



SWSOFT™

VIRTUOZZO™

SWsoft, Inc.

Virtuozzo™ for Windows

Evaluation Guide

Version 3.5.1 Service Pack 1



SWSOFT™

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CHAPTER 1

Preface

In This Chapter

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About This Guide

This guide is destined to introduce you to the main features of Virtuozzo 3.5.1 Service Pack 1 (SP1) and to its underlying technology, to help you set up an environment for evaluating the Virtuozzo major features, and to suggest the relevant procedures for this evaluation.

Who Should Read This Guide

This guide should be read by anyone evaluating Virtuozzo 3.5.1 SP1 for Windows. You can read this guide to get acquainted with the Virtuozzo capabilities, but it is recommended to follow this guide to get first-hand experience with the Virtuozzo features. Minimal Windows administration skills are required in order to fully understand the guide and complete the evaluation exercises.

Organization of This Guide

Chapter 2, *Introduction*, centers on the mission and main features of the Virtuozzo software, introduces major Virtuozzo notions, and elucidates the underlying technology.

Chapter 3, *Setting Up Evaluation Environment*, enumerates all the pre-requisites you must have for performing a test installation of Virtuozzo and provides complete instructions on how to do it.

Chapter 4, *Evaluating Virtuozzo for Windows*, guides you thru the process of evaluation with the help of a number of thought-out exercises allowing you to assess the Virtuozzo capabilities and decide whether Virtuozzo suits your purposes.

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 VE 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 VE. |
| <i>Monospace Italics</i> | Designates a command line placeholder, which is to be replaced with a real name or value. | To delete a VE, type <code>vzctl delete VE_ID</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.

Introduction

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Design Goals

The problem Virtuozzo™ is intended to solve may be outlined as follows:

Any modern enterprise experiences a number of problems related to maintaining its IT server infrastructure. These problems are brought about by an immense number of hardware servers present in any corporation. Large companies might have thousands, if not tens of thousands of servers in their datacenters. The manifestations of these problems boil down to the following:

- Having so huge a number of various servers involves very high costs on maintaining the IT infrastructure, let alone the price of the hardware as such. The software licenses are very often not used to their full extent, and the paychecks of administrative personnel amount to one of the greatest expense items in the corporation's budget.
- The prospective increase in the requirements for resources on the part of various departments within the enterprise makes it necessary to buy more powerful hardware than is currently needed, so much of the hardware power remains underused for a long time. On the other hand, using the hardware full power often means that this hardware will be outdated in a matter of months, which results in a low service level.
- Managing a multitude of thousands of servers is a very complex task, that puts great demands on both the quality and quantity of human resources involved in solving this task.
- With each hardware box in charge of a single server application, it is next to impossible to painlessly move an application to, say, a more powerful machine, or bring two applications together into one hardware server in order to fully use the computing resources of the latter. Thus, an extremely low flexibility of the existing infrastructure is obvious.

Many solutions present on the today's server automation market only add an additional set of servers with an additional level of management complexity and, therefore, make the problem still graver. The management costs soar, the software becomes more expensive, and the hardware – less utilized.

The implementation of Virtuozzo™ infrastructure decreases these costs, provides a significantly better and more controllable service level, lowers the complexity, and increases the flexibility of the enterprise IT assets.

Usage Scenarios

Virtuozzo empowers any enterprise to keep up with its increasing demands on IT infrastructure and management. Virtuozzo can be used to consolidate servers, manage critical application growth and minimize downtime, administer departmental and remotely located servers, and control development environments:

- *Server consolidation.* Application and IT managers have become accustomed to dedicating a physical server to each application and, with today's high powered servers, this approach leads to low utilization rates. Server consolidation dramatically increases the hardware utilization levels by placing multiple Virtuozzo VEs on a single physical server. The unique Virtuozzo VE architecture further accelerates the cost savings by reducing software licensing and support costs and through extensive management tools that help automate server management tasks. VE consolidation is also transparent to users making the consolidation much easier for IT organizations.
- *Managing critical application growth and minimizing down-time.* Business applications such as Microsoft Exchange have become critical business enablers. In response, IT departments nearly always overprovision and place these applications on dedicated servers. With Virtuozzo VEs, you can manage growth simply by placing the application on a server with excess capacity and utilizing the unused capacity for other VEs. VEs can be migrated to other physical servers in minutes so growth can be easily accommodated. VEs make hardware irrelevant and capacity planning less difficult.
- *Administering departmental and remotely located servers.* Many businesses have complex departmental, decentralized location, or specific configuration requests for IT infrastructure that are difficult and inefficient to manage. VEs help IT departments provide end users with the desired or required technology support without the complexity becoming cost prohibitive. It is no longer necessary to manually order and provision separate physical servers for each departmental application.
- *Controlling development environments.* Virtuozzo is designed for and typically used with deployed applications. It can also be a very important tool in a development environment, increasing quality and decreasing time-to-market. VEs are isolated from each other just like regular servers; therefore, a change can be made inside one VE without fear of harming any other VE. Developers will no longer need personal stand-alone servers. Moreover, quality assurance and testing can deploy a multitude of VEs on a single server for stress testing.

Virtuozzo may also be readily bundled with any Hosting Service Providers solution capable of working with Virtual Environments. Virtuozzo allows Hosting Service Providers to have a multitude of customers with their individual full-featured Virtual Environments sharing a single physical server, to provide each customer with a guaranteed Quality of Service, and to move customers and their environments between servers, without any manual reconfiguration.

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 Environments for testing purposes and the like.

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

Virtuozzo Capabilities

Virtuozzo is a complete server automation and virtualization solution based on a patent-pending technology developed by SWsoft. Virtuozzo creates multiple isolated Virtual Environments (VEs) on a single physical server to share hardware, licenses, and management effort with maximum efficiency. Each VE 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 VEs, each with full dedicated server functionality.
- **Resource Management** – Assign and control VE resource parameters and re-allocate resources in real-time.
- **Virtualization** - Move VEs and its application(s) between physical servers transparently with near-zero or zero downtime.
- **Mass Management** - Manage a multitude of physical servers and Virtual Environments in a unified way.

Technology Overview

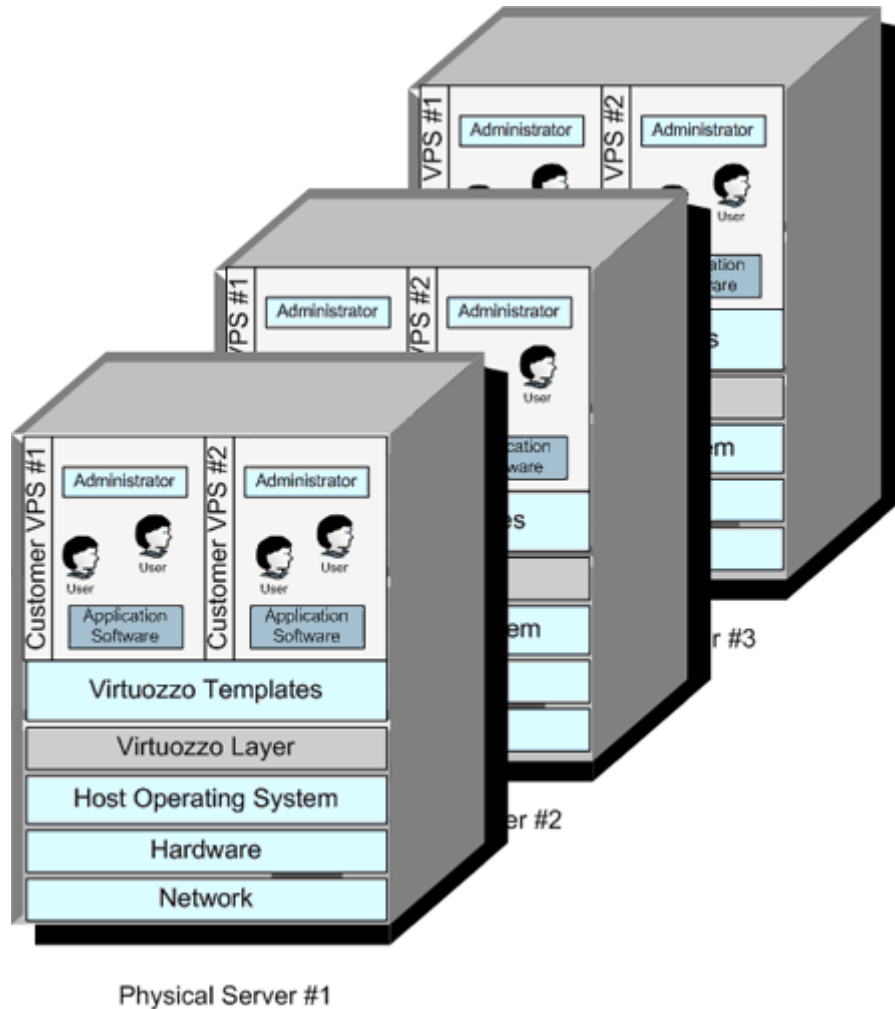


Figure 1: Virtuozzo Technology

This figure represents three separate servers with Virtuozzo installed. In Virtuozzo terminology, a server with Virtuozzo loaded is called a *Hardware Node* (or *HN*, or just a *Node*), because it represents a hardware unit within a network.

Virtuozzo for Windows is installed on a computer running Windows 2003 Server (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 shown as *Virtuozzo Layer* in the figure above. The Virtuozzo layer ensures that Virtual Environments, sharing the same *Hardware Node* and the same OS kernel, are isolated from each other. A Virtual Environment is a kind of ‘sandbox’ for processes and users.

Before you are able to create a Virtual Environment, 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 Environments can run only the Windows Server 2003 OS and the Windows Server 2003 OS with Service Pack 1 installed (English, German, French, Spanish, Traditional Chinese, Simplified Chinese, or Japanese Standard or Enterprise Edition). In this case we say that a VE is based on the Windows 2003 Server OS template.

After you have installed at least one OS template, you can create any number of VEs 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 VEs 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.

CHAPTER 3

Setting Up Evaluation Environment

This chapter presents a way to prepare custom Virtuozzo installations for you to seamlessly perform the demonstration exercises presented in the *Evaluating Virtuozzo for Windows* chapter (on page 49).

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Planning Your Virtuozzo System

Before installing the product, you should carefully plan the structure of your Virtuozzo network and the role(s) the individual computers are to perform in it. This will help you avoid many problems related to the Virtuozzo support maintenance and successfully solve the problems, if they appear.

The principal roles of computers in a Virtuozzo network are the following:

- 1 Hardware Node.** It is a computer with the Virtuozzo software installed that houses a certain number of Virtual Environments.
- 2 VZMC workstation.** It is a computer running a Windows OS with Virtuozzo Management Console (VZMC) installed. It may be located virtually everywhere on the Internet and serves for the remote administration of your Hardware Nodes.
- 3 VZCC client.** It is a computer providing you with the ability to manage a particular Hardware Node and all Virtual Environments residing on it with the help of a standard Web browser on any platform. The only requirement this computer should meet is to be able to connect to the Hardware Node and run a Web browser supported by Virtuozzo.
- 4 Backup Node.** It is a computer running the Virtuozzo software and used to store the Virtual Environments backups on its hard disk(s).
- 5 Monitor Node.** It is a computer running a Windows OS that allows you to keep track of the resources consumption on your Hardware Nodes and the state of the Nodes themselves.

Graphically, a typical Virtuozzo system may be represented as follows:

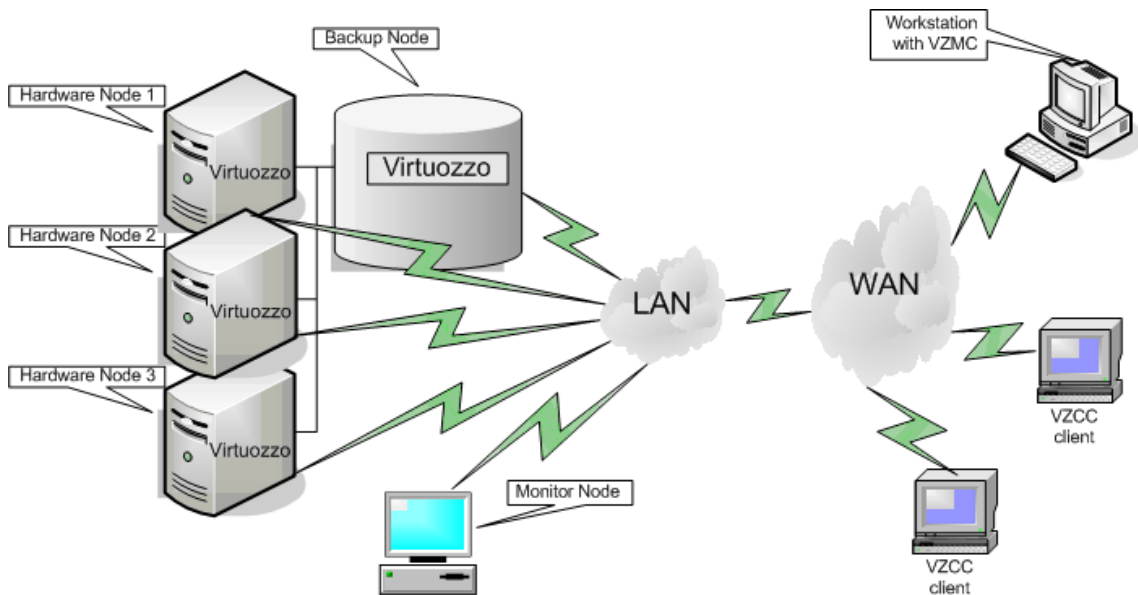


Figure 2: Virtuozzo System Configuration Scheme

This picture shows the configuration with a network consisting of a number of Hardware Nodes and two computers performing the functions of the Backup Node and the Monitor Node, respectively. As a rule, you are supposed to have several Virtuozzo-based physical servers; however, you may have only one dedicated server to effectively use Virtuozzo. All the Hardware Nodes have separate Virtuozzo licenses loaded to them and host a number of Virtual Private Servers. All the VEs residing on the Hardware Nodes can be migrated from one Node to another with near-zero downtime; so, you can easily move all VEs from a Node in case of its upgrading or for any other purpose. It is recommended to keep all the Hardware Nodes in one subnet. In this case you will be able to transparently migrate VEs from one Node to another without having to modify the VEs IP addresses or the HN routing tables.

The Backup Node is a Node intended for storing the backups of all your Virtual Environments. Generally, any Hardware Node can be assigned an additional role of the Backup Node. However, we recommend that you set up a dedicated Backup Node (which is shown in the picture above). The Backup Node shall run Virtuozzo and have high-capacity hard drives to be able to store the VEs backups on them. If you plan to use a dedicated Node for storing the VE backups only, you do not have to install a Virtuozzo license on this Node.

The Monitor Node has a standard network interface, periodically checks up the state of the Hardware Nodes registered for being monitored, and sends alerts to you if a Node is down, up again, or a critical parameter is violated. No special requirements are set for the Monitor Node – it just has to be able to run a standard Windows system.

