



Community Experience Distilled

# Getting Started with Red Hat Enterprise Virtualization

Leverage powerful Red Hat Enterprise Virtualization solutions to build your own IaaS cloud

**Pradeep Subramanian**

**[PACKT]** open source\*  
PUBLISHING community experience distilled

# Getting Started with Red Hat Enterprise Virtualization

Leverage powerful Red Hat Enterprise Virtualization solutions to build your own IaaS cloud

**Pradeep Subramanian**



BIRMINGHAM - MUMBAI

# Getting Started with Red Hat Enterprise Virtualization

Copyright © 2014 Packt Publishing

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, without the prior written permission of the publisher, except in the case of brief quotations embedded in critical articles or reviews.

Every effort has been made in the preparation of this book to ensure the accuracy of the information presented. However, the information contained in this book is sold without warranty, either express or implied. Neither the authors, nor Packt Publishing, and its dealers and distributors will be held liable for any damages caused or alleged to be caused directly or indirectly by this book.

Packt Publishing has endeavored to provide trademark information about all of the companies and products mentioned in this book by the appropriate use of capitals. However, Packt Publishing cannot guarantee the accuracy of this information.

First published: September 2014

Production reference: 1190914

Published by Packt Publishing Ltd.  
Livery Place  
35 Livery Street  
Birmingham B3 2PB, UK.

ISBN 978-1-78216-740-2

[www.packtpub.com](http://www.packtpub.com)

# Credits

**Author**

Pradeep Subramanian

**Reviewers**

Kyung Huh

René Koch

Anil Vettathu

Marcus Young

**Commissioning Editor**

Greg Wild

**Acquisition Editor**

Greg Wild

**Content Development Editor**

Athira Laji

**Technical Editors**

Shweta S. Pant

Humera Shaikh

**Copy Editors**

Mradula Hegde

Gladson Monteiro

Insiya Morbiwala

Aditya Nair

Adithi Shetty

Stuti Srivastava

**Project Coordinator**

Harshal Ved

**Proofreader**

Simran Bhogal

**Indexer**

Mariammal Chettiyar

**Production Coordinator**

Arvindkumar Gupta

**Cover Work**

Arvindkumar Gupta

# About the Author

**Pradeep Subramanian** is a Senior Platform Consultant at Red Hat, a global provider of open source software solutions that uses a community-powered approach to develop and offer operating system, middleware, virtualization, storage, and cloud technologies. He has 10 years of experience in open source and Linux, which includes 5 years of extensive experience in open source virtualization technologies such as Xen, KVM, and Red Hat Enterprise Virtualization. His other areas of interest include high availability and grid computing, performance tuning, designing and building open hybrid cloud, architectural design, and implementation of Enterprise IT using open source tools. This is his first book.

---

I would like to express my gratitude to many people who saw me through this book. I would like to thank all those who provided their support, talked things over, read, wrote, offered comments, allowed me to quote their remarks, and assisted in the editing, proofreading, and designing of this book.

I owe a huge thanks to my manager, Anirudha Karandikar (Andy), for providing excellent support and advice. Above all, I want to thank my wife, Sandhya; my parents, Subramanian, Selvi, Shanmugam, Usha; and my naughty one-and-a-half-year-old son, Harsh. They all supported and encouraged me in spite of all the time the book took me away from them. It was a long and difficult journey for them. I am dedicating this book to my son, Harsh. I hope that one day, he will read this book and understand why I spent so much time in front of my computer. Last but not least, I beg forgiveness from all those who have been with me over the course of the years and whose names I have failed to mention. Thanks for everything; I look forward to writing the second edition of this book and a few more books on Open Cloud Computing soon!

---

# About the Reviewers

**Kyung Huh** is currently working as a consultant in Korea. He has been working with Linux and open source software for more than 15 years as an instructor and consultant. He has experience in Red Hat Enterprise Virtualization in many production environments and also has experience in open source software such as clustering, performance tuning, and troubleshooting.

