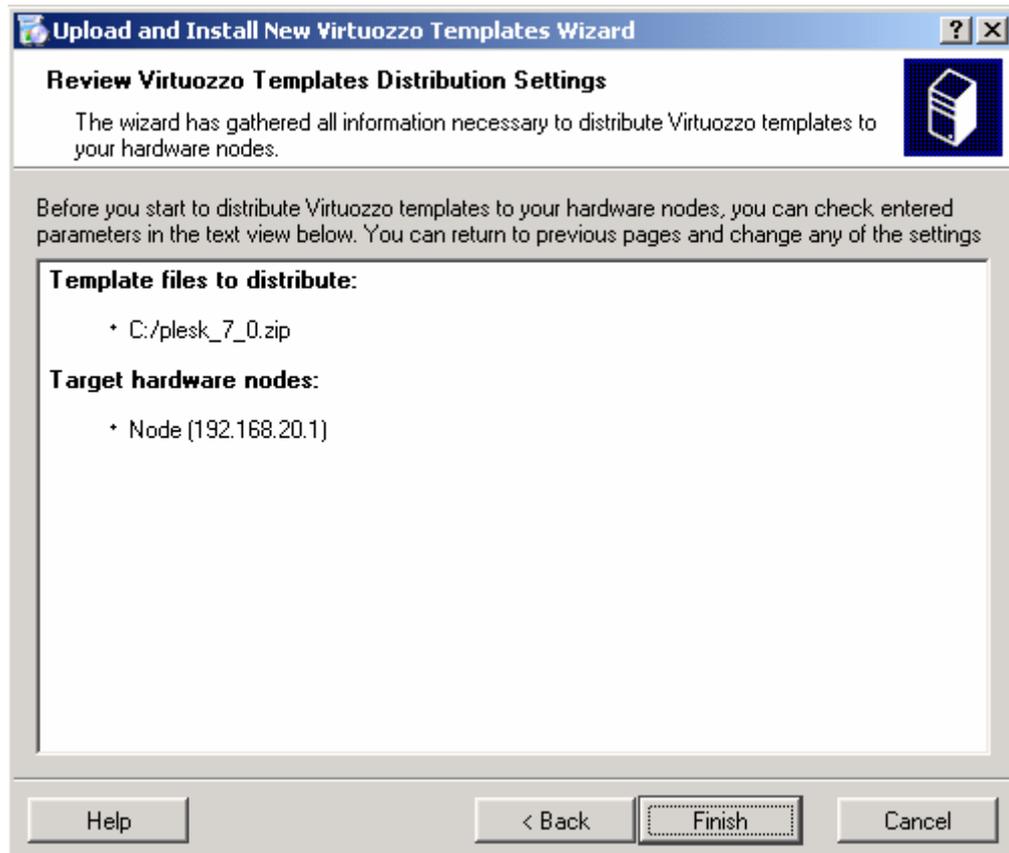


Figure 35: VZMC - Reviewing Virtuozzo Templates Distribution Settings

It summarizes the information provided by you on the previous steps, namely, what Virtuozzo templates to install and where to install them. If you are satisfied with the settings, press the **Finish** button. This will launch the upload and installation process. Otherwise, press **Back** to make the necessary changes to the information entered.

You can also install application templates by using the `vzpkgdeploy` utility. Please consult the **Reference** chapter for complete information on the `vzpkgdeploy` utility and its options.

Listing Templates

You may want to list the templates installed on the Hardware Node. They may be already used or not used by certain VPSs. To list templates in VZMC, it is sufficient to choose consecutively the **Templates** → **Application Templates** or **OS Templates** options under the name of the corresponding Node to see a list of the application or OS templates installed on the Node. For example:

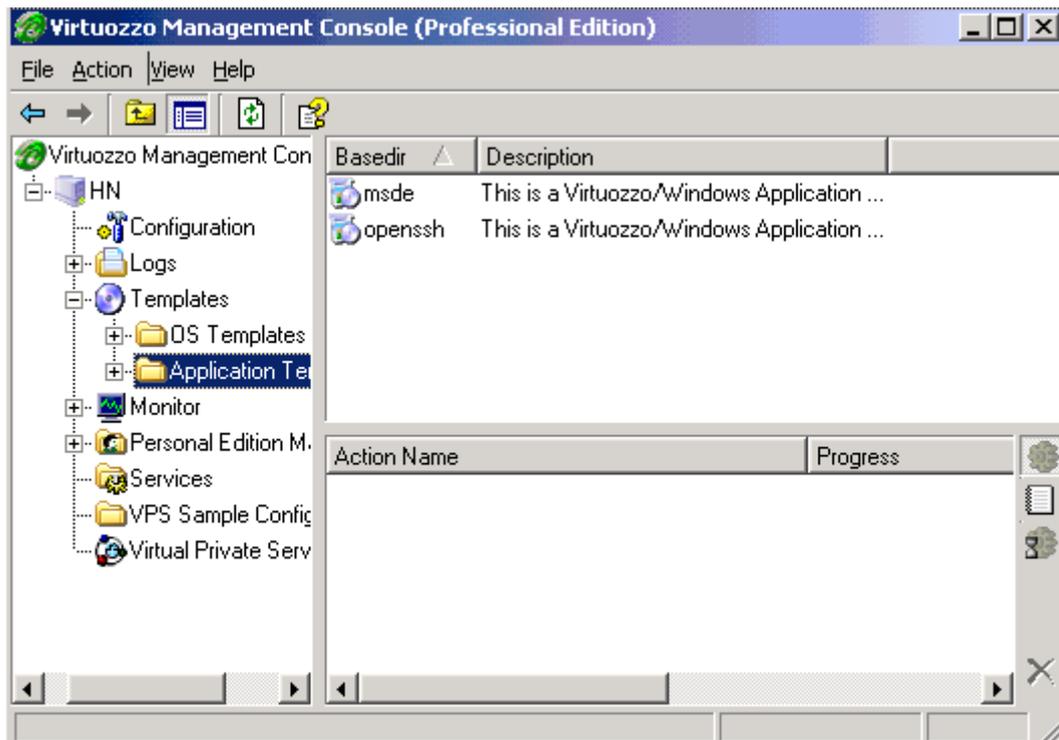


Figure 36: VZMC - Listing Templates

To see the templates used by a particular VPS, double-click the needed Virtual Private Server in the VPS list in the right pane to open this VPS management window, and then again choose **Templates** → **Application Templates** or **OS Templates** in the left pane of the new window.

In the command line, you can use the `vzpkgls` utility to list the templates installed on the Hardware Node. Detailed information on the `vzpkgls` utility can be found in the **Reference** chapter.

Adding Application Templates to VPSs

After you have installed a number of application templates on the Hardware Node, you may add them to any number of Virtual Private Servers. To successfully add a template to a VPS, this VPS should be running.

In VZMC, you can do it by performing the following operations:

- 1 Expand the Templates --> Application Templates item under the name of the Hardware Node where the needed templates are installed:

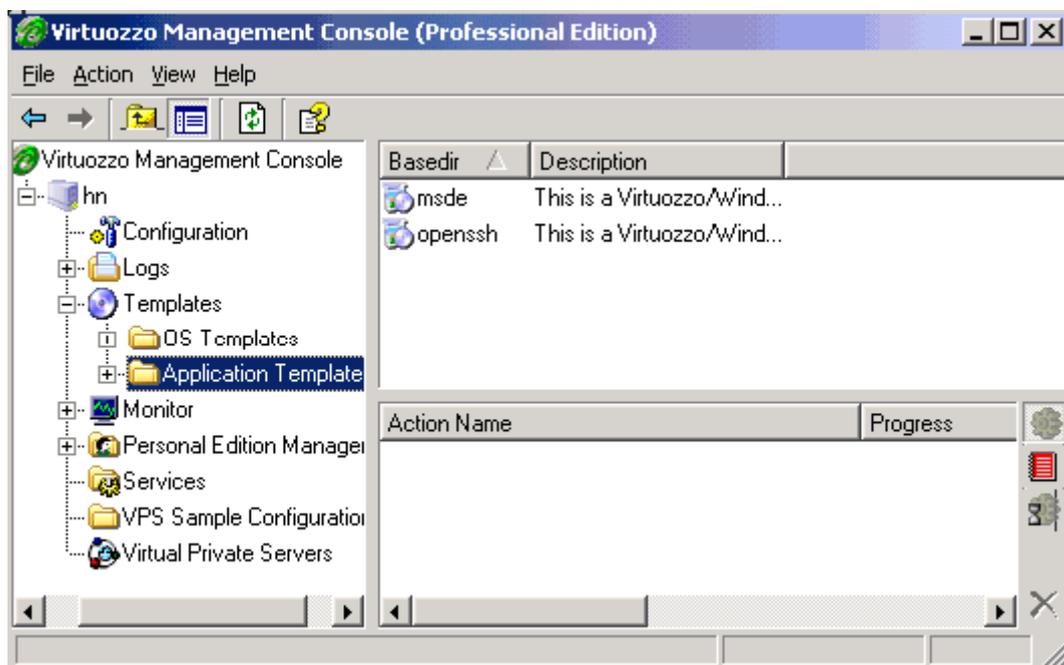


Figure 37: VZMC - Adding Templates to VPSs

- 2 Select all the necessary templates holding down the CTRL or SHIFT keys where necessary;
- 3 Right-click the selection and choose the Install Into Virtual Private Servers option;
- 4 Follow the instructions of the wizard.

If you are adding a template to only one VPS, you can as well do the following:

- 1 Open the list of Virtual Private Servers in the VZMC main window by selecting the Virtual Private Servers item in the Hardware Node tree;
- 2 Double-click the name of the VPS where you want to add a template;

- 3 Right-click on the **Templates** item in the main tree of the opened Virtual Private Server Manager, and select the **Add Virtuozzo Application Template** option on the context menu:

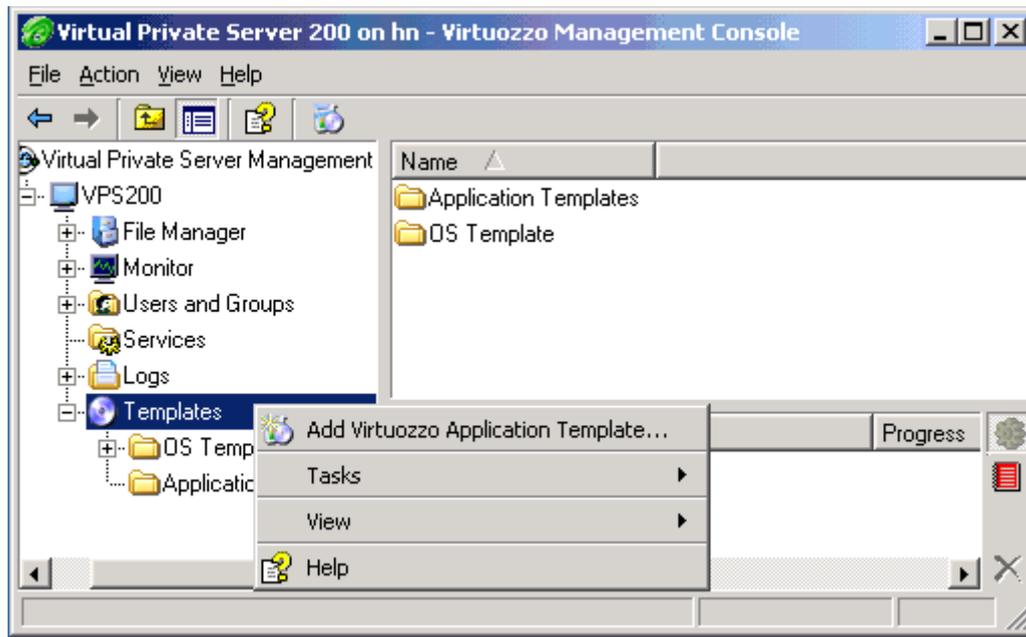


Figure 38: VZMC - Installing Templates in VPS Manager

- 4 Follow the instructions of the wizard.

In the command line, the `vzpkgadd` utility is used to add application templates to existing VPSs. Detailed information on the `vzpkgadd` utility is provided in the [Reference](#) chapter.

Notes: 1. You can as well do without templates and install virtually any application directly inside any VPS by using the Microsoft Terminal Services Client or Remote Desktop Connection, but this approach limits the scalability of the system.

2. If you are running the 64-bit version of Virtuozzo, you should use only 64-bit application templates to add them to your Virtual Private Servers.

Removing Virtuozzo Template From Hardware Node

Virtuozzo 3.5 allows you to remove those OS and application templates that are not needed any more. To this effect, you should perform the following operations:

- 1 Open the **Templates** folder under the corresponding Hardware Node name in the VZMC main tree.
- 2 Click on either the **Application Templates** or **OS Templates** item to display a list of all application or OS templates installed on the Node, respectively.

- 3 Right-click on the template you wish to delete in the right pane and select the Delete option on the context menu:

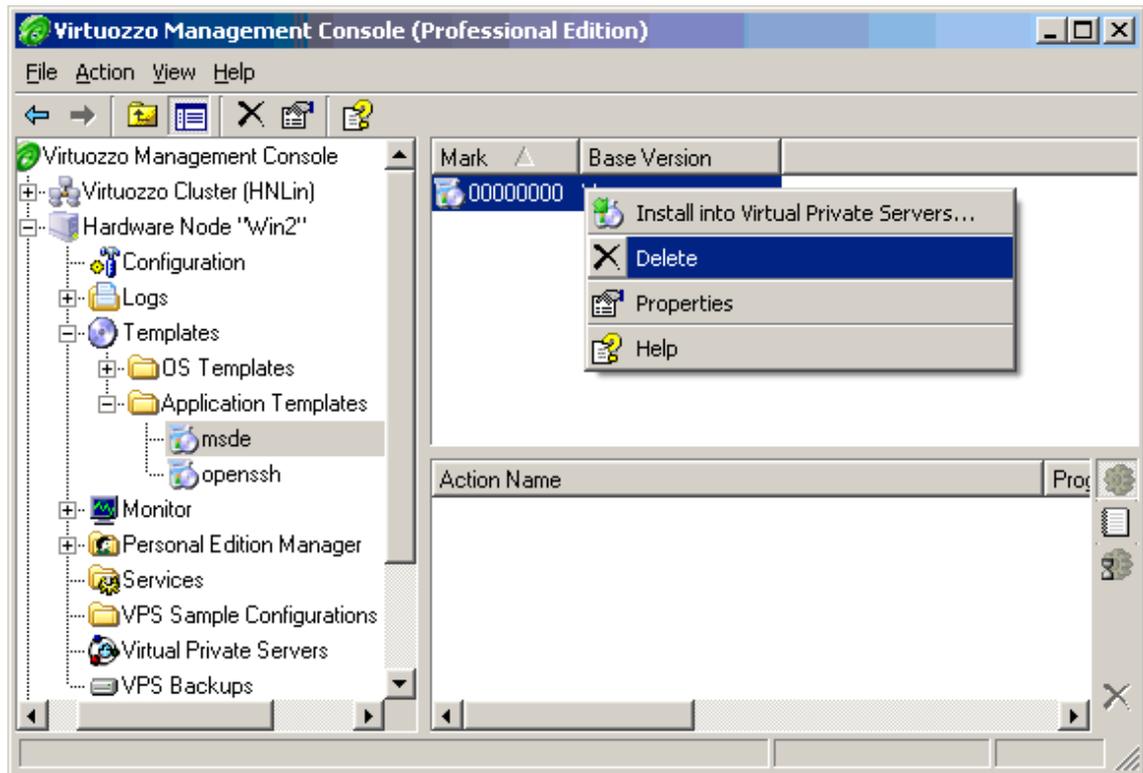


Figure 39: VZMC - Removing Template From Hardware Node

If you have several versions of an application template, you can delete this or that version by doing the following:

- 1 Open the **Templates** folder under the corresponding Hardware Node name in the VZMC main tree.
- 2 Click on either the **Application Templates** or **OS Templates** item to display a list of all application or OS templates installed on the Node, respectively.
- 3 Right-click on the needed template version in the right pane and select the **Delete** option on the context menu.

CHAPTER 5

Managing Resources

The main goal of resource control in Virtuozzo is to provide Service Level Management or Quality of Service (QoS) for Virtual Private Servers. Correctly configured resource control settings prevent serious impacts resulting from the resource over-usage (accidental or malicious) of any Virtual Private Server on the other Virtual Private Servers. Using resource control parameters for Quality of Service management also allows to enforce fairness of resource usage among Virtual Private Servers and better service quality for preferred VPSs, if necessary.

In the current version of Virtuozzo, you can manage the following resources:

- Disk space;
- Processor time;
- A set of memory-related parameters;
- A set of network parameters.

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Managing Network Resources	99
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Managing VPS Disk Space Quota

Virtuozzo allows you to control the amount of disk space a Virtual Private Server can use. The disk space quota imposed on the VPS is actually the size of its virtual hard disk, i.e. the size of the `root.efd` file in the `C:\vz\private\ directory of the Host operating system.`

The following subsections explain how to define the disk space quota parameter for your Virtual Private Servers and to check its status.

Setting Up Disk Space Quota

In VZMC, you can set up the disk space quota parameter by performing the following operations:

- 1 Click **Virtual Private Servers** in the VZMC left pane, then right-click the needed VPS in the right pane, and choose **Properties**.
- 2 Click the **QoS** tab and expand **Disk Quota** parameters.

- 3 Double-click the `Disk space` parameter to display the QoS counter properties window:

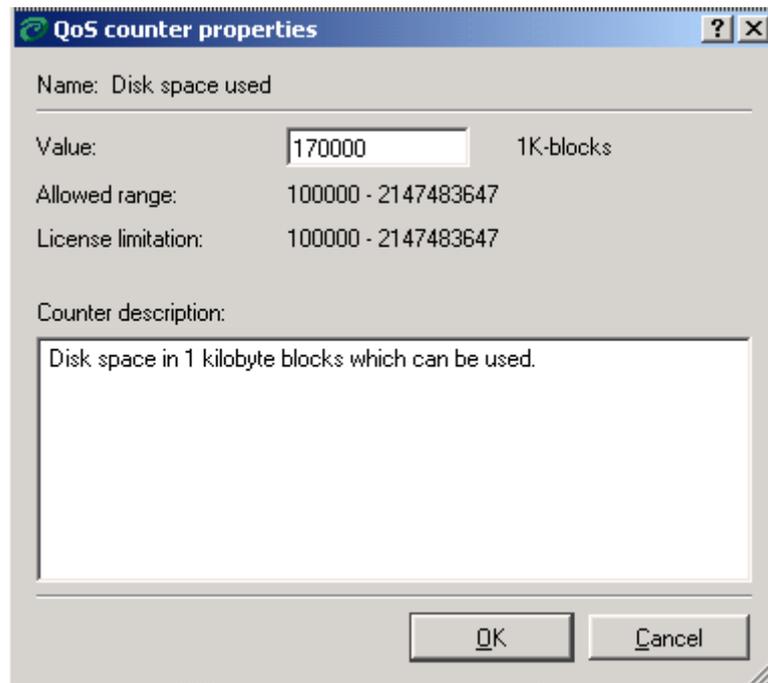


Figure 40: VZMC - Setting Disk Space Quota

In this window, you can change the value of disk space that can be used by the current Virtual Private Server. The value should be taken from the value range specified in the **Allowed range** field. Otherwise, the  symbol will be displayed opposite the **Allowed range** field. Mind that this value does not include the operating system files and the files of applications added to the VPS by means of application templates. As there are only stubs of these files inside the VPS, they do not occupy any space. So, there is no need to assign too much disk space (no more than 100-200 Mb) to individual VPSs.

- 4 Press OK.

It is possible to change the disk space quota parameter for a running Virtual Private Server. In this case the changes will take effect immediately.

You can also use the `vzctl set` command with the `diskspace` option or the `vzquota` utility to set up a new disk space quota for a VPS. Detailed information on the `vzctl` and `vzquota` utilities is provided in the [Reference](#) chapter.

Checking Disk Quota Status

As the Hardware Node system administrator, you can check the quota status for any Virtual Private Server.

To check the quota status for a VPS in VZMC, you should:

- 1 Open the needed Virtual Private Server manager window by double-clicking on the corresponding Virtual Private Server line in the right pane of the VZMC window;
- 2 Expand the **Monitor** item and select the **Quotas and Usage** folder.

You can see the disk space statistics for the current VPS in the right pane of the window:

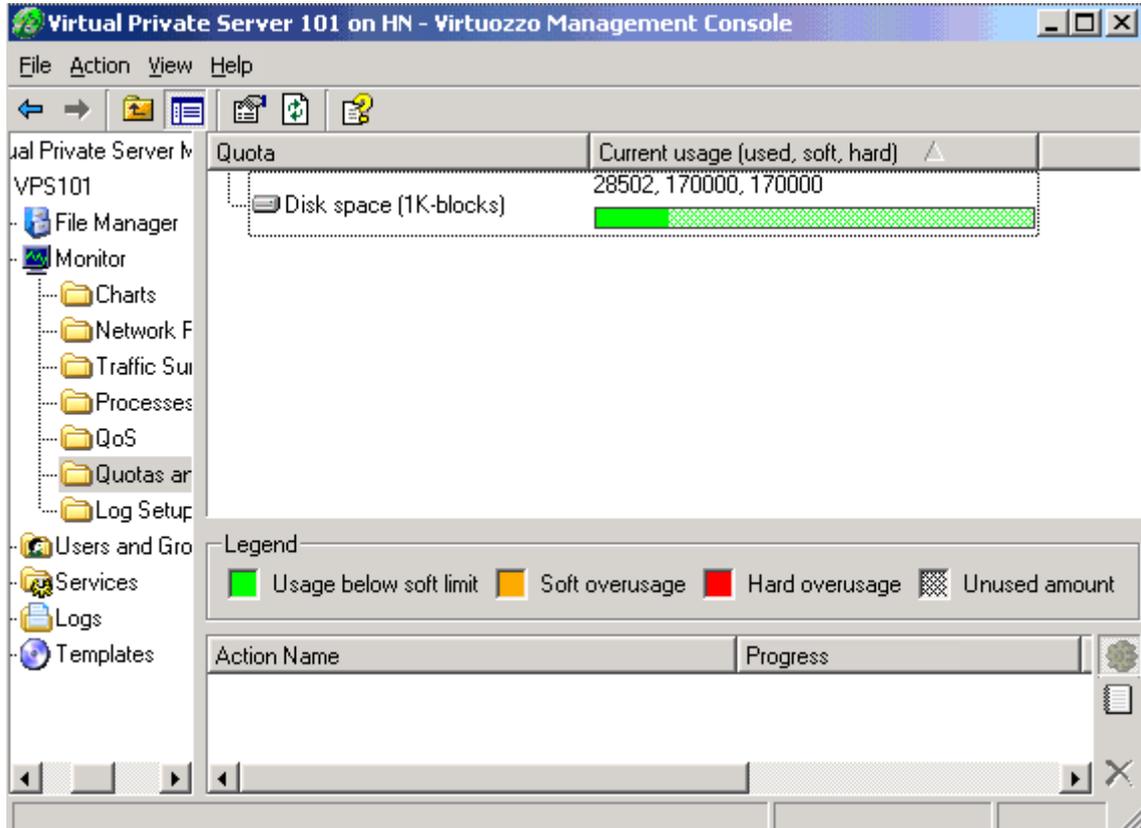


Figure 41: VZMC - Viewing VPS Disk Space Statistics

Managing VPS CPU Usage

The current section explains the CPU resource parameter that you can configure and monitor for each Virtual Private Server.

The CPU resource parameter in Virtuozzo-based systems is controlled by the Virtuozzo hierarchical scheduler and measured in CPU units. CPU units represent a positive integer number that defines how much CPU time one Virtual Private Server will receive in comparison with the other VPSs on the Hardware Node in case all the CPUs of the Node are fully used. For example, if VPSs 101 and 103 are set to receive 1000 CPU units each and VPS 102 - 2000 CPU units, VPS 102 will get twice as much CPU time as VPSs 101 or 103 in case all the CPUs of the Node are completely loaded.

Note: Processes belonging to any Virtual Private Server are scheduled for execution on all the CPUs of the Hardware Node. Consequently, VPSs are not bound to only one CPU, and any application inside each VPS can use all the free CPU power of the Node.

By default, the Hardware Node (VPS 0) receives 5000 CPU units and each VPS on the Node gets 1000 CPU units. In the current version of Virtuozzo, you cannot modify what default CPU value is to be used for the Hardware Node and any of its VPSs. However, you can change the current value of the CPU resource parameter for a particular Virtual Private Server (but not for the Node itself) by means of VZMC. To this effect, you should perform the following operations:

- 1 Click **Virtual Private Servers** in the VZMC left pane, then right-click the needed VPS in the right pane, and choose **Properties**.

- 2 Click the QoS tab and expand CPU parameters:

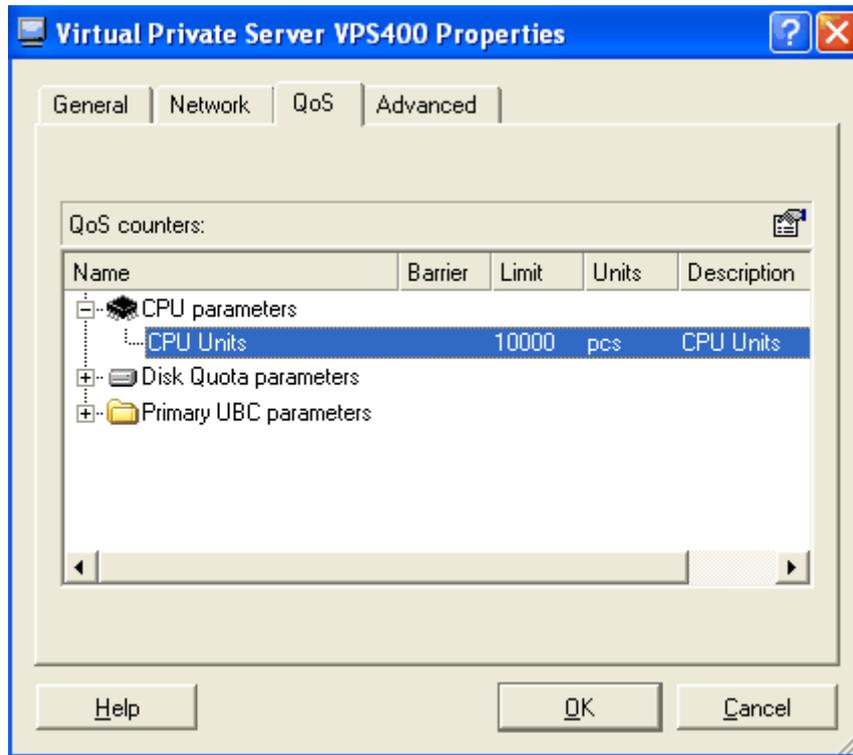


Figure 42: VZMC - Managing CPU Usage

- 3 Double-click the CPU Units parameter and enter the right value for the given VPS in the Value field of the QoS counter Properties window. You can specify any value in the range from 50 to 50000 CPU units. In case the value defined for the CPU resource parameter is set out of the allowed range, you will see the  symbol opposite the Allowed range field. It means that the entered value will be of no effect and rounded up or down by Virtuozzo to the minimal or maximal allowed value, respectively. For example, if you specify 30 CPU units in the Value field units, the entered value will be rounded up to 50 CPU units.

Note: Specifying 0 as the value of the CPU parameter will reset the current CPU value for the given VPS to the default one (i.e. to 1000 CPU units).

- 4 Press OK.

It is possible to change the CPU resource parameter for both stopped and running Virtual Private Servers. In the latter case, the changes will take effect immediately.

You can also use the `vzctl set` command with the `--cpuunits` option to set up the CPU Units parameter. Please consult the Reference chapter for complete information on this command.

Managing VPS System Resources

The resources a Virtual Private Server may allocate are defined by the system resource control parameters. The table below provides the description of these parameters:

Parameter	Description	Typical value
number of processes	The maximal number of processes the VPS may simultaneously create. It is important to properly estimate the maximal number of processes when configuring the resource control system.	30 - 80
number of sessions	The number of terminal sessions. This parameter is usually used to limit the number of simultaneous terminal sessions. An incorrect configuration of this parameter can affect the application functioning in the given Virtual Private Server.	2 - 4
VPS memory	The size of private (or potentially private) memory allocated by the VPS, in Mb. The memory that is always shared among different applications is not included in this resource parameter.	100 - 500

To view and/or change any of these parameters for a particular Virtual Private Server in VZMC, do the following:

- 1 Click **Virtual Private Servers** in the VZMC left pane, right-click the needed VPS in the right pane, and choose **Properties**.

- 2 Click the QoS tab and expand the Primary UBC parameters group:

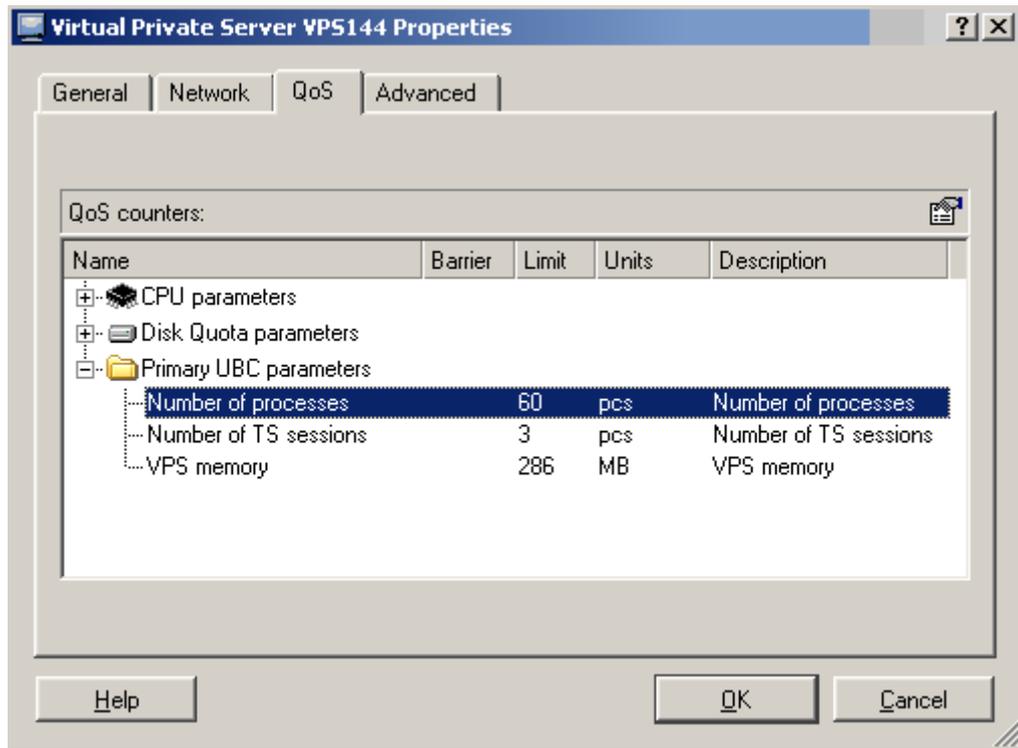


Figure 43: VZMC - Managing System Parameters

- 3 Double-click the necessary parameter, and, if necessary, enter the right value for the given VPS in the Value field of the QoS counter Properties window.
- 4 Press OK.

To manage system parameters by means of the command line, the `vzctl set` command is used. Detailed information on this command can be found in the Reference chapter.

Managing Network Resources

The given section provides information on how you can enable the Quality of Service scheduler and browsing for your Virtual Private Servers.

Enabling QoS Scheduler for VPS

Quality of Service (QoS) in MS Windows 2003 Server is a collection of components that enable differentiation and preferential treatment for subsets of data transmitted over the network. QoS provides different applications with a means which can be used to define the quality of network resources (e.g. bandwidth) to be allocated for this or that application. For example, you can use Quality of Service to differentiate between data transmitted by critical applications (e.g. Plesk) and excessive data (e.g. multimedia applications) and allow preferential treatment for the critical applications.

Note: The concept of Quality of Service in MS Windows 2003 ensuring quality data transmission for QoS-enabled applications on a network differs from that of Virtuozzo Quality of Service, which is used to provide a fair share of the main system resources (disk space, CPU time, etc.) among Virtual Private Servers.

Windows 2003 QoS is comprised of a number of components. One of the main components playing a central role in the provisioning of quality of service is the Quality of Service packet scheduler. The QoS packet scheduler is the traffic control module that can be used to regulate how much traffic an application inside your VPS is allowed, thus enforcing the QoS parameters originally set for a particular application.

By default, the QoS scheduler is disabled for all Virtual Private Servers residing on the Hardware Node. To enable it for a particular VPS, you should perform the following operations:

- 1 In VZMC, select the **Virtual Private Servers** item under the Hardware Node name.
- 2 Right-click the corresponding Virtual Private Server in the right part of VZMC and choose **Properties** on the context menu.

- 3 In the displayed window, go to the **Advanced** tab and select the **Enable QoS packet scheduler** checkbox:

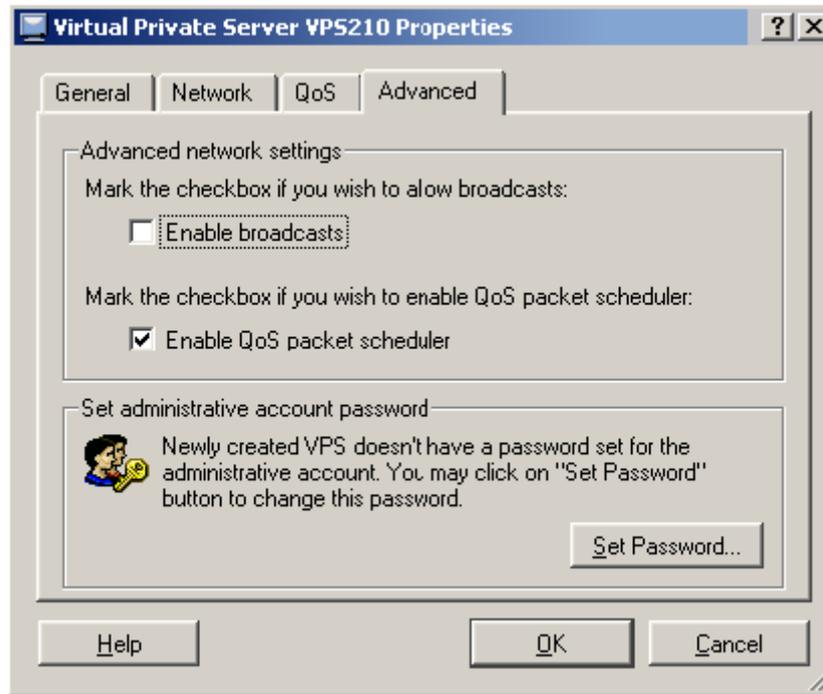


Figure 44: Enabling QoS Scheduler for VPS

- 4 Click **OK**.

Note: In case you have enabled the QoS packet scheduler for a running Virtual Private Server, you should restart this VPS for the changes to take effect.

After you have enabled the QoS packet scheduler, you can manage your VPS as a normal stand-alone Windows 2003 server in respect of setting and working with all Windows 2003 Quality of Service components. From this moment on, it depends entirely upon the VPS administrator to define which applications will be QoS-enabled and use all the benefits of Microsoft Windows Quality of Service.

Note: Additional information on the QoS packet scheduler is provided in the **Managing Bandwidth** section of the Windows 2003 Help system that can be invoked by selecting **Help and Support** on the Windows **Start** menu.

You can also use the `vzctl set` command with the `--psched` option to enable the Quality of Service packet scheduler for a Virtual Private Server. Detailed information on the `--psched` option is provided in the **Reference** chapter.

Enabling Network Browsing for VPS

The network browsing allows you to view and access all the network servers and file sharing resources available on your Windows 2003 network. However, to start using the network browsing feature inside a Virtual Private Server, which is disabled by default, you should first enable it for this VPS. To enable the network browsing for a particular VPS, you should perform the following operations:

- 1 In VZMC, select the Virtual Private Servers item under the Hardware Node name.
- 2 Right-click the corresponding Virtual Private Server in the right part of VZMC and choose Properties on the context menu.
- 3 In the displayed window, go to the Advanced tab and select the Enable broadcasts checkbox:



Figure 45: VZMC - Enabling Network Browsing

- 4 Click OK.

Now you can go to My Network Places --> Entire Network --> Microsoft Windows Network inside your Virtual Private Server, view what network resources are available for the VPS, and use these resources in accordance with the rights assigned to the VPS on the network.

Note: You can open My Network Places by clicking Start --> Programs --> Accessories --> Windows Explorer and selecting the My Network Places item in the left part of the displayed window.

Managing VPS Resources Configurations

Virtuozzo allows you to create new VPSs on the basis of the configuration sample files shipped with Virtuozzo 3.5. Currently, five configuration sample files are provided:

- `basic` – to be used for creating standard VPSs;
- `MSDE` – to be used for creating VPSs that are to run Microsoft SQL Server Desktop Engines;
- `Oracle` – to be used for creating VPSs that are to run Oracle database servers;
- `Plesk` – to be used for creating VPSs that are to run SWsoft Plesk 7.0 and above for Windows;
- `SharePoint` – to be used for creating VPSs that are to run SharePoint Portal Server 2003.

If the provided configurations do not satisfy your demands, you can create your own VPS configuration files by using VZMC. After that, you can copy them to any number of Hardware Nodes, if necessary. Below in this section, the process of VPS configuration file creating and copying is described.

Creating VPS Configuration Sample File

If you are not satisfied with the VPS configuration sample files shipped with Virtuozzo 3.5, you can create your own ones. VZMC provides a special wizard for creating VPS configuration sample files. The **Create Sample Configuration** wizard will guide you through the process and gather all the necessary information. In order to invoke the wizard, click the name of the Hardware Node where you wish to create the sample file and, in the right pane, click the **Create Sample Virtual Private Server Configuration** link under the **Wizards** item.

The **Create Sample Configuration** wizard opens:

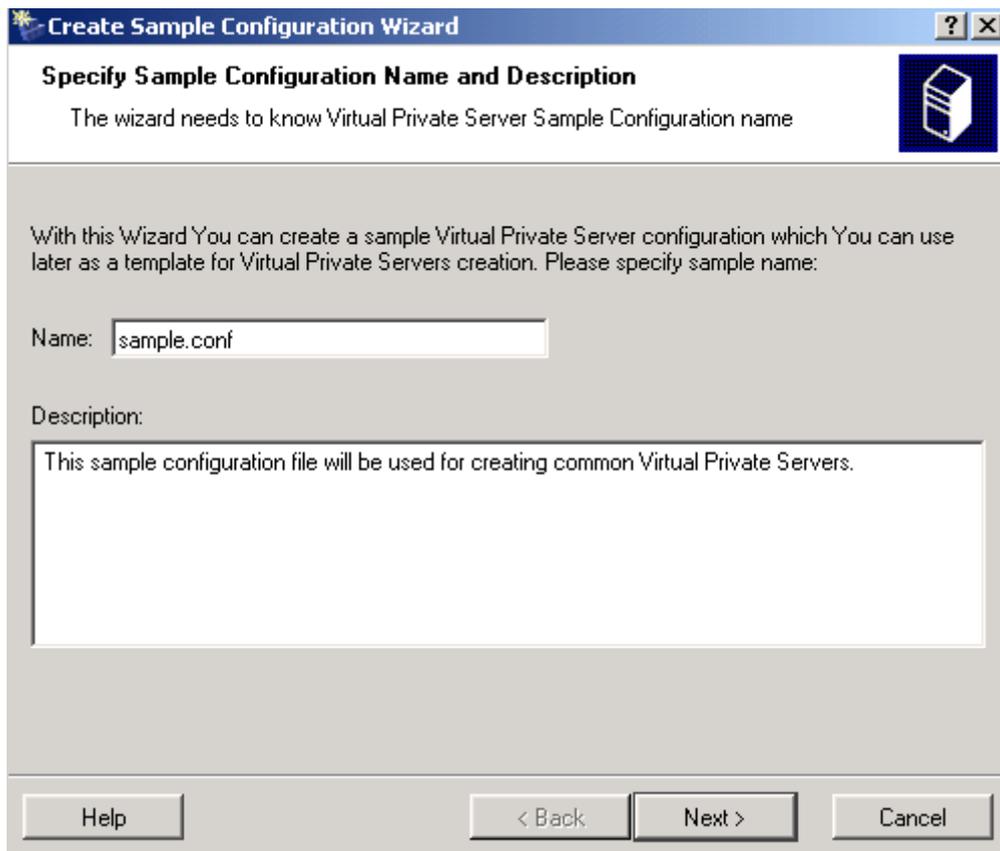


Figure 46: VZMC - Entering Sample Configuration Name and Description

In this window, you should choose a name for the sample file. You can type any alphanumeric identifier you consider reasonable for this file and that will be used to refer to the VPS sample configuration. Besides, you can enter any relevant comment on the file; it will be displayed within the list of VPS sample configurations. Click **Next**.

After that, you will be asked to choose a variant of the VPS configuration sample file creation:

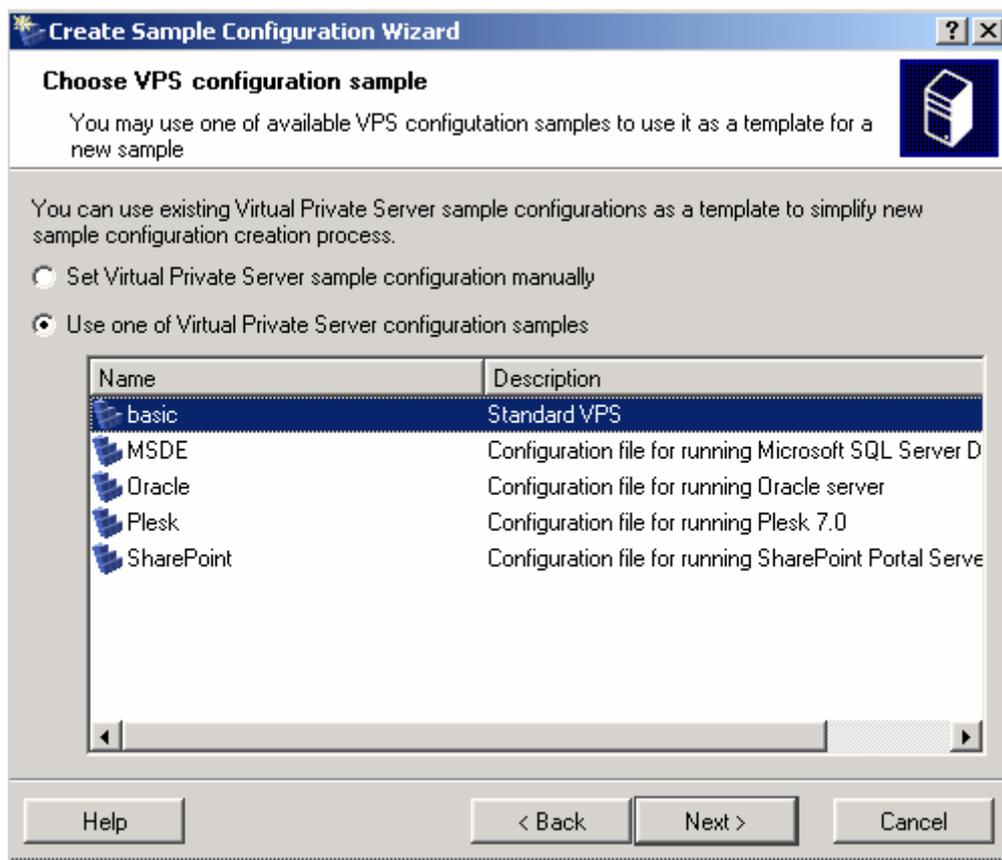


Figure 47: VZMC - Choosing VPS Configuration Sample

You can choose between two options:

- You can set the VPS sample configuration manually. Select this checkbox if there are no sample VPS configurations that can be used as the basis for the new one. In this case, you should define all QoS parameters one by one.
- You can use one of VPS configuration samples that are shipped with Virtuozzo 3.5 or have been already created by you. You may make use of this option if your new configuration sample differs from the existing one only slightly and can be created by adjusting some of its parameters. The information on the sample files shipped with Virtuozzo is provided in the [Managing VPS Resources Configuration](#) section (on page 103). All the available configuration samples are listed in the table below the **Use one of Virtual Private Server configuration samples** option. Just click on the needed sample and proceed with adjusting it.