Apart from the aforementioned computers, you can make use of the following computers to remotely manage the Hardware Node(s) and Virtual Environments:

- A computer with VZMC installed. A VZMC workstation allows you to control multiple Hardware Nodes, to manage all their Virtual Environments, and to monitor the system.
- A computer where Virtuozzo Control Center is launched in a standard Web browser, which enables you to perform all the main operations on a particular Hardware Node and inside its Virtual Environments.

The picture above shows only one of the possible configurations you may choose while planning your Virtuozzo network. You can hold to this scheme or work out your own one and build your own Virtuozzo system. You may, as a matter of fact, assign all the roles (except for the Monitor Node) to one and the same Hardware Node, although you are not recommended to. The only requirement that you should fulfill while planning any Virtuozzo network is to make sure that all the Nodes running Virtuozzo are accessible from the other participating computers.

Installation Requirements

After deciding on the structure of your Virtuozzo system, please make sure that all the Hardware Nodes where you are planning to deploy Virtuozzo for Windows meet the following system and network requirements.

System Requirements

This subsection focuses on the hardware and software requirements for the Virtuozzo 3.5.1 SP1 software product.

Network Requirements

The network pre-requisites enlisted in this subsection will help you avoid delays and problems with making Virtuozzo for Windows up and running. You should take care in advance of the following:

- Local Area Network (LAN) for the Hardware Node.
- Internet connection for the Hardware Node.
- A valid IP address for the Hardware Node as well as other IP parameters (default gateway, network mask, DNS and WINS configuration).
- At least one valid IP address for each ordinary Virtual Environment you will be creating on the Node. The total number of addresses should be no less than the planned number of VEs.

Note: The addresses to be assigned to Virtual Environments (including the Service VE) should differ from those of the Hardware Node, i.e. any existing IP address of the Hardware Node network interface cards must not be assigned to any VE. The VE IP addresses are automatically assigned by Virtuozzo to the virtual adapters of the corresponding VEs; so, you only have to specify what IP address is to be applied to what VE.

Besides, if you are going to use Virtuozzo tools (VZMC and VZCC/VZPP) for managing your Hardware Nodes and Virtual Environments residing on them and/or to keep track of the resources consumption on your Node(s) by means of the Monitor Node or thru a Web browser, you may have to open the following ports in your firewall:

- 22: this port should be opened on the Hardware Node and inside the Service VE and is needed to be able to establish an SSH connection to the Service VE from the computer where VZMC is installed.
- 3141: this port should be opened on the Hardware Node and is needed to be able to view the information on the current HN resources consumption on the Monitor Node or thru a standard Web browser.
- 3389: this port should be opened on the Hardware Node and is needed to connect to your Virtual Environments by means of the standard Windows Remote Desktop Connection (RDP) application.
- 8049: this port should be opened on the Hardware Node and is needed to check the information on the current state of the Hardware Node thru a standard Web browser.
- 4643: this port should be opened inside the Service VE and is needed to be able to connect to the Service VE and other VEs on the Node thru VZCC/VZPP.
- 8443: this port should be opened inside the Service VE and is needed to be able to connect to Virtual Environments on the Hardware Node by means of the Plesk application.
- 4646: this port should be opened inside the Service VE and is needed to be able to use VZAgent SOAP on your Hardware Node.

Virtuozzo Installation Overview

The Virtuozzo installation for evaluation purposes shall consist of the following major steps:

Note: We assume that you have successfully installed and activated the Windows 2003 operating system on your computer.

- 1 Installing the Virtuozzo 3.5.1 SP1 for Windows basic pack on the Hardware Node.
- 2 Performing a number of necessary preliminary steps with the help of the **Virtuozzo for Windows Configuration** wizard. These steps include installing a number of application templates on the Hardware Node, installing the Windows 2003 Server OS template on and copying additional Windows components to the Node, and creating the Service VE, which is responsible for accepting connections to the given Virtuozzo system from the outside. You are also supposed to install a Virtuozzo license on the Hardware Node on this step to start using Virtuozzo on your computer.
- 3 Install Virtuozzo Management Console (VZMC) - a graphical tool for administering Virtuozzo and performing main administrative tasks on Hardware Nodes and in the VE context - and register the needed Hardware Node(s).
- 4 Set Virtuozzo Control Center (VZCC) and Virtuozzo Power Panels (VZPP) to work. These tools are intended for managing a particular Hardware Node and/or individual Virtual Environments residing on it with the help of a standard Web browser.

These four steps are common for all Virtuozzo installations. However, in order to prepare the system for performing the evaluation procedures, one more step is needed:

- 5 Running a certain script that would create a number of specially configured Virtual Environments to correspond to the information provided in the **Evaluating Virtuozzo for Windows** chapter.

All these steps are described below in this chapter.

Installing Virtuozzo Software

To install Virtuozzo 3.5.1 SP1 for Windows on any given Hardware Node, launch the **Virtuozzo Installation Wizard** by double-clicking the `Virtuozzo351sp1_<system_architecture>_<language_name>.exe` installation file where `<system_architecture>` and `<language_name>` denote the system architecture and the language of the Windows Server 2003 OS under which the Virtuozzo software is to be run (e.g. `Virtuozzo351sp1_x86_en.exe` to install Virtuozzo on 32-bit systems running the English version of Windows Server 2003). The installation program will greet you with the following screen:

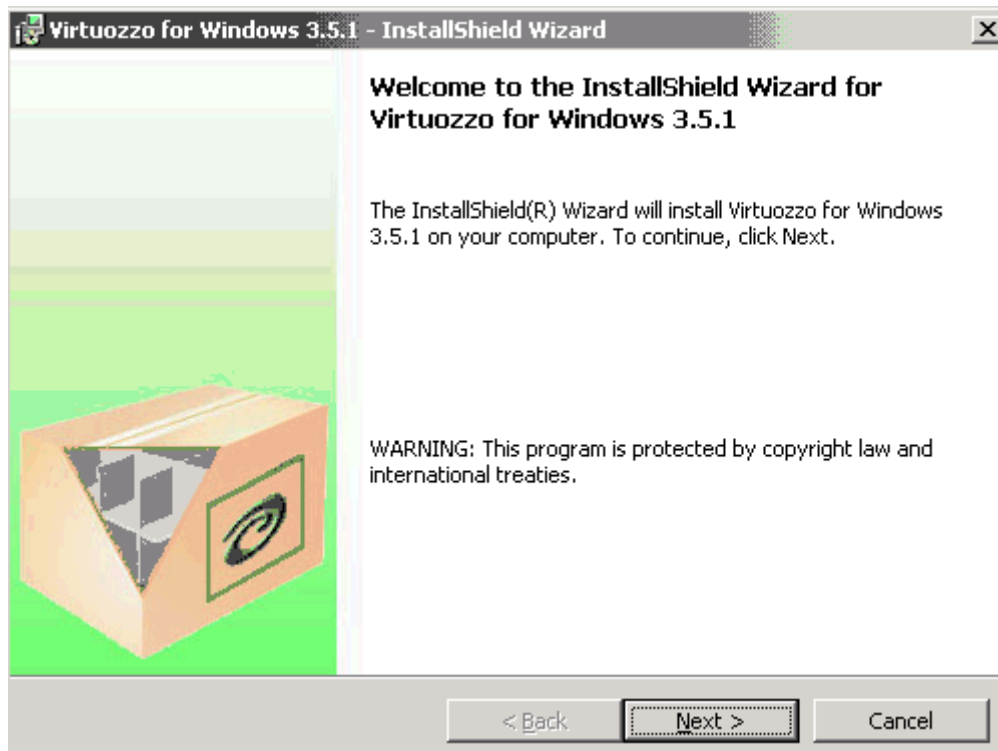


Figure 3: Installing Virtuozzo - Welcome to InstallShield Wizard

Pressing the **Next** button will display the SWsoft end user license agreement that you must accept to be able to install Virtuozzo. Use either the PgDn key or the down arrow on your keyboard to read all the text of the agreement.

After you have selected the **I accept the terms in the license agreement** radio button and clicked **Next** on the License Agreement screen, the **Customer Information** window is displayed:

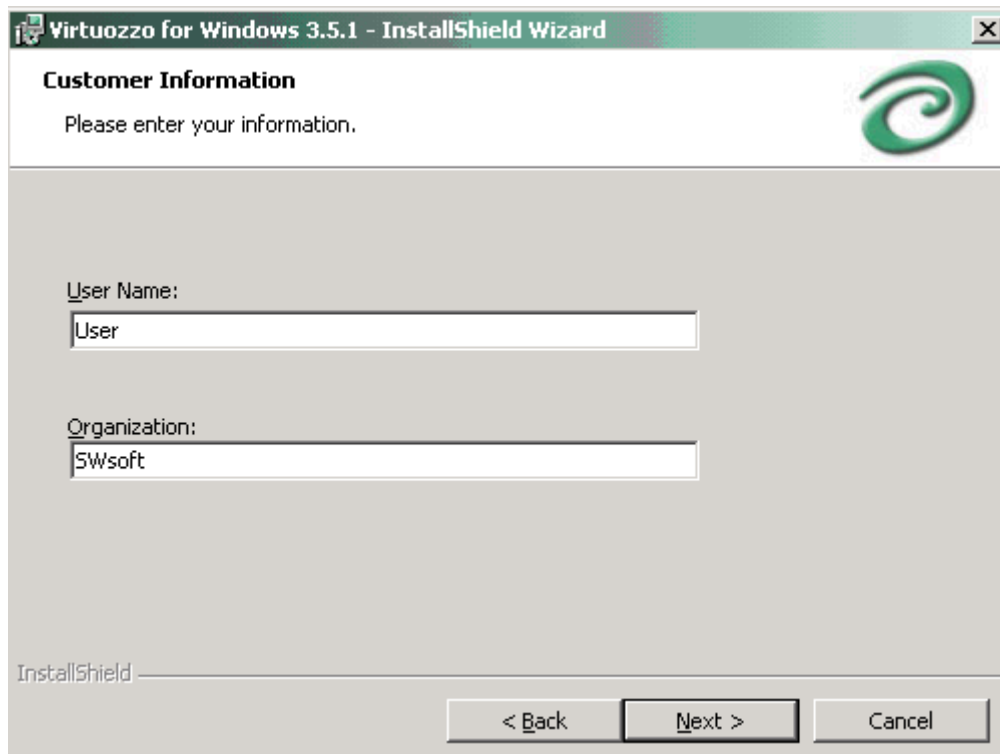


Figure 4: Installing Virtuozzo - Entering User's Information

Enter the necessary information in the fields provided and click Next.

On the next screen, you should specify the location for Virtuozzo program files and the folders for keeping all VE data and Virtuozzo backups:

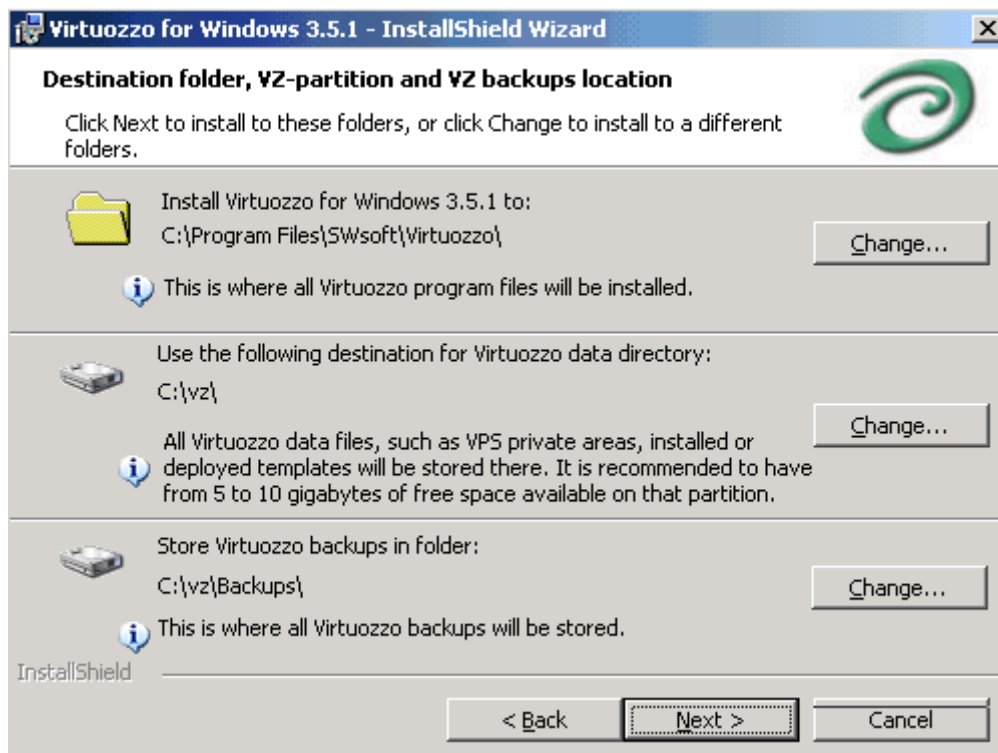


Figure 5: Installing Virtuozzo - Specifying Destination Folders

The three directories specified on the given step of the wizard mean the following:

- The first directory with the default path of `C:\Program Files\SWsoft\Virtuozzo\` contains all Virtuozzo program files including drivers, scripts, services, etc. specific for Virtuozzo. You can specify another path for the directory by clicking the **Change** button and selecting the desired path. Keep in mind that if Virtuozzo is uninstalled from your computer, this directory will be removed.
- The second directory is meant for storing all the data used by the Virtual Environments that you will be creating on the Node: private areas, installed templates, patches, logs, etc. By default, the `C:\vz\` path is used. You can specify another path for the directory by clicking the **Change** button and selecting the desired path. 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.

As distinct from the previous directory, this directory remains intact if Virtuozzo is uninstalled from your computer.

- The third directory is destined for keeping all VE backups created on the Node
 - by using the `vzexport` Virtuozzo backup utility (see Reference in the *Virtuozzo 3.5.1 for Windows User's Guide* for the description of this utility);
 - by using the `vzbackup` Virtuozzo utility (consult Reference in the *Virtuozzo 3.5.1 for Windows User's Guide* for detailed information on this utility),or
 - by means of `VZMC` and `VZCC/VZPP` if there is no default Backup Node or this Hardware Node is to serve as one. In the latter case, this directory will be used to store the VE backups from all Hardware Nodes registered in `VZMC`. Detailed information on the way to manage VE backups in `VZMC` and `VZCC/VZPP` is provided in the *Operations on Virtual Environments* chapter of the *Virtuozzo 3.5.1 for Windows User's Guide* and `VZCC/VZPP` online help, respectively.

The directory has the default path of `C:\vz\Backups\`. You can specify another path for the directory by clicking the **Change** button and selecting the desired path. While defining the backup directory, make sure that it has sufficient disk space for housing multiple VE backups.