**René Koch** is a senior solution architect and consultant, focusing on open source virtualization, Linux, system management, and system monitoring. He started working with Red Hat Enterprise Virtualization and oVirt in 2010 and implemented various environments on the customer side. As part of the oVirt community, he is not only an active member on the oVirt mailing list, but also gives lectures about Red Hat Enterprise Virtualization and oVirt in Austria and Germany. Furthermore, he is the author of two open source projects: the Nagios plugin `check_rhev3` – which is used to monitor the whole RHEV environment with Nagios and Icinga – and Monitoring UI-Plugin – which is a user interface plugin for Red Hat Enterprise Virtualization and oVirt that integrates Nagios-based monitoring environments into the RHEV WebAdmin portal.

**Anil Vettathu** started his interaction with Linux in college. He started his career in 2006 as a Linux System Administrator. He has specialized in Open Source Virtualization technologies, especially KVM. He had the opportunity to work on RHEV from its very early versions. Currently, he is working as a TAM for Red Hat.

**Marcus Young** recently graduated with a degree in Computer Science and Mathematics before getting involved in system administration and DevOps. He currently works in software automation using open source tools and Red-Hat-flavored operating systems in RHEV and AWS virtualization environments. His hobbies include playing ice hockey and making homebrewed beer. He has also developed many hardware projects based on devices such as Arduino, Raspberry Pi, UDOO, and others.

---

I'd like to thank my beautiful fiancé for putting up with many of my projects and work items that make their way into my free time. I would also like to thank my newborn son who will continue to inspire me to keep pushing myself.

---

# www.PacktPub.com

## Support files, eBooks, discount offers, and more

You might want to visit [www.PacktPub.com](http://www.PacktPub.com) for support files and downloads related to your book.

Did you know that Packt offers eBook versions of every book published, with PDF and ePub files available? You can upgrade to the eBook version at [www.PacktPub.com](http://www.PacktPub.com) and as a print book customer, you are entitled to a discount on the eBook copy. Get in touch with us at [service@packtpub.com](mailto:service@packtpub.com) for more details.

At [www.PacktPub.com](http://www.PacktPub.com), you can also read a collection of free technical articles, sign up for a range of free newsletters and receive exclusive discounts and offers on Packt books and eBooks.



<http://PacktLib.PacktPub.com>

Do you need instant solutions to your IT questions? PacktLib is Packt's online digital book library. Here, you can access, read and search across Packt's entire library of books.

## Why subscribe?

- Fully searchable across every book published by Packt
- Copy and paste, print and bookmark content
- On demand and accessible via web browser

## Free access for Packt account holders

If you have an account with Packt at [www.PacktPub.com](http://www.PacktPub.com), you can use this to access PacktLib today and view nine entirely free books. Simply use your login credentials for immediate access.





# Table of Contents

<b>Preface</b>	<b>1</b>
<b>Chapter 1: An Overview of Red Hat Enterprise Virtualization</b>	<b>7</b>
The virtualization overview	7
Kernel-based Virtual Machine (KVM)	8
Features of RHEV	9
Supported virtual machine operating systems	10
RHEV architecture	10
Components of RHEV	11
The hardware and software requirement of RHEV	12
Red Hat Enterprise Virtualization Manager	12
The Red Hat Enterprise Virtualization Hypervisor host	13
The Red Hat Enterprise Virtualization Manager client	14
Firewall Requirements	15
Summary	18
<b>Chapter 2: Installing RHEV Manager and Hypervisor Hosts</b>	<b>19</b>
Environment mapping	19
Setting up the RHEL operating system for the manager	20
Registering with Red Hat Network	20
Installing the RHEV-Manager packages	22
Running the initial engine setup	23
Connecting to the admin and user portal 006C	26
RHEV reporting	27
Installing the RHEV history database and report server	27
Accessing the RHEV report portal	28
Deploying RHEV Hypervisor	29
Installing the hypervisor	29
Configuring the hypervisor	33
Summary	37