Next, you will be asked to define the QoS parameters:

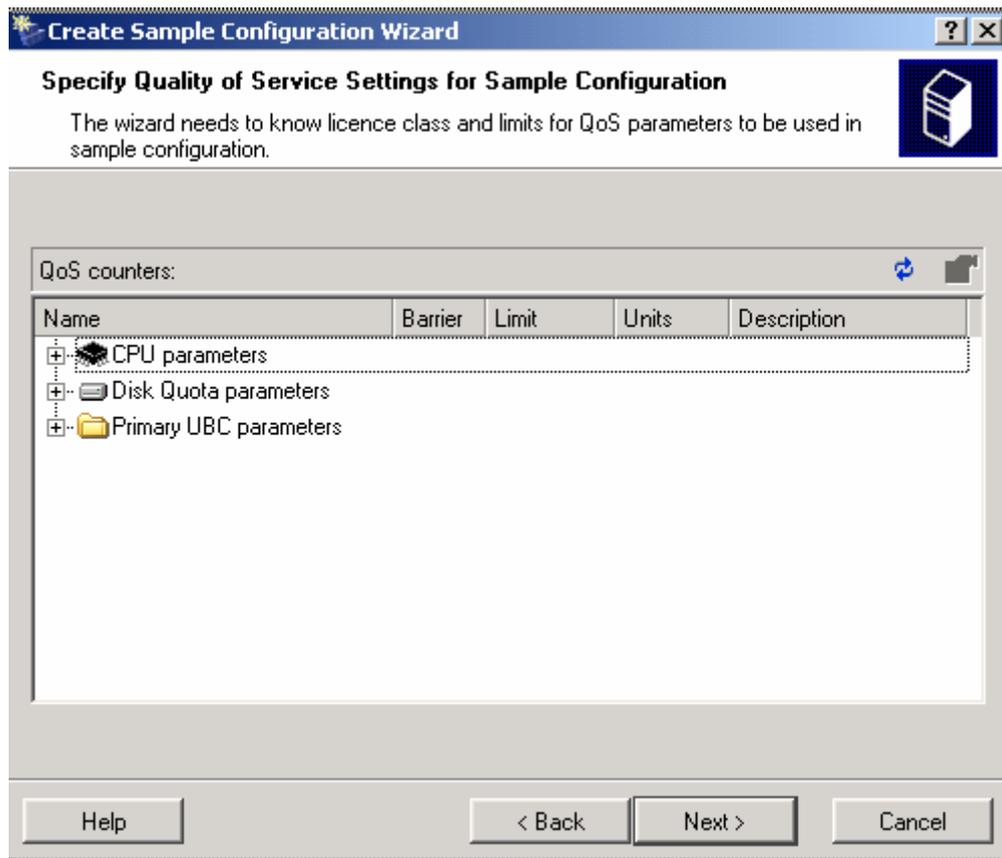


Figure 48: VZMC - Defining QoS parameters

In this window, you can adjust the following QoS parameters:

- CPU usage (see page 96);
- disk space quota (see page 93), and
- a number of system resource control parameters (see page 98).

To this effect, expand the corresponding group and double-click the parameter you wish to adjust. After you have set the necessary parameters, click **Next**.

On the next step, you are to define the OS template that will be used as the basis for creating Virtual Private Servers. OS templates are used to create new Virtual Private Servers. In Virtuozzo 3.5, you can use only the Windows Server 2003 OS template to create a VPS. If you do not want the VPS sample to predefine any specific OS template, select none in the Name column. Click **Next** to proceed after the selection.

On the next step, you can choose application templates to add to Virtual Private Servers which will be created from this sample configuration. All application templates available on your Hardware Node are listed in the table of the **Select Application Templates** window. Typical examples of application templates are `msde`, `openssh`, etc. After selecting the necessary application templates, click **Next**.

Note: This window will be displayed only if you have chosen the OS template on the previous page of the wizard the VPS template will be based on.

Finally, you will be offered to configure the automatic boot mode. Select the **Yes** checkbox if you want the VPSs based on the configuration sample being created to start automatically on the Hardware Node boot. To start the VPSs manually, select **No**.

The last screen summarizes all the data you have provided on the previous steps. If you are satisfied with the entered information, click **Finish** to start creating the VPS sample configuration file. Otherwise, you can return to the previous steps by clicking the **Back** button and change the corresponding parameters.

Now, you can use the new VPS sample configuration file to create VPSs on its basis. It will be displayed on the first screen of the **Create Virtual Private Servers** wizard together with the configuration files shipped with Virtuozzo 3.5.

Copying VPS Configuration Sample File

VZMC provides you with the opportunity to quickly disseminate one or more sample VPS files over several Hardware Nodes, or simply copy it/them to another Node. This is particularly useful when you have created a custom configuration file on one of the Nodes and wish to use it on the other Nodes as well.

To copy a sample VPS file, you should perform the following operations:

- 1 Select the **VPS Sample Configuration** item in the Hardware Node main tree.
- 2 Right-click the sample configuration file and choose **Tasks -> Copy to Another Hardware Node**:

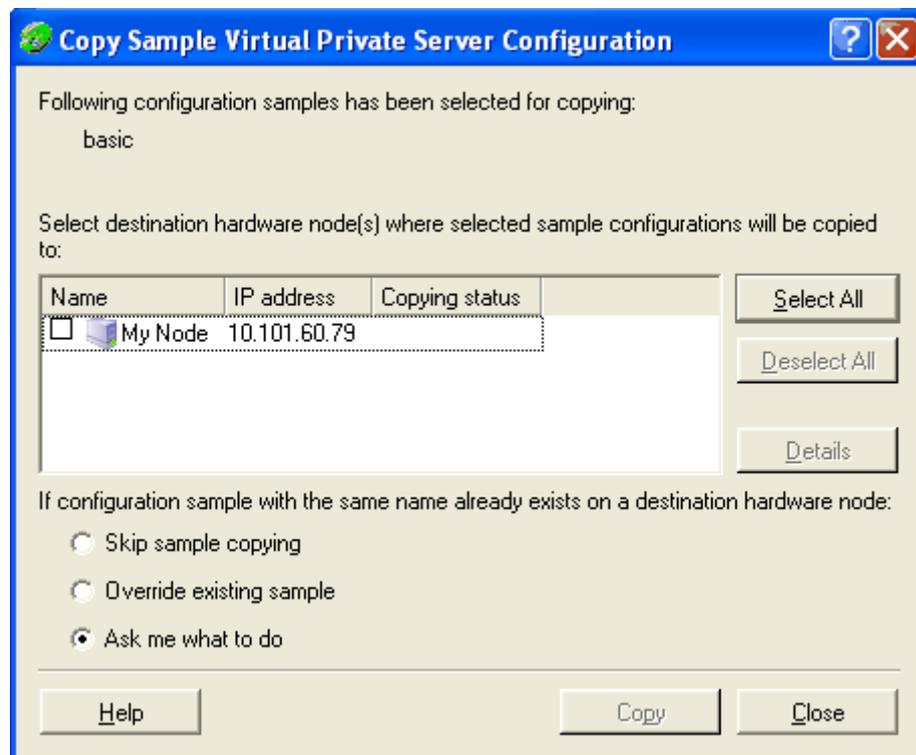


Figure 49: VZMC - Copying VPS Configuration Sample File

- 3 In the displayed window:

- Select the Hardware Node(s) where you want to copy the files (you might use the **Select All** and **Deselect All** buttons to this effect).
 - Select the action that will be performed in case a configuration sample file with the same name already exists on the destination Node.
- 4 Press the **Copy** button. In the **Copying Status** column, you may view the result of the operation.
 - 5 If the copy operation has completed successfully, press **Close** to close the window. If not, press the **Details** button to learn more about the error that occurred during the operation process. This is the only case when this button becomes active.

The VPS sample configuration files are stored in the `X:\Program Files\SWSoft\Virtuozzo\Configs` folder on each Hardware Node.

If you take default Virtuozzo sample configuration files, modify them, and copy to another Node preserving the default names, chances are that files with the same names already exist on the destination Node. To resolve this conflict, you are supposed to choose at the bottom of the window one of the three corresponding options, which best fits your needs.

Saving and Uploading Configuration Sample to/from Local Computer

VZMC allows you to upload a new sample file to your Node from and save any of the existing configuration sample files to your local computer.

In case you have one or more new configuration sample files that you would like to upload to your Hardware Node(s), you should first have these files accessible from the computer where VZMC is installed (e.g. insert the CD-ROM with the VPS sample file(s) into the computer CD-ROM drive or copy the sample file(s) to the computer hard disk). After that, you should do the following to upload your new sample file(s) to the Node:

- 1 Right-click the **VPS Sample Configurations** item under the Hardware Node name in the VZMC left pane and select **Tasks --> Upload VPS Sample from Local Computer** on the context menu.
- 2 In the displayed window, provide the right path to the configuration file you wish to upload and click **Open**.

3 You will be presented with the following window:

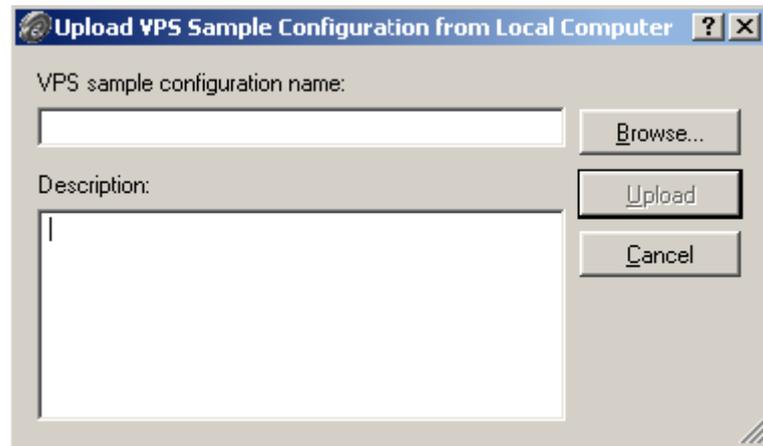


Figure 50: VZMC - Uploading Sample File

In this window, you can perform the following operations:

- Change the original name of the configuration sample file by typing a new one in the VPS sample configuration name field. This name will be used to refer to this sample file in the VPS configuration sample files listing.
- Provide the description of the sample file in the Description field. This description will be displayed to the right of the sample file in the VPS configuration sample files listing.
- Press the Upload button in the right part of the window to upload the sample file to the Node.

After the configuration sample file has been successfully uploaded, you can find it in the `X:\Program Files\SWSoft\Virtuozzo\Configs` folder on your Hardware Node.

You can also save any of the configuration sample files available on your Node to a computer where VZMC is installed. To this effect, you should perform the following operations:

- 1 In the VZMC left pane, select the VPS Sample Configurations item under the corresponding Hardware Node name in the VZMC left pane;
- 2 In the VZMC right pane, right-click the configuration sample file you wish to download and select Tasks --> Save to Local Computer on the context menu;
- 3 In the displayed window, provide the path to the location on the computer hard disk where you wish to save the sample file;
- 4 Click Save.

CHAPTER 6

Managing Hardware Nodes

The current chapter centers on all those operations you can perform on your Hardware Nodes. You will learn how to manage your Virtuozzo licenses, to update Virtuozzo software and the Windows Server 2003 operating system on your Node, to unite your Nodes into a cluster, to view and configure a number of Virtuozzo-related parameters.

In This Chapter

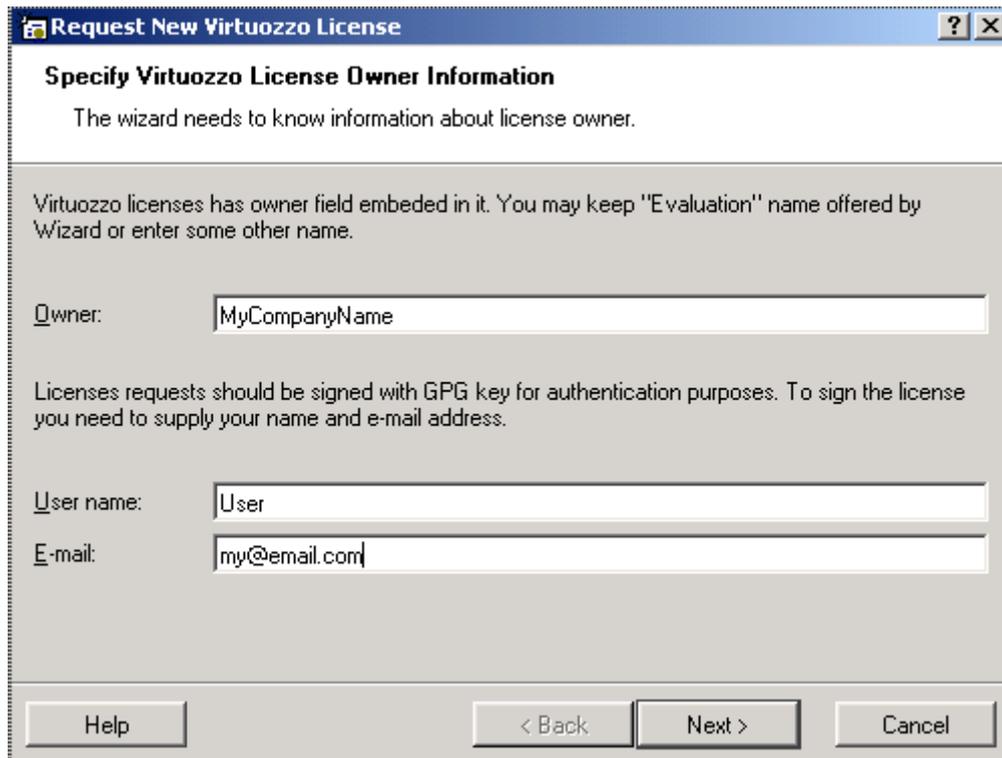
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Managing Virtuozzo Licenses

The given chapter provides information on managing Virtuozzo licenses. In particular, you will know how to view the current license status, to generate a new license request in case your license has expired, and to load a new license to your Hardware Node.

Generating License Request

The Virtuozzo license can be obtained from SWsoft by sending a license request to your SWsoft sales contact (e.g. sales@swsoft.com). A license request is a file generated with the help of the License Request Generation wizard. To launch the wizard, select the corresponding Hardware Node name and follow the Request New Virtuozzo License link under the Wizards group on the HN dashboard. The wizard will prompt you for all the necessary information. On the first step, you should provide your personal information:



The screenshot shows a window titled "Request New Virtuozzo License" with a subtitle "Specify Virtuozzo License Owner Information". The window contains the following text and fields:

The wizard needs to know information about license owner.

Virtuozzo licenses has owner field embeded in it. You may keep "Evaluation" name offered by Wizard or enter some other name.

Owner:

Licenses requests should be signed with GPG key for authentication purposes. To sign the license you need to supply your name and e-mail address.

User name:

E-mail:

At the bottom of the window, there are four buttons: "Help", "< Back", "Next >", and "Cancel".

Figure 51: VZMC - Entering Personal Information

In this window, you should enter your company name in the Owner field as all Virtuozzo licenses have an “owner” field in them. This field is purely informational and can help track the license history if needed. Besides, you should provide your user name and valid e-mail address in the User name and E-mail field, respectively.

The next screen asks you for the number of Virtual Private Servers you are planning to have:

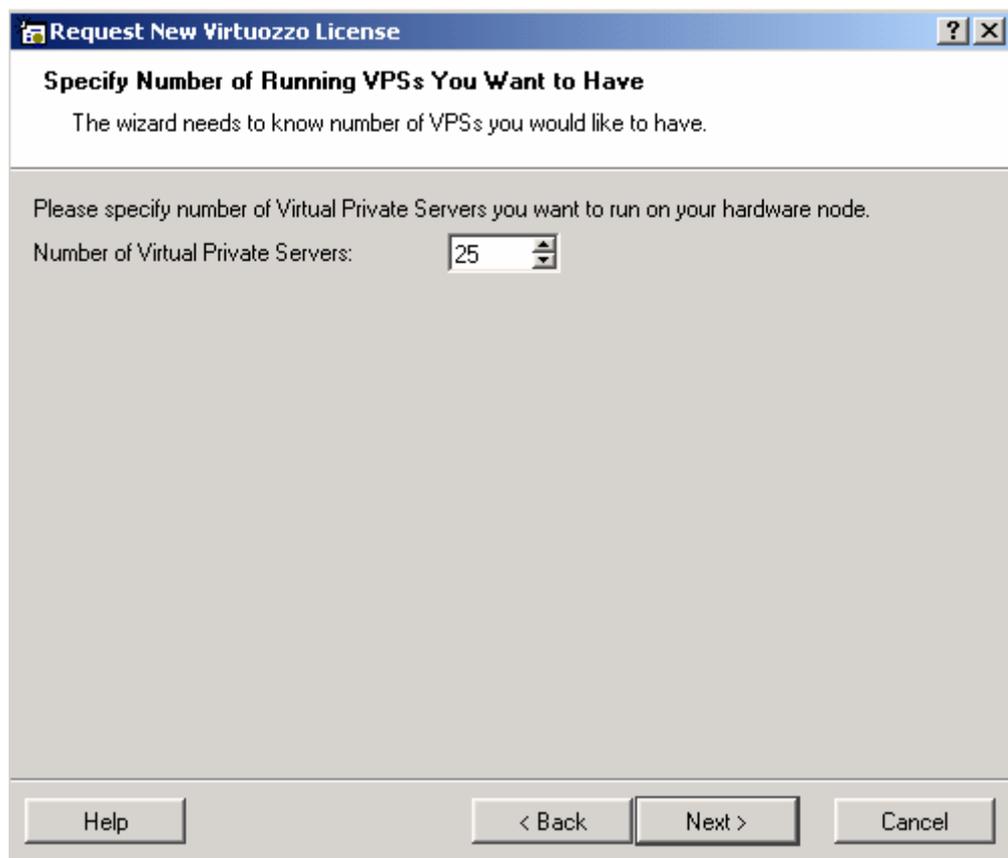


Figure 52: VZMC - Specifying Number of VPSs

Please note that you should specify a non-zero number; otherwise, the error message will be displayed asking you to enter the number again.

Note: The number of Virtual Private Servers entered relates to regular user VPSs only; the Service VPS is not included in this number.

The next screen will prompt you for the license expiration date. You can choose between two possibilities:

- **Unlimited. Never expires.** Select this radio button if you need a permanent license.
- **Time-limited evaluation license.** It may be suitable for you if you are going to evaluate Virtuozzo over a period of time. In this case you should enter the date when the license expires in the Expires on field under the radio button.

Then you will be asked to enter the number of processors you are planning to use on your Hardware Node:

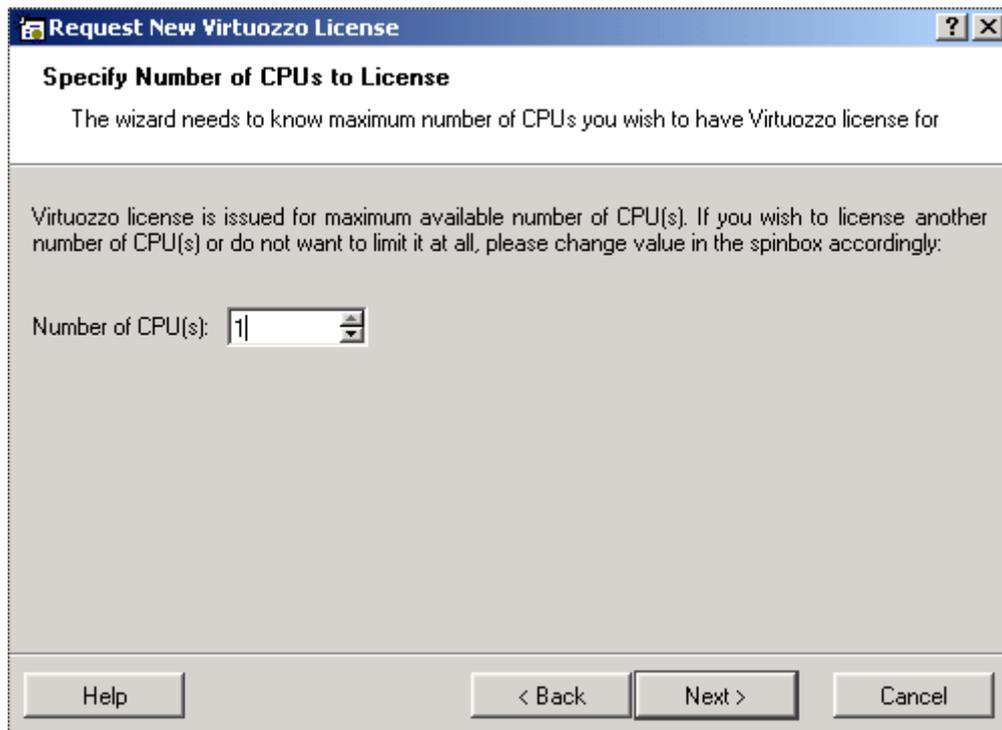


Figure 53: VZMC - Entering Number of CPUs

By default, VZMC displays the number of CPUs currently available on the Node. However, if you are going to install additional processors, then please enter the total CPU number after the upgrades in the **Number of CPU(s)** field.

The next screen will prompt you for the location where the license request file will be stored. It can be any directory on your Hardware Node. You can keep the directory offered by default or select the desired one by clicking the ... button to the right of the **License file path** field.

Finally, you will be presented with the screen summarizing all the parameters you have provided on the previous steps. If you are satisfied with the entered information, click **Finish** to complete the license generation process. Otherwise, you can return to the previous steps by clicking the **Back** button and change the corresponding parameters.

After the wizard exits, you can find the license request as the `vzLicReq.txt` file in the directory you have specified in the wizard. You should send this file to `sales@swsoft.com` (or your personal SWsoft contact).

You can also generate a Virtuozzo license request and send it to SWsoft by using Virtuozzo Control Center (VZCC). Detailed information on managing Virtuozzo licenses in VZCC is provided in the **Managing Virtuozzo Licenses** section of the **Managing Hardware Node** chapter in the **Virtuozzo Control Center Guide**.

Uploading License to Hardware Node

After SWsoft provides you with the corresponding license file named `vzlicense`, you can upload and install it on the Hardware Node in one of the following ways:

- 1 By using Virtuozzo Management Console (VZMC):

- Copy the license file to the computer where VZMC is installed.
 - In VZMC, click on the corresponding Hardware Node name and follow the **Manage Virtuozzo License** link at the HN dashboard.
 - On the **License** tab of the **Hardware Node Properties** window, click on the **Upload New License** button.
 - Specify the location of the `vzlicense` file and press the **Open** button to upload the new license to the Hardware Node.
- 2** By using Virtuozzo Control Center (VZCC):
- In VZCC, follow the **Hardware Node** link on the VZCC main menu and click the **License Management** link to display the **License Management** page.
 - On the **License Management** page, click the **Install New License** link to open the **Install New License** page.
 - Open the license file by using any text editor and copy its content to the clipboard.
 - Place the cursor to the **License** field of the **Install** page and paste the copied license text.
 - Press the **Submit** button.

You can also use the `vzlicload` utility to load your Virtuozzo license to the Hardware Node. Detailed information on this utility is provided in the **Reference** chapter.

Viewing Current License

In order to check the current status of the license installed on a Hardware Node, click on the corresponding Hardware Node name and follow the [Manage Virtuozzo License](#) link at the HN dashboard:

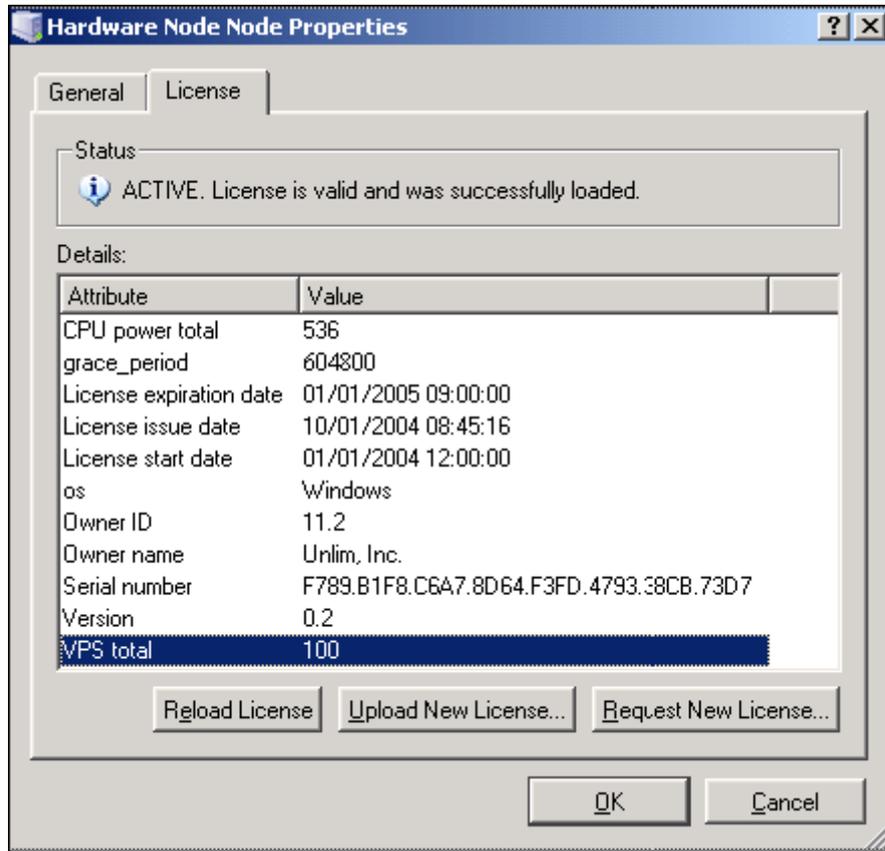


Figure 54: VZMC - Viewing Current Virtuozzo License

On the License tab of the Hardware Node Properties window, you can view the full information about the Hardware Node license. Pay attention to the license status that can be one of the following:

ACTIVE	The license file is valid and has been successfully loaded into the Virtuozzo management service.
VALID	The license file contains a valid license for this Hardware Node; however, no license is loaded into the Virtuozzo management service.
INVALID	The license file is invalid (for example, because of the Hardware Node ID mismatch) or corrupted.
EXPIRED	The license file matches the Hardware Node ID but has expired and, therefore, could not be loaded into the Virtuozzo management service.
GRACED	The license file has been successfully loaded into the Virtuozzo management service; however, it has expired and is currently on the grace period (i.e. it is active till the end of the grace period)
UNKNOWN	No Virtuozzo support has been detected on the Hardware Node.

You can also use the `vzlicview` utility to find out the status of your Virtuozzo system in respect of the license loaded. Detailed information on this utility is provided in the [Reference](#) chapter.

Virtuozzo License Expiration

As soon as the license period expires, the Hardware Node will continue working for a grace period, and then finally Virtuozzo will stop functioning. The grace period is measured in seconds, you can see its value in the license properties. During this period, you can generate a license request, send it to SWsoft, receive a new license, and upload it to your Node.

If the license expires in less than a week, you will be warned with the **Virtuozzo License Expires Soon** window every time you launch VZMC. Pressing **Details** in this window will take you to the **Hardware Node Properties** screen where you will be able to view the details of the currently loaded license as well as to request a new license from SWsoft and to upload it by clicking the corresponding buttons. Detailed information on how to generate license requests is provided in the [Generating License Request](#) section (on page 111).

Updating Hardware Node Software

This section provides information on how you can update the Virtuozzo software and Windows Server 2003 installed on your Hardware Node.

Updating Virtuozzo Software

Virtuozzo for Windows is constantly developing: there appear new versions of the Virtuozzo core and of existing Virtuozzo utilities, new functionality is implemented, new templates and utilities are added from time to time. As these changes grow in number, new Virtuozzo updates are released.

Virtuozzo is provided with a special module - Virtuozzo Update Services (VUS) - helping you deploy Virtuozzo updates to your Hardware Node. By default, the Virtuozzo installation configures VUS in such a way as for the latter to be able to automatically check the Virtuozzo updating center (accessible at <http://vzwinupdate.swsoft.com>) for the latest Virtuozzo updates, download, and install them on your Node. After new updates have been successfully downloaded and installed on the Node, the corresponding message is displayed on the screen notifying you that your Virtuozzo software has been updated and asking you to reboot your system for the new settings to take effect.

However, you may want to modify the default Virtuozzo update settings to meet your requirements. To this effect, you should select **Programs --> SWsoft --> Virtuozzo --> Virtuozzo Update Monitor** on the Windows Start menu. This will make the  icon appear in the system tray of your display. Right-click this icon and choose **Settings** on the context menu. You will be presented with the **Virtuozzo Update Settings** window:

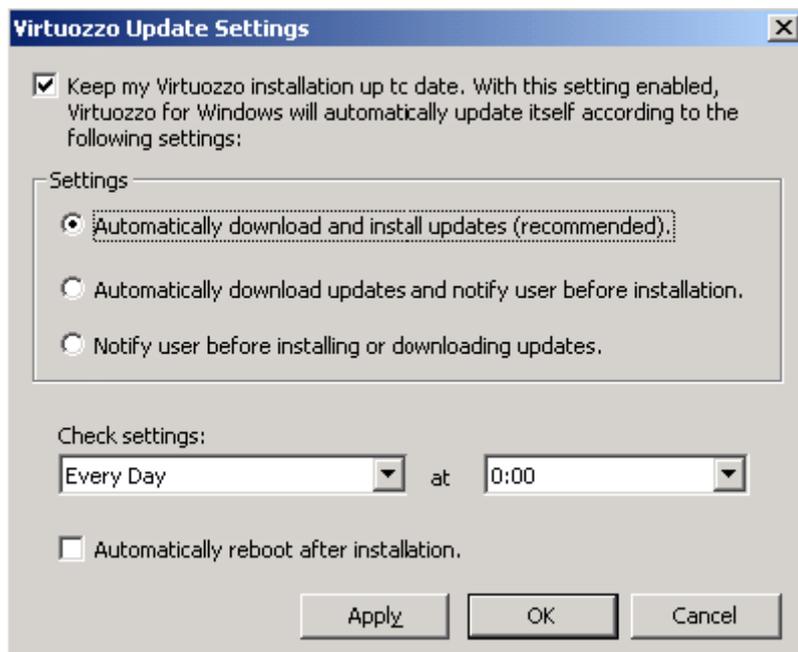


Figure 55: Defining Virtuozzo Update Settings

In this window, you can modify the Virtuozzo update settings in the following way:

- If the **Keep my Virtuozzo installation up to date ...** checkbox is selected, the following options are available:

- **Automatically download and install updates.** Select this radio button if you wish Virtuozzo updates to be automatically downloaded and installed on your Hardware Node on a schedule you specify in the fields provided under the **Check settings** group. By default, this radio button is selected. We recommend that you leave this option checked, which will always keep you at the latest Virtuozzo version.
- **Automatically download updates and notify user before installation.** Select this radio button if you wish Virtuozzo Update Services to automatically download the updates in the background of your system on a schedule you specify in the fields provided under the **Check settings** group. If you choose this option, the  icon will be displayed in the system tray notifying you each time new Virtuozzo updates are available. After the download of new updates is complete, the icon changes its color from grey to green, and when you place the mouse on the icon, the following message is displayed: `New Virtuozzo updates are available`. When you double-click the icon, the **Virtuozzo for Windows Updates Setup Wizard** is invoked that helps you install the downloaded updates in a few simple steps described below.
- **Notify user before installing or downloading updates.** Select this radio button if you wish VUS to check the Virtuozzo updating center for available updates on a schedule you specify in the fields provided under the **Check settings** group and to inform you in case it finds any updates for your Node. After you choose this option, the  icon will be displayed in the system tray notifying you each time new Virtuozzo updates are ready to be downloaded from the Virtuozzo updating center. In this case the icon changes its color from grey to green, and when you hover the mouse over the icon, the following message is displayed: `New Virtuozzo updates are available`. After you double-click the icon, the **Virtuozzo for Windows Updates Setup Wizard** is invoked that helps you download and install the corresponding Virtuozzo updates in a few simple steps described below.

- After new Virtuozzo updates are successfully downloaded and installed on your Node, you will be asked to reboot your system for the new settings to take effect. To automatically restart your computer after the installation, select the **Automatically reboot after installation** checkbox.

Note: If you do not want the  icon to be displayed in the system tray, right-click it and select **Exit** on the context menu. In this case the icon will automatically appear again as soon as new Virtuozzo updates are ready to be downloaded or/and installed on your Node.

You can also disable the automatic update of Virtuozzo software by clearing the **Keep my Virtuozzo installation up to date ...** checkbox in the **Virtuozzo Update Settings** window and update your Virtuozzo software manually with the help of the **Virtuozzo for Windows Updates Setup Wizard**. This is the same wizard that is launched when the automatic update is enabled and you double-click the  icon in the system tray to download or/and install new Virtuozzo updates. It is highly recommended to regularly run this wizard to ensure that you always use the latest Virtuozzo version. To invoke the wizard, select **Programs --> SWsoft --> Virtuozzo --> Virtuozzo Update Wizard** on the Windows Start menu. You will be presented with the **Welcome to the Virtuozzo Updates Setup Wizard** screen.



Figure 56: Running Virtuozzo Update Wizard

In this window, you can do the following:

- If you wish to use the Internet Explorer proxy settings to connect to the Virtuozzo updating center, click **Next** to start updating your Virtuozzo software.
- Otherwise, click the **Proxy Settings** button on the **Welcome to the Virtuozzo Update Wizard** screen to display the **Enter Proxy Settings** window:

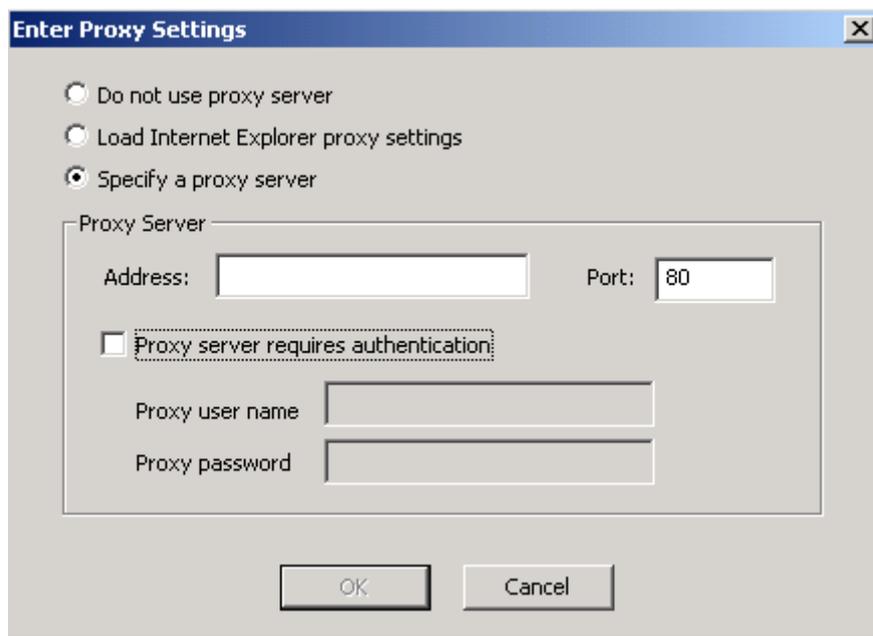


Figure 57: Installing Virtuozzo - Specifying Proxy Parameters

This window allows you to do one of the following:

- Select the **Do not use proxy server** radio button if your Hardware Node does not use a proxy server, i.e. it is directly connected to the Internet.
- Select the **Specify a proxy server** radio button to use a proxy server differing from the one specified in your Internet Explorer proxy settings to connect to the Virtuozzo updating center. In this case you should specify the IP address and the port of the proxy servers you are going to use to connect to the Internet in the **Address** and **Port** fields, respectively.
- If your proxy server is password-protected (i.e. you use a special user name and password to log in to the proxy server), you should also select the **Proxy server requires authentication** checkbox and specify the corresponding credentials in the **Proxy user name** and **Proxy password** fields.

After you click Next in the Welcome to the Virtuozzo Updates Setup Wizard window, the wizard connects to the Virtuozzo updating center and displays a list of Virtuozzo updates currently available for your Hardware Node, if any:

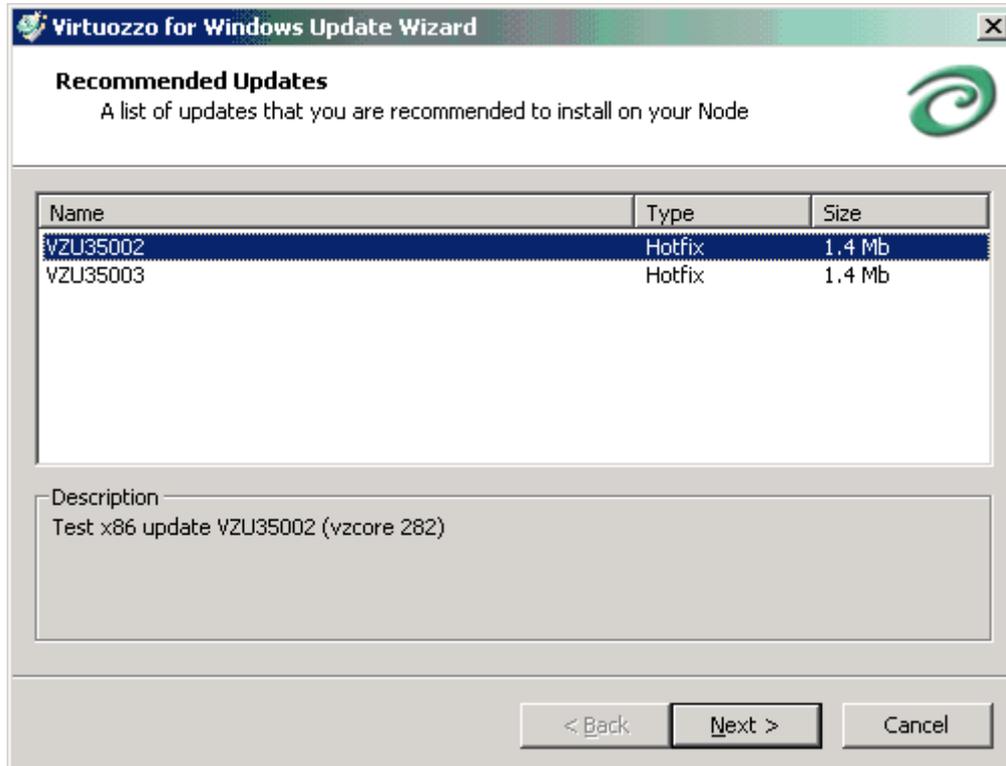


Figure 58: List of Virtuozzo Updates

Select the corresponding updates and click Next to download and install them on the Node.

Note: Make sure you always run the latest Virtuozzo version. Along with getting new Virtuozzo functionality, this will allow you to have the latest Windows Server 2003 updates installed on your Hardware Node. More information on Windows Server 2003 updates is provided in the Updating Windows Server 2003 subsection (on page 122).

Updating Windows Server 2003

Any standard Windows Server 2003 installation supports the Automatic Updates feature, which allows Windows Server 2003 to periodically check the Windows Update Web site for available updates, download these updates, and install them on your computer. To be compatible with this feature, the Virtuozzo installation configures the Windows Automatic Updates feature in such a way as to be able to automatically connect to the Virtuozzo updating center instead of the Windows Update site and download Windows updates from this center.

All Windows updates in the Virtuozzo updating center are checked for their compatibility with Virtuozzo software and can be fearlessly installed on your Node. However, to be consistent with new Windows updates, Virtuozzo may (and usually does) undergo some slight changes. It means that only those Windows updates can be downloaded and installed on your computer that are compatible with your current version of Virtuozzo. To be sure you have the latest Windows updates, you should update your Virtuozzo software at regular intervals. Detailed information on Virtuozzo updates is provided in the **Updating Virtuozzo Software** subsection (on page 117).

Thus, the Windows Server 2003 update procedure might look as follows.

- The latest Virtuozzo updates are downloaded and installed on your Hardware Node, which may be done by manually running the Virtuozzo Update wizard or enabling the automatic update of Virtuozzo software (for more information see the previous section);
- The Windows Automatic Update service connects to the Virtuozzo updating center and downloads the corresponding Windows update to the Node;
- After you have confirmed the installation, the Windows update is installed on your Hardware Node.

Note: 1. You do not have to update operating systems installed in Virtual Private Servers residing on your Hardware Node. They are automatically updated during the Host OS update.

2. Please do not try to update Windows Server 2003 manually by clicking **Start --> Windows Update**, connecting to the Windows Update Web site, downloading new updates from this site, and installing them on your Node. It may cause Virtuozzo to malfunction.

Managing Node Cluster

Organizing Hardware Nodes into a cluster is used to ensure a unified space of VPS IDs and VPS IP addresses throughout all the Nodes in the cluster. A cluster has the following advantages in comparison with standalone Nodes:

- You do not have to bother anymore about the Virtual Private Server IDs when migrating VPSs between Nodes.
- You do not have to manually assign IDs and IP addresses when creating VPSs.
- You can easily check if there are any identical IDs or IP addresses assigned to Virtual Private Servers of different Nodes.

Each cluster shall have one Master Node, where the database of VPS IDs and IP addresses is stored, and any number of Client (Slave) Nodes constituting the cluster.

Creating Cluster

To create a cluster of Nodes, you should right-click the Node you wish to be the Master one and select **Tasks --> Create Virtuozzo Cluster** on the context menu.

The newly-created Virtuozzo cluster will be displayed in the left pane of the VZMC window on the same level as standalone Nodes. The name of the cluster will be put in parentheses and coincide with the name of its Master Node. Click on the cluster name to view a list of Nodes registered in it together with vital statistics on them in the right pane. The information will be presented as follows:

Field Name	Description
Name	The name of the Hardware Node.
Address	The IP address of the Service VPS.
Connected with Master	Indicates whether the corresponding Node is connected to the Master Node, i.e. it can exchange data with the Master Node. The Node may happen to be the Master Node itself.
License	The status of the Virtuozzo license.
Agent	The version of the <code>vzagent</code> software.
OS	The operating system installed on the Hardware Node.
Memory	The amount of the physical memory installed on the Node.
Free Memory	The current amount of free physical memory on the Node.
Connected	Whether the given Node is connected to VZMC.

You may want to destroy a cluster. To this effect, select **Tasks --> Destroy Virtuozzo Cluster** on the context menu.

Note: After you destroy a cluster, all configured resource pools containing in the cluster will also be deleted.

Adding Nodes to Cluster

The Nodes that are added to an existing cluster automatically become Client (Slave) Nodes, as any cluster can have only one Master Node for storing a centralized database of VPS IDs and IP addresses. The easiest way to add new Nodes to a cluster is the following:

- 1 Right-click the name of the cluster where you wish to add new Nodes and select **Add Hardware Node to Cluster** on the context menu.
- 2 In the **Add Client Hardware Node Into Cluster** window, select those Nodes that you wish to add. In case of a large number of Nodes, it is reasonable to use the **Select All** and **Deselect All** buttons. The **Register New** button lets you invoke the **Register Hardware Node** wizard right from this window and then add the newly-registered Node to the cluster.
- 3 Press the **OK** button.