After you have made decision on all the folders, click **Next** to display the **Setup Type** window:

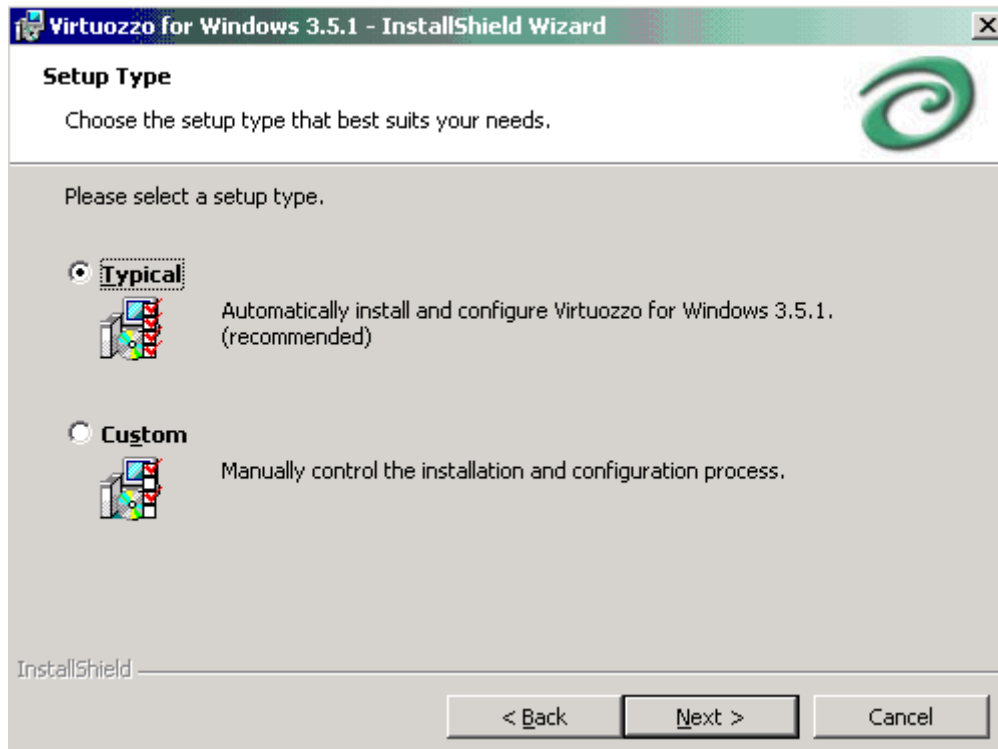


Figure 6: Installing Virtuozzo - Choosing Setup Type

In this window, you are supposed to choose the Virtuozzo installation type:

- **Typical:** select this radio button to automatically install and configure Virtuozzo components. This is the simplest type of installation where most setup and configuration steps are automated and performed by the Virtuozzo installation and configuration wizards themselves. This type is recommended for most administrators who has no experience with Virtuozzo and/or is installing the Virtuozzo software for the first time.
- **Custom:** select this radio button to manually control and/or complete all the steps of the installation and configurations wizards. This is a more complex installation type recommended for advanced administrators only.

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

Express Virtuozzo Installation

If you have selected the **Typical** radio button and clicked **Next** in the **Setup Type** window, you will be presented with the **Ready to Install the Program** screen. Pressing the **Install** button on this screen starts installing and configuring Virtuozzo onto your computer.

Note: You can change your installation settings (e.g. the location for Virtuozzo program files) made on the previous steps of the wizard by clicking the **Back** button in the **Ready to Install the Program** windows and making the necessary changes.

During the Virtuozzo installation and configuration, the following operations are performed:

- 1 The necessary Virtuozzo program files are automatically installed on your computer.
- 2 Your Virtuozzo installation is updated to the latest version. This is done by means of the **Virtuozzo Update Wizard** which is automatically launched during the Virtuozzo installation. In this wizard, you should do one of the following:
 - If your Hardware Node does not use a proxy server, i.e. it is directly connected to the Internet, just click **Next** on the **Welcome to the Virtuozzo Update Wizard** screen to start updating your Virtuozzo software.
 - If you wish to use the proxy settings of your Internet Explorer or of an external proxy server to connect to the Internet, click on the **Proxy Settings** button on the **Welcome to the Virtuozzo Update Wizard** screen to display the **Enter Proxy Settings** window:

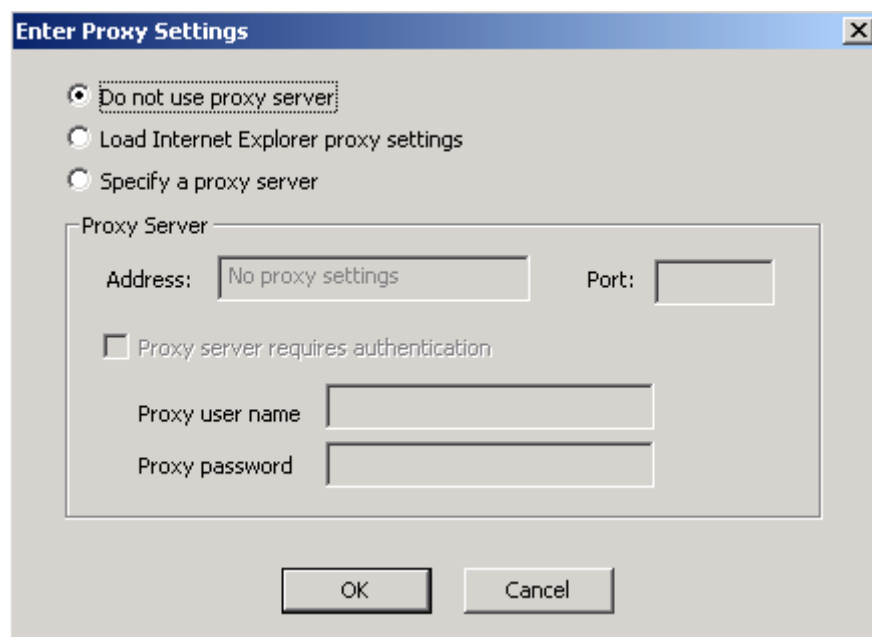


Figure 7: Installing Virtuozzo - Specifying Proxy Parameters

In this window, you can:

- a Select the **Load Internet Explorer proxy settings** radio button to use your Internet Explorer proxy settings to connect to the Virtuozzo updating center.
- b Select the **Specify a proxy server** radio button and specify the IP address and the port of the proxy server to be used to connect to the Virtuozzo updating center in the **Address** and **Port** fields, respectively.

- c 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.

Detailed information on how to update your Virtuozzo software by using the **Virtuozzo Update Wizard** is provided in the **Managing Hardware Node Software** chapter of the **Virtuozzo 3.5.1 for Windows User's Guide**.

- 3 Virtuozzo Management Console is automatically installed on your Hardware Node. VZMC is a graphical user interface client that allows you to remotely manage a multitude of Virtuozzo Hardware Nodes and their Virtual Environments.
- 4 The Virtuozzo Express Configuration Wizard is automatically launched:

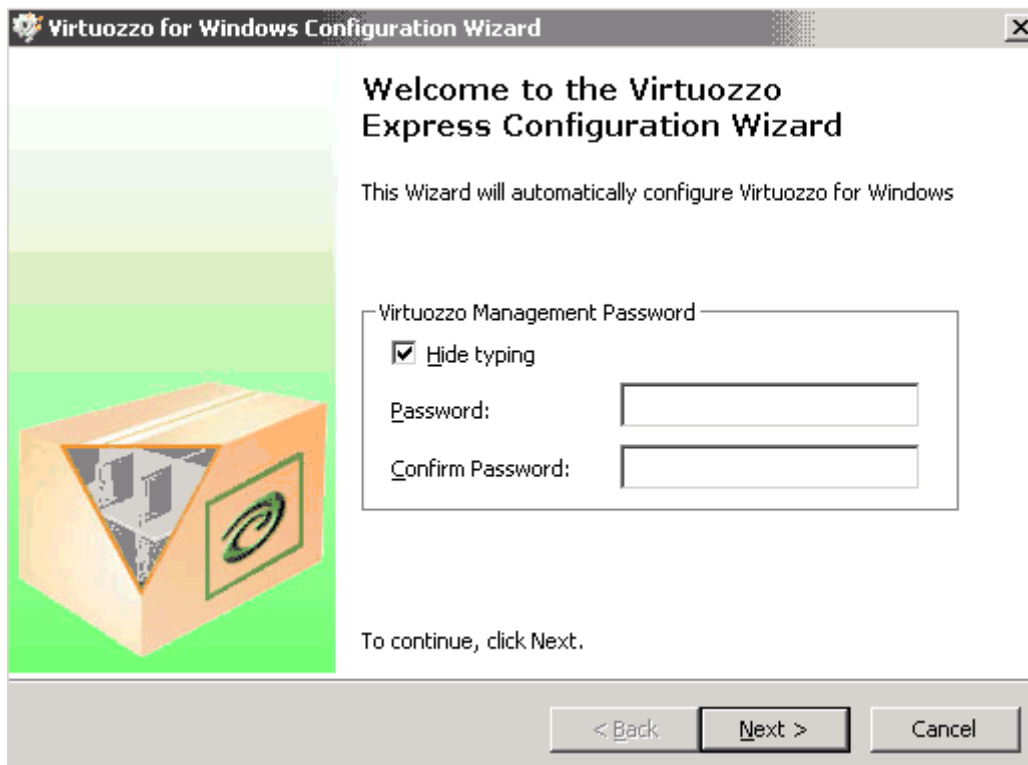


Figure 8: Installing Virtuozzo - Specifying Service VE Credentials

This wizard will help you complete the remaining steps needed to configure your Virtuozzo installation. The only thing the wizard will ask you before continuing with the Virtuozzo configuration is to specify the user password for the `vzagent0` user in the fields provided. You will need to enter this user name and this password every time you connect to the Hardware Node by means of VZMC and VZCC. The **Hide typing** checkbox allows you to choose the variant of entering the password:

- When the checkbox is selected, all symbols entered in the **Password** and **Confirm Password** fields are displayed as asterisks.
 - When the checkbox is cleared, all symbols entered in the **Password** and **Confirm Password** fields are shown as is.
- 5 A number of application templates are automatically installed on the Hardware Node. These applications are needed to perform certain tasks in the Service VE context or inside regular Virtual Environments.

- 6 The Windows Server 2003 template is automatically installed on the Hardware Node. The Windows 2003 OS template is needed to create Virtual Environments on its basis in future.

Note: If you are planning to create Virtual Environments running either localized versions of Windows Server 2003 x64 Editions or any versions of Windows Server 2003 R2, you should perform a number of additional steps described in the **Preparing Virtuozzo 64-bit for Creating Localized VEs** (on page 33) and **Preparing Virtuozzo to Create VEs With Windows Server 2003 R2** (on page 34) subsections, respectively.

- 7 Additional Windows Server 2003 components necessary for running Virtuozzo on your Hardware Node are installed. While adding Windows components, the wizard will ask you to provide a path to the Windows Server 2003 distribution files (either by inserting a CD with the Windows Server 2003 distribution kit or by clicking on the OK button in the displayed window and specifying the path to the distribution files).

Note: While adding the necessary Windows components, you must use the same Windows Server 2003 distribution kit as is installed on your Node.

- 8 The Service VE is automatically created. You should create the Service VE on every Node you are going to manage with the help of VZMC (Virtuozzo Management Console) or VZCC (Virtuozzo Control Center). The created Service VE is assigned a private IP address by Virtuozzo. However, this IP address can access (be accessible by) other computers on the network due to Network Address Translation (NAT) and port mapping settings configured by Virtuozzo in a special way during the Service VE creation.

Note: The Service VE IP address will be configured in such a way as to access (be accessible by) other computers from the outer world provided your Hardware Node has at least one valid public IP address assigned to it.

- 9 A Virtuozzo license is uploaded to the Hardware Node. On this step of the Virtuozzo configuration, you have to specify the path to your Virtuozzo license file by using the **Browse** button in the displayed window.

After Virtuozzo has been successfully installed and configured on your computer, the **InstallShield Wizard Completed** window is displayed where you should click on the **Finish** button to exit the wizard.

Custom Virtuozzo Installation

Selecting the Custom radio button and clicking Next on the Setup Type screen displays the following window:



Figure 9: Installing Virtuozzo - Choosing Setup Options

This window allows you to specify the following options:

- Select the **Install Virtuozzo for Windows management console** checkbox to automatically install Virtuozzo Management Console (VZMC) on your Node during the Virtuozzo installation. VZMC is a graphical user interface client that allows you to remotely manage a multitude of Virtuozzo Hardware Nodes and their Virtual Environments.
- Select the **Run Virtuozzo for Windows configuration wizard** checkbox to automatically launch the **Virtuozzo Configuration Wizard** right after the Virtuozzo installation. Otherwise, you will have to manually launch the wizard by clicking **Programs --> SWsoft --> Virtuozzo --> Virtuozzo Configuration Wizard** on the Windows **Start** menu after Virtuozzo is successfully installed on your computer. This wizard allows your to perform a number of configuration steps necessary to make Virtuozzo fully functional. If this checkbox is selected, you are also supposed to choose one of the following options:

- **Run Virtuozzo for Windows configurator in express mode:** in this case the Virtuozzo installation and configuration will be the same as described in the **Express Virtuozzo Installation** subsection (on page 24), i.e. most of the steps will be automatically completed by the installation and configuration wizard. You only have to set the password for the `vzagent0` user to manage your Hardware Node and its VEs by means of VZMC and/or VZCC, to specify the proxy settings to connect to the Virtuozzo updating center, to provide a path to the Windows Server 2003 distribution files, and to define the path to your Virtuozzo license file. Please consult the aforementioned subsection to get detailed information on these steps. After you click **Next** in the **Setup Options** window, you will be presented with the **Ready to Install the Program** screen. This screen allows you to change your Virtuozzo installation settings made on the previous steps of the wizard by clicking the **Back** button and making the necessary changes. Pressing the **Install** button on this screen starts installing and configuring Virtuozzo onto your computer. After Virtuozzo has been successfully installed and configured on your computer, the **InstallShield Wizard Completed** window is displayed where you should click on the **Finish** button to exit the **Virtuozzo Installation Wizard**.
- **Run Virtuozzo for Windows configurator in custom mode:** in this case you are to manually control the processes of installing and configuring Virtuozzo on your computer. Moreover, you will have to manually specify most of the Virtuozzo configuration parameters (e.g. the Service VE IP address).

After you click **Next**, you will be presented with the **Ready to Install the Program** screen. This screen allows you to change your Virtuozzo installation settings made on the previous steps of the wizard by clicking the **Back** button and making the necessary changes. Pressing the **Install** button on this screen starts installing Virtuozzo onto your computer. During the installation, the **Virtuozzo Update Wizard** will be automatically launched helping you update the Virtuozzo software to the latest version. Please see the **Express Virtuozzo Installation** subsection (on page 24) for more information on how to work with the wizard.