<b>Chapter 3: Setting Up the RHEV Virtual Infrastructure</b>	<b>39</b>
<b>Configuring RHEV</b>	<b>40</b>
Data centers	41
Clusters	43
<b>Approving hypervisor hosts</b>	<b>45</b>
<b>Logical networks</b>	<b>47</b>
Adding logical networks	48
<b>Storage domains</b>	<b>51</b>
Adding a data domain to store virtual machines	52
Adding a data domain of other storage types	54
Activating the ISO domain	54
Populate ISO images on an ISO domain	55
Configuring and activating an export domain	56
<b>Summary</b>	<b>57</b>
<b>Chapter 4: Creating and Managing Virtual Machines</b>	<b>59</b>
<b>Virtual machines</b>	<b>60</b>
Creating Linux virtual machines	60
General settings	60
System settings	63
Initial Run settings	63
Console settings	64
Host settings	65
High Availability settings	67
Resource Allocation settings	68
Boot Options settings	69
Custom Properties	70
Adding virtual disks	70
Installing Red Hat Enterprise Linux on a virtual machine	72
Installing guest agents and drivers on RHEL guests	74
<b>Creating Windows virtual machines</b>	<b>76</b>
Installing VirtIO drivers during the Windows installation	77
Guest agents and driver installation on Windows guests	78
<b>Virtual machine templates</b>	<b>80</b>
Creating a Red Hat Enterprise Linux template	80
Cloning a RHEL virtual machine from a template	82
Creating a Windows template	83
<b>Virtual machine snapshots</b>	<b>85</b>
Creating snapshots	85
Restoring virtual machines from the snapshot	85
Creating a virtual machine from the snapshot	86
Deleting a virtual machine snapshot	86
Backing up virtual machines to export disks	87

---

Exporting a virtual machine and template	87
Importing a virtual machine and template	88
<b>Summary</b>	<b>90</b>
<b>Chapter 5: Virtual Machine and Host High Availability</b>	<b>91</b>
<b>Virtual machine's live migration</b>	<b>91</b>
Advantages of live migration	92
The requirements of live migration	92
Manual live migration	93
Cold migration	94
Cancelling migration	94
<b>Virtual machine's high availability</b>	<b>94</b>
Automatic virtual machine migration	96
The migration priority	96
Disabling the automatic virtual machine migration	97
The host's high availability	98
Manual fencing	99
<b>Cluster policies</b>	<b>100</b>
The resilience policy	100
The cluster policy	100
<b>Summary</b>	<b>102</b>
<b>Chapter 6: Advanced Storage and Networking Features</b>	<b>103</b>
<b>Shareable disks</b>	<b>104</b>
<b>Direct LUN mapping</b>	<b>106</b>
<b>Virtual disk resize</b>	<b>109</b>
<b>Storage live migration</b>	<b>110</b>
<b>VNIC QoS</b>	<b>111</b>
<b>Hot plugging devices</b>	<b>114</b>
Hot plugging and removing virtual hard disks	114
Hot plugging in VNIC	115
Hot plugging virtual CPU	115
<b>Summary</b>	<b>116</b>
<b>Chapter 7: Quota and User Management</b>	<b>117</b>
<b>An overview of user management</b>	<b>117</b>
Adding the IdM domain to RHEV Manager	119
Validating and listing added domains	120
Adding directory users	120
Authorizing users and assigning roles	122
Creating a new role	124

<b>Introduction to Quota</b>	<b>125</b>
Enabling Quota	125
Creating the Quota policy	126
Assigning Quota to virtual machine objects	128
Assigning Quota to limit resources by users	129
<b>Summary</b>	<b>130</b>
<b>Chapter 8: Managing a Virtualization Environment from the Command Line</b>	<b>131</b>
<b>Introduction to the CLI</b>	<b>131</b>
Installing and setting up CLI	132
<b>Basic command-line examples</b>	<b>134</b>
Running Linux commands in a shell	136
Listing resources from the command-line shell	137
Creating and editing a virtual machine	137
<b>Summary</b>	<b>138</b>
<b>Chapter 9: Troubleshooting RHEV</b>	<b>139</b>
<b>RHEV Manager logs</b>	<b>139</b>
<b>RHEV Hypervisor hosts' logs</b>	<b>141</b>
<b>Guest agent and SPICE logs</b>	<b>142</b>
<b>The log collector utility</b>	<b>142</b>
<b>Maintaining an RHEV environment</b>	<b>143</b>
The stop procedure	143
The start procedure	143
<b>Summary</b>	<b>144</b>
<b>Chapter 10: Setting Up iSCSI, NFS, and IdM Directory Services for RHEV</b>	<b>145</b>
<b>Setting up iSCSI for the data domain</b>	<b>146</b>
<b>Setting up NFS for the export domain</b>	<b>148</b>
<b>Installing and configuring Red Hat IdM</b>	<b>149</b>
Adding users from CLI	153
<b>Summary</b>	<b>154</b>
<b>Index</b>	<b>155</b>