If you wish to add a particular Node to an existing cluster, you may also perform the following steps:

- 1 Right-click the name of the Node that you wish to add to a cluster and select **Tasks --> Register Node in Cluster** on the context menu.
- 2 In the **Add Client Hardware Node Into Cluster** window, select a Node in the table having "Master node" as its cluster status. If no Master Nodes are shown, it means that there are no clusters registered in VZMC. In this case you should close the **Add Client Hardware Node Into Cluster** dialog window and create a cluster first.
- 3 Press the Register button.

Configuring IP Addresses Pool

After you have registered all the needed Hardware Nodes in a cluster, it is time to configure the IP Addresses and IDs pool for Virtual Private Servers hosted on the Nodes of the given cluster. One of the purposes of organizing Hardware Nodes into clusters is to ensure a unified space of VPS IP addresses throughout all the Nodes in the cluster. The database of the IP addresses to be assigned to the VPSs belonging to all the Nodes of the cluster is stored on the Master Node.

To configure the pool of IP addresses, do the following:

- 1 Right-click the corresponding cluster name and select **Configure IP Addresses Pool** on the context menu.
- 2 On the **Pool Configuration** tab of the **IP Addresses Pool Configuration** window, view and configure one or more of continuous ranges of IP addresses comprising the pool. Every range may be characterized by the starting IP address, the ending IP address, and the number of IP addresses within the range. Obviously, it is enough to know any two of these three parameters to deduce the third one. This information on all the defined ranges is presented in the table. To configure the pool as desired, use the buttons to the right of the table:

Button	Description
Add Range	Displays a window where you can define a new range for the IP addresses pool of the current cluster.
Delete	Deletes the IP addresses range selected in the table.
Edit	Displays a window where you can edit the parameters of the range selected in the table.
Exclude Range	Displays a window where you can exclude a certain continuous subrange of IP addresses from the range selected in the table. As a rule, this brings about the appearance of two new ranges instead of the selected one.

Configuring Virtual Private Server IDs Pool

Another purpose of organizing Hardware Nodes into clusters is to ensure a unified space of VPS IDs throughout all the Nodes in the cluster. This would allow to avoid, for example, migration problems. The database of the IDs to be assigned to the VPSs belonging to all the Nodes of the cluster is stored on the Master Node.

To configure the pool of Virtual Private Server IDs, do the following:

- 1 Right-click the corresponding cluster name and select **Configure VPSIDs Pool** on the context menu.
- 2 On the **Pool Configuration** tab of the **Virtual Private Server IDs Pool Configuration at Node** window, view and configure one or more of continuous ranges of IDs comprising the pool. Every range may be characterized by the starting ID, the ending ID, and the number of IDs within the range. Obviously, it is enough to know any two of these three parameters to deduce the third one. This information on all the defined ranges is presented in the table. To configure the pool as desired, use the buttons to the right of the table:

Button	Description
Add Range	Displays a window where you can define a new range for the VPS ID pool of the current cluster.
Delete	Deletes the ID range selected in the table.
Edit	Displays a window where you can edit the parameters of the range selected in the table.
Exclude Range	Displays a window where you can exclude a certain continuous subrange of VPS IDs from the range selected in the table. As a rule, this brings about the appearance of two new ranges instead of the selected one.

Specifying Cluster Network Settings

VZMC allows you to define DNS servers for all Virtual Private Servers residing on Hardware Nodes that constitute a cluster. It can be of great use, for example, while creating a new Virtual Private Server. In this case the DNS servers field will be automatically filled in with the corresponding values from your cluster.

To set the aforementioned parameters, perform the following operations:

- 1 Right-click the cluster name and select **Network Configuration** on the context menu. The **Virtuozzo Cluster Network Setting** window appears:

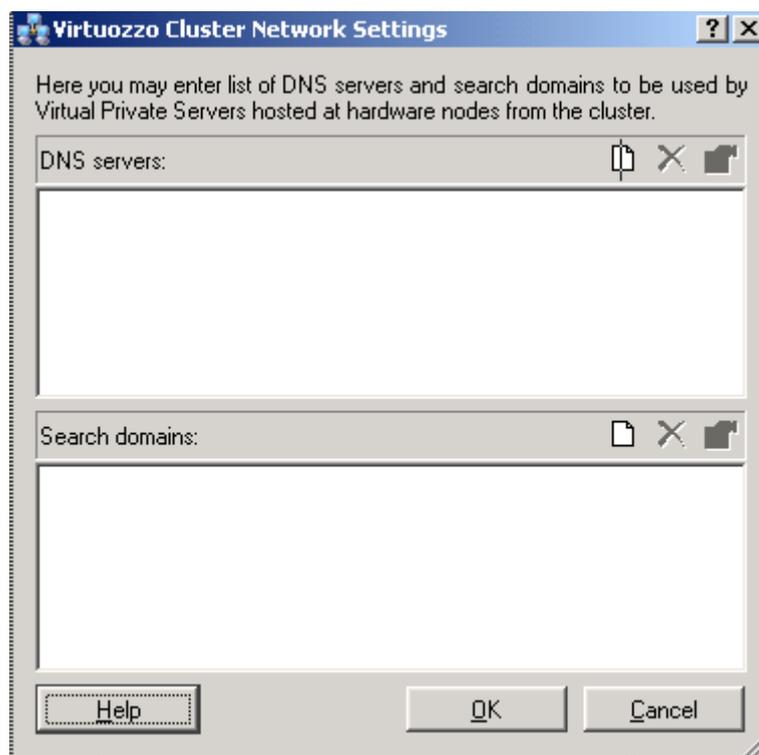


Figure 59: VZMC - Setting DNS Servers

- 2 Use the **Add**, **Remove**, and **Properties** buttons to the right of the **DNS servers** and **Search domains** fields to set, remove a DNS server or search domain, or change their properties, respectively.
- 3 After you have made the necessary changes, click **OK**.

Note: In the current version of Virtuozzo, you can specify DNS servers only.

Checking for Conflicts Among Nodes

There may happen situations when the consistency of really assigned VPS IDs and IP addresses across all the Nodes in the cluster is broken, i.e. when they do not correspond to the database configuration stored on the Master Node.

The most common kind of such conflicts happens when a newly-created VPS receives an ID or an IP address that have not been included in the corresponding pool. These conflicts are not very dangerous, but they may create problems in the future, so it is better to resolve them once they have been identified.

More serious conflicts are represented by one and the same IDs or IP addresses assigned to separate Virtual Private Servers. This situation may lead to immediate problems with VPSs functioning, so you should get rid of identical IDs or IP addresses at once.

To check for conflicts in the given cluster, right-click the cluster name in the left pane of the VZMC window and select **Check for Conflicts** on the pop-up menu. The **Virtual Private Server Conflicts Resolution** window is displayed.

This window identifies the conflicts described above and allows you to solve them. Depending on whether there are VPS ID conflicts or IP addresses conflicts, or both, the corresponding tabs are available in the window.

Whatever the tab, a table in the upper part of the window lists all the found conflicts on separate lines. The yellow icon denotes that the conflict is not that serious, and the red icon - that the conflict calls for an immediate resolution.

In this window, you can perform the following tasks:

- To sort all the conflicts in the table by a certain column, click on the heading of the column. A second click on the same heading reverses the sorting order.
- To view the detailed description of a conflict and its default resolution, select the corresponding line in the table. The description will be provided in a text area under the table.
- To resolve the desired conflicts, select the corresponding checkboxes in the table and press the **Resolve** button. To facilitate the selection, you may use the three buttons to the right of the table:
 - Pressing the **Select All** button marks all the checkboxes;
 - Pressing the **Deselect All** button clears all the checkboxes;
 - Pressing the **Default Resolution** button marks those checkboxes that allow for the default resolution of the corresponding conflicts.

Logs and Monitors

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Monitoring Resources

You can exploit the **Monitor** feature of VZMC for monitoring resources. This feature provides either the whole Hardware Node resources monitoring or the monitoring of resources consumption by a single VPS, depending on whether you use the VZMC main window or a particular VPS manager window. To open the latter, it is enough to double-click the necessary Virtual Private Server in the VPS table in the right pane of the VZMC main window. The principles of working with these two kinds of monitors are essentially the same (only the set of the parameters that can be displayed is slightly different); therefore, they can be described together.

To access the VZMC **Monitor** feature, you may either select the **Monitor** item in the left pane of the window you are working with, or open a separate **Monitor** console by clicking the **Monitor Hardware Node** button in the VZMC main window toolbar and register the necessary Hardware Node(s) and/or Virtual Private Server(s). In general, it does not make any difference whether a separate **Monitor** console is opened for a Hardware Node or for one of the VPSs. As soon as the **Monitor** console is opened, you can add Hardware Node(s) and/or VPS(s). Moreover, several **Monitor** consoles can be opened for several Hardware Nodes and VPSs in each console.

The windows in the **Monitor** console are identical to those in the **Monitor** item, so you may choose either. To simplify things, we speak only of the **Monitor** item in all the instructions below in this section.

Using Charts Representation

The charts section of VZMC lets you display quite a number of charts for monitoring various kinds of resources on a single grid. It offers means for better visualization of charts, like assigning colors and line styles to all the elements of the grid and charts or choosing a peculiar representation scale for each chart. You can save and load a set of counters you would usually monitor thus avoiding the necessity of adding the counters one by one each time you start VZMC. And, last but not least, there is a possibility to replay the charts for any specified period of time by using logs.

The sequence of your actions may be the following:

- 1 To display the chart, expand the **Monitor** item in the window you are working with (either the VZMC main window or a VPS manager window), and click **Charts** to see the monitor grid in the right pane.
- 2 Right-click in any place of the grid and select **Add Counters**, or press the **Add Counters** button on the **Charts** toolbar.
- 3 In the **Add Monitoring Counters** dialog window, select the set of counters from which you want to add one(s) by selecting the desired group on the **Counter type** drop-down menu.
- 4 Select the needed counter(s) and click **Add**. You may use the Ctrl and Shift keys to add a number of counters from a group. When you select a certain counter with your mouse, the counter description is provided in the lower part of the **Add Monitoring Counters** dialog window. For example:

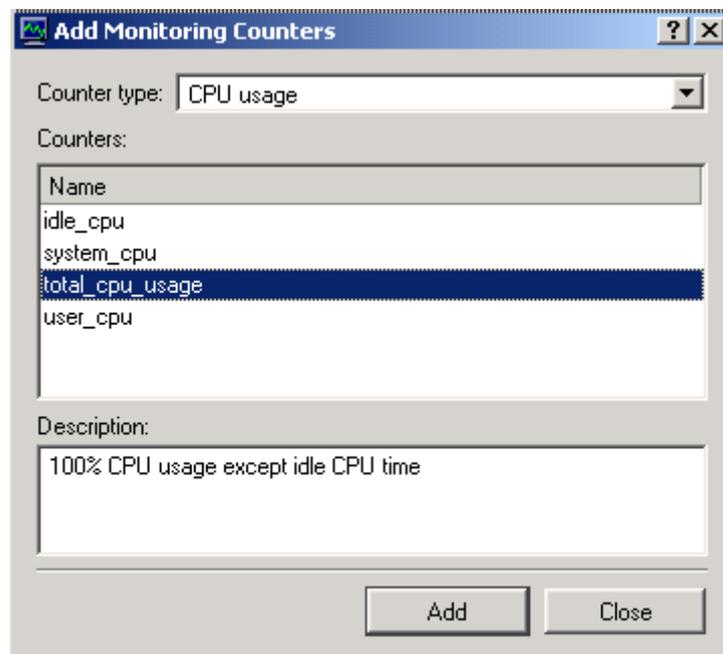


Figure 60: VZMC - Adding Monitoring Counters

- 5 Click **Close** after you have added all the desired counters.

Now that you have a number of counters on the grid, you can see a red line indicating the current moment of time moving from left to right as time passes and new values of monitored parameters appear on the grid. Now it's time to customize your view and learn the other opportunities. You may want to perform the following tasks:

- Adjust the periodicity of refreshing the information on the grid;
- Adjust the representation scale for each counter;
- Adjust colors and line styles for the visual elements;
- Highlight a certain counter;
- Save the current configuration of counters to be able to open it at any moment of time;
- Use the grid to replay some past real-time information about a set of parameters.

Adjusting Periodicity of Refreshing Information

To set the time interval at which the information is refreshed for all the charts, do the following:

- 1 Right-click on the **Monitor** item in the Hardware Node or Virtual Private Server main tree and choose **Properties**;
- 2 In the Monitor Properties window, select the **Charts** line:

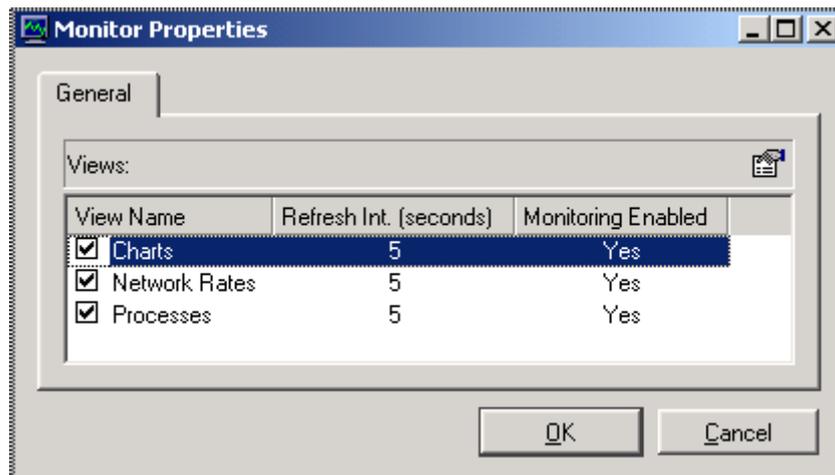


Figure 61: VZMC - Editing Monitor Update Interval

- 3 Press the **Set Refresh Interval** button in the right corner of the Monitor Properties window;
- 4 Enter the new time interval (in seconds) and press **OK**.

Adjusting Representation Scale

The value of any counter on the grid may vary from 0 to 100. These numbers are marked on the left of the grid. But the “weight” of these numbers is different for each counter. It is difficult to use one and the same scale, for example, for memory usage which may amount to hundreds of thousands of KBs and for CPU usage in percent. You can adjust the scale for each parameter separately for their better visualization on the grid:

- 1 Click on the name of the corresponding counter in the table of displayed counters below the grid:

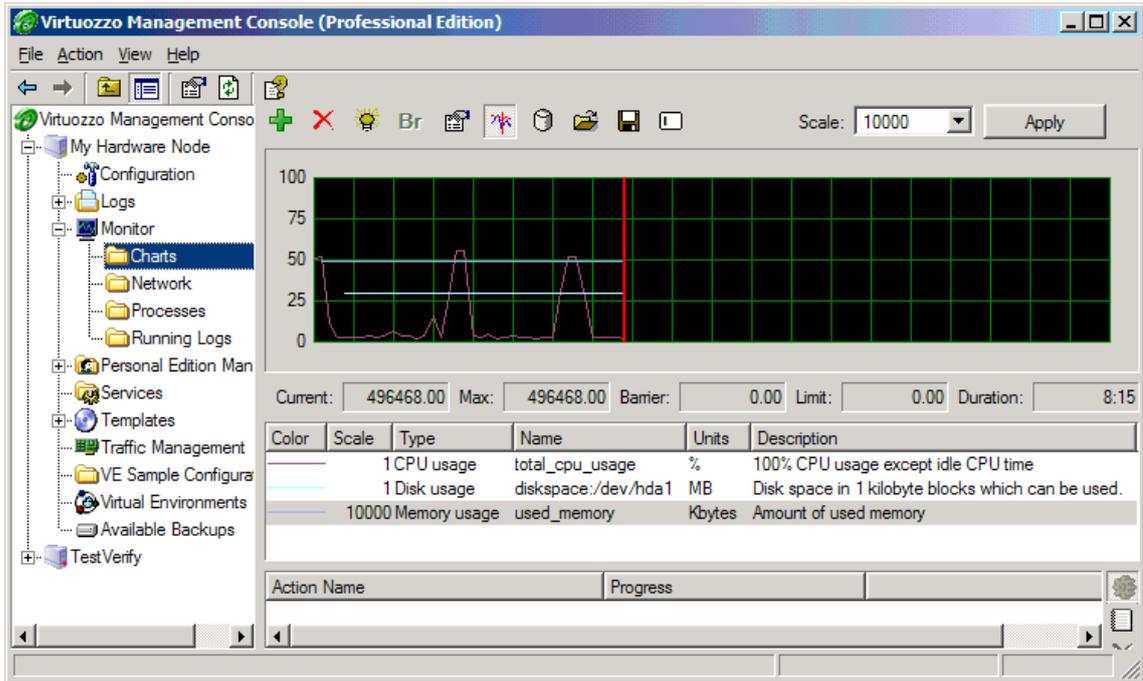


Figure 62: VZMC - Adjusting Charts Scale

- 2 Select the necessary scale on the Scale drop-down menu on top of the grid and click **Apply**.

Adjusting Colors and Styles

You can define the way this or that counter is displayed on the grid:

- 1 Right-click on the name of the corresponding counter in the table of displayed counters below the grid and choose **Properties**:

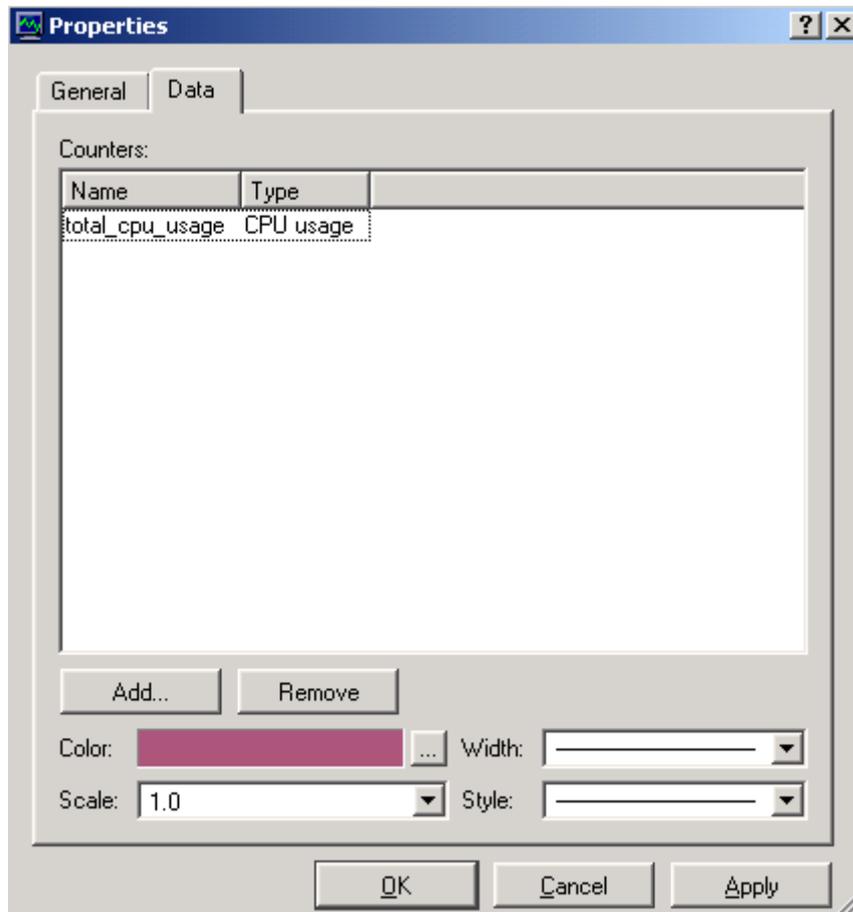


Figure 63: VZMC - Adjusting Charts View

- 2 In the corresponding boxes, adjust the color of the counter line, its width and style as desired;
- 3 Click the **General** tab and adjust the view of the grid elements. The options on that tab are self-explaining.
- 4 Click **OK**.

Highlighting Counter

In case there are many counters being simultaneously displayed on the grid, it might be difficult to quickly single out the needed one. VZMC provides a means for highlighting any one of the counters at a time:

- 1 Click on the name of the corresponding counter in the table of displayed counters below the grid;
- 2 Press the **Highlight Counter** button on the toolbar.

The selected counter will be highlighted on the grid with a broad white line.

Saving Counters Configuration

You can save the information about the current set of counters in the VZMC configuration file to call this information the next time it is needed sparing the labor of adding the counters one by one again. Only one set of counters can thus be saved. Just press the **Save Counters** button on the toolbar after all the desired counters have been added. When you alter the counters configuration (for example, when you restart VZMC, all the counters are erased) and wish to restore the saved configuration, press the **Load Counters** button. The saved set of counters will be loaded from the configuration file.

Replaying Information From Logs

The function of replaying the resources consumption information over a specified time span in the past is ensured by the background logging of all the parameters in Virtuozzo. The default periodicity of refreshing the resources consumption information in the logs is set to be 1 (one) hour. You may have the logs collect the resources consumption information more frequently by "accelerating" the necessary logs with the help of the **Log Setup** item under the **Monitor** item. For example:

- 1 Click **Log Setup** under the **Monitor** item.
- 2 In the provided table, double-click the necessary log group, or right-click it and select **Change Logging Period** on the context menu.

- 3 In the **Change Logging Period** window, set the update period for the given group of logs and the time they are to be stopped. Besides, you can specify the time when the logging period will be set to the default value (1 hour) again by selecting the corresponding radio button:

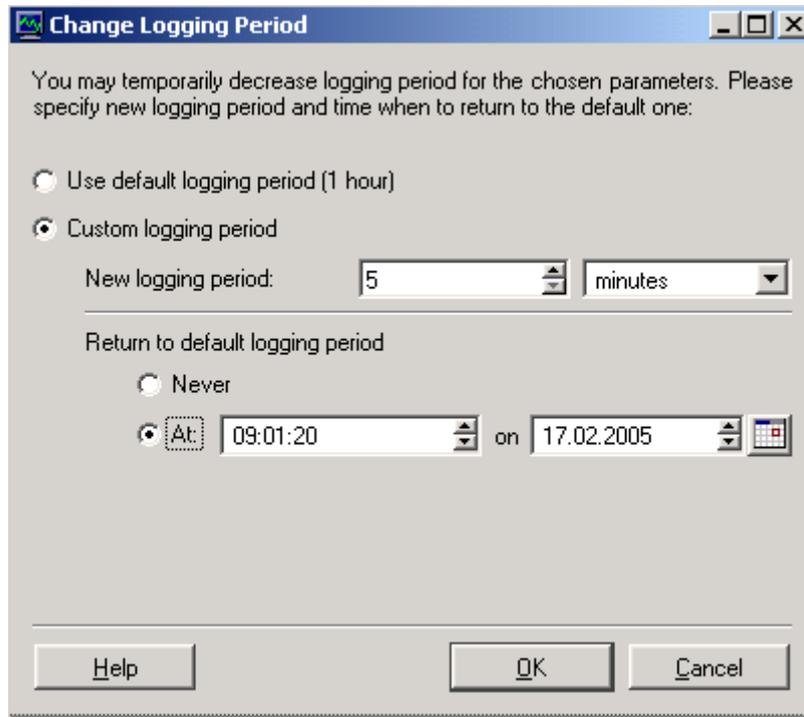


Figure 64: VZMC - Accelerating Logs

- 4 Press **OK** to close the window.

The replaying proper of logs is performed using the same grid of the **Charts** function as for real-time monitoring. The counters are also displayed and configured in the same way as for real-time monitoring. The principal difference is that when replaying the counters, the information for the charts is taken from the logs (both the default logs and the logs accelerated in the **Log Setup** section are used), and not from real-time monitoring.

To switch to the charts replaying mode:

- 1 Click **Charts** under the **Monitor** item
- 2 On the **Logged Counters** tab, press the **Add Counters** button on the toolbar to display the **Add Logged Counters** window.
- 3 On the **Data** tab of the **Add Logged Counters** window, press the **Add** button to add any of the available counters in the same way as they are added for real-time monitoring.
- 4 After adding the desired counters, adjust the style of their visualization with the help of the corresponding options on the **Data** tab.

- 5 Go to the Time tab of the Add Logged Counters window, define the update period, and the time span for which you wish to view the logs for the specified counters:

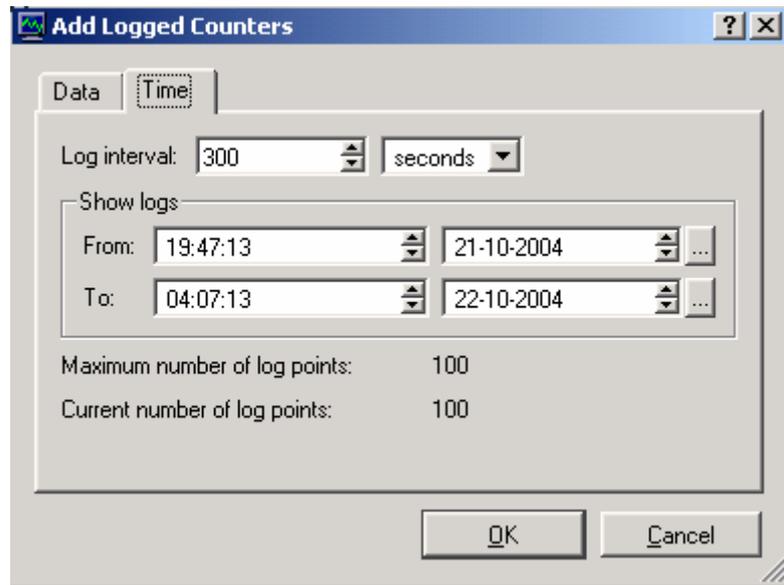


Figure 65: VZMC - Replaying Logs

Please pay attention to the **Maximum number of log points** field, which indicates how many log entries will be shown on the chart. The maximal number is 100. If you have asked for a greater number of entries (this happens in the cases when the update period is too small, or the time span is too large, or both), the update period is automatically lengthened for the time span to contain only 100 entries. This is done to relieve the traffic between the Hardware Node and VZMC.

Using Table Representation

Besides charts, it is possible to monitor many of the Hardware Node or VPS parameters in real time as a list of lines each of which reflects the name and the value of a parameter, as well as the attributes specific for this or that kind of parameters. In such a way, you can view the **Network Rates** and **Processes** groups for a particular Hardware Node, and the **Network Rates**, **Processes**, **Quality of Service (QoS)**, and **Quotas and Usage** groups for a particular Virtual Private Server. Choose any of these groups either in the VZMC main window or in a VPS manager window to see the real-time information about the selected parameters in the form of a table. For example, if you choose **Network Rates** under a HN tree, you will see the following window:

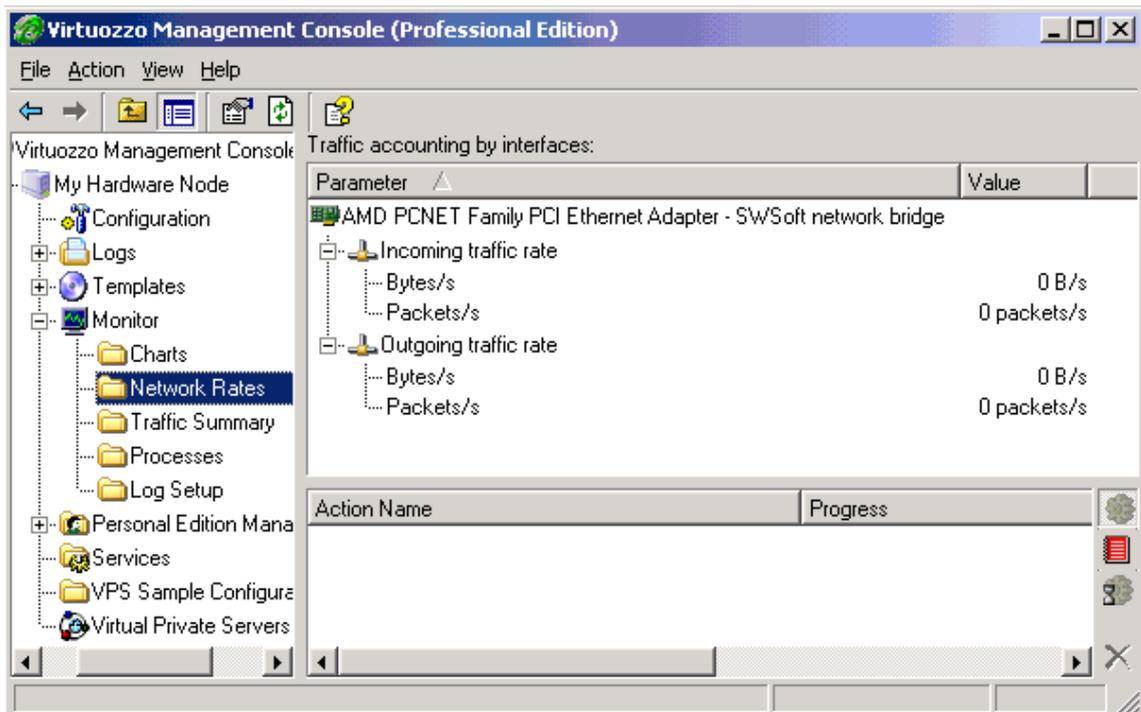


Figure 66: VZMC - Monitoring Traffic Parameters

The Traffic accounting table shows the values for the incoming and outgoing traffic rate in bytes per second and packets per second for all the network interfaces present on the Hardware Node. You could view this information as a chart as well.

You can change the time period with which the information is to be refreshed by doing the following:

- 1 Right-click on the **Monitor** item in the Hardware Node or Virtual Private Server main tree and choose **Properties**;
- 2 In the **Monitor Properties** window, select the line corresponding to the group of parameters for which you wish to change the update period;
- 3 Press the **Set Refresh Interval** button on top;
- 4 Enter the new time interval (in seconds) and press **OK**.

Viewing Network Traffic Summary

VZMC allows you to view the information on all incoming and outgoing traffic for your Hardware Node or any of the Virtual Private Servers residing on it over a specified time period in the past. In order to view the traffic, perform the following operations:

- 1 Expand the **Monitor** item in the main tree under either the Hardware Node name or the Virtual Private Server name and click **Traffic Summary**.

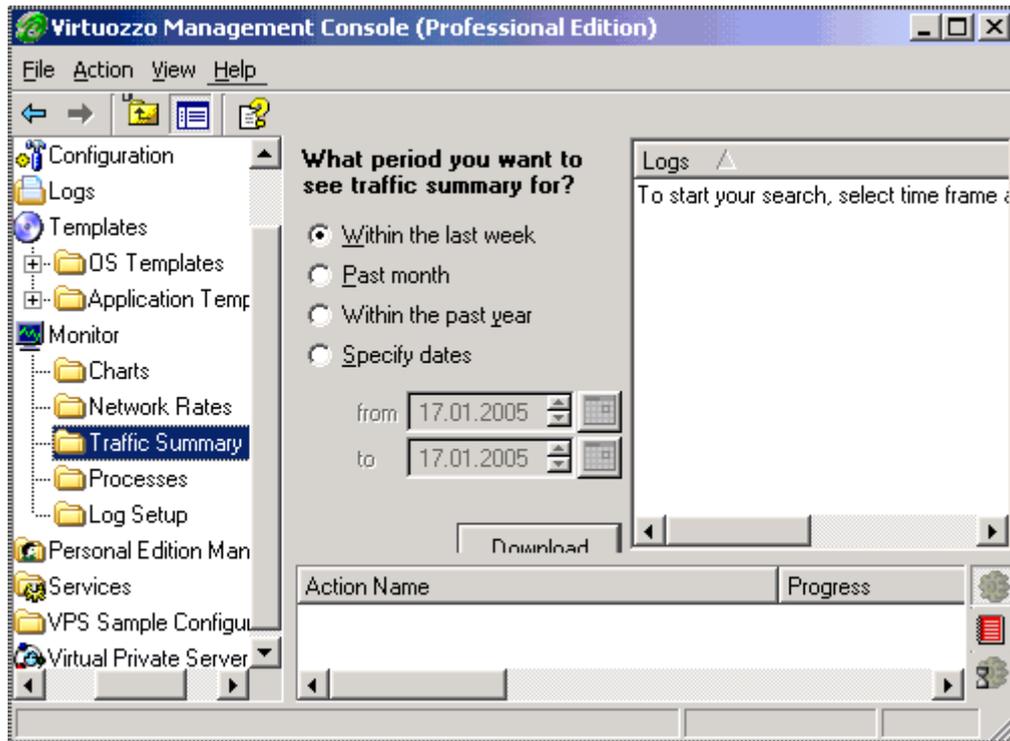


Figure 67: VZMC - Viewing Network Traffic Summary

- 2 Specify the time period for which you would like to view the logs.
- 3 Click **Download** to display a list of log entries in the right pane of the window.

Viewing System and Virtuozzo Logs

VZMC allows you to view the logs which are maintained on the corresponding Hardware Node both for the Hardware Node itself and for a particular Virtual Private Server. The following log types are available for a particular Hardware Node in the VZMC main window:

Log type	Description
Virtuozzo	Full Virtuozzo chronicles, i.e., system messages.
Events	All VPS-related events (start, stop, migrate, etc.).
Alerts	Resource management system messages generated in case a VPS is coming very close to the QoS limits specified for it.

Operations Asynchronous tasks performed with any VPS of the Hardware Node.

For Virtual Private Servers, only the Events, Alerts, and Operations logs are available in the corresponding VPS manager window.

In order to view the logs, do the following:

- 1 Open the **Logs** folder in the main tree under either the Hardware Node name or the Virtual Private Server name and click on the needed log type.
- 2 Specify the time period for which you would like to view the logs.
- 3 Click **Download** to display a list of log entries in the right pane of the window.

Subscribing for VZMC Alerts

VZMC allows you to configure and subscribe for e-mail notifications about resource-overusage system alerts. The subscription for this kind of alerts consists in specifying the e-mail address to send notification to. However, prior to subscribing for alerts, you should provide your e-mail relay server IP address to send e-mail notifications thru. To this effect, you should do the following:

- 1 In VZMC, click on the **Manage Alert Subscription** link on the Hardware Node dashboard to display the **Manage Alert Templates** window;
- 2 On the **Configuration** tab of the **Manage Alert Templates** window, enter an IP address to be used as the mail relay server in the **E-mail relay IP address** field;
- 3 Click **OK**.

Setting the e-mail relay server IP address is the only required operation that you have to perform before subscribing to alerts. However, there is a number of additional tasks that you may also wish to complete to configure the VZMC alert system to meet your demands:

- Creating your own alert template to specify how your e-mail notifications will look and what information they will contain. By default, VZMC uses a pre-configured notification template. This template includes special placeholders representing special symbols that will be substituted for in the actual message by the actual VPS identifier, parameter name, etc. A list of the main placeholders is given below:
 - **\$VEID**: the Virtual Private Server numeric identifier;
 - **\$ID**: the name of the QoS parameter (in the actual message, it will be “diskspace”, etc.);
 - **\$CURTYPE**: the alert type (at the alert generation moment). The “yellow” alert means that the barrier value of 90% has been reached, the “red” alert – that the value lies in the range from 95% to 100%, and the “black” alert - that the limit value has been hit;
 - **\$TIMERANGE**: the alert time (the server time);
 - **\$CURVALUE**: the current value of the parameter (at the alert generation moment);
 - **\$MAXVALUE**: the maximal value of the parameter during the time when alerts were collected;
 - **\$SOFT**: the parameter value barrier;
 - **\$HARD**: the parameter value limit.

- Changing the alert policy, i.e. specifying in what way your alerts will be sent. By default, only one alert is sent per subscription and you have to resubscribe to an alert each time after its receiving.

The aforementioned operations can be performed in the **Manage Alert Templates** window used to set your e-mail relay server IP address as well:

- If you are not satisfied with the default alert template, go to the **Templates** tab of the **Manage Alert Templates** window and click on the **Add Alert Template** button to the right of the **Alert template name** field to see the **Alert Template** window. In the displayed window, fill in the provided fields with your own text using any of the above placeholders and press **OK**.
- If you wish to change the default alert policy, you should go to the **Configuration** tab of the **Manage Alert Templates** window and choose one of the following options:
 - **Stop sending**. In this case after having received an alert, you have to resubscribe to it again. This option is selected by default.
 - **Keep sending**. In this case you will get alerts on a permanent basis without having to resubscribe to them each time after their receiving.
 - **Collect alerts before sending for**. In this case alerts will be permanently collected by VZAgent to a special database. This database will be periodically, i.e. with the period specified in the field opposite the option name, checked and if there were any alerts gathered during the set time, the corresponding notification will be sent to your e-mail address. The alert checking time is measured in seconds and can be set either by using the spin button or entering the needed period by hand.

After you have chosen the right option, click **OK** to save the settings.

Now that you have set the e-mail relay server IP address and, if necessary, changed the default alert template and/or default alert policy, you can subscribe for an alert:

- 1 Click on the **Subscribe to Alert** link on the Hardware Node dashboard.
- 2 Select the needed template on the **Alert template name** menu.
- 3 Type the needed e-mail address in the **To** textbox.
- 4 Press the **Subscribe** button.

Monitoring Hardware Node by Using vzwdog

Along with monitoring the Hardware Node resources by means of VZMC, Virtuozzo allows you to keep track of the current state of your Hardware Node by using the `vzwdog` component. You can also use this component in the case of your Hardware Node crash to find out the reasons for which this crash happened.

The `vzwdog` component is automatically installed on your Node during the Virtuozzo installation and includes two main parts:

- `vzwdog.sys` - a special Virtuozzo driver and
- `vzwdogsrv.exe` - a special Virtuozzo service.

`vzwdog.sys` is periodically called on the Hardware Node to collect information on a number of the Hardware Node resources. The gathered data are then kept in a temporary storage. In the current version of Virtuozzo, the following resources are processed by `vzwdog.sys`:

- kernel memory;
- processes currently running on the Node;
- Virtual Address Control Blocks (VACBs).

The period with which `vzwdog.sys` collects information on these resources is set to 10 seconds by default. However, you can change this period by editing the Hardware Node registry in the following way:

- 1 On the Hardware Node, select **Start --> Run** and execute the `regedit` command to open Registry Editor.
- 2 Locate `HKLM\SYSTEM\CurrentControlSet\Services\VzWdog\Parameters\` the `key`.
- 3 In the right pane of the **Registry Editor** window, double-click the `QueryPeriod` entry to open it for editing.
- 4 In the displayed window, enter the right time period, in seconds, and click **OK**.

The `vzwdogsrv.exe` service is used to process information collected by the `vzwdog.sys` driver. During its runtime, `vzwdogsrv.exe` reads data from the `vzwdog.sys` temporary storage and saves them to HTML files on the Hardware Node. By default, the generated HTML files are stored in several subfolders within the `C:\vz\log\wdog` folder on the Node. Information collected by `vzwdogsrv.exe` and stored in HTML files on the Node is presented in the way like the following:

```

                                Event log started at 09/30/05 15:56:07
+ 15:56:07 kernel memory nonpaged=62086 paged=129201
* 15:56:07 processes: 28
* 15:56:07 cache VACBs: 938 free, 420 used
...

```

In the top right corner of the displayed window, you can see the date and time when the current HTML file was created and the first log entry was added to the file. The remainder of the HTML file is filled with the entries containing brief information on the Hardware Node resources consumption. To get detailed information on any of the displayed resources, you should click on a symbol preceding the corresponding resource:

- +: click on this symbol to expand the corresponding string and display detailed information on the given HN resource in the same browser window;
- *: click on this symbol to open a new window where detailed information on the given HN resource is presented.

Information on the resources consumption displayed on clicking either + or * is given for the time specified beyond the corresponding symbol.

To check information contained in the generated HTML files, you can use one of the following ways:

- Access the corresponding HTML files directly on the Hardware Node and double-click on them to display their contents. As has been mentioned above, the HTML files generated by `vzwdogsrv.exe` and containing information on the Hardware Node resources consumption are stored in several subfolders within the `C:\vz\log\wdog` folder on the Node. So, you can explore these subfolders and check the existing HTML files to know your Hardware Node state.
- Display the contents of the generated HTML files by making an HTTP request to `vzwdogsrv.exe`. In this case the `vzwdogsrv.exe` service acts as an HTTP server obtaining the collected data from HTML files on the Node and sending them to either a local or a remote computer on your HTTP request. To generate a proper HTTP request, you should type `http://Hardware_Node_IP_Address:8049` in the address line of your Web browser, where *Hardware_Node_IP_Address* is the IP address or hostname of the corresponding Node and 8049 denotes the port number used to connect to the Node. For example, if you wish to check the current state of the Hardware Node with the IP address of 233.212.123.123, you should type

```
http://233.212.123.123:8049
```

in the address line of your browser and press ENTER.

Note: To receive the latest information on your HN resources consumption, you should refresh your Web browser window. For example, if you are using the Internet Explorer browser, you can do it by pressing the F5 key on your keyboard or clicking the Refresh button on the Internet Explorer toolbar.

Configuring vzwdog Parameters

The vzwdogsrv.exe service has a number of parameters which can be modified by editing the `HKLM\SYSTEM\CurrentControlSet\Services\VzWdogSrv\Parameters\` key of the Hardware Node registry. A list of available parameters is presented in the table below:

Parameter Name	Description
LogRoot	Specifies the path to the root folder where a number of subfolders are located. These subfolders keep the HTML files generated by vzwdogsrv.exe and containing information on the Hardware Node state. By default, the <code>C:\vz\log\wdog</code> folder on the Node is used.
LogDirs	Sets the number of subfolders for storing HTML files that can be created in the root folder specified as the value of the LogRoot option. A new subfolder is created every time after the Hardware Node reboot and can be identified by its name reflecting the date and time of the HN start (e.g. 2005Sep23_193839). By default, no more than 3 subfolders can simultaneously exist on the Node. In case 3 subfolders are already present on the Hardware Node and the Node is rebooted once more, the oldest subfolder is removed and a new one is created instead of it.
FileSize	Sets the upper limit for the HTML file size, in kilobytes. By default, the size of an HTML file is limited by 16 Kb. In case the specified limit has been exceeded, a new HTML file is created.
LogFiles	Defines the number of HTML files that can be created in each of the subfolders located in the root folder. By default, only 2 HTML files can be present in any subfolder at a time. In case the size of the collected data exceeds the size of two HTML files (i.e. exceeds 32 Kb), the oldest HTML file is deleted and a new one is created instead of it.
LogLevel	Defines the level of detail used when collecting data on the Hardware Node state. You can choose any level in the range from 0 (the lowest level of detail) to 3 (the highest level of detail); by default, level 2 is set.

To modify any of the aforementioned parameters, you should locate the `HKLM\SYSTEM\CurrentControlSet\Services\VzWdogSrv\Parameters\` key, double-click the corresponding parameter entry in the right pane of Registry Editor, enter the right value, and click OK.

Monitoring Top Resources Consumption

VZMC provides you with the ability to view the Virtual Private Servers with the top resources usage. You may use this option to avoid or solve the problem of the Hardware Node overcommitment or simply monitor the load on the VPSs residing on your Node. To see a list of the top resource demanding VPSs, expand the **Monitor** item under the corresponding Hardware Node name and click the **Resource Consuming VPSs** folder in the VZMC left pane.

Note: The statistics on a certain resource utilization shown in the right VZMC pane is an averaged usage data for a given timeframe.