After Virtuozzo has been successfully installed on your computer, the **InstallShield Wizard Completed** window is displayed where you are supposed to select the **Launch Virtuozzo Configuration Wizard** checkbox to launch the **Virtuozzo Configuration Wizard** right after the **Virtuozzo Installation Wizard** exits. Detailed information on how to manually run and complete the **Virtuozzo Configuration Wizard** is provided in the next subsection.

Running Virtuozzo Configuration Wizard

You are supposed to manually control the process of configuring your Virtuozzo installation in the following cases:

- You selected the **Run Virtuozzo for Windows configuration wizard** checkbox and the **Run Virtuozzo for Windows configurator** in custom mode radio button in the **Setup Options** window. In this case the **Virtuozzo for Windows Configuration** wizard is automatically launched after you have successfully installed Virtuozzo on your computer, selected the **Launch Virtuozzo Configuration Wizard** checkbox in the **InstallShield Wizard Completed** window, and clicked on the **Finish** button to exit the **Virtuozzo Installation Wizard**.
- You cleared the **Run Virtuozzo for Windows configuration wizard** checkbox in the **Setup Options** window. In this case after Virtuozzo has been successfully installed on your computer, you can invoke the **Virtuozzo for Windows Configuration** wizard by selecting **Programs --> SWsoft --> Virtuozzo --> Virtuozzo Configuration Wizard** on the Windows Start menu.

The Virtuozzo configuration includes five major steps:

- Installing a number of application templates on the Hardware Node;
- Installing the Windows Server 2003 template on the Hardware Node;
- Installing additional Windows Server 2003 components necessary for running Virtuozzo on the Hardware Node;
- Creating the Service VE, and
- Uploading a Virtuozzo license to the Hardware Node.

The steps of installing application templates, installing the Windows Server 2003 OS template, and copying additional Windows Server 2003 components to your Host OS should precede the creation of the Service VE.

After invoking the wizard, you will be presented with the **Welcome to the Virtuozzo Configuration Wizard** window where you should click **Next** to start configuring Virtuozzo on your computer. In the **Application Templates Installation** window, you are supposed to install the following applications on the Hardware Node:

- `openssh` (Secure Shell to remotely log in to VEs);
- `msde2000` (Microsoft SQL Server Desktop Engine);
- `vzagentve` (Virtuozzo Agent for a regular VE);
- `vzagentsve` (Virtuozzo Agent for the Service VE).

You will need these applications to perform certain tasks in the Service VE context or inside regular VEs. For example, the `vzagentve` application allows Virtual Environments to be managed thru the Service VE by means of VZMC or VZCC, which, however, is possible only on condition that `vzagentsve` is installed inside the Service VE.

On the next step of the **Virtuozzo for Windows Configuration** wizard, you will be asked to install the Windows 2003 OS template on the Hardware Node:

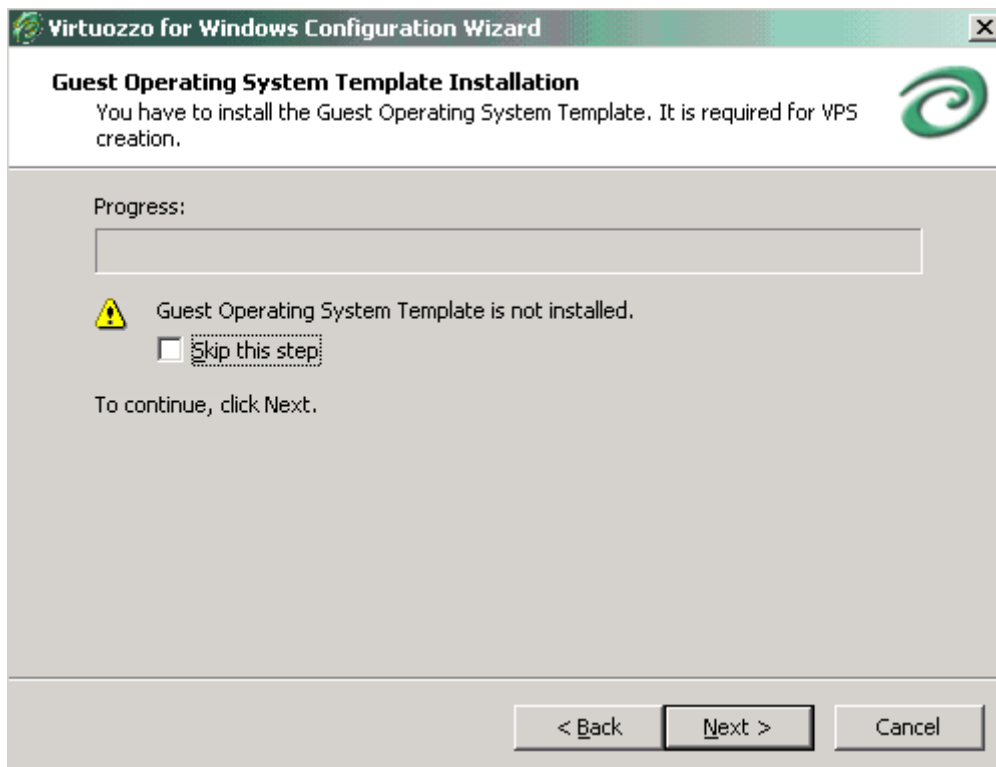


Figure 10: Configuring Virtuozzo - Installing OS Template

The Windows 2003 OS template is needed to create Virtual Environments on its basis in future. The Windows 2003 OS template is shipped with Virtuozzo; just press **Next** to start the installation. The OS template installation may take a rather long run. The progress is displayed in the **Progress** bar.

Note: If you are planning to create Virtual Environments running either German, Spanish, French, Simplified Chinese, and Traditional Chinese versions of Windows Server 2003 x64 Editions or English, German, and Japanese versions of Windows Server 2003 R2, you should perform a number of additional steps described in the **Preparing Virtuozzo 64-bit for Creating Localized VEs** (on page 33) and **Preparing Virtuozzo to Create VEs With Windows Server 2003 R2** (on page 34) subsections, respectively.

In the **Windows Components Installation** window, you will be prompted to add certain Windows components to your Host OS. These components are necessary to make the installed Windows Server 2003 OS template fully operational, i.e. to be able to create Virtual Environments on its basis. Press **Next** to start adding components to the Host OS. During the installation, you will be presented with the window asking you to insert a CD with the Windows Server 2003 distribution kit into your CD-ROM drive. Alternatively, you can click on the **OK** button and provide a path to the Windows Server 2003 distribution files.

Note: While adding the necessary Windows components, you must use the same Windows Server 2003 distribution kit as is installed on your Node.

After that, the wizard asks you to define the parameters for creating the Service VE:

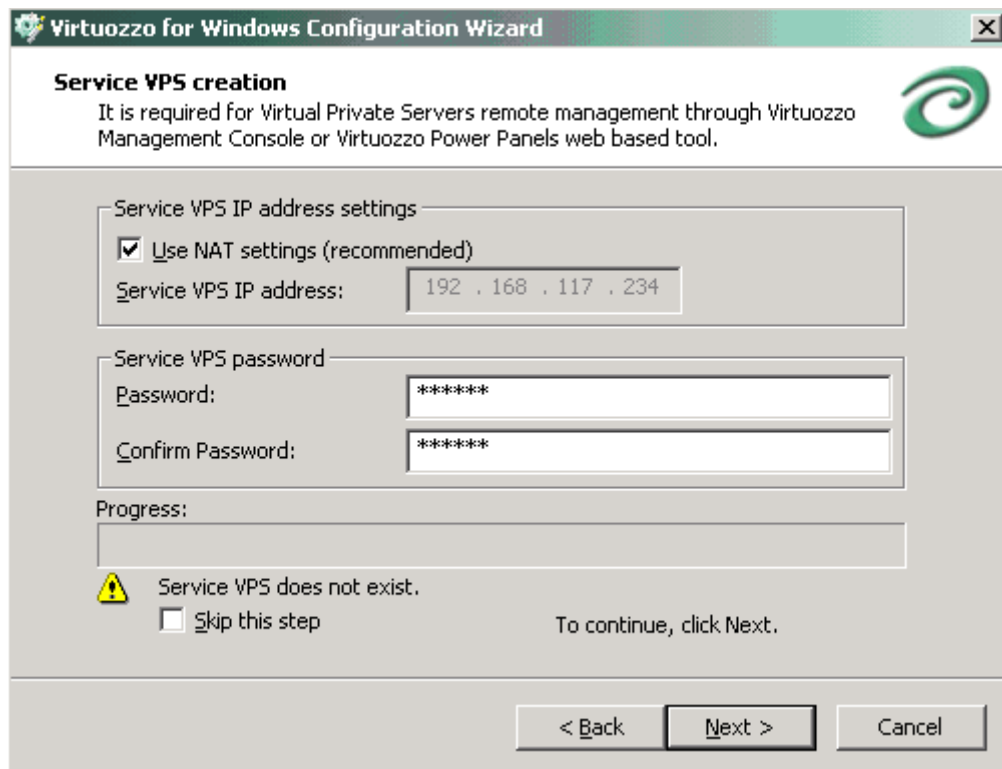


Figure 11: Configuring Virtuozzo - Creating Service VE

You should create the Service VE on every Node you are going to manage with the help of VZMC (Virtuozzo Management Console), VZCC (Virtuozzo Control Center), or VZPP (Virtuozzo Power Panels).

On the displayed screen, specify the Service VE IP address and type the user password for the `vzagent0` user in the fields provided. You will need to provide this IP address, user name, and password when connecting to the Hardware Node by means of VZMC and VZCC. While setting the Service VE IP address, you can do one of the following:

- Select the **Use NAT settings** checkbox to let Virtuozzo automatically assign a private IP address to the Service VE. This private IP address will have access/be accessed to/from the Internet due to Network Address Translation (NAT) and port mapping settings configured by Virtuozzo in a special way during the Service VE creation.

Note: The Service VE IP address will be configured in such a way as to access/be accessible to/from the outer world provided your Hardware Node has at least one valid public IP address assigned to it.

- Clear the **Use NAT settings** checkbox to manually specify the IP address of the Service VE. While specifying the IP address of the Service VE make sure that it is different from that of the Hardware Node and all the other VEs. You should specify an unoccupied IP address from your pool of IP addresses, and Virtuozzo will automatically assign it to the virtual adapter of the Service VE. Please ascertain that the Service VE IP address can be accessed from public networks, for example, from the computer where VZMC is to be installed. To make the Service VE accessible from external networks, you should configure routing to it via the IP address of the Hardware Node where this Service VE resides. Routing should be set on every computer you wish to have access to the Service VE.

Pressing the **Next** button starts the process of the Service VE creation. Virtuozzo will create the Service VE, start it, and add the required applications to it.

Finally, you will be prompted to upload a valid Virtuozzo license to the Hardware Node to start using Virtuozzo on your computer:

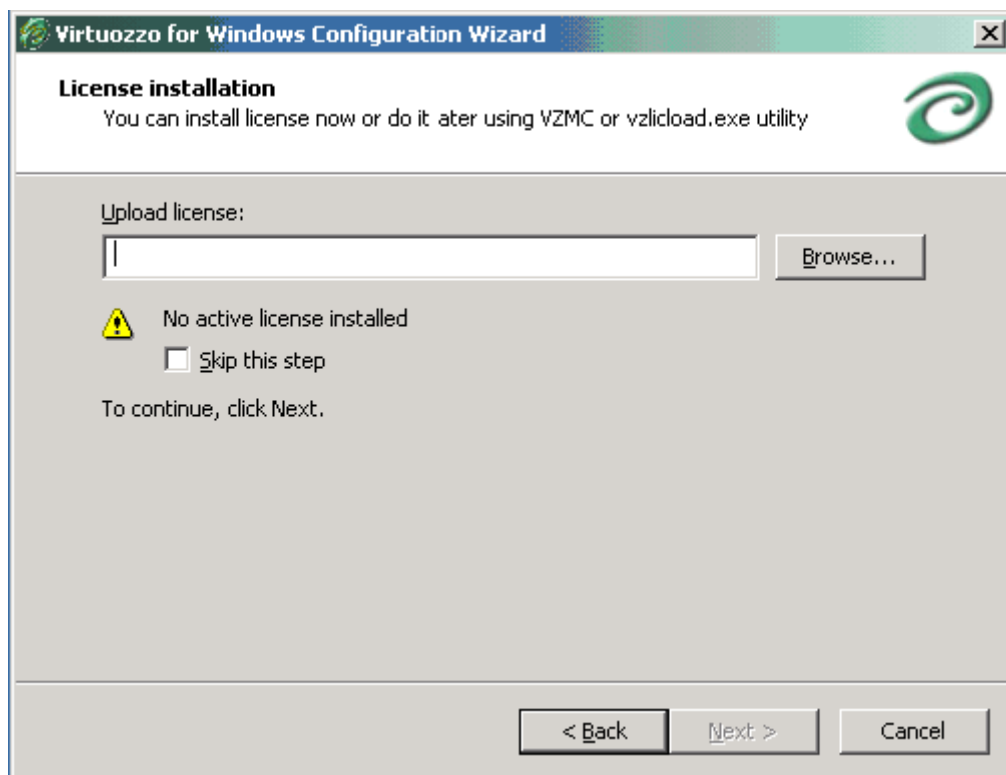


Figure 12: Configuring Virtuozzo - Uploading Virtuozzo License

Every Hardware Node should have its own Virtuozzo license installed. Licenses are issued by SWsoft and needed to start using Virtuozzo on your computer. Although you can complete some tasks on the Hardware Node without having a Virtuozzo license (e.g. store VE backups on this Node), you are not allowed to perform the majority of operations until you upload a valid Virtuozzo license to the Node (e.g. all VE-related operations including the VE creation). To install a Virtuozzo license on your Node, click on the **BROWSE** button and specify the path to your license file.

Note: You can skip the step of uploading a Virtuozzo license to your Node and install it later by means of VZMC, VZCC, or the `vzlicload` utility. Detailed information on how to install Virtuozzo licenses by using these tools is provided in the *Managing Hardware Node* of the *Virtuozzo 3.5.1 for Windows User's Guide* and in the *Virtuozzo 3.5.1 for Window Reference Guide*, respectively.

Now you can connect to the Service VE as the `vzagent0` user by means of the VZMC and/or VZCC client programs and start managing the Hardware Node over the Virtuozzo Agent protocol.

Preparing Virtuozzo 64-bit to Create Localized VEs

If you are going to use the Virtuozzo 64-bit version on your computer and planning to create Virtual Environments which are to run German, Spanish, French, Simplified Chinese, or Traditional Chinese versions of Windows Server 2003 x64 Edition, you should complete a number of additional steps after you have successfully installed the English version of Windows Server 2003 x64 Edition. These steps include:

- Installing the Multilingual User Interface pack (MUI) on the English version of Windows Server 2003 x64 Edition. The MUI pack allows the user interface language of your English 64-bit version of Windows to be changed according to your preferences to one of the following languages: German, Spanish, French, Simplified Chinese, or Traditional Chinese. For detailed information on how you can install the Windows Server 2003 x64 MUI on your computer and configure the system post setup, please visit the Microsoft web site under <http://www.microsoft.com/globaldev/reference/win2k/setup/default.mspx>.