---

# Preface

Red Hat Enterprise Virtualization (RHEV), which is a complete enterprise virtualization management solution for servers and desktops, provides fully integrated management of your virtual infrastructures. RHEV is based on and built using two open source projects: Kernel Virtual Machine (KVM), which is open source software that comes with all standard Linux distributions, and oVirt. Based on the popular oVirt open virtualization management project, Red Hat Enterprise Virtualization positions itself as a strategic virtualization alternative to proprietary virtualization platforms with performance advantages, competitive pricing, and a trusted and stable environment.

Step-by-step, you'll learn how to build and manage Red Hat Enterprise Virtualization from scratch with various advanced features and troubleshooting steps. You'll also dive deep into the RHEV internal architecture and components.

## What this book covers

*Chapter 1, An Overview of Red Hat Enterprise Virtualization*, gives you a basic introduction to RHEV, its internal architecture and components, and the basic hardware and software prerequisites.

*Chapter 2, Installing RHEV Manager and Hypervisor Hosts*, shows you how to set up and configure the RHEV Manager and access the web-based admin portal, install and configure RHEV's hypervisor hosts, and install and connect to the report portal in order to report scenarios of your virtual infrastructure's resource usage.

*Chapter 3, Setting Up the RHEV Virtual Infrastructure*, shows you how to create a virtual data center and cluster, add the hypervisor host to cluster, configure storage, and perform networking.

*Chapter 4, Creating and Managing Virtual Machines*, shows you how to create virtual machines, templates, derive virtual machines from the template, take live snapshots of virtual machines, and back up and restore of virtual machines using export and import disks.

*Chapter 5, Virtual Machine and Host High Availability*, shows you how to set up the virtual machine host availability, various cluster policies for cluster hosts, and perform live migration of virtual machines.

*Chapter 6, Advanced Storage and Networking Features*, briefs you about various storage disks options, such as sharing disks across virtual machines, direct LUN mapping from the storage, moving virtual machines across different storage domains, shaping the network traffic's VNIC profile for guest operating systems, and hot plugging of network adapter and memory into virtual machines.

*Chapter 7, Quota and User Management*, talks about applying quota to your virtualization infrastructure with user-role-based access control and integration with common directory services.

*Chapter 8, Managing a Virtualization Environment from the Command Line*, shows you how to set up the command-line tools in order to manage your virtualization infrastructure other than the standard RHEV Manager web-based interface.

*Chapter 9, Troubleshooting RHEV*, talks about various logfiles of the RHEV manager and hypervisor hosts and provides you with steps to put your RHEV virtualization infrastructure into maintenance mode for any planned outage.

*Chapter 10, Setting Up iSCSI, NFS, and IdM Directory Services for RHEV*, shows you how to set up your Red Hat Enterprise Linux server as an iSCSI, the NFS storage server for RHEV virtual machine data storage, the ISO library to store ISO, and export the domain to export the virtual machine for backup and restoration, and set up and configure IdM directory services on RHEL to integrate RHEV with the Red Hat IdM directory service for user management.

*Appendix* shows you how to upgrade RHEV environment from Version 3.3 to 3.4. This chapter is available as a bonus chapter and can be downloaded from [https://www.packtpub.com/sites/default/files/downloads/74020S\\_Appendix.pdf](https://www.packtpub.com/sites/default/files/downloads/74020S_Appendix.pdf).