You can currently view the statistics on:

- CPU time: displays the CPU time usage of your Virtual Private Servers against the entire CPU usage on the Hardware Node, in percents;
- Physical memory: shows the statistics results against the total Hardware Node physical memory resource, in megabytes or kilobytes (depending on the amount of physical memory used);
- Disk space: allows you to view the disk space utilization against the total Hardware Node resource value, in megabytes or kilobytes (depending on the amount of physical memory used);
- Incoming traffic: reflects the incoming traffic statistics against the total amount of incoming traffic consumed by all the VPSs on the Node, in megabytes or kilobytes (depending on the amount of incoming traffic);
- Outgoing traffic: lists the outgoing traffic statistics results against the overall outgoing traffic consumed by all the VPSs on the Node, in megabytes or kilobytes (depending on the amount of outgoing traffic).

Top CPU Resource Consuming VPSs

You may run the need to view the most CPU time consuming Virtual Private Servers on your Hardware Node, which can help you avoid the Node overcommit and the consequent VPSs operation impairments. To view the CPU usage of all Virtual Private Servers on your Node, you should expand the Monitor item under the corresponding Hardware Node name and select the Resource Consuming VPSs item in the VZMC left pane and then click on the CPU tab in the VZMC right pane:

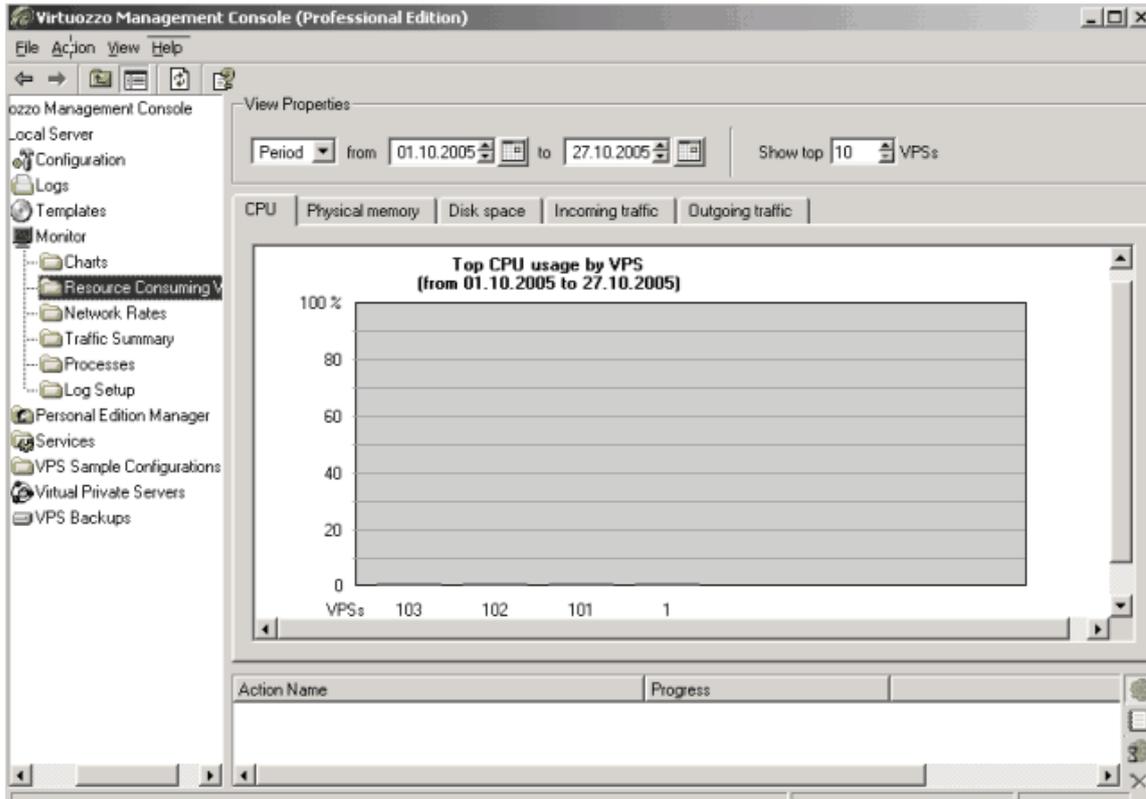


Figure 68: VZMC - Top CPU Resource Consuming VPSs

The statistics results are presented in the form of the Top CPU usage by VPS diagram where the X-axis denotes the IDs of the Virtual Private Servers for which the CPU resource usage statistics has been collected and the Y-axis represents the averaged CPU time, in percents, consumed by the given VPS for the selected timespan.

The View Properties group above the diagram allows you to define the following parameters to govern the statistics results:

- The time interval for which the CPU usage statistics is to be displayed. You can select one of the predefined values (day, month, year) on the drop-down menu or specify the needed period in the From and To fields.
- The number of the Virtual Private Servers characterized by the top consumption of the CPU time. You can set the number of VPSs to be monitored in the Show top field either by using the spin button or entering the needed value by hand.

Top Physical Memory Consuming VPSs

You might need to view the Virtual Private Servers using extensively the physical memory (RAM) of your Hardware Node. This can help you avoid the Node overcommit and the consequent VPSs operation impairments. To view the physical memory consumption by all VPSs on your Node, you should expand the **Monitor** folder under the corresponding Hardware Node name and select the **Resource Consuming VPSs** item in the VZMC left pane and then click on the **Physical memory** tab in the VZMC right pan:

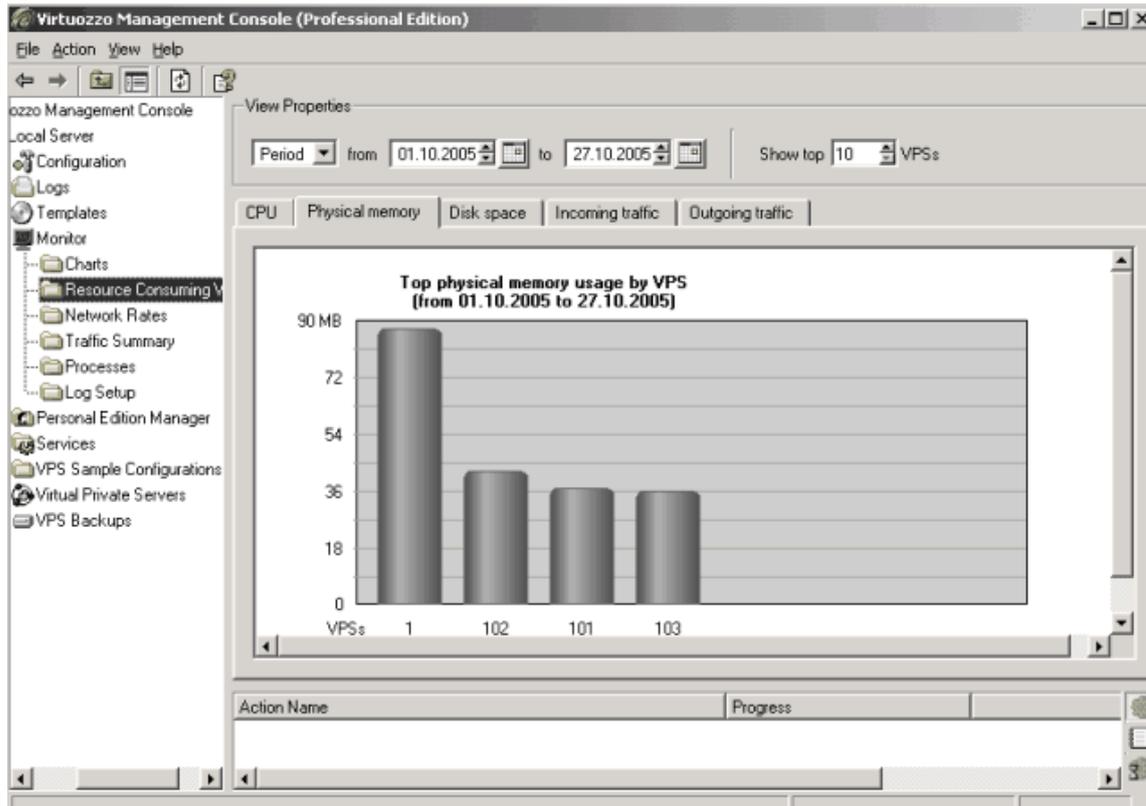


Figure 69: VZMC - Top Physical Memory Consuming VPSs

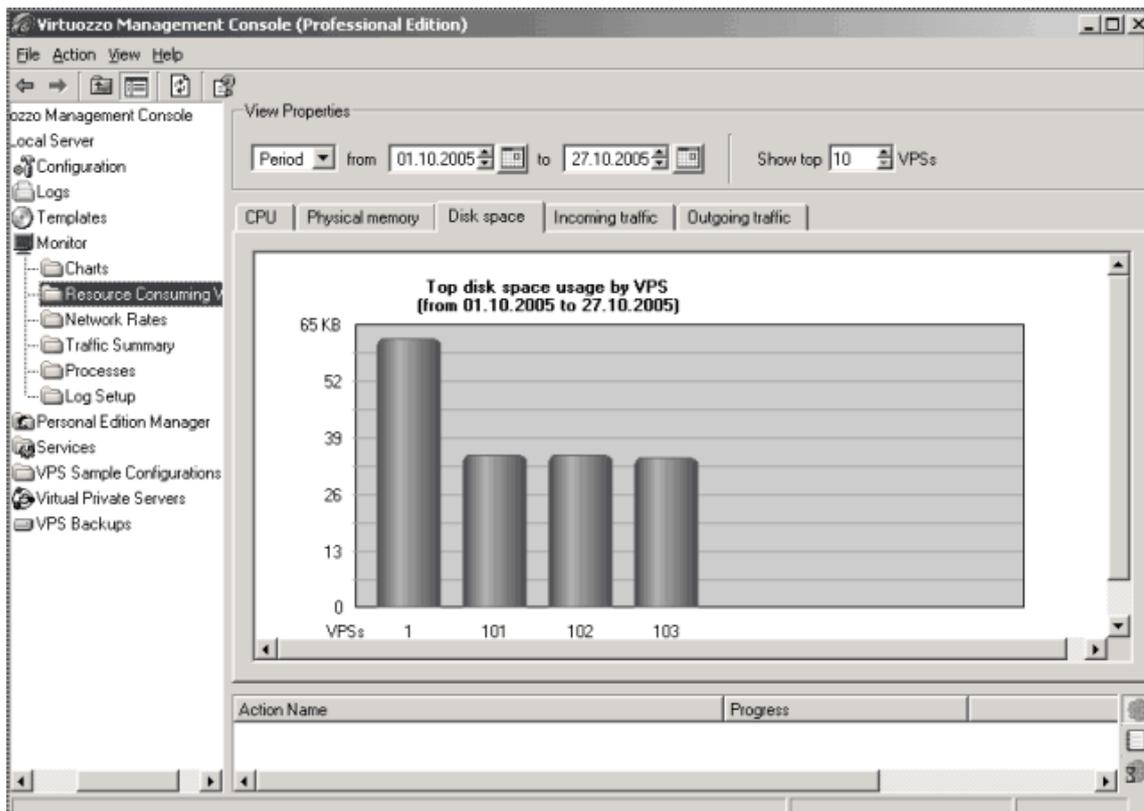
The statistics results are presented in the form of the **Top physical memory usage by VPS** diagram where the X-axis denotes the IDs of the Virtual Private Servers for which the physical memory usage statistics has been collected and the Y-axis shows the averaged amount of physical memory, in megabytes or kilobytes, consumed by the given VPS for the selected timespan.

The **View Properties** group above the diagram allows you to define the following parameters to govern the statistics results:

- The time interval for which the physical memory usage statistics is to be displayed. You can select one of the predefined values (day, month, year) on the drop-down menu or specify the needed period in the **From** and **To** fields.
- The number of the Virtual Private Servers characterized by the top consumption of physical memory. You can set the number of VPSs to be monitored in the **Show top** field either by using the spin button or entering the needed value by hand.

Top Disk Space Consuming VPSs

You might need to view the Virtual Private Servers occupying the most of your Hardware Node disk space. This can help you avoid the Node overcommit and the consequent VPSs operation impairments. To monitor the disk space usage on your Node, you should expand the **Monitor** folder under the corresponding Hardware Node and select the **Resource Consuming VPSs** item in the VZMC left pane and then click on the **Disk space** tab in the VZMC right pane:



The statistics results are presented in the form of the **Top disk space usage by VPS** diagram where the X-axis denotes the IDs of the Virtual Private Servers for which the disk space usage statistics has been collected and the Y-axis shows the averaged amount of disk space, in megabytes or kilobytes, consumed by the given VPS for the selected timespan.

The **View Properties** group above the diagram allows you to define the following parameters to govern the statistics results:

- The time interval for which the disk space usage statistics is to be displayed. You can select one of the predefined values (*day*, *month*, *year*) on the drop-down menu or specify the needed period in the **From** and **To** fields.
- The number of the Virtual Private Servers characterized by the top consumption of disk space. You can set the number of VPSs to be monitored in the **Show top** field either by using the spin button or entering the needed value by hand.

Top Incoming Traffic Receiving VPSs

You might need to view the most incoming-traffic active Virtual Private Servers on your Hardware Node. This can help you monitor the traffic used by all the VPSs on your Node. To view the VPSs incoming traffic on the Node, you should expand the **Monitor** folder under the corresponding Hardware Node name and select the **Resource Consuming VPSs** item in the VZMC left pane and then click on the **Incoming traffic** tab in the VZMC right pane:

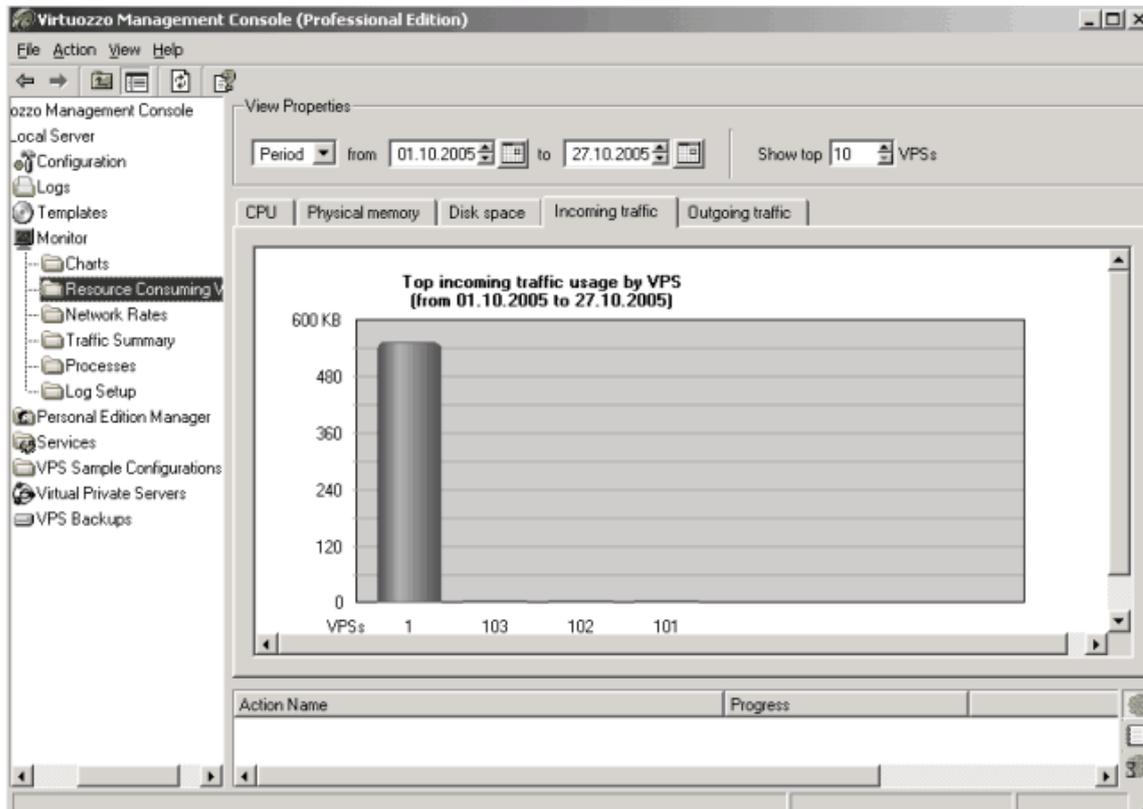


Figure 70: VZMC - Top Incoming Traffic Receiving VPSs

The statistics results are presented in the form of the **Top incoming traffic usage by VPS** diagram where the X-axis denotes the IDs of the Virtual Private Servers for which the incoming traffic statistics has been collected and the Y-axis shows the averaged amount of incoming traffic, in megabytes or kilobytes, for the given VPS for the selected timespan.

The **View Properties** group above the diagram allows you to define the following parameters to govern the statistics results:

- The time interval for which the incoming traffic statistics is to be displayed. You can select one of the predefined values (*day*, *month*, *year*) on the drop-down menu or specify the needed period in the **From** and **To** fields.
- The number of the Virtual Private Servers characterized by the top consumption of incoming traffic. You can set the number of VPSs to be monitored in the **Show top** field either by using the spin button or entering the needed value by hand.

Top Outgoing Traffic Consuming VPSs

There might arise the need for you to view the most outgoing-traffic active Virtual Private Servers on your Hardware Node. This can help you monitor the traffic used by all the VPSs on your Node. To view the VPSs outgoing traffic on the Node, you should expand the **Monitor** folder under the corresponding Hardware Node name and select the **Resource Consuming VPSs** item in the VZMC left pane and then click on the **Outgoing traffic** tab in the VZMC right pane:

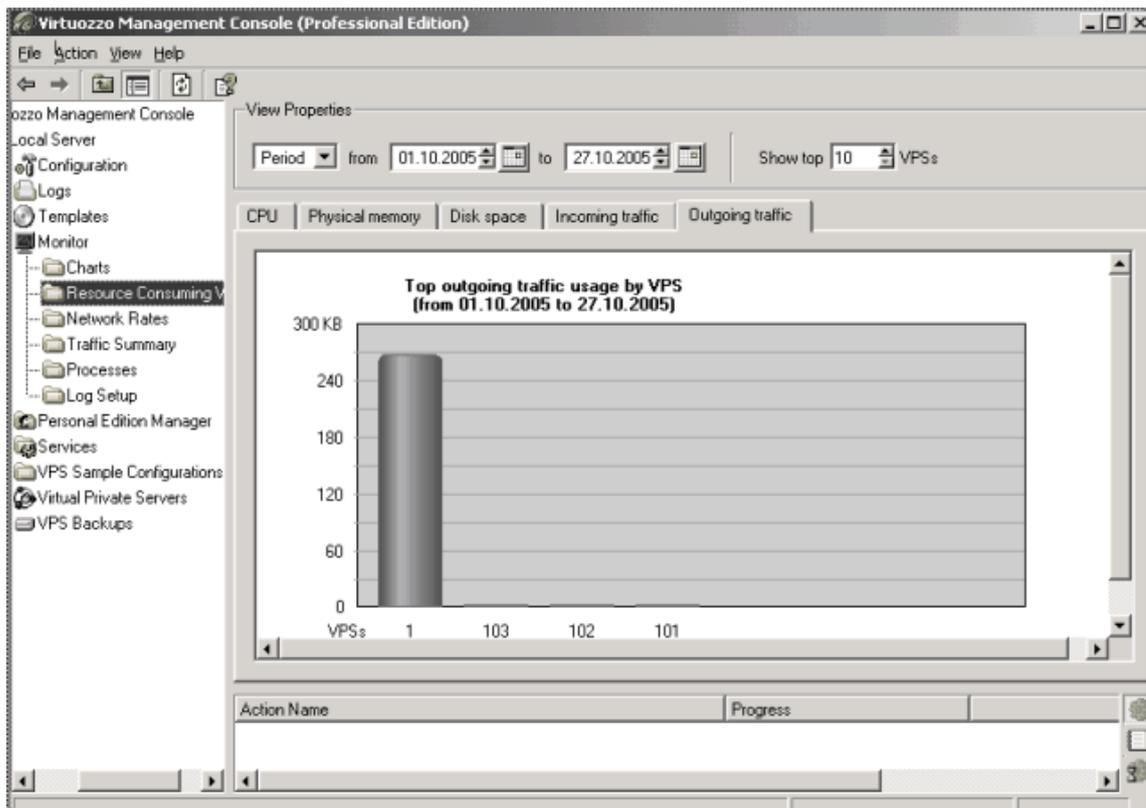


Figure 71: VZMC - Top Outgoing Traffic Consuming VPSs

The statistics results are presented in the form of the **Top outgoing traffic usage by VPS** diagram where the X-axis denotes the IDs of the Virtual Private Servers for which the outgoing traffic statistics has been collected and the Y-axis shows the averaged amount of outgoing traffic, in megabytes or kilobytes, for the given VPS for the selected timespan.

The **View Properties** group above the diagram allows you to define the following parameters to govern the statistics results:

- The time interval for which the outgoing traffic statistics is to be displayed. You can select one of the predefined values (*day*, *month*, *year*) on the drop-down menu or specify the needed period in the **From** and **To** fields.
- The number of the Virtual Private Servers characterized by the top consumption of outgoing traffic. You can set the number of VPSs to be monitored in the **Show top** field either by using the spin button or entering the needed value by hand.

Auditing Objects Inside VPS

You may wish to set a system access control list (SACL) to control how access to this or that object inside your VPS is audited, i.e. record all attempts to access an object and have them displayed in Event Log. An object can be any file, folder, registry key, etc. inside your Virtual Private Server.

Let us assume that you wish to set a SACL for the `MyPrivateDocuments` folder inside VPS 155 for the `Users` group and let the records related to the operations on this folder be shown in Event Log on the Hardware Node. To this effect, you should perform the following operations:

- 1 Log in to VPS 155 via the Remote Desktop Protocol (RDP).
- 2 Create the `C:\MyPrivateDocuments` folder inside the VPS.
- 3 Right-click the newly created folder and select **Properties** on the context menu.
- 4 In the displayed window, go to the **Security** tab:

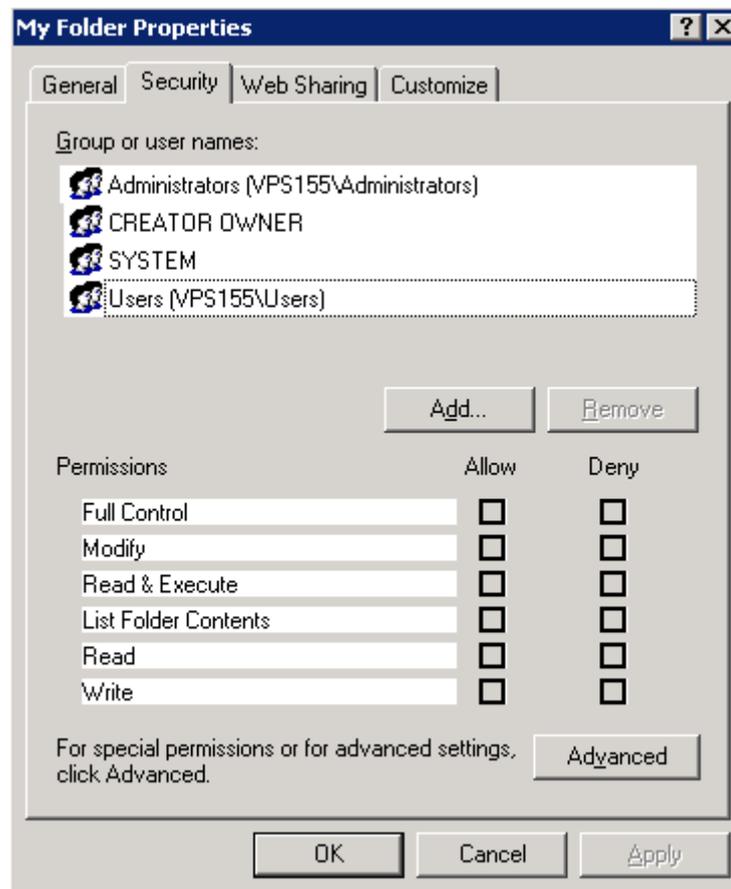


Figure 72: Auditing Objects in VPS - Displaying Security Settings

- 5 Choose the `Users (VPS155\Users)` item in the **Group or user names** table and select the **Full Control** checkbox under the **Allow** column in the **Permissions** table. This will grant the full access to the `User` group in respect of the `MyPrivateDocuments` folder.

- 6 Select the **Write** checkbox under the **Deny** column. This will let all the users created within the **User** group read and list the contents of the `MyPrivateDocuments` folder and prevent them from modifying this folder in any way (e.g. to rename subfolders in the `MyPrivateDocuments` folder or copy files to it). Your **Permission** table should look as follows:

Permissions for Users	Allow	Deny
Full Control	<input type="checkbox"/>	<input type="checkbox"/>
Modify	<input type="checkbox"/>	<input type="checkbox"/>
Read & Execute	<input checked="" type="checkbox"/>	<input type="checkbox"/>
List Folder Contents	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Read	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Write	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Figure 73: Auditing Objects Inside VPS - Defining Permissions

- 7 Click on the **Advanced** button at the bottom of the window and, in the **Advanced Security Settings** window, go the **Auditing** tab. This tab allows you to enable auditing any attempts of the users from the **User** group to access the `MyPrivateDocuments` folder.

- 8 On the **Auditing** tab, click the **Add** button under the **Auditing entries** table and type `VPS155\Users` in the **Enter the object name to select** field and then **OK**. The **Auditing Entry** window is displayed:

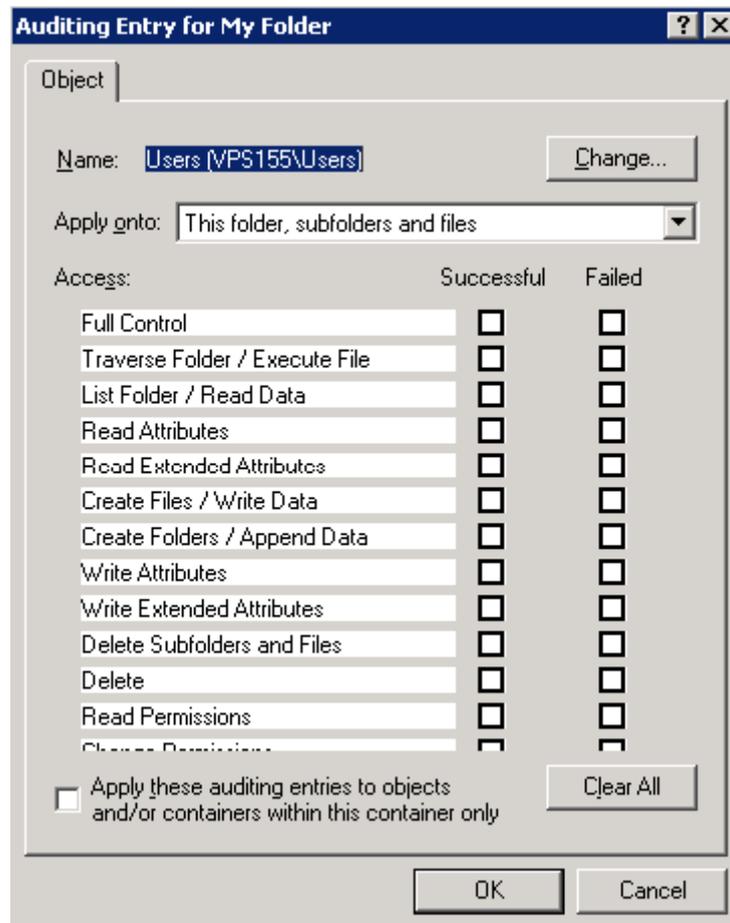


Figure 74: Auditing Objects Inside VPS - Enabling Audit

- 9 Select the **Full Control** checkboxes under the **Successful** and **Failed** columns and click **OK**. This will log all entries (successful and failed) that relate to operations on the `MyPrivateDocuments` folder.
- 10 Create a new user for VPS 155 (e.g. bob) and add this user to the **Users** and **Remote Desktop Users** groups. The latter group allows the newly created user to remotely log in to VPS 155 via RDP.
- 11 Now you should enable the **Audit object access** feature on the **Hardware Node**:
 - On the Node, select **Programs --> Administrative Tools --> Local Security Policy** on the Windows **Start** menu.
 - In the left part of the displayed window, expand the **Local Policies** item and choose **Audit Policy**.
 - In the right part of the **Audit object access Properties** window, double-click the **Audit Object Access** item and select the **Success** and **Failure** checkboxes.
 - Click **OK**.

This will record both the successful and failed attempts to access and modify the `MyPrivateDocuments` folder inside VPS 155 by users from the `Users` group. Success entries are generated when a user successfully accesses the folder; failure entries - when a user unsuccessfully attempts to modify the folder (for example, tries to create a subfolder within the `MyPrivateDocuments` folder).

- 12** Close the RDP connection window and log in to VPS 155 anew by using credentials of the newly created user belonging to the `Users` group.
- 13** Open the `C:\MyPrivateDocuments` folder and create a new subfolder by right-clicking any place inside the folder and choosing **New --> Folder** on the context menu.
- 14** Rename the newly created subfolder. For example, you can do by right-clicking the subfolder and selecting **Rename** on the context menu. After trying to save the changes made to the subfolder name, a message is displayed informing you that you have no rights to do so.
- 15** On the Hardware Node, select **Programs --> Administrative Tools --> Event Viewer** on the Windows **Start** menu and, in the displayed window, choose **Event Viewer --> Security**. A list of records related to the attempts to access and modify the `MyPrivateDocuments` folder will be displayed in the right part of the **Event Viewer** window.

CHAPTER 8

Managing Services and Processes

This chapter provides information on what services and processes are, the influence they have on the operation and performance of your system, and the tasks they perform in the system.

You will learn how to use VZMC in order to manage services and processes in Virtuozzo. In particular, you will get to know how you can monitor active processes in your system, start, stop, or restart services and processes.

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What Are Services and Processes

Instances of any programs currently running in the system are referred to as processes. A process can be regarded as the virtual address space and the control information necessary for the execution of a program. A typical example of a process is the `Notepad` program (or any other program) running on your Hardware Node or inside your VPS(s). Along with common processes, there are a great number of processes that provide an interface for other processes to call. These are called services. In many cases, services act as the brains behind many crucial system processes; they typically spend most of their time waiting for an event to occur or for a period when they are scheduled to perform some task. Many services provide the possibility for other computers on the network to connect to the given one via various network protocols.

Virtuozzo has a set of services at its disposal that perform certain tasks on the Hardware Node or inside Virtual Private Servers. A number of services are launched during the Hardware Node startup (for example, `Virtuozzo KSAL Service` or `Virtuozzo Management Service`), which is explained by the fact that Virtuozzo requires a specific set of running services to provide virtualization capabilities for the Node. These services are necessary for the proper functioning of your system (they are also called critical services).

When working with services, you should keep in mind the following. During the lifetime of a service, it uses many system resources. It uses the CPUs in the system to run its instructions and the system's physical memory to hold itself and its data. It opens and uses files within the filesystems and may directly or indirectly use certain physical devices in the system. Therefore, in order not to damage your system performance you should run only those services that are really needed at the moment.

Besides, you should always remember that running services in the Host OS is much more dangerous than running them in Virtual Private Servers. In case violators get access to one of the VPSs thru any running service, they will be able to damage only the VPS where this service is running, but not the other VPSs on your Hardware Node. The Hardware Node itself will also remain unhurt. And if the service were running on the Hardware Node, it would have damaged both the Hardware Node and all the VPSs residing on it. Thus, you should make sure that you run only those services on the Hardware Node that are really necessary for its proper functioning. Please launch all additional services you need at the moment inside separate VPSs. It will significantly improve your system safety.

Note: In VZMC, you can view all available services/processes by selecting `Services/Monitor --> Processes` in the left pane below the Hardware Node name or the Virtual Private Server name.

Main Operations on Services and Processes

The ability to monitor and control processes and services in your Virtuozzo system is essential because of the profound influence they have on the operation and performance of your whole system. The more you know about what each process or service is up to, the easier it will be to pinpoint and solve problems when they creep in.

The most common tasks associated with managing services in the Host operating system of the Hardware Node or inside a Virtual Private Server are starting, stopping, and restarting a service. For example, you might need to start a service in order to use certain server-based applications, or you might need to stop or pause a service in order to perform testing or to troubleshoot a problem. All these operations can be performed by means of VZMC.

As for processes, the main operations you can perform on them are monitoring the processes currently running on your Hardware Node or inside your Virtual Private Server(s) and making some control operations on them.

Managing Services and Processes

Virtuozzo Management Console allows you to manage (monitor and partially configure) the services and processes present in the Host operating system of the Hardware Node or in a Virtual Private Server. By using VZMC, you can start, stop, or restart a service. Below in this chapter detailed information on all those tasks that can be performed by means of VZMC is given.

Managing Processes

In VZMC, you can view those processes that are currently running on your Hardware Node and/or inside your Virtual Private Server(s). To display the processes, click the Hardware Node name where you wish to monitor processes and then select **Monitor -> Processes**. The list of the Host OS or VPS OS processes should appear in the right pane:

pid	%cpu	pri	rss	time	command	user
4044	0	6	9648	00:00:25	svchost.exe	NT AUTHORITY\S...
3960	3	8	23332	00:00:56	swmc.exe	VZCLEAR\Administr...
3940	0	6	692	00:00:01	svchost.exe	NT AUTHORITY\N...
3928	0	6	3164	00:00:02	appmgr.exe	NT AUTHORITY\S...
3924	0	6	716	00:00:01	svchost.exe	NT AUTHORITY\L...
3904	3	8	3060	00:00:32	ssh.exe	VZCLEAR\Administr...
3864	0	6	2084	00:00:03	svchost.exe	NT AUTHORITY\S...
3768	0	6	3920	00:00:01	sshd.exe	
3752	3	6	5784	00:00:04	vzaserv.exe	NT AUTHORITY\S...
3748	0	6	6412	00:00:08	wmiprvse.exe	NT AUTHORITY\S...
3700	0	6	4420	00:00:00	sshd.exe	

Figure 75: VZMC - Monitoring Active Processes

The column names and their description are presented in the table below:

Column name	Description
pid	The identifier the process belongs to.
%cpu	The CPU time in percents used by the process.
pri	The kernel scheduling priority for the process. The higher value stands for higher process priority.
rss	Number of pages guaranteed to remain in the physical memory (not to be dumped to the page file).
time	The total CPU time the process has used, it is displayed in the hh/mm/ss format.
user	The user who has launched the process.
command	The command that invoked the process.

To view the processes inside a Virtual Private Server, double-click on its name and select **Monitor -> Processes**.

You can send different signals to processes by right-clicking a process and selecting the corresponding signal on the context menu.

Managing Services

Virtuozzo Management Console allows you to monitor the services present in the Host operating system of the Hardware Node or in that of a Virtual Private Server. Click on the Services folder item in the tree below the Hardware Node name or the Virtual Private Server name. A list of the Host OS or VPS OS services should appear in the right pane:

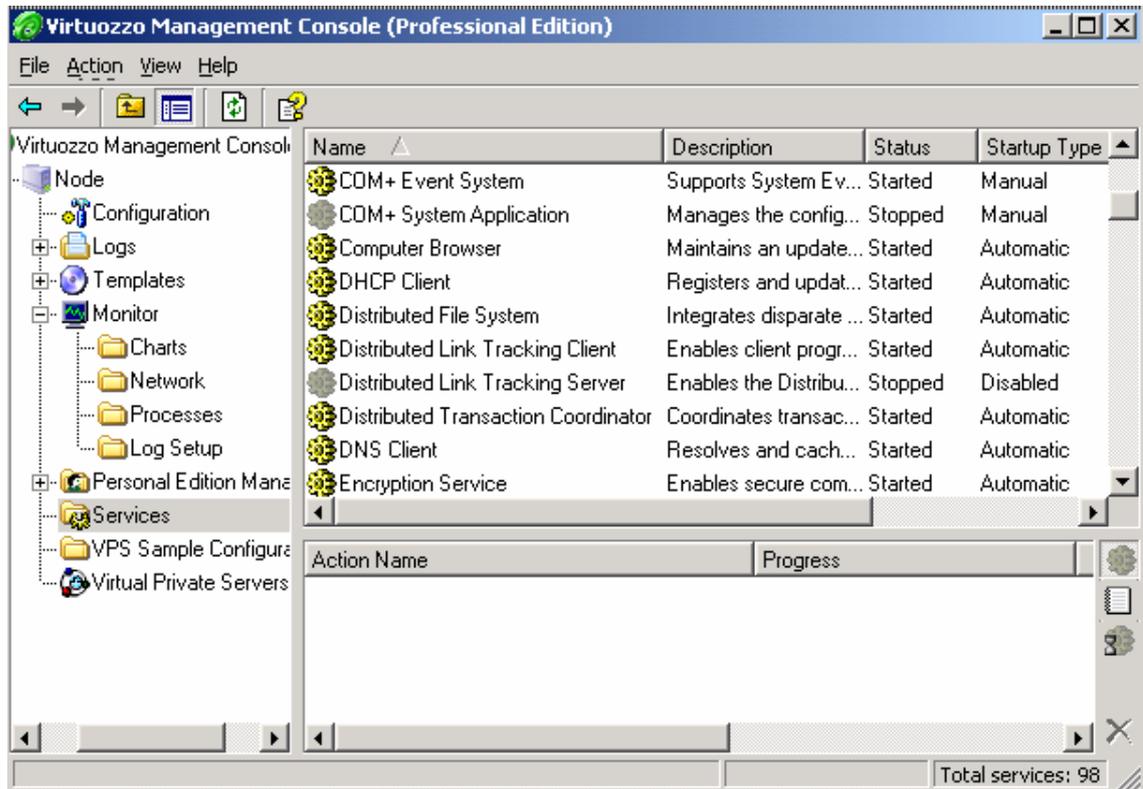


Figure 76: VZMC - Viewing Services

Running services are indicated with bright icons. Stopped services have shaded icons. The Status column of the table duplicates this information in the text form.

You can manage all services available on the Node or in a VPS in the same way you do it on a usual standalone server running Windows Server 2003, i.e. start, stop, or restart services, define their startup type (automatic, manual, disabled), view their dependencies, etc. To this effect, select the corresponding service in the table and either use the buttons on the toolbar or right-click the service and select **Properties** on the context menu.

Note: It is not necessary to use VZMC to manage the Node or VPS services. You can as well use the standard Services Microsoft Management Console (MMC) snap-in. To this effect, run the `services.msc` command either on the Hardware Node or in the VPS remote desktop connection window, respectively.

CHAPTER 9

Customizing VZCC/VZPP

This chapter contains instructions for experienced administrators on the way to customize Virtuozzo Control Center and Virtuozzo Power Panels by changing the VZCC/VZPP layout and appearance and modifying certain VZCC/VZPP settings.

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Overview

The Hardware Node administrator may customize VZCC and VZPP by altering their layout and appearance (e.g. including additional links on the menu) as well as by modifying certain VZCC/VZPP settings. This chapter begins with the step-by-step descriptions of the most common tasks you are likely to perform:

- adding your own links to the VZCC/VZPP menu (on page 160);
- setting automatic logout time (on page 162);
- setting the maximal number of allowed VPS backups (on page 164).

If you are looking for other ways to customize VZCC/VZPP, you are recommended to read on and peruse the **VZCC/VZPP Architecture** section (on page 165) as well as the consequent sections devoted to the following tasks:

- modifying an existing VZCC/VZPP page (by the example of the VZPP services page) (on page 167);
- adding a new VZCC/VZPP page (by the example of adding a new dashboard to the VZPP menu) (on page 169);
- customizing the VZCC/VZPP menu (on page 172);
- customizing the VZCC/VZPP general layouts (on page 174);
- changing VZCC/VZPP graphical skins (on page 175).

When customizing VZCC/VZPP, you are supposed to work with XML and XSL files located inside the Service VPS. There are three ways to edit these files:

- 1** Log in to the Service VPS via Remote Desktop Protocol (RDP) with the Administrator account. You should make sure that you have specified the Administrator password for the Service VPS; if not, turn to the **Changing Administrator Password** section (on page 69) for instructions on how to do it. Then use any text editor like Notepad for modifying the necessary files.
- 2** Log in to the Hardware Node where the Service VPS is hosted and go to the `C:\vz\root\1` directory, which is the main directory for the Service VPS. Then, again, any text editor can be used for modifying the files.
- 3** Use the VZMC file manager for modifying the necessary text files inside the Service VPS, i.e. download the corresponding files to your local computer, edit them, and upload the files again to the Service VPS.

Finally, the **Configuring VPS Offline Management** section of the current chapter contains instructions on how you can manage your offline services and to enable/disable access to a particular Virtual Private Server by using VZPP.

Common Tasks

Adding VZCC/VZPP Links

Adding your own links to the VZCC or VZPP menus is performed by editing the `C:\Program Files\SWSoft\vizcp\etc\cc\menu.xml` and `C:\Program Files\SWSoft\vizcp\etc\pp\menu.xml` files inside the Service VPS, respectively. Let us assume that you wish to provide VZPP with a link to the page on the provider's website where the VPS administrator is able to buy additional resources for their VPS. Open the `C:\Program Files\SWSoft\vizcp\etc\pp\menu.xml` file with the help of Notepad or any other editor.

Note: To add a new link to the VZCC menu, you should open the `C:\Program Files\SWSoft\vizcp\etc\cc\menu.xml` file inside the Service VPS and edit it in the same way as is described below for VZPP.

As you see, there are four `<submenu>` elements in this file. Each `<submenu>` element is opened with the `<submenu list_of_attributes>` tag and closed with the `</submenu>` tag. In the browser, each `<submenu>` element corresponds to one of the four groups of links on the VZPP menu. Let us add a link to the first group of links called **VPS Management**:

- 1 In the `C:\Program Files\SWSoft\vizcp\etc\pp\menu.xml` file, locate the `<submenu>` element having `name="VPS Management"` as one of its attributes. Between the `<submenu>` opening tag and the `</submenu>` closing tag, there are a number of `<item>` elements, also having their corresponding opening and closing tags. Each `<item>` element corresponds to a link on the VZPP menu.
- 2 Create a copy of one of the `<item>` elements (i.e. all the text between the `<item>` opening tag and the `</item>` closing tag, including the tags proper) and place it just before the `</submenu>` closing tag. This will be a basis for your link.
- 3 Edit this `<item>` element in the following way:
 - Enter the path to the page where the VPS administrator can buy more resources for their VPS as the value of the `href` attribute.
 - Enter the ID of the icon file to be shown to the left of the link as the value of the `icon` attribute. The file should be located in the `C:\Program Files\SWSoft\vizcp\static\viz\skins\<skin_name>\icons` directory inside the Service VPS and have the following name pattern: `<id>_16.gif`.

Note: There are a number of subdirectories in the `C:\Program Files\SWSoft\vizcp\static\viz\skins\` directory. One subdirectory corresponds to one VZPP skin defining such VZPP elements as its general layout, icons and images, the color palette, etc. Therefore, to allow your new icon to be displayed in VZPP when using any of the existing skins, you should add the icon file to each subdirectory.

- Between the `<title>` and `</title>` tags, enter the text to be shown as the new link in the browser.

- Remove the remaining attributes of the `<item>` element and the existing `<screen>` elements.

In the end, your new `<item>` element may look like below:

```
<item href="http://www.domain.com/res.cfm" icon="res_16"
target="_blank">
  <title>Buy resources</title>
</item>
```

Note: The `target="_blank"` attribute tells the browser to open the link in a new browser window. Omitting this attribute will open the link in the same browser window.

The newly created link will be available for all VPS administrators having access to the `<submenu>` element where your new `<item>` element is included. However, you may wish to restrict access to the link. The `cred` attribute in the `<item>` element allows you to prevent the link from being displayed on the VZPP menu. To this effect, you should enter a random ID as the value of the `cred` attribute and make sure that this ID is not specified in the `C:\vz\private\1\root\Program Files\SWSoft\vzcp\etc\vzcpcon.conf` file on the Hardware Node as one of the existing XML elements included in the `<access>` pattern element.