Note: MUI packs are add-ons to the English version of Windows Server 2003 x64 Edition and should not be installed on localized versions of Windows Server 2003 x64 Edition.

- Adding the corresponding Virtuozzo operating system MUI template shipped with Virtuozzo to the Hardware Node. For example, to install the French template, you should execute the `Virtuozzo Operating System MUI Template (French version).exe` file. After the MUI template is added to the Node, it can be viewed by using Virtuozzo Management Console (VZMC), Virtuozzo Console Center (VZCC), or the `vzpkgls` Virtuozzo utility. The corresponding names are:
 - `w2k3_fr` for the French MUI template;
 - `w2k3_de` for the German MUI template;
 - `w2k3_sp` for the Spanish MUI template;
 - `w2k3_sc` for the Simplified Chinese MUI template;
 - `w2k3_tc` for the Traditional Chinese MUI template.

After you have successfully installed the corresponding MUI pack and Virtuozzo OS MUI template on your Hardware Node, you can start creating Virtual Environments based on the corresponding MUI template. Detailed information on how to create new VEs on your Node is provided in the *Operations on Virtual Environments* chapter of the *Virtuozzo 3.5.1 for Windows User's Guide*.

Preparing Virtuozzo to Create VEs With Windows Server 2003 R2

Virtuozzo 3.5.1 SP1 supports Windows Server 2003 R2 extending the Windows Server 2003 operating system and providing a number of additional enhancements in comparison with its predecessor: simplified branch server management, improved identity and access management, more efficient storage management, etc. Currently, you can create Virtual Environments running the following versions of Windows Server 2003 R2:

- 32-bit: English, Japanese, and German;
- 64-bit: English and Japanese.

However, before starting to create VEs with Windows Server 2003 R2, you should install the corresponding R2 operating system template shipped with Virtuozzo on the Hardware Node (e.g. the `w2k3_r2` and `w2k3de_r2` templates for the English and German 32-bit versions of Windows Server 2003 R2, respectively). Please keep in mind that R2 OS templates can be installed and used only on Hardware Nodes running one of the aforementioned Windows Server 2003 R2 versions.

Note: You can create Virtual Environments on the Hardware Node running Windows Server 2003 R2 without installing the R2 OS template on this Node. However, in this case your VEs will lack all the benefits and improvements provided in Windows Server 2003 R2.

Thus, to be able to create VEs which are to run the English 32-bit version of Windows Server 2003 R2, you should:

- Make sure that the English 32-bit version of Windows Server 2003 R2 is installed on the Hardware Node;
- Execute the `Virtuozzo Operating System Windows Server 2003 R2 Template (English version).exe` to install the English R2 OS template on the Hardware Node.

After you have successfully installed the English R2 template on the Hardware Node, you can start creating Virtual Environments on its basis. Detailed information on how to create new VEs on your Node is provided in the [Operations on Virtual Environments](#) chapter of the [Virtuozzo 3.5.1 for Windows User's Guide](#).

Installing Virtuozzo Management Console

Virtuozzo Management Console (VZMC) is a graphical user interface client that allows you to remotely manage a multitude of Virtuozzo Hardware Nodes and their Virtual Environments.

VZMC should have been automatically installed on your Node during the Virtuozzo installation in the following cases:

- If have selected the **Typical** radio button in the **Setup Type** window, i.e. all installation and configuration steps were automatically performed by the Virtuozzo installation and configuration wizards.
- If have selected the **Custom** radio button in the **Setup Type** window and on the next screen - the **Install Virtuozzo for Windows management console** checkbox.

If Virtuozzo Management Console has been already installed on your Hardware Node, you can launch it by clicking **Programs --> SWsoft --> VZMC Pro --> Virtuozzo Management Console** on the Windows **Start** menu. In this case you can skip the **Installing Graphical Client** section where the process of the VZMC installation is described and start with the **Installing VZMC License** section. Otherwise, you should read the next section to learn how to manually install Virtuozzo Management Console on the Hardware Node or on any other computer on a TCP/IP network.

Installing Graphical Client

The Virtuozzo Management Console is recommended to be installed on a workstation for the remote administration of the existing Hardware Nodes. However, you may also install VZMC on one of the existing Hardware Nodes running Virtuozzo. To install VZMC, launch the `SETUP_VZMC_ADMIN_PRO.EXE` file. The VZMC InstallShield Wizard will greet you with the following screen:

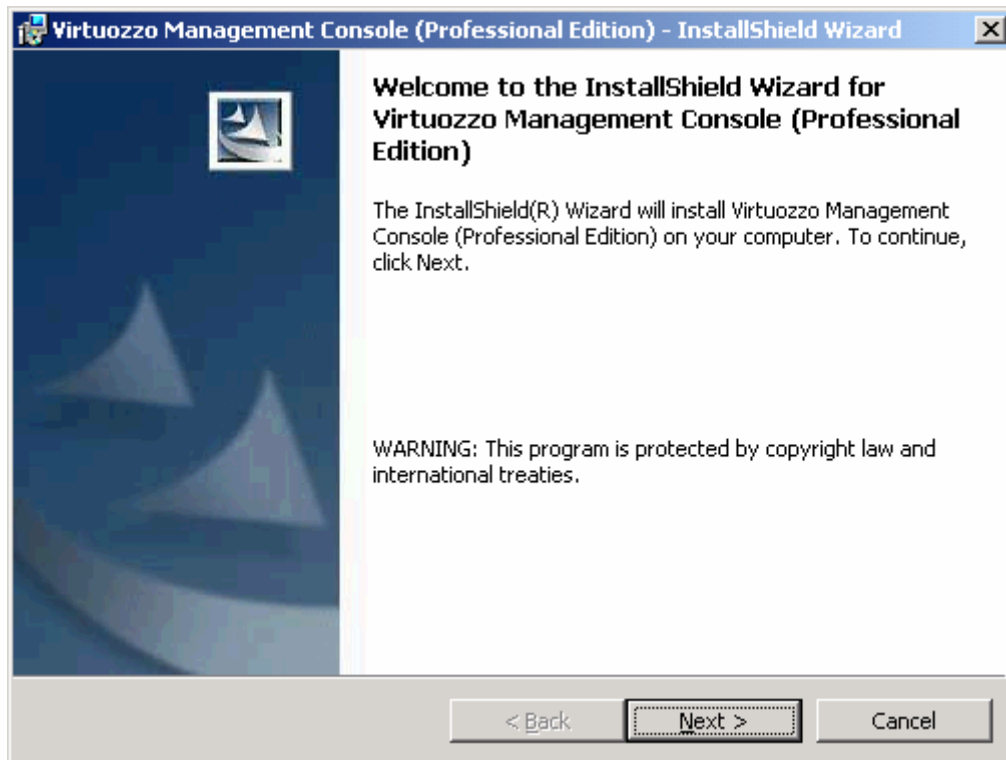


Figure 13: Installing VZMC - Welcome to InstallShieldWizard

Pressing the **Next** button will display the SWsoft end user license agreement that you must accept to be able to install VZMC on the computer. Use either the PgDn key or the down arrow on your keyboard to read all the text of the agreement.

After you have selected the **I accept the terms in the license agreement** radio button and clicked **Next** on the **License Agreement** screen, the **Customer Information** window is displayed. Enter your name and organization in the fields provided and click **Next**.

On the next screen, you should specify the location of the directory where VZMC is to be installed:

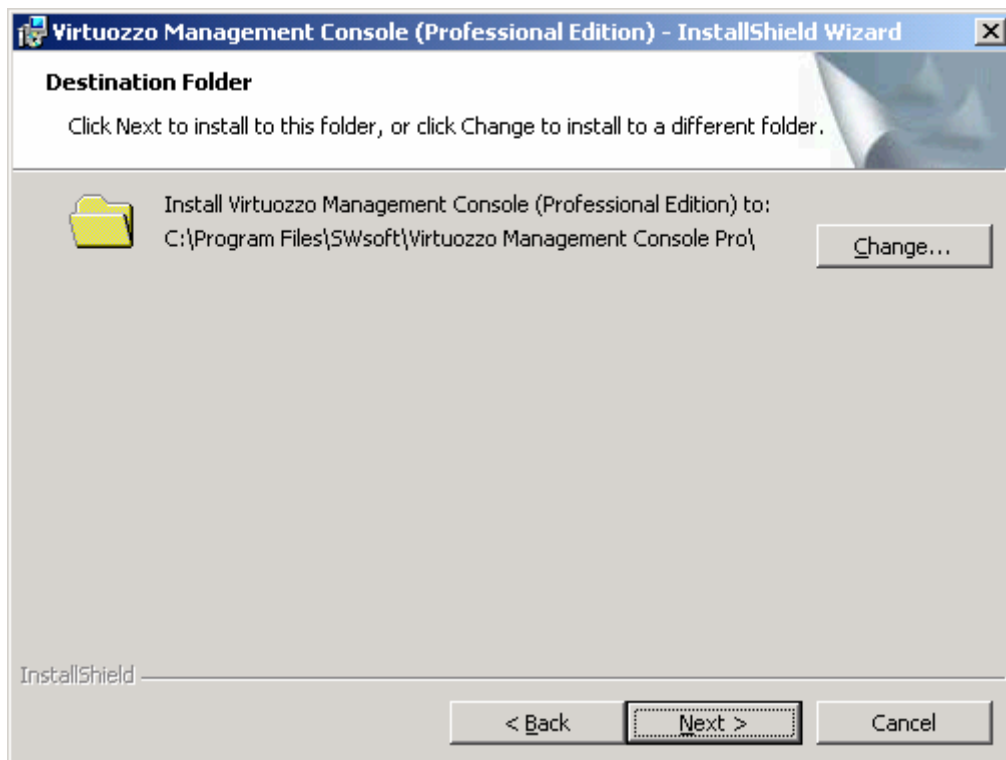


Figure 14: Installing VZMC - Choosing Destination Folder

The **Change** button allows you to choose another folder for the VZMC installation than the default one. Pressing the **Next** button starts installing VZMC onto your computer. After a while, the **InstallShieldWizard Completed** window is displayed indicating that the installation process has successfully completed. Click the **Finish** button to exit the wizard.

After the installation is complete, you can start VZMC by selecting **Programs --> SWsoft --> VZMC Pro --> Virtuooso Management Console** on the Windows **Start** menu.

Installing VZMC License

The first time you start VZMC, you will be asked to enter the VZMC license number. The VZMC licensing model does not allow concurrent connections to the same Hardware Node from two clients with identical licenses. After you have entered a valid license serial number, you can proceed with the normal course of work.

The VZMC license should be installed on each computer where Virtuozzo Management Console is to be run. It differs from the Virtuozzo license that should be loaded to the Hardware Node. A picture representing these two kinds of licenses is given below:

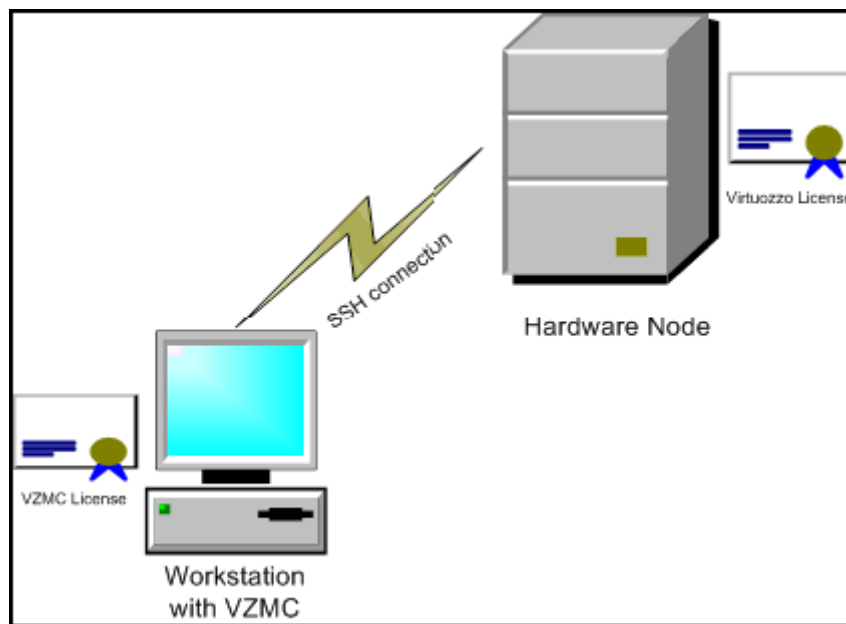


Figure 15: Virtuozzo License vs. VZMC License

VZMC serial numbers can be of two types:

- A serial number allowing the given VZMC client to connect to an unlimited number of Virtuozzo Nodes and to manage Node clusters;
- A serial number allowing the given VZMC client to connect to no more than a pre-defined number of Nodes and not providing the ability of managing Node clusters.

For this version of Virtuozzo for Windows, you will be provided with a VZMC license number directly by SWsoft.

While entering the license serial number, you may be logged in as any user - not necessarily as Administrator. The serial number will be stored in the home directory of the currently logged in user unless you select the **Store in the shared storage available for all users** radio button in the **Virtuozzo Management Console License** window to store it in the common directory.

Note: If you have not uploaded a valid Virtuozzo license to the Hardware Node during the Virtuozzo installation and configuration, you will be offered to obtain a trial license by following the corresponding link in the **Virtuozzo Management Console License** window. Detailed information on Virtuozzo licenses is provided in the **Managing Virtuozzo Licenses** section of the **Managing Hardware Node** chapter in the **Virtuozzo 3.5.1 for Windows User's Guide**.

Registering Hardware Node

A special wizard will guide you through the registration process. To start the Node registration wizard, click on the **Register Virtuozzo Hardware Node** link in the right pane of the VZMC main window or select the **Register Hardware Node** item on the **Action** menu. You will be presented with the **Specify Virtuozzo Hardware Node Address** window:

Register Virtuozzo Hardware Node

Specify Virtuozzo Hardware Node Address

The wizard needs to know Hardware Node friendly name and service VPS network address.

Enter hardware node friendly name. This name will be displayed in the Management Console namespace tree.

Friendly name:

Enter hostname or IP address of service VPS, which will be used for further communications with hardware node.

Address:

Select version of secure shell protocol (SSH) used to connect to service VPS.

SSH version:

Enter port number, on which service VPS listens for connection requests.

SSH port:

Help < Back Next > Cancel

Figure 16: VZMC - Registering Virtuozzo Hardware Node Wizard

In this window, you should specify:

- A friendly name for the Hardware Node which will be displayed in the VZMC left pane and help you easily find your Node among other Hardware Nodes registered in VZMC. You may specify any name you consider suitable for the Node.
- The IP address of the Hardware Node or of the Service VE. You should have already created the Service VE during the Virtuozzo configuration. Instead of the IP address, you may enter the hostname of your Hardware Node or Service VE, respectively.