## What you need for this book

To set up a demo environment for this book, you need a valid Red Hat account to access the Red Hat software and support portal or, optionally, an evaluation version of RHEV:

- <https://access.redhat.com/downloads/>
- <https://access.redhat.com/products/red-hat-enterprise-virtualization#evaluations>

Please note that the current RHEV GA release is 3.4, but the book is based on a 3.3 release. So if you access the preceding evaluation link, it will direct you to 3.4. Please create an evaluation account, log in to <https://access.redhat.com/downloads/>, and choose the RHEV Manager channel `rhel-x86_64-server-6-rhev-3.3` for the manager deployment.

You will also need the following set of hardware and software in order to run the examples in this book.

## Red Hat Enterprise Virtualization Manager 3.3

The following are the hardware and software requirements of the Red Hat Enterprise Virtualization manager 3.3:

- **Hardware:** The commodity's physical hardware or virtual machine
- **Operating system:** Red Hat Enterprise Linux 6 Update 5
- **Software channels:**
  - `rhel-x86_64-server-6-rhev-3.3`
  - `rhel-x86_64-server-supplementary-6 -c`
  - `jbappplatform-6-x86_64-server-6-rpm`

## The Red Hat Enterprise Virtualization Hypervisor host

The following are the hardware and software requirements of the Red Hat Enterprise Virtualization Hypervisor host:

- **Hardware:** Commodity virtualization-enabled physical hardware supports Red Hat Enterprise Linux 6 Update 5
- **Software:** RHEV-H image (for RHEV-M 3.3) — downloadable from <https://access.redhat.com/downloads/>



## Optional requirements

The following are the optional requirements that are needed to run the examples in this book:

- Red Hat IdM Directory Service:
  - **Hardware:** The commodity physical hardware or virtual machine that acts as a directory server
  - **Operating System:** Red Hat Enterprise Linux 6 Update 5
  - **Software:** Identity management (ships by default)
- ISCSI / NFS storage service:
  - **Hardware:** The commodity physical hardware or virtual machine that acts as a storage
  - **Operating system:** Red Hat Enterprise Linux 6 Update 5
  - **Software:** NFS/iSCSI-related package ships with default operating systems

## Who this book is for

If you are a system administrator who is interested in implementing and managing open source virtualization infrastructures, this is the book for you. You need a basic knowledge of virtualization and its use cases and some very basic Linux command-line work experience.

## Conventions


In this book, you will find a number of styles of text that distinguish between different kinds of information. Here are some examples of these styles, and an explanation of their meaning.


Code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles are shown as follows: "This command will switch off SELinux enforcement temporarily until the machine is rebooted. If you would like to permanently disable it, edit `/etc/sysconfig/selinux` and enter `SELINUX=disabled`."

Any command-line input or output is written as follows:

```
# rhn-channel -a -c rhel-x86_64-server-6-rhev-3.3 -c rhel-x86_64-server-  
supplementary-6 -c jbpplatform-6-x86_64-server-6-rpm  
Username: "yourrhlogin"  
Password: XXXX
```

**New terms** and **important words** are shown in bold. Words that you see on the screen, in menus or dialog boxes for example, appear in the text like this: "Finally, label the ISO domain with a name that will be unique and easily identifiable on the **Storage** tab of the administration portal".

[  Warnings or important notes appear in a box like this. ]

[  Tips and tricks appear like this. ]

## Reader feedback

Feedback from our readers is always welcome. Let us know what you think about this book – what you liked or may have disliked. Reader feedback is important for us to develop titles that you really get the most out of.

To send us general feedback, simply send an e-mail to [feedback@packtpub.com](mailto:feedback@packtpub.com), and mention the book title via the subject of your message.

If there is a topic that you have expertise in and you are interested in either writing or contributing to a book, see our author guide on [www.packtpub.com/authors](http://www.packtpub.com/authors).

## Customer support

Now that you are the proud owner of a Packt book, we have a number of things to help you to get the most from your purchase.