To make the link available on the VZPP menu again, you can choose one of the following ways:

- Remove the `cred` attribute from the `<item>` element in the `C:\Program Files\SWSoft\vzcp\etc\pp\menu.xml` file inside the Service VPS;
- Specify the `cred` attribute in the `C:\vz\private\1\root\Program Files\SWSoft\vzcp\etc\vzcpcon.conf` file inside the Service VPS as an XML element (for example, `<buy_resources/>`). The name of the element should coincide with the ID of the `cred` attribute in the `C:\Program Files\SWSoft\vzcp\etc\pp\menu.xml` file, and the element itself should be placed between the following pattern elements:

```
<auth>
  <type>VEUser</type>
  <user>root</user>
  <creds>
  <management>
```

and

```
</management>
</creds>
</auth>
```

In this case the `root` user will gain access to the created link, i.e. this link will be displayed on the VZPP menu under the `VPS Management` group when the `root` user is logged in to the Virtual Private Server.

Note: If you are creating a new VZCC link, you should look for the `<type>SVEUser</type>` string instead of `<type>VEUser</type>` in the `C:\vz\private\1\root\Program Files\SWSoft\vzcp\etc\vzcpcon.conf` file and place the corresponding XML element between the subsequent `<management>` opening tag and the `</management>` closing tag.

While working with the `cred` attribute, you should also keep in mind the following:

- a** After you have defined a new element in the `C:\vz\private\1\root\Program Files\SWSoft\vzcp\etc\vzcpcon.conf` file inside the Service VPS, you should restart the `vzcp` service by executing the `vzctl exec 1 sc stop vzcpd` and `vzctl exec 1 sc start vzcpd` commands on the Hardware Node and log out of and log in to VZPP afresh for the new settings to take effect.
- b** Do not use spaces in the value of the `cred` attribute.

To learn more about the VZCC/VZPP menu customization, turn to the Customizing VZCC/VZPP Menu subsection (on page 172).

Setting Auto Logout Time

If a VZCC/VZPP user has been inactive for a certain time after logging in to VZCC/VZPP, the system automatically logs them out, and the continuation of working with VZCC/VZPP is possible only after logging in anew. You may customize the period of inactivity before an automatic logging out by editing the `vzagent.conf` file located in the `C:\Program Files\SWSoft\VZAgent\etc\` directory on the Hardware Node. Open the file for editing and find the following fragment of code inside the file:

```
<ticketm>
  <configuration>
    <ticket_expiration>10800</ticket_expiration>
  </configuration>
</ticketm>
```

The value of the `<ticket_expiration>` element denotes this period of inactivity in seconds (3 hours in the example above). Edit this value as required and save the file. After you have appropriately edited the file, restart `vzagent` by opening the Services snap-in on the Hardware Node, right-clicking the `VZAop` service in the displayed window, and choosing **Restart** on the context menu.

A simpler way of editing the `vzagent` configuration is by using VZMC:

- 1** Right-click the Hardware Node name in the VZMC left pane and select **Tasks --> Manage VZAgent Configuration** on the context menu.
- 2** In the **VZAgent Configuration** window, expand the `ticketm` key and select the configuration subkey.

- 3 Double-click the `ticket_expiration` parameter in the right pane:

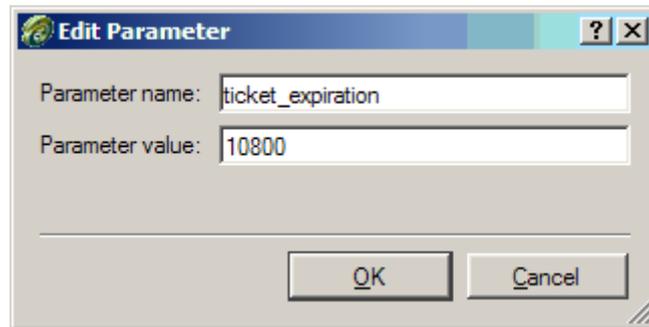


Figure 77: VZMC - Setting VZCP Auto Logout Time

- 4 In the Edit Parameter window, enter the value you want in the Parameter value field.
- 5 Press OK.

The change will take effect immediately. In VZMC, you need to edit the value only once, and you do not need to restart `vzagent` manually.

Note: The `ticket_expiration` parameter set in the `C:\Program Files\SWSOft\VZAgent\etc\vzagent.conf` file defines the logout time for both VZCC and VZPP.

Setting Maximal Backups Number

Service VPS users and VPS administrators may be able to back up their Virtual Private Servers by means of VZCC and VZPP, respectively. VPS backups are stored on the Hardware Node and may take up a vast amount of disk space. That is why the Hardware Node administrator may wish to limit the number of VPS backups Service VPS users and VPS administrators are allowed to create. This number can be customized by editing the `vzagent` configuration file (`C:\Program Files\SWSOft\VZAgent\etc\vzagent.conf`). Open this file for editing and find the following fragment of code inside the file:

```
<backm>
  <configuration>
    a number of lines...
    <pe_backups_limit>1</pe_backups_limit>
    a number of lines...
  </configuration>
</backm>
```

The value of the `<pe_backups_limit>` element denotes this number of backups (1 is the default value). Edit this value as required and save the file. After you have appropriately edited both files, restart `vzagent` by executing the following command on the Hardware Node:

```
C:\Documents and Settings\Administrator>vzctl exec 1 sc stop vzcpd
...
Command 'exec' is successfully finished
C:\Documents and Settings\Administrator>vzctl exec 1 sc start vzcpd
...
Command 'exec' is successfully finished
```

A simpler way of editing the `vzagent` configuration is by using VZMC:

- 1 Right-click the Hardware Node name in the VZMC left pane and select **Tasks --> Manage VZAgent Configuration** on the context menu.
- 2 In the **VZAgent Configuration** window, expand the `backm` key and select the `configuration` subkey.
- 3 Double-click the `pe_backups_limit` parameter in the right pane.
- 4 In the **Edit Parameter** window, enter the value you want in the **Parameter value** field.
- 5 Press **OK**.

The change will take effect immediately. In VZMC, you need to edit the value only once, and you do not need to restart `vzagent` manually.

Note: The limits set on the number of VPS backups by editing the `vzagent` configuration files concern only VPS administrators and Service VPS users. There are no restrictions for a Hardware Node administrator (i.e. for the `vzagent0` user), who is allowed to create as many VPS backups as s/he wants to.

VZCC/VZPP Architecture

The way VZCC/VZPP pages are organized and presented in a browser is determined by the corresponding XSL tables installed inside the Service VPS. It means that the layout and appearance of VZCC/VZPP pages are not hard-coded anywhere but may be customized as needed by editing these XSL files to create an individual look and feel for your VZCC/VZPP. Thus, the following things may be done:

- Customizing individual VZCC/VZPP pages, including dashboards;
- Customizing the VZCC/VZPP menu;
- Customizing the VZCC/VZPP general layout;
- Creating skins for VZCC/VZPP (whole sets of CSS and image files as well as some other parameters) and switching among various skins.

All these tasks will be explained and covered in the following sections. In a general case, it is enough to possess an adequate HTML knowledge to customize the pages. However, it is also very desirable to know the basics of XML syntax. An expertise in the XSL language will give you the complete control over the VZCC/VZPP presentation.

Before reading on, it is important to understand in what way the XSL stylesheets take part in the process of making up HTML pages displayed in the VPS administrator's browser. The scheme below illustrates the actions performed inside the Service VPS between receiving a request from the browser and sending back the resulting HTML page to it:

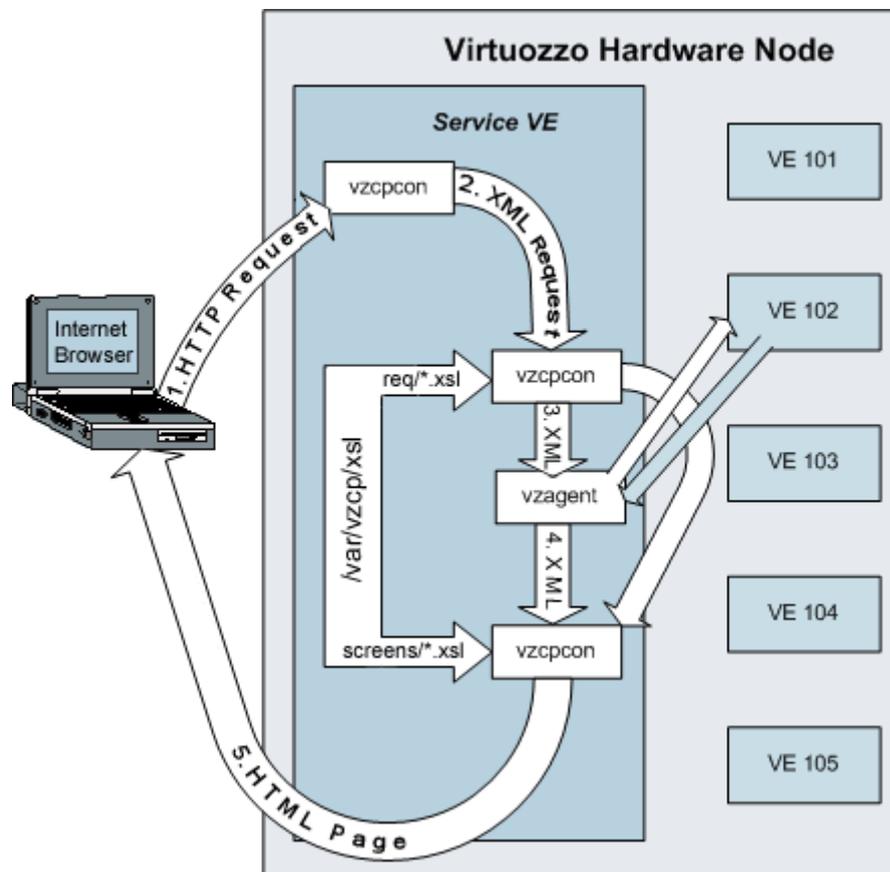


Figure 78: VZCC/VZPP Transformations

Now each action is treated in more detail:

- 1 The administrator follows, say, the `http://<Service_VPS_IP_address:TCP_port>/cp/pwd` link in his browser (or enters this link in the browser address line, for that matter). This page is used to change the `root` password in the current VPS. The administrator may use the IP address not of the Service VPS, but of a particular VPS s/he is managing. It is not of much importance here, since any such request is anyway redirected to the Service VPS.
- 2 The `vzcpcon` process inside the Service VPS handles the HTTP request from the browser and converts it to an XML request (the contents of the HTTP request presented in the XML format).
- 3 The `vzcpcon` process converts the created XML request to another XML format suitable for parsing by `vzagent`. To perform this action, `vzcpcon` uses the corresponding `*.xsl` file located in the `C:\Program Files\SWSOft\vzcp\xsl\req` directory inside the Service VPS (or, the `C:\vz\root\1\C\Program Files\SWSOft\vzcp\xsl\req` directory on the Hardware Node). In our case, the `pwd.xsl` file is used.

Note: If the request does not need a response from the VPS being managed (for example, the request is for displaying a dashboard common for all the VPSs), and therefore, `vzagent` is not involved, `vzcpcon` proceeds directly to Step 5. This is shown as a side arrow on the scheme above.

- 4 `vzagent` handles the request by connecting to the corresponding VPS and makes up a response to `vzcpcon`. This response is also in the XML format, since XML is the primary language of `vzagent`.
- 5 The `vzcpcon` process merges this XML response with the corresponding `*.xsl` file located in the `C:\Program Files\SWSOft\vzcp\xsl\screens` directory inside the Service VPS (or the `C:\vz\root\1\C\Program Files\SWSOft\vzcp\xsl\screens` directory on the Hardware Node). In our case, it will be the `pwd.xsl` file. Any such `xsl` file can be regarded as a set of templates instructing `vzcpcon` of the way to convert the XML response from `vzagent` to a valid HTML page. The resulting HTML page is sent back to the Internet browser and displayed in the administrator's window.

Thus, we see that it is modifying HTML templates inside the `*.xsl` files that tells upon the way the VZCC/VZPP pages are generated. To learn more about this process and to get to know certain nuances of customizing VZCC/VZPP, see the following subsections.

Customizing Individual Pages

You may alter the appearance of a basic VZCC/VZPP page, or you may add your own pages to VZCC/VZPP. These tasks are described below.

Modifying Existing Page

To modify an existing VZCC/VZPP page, you should first determine what xsl file is responsible for displaying this or that page. Let us assume you wish to reorganize the **Services** table in VZPP:

Note: To modify a VZCC page, you should perform the same operations that are described below for customizing a VZPP page.

- 1 Log in to VZPP and click the **System Services** link on the left menu. If you are using the framed layout for VZPP, you may determine the URL of the page, for example, by placing the mouse on the link and looking at the status bar of your browser. In our case, it should read `.../cp/services`. This means that this page is displayed with the help of the `services.xsl` file in the `C:\Program Files\SWSOft\vizcp\xsl\screens` directory inside the Service VPS.
- 2 Log in to the Service VPS with the Administrator account and open the `C:\Program Files\SWSOft\vizcp\xsl\screens\services.xsl` file for viewing and editing. You should make sure that you have enabled the Administrator account for the Service VPS; if not, turn to the **Changing Administrator Password** section (on page 69) for instructions on how to do it. If you are logged on to the Hardware Node where the Service VPS is hosted, but not to the Service VPS itself, you may as well work with the `C:\vz\root\1\C\Program Files\SWSOft\vizcp\xsl\screens\services.xsl` file. Still, another possibility for working with text files is provided by the VZMC file manager feature.
- 3 To unravel the way this (and any) xsl file forms the HTML page, you should search for the following string in the file:

```
<xsl:template name="screen">
```

This element marks the beginning of generating an HTML page, and, if you know the XSL language, you may learn what auxiliary templates it calls (located either in the `services.xsl` file or in other files enumerated as attributes in the `<xsl:include/>` elements at the end of the file) and modify these templates as needed. If XSL is not your forte, you should search for the HTML code in the `services.xsl` file resembling the table on the **System Services** page. For example, you may guess that the following code is responsible for displaying the header row in the table:

```

<xsl:with-param name="browse">
  <ui:cols>
    <ui:column id="id" nav-type="id" title="{sw:text('Name')}}"
      filter="auto" encode="no"/>
    <ui:column id="name" title="{sw:text('Title')}" />
    <ui:column id="srv_state" align="center" apply-templates="yes"
      title="{sw:text('Status')}" filter="select">
      <ui:filter-option value="0" title="{sw:text('Stopped')}" />
      <ui:filter-option value="1" title="{sw:text('Running')}" />
    </ui:column>
    <ui:column id="srv_autostart_status" sorting="no"
      align="center" apply-templates="yes"
      title="{sw:text('Autostart')}" />
  </ui:cols>
</xsl:with-param>

```

- 4 Modify the HTML code as needed. Mind that this code should comply with the XHTML requirements, i.e. you should close all orphan elements (e.g. `
` instead of `
`) and do not use cross-nested elements (e.g. `<i>text</i>` is correct, whereas `<i>text</i>` is incorrect). If you are unsure whether your modifications comply with the XHTML requirements, you may use third-party software, for example, XMLSPY (www.altova.com) to check whether the resulting file is well-formed.

For example, you may exchange the places of the following fragments of code:

```

<ui:column id="srv_state" align="center" apply-templates="yes"
  title="{sw:text('Status')}" filter="select">
  <ui:filter-option value="0" title="{sw:text('Stopped')}" />
  <ui:filter-option value="1" title="{sw:text('Running')}" />
</ui:column>

```

and

```

<ui:column id="srv_autostart_status" align="center"
  apply-templates="yes" title="{sw:text('Autostart')}" />

```

After that, the **Status** and **Autostart** columns will be exchanged in the **Services** table. Refresh your VZPP page to see the results.

Note: The VZPP **Services** page reflects not all the services inside the VPS, but only those services which are also present in the `C:\Program Files\SWSoft\vzcp\etc\services.xml` file inside the Service VPS. To be able to display additional services, you should add the corresponding `<service/>` elements to this file.

Adding New Page

New VZCC/VZPP pages are created by adding new *.xsl files to the C:\Program Files\SWSoft\vizcp\xsl\screens directory inside the Service VPS. Since these xsl files are written specifically for the XML generated by vzaagent, it is recommended not to create new files from scratch but use existing files as a starting point. In this subsection, we will consider a situation when you want to add a new dashboard to your VZPP, say, for housing external links related to your business. So, here is what you should do (we suppose that you are working inside the Service VPS):

Note: The C:\Program Files\SWSoft\vizcp\xsl\screens directory inside the Service VPS contains the *.xsl files common for both VZCC and VZPP. However, there are some *.xsl files used for creating VZCC pages only. These files are located in the C:\Program Files\SWSoft\vizcp\xsl\screens\cc directory in the Service VPS.

- Decide on any existing VZPP dashboard file and make a copy of it in the C:\Program Files\SWSoft\vizcp\xsl\screens directory. For example, you can copy the vps.xsl file to be a basis for your new page and call it my_dash.xsl.
- Open the newly-created file for editing by means of a text editor (e.g. Notepad).
- Find the following line in the file:

```
<ui:screen id="07.03.00.00" title="{sw:text('VPS Management')}"
icon="vps_management" cred="/vps/management">
```

and change the value of the following attributes:

- *id*. When defining the *id* values for your own VZPP pages, you should leave the first dyad intact (it identifies VZPP as a module), change the second one to a large number (to identify your personal screens), and have the last two ones at your choice (they would identify different subscreens within the group of your personal screens). Thus, you may define the following ID for your VZPP page:

```
<ui:screen id="07.99.01.00" ...>
```

- *title*. Change the value of the attribute to what you wish to be reflected as the title of your dashboard on the VZPP page.
- *icon*. Change the value of the attribute to point to the icon file you wish to be displayed to the left of the dashboard title. The icon file itself should be placed to the C:\Program Files\SWSoft\vizcp\static\viz\skins*<skin_name>*\icons folder with the following name mask: *<id>*_32.gif. The *id* value of this mask should be entered as the value of the select attribute instead of the vps_management string.

Note: There are a number of subdirectories in the C:\Program Files\SWSoft\vizcp\static\viz\skins\ directory. One subdirectory corresponds to one VZPP skin defining such VZPP elements as its general layout, icons and images, and the color palette. Therefore, to allow your new icon to be displayed when using any of the existing skins, you should place the icon file in each subdirectory.

- `cred`. Optional. Change the ID of the `cred` attribute responsible for granting VPS administrators access to this link on the VZPP menu. This ID should be specified in the `C:\Program Files\SWSoft\vizcp\etc\vizcpcon.conf\vizcpcon.conf` file inside the Service VPS between the `<auth>` and `</auth>` tags. Detailed information on the `cred` attribute is provided in the **Adding VZCC/VZPP Links** subsection (on page 160).

Inasmuch as there is no need in connecting to any VPS for displaying any dashboard page, and so `vzagent` is not involved in the process, `vizcpcon` uses not the XML response from `vzagent` to build an HTML page, but the static `C:\Program Files\SWSoft\vizcp\etc\pp\dashboard.xml` file. So, you further need to define your dashboard in this file. Open it for editing by means of any editor (for example, of Notepad).

Note: While adding a new VZCC page, you should work with the `dashboard.xml` file located in the `C:\Program Files\SWSoft\vizcp\etc\cc\` directory.

There are four `<dashboard>` elements defined in this file, including the top dashboard providing links to the three others.

- Copy one of the children `<dashboard>` elements inside the file to provide a basis for defining your own dashboard, for example, the **Services** dashboard:

```

<!-- VPS Services dashboard -->
<dashboard id="07.04.01.00" name="VPS Services" cred="/vps/services">
  <item href="$baseurl/services" title="System Services"
    icon="services" tip="srv_screen" cred="system_services"
    platform="linux">
    <text>On this screen you may manage various services
      in this VPS.</text>
  </item>
  <item href="$baseurl/proc" title="System Processes"
    icon="processes"
    tip="proc_screen" cred="system_processes">
    <text>On this screen you may check processes currently
      running in your VPS and send them system signals.</text>
  </item>
  ...
</dashboard>

```

- Now edit this dashboard definition to reflect your own template:
 - Edit the commentary describing your dashboard;
 - Edit the value of the `id` attribute of the `<dashboard>` element to reflect the screen ID you have specified in the `my_dash.xml` file;
 - Edit the value of the `name` attribute of the `<dashboard>` element to provide a good description to your dashboard. There are no restrictions as to what this name should be;
 - Create as many `<item>` elements as the number of links on your dashboard;
 - Edit the value of the `href` attribute of each `<item>` element. This will be the value of the `href` attribute of the `<a>` element in the resulting HTML. You may specify an absolute path here as well.
 - Edit the value of the `title` attribute of each `<item>` element. This will be the text between the `<a>` and `` tags in the resulting HTML.

- Edit the value of the `icon` attribute of each `<item>` element to point to the icon you wish to be displayed to the left of the title. See above for details on how this value should be specified.
- Edit the value of the `tip` attribute of each `<item>` element to display the brief description of the page currently opened in VZPP. The value of the `tip` attribute should be specified as the `id` attribute of the `<tip>` element in the `C:\vz\private\1\root\Program Files\SWSoft\vzcp\etc\tips.xml` file inside the Service VPS.
- Edit the value of the `cred` attribute of each `<item>` element, if any, to grant a VPS administrator access to the VZPP page. Detailed information on the `cred` attribute is provided in the **Adding VZCC/VZPP Links** subsection (on page 160).
- Enter `win32` as the value of the `platform` attribute of each `<item>` element if you wish the link defined by this `<item>` element to be available on Windows Hardware Nodes only. Otherwise, remove this attribute from the `<item>` element.
- You may additionally define the `target` attribute for any `<item>` element that would be copied as the `target` attribute for the `<a>` element in the resulting HTML.
- Edit the text between the `<text>` and `</text>` tags for each `<item>` element. This will be the description of your link on the HTML page.
- At last you have to create an additional `<item>` element for the top dashboard. For example, you may define it as follows:

```
<item href="$baseurl/my_link" title="External Links"
icon="external_links">
  <text>
    Various external links gathered for your convenience.
  </text>
</item>
```

That is almost all about creating a new dashboard of yours. You may now access it by typing

`https://<Service_VPS_IP_address_or_hostname>:<TCP_port>/cp/my_dash`

into the address line of your browser or by following the proper link from the top VZPP dashboard. However, after creating your new dashboard, you may naturally want to provide a link to it in the left VZPP menu. Please consult the **Adding VZCC/VZPP Links** subsection (on page 160) to know how to add your own links to the VZPP menu.

Customizing VZCC/VZPP Menu

Inasmuch as there is no need in connecting to any VPS for displaying the VZCC/VZPP menu on any page, and so `vzagent` is not involved in the process, `vzcpcon` uses not the XML response from `vzagent` to build the menu, but the static `C:\Program Files\SWSoft\vzcp\etc\cc\menu.xml` and `C:\Program Files\SWSoft\vzcp\etc\pp\menu.xml` files inside the Service VPS, respectively. So, you may define your additional links and submenus in these particular files or change the properties of the existing ones. Detailed information on how to add your own links and submenus to the VZCC/VZPP menu is provided in the **Adding VZCC/VZPP Links** subsection (on page 160). The given subsection familiarizes you with the way to modify the existing links and submenus on the VZCC/VZPP menus only.

You can customize the properties of the VZCC and VZPP links and submenus by editing the `C:\Program Files\SWSoft\vzcp\etc\cc\menu.xml` and `C:\Program Files\SWSoft\vzcp\etc\pp\menu.xml` files inside the Service VPS, respectively. Let us assume you wish to edit the VZCC menu. To this effect, open the `C:\Program Files\SWSoft\vzcp\etc\cc\menu.xml` file for editing by means of Notepad or any other XML editor.

As you probably know from the **Adding VZCC/VZPP Links** subsection (on page 160), there are three `<submenu>` elements defined in this file by default. One `<submenu>` element constitutes one group on the VZCC menu providing links to the existing dashboards and grouping the links to individual VZCC pages presented by the `<item>` elements inside each `<submenu>` element. The properties of all `<submenu>` and `<item>` elements are defined by the values of their attributes and/or their subelements; so you should simply change these values to customize the VZCC menu properties. The table below describes the meaning of each attribute/subelement in the `C:\Program Files\SWSoft\vzcp\etc\cc\menu.xml` file:

Attribute/subelement	Description
<code>name</code>	The name of the dashboard link as it will be displayed on the menu.
<code>href</code>	The path the link references. This may be either an absolute or relative path. The <code>\$baseurl</code> variable stands for <code>https://<VPS_IP_address>:<TCP_port>/vz/cp</code> corresponding to <code>C:\Program Files\SWSoft\vzcp\xsl\screens</code> inside the Service VPS. If the path specifies an <code>xsl</code> file in this directory, its extension should be omitted.
<code>cred</code>	The ID of the <code>cred</code> attribute responsible for granting a Service VPS user access to this or that link on the VZCC menu. This ID should be specified in the <code>C:\Program Files\SWSoft\vzcp\etc\vzcpcon.conf\vzcpcon.conf</code> file inside the Service VPS between the <code><auth></code> and <code></auth></code> tags. Detailed information on the <code>cred</code> attribute is provided in the Adding VZCC/VZPP Links subsection (on page 160).

<code>tip</code>	The value of the <code>id</code> attribute of the <code><tip></code> element in the <code>C:\Program Files\SWSoft\vizcp\etc\tips.xml</code> file inside the Service VPS. The contents of the corresponding <code><tip></code> element is the description of the link the Service VPS user sees when moving the mouse over the link.
<code>screen-id</code>	The ID of the screen the link refers to. This attribute has no special meaning apart from highlighting the link when you are on the corresponding VZCC page.
<code>type</code>	Defines the link area where the contents of the <code><tip></code> element will be shown when moving the mouse over the corresponding element on the VZCC interface.
<code>icon</code>	The ID of the icon file to be shown to the left of the link. The file should be located in the <code>C:\Program Files\SWSoft\vizcp\static\viz\skins\<skin_name>/icons</code> directory inside the Service VPS and have the following name pattern: <code><id>_16.gif</code> .
<code>id</code>	The ID of the screen the link refers to. This attribute has no special meaning apart from highlighting the link when you are on the corresponding VZCC page.
<code>target</code>	An optional attribute of the <code><item></code> element acting as the <code>target</code> attribute of the HTML <code><a></code> element. For example, specifying <code>target="_blank"</code> will tell the browser to open the corresponding link in a new window.
<code>svps</code>	Indicates if the operation defined by the <code><item></code> element where this attribute is specified can be performed in the Service VPS context. To prevent the operation to be applied to the Service VPS, you should set the value of this attribute to <code>deny</code> . Omitting the attribute or specifying another value in this attribute will allow you to perform the operation in the Service VPS context.
<code>platform</code>	If specified, indicates the platform (Hardware Node) where the link defined by the <code><item></code> element containing this attribute will be displayed on the VZCC menu. The values that can be set in this attribute are the following: <ul style="list-style-type: none"> ▪ <code>win32</code>: the link will be shown for all Hardware Nodes running the Windows Server 2003 OS; ▪ <code>linux</code>: the link will be displayed for all Hardware Nodes running the Linux OS (Red Hat 9, Fedora Core 3, etc.).
<code>cond</code>	Is used to additionally check if the link should be displayed on the VZCC menu.
<code><title></code>	The name of the link under the dashboard link as it will be displayed on the menu to the right of its icon.
<code><screen></code>	Attaches screens whose identifiers are listed as the value of the <code>id</code> attribute.
<code><custom_script></code>	Indicates what Java script should be executed while clicking the link on the VZCC menu.
<code><template></code>	Is used to check the version of the Confixx template and, depending on the version, to decide whether the Confixx link should be shown on the VZCC menu or will be unavailable for users.

Note: The aforementioned attributes and subelements can be specified in both files `C:\Program Files\SWSoft\vizcp\etc\pp\menu.xml` and `C:\Program Files\SWSoft\vizcp\etc\cc\menu.xml`, i.e. any of these elements can be used for building both the VZPP menu and the VZCC menu.

The appearance proper of the VZCC menu is controlled by the `C:\Program Files\SWSoft\vizcp\xsl\lib\nav_menu.xsl` file inside the Service VPS. You may edit the HTML code in this file to create a different look for the menu. This procedure is covered in the [Customizing Individual Pages](#) subsection above.

Customizing VZCC/VZPP Layout

If you simply want to define a kind of layout (framed, non-framed, vzc, etc.) to be used for building VZCC/VZPP pages, you should turn to the [Adding Skins to VZCC/VZPP](#) subsection for the instructions.

If you want to perform a more intricate customization, you should modify the code inside one of the `.xsl` files in the Service VPS `C:\Program Files\SWSoft\vizcp\xsl\layout\` directory. The `.xsl` files from this directory are used to transform the XML response from `vzagent` - a set of `.xml` files containing all the needed information on your pages, dashboards, menus, etc. in Virtuozzo Control Center and Virtuozzo Power Panels - to the HTML pages as they are displayed on your screen. In other words, these files are responsible for forming the VZCC/VZPP layout, although to a variable extent. For example, you can edit the `plain.xsl` or `framed.xsl` files in the `C:\Program Files\SWSoft\vizcp\xsl\layout\` directory, which build up the body of the HTML page, to define the general VZCC/VZPP layout (the appearance and relative positions of the VZCC/VZPP menu, title bar, etc.). In its turn, the complete HTML page as such, i.e. beginning with its essential `<html><head>` elements and so on, is made up by the `basic.xsl` file located in this directory; so, you may modify this file to customize the VZCC/VZPP appearance.

Note: To edit the `.xsl` files in the `C:\Program Files\SWSoft\vizcp\xsl\layout\` directory, you should have sound knowledge of Extensible Stylesheet Language Transformations (XSLT).

After you have edited and saved any layout `.xsl` file, it is necessary to restart `vizcp` for the changes to take effect by issuing the following commands on the Hardware Node:

```
C:\Documents and Settings\Administrator>vizctl exec 1 sc stop vizcpd
...
Command 'exec' is successfully finished
C:\Documents and Settings\Administrator>vizctl exec 1 sc start vizcpd
...
Command 'exec' is successfully finished
```

Adding Skins to VZCC/VZPP

VZCC/VZPP skins are sets of parameters determining such VZCC/VZPP elements as the layout used (framed, non-framed, vzc-plesk, vzc-plesk, or plesk-integrated), the menu behavior (collapsing or static), as well as the icon and image files and CSS stylesheets used to form VZCC/VZPP pages. Multiple skins are available for VZCC/VZPP; you may also create and use your own skins. Any one of these skins may then be chosen on the **Configure Control Center** page of VZCC and the **Configure Power Panels** page of VZPP to be used in your browser.

In our example, we will define a new skin for VZCC. To this effect, you should perform the following operations:

- 1 In the Service VPS, open the `C:\Program Files\SWSOft\vcz\etc\skins.xml` file for editing by means of Notepad or any other XML editor.

- 2 Search for the following string in the file:

```
<mode id="vzc">
```

- 3 Copy an existing `<skin>` element inside the file (all the text between the `<skin>` opening tag and the `</skin>` closing tag including these tags themselves) to provide a basis for your own skin. Your new `<skin>` element should be placed between the `<mode id="vzc">` opening tag and the `</mode>` closing tag.

Note: While creating a new skin for VZPP, make sure your new `<skin>` element is placed between the `<mode id="vcz">` opening tag and the `</mode>` closing tag inside the `C:\Program Files\SWSOft\vcz\etc\skins.xml` file.

- 4 Edit this `<skin>` element in the following way:
 - Between the `<id>` and `</id>` tags, enter a name that will be used to refer to your new VZCC skin. You may specify any name you consider suitable for your skin.
 - Between the `<theme>` and `</theme>` tags, provide a new string corresponding to the name of a subdirectory in the `C:\Program Files\SWSOft\vcz\static\vcz\skins` directory housing all the necessary image and CSS files. There are a number of pre-installed subdirectories (aqua, ice, etc.) as is seen from the `<id>` elements of the existing skins. When using your own skin, you should make sure that you have created the corresponding subdirectory in the `C:\Program Files\SWSOft\vcz\static\vcz\skins` directory. This subdirectory should, in its turn, contain the `icons` and `images` subdirectories with all the necessary icon and image files, correspondingly, and a custom CSS file named `vcz.css` in its root. You should also make sure that all the icon and image files have names absolutely identical to those of any pre-installed skin and that your CSS file defines exactly the same styles as any pre-installed CSS file.
 - Between the `<name>` and `</name>` tags, provide a string that will be displayed when expanding the **Interface Skin** menu on the **Configure Control Center** page of VZCC.
 - Between the `<layout>` and `</layout>` tags, enter `framed`, `non-framed`, `vzc`, `vzc-plesk`, or `plesk-integrated`, depending on what kind of layout you wish to be associated with the current skin.

- Between the `<menu>` and `</menu>` tags, enter either `collapsing` or `static`, depending on whether you want the left menu groups to be able to collapse or not for the current skin.
- Between the `<buttons>` and `</buttons>` tags, enter either `images` or `text`, depending on whether you want the buttons on VZCC screens to be displayed as images found in the `C:\Program Files\SWSoft\vizcp\static\viz\skins\<skin_name>\images` directory or to be drawn by the browser.
- Optionally, add the `<background/>` element to enable beautiful backgrounds on VZCC pages.

5 Save the file.

Now you can choose the relevant skin for your browser by means of the **VZCC Configure Control Center** page.

Configuring VPS Offline Management

The offline management functionality allows you to manage a particular Virtual Private Server with the help of VZPP. When offline management is enabled for a VPS, this VPS is said to be subscribed to one or more offline services, which means that one or more ports of its IP address are permanently active whatever the VPS state. This is needed to ensure the VPS manageability in its down state.

The currently supported services are `vzpp` (for managing Virtual Private Servers by means of Virtuozzo Power Panels) and `plesk` (for managing Virtual Private Servers by means of the Plesk control panel integrated with Virtuozzo Power Panels). The names of the accessible services should be given as the value of the `OfflineServices` parameter in the `C:\vz\Conf\0.conf` file; the active ports of the services should be set as the value of the `vzpp` and `plesk` entries in the `HKLM\Software\SWSoft\Virtuozzo\Redirect` subkey of the Windows registry in the following format:

```
DESTINATION_VPSID:PORT
```

where

- `DESTINATION_VPSID` is the ID of the VPS where the requests coming to the specified port will be redirected (e.g. "1" for the Service VPS).
- `PORT` denotes the port that should be entered in the address line of an Internet browser after the VPS IP address when managing a VPS by means of Virtuozzo Power Panels or the Plesk control panel (e.g. "4643" for the `vzpp` service).

Note: During the Virtuozzo installation, the `Conf` folder is automatically created in the directory you specified for storing all VPS data. By default, the `C:\vz\` directory is used. However, you might have defined another path for the directory.

For example, specifying `vzpp` as the value of the `OfflineServices` parameter in the `C:\vz\Conf\0.conf` file and setting `1:4643` as the value of the `vzpp` entry in the `HKLM\Software\SWSoft\Virtuozzo\Redirect` subkey allows you to use VZPP for managing individual Virtual Private Servers and port 4643 for logging in to the VPS by means of VZPP.

By default, offline management is enabled for all Virtual Private Servers residing on the Node. To start using the offline management feature, inform the VPS administrator of the TCP port that is the value of the `vzpp` or `plesk` entries in the `HKLM\Software\SWSoft\Virtuozzo\Redirect` subkey. It will be enough to enter

```
https://<VPS_IP_address_or_hostname>:<TCP_port>
```

in the address line of any browser and to log in as Administrator with the appropriate password (you should have specified this password during the VPS creation) to start to remotely manage the corresponding Virtual Private Server. This way of logging in to a VPS is very handy for VPS administrators because they need to know only the IP address/hostname of their VPS and its Administrator credentials to be able to manage the VPS. No additional information (e.g. the Service VPS IP address) is required.

In case the Plesk control panel application is installed in a Virtual Private Server and this VPS is subscribed to the `plesk` service, the Plesk admin account can also be used by the VPS administrator for logging in to Virtuozzo Power Panels. The Plesk control panel is integrated with VZPP in such a way that the **Virtuozzo** menu item on the Plesk menu allows the VPS administrator to access the standard VZPP functionality, whereas all the other menu items on the Plesk menu ensure the standard Plesk functionality.

At any time, you can disable the offline management for the given VPS by setting the value of the `OfflineMgmt` parameter in the `C:\vz\Config\ file to 0. In its turn, setting the value of the vzpp or plesk offline services in the C:\vz\Config\0.conf file to 0 disables the offline management feature for all Virtual Private Servers residing on the Node.`

You can also disable the offline management for one or all VPSs on the Node by means of VZMC:

- To disable the offline management for the given VPS:
 - Select the **Virtual Private Servers** item under the Hardware Node name;
 - Right-click the name of the VPS on the VPS list and select **Properties** on the context menu;
 - Go to the **General** tab;
 - Clear the **Enable offline management** checkbox;
 - Press **OK**.
- To disable the offline management for all Virtual Private Servers residing on the Node at once:
 - Right-click the Hardware Node name and select **Tasks --> Manage Offline Services Configuration**;
 - In the **Offline Services Configuration** window, clear the **Enable Virtuozzo Power Panels and Control Center services** checkbox ;
 - Press **OK**.

Note: If the `OfflineMgmt` and `OfflineServices` parameters are not present in the `C:\vz\Config\ file, the offline management feature is enabled for all offline services enumerated in the C:\vz\Config\0.conf file provided the OfflineMgmt parameter in the latter file is set to "1".`

CHAPTER 10

Advanced Tasks

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Customizing VPS Desktop

A VPS administrator may wish to customize the VPS desktop to meet their demands. Generally, Virtuozzo allows VPS administrators to configure their VPS desktops in the same way as they would do it in any other Windows system installed on a stand-alone computer: place the most frequently used icons to the desktop, arrange these icons in the desired order, change the display settings (e.g. color scheme, font size), etc. However, there are some VPS desktop features that require the performance of additional steps in comparison with a standard Windows system or are implemented in Virtuozzo VPSs only.

These features include:

- Changing the VPS desktop background (i.e. desktop wallpapers) and
- Customizing the VPS ID string in the top right corner of the desktop.

To change the desktop wallpaper in a standard Windows system, one should right-click on a spare place on the desktop, select **Properties** on the context menu, and, in the displayed window, go to the **Desktop** tab and choose the right wallpaper. However, to allow VPS administrators to change the desktop background inside their Virtual Private Servers in Virtuozzo-based systems, you should first restart the Hardware Node in case you have never done so after the Virtuozzo installation.

Each Virtual Private Server on the Node has a string displayed in the top right corner of the desktop and identifying the ID of the VPS you are currently logged in to (e.g. VPS 133). Virtuozzo enables you to customize this string in the following way:

- change the string color;
- change the string font;
- change the font size of the string;
- change the string transparency;
- change the font weight;
- remove the string from the VPS desktop.

Note: If you just wish to remove the VPS ID string from being displayed on the VPS desktop, you can resort to the help of VZMC where you should right-click the corresponding VPS, select **Properties** on the context menu, go to the **General** tab, clear the **Show VPS ID at desktop background** checkbox, and click **OK**. Next time you log in to your VPS via RDP, the VPS ID string will be absent from your desktop.

To customize the VPS ID string, you should perform the following operations:

- 1 On the Hardware Node, select **Start --> Run** and execute the `regedit` command to open the **Registry Editor** window.
- 2 In the left part of the displayed window, navigate to the `HKEY_LOCAL_MACHINE\Software\SWSoft\Virtuozzo` key.
- 3 Create a new subkey by right-clicking the `HKEY_LOCAL_MACHINE\Software\SWSoft\Virtuozzo` key, selecting **New --> Key** on the context menu, and entering `DisplayVPSID` as the subkey name where `ID` denotes the ID of the VPS whose string you wish to customize (e.g. `DisplayVPS133`).

- 4 Navigate to the created subkey (i.e. `DisplayVPSID`) and, in the right pane of the **Registry Editor** window, create one or several entries (depending on how many string properties you wish to configure) that will define the VPS ID string appearance. For example, you can create the `bItalic` entry and specify 0 as its value to apply italic formatting to the VPS ID string or add the `bDisabled` entry and set 1 as its value to completely remove the string from the VPS desktop. A list of all possible entries is presented in the table below.
- 5 Log off from the VPS and log in to it anew for the new string settings to take effect.

The following entries can be created in the `DisplayVPSID` subkey to customize the VPS ID string:

Entry Name	Data Type	Description	Default Value
RGB	REG_DWORD	The string color in the RGB format (i.e. in the form of 0xRRGGBB).	0x00e000
FontName	REG_SZ	The font used to display the string. The name of the font should not exceed 31 characters. Otherwise, the default font will be used.	Arial
Size	REG_DWORD	The font size for the string. The font size is specified in the logical items and should lie in the range from 0 to 255.	25
Transparency	REG_DWORD	The string transparency. The values for this parameter can range from 0 to 255. 0 denotes the full transparency of the string, 255 - the full non-transparency of the string.	128
Weight	REG_DWORD	The font style (thin, regular, or bold) used to display the string. The values for this parameter can range from 0 to 900. 400 denotes the regular font style, 900 - the bold font style.	700
bItalic	REG_DWORD	0 specified as the value of this parameter indicates that the string should be italicized.	0
bDisabled	REG_DWORD	Enable/disable the string to be displayed on the VPS desktop. Specifying 0 as the value of the entry or omitting the entry indicates that the string should be displayed on the VPS desktop. Setting any other value will remove the string from the VPS desktop.	0

Managing External Drives and Image Files for VPS

The given section provides information on how you can add new virtual drives to your Virtual Private Servers and configure them to meet your demands. Besides, it explains you the way to mount available drives and image files located on the Hardware Node to drives and files inside a VPS to make them accessible from within the VPS.

Managing VPS Virtual Disks

Virtuozzo enables you to perform the following operations on VPS virtual disk drives:

- Add additional disk drives to your Virtual Private Servers;
- Increase/decrease the current size of the disk drive and modify its measurement units;
- Remove an existing disk drive from your Virtual Private Server.

All these operations are described below in detail.

Adding New Disk Drive to VPS

In Virtuozzo-based systems, any Virtual Private Server is created with only one disk storage inside it - the C:\ disk drive. However, Virtuozzo allows you to add new virtual disk drives to any VPS residing on your Hardware Node. After a new disk drive has been successfully added to a VPS, it becomes visible:

- On the Hardware Node:
 - As a file in the .efd format in the X:\vz\private\VPS_ID folder and
 - As a folder in the X:\vz\root\VPS_ID\ directory.
- From inside the Virtual Private Server: log in to the VPS via RDP and launch Windows Explorer. Your new drive will be displayed among other local disk drives available inside your VPS.

You can then use the newly created virtual disk drive in the same way as you would use it on a stand-alone computer: format it, create new files and folders within the drive, etc.

To add a new virtual disk drive to a VPS, you should perform the following operations:

- 1 In VZMC, expand the corresponding Hardware Node name and select the **Virtual Private Servers** item to display a list of VPSs currently existing on the Node.
- 2 Right-click the VPS you wish to add a new virtual drive to and choose **Tasks --> Manage Mounts** on the context menu.

Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **Actions** section of the VZMC view pane.