Note: In case your Service VE is assigned a private IP address which cannot be accessed from the outer world, you should enter the IP address of the Hardware Node.

You can also choose a version of Secure Shell Protocol (SSH) and change the port number to be used to connect to the Service VE/Hardware Node via SSH. The default port where the SSH service is listening is 22; you may modify it if necessary. You have an option to use SSH version 1 instead of default SSH version 2; however, we recommend using SSH version 2 because it provides a better security level.

After providing the necessary information and clicking **Next**, the program will try to establish a secure connection to the Service VE/Hardware Node with default SSH keys. If you are registering the Node for the first time, VZMC will ask you for the password of the `vzagent0` user having access to the Service VE/Hardware Node. Use the password you entered for `vzagent0` while configuring your Virtuozzo installation. You also need to provide valid SSH keys to enable SSH access to the Node. You can choose between two possibilities:

- Select the **Generate SSH key and store in default location** option to generate the corresponding public and secret keys for the supplied `vzagent0` user credentials.
- If you already have valid SSH keys stored on your computer, you can select the **Use the following SSH keys** option and specify the path to the keys.

The **Specify Registration Information** window displayed after establishing the SSH connection to the Service VE/Hardware Node allows you to review all the parameters entered on the previous steps of the wizard. You can use the **Back** button to return to any step and change the corresponding parameter, if needed. Press the **Finish** button to register the Hardware Node in VZMC.

After your Node has been successfully registered in VZMC, its name is displayed in both parts of the VZMC main window - the tree pane on the left and the view pane on the right.

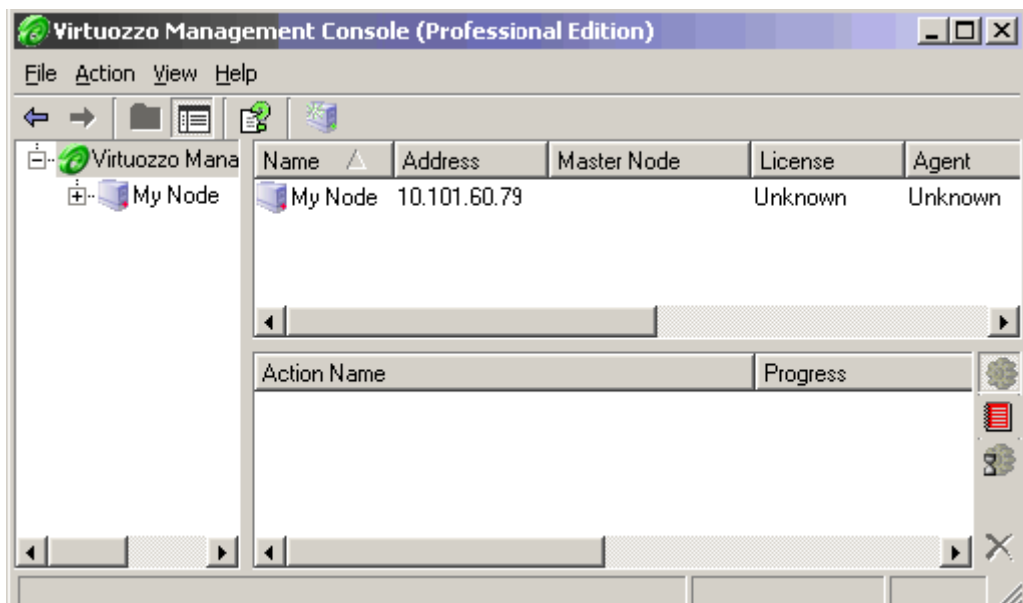


Figure 17: VZMC - Viewing Registered Node

After the Node is registered in VZMC, you will see it in the VZMC tree pane.

Note: If you are going to test the Virtuozzo migration capabilities, you should register two Nodes in VZMC. You should also make sure that the corresponding Service VEs of these Nodes are visible to each other, i.e. their IP addresses are located in one subnet.

Setting VZCC/VZPP to Work

Along with VZMC, you can make use of the following tools intended for managing your computers running Virtuozzo:

- **Virtuozzo Control Center (VZCC).** This tool is designed for Hardware Node administrators and provides you with the ability to manage a particular Hardware Node and all Virtual Environments residing on it with the help of a standard Web browser on any platform. Detailed information on VZCC is given in the VZCC online help system shipped with Virtuozzo.
- **Virtuozzo Power Panels (VZPP).** This tool provides the most part of the VZCC functionality in respect of managing individual Virtual Environments. However, as distinct from VZCC, it does not allow you to manage Hardware Nodes, adjust VE resources, and has some other restrictions. Therefore, VZPP is primarily regarded as a means for individual VE customers to manage their personal Virtual Environments. Detailed information on all VZPP functionality is provided in the VZPP online help system shipped with Virtuozzo.

Logging In to VZCC

To log in to VZCC, launch a VZCC-compatible Web browser. A list of Web browsers currently supported by Virtuozzo is given in the VZCC Overview subsection of the **Virtuozzo Philosophy** chapter in the **Virtuozzo 3.5.1 SP1 for Windows User's Guide**. After you have opened a browser window, you can log in to VZCC in one of the following ways:

- 1 By using the IP address (or hostname) of the Virtuozzo Service VE and the TCP port specified in Virtuozzo offline services (by default, this port is 4643). When connecting to the Service VE, you should enter the user name and password of a Service VE user (for example, `vzagent0`) who is entitled to manage the given Hardware Node and press **Login**. Let us assume that your Service VE has the IP address of `192.168.20.1`. In this case you should enter

```
https://192.168.20.1:4643
```

in the address line of your browser and log in with the credentials of a Service VE user.

- 2 By using the IP address (or hostname) of any VE residing on the given Hardware Node and the TCP port specified in Virtuozzo offline services (by default, this port is 4643). If you are connecting to one of your personal VEs, you should enter the user name and password of a Service VE user who is entitled to manage the given VE and press **Login**. For example, if you have assigned the IP address of `192.168.20.112` to one of your Virtual Environments, you can type

```
https://192.168.20.112:4643
```

and provide the credentials of a Service VE user to log in to VZCC.

Note: Detailed information on Service VE users and Virtuozzo offline services is provided in the **Creating Service VE Users** (on page 43) and **Using Offline Management** (on page 44) subsections, respectively.

Installing VZCC License

The VZCC licensing model envisages the necessity of having a proper VZCC license loaded on the Hardware Node for this Node to be manageable thru VZCC/VZPP. The first time you log in to VZCC, you should provide a valid VZCC license.

Note: In the current version of Virtuozzo, you do not need to install a VZCC license; a trial VZCC license is already included in the Virtuozzo basic pack.

To install a VZCC license, do the following:

- 1 Open the license file obtained from SWsoft and copy its contents to the clipboard.
- 2 Paste the copied contents to the VZCC License field.
- 3 Click Install.

By default, VZCC licenses are stored in the `C:\vz\root\1\C\Program Files\SWsoft\vzcp\licenses\` directory on the Hardware Node and contain information on whether you can use either Virtuozzo Power Panels (VZPP) or Virtuozzo Control Center (VZCC), or both tools to manage your Hardware Node and Virtual Environments residing on it.

After you have successfully installed the VZCC license, you can proceed with the normal course of work.

Managing VZCC/VZPP Access Rights

As the Hardware Node administrator, you can use the credentials of the `vzagent0` user (you specified the password for this user while creating the Service VE) who has a full administrative access to the Service VE to manage your Node and all Virtual Environments residing on it by means of VZCC. However, you may want to grant the rights to other users to manage certain VEs only without having access to the remaining Virtual Environments on the Node and to the Node itself. There are two ways of achieving this:

- Creating a Service VE user who would have access to certain Virtual Environments by means of VZCC.
- Using the offline management feature for a Virtual Environment to be directly managed by its administrator from any browser with the help of VZPP.

These two methods are virtually identical as regards the functionality of managing VEs. Their only difference consists in that the first method allows the VE administrator to connect to the Service VE as its user and manage all their personal VEs without having to log in to each particular VE. If using the second method, the VE administrator will have to log in each time when connecting to a new VE.

Creating Service VE Users

You can create new users of the Service VE and allow them to access certain Virtual Environments by means of VZCC in Virtuozzo Management Console (VZMC).

To open the table of Service VE users, select **Personal Edition Manager** --> **Service VE Users** in the VZMC tree pane below the Hardware Node name. The columns of the users table contain the login name of the user, user ID, group ID, and the description of the user (or comment).

Use the **New User** toolbar button to create a new user:

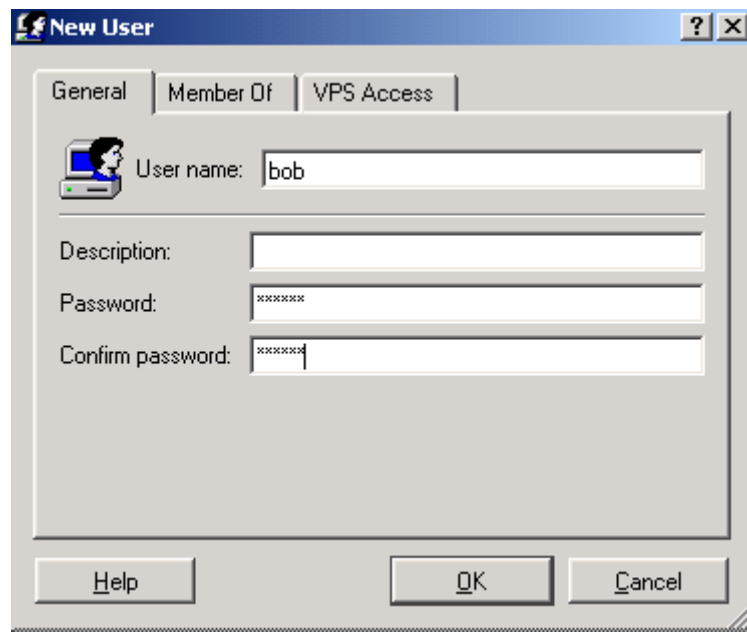


Figure 18: VZMC - User Properties Dialog

In the **New User** window, you can perform the following operations:

- Use the **General** tab to define the general settings like the name and the description of the user and the password to log in to VZCC. User names are often an abbreviation of the user's full name, which makes it easier for the user to remember them.
- Use the **Member Of** tab to add/remove the user to/from any group existing in the Service VE.
- Use the **VE Access** tab to specify those Virtual Environments that the user will be allowed to manage.

After you have created a new user, you can change the settings for this user by double-clicking on their name or selecting **Properties** on the context menu. To change the password for a user, right-click the user in the table of Service VE users, select **Set Password** on the menu, then enter the new password in the fields provided.

Note: The Service VE user differs from the internal VE administrator and is created in the Service VE only.

Using Offline Management

Any VE is created to be managed as a virtual private server by a person who is supposed to be the administrator of this VE. This may be a hosting service subscriber, a student, a server administrator within an enterprise, or any like user. The Hardware Node administrator should ensure that this person may manage the corresponding VE with the help of VZPP without compromising the security of the Hardware Node. This can be achieved by enabling the offline management of the given VE.

When offline management is enabled for a particular Virtual Environment, this VE 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 VE state. This is needed to ensure the VE manageability in its down state. The currently supported services are `vzpp` (for managing Virtual Environments by means of Virtuozzo Power Panels) and `plesk` (for managing Virtual Environments by means of the Plesk control panel integrated with Virtuozzo Power Panels).

By default, offline management is enabled for all Virtual Environments residing on the Node. To start using the offline management feature, it is enough to enter

```
https://<VE_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 VE creation) to start to remotely manage the corresponding Virtual Environment. `<TCP_port>` in the line above denotes the port used by the offline service to access the corresponding VE. The port numbers for the `vzpp` and `plesk` offline services are 4643 and 8443, respectively.

This way of logging in to a VE is very handy for VE administrators because they need to know only the IP address/hostname of their VE and its Administrator credentials to be able to manage the VE. No additional information (e.g. the Service VE IP address) is required.

In case the Plesk control panel application is installed in a Virtual Environment and this VE is subscribed to the `plesk` service, the Plesk `admin` account can also be used by the VE 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 VE 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 one or all VEs on the Node by means of VZMC:

- To disable the offline management for the given VE:
 - Select the **Virtual Environments** item under the Hardware Node name;
 - Right-click the name of the VE on the VE 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 Environments 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**.

Detailed information on how to manage offline services (e.g. to add a new offline service or to change the port number of an existing offline services) is provided in the **Configuring VE Offline Management** section of the **Customizing VZCC/VZPP** chapter in the **Virtuozzo 3.5.1 for Windows User's Guide**.

Configuring Mail for VZCC/VZPP

To be able to send e-mail messages from the Hardware Node to external e-mail addresses, you should configure its mail settings. The situations when some data from the Node are to be dispatched may be the following:

- A user is unable to reach their Virtual Environment(s) thru VZCC/VZPP due to password-related problems and follows the **Forgot your password?** link on the login page in order to receive a URL at their e-mail address informing the user how to change their password.
- The Hardware Node administrator wishes to obtain a new Virtuozzo or VZCC license from SWsoft, generates a license request in VZCC, and sends it to their SWsoft sales contact.

To start sending information from the Node to external addresses, you should perform the following operations:

- 1 Specify an IP address of the mail relay server to send e-mail messages thru. You should do it by means of VZMC:
 - Click on the **Manage Alert Subscription** link on the Hardware Node dashboard to display the **Manage Alert Templates** window;
 - 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;
 - Click **OK**.

You can also use VZCC to set your mail relay server:

- On the **Hardware Node** dashboard, click the **Configuration** link and, in the displayed window, the **Email & Notifications** link;
 - In the **Relay Server IP** field, enter the IP address of the mail relay server.
- 2 Specify the sender's e-mail address. This address will be shown in the **From:** field of the message sent from the Node. To this effect, you should do the following:
 - On the Node, open the `vzcpcon.conf` file for editing (e.g. by using Notepad). It is located in the `C:\vz\private\1\root\Program Files\SWSoft\vzcp\etc\` directory by default; however, you might have specified another path for storing all Virtuozzo data during the Virtuozzo installation.
 - Search for the following strings in the file

```
<restore_password>
  <from-email></from-email>
  <signature>Your VE</signature>
</restore_password>
```

and enter an e-mail address as the value of the `<from-email>` element. Make sure that a valid address is specified; otherwise, your message will not be dispatched to the recipient. While setting the sender's e-mail address, you can choose between two variants:

- a** You can type an e-mail address in the form of `name@domain_name`, where `name` identifies the sender's ID (e.g. `peter`) and `domain_name` denotes the actual domain where the mail sender resides. In this case the address will be shown in the **From:** field in exactly the same way as is specified in the `<from-email>` element.
- b** You can type an e-mail address in the form of `name` only. In this case the address will be displayed in the **From:** field as `name@Service_VE_domain_name` where `name` identifies the sender's ID (e.g. `peter`) and `Service_VE_domain_name` denotes the domain name of your Service VE. For example, if the Service VE has a domain name of `sve.your-domain.com` and you specified `peter` as the value of the `<from-email>` element, the **From:** field in your messages will read: `peter@sve.your-domain.com`.

Notes: 1. While specifying the sender's e-mail address, make sure that the messages from this address can be accepted by the set mail relay server.

2. You can choose the **b.** variant only in case the domain name for the Service VE is specified.

- Save the file and restart `vzcp` for the changes to take effect:

```
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
```

Running Demonstration Preparation Script

Generally speaking, your system is up and running by now and ready to perform all the virtualization tasks it is supposed to perform. However, to facilitate your evaluating of major Virtuozzo features, we have prepared a special script that creates a number of VEs on the Node, configures them in a certain way, and installs a number of benchmark utilities allowing you to assess the Virtuozzo resource management capabilities.

Before running the script, make sure that you are logged in to the Hardware Node under the Administrator's account. To run the script, select Programs --> SWsoft --> Virtuozzo --> Virtuozzo Demo Utility on the Windows Start menu. The Virtuozzo Evaluation Preparation wizard will greet you with the following window:

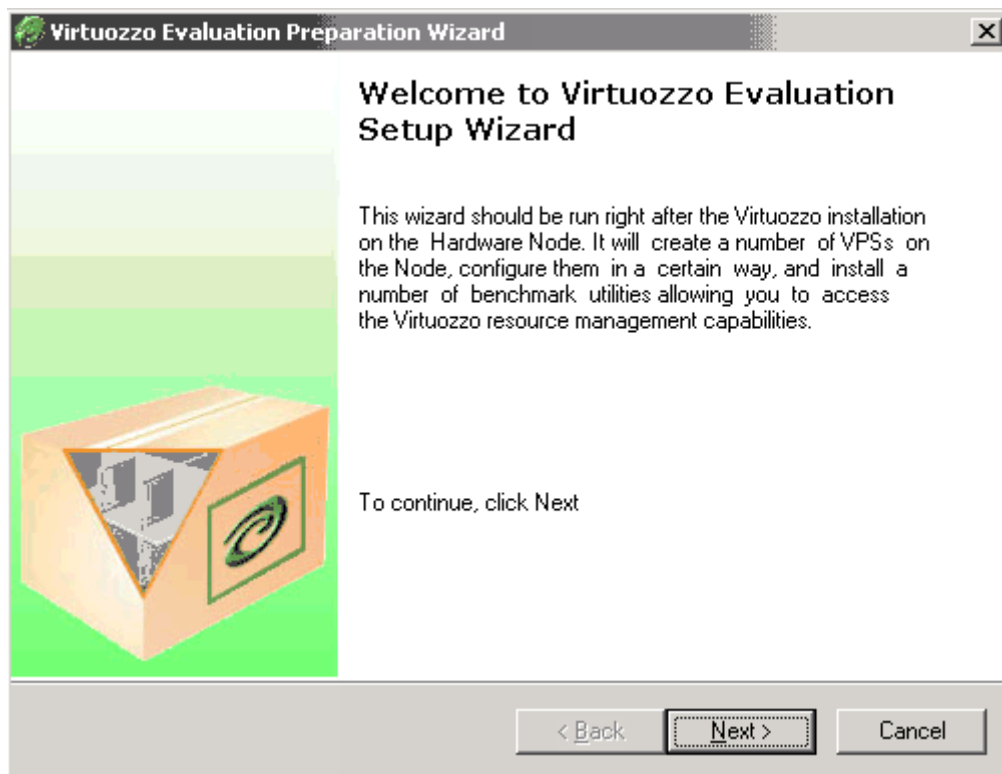


Figure 19: Launching Demonstration Preparation Script

Click Next to proceed with the evaluation demo configuration.

On the second screen of the wizard, you should specify a subnet where your Virtual Environments will be created:

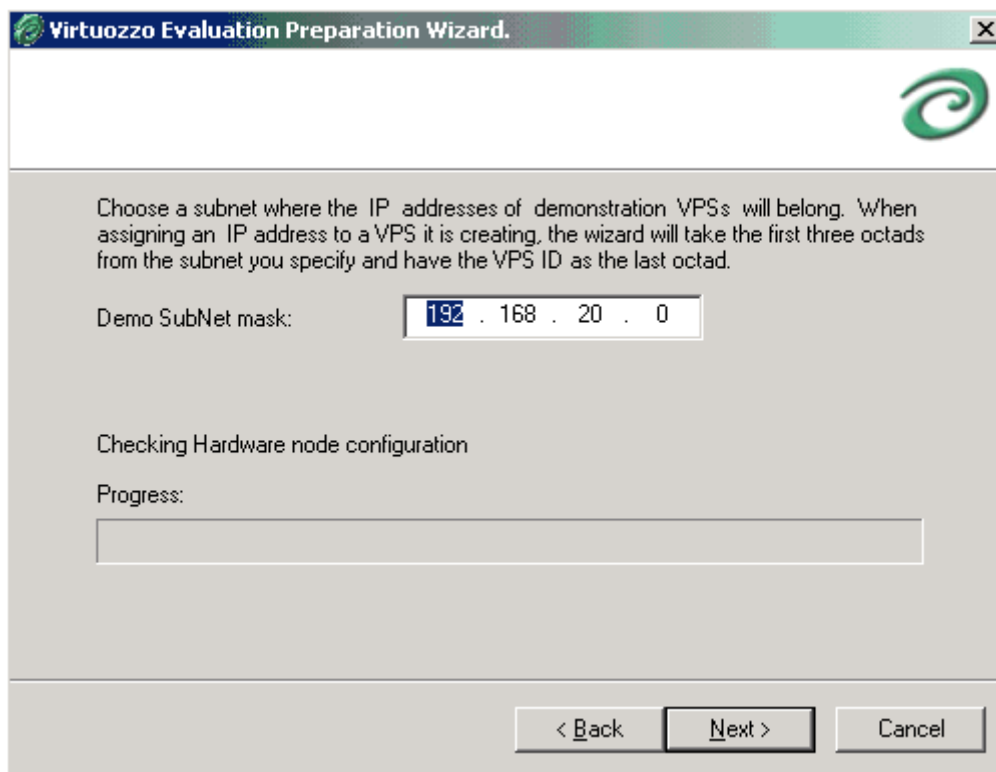


Figure 20: Running Demonstration Preparation Script - Specifying Subnet

By default, subnet 192.168.20.0 is shown. You may leave this value or change it by entering the right value. Click Next.

Note: All examples described in this guide assume that subnet 192.168.20.0 has been created on this step of the wizard.

Clicking **Next** in this window starts the process of creating demo Virtual Environments and configuring the necessary services. Wait until the script finishes its work. As the script performs quite a number of resource-consuming operations, you might have to wait for a relatively long time (all depends on your processor and memory characteristics). The demonstration script creates VEs with IDs 151-157 and assigns them IP addresses from the specified subnet (in our case, 192.168.20.151-192.168.20.157).

After the script completes its work, click **Next** to display the **You have finished Evaluation preparation Wizard** window where you should press the **Finish** button to exit the wizard.

Congratulations! You are now ready to evaluate Virtuozzo with the help of special procedures presented in the next chapter.

CHAPTER 4

Evaluating Virtuozzo for Windows

This chapter presents a list of step-by-step procedures that may be performed on an evaluation Virtuozzo installation in order to assess the following Virtuozzo features:

- Creating and running a number of Virtual Environments on a single Hardware Node;
- Isolating VE applications;
- Isolating VE users;
- Fine-tuning VE Quality of Service;
- Managing Virtuozzo systems by means of a common web browser;
- Migrating VEs.

We assume that you have already installed and configured Virtuozzo 3.5.1 SP1 on one or two Windows servers, started Virtuozzo Management Console, installed the Virtuozzo license, set VZCC/VZPP to work, and run the demonstration preparation script on the first server.

Note: If VZMC is not running, you can start it by selecting **Programs --> SWsoft --> VZMC Pro --> Virtuozzo Management Console** on the Windows Start menu.

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Creating and Accessing VE

- 1 In the left pane of the VZMC window, expand the **Virtuozzo Management Console** item by clicking on the plus sign beside it, then expand the item corresponding to the name of your Node and select **Virtual Environments** underneath.
- 2 Make sure that all VEs with IDs in the range from 151 to 157 and VE 1 (the Service VE) are displayed in the right pane of the VZMC window. All these VEs but VE 1 have been created by the demonstration script. Now you will have a chance to manually create your own VE.
- 3 Create VE 200:
 - Right-click the **Virtual Environments** item under the name of your Node and select **Create New Virtual Environments** on the context menu.
 - In the table of available sample configurations, select `basic`.

- Set **Number of Virtual Environments** to create to 1.
 - Set **Virtual Environment ID Start From** to 200.
 - Set **Administrative account password** to `test`.
 - Press the **Next** button.
 - In the **IP address** field, press the **Add IP address** icon and set a valid IP address for the new VE, for example, 192.168.20.200 (we will use this address in our examples).
 - Press the **Finish** button.
 - Wait until the **Virtual Environment(s) has been created successfully** message is displayed.
- 4 After the VE has been created, you can access it by the standard Windows Remote Desktop Protocol (RDP):
- Right-click VE 200 and choose **Connect via Remote Desktop**.
 - After connecting, log on to the VE by typing `Administrator` as the user name and `test` as the password in the fields provided.

Note: If your Hardware Node is running a French version of Windows 2003 Server, you should enter `Administrateur` as the user name instead of `Administrator` each time you wish to log in to the VE.

- 5 Explore VE 200:
- Inside the VE window, double-click the **My computer** icon and then the `C:\` drive.
 - Compare its contents (the number of files and their names) with those of the `C:\` drive of the host system. Make sure that they are different, i.e. the VE has its own set of all system files.
- 6 Now you are invited to connect to the VE 200 file system from the host system:
- While you are still in VE 200, check that there is no `hello.txt` file on its `C:\` drive.
 - Start the **Server** service inside the VE by typing `net start server` in the command line.
 - Minimize the RDP window of VE 200.
 - In the host system, select **Start --> Run**.
 - Type `\\192.168.20.200\c$` and press ENTER.
 - Log in to the VE with the `Administrator` user name and the `test` password
 - Create the `hello.txt` file on the `\\192.168.20.200\c$` drive (selecting **New --> Text Document** on the context menu).
 - Maximize the RDP window of VE 200 and make sure that this file appears on the `C:\` disk inside the VE.
- 7 Log off and stop VE 200:
- a Inside the RDP window of VE 200, select **Start --> Log Off**.
 - b In the displayed dialog window, click **Log Off**.
 - c In the left part of the VZMC window, select *Your Node Name* --> **Virtual Environments**, right-click VE 200, and choose **Stop**.

Make sure that the VE is stopped.

Running Multiple VEs Simultaneously

In this section, you will start a number of VEs simultaneously and make sure that each one is running its own set of services.

- 1 In VZMC, select a group of VEs in the range from 151 to 153.
- 2 Right-click on them and choose **Start** on the context menu.
- 3 After the VEs have been started, wait several minutes for the IIS and MSSQL services to start in these VEs.
- 4 Double-click the `Test_Application.html` file from the desktop of the host system.
- 5 In the displayed Internet Explorer window, set the **VE Range** to be from 151 to 153, select the **Auto-update** checkbox, and press the **Refresh** button.
- 6 Make sure that 3 frames (one for each VE) have appeared in the Internet Explorer window and the test ASP application has completed in each of them. This demonstrates that the IIS and MSSQL services operate correctly in each VE.
- 7 Log in to VE 153 via RDP in the following way:
 - Select **Programs -> Accessories -> Communications -> Remote Desktop Connection** on the Windows **Start** menu of the host system.
 - Enter `192.168.20.153` in the **Computer** field.
 - After connecting, log on to the VE using the `Administrator` user name and the `1q` password.
- 8 Stop IIS in VE 153
 - Launch the services management utility in VE 153 by selecting **Start --> Administrative Tools --> Services**.
 - Right-click on the **World Wide Web Publishing** service and choose **Stop**.
- 9 Switch back to the host system context (for example, by pressing ALT+TAB) and make sure that the frame corresponding to VE 153 in the **Test Application IE** window now displays the **Action Canceled** page. This means that the **World Wide Web Publishing** service has been stopped in VE 153 only and nowhere else.
- 10 Close the **Test Application** window.

Applications Isolation Between VEs

Test whether services and applications interfere with other VEs.

- 1 Check the list of installed services in VE 153:
 - In the RDP window of VE 153, launch the **Services Management** application: **Start --> Administrative Tools --> Services**.

- Make sure that inside the VE both the `MSSQLServer` and the `World Wide Web Publishing` services are installed (i.e. exist in the list of services).
- 2 Check the list of installed services in VE 156:
 - Launch VE 156 by choosing **Start** on the VE context menu.
 - Log in to VE 156 via RDP using either of the ways presented in the previous sections.
 - In the VE window, launch **Services Management**.
 - Make sure that the `World Wide Web Publishing` service is installed, but the `MSSQLServer` service is not installed in the VE.
 - 3 Now install the WinRAR application in VE 153 and make sure it works:
 - In VE 153, open **My Computer** and then the `C:\` disk.
 - Launch the `c:\wrar300.exe` file.
 - Follow the installation wizard instructions (the default values will do everywhere).
 - Start WinRAR by selecting **Start --> All Programs --> WinRAR --> WinRAR**.
 - If you wish, check any other VE and make sure that WinRAR has not been installed anywhere else.

Users Isolation Among VEs

Verify that users are created inside of a Virtual Environment.

- 1 Create the `myuser` user inside VE 153:
 - Launch the **Computer Management** application inside VE 153 by selecting **Start --> Administrative Tools --> Computer Management**.
 - In the left console pane, choose **Local Users and Groups --> Users**.
 - Right-click on **Users**, select **New user**.
 - In the **User name** field, enter `myuser`.
 - Press the **Create** button.
 - Press the **Close** button.
 - Make sure that there is the `myuser` user in the right pane of the management console.
- 2 Make sure that the `myuser` user does not exist inside VE 156:
 - In VE 156, issue the `compmgmt.msc` command in the command line.
 - In the left console pane, choose **Local Users and Groups --> Users**.
 - Make sure that there is no `myuser` user in the right pane of the management console.
- 3 Log off and stop VE 156:
 - Inside the RDP window of VE 156, select **Start --> Shut Down --> Log Off Administrator**.
 - In VZMC, right-click VE 156 and select **Stop**.

VE Resource Management

Virtuozzo 3.5.1 SP1 for Windows allows you to differentiate the Quality of Service for separate Virtual Environments by adjusting the following resource characteristics:

- Disk space;
- CPU time share;
- Private memory.

Managing Disk Quota

When defining the disk quota for a VE:

- 1 See how much free space is available on the hard drive of VE 153:
 - Inside the RDP window of VE 153, open **My Computer** and right-click the **C : ** drive.
 - Select **Properties** on the pop-up menu.
 - Make sure that the space used is 70 Mb (the size may slightly differ depending on a version of the Windows 2003 OS template - English, German, etc. - installed on your Node), and the free space is about 130 Mb. The sum of these numbers - 200 Mb - is the disk quota imposed on VE 153. The 70 Mb are taken by stubs. But if you check the size of all the VE files from inside the VE, you will find out that it is far far greater than 70 Mb, because the VE sees all its pointers as real files.
- 2 Change the hard drive space quota for VE 153:
 - Minimize the RDP window.
 - Right-click on VE 153 in the VZMC right pane and select **Properties**.
 - Select the **QoS** tab, choose **Disk Quota**, and double-click **Disk space**.
 - In the **Value** field, enter 307200 in the **Limit** field.
 - Press **OK** twice.
 - Wait while the disk quota for VE 153 is set to 300 Mb.
- 3 See how much free space is now available on the hard drive of VE 153:
 - Maximize the RDP window of VE 153.
 - Open **My Computer** and right-click the **C : ** drive.
 - Select **Properties** on the pop-up menu.
 - Make sure that the space used remains about 70 Mb, and the free space is now about 230 Mb.
- 4 Log off and stop VE 153:
 - Inside the RDP window of VE 153, select **Start --> Shut Down --> Log Off Administrator**.
 - In VZMC, right-click VE 153 and select **Stop**.

Managing CPU Usage Quota

This section will use the standard Windows Performance Monitor application and a sample CPU Utilization Test utility to show you how the CPU usage shares are distinguished among VEs.

Note: The utility has been written in order to be performed on one-processor machines only. So, if you have more than one processor installed on your system, the exercise below might prove irrelevant.

- 1 Set the current CPU quotas for VE 151 and VE 152:
 - For each of these VEs, choose **Properties** on their respective context menus in the right pane of VZMC, go to the **QoS** tab and double-click **CPU Parameters**.
 - Double-click **CPU Units** and set the **CPU Units** value to 1000 for VE 151 and to 2000 for VE 152, then press **OK**. VE 152 is now allowed to receive twice as much the CPU time as VE 151.
- 2 Add CPU usage counters:
 - Run the **Performance Monitor** in the host system: select **Start --> Run**, type `perfmon`, and press **Enter**.
 - Delete the existing counters if any (click on each counter and press **Delete**).
 - Right-click in the right pane of the console and select **Add Counters** on the context menu.
 - From the **Performance Object** list, choose **Virtuozzo**.
 - In the **Select counters from list** field, select **VE - % Processor Time**.
 - Under the **Select instances from list** group, select VE 151 and VE 152.
 - Click **Add**.
 - Click **Close**.
 - In the toolbar, choose **View Histogram**.
 - On the context menu (right-click in the right pane of the console), choose **Properties --> Graph**. Set the **Maximum** field to 60.
 - On the same context menu, choose **Properties --> General**. Set **Report and Histogram Data** to **Average**.
 - In the toolbar, choose **Clear Display**.
- 3 Run the CPU test application and make sure that the test finishes successfully:
 - Launch the **CPU Utilization Test** utility from the host system desktop.
 - Wait for a while until the diagrams in the **Performance Monitor** are settled.