- 3 In the opened window, click on the **Add** button to display the **Mount Point** window:

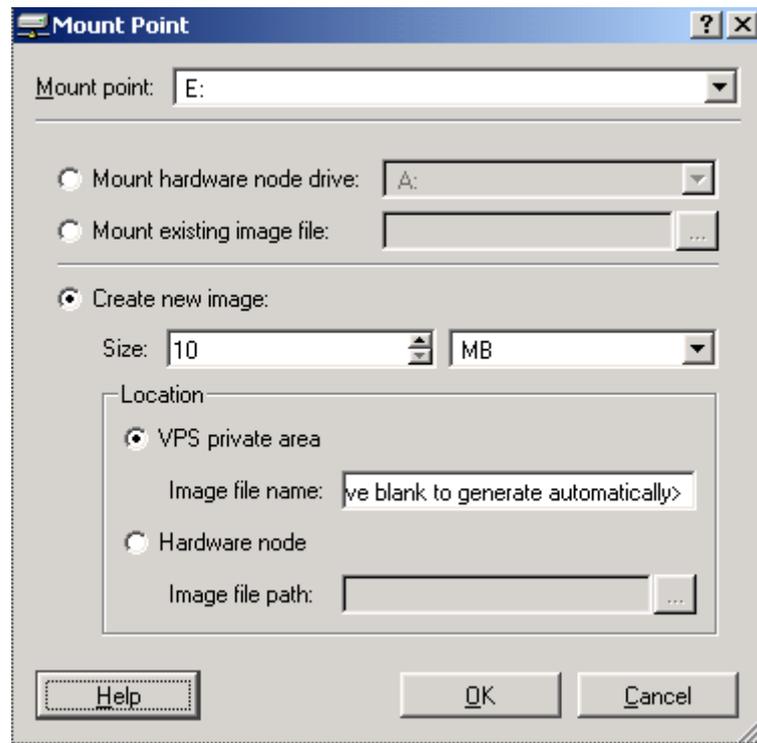


Figure 79: VZMC - Adding New Drive to VPS

In this window, you should do the following:

- In the **Mount point** list, click the drop-down arrow and select a drive letter under which the created disk drive will be accessible inside the Virtual Private Server. The specified letter will be also displayed as the name of the folder in the `X:\vz\root\VPS_ID\` directory on the Node.
 - Select the **Create new image** radio button to make the options below active:
 - In the **Size** field, specify the size for your new disk drive either by using the spin button or by entering the needed value manually. You can also change the units in which the drive size will be measured by selecting **GB** (gigabytes) instead of **MB** (megabytes) on the drop-down menu. By default, you are offered to create a 10 Mb disk drive.
 - Under the **Location** subgroup, choose one of the following options to specify where on the Node the file corresponding to the created drive and having the `.efd` extension will be located:
 - a** Select the **VPS private area** radio button to create and locate the file in the private area of the corresponding VPS (i.e. in the `X:\vz\private\VPS_ID` folder on the Node). You can also specify the name of the file in the **Image file name** field. If you leave this field blank, the file name will be automatically generated by VZMC in the form of `lpbkVPS_Number.efd` where `VPS_Number` denotes the index number of the disk drive automatically created inside the VPS (i.e. `lpbk0000.efd` for the first disk drive, `lpbk0001.efd` for the disk second drive, etc.).
 - b** Select the **Hardware node** radio button to create and locate the file in a place other than the VPS private area. In this case you should specify the full path to the file on the Hardware Node (e.g. `C:\MyFolder\MyFile.efd`).
- 4 Click **OK**.

In the command line, you can add a new virtual disk drive to your Virtual Private Server with the `vzctl partadd` command. Detailed information on this command is provided in the Reference chapter.

Configuring VPS Disk Drive

After a new disk drive has been created and added to your Virtual Private Server, you can start using it as a usual hard disk storage on a stand-alone computer. However, in certain situations you may wish to modify a particular disk parameter to meet your demands. For example, if you may need more disk space in a Virtual Private Server but do not want to add another disk drive to it, you can instead change the maximum size of the VPS disk.

The current version of Virtuozzo allows you to configure your VPS virtual disk drive as follows:

- Increase/decrease the current size of the disk drive;
- Change the units in which the VPS virtual disk is measured.

Note: The aforementioned operations can be performed on any VPS virtual disk drive except for the `C:\` drive. Detailed information on how you can manage your `C:\` drive is provided in the [Managing VPS Disk Space](#) section (on page 93).

To change the virtual drive size and/or its measurement units, you should perform the following operations:

- 1 In VZMC, expand the corresponding Hardware Node name and select the **Virtual Private Servers** item to display a list of VPSs currently existing on the Node.
- 2 Right-click the VPS whose disk drive you wish to configure and choose **Tasks --> Manage Mounts** on the context menu.

Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **Actions** section of the VZMC view pane.

- 3 In the opened window, click on the **Resize** button to display the **Mount Point** window:

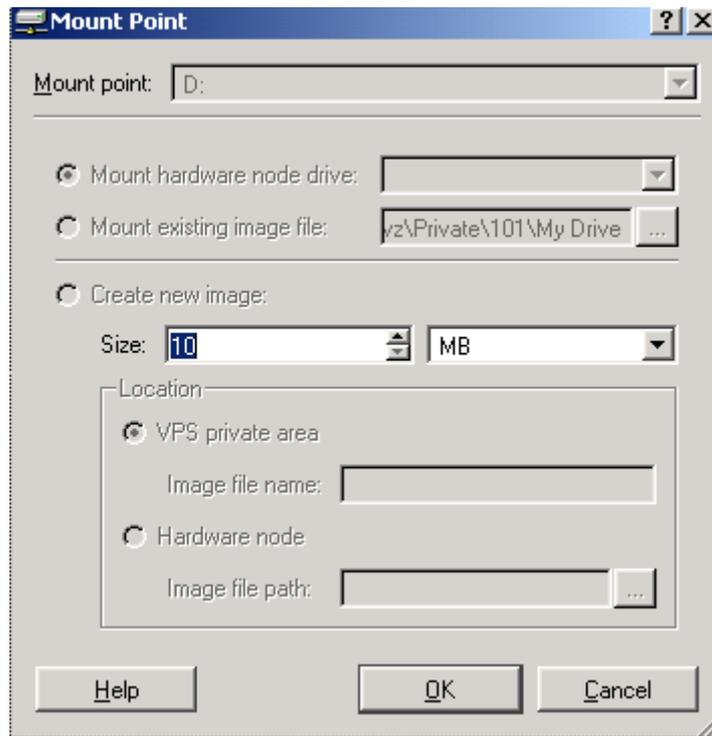


Figure 80: VZMC - Configuring VPS Drive

This is the same window as is used to create new disk drives and add them to your Virtual Private Server. However, all the options available on this screen are inactive except for the **Size** field where you can modify:

- The drive size: use the spin button or type the needed value by hand to change the current size value. While changing the disk drive size, please note that it should not be less than the size of files and folders located on this drive; otherwise, the drive resizing will fail.
 - The units in which the drive size is to be measured: select **MB** (stands for megabytes) or **GB** (stands for gigabytes) on the drop-down menu.
- 4 When you are ready with specifying new values for your virtual drive, click **OK**.

You can also use the `vzctl set` command to change the current size of a VPS disk drive. Detailed information on this command can be found in the **Reference** chapter.

Removing Disk Drive From VPS

You can remove any existing disk drive from your Virtual Private Server except for the `C:\` drive. To remove a virtual disk drive, you should perform the following operations:

- 1 In VZMC, click the **Virtual Private Servers** item under the corresponding **Hardware Node** name to display a list of all Virtual Private Servers residing on the Node.
- 2 Right-click the VPS from where you wish to remove a disk drive and select **Tasks --> Manage Mounts** on the context menu. Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **Actions** section of the VZMC view pane.

The Mount Points Manager window will be displayed where you can see all the drives currently available inside your VPS:

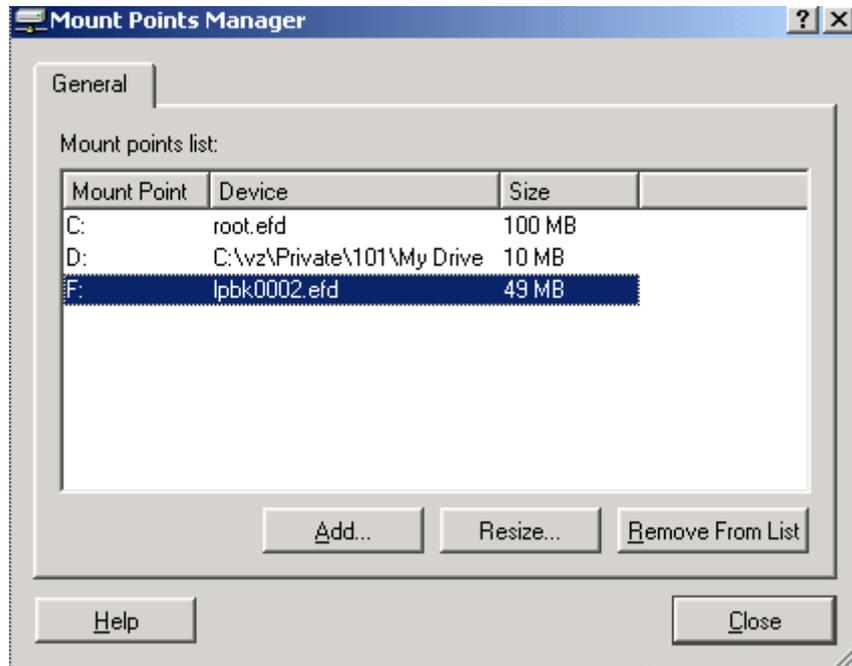


Figure 81: VZMC - Removing Drive From VPS

- 3 Select the disk drive you wish to remove from your VPS and click on the Remove From List button.
- 4 In the Delete Drive window displayed after you click on the Remove From List button, you can do one of the following:
 - Click Yes without selecting the Delete image file ... checkbox. In this case the disk drive will become inaccessible from within the Virtual Private Server (i.e. invisible in Windows Explorer) and the corresponding folder will be deleted from the `X:\vz\root\VPS_ID\` directory on the Hardware Node. However, the file in the `.efd` format in the `X:\vz\private\VPS_ID` folder on the Node conforming to the removed disk drive will remain intact.
 - Select the Delete image file ... checkbox and click Yes. In addition to the operations performed in the previous case, this will also remove the corresponding file in the `.efd` from the `X:\vz\private\VPS_ID` folder on the Hardware Node.

Note: While deciding on your virtual disk drive removal, please keep in mind that all folders and files located on the drive will be deleted from the VPS without affording you an opportunity to restore them.

In the command line, you should use the `vzctl partdel` command to remove an existing disk drive from your VPS. Detailed information on this command is provided in the Reference chapter.

Managing Hardware Node Drives

In some circumstances, you may need to give your Virtual Private Server direct access to a drive on your Hardware Node. Virtuozzo allows you to mount a drive on the Node to a drive inside your VPS, thus, granting you access to this drive from inside the VPS. After mounting the drive, you can log in to the VPS via RDP and work with the mounted drive in the same way as you would do it on the Hardware Node.

Virtually any drive available on the Node can be mounted to a VPS, e.g.:

- a physical hard drive;
- a DVD-ROM drive;
- a CD-ROM drive;
- a floppy disk, etc.

To mount a Hardware Node drive to a VPS, you should perform the following operations:

- 1 In VZMC, click the **Virtual Private Servers** item under the corresponding Hardware Node name to display a list of all Virtual Private Servers residing on the Node.
- 2 Right-click the VPS where you wish to mount a drive from the Hardware Node and select **Tasks --> Manage Mounts** on the context menu.

Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **Actions** section of the VZMC view pane.

- 3 In the opened window, click on the **Add** button to display the **Mount Point** window:

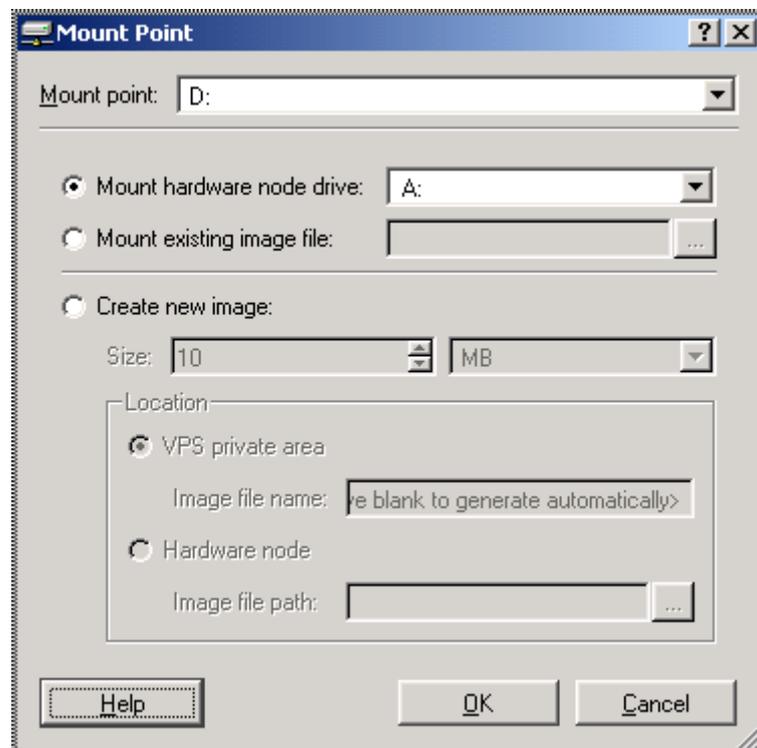


Figure 82: VZMC - Mounting Hardware Node Drive

In this window, you should do the following:

- In the **Mount point** list, click the drop-down arrow and select a letter under which the mounted drive will be accessible inside the Virtual Private Server.
- Check the **Mount hardware node drive** radio button and, on the drop-down menu, select a letter assigned to the drive on the Node that you wish to mount to the VPS.

Note: The permissions of the drive mounted to a VPS correspond to those of this drive on the Hardware Node, i.e. you are able to perform the same operations on the drive inside the VPS as you are allowed on the Node.

At any time, you can unmount the mounted drive from your Virtual Private Server. To this effect, do the following:

- 1 In VZMC, click the **Virtual Private Servers** item under the corresponding Hardware Node name to display a list of all Virtual Private Servers residing on the Node.
- 2 Right-click the VPS from where the drive is to be unmounted and select **Tasks --> Manage Mounts** on the context menu.

Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **Actions** section of the VZMC view pane.

- 3 In the **Mount Points Manager** window, you can see all the drives currently available inside the VPS:

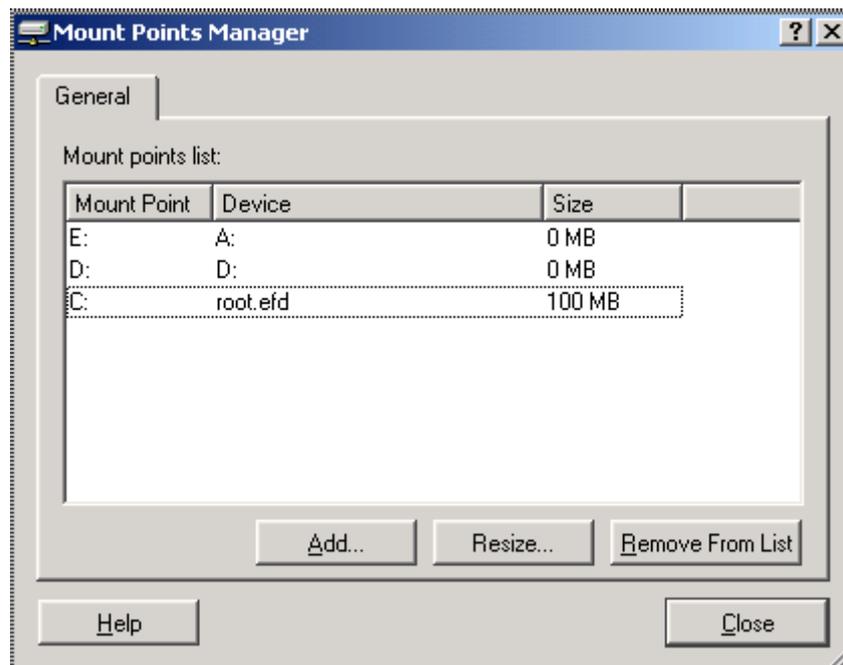


Figure 83: VZMC - Removing Hardware Node Drive

Select the drive you wish to unmount from your VPS and click on the **Remove From List** button.

- 4 In the opened window, click **Yes** to confirm your decision.

In the command line, you can use the `vzctl mounttext` and `vzctl umounttext` commands to mount/unmount your Hardware Node drives to drives inside a VPS. Detailed information on this command is provided in the **Reference** chapter.

Managing Image Files

Another possibility to use external files located on the Hardware Node from inside a VPS is to mount an image file located on the Node to a drive letter inside the VPS. Image files can be located anywhere on the Hardware Node (on your hard disk, CD-ROM drive, floppy drive, etc.) and should have either the `.efd` or `.iso` extensions.

To mount a Hardware Node image file to a drive letter inside your VPS, you should perform the following operations:

- 1 In VZMC, click the **Virtual Private Servers** item under the corresponding Hardware Node name to display a list of all Virtual Private Servers residing on the Node.
- 2 Right-click the VPS where you wish to mount an image file from the Hardware Node and select **Tasks --> Manage Mounts** on the context menu.

Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **Actions** section of the VZMC view pane.

- 3 In the opened window, click on the **Add** button to display the **Mount Point** window:

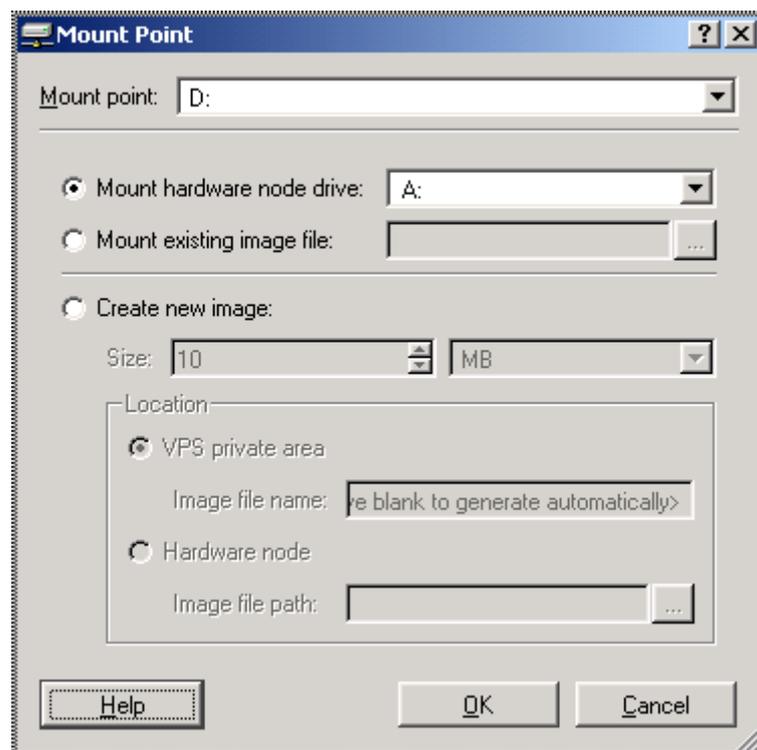


Figure 84: VZMC - Mounting Hardware Node Drive

In this window, you should do the following:

- In the **Mount point** list, click the drop-down arrow and select a letter under which the mounted image file will be accessible inside the Virtual Private Server.
- Check the **Mount existing image file** radio button and do one of the following:
 - a Type the full path to the image file on the Node by hand or
 - b Use the **...** button to specify the path to the image file.

Note: The permissions of the image file mounted to a VPS correspond to those of this image file on the Hardware Node, i.e. you are able to perform the same operations on the file inside the VPS as you are allowed on the Node.

At any time, you can unmount the mounted image from your Virtual Private Server. To this effect, do the following:

- 1** In VZMC, click the **Virtual Private Servers** item under the corresponding Hardware Node name to display a list of all Virtual Private Servers residing on the Node.
- 2** Right-click the VPS from where your image is to be unmounted and select **Tasks --> Manage Mounts** on the context menu.

Alternatively, you can open the Virtual Private Server Manager window for the given VPS and click on the **Manage Mounts** link in the **ACTIONS** section of the VZMC view pane.

- 3** In the **Mount Points Manager** window, select the image you wish to unmount from your VPS and click on the **Remove From List** button.
- 4** In the displayed window, click **Yes** to confirm your decision.

Changing VPS Network Adapter

In case there are several network interface cards (or network interface adapters) installed on the Hardware Node, Virtuozzo allows you to specify the preferred network adapter for a Virtual Private Server. Specifying the preferred adapter for a VPS means that this network adapter will be used to connect the VPS to the network and, therefore, to handle the whole network traffic for this VPS.

Please see the following picture:

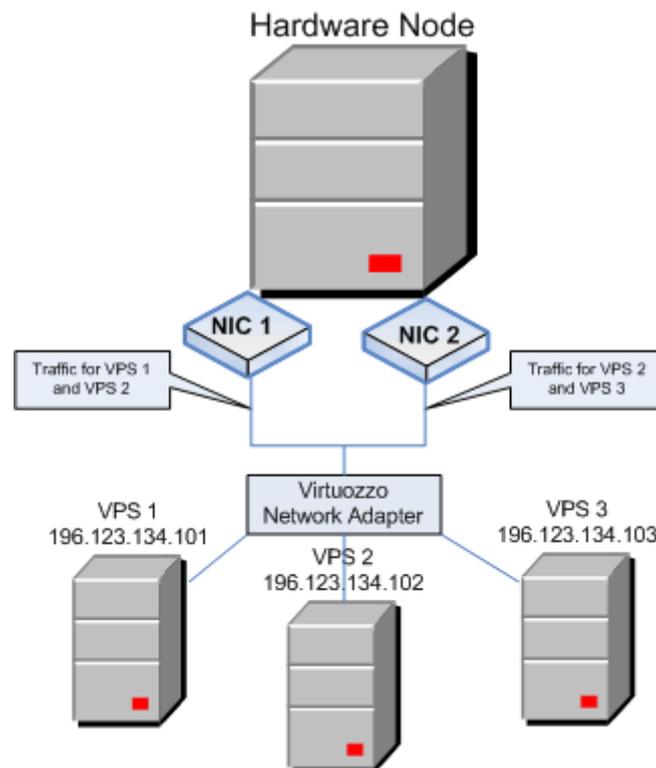


Figure 85: Hardware Node With Several Adapters

The picture presumes that the Hardware Node has two network interface cards (depicted as *NIC 1* and *NIC 2*) installed. The network adapters are playing the following roles:

- *NIC 1* controls all the network flows of VPS 1;
- *NIC 2* controls all the network flows of VPS 3, and
- both network adapters *NIC 1* and *NIC 2* handle network traffic for VPS 2.

All three of the VPSs use the *Virtuozzo Network Adapter* to exchange the traffic among themselves and to receive data to/from other networks. However, in the latter case all IP packets from/to the Virtual Private Servers come first to the *Virtuozzo Network Adapter* and are then redirected to different network interface cards on the Hardware Node through which the VPSs communicate with the outer world: VPS 1 through *NIC 1*, VPS 3 through *NIC 2*, and VPS 2 through both *NIC 1* and *NIC 2*. This may have the following consequences:

- Although all the VPSs can easily communicate with each other by using the *Virtuozzo Network Adapter*, VPS 1 may have no access to the computers on other networks that can be accessed by VPS 3, and vice versa. This is caused by the fact that *NIC 1* and *NIC 2* (used to control network flows of VPS 1 and VPS 3, respectively) may be connected to different networks and, therefore, provide access for VPS 1 and VPS 3 to different networks.
- VPS 2 have access to all the computers on other networks that can be accessed by both VPS 1 and VPS 3. This is explained by the fact that VPS 2 use both network adapters (*NIC 1* and *NIC 2*) to communicate with the outer world.

Every network interface card installed on the Hardware Node is identified by its unique Media Access Control (MAC) address assigned to it. So, to set a preferred adapter for a particular Virtual Private Server on the Node, you should associate the adapter MAC address with this VPS. To this effect, you should perform the following operations in VZMC:

Note: After the Virtuozzo installation, all active adapters on the Hardware Node are used to control network traffic for all VPSs residing on the Node.

- 1 Click the **Virtual Private Servers** item under the corresponding Hardware Node name in the VZMC left pane.
- 2 Right-click the Virtual Private Server to which you wish to assign another network adapter and select **Properties** on the context menu.

- 3 In the displayed window, go to the Network tab:

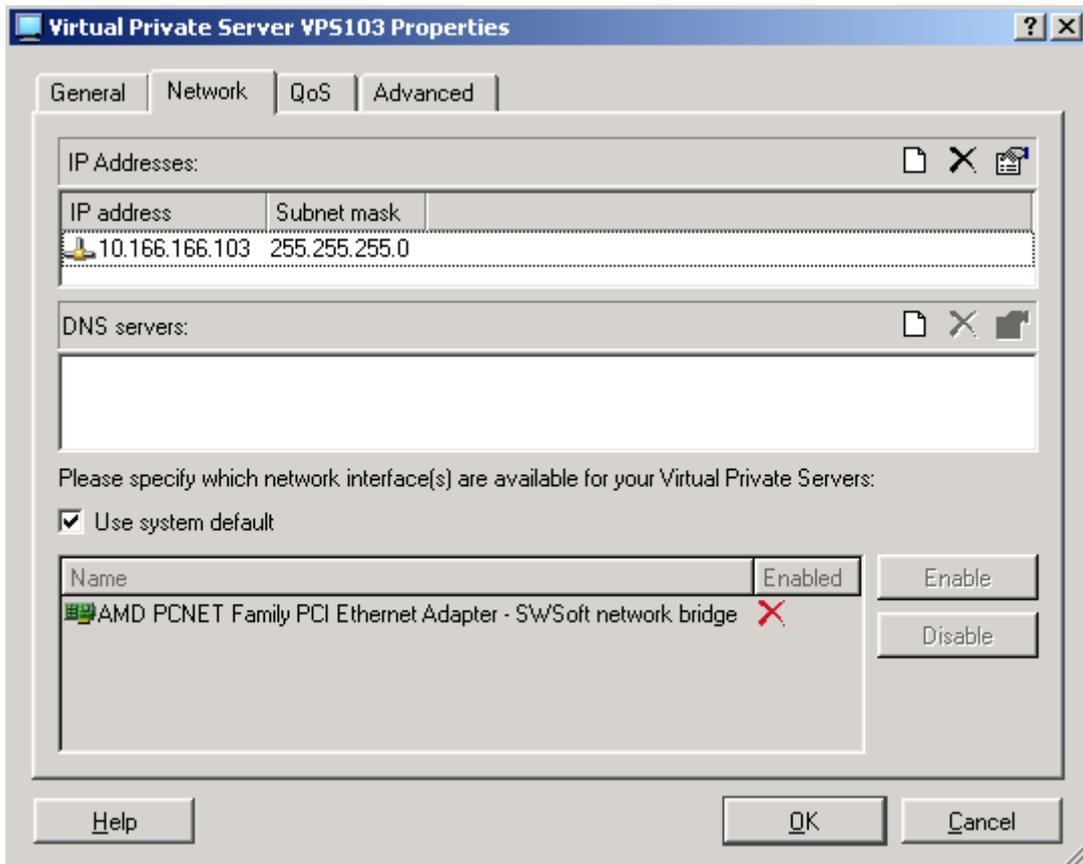


Figure 86: VZMC - Changing Network Adapter for VPS

All network adapters currently available on the Hardware Node are listed in the table at the bottom of the displayed window. By default, all network adapters available on the Node and listed in the table are used to control network flows of the given VPS.

- 4 Clear the **Use system default** checkbox, select the adapter(s) you do not wish to use for the VPS, and click on the **Disable** button.

Note: If you disable all the network adapters for the Virtual Private Server, the network adapters of VPS 0 (i.e. of the Node itself) will be used to control network flows for the corresponding VPS. If there is no adapter set for VPS 0, then all the adapters currently active on the Node will handle the VPS network traffic.

- 5 Click **OK**.

You may also wish to set one or several network adapters for all Virtual Private Servers residing on your Node at once. To this effect, do the following:

- 1 Right-click the **Virtual Private Servers** item under the corresponding Hardware Node name in the VZMC left pane and select **Tasks --> Set Default Net Interfaces** on the context menu. The displayed window allows you to view all network adapters currently available on the Node.
- 2 Select one or more network adapters to be used for handling the network traffic for all Virtual Private Servers residing on your Hardware Node by selecting the checkboxes in front of the corresponding adapters.
- 3 Click **OK**.

In the command line, you can use the `vzctl set` command and pass the `--preferred_adapter` parameters to it to set one or several network interface adapters for the given VPS. Detailed information on the `vzctl set` command and all its options is provided in the [Reference](#) chapter.

Configuring VZAgent

VZAgent is the managing protocol and server-side software for Virtuozzo. Basically, it is supposed to be the Hardware Node control interface and should be used for tuning, monitoring, and managing the Hardware Node itself and all the VPSs residing on it. VZAgent was created in order to unify the way the client software accesses the Hardware Node, to provide an easy and standard means of using Virtuozzo services, and to limit the impact on HN resources caused by an excessive number of clients connecting to it and using it at one and the same time, while allowing them to share the collected information instead of repeatedly fetching it.

VZAgent provides a great number of different services. Among them are the following:

- VPS management: VPS creation, starting, stopping, migrating, cloning, moving, mounting, unmounting, getting information on current VPS statistics and resource usage.
- Hardware Node management: fetching lists of existing VPSs, Virtuozzo logs, Hardware Node characteristics such as disk, network, and other system information, editing sample and global Virtuozzo configuration files, etc.

Note: Detailed information on all VZAgent functionality is provided in the *VZAgent Developer's Guide* shipped with Virtuozzo.

VZMC allows you to adjust VZAgent configuration by changing some of its keys, subkeys, and parameters in the following way:

- Loading the configuration from a local file that you might have previously saved;
- Saving the current configuration to a local file;
- Reloading the VZAgent configuration from the Service VPS to VZMC;
- Adding a key with a specified name to the same level as the currently selected key;
- Adding a subkey with a specified name under the key currently selected;
- Adding a parameter with a specified name and value to the subkey currently selected;
- Modifying the name of the selected subkey or the name and the value of the selected parameter;
- Deleting the selected key/parameter;
- Cutting the selected key/parameter to the clipboard;
- Copying the selected key/parameter to the clipboard;
- Pasting the selected key/parameter from the clipboard to the key currently selected;
- Creating a copy of the selected key/parameter on the same level;
- Expanding all the configuration keys/subkeys;
- Collapsing all the configuration keys/subkeys.

To perform these operations, right-click the corresponding Hardware Node and select **Tasks -> Manage VZAgent Configuration** on the context menu (all operations listed above correspond to the icons on the toolbar from left to right). After you have made corrections, click the **Apply** button for the changes to take effect with VZAgent.

To get more information on what key, subkey, or parameter to change to achieve this or that goal and how to change them, please consult the **Appendix B Configuration** chapter of the *VZAgent Developer's Guide* where each option is described in detail.

Viewing Global Virtuozzo Parameters

VZMC allows you to view and configure various settings configured for the Virtuozzo system on your Hardware Node. Below is the description of all the parameters defined in this version of Virtuozzo:

Parameters	Description
<code>actionlogdir</code>	This is the directory where Virtuozzo keeps a log of its actions.
<code>controlpanel_port</code>	This port must be entered in the address line of an Internet browser after the VPS IP address when managing the VPS by means of Virtuozzo Power Panels or Virtuozzo Control Center.
<code>install</code>	This is the directory where Virtuozzo files are installed.
<code>offline_management</code>	Specifies whether the VPS can be directly managed by its root from any browser at its own IP address.
<code>template</code>	This is the directory where all Virtuozzo templates installed on the Hardware Node are located.
<code>ve_private</code>	This is a path to the VPS private area, where VZFS keeps its private data.
<code>ve_root</code>	This is a path to the VPS root directory where the VPS private area is located.
<code>vz_root</code>	This is a path to the directory where all the data used by Virtual Private Servers are stored: private areas, installed templates, patches, logs, etc.

To view any of the aforementioned parameters in VZMC, select the **Configuration** item in the VZMC left pane and double-click the corresponding parameter in the right pane:

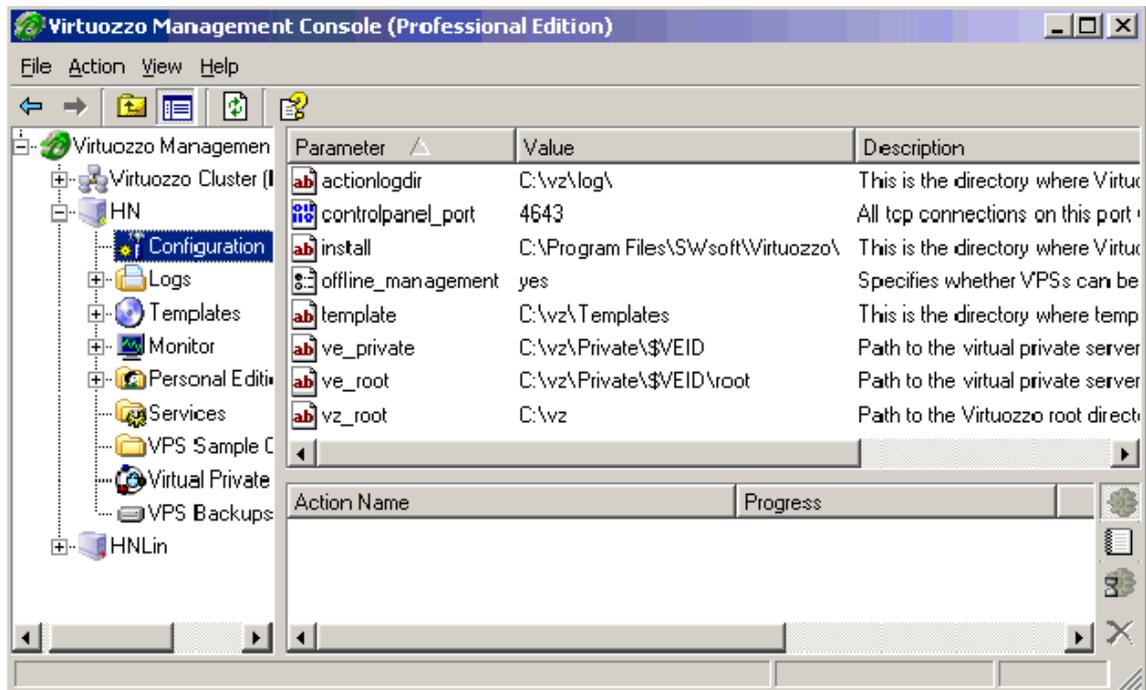


Figure 87: VZMC - Viewing Global Virtuozzo Parameters

CHAPTER 11

Troubleshooting

This chapter provides the information about those problems that may occur during your work with Virtuozzo and suggests the ways to solve them, including getting technical support from SWsoft.

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General Considerations

The general issues to take into consideration when troubleshooting your Virtuozzo system are listed below. You should read them carefully before trying to solve more specific problems.

- Make sure a valid license is always loaded on the Hardware Node. If your license has expired and the grace period is over, all the VPSs on your Node (except the Service VPS) will be stopped!
- Check that the directory where the Windows Server 2003 OS is installed is `C:\WINDOWS`. Otherwise, you might have problems with running Virtuozzo on your computer.
- If a Hardware Node is experiencing slow performance, you can launch Virtuozzo Management Console and select the **Services and Monitor --> Processes** items in the VZMC main window to find out what process or service might affect your system performance. In case of discovering any, you can terminate the problem process/service. Anyway, try to investigate what reason may have brought about the problem before resorting to the last means - rebooting the Node.
- Please do not install and run Microsoft Terminal Server inside Virtual Private Servers. You are able to open terminal sessions with VPSs thanks to the MS Terminal Server installed on the Host OS. Terminal Server installed inside a VPS is completely irrelevant and may interfere with normal VPS operation. By default, you are allowed to have only 2 (two) RDP/MS TSC sessions per Hardware Node opened at the same time. If you wish to be able to open more RDP/MS TSC sessions at once, you should install additional TSAL (Terminal Service Access License) licenses on the Hardware Node.
- Run Virtuozzo Updater at regular intervals (at least once a week). Along with the Virtuozzo updates, this will allow you to automatically download and install the latest Windows Server 2003 updates on your Hardware Node. Please do not try to update the Windows Server 2003 OS manually. It may cause Virtuozzo to malfunction.

Problems With VPS Management

This section includes recommendations on how to settle some problems with your VPSs.

Failure to Start VPS

An attempt to start a Virtual Private Server fails.

Solution 1

Make sure you have assigned at least one IP address to the VPS. If you have not, please do it. To assign an IP address in VZMC, select the **Virtual Private Servers** item in the VZMC left pane, right-click the problem VPS in the right pane, and choose **Properties** on the context menu. On the **Network** tab of the displayed window, click the **Add IP Address** button and specify a valid IP address. You can also use the `vzctl set --ipadd` command to add a new IP address to the VPS.

Solution 2

Check if the IP address assigned to the problem VPS is not already in use. You can view all IP addresses of the existing Virtual Private Servers by selecting the **Virtual Private Servers** item in the VZMC left pane and examining the **IP address** column in the right pane or by issuing the `vzlist -a` command in the command line. If the IP address of the problem VPS coincides with that of another VPS, please remove it and specify a new valid IP address, as is shown above.

Failure to Access VPS From Network

Solution 1

The IP address assigned to this Virtual Private Server might be already in use in your network. Make sure it is not. Otherwise, please replace the existing IP address with another one, as is described in the previous subsection.

Solution 2

Make sure the routing to the Virtual Private Server is properly configured. Virtual Private Servers can use the default router for your network, or you may configure the Hardware Node as router for its VPSs.

Failure to Log In to VPS

The Virtual Private Server starts successfully, but you cannot log in.

Solution 1

You are trying to connect via RDP or MS TSC, but access is denied. Probably you have not set the password of the Administrator user yet. Detailed information on how to set the Administrative password is provided in the **Setting Administrator Password** section (on page 69).

Solution 2

While connecting to the VPS via RDP or MS TSC, you have got the following message: The terminal server has exceeded the maximum amount of allowed connections. Make sure you have no more than 2 (two) RDP/MS TSC sessions per Hardware Node opened at the same time. If it is the case, you should close one of your opened sessions or install additional TSAL (Terminal Service Access License) licenses on the Hardware Node to be able to connect to the VPS.

Solution 3

You are trying to connect to the VPS by means of VZCC/VZPP, but the corresponding page cannot be displayed by your browser. Make sure the offline management is enabled for the given VPS. To this effect, select the **Virtual Private Servers** item in the VZMC left pane, right-click the problem VPS in the right pane, and choose **Properties** on the context menu. On the **General** tab of the displayed window, ascertain that the **Enable offline management** checkbox is selected. If it is not, select it and press **OK**.

Failure to Manage VPSs in PAE-disabled System

You created a multitude of Virtual Private Servers on the Hardware Node. However, after a while, they became non-operational. For example, you cannot execute the `vzctl enter VPS_ID` command (where `VPS_ID` denotes the VPS the command refers to), run any application inside your VPS, or may get error messages with code 128 returned (an unspecified error) when performing VPS-related operations.

The problem might be caused by the fact that your VPSs and their applications have reached the 4-gigabyte paging file limit. By default, Hardware Nodes running the 32-bit editions of Windows Server 2003, Standard or Enterprise Edition, support only 32-bit memory addressing and thus set the limit on paging files to 4 GB. When the 4-gigabyte limit is reached, which is most likely the case when running tens of VPSs or performance-intensive applications in them, you may start experiencing performance problems or even get your VPSs in a non-operational state.

Note: This problem does not concern PAE(Physical Addressing Extensions)-enabled operating systems allowing paging files up to several terabytes. PAE is automatically enabled when you have more than 4 GB of physical memory installed on your system, or you can enable PAE manually as is described below in **Solution 2**.

To be sure the problem is caused by reaching the paging file limit, you can check the size of the `pagefile.sys` file located in the `C:\` directory on your Node. By default, the `pagefile.sys` file is hidden. To view this file, do the following:

- 1 Click on the **Tools** menu in any folder window and select **Folder Options** on the drop-down menu.
- 2 On the **View** tab of the displayed window, under **Advanced settings**, clear the **Hide protected operating system files** checkbox.
- 3 Click **OK**.

Alternatively, you can open Windows Task Manager, click on the **Performance** tab, and view the paging file size in the **PF Usage** window.

Note: The size shown in the **PF Usage** window may not correspond to the size of the `pagefile.sys` file because the former contains information on both the paging file itself and the paged memory (the memory that can be moved to your hard drive) in RAM, whereas the latter displays the size of the paging file only.

If your computer is running near the maximum of the paging file limit, i.e. coming very close to 4 GB, you can take the following measures:

Solution 1

If your Hardware Node has several drives, you can create a paging file for every drive on the Node. You can also create several paging files on a single drive by placing them in separate folders. In the example below, we show you how to create multiple paging files in case your Node has only one drive:

- 1 On the drive, create as many folders as the number of paging files you wish to be created (e.g. `C:\Pagefile1`, `C:\Pagefile2`).

- 2 Select **Start --> Run** and execute the `regedit` command to open Registry Editor.
- 3 Locate the
`HKEY_LOCAL_MACHINE\System\CurrentControlSet\Control\SessionMa
nager\MemoryManagement` key.
- 4 In the right pane of the **Registry Editor** window, double-click the `PagingFiles` value to open it for editing.
- 5 Remove any existing value and add the following values:
 - `C:\pagefile1\pagefile.sys 3000 4000`
 - `C:\pagefile2\pagefile.sys 3000 4000`

where 3000 and 4000 denote the initial size of the extra paging files and their maximum size, respectively. The size is measured in megabytes.
- 6 Click **OK**.
- 7 Restart your Node for the changes to take effect.

Solution 2

Enable Physical Addressing Extensions (PAE) allowing your Host OS and applications access to the additional physical memory (up to several terabytes). To this effect, you should perform the following operations:

- 1 Select **Start --> Run**.
- 2 Type `X:\boot.ini` where *X* is the drive letter where your boot files are located.
- 3 Modify the line that corresponds to your Host OS by appending the `/PAE` switch to it.
- 4 Save the file and then restart the computer.

Solution 3

Find out what process or service might affect your system performance, i.e. consumes a large amount of memory (for example, by selecting the **Services and Monitor --> Processes** items in the VZMC main window). In case of discovering any, you can terminate (or kill) the problem process/service by sending the corresponding signal to it. This will free memory for other processes running in your system.

Failure to Run Sound Files in VPS

You have successfully connected to a Virtual Private Server thru RDP. However, you cannot play any sound file inside this VPS.

Solution

To be able to run sound files in a VPS, you should perform the following operations:

Note: If you have any open RDP session, please close it before completing the tasks below.

- 1 On the Hardware Node, choose **Programs --> Administrative Tools --> Terminal Services Configuration** on the Windows Start menu.

- 2 In the Terminal Services Configuration window, double-click the RDP-Tcp connection in the right part of the screen.
- 3 On the Client Settings tab of the RDP-Tcp Properties window, clear the Audio mapping checkbox.
- 4 Press the Apply button.
- 5 Now start the Remote Desktop Connection client by choosing Programs --> Accessories --> Communications --> Remote Desktop Connection on the Windows Start menu or by selecting Start --> Run and executing the `mstsc` command.
- 6 Click on the Options button to expand the Remote Desktop Connection window.
- 7 On the Local Resources tab under the Remote computer sound group, select the Bring to this computer option on the drop-down menu.
- 8 On the General tab of the Remote Desktop Connection window, specify the IP address of the Virtual Private Server you wish to connect to and press the Connect button.

Failure to See Mounted Drives Inside VPS

You have mounted a drive from the Hardware Node to a directory inside your Virtual Private Server. However, the mounted drive is not displayed among other drives in My Computer.

Solution 1

Inside your VPS, open My Computer by double-clicking the My Computer icon on the desktop and type the path to the mounted drive in the address line of Windows Explorer. For example, if you mounted the CD-ROM from the Hardware Node, you should specify `C:\CDROM` in the address line and press Enter to display the CD-ROM content.

Solution 2

Close your current terminal session and then log in to your VPS anew. Open My Computer by double-clicking the My Computer icon on the desktop. Now your mounted drive will be shown in the My Computer folder and can be accessed by double-clicking on its name.

Submitting Problem Report to Technical Support

In most cases, the SWsoft support team must rely on the customer's observations and communications with the customer in order to diagnose and solve the problem. Therefore, a detailed problem report is extremely important. The Submit Support Issue wizard helps you draw up such a report and automatically send it to the SWsoft support team. To invoke the wizard, select Programs --> SWsoft --> Virtuozzo --> Submit Support Issue on the Windows Start menu. The wizard will guide you thru a number of steps asking you to provide your first name, last name, e-mail, and detailed problem description, collecting Virtuozzo logs and information on your system network settings into a special zip file, and sending it to the SWsoft technical support team. You can also find the generated zip file in the `X:\vz\Reports\` directory (where `X:\vz\` is the path you specified for storing all VPS data while installing Virtuozzo) and send it manually later to `vzwin-support@swsoft.com`.

Establishing Secure Channel to SWsoft Support

Virtuozzo provides you with a special tool - *Virtuozzo Support Tunnel* - which allows you to establish a private secure channel to the SWsoft support team server. After establishing such a channel, the support team will be able to quickly and securely connect to your Node and diagnose and solve your problem. The secure connection to your computer is achieved thru a Virtual Private Network (VPN) created between the SWsoft support team server and your Hardware Node.

To start using the *Virtuozzo Support Tunnel* tool, you should first ask SWsoft for a special certificate which will uniquely identify you as a Virtuozzo user. Certificates are issued by SWsoft in the form of files and should be copied to the `C:\Program Files\SWsoft\Virtuozzo\Licenses` folder on your Node.

After you have received a certificate and copied it to the right folder on the Node and in case you encountered a Virtuozzo-related problem, you can do the following to get assistance from the SWsoft support:

- 1 Make sure that your Hardware Node is connected to the Internet.
- 2 On the Node, select **Programs --> SWsoft --> Virtuozzo --> Virtuozzo Support Tunnel** on the Windows **Start** menu to establish a VPN between your Node and the SWsoft support server.
- 3 Contact the SWsoft support team (by telephone or via e-mail) and inform them of the problem you encountered. You should also mention that you have launched the *Virtuozzo Support Tunnel* tool and established a VPN to the SWsoft support server.
- 4 After that, the SWsoft support team will closely examine your problem, connect to your Node by using the secure VPN established, if needed, and make its best to solve your problem as quickly as possible.

Reference

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Configuring VPSs

Each Virtual Private Server has its own configuration file, which is stored in the `X:\vz\Conf\` directory and has a name of `VPS_ID.conf`. The parameters in the `X:\vz\Conf\ file are presented in the form of the PARAMETER="value" pattern. The main parameters defining the VPS configuration can be subdivided into the following categories: miscellaneous, resource management, and networking parameters.`

Note: During the Virtuozzo installation, the `Conf` subdirectory is automatically created in the directory you specified for storing all VPS configuration files. By default, the `C:\vz\` directory is used. However, you might have defined another path for this directory.

Miscellaneous parameters:

Parameter	Description	Default value
<code>VzPrivate</code>	The path to the VPS private area. You specify the location of the VPS private area by passing the <code>--private path</code> argument to the <code>vmctl create</code> command. This parameter is omitted if the VPS private area is located in the <code>C:\vz\private\</code> directory.	<code>C:\vz\private\</code>
<code>GUID</code>	The pseudo-random number used to uniquely identify the Virtual Private Server. GUIDs (Globally Unique Identifiers) are written using a four-byte word, 3 two-byte words, and a six-byte word, such as: {3F2504E0-4F89-11D3-9A0C-0305E82C3301}	-
<code>Autoboot</code>	Specifies whether the VPS should be started automatically on system startup. Virtuozzo automatically starts all Virtual Private Servers that have this value set to "1".	1

OfflineMgmt	Specifies whether the VPS can be managed by the VPS administrator using the offline services indicated in the OfflineServices parameter in this file provided the OfflineMgmt parameter in the C:\vz\Config\0.conf file is set to "1".	1
OfflineServices	Overrides the OfflineServices parameter from the C:\vz\Config\0.conf file. The services enumerated in this parameter can be used by the VPS administrator for managing Virtual Private Servers, if the OfflineMgmt parameter in the C:\vz\Config\0.conf file is set to "1".	-
TEMPLATE	This is the name of the OS template the VPS is based upon.	w2k3
TEMPLATES	Provides a list of application templates. You are not recommended to modify this parameter since it is used to track the history of the added templates. This parameter is omitted if no templates have been added to the VPS.	-

Resource management parameters control the amount of resources a VPS can consume. All resources are described in the **Managing Resources** chapter (on page 93) in detail; here is only a list of parameters that can be found in the C:\vz\Config*<VPS_ID>*.conf file:

Parameter	Description
DiskQuota	The total size of disk space that can be consumed by the Virtual Private Server, in 1-Kb blocks.
CpuUnits	The positive integer number that defines how much CPU time one Virtual Private Server will receive in comparison with the other VPSs on the Hardware Node in case all the CPUs of the Node are fully used.
ProcessCountLimit	The maximal number of processes the VPS may create. Upon hitting this limit, the VPS will not be able to start a new process or thread.
SessionCountLimit	The number of terminal sessions. This parameter is used to limit the number of simultaneous terminal sessions, i.e. the number of users that are allowed to connect to the VPS at the same time thru MS TSC, RDP, etc.
CommittedMemoryLimit	The size of private (or potentially private) memory that can be allocated by the VPS, in bytes. The memory that is always shared among different applications is not included in this resource parameter.
NetAllowBroadcasts	Setting this parameter to "1" enables the network browsing for the VPS. The network browsing, if enabled, allows the VPS administrator to view all the network servers and file sharing resources available on the Microsoft Windows network. By default, the network browsing is disabled. You can enable this feature for all VPSs on your Node at once by setting this parameter to "1" in the C:\vz\Config\0.conf file.

`NetQoSPacketScheduler` Setting this parameter to "1" enables the Windows QoS packet scheduler for the VPS. The QoS packet scheduler is used to regulate how much traffic an application inside your VPS is allowed, thus enforcing the QoS parameters originally set for a particular application. By default, the QoS packet scheduler is disabled.

Note: In case you have enabled the QoS packet scheduler for a running Virtual Private Server, you should restart this VPS for the changes to take effect.

Network-related parameters allow you to set a hostname, an IP address, and a network mask for the given VPS:

Parameter	Description
Hostname	Specifies the hostname of the VPS.
IP	Sets an IP address for the VPS. Several IP addresses per VPS are allowed; in this case they should be divided by the semicolon and a space.
IPMASK	The network mask of the VPS. It should be the same for all the VPSs located on a specific physical network segment.

Adding Custom Action Scripts

Virtuozzo allows you to write and execute your own scripts on the Hardware Node to do additional actions when certain VPS-related operations are performed. There are two kinds of scripts you can specify for execution on the Node or in the VPS context:

- **Preoperation scripts.** These scripts are executed before some action is performed. They should be specified in the form of the `vz-pre<action_name>.<ext>` pattern, where `<action_name>` denotes the name of the operation to be performed (e.g. `start`), and `<ext>` is the extension of the file containing the script. Currently, the files with the `.exe`, `.cmd`, `.bat`, `.vbs` extensions are supported.
- **Postoperation scripts.** These scripts are executed after some action has been successfully completed. They should be specified in the form of the `vz-post<action_name>.<ext>` pattern where `<action_name>` denotes the name of the operation to be performed (e.g. `stop`), and `<ext>` is the extension of the file containing the script. Currently, the files with the `.exe`, `.cmd`, `.bat`, `.vbs` extensions are supported.

The names of all possible scripts that may be specified for executing before or after performing an operation are listed in the table below:

Script Name	Description
<code>vz-precreate.<ext></code>	This script is to be run before the VPS creation.
<code>vz-postcreate.<ext></code>	This script is to be run after the VPS creation.
<code>vz-premount.<ext></code>	This script is to be run before mounting the VPS private area.
<code>vz-postmount.<ext></code>	This script is to be run after mounting the VPS private area.
<code>vz-preunmount.<ext></code>	This script is to be run before unmounting the VPS private area.

<code>vz-postmount.<ext></code>	This script is to be run after unmounting the VPS private area.
<code>vz-prestart.<ext></code>	This script is to be run before the VPS start.
<code>vz-poststart.<ext></code>	This script is to be run after the VPS start.
<code>vz-prestop.<ext></code>	This script is to be run before stopping the VPS.
<code>vz-poststop.<ext></code>	This script is to be run after stopping the VPS.
<code>vz-preclone.<ext></code>	This script is to be run before copying the VPS.
<code>vz-postclone.<ext></code>	This script is to be run after copying the VPS.
<code>vz-prechangevpsid.<ext></code>	This script is to be run before changing the VPS ID.
<code>vz-postchangevpsid.<ext></code>	This script is to be run after changing the VPS ID.

Note: All the scripts are executed in the Host OS context.

You may specify scripts that will be applied to all Virtual Private Servers residing on the Hardware Node. To this effect, you should place your script to the `C:\vz\Scripts\`. In its turn, locating a script to the `C:\vz\private\VPS_ID\scripts\` directory allows you to set this script for executing in the given VPS only (per-VPS script). In the latter case, you may need to create the `C:\vz\private\VPS_ID\scripts\` directory manually since it is not created by creating a Virtual Private Server. When executed, any script takes only one parameter - the ID of the corresponding VPS.

Note: During the Virtuozzo installation, the `Scripts` subdirectory is automatically created in the directory you specified for storing all VPS configuration files. By default, the `C:\vz\` directory is used. However, you might have defined another path for the directory.

Let us assume you have created Virtual Private Server 101 with the private area located in the `C:\vz\Private\101\` directory. And now you wish to write a script that will be executed each time after the VPS start and display the number of events currently recorded in the VPS System event log. To this effect, you should open Notepad or another text editor and write the following script code:

```
strComputer = "."
Set objWMIService = GetObject("winmgmts:" _
    & "{impersonationLevel=impersonate}!\\" & strComputer &
    "\root\cimv2")
Set colLogFiles = objWMIService.ExecQuery _
    ("Select * from Win32_NTEventLogFile where LogFileName='System'")
For Each objLogFile in colLogFiles
    Wscript.Echo objLogFile.NumberOfRecords
Next
```

After that, you should save the file with the `vz-poststart.vbs` name, create the `scripts` subdirectory in the `C:\vz\Private\101\` directory, and place your script to this subdirectory. Make sure that the full path of the script is `C:\vz\Private\101\scripts\vz-poststart.vbs`. From this point on, the `vz-poststart.vbs` script will be executed every time you start VPS 101.

Note: By default, Virtuozzo is shipped with the `vz-poststart.cmd` script located in the `C:\vz\Scripts\` directory. This script is needed for all Virtual Private Servers residing on the Hardware Node to perform certain operations necessary for VPS error-free functioning. However, specifying your own per-VPS scripts (i.e. scripts in the `C:\vz\private\VPS_ID\scripts\` directory) prevents the `vz-poststart.cmd` script from running. Therefore, you should make sure that each of your per-VPS scripts calls the `C:\vz\Scripts\vz-poststart.cmd` script.

Virtuozzo Command Line Interface

This section documents the utilities supported in the current version of Virtuozzo for Windows. For every utility, all available command-line options are described.

All the Virtuozzo utilities are supposed to be run on the Hardware Node by using the `cmd.exe` command interpreter, which can be opened by selecting **Start --> Run** and executing the `cmd` command. There are a number of regulations which should be observed while working in the command prompt window. One of such rules would be to enclose in quote marks any parameter consisting of two or more words (e.g. "C:\Program Files"). Please consult the **Microsoft Command-line reference** (<http://www.microsoft.com/resources/documentation/windows/xp/all/proddocs/en-us/ntcmds.msp>) to learn the rules of working in the command prompt window.

The Virtuozzo command-line utilities can be subdivided into the following categories: general utilities, licensing utilities, VPS migration utilities, VPS backup utilities, template management utilities, and supplementary utilities.

General utilities are intended for performing day-to-day maintenance tasks:

<code>vzctl</code>	Utility to control Virtual Private Servers.
<code>vzlist</code>	Utility to view a list of VPSs existing on the Node with additional information.
<code>vzquota</code>	Utility to control Virtuozzo disk quotas.

Licensing utilities allow loading new license files and viewing the state of the license:

<code>vzlicview</code>	Utility to show the Virtuozzo license status and parameters.
<code>vzlicload</code>	Virtuozzo license loader.

VPS migration utilities allow to migrate Virtual Private Servers between Hardware Nodes or within one Hardware Node:

<code>vzmigrate</code>	Utility for migrating VPSs to another Hardware Node.
<code>vzmlocal</code>	Utility for the local cloning or moving of the Virtual Private Servers.

VPS backup utilities allow to back up and restore the VPS private areas, configuration files, and quota information:

<code>vzexport</code>	Utility to back up Virtual Private Servers and to store them on the Hardware Node where these VPSs are residing.
<code>vzimport</code>	Utility to restore Virtual Private Servers backed up by using the <code>vzexport</code> utility.
<code>vzbackup</code>	Utility to back up Virtual Private Servers and to store them either on a local Node or a special Backup Node.
<code>vzrestore</code>	Utility to restore Virtual Private Servers backed up by using the <code>vzbackup</code> utility.

Template management utilities allow template creation, maintenance, and installation of applications into a VPS:

<code>vzpkgls</code>	Utility to get a list of templates available on the Hardware Node and in VPSs.
----------------------	--

- `vzpkgdeploy` Utility to deploy and install OS and application templates on the Hardware Node.
- `vzpkgadd` Utility to add a new template to a VPS.

Supplementary utilities perform a number of tasks and are used by other Virtuozzo utilities:

- `vzsveinstall` Utility to create the Service VPS on the Hardware Node.
- `vzkeygen` Utility to show the Hardware Node ID.
- `vzcache` Utility to cache common files across Virtual Private Servers.
- `vzlscache` Utility to list the directories created by `vzcache`.
- `vzuncache` Utility to detach a Virtual Private Server from its cache and copy the cached files back to the VPS private area.

vzctl

`vzctl` is the primary tool for Virtual Private Server management. To use it, you have to log in to the Hardware Node as the administrator. The syntax of `vzctl` is:

```
vzctl [--quite | --verbose] command VPS_ID
vzctl --version
vzctl --help
```

Where `command` can be one of the following:

- `create` Used to create Virtual Private Servers.
- `destroy` Used to destroy a Virtual Private Server.
- `mount` Used to mount the VPS private area.
- `unmount` Used to unmount the VPS private area.
- `start` Starts a Virtual Private Server.
- `stop` Stops a Virtual Private Server.
- `restart` Restarts a Virtual Private Server.
- `status` Displays a Virtual Private Server status.
- `set` Used to set Virtual Private Server parameters, including resource control settings, the VPS private area location, its hostname, IP addresses, etc.
- `enter` Provides a way for hardware node administrator to “enter” a Virtual Private Server without knowing VPS root password. Use this command with caution and never run it on un-trusted Virtual Private Servers.
- `exec`, `exec2` These two commands allows running arbitrary commands inside a VPS without logging in to the corresponding VPS. The difference between two is the returned status.
- `mountext` Used to mount folders and drives of the Hardware Node to a Virtual Private Server.
- `umountext` Used to unmount external folders and drives of the Hardware Node from a Virtual Private Server.
- `partadd` Used to create a new VPS drive by mounting it to a loopback file on the Hardware Node.
- `partdel` Used to unmount the VPS drive mounted by means of the `vzctl partadd` command from a file on the Hardware Node.

Verbosity options can be used with any of the above commands and they are:

- `--quiet` Disables logging to the display and to the log file.
- `--verbose` Sets the log level to the maximum possible value for this `vzctl` session.

You can also pass to `vzctl` one of the following options:

- `--version` Displays the Virtuozzo version currently installed on the Hardware Node.
- `--help` Displays the usage information on `vzctl`.

vzctl create

This command is used to create a new Virtual Private Server. It has the following syntax:

```
vzctl create VPSID --pkgset name [--ipadd ip_address]
[--hostname hostname] [--config filename] [--private path]
```

With this command, you can create regular VPSs. A Virtual Private Server ID is required for this command and shall be unique within a Hardware Node.

Note: Virtual Private Server IDs from 1 to 100 are reserved for internal Virtuozzo needs. Do not use IDs from 1 to 100 for your Virtual Private Servers.

Command arguments are as follows:

Name	Description
<code>--pkgset name</code>	Mandatory. Specified when creating a regular Virtual Private Server. Denotes the OS template to use when creating the Virtual Private Server.
<code>--ipadd ip_address</code>	Optional. Adds IP address to the list of IP addresses the Virtual Private Server can use and brings up network interface with this address inside the VPS.
<code>--hostname hostname</code>	Optional. Sets the hostname to the specified name.
<code>--config filename</code>	Optional. If this option is given, <code>vzctl</code> copies the values from the sample VPS configuration file located in <code>C:\Program Files\SWSoft\Virtuozzo\Configs</code> and having the name in the form of <code>ve-<name>.conf-sample</code> . The sample configuration files usually have a number of resource control limits for the VPS and some application templates to be added to the VPS immediately upon its creation. If you skip this option, you will have to set resource control parameters for the VPS by using the <code>vzctl set</code> command before you are able to start the VPS. The application templates will have to be also added manually.

- `--private path` Optional. Specifies the location of the VPS private area. The VPS private area can be placed anywhere on your hard disk. For example, you may specify the `--private F:\MyPrivateArea` argument to locate your VPS private area in the `MyPrivateArea` directory on the `F:\` volume in case the `F:\` volume exists on the hard drive. While defining a path for this directory, you should take care of the following:
- This directory cannot be a mount point, i.e. you cannot mount external disk partitions to this directory.
 - This directory cannot be a network share, i.e. it cannot be located on a computer network drive.
 - The hard disk partition where this directory will be located should have no less than 10 Gb of free disk space.

When creating a new Virtual Private Server, you should specify a unique ID for it. There are no restrictions besides uniqueness from the `vmctl` standpoint. However, it is advisable to assign different ID ranges to hardware nodes in multi-node environments. For example, you can use IDs from 101 to 2000 on the first node, IDs from 2001 to 4000 on the second one and so on. This will help you in tracking down the node where VPS was created and will eliminate possibility of VPS IDs conflicts when migrating Virtual Private Servers between Nodes.

vmctl destroy

The syntax of this command is:

```
vmctl destroy <VPSID>
```

This command is used to delete a Virtual Private Server, which is no longer needed. It physically removes all the files located in VPS private area. This command does not take any additional arguments and requires the Virtual Private Server to be stopped and its private area to be dismounted.

vmctl mount and vmctl umount

These commands take no additional arguments:

```
vmctl mount <VPSID>
vmctl umount <VPSID>
```

The first command mounts the VPS private area to the VPS root directory (for example, `C:\vm\root\<VPS_ID>` on the Hardware Node) without starting it and the VPS registry to the `HKEY_LOCAL_MACHINE\<VPS_ID>` key in the registry of the Node. Normally you do not have to use this command as the `vmctl start` command mounts the VPS private area and registry automatically.

The `vmctl umount` command unmounts the VPS private area and registry. Usually there is no need in using this command either, for `vmctl stop` unmounts the VPS private area and registry automatically.

vzctl mounttext and vzctl umounttext

You may wish to mount a drive or one of the folders on the Hardware Node to a drive or directory inside your Virtual Private Server. To this effect, you can use the `vzctl mounttext` command. It has the following syntax:

```
vzctl mounttext VPSID --srcdir path --dstdir path
```

The command should be used with the following arguments:

Name	Description
<i>VPSID</i>	The ID of the Virtual Private Server where an external folder/drive from the Hardware Node will be mounted.
<code>--srcdir <i>path</i></code>	The drive/folder inside your Virtual Private Server where a folder/drive from the Node will be mounted. You may use any existing directory or drive or create a new directory to mount the desired folder/drive.
<code>--dstdir <i>path</i></code>	The full path to the folder/drive on the Node that is to be mounted inside your Virtual Private Server.

However, before mounting drives and folders from the Hardware Node to any of your Virtual Private Servers, you should first make them accessible by executing the `vzctl set --devadd` command (see page 215). The session below demonstrates how you can make your CD-ROM drive on the Hardware Node available for VPS 101:

```
vzctl set 101 --devadd D:
Command output
vzctl mounttext 101 --srcdir C:\CDROM --dstdir D:
Command output
```

In the example above, we granted VPS 101 access to the D: drive on the Node (assuming this is used as the Node CD-ROM drive) and mounted this drive to the C:\CDROM directory inside VPS 101.

You might as well mount the Node CD-ROM drive to a separate drive letter inside the VPS:

```
vzctl set 101 --devadd D:
Command output
vzctl mounttext 101 --srcdir E: --dstdir D:
Command output
```

Note: The permissions of the directory/drive mounted to a VPS correspond to those of this directory/drive on the Hardware Node, i.e. you are able to perform the same operations on the directory/drive inside the VPS as you are allowed on the Node.

At any time, you can use the `vzctl umounttext` command to unmount external folders and drives of the Hardware Node from a Virtual Private Server. So, if you used the first example for mounting the CD-ROM drive, you can issue the following command to unmount it from VPS 101:

```
vzctl umounttext 101 --srcdir C:\CDROM
```

As can be seen from our example, you should pass the *VPSID* and `--srcdir path` arguments to the command to identify the Virtual Private Server where the mounted directory/drive exists and the directory/drive itself that will be unmounted from this VPS.

vzctl start, vzctl stop, vzctl restart, and vzctl status

These four commands have the same syntax and take no obligatory arguments:

```
vzctl start <VPSID>
vzctl stop <VPSID>
vzctl restart <VPSID>
vzctl status <VPSID>
```

The first command is used to start a Virtual Private Server. It will set up all network interfaces, initialize VPS quota, if needed, etc.

`vzctl stop` shuts the Virtual Private Server down.

The `vzctl restart <VPSID>` command consecutively performs the stopping and starting of the corresponding VPS.

The `vzctl status` command shows the current VPS state. It outputs the following information: what IP address is assigned to the VPS and whether the VPS is running as in the example below:

```
C:\Documents and Settings\Administrator> vzctl status 101
VpsId 101 exist unmounted down
```

vzctl set

This command is used for setting VPS parameters. It has the following syntax:

```
vzctl set <vpsid> <setting_name> <value> [ --save ]
```

An optional `--save` switch tells `vzctl` whether to save changes into the VPS configuration file. Practically all VPS settings can be changed dynamically without the necessity of VPS reboot. The only exception is the `--onboot` option.

The settings that can be passed to the `vzctl set` command are subdivided into the following categories: miscellaneous, networking, and resource management parameters.

Miscellaneous settings:

<code>--onboot yes no</code>	This setting requires the <code>--save</code> switch. If you set it to “yes”, Virtuozzo will automatically start this Virtual Private Server on next system startup.
<code>--userpasswd user:password</code>	This setting creates a new user with the specified password inside the Virtual Private Server, or changes the password of an already existing user. Omitting the user name (e.g. <code>:2wse3rd</code>) will change the password for the built-in Administrator account inside the VPS, even though it was renamed for some reason or other.
<code>--offline_management yes no</code>	Enabling/disabling the direct managing of the VPS thru a common Internet browser by means of Virtuozzo Power Panels. To enable/disable the offline management feature for the Hardware Node and, therefore, for all VPSs residing on it, you should set this parameter for the VPS with ID 0.
<code>--devadd device</code>	This setting allows you to grant access to any directory/drive on the Hardware Node from inside a Virtual Private Server.

`--devdel device` This setting shuts down access to a directory/drive on the Hardware Node granted by means of the `--devadd` setting.

Resource management settings control the amount of resources a VPS can consume.

`-p, --numproc number` The number of processes allowed to simultaneously run inside the VPS. Upon hitting this limit, the VPS will not be able to start a new process.

`-t, --numsessions number` The number of terminal sessions that can be opened simultaneously to the VPS.

`--cpuunits units` Allowed CPU power. This is a positive integer number that defines how much CPU time one Virtual Private Server will receive in comparison with the other VPSs on the Hardware Node in case all the CPUs of the Node are fully used.

`--diskspace number` The total size of disk space that can be consumed by the VPS, in 1 Kb blocks. You can additionally use the `--drive` option to specify for which VPS drive the disk space is to be set. If the `--drive` option is omitted, the disk space limit is set for the `C:\` drive.

`--drive drive_name` The name of the drive inside the VPS for which a disk space limit is to be set. This option should be used in conjunction with the `--diskspace` option.

`--vprvmem number` The size of private (or potentially private) memory allocated by an application, in 4 Kb pages. The memory that is always shared among different applications is not included in this resource parameter.

Network related settings allow you to set the hostname, IP address(es), DNS server address(es), etc. that a Virtual Private Server can use:

`--hostname name` Sets the hostname of the VPS.

`--ipadd addr` Adds an IP address to a list of IP addresses the Virtual Private Server can use and brings up the network interface with this address inside the VPS.

`--ipadd addr/netmaskbits` Along with adding an IP address, it sets a subnet mask that determines what subnet the given IP address belongs to.

`--ipadd addr:netmask`

`--ipdel addr` Allows you to revoke an IP address from the Virtual Private Server.

`--nameserver addr` The DNS server IP address for the VPS. More than one server may be specified in space-separated format.

`--searchdomain domain` The DNS search domain for the VPS. You may specify several domains and separate them by spaces.

`--psched on|off`

Enabling/disabling the Quality of Service packet scheduler for the specified Virtual Private Server; by default, it is disabled. The QoS packet scheduler is used to regulate how much traffic an application inside your VPS is allowed, thus enforcing the QoS parameters originally set for a particular application. After enabling the Quality of Service packet scheduler, any VPS can be managed as a normal stand-alone Windows 2003 server in respect of setting and working with all Windows Quality of Service components.

Note: In case you have enabled the QoS packet scheduler for a running Virtual Private Server, you should restart this VPS for the changes to take effect.

`--isolate on|off`

Defines whether the Virtual Private Server should be isolated within its subnet or can also be accessed from other subnets:

- Use the `on` command switch to allow the VPS to communicate only with the computers from the same subnet(s).
- Use the `off` command switch to enable the VPS to access/be accessed by the computers located both on the same subnet and on other ones.

`--preferred_adapter`
Adapter_ID

In case there are several network adapter cards installed on the Hardware Node, you can use this option to specify the preferred network adapter for a Virtual Private Server. Specifying the preferred adapter for a VPS means that this network adapter will be used to connect the VPS to the network and, therefore, to handle the whole network traffic of the VPS.

In Virtuozzo-based systems, network adapters are identified by the Media Access Control (MAC) addresses assigned to them. So, if you wish to set a particular adapter to be used for this or that VPS on the Node, you should specify its MAC address as the value of this option. For example, the following command

```
# vzctl set 101 --preferred_adapter 00-0A-CR-32-F1-FD
```

sets the network adapter card with the MAC address of 00-0A-CR-32-F1-FD to be used for handling all the network traffic for VPS 101.

While working with network adapters in Virtuozzo-based systems, please keep in mind the following:

- After the Virtuozzo installation, all active adapters on the Hardware Node are used to control network traffic for all VPSs residing on the Node.
- You can specify several network adapters for any VPS on the Node and separate them by spaces. In this case the corresponding VPS will be able to access all networks to which the specified adapters are connected.
- If you use the option without specifying any value (i.e. execute the `vzctl set VPS_ID --preferred_adapter ""` command), the network adapters of VPS 0 (i.e. of the Node itself) will be used to control network flows for the corresponding VPS. If there is no adapter set for VPS 0, then all the adapters currently active on the Node will handle the VPS network traffic.

vzctl partadd and vzctl partdel

The `vzctl partadd` command is used to create a new drive inside your Virtual Private Server by mounting it to a loopback file on the Hardware Node. After the command execution, the mounted drive becomes visible

- On the Hardware Node:
 - As a folder in the `X:\vz\root\VPS_ID\` directory and
 - As a file in the `.efd` format in the `X:\vz\private\VPS_ID` folder.

- From inside the Virtual Private Server: log in to the VPS via RDP and launch Windows Explorer. Your new drive will be displayed among other local drives available inside your VPS.

You can then use the newly created VPS drive in the same way as you would use it on a stand-alone computer: format it, create new files and folders within the drive, etc.

The `vzctl partadd` command has the following syntax:

```
vzctl partadd VPS_ID --drive VPS_drive --size drive_size
[--file File_Name]
```

The options that can be passed to `vzctl partadd` are explained in the table below:

Option	Description
<code>--drive VPS_drive</code>	Mandatory. The name of the VPS drive to be created inside the Virtual Private Server. After the command completion, this name will be shown as the name of the folder in the <code>X:\vz\root\VPS_ID\</code> directory on the Node (e.g. <code>C:\vz\root\101\F</code>). If you log in to the VPS via RDP, you can see this name by launching Windows Explorer where it will be listed among your other local drives. The formats that can be used for specifying the drive name are <code>X</code> , <code>X:</code> or <code>X:\</code> where <code>X</code> denotes the name of the drive you wish to create inside the VPS.
<code>--size drive_size</code>	Mandatory. The size of the VPS drive to be created inside the Virtual Private Server, in kilobytes. If you use this option without specifying any value, the VPS drive size will be set to 100 Mb.
<code>--file File_Name</code>	Optional. The name of the file to be created on the Node. After the command completion, this name will be visible as the name of the file in the <code>.efd</code> format located in the <code>X:\vz\private\VPS_ID</code> folder on the Node (e.g. <code>C:\vz\private\101\My_File.efd</code>).

Let us assume that you wish to create a new drive having the name of `F:\` and the size of 50 Mb inside VPS 101. Besides, you want the drive to be displayed as the `MyVirtualDisk.efd` file inside the `C:\vz\private\101\` folder on the Hardware Node. To this effect, you should issue the following command on your Node:

```
vzctl partadd 101 --drive F:\ --size 51200 --file MyVirtualDisk
```

After the command execution, the newly created drive becomes visible as the `C:\vz\root\101\F` folder and the `C:\vz\private\101\MyVirtualDisk.efd` file on your Hardware Node. You can also log in to VPS 101 via RDP and check (e.g. by launching Windows Explorer) that a new drive with the name of `Local Disk (F:)` is now available inside the VPS. This drive has the size of 50 Mb and can be used as any other drive on a stand-alone computer.

The `vzctl partdel` command is used to unmount the VPS drive mounted by means of the `vzctl partadd` command from a file on the Hardware Node. It has the following syntax:

```
vzctl partdel VPS_ID --drive VPS_drive [--delete]
```

The command requires only the `--drive` option to be specified. However, you may also use the `--delete` option to remove the file from the `X:\vz\private\VPS_ID` folder on the Node which, otherwise, remains intact.

For example, to unmount the `F:\` drive that was mounted to VPS 101 in the example above and delete the `MyVirtualDisk` file from the `C:\vz\private\101` folder on the Node, you should execute the following command:

```
vzctl partdel 101 --drive F:\ --delete
```

vzctl exec, vzctl exec2, and vzctl enter

These commands are used to run arbitrary commands inside a Virtual Private Server being authenticated as administrator on the Hardware Node. The syntax of these commands is as follows:

```
vzctl { exec, exec2 } <VPSID> <command>  
vzctl enter <VPSID>
```

where `command` is a string to be executed in the Virtual Private Server.

The difference between `exec` and `exec2` is the exit code. `vzctl exec` returns 0 in case `vzctl` has been able to launch the command and does not take into account the exit code of the command itself. `vzctl exec2` returns the exit code of the command executed in the Virtual Private Server.

`vzctl enter` is similar to `vzctl exec`. The difference between the two is that `vzctl enter` makes the command line believe that it is connected to a terminal. As such, you receive a command line prompt and are able to execute multiple commands as if you were logged in to the Virtual Private Server.

vzlist

The `vzlist` utility is used to list the VPSs existing on the given Hardware Node together with additional information about these VPSs. The output and sorting of this information can be customized as needed. The utility has the following syntax:

```
vzlist [-a] [-S] [-o specifier[,specifier...]] [-H] [VPSID [VPSID...]]
      [-s specifier | -specifier] [-h [*]pattern[*]]
      [--quiet] [--verbose]
vlist -L
vlist --help
```

Here follows the description of available options:

Option	Description
<code>-a, --all</code>	List all the VPSs existing on the Node. By default, only running VPSs are shown.
<code>-S, --stopped</code>	List only stopped VPSs.
<code>-o parameter[.specifier]</code>	This option is used to display only particular information about the VPSs. The parameters and their specifiers that can be used after the <code>-o</code> option are listed in the following subsection. To display a number of parameters in a single output, they should be separated with commas, as is shown in the synopsis above.
<code>-H, --no-header</code>	Do not display column headers.
<code>-L, --list</code>	List all the parameters available.
<code>--help</code>	Display the usage info and exit.
<code>-s, --sort</code> <code>[-]parameter[.specifier]</code>	Sort the VPSs in the list by the specified parameter. If "-" is given before the name of the parameter, the sorting order is reversed.
<code>-h, --hosthame</code> <code>hostname_pattern</code>	Display only those VPSs that correspond to the specified hostname pattern. The following wildcards can be used: *.
<code>--quiet</code>	Disables logging to the display and to the log file.
<code>--verbose</code>	Sets the log level to the maximum possible value for this <code>vzlist</code> session.

vzlist Output Parameters and Their Specifiers

Some parameters that can be used after the `-o` and `-s` switches of the `vzlist` utility can be specified by the "dot+letter" combination following the parameter and denoting one of the following things:

Specifier	Description
<code>.b</code>	The barrier on using the corresponding resource set for the given VPS.
<code>.h</code>	The hard limit on using the corresponding resource set for the given VPS.

The following parameters are available for using with the utility:

Parameter	Output Column	Description
<code>vpsid</code>	VPSID	The VPS ID.
<code>hostname</code>	HOSTNAME	The VPS hostname.
<code>ip</code>	IP_ADDR	The VPS IP address.
<code>status</code>	STATUS	Specifies whether the VPS is running or stopped.
<code>numproc</code>	NPROC	Number of processes allowed. Can be used with the <code>.b</code> specifier.
<code>numsessions</code>	SESSIONS	Number of terminal sessions opened to the VPS. Can be used with the <code>.b</code> specifier.
<code>diskspace</code>	DQBLOCKS	Total size of disk space consumed by the VPS, in 1 Kb blocks. Can be used with the <code>.h</code> specifier defining the hard limit on using disk space.
<code>cpuunits</code>	CPUUNI	Allowed CPU power. This is a positive integer number, which determines the minimal guaranteed share of the CPU the Virtual Private Server will receive.
<code>vprvmem</code>	VPRVMEM	The size of private (or potentially private) memory allocated by an application. The memory that is always shared among different applications is not included in this resource parameter.

If a parameter that can be used with a specifier is used without any specifier in the command line, the current usage of the corresponding resource is shown by default.

vzquota

This command is used to configure and see disk quota statistics for Virtual Private Servers. `vzctl` uses `vzquota` internally to configure quotas and you usually do not have to use `vzquota` except for checking current quota statistics. The syntax of `vzquota` command is as follows:

```
vzquota [--quiet | --verbose] [-b] setlimit vps_id -B num
vzquota [--quiet | --verbose] [-b] stat vps_id
vzquota [--quiet | --verbose] [-b] show vps_id
vzquota --help
```

General options available to all `vzquota` commands are:

- `-v` Verbose mode. Causes `vzquota` to print debugging messages about its progress. You can give up to two `-v` switches to increase verbosity.
- `-q` Quiet mode. Causes all warning and diagnostic messages to be suppressed. Only fatal errors are displayed.
- `--help` Display the usage info and exit.
- `-b` Set the batch mode.

vzquota understands the following commands:

setlimit	Allows changing the quota limits for the running quota.
stat	Shows quota statistics for the running quota.
show	Shows quota usage from quota file.

vzquota setlimit

This command updates limits for the running VPS quota. It requires at least one limit to be specified. The syntax of this command is:

```
vzquota setlimit <VPSID> -B num [--drive name]
```

Currently, only one option can be used with the command:

-B, --block-hardlimit <i>num</i>	Required. Specifies the disk quota block hard limit, in 1 Kb blocks. This limit cannot be exceeded by the Virtual Private Server.
--drive <i>name</i>	Optional. Specifies the disk drive inside the VPS for which the disk quota limit is to be set.

The only required parameter for this command is the ID of the Virtual Private Server whose disk quota limit you wish to set. However, you can additionally use the `--drive` option to specify to what VPS disk drive the defined quota limit is to be applied. For example, the following command sets the disk quota limit of 100 Mb for the F:\ drive inside VPS 101:

```
C:\...\Administrator>vzquota setlimit 101 -B 102400 --drive F:\
Command 'setlimit' is successfully finished
```

Note: The disk quota limit for all VPS disk drives except for the C:\ drive is set on the fly. To make the disk quota limit changes apply to the C:\ drive, you should restart the Virtual Private Server where the drive is located.

vzquota stat and vzquota show

These commands are used for querying the VPS quota statistics. The syntax is as below:

```
vzquota show <VPSID>
vzquota stat <VPSID>
```

You can use both the `vzquota stat` and `vzquota show` commands to view disk quota parameters. A typical output of the commands is below:

```
C:\Documents and Settings\Administrator>vzquota stat 101
disk resource usage hardlimit path
C: 1k-blocks 32768 122880 C:\vz\private\101\root.efd
```

The output shows that only one disk drive - C:\ - exists inside Virtual Private Server 101. It is located in the C:\vz\private\101 folder on the Hardware Node. VPS 101 currently uses 32 Mb of disk space available on the C:\ drive and the hard limit for this drive is set to 120 Mb.

Licensing Utilities

vzlicload

This utility loads Virtuozzo licenses. It has the following syntax:

```
vzlicload [options]
```

This utility is called automatically by the Hardware Node initialization scripts and searches the `C:\Program Files\SWsoft\Virtuozzo\Licenses` directory for a `vzlicense` file. If the file is found, the utility loads its contents. You can run this utility when you received a new license and want to load it. You need a new license if your hardware configuration changed or you need to run more Virtual Private Servers than your current license allows.

The utility accepts the following options:

```
-f, --license-file <file> File to load. If omitted, then the C:\Program
                           Files\SWsoft\Virtuozzo\Licenses directory is
                           used.
-i, --stdin                Use standard input as a license file.
```

vzlicview

This utility displays license content along with license status information. It has the following syntax:

```
vzlicview [options]
```

It is important to remember that this utility always operates on a license file. When the utility runs without arguments it returns content and status of the license found in the default location `C:\Program Files\SWsoft\Virtuozzo\Licenses`.

The following options can be used with this utility:

```
-f, --license-file <file> File to load. If omitted, then C:\Program
                           Files\SWsoft\Virtuozzo\Licenses is used.
-i, --stdin                Use standard input as a license file.
```

The utility reports the following statuses for the license:

ACTIVE	The license file is loaded, verified for validity and active.
VALID	The license is valid, but has not been loaded into the kernel.
GRACED	The license will be disabled after grace period expiration, but currently is still active. The license either bound to different hardware configuration or expired.
EXPIRED	The expired license, which has not been loaded.
UNKNOWN	License status is unknown. Virtuozzo support is not installed on the system.

Migration Utilities

Very often it is necessary to migrate one or more Virtual Private Servers from one Hardware Node to another (e.g. in the case of the Hardware Node upgrade). Sometimes you may want to move or copy a VPS within one and the same Node, i.e. to change the VPS ID and/or the VPS private area path. These tasks are performed by means of the migration tools described further on.

vzmigrate

This utility is used for moving Virtual Private Servers to another system (i.e. from the Source Node to the Destination Node) with minimal downtime. It has the following syntax:

```
vzmigrate [-r yes|no] [-n] -A ServerNodeAddr \
-P ServerPassword {VPS_list}
{VPS List} = <source_VPSID>[:<dest_VPSID>] [...]
vzmigrate --help
```

The following options can be used with the `vzmigrate` utility:

<code>-r, --remove-area yes no</code>	If “yes” is specified, then the private area will be deleted after the corresponding VPS is successfully migrated to the Destination Node. If “no” is specified, the private area will not be deleted. In this case the VPS configuration file will be renamed from <code>VPS_ID.conf</code> to <code>VPS_ID.conf_migrated</code> . By default, the VPS private area is removed from the Source Node.
<code>-n, --nostart</code>	Do not attempt to start the VPS on the Destination Node after its successful migration. This option does not have any effect if the Virtual Private Server was not running on the Source Node.
<code>-A, --srv_addr</code>	The IP address or the hostname of the Destination Node, i.e. of the Node where the VPS is to be migrated.
<code>-P, --srv_pswd</code>	The password of the <code>vzagent0</code> user. You should provide the password you use to log in as <code>vzagent0</code> to the Service VPS on the Destination Node.
<code>-h, --help</code>	Displays the utility usage and exits.
<code>--quiet</code>	Disables logging to the screen and to the log file.
<code>--verbose</code>	Sets the log level to the maximum possible value for this <code>vzmigrate</code> session.

To migrate the VPS, you should execute the `vzmigrate` command on the Source Node and pass the corresponding options to it. `{VPS_list}` is a list of `<source_VPSID>[:<dest_VPSID>]` denotations separated by spaces. A different destination VPS ID parameter is needed in case the Source Node (the one where you run the `vzmigrate` command) and the Destination Node have Virtual Private Servers with one and the same ID. You can specify multiple Virtual Private Servers at once for migration.

If the Virtual Private Server is running on the Source Node, `vzmigrate` copies its private files, registry settings, etc. to the Destination Node, stops the Virtual Private Server on the Source Node, copies the files changed after the first copying to the Destination Node again, and starts the VPS on the Destination Node (if the `-n` option is not specified).

Since a Virtual Private Server consists of thousands of files, copying all of them to a new Hardware Node may take considerable time. However, `vzmigrate` stops the Virtual Private Server only after all the files have been copied to the new Hardware Node and resynchronizes only those files that have been changed while being copied. This brings down a typical VPS downtime to the time required for restarting a Virtual Private Server.

For example, to migrate VPS 101 residing from the Source Node to VPS 111 on the Destination Node having the IP address of `123.154.154.123`, you can execute the following command:

```
C:\...\Administrator>vzmigrate -A 123.154.154.123 -P qw3r5f 101:111
```

vzmlocal

Moving/copying a VPS within one and the same Hardware Node consists in changing/adding the VPS ID, private area, and root paths. Thus, you may use the `vzmlocal` utility either to change the ID and/or the private area path and/or the root path of any existing VPS(s) or to clone a VPS, i.e. to create a complete copy of an existing VPS with different ID and path. It has the following syntax:

```
vzmlocal <VPS List>
<VPS List> = <source_VPSID>:<dest_VPSID>[:<dest_private>] [...]
vzmlocal -C <VPS List>
<VPS List> = <source_VPSID>:<dest_VPSID>[:<dest_private>] [...]
vzmlocal --help
```

The options are the following:

- | | |
|-------------------------|--|
| <code>-C, --copy</code> | Clone the source Virtual Private Server instead of moving it. |
| <code>--quiet</code> | Disables logging to screen and to the log file. |
| <code>--verbose</code> | Sets log level to maximum possible value for this <code>vzlist</code> session. |
| <code>--help</code> | Display the utility help. |

You should specify the source VPS ID (*<source_VPSID>*) and, if you are cloning a VPS, the destination VPS ID (*<dest_VPSID>*). Specifying the destination VPS private area path (*<dest_private>*) is optional; it allows you to override the default path of *X:\vz\private\<VPSID>*. For example, you can issue the following command to move VPS 101 to VPS 201, i.e. to change the VPS ID from 101 to 201, and to locate the VPS private area in the *C:\MyVPS* folder on the Hardware Node:

```
C:\...\Administrator>vzlist -a
  VEID  NPROC  STATUS  IP_ADDR  HOSTNAM
    1    22    running 192.168.45.63  VPS1
   101    0    stopped 10.198.198.101 VPS101
C:\...\Administrator>vzmllocal 101:201:C:\MyVPS
Command 'vzmllocal' is successfully finished
```

Note: In the current version of Virtuozzo, you can change IDs of stopped Virtual Private Servers only.