 - Look at the diagrams and make sure that VE 152 consumes approximately two times greater CPU resources than VE 151 (inasmuch as its CPU units quota is two times larger than that of VE 151). It may be not exactly two times due to a short time span between the corresponding launches of the utility for the two VEs.
 - In the **CPU Limits Test - VE 151** and **CPU Limits Test - VE 152** consoles that were launched by the **CPU Utilization Test** utility, you can see the number of fetches made to each VE in 30 seconds. Make sure that the number of successful fetches (**HTTP Response Codes**, code 200) to VE 152 is two times greater than that to VE 151.

- Close the CPU Limits Test - VE 151/152 windows (press any key in each of them).

Managing Virtual Memory Quota

In this section you will see how resource settings define the allocation of memory for every single VE.

- 1 Check the current quota for VE 151:
 - Select the **Virtual Environments** item in the left pane of VZMC.
 - On the VE 151 context menu, choose **Properties --> QoS** and double-click **Primary UBC Parameters**.
 - Double-click **VE memory**. Make sure that 0 is shown in the **Value** field of the displayed window, i.e. no quota is set.
 - Press the **Cancel** button twice.
- 2 Add the virtual memory counter to the **Windows Performance Monitor**:
 - If the **Performance Monitor** is not running in the host system, run it: select **Start --> Run**, type `perfmon`, and press **Enter**.
 - Delete the existing counters if any (click on each counter and press **Delete**).
 - Right-click in the right pane of the console and select **Add Counters** on the context menu.
 - From the **Performance Object** list, choose **Virtuozzo**.
 - In the **Select counters from list** field, select **VE - Memory Usage (bytes)**.
 - Under the **Select instances from list** group, select **VE 151**.
 - Click **Add**.
 - Click **Close**.
 - In the toolbar, choose **View Graph**.
 - Right-click in the right pane of the console and choose **Properties** on the context menu. Go to the **Graph** tab, set the **Maximum** field to 200.
 - Now go to the **General** tab and select the **Current** option under the **Report and Histogram Data** group.
 - Click **OK**.
 - In the toolbar, choose **Clear Display**.
 - Mark the value of the virtual memory consumed by VE 151 (it can approximately lie in the range from 60 Mb for the English version of Virtuozzo to 90 Mb for the Japanese version of Virtuozzo).
- 3 Run a virtual memory test and make sure that this test finishes successfully:
 - Launch **Virtual Memory Limits Demo Page** from the host system desktop (add the IP address of VE 151 to **Trusted site**, if needed, during the opening).
 - On the displayed web page, press **Allocate**.
 - Make sure that the application was able to allocate 80 Mb of memory as indicated in the **Allocate Total** field. In the case of successful memory allocation, the **OK** string should be displayed opposite every allocation operation performed.

- Also use the **Performance Monitor** diagram to make sure that the virtual memory was allocated.
 - Close Internet Explorer.
- 4** Set a new virtual memory quota for VE 151:
- Select the **Virtual Environments** item in the left pane of VZMC.
 - On the VE 151 context menu, choose **Properties --> QoS** and double-click **Primary UBC Parameters**.
 - Double-click **VE memory** and clear the **No limit** checkbox. In the **Value** field, specify the memory limit for VE 151. To set the limit, increase the amount of virtual memory that VE 151 consumed before running **Virtual Memory Limits Demo Page** by 30-40 Mb. For example, the virtual memory limit for VE 151 in the English version of Virtuozzo should be set to about 90-100 Mb or to about 120-130 Mb in the Japanese version of Virtuozzo.
 - Press the **OK** button twice.
 - Wait until the new quota is set.
- 5** Run the virtual memory test again and make sure that this test finishes successfully:
- Maximize the **Performance Monitor** again and choose **Clear Display** in its toolbar.
 - Launch **Virtual Memory Limits Demo Page** from the host system desktop.
 - On the displayed web page, press **Allocate**.
 - Make sure that the application was now unable to allocate 80 Mb of memory. In the case of the memory allocation failure, you will see a number of the **Failed** strings opposite allocation operations performed. Other VE processes also consume some virtual memory, so the memory the demo application is really able to allocate is less than 80 Mb.
 - Also use the **Performance Monitor** diagram to make sure that no more than the specified amount of virtual memory was allocated for all the processes inside VE 151 (as is seen in the **Maximum** field under the diagram).
 - Close Internet Explorer.

Virtuozzo Control Center

This section introduces a web interface for managing all the VEs on the given Hardware Node. You can use any computer with an Internet browser for logging in to VZCC. The browser establishes a secure connection to the Service VE on the Hardware Node and lets you perform various administrative operations. It goes without saying that you can launch the browser on the Hardware Node itself, though it is not by any means necessary. 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.

1 Log in to VZCC:

- Launch Internet Explorer or another browser and enter `https://<Service_VE_IP_address>:4643` into the address line. The `<Service_VE_IP_address>` stands for the IP address that was automatically assigned to the Service VE during the Virtuozzo express installation or that you have manually provided in the **Virtuozzo for Windows Configuration** wizard during the Service VE creation.
- If the Security alert window appears, press Yes.
- Add the Service VE to the list of trusted sites, if needed (select **Add to trusted sites** in the warning displayed, then press **Add** and **Ok**).
- When the VZCC login page has loaded, you should provide `vzagent0` as the user name and the password that was also entered either before running the **Virtuozzo Express Configuration** wizard or in the **Virtuozzo for Windows Configuration** wizard during the Service VE creation depending on the Virtuozzo installation type you chose.
- Press **Login** to log in to Virtuozzo Control Center of the given Node.

2 Create a new VE:

- In Virtuozzo Control Center, click on the **New VE** icon to open the **Create New VE** window.
- In the **Select VE configuration** field of the **Configuration** group, select `basic` on the drop-down menu.
- In the **OS template** field of the **Configuration** group, select `w2k3` on the drop-down menu.
- In the **IP Address** field of the **Network** group, type the IP address that you wish to assign to the new VE.
- In the **Hostname** field of the **Network** group, enter `VE300`.
- In the **Administrator password** field of the **Password** group, type `test` and then `test` once more in the **Retype password** field.
- Press the **Next** button and then the **Create** button. Wait until the VE is created.

- 3 Start the created VE as a customer and establish a terminal connection to the VE:
 - Select the checkbox opposite VE 300 and click on the **Start** icon.
 - Wait until the VE is started.
 - In the **Hostname** column, click on VE 300.
 - Under the **General** tab, click the **Remote Desktop Connection** icon.
 - On the **Remote Desktop** page, press the **Login** button. The terminal client window is displayed.
 - Log in to the VE from the terminal client window by entering `Administrator` as the username and `test` as the password.
- 4 Log out of VZCC:
 - Log off from the VE terminal connection and press the **Sign out** icon in the left panel of Virtuozzo Control Center.

Virtuozzo Power Panels

In this section you will learn to manage an individual VE in VZPP (Virtuozzo Power Panels) by means of any standard Web browser. The browser establishes a secure connection to the necessary VE on the Hardware Node and lets you perform various administrative operations. It goes without saying that you can launch the browser on the Hardware Node itself, though it is not by any means necessary. 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.

- 1 Log in to VZPP:
 - Launch the new Internet Explorer window and enter `https://<VE_IP_address>:4643` into the address line. The `<VE_IP_address>` stands for the IP address you have assigned to VE 300.
 - When the VZPP login page has loaded, you should enter `Administrator` as the user name and `test` as the password in the fields provided.
 - Press **Login** to log in to Virtuozzo Power Panels of the given Node.
- 2 Start, stop, and restart the created VE:
 - In Virtuozzo Power Panels, click on the **Start/Stop VE** link on the VZPP main menu in the left part of the window to open the **Start/Stop VE** page.
 - On the **Start/Stop VE** page, press the **Start VE** button to start the VE, if it is not started already.
 - Click on the **Start/Stop VE** link again to make sure that the VE is running, and the **Stop VE** and **Restart VE** buttons are available only.
 - On the **Start/Stop VE** page, press the **Restart VE** button to restart the VE.

- Click on the **Status Changes** link on the VZPP main menu.
 - On the **Status Changes** page in the **Status Obtained** column, check three last entries proving that the VE status has changed from **stopping** thru **starting** to **running**.
 - Click on the **Start/Stop VE** link once more and then press the **Stop VE** button to stop the VE.
 - Click on the **Start/Stop VE** link to make sure that only the **Start VE** button is available on the **Start/Stop VE** page.
- 3** Change the Administrator password:
- Click on the **Change Password** link to open the **Change Administrator Password** page.
 - In the **Password** field, type `test_change` and then `test_change` once more in the **Retype password** field.
 - Press the **Change** button.
 - Click on the **Sign Out** link on the menu in the left part of the window to log out of VZPP.
 - Enter `Administrator` as the user name and `test` as the password.
 - Make sure that the password is incorrect.
 - Enter `Administrator` as the user name and `test_change` as the password to log in to VZPP.

Migrating VE

If you have set up Virtuozzo on two computers, try migrating a running VE from the first to the second Node.

- 1** Start VE 157:
- In the VZMC right pane, right-click on VE 157 and select **Start**.
 - Launch **Test Application** from the host system desktop.
 - Set **VE Range** to include only VE 157, i.e. to be from 157 to 157.
 - Select the **Auto-update** checkbox.
 - Press the **Refresh** button.
 - Make sure that the frame with an SQL table appears, which means that the MSSQL service is running inside VE 157.
- 2** Migrate VE 157 to the second Node:
- Make sure you are registered and connected to the Node you wish to migrate the VE to.
 - On the source Node, right-click on VE 157 and select **Tasks --> Migrate to another Hardware Node** on the context menu.
 - Select the name of the second Hardware Node and press the **Migrate** button. Wait until the migration completes.
 - Make sure that VE 157 with the same IP address exists on the second Node and is running. Ascertain that the MSSQL service is running inside the migrated VE.

Glossary

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

Hardware Node (or *Node*) is a computer where *Virtuozzo* is installed for hosting *Virtual Environments*. Sometimes, it is marked as *VE 0*.

HN is an abbreviation of *Hardware Node*.

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

OS template (or *Operating System template*) is used to create new *Virtual Environments*. See also *Template*.

Package set is a synonym for *Template*.

Private area is a part of the file system where *VE* files that are not shared with other *Virtual Environments* are stored.

Service Virtual Environment is a special secure *VE* running *VZAgent* which is responsible for managing all the *Virtual Environments* of the given *Hardware Node*. You should use the IP address of the Service *VE* to connect to a *Hardware Node* by means of *VZMC* or *VZCC*. The Service *VE* is always marked as *Virtual Environment 1*.

Service VE is an abbreviation of *Service Virtual Environment*.

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.

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 files and registry settings installed on the *Host OS* in such a way as to be usable by any *VE* by mounting over *Virtuozzo File System*. There are two types of templates. *OS Templates* are used to create new *Virtual Environments*. *Application templates* are used to install an application or a set of applications in *Virtual Environments*.

Virtual Environment 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 Environments* share one *Hardware Node* and one OS kernel. However, they are isolated from each other. A *Virtual Environment* is a kind of 'sandbox' for processes and users. *Virtual Environment 0* is used to designate the *Hardware Node* itself.

Virtual Private Server or *VPS* is an obsolete designation of a *Virtual Environment*. See *Virtual Environment*.

Virtuozzo is a complete server automation and virtualization solution allowing you to create multiple isolated *Virtual Environments* on a single physical server to share hardware, licenses, and management effort with maximum efficiency.

Virtuozzo Control Center is a tool designed for managing a particular *Hardware Node* and all *Virtual Environments* 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 VE private areas. VZFS links are seen as real files inside *Virtual Environments*.

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 Environments*.

Virtuozzo Power Panels is a means for administering personal *Virtual Environments* with the help of a standard Web browser (Internet Explorer, Mozilla, etc.) on any platform.

VE is an abbreviation of *Virtual Environment*.

VE 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 Environments* 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 VE*. 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 loaded to the *Hardware Node* and 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 installed on each computer where *Virtuozzo Management Console* is to be run and 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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