Backing-Up Utilities

Any Virtual Private Server is defined by its private area and configuration parameters stored in the registry. Backing up these components allows you to restore the whole Virtual Private Server at any time in case the VPS gets broken.

The following subsections provide the complete reference on the Virtuozzo backup and restore utilities:

- `vzexport`;
- `vzimport`;
- `vzbackup`;
- `vzrestore`.

vzexport

The `vzexport` utility is used to back up the given VPS to some file on your Hardware Node. Later on, the VPS backup may be restored from this file. The following components are backed up to a zip file:

- *C:\vz\private\<VPS_ID>*: the directory where the VPS private area is stored; it contains all the VPS-related data.
- *HKLM\Software\SWSoft\Virtuozzo\Ve\<VPS_ID>*: the subkey in the registry where all basic VPS configuration parameters are stored.

The `vzexport` utility has the following syntax:

```
vzexport VPS_ID --backup_file name [-s]
vzexport --help
```

The backup options are the following:

- `-b, --backup_file name` Used to define the name of the file the Virtual Private Server will be backed up to.
- `-s` Stops the Virtual Private Server, in case it is running, for the time necessary for its backing up.

`--help, /?` Displays the utility help.

vzimport

The `vzimport` utility uses the VPS backups stored in the corresponding file on the Hardware Node to restore them to their original state. The syntax of the command is the following:

```
vzimport --backup_file name [-s] [-f]
vzimport --help
```

The restore options are the following:

<code>-b,</code> <code>backup_file <i>name</i></code>	<code>--</code>	The name of the file the Virtual Private Server was backed up to. This file should have the <code>.zip</code> extension.
<code>-f</code>		Restores the backed up Virtual Private Server even in case a VPS with the same ID exists on the Node. Keep in mind that the VPS will be restored with all the values overwritten from the backup, including the hostname, IP address, application set, etc.
<code>-s</code>		Stops the Virtual Private Server, in case it exists on the Node and is running, for the time necessary for its restoring.
<code>--help, /?</code>		Displays the utility help.

vzbackup

The `vzbackup` utility is used to create and manage Virtual Private Server backups. As distinct from `vzexport`, you can:

- Run this utility on virtually every Node in your network. It can be:
 - The Source Node where the VPS to be backed up is residing;
 - The Backup Node - a special Node intended for storing VPS backups, or
 - Any other Virtuozzo-based physical server in your network.

The only requirements that should be met to execute `vzbackup` is to have a computer with Virtuozzo 3.5 for Windows installed on it and to provide the network connectivity for this computer to be able to establish connections to the Source and Backup Nodes, if necessary. The created VPS backups are then stored on the Backup Node which can also be presented by any Node with running Virtuozzo software.

- Use this utility to manage your existing VPS backups in the following way:
 - List all VPS backups available on the Backup Node and display detailed information on them;
 - Change the path to the folder on the Backup Node where VPS backups are to be stored;
 - Remove a VPS backup.

The `vzbackup` utility has the following syntax:

```
vzbackup VPS_ID [backup options]
vzbackup --help
```

The backup options are the following:

Name	Description
<code>-A, BackupNodeAddress</code> <code>--srv_addr</code>	The IP address or hostname of the Backup Node where the VPS is to be backed up. If the option is omitted, the Source Node will be used to store the VPS backup and act the Backup Node. In the case of running <code>vzbackup</code> on a Node other than the Backup Node, you should obligatorily specify this option.
<code>-U, BackupNodeUser</code> <code>--srv_user</code>	The user name used by <code>vzbackup</code> to log in to the Backup Node. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzbackup</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
<code>-P, BackupNodePasswrđ</code> <code>--srv_pswd</code>	The password of the user specified as the value of the <code>-U</code> option. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzbackup</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.
<code>-a, SourceNodeAddress</code> <code>--clnt_addr</code>	The IP address or hostname of the Source Node, i.e. of the Node where the VPS to be backed up is residing. If the option is omitted, the VPS to be backed up will be taken from your local Node. In the case of running <code>vzbackup</code> on a Node other than the Source Node, you should obligatorily specify this option.
<code>-u, SourceNodeUser</code> <code>--clnt_user</code>	The user name used by <code>vzbackup</code> to log in to the Source Node. This option is taken into account in case the <code>-a</code> option is specified during the <code>vzbackup</code> execution. If the <code>-a</code> option is specified and the <code>-u</code> option is omitted, the utility tries to log in to the Source Node as <code>vzagent0</code> created on the Source Node during the Virtuozzo installation.
<code>-p, SourceNodePasswrđ</code> <code>--clnt_pswd</code>	The password of the user specified as the value of the <code>-u</code> option. This option is taken into account in case the <code>-a</code> option is specified during the <code>vzbackup</code> execution. If the <code>-a</code> option is used and the <code>-u</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Source Node for managing your Node and all its VPS by means of VZMC and VZCC.
<code>-s</code>	Stops the Virtual Private Server, in case it is running, for the time necessary for its backing up.
<code>-I</code>	Make an incremental backup or, if no full backups are available, a full backup.
<code>-d BackupID</code>	Remove the VPS backup with the specified backup ID.

While running, `vzbackup` performs the following operations:

- 1 Connects via SSH to the Source Node where the Virtual Private Server you wish to back up is residing;

- 2 Compresses the VPS private area and registry settings to a file in the .zip format;
- 3 Connects via SSH to the Backup Node;
- 4 Transfers the compressed file from the Source Node to a special backup folder on the Backup Node.

For example, you can issue the following command to back up VPS 101 from the Source Node having the IP address of 134.156.156.134 and to place the VPS backup to the Backup Node with the IP address of 203.156.156.203:

```
C:\...\Administrator>vzbackup 101 -S 203.156.156.203 -U Administrator
-P 5tghy7ui8 -c 134.156.156.134 -u Administrator
connection adjust...
backing up...
Command 'vzbackup' is successfully finished
```

After the command completion, you can find your VPS backup on the Backup Node, in the folder specified during the Virtuozzo installation for storing all VPS backups. By default, the `X:\vz\Backups` folder on the Node is used. However, you can specify another folder on the Backup Node for storing your VPS backups by using the `vzbackup storage` command. Detailed information on this command is given in the `vzbackup storage` subsection.

vzbackup list

The `vzbackup list` command lists all Virtual Private Servers backups available on the Backup Node. It has the following syntax:

```
vzbackup list VPS_ID [options]
vzbackup list -b backup_ID [options]
```

The options that can be passed to `vzbackup list` are presented in the table below:

Name	Description
<code>-A,</code> <i>BackupNodeAddress</i> <code>--srv_addr</code>	The IP address or hostname of the Backup Node where the VPS backup is stored. If the option is omitted, your local Node will be searched for available backups of the specified VPS. In the case of executing <code>vzbackup list</code> on a Node other than the Backup Node, you should obligatorily specify this option.
<code>-U,</code> <i>BackupNodeUser</i> <code>--srv_user</code>	The user name used by <code>vzbackup list</code> to log in to the Backup Node. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzbackup list</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
<code>-P,</code> <i>BackupNodePassword</i> <code>--srv_pswd</code>	The password of the user specified as the value of the <code>-U</code> option. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzbackup list</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.
<code>--all</code>	Displays detailed information on the Virtual Private Server backup(s).

`-b backup_ID` Lists all disk drives contained in the VPS backup with the specified backup ID.

Note: If you use the `-b` option, you should not specify the Virtual Private Server ID (e.g. `vzbackup list -b {BB05D401-CD53-...}\000011bk`).

`-f FolderName` Displays the contents of the specified folder in the VPS backup. If the option is omitted, the contents of the `C:\` folder is shown. This option should be used in conjunction with the `-b` option.

For example, if you wish to list all available backups of VPS 101 on the Backup Node having the IP address of 203.156.156.203, you can issue the following command on the Hardware Node:

```
C:\...\Administrator>vzbackup list 101 -S 203.156.156.203 \
-U Administrator -P 5tghy7ui8 --all
connection adjust...
listing...

VPS 101

backup ID                type    node          created
{BB05D401-CD53-...}\000011bk  full   MyNode       17/09/2005 14:20:26
```

In the example above, the connection to the Backup Node is established by using the Administrator credentials (specified as the values of the `-U` and `-P` options). The output shows us that only one backup of VPS 101 exists on the Backup Node having the IP address of 203.156.156.203. Information on the VPS backup is presented in the table having the following columns:

- `type`: the backup type. It can be either full or incremental. In our case we created a full VPS backup containing the whole VPS private area and its registry settings. Detailed information on backup types is provided in the **Backing Up and Restoring VPS** section (on page 45).
- `node`: the hostname of the Backup Node where the VPS backup is stored. In our case the Backup Node has the `MyNode` hostname which corresponds to the IP address of 203.156.156.203. In the case of omitting the `-all` option, this information is not displayed.
- `created`: the date and time of the backup creation. As can be seen, our VPS backup was created on September 17, 2005 at 14:20:26.
- `backup ID`: the backup ID assigned to the VPS backup during its creation.

The last point needs further explanation. Any VPS backup is recognized by a unique ID assigned to the backup during its creation. Backup identifiers are automatically generated by the `vzbackup` utility and can have the following forms:

- `{xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx}\Backup_numberbk` for a full VPS backup (e.g. `{39EF8C5C-C470-4166-AE51-5F5BEB0CF864}\000029bk`) and
- `{xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx}\Backup_numberbk#` for an incremental VPS backup where `#` denotes the index number of the incremental backup (e.g. `{39EF8C5C-C470-4166-AE51-5F5BEB0CF864}\000029bk2` for the second incremental backup created for the given VPS).

Backup identifiers can then be used by the `vzbackup list` and `vzbackup delete` commands to manage VPS backups with the corresponding backup IDs: list disk drives inside the VPS backup, remove the VPS backup with the specified backup ID from the Backup Node, etc. You should also specify a VPS backup ID while running the `vzrestore` utility to point out what VPS backup is to be restored.

You can also use the `-b` and `-f` options to display information on the backed up VPS disk drives and the contents of a particular folder (i.e. all its subfolders and files) inside your VPS backup. In this case you should use the backup ID instead of the VPS ID to specify the backup the disk drives or folders of which is to be shown:

- To see information on the backed up VPS disk drives, issue the following command:

```
C:\...\Administrator>vzbackup list -b {BB05D401-CD53-...}\000011bk \
-S 203.156.156.203 -U Administrator -P 5tghy7ui8
connection adjust...
listing...

name size date
C:          Dec 31 16:00:00 1999
```

- To view the contents of a particular folder inside the VPS backup with the backup ID specified, you should provide the full path to the folder inside the VPS at the moment of the VPS backup creation. So, if you wish to view the contents of the `Private` subfolder that was located in the `C:\MyDocs` folder inside VPS 101 at the moment of the backup creation, you can execute the following command (assuming that the backup is taken from the example above):

```
C:\...\Administrator>vzbackup list -b {BB05D401-CD53-...}\000011bk \
-S 203.156.156.203 -U Administrator -P 5tghy7ui8 -f C:\MyDocs\Private
connection adjust...
listing...

C:\MyDocs\Private
Document1.doc
```

vzbackup storage

The `vzbackup storage` command is used to manage the folder on the Backup Node where VPS backups are to be stored. It has the following syntax:

```
vzbackup storage [options]
vzbackup storage -G [options]
vzbackup storage -D [options]
```

You can use the following options with the `vzbackup storage` command:

Name	Description
<code>-A, --srv_addr BackupNodeAddress</code>	The IP address or hostname of the Backup Node where the VPS backup folder location is to be changed. If the option is omitted, the path to the backup folder on your local Node will be modified.
<code>-U, --srv_user BackupNodeUser</code>	The user name used by <code>vzbackup storage</code> to log in to the Backup Node. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzbackup storage</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the VirtuoZZo installation.
<code>-P, --srv_passwd BackupNodePassword</code>	The password of the user specified as the value of the <code>-U</code> option. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzbackup storage</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the VirtuoZZo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.
<code>-a</code>	The path to the folder on the Backup Node. It can be a local folder or a folder on your network share. In case you wish to locate your backup folder on a network share and this share is password-protected, you should additionally specify the <code>-u</code> and <code>-p</code> options to access the folder.
<code>-u</code>	The user name used to log in to the network share where your backup folder is to be located. If your network share is not password-protected, you can omit this option.

-
- P The password of the user specified as the value of the `-u` option.
 - G Displays information about the VPS backup folder on the Backup Node.
 - D Deletes information about the current backup folder on the Backup Node. After removing information on the backup folder, you should set the backup folder anew (by executing the `vzbackup storage -a` command) to be able to save VPS backups on the Backup Node.

All VPS backups are stored in the folder on the Node you specified during the Virtuozzo installation for storing all VPS backups. By default, the `X:\vz\Backups` folder on the Node is used. To change the VPS backup folder location, you should execute the `vzbackup storage` command. For example:

```
C:\...\Administrator>vzbackup storage -A 203.156.156.203 \
-U Administrator -P 5tghy7ui8 -a G:\MyBackups -u Peter -p 3ewr45t
connection adjust
Command 'storage' is successfully finished
```

In our example, we specified the `MyBackups` folder located on the Backup Node with the IP address of `203.156.156.203` for storing your VPS backups. This folder is located on the `G:\` network disk drive mapped to the Backup Node. The `G:\` drive is password-protected and can be accessed by providing the `Peter` user name and the `3ewr45t` password.

Note: Before specifying another backup folder for storing VPS backups, please make sure that this folder already exists on the Backup Node; otherwise, the `vzbackup storage -a` command will fail.

To display information on the VPS backup folder located on the Backup Node with the IP address of `203.156.156.203`, you can execute the following command:

```
C:\...\Administrator>vzbackup storage -G -A 203.156.156.203 \
-U Administrator -P 5tghy7ui8
path = G:\MyBackups
login = Peter
```

The output shows us that:

- The `G:\MyBackups` folder is currently used to store VPS backups on the Backup Node with the IP address of `203.156.156.203`;
- The `MyBackups` folder is located on the password-protected `G:\` network drive and the `Peter` user name is used to log in to this network drive.

vzbackup delete

The `vzbackup delete` command is used to remove a VPS backup from the Backup Node. This command takes the backup ID to identify what VPS backup is to be removed from the Node. It has the following syntax:

```
vzbackup delete backupID [options]
```

You can use the following options with `vzbackup delete`:

Name	Description
<code>-A</code> , <i>BackupNodeAddress</i> <code>--srv_addr</code>	The IP address or hostname of the Backup Node from where the VPS backup is to be removed. If the option is omitted, the backup from your local Backup Node will be deleted. In the case of executing <code>vzbackup delete</code> on a Node other than the local Backup Node, you should obligatorily specify this option.
<code>-U</code> , <i>BackupNodeUser</i> <code>--srv_user</code>	The user name used by <code>vzbackup</code> to log in to the Backup Node. If the option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
<code>-P</code> , <i>BackupNodePasswr</i> <code>--srv_pswd</code>	The password of the user specified as the value of the <code>-U</code> option. In case the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.

If you are going to run the `vzbackup delete` command on the Backup Node itself, you only need to specify the VPS backup ID to remove it from the Node. However, to delete a VPS backup by executing the command on a Node other than the local Backup Node, you should also use the options described in the table above.

For example, the following session shows how to delete the backup of VPS 101 located on the Backup Node with the IP address of `203.156.156.203`:

- To learn what ID is assigned to the backup of VPS 101:

```
C:\...\Administrator>vzbackup list 101 -s 203.156.156.203 \
-U Administrator -P 5tghy7ui8
connection adjust...
listing...

VPS 101

backup ID                type   node      created
{BB05D401-CD53-...}\000011bk full   MyNode    17/09/2005 14:20:26
```

- To delete the backup of VPS 101:

```
C:\...\Administrator> vzbackup delete {BB05D401-CD53-...}\000011bk
connection adjust...
deleting...
Command 'delete' is successfully finished
```

vzrestore

The `vzrestore` utility is used to restore and manage Virtual Private Server backups. It uses the VPS backups stored on the Backup Node to restore them to their original Hardware Node(s) or to any other Node on your network. Similarly to `vzbackup`, it can be:

- Run on virtually every Node in your network:
 - On the Backup Node where VPS backups are stored;
 - On the Destination Node where the backed up VPS is to be restored, or
 - On any other Virtuozzo-based physical server in your network

The only requirements that should be met to execute `vzrestore` is to have a computer with Virtuozzo 3.5 for Windows installed on it and to provide the network connectivity for this computer to be able to establish connections to the Backup and Destination Nodes, if necessary.

- Used to manage your existing VPS backups:
 - List all VPS backups available on the Backup Node and display detailed information on them;
 - Change the path to the folder on the Backup Node where VPS backups are to be stored;
 - Remove a VPS backup.

The `vzrestore` utility has the following syntax:

```
vzrestore VPS_ID -b backupID [options]
vzrestore --help
```

The following options can be used with the `vzrestore` utility:

Name	Description
<code>-b backupID</code>	The ID assigned to the VPS backup during its creation and uniquely identifying the backup.
<code>-A, --srv_addr BackupNodeAddress</code>	The IP address or hostname of the Backup Node from where the VPS is to be restored. If the option is omitted, the VPS backup from your local Backup Node will be restored. In the case of running <code>vzrestore</code> on a Node other than the local Backup Node, you should obligatorily specify this option.
<code>-U, --srv_user BackupNodeUser</code>	The user name used by <code>vzrestore</code> to log in to the Backup Node. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzrestore</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
<code>-P, --srv_pswd BackupNodePasswd</code>	The password of the user specified as the value of the <code>-U</code> option. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzrestore</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.

<code>-a,</code> <i>DestNodeAddress</i>	<code>--clnt_addr</code>	The IP address or hostname of the Destination Node where the VPS backup is to be restored. If the option is omitted, the VPS backup will be restored to your local Backup Node which will act in this case as the Destination Node. In the case of running <code>vzrestore</code> on a Node other than the Destination Node, you should obligatorily specify this option.
<code>-u,</code> <i>DestNodeUser</i>	<code>--srv_user</code>	The user name used by <code>vzrestore</code> to log in to the Destination Node. This option is taken into account in case the <code>-a</code> option is specified during the <code>vzrestore</code> execution. If the <code>-a</code> option is specified and the <code>-u</code> option is omitted, the utility tries to log in to the Destination Node as <code>vzagent0</code> created on the Destination Node during the Virtuozzo installation.
<code>-p,</code> <i>DestNodePasswrđ</i>	<code>--srv_pswd</code>	The password of the user specified as the value of the <code>-u</code> option. This option is taken into account in case the <code>-a</code> option is specified during the <code>vzrestore</code> execution. If the <code>-a</code> option is used and the <code>-u</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Destination Node for managing your Node and all its VPSs by means of VZMC and VZCC.
<code>-f,</code> <i>FileName</i>	<code>--files</code>	The full path to the file/folder inside the VPS backup with the specified backup ID that you wish to restore. You can specify several files/folders and separate them by spaces.

To restore a particular VPS backup, you should specify two options:

- the VPS ID and
- the backup ID.

For example, to restore a backup of VPS 101 having the backup ID of `{BB05D401-CD53-...}\000011bk` and residing on the Backup Node with the IP address of `203.156.156.203` to the Destination Node with the IP address of `122.133.133.122`, you should do the following:

```
C:\...\Administrator>vzrestore 101 -b {BB05D401-CD53-...}\000011bk \
-A 203.156.156.156 -U Administrator -P 5tghy7ui8 -a 122.133.133.122 \
-u Administrator -p t6uj8js0
connection adjust
restoring
Command 'vzrestore' is successfully finished
```

Note: The VPS on the Destination Node you are going to restore should be stopped; otherwise, the restoring process will fail.

vzrestore list

The `vzrestore list` command lists all Virtual Private Servers backups available on the Backup Node. It has the following syntax:

```
vzrestore list VPS_ID [options]
vzrestore list -b backup_ID [options]
```

The options that can be passed to `vzrestore list` are presented in the table below:

Name	Description
-A, <i>BackupNodeAddress</i> --srv_addr	The IP address or hostname of the Backup Node where the VPS backup is stored. If the option is omitted, your local Backup Node will be searched for available backups of the specified VPS. In the case of executing <code>vzrestore list</code> on a Node other than the local Backup Node, you should obligatorily specify this option.
-U, <i>BackupNodeUser</i> --srv_user	The user name used by <code>vzrestore</code> to log in to the Backup Node. This option is taken into account in case the -A option is specified during the <code>vzrestore list</code> execution. If the -A option is used and the -U option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
-P, <i>BackupNodePassword</i> --srv_pswd	The password of the user specified as the value of the -U option. This option is taken into account in case the -A option is specified during the <code>vzrestore list</code> execution. If the -A option is used and the -U option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.
--all	Displays detailed information on the Virtual Private Server backup(s).
-b <i>backup_ID</i>	Lists all disk drives contained in the VPS backup with the specified backup ID. Note: If you use the -b option, you should not specify the Virtual Private Server ID (e.g. <code>vzrestore list -b {BB05D401-CD53-...}\000011bk</code>).
-f <i>FolderName</i>	Displays the contents of the specified folder in the VPS backup. If the option is omitted, the contents of the <code>C:\</code> folder is shown. This option should be used in conjunction with the -b option.

For example, if you wish to list all available backups of VPS 101 on the Backup Node having the IP address of 203.156.156.203, you can issue the following command on the Hardware Node:

```
C:\...\Administrator>vzrestore list 101 -S 203.156.156.203 \
-U Administrator -P 5tghy7ui8 --all
connection adjust...
listing...

VPS 101

backup ID                type    node      created
{BB05D401-CD53-...}\000011bk  full   MyNode    17/09/2005 14:20:26
```

In the example above, the connection to the Backup Node is established by using the Administrator credentials (specified as the values of the `-U` and `-P` options). The output shows us that only one backup of VPS 101 exists on the Backup Node having the IP address of 203.156.156.203. Information on the VPS backup is presented in the table having the following columns:

- `type`: the backup type. It can be either full or incremental. In our case we created a full VPS backup containing the whole VPS private area and its registry settings. Detailed information on backup types is provided in the [Backing Up and Restoring VPS](#) section (on page 45).
- `node`: the hostname of the Backup Node where the VPS backup is stored. In our case the Backup Node has the `MyNode` hostname which corresponds to the IP address of 203.156.156.203.
- `created`: the date and time of the backup creation. As can be seen, our VPS backup was created on September 17, 2005 at 14:20:26.
- `backup ID`: the backup ID assigned to the VPS backup during its creation.

You can also use the `-b` and `-f` options to display information on the backed up VPS disk drives and the contents of a particular folder (i.e. all its subfolders and files) inside your VPS backup. In this case you should use the backup ID instead of the VPS ID to specify the backup the disk drives or folders of which is to be shown:

- To see information on the backed up VPS disk drives, issue the following command:

```
C:\...\Administrator>vzrestore list -b {BB05D401-CD53-...}\000011bk \
-S 203.156.156.203 -U Administrator -P 5tghy7ui8
connection adjust...
listing...

name  size  date
C:    Dec 31 16:00:00 1999
```

- To view the contents of a particular folder inside the VPS backup with the backup ID specified, you should provide the full path to the folder inside the VPS at the moment of the VPS backup creation. So, if you wish to view the contents of the `Private` subfolder that was located in the `C:\MyDocs` folder inside VPS 101 at the moment of the backup creation, you can execute the following command (assuming that the backup is taken from the example above):

```
C:\...\Administrator>vzrestore list -b {BB05D401-CD53-...}\000011bk \
-S 203.156.156.203 -U Administrator -P 5tghy7ui8 -f C:\MyDocs\Private
connection adjust...
listing...

C:\MyDocs\Private
```

Document1.doc

vzrestore storage

The `vzrestore storage` command is used to manage the default backup folder on the Backup Node, i.e. the folder where all VPS backups are to be stored. It has the following syntax:

```
vzrestore storage [options]
vzrestore storage -G [options]
vzbackup storage -D [options]
```

You can use the following options with the `vzrestore storage` command:

Name	Description
<code>-A, BackupNodeAddress</code> <code>--srv_addr</code>	The IP address or hostname of the Backup Node where the VPS backup folder location is to be changed. If the option is omitted, the path to the backup folder on your local Node will be modified.
<code>-U, BackupNodeUser</code> <code>--srv_user</code>	The user name used by <code>vzrestore storage</code> to log in to the Backup Node. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzrestore storage</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
<code>-P, BackupNodePassword</code> <code>--srv_passwd</code>	The password of the user specified as the value of the <code>-U</code> option. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzrestore storage</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> user. This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.
<code>-a</code>	The path to the folder on the Backup Node. It can be a local folder or a folder on your network share. In case you wish to locate your backup folder on a network share and this share is password-protected, you should additionally specify the <code>-u</code> and <code>-p</code> options to access the folder.
<code>-u</code>	The user name used to log in to the network share where your backup folder is to be located. If your network share is not password-protected, you can omit this option.
<code>-p</code>	The password of the user specified as the value of the <code>-u</code> option.
<code>-G</code>	Displays information about the VPS backup folder on the Backup Node.
<code>-D</code>	Deletes information about the current backup folder on the Backup Node. After removing information on the backup folder, you should set the backup folder anew (by executing the <code>vzbackup storage -a</code> command) to be able to save VPS backups on the Backup Node.

All VPS backups are stored in the folder on the Node you specified during the Virtuozzo installation for storing all VPS backups. By default, the `X:\vz\Backups` folder on the Node is used. To change the VPS backup folder location, you should use the `vzrestore` storage command. For example:

```
C:\...\Administrator>vzrestore storage -A 203.156.156.203 \
-U Administrator -P 5tghy7ui8 -a G:\MyBackups -u Peter -p 3ewr45t
connection adjust
Command 'storage' is successfully finished
```

In our example, we specified the `MyBackups` folder on the Backup Node with the IP address of `203.156.156.203` for storing your VPS backups. This folder is located on the `G:\` network disk drive mapped to the Backup Node. The `G:\` drive is password-protected and can be accessed by providing the `Peter` user name and the `3ewr45t` password.

Note: Before specifying another backup folder for storing VPS backups, please make sure that this folder already exists on the Backup Node; otherwise, the `vzbackup storage -a` command will fail.

To display information on the VPS backup folder located on the Backup Node with the IP address of `203.156.156.203`, you can execute the following command:

```
C:\...\Administrator>vzrestore storage -G -A 203.156.156.203 \
-U Administrator -P 5tghy7ui8
path = G:\MyBackups
login = Peter
```

The output shows us that:

- The `G:\MyBackups` folder is currently used to store VPS backups on the Backup Node with the IP address of `203.156.156.203`;
- The `MyBackups` folder is located on the password-protected `G:\` network drive and the `Peter` user name is used to log in to this network drive.

vzrestore delete

The `vzrestore delete` command is used to remove a VPS backup from the Backup Node. This command takes the backup ID to identify what VPS backup is to be deleted from the Node. It has the following syntax:

```
vzrestore delete backupID [options]
```

You can use the following options with `vzrestore delete`:

Name	Description
<code>-A, --srv_addr BackupNodeAddress</code>	The IP address or hostname of the Backup Node from the where the VPS backup is to be removed. If the option is omitted, the backup will be deleted from your local Backup Node. In the case of executing <code>vzrestore delete</code> on a Node other than the local Backup Node, you should obligatorily specify this option.

<code>-U, BackupNodeUser</code>	<code>--srv_user</code>	The user name used by <code>vzrestore delete</code> to log in to the Backup Node. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzrestore delete</code> execution. If the <code>-A</code> option is used and the <code>-U</code> option is omitted, the utility tries to log in to the Backup Node as <code>vzagent0</code> created on the Backup Node during the Virtuozzo installation.
<code>-P, BackupNodePasswrđ</code>	<code>--srv_pswd</code>	The password of the user specified as the value of the <code>-U</code> option. This option is taken into account in case the <code>-A</code> option is specified during the <code>vzrestore delete</code> execution. If the <code>-A</code> is used and the <code>-U</code> option is omitted, you should enter the password of the <code>vzagent0</code> . This is the same password you entered during the Virtuozzo installation on the Backup Node for managing your Node and all its VPSs by means of VZMC and VZCC.

If you are going to run the `vzrestore delete` command on the Backup Node itself, you only need to specify the VPS backup ID(s) to remove it from the Node. However, to delete a VPS backup by executing the command on a Node other than local Backup Node, you should also use the options described in the table above.

For example, the following session shows how to delete the VPS backup of VPS 101 located on the Backup Node with the IP address of `203.156.156.203`:

- To learn what ID is assigned to the backup of VPS 101:

```
C:\...\Administrator>vzrestore list 101 -S 203.156.156.203 \
-U Administrator -P 5tghy7ui8
connection adjust...
listing...

VPS 101
```

backup ID	type	node	created
{BB05D401-CD53-...}\000011bk	full	MyNode	17/09/2005 14:20:26

- To delete the backup of VPS 101 with the backup ID of `{BB05D401-CD53-...}\000011bk`:

```
C:\...\Administrator> vzrestore delete {BB05D401-CD53-...}\000011bk
connection adjust...
deleting...
Command 'delete' is successfully finished
```

Template Management Utilities

Template (or package set) is a set of original application files, repackaged for mounting over Virtuozzo File System. There are two types of templates in Virtuozzo: *OS templates* are used to create new Virtual Private Servers. A typical example of the OS template is the template containing the Windows Server 2003 distribution kit. OS template cannot be installed into VPS, because VPS is already based on some OS template. *Application templates* can be installed into VPS after VPS creation; more than one application template may be installed in the same VPS. Examples of application templates are the `msde` template, `openssh` template, or template with any other application (possibly more than one in single template) not included into OS template for some reason.

vzpkgls

This utility lists templates installed on the Hardware Node or already installed into a particular VPS. It has the following syntax:

```
vzpkgls [options] [<VPSID> ...]
```

If you specify one or more Virtual Private Server IDs to this command, it lists templates applied to the VPSs. Without the <VPSID> argument, the utility lists templates available for Virtual Private Servers on the Hardware Node. Other options available to the `vzpkgls` command are listed below:

<code>-h, --help</code>	Displays the usage information and exits.
<code>-d, --deployed</code>	List the templates ready to be used for Virtual Private Servers.
<code>-s, --separate</code>	By default <code>vzpkgls</code> outputs template and all its updates on a single line separated by a space. This option changes output and prints a separate line for each available version of the template.
<code>--quiet</code>	Disables logging to the display and to the log file.
<code>--verbose</code>	Sets the log level to the maximum possible value for this <code>vzpkgls</code> session.

vzpkgdeploy

This utility is used for managing OS and application templates on the Hardware Node. It has the following syntax:

```
vzpkgdeploy [options] PACKAGESTUB DISTRIBPATH
vzpkgdeploy [options] --install | --uninstall PACKAGE...
vzpkgdeploy --help
```

The options available to this command are:

<code>-i, PACKAGE...</code>	<code>--install</code> Install deployed template(s) on the Hardware Node.
<code>-u, PACKAGE...</code>	<code>--uninstall</code> Uninstall template(s) already installed on the Hardware Node.
<code>-s</code>	Add Windows Server 2003 components necessary for running Virtuozzo to the Host OS.
<code>-h, --help</code>	Display the usage information and exit.
<code>--quiet</code>	Disables logging to the display and to the log file.
<code>--verbose</code>	Sets the log level to the maximum possible value for this <code>vzpkgdeploy</code> session.

vzpkgadd

This utility is used to add an application template to a Virtual Private Server. It has the following syntax:

```
vzpkgadd [options] <VPSID> PACKAGE[/VERSION]...
```

This command will add a template (<template>) to the Virtual Private Server with the ID of <VPSID>. The <version> parameter specifies the template version to use if there are available upgrades; by default, the latest available version is used.

You may specify a number of templates for adding to a VPS.

Options available to this command are:

-h, --help	Display the usage info and exit.
-f, --force	Force template installation.
--quiet	Disables logging to the display and to the log file.
--verbose	Sets the log level to the maximum possible value for this vzpkgadd session.

A Virtual Private Server has to be running in order to apply a template to it.

Supplementary Tools

vzsveinstall

This utility is used for the Service Virtual Private Server installation. The Service VPS is needed for running VZAgent, which is used by Virtuozzo Management Console. The syntax of this command is as follows:

```
vzsveinstall -s IP [-t OS_Template] [-p] [-w] [-f]
```

This utility creates and starts the Service Virtual Private Server. This utility accepts the following options:

-h, --help	Displays the utility help.
-s <svpsip>	Required. IP address to be assigned to the Service Virtual Private Server.
-t <OS template>	Optional. OS template to use for the Service Virtual Private Server. By default, w2k3 is used.
-p	Optional. Reads the vzagent0 password from the standard input. By default, it reads from the console.
-w	Optional. Allows to install the Virtuozzo Control Center application to the Service VPS.

Upon creating the Service Virtual Privates Server and installing the necessary packages into it, vzsveinstall will prompt you for the vzagent0 user password. Remember this password: you will need it when registering the Hardware Node in Virtuozzo Management Console.

vzkeygen

This utility is used to generate the Hardware Node ID to uniquely identify the Node. You should send your HWID together with a Virtuozzo license request to the SWsoft sales department to obtain a license for running Virtuozzo. It has the following syntax:

```
vzkeygen [-n, --company-name NAME] [-o, --output-file FILENAME]
vzkeygen [-h, --help]
```

When using the utility without any options, the output is directed to `stdout`. By providing the `-n` and `-o` options, the Hardware Node ID will be stored in the specified file in the `C:\Documents and Settings\Administrator` directory.

vzcache

There may be situations when one and the same application or application update is installed not as a template, but separately inside each and every VPS. A good example of this is the Adobe Acrobat Reader application that can be installed inside a number of Virtual Private Servers thus having a vast amount of identical files throughout the VPSs. This fact tells dramatically on the VPS quotas, which may be avoided by putting all the identical files to the Hardware Node template area and creating links instead of real files inside the affected VPSs.

The problem like the one described above is solved by using the `vzcache` utility. The `vzcache` utility scans the specified Virtual Private Servers for common files and caches these files in the Hardware Node template area (in the `C:\vz\templates__vzcache` directory), replacing the real files inside the VPSs with links or the so-called stubs, to the template area. In case of a significant number of identical files, using this utility results in a notable disk space gain. `vzcache` has the following syntax:

```
vzcache [options] VPSID-list
```

The following command-line options can be used with the `vzcache` utility:

Option	Description
<code>-h, --help</code>	Print usage information.
<code>--version</code>	Display the utility version.
<code>-v, --verbose</code>	Verbose mode. Causes <code>vzcache</code> to print debugging messages about its progress. Multiple <code>-v</code> options increase verbosity. The maximal number of allowed options is 2.
<code>-q, --quiet</code>	Quiet mode. Causes all warning and diagnostic messages to be suppressed. Only fatal errors are displayed.
<code>-a, --append</code>	Use an existing cache for comparing its files with the regular files inside the specified Virtual Private Servers. Should be used together with the <code>-n</code> option.
<code>-n, --cache-name NAME</code>	The name of the cache subdirectory in the <code>C:\vz\templates__vzcache</code> directory.
<code>-t, --test</code>	Do not perform any caching. Just collect and display the statistics on identical files.
<code>-s, --size-limit N</code>	Do not process files smaller than <code>N</code> bytes. By default, only empty files are not processed.
<code>-c, --comm-index M</code>	Cache files found at least <code>M</code> times. The default value is 2.

`-f, --force` Force `vzcache` operations for a single Virtual Private Server and single regular files.

Here are some examples on using the `vzcache` utility:

To create a cache named `myfirstcache` for VPSs 153 and 154 caching only those files which are greater than 1024 bytes by using the `vzcache` utility, you should issue the following command:

```
vzcache -s 1024 -n myfirstcache 153 154
```

To append VPS 155 to the existing `myfirstcache` cache:

```
vzcache -a -n myfirstcache 155
```

vzlscache

The `vzlscache` utility displays a list of cache directories created by the `vzcache` utility (see above). It can be used to show either all the cache directories created on the given Hardware Node, or those used by the specified VPS(s). The syntax of the command is the following:

```
vzlscache [options] [VPSID ...]
```

The following options may be given:

Option	Description
<code>-h, --help</code>	Print usage information.
<code>-q, --quiet</code>	Quiet mode. Causes all warning and diagnostic messages to be suppressed. Only fatal errors are displayed.

vzuncache

Whereas the `vzcache` utility helps effectively gain disk space both in the Hardware Node and within Virtual Private Servers, there may be situations when it is necessary to detach a Virtual Private Server from its cache and copy the cached files back to the VPS private area. A typical example of this is migrating a VPS to another Hardware Node. The migration is not possible if there are links in the VPS private area pointing to the `C:\vz\templates__vzcache` directory on the Hardware Node.

The `vzuncache` utility is used to copy the regular files from the specified cache directory on the Hardware Node (located in the `C:\vz\templates__vzcache` directory) back to the private area of the specified VPS, replacing the corresponding links or stubs inside the VPS with the real files and thus detaching the VPS from its cache. `vzuncache` has the following syntax:

```
vzuncache [options] VPSID [cache-directory-name ...]
```

The following command-line options can be used with the `vzuncache` utility:

Option	Description
<code>-h, --help</code>	Print usage information.
<code>--version</code>	Display the utility version.
<code>-q, --quiet</code>	Quiet mode. Causes all warning and diagnostic messages to be suppressed. Only fatal errors are displayed.

<code>-v, --verbose</code>	Verbose mode. Causes <code>vzuncache</code> to print debugging messages about its progress. Multiple <code>-v</code> options increase verbosity.
<code>-a, --all</code>	Detach the specified Virtual Private Server from all the caches. The list of cache directories is not needed if this option is specified.
<code>-t, --test</code>	Do not copy files from the cache. Just collect and display the relevant statistics.
<code>-f, --force</code>	Detach the specified Virtual Private Server from its cache even in case the cache does not exist.

For example, you can use the `vzuncache` utility to learn what cache(s) a certain VPS is using or to ensure that it does not use any caches:

```
vzuncache -t -f -a <VPSID>
```

Glossary

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

Hardware Node (or *Node*) is a computer where *Virtuozzo* is installed for hosting *Virtual Private Servers*.

HN is an abbreviation of *Hardware Node*.

Host Operating System (or *Host OS*) is an operating system installed on the *Hardware Node*. Sometimes, it is marked as *VPS 0*.

HSPcomplete is an end-to-end solution for Hosting Service Providers by SWsoft. Is dependent on *Virtuozzo*.

OS template (or *Operating System template*) is used to create new *Virtual Private Servers*. See also *Template*.

Package set is a synonym for *Template*.

Private area is a part of the file system where *VPS* files that are not shared with other *Virtual Private Servers* are stored.

QoS is an abbreviation of *Quality of Service*.

Quality of Service specifies the performance properties of a *VPS*. It allows you to provide a fair share of the main system resources among *Virtual Private Servers* and better service quality for preferred *VPSs*.

Service Virtual Private Server denotes a special secure *VPS* running *VZAgent* which is responsible for managing all the *Virtual Private Servers* of the given *Hardware Node*. You should use the IP address of the Service *VPS* to connect to a *Hardware Node* by means of *VZMC* or *VZCC*. The Service *VPS* is always marked as *Virtual Private Server 1*.

Service VPS is an abbreviation of *Service Virtual Private Server*.

SSH stands for *Secure Shell*. It is a protocol for logging on to a remote machine and executing commands on that machine. It provides secure encrypted communications between two untrusted hosts over an insecure network.

Stub is a special file (usually inside a *Virtual Private Server*) containing a pointer to a real file on the *Node*. The size of this file is equal to 0. However, thanks to the *Virtuozzo File System*, stubs appear to a *VPS* user as real files.

TCP (TCP/IP) stands for *Transmission Control Protocol/Internet Protocol*. This suite of communications protocols is used to connect hosts on the *Internet*.

Template (or *package set*) is a set of original application files (packages) repackaged for mounting over *Virtuozzo File System*. There are two types of templates. *OS Templates* are used to create new *Virtual Private Servers*. *Application templates* are used to install an application or a set of applications in *Virtual Private Servers*.

UBC is an abbreviation of *User Beancounter*.

User Beancounter is the subsystem of *Virtuozzo* for managing VPS memory and some system-related resources.

Virtual Environment or *VE* is an obsolete designation of a virtual private server. See *Virtual Private Server*.

Virtual Private Server is a virtual private server, which is functionally identical to an isolated standalone server, with its own IP addresses, processes, files, its own users database, its own configuration files, its own applications, system libraries, and so on. *Virtual Private Servers* share one *Hardware Node* and one OS kernel. However, they are isolated from each other. *Virtual Private Server* is a kind of ‘sandbox’ for processes and users. *Virtual Private Server 0* is used to designate the *Hardware Node* itself.

Virtuozzo is a complete server automation and virtualization solution allowing you to create multiple isolated *Virtual Private Servers* on a single physical server to share hardware, licenses, and management effort with maximum efficiency.

Virtuozzo Adapter is a virtual networking device, a gateway from a *VPS* to the external network. *Virtuozzo Adapter* is automatically created during the *Virtuozzo* installation.

Virtuozzo Control Center is a tool designed for managing a particular *Hardware Node* and all *Virtual Private Servers* residing on it with the help of a standard Web browser on any platform.

Virtuozzo File System is a virtual file system for mounting to *VPS* private areas. *VZFS* links are seen as real files inside *Virtual Private Servers*.

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

Virtuozzo Management Console is a *Virtuozzo* management and monitoring tool with graphical user interface. It uses *VZagent Protocol* to control *Hardware Nodes* and their *Virtual Private Servers*. *VZMC* is cross-platform and runs on both Microsoft Windows and Linux workstations.

Virtuozzo Power Panels is a means for administering personal *Virtual Private Servers* with the help of a standard Web browser (Internet Explorer, Mozilla, etc.) on any platform.

VPS is an abbreviation of *Virtual Private Server*.

VPS 0 is used to designate a *Hardware Node* where *Virtuozzo* is installed.

VZagent is a special software used to tune, monitor, and manage the given *Hardware Node* and all the *Virtual Private Servers* residing on this Node.

VZagent Protocol is an XML-based protocol used to monitor and manage a *Hardware Node*. The *vzagent* software implements this protocol and is a backend for the *Virtuozzo Management Console* and other *Virtuozzo* utilities.

vzagent0 is the user who has a full administrative access to the *Service VPS*. You will need to provide this user name and password when connecting to a Hardware Node by means of *VZMC* and *VZCC*.

VZCC is an abbreviation of *Virtuozzo Control Center*.

VZCC license is a license needed to activate *VZCC*. You should enter it the first time you log in to *VZCC*.

VZFS is an abbreviation of *Virtuozzo File System*.

VZMC is an abbreviation of *Virtuozzo Management Console*.

VZMC license is a license needed to activate *VZMC*. You should enter it the first time you launch *VZMC*.

VZPP is an abbreviation of *Virtuozzo Power Panels*.

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